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Appendix 3.5-33

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(Note: As part of an August 2000 EIR update, additional antimony, beryllium, cadmium, chromium, lead, nickel, and silver data were added to the waste rock master and high sulfur composites (WD-05, -06, -07, -08, -09, -10, -11, and -12). The added data is in bold italics.)

Appendix 3.5-33 Table 1.
Test Methods, and Sampling and Analysis Schedule.

Appendix 3.5-33 Table 1

Test Methods, Sampling and Analysis Schedule

A. ABA Testing

1. The following parameters will be determined on each selected sample using the modified USEPA Method (Sobek, et al., 1978):

   Paste pH (performed on a powdered sample)
   Total sulfur (by furnace)
   Sulfide sulfur
   Neutralization potential titration

B. Waste Rock Composites (composites WD-05 through WD-12)

1. Columns containing waste rock composites have been reacted with deionized (DI) water which has been applied to the composites under alternating cycles of wet and dry conditions. The columns consist of 30-gallon cylindrical polyethylene columns. The samples were supported in the columns so that they are free draining. Leachate that formed from the reaction between each waste rock composite and DI water was collected at the end of each wet/dry cycle (approximately once per week). The following parameters were analyzed or measured in each leachate sample collected:

   pH
   Specific electrical conductivity
   Temperature
   Alkalinity/acidity
   Volume of leachate collected

2. In addition, leachate samples collected on an approximate geometric time scale (ie. at the end of cycles 1, 2, 4, etc.) have been digested, without filtering, and analyzed for the following parameters:

Aluminum	Gallium	Silver
Antimony	Germanium	Sodium
Arsenic	Iron	Sulfate
Barium	Lead	Tellurium
Beryllium	Magnesium	Thallium
Bismuth	Manganese	Tin
Cadmium	Mercury	Titanium
Calcium	Molybdenum	Uranium
Chromium	Nickel	Zinc
Cobalt	Potassium	
Copper	Selenium	

Table 3.5-33 Table 1, continued

3. Leaching, sampling and analysis for the parameters listed above continued, as necessary, through cycles 32, 64, etc., until the analytical results indicated that a constant rate of leaching had been achieved. The sampling cycles were adjusted based upon the results of the parameters listed in above B.1., and to collect additional samples.

4. Previously collected data from this project, and experience with similar materials, has suggested that many of the listed parameters would not be detected in the leachate samples. Given this fact, if a parameter was not detected after three rounds of analyses, further analysis for that particular parameter was terminated. In addition, if a previously detected parameter was no longer detected in two consecutive analyses, further analysis for that parameter was also terminated.

C. TMA Tailings Composites (composites RS-18 and RS-13)

1. Two columns, one of which contained a fine tailings composite RS-18), and another which contained a coarse tailings composite (RS-13) been reacted with residual process waters which was applied to the tailings columns under ponded (saturated) conditions. The columns were formed from modified 30-gallon cylindrical polyethylene columns. Residual process water (leachate) that had reacted with the tailings composites was collected at two widely spaced times. The following parameters were analyzed or measured in each leachate sample collected:

   pH
   Specific electrical conductivity
   Temperature
   Alkalinity/acidity
   Volume of leachate collected

2. In addition, these samples were digested, without filtering, and analyzed for the following parameters:

Aluminum	Cyanide	Selenium
Antimony	Gallium	Silver
Arsenic	Germanium	Sodium
Barium	Iron	Sulfate
Beryllium	Lead	Tellurium
Bismuth	Magnesium	Thallium
Cadmium	Manganese	Tin
Calcium	Mercury	Titanium
Chromium	Molybdenum	Uranium
Cobalt	Nickel	Zinc
Copper	Potassium	

3. Following the collection of the second ponded leachate sample, the columns were drained. From that time on the composites were reacted with DI water applied under alternating wet and dry conditions. Leachate that formed from the reaction between

the tailings and water was collected at the end of each wet/dry cycle (approximately once per week) and analyzed for the parameters listed in C.1., above. In addition, leachate samples collected on an approximate geometric time scale (ie. at the end of cycles 1, 2, 4, etc.) were digested, without filtering, and analyzed for the parameters listed above in C.2.

4. Leaching, sampling and analysis for the parameters listed above continued, as necessary, through wet/dry cycles 32, 64, etc. until the analytical results indicate that a constant rate of leaching had been achieved. The sampling cycles were adjusted based upon the results of the parameters listed above in C.1., and to collect additional samples.

5. Previously collected data from this project, and experience with similar materials, has suggested that many of the listed parameters would not be detected in the leachate samples. Given this fact, if a parameter was not detected after three rounds of analyses, further analysis for that particular parameter was terminated. In addition, if a previously detected parameter was no longer detected in two consecutive analyses, further analysis for that parameter was also terminated.

D. TMA Tailings Neutralization Potential (composites WD-13 and WD-14)

1. Two columns containing a composite of whole tailings and a lime amended whole tailings composite were prepared. The materials were each placed in modified 30-gallon cylindrical polyethylene columns such that they are freely draining. The composites were reacted once with residual process water after which they were reacted with DI water. Leachate that formed from the reaction between the each composite and water was collected at the end of each wet/dry cycle (approximately once per week). The following parameters were analyzed or measured in each leachate sample collected:

   pH
   Specific electrical conductivity
   Temperature
   Alkalinity/acidity
   Volume of leachate collected

2. In addition, leachate samples were collected on an approximate geometric time scale (ie. at the end of cycles 1, 2, 4, etc.). Each sample was digested, without filtering, and analyzed for the following parameters:

Aluminum	Cyanide	Selenium
Antimony	Gallium	Silver
Arsenic	Germanium	Sodium
Barium	Iron	Sulfate
Beryllium	Lead	Tellurium
Bismuth	Magnesium	Thallium
Cadmium	Manganese	Tin

Table 3.5-33 Table 1, continued

Calcium	Mercury	Titanium
Chromium	Molybdenum	Uranium
Cobalt	Nickel	Zinc
Copper	Potassium	

3. Leaching, sampling and analysis for the parameters listed above continued, as necessary, through cycles 32, 64, etc. until the analytical results indicated that a constant rate of leaching had been achieved. The sampling cycles were adjusted based upon the results of the parameters listed above in D.1., and to collect additional samples.

4. Previously collected data from this project, and experience with similar materials, has suggested that many of the listed parameters would not be detected in the leachate samples. Given this fact, if a parameter was not detected after three rounds of analyses, further analysis for that particular parameter was terminated. In addition, if a previously detected parameter was no longer detected in two consecutive analyses, further analysis for that parameter was also terminated.

E. Backfill Tailings (composites AL-13, AL-15, AL-16, and AL-17)

1. Four columns containing whole tailings, coarse tailings, broken fragments of cemented whole tailings, and broken fragments of cemented coarse tailings were prepared. The columns were formed from 5-gallon cylindrical polyethylene columns in which the samples were placed so that they could be freely draining. Waters were applied to the samples at two widely spaced times. The first application and leaching was made with residual process water and the second application and leaching was made with site groundwater. Leachate that formed from the reaction between each of the composites and these waters was collected at the end of each wet/dry cycle. The following parameters were analyzed or measured in each leachate sample collected:

   pH
   Specific electrical conductivity
   Temperature
   Alkalinity/acidity
   Volume of leachate collected

2. In addition, leachate samples collected at the end of the two wet/dry cycles were digested, without filtering, and analyzed for the following parameters:

Aluminum	Cyanide	Selenium
Antimony	Gallium	Silver
Arsenic	Germanium	Sodium
Barium	Iron	Sulfate
Beryllium	Lead	Tellurium
Bismuth	Magnesium	Thallium
Cadmium	Manganese	Tin
Calcium	Mercury	Titanium

Table 3.5-33 Table 1, continued

Chromium	Molybdenum	Uranium
Cobalt	Nickel	Zinc
Copper	Potassium	

3. Following the collection of the two wet/dry cycles, the columns were saturated with site groundwater and remained in a saturated condition until the termination of the testing of these composites.

4. Leachate that formed from the reaction between the composites and the site groundwater was collected at the end of each "saturated cycle" (approximately once per week) and analyzed for the parameters listed above in E.1. In addition, samples of leachate collected from each column on an approximate geometric time scale (ie., at the end of "saturated cycle" 1, 2, 4, etc.) and analyzed or measured for the following parameters listed above in E.2.

5. Leaching, sampling and analysis for the parameters listed above continued, as necessary, through saturated cycles 8, 16, 32, etc. until the analytical results indicated that a constant rate of leaching has been achieved. The sampling cycles were adjusted based upon the results of the parameters listed above in E.1, and to collect additional samples.

6. Site groundwater was added to the saturated columns as needed to replace the leachate withdrawn for analysis.

7. Previously collected data from this project, and experience with similar materials, has suggested that many of the listed parameters would not be detected in the saturated leachate samples. Given this fact, if a parameter was not detected after three rounds of analyses of saturated leachate, further analysis for that particular parameter was terminated. In addition, if a previously detected parameter was no longer detected in two consecutive analyses, further analysis for that parameter was also terminated.

Appendix 3.5-33 Table 1a.
Physical Dimensions and Test Conditions of the Composites Used in the Kinetic Tests.

Appendix 3.5-33 Table 1a

Physical Dimensions and Test Conditions of the Composites Used in the Kinetic Tests

1 Waste Rock Composites

A. The Rice Lake and Upper Mole Lake Master Composites were each placed leached in a modified large scale humidity cell formed from a 30-gallon polyethylene column with a conical base which had a spigot at the lowest part of the base. A layer of lead-free fiberglass covered the base of each column. The composites drained freely.

B. The six other waste rock composites were each placed leached in a modified large scale humidity cell formed from a 30-gallon polyethylene cylindrical column which had a spigot in the sidewall of the column at the base. The base of each composite was supported by a porous plexiglass plate covered with lead-free fiberglass above the upper level of the spigot such that the composites drained freely.

C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Column Diameter (cm)	Composite Height Above Plate/Base (cm)
Skunk Lake Master (WD-05)	84.55	45.7	35.6
Rice Lake Master (WD-06)	126.59	45.7	48.3
Upper Mole Lake Master (WD-07)	133.18	45.7	50.8
Lower Mole Lake Master (WD-08)	77.73	45.7	30.5
Skunk Lake High Sulfur (WD-09)	73.64	45.7	26.7
Rice Lake High Sulfur (WD-10)	81.14	45.7	27.9
Upper Mole Lake High Sulfur (WD-11)	78.18	45.7	29.2
Lower Mole Lake High Sulfur (WD-12)	74.32	45.7	26.7

D. Each leaching cycle was one week in length. During the first day of a cycle, the approximate average weekly precipitation for the Crandon area was applied to the composite in the form of a single storm event. The storm precipitation was

applied to the top of the entire composite. During the remaining six days of a cycle, the approximate average weekly precipitation for the Crandon area was applied in 12 equal amounts at about noon and midnight of each day. The day 2-7 precipitation was applied to the top of the composite in the form of a mist. The diameter of the area that received mist precipitation was about one half the diameter of the 30-gallon column. The area that received the mist was reversed 180 degrees every week. All leaching was conducted with deionized (DI) water which was used to simulate rainfall.

E. Humidified air was pumped into the base of each column for two 4-hour periods each day between 4-8 AM and 4-8 PM. The humidified air was applied through two ports which were opposite each other and at right angles to the axis of spray application.

2 TMA Tailings

A. Each of the four TMA tailings composites were placed and are being leached in a modified large scale humidity cell formed from part of a 30-gallon polyethylene cylindrical column which had a spigot in the sidewall of the column at the column base. The base of each composite was supported by a porous plexiglass plate covered with lead-free fiberglass above the level of the spigot such that the composite drained freely when leaching under alternating W/D conditions was desired. Successive ½- to ¾-inch thick layers of coarse and fine, precleaned silica sand separated the tailings composites from the fiberglass layer to minimize the physical loss of the tailings materials during leachate sample collection.

B. The upper surface of each of the composites was dimpled to increase the surface area exposed to oxidation, and to promote drainage of the leaching fluids through the central portion of the materials when leaching under alternating W/D conditions.

C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Column Diameter (cm)	Composite Height Above Base (cm)	Dimple Depth (cm)
Fine Tails[a] (RS-18)	18.2	45.7	8.8	5.0
Whole Tails[a] (RS-13)	22.7	45.7	8.8	7.6
Whole Tails[b] (WD-13)	30.1	45.7	12.7	7.6
Lime Amended Whole Tails[b] (WD-14)	34.8	45.7	15.2	10.1

[a] = leached under saturated, followed by alternating W/D, conditions
[b] = leached under alternating W/D conditions

D. Each leaching W/D cycle was one week in length. During the sixth day of each alternating W/D cycle, two times the average weekly Crandon area precipitation

was applied to the top of each composite. Due to the high moisture retention capacity of these composites, all of the DI water used for the W/D leaching was applied at one time to enhance surface oxidation between applications. Saturated leaching occurred under ponded conditions in which the composites were saturated with, and covered by, process water.

E. The composites were allowed to oxidize naturally between cycles. The spigot beneath the plexiglass plate was left open at all times to permit some oxidation of the materials from the base.

3 Backfill Tailings

A. Each of the four backfill tailings composites were placed and leached in a modified large scale humidity cell formed from a 5-gallon polyethylene column which had a spigot in the sidewall of the column at the column base. The base of each composite is supported by a layered system similar to that used in the TMA tailings humidity cells.

B. The cemented tailings composites consisted primarily of gravel size fragments of cemented tailings. The cemented samples were formed in standard plastic cement molds and cured for 14 days, after which the samples were broken and the resulting fragments were used to charge the appropriate columns.

C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Column Diameter (cm)	Composite Height Above Plate (cm)
Coarse Tails (Al-15)	8.12	27.9	13.2
Cemented Coarse Tails (AL-17)	25.5	27.9	63.6
Whole Tails (AL-13)	7.08	27.9	11.4
Cemented Whole Tails (AL-16)	25.3	27.9	63.6

D. Each leaching cycle was one week in length. The first two leaching cycles consisted of two, widely spaced W/D leachings. The composites were leached with 4.8 L of process water during the first W/D cycle. The composites were leached with 4.8 L of groundwater collected from a well at the Crandon site during the second W/D cycle. Following the collection of the second W/D leachate sample, the composites were saturated with, and continuously covered by groundwater collected from a well at the Crandon site. As seen in Appendix 3.5-35 Tables 30, 37, 44, and 51, the amount of leachate extracted per saturated leaching cycle was much less than that collected during the W/D leachings. Site groundwater was added to each composite after the collection of a sample in order to maintain a continuously saturated condition.

Laboratory Data Base for Leachate Analyses.

Crandon Project Leachate Summary
Skunk Lake Master Waste Rock Composite (WD-05)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/21/94	11/28/94	12/05/94	12/12/94	12/19/94	12/27/94	01/03/95
Alkalinity	mg/L	44	33	33	30	34	27	29	30	31	28	31
Alkalinity, Bicarbonate	mg/L	44	33	33	30	34	27	29	30	31	28	31
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	83	77			44				22.7		
Calcium, total	mg/L	20	19			11				8.5		
Arsenic, total	mg/L	0.013	0.018			0.011				0.016		
Barium, total	mg/L	0.016	0.035			0.009				0.010		
Bismuth	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025			< 0.025				< 0.025		
Iron, total	mg/L	6.8	20			1.6				2.3		
Manganese, total	mg/L	0.51	0.63			0.21				0.18		
Molybdenum, total	mg/L	< 0.020	0.022			< 0.020				0.024		
Selenium, total	mg/L	0.030	0.032			0.020				0.005		
Silver, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Chromium, total	mg/L	< 0.005	0.017			< 0.005				0.005		
Cobalt, total	mg/L	0.009	< 0.010			< 0.010				< 0.010		
Beryllium, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080			< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32			< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24			< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050			< 0.050				< 0.050		
Nickel, total	mg/L	< 0.020	< 0.020			< 0.020				< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050			< 0.050				< 0.050		
Magnesium, total	mg/L	14	19			7.3				5.6		
Potassium, total	mg/L	13.0	10.9			9.2				7.4		
Sodium, total	mg/L	11	8.1			3.1				1.4		
Aluminum, total	mg/L	4.2	12			0.93				1.6		
Cadmium, total	mg/L	< 0.005	< 0.005			0.008				< 0.005		
Copper, total	mg/L	0.29	0.56			0.057				0.080		
Lead, total	mg/L	< 0.040	< 0.040			< 0.040				< 0.040		
Mercury, total	ug/L	< 0.2	< 0.2			< 0.2				< 0.2		
Zinc, total	mg/L	0.11	0.20			0.034				0.041		
Uranium, total	mg/L	< 0.001	< 0.001			< 0.0010				< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Skunk Lake Waste Rock Master Composite (WD-05) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Alkalinity	mg/L	26	26	24	26	23	23	26	29	24	200	20
Alkalinity, Bicarbonate	mg/L	26	26		26	23	23	26	29	24	200	20
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						33					
Calcium, total	mg/L						9.2					
Arsenic, total	mg/L						0.010					
Barium, total	mg/L						< 0.005					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						0.097					
Manganese, total	mg/L						0.17					
Molybdenum, total	mg/L											
Selenium, total	mg/L						0.006					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< ***0.01***					
Cobalt, total	mg/L											
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< ***0.04***					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						5.0					
Potassium, total	mg/L						4.7					
Sodium, total	mg/L						1.1					
Aluminum, total	mg/L						0.068					
Cadmium, total	mg/L						< ***0.005***					
Copper, total	mg/L						0.022					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L											
Zinc, total	mg/L						0.040					
Uranium, total	mg/L											

Skunk Lake Waste Rock Master Composite (WD-05) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
Alkalinity	mg/L	18	16	20	16	14	24	17	20	16	18	*
Alkalinity, Bicarbonate	mg/L	18	16	20	16	14	24	17	20	16	18	18
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L											27
Calcium, total	mg/L											9.5
Arsenic, total	mg/L											0.010
Barium, total	mg/L											< 0.005
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.23
Manganese, total	mg/L											0.10
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.011
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< ***0.01***
Cobalt, total	mg/L											
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											< ***0.04***
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											5.4
Potassium, total	mg/L											2.6
Sodium, total	mg/L											0.90
Aluminum, total	mg/L											0.092
Cadmium, total	mg/L											< ***0.005***
Copper, total	mg/L											0.025
Lead, total	mg/L											***0.037***
Mercury, total	ug/L											
Zinc, total	mg/L											0.046
Uranium, total	mg/L											

Skunk Lake Waste Rock Master Composite (WD-05) Continued

PARAMETER	Units	06/12/95	06/19/95	06/20/95	06/26/95	09/05/95	09/11/95	09/18/95	09/25/95	10/02/95	10/10/95	10/16/95
Alkalinity	mg/L	22	14	14	14	12	12	13	13	14	14	13
Alkalinity, Bicarbonate	mg/L	22	14	14	14	12	12	13	13	14	14	13
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L					23	24	35	68	20	20	39
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Skunk Lake Waste Rock Master Composite (WD-05) Continued

PARAMETER	Units	10/23/95	10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96
Alkalinity	mg/L	11	14	13	17	18	17	16	16	15	14	14
Alkalinity, Bicarbonate	mg/L	11	14	13	17	< 5	< 5	16	16	15	14	14
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	26	19	19	19	19						
Calcium, total	mg/L		8.8			8.6						
Arsenic, total	mg/L		0.0091									
Barium, total	mg/L		< 0.005									
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		0.044									
Manganese, total	mg/L		0.098									
Molybdenum, total	mg/L											
Selenium, total	mg/L		0.011									
Silver, total	mg/L		< ***0.01***									
Chromium, total	mg/L		< 0.005									
Cobalt, total	mg/L											
Beryllium, total	mg/L		< ***0.005***									
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L		< ***0.04***									
Antimony, total	mg/L		< ***0.06***									
Magnesium, total	mg/L		5.4			4.4						
Potassium, total	mg/L		0.93									
Sodium, total	mg/L		0.64									
Aluminum, total	mg/L		0.045									
Cadmium, total	mg/L		< 0.005									
Copper, total	mg/L		0.21									
Lead, total	mg/L		< 0.003									
Mercury, total	ug/L											
Zinc, total	mg/L		0.23									
Uranium, total	mg/L											

Skunk Lake Waste Rock Master Composite (WD-05) Continued

PARAMETER	Units	01/23/96	02/20/96	03/18/96	04/16/96	05/21/96	06/17/96	07/30/96	08/29/96	09/30/96	10/24/96
Alkalinity	mg/L	14	12	12	10	8	8	8	7	10	11
Alkalinity, Bicarbonate	mg/L	14	12	12	< 5	8	8		< 5	10	11
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5
Sulfate	mg/L	17	17	16	16	16	18	23	21	23	18
Calcium, total	mg/L	8.1	7.0	7.3	7.7	8.1	7.3	8.0	7.0	9.0	7.1
Arsenic, total	mg/L										
Barium, total	mg/L										
Bismuth	mg/L										
Gallium	mg/L										
Germanium	mg/L										
Iron, total	mg/L										
Manganese, total	mg/L										
Molybdenum, total	mg/L										
Selenium, total	mg/L										
Silver, total	mg/L										
Chromium, total	mg/L										
Cobalt, total	mg/L										
Beryllium, total	mg/L										
Thallium, total	mg/L										
Tellurium	mg/L										
Tin	mg/L										
Titanium	mg/L										
Nickel, total	mg/L										
Antimony, total	mg/L										
Magnesium, total	mg/L	3.9	3.4	3.7	3.7	4.1	3.7	4.0	3.5	4.5	3.2
Potassium, total	mg/L										
Sodium, total	mg/L										
Aluminum, total	mg/L										
Cadmium, total	mg/L										
Copper, total	mg/L		0.019								
Lead, total	mg/L										
Mercury, total	ug/L										
Zinc, total	mg/L		0.043								
Uranium, total	mg/L										

Crandon Project Leachate Summary
Rice Lake Master Waste Rock Composite (WD-06)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/21/94	11/28/94	12/05/94	12/12/94	12/19/94	12/27/94	01/03/95
Alkalinity	mg/L	130	110	100	110	91	91	92	71	80	93	87
Alkalinity, Bicarbonate	mg/L	130	110	95	110	91	91	92	71	80	93	87
Alkalinity, Carbonate	mg/L	< 5	< 5	6	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	43.5	35.4			18.9			14.1	27.8		
Calcium, total	mg/L	20	14			14			19	16		
Arsenic, total	mg/L	0.049	0.033			0.026			0.033	0.022		
Barium, total	mg/L	0.12	0.078			0.033			0.043	0.037		
Bismuth	mg/L	< 0.20	< 0.20			< 0.20			< 0.20	< 0.20		
Gallium	mg/L	< 0.20	< 0.20			< 0.20			< 0.20	< 0.20		
Germanium	mg/L	< 0.025	< 0.025			< 0.025			< 0.025	< 0.025		
Iron, total	mg/L	110	60			20			11	27		
Manganese, total	mg/L	2.3	1.2			0.42			0.56	0.62		
Molybdenum, total	mg/L	0.051	0.061			< 0.020			< 0.020	< 0.020		
Selenium, total	mg/L	< 0.005	< 0.005			0.007			< 0.005	< 0.005		
Silver, total	mg/L	0.005	< 0.005			< 0.005			< 0.005	< 0.005		
Chromium, total	mg/L	0.054	0.043			< 0.005			0.005	0.013		
Cobalt, total	mg/L	0.039	0.019			< 0.010			< 0.010	< 0.010		
Beryllium, total	mg/L	< 0.005	< 0.005			< 0.005			< 0.005	< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080			< 0.080			< 0.080	< 0.080		
Tellurium	mg/L	< 0.32	< 0.32			< 0.32			< 0.32	< 0.32		
Tin	mg/L	< 0.24	< 0.24			< 0.24			< 0.24	< 0.24		
Titanium	mg/L	0.11	0.083			< 0.050			< 0.050	< 0.050		
Nickel, total	mg/L	0.030	0.028			< 0.020			< 0.020	< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050			< 0.050			< 0.050	< 0.050		
Magnesium, total	mg/L	66	40			21			13	23		
Potassium, total	mg/L	19.1	17.4			9.9			6.8	9.7		
Sodium, total	mg/L	43	30			10			5.6	5.0		
Aluminum, total	mg/L	76	42			13			7.0	19		
Cadmium, total	mg/L	< 0.005	< 0.005			0.006			< 0.005	< 0.005		
Copper, total	mg/L	0.85	0.52			0.19			0.53	0.23		
Lead, total	mg/L	0.065	0.058			< 0.040			< 0.040	< 0.040		
Mercury, total	ug/L	0.2	< 0.2			< 0.2			< 0.2	< 0.2		
Zinc, total	mg/L	0.57	0.34			0.13			0.28	0.16		
Uranium, total	mg/L	< 0.001	< 0.001			< 0.0010			< 0.0010	< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Rice Lake Waste Rock Master Composite (WD-06) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Alkalinity	mg/L	89	83	52	51	82	86	83	82	81	78	76
Alkalinity, Bicarbonate	mg/L	89	83		51	82	86	83	82	81	78	76
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						15					
Calcium, total	mg/L						16					
Arsenic, total	mg/L						0.026					
Barium, total	mg/L						0.014					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						1.4					
Manganese, total	mg/L						0.11					
Molybdenum, total	mg/L											
Selenium, total	mg/L						< 0.005					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< ***0.04***					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						9.5					
Potassium, total	mg/L						6.4					
Sodium, total	mg/L						3.6					
Aluminum, total	mg/L						0.99					
Cadmium, total	mg/L						< 0.005					
Copper, total	mg/L						0.096					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L											
Zinc, total	mg/L						0.057					
Uranium, total	mg/L											

Rice Lake Waste Rock Master Composite (WD-06) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
												*
Alkalinity	mg/L	78	75	73	73	39	80	71	74	68	68	70
Alkalinity, Bicarbonate	mg/L	78	75	73	73	39	80	71	74	68	68	70
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L											11
Calcium, total	mg/L											18
Arsenic, total	mg/L											0.035
Barium, total	mg/L											0.008
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.13
Manganese, total	mg/L											0.048
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.008
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< 0.005
Cobalt, total	mg/L											< 0.010
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											< ***0.04***
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											8.0
Potassium, total	mg/L											3.2
Sodium, total	mg/L											2.0
Aluminum, total	mg/L											0.18
Cadmium, total	mg/L											< ***0.005***
Copper, total	mg/L											0.009
Lead, total	mg/L											***0.034***
Mercury, total	ug/L											
Zinc, total	mg/L											< 0.020
Uranium, total	mg/L											

Rice Lake Waste Rock Master Composite (WD-06) Continued

PARAMETER	Units	06/12/95	06/19/95	06/26/95	09/05/95	09/11/95	09/18/95	09/25/95	10/02/95	10/10/95	10/16/95	10/23/95
Alkalinity	mg/L	70	70	70	65	60	65	43	64	66	62	62
Alkalinity, Bicarbonate	mg/L	70	70	20	65	60	65	43	64	66	62	62
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L				8	8	8.4	20	7	8	8.7	11
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Rice Lake Waste Rock Master Composite (WD-06) Continued

PARAMETER	Units	10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96	01/23/96
Alkalinity	mg/L	61	61	79	68	67	73	74	71	66	69	71
Alkalinity, Bicarbonate	mg/L	61	61	79	< 5	< 5	73	74	71	66	69	71
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	8	7	8	7							6
Calcium, total	mg/L	31			18							21
Arsenic, total	mg/L	0.031										
Barium, total	mg/L	0.006										
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L	0.23										
Manganese, total	mg/L	0.020										
Molybdenum, total	mg/L											
Selenium, total	mg/L	0.0084										
Silver, total	mg/L	< ***0.01***										
Chromium, total	mg/L	< 0.005										
Cobalt, total	mg/L											
Beryllium, total	mg/L	< ***0.005***										
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L	< ***0.04***										
Antimony, total	mg/L	< ***0.06***										
Magnesium, total	mg/L	6.0			6.1							5.9
Potassium, total	mg/L	1.9										
Sodium, total	mg/L	1.1										
Aluminum, total	mg/L	0.22										
Cadmium, total	mg/L	< 0.005										
Copper, total	mg/L	0.005										
Lead, total	mg/L	< 0.003										
Mercury, total	ug/L											
Zinc, total	mg/L	< 0.020										
Uranium, total	mg/L											

Rice Lake Waste Rock Master Composite (WD-06) Continued

PARAMETER	Units	02/20/96	03/18/96	04/16/96	05/21/96	06/17/96	07/30/96	08/29/96	09/30/96	10/24/96
Alkalinity	mg/L	72	65	62	63	60	58	63	62	62
Alkalinity, Bicarbonate	mg/L	72	65	< 5	63	60		< 5	62	62
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5
Sulfate	mg/L	6	5	5	5	5	11	3	7	2
Calcium, total	mg/L	20	19	20	21	19	20	20	21	20
Arsenic, total	mg/L									
Barium, total	mg/L									
Bismuth	mg/L									
Gallium	mg/L									
Germanium	mg/L									
Iron, total	mg/L									
Manganese, total	mg/L									
Molybdenum, total	mg/L									
Selenium, total	mg/L									
Silver, total	mg/L									
Chromium, total	mg/L									
Cobalt, total	mg/L									
Beryllium, total	mg/L									
Thallium, total	mg/L									
Tellurium	mg/L									
Tin	mg/L									
Titanium	mg/L									
Nickel, total	mg/L									
Antimony, total	mg/L									
Magnesium, total	mg/L	5.2	5.2	5.4	5.1	4.8	4.9	4.8	6.0	4.5
Potassium, total	mg/L									
Sodium, total	mg/L									
Aluminum, total	mg/L									
Cadmium, total	mg/L									
Copper, total	mg/L									
Lead, total	mg/L									
Mercury, total	ug/L									
Zinc, total	mg/L									
Uranium, total	mg/L									

Crandon Project Leachate Summary
Upper Mole Lake Master Waste Rock Composite (WD-07)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/21/94	11/28/94	12/05/94	12/12/94	12/20/94	12/27/94	01/03/95
Alkalinity	mg/L	120	120	110	110	100	87	100	97	93	96	94
Alkalinity, Bicarbonate	mg/L	120	120	110	110	100	87	100	97	93	96	94
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	48	44.7			39.8				20.6		
Calcium, total	mg/L	13	12			16				18		
Arsenic, total	mg/L	0.022	0.022			0.012				0.015		
Barium, total	mg/L	0.045	0.029			0.015				0.030		
Bismuth	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025			< 0.025				< 0.025		
Iron, total	mg/L	30	20			4.3				17		
Manganese, total	mg/L	0.51	0.34			0.10				0.31		
Molybdenum, total	mg/L	0.054	0.050			0.039				< 0.020		
Selenium, total	mg/L	0.009	0.012			0.008				0.008		
Silver, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Chromium, total	mg/L	0.015	0.012			< 0.005				0.008		
Cobalt, total	mg/L	0.012	< 0.010			< 0.010				< 0.010		
Beryllium, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080			< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32			< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24			< 0.24				< 0.24		
Titanium	mg/L	0.054	0.076			< 0.050				< 0.050		
Nickel, total	mg/L	< 0.020	< 0.020			< 0.020				< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050			< 0.050				< 0.050		
Magnesium, total	mg/L	20	17			13				18		
Potassium, total	mg/L	12.9	16.2			11.7				9.6		
Sodium, total	mg/L	49	36			18				7.6		
Aluminum, total	mg/L	20	14			2.8				12		
Cadmium, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Copper, total	mg/L	0.22	0.17			0.037				0.11		
Lead, total	mg/L	< 0.040	< 0.040			< 0.040				< 0.040		
Mercury, total	ug/L	< 0.2	< 0.2			< 0.2				< 0.2		
Zinc, total	mg/L	0.19	0.14			0.043				0.099		
Uranium, total	mg/L	< 0.001	< 0.001			< 0.0010				< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Upper Mole Lake Waste Rock Master Composite (WD-07) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Alkalinity	mg/L	91	90	88	71	68	79	88	86	84	82	78
Alkalinity, Bicarbonate	mg/L	91	90		71	68	79	88	86	84	82	78
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						41					
Calcium, total	mg/L						21					
Arsenic, total	mg/L						0.011					
Barium, total	mg/L						0.020					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						2.6					
Manganese, total	mg/L						0.22					
Molybdenum, total	mg/L						0.030					
Selenium, total	mg/L						< 0.005					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< ***0.04***					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						12					
Potassium, total	mg/L						6.9					
Sodium, total	mg/L						4.3					
Aluminum, total	mg/L						1.6					
Cadmium, total	mg/L						***0.011***					
Copper, total	mg/L						0.066					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L											
Zinc, total	mg/L						1.4					
Uranium, total	mg/L											

Upper Mole Lake Waste Rock Master Composite (WD-07) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
Alkalinity	mg/L	80	78	67	78	77	84	75	76	79	76	*
Alkalinity, Bicarbonate	mg/L	80	78	67	78	77	84	75	76	79	76	75
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L											12
Calcium, total	mg/L											19
Arsenic, total	mg/L											0.020
Barium, total	mg/L											0.006
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.093
Manganese, total	mg/L											0.014
Molybdenum, total	mg/L											< 0.020
Selenium, total	mg/L											0.010
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< ***0.01***
Cobalt, total	mg/L											< 0.010
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											< ***0.04***
Antimony, total	mg/L											***0.11***
Magnesium, total	mg/L											8.6
Potassium, total	mg/L											4.3
Sodium, total	mg/L											2.2
Aluminum, total	mg/L											0.14
Cadmium, total	mg/L											< ***0.005***
Copper, total	mg/L											0.006
Lead, total	mg/L											***0.059***
Mercury, total	ug/L											
Zinc, total	mg/L											0.038
Uranium, total	mg/L											

Upper Mole Lake Waste Rock Master Composite (WD-07) Continued

PARAMETER	Units	06/12/95	06/19/95	06/26/95	09/05/95	09/11/95	09/18/95	09/25/95	10/02/95	10/10/95	10/16/95	10/23/95
Alkalinity	mg/L	74	82	73	70	67	69	68	71	70	69	69
Alkalinity, Bicarbonate	mg/L	74	82	73	70	67	69	68	71	70	69	69
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L				11	11	14	43	9	110	12	11
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Upper Mole Lake Waste Rock Master Composite (WD-07) Continued

PARAMETER	Units		10/30/95 *		11/06/95		11/20/95		11/27/95		12/04/95		12/11/95		12/18/95		12/26/95		01/02/96		01/09/96
Alkalinity	mg/L		55		65		81		75		72		77		83		76		70		74
Alkalinity, Bicarbonate	mg/L		55		65		81	<	5	<	5		77		83		76		70		74
Alkalinity, Carbonate	mg/L	<	5	<	5	<	5	<	5	<	5	<	5	<	5	<	5	<	5	<	5
Sulfate	mg/L		9		8		8		8												
Calcium, total	mg/L		20						21												
Arsenic, total	mg/L		0.018																		
Barium, total	mg/L	<	0.005																		
Bismuth	mg/L																				
Gallium	mg/L																				
Germanium	mg/L																				
Iron, total	mg/L		0.12																		
Manganese, total	mg/L		0.010																		
Molybdenum, total	mg/L																				
Selenium, total	mg/L		0.010																		
Silver, total	mg/L	<	***0.01***																		
Chromium, total	mg/L	<	0.005																		
Cobalt, total	mg/L																				
Beryllium, total	mg/L	<	***0.005***																		
Thallium, total	mg/L																				
Tellurium	mg/L																				
Tin	mg/L																				
Titanium	mg/L																				
Nickel, total	mg/L	<	***0.04***																		
Antimony, total	mg/L	<	***0.06***																		
Magnesium, total	mg/L		7.3						7.6												
Potassium, total	mg/L		2.2																		
Sodium, total	mg/L		1.2																		
Aluminum, total	mg/L		0.13																		
Cadmium, total	mg/L	<	0.005																		
Copper, total	mg/L	<	0.005																		
Lead, total	mg/L	<	0.003																		
Mercury, total	ug/L																				
Zinc, total	mg/L		0.031																		
Uranium, total	mg/L																				

Crandon Project Leachate Summary
Lower Mole Lake Master Waste Rock Composite (WD-08)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/21/94	11/28/94	12/05/94	12/12/94	12/20/94	12/27/94	01/03/95
Alkalinity	mg/L	120	91	89	75	76	75	76	77	79	83	81
Alkalinity, Bicarbonate	mg/L	120	91	89	75	76	75	76	77	79	83	81
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	115	81			46				24.5		
Calcium, total	mg/L	26	21			16				17		
Arsenic, total	mg/L	0.11	0.095			0.035				0.028		
Barium, total	mg/L	0.017	0.022			0.009				0.008		
Bismuth	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20			< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025			< 0.025				< 0.025		
Iron, total	mg/L	7.9	20			2.8				3.4		
Manganese, total	mg/L	0.24	0.40			0.12				0.14		
Molybdenum, total	mg/L	0.034	0.024			< 0.020				< 0.020		
Selenium, total	mg/L	0.011	0.009			0.006				< 0.005		
Silver, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Chromium, total	mg/L	0.005	< 0.005			< 0.005				< 0.005		
Cobalt, total	mg/L	0.006	< 0.010			< 0.010				< 0.010		
Beryllium, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080			< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32			< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24			< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050			< 0.050				< 0.050		
Nickel, total	mg/L	< 0.020	< 0.020			< 0.020				< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050			< 0.050				< 0.050		
Magnesium, total	mg/L	20	21			12				10		
Potassium, total	mg/L	16.6	13.4			9.2				7.0		
Sodium, total	mg/L	57	36			11				4.5		
Aluminum, total	mg/L	4.9	12			1.6				2.2		
Cadmium, total	mg/L	< 0.005	< 0.005			< 0.005				< 0.005		
Copper, total	mg/L	0.11	0.20			0.037				0.042		
Lead, total	mg/L	< 0.040	< 0.040			< 0.040				< 0.040		
Mercury, total	ug/L	0.3	0.2			< 0.2				0.5		
Zinc, total	mg/L	0.14	0.20			0.045				0.065		
Uranium, total	mg/L	< 0.001	< 0.001			< 0.0010				< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Lower Mole Lake Waste Rock Master Composite (WD-08) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Alkalinity	mg/L	75	71	73	76	70	72	73	73	72	76	68
Alkalinity, Bicarbonate	mg/L	75	71		76	70	72	73	73	72	76	68
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						25					
Calcium, total	mg/L						18					
Arsenic, total	mg/L						0.024					
Barium, total	mg/L						0.007					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						1.5					
Manganese, total	mg/L						0.14					
Molybdenum, total	mg/L						< 0.020					
Selenium, total	mg/L						0.005					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< ***0.01***					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< 0.020					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						8.6					
Potassium, total	mg/L						5.0					
Sodium, total	mg/L						2.6					
Aluminum, total	mg/L						1.2					
Cadmium, total	mg/L						0.005					
Copper, total	mg/L						0.021					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L						< 0.2					
Zinc, total	mg/L						0.063					
Uranium, total	mg/L											

Lower Mole Lake Waste Rock Master Composite (WD-08) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95 *
Alkalinity	mg/L	71	66	64	62	63	74	62	64	64	62	61
Alkalinity, Bicarbonate	mg/L	71	66	64	62	63	74	62	64	64	62	61
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L											18
Calcium, total	mg/L											21
Arsenic, total	mg/L											0.029
Barium, total	mg/L											< 0.005
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.19
Manganese, total	mg/L											0.031
Molybdenum, total	mg/L											
Selenium, total	mg/L											< 0.005
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< 0.005
Cobalt, total	mg/L											< 0.010
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											< 0.020
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											6.6
Potassium, total	mg/L											2.2
Sodium, total	mg/L											1.5
Aluminum, total	mg/L											0.19
Cadmium, total	mg/L											< 0.005
Copper, total	mg/L											0.011
Lead, total	mg/L											***0.053***
Mercury, total	ug/L											< 0.2
Zinc, total	mg/L											< 0.020
Uranium, total	mg/L											

Lower Mole Lake Waste Rock Master Composite (WD-08) Continued

PARAMETER	Units	06/12/95	06/19/95	06/26/95	09/05/95	09/11/95	09/18/95	09/25/95	10/02/95	10/10/95	10/16/95	10/23/95
Alkalinity	mg/L	60	60	62	55	58	52	52	56	53	53	53
Alkalinity, Bicarbonate	mg/L	60	60	62	55	58	52	52	56	53	53	53
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L				19	21	25	45	15	780	26	25
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Lower Mole Lake Waste Rock Master Composite (WD-08) Continued

PARAMETER	Units	10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96	02/20/96
Alkalinity	mg/L	57	50	61	62	60	58	59	59	59	59	
Alkalinity, Bicarbonate	mg/L	57	50	61	< 5	< 5	58	59	59	59	59	
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	
Sulfate	mg/L	14	14	14	14							
Calcium, total	mg/L	20			22							
Arsenic, total	mg/L	0.023										
Barium, total	mg/L	< 0.005										
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L	0.096										
Manganese, total	mg/L	0.012										
Molybdenum, total	mg/L											
Selenium, total	mg/L	0.0067										
Silver, total	mg/L	< ***0.01***										
Chromium, total	mg/L	< 0.005										
Cobalt, total	mg/L											
Beryllium, total	mg/L	< ***0.005***										
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L	< ***0.04***										
Antimony, total	mg/L	< ***0.06***										
Magnesium, total	mg/L	5.9			6.8							
Potassium, total	mg/L	1.5										
Sodium, total	mg/L	0.94										
Aluminum, total	mg/L	0.085										
Cadmium, total	mg/L	< 0.005										
Copper, total	mg/L	< 0.005										
Lead, total	mg/L	< 0.003										
Mercury, total	ug/L											
Zinc, total	mg/L	0.10										< 0.020
Uranium, total	mg/L											

Crandon Project Leachate Summary
Skunk Lake High Sulfur Waste Rock Composite (WD-09)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/24/94	11/01/94	11/09/94	11/15/94	11/21/94	11/28/94	12/06/94	12/13/94	12/20/94	12/27/94	01/03/95
Acidity	mg/L											
Alkalinity	mg/L	34	24	20	16	17	15	16	19	20	18	19
Alkalinity, Bicarbonate	mg/L	34	24	20	16	17	15	16	19	20	18	19
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	516	381		254	212				74		
Calcium, total	mg/L	82	65		48	42				30		
Arsenic, total	mg/L	0.012	0.010		0.006	< 0.005				< 0.005		
Barium, total	mg/L	0.027	0.018		0.009	0.010				0.006		
Bismuth	mg/L	< 0.20	< 0.20	<	0.20	< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20	<	0.20	< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025	<	0.025	< 0.025				< 0.025		
Iron, total	mg/L	6.7	4.5		3.3	1.4				0.59		
Manganese, total	mg/L	2.1	1.6		1.1	0.93				0.70		
Molybdenum, total	mg/L	< 0.020	< 0.020	<	0.020	< 0.020				< 0.020		
Selenium, total	mg/L	0.025	0.018		0.020	0.016				0.006		
Silver, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Chromium, total	mg/L	0.007	< 0.005	<	0.005	< 0.005				< 0.005		
Cobalt, total	mg/L	0.042	0.017	<	0.010	< 0.010				< 0.010		
Beryllium, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080	<	0.080	< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32	<	0.32	< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24	<	0.24	< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050	<	0.050	< 0.050				< 0.050		
Nickel, total	mg/L	< 0.020	< 0.020	<	0.020	< 0.020				< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050	<	0.050	< 0.050				< 0.050		
Magnesium, total	mg/L	79	58		38	31				19		
Potassium, total	mg/L	28.6	19.0		8.8	7.3				< 4.8		
Sodium, total	mg/L	14	6.3		2.9	2.0				0.90		
Aluminum, total	mg/L	6.1	4.2		2.8	1.2				0.60		
Cadmium, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Copper, total	mg/L	0.16	0.10		0.072	0.034				0.016		
Lead, total	mg/L	< 0.040	< 0.040	<	0.040	< 0.040				< 0.040		
Mercury, total	ug/L	< 0.2	< 0.2		0.33	< 0.2				< 0.2		
Zinc, total	mg/L	0.58	0.32		0.25	0.16				0.12		
Uranium, total	mg/L	< 0.001	< 0.001	<	0.0010	< 0.0012				< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Acidity	mg/L											
Alkalinity	mg/L	19	21	21	20	20	20	19	17	18	16	15
Alkalinity, Bicarbonate	mg/L	19	21		20	20	20	19	17	18	16	15
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						160					
Calcium, total	mg/L						34					
Arsenic, total	mg/L						< 0.005					
Barium, total	mg/L						0.007					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						0.46					
Manganese, total	mg/L						0.78					
Molybdenum, total	mg/L											
Selenium, total	mg/L						0.013					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< ***0.01***					
Cobalt, total	mg/L											
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< ***0.04***					
Antimony, total	mg/L						***0.06***					
Magnesium, total	mg/L						19					
Potassium, total	mg/L						3.1					
Sodium, total	mg/L						0.74					
Aluminum, total	mg/L						0.47					
Cadmium, total	mg/L						***0.006***					
Copper, total	mg/L						0.021					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L											
Zinc, total	mg/L						0.25					
Uranium, total	mg/L											

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
Acidity	mg/L											*
Alkalinity	mg/L	12	13	14	13	12	21	11	14	10	11	12
Alkalinity, Bicarbonate	mg/L	12	13	14	13	12	21	11	14	10	11	12
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L											210
Calcium, total	mg/L											48
Arsenic, total	mg/L											< 0.005
Barium, total	mg/L											0.007
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.077
Manganese, total	mg/L											0.47
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.015
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< ***0.01***
Cobalt, total	mg/L											
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											< ***0.04***
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											29
Potassium, total	mg/L											1.8
Sodium, total	mg/L											0.63
Aluminum, total	mg/L											0.092
Cadmium, total	mg/L											< ***0.005***
Copper, total	mg/L											0.012
Lead, total	mg/L											***0.04***
Mercury, total	ug/L											
Zinc, total	mg/L											0.95
Uranium, total	mg/L											

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	06/12/95	06/19/95	06/26/95	07/03/95	07/10/95	07/24/95	07/31/95	08/07/95	08/14/95	08/21/95	08/30/95
Acidity	mg/L											
Alkalinity	mg/L	11	13	12	13	14	18	14	17	12	12	13
Alkalinity, Bicarbonate	mg/L	11	13	12	13	14	18	14	17	12	12	13
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5
Sulfate	mg/L											
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	09/05/95	09/11/95	09/18/95	09/25/95	10/03/95	10/10/95	10/16/95	10/23/95	10/30/95 *	11/06/95	11/20/95
Acidity	mg/L											
Alkalinity	mg/L	13	< 5	14	12	13	12	11	12	17	9	16
Alkalinity, Bicarbonate	mg/L	13	< 5	14	12	13	12	11	12	17	9	16
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	190	210	280	270	170	180	420	230	180	180	180
Calcium, total	mg/L									54		
Arsenic, total	mg/L									< 0.005		
Barium, total	mg/L									0.006		
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L									0.050		
Manganese, total	mg/L									0.37		
Molybdenum, total	mg/L											
Selenium, total	mg/L									0.0094		
Silver, total	mg/L									< 0.005		
Chromium, total	mg/L									< 0.005		
Cobalt, total	mg/L									0.012		
Beryllium, total	mg/L									< ***0.005***		
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L									< 0.020		
Antimony, total	mg/L									< ***0.06***		
Magnesium, total	mg/L									25		
Potassium, total	mg/L									0.87		
Sodium, total	mg/L									0.49		
Aluminum, total	mg/L									0.046		
Cadmium, total	mg/L									< 0.005		
Copper, total	mg/L									0.011		
Lead, total	mg/L									< 0.003		
Mercury, total	ug/L											
Zinc, total	mg/L									1.5		
Uranium, total	mg/L											

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96	02/20/96	03/18/96	04/16/96	05/21/96
Acidity	mg/L											
Alkalinity	mg/L	17	15	19	13	13	12	12	8	6	< 5	< 5
Alkalinity, Bicarbonate	mg/L	< 5	< 5	19	< 5	13	12	12	8	6	< 5	< 5
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	13	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	180							210	290	270	260
Calcium, total	mg/L	41							46	58	57	49
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L	26							30	40	38	35
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L	< 0.2										
Zinc, total	mg/L								4.9			
Uranium, total	mg/L											

Skunk Lake High Sulfur Waste Rock Composite (WD-09) Continued

PARAMETER	Units	06/17/96	07/30/96	08/29/96	09/30/96	10/24/96
Acidity	mg/L			56	76	64
Alkalinity	mg/L	< 5	< 5			
Alkalinity, Bicarbonate	mg/L	< 5				
Alkalinity, Carbonate	mg/L	< 5				
Sulfate	mg/L	290	340	470	390	280
Calcium, total	mg/L	55	62	59	78	52
Arsenic, total	mg/L					
Barium, total	mg/L					
Bismuth	mg/L					
Gallium	mg/L					
Germanium	mg/L					
Iron, total	mg/L					
Manganese, total	mg/L					
Molybdenum, total	mg/L					
Selenium, total	mg/L					
Silver, total	mg/L					
Chromium, total	mg/L					
Cobalt, total	mg/L					
Beryllium, total	mg/L					
Thallium, total	mg/L					
Tellurium	mg/L					
Tin	mg/L					
Titanium	mg/L					
Nickel, total	mg/L					
Antimony, total	mg/L					
Magnesium, total	mg/L	39	46	44	34	35
Potassium, total	mg/L					
Sodium, total	mg/L					
Aluminum, total	mg/L					
Cadmium, total	mg/L					
Copper, total	mg/L					
Lead, total	mg/L					
Mercury, total	ug/L					
Zinc, total	mg/L					
Uranium, total	mg/L					

Crandon Project Leachate Summary
Rice Lake High Sulfur Waste Rock Composite (WD-10)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/24/94	11/01/94	11/09/94	11/15/94	11/21/94	11/28/94	12/06/94	12/13/94	12/20/94	12/27/94	01/03/95
Acidity, Total	mg/L			44	54	61	50	56	78	86	110	100
Alkalinity	mg/L	< 5	< 5									
Alkalinity, Bicarbonate	mg/L	< 5	< 5									
Alkalinity, Carbonate	mg/L	< 5	< 5									
Sulfate	mg/L	743	602		448	448				344		
Calcium, total	mg/L	80	71		48	48				37		
Arsenic, total	mg/L	0.007	0.009		< 0.005	< 0.005				< 0.005		
Barium, total	mg/L	0.047	0.043		0.035	0.039				0.037		
Bismuth	mg/L	< 0.20	< 0.20		< 0.20	< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20		< 0.20	< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025		< 0.025	< 0.025				< 0.025		
Iron, total	mg/L	5.5	4.4		4.4	2.2				3.5		
Manganese, total	mg/L	2.8	3.1		3.0	3.0				2.4		
Molybdenum, total	mg/L	< 0.020	< 0.020		< 0.020	< 0.020				< 0.020		
Selenium, total	mg/L	0.044	0.032		0.027	0.024				0.022		
Silver, total	mg/L	< 0.005	< 0.005		< 0.005	< 0.005				< 0.005		
Chromium, total	mg/L	< 0.005	< 0.005		< 0.005	< 0.005				< 0.005		
Cobalt, total	mg/L	0.49	0.47		0.43	0.47				0.48		
Beryllium, total	mg/L	< 0.005	< 0.005		< 0.005	0.007				0.010		
Thallium, total	mg/L	< 0.080	< 0.080		< 0.080	< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32		< 0.32	< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24		< 0.24	< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050		< 0.050	< 0.050				< 0.050		
Nickel, total	mg/L	0.023	0.027		0.029	0.043				0.039		
Antimony, total	mg/L	< 0.050	< 0.050		< 0.050	< 0.050				< 0.050		
Magnesium, total	mg/L	100	90		56	55				37		
Potassium, total	mg/L	37.6	33.7		20.1	18.3				9.5		
Sodium, total	mg/L	46	27		7.4	5.6				2.2		
Aluminum, total	mg/L	4.2	3.9		6.4	6.0				8.4		
Cadmium, total	mg/L	< 0.005	< 0.005		< 0.005	0.007				< 0.005		
Copper, total	mg/L	2.7	2.9		3.7	4.6				7.2		
Lead, total	mg/L	< 0.040	0.15		0.065	< 0.040				< 0.040		
Mercury, total	ug/L	< 0.2	< 0.2		< 0.2	0.2				< 0.2		
Zinc, total	mg/L	2.5	2.5		3.2	4.0				5.6		
Uranium, total	mg/L	< 0.001	0.001		0.0017	0.0018				0.0018		

Rice Lake High Sulfur Waste Rock Composite (WD-10) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Acidity, Total	mg/L	110	130	150	170	180	94	190	190	200	190	220
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L						370					
Calcium, total	mg/L						25					
Arsenic, total	mg/L						< 0.005					
Barium, total	mg/L						0.030					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						9.4					
Manganese, total	mg/L						1.6					
Molybdenum, total	mg/L											
Selenium, total	mg/L						0.024					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						0.37					
Beryllium, total	mg/L						***0.016***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						***0.043***					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						27					
Potassium, total	mg/L						5.8					
Sodium, total	mg/L						1.5					
Aluminum, total	mg/L						18					
Cadmium, total	mg/L						***0.007***					
Copper, total	mg/L						10					
Lead, total	mg/L						***0.031***					
Mercury, total	ug/L											
Zinc, total	mg/L						4.8					
Uranium, total	mg/L											

Rice Lake High Sulfur Waste Rock Composite (WD-10) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
Acidity, Total	mg/L	250	260	320	330	400	430	450	480	490	520	* 530
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L											740
Calcium, total	mg/L											33
Arsenic, total	mg/L											0.008
Barium, total	mg/L											0.018
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											20
Manganese, total	mg/L											1.8
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.020
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											0.010
Cobalt, total	mg/L											0.36
Beryllium, total	mg/L											***0.021***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											***0.044***
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											45
Potassium, total	mg/L											1.9
Sodium, total	mg/L											1.2
Aluminum, total	mg/L											60
Cadmium, total	mg/L											***0.015***
Copper, total	mg/L											8.6
Lead, total	mg/L											***0.042***
Mercury, total	ug/L											
Zinc, total	mg/L											7.1
Uranium, total	mg/L											

Rice Lake High Sulfur Waste Rock Composite (WD-10) Continued

PARAMETER	Units	06/12/95	06/20/95	06/26/95	09/05/95	09/11/95	09/18/95	09/25/95	10/03/95	10/10/95	10/16/95	10/24/95
Acidity, Total	mg/L	500	440	450	860	870	840	810	770	800	82	76
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L				1000	1000	1200	1400	905	920	1200	1400
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Rice Lake High Sulfur Waste Rock Composite (WD-10) Continued

PARAMETER	Units	10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96
Acidity, Total	mg/L	740	770	830	720	710	760	720	680	640	650
Alkalinity	mg/L										
Alkalinity, Bicarbonate	mg/L										
Alkalinity, Carbonate	mg/L										
Sulfate	mg/L	860		890	86						
Calcium, total	mg/L	31			26						
Arsenic, total	mg/L	< 0.005									
Barium, total	mg/L	0.009									
Bismuth	mg/L										
Gallium	mg/L										
Germanium	mg/L										
Iron, total	mg/L	53									
Manganese, total	mg/L	1.6									
Molybdenum, total	mg/L										
Selenium, total	mg/L	0.012									
Silver, total	mg/L	< 0.005									
Chromium, total	mg/L	0.009									
Cobalt, total	mg/L	0.24									
Beryllium, total	mg/L	***0.008***									
Thallium, total	mg/L										
Tellurium	mg/L										
Tin	mg/L										
Titanium	mg/L										
Nickel, total	mg/L	0.022									
Antimony, total	mg/L	< ***0.06***									
Magnesium, total	mg/L	50			49						
Potassium, total	mg/L	< 0.60									
Sodium, total	mg/L	0.73									
Aluminum, total	mg/L	51									
Cadmium, total	mg/L	0.027									
Copper, total	mg/L	11									
Lead, total	mg/L	0.0082									
Mercury, total	ug/L				< 0.2						
Zinc, total	mg/L	11									
Uranium, total	mg/L										

Crandon Project Leachate Summary
Upper Mole Lake High Sulfur Waste Rock Composite (WD-11)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/24/94	11/01/94	11/09/94	11/16/94	11/21/94	11/28/94	12/06/94	12/13/94	12/20/94	12/27/94	01/03/95
Acidity, Total	mg/L									10	19	18
Alkalinity	mg/L	23	11	9	< 5	< 5	< 5	< 5	< 5			
Alkalinity, Bicarbonate	mg/L	23	11	9	< 5	< 5	< 5	< 5	< 5			
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
Sulfate	mg/L	890	821		696	668				290		
Calcium, total	mg/L	110	120		110	100				51		
Arsenic, total	mg/L	0.010	0.012		0.005	< 0.005				< 0.005		
Barium, total	mg/L	0.043	0.037		0.027	0.032				0.028		
Bismuth	mg/L	< 0.20	< 0.20	<	0.20	< 0.20				< 0.20		
Gallium	mg/L	< 0.20	< 0.20	<	0.20	< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025	<	0.025	< 0.025				< 0.025		
Iron, total	mg/L	8.0	7.9		5.5	0.90				1.0		
Manganese, total	mg/L	3.2	3.0		2.9	2.8				1.7		
Molybdenum, total	mg/L	< 0.020	< 0.020	<	0.020	< 0.020				< 0.020		
Selenium, total	mg/L	0.026	0.022		0.022	0.019				0.010		
Silver, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Chromium, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Cobalt, total	mg/L	0.14	0.083		0.079	0.11				0.059		
Beryllium, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080	<	0.080	< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32	<	0.32	< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24	<	0.24	< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050	<	0.050	< 0.050				< 0.050		
Nickel, total	mg/L	< 0.020	< 0.020	<	0.020	< 0.020				< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050	<	0.050	< 0.050				< 0.050		
Magnesium, total	mg/L	130	120		92	84				33		
Potassium, total	mg/L	27.3	27.1		19.5	18.4				8.1		
Sodium, total	mg/L	56	34		15	11				1.9		
Aluminum, total	mg/L	5.8	6.0		3.3	0.58				1.2		
Cadmium, total	mg/L	< 0.005	< 0.005	<	0.005	< 0.005				< 0.005		
Copper, total	mg/L	0.16	0.15		0.10	0.12				0.41		
Lead, total	mg/L	< 0.040	< 0.040		0.042	< 0.040				< 0.040		
Mercury, total	ug/L	< 0.2	0.2	<	0.2	< 0.2				< 0.2		
Zinc, total	mg/L	0.49	0.36		0.40	0.79				0.73		
Uranium, total	mg/L	< 0.001		<	0.0010	< 0.0010				< 0.0010		

Upper Mole Lake High Sulfur Waste Rock Composite (WD-11) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Acidity, Total	mg/L	30	30	32	28	36	130	30	36	34	35	48
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L						340					
Calcium, total	mg/L						59					
Arsenic, total	mg/L						< 0.005					
Barium, total	mg/L						0.023					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						1.0					
Manganese, total	mg/L						2.8					
Molybdenum, total	mg/L						< 0.020					
Selenium, total	mg/L						0.011					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						0.095					
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< ***0.04***					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						36					
Potassium, total	mg/L						5.8					
Sodium, total	mg/L						1.1					
Aluminum, total	mg/L						2.1					
Cadmium, total	mg/L						< ***0.005***					
Copper, total	mg/L						0.76					
Lead, total	mg/L						***0.056***					
Mercury, total	ug/L											
Zinc, total	mg/L						1.3					
Uranium, total	mg/L											

Upper Mole Lake High Sulfur Waste Rock Composite (WD-11) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95 *
Acidity, Total	mg/L	62	41	47	40	60	61	67	56	81	78	78
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L											580
Calcium, total	mg/L											110
Arsenic, total	mg/L											< 0.005
Barium, total	mg/L											0.026
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											4.1
Manganese, total	mg/L											7.3
Molybdenum, total	mg/L											< 0.020
Selenium, total	mg/L											0.018
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											***0.004***
Cobalt, total	mg/L											0.22
Beryllium, total	mg/L											***0.009***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											***0.026***
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											67
Potassium, total	mg/L											4.2
Sodium, total	mg/L											1.1
Aluminum, total	mg/L											7.2
Cadmium, total	mg/L											***0.006***
Copper, total	mg/L											1.5
Lead, total	mg/L											**0.111**
Mercury, total	ug/L											
Zinc, total	mg/L											4.7
Uranium, total	mg/L											

Upper Mole Lake High Sulfur Waste Rock Composite (WD-11) Continued

PARAMETER	Units	06/12/95	06/19/95	06/26/95	09/06/95	09/11/95	09/18/95	09/25/95	10/03/95	10/10/95	10/16/95	10/24/95
Acidity, Total	mg/L	88	54	62	280	310	340	380	430	500	50	60
Alkalinity	mg/L											
Alkalinity, Bicarbonate	mg/L											
Alkalinity, Carbonate	mg/L											
Sulfate	mg/L				770	840	1300	970	970	1000	1400	1400
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Upper Mole Lake High Sulfur Waste Rock Composite (WD-11) Continued

PARAMETER	Units	10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96
Acidity, Total	mg/L	540	600	630	600	610	690	690	590	620	560
Alkalinity	mg/L										
Alkalinity, Bicarbonate	mg/L										
Alkalinity, Carbonate	mg/L										
Sulfate	mg/L	1200		1300	1300						
Calcium, total	mg/L	150			140						
Arsenic, total	mg/L	0.0062									
Barium, total	mg/L	0.015									
Bismuth	mg/L										
Gallium	mg/L										
Germanium	mg/L										
Iron, total	mg/L	19									
Manganese, total	mg/L	8.8									
Molybdenum, total	mg/L										
Selenium, total	mg/L	0.014									
Silver, total	mg/L	< 0.005									
Chromium, total	mg/L	0.006									
Cobalt, total	mg/L	0.26									
Beryllium, total	mg/L	***0.017***									
Thallium, total	mg/L										
Tellurium	mg/L										
Tin	mg/L										
Titanium	mg/L										
Nickel, total	mg/L	0.022									
Antimony, total	mg/L	< ***0.06***									
Magnesium, total	mg/L	110			110						
Potassium, total	mg/L	1.8									
Sodium, total	mg/L	0.87									
Aluminum, total	mg/L	55									
Cadmium, total	mg/L	0.018									
Copper, total	mg/L	3.0									
Lead, total	mg/L	0.060									
Mercury, total	ug/L				< 0.2						
Zinc, total	mg/L	6.4									
Uranium, total	mg/L										

Crandon Project Leachate Summary
Lower Mole Lake High Sulfur Waste Rock Composite (WD-12)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/24/94	11/01/94	11/09/94	11/16/94	11/21/94	11/28/94	12/06/94	12/12/94	12/20/94	12/27/94	01/03/95
Acidity, Total	mg/L	830	1100	430	280	80	93	82	60	38	68	50
Sulfate	mg/L	2100	1570		2390	1920			1420	923		
Calcium, total	mg/L	180	320		320	260			260	190		
Arsenic, total	mg/L	0.033	0.029		0.037	0.025			0.034	0.009		
Barium, total	mg/L	0.020	0.008		< 0.005	0.008			0.012	0.008		
Bismuth	mg/L	0.50	0.55		< 0.20	< 0.20			< 0.20	< 0.20		
Gallium	mg/L	< 0.20	< 0.20		< 0.20	< 0.20			< 0.20	< 0.20		
Germanium	mg/L	< 0.025	< 0.025		< 0.025	< 0.025			< 0.025	< 0.025		
Iron, total	mg/L	190	180		38	16			5.8	2.9		
Manganese, total	mg/L	22	55		30	19			14	9.1		
Molybdenum, total	mg/L	< 0.020	< 0.020		< 0.020	< 0.020			< 0.020	< 0.020		
Selenium, total	mg/L	0.17	0.36		0.27	0.21			0.21	0.14		
Silver, total	mg/L	0.013	0.012		0.006	< 0.005			< 0.005	< 0.005		
Chromium, total	mg/L	< 0.005	< 0.005		< 0.005	< 0.005			< 0.005	< 0.005		
Cobalt, total	mg/L	3.3	6.1		2.6	1.5			0.88	0.57		
Beryllium, total	mg/L	0.008	0.012		< 0.005	< 0.005			< 0.005	< 0.005		
Thallium, total	mg/L	< 0.080	0.10		< 0.080	< 0.080			< 0.080	< 0.080		
Tellurium	mg/L	< 0.32	< 0.32		< 0.32	< 0.32			< 0.32	< 0.32		
Tin	mg/L	< 0.24	< 0.24		< 0.24	< 0.24			< 0.24	< 0.24		
Titanium	mg/L	< 0.050	< 0.050		< 0.050	< 0.050			< 0.050	< 0.050		
Nickel, total	mg/L	0.51	0.93		0.38	0.23			0.10	0.070		
Antimony, total	mg/L	< 0.050	< 0.050		0.069	0.062			< 0.050	< 0.050		
Magnesium, total	mg/L	210	500		290	190			120	80		
Potassium, total	mg/L	< 4.8	7.8		5.1	< 4.8			< 4.8	4.9		
Sodium, total	mg/L	11	17		8.1	4.4			4.2	1.7		
Aluminum, total	mg/L	26	34		8.2	4.1			2.0	1.1		
Cadmium, total	mg/L	0.047	0.070		0.032	0.027			0.027	0.018		
Copper, total	mg/L	120	200		48	24			8.3	5.5		
Lead, total	mg/L	< 0.040	< 0.040		< 0.040	< 0.040			0.053	0.057		
Mercury, total	ug/L	0.8	0.9		0.53	0.4			1.1	0.8		
Zinc, total	mg/L	54	94		37	22			16	12		
Uranium, total	mg/L	< 0.001	< 0.001		< 0.0010	< 0.0010			< 0.0010	< 0.0010		

Additional metals data for the 2/13/95, 6/5/95, and 10/30/95 samples was obtained from Pace Analytical, Inc. in July 2000 as part of the development of the project's reflooded mine management plan. This data is shown in bold and italic font.

Lower Mole Lake High Sulfur Waste Rock Composite (WD-12) Continued

PARAMETER	Units	01/09/95	01/17/95	01/23/95	01/30/95	02/06/95	02/13/95 *	02/20/95	02/27/95	03/06/95	03/13/95	03/20/95
Acidity, Total	mg/L	54	70	78	82	78	110	92	95	86	88	92
Sulfate	mg/L						1300					
Calcium, total	mg/L						290					
Arsenic, total	mg/L						0.007					
Barium, total	mg/L						0.007					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						2.8					
Manganese, total	mg/L						15					
Molybdenum, total	mg/L						< 0.020					
Selenium, total	mg/L						0.22					
Silver, total	mg/L						< ***0.01***					
Chromium, total	mg/L						< ***0.01***					
Cobalt, total	mg/L						0.71					
Beryllium, total	mg/L						< ***0.005***					
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						0.097					
Antimony, total	mg/L						< ***0.06***					
Magnesium, total	mg/L						120					
Potassium, total	mg/L						5.3					
Sodium, total	mg/L						1.7					
Aluminum, total	mg/L						1.6					
Cadmium, total	mg/L						0.056					
Copper, total	mg/L						11					
Lead, total	mg/L						< ***0.025***					
Mercury, total	ug/L						< 0.2					
Zinc, total	mg/L						31					
Uranium, total	mg/L											

Lower Mole Lake High Sulfur Waste Rock Composite (WD-12) Continued

PARAMETER	Units	03/27/95	04/04/95	04/10/95	04/17/95	04/24/95	05/01/95	05/08/95	05/15/95	05/22/95	05/30/95	06/05/95
Acidity, Total	mg/L	110	110	110	120	160	140	170	130	150	140	*
Sulfate	mg/L											130
Calcium, total	mg/L											910
Arsenic, total	mg/L											210
Barium, total	mg/L											0.016
Bismuth	mg/L											0.008
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											5.4
Manganese, total	mg/L											11
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.13
Silver, total	mg/L											< ***0.01***
Chromium, total	mg/L											< ***0.01***
Cobalt, total	mg/L											0.39
Beryllium, total	mg/L											< ***0.005***
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											0.050
Antimony, total	mg/L											< ***0.06***
Magnesium, total	mg/L											84
Potassium, total	mg/L											3.1
Sodium, total	mg/L											0.84
Aluminum, total	mg/L											1.8
Cadmium, total	mg/L											0.085
Copper, total	mg/L											11
Lead, total	mg/L											***0.049***
Mercury, total	ug/L											< 0.2
Zinc, total	mg/L											43
Uranium, total	mg/L											

Lower Mole Lake High Sulfur Waste Rock Composite (WD-12) Continued

PARAMETER	Units	06/12/95	06/20/95	06/26/95	09/06/95	09/11/95	09/18/95	09/25/95	10/03/95	10/10/95	10/16/95	10/24/95
Acidity, Total	mg/L	140	120	140	280	300	300	350	340	370	35	91
Sulfate	mg/L				1400	1300	2100	2300	1200	1300	5200	2700
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Lower Mole Lake High Sulfur Waste Rock Composite (WD-12) Continued

PARAMETER	Units		10/30/95 *	11/06/95	11/20/95	11/27/95	12/04/95	12/11/95	12/18/95	12/26/95	01/02/96	01/09/96
Acidity, Total	mg/L		380	410	410	380	380	440	410	350	350	360
Sulfate	mg/L		1200		1400	1300						
Calcium, total	mg/L		210			200						
Arsenic, total	mg/L		0.016									
Barium, total	mg/L	<	0.005									
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		7.4									
Manganese, total	mg/L		12									
Molybdenum, total	mg/L											
Selenium, total	mg/L		0.082									
Silver, total	mg/L	<	0.005									
Chromium, total	mg/L	<	0.005									
Cobalt, total	mg/L		0.36									
Beryllium, total	mg/L	<	***0.005***									
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L		0.061									
Antimony, total	mg/L	<	***0.06***									
Magnesium, total	mg/L		110			100						
Potassium, total	mg/L		1.6									
Sodium, total	mg/L		0.83									
Aluminum, total	mg/L		8.3									
Cadmium, total	mg/L		0.20									
Copper, total	mg/L		19									
Lead, total	mg/L		0.029									
Mercury, total	ug/L					< 0.2						
Zinc, total	mg/L		92									
Uranium, total	mg/L											

Crandon Project : Leachate Summary
Site Groundwater Used in Leaching Tests (WD-04)

PARAMETER	UNITS		08/19/94
Sulfate	mg/L		9.9
Calcium, total	mg/L		25
Arsenic, total	mg/L	<	0.005
Barium, total	mg/L		0.012
Bismuth	mg/L	<	0.2
Gallium	mg/L	<	0.2
Germanium	mg/L	<	0.025
Iron, total	mg/L		0.030
Manganese, total	mg/L		0.011
Molybdenum, total	mg/L	<	0.020
Selenium, total	mg/L	<	0.005
Silver, total	mg/L	<	0.005
Chromium, total	mg/L	<	0.005
Cobalt, total	mg/L	<	0.010
Beryllium, total	mg/L	<	0.005
Thallium, total	mg/L	<	0.040
Tellurium	mg/L	<	0.32
Tin	mg/L	<	0.24
Titanium	mg/L	<	0.050
Nickel, total	mg/L	<	0.015
Antimony, total	mg/L	<	0.040
Magnesium, total	mg/L		13
Potassium, total	mg/L		0.75
Sodium, total	mg/L		1.9
Aluminum, total	mg/L	<	0.030
Cadmium, total	mg/L	<	0.005
Copper, total	mg/L		0.027
Lead, total	mg/L	<	0.040
Mercury, total	ug/L	<	0.2
Zinc, total	mg/L		0.44
Uranium, total	mg/L	<	0.001

Crandon Project Leachate Summary
Fine Tailings Composite (RS-18)
Leached Under Saturated, Followed by Alternating W/D Conditions

PARAMETER	Units	12/14/94	01/18/95	02/21/95	02/28/95	03/07/95	03/14/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95
Acidity, Total	mg/L						5					27
Alkalinity	mg/L	37	52	26	20	20		< 5	< 5	< 5	< 5	
Alkalinity, Bicarbonate	mg/L	37	52	26	20	20		< 5	< 5	< 5	< 5	
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5	
Sulfate	mg/L	717	3640	840	510		370				830	
Cyanide, total	ug/L	< 10	< 10	< 10	< 10		28				22	
Calcium, total	mg/L	270	340	330	210		140				180	
Arsenic, total	mg/L	0.037	0.039	0.021	0.016		0.007				0.053	
Barium, total	mg/L	0.26	0.21	0.077	0.045		0.035				0.045	
Bismuth	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025	
Iron, total	mg/L	2.8	2.8	0.12	0.22		0.069				0.64	
Manganese, total	mg/L	0.79	1.2	1.6	1.0		0.97				3.3	
Molybdenum, total	mg/L	< 0.020	0.022	< 0.020	< 0.020		< 0.020				< 0.020	
Selenium, total	mg/L	0.035	0.038	0.037	0.028		0.015				0.029	
Silver, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Chromium, total	mg/L	0.50	0.026	< 0.005	< 0.005		< 0.005				0.027	
Cobalt, total	mg/L	0.026	0.030	0.021	0.014		< 0.010				0.016	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	< 0.080	< 0.080	< 0.080	< 0.080		< 0.080				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.28	< 0.28		< 0.28				< 0.28	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050	0.064		< 0.050				< 0.050	
Magnesium, total	mg/L	26	24	31	21		15				29	
Potassium, total	mg/L	8.1	8.8	9.3	6.1		4.1				5.7	
Sodium, total	mg/L	57	53	46	28		16				13	
Aluminum, total	mg/L	0.41	0.45	0.035	0.063		0.042				0.12	
Cadmium, total	mg/L	0.006	< 0.005	< 0.005	0.005		< 0.005				0.006	
Copper, total	mg/L	0.080	0.26	0.039	0.032		0.022				0.039	
Lead, total	mg/L	0.39	0.26	< 0.040	< 0.040		0.12				0.21	
Mercury, total	ug/L	< 0.2	< 0.2	< 0.2	< 0.2		< 0.2				< 0.2	
Methylmercury	ng/L											
Zinc, total	mg/L	0.87	0.80	0.59	0.70		1.3				2.6	
Uranium, total	mg/L	< 0.0010	< 0.0010	< 0.001	< 0.001		< 0.001				< 0.001	

Note: RS-18A Lab Data Sheets Are Part of the RS-18 Database.

Crandon Project Leachate Summary
Fine Tailings Composite (RS-18)
Leached Under Saturated, Followed by Alternating W/D Conditions

PARAMETER	Units	12/14/94	01/18/95	02/21/95	02/28/95	03/07/95	03/14/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95
Acidity, Total	mg/L						5					27
Alkalinity	mg/L	37	52	26	20	20		< 5	< 5	< 5	< 5	
Alkalinity, Bicarbonate	mg/L	37	52	26	20	20		< 5	< 5	< 5	< 5	
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5	
Sulfate	mg/L	717	3640	840	510		370				830	
Cyanide, total	ug/L	< 10	< 10	< 10	< 10		28				22	
Calcium, total	mg/L	270	340	330	210		140				180	
Arsenic, total	mg/L	0.037	0.039	0.021	0.016		0.007				0.053	
Barium, total	mg/L	0.26	0.21	0.077	0.045		0.035				0.045	
Bismuth	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025	
Iron, total	mg/L	2.8	2.8	0.12	0.22		0.069				0.64	
Manganese, total	mg/L	0.79	1.2	1.6	1.0		0.97				3.3	
Molybdenum, total	mg/L	< 0.020	0.022	< 0.020	< 0.020		< 0.020				< 0.020	
Selenium, total	mg/L	0.035	0.038	0.037	0.028		0.015				0.029	
Silver, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Chromium, total	mg/L	0.50	0.026	< 0.005	< 0.005		< 0.005				0.027	
Cobalt, total	mg/L	0.026	0.030	0.021	0.014		< 0.010				0.016	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	< 0.080	< 0.080	< 0.080	< 0.080		< 0.080				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.28	< 0.28		< 0.28				< 0.28	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050	0.064		< 0.050				< 0.050	
Magnesium, total	mg/L	26	24	31	21		15				29	
Potassium, total	mg/L	8.1	8.8	9.3	6.1		4.1				5.7	
Sodium, total	mg/L	57	53	46	28		16				13	
Aluminum, total	mg/L	0.41	0.45	0.035	0.063		0.042				0.12	
Cadmium, total	mg/L	0.006	< 0.005	< 0.005	0.005		< 0.005				0.006	
Copper, total	mg/L	0.080	0.26	0.039	0.032		0.022				0.039	
Lead, total	mg/L	0.39	0.26	< 0.040	< 0.040		0.12				0.21	
Mercury, total	ug/L	< 0.2	< 0.2	< 0.2	< 0.2		< 0.2				< 0.2	
Methylmercury	ng/L											
Zinc, total	mg/L	0.87	0.80	0.59	0.70		1.3				2.6	
Uranium, total	mg/L	< 0.0010	< 0.0010	< 0.001	< 0.001		< 0.001				< 0.001	

Note: RS-18A Lab Data Sheets Are Part of the RS-18 Database.

Fine Tailings Composite (RS-18) Continued

PARAMETER	Units	04/25/95	05/02/95	05/10/95	05/17/95	05/23/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/05/95
Acidity, Total	mg/L	33	27	30	22	35	47	23		21	20	28
Alkalinity	mg/L								< 5			
Alkalinity, Bicarbonate	mg/L								< 5			
Alkalinity, Carbonate	mg/L								< 5			
Sulfate	mg/L							490				
Cyanide, total	ug/L											
Calcium, total	mg/L							140				
Arsenic, total	mg/L							0.015				
Barium, total	mg/L							0.028				
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L							0.94				
Manganese, total	mg/L							2.9				
Molybdenum, total	mg/L											
Selenium, total	mg/L							0.009				
Silver, total	mg/L											
Chromium, total	mg/L							0.010				
Cobalt, total	mg/L							0.029				
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L							36				
Potassium, total	mg/L							3.1				
Sodium, total	mg/L							4.8				
Aluminum, total	mg/L							0.12				
Cadmium, total	mg/L							0.008				
Copper, total	mg/L							0.046				
Lead, total	mg/L							0.12				
Mercury, total	ug/L											
Methylmercury	ng/L											
Zinc, total	mg/L							3.6				

Fine Tailings Composite (RS-18) Continued

PARAMETER	Units	07/11/95	07/25/95	08/01/95	08/08/95	08/15/95	08/22/95	08/31/95	09/06/95	09/12/95	09/19/95	09/26/95
Acidity, Total	mg/L	19	12	15	15	10	< 10					
Alkalinity	mg/L							< 5	8	12	12	15
Alkalinity, Bicarbonate	mg/L							< 5	8	12	12	15
Alkalinity, Carbonate	mg/L							< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L								490	490	780	530
Cyanide, total	ug/L											
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Methylmercury	ng/L											
Zinc, total	mg/L											

Fine Tailings Composite (RS-18) Continued

PARAMETER	Units	10/03/95	10/10/95	10/17/95	10/24/95	10/31/95	11/07/95	11/21/95	11/28/95	12/05/95	12/12/95	12/19/95
Acidity, Total	mg/L											
Alkalinity	mg/L	35	18	19	17	61	15	15	19	15	15	18
Alkalinity, Bicarbonate	mg/L	35	18	19	17	61	15	15	< 5	< 5	15	18
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	360	340	510	480	310	250	210	250			
Cyanide, total	ug/L											
Calcium, total	mg/L					98			82			
Arsenic, total	mg/L					< 0.005						
Barium, total	mg/L					0.021						
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L					0.088						
Manganese, total	mg/L					0.74						
Molybdenum, total	mg/L											
Selenium, total	mg/L					< 0.005						
Silver, total	mg/L					< 0.005						
Chromium, total	mg/L					< 0.005						
Cobalt, total	mg/L					< 0.010						
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L					< 0.020						
Antimony, total	mg/L											
Magnesium, total	mg/L					24			22			
Potassium, total	mg/L					0.72						
Sodium, total	mg/L					1.5						
Aluminum, total	mg/L					0.043						
Cadmium, total	mg/L					< 0.005						
Copper, total	mg/L					0.014						
Lead, total	mg/L					0.0058						
Mercury, total	ug/L								< 0.2			
Methylmercury	ng/L											
Zinc, total	mg/L					0.91						

Fine Tailings Composite (RS-18) Continued

PARAMETER	Units	12/27/95	01/03/96	01/10/96	01/23/96	02/20/96	02/20/96	02/27/96	03/05/96	03/18/96	04/16/96	05/21/96
Acidity, Total	mg/L											
Alkalinity	mg/L	15	8	7	9			5	< 5	< 5	< 5	< 5
Alkalinity, Bicarbonate	mg/L	15	8	7	9			5	< 5	< 5	< 5	< 5
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5			< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L				150			130		130	160	150
Cyanide, total	ug/L											
Calcium, total	mg/L				48			39		38	45	43
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L				13			11		12	15	14
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L					0.000841	0.0111		0.00110			
Methylmercury	ng/L					0.117	< 0.0477		< 0.0360			
Zinc, total	mg/L											

Fine Tailings Composite (RS-18) Continued

PARAMETER	Units	06/17/96	07/30/96	08/29/96	09/30/96	10/24/96
Acidity, Total	mg/L					
Alkalinity	mg/L	< 5	< 5	6	20	7
Alkalinity, Bicarbonate	mg/L	< 5		< 5	20	7
Alkalinity, Carbonate	mg/L	< 5		< 5	< 5	< 5
Sulfate	mg/L	170	330	360	630	280
Cyanide, total	ug/L					
Calcium, total	mg/L	45	100	80	140	85
Arsenic, total	mg/L					
Barium, total	mg/L					
Bismuth	mg/L					
Gallium	mg/L					
Germanium	mg/L					
Iron, total	mg/L					
Manganese, total	mg/L					
Molybdenum, total	mg/L					
Selenium, total	mg/L					
Silver, total	mg/L					
Chromium, total	mg/L					
Cobalt, total	mg/L					
Beryllium, total	mg/L					
Thallium, total	mg/L					
Tellurium	mg/L					
Tin	mg/L					
Titanium	mg/L					
Nickel, total	mg/L					
Antimony, total	mg/L					
Magnesium, total	mg/L	17	41	33	78	34
Potassium, total	mg/L					
Sodium, total	mg/L					
Aluminum, total	mg/L					
Cadmium, total	mg/L					
Copper, total	mg/L					
Lead, total	mg/L					
Mercury, total	ug/L					
Methylmercury	ng/L					
Zinc, total	mg/L					

Crandon Project Leachate Summary
Whole Tailings Composite (RS-13)
Leached Under Saturated, Followed by Alternating W/D Conditions

PARAMETER	Units	12/14/94	01/18/95	02/21/95	02/28/95	03/07/95	03/14/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95
Alkalinity	mg/L	86	79	40	62	59	51	50	46	48	32	38
Alkalinity, Bicarbonate	mg/L	86	79	40	62	59	51	50	46	48	32	38
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	1550	1910	1700	1100		650				850	
Cyanide, total	ug/L	< 10	< 10	< 10	< 10		< 10				16	
Calcium, total	mg/L	480	550	610	420		240				180	
Arsenic, total	mg/L	0.033	0.14	0.032	0.024		0.012				0.012	
Barium, total	mg/L	0.074	0.052	0.039	0.031		0.031				0.025	
Bismuth	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		0.027				< 0.025	
Iron, total	mg/L	2.9	5.7	1.0	0.67		0.059				0.065	
Manganese, total	mg/L	14	14	9.8	5.2		3.2				3.1	
Molybdenum, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Selenium, total	mg/L	0.13	0.19	0.14	0.068		0.040				0.057	
Silver, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Chromium, total	mg/L	0.011	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Cobalt, total	mg/L	0.15	0.16	0.088	0.037		0.023				0.018	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	0.15	< 0.080	< 0.080	< 0.080		< 0.080				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.28	< 0.28		< 0.28				< 0.28	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	0.11	0.10	0.056	0.036		0.020				< 0.020	
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050	0.076		< 0.050				< 0.050	
Magnesium, total	mg/L	95	95	97	54		32				35	
Potassium, total	mg/L	9.6	9.8	14	10		7.0				3.9	
Sodium, total	mg/L	49	50	53	29		15				6.8	
Aluminum, total	mg/L	0.20	0.63	0.19	0.11		0.044				0.036	
Cadmium, total	mg/L	0.023	0.097	0.049	0.021		0.017				0.016	
Copper, total	mg/L	0.017	0.64	0.013	0.015		0.007				< 0.005	
Lead, total	mg/L	1.5	0.91	0.56	0.22		0.11				0.066	
Mercury, total	ug/L	< 0.2	< 0.2	< 0.2	< 0.2		< 0.2				< 0.2	
Methylmercury	ng/L											
Zinc, total	mg/L	31	32	21	8.8		5.8				6.3	
Uranium, total	mg/L	< 0.0010	< 0.0010	< 0.001	< 0.001		< 0.001				< 0.001	

Note: RS-13A Lab Data Sheets Are Part of the RS-13 Database.

Crandon Project Leachate Summary
Whole Tailings Composite (RS-13)
Leached Under Saturated, Followed by Alternating W/D Conditions

PARAMETER	Units	12/14/94	01/18/95	02/21/95	02/28/95	03/07/95	03/14/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95
Alkalinity	mg/L	86	79	40	62	59	51	50	46	48	32	38
Alkalinity, Bicarbonate	mg/L	86	79	40	62	59	51	50	46	48	32	38
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	1550	1910	1700	1100		650				850	
Cyanide, total	ug/L	< 10	< 10	< 10	< 10		< 10				16	
Calcium, total	mg/L	480	550	610	420		240				180	
Arsenic, total	mg/L	0.033	0.14	0.032	0.024		0.012				0.012	
Barium, total	mg/L	0.074	0.052	0.039	0.031		0.031				0.025	
Bismuth	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.20	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		0.027				< 0.025	
Iron, total	mg/L	2.9	5.7	1.0	0.67		0.059				0.065	
Manganese, total	mg/L	14	14	9.8	5.2		3.2				3.1	
Molybdenum, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Selenium, total	mg/L	0.13	0.19	0.14	0.068		0.040				0.057	
Silver, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Chromium, total	mg/L	0.011	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Cobalt, total	mg/L	0.15	0.16	0.088	0.037		0.023				0.018	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	0.15	< 0.080	< 0.080	< 0.080		< 0.080				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.28	< 0.28		< 0.28				< 0.28	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	0.11	0.10	0.056	0.036		0.020				< 0.020	
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050	0.076		< 0.050				< 0.050	
Magnesium, total	mg/L	95	95	97	54		32				35	
Potassium, total	mg/L	9.6	9.8	14	10		7.0				3.9	
Sodium, total	mg/L	49	50	53	29		15				6.8	
Aluminum, total	mg/L	0.20	0.63	0.19	0.11		0.044				0.036	
Cadmium, total	mg/L	0.023	0.097	0.049	0.021		0.017				0.016	
Copper, total	mg/L	0.017	0.64	0.013	0.015		0.007				< 0.005	
Lead, total	mg/L	1.5	0.91	0.56	0.22		0.11				0.066	
Mercury, total	ug/L	< 0.2	< 0.2	< 0.2	< 0.2		< 0.2				< 0.2	
Methylmercury	ng/L											
Zinc, total	mg/L	31	32	21	8.8		5.8				6.3	
Uranium, total	mg/L	< 0.0010	< 0.0010	< 0.001	< 0.001		< 0.001				< 0.001	

Whole Tailings Composite (RS-13) Continued

PARAMETER	Units	04/25/95	05/02/95	05/10/95	05/17/95	05/23/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/05/95
Alkalinity	mg/L	45	54	47	51	57	56	53	49	46	56	50
Alkalinity, Bicarbonate	mg/L	45	54	47	51	57	56	53	49	46	56	50
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L							450				
Cyanide, total	ug/L											
Calcium, total	mg/L							150				
Arsenic, total	mg/L							0.009				
Barium, total	mg/L							0.020				
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L							0.066				
Manganese, total	mg/L							3.2				
Molybdenum, total	mg/L											
Selenium, total	mg/L							0.029				
Silver, total	mg/L							< 0.005				
Chromium, total	mg/L											
Cobalt, total	mg/L							0.012				
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L							< 0.020				
Antimony, total	mg/L											
Magnesium, total	mg/L							38				
Potassium, total	mg/L							2.0				
Sodium, total	mg/L							4.7				
Aluminum, total	mg/L							< 0.030				
Cadmium, total	mg/L							0.010				
Copper, total	mg/L							< 0.005				
Lead, total	mg/L							0.053				
Mercury, total	ug/L											
Methylmercury	ng/L											
Zinc, total	mg/L							3.8				
Uranium, total	mg/L											

Whole Tailings Composite (RS-13) Continued

PARAMETER	Units	07/11/95	08/01/95	08/08/95	08/15/95	08/22/95	08/31/95	09/08/95	09/12/95	09/19/95	09/26/95	10/03/95
Alkalinity	mg/L	53	52	51	50	49	50	48	44	41	40	42
Alkalinity, Bicarbonate	mg/L	53	52	51	50	49	50	48	44	41	40	42
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L							330	300	500	300	280
Cyanide, total	ug/L											
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Methylmercury	ng/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Whole Tailings Composite (RS-13) Continued

PARAMETER	Units	10/10/95	10/17/95	10/24/95	10/31/95	11/07/95	11/21/95	11/28/95	12/05/95	12/12/95	12/19/95	12/27/95
Alkalinity	mg/L	43	41	36	40	35	40	44	42	39	37	32
Alkalinity, Bicarbonate	mg/L	43	41	36	40	35	40	< 5	< 5	39	37	32
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	250	320	390	250	220	240	250				
Cyanide, total	ug/L											
Calcium, total	mg/L				75			72				
Arsenic, total	mg/L				0.0051							
Barium, total	mg/L				0.017							
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L				0.12							
Manganese, total	mg/L				2.5							
Molybdenum, total	mg/L											
Selenium, total	mg/L				0.007							
Silver, total	mg/L				< 0.005							
Chromium, total	mg/L				< 0.005							
Cobalt, total	mg/L				< 0.010							
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L				< 0.020							
Antimony, total	mg/L											
Magnesium, total	mg/L				29			29				
Potassium, total	mg/L				< 0.60							
Sodium, total	mg/L				1.1							
Aluminum, total	mg/L				0.048							
Cadmium, total	mg/L				< 0.005							
Copper, total	mg/L				< 0.005							
Lead, total	mg/L				0.0064							
Mercury, total	ug/L							< 0.2				
Methylmercury	ng/L											
Zinc, total	mg/L				1.9							
Uranium, total	mg/L											

Whole Tailings Composite (RS-13) Continued

PARAMETER	Units	01/03/96	01/10/96	01/23/96	02/20/96	02/20/96	02/27/96	03/05/96	03/18/96	04/16/96	05/21/96	06/17/96
Alkalinity	mg/L	39	37	39			38		35	35	33	34
Alkalinity, Bicarbonate	mg/L	39	37	39			38		35	< 5	33	34
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5			< 5		< 5	< 5	< 5	< 5
Sulfate	mg/L			190			180		190	210	190	190
Cyanide, total	ug/L											
Calcium, total	mg/L			60			55		52	61	53	51
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L			23			24		23	26	24	24
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L				0.00190	0.00227		0.0475				
Methylmercury	ng/L				< 0.0481	< 0.0480		< 0.0367				
Zinc, total	mg/L											
Uranium, total	mg/L											

Whole Tailings Composite (RS-13) Continued

PARAMETER	Units	07/30/96	08/29/96	09/30/96	10/24/96
Alkalinity	mg/L	32	22	< 5	26
Alkalinity, Bicarbonate	mg/L	< 5	< 5	< 5	26
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5
Sulfate	mg/L	270	430	310	480
Cyanide, total	ug/L				
Calcium, total	mg/L	86	81	66	120
Arsenic, total	mg/L				
Barium, total	mg/L				
Bismuth	mg/L				
Gallium	mg/L				
Germanium	mg/L				
Iron, total	mg/L				
Manganese, total	mg/L				
Molybdenum, total	mg/L				
Selenium, total	mg/L				
Silver, total	mg/L				
Chromium, total	mg/L				
Cobalt, total	mg/L				
Beryllium, total	mg/L				
Thallium, total	mg/L				
Tellurium	mg/L				
Tin	mg/L				
Titanium	mg/L				
Nickel, total	mg/L				
Antimony, total	mg/L				
Magnesium, total	mg/L	41	39	49	55
Potassium, total	mg/L				
Sodium, total	mg/L				
Aluminum, total	mg/L				
Cadmium, total	mg/L				
Copper, total	mg/L				
Lead, total	mg/L				
Mercury, total	ug/L				
Methylmercury	ng/L				
Zinc, total	mg/L				
Uranium, total	mg/L				

Crandon Project Leachate Summary
Whole Tailings Composite (WD-13)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/22/94	11/29/94	12/06/94	12/13/94	12/21/94	12/28/94	01/04/95	01/10/95
Acidity, Total	mg/L												
Alkalinity	mg/L	1000	380	200	22	30	46	75	82	51	100	92	79
Alkalinity, Bicarbonate	mg/L	< 5	< 5	< 5	22	30	46	75	82	51	100	92	79
Alkalinity, Carbonate	mg/L	340	120	100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride, total	mg/L												
Fluoride	mg/L												
Sulfate	mg/L	747	564		356	438				1820			
Cyanide, total	ug/L		< 10		< 10	< 10				< 10			
Boron, total	mg/L												
Calcium, total	mg/L	300	220		120	130				530			
Arsenic, total	mg/L	0.061	0.052		0.36	0.20				0.009			
Barium, total	mg/L	0.042	0.030		0.016	0.017				0.028			
Bismuth	mg/L	< 0.20	< 0.20		< 0.20	< 0.20				< 0.20			
Gallium	mg/L	< 0.20	< 0.20		< 0.20	< 0.20				< 0.20			
Germanium	mg/L	< 0.025	< 0.025		< 0.025	< 0.025				< 0.025			
Iron, total	mg/L	2.2	2.1		24	13				1.3			
Manganese, total	mg/L	4.5	3.5		2.7	3.0				11			
Molybdenum, total	mg/L	< 0.020	< 0.020		< 0.020	< 0.020				< 0.020			
Selenium, total	mg/L	0.061	0.042		0.035	0.043				0.085			
Silver, total	mg/L	< 0.005	< 0.005		0.013	< 0.005				0.007			
Chromium, total	mg/L	< 0.005	< 0.005		0.029	0.016				0.009			
Cobalt, total	mg/L	0.059	0.035		0.027	0.022				0.030			
Beryllium, total	mg/L	< 0.005	< 0.005		< 0.005	< 0.005				< 0.005			
Thallium, total	mg/L	< 0.080	< 0.080		< 0.080	< 0.080				< 0.080			
Tellurium	mg/L	< 0.32	< 0.32		< 0.32	< 0.32				< 0.32			
Tin	mg/L	< 0.24	< 0.24		< 0.24	< 0.24				< 0.24			
Titanium	mg/L	< 0.050	< 0.050		< 0.050	< 0.050				< 0.050			
Nickel, total	mg/L	0.044	0.037		0.023	0.034				0.12			
Antimony, total	mg/L	< 0.050	0.064		< 0.050	0.051				0.054			
Magnesium, total	mg/L	66	51		37	46				110			
Phosphorus, total	mg/L												
Potassium, total	mg/L	7.0	< 4.8		< 4.8	< 4.8				6.5			
Sodium, total	mg/L	11	6.9		3.7	4.0				7.6			
Aluminum, total	mg/L	0.39	0.40		2.6	1.4				0.072			
Cadmium, total	mg/L	0.059	0.044		0.017	0.024				0.017			
Copper, total	mg/L	0.12	0.15		0.36	0.20				0.047			
Lead, total	mg/L	0.60	0.43		1.8	0.96				0.18			
Mercury, total	ug/L	0.5	0.2		0.34	0.2				0.4			
Zinc, total	mg/L	22	17		13	11				34			
Uranium, total	mg/L		< 0.001		< 0.001	< 0.0010				< 0.0010			
Strontium, total	mg/L												

Whole Tailings Composite (WD-13) Continued

PARAMETER	Units	01/10/95	01/17/95	01/24/95	01/31/95	02/08/95	02/15/95	02/21/95	02/28/95	03/07/95	03/14/95	03/21/95
Acidity, Total	mg/L											
Alkalinity	mg/L	79	71	34	26	31	20	29	20	17	12	17
Alkalinity, Bicarbonate	mg/L	79	71		26	31	20	29	20	17	12	17
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride, total	mg/L											
Fluoride	mg/L											
Sulfate	mg/L		1400				740					
Cyanide, total	ug/L											
Boron, total	mg/L											
Calcium, total	mg/L		480				250					
Arsenic, total	mg/L		0.023				0.014					
Barium, total	mg/L		0.028				0.022					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		0.51				< 0.020					
Manganese, total	mg/L		8.1				6.8					
Molybdenum, total	mg/L											
Selenium, total	mg/L		0.033				0.041					
Silver, total	mg/L		0.009				< 0.005					
Chromium, total	mg/L	< 0.005					< 0.005					
Cobalt, total	mg/L		0.028				0.064					
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L		0.096				0.079					
Antimony, total	mg/L		< 0.050				< 0.050					
Magnesium, total	mg/L		52				44					
Phosphorus, total	mg/L											
Potassium, total	mg/L		4.1				1.3					
Sodium, total	mg/L		2.0				0.88					
Aluminum, total	mg/L		0.077				0.053					
Cadmium, total	mg/L		0.026				0.040					
Copper, total	mg/L		0.078				0.027					

Whole Tailings Composite (WD-13) Continued

PARAMETER	Units	03/28/95	04/04/95	04/11/95	04/18/95	04/25/95	05/02/95	05/10/95	05/17/95	05/23/95	05/30/95	06/06/95
Acidity, Total	mg/L											
Alkalinity	mg/L	16	24	35	20	11	10	9	16	29	15	28
Alkalinity, Bicarbonate	mg/L	16	24	35	20	11	10	9	16	29	15	28
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride, total	mg/L											
Fluoride	mg/L											
Sulfate	mg/L											780
Cyanide, total	ug/L											
Boron, total	mg/L											
Calcium, total	mg/L											190
Arsenic, total	mg/L											0.012
Barium, total	mg/L											0.016
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											0.10
Manganese, total	mg/L											9.4
Molybdenum, total	mg/L											
Selenium, total	mg/L											0.047
Silver, total	mg/L											< 0.005
Chromium, total	mg/L											
Cobalt, total	mg/L											0.036
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											0.076
Antimony, total	mg/L											
Magnesium, total	mg/L											86
Phosphorus, total	mg/L											
Potassium, total	mg/L											1.3
Sodium, total	mg/L											0.84
Aluminum, total	mg/L											< 0.030
Cadmium, total	mg/L											0.025
Copper, total	mg/L											0.076

Whole Tailings Composite (WD-13) Continued

PARAMETER	Units	06/12/95	06/20/95	06/26/95	07/05/95	07/11/95	07/25/95	08/01/95	08/08/95	08/15/95	08/21/95	08/31/95
Acidity, Total	mg/L											
Alkalinity	mg/L	33	34	37	39	32	28	8	20	27	25	25
Alkalinity, Bicarbonate	mg/L	33	34	37	39	32	28	8	20	27	25	25
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloride, total	mg/L											
Fluoride	mg/L											
Sulfate	mg/L											
Cyanide, total	ug/L											
Boron, total	mg/L											
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Phosphorus, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											

Whole Tailings Composite (WD-13) Continued

PARAMETER	Units	09/06/95	09/12/95	09/19/95	09/26/95	10/03/95	10/10/95	10/17/95	10/24/95	10/31/95	11/07/95	11/21/95
Acidity, Total	mg/L											80
Alkalinity	mg/L	21	21	17	21	19	22	86	18	22	14	
Alkalinity, Bicarbonate	mg/L	21	21	17	21	19	22	86	18	22	14	
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	
Chloride, total	mg/L											
Fluoride	mg/L											
Sulfate	mg/L	560	560	1100	590	500	700	730	680	480	450	660
Cyanide, total	ug/L											
Boron, total	mg/L											
Calcium, total	mg/L									100		
Arsenic, total	mg/L									0.023		
Barium, total	mg/L									0.008		
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L									2.0		
Manganese, total	mg/L									6.0		
Molybdenum, total	mg/L											
Selenium, total	mg/L									0.030		
Silver, total	mg/L								<	0.005		
Chromium, total	mg/L								<	0.005		
Cobalt, total	mg/L									0.028		
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L									0.038		
Antimony, total	mg/L											
Magnesium, total	mg/L									65		
Phosphorus, total	mg/L											
Potassium, total	mg/L								<	0.60		
Sodium, total	mg/L									0.58		
Aluminum, total	mg/L									1.1		
Cadmium, total	mg/L									0.018		
Copper, total	mg/L									0.86		

Whole Tailings Composite (WD-13) Continued

PARAMETER	Units	11/28/95	12/05/95	12/12/95	12/19/95	12/27/95	01/03/96	01/10/96	01/23/96	07/16/96
Acidity, Total	mg/L	280	290	330	210	170	160	130	100	4600
Alkalinity	mg/L									<
Alkalinity, Bicarbonate	mg/L									
Alkalinity, Carbonate	mg/L									
Chloride, total	mg/L									< 1
Fluoride	mg/L									< 0.1
Sulfate	mg/L	1600							760	12000
Cyanide, total	ug/L									
Boron, total	mg/L									0.22
Calcium, total	mg/L	270							130	300
Arsenic, total	mg/L									1.1
Barium, total	mg/L									0.006
Bismuth	mg/L									
Gallium	mg/L									
Germanium	mg/L									
Iron, total	mg/L									460
Manganese, total	mg/L									180
Molybdenum, total	mg/L									
Selenium, total	mg/L									1.1
Silver, total	mg/L									0.028
Chromium, total	mg/L									0.50
Cobalt, total	mg/L									2.9
Beryllium, total	mg/L									0.007
Thallium, total	mg/L									
Tellurium	mg/L									
Tin	mg/L									
Titanium	mg/L									
Nickel, total	mg/L									1.9
Antimony, total	mg/L									< 0.050
Magnesium, total	mg/L	150							89	1500
Phosphorus, total	mg/L									< 0.05
Potassium, total	mg/L									< 0.60
Sodium, total	mg/L									4.7
Aluminum, total	mg/L									28
Cadmium, total	mg/L									5.4
Copper, total	mg/L									66

Crandon Project Leachate Summary
Lime Amended Whole Tailings Composite (WD-14)
Leached Under Alternating W/D Conditions

PARAMETER	Units	10/25/94	11/02/94	11/09/94	11/16/94	11/22/94	11/29/94	12/06/94	12/12/94	12/21/94	12/28/94	01/04/95
Alkalinity	mg/L	17	18	23	190	200	172*	146*	510	36	78	52
Alkalinity, Bicarbonate	mg/L	17	18	23	< 5	60	12	26	90	36	62	28
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	80	140	160	120	180	< 5	16	24
Sulfate	mg/L	326	169		98	91			104	115		
Cyanide, total	ug/L	< 10	< 10		< 10	23			12	27		
Calcium, total	mg/L	760	360		160	130			160	120		
Arsenic, total	mg/L	0.21	0.26		1.2	1.9			1.4	1.2		
Barium, total	mg/L	0.066	0.035		0.016	0.022			0.019	0.016		
Bismuth	mg/L	< 0.20	< 0.20		< 0.20	< 0.20			< 0.20	< 0.20		
Gallium	mg/L	< 0.20	< 0.20		< 0.20	< 0.20			< 0.20	< 0.20		
Germanium	mg/L	< 0.025	< 0.025		< 0.025	< 0.025			< 0.025	< 0.025		
Iron, total	mg/L	0.59	3.6		92	140			80	90		
Manganese, total	mg/L	< 0.005	0.024		0.36	0.58			0.99	0.36		
Molybdenum, total	mg/L	0.086	0.035		< 0.020	< 0.020			0.023	< 0.020		
Selenium, total	mg/L	0.33	0.22		0.16	0.15			0.17	0.14		
Silver, total	mg/L	< 0.005	< 0.005		0.013	0.018			0.012	0.014		
Chromium, total	mg/L	0.008	< 0.005		0.038	0.078			0.074	0.040		
Cobalt, total	mg/L	0.011	< 0.010		0.025	0.046			0.030	0.030		
Beryllium, total	mg/L	< 0.005	< 0.005		< 0.005	< 0.005			< 0.005	< 0.005		
Thallium, total	mg/L	0.091	< 0.080		< 0.080	< 0.080			< 0.080	< 0.080		
Tellurium	mg/L	< 0.32	< 0.32		< 0.32	< 0.32			< 0.32	< 0.32		
Tin	mg/L	< 0.24	< 0.24		< 0.24	< 0.24			< 0.24	< 0.24		
Titanium	mg/L	< 0.050	< 0.050		< 0.050	< 0.050			< 0.050	< 0.050		
Nickel, total	mg/L	0.051	0.031		< 0.020	0.039			0.081	0.064		
Antimony, total	mg/L	0.054	< 0.050		< 0.050	< 0.050			< 0.050	< 0.050		
Magnesium, total	mg/L	0.33	1.2		11	20			27	13		
Potassium, total	mg/L	35.7	19.2		7.4	6.5			5.0	< 4.8		
Sodium, total	mg/L	21	10		4.2	3.5			3.2	2.8		
Aluminum, total	mg/L	0.14	0.44		5.0	9.4			5.2	5.4		
Cadmium, total	mg/L	< 0.005	< 0.005		< 0.005	0.008			0.011	< 0.005		
Copper, total	mg/L	0.92	0.66		0.86	1.3			1.4	0.91		
Lead, total	mg/L	53	28		11	9.0			8.9	3.5		
Mercury, total	ug/L	< 0.2	< 0.2		0.57	1.4			< 0.2	1.0		
Zinc, total	mg/L	2.2	0.46		4.0	7.1			5.6	3.3		
Uranium, total	mg/L		< 0.001		< 0.0010	< 0.0012			< 0.0023	< 0.0010		

* Revised Data, Lab Sheets Likely Incorrect.

Lime Amended Whole Tailings Composite (WD-14) Continued

PARAMETER	Units	01/10/95	01/17/95	01/24/95	01/31/95	02/08/95	09/12/95	09/19/95	09/26/95	10/03/95	10/10/95	10/17/95
Alkalinity	mg/L	73	39	150	47	24	22	25	20	89	33	23
Alkalinity, Bicarbonate	mg/L	73	35		47	24	22	25	20	89	33	23
Alkalinity, Carbonate	mg/L	< 5	< 5		< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L		210				410	610	580	420	490	580
Cyanide, total	ug/L		< 10									
Calcium, total	mg/L		140									
Arsenic, total	mg/L		0.22									
Barium, total	mg/L		0.018									
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		12									
Manganese, total	mg/L		0.12									
Molybdenum, total	mg/L		< 0.020									
Selenium, total	mg/L		0.075									
Silver, total	mg/L		< 0.005									
Chromium, total	mg/L		0.017									
Cobalt, total	mg/L		< 0.010									
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L		0.066									
Antimony, total	mg/L											
Magnesium, total	mg/L		14									
Potassium, total	mg/L		5.7									
Sodium, total	mg/L		3.3									
Aluminum, total	mg/L		1.7									
Cadmium, total	mg/L		< 0.005									
Copper, total	mg/L		0.36									
Lead, total	mg/L		1.7									
Mercury, total	ug/L		< 0.2									
Zinc, total	mg/L		1.6									
Uranium, total	mg/L											

Lime Amended Whole Tailings Composite (WD-14) Continued

PARAMETER	Units	10/24/95	10/31/95	11/07/95	11/21/95	11/28/95	12/05/95	12/12/95	12/19/95	12/27/95	01/03/96	01/10/96
Alkalinity	mg/L	20	29	20	< 5	26	21	24	31	19	31	19
Alkalinity, Bicarbonate	mg/L	20	29	20	< 5	< 5	< 5	24	31	19	31	19
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	540	420	390	320	470						
Cyanide, total	ug/L											
Calcium, total	mg/L		160			150						
Arsenic, total	mg/L		0.010									
Barium, total	mg/L		0.016									
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		0.24									
Manganese, total	mg/L		0.24									
Molybdenum, total	mg/L											
Selenium, total	mg/L		0.028									
Silver, total	mg/L		< 0.005									
Chromium, total	mg/L		< 0.005									
Cobalt, total	mg/L		< 0.010									
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L		0.037									
Antimony, total	mg/L											
Magnesium, total	mg/L		42			46						
Potassium, total	mg/L		2.0									
Sodium, total	mg/L		2.3									
Aluminum, total	mg/L		0.50									
Cadmium, total	mg/L		< 0.005									
Copper, total	mg/L		0.026									
Lead, total	mg/L		0.073									
Mercury, total	ug/L					< 0.2						
Zinc, total	mg/L		0.95									
Uranium, total	mg/L											

Crandon Project Leachate Summary
Backfill Coarse Tailings Composite (AL-15)
Leached Under Alternating W/D, Followed by Saturated Conditions

PARAMETER	Units	10/11/94	12/21/94	12/28/94	01/03/95	01/11/95	01/17/95	01/23/95	01/30/95	02/08/95	02/15/95	02/21/95
Alkalinity	mg/L		70	24	44	71	86	87	96	110	72	90
Alkalinity, Bicarbonate	mg/L		70	24	44	71	86		96	110	72	90
Alkalinity, Carbonate	mg/L		< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
Sulfate	mg/L	2300	1480	1570		540	370			256		
Cyanide, total	ug/L		< 10	13		< 10	< 10			< 10		
Calcium, total	mg/L	440	480	460		240	200			96		
Arsenic, total	mg/L	0.53	1.5	0.080		0.091	0.022			0.021		
Barium, total	mg/L	0.13	0.044	0.025		0.029	0.032			0.034		
Bismuth	mg/L	< 0.2	< 0.20	< 0.20		< 0.20				< 0.20		
Gallium	mg/L	< 0.2	< 0.20	< 0.20		< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025		
Iron, total	mg/L	44	100	2.2		2.8	0.022			< 0.020		
Manganese, total	mg/L	27	44	13		5.2	3.6			1.9		
Molybdenum, total	mg/L	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020		
Selenium, total	mg/L	0.16	0.36	0.056		0.030	0.015			< 0.005		
Silver, total	mg/L	0.022	0.057	0.015		< 0.005	< 0.005			< 0.005		
Chromium, total	mg/L	0.027	0.027	< 0.005		< 0.005	< 0.005			< 0.005		
Cobalt, total	mg/L	0.70	0.63	0.17		0.064	0.033			0.011		
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080	0.12		< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24	< 0.24		< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050		
Nickel, total	mg/L	0.37	0.48	0.17		0.064	0.038			< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050	0.069		< 0.050				< 0.050		
Magnesium, total	mg/L	220	320	88		42	31			23		
Potassium, total	mg/L	8.8	8.4	< 4.8		< 4.8	2.8			< 4.8		
Sodium, total	mg/L	43	38	5.8		3.4	3.1			3.4		
Aluminum, total	mg/L	2.4	4.7	0.24		0.39	0.051			< 0.030		
Cadmium, total	mg/L	0.33	0.23	0.069		0.034	0.021			0.006		
Copper, total	mg/L	0.17	0.35	0.042		0.039	0.007			0.008		
Lead, total	mg/L	1.2	3.5	0.43		0.48	0.28			0.074		
Mercury, total	ug/L	0.9	0.6	< 0.2		< 0.2	< 0.2			< 0.2		
Zinc, total	mg/L	240	190	64		22	12			3.4		
Uranium, total	mg/L		< 0.0029	< 0.0010		< 0.001				< 0.0005		

Backfill Coarse Tailings Composite (AL-15) Continued

PARAMETER	Units	02/28/95	03/07/95	03/13/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95	04/25/95	05/01/95	05/08/95
Alkalinity	mg/L	100	110	110	120	110	120	80	96	110	110	110
Alkalinity, Bicarbonate	mg/L	100	110	110	120	110	120	80	96	110	110	110
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						250					
Cyanide, total	ug/L											
Calcium, total	mg/L						380					
Arsenic, total	mg/L						0.047					
Barium, total	mg/L						0.033					
Bismuth	mg/L						< 0.20					
Gallium	mg/L						< 0.20					
Germanium	mg/L						< 0.025					
Iron, total	mg/L						0.036					
Manganese, total	mg/L						2.0					
Molybdenum, total	mg/L						< 0.020					
Selenium, total	mg/L						< 0.005					
Silver, total	mg/L						< 0.005					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L						< 0.005					
Thallium, total	mg/L						< 0.080					
Tellurium	mg/L						< 0.32					
Tin	mg/L						< 0.28					
Titanium	mg/L						< 0.050					
Nickel, total	mg/L						< 0.020					
Antimony, total	mg/L						< 0.050					
Magnesium, total	mg/L						33					
Potassium, total	mg/L						1.1					
Sodium, total	mg/L						4.2					
Aluminum, total	mg/L						< 0.030					
Cadmium, total	mg/L						0.005					
Copper, total	mg/L						< 0.005					
Lead, total	mg/L						< 0.040					
Mercury, total	ug/L						< 0.2					
Zinc, total	mg/L						1.3					
Uranium, total	mg/L						< 0.001					

Backfill Coarse Tailings Composite (AL-15) Continued

PARAMETER	Units	05/15/95	05/22/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/25/95	09/06/95	09/11/95	09/18/95
Alkalinity	mg/L	110	110	110	100	100	97	100	90	81	66	66
Alkalinity, Bicarbonate	mg/L	110	110	110	100	100	97	100	90	81	66	66
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L								270	290	300	920
Cyanide, total	ug/L											
Calcium, total	mg/L								85			
Arsenic, total	mg/L								46			
Barium, total	mg/L								0.030			
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L								< 0.020			
Manganese, total	mg/L								2.4			
Molybdenum, total	mg/L											
Selenium, total	mg/L								5.2			
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L								< 0.010			
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L								< 0.020			
Antimony, total	mg/L											
Magnesium, total	mg/L								42			
Potassium, total	mg/L											
Sodium, total	mg/L								4.6			
Aluminum, total	mg/L								0.036			
Cadmium, total	mg/L								< 0.005			
Copper, total	mg/L								< 0.005			
Lead, total	mg/L								0.023			
Mercury, total	ug/L											
Zinc, total	mg/L								0.62			
Uranium, total	mg/L											

Backfill Coarse Tailings Composite (AL-15) Continued

PARAMETER	Units	09/25/95	10/03/95	10/10/95	10/17/95	10/23/95	10/30/95	11/06/95	11/20/95	11/27/95	12/05/95	12/11/95
Alkalinity	mg/L	62	64	66	67	67	65	65	72	70	71	74
Alkalinity, Bicarbonate	mg/L	62	64	66	67	67	65	65	72	< 5	< 5	74
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	800	200	220	220	430	160	150	150	150		
Cyanide, total	ug/L											
Calcium, total	mg/L						57			54		
Arsenic, total	mg/L						0.020					
Barium, total	mg/L						0.028					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						0.39					
Manganese, total	mg/L						1.5					
Molybdenum, total	mg/L											
Selenium, total	mg/L						0.012					
Silver, total	mg/L					<	0.005					
Chromium, total	mg/L					<	0.005					
Cobalt, total	mg/L					<	0.010					
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L					<	0.020					
Antimony, total	mg/L											
Magnesium, total	mg/L						27			25		
Potassium, total	mg/L						0.84					
Sodium, total	mg/L						2.8					
Aluminum, total	mg/L						1.0					
Cadmium, total	mg/L					<	0.005					
Copper, total	mg/L						0.057					
Lead, total	mg/L						0.016					
Mercury, total	ug/L								<	0.2		
Zinc, total	mg/L						0.42					
Uranium, total	mg/L											

Backfill Coarse Tailings Composite (AL-15) Continued

PARAMETER	Units	12/18/95	12/26/95	01/02/96	01/10/96	02/22/96	02/22/96	04/18/96
Alkalinity	mg/L	69	69	77	75			95
Alkalinity, Bicarbonate	mg/L	69	69	77	75			< 5
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5			< 5
Sulfate	mg/L					180	63	210
Cyanide, total	ug/L							
Calcium, total	mg/L							68
Arsenic, total	mg/L							
Barium, total	mg/L							
Bismuth	mg/L							
Gallium	mg/L							
Germanium	mg/L							
Iron, total	mg/L							
Manganese, total	mg/L							
Molybdenum, total	mg/L							
Selenium, total	mg/L							
Silver, total	mg/L							
Chromium, total	mg/L							
Cobalt, total	mg/L							
Beryllium, total	mg/L							
Thallium, total	mg/L							
Tellurium	mg/L							
Tin	mg/L							
Titanium	mg/L							
Nickel, total	mg/L							
Antimony, total	mg/L							
Magnesium, total	mg/L							33
Potassium, total	mg/L							
Sodium, total	mg/L							
Aluminum, total	mg/L							
Cadmium, total	mg/L							
Copper, total	mg/L					0.034	< 0.005	< 0.005
Lead, total	mg/L							
Mercury, total	ug/L							
Zinc, total	mg/L							1.7
Uranium, total	mg/L							

Crandon Project Leachate Summary
Backfill Cemented Coarse Tailings Composite (AL-17)
Leachated Under Alternating W/D, Followed by Saturated Conditions

PARAMETER	Units	10/11/94	12/14/94	12/20/94	12/27/94	01/03/95	01/11/95	01/17/95	01/23/95	01/30/95	02/08/95	02/15/95
Alkalinity	mg/L		350	510	550	470	560		530	520	520	510
Alkalinity, Bicarbonate	mg/L	< 5	450	< 5	< 5	< 5			< 5	< 5	< 5	
Alkalinity, Carbonate	mg/L		80	60	60	32	48			40	50	60
Sulfate	mg/L	1190	1390	1340	915		561				344	
Cyanide, total	ug/L	< 10	< 10	17	78		23	26			13	
Calcium, total	mg/L	570	250	440	410		340	340			290	
Arsenic, total	mg/L	0.012	0.011	0.014	0.012		0.010	0.010			0.006	
Barium, total	mg/L	0.23	0.060	0.091	0.084		0.072	0.081			0.055	
Bismuth	mg/L	< 0.2	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.2	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025	
Iron, total	mg/L	0.16	0.23	0.061	0.16		0.032	0.036			< 0.020	
Manganese, total	mg/L	< 0.005	0.021	< 0.005	< 0.005		< 0.005	0.15			< 0.005	
Molybdenum, total	mg/L	0.064	0.030	0.041	0.034		0.042	0.028			0.024	
Selenium, total	mg/L	0.088	0.034	0.032	0.040		0.024	0.027			0.020	
Silver, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Chromium, total	mg/L	1.7	0.017	0.006	< 0.005		< 0.005	< 0.005			< 0.005	
Cobalt, total	mg/L	< 0.010	< 0.010	< 0.010	< 0.010		< 0.010				< 0.010	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	< 0.080	< 0.080	< 0.080	< 0.080		0.12				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.24	< 0.24		< 0.24				< 0.24	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Magnesium, total	mg/L	0.057	1.3	0.044	0.073		0.050	1.0			< 0.030	
Potassium, total	mg/L	456	244	256	197		140	100			75.0	
Sodium, total	mg/L	160	65	82	56		40	29			20	
Aluminum, total	mg/L	0.30	0.14	0.11	0.10		0.097	0.078			0.082	
Cadmium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Copper, total	mg/L	0.035	0.009	< 0.005	0.008		< 0.005	< 0.005			0.006	
Lead, total	mg/L	0.77	< 0.040	0.078	0.075		0.089	0.13			0.066	
Mercury, total	ug/L	< 0.2	< 0.2	< 0.2	< 0.2		< 0.2				< 0.2	
Zinc, total	mg/L	0.075	0.037	0.18	< 0.020		0.21	0.65			< 0.020	
Uranium, total	mg/L	< 0.001	< 0.0010	< 0.0010	< 0.0010		< 0.001				< 0.0005	

Backfill Cemented Coarse Tailings Composite (AL-17) Continued

PARAMETER	Units	02/21/95	02/28/95	03/07/95	03/13/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95	04/25/95	05/01/95
Alkalinity	mg/L	500	500	500	500	480	480	440	470	470	450	420
Alkalinity, Bicarbonate	mg/L	470	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Alkalinity, Carbonate	mg/L	30	28	18	80	20	30	400	10	60	50	40
Sulfate	mg/L							330				
Cyanide, total	ug/L											
Calcium, total	mg/L							290				
Arsenic, total	mg/L							< 0.005				
Barium, total	mg/L							0.046				
Bismuth	mg/L							< 0.20				
Gallium	mg/L							< 0.20				
Germanium	mg/L							< 0.025				
Iron, total	mg/L							0.12				
Manganese, total	mg/L							< 0.005				
Molybdenum, total	mg/L							0.023				
Selenium, total	mg/L							0.016				
Silver, total	mg/L							< 0.005				
Chromium, total	mg/L							< 0.005				
Cobalt, total	mg/L							< 0.010				
Beryllium, total	mg/L							< 0.005				
Thallium, total	mg/L							< 0.080				
Tellurium	mg/L							< 0.32				
Tin	mg/L							< 0.28				
Titanium	mg/L							< 0.050				
Nickel, total	mg/L							< 0.020				
Antimony, total	mg/L							< 0.050				
Magnesium, total	mg/L							< 0.030				
Potassium, total	mg/L							45				
Sodium, total	mg/L							15				
Aluminum, total	mg/L							0.12				
Cadmium, total	mg/L							< 0.005				
Copper, total	mg/L							< 0.005				
Lead, total	mg/L							< 0.040				
Mercury, total	ug/L							< 0.2				
Zinc, total	mg/L							0.029				
Uranium, total	mg/L							< 0.001				

Backfill Cemented Coarse Tailings Composite (AL-17) Continued

PARAMETER	Units	05/08/95	05/15/95	05/22/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/25/95	09/06/95	09/11/95
Alkalinity	mg/L	400	42	410	390	380	370	370	340	320	300	300
Alkalinity, Bicarbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Alkalinity, Carbonate	mg/L	50	16	30	10	20	50	20	30	39	32	10
Sulfate	mg/L									400	390	400
Cyanide, total	ug/L											
Calcium, total	mg/L									320		
Arsenic, total	mg/L									0.007		
Barium, total	mg/L									0.049		
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L								<	0.020		
Manganese, total	mg/L											
Molybdenum, total	mg/L									0.024		
Selenium, total	mg/L									0.021		
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L								<	0.030		
Potassium, total	mg/L									28		
Sodium, total	mg/L									12		
Aluminum, total	mg/L									0.11		
Cadmium, total	mg/L											
Copper, total	mg/L								<	0.005		
Lead, total	mg/L									0.017		
Mercury, total	ug/L											
Zinc, total	mg/L								<	0.020		
Uranium, total	mg/L											

Backfill Cemented Coarse Tailings Composite (AL-17) Continued

PARAMETER	Units	09/18/95	09/25/95	10/03/95	10/10/95	10/17/95	10/23/95	10/30/95	11/06/95	11/20/95	11/27/95	12/05/95
Alkalinity	mg/L	310	300	300	300	300	290	290	300	290	290	300
Alkalinity, Bicarbonate	mg/L	< 5	< 5	0	0	0	< 5	< 5	< 5	< 5	250	240
Alkalinity, Carbonate	mg/L	20	14	12	18	50	8	22	20	50	38	60
Sulfate	mg/L	640	530	360	345	460	530	360	350	340	330	
Cyanide, total	ug/L											
Calcium, total	mg/L							280			250	
Arsenic, total	mg/L							0.0077				
Barium, total	mg/L							0.045				
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L							0.11				
Manganese, total	mg/L							0.15				
Molybdenum, total	mg/L											
Selenium, total	mg/L							0.017				
Silver, total	mg/L							< 0.005				
Chromium, total	mg/L							< 0.005				
Cobalt, total	mg/L							< 0.010				
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L							< 0.020				
Antimony, total	mg/L											
Magnesium, total	mg/L							2.2			0.54	
Potassium, total	mg/L							11				
Sodium, total	mg/L							5.8				
Aluminum, total	mg/L							0.25				
Cadmium, total	mg/L							< 0.005				
Copper, total	mg/L							0.23				
Lead, total	mg/L							0.021				
Mercury, total	ug/L										< 0.2	
Zinc, total	mg/L							1.2				
Uranium, total	mg/L											

Backfill Cemented Coarse Tailings Composite (AL-17) Continued

PARAMETER	Units	12/11/95	12/18/95	12/26/95	01/02/96	01/10/96
Alkalinity	mg/L	280	270	260	280	240
Alkalinity, Bicarbonate	mg/L	< 5	< 5	< 5	< 5	< 5
Alkalinity, Carbonate	mg/L	60	< 5	10	30	120
Sulfate	mg/L					
Cyanide, total	ug/L					
Calcium, total	mg/L					
Arsenic, total	mg/L					
Barium, total	mg/L					
Bismuth	mg/L					
Gallium	mg/L					
Germanium	mg/L					
Iron, total	mg/L					
Manganese, total	mg/L					
Molybdenum, total	mg/L					
Selenium, total	mg/L					
Silver, total	mg/L					
Chromium, total	mg/L					
Cobalt, total	mg/L					
Beryllium, total	mg/L					
Thallium, total	mg/L					
Tellurium	mg/L					
Tin	mg/L					
Titanium	mg/L					
Nickel, total	mg/L					
Antimony, total	mg/L					
Magnesium, total	mg/L					
Potassium, total	mg/L					
Sodium, total	mg/L					
Aluminum, total	mg/L					
Cadmium, total	mg/L					
Copper, total	mg/L					
Lead, total	mg/L					
Mercury, total	ug/L					
Zinc, total	mg/L					
Uranium, total	mg/L					

Crandon Project Leachate Summary
Backfill Whole Tailings Composite (AL-13)
Leached Under Alternating W/D, Followed by Saturated Conditions

PARAMETER	Units	10/11/94	12/21/94	12/28/94	01/03/95	01/11/95	01/17/95	01/23/95	01/30/95	02/08/95	02/15/95	02/21/95
Alkalinity	mg/L		74	76	34	82	66	75	78	90	20	71
Alkalinity, Bicarbonate	mg/L		74	76	34	82	66		78	90	20	71
Alkalinity, Carbonate	mg/L		< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
Sulfate	mg/L	1150	1440	608		295	260			301		
Cyanide, total	ug/L	< 10	44	< 10		< 10	18			< 10		
Calcium, total	mg/L	410	270	230		180	120			140		
Arsenic, total	mg/L	3.6	0.36	0.24		0.26	2.2			0.086		
Barium, total	mg/L	0.25	0.028	0.032		0.044	0.036			0.023		
Bismuth	mg/L	< 0.2	< 0.20	< 0.20		< 0.20				< 0.20		
Gallium	mg/L	< 0.2	< 0.20	< 0.20		< 0.20				< 0.20		
Germanium	mg/L	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025		
Iron, total	mg/L	250	22	14		15	79			3.4		
Manganese, total	mg/L	6.6	7.3	2.9		2.6	3.5			2.4		
Molybdenum, total	mg/L	< 0.020	< 0.020	< 0.020		0.027				< 0.020		
Selenium, total	mg/L	0.20	0.070	0.030		0.012	0.033			0.015		
Silver, total	mg/L	0.092	0.006	0.005		0.005	0.005			< 0.005		
Chromium, total	mg/L	0.21	0.032	0.020		0.022	0.30			0.008		
Cobalt, total	mg/L	0.16	0.064	0.031		0.022	0.034			0.018		
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005		
Thallium, total	mg/L	< 0.080	< 0.080	< 0.080		< 0.080				< 0.080		
Tellurium	mg/L	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32		
Tin	mg/L	< 0.24	< 0.24	< 0.24		< 0.24				< 0.24		
Titanium	mg/L	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050		
Nickel, total	mg/L	0.065	0.074	0.036		0.037	0.052			< 0.020		
Antimony, total	mg/L	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050		
Magnesium, total	mg/L	110	80	42		33	39			29		
Potassium, total	mg/L	6.7	7.2	< 4.8		< 4.8	2.6			< 4.8		
Sodium, total	mg/L	40	23	8.1		4.9	3.1			4.0		
Aluminum, total	mg/L	18	3.0	1.6		1.9	6.2			0.45		
Cadmium, total	mg/L	0.052	0.036	0.014		0.018	0.055			0.007		
Copper, total	mg/L	1.3	0.35	0.20		0.20	2.4			0.060		
Lead, total	mg/L	8.3	1.8	0.85		1.1	23			0.38		
Mercury, total	ug/L	1.2	0.3	0.2		0.3	0.5			< 0.2		
Zinc, total	mg/L	20	19	6.9		6.5	22			5.0		
Uranium, total	mg/L		< 0.0010	< 0.0010		< 0.001				< 0.0005		

Backfill Whole Tailings Composite (AL-13) Continued

PARAMETER	Units	02/28/95	03/07/95	03/13/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95	04/25/95	05/01/95	05/08/95
Alkalinity	mg/L	79	88	94	97	92	96	60	67	71	69	64
Alkalinity, Bicarbonate	mg/L	79	88	94	97	92	96	60	67	71	69	64
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L						300					
Cyanide, total	ug/L											
Calcium, total	mg/L						100					
Arsenic, total	mg/L						0.032					
Barium, total	mg/L						0.027					
Bismuth	mg/L						< 0.20					
Gallium	mg/L						< 0.20					
Germanium	mg/L						0.027					
Iron, total	mg/L						0.20					
Manganese, total	mg/L						1.8					
Molybdenum, total	mg/L						< 0.020					
Selenium, total	mg/L						< 0.005					
Silver, total	mg/L						< 0.005					
Chromium, total	mg/L						< 0.005					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L						< 0.005					
Thallium, total	mg/L						< 0.080					
Tellurium	mg/L						< 0.32					
Tin	mg/L						< 0.28					
Titanium	mg/L						< 0.050					
Nickel, total	mg/L						< 0.020					
Antimony, total	mg/L						< 0.050					
Magnesium, total	mg/L						27					
Potassium, total	mg/L						1.8					
Sodium, total	mg/L						4.1					
Aluminum, total	mg/L						< 0.030					
Cadmium, total	mg/L						< 0.005					
Copper, total	mg/L						< 0.005					
Lead, total	mg/L						< 0.040					
Mercury, total	ug/L						< 0.2					
Zinc, total	mg/L						1.6					
Uranium, total	mg/L						< 0.001					

Backfill Whole Tailings Composite (AL-13) Continued

PARAMETER	Units	05/15/95	05/22/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/25/95	09/06/95	09/11/95	09/18/95
Alkalinity	mg/L	72	63	73	89	76	76	69	63	49	51	59
Alkalinity, Bicarbonate	mg/L	72	63	73	89	76	76	69	63	49	51	59
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L								350	340	370	810
Cyanide, total	ug/L											
Calcium, total	mg/L								140			
Arsenic, total	mg/L								0.160			
Barium, total	mg/L								0.024			
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L								5			
Manganese, total	mg/L								3.6			
Molybdenum, total	mg/L											
Selenium, total	mg/L								< 0.005			
Silver, total	mg/L								< 0.005			
Chromium, total	mg/L								< 0.005			
Cobalt, total	mg/L								0.021			
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L								46			
Potassium, total	mg/L								1.7			
Sodium, total	mg/L											
Aluminum, total	mg/L								042			
Cadmium, total	mg/L								0.014			
Copper, total	mg/L								0.030			
Lead, total	mg/L								0.160			
Mercury, total	ug/L								< 0.2			
Zinc, total	mg/L											
Uranium, total	mg/L											

Backfill Whole Tailings Composite (AL-13) Continued

PARAMETER	Units	09/25/95	10/03/95	10/10/95	10/17/95	10/23/95	10/30/95	11/06/95	11/20/95	11/27/95	12/05/95	12/11/95
Alkalinity	mg/L	60	74	64	66	59	62	70	65	72	64	75
Alkalinity, Bicarbonate	mg/L	60	74	64	66	59	62	70	65	< 5	< 5	75
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Sulfate	mg/L	400	240	230	270	460	170	160	210	200		
Cyanide, total	ug/L											
Calcium, total	mg/L						56			67		
Arsenic, total	mg/L						0.200					
Barium, total	mg/L						0.026					
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L						10					
Manganese, total	mg/L						1.3					
Molybdenum, total	mg/L											
Selenium, total	mg/L						0.0079					
Silver, total	mg/L						< 0.005					
Chromium, total	mg/L						0.016					
Cobalt, total	mg/L						< 0.010					
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L						< 0.020					
Antimony, total	mg/L											
Magnesium, total	mg/L						25			29		
Potassium, total	mg/L						< 0.60					
Sodium, total	mg/L						2.5					
Aluminum, total	mg/L						1.4					
Cadmium, total	mg/L						0.010					
Copper, total	mg/L						0.24					
Lead, total	mg/L						1.200					
Mercury, total	ug/L								< 0.2			
Zinc, total	mg/L						2.7					
Uranium, total	mg/L											

Backfill Whole Tailings Composite (AL-13) Continued

PARAMETER	Units	12/18/95	12/26/95	01/02/96	01/10/96
Alkalinity	mg/L	68	62	78	80
Alkalinity, Bicarbonate	mg/L	68	62	78	80
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5
Sulfate	mg/L				
Cyanide, total	ug/L				
Calcium, total	mg/L				
Arsenic, total	mg/L				
Barium, total	mg/L				
Bismuth	mg/L				
Gallium	mg/L				
Germanium	mg/L				
Iron, total	mg/L				
Manganese, total	mg/L				
Molybdenum, total	mg/L				
Selenium, total	mg/L				
Silver, total	mg/L				
Chromium, total	mg/L				
Cobalt, total	mg/L				
Beryllium, total	mg/L				
Thallium, total	mg/L				
Tellurium	mg/L				
Tin	mg/L				
Titanium	mg/L				
Nickel, total	mg/L				
Antimony, total	mg/L				
Magnesium, total	mg/L				
Potassium, total	mg/L				
Sodium, total	mg/L				
Aluminum, total	mg/L				
Cadmium, total	mg/L				
Copper, total	mg/L				
Lead, total	mg/L				
Mercury, total	ug/L				
Zinc, total	mg/L				
Uranium, total	mg/L				

Crandon Project Leachate Summary
Backfill Cemented Whole Tailings Composite (AL-16)
Leached Under Alternating W/D, Followed by Saturated Conditions

PARAMETER	Units	10/11/94	12/14/94	12/20/94	12/28/94	01/03/95	01/11/95	01/17/95	01/23/95	01/30/95	02/08/95	02/15/95
Acidity, Total	mg/L					41						
Alkalinity	mg/L		< 5	< 5	< 5		17	8	12	10	22	24
Alkalinity, Bicarbonate	mg/L		< 5	< 5	< 5		17	8		10	12	24
Alkalinity, Carbonate	mg/L		< 5	< 5	< 5		< 5	< 5		< 5	10	< 5
Sulfate	mg/L	1620	1640	1690	2000		1720	1500			4110	
Cyanide, total	ug/L	< 10	< 10	< 10	< 10		< 10				< 10	
Calcium, total	mg/L	850	720	840	790		750	730			690	
Arsenic, total	mg/L	0.021	0.030	0.034	0.013		0.009	0.011			0.007	
Barium, total	mg/L	0.47	0.093	0.098	0.079		0.067	0.057			0.053	
Bismuth	mg/L	< 0.2	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Gallium	mg/L	< 0.2	< 0.20	< 0.20	< 0.20		< 0.20				< 0.20	
Germanium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025		< 0.025				< 0.025	
Iron, total	mg/L	1.1	2.2	1.3	0.47		0.26	0.14			0.023	
Manganese, total	mg/L	0.26	1.1	1.5	1.6		1.6	0.97			0.73	
Molybdenum, total	mg/L	0.12	< 0.020	0.050	0.056		0.037	0.061			0.065	
Selenium, total	mg/L	0.14	0.14	0.15	0.15		0.090	0.067			0.054	
Silver, total	mg/L	0.041	0.031	0.035	0.040		0.031	0.014			0.008	
Chromium, total	mg/L	0.60	0.044	0.090	0.022		0.010	< 0.005			0.005	
Cobalt, total	mg/L	0.026	0.022	0.022	0.030		0.023	0.014			< 0.010	
Beryllium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Thallium, total	mg/L	< 0.080	< 0.080	< 0.080	< 0.080		0.084				< 0.080	
Tellurium	mg/L	< 0.32	< 0.32	< 0.32	< 0.32		< 0.32				< 0.32	
Tin	mg/L	< 0.24	< 0.24	< 0.24	< 0.24		< 0.24				< 0.24	
Titanium	mg/L	< 0.050	< 0.050	< 0.050	< 0.050		< 0.050				< 0.050	
Nickel, total	mg/L	< 0.020	< 0.020	< 0.020	< 0.020		< 0.020				< 0.020	
Antimony, total	mg/L	< 0.050	0.070	< 0.050	0.063		0.083	0.053			< 0.050	
Magnesium, total	mg/L	4.5	11	8.0	5.3		3.7	3.8			2.2	
Potassium, total	mg/L	525	321	264	196		135	100			87.8	
Sodium, total	mg/L	170	94	80	54		34	22			16	
Aluminum, total	mg/L	0.31	0.31	0.40	0.24		0.18	0.080			0.082	
Cadmium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005				< 0.005	
Copper, total	mg/L	0.076	0.040	0.11	0.17		0.10	0.053			0.047	
Lead, total	mg/L	0.12	0.28	0.18	0.047		< 0.040	0.044			< 0.040	
Mercury, total	ug/L	0.4	0.3	< 0.2	0.3		< 0.2	< 0.2			< 0.2	
Zinc, total	mg/L	0.18	0.35	0.20	0.10		0.075	0.53			0.030	
Uranium, total	mg/L	< 0.001	< 0.0010	< 0.0010	< 0.0010		< 0.001				< 0.0005	

Backfill Cemented Whole Tailings Composite (AL-16) Continued

PARAMETER	Units	02/21/95	02/28/95	03/07/95	03/13/95	03/21/95	03/28/95	04/04/95	04/11/95	04/18/95	04/25/95	05/01/95
Acidity, Total	mg/L											
Alkalinity	mg/L	19	17	13	13	< 5	< 5	< 5	32	37	22	20
Alkalinity, Bicarbonate	mg/L	19	17	13	13	< 5	< 5	< 5	14	11	22	20
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	18	26	< 5	< 5
Sulfate	mg/L							1600				
Cyanide, total	ug/L											
Calcium, total	mg/L							710				
Arsenic, total	mg/L							0.017				
Barium, total	mg/L							0.042				
Bismuth	mg/L							< 0.20				
Gallium	mg/L							< 0.20				
Germanium	mg/L							< 0.025				
Iron, total	mg/L							0.020				
Manganese, total	mg/L							0.17				
Molybdenum, total	mg/L							0.11				
Selenium, total	mg/L							0.054				
Silver, total	mg/L							< 0.005				
Chromium, total	mg/L							< 0.005				
Cobalt, total	mg/L							< 0.010				
Beryllium, total	mg/L							< 0.005				
Thallium, total	mg/L							< 0.080				
Tellurium	mg/L							< 0.32				
Tin	mg/L							< 0.28				
Titanium	mg/L							< 0.050				
Nickel, total	mg/L							< 0.020				
Antimony, total	mg/L							< 0.050				
Magnesium, total	mg/L							1.6				
Potassium, total	mg/L							44				
Sodium, total	mg/L							10				
Aluminum, total	mg/L							0.067				
Cadmium, total	mg/L							< 0.005				
Copper, total	mg/L							< 0.005				
Lead, total	mg/L							< 0.040				
Mercury, total	ug/L							< 0.2				
Zinc, total	mg/L							0.024				
Uranium, total	mg/L							< 0.001				

Backfill Cemented Whole Tailings Composite (AL-16) Continued

PARAMETER	Units	05/08/95	05/15/95	05/22/95	05/30/95	06/06/95	06/12/95	06/20/95	06/26/95	07/03/95	07/25/95	07/31/95
Acidity, Total	mg/L											
Alkalinity	mg/L	32	14	21	17	10	13	19	16	< 5	14	17
Alkalinity, Bicarbonate	mg/L	32	14	21	17	10	13	19	16	< 5	14	7
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	10
Sulfate	mg/L										1500	
Cyanide, total	ug/L											
Calcium, total	mg/L										680	
Arsenic, total	mg/L											
Barium, total	mg/L										0.033	
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L										< 0.020	
Manganese, total	mg/L										0.023	
Molybdenum, total	mg/L										0.070	
Selenium, total	mg/L										0.062	
Silver, total	mg/L											
Chromium, total	mg/L										< 0.005	
Cobalt, total	mg/L										< 0.010	
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L										0.83	
Potassium, total	mg/L										24	
Sodium, total	mg/L										9.2	
Aluminum, total	mg/L										0.076	
Cadmium, total	mg/L											
Copper, total	mg/L										< 0.005	
Lead, total	mg/L										< 0.003	
Mercury, total	ug/L											
Zinc, total	mg/L										< 0.020	
Uranium, total	mg/L											

Backfill Cemented Whole Tailings Composite (AL-16) Continued

PARAMETER	Units	08/07/95	08/14/95	08/21/95	08/30/95	09/06/95	09/11/95	09/18/95	09/25/95	10/03/95	10/10/95	10/17/95
Acidity, Total	mg/L											
Alkalinity	mg/L	16	15	14	5	16	18	23	20	21	32	25
Alkalinity, Bicarbonate	mg/L	16	15	14	5	14	14	13	10	5	12	25
Alkalinity, Carbonate	mg/L	< 5	< 5	< 5	< 5	2	4	10	10	16	20	< 5
Sulfate	mg/L					1500	1700	1800	2100	1500	1500	2200
Cyanide, total	ug/L											
Calcium, total	mg/L											
Arsenic, total	mg/L											
Barium, total	mg/L											
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L											
Manganese, total	mg/L											
Molybdenum, total	mg/L											
Selenium, total	mg/L											
Silver, total	mg/L											
Chromium, total	mg/L											
Cobalt, total	mg/L											
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L											
Antimony, total	mg/L											
Magnesium, total	mg/L											
Potassium, total	mg/L											
Sodium, total	mg/L											
Aluminum, total	mg/L											
Cadmium, total	mg/L											
Copper, total	mg/L											
Lead, total	mg/L											
Mercury, total	ug/L											
Zinc, total	mg/L											
Uranium, total	mg/L											

Backfill Cemented Whole Tailings Composite (AL-16) Continued

PARAMETER	Units	10/23/95	10/30/95	11/06/95	11/20/95	11/27/95	12/05/95	12/11/95	12/18/95	12/26/95	01/02/96	01/10/96
Acidity, Total	mg/L											
Alkalinity	mg/L	21	20	21	20	23	24	25	24	20	21	20
Alkalinity, Bicarbonate	mg/L	5	< 5	7	20	< 5	< 5	25	6	6	13	12
Alkalinity, Carbonate	mg/L	16	16	14	< 5	< 5	< 5	< 5	18	14	8	8
Sulfate	mg/L	2500	1400	60	1000	1500						
Cyanide, total	ug/L											
Calcium, total	mg/L		620			560						
Arsenic, total	mg/L		0.035									
Barium, total	mg/L		0.024									
Bismuth	mg/L											
Gallium	mg/L											
Germanium	mg/L											
Iron, total	mg/L		0.064									
Manganese, total	mg/L		0.057									
Molybdenum, total	mg/L											
Selenium, total	mg/L		0.047									
Silver, total	mg/L	<	0.005									
Chromium, total	mg/L	<	0.005									
Cobalt, total	mg/L	<	0.010									
Beryllium, total	mg/L											
Thallium, total	mg/L											
Tellurium	mg/L											
Tin	mg/L											
Titanium	mg/L											
Nickel, total	mg/L	<	0.020									
Antimony, total	mg/L											
Magnesium, total	mg/L		1.4			0.97						
Potassium, total	mg/L		9.7									
Sodium, total	mg/L		3.8									
Aluminum, total	mg/L		0.13									
Cadmium, total	mg/L	<	0.005									
Copper, total	mg/L		0.006									
Lead, total	mg/L	<	0.003									
Mercury, total	ug/L					< 0.2						
Zinc, total	mg/L		0.077									
Uranium, total	mg/L											

Notes Regarding Modifications to the Analytical Data Base.

Notes Regarding Modifications to the Analytical Data Base

1. Data reported in the Appendices of this report are presented as received from the laboratory and represents the most current and correct values available.

2. During the waste characterization kinetic (leaching) tests, the accumulating data for each leaching test was plotted as a function of time (progressive leaching cycles) to monitor developing trends. Upon review of the plotted data it became obvious that trends in measured and/or analyzed parameters (eg. pH, alkalinity) were developing within a specific leaching column. Abrupt changes in a single analytical parameter or, in the case of one parameter, a progressive drift in values suggested that a value, or series of values, in an otherwise smoothly developing trend might represent in error in measurement and/or analysis. All analyses and measurements were performed on unfiltered samples, so a certain degree of parameter variability was anticipated since the quantity of solids collected in each sample varied from sample to sample.

   a. On occasion, a challenge of a reported analytical value was made to a laboratory by Foth & Van Dyke. Upon review of its measurements and/or calculations the laboratory may have issued a written correction for the challenged value or verified the previously reported value. Foth & Van Dyke updated its project data base upon receipt of corrected values.

   b. If a challenged and verified value still appeared to be unrepresentative of an otherwise developing trend two things occurred: 1) the verified value was recorded in the project's summary data base included in Appendix 3.5-33; and, 2) a question mark was placed after the value in the appropriate waste rock or tailings 'Data and Calculations' tables included in Appendix 3.5-34 or Appendix 3.5-35, respectively. The question mark implies that, although the value appears to be correct in a mathematical and/or analytical sense, it is uncertain what the value indicates.

      1). For example, the alkalinity value reported for the leachate collected from the Skunk Lake master waste rock composite (WD-05) on March 13, 1995

was challenged and verified to be 200 mg/L. Other alkalinity values reported for leachate collected from this sample both before and after this date ranged from about 14 to 26 mg/L (see the first page of Appendix 3.5-34 Table 3). The reported value would appear to be in excess of what might be expected by an order of magnitude. However, this alkalinity value could have resulted from the presence of a few fine grains of calcite collected in the unfiltered sample and would therefore be an accurate value, although not very meaningful in determining leaching trends. A question mark was therefore placed after this value.

c. A slow decline in pH values was measured in some composite leachates (primarily in leachate collected from the master waste rock composites) from September 25, 1995 through November 27, 1995. This slow change in trend occurred only in those leachates that were circumneutral in value and having a low ionic strength, as indicated by the low conductivity values. At the same time, leachates from other columns that normally had a much higher ionic strength, or were strongly alkaline or acidic in value, did not show this pH decline. It was therefore not immediately apparent that a problem existed with regards to the pH measurements.

Following the November 27, 1995 pH readings, Foth & Van Dyke reconditioned and recalibrated its pH probe. During the next set of pH measurements, conducted on December 4, 1995, it was found that the pH values measured in those leachates that had showed this slow decline reverted to values similar to those established by the trend analyses. In addition, the pH values in the leachates that had not been effected by this decline continued unchanged by the reconditioning of the pH probe.

The pH values considered to be part of this slow decline are considered to be a function of pH probe aging and not a function of the leaching process. A question mark was therefore placed after each of the recorded values (for example see the second page of Appendix 3.5-34 Table 3).

d. Some of the analytical and measurement values reported in the data base have been plotted to show changes in leaching behavior as a function of time. Values listed in Appendix 3.5-34 and 3.4-35 which have question marks associated with them are not plotted in these figures.

Appendix 3.5-33 Table 1b.
Explanation of the Tabulated Leachate Analysis Data Sheets and Calculations.

Appendix 3.5-33 Table 1b

Explanation of the Tabulated Leachate Analysis Data Sheets and Calculations

The test data and calculated results for each of the waste rock composite leaching tests, organized by waste rock composite, are included in Appendix 3.5-34 Tables 2 through 57. This information is contained in seven consecutive tables for each composite. For example, Appendix 3.5-34 Table 2 contains the first Skunk Lake Waste Rock Master Composite table entitled "Sample Characterization". Appendix 3.5-34 Table 3 contains the second table for this composite. Appendix 3.5-34 Table 9 contains the first Rice Lake Waste Rock Master Composite table, etc.

The test data and calculated results for each of the tailings composite leaching tests are organized similar to those for the waste rock composites and are included in Appendix 3.5-35 Tables 2 through 57. An explanation of each table, and the calculations used to prepare each table, follows.

1st Table. **Sample characterization** - includes tailings or waste rock bulk chemical (head) analysis (calculated from Lakefield Research and Chemex data); acid base accounting results (Lakefield Research data); the sample mass used in the test; and, if applicable, the analysis of process water or groundwater used as the leach solution in specific stages of some tests.

The bulk chemical (head) analysis values are expressed as milligrams of metal per kilogram of test sample, converted from percentages reported for the analyses carried out by Lakefield Research as detailed in Tables 1 and 2 in Appendix 3.5-32 of the EIR.

2nd Table. **Parameters measured weekly,** or some other period, include volume of leachate collected, pH, conductivity, alkalinity/acidity, and sulfate. Cumulative sulfate leached is included in this table.

Actual measured sulfate analyses are shown in bold typeface. Since sulfate analyses were not performed on every leachate sample obtained weekly, intermediate values are calculated by linear interpolation.

Cumulative sulfate(mg/kg) is calculated by determining the milligrams of sulfate leached per kilogram of test sample at a specific cycle (the mass flux) and the value obtained is added to the cumulative total for the previous cycle. For example, for a test waste rock sample of mass = 8.0 kg:

At cycle 1, volume of leachate = 4.5 L (measured), sulfate analysis = 800 mg/L (by analysis)
At cycle 2, volume of leachate = 4.3 L (measured), sulfate analysis = 600 mg/L (by analysis)

then, mass flux of sulfate at cycle 1 = $\frac{4.5\ L\ *\ 800\ mg/L}{8\ kg}$ = 450.0 mg/kg of SO_4

and, mass flux of sulfate at cycle 2 = $\frac{4.3\ L\ *\ 600\ mg/L}{8\ kg}$ = 322.5 mg/kg of SO_4

therefore, cumulative mass flux at cycle 2 = 450.0 + 322.5 = 772.5 mg/kg SO_4

3rd Table. **Leachate analysis** - provides the analyses of metals in leachates for each leach cycle (Pace Laboratories data)

As with the sulfate analyses given in Table 2, metal analyses are not performed on all leachate samples. Intermediate values are calculated by linear interpolation.

4th Table. **Cumulative mass flux** - provides the calculated cumulative values of the mass of each metal leached from the test sample in units of milligrams metals leached per kilogram of sample.

Cumulative mass flux (mg/kg) values for metals leached are, in the general case, calculated by the same methodology as shown above for sulfate, using the values given in Table 3. All cumulative mass flux values for tests on waste rock are calculated in this way.

For tests on tailings in which process water or groundwater were used as the leach solution, a correction is made for the contribution of that metal in the leach solution for each metal analysis in the leachate shown in Table 3 before the cumulative mass flux value is calculated. For example, for a test tailings sample of mass = 12 kg,

Volume of leachate collected at cycle 6 = 4.1 L
Analysis of leachate for copper at cycle 6 = 3.5 mg/L
Analysis of process water for copper = 0.30 mg/L
Therefore, the corrected (or net) values of copper in the leachate = 3.5 - 0.30 = 3.2 mg/L

and, the mass flux of copper at cycle 6 = $\frac{4.1\ L\ *\ 3.2\ mg/L}{12\ kg}$ = 1.093 mg/kg

The cumulative mass flux of copper at cycle 6 = the value at cycle 5 + 1.093 mg/kg

5th Table. **Cumulative metal extractions** - provides calculated values of the percentage of each metals leached from the test sample on a cumulative basis.

Cumulative metal extractions (%) are determined by expressing the cumulative mass flux values given in Table 4 for each metal at each cycle as a percentage of the value in the original bulk composition (head) of the sample as provided in Table 1. For example, the cumulative mass flux of zinc at cycle 17 for a test on a tailings sample = 45.75 mg/kg.

From Table 1, the bulk chemical (head) analysis of zinc = 4400 mg/kg

Therefore, the cumulative extraction of zinc at cycle 17 = $\frac{45.75 \text{ mg/kg}}{4400 \text{ mg/kg}} * 100\% = 1.04\%$

6th Table. **Metal extraction rates** - provides calculated values of the rate of metal extraction at each cycle, calculated as a 5-cycle (usually 5 weeks) moving average.

Metal extraction rates are calculated as 5-cycle moving averages by determining, from Table 4, the total mass flux of each metal over successive 5-cycle periods and then dividing the flux value by the corresponding time interval. Values of rate are expressed in units of milligrams of metal per kilogram of test sample per week. For example, the cumulative mass fluxes of calcium for a test on a waste rock sample are as follows:

At cycle 24 (215 days), the cumulative mass flux of calcium = 1376.3 mg/kg
At cycle 29 (250 days), the cumulative mass flux of calcium = 1434.5 mg/kg
Therefore, the calcium extraction rate at cycle 29 for the period cycle 24 to 29 is given by:

$$\text{Rate} = \frac{(1434.5 \text{ mg/kg} - 1376.3 \text{ mg/kg})}{(250 \text{ days} - 215 \text{ days})} * \frac{7 \text{ days}}{\text{week}} = 11.64 \text{ mg Ca/kg/week}$$

7th Table. **Oxidation and neutralization results** - provides calculated values to assess the extent and rate of both sulfide oxidation and the depletion of neutralization, including cumulative sulfate flux , sulfur depletion, sulfate production rate, the moles of SO_4, Ca and Mg extracted, the [Ca + Mg]/[SO_4] molar ratio, cumulative neutralization potential (NP) depletion, NP depletion rate, and NP consumed.

Cumulative sulfate flux (mg/kg) values are carried forward from Table 2, calculated as previously described.

Sulfur depletion (%) values are determined by converting the cumulative mass flux values for sulfate at each cycle to cumulative mass flux values of sulfur and expressing them as a percentage of the value in the original (head) sample, converted from the value in percent in Table 1 to mg/kg. For example, for a test on a tailings sample:

Cumulative mass flux of sulfate at cycle 31 = 1850 mg/kg

Thus, cumulative mass flux of sulfur = 1850 mg/kg SO_4 * $\frac{32 \text{ (mol weight of sulfur)}}{96 \text{ (mol weight of sulfate)}}$ = 616.7 mg/kg S

From Table 1, the bulk chemical (head) analysis of sulfur = 21.3% = $\frac{21.3}{100}$ * 1,000,000 = 213,000 mg/kg S

Therefore, the cumulative extraction of sulfur at cycle 31 = $\frac{616.7 \text{ mg/kg}}{213{,}000 \text{ mg/kg}} * 100\% = 0.29\%$

Sulfate Production Rate (mg/kg/week) values are calculated as 5-cycle moving averages by determining the cumulative mass flux of sulfate over successive 5-cycle periods and then dividing the flux value by the corresponding time interval. Values of rate are expressed in units of milligrams of sulfate per kilogram of test sample

per week. An example of the methodology of this calculation is shown above for metal extraction rates (Table 6).

Moles extracted of sulfate, calcium and magnesium are calculated for the purpose of determining the ratio of moles of calcium plus magnesium to moles of sulfate. The moles extracted at a specific cycle are calculated by dividing the sulfate, calcium and magnesium leachate analyses for the same cycle (from Table 3) by the corresponding molecular weights. For example,

At cycle 23, the leachate analysis gave sulfate, calcium, and magnesium values of 240, 110, and 8 mg/L, respectively.

$$\text{Converting to moles: sulfate} = \frac{240 \text{ mg/L}}{96} = 2.50 \text{ mmoles},$$

$$\text{calcium} = \frac{110}{40} = 2.75 \text{ mmoles},$$

$$\text{and magnesium} = \frac{8}{24.3} = 0.33 \text{ mmoles}$$

The *mole ratio [Ca + Mg] / [SO_4]* is calculated at each cycle from the values of the moles extracted of sulfate, calcium and magnesium as calculated above. For the above example:

$$\text{At cycle 23, } \frac{[\text{Ca} + \text{Mg}]}{[\text{SO}_4]} = \frac{[2.75 + 0.33]}{2.50} = 1.23$$

The appearance of sulfate in solution can be assumed to result from the oxidation of sulfide and the calculated sulfate production rate at any cycle indicative of the rate of oxidation at that time based on a 5-cycle average. In practice, samples usually contain some sulfate, such as products of oxidation or mineral phases such as gypsum, at the start of testing, which are leached in the early cycles of the test. However, if the amount of already-soluble sulfate is not excessive, and the tests are run with sufficiently high volumes of leachate to prevent or minimize sulfate precipitation, it can be assumed that sulfate production rates after the early cycles are a measure of oxidation rates.

Acidity produced during oxidation is neutralized by acid consuming minerals resulting in the appearance in solution of cations from those minerals. Since the carbonate minerals such as calcite and dolomite are dominant in neutralization reactions, especially in neutral pH conditions, the values of calcium and magnesium in solution are indicative of the dissolution of the neutralizing minerals. Other cations such as potassium, sodium, aluminum also appear in solution, resulting from some reaction of leachate with silicate minerals. However, these can usually be ignored, especially for solutions with pH in the neutral range. Therefore, the value of the molar ratio [Ca + Mg]/[SO_4] provides an indication of the relative rates of oxidation and the depletion of neutralizing minerals. It should be noted that depletion of neutralization minerals occurs in the absence of acid producing conditions and which is therefore included in the value of the ratio.

Cumulative neutralization potential (NP) depletion (mg/kg) is calculated by multiplying the cumulative sulfate flux at a specific cycle by the molar ratio [Ca +

Mg]/[SO_4] at that cycle. The value obtained is then converted from mg/kg SO_4 to mg/kg $CaCO_3$. For example:

At cycle 14, the cumulative sulfate flux (Table 7) = 130.4 mg/kg
At the same cycle, the ratio [Ca + Mg]/[SO_4] = 1.45

Therefore, the cumulative NP depletion = $130.4 * 1.45 * \frac{100.1 \text{ (mol. wt. } CaCO_3)}{96 \text{ (mol. wt. of } SO_4)} = 197.2$ mg/kg

NP depletion rate (mg/kg/week) is calculated as a 5-cycle moving average from the cumulative NP depletion in the same manner as described above for the sulfate production rate.

NP consumed (%) is calculated by expressing cumulative NP depletion values as a percentage of the NP values given in Table 1, converted from kg/tonne to units of mg/tonne. For example, for a test on a waste rock sample:

Cumulative NP depletion at cycle 22 = 357 mg/kg
From Table 1, sample NP = 15.5 kg/tonne = 15.5 kg/tonne * 1000 g/kg (or mg/kg) = 15,500 mg/kg

Therefore, the cumulative NP depletion at cycle 22 = $\frac{357 \text{ mg/kg}}{15{,}500 \text{ mg/kg}} * 100\% = 2.3\%$

As a result of changes made to Appendix 3.5-33 on August 7, 1997, pages 3.5-33-110 through 3.5-33-338 have been deleted.

REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 4

Client Reference: Crandon Mining Leachates

B	Analyte is found in the associated blank as well as in the sample.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

December 16, 1994
PACE Project Number: 941103508

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0260487	10 0260495	10 0260509
Date Collected:			11/01/94	11/01/94	11/01/94
Time Collected:			20:20	23:00	23:20
Date Received:			11/03/94	11/03/94	11/03/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-09-2	-10-2	-11-2
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	0.001	-
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	19.0	33.7	27.1
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	150	381	602	821
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead	mg/L	0.040	ND	0.15	ND
Mercury	ug/L	0.2	ND	ND	0.2
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.010	0.009	0.012
Selenium	mg/L	0.005	0.018	0.032	0.022
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND
Aluminum	mg/L	0.030	4.2 B	3.9 B	6.0 B
Barium	mg/L	0.005	0.018	0.043	0.037
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	65	71	120

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REPORT OF LABORATORY ANALYSIS

December 16, 1994
PACE Project Number: 941103508

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0260487	10 0260495	10 0260509
Date Collected:			11/01/94	11/01/94	11/01/94
Time Collected:			20:20	23:00	23:20
Date Received:			11/03/94	11/03/94	11/03/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-09-2	-10-2	-11-2
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Cadmium	mg/L	0.005	ND	ND	ND
Cobalt	mg/L	0.010	0.017	0.47	0.083
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	0.10	2.9	0.15
Iron	mg/L	0.020	4.5 B	4.4 B	7.9 B
Magnesium	mg/L	0.030	58	90	120
Manganese	mg/L	0.005	1.6	3.1	3.0
Sodium	mg/L	0.040	6.3 B	27 B	34 B
Nickel	mg/L	0.020	ND	0.027	ND
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	0.32	2.5	0.36

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

December 16, 1994
PACE Project Number: 941103508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0260517 11/01/94 23:50 11/03/94 CMC-WCL-WD -12-2	10 0260525 11/02/94 00:20 11/03/94 CMC-WCL-WD -05-2	10 0260533 11/02/94 00:40 11/03/94 CMC-WCL-WD -08-2
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	0.55	ND	ND
Potassium	mg/L	4.8	7.8	10.9	13.4
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	15	-	77	81
Sulfate	mg/L	300	1570	-	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Lead	mg/L	0.040	ND	ND	ND
Mercury	ug/L	0.2	0.9	ND	0.2
Molybdenum	mg/L	0.020	ND	0.022	0.024
Thallium	mg/L	0.080	0.10	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.029	0.018	0.095
Selenium	mg/L	0.005	0.36	0.032	0.009
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	0.012	ND	ND
Aluminum	mg/L	0.030	34 B	12 B	12 B
Barium	mg/L	0.005	0.008	0.035	0.022
Beryllium	mg/L	0.005	0.012	ND	ND
Calcium	mg/L	0.040	320	19	21
Cadmium	mg/L	0.005	0.070	ND	ND
Cobalt	mg/L	0.010	6.1	ND	ND

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REPORT OF LABORATORY ANALYSIS

December 16, 1994
PACE Project Number: 941103508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0260517 11/01/94 23:50 11/03/94 CMC-WCL-WD -12-2	10 0260525 11/02/94 00:20 11/03/94 CMC-WCL-WD -05-2	10 0260533 11/02/94 00:40 11/03/94 CMC-WCL-WD -08-2
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Chromium	mg/L	0.005	ND	0.017	ND
Copper	mg/L	0.005	200	0.56	0.20
Iron	mg/L	0.020	180 B	20 B	20 B
Magnesium	mg/L	0.030	500	19	21
Manganese	mg/L	0.005	55	0.63	0.40
Sodium	mg/L	0.040	17 B	8.1 B	36 B
Nickel	mg/L	0.020	0.93	ND	ND
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	94	0.20	0.20

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 4

December 16, 1994
PACE Project Number: 941103508

Client Reference: Crandon Mining Leachates

B	Analyte is found in the associated blank as well as in the sample.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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January 5, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Projects 941118.523, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on November 18, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. The record documenting the transfer of samples to CEP is within the CEP raw data section. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan-
Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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FAX: 612-525-3377

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If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

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Crandon Mining Company Project -
PACE Projects 941118.523

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-03	27492.5
CMC-WCL-WD-06-03	27493.3
CMC-WCL-WD-07-03	27494.1
CMC-WCL-WD-08-03	27495.0
CMC-WCL-WD-09-03	27496.8
CMC-WCL-WD-10-03	27497.6
CMC-WCL-WD-11-03	27498.4
CMC-WCL-WD-12-03	27499.2
CMC-WCL-WD-03-16	27500.0
CMC-WCL-WD-13-03	27501.8
CMC-WCL-WD-14-03	27502.6

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Crandon Mining Company Project -
PACE Projects 941118.523

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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195197

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD. GREEN BAY, WIS. 54307
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference: 93C049
Project Name / No.: CRANDON MINING Co.

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 94118.523
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 11/15-16/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: METALS (2)	SULFATE	URANIUM	CYANIDE	T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-03	11/16 1445	LEACHATE	27492	1	/							/				
2	CMC-WCL-WD-06-03	11/16 1400		27493.3	1	/							/				
3	CMC-WCL-WD-07-03	11/16 1430		27494.1	1	/							/				
4	CMC-WCL-WD-08-03	11/16 1515		27495.0	1	/							/				
5	CMC-WCL-WD-09-03	11/15 1400		27496.8	4	2		2			/	/	/	/			2 SETS OF METALS: ETC AND ENVIROSCAN
6	CMC-WCL-WD-10-03	11/15 1545		27497.6	4	2		2			/	/	/	/	/		
7	CMC-WCL-WD-11-03	11/16 0830		27498.4	4	2		2			/	/	/	/	/		
8	CMC-WCL-WD-12-03	11/16 0915		27499.2	4	2		2			/	/	/	/	/		

3.5-33-120

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	D. Loritz / FOTH + VAN DYKE	S McHodge / PACE	11/17/94	0900
			11/18/94	16:15

Additional Comments: RUN ALL PARAMETERS, EVEN IF HOLDING TIMES ARE EXCEEDED.

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

195198

pace INCORPORATED
THE ASSURANCE OF QUALITY

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH AND VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54307
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.: 15041
Pace Project Manager: SRC
Pace Project No.: 941118.523
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 11/16/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: METALS (ETC)	METALS (ENVIRO. SCAN)	SULFATE	URANIUM	CYANIDE	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 03 - 16	1115	LEACHATE	27500.0	4	2		2			/	/	/				
2	CMC - WCL - WD - 13 - 03	1315		27501.8	5	2		2		1	/	/	/	/	/	/	
3	CMC - WCL - WD - 14 - 03	1030		27502.6	5	2		2		1	/	/	/	/	/	/	
4																	
5																	
6																	
7																	
8																	

3.5-33-121

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

Additional Comments: RUN ALL PARAMETERS, EVEN IF HOLDING TIMES ARE EXCEEDED.

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	D. Loritz / FOTH + VAN DYKE	S. McHaffie / PACE	11/17/94	0900
			11/18/94	1621

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

22026679 22026685

SEND TO: Enviroscan

130786

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE, Inc.
Address: 1710 Douglas Drive North
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference
Project Name / No.: Crandon Mining Co.

Pace Client No.
Pace Project Manager: Steve Crupi
Pace Project No.: 94118.523
*Requested Due Date: 12-23-94

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled

ITEM NO	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	SO4	REMARKS
1	CMC-WCL-WD-03-16	"/16	LIQUID	27500.0	2	✓		✓		✓	✓	
2	CMC-WCL-WD-13-03	"/16	"	27501.8	2	✓		✓		✓	✓	
3	CMC-WCL-WD-14-03	"/16		27502.6	2	✓		✓		✓	✓	
4	CMC-WCL-WD-09-03	"/15		27496.8	2	✓		✓		✓	✓	
5	CMC-WCL-WD-10-03	"/15		27497.6	2	✓		✓		✓	✓	
6	CMC-WCL-WD-11-03	"/16		27498.4	2	✓		✓		✓	✓	
7	CMC-WCL-WD-12-03	"/16		27499.2	2	✓		✓		✓	✓	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT - DATE	SHIPMENT METHOD RETURNED - DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1	Surface/PACE	FED EX	11/22/94	18:00
	FED EX	Sheila Ryan	11/23/94	11:50 a.m.
		<4.0° Iced on Blue ice		

Additional Comments

Metals → Bi, K, Te, SN, Ga, Ge

Report to include: narrative, sample result summary, QC summary, all supporting raw data.

ORIGINAL

SEE REVERSE SIDE

3.5-33-122

11/23/94 18:28 9715 355 3219 ZIMPRO/ESCAN 002

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 05, 1995
PACE Project Number: 941118523

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachate

PACE Sample Number:			10 0274925	10 0274933	10 0274941
Date Collected:			11/16/94	11/16/94	11/16/94
Time Collected:			14:45	14:00	14:30
Date Received:			11/18/94	11/18/94	11/18/94
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-05-03	-06-03	-07-03
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	30	110	110
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	30	110	110

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

Parameter	Units	MDL	10 0274950 11/16/94 15:15 11/18/94 CMC-WCL-WD -08-03	10 0274968 11/15/94 14:00 11/18/94 CMC-WCL-WD -09-03	10 0274976 11/15/94 15:45 11/18/94 CMC-WCL-WD -10-03
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	ND	0.001
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	ND	ND
Potassium	mg/L	4.8	-	8.8	20.1
Tellurium	mg/L	0.32	-	ND	ND
Tin	mg/L	0.24	-	ND	ND
Gallium	mg/L	0.20	-	ND	ND
Germanium	mg/L	0.025	-	ND	ND
Sulfate	mg/L	120	-	-	448
Sulfate	mg/L	60	-	254	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	54
Alkalinity, Bicarbonate	mg/L	5	75	16	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	75	16	-
Lead	mg/L	0.040	-	ND	0.065
Mercury	ug/L	0.2	-	0.33	ND
Molybdenum	mg/L	0.020	-	ND	ND
Thallium	mg/L	0.080	-	ND	ND
Titanium	mg/L	0.050	-	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	0.006	ND
Selenium	mg/L	0.005	-	0.020	0.027
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	ND	ND
Aluminum	mg/L	0.030	-	2.8	6.4
Barium	mg/L	0.005	-	0.009	0.035

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

PACE Sample Number:				10 0274950	10 0274968	10 0274976
Date Collected:				11/16/94	11/15/94	11/15/94
Time Collected:				15:15	14:00	15:45
Date Received:				11/18/94	11/18/94	11/18/94
Client Sample ID:				CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL		-08-03	-09-03	-10-03
INORGANIC ANALYSIS						
TARGET ANALYTE LIST, METALS						
Beryllium	mg/L	0.005	-	ND	ND	
Calcium	mg/L	0.040	-	48	48	
Cadmium	mg/L	0.005	-	ND	ND	
Cobalt	mg/L	0.010	-	ND	0.43	
Chromium	mg/L	0.005	-	ND	ND	
Copper	mg/L	0.005	-	0.072	3.7	
Iron	mg/L	0.020	-	3.3	4.4	
Magnesium	mg/L	0.030	-	38	56	
Manganese	mg/L	0.005	-	1.1	3.0	
Sodium	mg/L	0.040	-	2.9	7.4	
Nickel	mg/L	0.020	-	ND	0.029	
Antimony	mg/L	0.050	-	ND	ND	
Zinc	mg/L	0.020	-	0.25	3.2	

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REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

Parameter	Units	MDL	10 0274984 CMC-WCL-WD -11-03	10 0274992 CMC-WCL-WD -12-03	10 0275000 CMC-WCL-WD -03-16
PACE Sample Number:			10 0274984	10 0274992	10 0275000
Date Collected:			11/16/94	11/16/94	11/16/94
Time Collected:			08:30	09:15	11:15
Date Received:			11/18/94	11/18/94	11/18/94
Client Sample ID:			CMC-WCL-WD -11-03	CMC-WCL-WD -12-03	CMC-WCL-WD -03-16
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	19.5	5.1	ND
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	30	-	-	95
Sulfate	mg/L	300	696	-	-
Sulfate	mg/L	600	-	2390	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	280	-
Alkalinity, Bicarbonate	mg/L	5	ND	-	-
Alkalinity, Carbonate	mg/L	5	ND	-	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	ND	-	-
Lead	mg/L	0.040	0.042	ND	ND
Mercury	ug/L	0.2	ND	0.53	ND
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.005	0.037	ND
Selenium	mg/L	0.005	0.022	0.27	0.025
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	0.006	ND
Aluminum	mg/L	0.030	3.3	8.2	ND

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

PACE Sample Number:			10 0274984	10 0274992	10 0275000
Date Collected:			11/16/94	11/16/94	11/16/94
Time Collected:			08:30	09:15	11:15
Date Received:			11/18/94	11/18/94	11/18/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-11-03	-12-03	-03-16
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Barium	mg/L	0.005	0.027	ND	ND
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	110	320	28
Cadmium	mg/L	0.005	ND	0.032	0.043
Cobalt	mg/L	0.010	0.079	2.6	0.026
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	0.10	48	0.25
Iron	mg/L	0.020	5.5	38	0.089
Magnesium	mg/L	0.030	92	290	14
Manganese	mg/L	0.005	2.9	30	0.17
Sodium	mg/L	0.040	15	8.1	2.1
Nickel	mg/L	0.020	ND	0.38	ND
Antimony	mg/L	0.050	ND	0.069	ND
Zinc	mg/L	0.020	0.40	37	13

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REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

Parameter	Units	MDL	10 0275018 CMC-WCL-WD -13-03	10 0275026 CMC-WCL-WD -14-03
PACE Sample Number:			10 0275018	10 0275026
Date Collected:			11/16/94	11/16/94
Time Collected:			13:15	10:30
Date Received:			11/18/94	11/18/94
Client Sample ID:			CMC-WCL-WD -13-03	CMC-WCL-WD -14-03
SUBCONTRACT ANALYSIS				
INDIVIDUAL PARAMETERS				
Uranium, total	mg/L	0.001	ND	ND
INORGANIC ANALYSES				
Bismuth	mg/L	0.20	ND	ND
Potassium	mg/L	4.8	ND	7.4
Tellurium	mg/L	0.32	ND	ND
Tin	mg/L	0.24	ND	ND
Gallium	mg/L	0.20	ND	ND
Germanium	mg/L	0.025	ND	ND
Sulfate	mg/L	30	-	98
Sulfate	mg/L	60	356	-
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	22	ND
Alkalinity, Carbonate	mg/L	5	ND	80
Alkalinity, Total as Calcium Carbonate	mg/L	5	22	190
Cyanide, Total	ug/L	10	ND	ND
Lead	mg/L	0.040	1.8	11
Mercury	ug/L	0.2	0.34	0.57
Molybdenum	mg/L	0.020	ND	ND
Thallium	mg/L	0.080	ND	ND
Titanium	mg/L	0.050	ND	ND
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	0.36	1.2
Selenium	mg/L	0.005	0.035	0.16
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	0.013	0.013
Aluminum	mg/L	0.030	2.6	5.0
Barium	mg/L	0.005	0.016	0.016

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REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941118523

Client Reference: Crandon Mining Leachate

Parameter	Units	MDL	10 0275018 11/16/94 13:15 11/18/94 CMC-WCL-WD -13-03	10 0275026 11/16/94 10:30 11/18/94 CMC-WCL-WD -14-03
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
INORGANIC ANALYSIS				
TARGET ANALYTE LIST, METALS				
Beryllium	mg/L	0.005	ND	ND
Calcium	mg/L	0.040	120	160
Cadmium	mg/L	0.005	0.017	ND
Cobalt	mg/L	0.010	0.027	0.025
Chromium	mg/L	0.005	0.029	0.038
Copper	mg/L	0.005	0.36	0.86
Iron	mg/L	0.020	24	92
Magnesium	mg/L	0.030	37	11
Manganese	mg/L	0.005	2.7	0.36
Sodium	mg/L	0.040	3.7	4.2
Nickel	mg/L	0.020	0.023	ND
Antimony	mg/L	0.050	ND	ND
Zinc	mg/L	0.020	13	4.0

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
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TEL: 612-544-5542
FAX:612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 7

Client Reference: Crandon Mining Leachate

MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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January 6, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Projects 941123.521, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on November 23, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 941123.521

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-04	27993.5
CMC-WCL-WD-06-04	27994.3
CMC-WCL-WD-07-04	27995.1
CMC-WCL-WD-08-04	27996.0
CMC-WCL-WD-09-04	27997.8
CMC-WCL-WD-10-04	27998.6
CMC-WCL-WD-11-04	27999.4
CMC-WCL-WD-12-04	28000.3
CMC-WCL-WD-13-04	28001.1
CMC-WCL-WD-14-03	28002.0

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Crandon Mining Company Project -
PACE Projects 941123.521

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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130225

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CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 941123.521
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 11/22/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: METALS (PACE)	METALS (ENVIRO SCAN)	SULFATE	URANIUM	T. CYANIDE	T. ALKALINITY	REMARKS
1	CMC-WCL-WD-13-04	0830	LEACHATE	28001.1	6	3	2			1	/	/	/	/	/	/	
2	CMC-WCL-WD-14-04	0915	↓	28002.0	6	3	2			1	/	/	/	/	/	/	
3																	
4																	
5																	
6																	
7																	
8																	

3.5-33-135

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 11/22/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
12	Dennis J. Loritz / FVD	[illegible] / PACE	11/22/94	1115
			11/23/94	1600

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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130226

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH + VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC / 930049

Pace Client No. 150419
Pace Project Manager SRC
Pace Project No. 941123.521
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 11/21/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: METALS (PACE)	METALS (ENVIRO. SCAN)	SULFATE	URANIUM	T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-04	0930	LEACHATE	27993.5	5	3		2		/	/	/	/	/		
2	CMC-WCL-WD-06-04	1100		27994.3	5	3		2		/	/	/	/	/		
3	CMC-WCL-WD-07-04	1130		27995.1	5	3		2		/	/	/	/	/		
4	CMC-WCL-WD-08-04	1300		27996.0	5	3		2		/	/	/	/	/		
5	CMC-WCL-WD-09-04	1400		27997.8	5	3		2		/	/	/	/	/		
6	CMC-WCL-WD-10-04	1445		27998.6	5	3		2		/	/	/	/	/	/	
7	CMC-WCL-WD-11-04	1515		27999.4	5	3		2		/	/	/	/	/		
8	CMC-WCL-WD-12-04	1530		28000.3	5	3		2		/	/	/	/	/	/	

3.5-33-136

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 11/22/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
40	Dennis J. Loritz / F+VD	Smyladge/PACE	11/22/94	1100
			11/23/94	16:00

ORIGINAL

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1-27362

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1 of 2

07027371

130789

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CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE	Report To: Steve Crupi	Pace Client No.	
Address: 1710 Douglas Drive N Minneapolis, MN 55422	Bill To:	Pace Project Manager: Steve Crupi	
Phone: 612-525-3454	P.O. # / Billing Reference: Crandon	Pace Project No.: 94 1123.521	
	Project Name / No.: Crandon Mining	*Requested Due Date: 12-30-94	

Sampled By (PRINT): CLIENT

Sampler Signature

Date Sampled: 11/21/94

ITEM NO	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	Sulfate	REMARKS
1	CMC-WCL-WD-05-04		Leachate	27993.5	2	1		1		1	1	
2	CMC-WCL-WD-06-04			27994.3	2	1		1		1	1	
3	CMC-WCL-WD-07-04			27995.1	2	1		1		1	1	
4	CMC-WCL-WD-08-04			27996.0	2	1		1		1	1	
5	CMC-WCL-WD-09-04			27997.8	2	1		1		1	1	
6	CMC-WCL-WD-10-04			27998.6	2	1		1		1	1	
7	CMC-WCL-WD-11-04			27999.4	2	1		1		1	1	
8	CMC-WCL-WD-12-04			28000.3	2	1		1		1	1	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
18	S. Hodge / PACE FED EX	FED EX	11/24	1715
		Doris Betzinger Rec'd @ 2.4°C	12/2/94	2:40 pm

Additional Comments

Metals = B., K, Te, Sn, Ga, Ge

Full Range data PKg Req'd

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

002

ZIMPRO/ESCAN

3.5-33-137

715 355 3219

12/05/94 11:41

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2 of 2 07027371 130788

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE
Address 1710 Douglas Drive North
Minneapolis, MN 55422
Phone 612-525-3454

Report To: Steve Crupi
Bill To:
P.O. # / Billing Reference Cranedam
Project Name / No. Cranedam Mining

Pace Client No.
Pace Project Manager Steve Crupi
Pace Project No. 4411127.521
*Requested Due Date: 12-30-94

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled 11/22/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	ANALYSES REQUEST: Sulfate	REMARKS
1	CMC-WCL-WD-13-04		Leachate	25001.1	2	1		1		✓	✓	
2	CMC-WCL-WD-14-04		↓	28 could	2	1		1		✓	✓	
3												
4												
5												
6												
7												
8												

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-2	[illegible] / PACE FED EX	FED EX	12/1/94	17:15
	Darcia Bitzenjer	Rec'd @ 4°C	12/2/94	2:40

Additional Comments

Metals = Bi, K, Te, Sn, Ga, Ge
Full Raw data Package Req'd

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

3.5-33-138

ZIMPRO/ESCAN 715 355 3219 12/05/94 11:41 003

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 06, 1995
PACE Project Number: 941123521

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0279935 11/21/94 09:30 11/23/94 CMC-WCL-WD 05-04	10 0279943 11/21/94 11:00 11/23/94 CMC-WCL-WD 06-04	10 0279951 11/21/94 11:30 11/23/94 CMC-WCL-WD 07-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	9.2	9.9	11.7
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	12	44	-	-
Sulfate	mg/L	3.0	-	18.9	-
Sulfate	mg/L	6.0	-	-	39.8
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	34	91	100
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	34	91	100
Lead	mg/L	0.040	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Molybdenum	mg/L	0.020	ND	ND	0.039
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.011	0.026	0.012
Selenium	mg/L	0.005	0.020	0.007	0.008

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REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 94112352

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0279935 11/21/94 09:30 11/23/94 CMC-WCL-WD 05-04	10 0279943 11/21/94 11:00 11/23/94 CMC-WCL-WD 06-04	10 0279951 11/21/94 11:30 11/23/94 CMC-WCL-WD 07-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND
Aluminum	mg/L	0.030	0.93	13	2.8
Barium	mg/L	0.005	0.009	0.033	0.015
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	11	14	16
Cadmium	mg/L	0.005	0.008	0.006	ND
Cobalt	mg/L	0.010	ND	ND	ND
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	0.057	0.19	0.037
Iron	mg/L	0.020	1.6 B	20 B	4.3 B
Magnesium	mg/L	0.030	7.3	21	13
Manganese	mg/L	0.005	0.21	0.42	0.10
Sodium	mg/L	0.040	3.1	10	18
Nickel	mg/L	0.020	ND	ND	ND
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	0.034	0.13	0.043

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 941123521

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0279960	10 0279978	10 0279986
Date Collected:			11/21/94	11/21/94	11/21/94
Time Collected:			13:00	14:00	14:45
Date Received:			11/23/94	11/23/94	11/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-04	09-04	10-04
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	0.001
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	9.2	7.3	18.3
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	12	46	-	-
Sulfate	mg/L	120	-	-	448
Sulfate	mg/L	30	-	212	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	61
Alkalinity, Bicarbonate	mg/L	5	76	17	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	76	17	-
Lead	mg/L	0.040	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	0.2
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.035	ND	ND
Selenium	mg/L	0.005	0.006	0.016	0.024
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND
Aluminum	mg/L	0.030	1.6	1.2	6.0

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REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 941123521

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0279960 11/21/94 13:00 11/23/94 CMC-WCL-WD 08-04	10 0279978 11/21/94 14:00 11/23/94 CMC-WCL-WD 09-04	10 0279986 11/21/94 14:45 11/23/94 CMC-WCL-WD 10-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Barium	mg/L	0.005	0.009	0.010	0.039
Beryllium	mg/L	0.005	ND	ND	0.007
Calcium	mg/L	0.040	16	42	48
Cadmium	mg/L	0.005	ND	ND	0.007
Cobalt	mg/L	0.010	ND	ND	0.47
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	0.037	0.034	4.6
Iron	mg/L	0.020	2.8 B	1.4 B	2.2 B
Magnesium	mg/L	0.030	12	31	55
Manganese	mg/L	0.005	0.12	0.93	3.0
Sodium	mg/L	0.040	11	2.0	5.6
Nickel	mg/L	0.020	ND	ND	0.043
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	0.045	0.16	4.0

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek

January 06, 1995
PACE Project Number: 94112352

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0279994	10 0280003	10 0280011
Date Collected:			11/21/94	11/21/94	11/22/94
Time Collected:			15:15	15:30	08:30
Date Received:			11/23/94	11/23/94	11/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	11-04	12-04	13-04
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	0.001	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	18.4	ND	ND
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	120	668	-	-
Sulfate	mg/L	300	-	1920	-
Sulfate	mg/L	60	-	-	438
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	80	-
Alkalinity, Bicarbonate	mg/L	5	ND	-	30
Alkalinity, Carbonate	mg/L	5	ND	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	ND	-	30
Cyanide, Total	ug/L	10	-	-	ND
Lead	mg/L	0.040	ND	ND	0.96
Mercury	ug/L	0.2	ND	0.4	0.2
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	ND	0.025	0.20
Selenium	mg/L	0.005	0.019	0.21	0.043
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND

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REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 94112352

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0279994 11/21/94 15:15 11/23/94 CMC-WCL-WD 11-04	10 0280003 11/21/94 15:30 11/23/94 CMC-WCL-WD 12-04	10 0280011 11/22/94 08:30 11/23/94 CMC-WCL-WD 13-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Aluminum	mg/L	0.030	0.58	4.1	1.4
Barium	mg/L	0.005	0.032	0.008	0.017
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	100	260	130
Cadmium	mg/L	0.005	ND	0.027	0.024
Cobalt	mg/L	0.010	0.11	1.5	0.022
Chromium	mg/L	0.005	ND	ND	0.016
Copper	mg/L	0.005	0.12	24	0.20
Iron	mg/L	0.020	0.90 B	16 B	13 B
Magnesium	mg/L	0.030	84	190	46
Manganese	mg/L	0.005	2.8	19	3.0
Sodium	mg/L	0.040	11	4.4	4.0
Nickel	mg/L	0.020	ND	0.23	0.034
Antimony	mg/L	0.050	ND	0.062	0.051
Zinc	mg/L	0.020	0.79	22	11

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REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 941123521

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0280020
PACE Sample Number:			10 0280020
Date Collected:			11/22/94
Time Collected:			09:15
Date Received:			11/23/94
Client Sample ID:			CMC-WCL-WD
			14-04
SUBCONTRACT ANALYSIS			
INDIVIDUAL PARAMETERS			
Uranium, total	mg/L	0.001	ND
INORGANIC ANALYSES			
Bismuth	mg/L	0.20	ND
Potassium	mg/L	4.8	6.5
Tellurium	mg/L	0.32	ND
Tin	mg/L	0.24	ND
Gallium	mg/L	0.20	ND
Germanium	mg/L	0.025	ND
Sulfate	mg/L	15	91
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Alkalinity, Bicarbonate	mg/L	5	60
Alkalinity, Carbonate	mg/L	5	140
Alkalinity, Total as Calcium Carbonate	mg/L	5	200
Cyanide, Total	ug/L	10	23
Lead	mg/L	0.040	9.0
Mercury	ug/L	0.2	1.4
Molybdenum	mg/L	0.020	ND
Thallium	mg/L	0.080	ND
Titanium	mg/L	0.050	ND
METALS BY TRACE ICP			
Arsenic	mg/L	0.005	1.9
Selenium	mg/L	0.005	0.15
TARGET ANALYTE LIST, METALS			
Silver	mg/L	0.005	0.018
Aluminum	mg/L	0.030	9.4
Barium	mg/L	0.005	0.022
Beryllium	mg/L	0.005	ND

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

January 06, 1995
PACE Project Number: 941123521

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0280020
Date Collected:			11/22/94
Time Collected:			09:15
Date Received:			11/23/94
Client Sample ID:			CMC-WCL-WD
Parameter	Units	MDL	14-04
INORGANIC ANALYSIS			
TARGET ANALYTE LIST, METALS			
Calcium	mg/L	0.040	130
Cadmium	mg/L	0.005	0.008
Cobalt	mg/L	0.010	0.046
Chromium	mg/L	0.005	0.078
Copper	mg/L	0.005	1.3
Iron	mg/L	0.020	140 B
Magnesium	mg/L	0.030	20
Manganese	mg/L	0.005	0.58
Sodium	mg/L	0.040	3.5
Nickel	mg/L	0.020	0.039
Antimony	mg/L	0.050	ND
Zinc	mg/L	0.020	7.1

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5542
FAX:612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 8

Client Reference: Crandon Mining Leachates

B	Analyte is found in the associated blank as well as in the sample.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5542
FAX:612-525-3377

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pace
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December 22, 1994

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941130.508, Alkalinity/Acidity

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on November 30, 1994.

Included in this submittal are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

The samples were analyzed for either total alkalinity or acidity by EPA Method 310.1, as directed by chain of custody record.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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Crandon Mining Company Project -
PACE Project 941130.508

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-05	28274.0
CMC-WCL-WD-06-05	28275.8
CMC-WCL-WD-07-05	28276.6
CMC-WCL-WD-08-05	28277.4
CMC-WCL-WD-09-05	28278.2
CMC-WCL-WD-10-05	28279.0
CMC-WCL-WD-11-05	28280.4
CMC-WCL-WD-12-05	28281.2
CMC-WCL-WD-13-05	28282.0
CMC-WCL-WD-14-05	28283.9

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FAX: 612-525-3377

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THE ASSURANCE OF QUALITY

130274

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 930049

Pace Client No.
Pace Project Manager
Pace Project No.: 9411130508
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J Loritz
Date Sampled: 11/28/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-05	0915	LEACHATE	28274.0	1	✓				✓		
2	CMC-WCL-WD-06-05	1030		28275.8	1	✓				✓		
3	CMC-WCL-WD-07-05	1100		28276.6	1	✓				✓		
4	CMC-WCL-WD-08-05	1115		28277.4	1	✓				✓		
5	CMC-WCL-WD-09-05	1315		28278.2	1	✓				✓		
6	CMC-WCL-WD-10-05	1345		28279.0	1	✓					✓	
7	CMC-WCL-WD-11-05	1415		28280.4	1	✓				✓		
8	CMC-WCL-WD-12-05	1430		28281.2	1	✓					✓	

3.5-33-150

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX 11/29/94

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD	J. Meza / Pace	11/29/94	1000

Additional Comments

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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THE ASSURANCE OF QUALITY

130275

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference:
Project Name / No.: CMC / 93C049

Pace Client No.:
Pace Project Manager:
Pace Project No.: 94130.508
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J Loritz
Date Sampled: 11/29/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 05	0845	LEACHATE	28282.0	1	/				/	
2	CMC - WCL - WD - 14 - 05	0915	↓	28283.9	1	/				/	
3											
4											
5											
6											
7											
8											

3.5-33-151

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 11/29/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD	J. Meyer / Pace	11/29/94	1000

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

December 14, 1994
PACE Project Number: 941130508

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Alk Leachate

Parameter	Units	MDL	10 0282740 11/28/94 09:15 11/30/94 CMC-WCL-WD -05-05	10 0282758 11/28/94 10:30 11/30/94 CMC-WCL-WD -06-05	10 0282766 11/28/94 11:00 11/30/94 CMC-WCL-WD -07-05
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	27	91	87
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	27	91	87

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Minneapolis, MN 55422
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FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

December 14, 1994
PACE Project Number: 941130508

Client Reference: Crandon Mining Alk Leachate

PACE Sample Number:			10 0282774	10 0282782	10 0282790
Date Collected:			11/28/94	11/28/94	11/28/94
Time Collected:			11:15	13:15	13:45
Date Received:			11/30/94	11/30/94	11/30/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-08-05	-09-05	-10-05
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	50
Alkalinity, Bicarbonate	mg/L	5	75	15	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	75	15	-

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REPORT OF LABORATORY ANALYSIS

December 14, 1994
PACE Project Number: 941130508

Client Reference: Crandon Mining Alk Leachate

Parameter	Units	MDL	10 0282804 CMC-WCL-WD -11-05	10 0282812 CMC-WCL-WD -12-05	10 0282820 CMC-WCL-WD -13-05
PACE Sample Number:					
Date Collected:			11/28/94	11/28/94	11/29/94
Time Collected:			14:15	14:30	08:45
Date Received:			11/30/94	11/30/94	11/30/94
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	93	-
Alkalinity, Bicarbonate	mg/L	5	ND	-	46
Alkalinity, Carbonate	mg/L	5	ND	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	ND	-	46

1710 Douglas Drive North
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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

December 14, 1994
PACE Project Number: 941130508

Client Reference: Crandon Mining Alk Leachate

PACE Sample Number:			10 0282839
Date Collected:			11/29/94
Time Collected:			09:15
Date Received:			11/30/94
Client Sample ID:			CMC-WCL-WD
Parameter	Units	MDL	-14-05
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Alkalinity, Bicarbonate	mg/L	5	12
Alkalinity, Carbonate	mg/L	5	160
Alkalinity, Total as Calcium Carbonate	mg/L	5	12

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 4

Client Reference: Crandon Mining Alk Leachate

MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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TEL: 612-544-5543
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pace INCORPORATED
ENVIRONMENTAL LABORATORIES

January 5, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941207.504, Alkalinity/Acidity

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on December 7, 1994.

Included in this submittal are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

The samples were analyzed for either total alkalinity or acidity by EPA Method 310.1, as directed by chain of custody record.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5542
FAX. 612-525-3377

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pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Project 941207.504

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-06	28737.7
CMC-WCL-WD-06-06	28738.5
CMC-WCL-WD-07-06	28739.3
CMC-WCL-WD-08-06	28740.7
CMC-WCL-WD-09-06	28741.5
CMC-WCL-WD-10-06	28742.3
CMC-WCL-WD-11-06	28743.1
CMC-WCL-WD-12-06	28744.0
CMC-WCL-WD-13-06	28745.8
CMC-WCL-WD-14-06	28746.6

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Minneapolis, MN 55422
TEL: 612-544-5542
FAX: 612-525-3377

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 05, 1995
PACE Project Number: 941207504

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Alkalinity Leachates

PACE Sample Number:			10 0287377	10 0287385	10 0287393
Date Collected:			12/05/94	12/05/94	12/05/94
Time Collected:			14:00	14:45	15:00
Date Received:			12/07/94	12/07/94	12/07/94
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	05-06	06-06	07-06
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	29	92	100
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	29	92	100

1710 Douglas Drive
Minneapolis, MN 55422
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REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941207504

Client Reference: Crandon Mining Alkalinity Leachates

PACE Sample Number:			10 0287407	10 0287415	10 0287423
Date Collected:			12/05/94	12/06/94	12/06/94
Time Collected:			14:30	08:15	08:45
Date Received:			12/07/94	12/07/94	12/07/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-06	09-06	10-06
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	56
Alkalinity, Bicarbonate	mg/L	5	76	16	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	76	16	-

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5542
FAX:612-525-3377

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REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941207504

Client Reference: Crandon Mining Alkalinity Leachates

PACE Sample Number:			10 0287431	10 0287440	10 0287458
Date Collected:			12/06/94	12/06/94	12/06/94
Time Collected:			09:00	09:15	10:15
Date Received:			12/07/94	12/07/94	12/07/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	11-06	12-06	13-06
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	82	-
Alkalinity, Bicarbonate	mg/L	5	ND	-	75
Alkalinity, Carbonate	mg/L	5	ND	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	ND	-	75

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

January 05, 1995
PACE Project Number: 941207504

Client Reference: Crandon Mining Alkalinity Leachates

PACE Sample Number:			10 0287466
Date Collected:			12/06/94
Time Collected:			10:30
Date Received:			12/07/94
Client Sample ID:			CMC-WCL-WD
Parameter	Units	MDL	14-06
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Alkalinity, Bicarbonate	mg/L	5	26
Alkalinity, Carbonate	mg/L	5	120
Alkalinity, Total as Calcium Carbonate	mg/L	5	26

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5542
FAX:612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 4

Client Reference: Crandon Mining Alkalinity Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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TEL: 612-544-5542
FAX:612-525-3377

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THE ASSURANCE OF QUALITY

203561

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93C049

Pace Client No.
Pace Project Manager
Pace Project No. 941103.504
PROPOSAL NO. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J Loritz
Date Sampled: 12/05/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 05 - 06	1400	LEACHATE	28737.7	1	✓				✓	
2	CMC - WCL - WD - 06 - 06	1445	↓	28738.5	1	✓				✓	
3	CMC - WCL - WD - 07 - 06	1500	↓	28739.3	1	✓				✓	
4	CMC - WCL - WD - 08 - 06	1430	↓	28740.7	1	✓				✓	
5											
6											
7											
8											

3.5-33-164

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 12/6/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD FedEx	Jodelle Meyer / Pace	12/6/94 12/7/94	1130 1050

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

203562

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.
Pace Project Manager: 941207.504
Pace Project No.
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12/6/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 09 - 06	0815	LEACHATE	28741.5	1	/				/		
2	CMC - WCL - WD - 10 - 06	0845		28742.3	1	/				/		
3	CMC - WCL - WD - 11 - 06	0900		28743.1	1	/				/		
4	CMC - WCL - WD - 12 - 06	0915		28744.0	1	/				/		
5	CMC - WCL - WD - 13 - 06	1015		28745.8	1	/				/		
6	CMC - WCL - WD - 14 - 06	1030		28746.6	1	/				/		
7												
8												

3.5-33-165

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 12/6/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD	Jodell Meyer / Pace	12/6/94	1300

SEE REVERSE SIDE FOR INSTRUCTIONS

ORIGINAL

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

January 16, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941220.515, Leachate

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate sample received at PACE on December 2, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories. The Enviroscan metals container was sent directly to Enviroscan. The sulfate bottle was mistakenly sent to PACE. PACE sent this container to Enviroscan. CEP received their container on December 21, 1994.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan-
Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

An Equal Opportunity Employer

JAN 17 1995

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Project 941220.515

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-03-21	30203.1

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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pace INCORPORATED
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Crandon Mining Company Project -
PACE Project 941220.515

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REQUEST FOR SERVICES

ENVIROSCAN

303 W. MILITARY RD. ROTHSCHILD, WI 54474 1-800-338-SCAN

CLIENT INFORMATION

Name: STEVE CRUPI
Company: PACE, INC.
Address: 1710 DOUGLAS DR. NORTH
MINNEAPOLIS, MN. 55422
Phone: (612) 525-3454
P.O. # / Project #: CRANDON MINING CO.
Quote / Reference #:
Note: Terms and conditions printed on back apply.

Turnaround Time
- ☐ Normal
- ☑ Rush

Date Needed 12/27/94
(Preapproved by Lab)

Sample Type (Check all that apply)
- ☐ Groundwater
- ☐ Wastewater
- ☐ Soil
- ☐ Solid Waste
- ☐ Oil
- ☑ Other LEACHATE

Sample Handling
- ☑ Nonhazardous
- ☐ Flammable
- ☐ Skin Irritant
- ☐ Highly Toxic
- ☐ Other (specify) _____
- ☑ Refrigerate
- ☐ Work in Hood
- ☐ Wear Gloves

ANALYTICAL REQUESTS
(use separate sheet if necessary)

LAB USE ONLY	DATE	TIME	No. of Containers COMP	No. of Containers GRAB	SAMPLE ID	METALS	BI	K	TE	SN	G.A.	EE	REMARKS
19028899	12/19	1015	1		CMC-WCL-WD-03-21	✓							HNO_3 ADDED

PACEINCMN

Del'v: Hand Comm
Ship. Cont. OK? Y N N/A
Rec'd Refrig.? Y N N/A
Seals OK? Y N N/A
Samples leaking? Y N N/A
Comments:

CHAIN OF CUSTODY RECORD

SAMPLERS: (Signature)
FOTH + VAN DYKE
DENNIS J LORITZ Dennis J. Loritz

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
Dennis J. Loritz	12/19/94 1300	
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED FOR LABORATORY BY: (Signature) / DATE/TIME
		Bev Reader 12/20/94 11:15AM

3.5-33-170

pace
INCORPORATED
THE ASSURANCE OF QUALITY

205655

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH + VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC / 93C049

Pace Client No. 150419
Pace Project Manager SRL
Pace Project No. 941220.515
PROPOSAL No. 941103.500
*Requested Due Date: 12/27/94

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J. Lority
Date Sampled: 12/19/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	PACE-METALS	ENVIROSCAN-METALS	SULFATE	CEP-URANIUM	T. ALKALINITY	REMARKS
1	CMC-WCL-WD-03-21	1015	LEACHATE	30203.1	5	3		2		/	/	/	/	/	METALS AND URANIUM SAMPLES SENT DIRECTLY TO ENVIROSCAN AND CEP.
2															
3															
4															
5															
6															
7															
8															

3.5-33-171

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE
			FED Ex. 12/19/94

Additional Comments: NEED RESULTS BY 12/27/94.

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Lority / FVD	[illegible] / PACE	12/19/94	1300
			12/20/94	14:45

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

21029279

205664

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE
Address: 1710 Douglas Drive N
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To:
P.O. # / Billing Reference: Leachate
Project Name / No.: Crandon Mining

Pace Client No.
Pace Project Manager: Steve Crupi
Pace Project No.: 9411220.515
*Requested Due Date: verbals 12-27-94

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled: 12-19-94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Sulfate	REMARKS
1	CMC-WCL-WD-03-21		Water	30203.1	1	1				✓	Report to follow FULL QC PKG w/ narrative
2											
3											
4											
5											
6											
7											
8											

3.5-33-172

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1	Steven R. Crupi/PACE		12/20/94	1700
		Sheila Ryan	12-22-94	11:40
		Rec'd at 11.0°		

Additional Comments

This container is part of Sample received 12-20-94 at Enviroscan directly from FVD. The SO4 container was mistakenly sent to PACE. Report Results to PACE

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 16, 1995
PACE Project Number: 941220515

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mine Rush Leachate

PACE Sample Number:			10 0302031
Date Collected:			12/19/94
Time Collected:			10:15
Date Received:			12/20/94
			CMC-WCL-WD
Parameter	Units	MDL	-03-21
SUBCONTRACT ANALYSIS			
INDIVIDUAL PARAMETERS			
Uranium, total	mg/L	0.001	ND
INORGANIC ANALYSES			
Bismuth	mg/L	0.20	ND
Potassium	mg/L	4.8	ND
Tellurium	mg/L	0.32	ND
Tin	mg/L	0.24	ND
Gallium	mg/L	0.20	ND
Germanium	mg/L	0.025	ND
Sulfate	mg/L	30	202
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Alkalinity, Bicarbonate	mg/L	5	8
Alkalinity, Carbonate	mg/L	5	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	8
Lead	mg/L	0.040	0.097
Mercury	ug/L	0.2	ND
Molybdenum	mg/L	0.020	ND
Thallium	mg/L	0.080	ND
Titanium	mg/L	0.050	ND
METALS BY TRACE ICP			
Arsenic	mg/L	0.005	ND
Selenium	mg/L	0.005	0.020
TARGET ANALYTE LIST, METALS			
Silver	mg/L	0.005	ND

1710 Douglas Drive
Minneapolis, MN 55422
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FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

January 16, 1995
PACE Project Number: 941220515

Client Reference: Crandon Mine Rush Leachate

PACE Sample Number:			10 0302031
Date Collected:			12/19/94
Time Collected:			10:15
Date Received:			12/20/94
Client Sample ID:			CMC-WCL-WD
Parameter	Units	MDL	-03-21
INORGANIC ANALYSIS			
TARGET ANALYTE LIST, METALS			
Aluminum	mg/L	0.030	ND
Barium	mg/L	0.005	0.011
Beryllium	mg/L	0.005	ND
Calcium	mg/L	0.040	24
Cadmium	mg/L	0.005	0.19
Cobalt	mg/L	0.010	0.055
Chromium	mg/L	0.005	ND
Copper	mg/L	0.005	1.8
Iron	mg/L	0.020	ND
Magnesium	mg/L	0.030	12
Manganese	mg/L	0.005	0.42
Sodium	mg/L	0.040	1.4
Nickel	mg/L	0.020	ND
Zinc	mg/L	0.020	53

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 2

Client Reference: Crandon Mine Rush Leachate

MDL Method Detection Limit
ND Not detected at or above the MDL.

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ENVIRONMENTAL LABORATORIES

January 20, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941215.508, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on December 15, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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3.5-33-176

JAN 23 1995

Six samples were analyzed beyond the holding time for mercury. This situation was communicated to you via FAX on January 19, 1995 (copy attached). These samples were initially analyzed within the holding time, however reanalysis was deemed necessary because of quality control concerns affecting the initial analysis of these samples. Reanalysis could not be conducted within the holding time because of instrument breakdown. Future occurences of this nature will be prevented by transferring sample volumes to another WI certified laboratory if there is any indication that mercury holding times may be in jeopardy.

The matrix spike and matrix spike duplicate recoveries for aluminum and iron were well above the QC limits. The high recoveries are due to the fact that the amount of these elements native to the sample (CMC-WCL-WD-14-07) are significantly higher than the amount added for the spike analyses.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 941215.508

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-13-07	29641.4
CMC-WCL-WD-14-07	29643.0
CMC-WCL-RS-13-01	29644.9
CMC-WCL-RS-18-01	29645.7
CMC-WCL-AL-16-02	29646.5
CMC-WCL-AL-17-02	29647.3
CMC-WCL-WD-03-20	29648.1
CMC-WCL-WD-05-07	29649.0
CMC-WCL-WD-06-07	29651.1
CMC-WCL-WD-07-07	29652.0
CMC-WCL-WD-08-07	29653.8
CMC-WCL-WD-09-07	29654.6
CMC-WCL-WD-10-07	29655.4
CMC-WCL-WD-11-07	29656.2
CMC-WCL-WD-12-07	29657.0

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FAX: 612-525-3377

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pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 941215.508

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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TO: Enviroscan

19028907
19028913

205552

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE
Address: 1710 Douglas Drive North
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To:
P.O. # / Billing Reference
Project Name / No.: Crandon Mining Leachates

Pace Client No.
Pace Project Manager: Steve Crupi
Pace Project No.: 941215.508
Requested Due Date: FAX Results by 1-10-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled

Full QC Pkg by 1-17-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	Sulfate	REMARKS
1	CMC-WCL-WD-14-07 12/13/94	1200	Water	29643.0	2	1		1		✓	✓	
2	CMC-WCL-RS-13-01 12/14/94	1015	↓	29644.9	2	1		1		✓	✓	
3	CMC-WCL-RS-18-01 12/14/94	0930	↓	29645.7	2	1		1		✓	✓	
4	CMC-WCL-AL-16-02 12/14/94	1300	↓	29646.5	2	1		1		✓	✓	
5	CMC-WCL-AL-17-02 12/14/94	1115	↓	29647.3	2	1		1		✓	✓	
6	CMC-WCL-WD-06-07 12/12/94	1130	↓	29651.1	2	1		1		✓	✓	
7	CMC-WCL-WD-12-07 12/12/94	1115	↓	29657.0	2	1		1		✓	✓	
8												

3.5-33-180

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-7	Steven R. Crupi / PACE	FED EX	12/9/94	1600
		Ben Roddy Enviroscan	12/30/94	12:50 pm

Additional Comments

Metals = Bi, K, Te, Sn, Ga, Ge

Need Full QC Raw data package

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

205557

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH AND VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93 C049

Pace Client No.
Pace Project Manager
Pace Project No. 94121532B
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12|13-14|94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	PACE - METALS	ENVIROSCAN - METALS	T. CYANIDE	SULFATE	URANIUM	T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 13 - 07	12|13 0940	LEACHATE	29641.4	1	1									✓			
2	CMC - WCL - WD - 14 - 07	12|12 1200		29643.0	6	3		2		1	/	/	/	/	/	/		
3	CMC - WCL - RS - 13 - 01	12|14 1015		29644.9	6	3		2		1	/	/	/	/	/	/		
4	CMC - WCL - RS - 18 - 01	12|14 0930		29645.7	6	3		2		1	/	/	/	/	/	/		
5	CMC - WCL - AL - 16 - 02	12|14 1300		29646.5	6	3		2		1	/	/	/	/	/	/		
6	CMC - WCL - AL - 17 - 02	12|12 1115		29647.3	6	3		2		1	/	/	/	/	/	/		
7	CMC - WCL - WD - 03 - 20	1005		29648.1	1	1									✓			
8																		

3.5-33-181

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 12|14|94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	DR Stadelman Pace	12|14|94	1430
			12-15-94	1300

SEE REVERSE SIDE FOR INSTRUCTIONS

ORIGINAL

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THE ASSURANCE OF QUALITY

205556

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH AND VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.
Pace Project Manager
Pace Project No. 94121508
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12/12/94 - 12/13/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	PACE: METALS	ENVIROSCAN - METALS	T. CYANIDE	SULFATE	URANIUM	T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 05 - 07	12/12 1430	LEACHATE	29649.0	1	1								✓			
2	CMC - WCL - WD - 06 - 07	12/12 1130		29651.1	5	3		2		✓	✓	✓	✓	✓			
3	CMC - WCL - WD - 07 - 07	12/12 1445		29652.0	1	1								✓			
4	CMC - WCL - WD - 08 - 07	12/12 1500		29653.8	1	1								✓			
5	CMC - WCL - WD - 09 - 07	12/13 0800		29654.6	1	1								✓			
6	CMC - WCL - WD - 10 - 07	12/13 0830		29655.4	1	1									✓		
7	CMC - WCL - WD - 11 - 07	12/13 0845		29656.2	1	1								✓			
8	CMC - WCL - WD - 12 - 07	12/12 1115		29657.0	5	3		2		✓	✓	✓	✓	✓			

3.5-33-182

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE
			FED. EX. 12/14/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	[illegible] / lab	12/14/94 12/15/94	1430 1300

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

PACE PROJECT NAME: FOTH & VAN DYKE - CRANDON MINING LEACHATES
PACE PROJECT MANAGER: Steve Crupi

CLOSED DUE 1/10/95

SDG	PROJ. NO.	CLIENT	LAB NO.	FIELD ID	QC	ATRI	SAMPLED DATE	RECEIVED DATE	Met	PB-N	MO-N	AS-T	SE-	TL-N	TI-N	HG-U	FENV	Ur	TCN	T-ALK	ACIDITY
																				x	
29641	941215508	OTH&V	29641.4	CMC-WCL-WD-13-07	X	Leach	12/13/94	12/15/94													
29641	941215508	OTH&V	29643.0	CMC-WCL-WD-14-07		Leach	12/12/94	12/15/94	x	x	x	x	x	x	x	x	x	x	x	x	
29641	941215508	OTH&V	29644.9	CMC-WCL-RS-13-01		Leach	12/14/94	12/15/94	x	x	x	x	x	x	x	x	x	x	x	x	
29641	941215508	OTH&V	29645.7	CMC-WCL-RS-18-01		Leach	12/14/94	12/15/94	x	x	x	x	x	x	x	x	x	x	x	x	
29641	941215508	OTH&V	29646.5	CMC-WCL-AL-16-02		Leach	12/14/94	12/15/94	x	x	x	x	x	x	x	x	x	x	x	x	
29641	941215508	OTH&V	29647.3	CMC-WCL-AL-17-02		Leach	12/14/94	12/15/94	x	x	x	x	x	x	x	x	x	x	x	x	
29641	941215508	OTH&V	29648.1	CMC-WCL-WD-03-20		Leach	12/12/94	12/15/94												x	
29641	941215508	OTH&V	29649.0	CMC-WCL-WD-05-07		Leach	12/12/94	12/15/94												x	
29641	941215508	OTH&V	29651.1	CMC-WCL-WD-06-07		Leach	12/12/94	12/15/94	x	x	x	x	x	x	x	x	x	x		x	
29641	941215508	OTH&V	29652.0	CMC-WCL-WD-07-07		Leach	12/12/94	12/15/94												x	
29641	941215508	OTH&V	29653.8	CMC-WCL-WD-08-07		Leach	12/12/94	12/15/94												x	
29641	941215508	OTH&V	29654.6	CMC-WCL-WD-09-07		Leach	12/13/94	12/15/94												x	
29641	941215508	OTH&V	29655.4	CMC-WCL-WD-10-07		Leach	12/13/94	12/15/94													x
29641	941215508	OTH&V	29656.2	CMC-WCL-WD-11-07		Leach	12/13/94	12/15/94												x	
29641	941215508	OTH&V	29657.0	CMC-WCL-WD-12-07		Leach	12/12/94	12/15/94	x	x	x	x	x	x	x	x	x	x			x

Raw Data Package required. Must include calibrations, calibration checks and quality control samples. Also, WANG report plus QC needed.

3.5-33-183

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 20, 1995
PACE Project Number: 941215508

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296414 12/13/94 09:40 12/15/94 CMC-WCL-WD-13-07	10 0296430 12/12/94 12:00 12/15/94 CMC-WCL-WD-14-07	10 0296449 12/14/94 10:15 12/15/94 CMC-WCL-RS-13-01
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	0.002	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	ND	ND
Potassium	mg/L	4.8	-	5.0	9.6
Tellurium	mg/L	0.32	-	ND	ND
Tin	mg/L	0.24	-	ND	ND
Gallium	mg/l	0.20	-	ND	ND
Germanium	mg/L	0.025	-	ND	ND
Sulfate	mg/L	30	-	104	-
Sulfate	mg/L	300	-	-	1550
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	82	90	86
Alkalinity, Carbonate	mg/L	5	ND	180	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	82	510	86
Cyanide, Total	ug/L	10	-	12	ND
Lead	mg/L	0.040	-	8.9	1.5
Mercury	ug/L	0.2	-	ND	ND
Molybdenum	mg/L	0.020	-	0.023	ND
Thallium	mg/L	0.080	-	ND	0.15
Titanium	mg/L	0.050	-	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	1.4	0.033
Selenium	mg/L	0.005	-	0.17	0.13

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL		10 0296414 12/13/94 09:40 12/15/94 CMC-WCL-WD-13-07	10 0296430 12/12/94 12:00 12/15/94 CMC-WCL-WD-14-07	10 0296449 12/14/94 10:15 12/15/94 CMC-WCL-RS-13-01
PACE Sample Number:						
Date Collected:						
Time Collected:						
Date Received:						
Client Sample ID:						
INORGANIC ANALYSIS						
TARGET ANALYTE LIST, METALS						
Silver	mg/L	0.005	-		0.012	ND
Aluminum	mg/L	0.030	-		5.2	0.20
Barium	mg/L	0.005	-		0.019	0.074
Beryllium	mg/L	0.005	-		ND	ND
Calcium	mg/L	0.040	-		160	480
Cadmium	mg/L	0.005	-		0.011	0.023
Cobalt	mg/L	0.010	-		0.030	0.15
Chromium	mg/L	0.005	-		0.074	0.011
Copper	mg/L	0.005	-		1.4	0.017
Iron	mg/L	0.020	-		80	2.9
Magnesium	mg/L	0.030	-		27	95
Manganese	mg/L	0.005	-		0.99	14
Sodium	mg/L	0.040	-		3.2	49
Nickel	mg/L	0.020	-		0.081	0.11
Antimony	mg/L	0.050	-		ND	ND
Zinc	mg/L	0.020	-		5.6	31

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296457 12/14/94 09:30 12/15/94 CMC-WCL-RS-18-01	10 0296465 12/14/94 13:00 12/15/94 CMC-WCL-AL-16-02	10 0296473 12/14/94 11:15 12/15/94 CMC-WCL-AL-17-02
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	0.001	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	8.1	321	244
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	300	717	1640	1390
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	37	ND	ND
Alkalinity, Carbonate	mg/L	5	ND	ND	80
Alkalinity, Total as Calcium Carbonate	mg/L	5	37	ND	350
Cyanide, Total	ug/L	10	ND	ND	ND
Lead	mg/L	0.040	0.39	0.28	ND
Mercury	ug/L	0.2	ND	0.3	ND
Molybdenum	mg/L	0.020	ND	ND	0.030
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.037	0.030	0.011
Selenium	mg/L	0.005	0.035	0.14	0.034
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	0.031	ND
Aluminum	mg/L	0.030	0.41	0.31	0.14
Barium	mg/L	0.005	0.26	0.093	0.060
Beryllium	mg/L	0.005	ND	ND	ND

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FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 4

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296457 12/14/94 09:30 12/15/94 CMC-WCL-RS-18-01	10 0296465 12/14/94 13:00 12/15/94 CMC-WCL-AL-16-02	10 0296473 12/14/94 11:15 12/15/94 CMC-WCL-AL-17-02
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Calcium	mg/L	0.040	270	720	250
Cadmium	mg/L	0.005	0.006	ND	ND
Cobalt	mg/L	0.010	0.026	0.022	ND
Chromium	mg/L	0.005	0.50	0.044	0.017
Copper	mg/L	0.005	0.080	0.040	0.009
Iron	mg/L	0.020	2.8	2.2	0.23
Magnesium	mg/L	0.030	26	11	1.3
Manganese	mg/L	0.005	0.79	1.1	0.021
Sodium	mg/L	0.040	57	94	65
Nickel	mg/L	0.020	ND	ND	ND
Antimony	mg/L	0.050	ND	0.070	ND
Zinc	mg/L	0.020	0.87	0.35	0.037

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296481 12/12/94 10:05 12/15/94 CMC-WCL-WD-03-20	10 0296490 12/12/94 14:30 12/15/94 CMC-WCL-WD-05-07	10 0296511 12/12/94 11:30 12/15/94 CMC-WCL-WD-06-07
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	-	0.001
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	-	ND
Potassium	mg/L	4.8	-	-	6.8
Tellurium	mg/L	0.32	-	-	ND
Tin	mg/L	0.24	-	-	ND
Gallium	mg/L	0.20	-	-	ND
Germanium	mg/L	0.025	-	-	ND
Sulfate	mg/L	3.0	-	-	14.1
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	43	30	71
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	43	30	71
Lead	mg/L	0.040	-	-	ND
Mercury	ug/L	0.2	-	-	ND
Molybdenum	mg/L	0.020	-	-	ND
Thallium	mg/L	0.080	-	-	ND
Titanium	mg/L	0.050	-	-	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	-	0.033
Selenium	mg/L	0.005	-	-	ND
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	-	ND
Aluminum	mg/L	0.030	-	-	7.0
Barium	mg/L	0.005	-	-	0.043
Beryllium	mg/L	0.005	-	-	ND
Calcium	mg/L	0.040	-	-	19

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0296481	10 0296490	10 0296511
Date Collected:			12/12/94	12/12/94	12/12/94
Time Collected:			10:05	14:30	11:30
Date Received:			12/15/94	12/15/94	12/15/94
Client Sample ID:			CMC-WCL-WD-03-20	CMC-WCL-WD-05-07	CMC-WCL-WD-06-07
Parameter	Units	MDL			
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Cadmium	mg/L	0.005	-	-	ND
Cobalt	mg/L	0.010	-	-	ND
Chromium	mg/L	0.005	-	-	0.005
Copper	mg/L	0.005	-	-	0.53
Iron	mg/L	0.020	-	-	11
Magnesium	mg/L	0.030	-	-	13
Manganese	mg/L	0.005	-	-	0.56
Sodium	mg/L	0.040	-	-	5.6
Nickel	mg/L	0.020	-	-	ND
Antimony	mg/L	0.050	-	-	ND
Zinc	mg/L	0.020	-	-	0.28

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296520 CMC-WCL-WD-07-07	10 0296538 CMC-WCL-WD-08-07	10 0296546 CMC-WCL-WD-09-07
PACE Sample Number:			10 0296520	10 0296538	10 0296546
Date Collected:			12/12/94	12/12/94	12/13/94
Time Collected:			14:45	15:00	08:00
Date Received:			12/15/94	12/15/94	12/15/94
Client Sample ID:			CMC-WCL-WD-07-07	CMC-WCL-WD-08-07	CMC-WCL-WD-09-07
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	97	77	19
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	97	77	19

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 8

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296554 12/13/94 08:30 12/15/94 CMC-WCL-WD-10-07	10 0296562 12/13/94 08:45 12/15/94 CMC-WCL-WD-11-07	10 0296570 12/12/94 11:15 12/15/94 CMC-WCL-WD-12-07
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	-	0.001
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	-	ND
Potassium	mg/L	4.8	-	-	ND
Tellurium	mg/L	0.32	-	-	ND
Tin	mg/L	0.24	-	-	ND
Gallium	mg/L	0.20	-	-	ND
Germanium	mg/L	0.025	-	-	ND
Sulfate	mg/L	300	-	-	1420
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	78	-	60
Alkalinity, Bicarbonate	mg/L	5	-	ND	-
Alkalinity, Carbonate	mg/L	5	-	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	ND	-
Lead	mg/L	0.040	-	-	0.053
Mercury	ug/L	0.2	-	-	1.1
Molybdenum	mg/L	0.020	-	-	ND
Thallium	mg/L	0.080	-	-	ND
Titanium	mg/L	0.050	-	-	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	-	0.034
Selenium	mg/L	0.005	-	-	0.21
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	-	ND
Aluminum	mg/L	0.030	-	-	2.0
Barium	mg/L	0.005	-	-	0.012
Beryllium	mg/L	0.005	-	-	ND

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0296554 CMC-WCL-WD-10-07	10 0296562 CMC-WCL-WD-11-07	10 0296570 CMC-WCL-WD-12-07
PACE Sample Number:			10 0296554	10 0296562	10 0296570
Date Collected:			12/13/94	12/13/94	12/12/94
Time Collected:			08:30	08:45	11:15
Date Received:			12/15/94	12/15/94	12/15/94
Client Sample ID:			CMC-WCL-WD-10-07	CMC-WCL-WD-11-07	CMC-WCL-WD-12-07
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Calcium	mg/L	0.040	-	-	260
Cadmium	mg/L	0.005	-	-	0.027
Cobalt	mg/L	0.010	-	-	0.88
Chromium	mg/L	0.005	-	-	ND
Copper	mg/L	0.005	-	-	8.3
Iron	mg/L	0.020	-	-	5.8
Magnesium	mg/L	0.030	-	-	120
Manganese	mg/L	0.005	-	-	14
Sodium	mg/L	0.040	-	-	4.2
Nickel	mg/L	0.020	-	-	0.10
Antimony	mg/L	0.050	-	-	ND
Zinc	mg/L	0.020	-	-	16

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 9

January 20, 1995
PACE Project Number: 941215508

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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January 20, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941223.517, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on December 23, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan-
Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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3.5-33-194

JAN 23 1995

One sample was analyzed beyond the holding time for mercury. This situation was communicated to you via FAX on January 19, 1995 (copy attached). The sample was initially analyzed within the holding time, however reanalysis was deemed necessary because of quality control concerns affecting the initial analysis of the sample. Reanalysis could not be conducted within the holding time because of instrument breakdown. Future occurences of this nature will be prevented by transferring sample volumes to another WI certified laboratory if there is any indication that mercury holding times may be in jeopardy.

The sulfate analysis for sample CMC-WCL-WD-0319 was conducted outside of the holding time. The sample was collected on 12/07/94 and received at PACE on 12/23/94. By the time Enviroscan received the sulfate bottle from PACE, little time of the holding time remained to conduct the analysis.

A low matrix spike recovery for germanium was calculated. This low recovery affects nine samples. See the third page of the Enviroscan raw data package for a summary of affected samples.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 941223.517

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-08	30829.3
CMC-WCL-WD-06-08	30830.7
CMC-WCL-WD-07-08	30831.5
CMC-WCL-WD-08-08	30832.3
CMC-WCL-WD-09-08	30833.1
CMC-WCL-WD-10-08	30834.0
CMC-WCL-WD-11-08	30835.8
CMC-WCL-WD-12-08	30836.6
CMC-WCL-WD-13-08	30837.4
CMC-WCL-WD-14-08	30838.2
CMC-WCL-AL-16-03	30839.0
CMC-WCL-AL-17-03	30840.4
CMC-WCL-WD-03-19	30841.2
CMC-WCL-AL-15-03	30842.0
CMC-WCL-AL-13-03	30843.9

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Crandon Mining Company Project -
PACE Projects 941223.517

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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FAX: 612-525-3377

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130246

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93 C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 94122.517
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12/20-21/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	PACE - METALS	ENVIROSCAN - METALS	SULFATE	URANIUM	T. CYANIDE	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 08	12/21 0930	LEACHATE	30837.4	6	3		2		1	/	/	/	/	/	/	
2	CMC - WCL - WD - 14 - 08	12/21 0945		30838.2	6	3		2		1	/	/	/	/	/	/	
3	CMC - WCL - AL - 16 - 03	12/20 1630		30839.0	6	3		2		1	/	/	/	/	/	/	
4	CMC - WCL - AL - 17 - 03	12/20 1515		30840.1	6	3		2		1	/	/	/	/	/	/	
5	CMC - WCL - WD - 03 - 19	12/7 A.M.		30841.2	5	3		2			/	/	/	/		/	
6	CMC - WCL - AL - 15 - 03	12/21 1515		30842.0	6	3		2		1	/	/	/	/	/	/	
7	CMC - WCL - AL - 13 - 03	12/21 1545		30843.9	6	3		2		1	/	/	/	/	/	/	
8																	

3.5-33-198

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 12/22/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	Amy Hooker / PACE	12/22/94	0900
			12/23/94	1600

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

130245

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD. GREEN BAY, WIS 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference:
Project Name / No.: CMC / 93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 94122S.577
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12/19-21/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: PACE-METALS	ENVIROSCAN-METALS	URANIUM	SULFATE	T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-08	12/19 1445	LEACHATE	30829.3	5	3		2		/	/	/	/	/		
2	CMC-WCL-WD-06-08	12/19 1530		30830.7	5	3		2		/	/	/	/	/		
3	CMC-WCL-WD-07-08	12/20 0845		30831.5	5	3		2		/	/	/	/	/		
4	CMC-WCL-WD-08-08	12/20 0930		30832.3	5	3		2		/	/	/	/	/		
5	CMC-WCL-WD-09-08	12/20 1100		30833.1	5	3		2		/	/	/	/	/		
6	CMC-WCL-WD-10-08	12/20 1245		30834.0	5	3		2		/	/	/	/	/	/	
7	CMC-WCL-WD-11-08	12/20 1315		30835.8	5	3		2		/	/	/	/	/	/	
8	CMC-WCL-WD-12-08	12/20 1345		30836.6	5	3		2		/	/	/	/	/	/	

3.5-33-199

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 12/22/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD		12/22/94	1115
		[illegible] / PACE	12/23/94	1500

ORIGINAL

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Send to Enviroscan 1 of 2

205657

0402618 04029625

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE
Address 1710 Douglas Drive North
Minneapolis MN 55422
Phone 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference Cranden 941223.517
Project Name / No. Cranden Mining

Pace Client No.
Pace Project Manager Steve Crupi
Pace Project No. 941223.517
*Requested Due Date: 1-19-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	SOM	REMARKS
1	CMC-WCL-WD-05-08	12/19	Water	30829.3	2	1		1		✓	✓	→ See note below
2	CMC-WCL-WD-06-08	12/19		30830.7	2	1		1		✓	✓	
3	CMC-WCL-WD-07-08	12/20		30831.5	2	1		1		✓	✓	
4	CMC-WCL-WD-08-08	12/20		30832.3	2	1		1		✓	✓	
5	CMC-WCL-WD-09-08	12/20		30833.1	2	1		1		✓	✓	
6	CMC-WCL-WD-10-08	12/20		30834.0	2	1		1		✓	✓	
7	CMC-WCL-WD-11-08	12/20		30835.8	2	1		1		✓	✓	
8	CMC-WCL-WD-12-08	12/20		30836.6	2	1		1		✓	✓	

3.5-33-200

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT · DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-8	Sam Hodge/PACE FED EX	FED EX	12/28/94	1800
		Doris Retzinger Enviroscan Corp	12/29/94	11:00AM

Additional Comments

Metals = Bi, K, Te, Sn, Ga, Ge

Note: Sample #1 → pH > 2. Analyze Sample and footnote report.

Full QC package is required (raw data pkg)

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

Rec'd on Blue

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Send to Enviroscan 2 of 2

04029626 04029632

205658

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE

Address 1710 Douglas Drive North
Minneapolis, MN 55422

Phone 612-525-3454

Report To: Steve Crupi

Bill To: Steve Crupi

P.O. # / Billing Reference 941223.517

Project Name / No. Crandon Mining

Pace Client No.

Pace Project Manager Steve Crupi

Pace Project No. 941223.517

*Requested Due Date: 1-19-95

Sampled By (PRINT): CLIENT

Sampler Signature

Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: Metals	SO4	REMARKS
1	CMC-WCL-WD-13-08	12/21	Water	30837.4	2	1		1				✓	✓	Data Taken from Bottle Labels 12/29/94 DKE
2	CMC-WCL-WD-14-08	↓		30838.2	2	1		1				✓	✓	
3	CMC-WCL-AL-16-03	12/20		30839.0	2	1		1				✓	✓	
4	CMC-WCL-AL-17-03	↓		30840.4	2	1		1				✓	✓	
5	CMC-WCL-WD-03-19	12/07		30841.2	2	1		1				✓	✓	
6	CMC-WCL-AL-15-03	12/21		30842.0	2	1		1				✓	✓	
7	CMC-WCL-AL-13-03	12/21	↓	30843.9	2	1		1				✓	✓	
8														

3.5-33-201

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE

Additional Comments

Metals = Bi, K, Te, Sn, Ga, Ge

Full QC raw data package required

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-7	[illegible] PACE	FED EX	12/28/94	7500
	FED EX			
	Doris Retzuger Enviroscan Corp		12/29/94	11:00 AM

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS Rec'd on Blue

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 20, 1995
PACE Project Number: 941223517

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308293 12/19/94 14:45 12/23/94 CMC-WCL-WD 05-08	10 0308307 12/19/94 15:30 12/23/94 CMC-WCL-WD 06-08	10 0308315 12/20/94 08:45 12/23/94 CMC-WCL-WD 07-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	7.4	9.7	9.6
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	3.0	-	-	20.6
Sulfate	mg/L	6.0	22.7	27.8	
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	31	80	93
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	31	80	93
Lead	mg/L	0.040	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Molybdenum	mg/L	0.020	0.024	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.016	0.022	0.015
Selenium	mg/L	0.005	0.005	ND	0.008

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308293 12/19/94 14:45 12/23/94 CMC-WCL-WD 05-08	10 0308307 12/19/94 15:30 12/23/94 CMC-WCL-WD 06-08	10 0308315 12/20/94 08:45 12/23/94 CMC-WCL-WD 07-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND
Aluminum	mg/L	0.030	1.6	19	12
Barium	mg/L	0.005	0.010	0.037	0.030
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	8.5 B	16 B	18 B
Cadmium	mg/L	0.005	ND	ND	ND
Cobalt	mg/L	0.010	ND	ND	ND
Chromium	mg/L	0.005	0.005	0.013	0.008
Copper	mg/L	0.005	0.080	0.23	0.11
Iron	mg/L	0.020	2.3 B	27 B	17 B
Magnesium	mg/L	0.030	5.6	23	18
Manganese	mg/L	0.005	0.18	0.62	0.31
Sodium	mg/L	0.040	1.4	5.0	7.6
Nickel	mg/L	0.020	ND	ND	ND
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	0.041	0.16	0.099

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308323 12/20/94 09:30 12/23/94 CMC-WCL-WD 08-08	10 0308331 12/20/94 11:00 12/23/94 CMC-WCL-WD 09-08	10 0308340 12/20/94 12:45 12/23/94 CMC-WCL-WD 10-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	0.002	0.001
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	7.0	ND	9.5
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	15	-	74	-
Sulfate	mg/L	6.0	24.5	-	-
Sulfate	mg/L	60	-	-	344
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	86
Alkalinity, Bicarbonate	mg/L	5	79	20	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	79	20	-
Lead	mg/L	0.040	ND	ND	ND
Mercury	ug/L	0.2	0.5	ND	ND
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.028	ND	ND
Selenium	mg/L	0.005	ND	0.006	0.022
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	ND
Aluminum	mg/L	0.030	2.2	0.60	8.4

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0308323	10 0308331	10 0308340
Date Collected:			12/20/94	12/20/94	12/20/94
Time Collected:			09:30	11:00	12:45
Date Received:			12/23/94	12/23/94	12/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-08	09-08	10-08
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Barium	mg/L	0.005	0.008	0.006	0.037
Beryllium	mg/L	0.005	ND	ND	0.010
Calcium	mg/L	0.040	17 B	30 B	37 B
Cadmium	mg/L	0.005	ND	ND	ND
Cobalt	mg/L	0.010	ND	ND	0.48
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	0.042	0.016	1.2
Iron	mg/L	0.020	3.4 B	0.59 B	3.5 B
Magnesium	mg/L	0.030	10	19	37
Manganese	mg/L	0.005	0.14	0.70	2.4
Sodium	mg/L	0.040	4.5	0.90	2.2
Nickel	mg/L	0.020	ND	ND	0.039
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	0.065	0.12	5.6

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308358 12/20/94 13:15 12/23/94 CMC-WCL-WD 11-08	10 0308366 12/20/94 13:45 12/23/94 CMC-WCL-WD 12-08	10 0308374 12/21/94 09:30 12/23/94 CMC-WCL-WD 13-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	8.1	4.9	6.5
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	150	-	923	
Sulfate	mg/L	300	-	-	1820
Sulfate	mg/L	60	290	-	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	10	38	-
Alkalinity, Bicarbonate	mg/L	5	-	-	51
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	51
Cyanide, Total	ug/L	10	-	-	ND
Lead	mg/L	0.040	ND	0.057	0.18
Mercury	ug/L	0.2	ND	0.8	0.4
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	ND	0.009	0.009
Selenium	mg/L	0.005	0.010	0.14	0.085
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	ND	0.007

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 6

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0308358	10 0308366	10 0308374
Date Collected:			12/20/94	12/20/94	12/21/94
Time Collected:			13:15	13:45	09:30
Date Received:			12/23/94	12/23/94	12/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	11-08	12-08	13-08
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Aluminum	mg/L	0.030	1.2	1.1	0.072
Barium	mg/L	0.005	0.028	0.008	0.028
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	51	190 B	530 B
Cadmium	mg/L	0.005	ND	0.018	0.017
Cobalt	mg/L	0.010	0.059	0.57	0.030
Chromium	mg/L	0.005	ND	ND	0.009
Copper	mg/L	0.005	0.41	5.5	0.047
Iron	mg/L	0.020	1.0	2.9 B	1.3 B
Magnesium	mg/L	0.030	33	80	110
Manganese	mg/L	0.005	1.7	9.1	11
Sodium	mg/L	0.040	1.9	1.7	7.6
Nickel	mg/L	0.020	ND	0.070	0.12
Antimony	mg/L	0.050	ND	ND	0.054
Zinc	mg/L	0.020	0.73	12	34

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308382 12/21/94 09:45 12/23/94 CMC-WCL-WD 14-08	10 0308390 12/20/94 16:30 12/23/94 CMC-WCL-AL 16-03	10 0308404 12/20/94 15:15 12/23/94 CMC-WCL-AL 17-03
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	ND	264	256
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	30	115	-	
Sulfate	mg/L	300	-	1690	1340
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	36	ND	450
Alkalinity, Carbonate	mg/L	5	ND	ND	60
Alkalinity, Total as Calcium Carbonate	mg/L	5	36	ND	510
Cyanide, Total	ug/L	10	27	ND	17
Lead	mg/L	0.040	3.5	0.18	0.078
Mercury	ug/L	0.2	1.0	ND	ND
Molybdenum	mg/L	0.020	ND	0.050	0.041
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	1.2	0.034	0.014
Selenium	mg/L	0.005	0.14	0.15	0.032
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	0.014	0.035	ND
Aluminum	mg/L	0.030	5.4	0.40	0.11
Barium	mg/L	0.005	0.016	0.098	0.091

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 8

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0308382	10 0308390	10 0308404
Date Collected:			12/21/94	12/20/94	12/20/94
Time Collected:			09:45	16:30	15:15
Date Received:			12/23/94	12/23/94	12/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	14-08	16-03	17-03
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	120 B	840 B	440 B
Cadmium	mg/L	0.005	ND	ND	ND
Cobalt	mg/L	0.010	0.030	0.022	ND
Chromium	mg/L	0.005	0.040	0.090	0.006
Copper	mg/L	0.005	0.91 B	0.11	ND
Iron	mg/L	0.020	90	1.3 B	0.061 B
Magnesium	mg/L	0.030	13	8.0	0.044
Manganese	mg/L	0.005	0.36	1.5	ND
Sodium	mg/L	0.040	2.8	80	82
Nickel	mg/L	0.020	0.064	ND	ND
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	3.3	0.20	0.18

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308412 12/07/94 12/23/94 CMC-WCL-WD 03-19	10 0308420 12/21/94 15:15 12/23/94 CMC-WCL-AL 15-03	10 0308439 12/21/94 15:45 12/23/94 CMC-WCL-AL 13-03
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	ND	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	ND	ND	ND
Potassium	mg/L	4.8	ND	8.4	7.2
Tellurium	mg/L	0.32	ND	ND	ND
Tin	mg/L	0.24	ND	ND	ND
Gallium	mg/L	0.20	ND	ND	ND
Germanium	mg/L	0.025	ND	ND	ND
Sulfate	mg/L	15	86	-	-
Sulfate	mg/L	300	-	1480	1440
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	77	70	74
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	77	70	74
Cyanide, Total	ug/L	10	-	ND	44
Lead	mg/L	0.040	0.055	3.5	1.8
Mercury	ug/L	0.2	0.2	0.6	0.3
Molybdenum	mg/L	0.020	ND	ND	ND
Thallium	mg/L	0.080	ND	ND	ND
Titanium	mg/L	0.050	ND	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	ND	1.5	0.36
Selenium	mg/L	0.005	0.018	0.36	0.070
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	ND	0.057	0.006
Aluminum	mg/L	0.030	ND	4.7	3.0
Barium	mg/L	0.005	ND	0.044	0.028

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PACE INCORPORATED
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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 10

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0308412 12/07/94 12/23/94 CMC-WCL-WD 03-19	10 0308420 12/21/94 15:15 12/23/94 CMC-WCL-AL 15-03	10 0308439 12/21/94 15:45 12/23/94 CMC-WCL-AL 13-03
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Beryllium	mg/L	0.005	ND	ND	ND
Calcium	mg/L	0.040	26 B	480 B	270 B
Cadmium	mg/L	0.005	0.045	0.23	0.036
Cobalt	mg/L	0.010	0.020	0.63	0.064
Chromium	mg/L	0.005	0.005	0.027	0.032
Copper	mg/L	0.005	0.21	0.35	0.35
Iron	mg/L	0.020	0.060 B	100 B	22 B
Magnesium	mg/L	0.030	13	320	80
Manganese	mg/L	0.005	0.15	44	7.3
Sodium	mg/L	0.040	2.1	38	23
Nickel	mg/L	0.020	ND	0.48	0.074
Antimony	mg/L	0.050	ND	ND	ND
Zinc	mg/L	0.020	12	190	19

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 10

January 20, 1995
PACE Project Number: 941223517

Client Reference: Crandon Mining Leachates

B	Analyte is found in the associated blank as well as in the sample.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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January 20, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 941229.514, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on December 29, 1994. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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JAN 26 1995

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 941229.514

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-08	31153.7
CMC-WCL-WD-06-08	31154.5
CMC-WCL-WD-07-08	31155.3
CMC-WCL-WD-08-08	31156.1
CMC-WCL-WD-09-08	31157.0
CMC-WCL-WD-10-08	31158.8
CMC-WCL-WD-11-08	31159.6
CMC-WCL-WD-12-08	31160.0
CMC-WCL-WD-13-08	31161.8
CMC-WCL-WD-14-08	31162.6
CMC-WCL-AL-16-03	31163.4
CMC-WCL-AL-17-03	31164.2
CMC-WCL-WD-03-19	31165.0
CMC-WCL-AL-15-03	31166.9

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Crandon Mining Company Project -
PACE Projects 941229514

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH + VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC / 93C049

Pace Client No. 150419
Pace Project Manager SRC
Pace Project No. 941229-574
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J Loritz
Date Sampled: 12/27-28/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: PACE - METALS	ENVIROSCAN - METALS	T. CYANIDE	SULFATE	URANIUM	~~PH~~	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 09	12/28 1230	LEACHATE	31161.8	1	1											✓	
2	CMC - WCL - WD - 14 - 09	12/28 1245		31162.6	1	1											✓	
3	CMC - WCL - AL - 13 - 04	12/28 1000		31163.4	6	3	2			1	/	/	/	/	/		/	
4	CMC - WCL - AL - 15 - 04	12/28 0930		31164.2	6	3	2			1	/	/	/	/	/		/	
5	CMC - WCL - AL - 16 - 04	12/28 0845		31165.0	6	3	2			1	/	/	/	/	/		/	
6	CMC - WCL - AL - 17 - 04	12/27 1515		31166.9	6	3	2			1	/	/	/	/	/		/	
7																		
8																		

3.5-33-217

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED EX. 12/28/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD		12/28/94	1400
		Cindy Hodge / PACE	12/29/94	1600

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

200538

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH & VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC / 93C049

Pace Client No. 15049
Pace Project Manager SRC
Pace Project No. 94/229.514
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 12/27/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-09	0945	LEACHATE	31153.7	1	1				/	/	
2	CMC-WCL-WD-06-09	1015		31154.5	1	1				/	/	
3	CMC-WCL-WD-07-09	1030		31155.3	1	1				/	/	
4	CMC-WCL-WD-08-09	1100		31156.1	1	1				/	/	
5	CMC-WCL-WD-09-09	1115		31157.0	1	1				/		
6	CMC-WCL-WD-10-09	1130		31158.8	1	1				/		
7	CMC-WCL-WD-11-09	1245		31159.6	1	1				/		
8	CMC-WCL-WD-12-09	1300		31160.0	1	1				/		

3.5-33-218

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED EX 12/28/94

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	Smyladge / PACE	12/28/94	1400
			12/29/94	1000

ORIGINAL

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pace INCORPORATED
THE ASSURANCE OF QUALITY

05029745 05029748

205680

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE, INC
Address: 1710 DOUGLAS DR. MINNEAPOLIS, MN 55422
Phone: 612/544-5513

Report To: STEVE CRUPI
Bill To:
P.O. # / Billing Reference
Project Name / No.: 941229.514

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date: 1/19/95

Sampled By (PRINT):
Sampler Signature
Date Sampled: 12/28/94 12/27/94

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: 524 / 5Bi, K, Te, Sn, Ga, Ge	REMARKS
1	CMC-WCL-AL-13-04	12/28 1000	LEACHATE	31163.4	2	1		1		X X	
2	CMC-WCL-AL-15-04	12/28 0930		31164.2	2	1		1		X X	
3	CMC-WCL-AL-16-04	12/28 0845		31165.0	2	1		1		X X	
4	CMC-WCL-AL-1704	12/27 1575		31166.9	2	1		1		X X	
5											
6											
7											
8											

3.5-33-219

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Smadge / PACE MN FED EX	FED EX	12/29/94	1700
		Doris Ratzinger ENVIROSCAN CORP	12/30/94	11:25 Rec'd on Blue Ice @

Additional Comments

FULL RAW DATA PKG REQUIRED.

TO: ENVIROSCAN

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

January 20, 1995
PACE Project Number: 941229514

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0311537	10 0311545	10 0311553
Date Collected:			12/27/94	12/27/94	12/27/94
Time Collected:			09:45	10:15	10:30
Date Received:			12/29/94	12/29/94	12/29/94
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	05-09	06-09	07-09
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	28	93	96
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	28	93	96

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

An Equal Opportunity Employer

REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0311561	10 0311570	10 0311588
Date Collected:			12/27/94	12/27/94	12/27/94
Time Collected:			11:00	11:15	11:30
Date Received:			12/29/94	12/29/94	12/29/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-09	09-09	10-09
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	110
Alkalinity, Bicarbonate	mg/L	5	83	18	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	83	18	-

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0311596	10 0311600	10 0311618
Date Collected:			12/27/94	12/27/94	12/28/94
Time Collected:			12:45	13:00	12:30
Date Received:			12/29/94	12/29/94	12/29/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	11-09	12-09	13-09
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	19	68	--
Alkalinity, Bicarbonate	mg/L	5	-	-	100
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	100

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 4

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL			
PACE Sample Number:			10 0311626	10 0311634	10 0311642
Date Collected:			12/28/94	12/28/94	12/28/94
Time Collected:			12:45	10:00	09:30
Date Received:			12/29/94	12/29/94	12/29/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-AL	CMC-WCL-AL
			14-09	13-04	15-04
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	ND	ND
Potassium	mg/L	4.8	-	ND	ND
Tellurium	mg/L	0.32	-	ND	ND
Tin	mg/L	0.24	-	ND	ND
Gallium	mg/L	0.20	-	ND	ND
Germanium	mg/L	0.025	-	ND	ND
Sulfate	mg/L	150	-	608	-
Sulfate	mg/L	300	-	-	1570
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	62	76	24
Alkalinity, Carbonate	mg/L	5	16	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	78	76	24
Cyanide, Total	ug/L	10	-	ND	13
Lead	mg/L	0.040	-	0.85	0.43
Mercury	ug/L	0.2	-	0.2	ND
Molybdenum	mg/L	0.020	-	ND	ND
Thallium	mg/L	0.080	-	ND	0.12
Titanium	mg/L	0.050	-	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	0.24	0.080
Selenium	mg/L	0.005	-	0.030	0.056
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	0.005	0.015
Aluminum	mg/L	0.030	-	1.6	0.24
Barium	mg/L	0.005	-	0.032	0.025

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL				
PACE Sample Number:				10 0311626	10 0311634	10 0311642
Date Collected:				12/28/94	12/28/94	12/28/94
Time Collected:				12:45	10:00	09:30
Date Received:				12/29/94	12/29/94	12/29/94
Client Sample ID:				CMC-WCL-WD 14-09	CMC-WCL-AL 13-04	CMC-WCL-AL 15-04
INORGANIC ANALYSIS						
TARGET ANALYTE LIST, METALS						
Beryllium	mg/L	0.005	-		ND	ND
Calcium	mg/L	0.040	-		230	460
Cadmium	mg/L	0.005	-		0.014	0.069
Cobalt	mg/L	0.010	-		0.031	0.17
Chromium	mg/L	0.005	-		0.020	ND
Copper	mg/L	0.005	-		0.20	0.042
Iron	mg/L	0.020	-		14	2.2
Magnesium	mg/L	0.030	-		42	88
Manganese	mg/L	0.005	-		2.9	13
Sodium	mg/L	0.040	-		8.1	5.8
Nickel	mg/L	0.020	-		0.036	0.17
Antimony	mg/L	0.050	-		ND	0.069
Zinc	mg/L	0.020	-		6.9	64

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REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0311650 12/28/94 08:45 12/29/94 CMC-WCL-AL 16-04	10 0311669 12/27/94 15:15 12/29/94 CMC-WCL-AL 17-04
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
SUBCONTRACT ANALYSIS				
INDIVIDUAL PARAMETERS				
Uranium, total	mg/L	0.001	ND	ND
INORGANIC ANALYSES				
Bismuth	mg/L	0.20	ND	ND
Potassium	mg/L	4.8	196	197
Tellurium	mg/L	0.32	ND	ND
Tin	mg/L	0.24	ND	ND
Gallium	mg/L	0.20	ND	ND
Germanium	mg/L	0.025	ND	ND
Sulfate	mg/L	300	2000	915
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	ND	ND
Alkalinity, Carbonate	mg/L	5	ND	60
Alkalinity, Total as Calcium Carbonate	mg/L	5	ND	550 (1)
Cyanide, Total	ug/L	10	ND	78
Lead	mg/L	0.040	0.047	0.075
Mercury	ug/L	0.2	0.3	ND
Molybdenum	mg/L	0.020	0.056	0.034
Thallium	mg/L	0.080	ND	ND
Titanium	mg/L	0.050	ND	ND
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	0.013	0.012
Selenium	mg/L	0.005	0.15	0.040
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	0.040	ND
Aluminum	mg/L	0.030	0.24	0.10
Barium	mg/L	0.005	0.079	0.084
Beryllium	mg/L	0.005	ND	ND

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

January 20, 1995
PACE Project Number: 941229514

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0311650 12/28/94 08:45 12/29/94 CMC-WCL-AL 16-04	10 0311669 12/27/94 15:15 12/29/94 CMC-WCL-AL 17-04
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
INORGANIC ANALYSIS				
TARGET ANALYTE LIST, METALS				
Calcium	mg/L	0.040	790	410
Cadmium	mg/L	0.005	ND	ND
Cobalt	mg/L	0.010	0.030	ND
Chromium	mg/L	0.005	0.022	ND
Copper	mg/L	0.005	0.17	0.008
Iron	mg/L	0.020	0.47	0.16
Magnesium	mg/L	0.030	5.3	0.073
Manganese	mg/L	0.005	1.6	ND
Sodium	mg/L	0.040	54	56
Nickel	mg/L	0.020	ND	ND
Antimony	mg/L	0.050	0.063	ND
Zinc	mg/L	0.020	0.10	ND

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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Client Reference: Crandon Mining Leachates

#	Data subject to final review.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.
(1)	The hydroxide component of the alkalinity is 490 mg/L.

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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pace INCORPORATED
ENVIRONMENTAL LABORATORIES

February 15, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950106.505, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on January 6, 1995. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. The chain of custody record documenting the transfer to CEP is located in the CEP raw data section. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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FEB 2 0 1995

The matrix spike analysis associated with tellurium and germanium fell below Enviroscan's QC limits, indicating a possible low bias. Precision information for germanium also fell outside of the QC limits. This information is summarized in the quality control summary section of Enviroscan's raw data package.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 950106.505

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-10	209.7
CMC-WCL-WD-06-10	210.0
CMC-WCL-WD-07-10	211.9
CMC-WCL-WD-08-10	212.7
CMC-WCL-WD-09-10	213.5
CMC-WCL-WD-10-10	214.3
CMC-WCL-WD-11-10	215.1
CMC-WCL-WD-12-10	216.0
CMC-WCL-WD-13-10	217.8
CMC-WCL-WD-14-10	218.6
CMC-WCL-AL-13-05	219.4
CMC-WCL-AL-15-05	220.8
CMC-WCL-AL-16-05	221.6
CMC-WCL-AL-17-05	222.4
CMC-WCL-WD-04-PH2.5	223.2

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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Crandon Mining Company Project -
PACE Projects 950106.505

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na,, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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205596

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950106.505
PROPOSAL No. 941103.50C
Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/3-5/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	PAS METALS	ENVIROSCAN-METALS	URANIUM	SULFATE	REMARKS
1	CMC - WCL - WD - 13 - 10	1/4 0900	LEACHATE	217-8	1	1				/						
2	CMC - WCL - WD - 14 - 10	1/4 0915		218-6	1	1				/						
3	CMC - WCL - AL - 13 - 05	1/3 1500		219-4	1	1				/						
4	CMC - WCL - AL - 15 - 05	1/3 1530		220-8	1	1				/						
5	CMC - WCL - AL - 16 - 05	1/3 1545		221-6	1	1				J						
6	CMC - WCL - AL - 17 - 05	1/3 1600		222-4	1	1				/						
7	CMC - WCL - WD-04-pH2.5	1/5 0900		223-2	5	3	2			J	/	/	/	/	/	
8																

3.5-33-232

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX 1/5/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J Loritz / FVD		1/5/95	1400
		Sue Hodge / PACE	1/6/95	1215

ORIGINAL

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200592

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference:
Project Name / No.: CMC / 93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950106.505
PROPOSAL NO. 941103.50
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/3/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 05 - 10	1100	LEACHATE	209.7	1	1				/		
2	CMC - WCL - WD - 06 - 10	1115		210.0	1	1				/		
3	CMC - WCL - WD - 07 - 10	1130		211.9	1	1				/		
4	CMC - WCL - WD - 08 - 10	1215		212.7	1	1				/		
5	CMC - WCL - WD - 09 - 10	1400		213.5	1	1				/		
6	CMC - WCL - WD - 10 - 10	1415		214.3	1	1				/		
7	CMC - WCL - WD - 11 - 10	1430		215.1	1	1				/		
8	CMC - WCL - WD - 12 - 10	1445		216.0	1	1				/		

3.5-33-233

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX 1/5/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD		1/5/95	1400
		Sam Fudge / PACE	1/6/95	1215

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Send to : Environscan 1 of 1

200606

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE
Address 1710 Douglas Drive North
Minneapolis, MN 55427
Phone 617-535-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference 950106.505
Project Name / No. Crawlon Mining

Pace Client No.
Pace Project Manager Steve Crupi
Pace Project No. 950106.505
*Requested Due Date: 2-1-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled 1-05-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Sulfide* Metals	REMARKS
1					2	1		1		✓ ✓	
2											
3											
4											
5											
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1			1/6/95	

Additional Comments

Metals = Bi, K, Te, Sn, Ga, Ge

Full raw data package to include quality control samples is required. Please FAX results when they become available.

SEE REVERSE SIDE FOR INSTRUCTIONS

3.5-33-234

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Send to: CEP 1 of 1

200607

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE
Address 1710 Douglas Drive N
Minneapolis, MN 55427
Phone 612 - 525 - 3454

Report To: Steve Crapi
Bill To: Steve Crapi
P.O. # / Billing Reference 950106.505
Project Name / No. Canadian Mining

Pace Client No.
Pace Project Manager Steve Crapi
Pace Project No. 950106.505
*Requested Due Date: 2-1-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled 1-05-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Uranium	REMARKS
1											
2											
3											
4											
5											
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

Additional Comments

Level 3 Package Req'd

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1			1/05/95	

3.5-33-235

5

SEE REVERSE SIDE FOR INSTRUCTIONS

5183717515

JAN-12-95 THU 8:56 ZIMPRO EASTERN RGN 3.5-33-236

200606

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ENVIRONMENTAL LABORATORIES

Send to : Enviroscan 1 of 1

12030410

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE
Address 1710 Douglas Drive North
Minneapolis, MN 55422
Phone 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference 950106.505
Project Name / No. Crandon Mining

Pace Client No.
Pace Project Manager Steve Crup
Pace Project No. 950106.505
*Requested Due Date: 2-1-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled 1-05-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Sulfate	Metals	REMARKS
1	CMC-WCL-WD-04-pH 2.5	0900	water	223.2	2	1		1		✓	✓	
2												
3												
4												
5												
6												
7												
8												

COOLER NOS	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY AFFILIATION	ACCEPTED BY AFFILIATION	DATE	TIME
1	[illegible]	FED EX	1/10/95	17:25
		Blue Ice <4°C		
		[illegible] Enviroscan	1/11/95	1:55PM

Additional Comments

Metals = B, K, Te, Sn, Ga, Ge

Full raw data package to include quality control samples is required. Please FAX results when they become available.

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

February 09, 1995
PACE Project Number: 950106505

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0002097	10 0002100	10 0002119
Date Collected:			01/03/95	01/03/95	01/03/95
Time Collected:			11:00	11:15	11:30
Date Received:			01/06/95	01/06/95	01/06/95
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	05-10	06-10	07-10
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	31	87	94
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	31	87	94

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0002127	10 0002135	10 0002143
Date Collected:			01/03/95	01/03/95	01/03/95
Time Collected:			12:45	14:00	14:15
Date Received:			01/06/95	01/06/95	01/06/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-10	09-10	10-10
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	100
Alkalinity, Bicarbonate	mg/L	5	81	19	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	81	19	-

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0002151 01/03/95 14:30 01/06/95 CMC-WCL-WD 11-10	10 0002160 01/03/95 14:45 01/06/95 CMC-WCL-WD 12-10	10 0002178 01/04/95 09:00 01/06/95 CMC-WCL-WD 13-10
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	18	50	-
Alkalinity, Bicarbonate	mg/L	5	-	-	92
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	92

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REPORT OF LABORATORY ANALYSIS

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0002186 01/04/95 09:15 01/06/95 CMC-WCL-WD 14-10	10 0002194 01/03/95 15:00 01/06/95 CMC-WCL-AL 13-05	10 0002208 01/03/95 15:30 01/06/95 CMC-WCL-AL 15-05
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	28	34	44
Alkalinity, Carbonate	mg/L	5	24	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	52	34	44

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0002216 01/03/95 15:45 01/06/95 CMC-WCL-AL 16-05	10 0002224 01/03/95 16:00 01/06/95 CMC-WCL-AL 17-05	10 0002232 01/05/95 09:00 01/06/95 CMC-WCL-WD 04-pH2.5
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	-	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	-	ND
Potassium	mg/L	4.8	-	-	ND
Tellurium	mg/L	0.32	-	-	ND
Tin	mg/L	0.24	-	-	ND
Gallium	mg/L	0.20	-	-	ND
Germanium	mg/L	0.025	-	-	ND
Sulfate	mg/L	60	-	-	288
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	41	-	180
Alkalinity, Bicarbonate	mg/L	5	-	ND	-
Alkalinity, Carbonate	mg/L	5	-	32	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	470	-
Lead	mg/L	0.040	-	-	ND
Mercury	ug/L	0.2	-	-	ND
Molybdenum	mg/L	0.020	-	-	ND
Thallium	mg/L	0.080	-	-	ND
Titanium	mg/L	0.050	-	-	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	-	ND
Selenium	mg/L	0.005	-	-	ND
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	-	ND
Aluminum	mg/L	0.030	-	-	ND
Barium	mg/L	0.005	-	-	0.010
Beryllium	mg/L	0.005	-	-	ND

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REPORT OF LABORATORY ANALYSIS

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0002216 CMC-WCL-AL 16-05	10 0002224 CMC-WCL-AL 17-05	10 0002232 CMC-WCL-WD 04-pH2.5
PACE Sample Number:					
Date Collected:			01/03/95	01/03/95	01/05/95
Time Collected:			15:45	16:00	09:00
Date Received:			01/06/95	01/06/95	01/06/95
Client Sample ID:			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-WD
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Calcium	mg/L	0.040	-	-	24
Cadmium	mg/L	0.005	-	-	ND
Cobalt	mg/L	0.010	-	-	ND
Chromium	mg/L	0.005	-	-	ND
Copper	mg/L	0.005	-	-	0.015
Iron	mg/L	0.020	-	-	ND
Magnesium	mg/L	0.030	-	-	13
Manganese	mg/L	0.005	-	-	ND
Sodium	mg/L	0.040	-	-	2.1
Nickel	mg/L	0.020	-	-	ND
Antimony	mg/L	0.050	-	-	ND
Zinc	mg/L	0.020	-	-	0.14

These data have been reviewed and are approved for release.

Steve Crupi
Project Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 6

February 09, 1995
PACE Project Number: 950106505

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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ENVIRONMENTAL LABORATORIES

February 15, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950113.517, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on January 13, 1995. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. The chain of custody record documenting the transfer to CEP is located in the CEP raw data section. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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The matrix spike analysis associated with tellurium and germanium fell below Enviroscan's QC limits, indicating a possible low bias. Precision information for germanium also fell outside of the QC limits. This information is summarized in the quality control summary section of Enviroscan's raw data package.

The matrix spike recovery for iron was above the QC limit. The high recovery is due to the amount of iron native to the sample being significantly greater than the amount of iron spiked into the sample. The spike amount was effectively masked by the sample.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 950113.517

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-11	755.2
CMC-WCL-WD-06-11	756.0
CMC-WCL-WD-07-11	757.9
CMC-WCL-WD-08-11	758.7
CMC-WCL-WD-09-11	759.5
CMC-WCL-WD-10-11	760.9
CMC-WCL-WD-11-11	761.7
CMC-WCL-WD-12-11	762.5
CMC-WCL-WD-13-11	763.3
CMC-WCL-WD-14-11	764.1
CMC-WCL-AL-13-06	765.0
CMC-WCL-AL-15-06	766.8
CMC-WCL-AL-16-06	767.6
CMC-WCL-AL-17-06	768.4

1710 Douglas Drive North
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TEL: 612-544-5543
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Crandon Mining Company Project -
PACE Projects 950113.517

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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205592

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH AND VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. ~~RECEIVABLE~~ PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93 C049

Pace Client No.
Pace Project Manager
Pace Project No.: 95013577
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/9/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 05 - 11	1035	LEACH-ATE	755.2	1	1				/	/	T=15.0
2	CMC - WCL - WD - 06 - 11	1055		756.0	1	1				/	/	
3	CMC - WCL - WD - 07 - 11	1105		757.9	1	1				/	/	
4	CMC - WCL - WD - 08 - 11	1130		758.7	1	1				/	/	
5	CMC - WCL - WD - 09 - 11	1310		759.5	1	1				/	/	
6	CMC - WCL - WD - 10 - 11	1315		760.9	1	1				/	/	
7	CMC - WCL - WD - 11 - 11	1330		761.7	1	1				/	/	
8	CMC - WCL - WD - 12 - 11	1335		762.5	1	1				/	/	

3.5-33-248

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE
2			FED. EX. 1/11/95

Additional Comments: T = 14.6, 15.0

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	Dfelder/Pace	1/11/95	1430
			1-13-95	1615

ORIGINAL

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pace
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THE ASSURANCE OF QUALITY

205593

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.
Pace Project Manager
Pace Project No.: PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/10-11/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: PACE - METALS	ENVIROSCAN - METALS	T. CYANIDE	URANIUM	SULFATE	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 11	1/10 1550	LEACHATE	7633	1	1					/	/	/	/	/	/	T=15.0
2	CMC - WCL - WD - 14 - 11	1600		764.1	1	1					/	/	/	/	/	/	↓
3	CMC - WCL - AL - 13 - 06	1/11 1330		765.0	6	3	2			1	/	/	/	/	/	/	T=14.6
4	CMC - WCL - AL - 15 - 06	1130		766.8	6	3	2			1	/	/	/	/	/	/	↓
5	CMC - WCL - AL - 16 - 06	1040		767.6	6	3	2			1	/	/	/	/	/	/	
6	CMC - WCL - AL - 17 - 06	1000		768.4	6	3	2			1	/	/	/	/	/	/	
7																	
8																	

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE
2			FED EX. 1/11/95

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	[signature] / Pace	1/11/95	1430
			1/13/95	1630

Additional Comments
3.5-33-249
T=14.6, 15.0

ORIGINAL

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pace
INCORPORATED
THE ASSURANCE OF QUALITY

205662

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE

Address 1700 Douglas Drive N.
Minneapolis, MN 55422

Phone 612-525-3424

Report To: Steve Pugh

Bill To:

P.O. # / Billing Reference 95e113.517

Project Name / No. Canadian Mining

Pace Client No.

Pace Project Manager Steve Pugh

Pace Project No. 95e113.517

*Requested Due Date: 2-9-95

Sampled By (PRINT): CLIENT

Sampler Signature

Date Sampled 1-11-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	REMARKS
1	CMC-WEL-AL-13-06	1430	WATER	765.0	2	1		1		✓	
2	CMC-WELL-AL-15-06	1510	WATER	766.8	2	1		1		✓	
3	CMC-WELL-AL-16-06	1610	WATER	767.6	2	1		1		✓	
4	CMC-WELL-AL-17-06	1600	WATER	768.4	2	1		1		✓	
5											
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
			1/16/95	

Additional Comments

Metals: Ba, K, Te, Sn, Ga, Ge
Rush Analysis Req'd.

3.5-33-250

SEE REVERSE SIDE FOR INSTRUCTIONS

200609

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

1 of 1

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client PACE

Address 1700 Douglas Drive N.
Minneapolis, MN 55422

Phone 612-525-3151

Report To: Steve Copp.

Bill To: Steve Copp.

P.O. # / Billing Reference 950113.517

Project Name / No. Crandon Mining

Pace Client No.

Pace Project Manager Steve Copp.

Pace Project No. 950113.517

*Requested Due Date: 2-9-95

Sampled By (PRINT): CLIENT

Sampler Signature

Date Sampled 1-11-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST	REMARKS
1	CMP-WCE-AL-13-06				1	✓				✓	
2	CMP-WCE-AL-15-06				1	✓				✓	
3	CMP-WCE-AL-16-06				1	✓				✓	
4	CMP-WCE-AL-17-06				1	✓				✓	
5											
6											
7											
8											

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1			1/12/95	

Additional Comments

3.5-33-251

Lot 1 3 pkg Neg's *

5

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THE ASSURANCE OF QUALITY

16030852 To Enviroscan 1 of 1

16030855

205662

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE
Address: 1710 Douglas Drive N.
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference: 950113.517
Project Name / No.: Crandon Mining

Pace Client No.:
Pace Project Manager: Steve Crupi
Pace Project No.: 950113.517
*Requested Due Date: 2-9-95

Sampled By (PRINT): CLIENT
Sampler Signature:
Date Sampled: 1-11-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	Sulfate	REMARKS
1	CMC-WCL-AL-13-06	1330	Water	765.0	2	1		1		✓	✓	
2	CMC-WCL-AL-15-06	1130	↓	766.8	2	1		1		✓	✓	
3	CMC-WCL-AL-16-06	1040	↓	767.6	2	1		1		✓	✓	
4	CMC-WCL-AL-17-06	1000	↓	768.4	2	1		1		✓	✓	
5												
6												
7												
8												

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-4	[signature]		1/16/95	1500
		[signature] Enviroscan	1/17/95	11:15

Rec'd on ice

Additional Comments:

Metals = Bi, K, Te, Sn, Ga, Ge

Full Raw data Pkg Req'd.

3.5-33-252

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

01/18/95 08:51 715 355 3219 ZIMPRO/ESCAN 002

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

February 08, 1995
PACE Project Number: 950113517

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0007552	10 0007560	10 0007579
Date Collected:			01/09/95	01/09/95	01/09/95
Time Collected:			10:35	10:55	11:05
Date Received:			01/13/95	01/13/95	01/13/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-05-11	-06-11	-07-11
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	26	89	91
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	26	89	91

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0007587 CMC-WCL-WD-08-11	10 0007595 CMC-WCL-WD-09-11	10 0007609 CMC-WCL-WD-10-11
PACE Sample Number:			10 0007587	10 0007595	10 0007609
Date Collected:			01/09/95	01/09/95	01/09/95
Time Collected:			11:30	13:10	13:15
Date Received:			01/13/95	01/13/95	01/13/95
Client Sample ID:			CMC-WCL-WD-08-11	CMC-WCL-WD-09-11	CMC-WCL-WD-10-11
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	110
Alkalinity, Bicarbonate	mg/L	5	75	19	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	75	19	-

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0007617	10 0007625	10 0007633
Date Collected:			01/09/95	01/09/95	01/10/95
Time Collected:			13:30	13:35	15:50
Date Received:			01/13/95	01/13/95	01/13/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-11-11	-12-11	-13-11
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	30	54	-
Alkalinity, Bicarbonate	mg/L	5	-	-	79
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	79

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REPORT OF LABORATORY ANALYSIS

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0007641 01/10/95 16:00 01/13/95 CMC-WCL-WD -14-11	10 0007650 01/11/95 13:30 01/13/95 CMC-WCL-AL -13-06	10 0007668 01/11/95 11:30 01/13/95 CMC-WCL-AL -15-06
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	ND	ND
Potassium	mg/L	4.8	-	ND	ND
Tellurium	mg/L	0.32	-	ND	ND
Tin	mg/L	0.24	-	ND	ND
Gallium	mg/L	0.20	-	ND	ND
Germanium	mg/L	0.025	-	ND	ND
Sulfate	mg/L	150	-	-	540
Sulfate	mg/L	60	-	295	-
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	73	82	71
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	73	82	71
Cyanide, Total	ug/L	10	-	ND	ND
Lead	mg/L	0.040	-	1.1	0.48
Mercury	ug/L	0.2	-	0.3	ND
Molybdenum	mg/L	0.020	-	0.027	ND
Thallium	mg/L	0.080	-	ND	ND
Titanium	mg/L	0.050	-	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	0.26	0.091
Selenium	mg/L	0.005	-	0.012	0.030
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	0.005	ND
Aluminum	mg/L	0.030	-	1.9	0.39
Barium	mg/L	0.005	-	0.044	0.029

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL			
PACE Sample Number:				10 0007641	10 0007650	10 0007668
Date Collected:				01/10/95	01/11/95	01/11/95
Time Collected:				16:00	13:30	11:30
Date Received:				01/13/95	01/13/95	01/13/95
Client Sample ID:				CMC-WCL-WD -14-11	CMC-WCL-AL -13-06	CMC-WCL-AL -15-06
INORGANIC ANALYSIS						
TARGET ANALYTE LIST, METALS						
Beryllium	mg/L	0.005	-	ND	ND
Calcium	mg/L	0.040	-	180	240
Cadmium	mg/L	0.005	-	0.018	0.034
Cobalt	mg/L	0.010	-	0.022	0.064
Chromium	mg/L	0.005	-	0.022	ND
Copper	mg/L	0.005	-	0.20	0.039
Iron	mg/L	0.020	-	15	2.8
Magnesium	mg/L	0.030	-	33	42
Manganese	mg/L	0.005	-	2.6	5.2
Sodium	mg/L	0.040	-	4.9	3.4
Nickel	mg/L	0.020	-	0.037	0.064
Antimony	mg/L	0.050	-	ND	ND
Zinc	mg/L	0.020	-	6.5	22

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REPORT OF LABORATORY ANALYSIS

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0007676 01/11/95 10:40 01/13/95 CMC-WCL-AL -16-06	10 0007684 01/11/95 10:00 01/13/95 CMC-WCL-AL -17-06
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
SUBCONTRACT ANALYSIS				
INDIVIDUAL PARAMETERS				
Uranium, total	mg/L	0.001	ND	ND
INORGANIC ANALYSES				
Bismuth	mg/L	0.20	ND	ND
Potassium	mg/L	4.8	135	140
Tellurium	mg/L	0.32	ND	ND
Tin	mg/L	0.24	ND	ND
Gallium	mg/L	0.20	ND	ND
Germanium	mg/L	0.025	ND	ND
Sulfate	mg/L	150	-	561
Sulfate	mg/L	300	1720	-
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	17	ND
Alkalinity, Carbonate	mg/L	5	ND	48
Alkalinity, Total as Calcium Carbonate	mg/L	5	17	560
Cyanide, Total	ug/L	10	ND	23
Lead	mg/L	0.040	ND	0.089
Mercury	ug/L	0.2	ND	ND
Molybdenum	mg/L	0.020	0.037	0.042
Thallium	mg/L	0.080	0.084	0.12
Titanium	mg/L	0.050	ND	ND
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	0.009	0.010
Selenium	mg/L	0.005	0.090	0.024
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	0.031	ND
Aluminum	mg/L	0.030	0.18	0.097
Barium	mg/L	0.005	0.067	0.072

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 7

February 08, 1995
PACE Project Number: 950113517

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0007676 01/11/95 10:40 01/13/95 CMC-WCL-AL -16-06	10 0007684 01/11/95 10:00 01/13/95 CMC-WCL-AL -17-06
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
INORGANIC ANALYSIS				
TARGET ANALYTE LIST, METALS				
Beryllium	mg/L	0.005	ND	ND
Calcium	mg/L	0.040	750	340
Cadmium	mg/L	0.005	ND	ND
Cobalt	mg/L	0.010	0.023	ND
Chromium	mg/L	0.005	0.010	ND
Copper	mg/L	0.005	0.10	ND
Iron	mg/L	0.020	0.26	0.032
Magnesium	mg/L	0.030	3.7	0.050
Manganese	mg/L	0.005	1.6	ND
Sodium	mg/L	0.040	34	40
Nickel	mg/L	0.020	ND	ND
Antimony	mg/L	0.050	0.083	ND
Zinc	mg/L	0.020	0.075	0.21

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 7

Client Reference: Crandon Mining Leachates

MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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ENVIRONMENTAL LABORATORIES

February 16, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950119.507, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on January 19, 1995. Analysis results in this submittal cover tests performed at PACE, CEP and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. The chain of custody record documenting the transfer to CEP is located in the CEP raw data section. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE - Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn

CEP - Uranium

Enviroscan- Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at CEP and Enviroscan is included in their respective raw data submittals.

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3.5-33-261 FEB 20 1995 FEB 20 19

The matrix spike analysis associated for germanium fell below Enviroscan's QC limits, indicating a possible low bias. This information is summarized in the quality control summary section of Enviroscan's raw data package.

Sample CMC-WCL-WD-04-Final pH was used to perform one of the two metals matrix spike/matrix spike duplicate sets submitted in this report. The recoveries for Al, Cu, Fe and Zn were well above the QC limits. The high recoveries are due to the concentration levels of these metals native to the sample being significantly greater than the amount into the sample. The spike amounts were effectively masked by the sample matrix.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 950119.507

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-AL-17-07	1183.5
CMC-WCL-AL-16-07	1184.3
CMC-WCL-AL-15-07	1186.0
CMC-WCL-AL-13-07	1192.4
CMC-WCL-WD-13-12	1194.0
CMC-WCL-WD-14-12	1195.9
CMC-WCL-WD-05-12	1196.7
CMC-WCL-WD-06-12	1197.5
CMC-WCL-WD-07-12	1198.3
CMC-WCL-WD-08-12	1199.1
CMC-WCL-WD-09-12	1200.9
CMC-WCL-WD-10-12	1201.7
CMC-WCL-WD-11-12	1202.5
CMC-WCL-WD-12-12	1203.3
CMC-WCL-WD-04-FPH	1204.1
CMC-WCL-RS-18	1205.0
CMC-WCL-RS-13	1206.8

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Crandon Mining Company Project -
PACE Projects 950119.507

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, Ti, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 908.1 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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Cooler 12

200727

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ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD. GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference:
Project Name / No.: CMC / 93C049

Pace Client No.:
Pace Project Manager:
Pace Project No.: 9501987
PROPOSAL NO. 941103.500
*Requested Due Date: 1/31/95

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/17/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	METALS	T. CYANIDE	SULFATE	T. ALKALINITY	REMARKS
1	CMC - WCL - AL - 17 - 07	1315	LEACHATE	11835	3	1		1		1	/	/	X	X	NON Pressurized-open upon receipt
2	CMC - WCL - AL - 16 - 07	1350		1184.3	2	1		1			/		/	/	
3	CMC - WCL - AL - 15 - 07	1415		1186.0	3	1		1		1	/	/	/	/	
4	CMC - WCL - AL - 13 - 07	1505		1192.4	3	1		1		1	/	/	/	/	
5	CMC - WCL - WD - 13 - 12	1530		1194.0	2	1		1			/		/	/	
6	CMC - WCL - WD - 14 - 12	1545		1195.9	3	1		1		1	/	/	/	/	
7															
8															

3.5-33-265

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 1/17/95

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	Dave Hodder / Pace	1/17/95	1630
			1/19/95	1430

Additional Comments: NEED RESULTS BY 1/31/95. SEE ATTACHED LIST FOR REDUCED METALS ANALYSES.

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace
INCORPORATED
THE ASSURANCE OF QUALITY

cooler 2/2

205595

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH + VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC/93C049

Pace Client No.
Pace Project Manager
Pace Project No. 950/19807
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/17/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 05 - 12	0825	LEACHATE	11196.7								
2	CMC - WCL - WD - 06 - 12	0840		1197.5								
3	CMC - WCL - WD - 07 - 12	0850		1198.3								
4	CMC - WCL - WD - 08 - 12	0900		1199.1								
5	CMC - WCL - WD - 09 - 12	0910		1200.9								
6	CMC - WCL - WD - 10 - 12	0925		1201.7								
7	CMC - WCL - WD - 11 - 12	0940		1202.5								
8	CMC - WCL - WD - 12 - 12	0950		12033								

3.5-33-266

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT. DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 1/18/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FYD	[illegible]	1/18/95	1500
		[illegible]	1/19/95	1430

ORIGINAL

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ENVIRONMENTAL LABORATORIES

Cooler #12

200728

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference:
Project Name / No.: CMC / 93 C049

Pace Client No.:
Pace Project Manager:
Pace Project No.: 9501/9607
PROPOSAL NO. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/16-18/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	$NaOH$	ANALYSES REQUEST: PACE - METALS	ENVIROSCAN - METALS	T. CYANIDE	URANIUM	SULFATE	T. ALKALINITY	ACIDITY	REMARKS
1	CMC · WCL · WD · 04 · pH FINAL	1/16 1050	LEACHATE	1204.1	5	3		2			✓	✓	✓	✓		✓		
2	CMC · WCL · RS - 18	1/18 1100	↓	1205.0	6	3		2		1	✓	✓	✓	✓	✓			
3	CMC · WCL · RS - 13	1/18 1345		1206.8	6	3		2		1	✓	✓	✓	✓	✓			
4																		
5																		
6																		
7																		
8																		

3.5-33-267

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 1/18/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	[illegible]	1/18/95	1500
			1/19/95	1430

ORIGINAL

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P-02

5183717515

JAN-25-95 WED 18:24 ZIMPRO EASTERN RGN

200611

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Send to: Enviroscan

22031392

22031390

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE, Incorporated
Address: 1710 Douglas Drive North
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference: 950119.507
Project Name / No.: Crandon Mining

Pace Client No.
Pace Project Manager: SRC
Pace Project No.: 950119.507
*Requested Due Date: 2-16-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	Sulfate	REMARKS
1	CMC-WCL-WD-04-Final	11/16	Water	1204.1	2	1		1		✓	✓	
2	CMC-WCL-RS-18	11/16	"	1205.0	2	1		1		✓	✓	
3	CMC-WCL-RS-13	↓	↓	1206-8	2	1		1		✓	✓	
4												
5												
6												
7												
8												

COOLER NOS	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED DATE

ITEM NUMBER	RELINQUISHED BY AFFILIATION	ACCEPTED BY AFFILIATION	DATE	TIME
1-3	[illegible]/PACE	FEDEX	1/24/95	17:55

4°C

[illegible]/Enviroscan 1/25/95 10:35am

Additional Comments

Metals = B, K, Te, Sn, Ga, Ge

Full raw data package Req'd

3.5-33-268

ORIGINAL

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

February 15, 1995
PACE Project Number: 950119507

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0011835	10 0011843	10 0011860
Date Collected:			01/17/95	01/17/95	01/17/95
Time Collected:			13:15	13:50	14:15
Date Received:			01/19/95	01/19/95	01/19/95
Client Sample ID:			CMC-WCL-AL-17-07	CMC-WCL-AL-16-07	CMC-WCL-AL-15-07
Parameter	Units	MDL			
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	-	8	86
Alkalinity, Carbonate	mg/L	5	-	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	8	86
Cyanide, Total	ug/L	10	26	-	ND
Lead	mg/L	0.040	0.13	0.044	0.28
Mercury	ug/L	0.2	-	ND	ND
Molybdenum	mg/L	0.020	0.028	0.061	-
Sulfate	mg/L	1	-	1500	370
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	0.010	0.011	0.022
Selenium	mg/L	0.005	0.027	0.067	0.015
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	0.014	ND
Aluminum	mg/L	0.030	0.078	0.080	0.051
Barium	mg/L	0.005	0.081	0.057	0.032
Calcium	mg/L	0.040	340 B	730 B	200 B
Cadmium	mg/L	0.005	-	-	0.021
Cobalt	mg/L	0.010	-	0.014	0.033
Chromium	mg/L	0.005	ND	ND	ND
Copper	mg/L	0.005	ND	0.053	0.007
Iron	mg/L	0.020	0.036	0.14	0.022
Potassium	mg/L	0.600	100	100	2.8
Magnesium	mg/L	0.030	1.0	3.8	31
Manganese	mg/L	0.005	0.15	0.97	3.6
Sodium	mg/L	0.040	29	22	3.1
Nickel	mg/L	0.020	-	-	0.038

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REPORT OF LABORATORY ANALYSIS

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0011835 01/17/95 13:15 01/19/95 CMC-WCL- AL-17-07	10 0011843 01/17/95 13:50 01/19/95 CMC-WCL- AL-16-07	10 0011860 01/17/95 14:15 01/19/95 CMC-WCL- AL-15-07
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Antimony	mg/L	0.050	-	0.053	-
Zinc	mg/L	0.020	0.65	0.53	12

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0011924	10 0011940	10 0011959
Date Collected:			01/17/95	01/17/95	01/17/95
Time Collected:			15:05	15:30	15:45
Date Received:			01/19/95	01/19/95	01/19/95
Client Sample ID:			CMC-WCL-AL-13-07	CMC-WCL-WD-13-12	CMC-WCL-WD-14-12
Parameter	Units	MDL			
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	66	71	35
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	66	71	39
Cyanide, Total	ug/L	10	18	-	ND
Lead	mg/L	0.040	23	0.26	1.7
Mercury	ug/L	0.2	0.5	ND	ND
Molybdenum	mg/L	0.020	-	-	ND
Sulfate	mg/L	1	260	1400	210
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	2.2	0.023	0.22
Selenium	mg/L	0.005	0.033	0.033	0.075
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	0.005	0.009	ND
Aluminum	mg/L	0.030	6.2	0.077	1.7
Barium	mg/L	0.005	0.036	0.028	0.018
Calcium	mg/L	0.040	120 B	480 B	140 B
Cadmium	mg/L	0.005	0.055	0.026	ND
Cobalt	mg/L	0.010	0.034	0.028	ND
Chromium	mg/L	0.005	0.30	ND	0.017
Copper	mg/L	0.005	2.4	0.078	0.36
Iron	mg/L	0.020	79	0.51	12
Potassium	mg/L	0.600	2.6	4.1	5.7
Magnesium	mg/L	0.030	39	52	14
Manganese	mg/L	0.005	3.5	8.1	0.12
Sodium	mg/L	0.040	3.1	2.0	3.3
Nickel	mg/L	0.020	0.052	0.096	0.066
Antimony	mg/L	0.050	-	ND	-
Zinc	mg/L	0.020	22	34	1.6

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REPORT OF LABORATORY ANALYSIS

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0011967 01/17/95 08:25 01/19/95 CMC-WCL- WD-05-12	10 0011975 01/17/95 08:40 01/19/95 CMC-WCL- WD-06-12	10 0011983 01/17/95 08:50 01/19/95 CMC-WCL- WD-07-12
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	26	83	90
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	26	83	90

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0011991	10 0012009	10 0012017
Date Collected:			01/17/95	01/17/95	01/17/95
Time Collected:			09:00	09:10	09:25
Date Received:			01/19/95	01/19/95	01/19/95
Client Sample ID:			CMC-WCL-WD-08-12	CMC-WCL-WD-09-12	CMC-WCL-WD-10-12
Parameter	Units	MDL			
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	130
Alkalinity, Bicarbonate	mg/L	5	71	21	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	71	21	-

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REPORT OF LABORATORY ANALYSIS

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0012025 01/17/95 09:40 01/19/95 CMC-WCL-WD-11-12	10 0012033 01/17/95 09:50 01/19/95 CMC-WCL-WD-12-12	10 0012041 01/16/95 10:30 01/19/95 CMC-WCL-WD-04-Final pH
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.001	-	-	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	-	ND
Potassium	mg/L	4.8	-	-	ND
Tellurium	mg/L	0.32	-	-	ND
Tin	mg/L	0.24	-	-	ND
Gallium	mg/L	0.20	-	-	ND
Germanium	mg/L	0.025	-	-	ND
Sulfate	mg/L	3000	-	-	13000
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	30	70	450
Lead	mg/L	0.040	-	-	5.1
Mercury	ug/L	0.2	-	-	ND
Molybdenum	mg/L	0.020	-	-	ND
Thallium	mg/L	0.080	-	-	ND
Titanium	mg/L	0.050	-	-	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	-	0.23
Selenium	mg/L	0.005	-	-	0.12
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	-	ND
Aluminum	mg/L	0.030	-	-	9.3
Barium	mg/L	0.005	-	-	0.008
Beryllium	mg/L	0.005	-	-	ND
Calcium	mg/L	0.040	-	-	56 B
Cadmium	mg/L	0.005	-	-	0.16
Cobalt	mg/L	0.010	-	-	0.18

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 7

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0012025	10 0012033	10 0012041
Date Collected:			01/17/95	01/17/95	01/16/95
Time Collected:			09:40	09:50	10:30
Date Received:			01/19/95	01/19/95	01/19/95
Client Sample ID:			CMC-WCL-WD-11-12	CMC-WCL-WD-12-12	CMC-WCL-WD-04-Final pH
Parameter	Units	MDL			
INORGANIC ANALYSIS					
TARGET ANALYTE LIST, METALS					
Chromium	mg/L	0.005	-	-	0.008
Copper	mg/L	0.005	-	-	41
Iron	mg/L	0.020	-	-	38
Magnesium	mg/L	0.030	-	-	28
Manganese	mg/L	0.005	-	-	2.2
Sodium	mg/L	0.040	-	-	3.1
Nickel	mg/L	0.020	-	-	0.043
Antimony	mg/L	0.050	-	-	ND
Zinc	mg/L	0.020	-	-	70

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REPORT OF LABORATORY ANALYSIS

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0012050 01/18/95 11:00 01/19/95 CMC-WCL-RS-18	10 0012068 01/18/95 13:45 01/19/95 CMC-WCL-RS-13
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
SUBCONTRACT ANALYSIS				
INDIVIDUAL PARAMETERS				
Uranium, total	mg/L	0.001	ND	ND
INORGANIC ANALYSES				
Bismuth	mg/L	0.20	ND	ND
Potassium	mg/L	4.8	8.8	9.8
Tellurium	mg/L	0.32	ND	ND
Tin	mg/L	0.24	ND	ND
Gallium	mg/L	0.20	ND	ND
Germanium	mg/L	0.025	ND	ND
Sulfate	mg/L	300	-	1910
Sulfate	mg/L	600	3640	-
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	52	79
Alkalinity, Carbonate	mg/L	5	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	52	79
Cyanide, Total	ug/L	10	ND	ND
Lead	mg/L	0.040	0.26	0.91
Mercury	ug/L	0.2	ND	ND
Molybdenum	mg/L	0.020	0.022	ND
Thallium	mg/L	0.080	ND	ND
Titanium	mg/L	0.050	ND	ND
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	0.039	0.14
Selenium	mg/L	0.005	0.038	0.19
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	ND	ND
Aluminum	mg/L	0.030	0.45	0.63
Barium	mg/L	0.005	0.21	0.052

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 9

February 15, 1995
PACE Project Number: 950119507

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL		
PACE Sample Number:			10 0012050	10 0012068
Date Collected:			01/18/95	01/18/95
Time Collected:			11:00	13:45
Date Received:			01/19/95	01/19/95
Client Sample ID:			CMC-WCL-RS-18	CMC-WCL-RS-13
INORGANIC ANALYSIS				
TARGET ANALYTE LIST, METALS				
Beryllium	mg/L	0.005	ND	ND
Calcium	mg/L	0.040	340 B	550 B
Cadmium	mg/L	0.005	ND	0.097
Cobalt	mg/L	0.010	0.030	0.16
Chromium	mg/L	0.005	0.026	ND
Copper	mg/L	0.005	0.26	0.64
Iron	mg/L	0.020	2.8	5.7
Magnesium	mg/L	0.030	24	95
Manganese	mg/L	0.005	1.2	14
Sodium	mg/L	0.040	53	50
Nickel	mg/L	0.020	ND	0.10
Antimony	mg/L	0.050	ND	ND
Zinc	mg/L	0.020	0.80	32

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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Client Reference: Crandon Mining Leachates

B	Analyte is found in the associated blank as well as in the sample.
MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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February 16, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950125.511, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on January 25, 1995. Analysis results in this submittal cover tests performed at PACE for alkalinity and acidity. The analyses were performed following EPA method 310.1.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

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3.5-33-279

FEB 20 1995

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Crandon Mining Company Project -
PACE Projects 950125.511

Sample Cross Reference

Sample ID	PACE ID
CMC-WCL-WD-05-13	1740.0
CMC-WCL-WD-06-13	1741.8
CMC-WCL-WD-07-13	1742.6
CMC-WCL-WD-08-13	1743.4
CMC-WCL-WD-09-13	1744.2
CMC-WCL-WD-10-13	1745.0
CMC-WCL-WD-11-13	1746.9
CMC-WCL-WD-12-13	1747.7
CMC-WCL-WD-13-08	1748.5
CMC-WCL-AL-15-08	1749.3
CMC-WCL-AL-16-08	1750.7
CMC-WCL-AL-17-08	1751.5
CMC-WCL-WD-13-13	1752.3
CMC-WCL-WD-14-13	1753.1

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PACE PROJECT NAME: FOTH & VAN DYKE - CRANDON MINING LEACHATES
PACE PROJECT MANAGER: Steve Crupi

CLOSED DUE 2/15/95

SDG	CLIENT	LAB NO.	FIELD ID	QC	MATRIX	SAMPLED DATE	RECEIVED DATE	T-ALK	ACIDITY
1740	FOTH&VD	1740.0	CMC-WCL-WD-05-13	x	Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1741.8	CMC-WCL-WD-06-13		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1742.6	CMC-WCL-WD-07-13		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1743.4	CMC-WCL-WD-08-13		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1744.2	CMC-WCL-WD-09-11		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1745.0	CMC-WCL-WD-10-13	x	Leach	01/23/95	01/25/95		x
1740	FOTH&VD	1746.9	CMC-WCL-WD-11-13		Leach	01/23/95	01/25/95		x
1740	FOTH&VD	1747.7	CMC-WCL-WD-12-13		Leach	01/23/95	01/25/95		x
1740	FOTH&VD	1748.5	CMC-WCL-WD-13-08		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1749.3	CMC-WCL-AL-15-08		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1750.7	CMC-WCL-AL-16-08		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1751.5	CMC-WCL-AL-17-08		Leach	01/23/95	01/25/95	x	
1740	FOTH&VD	1752.3	CMC-WCL-WD-13-13		Leach	01/24/95	01/25/95	x	
1740	FOTH&VD	1753.1	CMC-WCL-WD-14-13		Leach	01/24/95	01/25/95	x	

Raw Data Package required. Must include prep information, calibrations, calibration checks and quality control samples. Also, WANG report plus QC needed.

3.5-33-281

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THE ASSURANCE OF QUALITY

205594

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950125.511
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/23/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD-05 - 13	0930	LEACHATE	1740.0	1	/				/		
2	CMC - WCL - WD-06 - 13	1120		1741.8	1	/				/		
3	CMC - WCL - WD-07 - 13	1130		1742.6	1	/				/		
4	CMC - WCL - WD-08 - 13	1140		1743.4	1	/				/		
5	CMC - WCL - WD-09 - 13	1335		1744.2	1	/				/		
6	CMC - WCL - WD-10 - 13	1340		1745.0	1	/					/	
7	CMC - WCL - WD-11 - 13	1355		1746.9	1	/					/	
8	CMC - WCL - WD-12 - 13	1410		1747.7	1	/					/	

3.5-33-282

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 1/24/95

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-8	Dennis Loritz / FVD	FED EX	1/24/95	1100
		Allan/PACE	1/24/95	1500

Additional Comments
Rec'd @ 12.2°C

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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THE ASSURANCE OF QUALITY

130247

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No. 15041 9
Pace Project Manager SRC
Pace Project No. 950125.511
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 1/23-24/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	REMARKS
1	CMC - WCL - AL - 13 - 08	1/23 1500	LEACH-ATE	1748.5	1	/				/	
2	CMC - WCL - AL - 15 - 08	1505		1749.3	1	/				/	
3	CMC - WCL - AL - 16 - 08	1530		1750.7	1	/				/	
4	CMC - WCL - AL - 17 - 08	1540		1751.5	1	/				/	
5	CMC - WCL - WD - 13 - 13	1/24 0835		1752.3	1	/				/	
6	CMC - WCL - WD - 14 - 13	0850		1753.1	1	/				/	
7											
8											

3.5-33-283

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 1/24/95

Additional Comments
Rec'd @ 12.2°C

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-6	Dennis Loritz / FED EX	FED EX / Elizabeth PACE	1/24/95 / 1/25/95	1100 / 1500

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 7 through 8

Client Reference: Crandon Mining Leachates

MDL	Method Detection Limit
ND	Not detected at or above the MDL.
RPD	Relative Percent Difference

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REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

February 14, 1995
PACE Project Number: 950125511

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0017400	10 0017418	10 0017426
Date Collected:			01/23/95	01/23/95	01/23/95
Time Collected:			09:30	11:20	11:30
Date Received:			01/25/95	01/25/95	01/25/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-05-13	-06-13	-07-13
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Total as Calcium Carbonate	mg/L	5	24	52	88

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REPORT OF LABORATORY ANALYSIS

February 14, 1995
PACE Project Number: 950125511

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0017434	10 0017442	10 0017450
Date Collected:			01/23/95	01/23/95	01/23/95
Time Collected:			11:40	13:35	13:40
Date Received:			01/25/95	01/25/95	01/25/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-08-13	-09-13	-10-13
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	150
Alkalinity, Total as Calcium Carbonate	mg/L	5	73	21	-

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REPORT OF LABORATORY ANALYSIS

February 14, 1995
PACE Project Number: 950125511

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0017469	10 0017477	10 0017485
Date Collected:			01/23/95	01/23/95	01/23/95
Time Collected:			13:55	14:10	15:00
Date Received:			01/25/95	01/25/95	01/25/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-AL
Parameter	Units	MDL	-11-13	-12-13	-13-08
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	32	78	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	75

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REPORT OF LABORATORY ANALYSIS

February 14, 1995
PACE Project Number: 950125511

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0017493 CMC-WCL-AL -15-08	10 0017507 CMC-WCL-AL -16-08	10 0017515 CMC-WCL-AL -17-08
PACE Sample Number:			10 0017493	10 0017507	10 0017515
Date Collected:			01/23/95	01/23/95	01/23/95
Time Collected:			15:05	15:30	15:40
Date Received:			01/25/95	01/25/95	01/25/95
Client Sample ID:			CMC-WCL-AL -15-08	CMC-WCL-AL -16-08	CMC-WCL-AL -17-08
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Total as Calcium Carbonate	mg/L	5	87	12	530

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

February 14, 1995
PACE Project Number: 950125511

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0017523	10 0017531
Date Collected:			01/24/95	01/24/95
Time Collected:			08:35	08:50
Date Received:			01/25/95	01/25/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-13-13	-14-13
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Total as Calcium Carbonate	mg/L	5	34	150

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 5

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit

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March 15, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

**Re: Crandon Mining Company Project -
PACE Project 950211.513, Leachates**

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on February 10, 1995. Analysis results in this submittal cover tests performed at PACE-MN, PACE-Denver and Enviroscan. The enclosed summary report and electronic deliverable summarize results from all three laboratories.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE and transfer of sample volumes to Enviroscan. The chain of custody record documenting the transfer to PACE-Denver is located in their raw data section. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

A summary of where each of the analyses were performed follows below.

PACE-MN	-	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Ag, Na, Tl, Ti, Zn
PACE-Denver	-	Uranium
Enviroscan	-	Bi, K, Te, SN, Ga, Ge, SO_4

The quality control summary for the analyses performed at PACE-Denver and Enviroscan is included in their respective raw data submittals.

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3.5-33-291

MAR 16 1995

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 950211.513

Method Listing

EPA 6010 -Al, Sb, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ag, Na, Tl, ~~Ti~~, Zn K

EPA 6010 (Trace ICP) - As, Se

KPA PACE Denver Procedure DN-R-003 - Uranium

EPA 6010 - Bi, K, Te, SN, Ga, Ge

EPA 300.0 - SO_4

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200842

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client FOTH + VAN DYKE
Address 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No. CMC / 930049

Pace Client No.
Pace Project Manager SRC
Pace Project No. 950211.573
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/8/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: PACE - METALS	ENVIROSCAN - METALS	T. CYANIDE	SULFATE	URANIUM	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 15	1315	LEACHATE	3393.6	1	/									/		
2	CMC - WCL - WD - 14 - 15	1330		3394.4	1	/									/		
3	CMC - WCL - AL - 13 - 10	1525		3395.2	6	3	2			1	/	/	/	/	/	/	
4	CMC - WCL - AL - 15 - 10	1500		3396.0	6	3	2			1	/	/	/	/	/	/	
5	CMC - WCL - AL - 16 - 10	1425		3397.9	6	3	2			1	/	/	/	/	/	/	
6	CMC - WCL - AL - 17 - 10	1400		3398.7	6	3	2			1	/	/	/	/	/	/	
7																	
8																	

3.5-33-294

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 2/9/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD FED EX	FED EX GW Lab / PACE	2/9/95	1100
			2/10/95	0900

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

200841

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.
Pace Project Manager: SRC
Pace Project No.: 9502115-13
PROPOSAL NO. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J Loritz
Date Sampled: 2/6/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-15	1415	LEACHATE	3385.5	1	✓				/		
2	CMC-WCL-WD-06-15	1425		3386.3	1	✓				/		
3	CMC-WCL-WD-07-15	1435		3387.1	1	✓				/		
4	CMC-WCL-WD-08-15	1450		3388.6	1	✓				/		
5	CMC-WCL-WD-09-15	1500		3389.8	1	✓					/	
6	CMC-WCL-WD-10-15	1505		3390.[illegible]	1	✓					/	
7	CMC-WCL-WD-11-15	1510		3391.0	1	✓					/	
8	CMC-WCL-WD-12-15	1520		3392.8	1	✓					/	

3.5-33-295

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 2/9/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz (FVD) FED EX	FED EX [illegible] (PACE)	2/9/95	1100

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

16032693 16032696

200643

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: PACE, Inc
Address: 1710 Douglas Drive North
Minneapolis, MN 55422
Phone: 612-525-3454

Report To: Steve Crupi
Bill To: Steve Crupi
P.O. # / Billing Reference: 950211.513
Project Name / No.: Crandon Mining

Pace Client No.
Pace Project Manager: Steve Crupi
Pace Project No.: 950211.513
*Requested Due Date: 3-1-95

Sampled By (PRINT): CLIENT
Sampler Signature
Date Sampled: 2-8-95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: Metals	Sulfate	REMARKS
1	CMC-WCL-AL-13-10		Water	3395.2	2	✓		✓		✓	✓	
2	CMC-WCL-AL-15-10			3396.0	2	✓		✓		✓	✓	
3	CMC-WCL-AL-16-10			3397.9	2	✓		✓		✓	✓	
4	CMC-WCL-AL-17-10			3398.7	2	✓		✓		✓	✓	
5												
6												
7												
8												

3.5-33-296

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-41	Steven R. Crupi / PACE		2/13/95	

Additional Comments

Metals = Bi, K, Sn, Te, Ga, Ge
Filtered / acidified / QC pkg

4°C

02/15/95 10:34 715 355 3219 ZIMPRO/ESCAN 002

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

March 14, 1995
PACE Project Number: 9502115[illegible]

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0033855	10 0033863	10 0033871
Date Collected:			02/06/95	02/06/95	02/06/95
Time Collected:			14:15	14:25	14:35
Date Received:			02/10/95	02/10/95	02/10/95
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-05-15	-06-15	-07-15
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	23	82	68
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	23	82	68

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95021151

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0033880 CMC-WCL-WD -08-15	10 0033898 CMC-WCL-WD -09-15	10 0033901 CMC-WCL-WD -10-15
PACE Sample Number:			10 0033880	10 0033898	10 0033901
Date Collected:			02/06/95	02/06/95	02/06/95
Time Collected:			14:50	15:00	15:05
Date Received:			02/10/95	02/10/95	02/10/95
Client Sample ID:			CMC-WCL-WD -08-15	CMC-WCL-WD -09-15	CMC-WCL-WD -10-15
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	180
Alkalinity, Bicarbonate	mg/L	5	70	20	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	70	20	-

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95021151

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0033910	10 0033928	10 0033936
Date Collected:			02/06/95	02/06/95	02/08/95
Time Collected:			15:10	15:20	13:15
Date Received:			02/10/95	02/10/95	02/10/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-11-15	-12-15	-13-15
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	36	78	-
Alkalinity, Bicarbonate	mg/L	5	-	-	31
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	31

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 950211513

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0033944	10 0033952	10 0033960
Date Collected:			02/08/95	02/08/95	02/08/95
Time Collected:			13:30	15:25	15:00
Date Received:			02/10/95	02/10/95	02/10/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	-14-15	-13-10	-15-10
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	mg/L	0.0005	-	ND	ND
INORGANIC ANALYSES					
Bismuth	mg/L	0.20	-	ND	ND
Potassium	mg/L	4.8	-	ND	ND
Tellurium	mg/L	0.32	-	ND	ND
Tin	mg/L	0.24	-	ND	ND
Gallium	mg/L	0.20	-	ND	ND
Germanium	mg/L	0.025	-	ND	ND
Sulfate	mg/L	60	-	301	256
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	24	90	110
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	24	90	110
Cyanide, Total	ug/L	10	-	ND	ND
Lead	mg/L	0.040	-	0.38	0.074
Mercury	ug/L	0.2	-	ND	ND
Molybdenum	mg/L	0.020	-	ND	ND
Thallium	mg/L	0.080	-	ND	ND
Titanium	mg/L	0.050	-	ND	ND
METALS BY TRACE ICP					
Arsenic	mg/L	0.005	-	0.086	0.021
Selenium	mg/L	0.005	-	0.015	ND
TARGET ANALYTE LIST, METALS					
Silver	mg/L	0.005	-	ND	ND
Aluminum	mg/L	0.030	-	0.45	ND
Barium	mg/L	0.005	-	0.023	0.034
Beryllium	mg/L	0.005	-	ND	ND

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

March 14, 1995
PACE Project Number: 950211513

Client Reference: Crandon Mining Leachates

PACE Sample Number:				10 0033944	10 0033952	10 0033960
Date Collected:				02/08/95	02/08/95	02/08/95
Time Collected:				13:30	15:25	15:00
Date Received:				02/10/95	02/10/95	02/10/95
Client Sample ID:				CMC-WCL-WD	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL		-14-15	-13-10	-15-10
INORGANIC ANALYSIS						
TARGET ANALYTE LIST, METALS						
Calcium	mg/L	0.040	-		140	96
Cadmium	mg/L	0.005	-		0.007	0.006
Cobalt	mg/L	0.010	-		0.018	0.011
Chromium	mg/L	0.005	-		0.008	ND
Copper	mg/L	0.005	-		0.060	0.008
Iron	mg/L	0.020	-		3.4	ND
Magnesium	mg/L	0.030	-		29	23
Manganese	mg/L	0.005	-		2.4	1.9
Sodium	mg/L	0.040	-		4.0	3.4
Nickel	mg/L	0.020	-		ND	ND
Antimony	mg/L	0.050	-		ND	ND
Zinc	mg/L	0.020	-		5.0	3.4

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 950211513

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0033979 CMC-WCL-AL -16-10	10 0033987 CMC-WCL-AL -17-10
PACE Sample Number:			10 0033979	10 0033987
Date Collected:			02/08/95	02/08/95
Time Collected:			14:25	14:00
Date Received:			02/10/95	02/10/95
Client Sample ID:			CMC-WCL-AL -16-10	CMC-WCL-AL -17-10
SUBCONTRACT ANALYSIS				
INDIVIDUAL PARAMETERS				
Uranium, total	mg/L	0.0005	ND	ND
INORGANIC ANALYSES				
Bismuth	mg/L	0.20	ND	ND
Potassium	mg/L	4.8	87.8	75.0
Tellurium	mg/L	0.32	ND	ND
Tin	mg/L	0.24	ND	ND
Gallium	mg/L	0.20	ND	ND
Germanium	mg/L	0.025	ND	ND
Sulfate	mg/L	60	-	344
Sulfate	mg/L	600	4110	-
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	12	ND
Alkalinity, Carbonate	mg/L	5	10	50
Alkalinity, Total as Calcium Carbonate	mg/L	5	22	520
Cyanide, Total	ug/L	10	ND	13
Lead	mg/L	0.040	ND	0.066
Mercury	ug/L	0.2	ND	ND
Molybdenum	mg/L	0.020	0.065	0.024
Thallium	mg/L	0.080	ND	ND
Titanium	mg/L	0.050	ND	ND
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	0.007	0.006
Selenium	mg/L	0.005	0.054	0.020
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	0.008	ND
Aluminum	mg/L	0.030	0.082	0.082
Barium	mg/L	0.005	0.053	0.055

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 7

March 14, 1995
PACE Project Number: 950211513

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0033979 02/08/95 14:25 02/10/95 CMC-WCL-AL -16-10	10 0033987 02/08/95 14:00 02/10/95 CMC-WCL-AL -17-10
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
INORGANIC ANALYSIS				
TARGET ANALYTE LIST, METALS				
Beryllium	mg/L	0.005	ND	ND
Calcium	mg/L	0.040	690	290
Cadmium	mg/L	0.005	ND	ND
Cobalt	mg/L	0.010	ND	ND
Chromium	mg/L	0.005	0.005	ND
Copper	mg/L	0.005	0.047	0.006
Iron	mg/L	0.020	0.023	ND
Magnesium	mg/L	0.030	2.2	ND
Manganese	mg/L	0.005	0.73	ND
Sodium	mg/L	0.040	16	20
Nickel	mg/L	0.020	ND	ND
Antimony	mg/L	0.050	ND	ND
Zinc	mg/L	0.020	0.030	ND

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX 612-525-3377

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Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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ENVIRONMENTAL LABORATORIES

March 15, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950217.508, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on February 16, 1995. Analysis results in this submittal cover tests performed at PACE-MN. The enclosed summary report and electronic deliverable summarize results from the analyses.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi
Project Manager

Attachments/Enclosures

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

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3.5-33-305

MAR 16 1995

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Crandon Mining Company Project -
PACE Projects 950217.508

Method Listing

EPA 6010 -Al, Sb, Ba, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, Ag, Na, K, Zn

EPA 6010 (Trace ICP) - As, Se

EPA 7470 - Hg

EPA 300.0 - SO_4

EPA 310.1 - Alkalinity

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Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

An Equal Opportunity Employer

200845

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS DANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93 C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950217-508
PROPOSAL NO.: 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/15/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: METALS	SULFATE	T. ALKALINITY	REMARKS
1	CMC - WCL - AL - 13 - 11	0920	LEACHATE	3774-5	1	1				/			
2	CMC - WCL - AL - 15 - 11	0850		3775.3	1	1				/			
3	CMC - WCL - AL - 16 - 11	0830		3776.1	1	1				/			
4	CMC - WCL - AL - 17 - 11	1000		3777.0	1	1				/			
5	CMC - WCL - WD - 13 - 16	0945		3778.8	3	2		1		/	/	/	
6													
7													
8													

3.5-33-307

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 2/15/95

Additional Comments: SEE ATTACHED SHEET FOR ANALYSES REQUESTED ON SAMPLE CMC - WCL - WD - 13 - 16.

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD	FEDEX	2/15/95	1315
	FEDEX	awah / PACE	2/16/95	0900

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

March 14, 1995
PACE Project Number: 95021750

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0037745	10 0037753	10 0037761
Date Collected:			02/15/95	02/15/95	02/15/95
Time Collected:			09:20	08:50	08:30
Date Received:			02/16/95	02/16/95	02/16/95
			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	-13-11	-15-11	-16-11
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	59	72	24
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	59	72	24

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95021750

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0037770 02/15/95 10:00 02/16/95 CMC-WCL-AL -17-11	10 0037788 02/15/95 09:45 02/16/95 CMC-WCL-WD -13-16
PACE Sample Number:				
Date Collected:				
Time Collected:				
Date Received:				
Client Sample ID:				
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Alkalinity, Bicarbonate	mg/L	5	ND	20
Alkalinity, Carbonate	mg/L	5	60	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	510	20
Lead	mg/L	0.040	-	0.098
Mercury	ug/L	0.2	-	ND
Sulfate	mg/L	1	-	740
METALS BY TRACE ICP				
Arsenic	mg/L	0.005	-	0.014
Selenium	mg/L	0.005	-	0.041
TARGET ANALYTE LIST, METALS				
Silver	mg/L	0.005	-	ND
Aluminum	mg/L	0.030	-	0.053
Barium	mg/L	0.005	-	0.022
Calcium	mg/L	0.040	-	250
Cadmium	mg/L	0.005	-	0.040
Cobalt	mg/L	0.010	-	0.064
Chromium	mg/L	0.005	-	ND
Copper	mg/L	0.005	-	0.027
Iron	mg/L	0.020	-	ND
Potassium	mg/L	0.600	-	1.3
Magnesium	mg/L	0.030	-	44
Manganese	mg/L	0.005	-	6.8
Sodium	mg/L	0.040	-	0.88
Nickel	mg/L	0.020	-	0.079
Antimony	mg/L	0.050	-	ND
Zinc	mg/L	0.020	-	30

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95021750

Client Reference: Crandon Mining Leachates

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-0877

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 3

March 14, 1995
PACE Project Number: 9502175

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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ENVIRONMENTAL LABORATORIES

March 15, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950222.514, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on February 22 1995. Analysis results in this submittal cover tests performed at PACE for cyanide, sulfate, alkalinity and acidity. The analyses were performed following EPA methods 9010, 300.0 and 310.1.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi
Project Manager

Attachments/Enclosures

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FAX: 612-525-3377

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3.5-33-312

MAR 16 1995

200846

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ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 936049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950222.STP
PROPOSAL NO. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/20/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-17	0945	LEACHATE	4076.2	1	1				/	/	
2	CMC-WCL-WD-06-17	1020		4077.0	1	1				/	/	
3	CMC-WCL-WD-07-17	1030		4078.9	1	1				/	/	
4	CMC-WCL-WD-08-17	1055		4079.7	1	1				/	/	
5	CMC-WCL-WD-09-17	1105		4080.0	1	1					/	
6	CMC-WCL-WD-10-17	1120		4081.9	1	1					/	
7	CMC-WCL-WD-11-17	1300		4082.7	1	1					/	
8	CMC-WCL-WD-12-17	1310		4083.5	1	1					/	

3.5-33-313

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED EX 2/21/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis Loritz / FVD	Pace	2/21/95	1500
			2/22/95	1200

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
THE ASSURANCE OF QUALITY

130248

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD. GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93C049

Pace Client No.: 150419
Pace Project Manager: EJS/Varley RDE SRC
Pace Project No.: 950222.514
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/21/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: PARAMETERS ENVELOPE	METALS	T. CYANIDE	SULFATE	AMMONIA	T. ALKALINITY	REMARKS
1	CMC - WCL - WD - 13 - 17	0855	LEACHATE	4084.3	1	1										/	
2	CMC - WCL - AL - 17 - 12	0910		4085.1	1	1										/	
3	CMC - WCL - AL - 16 - 12	0920		4086.0	1	1										/	
4	CMC - WCL - AL - 15 - 12	0930		4087.9	1	1										/	
5	CMC - WCL - AL - 13 - 12	0950		4088.6	1	1										/	
6	CMC - WCL - RS - 13A - 1	1025		4089.4	3 6	2 3	X	1			###	###	/	/	###	/	
7	CMC - WCL - RS - 18A - 1	1355		4090.8	3 6	2 3	X	1			###	###	/	/	###	/	
8																	

3.5-33-314

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED EX. 2/21/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J Loritz / FVD	D Alderson / Pace	2/21/95	1515
			2/22/95	1200

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

March 14, 1995
PACE Project Number: 950222514

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0040762 02/20/95 09:45 02/22/95 CMC-WCL-WD -05-17	10 0040770 02/20/95 10:20 02/22/95 CMC-WCL-WD -06-17	10 0040789 02/20/95 10:30 02/22/95 CMC-WCL-WD -07-17
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	26	83	88
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	26	83	88

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 950222514

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0040797	10 0040800	10 0040819
Date Collected:			02/20/95	02/20/95	02/20/95
Time Collected:			10:55	11:05	11:20
Date Received:			02/22/95	02/22/95	02/22/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-08-17	-09-17	-10-17
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	190
Alkalinity, Bicarbonate	mg/L	5	73	19	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	73	19	-

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95022251

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0040827	10 0040835	10 0040843
Date Collected:			02/20/95	02/20/95	02/21/95
Time Collected:			13:00	13:10	08:55
Date Received:			02/22/95	02/22/95	02/22/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-11-17	-12-17	-13-17
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	30	92	-
Alkalinity, Bicarbonate	mg/L	5	-	-	29
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	29

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 95022251

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0040851	10 0040860	10 0040878
Date Collected:			02/21/95	02/21/95	02/21/95
Time Collected:			09:10	09:20	09:30
Date Received:			02/22/95	02/22/95	02/22/95
Client Sample ID:			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	-17-12	-16-12	-15-12
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	470	19	90
Alkalinity, Carbonate	mg/L	5	30	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	500	19	90

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REPORT OF LABORATORY ANALYSIS

March 14, 1995
PACE Project Number: 950222514

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0040886	10 0040894	10 0040908
Date Collected:			02/21/95	02/21/95	02/21/95
Time Collected:			09:50	10:25	13:55
Date Received:			02/22/95	02/22/95	02/22/95
Client Sample ID:			CMC-WCL-AL	CMC-WCL-RS	CMC-WCL-RS
Parameter	Units	MDL	-13-12	-13A-1	-18A-1
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	71	40	26
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	71	40	26
Cyanide, Total	ug/L	10	-	ND	ND
Sulfate	mg/L	1	-	1700	840

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

1710 Douglas Drive
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FAX: 612-525-6307

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Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

March 21, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950301.506, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on March 1, 1995. Analysis results in this submittal cover tests performed at PACE for cyanide, sulfate, alkalinity and acidity. The analyses were performed following EPA methods 9010, 300.0 and 310.1.

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

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3.5-33-321

MAR 23 1995

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ENVIRONMENTAL LABORATORIES

207020

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.
Pace Project Manager
Pace Project No. 950301906
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/28/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	NaOH	ANALYSES REQUEST: T. ALKALINITY	SULFATE	T. CYANIDE	REMARKS
1	CMC - WCL - WD - 13 - 18	0850	LEACHATE	4780.5	1	1					/			
2	CMC - WCL - AL - 17 - 13	0915		4781.3	1	1					/			
3	CMC - WCL - AL - 16 - 13	0930		4782.1	1	1					/			
4	CMC - WCL - AL - 15 - 13	0940		4783.0	1	1					/			
5	CMC - WCL - AL - 13 - 13	0950		4784.8	1	1					/	/	/	
6	CMC - WCL - RS - 13A - 2	1300		4785.6	3	2			1		/	/	/	
7	CMC - WCL - RS - 18A - 2	1400		4786.4	3	2			1		/	/	/	
8														

3.5-33-322

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 2/28/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1	Dennis J. Loritz / FVD	Pace	2/28/95	1445
			3-1-95	1315

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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ENVIRONMENTAL LABORATORIES

207019

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-~~8516~~ 2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93 C049

Pace Client No.
Pace Project Manager
Pace Project No.: PROPOSAL No. 941103.50C
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 2/27/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC - WCL - WD - 05 - 18	1250	LEACHATE	4787.2						/	/	
2	CMC - WCL - WD - 06 - 18	1305		4788.0						/	/	
3	CMC - WCL - WD - 07 - 18	1320		4789.9						/	/	
4	CMC - WCL - WD - 08 - 18	1330		4790.2						/	/	
5	CMC - WCL - WD - 09 - 18	1345		4791.0						/	/	
6	CMC - WCL - WD - 10 - 18	1400		4792.9						/	/	
7	CMC - WCL - WD - 11 - 18	1415		4793.7						/	/	
8	CMC - WCL - WD - 12 - 18	1425		4794.5						/	/	

3.5-33-323

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 2/28/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FVD	[illegible] / Pace	2/28/95 3-1-95	1430 1315

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

March 20, 1995
PACE Project Number: 95030150

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0047805	10 0047813	10 0047821
Date Collected:			02/28/95	02/28/95	02/28/95
Time Collected:			08:50	09:15	09:30
Date Received:			03/01/95	03/01/95	03/01/95
Client Sample ID:			CMC-WCL-WD	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	-13-18	-17-13	-16-13
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	20	ND	17
Alkalinity, Carbonate	mg/L	5	ND	28	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	20	500	17

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 20, 1995
PACE Project Number: 95030150

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0047830	10 0047848	10 0047856
Date Collected:			02/28/95	02/28/95	02/28/95
Time Collected:			09:40	09:50	13:00
Date Received:			03/01/95	03/01/95	03/01/95
Client Sample ID:			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-RS
Parameter	Units	MDL	-15-13	-13-13	-13A-2
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	100	79	62
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	100	79	62
Cyanide, Total	ug/L	10	-	-	ND
Sulfate	mg/L	1	-	-	1100

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 20, 1995
PACE Project Number: 95030150

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0047864 02/28/95 14:00 03/01/95 CMC-WCL-RS -18A-2	10 0047872 02/27/95 12:50 03/01/95 CMC-WCL-WD -05-18	10 0047880 02/27/95 13:05 03/01/95 CMC-WCL-WD -06-18
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	20	29	82
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	20	29	82
Cyanide, Total	ug/L	10	ND	-	-
Sulfate	mg/L	1	510	-	-

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REPORT OF LABORATORY ANALYSIS

March 20, 1995
PACE Project Number: 95030150

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0047899 02/27/95 13:20 03/01/95 CMC-WCL-WD -07-18	10 0047902 02/27/95 13:30 03/01/95 CMC-WCL-WD -08-18	10 0047910 02/27/95 13:45 03/01/95 CMC-WCL-WD -09-18
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	86	73	17
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	86	73	17

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pace INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 20, 1995
PACE Project Number: 95030150

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0047929 CMC-WCL-WD -10-18	10 0047937 CMC-WCL-WD -11-18	10 0047945 CMC-WCL-WD -12-18
PACE Sample Number:					
Date Collected:			02/27/95	02/27/95	02/27/95
Time Collected:			14:00	14:15	14:25
Date Received:			03/01/95	03/01/95	03/01/95
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	190	36	95

These data have been reviewed and are approved for release.

Steve Crupi
Project Manager

1710 Douglas Drive
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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 5

March 20, 1995
PACE Project Number: 95030150

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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RECEIVED
MAR 2 3 1995
FOTH & VAN DYKE

March 21, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950309.503, Leachates

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the leachate samples received at PACE on March 9, 1995. Analysis results in this submittal cover tests performed at PACE for alkalinity and acidity (EPA method 310.1 and 305.1, respectively).

Attached to this letter are copies of the chain of custody records documenting receipt of the samples at PACE. Also attached to this letter is a table cross referencing the PACE sample identification and the sampling point identification.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Attachments/Enclosures

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MAR 2 3 1995

207067

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CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH + VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC / 93C049

Pace Client No.: 150419
Pace Project Manager: SRC
Pace Project No.: 950309.50
PROPOSAL No. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J. LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 3/7/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	REMARKS
1	CMC-WCL-WD-13-19	1740	LEACHATE	5485.2	1	1				/	
2	CMC-WCL-RS-13A-3	1845		5486.0	1	1				/	
3	CMC-WCL-RS-18A-3	1855		5487.9	1	1				/	
4	CMC-WCL-AL-17-14	1900		5488.7	1	1				/	
5	CMC-WCL-AL-16-14	1915		5489.5	1	1				/	
6	CMC-WCL-AL-15-14	1940		5490.9	1	1				/	
7	CMC-WCL-AL-13-14	2000		5491.7	1	1				/	
8											

3.5-33-331

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED.EX. 3/8/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz FED EX	FED EX	3/7/95	2130
		FED EX	3/8/95	1320

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

207066

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: FOTH & VAN DYKE
Address: 2737 S. RIDGE RD.
GREEN BAY, WIS. 54304
Phone: (414) 497-2500

Report To: RUSS JANESHEK
Bill To: ACCTS. PAYABLE
P.O. # / Billing Reference
Project Name / No.: CMC/93C049

Pace Client No. 150419
Pace Project Manager SRC
Pace Project No. 950309.503
PROPOSAL NO. 941103.500
*Requested Due Date:

Sampled By (PRINT): DENNIS J LORITZ
Sampler Signature: Dennis J. Loritz
Date Sampled: 3/6/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	ANALYSES REQUEST: T. ALKALINITY	ACIDITY	REMARKS
1	CMC-WCL-WD-05-19	0945	LEACHATE	5477.1	1	1				/		
2	CMC-WCL-WD-06-19	1010		5478.0	1	1				/		
3	CMC-WCL-WD-07-19	1025		5479.8	1	1				/		
4	CMC-WCL-WD-08-19	1040		5480.1	1	1				/		
5	CMC-WCL-WD-09-19	1055		5481.0	1	1				/		
6	CMC-WCL-WD-10-19	1105		5482.8	1	1				/		
7	CMC-WCL-WD-11-19	1250		5483.6	1	1				/		
8	CMC-WCL-WD-12-19	1310		5484.4	1	1				/		

3.5-33-332

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE
			FED. EX. 3/8/95

Additional Comments

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
	Dennis J. Loritz / FYD	FEDEX	3/7/95	2:15
	FEDEX	[illegible]	3/9/95	1320

SEE REVERSE SIDE FOR INSTRUCTIONS

ORIGINAL

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

March 21, 1995
PACE Project Number: 950309503

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0054771	10 0054780	10 0054798
Date Collected:			03/06/95	03/06/95	03/06/95
Time Collected:			09:45	10:10	10:25
Date Received:			03/09/95	03/09/95	03/09/95
			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	-05-19	-06-19	-07-19
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	24	81	84
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	24	81	84

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 21, 1995
PACE Project Number: 95030950

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0054801 03/06/95 10:40 03/09/95 CMC-WCL-WD -08-19	10 0054810 03/06/95 10:55 03/09/95 CMC-WCL-WD -09-19	10 0054828 03/06/95 11:05 03/09/95 CMC-WCL-WD -10-19
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	-	-	200
Alkalinity, Bicarbonate	mg/L	5	72	18	-
Alkalinity, Carbonate	mg/L	5	ND	ND	-
Alkalinity, Total as Calcium Carbonate	mg/L	5	72	18	-

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 21, 1995
PACE Project Number: 95030950

Client Reference: Crandon Mining Leachates

Parameter	Units	MDL	10 0054836 CMC-WCL-WD -11-19	10 0054844 CMC-WCL-WD -12-19	10 0054852 CMC-WCL-WD -13-19
PACE Sample Number:					
Date Collected:			03/06/95	03/06/95	03/07/95
Time Collected:			12:50	13:10	17:40
Date Received:			03/09/95	03/09/95	03/09/95
Client Sample ID:					
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Acidity, Total	mg/L	1	34	86	-
Alkalinity, Bicarbonate	mg/L	5	-	-	17
Alkalinity, Carbonate	mg/L	5	-	-	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	-	-	17

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 21, 1995
PACE Project Number: 95030950

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0054860	10 0054879	10 0054887
Date Collected:			03/07/95	03/07/95	03/07/95
Time Collected:			18:45	18:55	19:00
Date Received:			03/09/95	03/09/95	03/09/95
Client Sample ID:			CMC-WCL-RS	CMC-WCL-RS	CMC-WCL-AL
Parameter	Units	MDL	-13A-3	-18A-3	-17-14
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	59	20	ND
Alkalinity, Carbonate	mg/L	5	ND	ND	18
Alkalinity, Total as Calcium Carbonate	mg/L	5	59	20	500

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ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

March 21, 1995
PACE Project Number: 950309503

Client Reference: Crandon Mining Leachates

PACE Sample Number:			10 0054895	10 0054909	10 0054917
Date Collected:			03/07/95	03/07/95	03/07/95
Time Collected:			19:15	19:40	20:00
Date Received:			03/09/95	03/09/95	03/09/95
Client Sample ID:			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	-16-14	-15-14	-13-14
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Alkalinity, Bicarbonate	mg/L	5	13	110	88
Alkalinity, Carbonate	mg/L	5	ND	ND	ND
Alkalinity, Total as Calcium Carbonate	mg/L	5	13	110	88

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 5

Client Reference: Crandon Mining Leachates

MDL Method Detection Limit
ND Not detected at or above the MDL.

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Appendix 3.5-33 Table 2. Uranium Verification Analyses of Leachate Samples

Appendix 3.5-33 Table 2

Uranium Verification Analyses for Leachate Samples

Composite Leached	Date Sample Collected	CEP Controls for Environmental Pollution (mg/L)	PACE Environmental Laboratories (mg/L)
Skunk Lake Master Composite	112194	<0.001	<0.0010
	121994	<0.001	<0.0010
Rice Lake Master Composite	112194	<0.001	<0.0010
	121294	0.001	<0.0010
	121994	<0.001	<0.0010
Upper Mole Lake Master Composite	112194	<0.001	<0.0010
	122094	<0.001	<0.0010
Lower Mole Lake Master Composite	112194	<0.001	<0.0010
	122094	<0.001	<0.0010
Skunk Lake High Sulfur Composite	111594	<0.001	<0.0010
	112194	<0.001	<0.0012
	122094	0.002	<0.0010
Rice Lake High Sulfur Composite	111594	0.001	0.0017
	112194	0.001	0.0018
	122094	0.001	0.0018

Appendix 3.5-33 Table 2, continued

Composite Leached	Date Sample Collected	CEP Controls for Environmental Pollution (mg/L)	PACE Environmental Laboratories (mg/L)
Upper Mole Lake High Sulfur Composite	111694	<0.001	<0.0010
	112194	<0.001	<0.0010
	122094	<0.001	<0.0010
Lower Mole Lake High Sulfur Composite	111694	<0.001	<0.0010
	112194	0.001	<0.0010
	121294	0.001	<0.0010
	122094	<0.001	<0.0010
Whole Tailings W/D Leaching	112294	<0.001	<0.0010
	122194	<0.001	<0.0010
Lime Amended Whole Tailings W/D Leaching	111694	<0.001	<0.0010
	112294	<0.001	<0.0012
	121294	0.002	<0.0023
	122194	<0.001	<0.0010
Whole Tailings W/D + Saturated Leaching	122194	<0.001	<0.0010
	122894	<0.001	<0.0010

Appendix 3.5-33 Table 2, continued

Composite Leached	Date Sample Collected	CEP Controls for Environmental Pollution (mg/L)	PACE Environmental Laboratories (mg/L)
Whole Tails + NPC W/D + Saturated Leaching	121494	0.001	<0.0010
	122094	<0.001	<0.0010
	122894	<0.001	<0.0010
Coarse Tailings W/D + Saturated Leaching	122194	<0.001	<0.0029
	122894	<0.001	<0.0010
Crs. Tails + NPC W/D + Saturated Leaching	121494	<0.001	<0.0010
	122094	<0.001	<0.0010
	122794	<0.001	<0.0010
Whole Tailings Saturated + W/D Leaching	121494	<0.001	<0.0010
	011895	<0.001	<0.0010
Fine Tailings Saturated + W/D Leaching	121494	<0.001	<0.0010
	011895	<0.001	<0.0010
Unweathered Ore	120794	<0.001	<0.0010
Acidification Liquid (pH 2.5)	010595	<0.001	<0.0010
Acidification Liquid (final pH)	011695	<0.001	0.0208

W/D = Wet Dry

Prepared by: JET
Checked by: DJL

Laboratory Data Sheets for Uranium Verification Analyses of Leachate Samples

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

April 11, 1995

Mr. Russell Janeshek
Foth & Van Dyke
2737 S. Ridge Rd.
Green Bay, WI 54307-9012

Re: Crandon Mining Company Project -
PACE Project 950321.501, Waste Characterization Leachates
Uranium Reanalyses

Dear Mr. Janeshek:

Enclosed are the analytical report, raw data package and electronic deliverable representing the reanalysis of leachate samples for total uranium. Analysis results in this submittal cover tests performed at the Golden, CO, facility of PACE. The date received in the sample summary report reflect the original dates of receipt at PACE.

The reporting limit for several samples was elevated slightly due to the limited sample volume remaining for these samples. Three samples registered positive detects just above the detection limit of 1.0 µg/L. One sample, CMC-WCL-WD-04-Final pH collected on 01/16/95, reported a positive detect of 20.8 µg/L.

If you have any questions or comments concerning the data submitted, feel free to contact me at (612) 525-3454.

Sincerely,

Steven R. Crupi

Steven R. Crupi
Project Manager

Enclosure

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3.5-33-344

APR 12 1995

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Foth & Van Dyke & Associates
2737 South Ridge Road
P.O. Box 19012
Green Bay, WI 54307

April 11, 1995
PACE Project Number: 950321501

Attn: Mr. Russell Janeshek

Client Reference: Crandon Mining Uranium Reanalyses

PACE Sample Number:			10 0091413	10 0091421	10 0091430
Date Collected:			01/05/95	01/16/95	01/18/95
Time Collected:			09:00	10:30	11:00
Date Received:			01/16/95	01/19/95	01/19/95
Client Sample ID:			CMC-WCL-WD 04-pH2.5	CMC-WCL-WD-04-Final pH	CMC-WCL-RS-18
Parameter	Units	MDL			
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	-	ND
Uranium, total	ug/L	2.9	-	20.8	-

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 2

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091448 01/18/95 13:45 01/19/95 CMC-WCL-RS-13	10 0091456 11/15/94 14:00 11/18/94 CMC-WCL-WD-09-03	10 0091464 11/15/94 15:45 11/18/94 CMC-WCL-WD-10-03
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	1.7

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 3

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091472 11/16/94 08:30 11/18/94 CMC-WCL-WD -11-03	10 0091480 11/16/94 09:15 11/18/94 CMC-WCL-WD -12-03	10 0091499 11/16/94 10:30 11/18/94 CMC-WCL-WD -14-03
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091502 11/21/94 09:30 11/23/94 CMC-WCL-WD 05-04	10 0091510 11/21/94 11:00 11/23/94 CMC-WCL-WD 06-04	10 0091529 11/21/94 11:30 11/23/94 CMC-WCL-WD 07-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 5

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

PACE Sample Number:			10 0091537	10 0091545	10 0091553
Date Collected:			11/21/94	11/21/94	11/21/94
Time Collected:			13:00	14:00	14:45
Date Received:			11/23/94	11/23/94	11/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WD
Parameter	Units	MDL	08-04	09-04	10-04
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	-	1.8
Uranium, total	ug/L	1.2	-	ND	-

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REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 6

April 11, 1995
PACE Project Number: 95032150

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091561 11/21/94 15:15 11/23/94 CMC-WCL-WD 11-04	10 0091570 11/21/94 15:30 11/23/94 CMC-WCL-WD 12-04	10 0091588 11/22/94 08:30 11/23/94 CMC-WCL-WD 13-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 7

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

PACE Sample Number:			10 0091596	10 0091600	10 0091618
Date Collected:			11/22/94	12/12/94	12/14/94
Time Collected:			09:15	12:00	10:15
Date Received:			11/23/94	12/15/94	12/15/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-	CMC-WCL-
Parameter	Units	MDL	14-04	WD-14-07	RS-13-01
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	-	-	ND
Uranium, total	ug/L	1.2	ND	-	-
Uranium, total	ug/L	2.3	-	ND	-

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 8

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091626 12/14/94 09:30 12/15/94 CMC-WCL- RS-18-01	10 0091634 12/14/94 13:00 12/15/94 CMC-WCL- AL-16-02	10 0091642 12/14/94 11:15 12/15/94 CMC-WCL- AL-17-02
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Russell Janeshek
Page 9

April 11, 1995
PACE Project Number: 95032150

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091650 12/12/94 11:30 12/15/94 CMC-WCL-WD-06-07	10 0091669 12/12/94 11:15 12/15/94 CMC-WCL-WD-12-07	10 0091677 12/19/94 14:45 12/23/94 CMC-WCL-WD 05-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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April 11, 1995
PACE Project Number: 9503215C

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL			
PACE Sample Number:			10 0091685	10 0091693	10 009170
Date Collected:			12/19/94	12/20/94	12/20/94
Time Collected:			15:30	08:45	09:30
Date Received:			12/23/94	12/23/94	12/23/94
Client Sample ID:			CMC-WCL-WD	CMC-WCL-WD	CMC-WCL-WE
			06-08	07-08	08-08
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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April 11, 1995
PACE Project Number: 95032150

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091715 12/20/94 11:00 12/23/94 CMC-WCL-WD 09-08	10 0091723 12/20/94 12:45 12/23/94 CMC-WCL-WD 10-08	10 0091731 12/20/94 13:15 12/23/94 CMC-WCL-WD 11-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	1.8	ND

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April 11, 1995
PACE Project Number: 95032150

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091740 12/20/94 13:45 12/23/94 CMC-WCL-WD 12-08	10 0091758 12/21/94 09:30 12/23/94 CMC-WCL-WD 13-08	10 0091766 12/21/94 09:45 12/23/94 CMC-WCL-WD 14-08
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091774 12/20/94 16:30 12/23/94 CMC-WCL-AL 16-03	10 0091782 12/20/94 15:15 12/23/94 CMC-WCL-AL 17-03	10 0091790 12/07/94 12/23/94 CMC-WCL-WD 03-19
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

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April 11, 1995
PACE Project Number: 95032150

Client Reference: Crandon Mining Uranium Reanalyses

Parameter	Units	MDL	10 0091804 12/21/94 15:15 12/23/94 CMC-WCL-AL 15-03	10 0091812 12/21/94 15:45 12/23/94 CMC-WCL-AL 13-03	10 0091820 12/28/94 10:00 12/29/94 CMC-WCL-AL 13-04
PACE Sample Number:					
Date Collected:					
Time Collected:					
Date Received:					
Client Sample ID:					
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	-	ND	ND
Uranium, total	ug/L	2.9	ND	-	-

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April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

PACE Sample Number:			10 0091839	10 0091847	10 0091855
Date Collected:			12/28/94	12/28/94	12/27/94
Time Collected:			09:30	08:45	15:15
Date Received:			12/29/94	12/29/94	12/29/94
Client Sample ID:			CMC-WCL-AL	CMC-WCL-AL	CMC-WCL-AL
Parameter	Units	MDL	15-04	16-04	17-04
SUBCONTRACT ANALYSIS					
INDIVIDUAL PARAMETERS					
Uranium, total	ug/L	1.0	ND	ND	ND

These data have been reviewed and are approved for release.

Steven R. Crupi

Steve Crupi
Project Manager

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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 15

April 11, 1995
PACE Project Number: 950321501

Client Reference: Crandon Mining Uranium Reanalyses

MDL	Method Detection Limit
ND	Not detected at or above the MDL.

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Appendix 3.5-33 Tables 3-5.
Comparison of Leachate Analyses for Samples Split Between Pace Laboratories and the State Laboratory of Hygiene (SLOH).

Comparison of Leachate Analyses for Samples Split Between Pace Laboratories and the State Laboratory of Hygiene (SLOH)

Leachate Sample: Rice Lake Master Composite (WD-06)
Sampling and Splitting Date: 121294

Parameter	Pace Results (mg/L)	SLOH Results (mg/L)
pH, field	7.26	7.18
Conductivity, field	159	159
Alkalinity	71	71
Sulfate	14.1	14
Aluminum	7.0	59
Arsenic	0.033	0.027
Barium	0.043	0.094
Beryllium	<0.005	<0.0006
Bismuth	<0.20	<0.10
Calcium	19	17
Chromium	0.005	0.034
Cobalt	<0.010	0.026
Copper	0.53	0.68
Iron	11	82
Lead	<0.040	0.029
Magnesium	13	50
Manganese	0.56	1.7
Mercury	<0.0002	0.00009
Molybdenum	<0.020	0.025
Nickel	<0.020	0.027
Silver	<0.005	0.0007
Sodium	5.6	6.4
Zinc	0.28	0.41

Comparison of Leachate Analyses for Samples Split Between Pace Laboratories and the State Laboratory of Hygiene (SLOH)

Leachate Sample: Lower Mole Lake High Sulfur Composite (WD-12)
Sampling and Splitting Date: 121294

Parameter	Pace Results (mg/L)	SLOH Results (mg/L)
pH, field	4.20	4.24
Conductivity, field	1887	1887
Sulfate	1420	1200
Aluminum	2.0	5.5
Arsenic	0.034	0.043
Barium	0.012	0.015
Beryllium	<0.005	0.001
Bismuth	<0.20	<0.10
Cadmium	0.027	0.029
Calcium	260	270
Chromium	<0.005	0.002
Cobalt	0.88	0.90
Copper	8.3	9.3
Iron	5.8	16
Lead	0.053	0.11
Magnesium	120	130
Manganese	14	14
Mercury	0.0011	0.00096
Molybdenum	<0.020	0.006
Nickel	0.10	0.10
Selenium	0.21	0.19
Silver	<0.005	0.0062
Sodium	4.2	3.3
Zinc	16	17

Comparison of Leachate Analyses for Samples Split Between Pace Laboratories and the State Laboratory of Hygiene (SLOH)

Leachate Sample: Lime Amended Whole Tailings Composite (WD-14)
Sampling and Splitting Date: 121294

Parameter	Pace Results (mg/L)	SLOH Results (mg/L)
pH, field	10.6	11.6
Conductivity, field	967	985
Cyanide	0.012	0.02
Sulfate	104	84
Aluminum	5.2	22
Antimony	<0.050	0.14
Arsenic	1.4	4.4
Barium	0.019	0.028
Beryllium	<0.005	<0.0006
Bismuth	<0.20	<0.10
Cadmium	0.011	0.031
Calcium	160	180
Chromium	0.074	0.15
Cobalt	0.030	0.11
Copper	1.4	2.2
Iron	80	400
Lead	8.9	12
Magnesium	27	45
Manganese	0.99	1.4
Mercury	<0.0002	0.0024
Molybdenum	0.023	0.039
Nickel	0.081	0.098
Selenium	0.17	0.28
Silver	0.012	0.040
Sodium	3.2	3.5
Zinc	5.6	12

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
Inorganic chemistry (#1 of 30 on 02/13/95, unseen)

Id: Point/Well/..: Field #: WTCA-7 Route: SW70
Collection Date: 12/12/94 Time: 11:45 County: 21 (Forest)
From: CRANDON MINING CO (F&UD LAB) WHOLE TAILS PLUS LIME CYCLE #7
To: KENNETH MARKART Type: Compliance
DNR Source: Leachate
RHINELANDER
Account number: EA009 Collected by: MARKART
Split Enforcement
Date Received: 12/14/94 Labslip #: IF015782 Reported: 02/09/95

ALUMINUM, DIG, ICP	22000.	UG/L
ANTIMONY, DIG, ICP	140.	UG/L
ARSENIC, DIG, ICP	4400.	UG/L
BARIUM, DIG, ICP	28.	UG/L
BERYLLIUM, DIG, ICP	ND (LOD=0.6 UG/L)	
BISMUTH, DIG, ICP	ND (LOD=100. UG/L)	
CADMIUM, DIG, ICP	31.	UG/L
CALCIUM, DIG, ICP	180.	MG/L
CHLORIDE, AUTOMATED	101.	MG/L
CHROMIUM, DIG, ICP	150.	UG/L
COBALT, DIG, ICP	110.	UG/L
COD LOW LEVEL, COLORIMETRIC	670.	MG/L
CONDUCTIVITY (AT 25 DEG C), DISSOLVED	*793.0	UMHOS/CM #1
analysis rejected		
PH, LAB, DISSOLVED	*11.0	SU #1
analysis rejected		
ALKALINITY, DISSOLVED	*115.300	MG/L #1
analysis rejected		
CONDUCTIVITY (AT 25 DEG C)	884.	UMHOS/CM #2
PH, LAB	11.29	SU #2
ALKALINITY	**	MG/L #2
COPPER, DIG, ICP	2200.	UG/L
CYANIDE	0.02	MG/L
DIGEST 730.1, LIQUIDS, ICP EXCEPT AS,SE,AG	DIG MET	
DIGESTION 740.1, AG ICP	DIG MET	
FLUORIDE, DISSOLVED	0.06	MG/L
detected between 0.06 (LOD) and 0.2 (LOQ) MG/L		
HARDNESS, CALCULATION METHOD, DIG	650.	MG/L
IRON, ICP, DIG	400.	MG/L
LAB FILTRATION (SINGLE ANALYTE)	FILTERED	
LEAD, ICP, DIG	12000.	UG/L
MAGNESIUM, ICP, DIG	45.	MG/L
MANGANESE, ICP, DIG	1400.	UG/L
MOLYBDENUM, ICP, DIG	39.	UG/L

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
... continuing Labslip # IF015782, Field # WTCA-7

MERCURY, AA COLD VAPOR	2.4	UG/L
NICKEL, ICP, DIG	98.	UG/L
PH,LAB	11.19	SU
SELENIUM, ICP, DIG	282.14370	UG/L
SILVER, ICP, DIG	40.	UG/L
SODIUM, ICP, DIG	3.5	MG/L
SULFATE	84.	MG/L
TOTAL SOLIDS	2520.	MG/L
ZINC, ICP, DIG	12000.	UG/L
TEMPERATURE FIELD	17.1	C
PH FIELD	11.6	SU
CONDUCTIVITY FIELD	985	UMHOS/CM
TEMPERATURE	ICED	C

--- Footnotes ---
Remark #1: PRECISION QC LIMITS EXCEEDED; VALUE IS AN AVERAGE
Remark #2: POOR ALKALINITY ENDPOINT

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
Inorganic chemistry (#3 of 6 on 02/27/95, seen)

Id: Point/Well/..: Field #: RL-7 Route: SW70
Collection Date: 12/12/94 Time: 11:25 County: 21 (Forest)
From: CRANDON MINE CO (F&UD LAB) RICE LAKE COMPOSITE CYCLE #7
To: KENNETH MARKART Type: Compliance
DNR Source: Leachate
RHINELANDER
Account number: EA009 Collected by: MARKART
Split Enforcement
Date Received: 12/14/94 Labslip #: IF015784 Reported: 02/01/95

Comment: Partial report; RESULTS ARE PROVISIONAL AND MAY CHANGE.

ALUMINUM, DIG, ICP	59000.	UG/L
ANTIMONY, AA FURNACE, DIG	*1.3	UG/L #1
analysis rejected		
ARSENIC, AA FURNACE, DIG	27.	UG/L
BARIUM, DIG, ICP	94.	UG/L
BERYLLIUM, DIG, ICP	ND (LOD=0.6 UG/L)	
BISMUTH, DIG, ICP	ND (LOD=100. UG/L)	
CADMIUM, AA FURNACE, DIG	*0.60	UG/L #2
analysis rejected		
CALCIUM, DIG, ICP	17.	MG/L
CHLORIDE, AUTOMATED	2.0	MG/L
CHROMIUM, AA FURNACE, DIG	34.	UG/L
COBALT, DIG, ICP	26.	UG/L
COD LOW LEVEL, COLORIMETRIC	7.	MG/L
detected between 5. (LOD) and 16 (LOQ) MG/L		
CONDUCTIVITY (AT 25 DEG C)	162.	UMHOS/CM #3
PH, LAB	8.16	SU #3
ALKALINITY	*70.998	MG/L #3
COPPER, DIG, ICP	680.	UG/L
CYANIDE	<0.01	MG/L
DIGEST 730.1, LIQUIDS, ICP EXCEPT AS,SE,AG	DIG MET	
DIGESTION 740.1, LIQUIDS, FOR FURNACE	DIG MET	
DIGESTION 760.1, LIQUIDS & TOT REC FOR AS/SE	DIG MET	
FLUORIDE, DISSOLVED	0.40	MG/L
HARDNESS, CALCULATION METHOD, DIG	250.	MG/L
IRON, ICP, DIG	82.	MG/L
LAB FILTRATION (SINGLE ANALYTE)	FILTERED	
LEAD, AA FURNACE, DIG	29.	UG/L

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
... continuing Labslip # IF015784, Field # RL-7

MAGNESIUM, ICP, DIG	50.	MG/L
MANGANESE, ICP, DIG	1700.	UG/L
MOLYBDENUM, ICP, DIG	25.	UG/L
MERCURY, AA COLD VAPOR	0.09	UG/L
NICKEL, ICP, DIG	27.	UG/L
detected between 10 (LOD) and 33 (LOQ) UG/L		
SILVER, AA FURNACE, DIG	0.7	UG/L
detected between 0.2 (LOD) and 0.8 (LOQ) UG/L		
SODIUM, ICP, DIG	6.4	MG/L
SULFATE	14.	MG/L
TOTAL SOLIDS	1080.	MG/L
ZINC, ICP, DIG	410.	UG/L
TEMPERATURE FIELD	14.1	C
PH FIELD	7.18	SU
CONDUCTIVITY FIELD	159	UMHOS/CM
TEMPERATURE	ICED	C

--- Footnotes ---
Remark #1: QC FAILED. SPIKE REC.=42.6%, INSUFFICIENT SAMPLE
Remark #2: HIGH BLANK = 0.87, INSUFFICIENT SAMPLE TO REDIGEST
Remark #3: PRECISION QC LIMITS EXCEEDED; ALK VALUE IS AVERAGE

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
Inorganic chemistry (#1 of 5 on 02/07/95, unseen)

Id: Point/Well/..: Field #: LMLX-7 Route: SW70
Collection Date: 12/12/94 Time: 11:05 County: 21 (Forest)
From: CRANDON MINE CO (F&UD LAB) LOWER MOLE LAKE CYCLE #7 HIGH SULFIDE
To: KENNETH MARKART Type: Compliance
DNR Source: Leachate
RHINELANDER
Account number: EA009 Collected by: MARKART
Split Enforcement
Date Received: 12/14/94 Labslip #: IF015783 Reported: 02/06/95

ALUMINUM, DIG, ICP	5500.	UG/L
ANTIMONY, AA FURNACE, DIG	*5.1	UG/L #1
analysis rejected		
ARSENIC, AA FURNACE, DIG	43.	UG/L
BARIUM, DIG, ICP	15.	UG/L
BERYLLIUM, DIG, ICP	1.0	UG/L
detected between 0.6 (LOD) and 1.8 (LOQ) UG/L		
BISMUTH, DIG, ICP	ND (LOD=100. UG/L)	
CADMIUM, DIG, ICP	29.	UG/L
CALCIUM, DIG, ICP	270.	MG/L
CHLORIDE, AUTOMATED	1.5	MG/L
CHROMIUM, AA FURNACE, DIG	2.	UG/L
detected between 2 (LOD) and 7 (LOQ) UG/L		
COBALT, DIG, ICP	900.	UG/L
COD LOW LEVEL, COLORIMETRIC	22.	MG/L
CONDUCTIVITY (AT 25 DEG C)	1880.	UMHOS/CM #2
PH, LAB	4.29	SU #2
ALKALINITY	**	MG/L #2
COPPER, DIG, ICP	9300.	UG/L
CYANIDE	<0.01	MG/L
DIGEST 730.1, LIQUIDS, ICP EXCEPT AS,SE,AG	DIG MET	
DIGESTION 740.1, LIQUIDS, FOR FURNACE	DIG MET	
DIGESTION 760.1, LIQUIDS & TOT REC FOR AS/SE	DIG MET	
FLUORIDE, DISSOLVED	ND (LOD=0.06 MG/L)	
HARDNESS, CALCULATION METHOD, DIG	1200.	MG/L
IRON, ICP, DIG	16.	MG/L
LAB FILTRATION (SINGLE ANALYTE)	FILTERED	
LEAD, ICP, DIG	110.	UG/L
MAGNESIUM, ICP, DIG	130.	MG/L
MANGANESE, ICP, DIG	14000.	UG/L
MOLYBDENUM, ICP, DIG	6.	UG/L
detected between 4 (LOD) and 15 (LOQ) UG/L		
MERCURY, AA COLD VAPOR	0.96	UG/L
NICKEL, ICP, DIG	100.	UG/L

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Environmental Science Section (608) 262-3458 DNR LAB ID 113133790
... continuing Labslip # IF015783, Field # LMLX-7

SELENIUM, ICP, DIG	190.65335	UG/L
SILVER, AA FURNACE, DIG	6.2	UG/L
SODIUM, ICP, DIG	3.3	MG/L
SULFATE	1200.	MG/L
TOTAL SOLIDS	2130.	MG/L
ZINC, ICP, DIG	17000.	UG/L
TEMPERATURE FIELD	15.5	C
PH FIELD	4.24	SU
CONDUCTIVITY FIELD	18.87	UMHOS/CM
TEMPERATURE	ICED	C

--- Footnotes ---
Remark #1: QC FAILED. SPIKE REC.=42.6%, INSUFFICIENT SAMPLE
Remark #2: INITIAL pH BELOW ALKALINITY TITRATION ENDPOINT

Appendix 3.5-34

Waste Rock Kinetic Test Data and Calculations

- Appendix 3.5-34 Table 1. Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites.
- Appendix 3.5-34 Tables 2-8. Skunk Lake Waste Rock Master Composite (WD-05) Data and Calculations.
- Appendix 3.5-34 tables 9-15. Rice Lake Waste Rock Master Composite (WD-06) Data and Calculations.
- Appendix 3.5-34 Tables 16-22. Upper Mole Lake Waste Rock Master Composite (WD-07) Data and Calculations.
- Appendix 3.5-34 Tables 23-29. Lower Mole Lake Waste Rock Master Composite (WD-08) Data and Calculations.
- Appendix 3.5-34 Tables 30-36. Skunk Lake Waste Rock High Sulfur Composite (WD-09) Data and Calculations.
- Appendix 3.5-34 Tables 37-43. Rice Lake Waste Rock High Sulfur Composite (WD-10) Data and Calculations.
- Appendix 3.5-34 Tables 44-50. Upper Mole Lake Waste Rock High Sulfur Composite (WD-11) Data and Calculations.
- Appendix 3.5-34 Tables 51-57. Lower Mole Lake Waste Rock High Sulfur Composite (WD-12) Data and Calculations

(Note: As part of an August 2000 EIR update, additional analytical data for selected metals for the waste rock samples was added to the data base contained in Appendix 3.5-33. This data was added to aid in the development of the *Reflooded Mine Management Plan* (RMMP). Updated versions of some of the tables in this Appendix pertinent to the RMMP are included in the RMMP.)

Appendix 3.5-34 Table 1. Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites.

Appendix 3.5-34 Table 1

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Skunk Lake Master Composite (WD-05)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	5,725	0.234	0.234	316	6.23	44
110294	2	5,470	0.223	0.457	294	6.25	33
110994	3	4,055	0.166	0.623	240	5.65	33
111694	4	4,930	0.201	0.824	192	6.94	30
112194	5	4,460	0.182	1.006	186	6.01	34
112894	6	5,560	0.227	1.233	128	6.08	27
120594	7	4,250	0.173	1.406	121	6.51	29
121294	8	4,930	0.201	1.607	126	6.00	30
121994	9	4,320	0.176	1.783	126	7.73	31
122794	10	4,460	0.182	1.965	131	7.68	28
010395	11	4,970	0.203	2.168	131	7.62	31
010995	12	3,740	0.153	2.321	108	7.26	26
011795	13	4,290	0.175	2.496	112	7.30	26
012395	14	4,200	0.171	2.667	123	7.60	24
013095	15	4,580	0.187	2.854	123	7.54	26
020695	16	500	0.020	2.874	136	7.07	23
021395	17	8,160	0.333	3.207	147	8.30(?)	23
022095	18	4,700	0.192	3.399	132	7.07	26
022795	19	4,100	0.167	3.566	131	7.37	29
030695	20	4,780	0.195	3.761	141	7.51	24
031395	21	3,610	0.147	3.908	113	7.11	200(?)
032095	22	4,550	0.186	4.094	124	6.96	20
032795	23	4,420	0.180	4.274	134	6.75	18
040495	24	5,080	0.207	4.481	129	6.84	16
041095	25	4,960	0.202	4.683	138	6.93	20
041795	26	4,080	0.167	4.850	151(?)	6.74	16
042495	27	3,940	0.161	5.011	130	6.64	14
050195	28	4,060	0.166	5.177	123	6.72	24
050895	29	3,580	0.146	5.323	120	6.71	17
051595	30	4,400	0.180	5.503	120	6.91	20

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake Master Composite (WD-05)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
052295	31	3,950	0.161	5.664	116	7.12	16
053095	32	4,840	0.198	5.862	113	6.92	18
060595	33	4,320	0.176	6.038	114	6.65	18
061295	34	4,600	0.188	6.226	96	6.96	22
061995	35	5,740	0.234	6.460	107	7.54	14
062695	36	3,980	0.162	6.622	103	7.53	14
070395	37	4,280	0.175	6.797	106	7.34	NA
071095	38	5,260	0.215	7.012	110	7.35	NA
071795	39	0	0.000	7.012			
072495	40	7,110	0.290	7.302	114	7.07	NA
073195	41	3,320	0.136	7.438	117	7.24	NA
080795	42	4,900	0.200	7.638	120	7.13	NA
081495	43	3,560	0.145	7.783	112	7.21	NA
082195	44	4,460	0.182	7.965	114	7.16	NA
083095	45	5,440	0.222	8.187	111	7.11	NA
090595	46	4,120	0.168	8.355	118	7.13	12
091195	47	3,840	0.157	8.512	126	7.17	12
091895	48	3,620	0.148	8.660	117	7.03	13
092595	49	4,980	0.203	8.863	113	6.74(?)	13
100295	50	4,160	0.170	9.033	104	6.47(?)	14
100995	51	4,280	0.175	9.208	102	6.43(?)	14
101695	52	4,180	0.171	9.379	97	6.37(?)	13
102395	53	3,810	0.156	9.535	98	6.37(?)	11
103095	54	4,770	0.195	9.730	101	6.53(?)	14
110695	55	4,240	0.173	9.903	96	6.34(?)	13
111395	56	0	0.000	9.903			
112095	57	6,320	0.258	10.161	102	6.14(?)	17
112795	58	4,300	0.176	10.337	101	6.11(?)	18
120495	59	3,400	0.139	10.476	96	7.40	17
121195	60	4,100	0.167	10.643	103	7.27	16
121895	61	4,060	0.166	10.809	122	7.29	16
122695	62	4,560	0.186	10.995	105	7.33	15
010296	63	3,680	0.150	11.145	108	7.10	14
010996	64	4,520	0.184	11.329	100	6.93	14
011596	65	3,200	0.131	11.460	111	6.91	NA

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake Master Composite (WD-05)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
012396	66	4,100	0.167	11.627	95	6.65	14
013196	67	4,010	0.164	11.791	101	6.83	NA
020796	68	4,820	0.197	11.988	106	6.73	NA
021396	69	3,280	0.134	12.122	94	6.45	NA
022096	70	3,780	0.154	12.276	93	6.58	12
022796	71	4,650	0.190	12.466	105	6.70	NA
030596	72	4,100	0.167	12.633	103	6.58	NA
031196	73	4,280	0.175	12.808	92	7.48	NA
031896	74	3,960	0.162	12.970	87	6.31	12
032596	75	3,450	0.141	13.111	94	6.23	NA
040296	76	4,920	0.201	13.312	98	6.25	NA
040996	77	4,320	0.176	13.488	98	6.92	NA
041696	78	4,440	0.181	13.669	96	6.71	10
042996	79	3,820	0.156	13.825	101	6.61	NA
050796	80	5,120	0.209	14.034	107	7.02	NA
051396	81	4,160	0.170	14.204	93	6.63	NA
052196	82	3,820	0.156	14.360	96	6.73	8
052896	83	5,010	0.204	14.564	94	6.59	NA
060396	84	4,300	0.176	14.740	92	6.52	NA
061096	85	4,180	0.171	14.911	90	6.67	NA
061796	86	4,720	0.193	15.104	93	6.54	8
062496	87	4,500	0.184	15.288	93	6.61	NA
070196	88	4,340	0.177	15.465	88	6.62	NA
070896	89	3,910	0.160	15.625	88	6.48	NA
071596	90	4,460	0.182	15.807	90	6.64	NA
072296	91	3,560	0.145	15.952	85	6.40	NA
073096	92	5,000	0.204	16.156	91	6.49	8
080596	93	0	0.000	16.156			
081296	94	5,520	0.225	16.381	86	6.51	NA
081996	95	4,970	0.203	16.584	81	6.41	NA
082996	96	4,970	0.203	16.787	78	7.08	7
090296	97	0	0.000	16.787			
090996	98	0	0.000	16.787			
091996	99	3,320	0.136	16.923	106	7.12	NA
092396	100	0	0.000	16.923			

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake Master Composite (WD-05)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
093096	101	6,540	0.267	17.190	102	7.13	10
100796	102	4,680	0.191	17.381	91	7.50	NA
101796	103	6,050	0.247	17.628	79.7	7.32	NA
102496	104	4,400	0.180	17.808	155	6.63	11
110196	105	4,980	0.203	18.011	73	6.91	NA
110796	106	3,460	0.141	18.152	71	7.23	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Appendix 3.5-34 Table 1 *(Continued)*

Rice Lake Master Composite (WD-06)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	6,490	0.228	0.228	345	7.00	130
110294	2	4,785	0.168	0.396	315	7.36	110
110994	3	3,760	0.132	0.528	251	5.67(?)	100
111694	4	7,160	0.251	0.779	288	7.54	110
112194	5	3,400	0.119	0.898	238	7.00	91
112894	6	2,710	0.095	0.993	215	7.42	91
120594	7	2,480	0.087	1.08	214	7.78	92
121294	8	6,650	0.233	1.31	169	7.26	71
121994	9	5,400	0.190	1.50	195	8.13	80
122794	10	3,880	0.136	1.64	243	8.07	93
010395	11	3,900	0.137	1.78	233	8.31	87
010995	12	3,340	0.117	1.89	209	8.17	89
011795	13	3,400	0.119	2.01	202	8.22	83
012395	14	3,820	0.134	2.15	210	8.27	52
013095	15	4,030	0.141	2.29	206	8.37	51
020695	16	500	0.018	2.30	210	8.23	82
021395	17	7,480	0.263	2.57	217	8.19	86
022095	18	4,460	0.157	2.72	199	8.18	83
022795	19	4,320	0.152	2.88	202	8.39	82
030695	20	4,880	0.171	3.05	204	8.16	81
031395	21	3,820	0.134	3.18	174	8.17	78
032095	22	4,660	0.164	3.35	183	8.10	76
032795	23	4,600	0.161	3.51	202	8.12	78
040495	24	5,740	0.201	3.71	181	8.07	75
041095	25	5,160	0.181	3.89	204	8.14	73
041795	26	3,770	0.132	4.02	167	8.15	73
042495	27	4,400	0.154	4.18	166	8.13	39(?)
050195	28	4,380	0.154	4.33	170	8.11	80
050895	29	4,960	0.174	4.50	168	8.08	71
051595	30	5,100	0.179	4.68	164	8.05	74
052295	31	3,220	0.113	4.80	150	7.98	68
053095	32	3,780	0.133	4.93	157	7.94	68
060595	33	3,720	0.131	5.06	165	7.93	70
061295	34	4,700	0.165	5.22	153	8.10	70
061995	35	5,470	0.192	5.42	162	8.29	70
062695	36	5,100	0.179	5.60	156	8.23	70
070395	37	4,820	0.169	5.76	158	8.21	NA

Appendix 3.5-34 Table 1 *(Continued)*

Rice Lake Master Composite (WD-06)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
071095	38	5,150	0.181	5.94	154	8.16	NA
071795	39	0	0.000	5.94			
072495	40	7,180	0.252	6.20	162	8.03	NA
073195	41	4,480	0.157	6.35	158	8.06	NA
080795	42	4,780	0.168	6.52	154	8.06	NA
081495	43	4,960	0.174	6.70	152	8.10	NA
082195	44	4,750	0.167	6.86	154	8.07	NA
083095	45	5,620	0.197	7.06	157	8.05	NA
090595	46	4,360	0.153	7.21	154	8.20	65
091195	47	4,780	0.168	7.38	158	8.00	60
091895	48	4,360	0.153	7.53	155	7.85(?)	65
092595	49	4,340	0.152	7.69	156	7.71(?)	43(?)
100295	50	3,860	0.135	7.82	156	7.61(?)	64
100995	51	3,940	0.138	7.96	157	7.41(?)	66
101695	52	3,880	0.136	8.10	151	7.36(?)	62
102395	53	3,820	0.134	8.23	153	7.40(?)	62
103095	54	3,840	0.135	8.36	160	7.53(?)	61
110695	55	3,660	0.128	8.49	157	7.37(?)	61
111395	56	0	0.000	8.49			
112095	57	5,170	0.181	8.67	170	7.30(?)	79
112795	58	3,780	0.133	8.81	168	7.32(?)	68
120495	59	3,730	0.131	8.94	167	8.13	67
121195	60	4,180	0.147	9.08	177	8.15	73
121895	61	3,920	0.138	9.22	204	8.10	74
122695	62	4,660	0.164	9.39	179	8.20	71
010296	63	3,760	0.132	9.52	160	8.12	66
010996	64	4,000	0.140	9.66	161	7.98	69
011596	65	3,580	0.126	9.78	172	8.11	NA
012396	66	4,180	0.147	9.93	167	7.81	71
013196	67	3,940	0.138	10.1	166	7.86	NA
020796	68	4,920	0.173	10.2	172	7.90	NA
021396	69	3,520	0.124	10.4	159	7.75	NA
022096	70	3,720	0.131	10.5	163	7.84	72
022796	71	4,240	0.149	10.6	173	7.97	NA
030596	72	4,380	0.154	10.8	172	7.86	NA
031196	73	3,820	0.134	10.9	160	7.78	NA
031896	74	4,280	0.150	11.1	153	7.81	65

Appendix 3.5-34 Table 1 *(Continued)*

Rice Lake Master Composite (WD-06)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
032596	75	3,640	0.128	11.2	157	7.68	NA
040296	76	4,920	0.173	11.4	163	7.63	NA
040996	77	4,320	0.152	11.6	164	8.05	NA
041696	78	4,440	0.156	11.7	166	7.99	62
042996	79	3,820	0.134	11.8	164	8.07	NA
050796	80	5,120	0.180	12.0	161	8.07	NA
051396	81	4,160	0.146	12.2	158	7.89	NA
052196	82	3,820	0.134	12.3	150	8.03	63
052896	83	5,010	0.176	12.5	152	7.98	NA
060396	84	4,300	0.151	12.6	139	7.82	NA
061096	85	4,180	0.147	12.8	145	7.99	NA
061796	86	4,720	0.166	12.9	138	7.97	60
062496	87	4,500	0.158	13.1	141	7.95	NA
070196	88	4,340	0.152	13.3	132	8.12	NA
070896	89	3,730	0.131	13.4	128	7.88	NA
071596	90	3,410	0.120	13.6	132	7.83	NA
072296	91	3,460	0.121	13.7	132	7.86	NA
073096	92	3,600	0.126	13.8	141	7.82	58
080596	93	0	0.000	13.8			
081296	94	4,860	0.171	14.0	126	7.71	NA
081996	95	4,560	0.160	14.1	135	7.90	NA
082996	96	4,990	0.175	14.3	135	8.15	63
090296	97	0	0.000	14.3			
090996	98	0	0.000	14.3			
091996	99	3,800	0.133	14.4	217	8.25	NA
092396	100	0	0.000	14.4			
093096	101	3,840	0.135	14.6	163	8.30	62
100796	102	3,660	0.128	14.7	139	8.41	NA
101796	103	4,720	0.166	14.9	144	8.02	NA
102496	104	3,560	0.125	15.0	139	7.81	62
110196	105	3,860	0.135	15.1	137	8.01	NA
110796	106	3,000	0.105	15.2	138	8.43	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Appendix 3.5-34 Table 1 *(Continued)*

Upper Mole Lake Master Composite (WD-07)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	6,700	0.223	0.223	380	7.01	120
110294	2	4,915	0.164	0.387	358	7.21	120
110994	3	4,550	0.152	0.539	301	6.11	110
111694	4	2,490	0.083	0.622	339	7.62	110
112194	5	3,760	0.125	0.747	322	7.22	100
112894	6	7,950	0.265	1.012	217	7.58	87
120594	7	3,360	0.112	1.124	246	7.82	100
121294	8	4,700	0.157	1.281	256	7.77	97
122094	9	4,340	0.145	1.426	256	7.69	93
122794	10	4,080	0.136	1.562	268	8.15	96
010395	11	4,650	0.155	1.717	266	8.29	94
010995	12	3,730	0.124	1.841	224	8.34	91
011795	13	4,020	0.134	1.975	228	8.35	90
012395	14	3,780	0.126	2.101	233	8.34	88
013095	15	5,040	0.168	2.269	296	7.69	71
020695	16	500	0.017	2.286	291	8.05	68
021395	17	7,990	0.266	2.552	264	8.12	79
022095	18	4,460	0.149	2.701	220	8.34	88
022795	19	3,960	0.132	2.833	222	8.45	86
030695	20	3,960	0.132	2.965	228	8.41	84
031395	21	3,590	0.120	3.085	203	8.26	82
032095	22	4,390	0.146	3.231	215	8.22	78
032795	23	3,750	0.125	3.356	235	8.32	80
040495	24	3,240	0.108	3.464	212	8.25	78
041095	25	4,080	0.136	3.600	276	8.01	67
041795	26	5,100	0.170	3.770	211	8.28	78
042495	27	4,300	0.143	3.913	191	8.27	77
050195	28	4,120	0.137	4.050	193	8.29	84
050895	29	3,940	0.131	4.181	197	8.11	75
051595	30	3,540	0.118	4.299	192	8.21	76
052295	31	4,900	0.163	4.462	190	8.19	79
053095	32	5,740	0.191	4.653	180	8.09	76
060595	33	4,320	0.144	4.797	177	7.54	75
061295	34	4,700	0.157	4.954	168	8.19	74
061995	35	5,180	0.173	5.127	176	8.35	82
062695	36	4,120	0.137	5.264	171	8.29	73
070395	37	4,600	0.153	5.417	181	8.26	NA

Appendix 3.5-34 Table 1 *(Continued)*

Upper Mole Lake Master Composite (WD-07)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
071095	38	4,860	0.162	5.579	174	8.19	NA
071795	39	0	0.000	5.579			
072495	40	7,230	0.241	5.820	182	8.09	NA
073195	41	4,080	0.136	5.956	175	8.18	NA
080795	42	4,670	0.156	6.112	172	8.15	NA
081495	43	4,450	0.148	6.260	172	8.26	NA
082195	44	4,700	0.157	6.417	170	8.16	NA
083095	45	5,100	0.170	6.587	173	8.19	NA
090595	46	3,960	0.132	6.719	176	8.28	70
091195	47	3,900	0.130	6.849	184	8.19	67
091895	48	4,340	0.145	6.994	176	8.05	69
092595	49	4,800	0.160	7.154	182	7.89(?)	68
100295	50	5,160	0.172	7.326	176	7.77(?)	71
100995	51	4,730	0.158	7.484	172	7.62(?)	70
101695	52	4,700	0.157	7.641	167	7.65(?)	69
102395	53	4,600	0.153	7.794	168	7.55(?)	69
103095	54	5,020	0.167	7.961	183	7.73(?)	55
110695	55	4,800	0.160	8.121	175	7.53(?)	65
111395	56	0	0.000	8.121			
112095	57	7,560	0.252	8.373	186	7.38(?)	81
112795	58	4,570	0.152	8.525	185	7.45(?)	75
120495	59	4,380	0.146	8.671	178	8.18	72
121195	60	4,320	0.144	8.815	189	8.16	77
121895	61	4,420	0.147	8.962	224	8.15	83
122695	62	4,840	0.161	9.123	193	8.25	86
010296	63	4,160	0.139	9.262	179	8.16	80
010996	64	4,360	0.145	9.407	176	8.03	74
011596	65	4,160	0.139	9.546	190	8.16	NA
012396	66	4,670	0.156	9.702	183	8.00	NA
013196	67	4,720	0.157	9.859	186	8.00	NA
020796	68	4,200	0.140	9.999	186	8.04	NA
021396	69	3,430	0.114	10.113	176	7.92	NA
022096	70	3,370	0.112	10.225	177	7.99	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Appendix 3.5-34 Table 1 *(Continued)*

Lower Mole Lake Master Composite (WD-08)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	5,690	0.300	0.300	595	7.21	120
110294	2	4,655	0.245	0.545	431	6.67	91
110994	3	4,700	0.247	0.792	342	6.10	89
111694	4	4,780	0.252	1.04	294	7.41	75
112194	5	4,360	0.230	1.27	286	6.82	76
112894	6	5,300	0.279	1.55	227	7.50	75
120594	7	3,795	0.200	1.75	206	7.57	76
121294	8	4,840	0.255	2.01	224	7.70	77
122094	9	3,730	0.196	2.20	323(?)	7.93	79
122794	10	4,320	0.227	2.43	230	7.98	83
010395	11	4,840	0.255	2.69	226	8.09	81
010995	12	3,880	0.204	2.89	191	8.27	75
011795	13	3,950	0.208	3.10	195	8.31	71
012395	14	4,100	0.216	3.31	197	8.29	73
013095	15	5,290	0.278	3.59	199	8.35	76
020695	16	500	0.026	3.62	214	8.29	70
021395	17	8,500	0.447	4.06	213	8.17	72
022095	18	5,580	0.294	4.36	194	8.28	73
022795	19	3,940	0.207	4.57	196	8.36	73
030695	20	5,460	0.287	4.85	198	8.34	72
031395	21	4,530	0.238	5.09	180	8.20	76
032095	22	4,510	0.237	5.33	188	8.14	68
032795	23	4,540	0.239	5.57	206	8.26	71
040495	24	4,620	0.243	5.81	188	8.20	66
041095	25	5,490	0.289	6.10	204	8.17	64
041795	26	4,140	0.218	6.32	217	8.15	62
042495	27	4,720	0.248	6.56	188	8.19	63
050195	28	5,000	0.263	6.83	180	8.24	74
050895	29	4,540	0.239	7.07	177	8.10	62
051595	30	5,040	0.265	7.33	175	8.11	64
052295	31	3,580	0.188	7.52	167	8.19	64
053095	32	5,100	0.268	7.79	167	8.06	62
060595	33	3,790	0.200	7.99	164	7.79	61
061295	34	4,280	0.225	8.21	149	8.09	60
061995	35	4,300	0.226	8.44	175	8.26	60
062695	36	4,160	0.219	8.66	166	8.18	62
070395	37	3,680	0.194	8.85	167	8.11	NA

Appendix 3.5-34 Table 1 *(Continued)*

Lower Mole Lake Master Composite (WD-08)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
071095	38	4,860	0.256	9.11	167	8.11	NA
071795	39	0	0.000	9.11			
072495	40	7,750	0.408	9.52	172	7.86	NA
073195	41	4,060	0.214	9.73	175	8.05	NA
080795	42	4,180	0.220	9.95	166	8.01	NA
081495	43	4,800	0.253	10.2	168	8.05	NA
082195	44	4,480	0.236	10.4	168	8.01	NA
083095	45	4,840	0.255	10.7	164	7.99	NA
090595	46	4,040	0.213	10.9	172	8.13	55
091195	47	4,220	0.222	11.1	179	8.03	58
091895	48	3,690	0.194	11.3	192	7.95	52
092595	49	4,420	0.233	11.6	170	7.85(?)	52
100295	50	4,440	0.234	11.8	166	7.69(?)	56
100995	51	4,280	0.225	12.0	165	7.53(?)	53
101695	52	3,740	0.197	12.2	159	7.50(?)	53
102395	53	4,160	0.219	12.4	163	7.46(?)	53
103095	54	4,280	0.225	12.6	170	7.63(?)	57
110695	55	4,600	0.242	12.9	163	7.40(?)	50
111395	56	0	0.000	12.9			
112095	57	5,360	0.282	13.2	170	7.31(?)	61
112795	58	4,790	0.252	13.4	187	7.27(?)	62
120495	59	3,860	0.203	13.6	196	8.06	60
121195	60	3,580	0.188	13.8	187	8.04	58
121895	61	4,480	0.236	14.0	198	8.03	59
122695	62	4,220	0.222	14.3	178	8.10	59
010296	63	4,120	0.217	14.5	176	8.11	59
010996	64	4,620	0.243	14.7	171	7.98	59
011596	65	3,310	0.174	14.9	181	8.03	NA
012396	66	4,660	0.245	15.2	171	7.93	NA
013196	67	4,480	0.236	15.4	170	7.90	NA
020796	68	5,300	0.279	15.7	183	7.94	NA
021396	69	3,670	0.193	15.9	170	7.86	NA
022096	70	4,100	0.216	16.1	171	8.02	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake High Sulfur Composite (WD-09)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102494	1	5,875	0.405	0.405	1,010	6.23	34
110194	2	5,660	0.390	0.795	829	6.42	24
110994	3	2,860	0.197	0.992	679	5.39(?)	20
111594	4	5,420	0.374	1.37	617	5.84	16
112194	5	3,900	0.269	1.64	546	6.09	17
112894	6	6,040	0.417	2.05	407	5.89	15
120694	7	4,750	0.328	2.38	425	5.88	16
121394	8	5,200	0.359	2.74	390	5.89	19
122094	9	4,500	0.310	3.05	403	7.37	20
122794	10	4,860	0.335	3.38	425	7.84	18
010395	11	5,170	0.357	3.74	419	7.77	19
010995	12	3,700	0.255	4.00	353	6.68	19
011795	13	5,140	0.355	4.35	361	7.77	21
012395	14	5,220	0.360	4.71	379	7.15	21
013095	15	4,740	0.327	5.04	365	7.10	20
020695	16	500	0.035	5.07	387	7.98	20
021395	17	9,050	0.624	5.70	412	7.85	20
022095	18	5,060	0.349	6.05	401	7.74	19
022795	19	4,100	0.283	6.33	404	7.73	17
030695	20	5,060	0.349	6.68	420	7.73	18
031395	21	4,100	0.283	6.96	377	7.08	16
032095	22	4,850	0.335	7.30	420	7.45	15
032795	23	4,310	0.297	7.59	451	7.59	12
040495	24	3,760	0.259	7.85	431	7.51	13
041095	25	5,030	0.347	8.20	479	7.65	14
041795	26	4,040	0.279	8.48	427	7.53	13
042495	27	4,700	0.324	8.80	416	6.76	12
050195	28	4,380	0.302	9.10	433	6.72	21
050895	29	4,690	0.323	9.43	470	7.42	11
051595	30	4,600	0.317	9.74	447	7.53	14
052295	31	4,230	0.292	10.0	432	7.49	10
053195	32	4,840	0.334	10.4	474	6.44	11
060595	33	4,110	0.283	10.6	481	6.55	12
061295	34	4,700	0.324	11.0	427	7.33	11
061995	35	5,240	0.361	11.3	410	7.50	13
062695	36	4,160	0.287	11.6	423	7.41	12

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake High Sulfur Composite (WD-09)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
070395	37	5,000	0.345	12.0	443	7.35	13
071095	38	5,140	0.355	12.3	433	7.35	14
071795	39	0	0.000	12.3			
072495	40	7,690	0.530	12.8	444	7.22	18
073195	41	4,560	0.315	13.2	470	7.38	14
080795	42	4,900	0.338	13.5	459	7.32	17
081495	43	4,710	0.325	13.8	442	7.39	12
082195	44	4,880	0.337	14.2	436	7.36	12
083095	45	5,630	0.388	14.6	411	7.33	13
090595	46	4,700	0.324	14.9	431	7.47	13
091195	47	4,240	0.292	15.2	443	7.37	<5(?)
091895	48	4,570	0.315	15.5	418	7.43	14
092595	49	5,080	0.350	15.8	428	7.15	12
100395	50	4,500	0.310	16.1	399	6.57(?)	13
100995	51	4,980	0.343	16.5	419	6.88(?)	12
101695	52	4,710	0.325	16.8	412	6.91(?)	11
102395	53	4,790	0.330	17.1	437	6.92(?)	12
103095	54	4,290	0.296	17.4	433	7.02(?)	17
110695	55	4,960	0.342	17.8	444	6.80(?)	9(?)
111395	56	0	0.000	17.8			
112095	57	7,120	0.491	18.3	446	6.74(?)	16
112795	58	4,820	0.332	18.6	482	6.75(?)	17
120495	59	4,580	0.316	18.9	462	7.33	15
121195	60	4,370	0.301	19.2	501	7.25	19
121895	61	4,590	0.317	19.5	499	7.32	13
122695	62	5,020	0.346	19.9	468	7.34	13
010296	63	4,540	0.313	20.2	466	7.23	12
010996	64	4,520	0.312	20.5	468	7.21	12
011596	65	3,680	0.254	20.8	505	7.02	NA
012396	66	3,970	0.274	21.0	501	7.02	NA
013196	67	4,080	0.281	21.3	516	7.01	NA
020796	68	4,140	0.286	21.6	540	7.08	NA
021396	69	3.110	0.000	21.6	514	6.99	NA
022096	70	3,010	0.208	21.8	534	7.13	8
022796	71	2,990	0.206	22.0	613	6.81	NA
030596	72	2,900	0.200	22.2	677	6.78	NA

Appendix 3.5-34 Table 1 *(Continued)*

Skunk Lake High Sulfur Composite (WD-09)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
031196	73	3,100	0.214	22.4	632	6.62	NA
031896	74	3,790	0.261	22.7	632	6.67	6
032596	75	3,720	0.257	23.0	649	6.68	NA
040296	76	4,500	0.310	23.3	625	6.60	NA
040996	77	3,720	0.257	23.5	619	6.77	NA
041696	78	4,800	0.331	23.9	626	6.75	NA
042996	79	4,150	0.286	24.1	614	6.71	NA
050796	80	4,700	0.324	24.5	590	6.75	NA
051396	81	4,260	0.294	24.8	585	6.49	NA
052196	82	4,890	0.337	25.1	557	6.57	NA
052896	83	4,560	0.315	25.4	594	6.40	NA
060396	84	4,140	0.286	25.7	599	5.62	NA
061096	85	4,940	0.341	26.0	617	5.55	NA
061796	86	4,410	0.304	26.3	601	5.25	NA
062496	87	4,800	0.331	26.7	656	5.10	NA
070196	88	4,520	0.312	27.0	626	4.81	NA
070896	89	4,270	0.295	27.3	672	4.63	NA
071596	90	4,960	0.342	27.6	681	4.52	NA
072296	91	4,900	0.338	28.0	684	4.37	NA
073096	92	3,440	0.237	28.2	703	4.37	NA
080596	93	0	0.000	28.2			
081296	94	5,180	0.357	28.6	670	4.15	NA
081996	95	4,170	0.288	28.8	699	4.03	NA
082996	96	4,980	0.343	29.2	710	4.16	NA
090296	97	0	0.000	29.2			
090996	98	0	0.000	29.2			
091996	99	3,710	0.256	29.4	929	3.94	NA
092396	100	0	0.000	29.4			
093096	101	6,620	0.457	29.9	866	3.84	NA
100796	102	5,040	0.348	30.3	779	4.01	NA
101796	103	6,910	0.477	30.7	738	3.87	NA
102496	104	4,380	0.302	31.0	740	3.31	NA
110196	105	5,500	0.379	31.4	861	3.28	NA
110796	106	4,170	0.288	31.7	906	3.05	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Appendix 3.5-34 Table 1 *(Continued)*

Rice Lake High Sulfur Composite (WD-10)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
102494	1	5,565	0.418	0.418	1,400	6.30	<5[1]
110194	2	3,470	0.261	0.679	640(?)	6.88	<5[1]
110994	3	7,120	0.535	1.21	1,010	4.75	44[2]
111594	4	2,820	0.212	1.43	906	4.13	54[2]
112194	5	2,960	0.223	1.65	917	4.02	61[2]
112894	6	7,330	0.551	2.20	704	4.05	50[2]
120694	7	4,040	0.304	2.50	670	3.95	56[2]
121394	8	4,400	0.331	2.84	716	3.94	78[2]
122094	9	4,380	0.329	3.16	752	3.85	86[2]
122794	10	4,140	0.311	3.48	779	3.80	110[2]
010395	11	4,300	0.323	3.80	779	3.75	100[2]
010995	12	3,820	0.287	4.08	675	3.73	110[2]
011795	13	4,420	0.332	4.42	717	3.71	130[2]
012395	14	3,860	0.290	4.71	765	3.58	150[2]
013095	15	4,780	0.359	5.07	796	3.44	170[2]
020695	16	500	0.038	5.10	832	3.41	180[2]
021395	17	7,800	0.587	5.69	856	3.37	94[2](?)
022095	18	4,380	0.329	6.02	823	3.30	190[2]
022795	19	4,100	0.308	6.33	840	3.23	190[2]
030695	20	5,260	0.396	6.72	876	3.21	200[2]
031395	21	4,200	0.316	7.04	800	3.03	190[2]
032095	22	4,020	0.302	7.34	914	2.95	220[2]
032795	23	5,240	0.394	7.74	1,060	2.97	250[2]
040495	24	4,160	0.313	8.05	1,090	2.90	260[2]
041095	25	5,250	0.395	8.44	1,410	2.77	320[2]
041795	26	3,840	0.289	8.73	1,340	2.73	330[2]
042495	27	5,080	0.382	9.12	1,480	2.70	400[2]
050195	28	4,480	0.337	9.45	1,620	2.65	430[2]
050895	29	4,620	0.347	9.80	1,750	2.65	450[2]
051595	30	4,100	0.308	10.1	1,660	2.69	480[2]
052295	31	4,730	0.356	10.5	1,700	2.68	490[2]
053195	32	4,900	0.368	10.8	1,740	2.75	520[2]
060595	33	4,350	0.327	11.2	1,790	2.88	530[2]
061295	34	4,740	0.356	11.5	1,690	2.65	500[2]
061995	35	5,160	0.388	11.9	1,560	2.62	440[2]

Appendix 3.5-34 Table 1 *(Continued)*

Rice Lake High Sulfur Composite (WD-10)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
062695	36	4,660	0.350	12.2	1,630	2.64	450[2]
070395	37	4,740	0.356	12.6	1,700	2.61	NA
071095	38	4,960	0.373	13.0	1,680	2.60	NA
071795	39	0	0.000	13.0			
072495	40	7,720	0.581	13.6	1,880	2.67	NA
073195	41	4,140	0.311	13.9	1,960	2.63	NA
080795	42	4,190	0.315	14.2	1,930	2.69	NA
081495	43	5,010	0.377	14.6	2,020	2.66	NA
082195	44	4,260	0.320	14.9	2,140	2.68	NA
083095	45	5,850	0.440	15.3	2,310	2.66	NA
090595	46	4,320	0.325	15.6	2,360	2.50	860[2]
091195	47	3,860	0.290	15.9	2,570	2.53	870[2]
091895	48	4,960	0.373	16.3	2,430	2.00	840[2]
092595	49	4,390	0.330	16.6	2,440	2.49	810[2]
100395	50	5,070	0.381	17.0	2,330	2.57	770[2]
100995	51	4,640	0.349	17.4	2,460	2.58	800[2]
101695	52	4,640	0.349	17.7	2,340	2.64	820[2]
102395	53	4,420	0.332	18.0	2,420	2.63	760[2]
103095	54	4,460	0.335	18.4	2,420	2.58	740[2]
110695	55	4,800	0.361	18.8	2,470	2.57	770[2]
111395	56	0	0.000	18.8			
112095	57	6,400	0.481	19.2	2,610	2.67	830[2]
112795	58	4,800	0.361	19.6	2,750	2.67	720[2]
120495	59	4,700	0.353	19.9	2,490	2.45	710[2]
121195	60	4,520	0.340	20.3	2,730	2.45	760[2]
121895	61	4,200	0.316	20.6	2,650	2.47	720[2]
122695	62	4,920	0.370	21.0	2,410	2.54	680[2]
010296	63	4,720	0.355	21.3	2,430	2.51	640[2]
010996	64	4,310	0.324	21.6	2,380	2.54	650[2]
011596	65	5,150	0.387	22.0	2,380	2.39	NA

* Conductivity values corrected for temperature.
NA = not analyzed.
x^1 = Alkalinity value.
x^2 = Acidity value.

Appendix 3.5-34 Table 1 *(Continued)*

Upper Mole Lake High Sulfur Composite (WD-11)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
102494	1	6,475	0.385	0.385	1,630	6.79	23[1]
110194	2	2,435	0.145	0.530	1,480	7.08	11[1]
110994	3	4,934	0.294	0.824	1,280	5.38	9[1]
111694	4	2,360	0.141	0.965	1,260	5.69	<5[1]
112194	5	3,050	0.182	1.15	1,260	5.31	<5[1]
112894	6	5,120	0.305	1.45	1,020	5.12	<5[1]
120694	7	4,930	0.294	1.75	948	4.96	<5[1]
121394	8	6,000	0.357	2.10	711	4.90	<5[1]
122094	9	5,500	0.327	2.43	650	4.67	10[2]
122794	10	5,680	0.338	2.77	646	4.52	19[2]
010395	11	3,740	0.223	2.99	659	4.41	18[2]
010995	12	3,700	0.220	3.21	665	4.23	30[2]
011795	13	4,040	0.241	3.45	767	4.17	30[2]
012395	14	4,860	0.289	3.74	815	4.13	32[2]
013095	15	5,640	0.336	4.08	747	4.10	10[2]
020695	16	500	0.030	4.11	764	4.07	36[2]
021395	17	8,160	0.486	4.59	768	4.14	130[2](?)
022095	18	3,480	0.207	4.80	829	4.00	30[2]
022795	19	3,630	0.216	5.02	905	4.03	36[2]
030695	20	4,100	0.244	5.26	957	4.00	34[2]
031395	21	3,410	0.203	5.46	862	3.85	35[2]
032095	22	4,300	0.256	5.72	962	3.79	48[2]
032795	23	4,680	0.279	6.00	1,000	3.93	62[2]
040495	24	4,680	0.279	6.28	878	3.94	41[2]
041095	25	5,030	0.299	6.58	945	3.85	47[2]
041795	26	4,700	0.280	6.86	819	3.88	40[2]
042495	27	4,860	0.289	7.14	835	3.85	60[2]
050195	28	3,400	0.202	7.35	872	3.81	61[2]
050895	29	4,380	0.261	7.61	1,000	3.69	67[2]
051595	30	3,040	0.181	7.79	988	3.73	56[2]
052295	31	3,020	0.180	7.97	989	3.67	81[2]
053195	32	3,800	0.226	8.20	1,040	3.75	78[2]
060595	33	3,360	0.200	8.40	1,120	3.81	78[2]
061295	34	5,280	0.314	8.71	1,070	3.66	88[2]
061995	35	5,480	0.326	9.04	913	3.63	54[2]

Appendix 3.5-34 Table 1 *(Continued)*

Upper Mole Lake High Sulfur Composite (WD-11)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
062695	36	4,160	0.248	9.28	840	3.58	62[2]
070395	37	4,230	0.252	9.54	914	3.48	NA
071095	38	5,400	0.321	9.86	926	3.40	NA
071795	39	0	0.000	9.86			
072495	40	9,350	0.557	10.4	1,170	3.05	NA
073195	41	4,040	0.241	10.6	1,410	2.88	NA
080795	42	5,440	0.324	11.0	1,540	2.87	NA
081495	43	5,820	0.346	11.3	1,580	2.92	NA
082195	44	5,380	0.320	11.6	1,600	2.94	NA
083095	45	5,380	0.320	12.0	1,600	2.94	NA
090695	46	5,010	0.298	12.3	1,680	3.02	280[2]
091195	47	4,480	0.267	12.5	1,860	2.87	310[2]
091895	48	4,190	0.249	12.8	1,880	2.38	340[2]
092595	49	4,640	0.276	13.0	2,020	2.76	380[2]
100395	50	4,400	0.262	13.3	2,040	2.78	430[2]
100995	51	3,830	0.228	13.5	2,200	2.77	500[2]
101695	52	4,590	0.273	13.8	2,280	2.81	500[2]
102395	53	3,800	0.226	14.0	2,400	2.81	600[2]
103095	54	3,870	0.230	14.3	2,430	2.74	540[2]
110695	55	4,500	0.268	14.5	2,450	2.71	600[2]
111395	56	0	0.000	14.5			
112095	57	5,700	0.339	14.9	2,690	2.80	630[2]
112795	58	4,540	0.270	15.2	2,950	2.79	600[2]
120495	59	4,170	0.248	15.4	2,740	2.66	610[2]
121195	60	3,600	0.214	15.6	2,880	2.65	690[2]
121895	61	4,120	0.245	15.8	3,110	2.64	690[2]
122695	62	5,290	0.315	16.2	2,680	2.66	590[2]
010296	63	3,960	0.236	16.4	2,790	2.65	620[2]
010996	64	3,970	0.236	16.6	2,630	2.69	560[2]
011596	65	4,240	0.252	16.9	2,710	2.58	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

x^1 = Alkalinity value.
x^2 = Acidity value.

Appendix 3.5-34 Table 1 *(Continued)*

Lower Mole Lake High Sulfur Composite (WD-12)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Acidity (total, mg/L)
102494	1	5,100	0.364	0.364	2,870	3.91	830
110194	2	7,185	0.513	0.877	4,910	3.71	1,100
110994	3	3,440	0.246	1.12	3,070	4.04	430
111694	4	6,120	0.437	1.56	3,110	3.84	280
112194	5	3,820	0.273	1.83	2,520	3.92	80
112894	6	4,860	0.347	2.18	2,220	4.06	93
120694	7	3,580	0.256	2.44	2,360	4.00	82
121294	8	6,660	0.476	2.91	2,060	4.20	60
122094	9	4,600	0.329	3.24	1,600	4.24	38
122794	10	3,000	0.214	3.46	1,750	4.15	68
010395	11	4,560	0.326	3.78	2,050	4.02	50
010995	12	4,580	0.327	4.11	1,910	3.96	54
011795	13	3,740	0.267	4.38	1,950	3.92	70
012395	14	3,820	0.273	4.65	2,070	3.89	78
013095	15	4,140	0.296	4.94	2,160	3.85	82
020695	16	500	0.036	4.98	2,240	3.86	78
021395	17	8,590	0.614	5.60	2,290	3.89	110
022095	18	5,760	0.411	6.00	2,040	3.89	92
022795	19	4,890	0.349	6.35	1,980	3.87	95
030695	20	5,100	0.364	6.72	2,000	3.85	86
031395	21	5,040	0.360	7.08	1,770	3.71	88
032095	22	5,140	0.367	7.44	1,850	3.66	92
032795	23	4,380	0.313	7.76	1,940	3.78	110
040495	24	4,160	0.297	8.06	1,820	3.79	110
041095	25	4,150	0.296	8.35	2,030	3.71	110
041795	26	3,320	0.237	8.59	1,830	3.73	120
042495	27	5,050	0.361	8.95	1,890	3.69	160
050195	28	4,860	0.347	9.30	1,960	3.68	140
050895	29	5,460	0.390	9.69	1,970	3.64	170
051595	30	5,320	0.380	10.1	1,740	3.65	130
052295	31	5,020	0.359	10.4	1,630	3.70	150
053195	32	6,240	0.446	10.9	1,590	3.73	140
060595	33	4,530	0.324	11.2	1,610	3.89	130
061295	34	4,690	0.335	11.5	1,590	3.66	140
061995	35	4,630	0.331	11.9	1,500	3.67	120

Appendix 3.5-34 Table 1 *(Continued)*

Lower Mole Lake High Sulfur Composite (WD-12)

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Acidity (total, mg/L)
062695	36	4,340	0.310	12.2	1,520	3.67	140
070395	37	4,360	0.311	12.5	1,680	3.62	NA
071095	38	4,460	0.319	12.8	1,630	3.61	NA
071795	39	0	0.000	12.8			
072495	40	5,620	0.401	13.2	1,850	3.48	NA
073195	41	3,600	0.257	13.5	1,970	3.39	NA
080795	42	4,180	0.299	13.8	1,970	3.25	NA
081495	43	3,590	0.256	14.0	1,960	3.39	NA
082195	44	3,780	0.270	14.3	2,030	3.28	NA
083095	45	4,800	0.343	14.6	2,180	3.21	NA
090695	46	3,900	0.279	14.9	2,240	3.19	280
091195	47	4,040	0.289	15.2	2,410	3.01	300
091895	48	4,350	0.311	15.5	2,370	2.57	300
092595	49	4,500	0.321	15.8	2,410	2.91	350
100395	50	4,490	0.321	16.1	2,290	2.92	340
100995	51	4,870	0.348	16.5	2,390	2.89	370
101695	52	4,640	0.331	16.8	2,330	2.98	350
102395	53	4,920	0.351	17.2	2,450	2.92	910
103095	54	4,880	0.349	17.5	2,410	2.93	380
110695	55	4,790	0.342	17.9	2,430	2.84	410
111395	56	0	0.000	17.9			
112095	57	7,500	0.536	18.4	2,600	2.97	410
112795	58	4,840	0.346	18.8	2,750	2.92	380
120495	59	4,820	0.344	19.1	2,530	2.86	380
121195	60	4,760	0.340	19.4	2,740	2.85	440
121895	61	4,880	0.349	19.8	2,730	2.89	410
122695	62	5,140	0.367	20.2	2,410	2.90	350
010296	63	4,800	0.343	20.5	2,470	2.94	350
010996	64	5,040	0.360	20.8	2,430	2.99	360
011596	65	4,120	0.294	21.1	2,390	2.86	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Prepared by: MLD2
Checked by: JET

Appendix 3.5-34 Tables 2-8.
Skunk Lake Waste Rock Master Composite (WD-05) Data and Calculations.

Appendix 3.5-34 Table 2

Sample Characterization
Skunk Lake Waste Rock Master Composite (WD-05)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	63600
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	390
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	5.0
Calcium	Ca	1100
Carbon	C	800
Chromium	Cr	7.0
Cobalt	Co	21
Copper	Cu	860
Gallium	Ga	14
Iron	Fe	46000
Lead	Pb	140
Lithium	Li	NA
Magnesium	Mg	21200
Manganese	Mn	630
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	6
Phosphorus	P	NA
Potassium	K	17900
Selenium	Se	<3
Silicon	Si	311000
Silver	Ag	<0.01
Sodium	Na	1100
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	560
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	240
Sulfur	S	100

ABA Results	
Paste pH	8.7
S (Total) (%)	0.14
SO4 (%)	NA
S (sulfide) (%)	0.13
AP (kg CaCO3/tonne)	4.1
NP (kg CaCO3/tonne)	1.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-3.1
NP/AP	0.24

Note: NA = not analyzed

Sample Mass (kg)	84.55

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 3

Parameters Measured Weekly
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)		ALKALINITY (mg/L)		ACIDITY (mg/L)		SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	5.725	6.2		316		44				**83**	6
2-Nov-94	2	8	5.470	6.3		294		33				**77**	11
9-Nov-94	3	15	4.055	5.7		240		33				66	14
16-Nov-94	4	22	4.930	6.9		192		30				55	17
21-Nov-94	5	27	4.460	6.0		186		34				**44**	19
28-Nov-94	6	34	5.560	6.1		128		27				39	22
5-Dec-94	7	41	4.250	6.5		121		29				33	24
12-Dec-94	8	48	4.930	6.0		126		30				28	25
19-Dec-94	9	55	4.320	7.7		126		31				**23**	26
27-Dec-94	10	63	4.460	7.7		131		28				24	28
3-Jan-95	11	70	4.970	7.6		131		31				25	29
9-Jan-95	12	76	3.740	7.3		108		26				27	30
17-Jan-95	13	84	4.290	7.3		112		26				28	32
23-Jan-95	14	90	4.200	7.6		123		24				29	33
30-Jan-95	15	97	4.580	7.5		123		26				30	35
6-Feb-95	16	104	0.500	7.1		126		23				32	35
13-Feb-95	17	111	8.160	8.3	?	147		23				**33**	38
20-Feb-95	18	118	4.700	7.1		132		26				33	40
27-Feb-95	19	125	4.100	7.4		131		29				32	41
6-Mar-95	20	132	4.780	7.5		141		24				32	43
13-Mar-95	21	139	3.610	7.1		113		200	?			32	45
20-Mar-95	22	146	4.550	7.0		124		20				31	46
27-Mar-95	23	153	4.420	6.8		134		18				31	48
4-Apr-95	24	161	5.080	6.8		129		16				30	50
10-Apr-95	25	167	4.960	6.9		138		20				30	52
17-Apr-95	26	174	4.080	6.7		151	?	16				30	53
24-Apr-95	27	181	3.940	6.6		130		14				29	54
1-May-95	28	188	4.060	6.7		123		24				29	56
8-May-95	29	195	3.580	6.7		120		17				29	57
15-May-95	30	202	4.400	6.9		120		20				28	58
22-May-95	31	209	3.950	7.1		116		16				28	60
30-May-95	32	217	4.840	6.9		113		18				27	61
5-Jun-95	33	223	4.320	6.7		114		18				**27**	63
12-Jun-95	34	230	4.600	7.0		96		22				27	64
19-Jun-95	35	237	5.740	7.5		107		14				26	66
26-Jun-95	36	244	3.980	7.5		103		14				26	67
3-Jul-95	37	251	4.280	7.3		106						26	68
10-Jul-95	38	258	5.260	7.4		110						25	70
17-Jul-95	39	265	0.000										
24-Jul-95	40	272	7.110	7.1		114						25	72
31-Jul-95	41	279	3.320	7.2		117						25	73
7-Aug-95	42	286	4.900	7.1		120						24	74
14-Aug-95	43	293	3.560	7.2		112						24	75

Appendix 3.5-34 Table 3 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
21-Aug-95	44	300	4.460	7.2		114			24	77
30-Aug-95	45	309	5.440	7.1		111			23	78
5-Sep-95	46	315	4.120	7.1		118	12		**23**	79
11-Sep-95	47	321	3.840	7.2		126	12		**24**	80
18-Sep-95	48	328	3.620	7.0		117	13		**35**	82
25-Sep-95	49	335	4.980	6.7	?	113	13		28	83
2-Oct-95	50	342	4.160	6.5	?	104	14		**20**	84
9-Oct-95	51	349	4.280	6.4	?	102	14		**20**	85
16-Oct-95	52	356	4.180	6.4	?	97	13		**39**	87
23-Oct-95	53	363	3.810	6.4	?	98	11		**26**	89
30-Oct-95	54	370	4.770	6.5	?	101	14		**19**	90
6-Nov-95	55	377	4.240	6.3	?	96	13		**19**	91
13-Nov-95	56	384	0.000							
20-Nov-95	57	391	6.320	6.1	?	102	17		**19**	92
27-Nov-95	58	398	4.300	6.1	?	101	18		**19**	93
4-Dec-95	59	405	3.400	7.4		96	17		19	94
11-Dec-95	60	412	4.100	7.3		103	16		19	95
18-Dec-95	61	419	4.060	7.3		122	16		18	96
26-Dec-95	62	427	4.560	7.3		105	15		18	97
2-Jan-96	63	434	3.680	7.1		108	14		18	97
9-Jan-96	64	441	4.520	6.9		100	14		18	98
15-Jan-96	65	447	3.200	6.9		100			17	99
23-Jan-96	66	455	4.100	6.7		87	14		**17**	100
31-Jan-96	67	463	4.010	6.8		101			17	100
7-Feb-96	68	470	4.820	6.7		106			17	101
13-Feb-96	69	476	3.280	6.5		94			17	102
20-Feb-96	70	483	3.780	6.6		93	12		**17**	103
27-Feb-96	71	490	4.650	6.7		105			17	104
5-Mar-96	72	497	4.100	6.6		103			17	105
11-Mar-96	73	503	4.280	7.5		92			16	105
18-Mar-96	74	510	3.960	6.3		87	12		**16**	106
25-Mar-96	75	517	3.450	6.2		94			16	107
2-Apr-96	76	525	4.920	6.3		98			16	108
9-Apr-96	77	532	4.320	6.9		98			16	109
16-Apr-96	78	539	4.440	6.7		96	10		**16**	109
29-Apr-96	79	552	3.820	6.6		101			16	110
7-May-96	80	560	5.120	7.0		107			16	111
13-May-96	81	566	4.160	6.6		93			16	112
21-May-96	82	574	3.820	6.7		96	8		**16**	113
28-May-96	83	581	5.010	6.6		94			17	114
3-Jun-96	84	587	4.300	6.5		92			17	114
10-Jun-96	85	594	4.180	6.7		90			18	115
17-Jun-96	86	601	4.720	6.5		93	8		**18**	116
24-Jun-96	87	608	4.500	6.6		93			19	117
1-Jul-96	88	615	4.340	6.6		88			20	118
8-Jul-96	89	622	3.910	6.5		88			21	119
15-Jul-96	90	629	4.460	6.6		90			21	120
22-Jul-96	91	636	3.560	6.4		85			22	121
30-Jul-96	92	644	5.000	6.5		91	8		**23**	123
5-Aug-96	93	650	0.000							
12-Aug-96	94	657	5.520	6.5		86			22	124
19-Aug-96	95	664	4.970	6.4		81			22	125
29-Aug-96	96	674	4.970	7.1		78	7		**21**	127

Appendix 3.5-34 Table 3 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
2-Sep-96	97	678	0.000						
9-Sep-96	98	685	0.000						
19-Sep-96	99	695	3.320	7.1	106			22	128
23-Sep-96	100	699	0.000						
30-Sep-96	101	706	6.540	7.1	102	10		**23**	129
7-Oct-96	102	713	4.680	7.5	91			21	130
17-Oct-96	103	723	6.050	7.3	80			20	132
24-Oct-96	104	730	4.400	6.6	155	11		**18**	133
1-Nov-96	105	738	4.980	6.9	7				
7-Nov-96	106	744	3.460	7.2	71				

* Measured values of sulfate shown in bold.

Appendix 3.5-34 Table 4

Leachate Analysis
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca		Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	**4.2**	**0.013**	**0.016**	**20**	<	**0.005**	**0.29**	**6.8**	**14**	**0.51**	**13.0**	**0.030**	**11**	**0.11**
2	8	**12**	**0.018**	**0.035**	**19**		**0.017**	**0.56**	**20**	**19**	**0.63**	**10.9**	**0.032**	**8.1**	**0.20**
3	15	8.310	0.016	0.026	16.3		0.013	0.392	13.9	15.1	0.49	10.33	0.0280	6.43	0.145
4	22	4.620	0.013	0.018	13.7		0.009	0.225	7.7	11.2	0.35	9.77	0.0240	4.77	0.089
5	27	**0.93**	**0.011**	**0.009**	**11**	<	**0.005**	**0.057**	**1.6**	**7.3**	**0.21**	**9.2**	**0.020**	**3.1**	**0.034**
6	34	1.098	0.012	0.009	10.4		0.005	0.063	1.8	6.9	0.20	8.75	0.0163	2.68	0.036
7	41	1.265	0.014	0.010	9.8		0.005	0.069	2.0	6.5	0.20	8.30	0.0125	2.25	0.038
8	48	1.433	0.015	0.010	9.1		0.005	0.074	2.1	6.0	0.19	7.85	0.0088	1.83	0.039
9	55	**1.6**	**0.016**	**0.010**	**8.5**		**0.005**	**0.080**	**2.3**	**5.6**	**0.18**	**7.4**	**0.005**	**1.4**	**0.041**
10	63	1.409	0.015	0.009	8.6		0.005	0.073	2.0	5.5	0.18	7.06	0.0051	1.36	0.041
11	70	1.217	0.015	0.009	8.7		0.005	0.066	1.7	5.5	0.18	6.73	0.0053	1.33	0.041
12	76	1.026	0.014	0.008	8.8		0.005	0.058	1.5	5.4	0.18	6.39	0.0054	1.29	0.041
13	84	0.834	0.013	0.008	8.9		0.005	0.051	1.2	5.3	0.18	6.05	0.0055	1.25	0.041
14	90	0.643	0.012	0.007	8.9		0.005	0.044	0.9	5.2	0.17	5.71	0.0056	1.21	0.040
15	97	0.451	0.012	0.006	9.0		0.005	0.037	0.6	5.2	0.17	5.38	0.0058	1.18	0.040
16	104	0.260	0.011	0.006	9.1		0.005	0.029	0.4	5.1	0.17	5.04	0.0059	1.14	0.040
17	111	**0.068**	**0.010**	< **0.005**	**9.2**		**0.005**	**0.022**	**0.097**	**5.0**	**0.17**	**4.7**	**0.006**	**1.1**	**0.040**
18	118	0.070	0.010	0.005	9.2		0.005	0.022	0.11	5.0	0.17	4.57	0.0063	1.09	0.040
19	125	0.071	0.010	0.005	9.2		0.005	0.022	0.11	5.1	0.16	4.44	0.0066	1.08	0.041
20	132	0.073	0.010	0.005	9.3		0.005	0.023	0.12	5.1	0.16	4.31	0.0069	1.06	0.041
21	139	0.074	0.010	0.005	9.3		0.005	0.023	0.13	5.1	0.15	4.18	0.0073	1.05	0.042
22	146	0.076	0.010	0.005	9.3		0.005	0.023	0.14	5.1	0.15	4.04	0.0076	1.04	0.042
23	153	0.077	0.010	0.005	9.3		0.005	0.023	0.15	5.2	0.14	3.91	0.0079	1.03	0.042
24	161	0.079	0.010	0.005	9.3		0.005	0.023	0.16	5.2	0.14	3.78	0.0082	1.01	0.043
25	167	0.080	0.010	0.005	9.3		0.005	0.024	0.16	5.2	0.14	3.65	0.0085	1.00	0.043
26	174	0.082	0.010	0.005	9.4		0.005	0.024	0.17	5.2	0.13	3.52	0.0088	0.99	0.043

Appendix 3.5-34 Table 4 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As		Barium Ba	Calcium Ca		Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	181	0.083	0.010		0.005	9.4		0.005	0.024	0.18	5.3	0.13	3.39	0.0091	0.98	0.044
28	188	0.085	0.010		0.005	9.4		0.005	0.024	0.19	5.3	0.12	3.26	0.0094	0.96	0.044
29	195	0.086	0.010		0.005	9.4		0.005	0.024	0.20	5.3	0.12	3.13	0.0098	0.95	0.045
30	202	0.088	0.010		0.005	9.4		0.005	0.024	0.21	5.3	0.11	2.99	0.0101	0.94	0.045
31	209	0.089	0.010		0.005	9.5		0.005	0.025	0.21	5.4	0.11	2.86	0.0104	0.93	0.045
32	217	0.091	0.010		0.005	9.5		0.005	0.025	0.22	5.4	0.10	2.73	0.0107	0.91	0.046
33	223	**0.092**	**0.01**	**<**	**0.005**	**9.5**		0.005	**0.025**	**0.23**	**5.4**	**0.10**	**2.6**	**0.011**	**0.90**	**0.046**
34	230	0.090	0.010			9.5		0.005	0.025	0.22	5.4	0.10	2.52	0.0110	0.89	0.046
35	237	0.088	0.010			9.4		0.005	0.025	0.21	5.4	0.10	2.44	0.0110	0.88	0.046
36	244	0.085	0.010			9.4		0.005	0.025	0.20	5.4	0.10	2.36	0.0110	0.86	0.046
37	251	0.083	0.010			9.4		0.005	0.024	0.19	5.4	0.10	2.28	0.0110	0.85	0.046
38	258	0.081	0.010			9.3		0.005	0.024	0.19	5.4	0.10	2.20	0.0110	0.84	0.046
39	265															
40	272	0.076	0.010			9.3		0.005	0.024	0.17	5.4	0.10	2.04	0.0110	0.81	0.045
41	279	0.074	0.010			9.2		0.005	0.024	0.16	5.4	0.10	1.96	0.0110	0.80	0.045
42	286	0.072	0.010			9.2		0.005	0.024	0.15	5.4	0.10	1.88	0.0110	0.79	0.045
43	293	0.070	0.010			9.2		0.005	0.023	0.14	5.4	0.10	1.80	0.0110	0.78	0.045
44	300	0.067	0.010			9.1		0.005	0.023	0.13	5.4	0.10	1.73	0.0110	0.76	0.045
45	309	0.065	0.009			9.1		0.005	0.023	0.12	5.4	0.10	1.65	0.0110	0.75	0.045
46	315	0.063	0.009			9.1		0.005	0.023	0.11	5.4	0.10	1.57	0.0110	0.74	0.045
47	321	0.061	0.009			9.0		0.005	0.023	0.11	5.4	0.10	1.49	0.0110	0.73	0.045
48	328	0.058	0.009			9.0		0.005	0.023	0.10	5.4	0.10	1.41	0.0110	0.71	0.045
49	335	0.056	0.009			9.0		0.005	0.022	0.09	5.4	0.10	1.33	0.0110	0.70	0.045
50	342	0.054	0.009			8.9		0.005	0.022	0.08	5.4	0.10	1.25	0.0110	0.69	0.045
51	349	0.052	0.009			8.9		0.005	0.022	0.07	5.4	0.10	1.17	0.0110	0.68	0.045
52	356	0.049	0.009			8.9		0.005	0.022	0.06	5.4	0.10	1.09	0.0110	0.66	0.044
53	363	0.047	0.009			8.8		0.005	0.022	0.05	5.4	0.10	1.01	0.0110	0.65	0.044
54	370	**0.045**	**0.0091**			**8.8**	**<**	**0.005**	0.022	**0.044**	**5.4**	**0.098**	**0.93**	**0.011**	**0.64**	0.044
55	377					8.8			0.021		5.2					0.044
56	384															
57	391					8.7			0.021		4.7					0.044
58	398					**8.6**			0.021		**4.4**					0.044
59	405					8.4			0.021		4.2					0.044
60	412					**8.1**			0.021		**3.9**					0.044
61	419					8.0			0.020		3.9					0.044
62	427					7.9			0.020		3.8					0.044

Appendix 3.5-34 Table 4 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
63	434				7.8		0.020		3.8					0.044
64	441				7.7		0.020		3.7					0.043
65	447				7.6		0.020		3.7					0.043
66	455				7.4		0.020		3.6					0.043
67	463				7.3		0.019		3.6					0.043
68	470				7.2		0.019		3.5					0.043
69	476				7.1		0.019		3.5					0.043
70	483				**7.0**		**0.019**		**3.4**					**0.043**
71	490				7.1				3.5					
72	497				7.2				3.6					
73	503				7.2				3.6					
74	510				**7.3**				**3.7**					
75	517				7.4				3.7					
76	525				7.5				3.7					
77	532				7.6				3.7					
78	539				**7.7**				**3.7**					
79	552				7.8				3.8					
80	560				7.9				3.9					
81	566				8.0				4.0					
82	574				**8.1**				**4.1**					
83	581				7.9				4.0					
84	587				7.7				3.9					
85	594				7.5				3.8					
86	601				**7.3**				**3.7**					
87	608				7.4				3.8					
88	615				7.5				3.8					
89	622				7.7				3.9					
90	629				7.8				3.9					
91	636				7.9				4.0					
92	644				**8.0**				**4.0**					
93														
94	657				7.5				3.8					
95	664				7.3				3.6					
96	674				**7.0**				**3.5**					
97														
98														

Appendix 3.5-34 Table 4 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
99	695				8.2				4.1					
100														
101	706				**9.0**				**4.5**					
102	713				8.4				4.1					
103	723				7.7				3.6					
104	730				**7.1**				**3.2**					

* Measured values shown in bold.

MLD2\93C049\WASTCHAR\REGTEST\WD5.XLS\10000

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 5

Cumulative Mass Flux
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.28	0.001	0.001	1.4	0.000	0.020	0.46	0.9	0.035	0.9	0.002	0.7	0.01
2	8	1.06	0.002	0.003	2.6	0.001	0.06	1.75	2.2	0.075	1.6	0.004	1.3	0.02
3	15	1.46	0.003	0.005	3.4	0.002	0.07	2.42	2.9	0.099	2.1	0.005	1.6	0.03
4	22	1.73	0.004	0.006	4.2	0.003	0.09	2.87	3.6	0.119	2.7	0.007	1.9	0.03
5	27	1.78	0.004	0.006	4.7	0.003	0.09	2.95	3.9	0.130	3.1	0.008	2.0	0.03
6	34	1.85	0.005	0.007	5.4	0.003	0.09	3.07	4.4	0.144	3.7	0.009	2.2	0.04
7	41	1.91	0.006	0.007	5.9	0.003	0.10	3.17	4.7	0.153	4.1	0.010	2.3	0.04
8	48	2.00	0.006	0.008	6.4	0.004	0.10	3.29	5.1	0.164	4.6	0.010	2.4	0.04
9	55	2.08	0.007	0.008	6.9	0.004	0.11	3.41	5.4	0.174	5.0	0.010	2.5	0.04
10	63	2.15	0.008	0.009	7.3	0.004	0.11	3.52	5.6	0.183	5.3	0.011	2.6	0.05
11	70	2.22	0.009	0.009	7.8	0.005	0.11	3.62	6.0	0.193	5.7	0.011	2.6	0.05
12	76	2.27	0.010	0.010	8.2	0.005	0.12	3.69	6.2	0.201	6.0	0.011	2.7	0.05
13	84	2.31	0.010	0.010	8.7	0.005	0.12	3.75	6.5	0.210	6.3	0.011	2.8	0.05
14	90	2.34	0.011	0.010	9.1	0.005	0.12	3.79	6.7	0.219	6.6	0.012	2.8	0.05
15	97	2.37	0.011	0.011	9.6	0.006	0.12	3.83	7.0	0.228	6.9	0.012	2.9	0.06
16	104	2.37	0.012	0.011	9.7	0.006	0.12	3.83	7.0	0.229	6.9	0.012	2.9	0.06
17	111	2.38	0.013	0.011	10.6	0.006	0.13	3.84	7.5	0.245	7.4	0.013	3.0	0.06
18	118	2.38	0.013	0.012	11.1	0.006	0.13	3.84	7.8	0.255	7.6	0.013	3.1	0.06
19	125	2.38	0.014	0.012	11.5	0.007	0.13	3.85	8.0	0.262	7.8	0.013	3.1	0.06
20	132	2.39	0.014	0.012	12.0	0.007	0.13	3.86	8.3	0.271	8.1	0.014	3.2	0.07
21	139	2.39	0.015	0.012	12.4	0.007	0.13	3.86	8.6	0.278	8.3	0.014	3.2	0.07
22	146	2.40	0.015	0.013	12.9	0.007	0.13	3.87	8.8	0.286	8.5	0.014	3.3	0.07
23	153	2.40	0.016	0.013	13.4	0.008	0.13	3.88	9.1	0.293	8.7	0.015	3.3	0.07
24	161	2.40	0.016	0.013	14.0	0.008	0.13	3.89	9.4	0.302	8.9	0.015	3.4	0.07
25	167	2.41	0.017	0.013	14.5	0.008	0.14	3.90	9.7	0.310	9.1	0.016	3.4	0.08

Appendix 3.5-34 Table 5 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	2.41	0.017	0.014	15.0	0.008	0.14	3.91	10.0	0.316	9.3	0.016	3.5	0.08
27	181	2.42	0.018	0.014	15.4	0.009	0.14	3.91	10.2	0.322	9.5	0.017	3.5	0.08
28	188	2.42	0.018	0.014	15.9	0.009	0.14	3.92	10.5	0.328	9.6	0.017	3.6	0.08
29	195	2.42	0.019	0.014	16.3	0.009	0.14	3.93	10.7	0.333	9.8	0.018	3.6	0.09
30	202	2.43	0.019	0.015	16.8	0.009	0.14	3.94	11.0	0.339	9.9	0.018	3.7	0.09
31	209	2.43	0.020	0.015	17.2	0.010	0.14	3.95	11.2	0.344	10.0	0.019	3.7	0.09
32	217	2.44	0.020	0.015	17.7	0.010	0.14	3.96	11.5	0.350	10.2	0.019	3.8	0.09
33	223	2.44	0.021	0.015	18.2	0.010	0.15	3.98	11.8	0.355	10.3	0.020	3.8	0.10
34	230	2.45	0.021	0.015	18.7	0.010	0.15	3.99	12.1	0.360	10.5	0.020	3.9	0.10
35	237	2.45	0.022	0.015	19.4	0.011	0.15	4.00	12.5	0.367	10.6	0.021	3.9	0.10
36	244	2.46	0.022	0.015	19.8	0.011	0.15	4.01	12.7	0.372	10.7	0.022	4.0	0.10
37	251	2.46	0.023	0.015	20.3	0.011	0.15	4.02	13.0	0.377	10.9	0.022	4.0	0.11
38	258	2.47	0.023	0.015	20.9	0.012	0.15	4.03	13.3	0.383	11.0	0.023	4.1	0.11
39	265	2.47	0.023	0.015	20.9	0.012	0.15	4.03	13.3	0.383	11.0	0.023	4.1	0.11
40	272	2.47	0.024		21.7	0.012	0.15	4.05	13.8	0.391	11.2	0.024	4.1	0.11
41	279	2.48	0.025		22.0	0.012	0.16	4.05	14.0	0.395	11.2	0.024	4.2	0.11
42	286	2.48	0.025		22.6	0.012	0.16	4.06	14.3	0.401	11.4	0.025	4.2	0.12
43	293	2.48	0.026		22.9	0.013	0.16	4.07	14.5	0.405	11.4	0.025	4.2	0.12
44	300	2.49	0.026		23.4	0.013	0.16	4.08	14.8	0.410	11.5	0.026	4.3	0.12
45	309	2.49	0.027		24.0	0.013	0.16	4.08	15.2	0.417	11.6	0.027	4.3	0.12
46	315	2.49	0.027		24.5	0.014	0.16	4.09	15.4	0.421	11.7	0.027	4.4	0.13
47	321	2.50	0.028		24.9	0.014	0.16	4.09	15.7	0.426	11.8	0.028	4.4	0.13
48	328	2.50	0.028		25.3	0.014	0.16	4.10	15.9	0.430	11.8	0.028	4.4	0.13
49	335	2.50	0.029		25.8	0.014	0.16	4.10	16.2	0.436	11.9	0.029	4.5	0.13
50	342	2.51	0.029		26.2	0.014	0.17	4.11	16.5	0.441	12.0	0.029	4.5	0.13
51	349	2.51	0.030		26.7	0.015	0.17	4.11	16.8	0.446	12.0	0.030	4.5	0.14
52	356	2.51	0.030		27.1	0.015	0.17	4.11	17.0	0.451	12.1	0.030	4.6	0.14
53	363	2.51	0.030		27.5	0.015	0.17	4.12	17.3	0.455	12.1	0.031	4.6	0.14
54	370	2.52	0.031		28.0	0.015	0.17	4.12	17.6	0.461	12.2	0.032	4.6	0.14
55	377				28.4		0.17		17.8					0.15
56	384				28.4		0.17		17.8					0.15
57	391				29.1		0.17		18.2					0.15
58	398				29.5		0.17		18.4					0.15
59	405				29.9		0.17		18.6					0.15
60	412				30.3		0.18		18.8					0.15
61	419				30.6		0.18		18.9					0.16

Appendix 3.5-34 Table 5 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)											
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
62	427				31.1		0.18		19.1					0.16
63	434				31.4		0.18		19.3					0.16
64	441				31.8		0.18		19.5					0.16
65	447				32.1		0.18		19.6					0.17
66	455				32.5		0.18		19.8					0.17
67	463				32.8		0.18		20.0					0.17
68	470				33.2		0.18		20.2					0.17
69	476				33.5		0.18		20.3					0.17
70	483				33.8		0.19		20.5					0.18
71	490				34.2				20.7					
72	497				34.5				20.8					
73	503				34.9				21.0					
74	510				35.2				21.2					
75	517				35.6				21.3					
76	525				36.0				21.6					
77	532				36.4				21.8					
78	539				36.8				21.9					
79	552				37.1				22.1					
80	560				37.6				22.4					
81	566				38.0				22.5					
82	574				38.4				22.7					
83	581				38.8				23.0					
84	587				39.2				23.2					
85	594				39.6				23.4					
86	601				40.0				23.6					
87	608				40.4				23.8					
88	615				40.8				24.0					
89	622				41.1				24.1					
90	629				41.6				24.3					
91	636				41.9				24.5					
92	644				42.4				24.7					
93	650				42.4				24.7					
94	657				42.8				25.0					
95	664				43.3				25.2					
96	674				43.7				25.4					
97	678				43.7				25.4					

Appendix 3.5-34 Table 5 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)											
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685				43.7				25.4					
99	695				44.0				25.6					
100	699				44.0				25.6					
101	706				44.7				25.9					
102	713				45.2				26.1					
103	723				45.7				26.4					
104	730				46.1				26.6					

Appendix 3.5-34 Table 6

Cumulative Metal Extractions
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

		CUMULATIVE METAL EXTRACTIONS (%)												
CYCLE	DAYS	Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0004	0.0014	0.0003	0.12	0.005	0.0023	0.001	0.004	0.005	0.005	0.07	0.07	0.003
2	8	0.0017	0.0034	0.001	0.23	0.021	0.006	0.004	0.010	0.012	0.009	0.14	0.12	0.008
3	15	0.002	0.005	0.001	0.31	0.029	0.009	0.005	0.014	0.016	0.012	0.18	0.14	0.011
4	22	0.003	0.006	0.001	0.38	0.037	0.010	0.006	0.017	0.019	0.015	0.23	0.17	0.014
5	27	0.003	0.007	0.002	0.43	0.041	0.011	0.006	0.019	0.021	0.018	0.26	0.18	0.014
6	34	0.003	0.008	0.002	0.49	0.045	0.011	0.007	0.021	0.023	0.021	0.30	0.20	0.015
7	41	0.003	0.009	0.002	0.54	0.049	0.011	0.007	0.022	0.024	0.023	0.32	0.21	0.016
8	48	0.003	0.011	0.002	0.59	0.053	0.012	0.007	0.024	0.026	0.026	0.34	0.22	0.017
9	55	0.003	0.012	0.002	0.63	0.057	0.012	0.007	0.025	0.028	0.028	0.35	0.23	0.018
10	63	0.003	0.013	0.002	0.67	0.061	0.013	0.008	0.027	0.029	0.030	0.35	0.23	0.019
11	70	0.003	0.015	0.002	0.71	0.065	0.013	0.008	0.028	0.031	0.032	0.36	0.24	0.020
12	76	0.004	0.016	0.002	0.75	0.068	0.014	0.008	0.029	0.032	0.034	0.37	0.24	0.021
13	84	0.004	0.017	0.003	0.79	0.072	0.014	0.008	0.031	0.033	0.035	0.38	0.25	0.021
14	90	0.004	0.018	0.003	0.83	0.075	0.014	0.008	0.032	0.035	0.037	0.39	0.26	0.022
15	97	0.004	0.019	0.003	0.87	0.079	0.014	0.008	0.033	0.036	0.039	0.40	0.26	0.023
16	104	0.004	0.019	0.003	0.88	0.079	0.014	0.008	0.033	0.036	0.039	0.40	0.26	0.023
17	111	0.004	0.020	0.003	0.96	0.086	0.015	0.008	0.035	0.039	0.041	0.42	0.27	0.025
18	118	0.004	0.021	0.003	1.01	0.090	0.015	0.008	0.037	0.040	0.043	0.43	0.28	0.026
19	125	0.004	0.022	0.003	1.05	0.094	0.015	0.008	0.038	0.042	0.044	0.44	0.28	0.027
20	132	0.004	0.023	0.003	1.09	0.098	0.015	0.008	0.039	0.043	0.045	0.46	0.29	0.028
21	139	0.004	0.024	0.003	1.13	0.101	0.015	0.008	0.040	0.044	0.046	0.47	0.29	0.028
22	146	0.004	0.025	0.003	1.18	0.105	0.015	0.008	0.042	0.045	0.047	0.48	0.30	0.029
23	153	0.004	0.026	0.003	1.22	0.108	0.015	0.008	0.043	0.047	0.049	0.50	0.30	0.030
24	161	0.004	0.027	0.003	1.27	0.113	0.016	0.008	0.044	0.048	0.050	0.51	0.31	0.031
25	167	0.004	0.028	0.003	1.32	0.117	0.016	0.008	0.046	0.049	0.051	0.53	0.31	0.032

Appendix 3.5-34 Table 6 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.004	0.028	0.003	1.36	0.120	0.016	0.008	0.047	0.050	0.052	0.54	0.32	0.033
27	181	0.004	0.029	0.004	1.40	0.124	0.016	0.009	0.048	0.051	0.053	0.56	0.32	0.034
28	188	0.004	0.030	0.004	1.44	0.127	0.016	0.009	0.049	0.052	0.054	0.57	0.33	0.035
29	195	0.004	0.031	0.004	1.48	0.130	0.016	0.009	0.050	0.053	0.054	0.59	0.33	0.036
30	202	0.004	0.031	0.004	1.52	0.134	0.016	0.009	0.052	0.054	0.055	0.60	0.33	0.037
31	209	0.004	0.032	0.004	1.56	0.137	0.017	0.009	0.053	0.055	0.056	0.62	0.34	0.038
32	217	0.004	0.033	0.004	1.61	0.141	0.017	0.009	0.054	0.055	0.057	0.64	0.34	0.039
33	223	0.004	0.034	0.004	1.66	0.145	0.017	0.009	0.056	0.056	0.058	0.66	0.35	0.040
34	230	0.004	0.035	0.004	1.70	0.149	0.017	0.009	0.057	0.057	0.058	0.68	0.35	0.041
35	237	0.004	0.036	0.004	1.76	0.154	0.017	0.009	0.059	0.058	0.059	0.70	0.36	0.042
36	244	0.004	0.037	0.004	1.80	0.157	0.017	0.009	0.060	0.059	0.060	0.72	0.36	0.043
37	251	0.004	0.038	0.004	1.85	0.161	0.018	0.009	0.061	0.060	0.061	0.74	0.36	0.044
38	258	0.004	0.039	0.004	1.90	0.165	0.018	0.009	0.063	0.061	0.061	0.76	0.37	0.045
39	265	0.004	0.039	0.004	1.90	0.165	0.018	0.009	0.063	0.061	0.061	0.76	0.37	0.045
40	272	0.004	0.040		1.97	0.171	0.018	0.009	0.065	0.062	0.062	0.79	0.37	0.047
41	279	0.004	0.040		2.00	0.174	0.018	0.009	0.066	0.063	0.063	0.81	0.38	0.047
42	286	0.004	0.041		2.05	0.178	0.018	0.009	0.067	0.064	0.063	0.83	0.38	0.048
43	293	0.004	0.042		2.09	0.181	0.018	0.009	0.069	0.064	0.064	0.84	0.38	0.049
44	300	0.004	0.043		2.13	0.185	0.018	0.009	0.070	0.065	0.064	0.86	0.39	0.050
45	309	0.004	0.044		2.18	0.189	0.019	0.009	0.072	0.066	0.065	0.89	0.39	0.051
46	315	0.004	0.045		2.22	0.193	0.019	0.009	0.073	0.067	0.065	0.90	0.40	0.052
47	321	0.004	0.045		2.26	0.196	0.019	0.009	0.074	0.068	0.066	0.92	0.40	0.053
48	328	0.004	0.046		2.30	0.199	0.019	0.009	0.075	0.068	0.066	0.94	0.40	0.054
49	335	0.004	0.047		2.34	0.203	0.019	0.009	0.077	0.069	0.067	0.96	0.41	0.055
50	342	0.004	0.048		2.38	0.207	0.019	0.009	0.078	0.070	0.067	0.98	0.41	0.056
51	349	0.004	0.048		2.42	0.211	0.019	0.009	0.079	0.071	0.067	0.99	0.41	0.057
52	356	0.004	0.049		2.46	0.214	0.020	0.009	0.080	0.072	0.068	1.01	0.41	0.058
53	363	0.004	0.050		2.50	0.217	0.020	0.009	0.081	0.072	0.068	1.03	0.42	0.059
54	370	0.004	0.051		2.55	0.221	0.020	0.009	0.083	0.073	0.068	1.05	0.42	0.060
55	377				2.59		0.020		0.084					0.061
56	384				2.59		0.020		0.084					0.061
57	391				2.64		0.020		0.086					0.062
58	398				2.68		0.020		0.087					0.063
59	405				2.71		0.020		0.088					0.064
60	412				2.75		0.020		0.088					0.065
61	419				2.79		0.021		0.089					0.065

Appendix 3.5-34 Table 6 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
62	427				2.82		0.021		0.090					0.066
63	434				2.85		0.021		0.091					0.067
64	441				2.89		0.021		0.092					0.068
65	447				2.92		0.021		0.093					0.069
66	455				2.95		0.021		0.093					0.070
67	463				2.98		0.021		0.094					0.071
68	470				3.02		0.021		0.095					0.072
69	476				3.04		0.021		0.096					0.072
70	483				3.07		0.022		0.097					0.073
71	490				3.11				0.097					
72	497				3.14				0.098					
73	503				3.17				0.099					
74	510				3.20				0.100					
75	517				3.23				0.101					
76	525				3.27				0.102					
77	532				3.31				0.103					
78	539				3.34				0.104					
79	552				3.38				0.104					
80	560				3.42				0.105					
81	566				3.46				0.106					
82	574				3.49				0.107					
83	581				3.53				0.108					
84	587				3.57				0.109					
85	594				3.60				0.110					
86	601				3.64				0.111					
87	608				3.67				0.112					
88	615				3.71				0.113					
89	622				3.74				0.114					
90	629				3.78				0.115					
91	636				3.81				0.116					
92	644				3.85				0.117					
93	650				3.85				0.117					
94	657				3.90				0.118					
95	664				3.93				0.119					
96	674				3.97				0.120					
97	678				3.97				0.120					

Appendix 3.5-34 Table 6 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685				3.97				0.120					
99	695				4.00				0.121					
100	699				4.00				0.121					
101	706				4.06				0.122					
102	713				4.11				0.123					
103	723				4.16				0.125					
104	730				4.19				0.125					

Appendix 3.5-34 Table 7

Metal Extraction Rates
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	8	0.679	0.0010	0.002	1.08	0.0010	0.0317	1.13	1.08	0.036	0.62	0.0018	0.46	0.0113
3	15	0.548	0.0009	0.002	0.94	0.0008	0.0257	0.91	0.91	0.030	0.56	0.0016	0.39	0.0093
4	22	0.460	0.0009	0.001	0.89	0.0007	0.0217	0.77	0.83	0.027	0.56	0.0015	0.35	0.0080
5	27	0.387	0.0008	0.001	0.88	0.0007	0.0184	0.65	0.78	0.025	0.58	0.0015	0.33	0.0070
6	34	0.322	0.0008	0.001	0.84	0.0006	0.0155	0.54	0.71	0.022	0.58	0.0014	0.30	0.0060
7	41	0.181	0.0008	0.001	0.71	0.0004	0.0090	0.30	0.54	0.017	0.54	0.0012	0.22	0.0039
8	48	0.114	0.0008	0.001	0.65	0.0004	0.0059	0.19	0.46	0.014	0.53	0.0010	0.18	0.0029
9	55	0.074	0.0008	0.001	0.58	0.0003	0.0040	0.11	0.38	0.012	0.49	0.0007	0.13	0.0022
10	63	0.073	0.0008	0.001	0.50	0.0003	0.0039	0.11	0.33	0.010	0.43	0.0005	0.10	0.0021
11	70	0.073	0.0008	0.000	0.47	0.0003	0.0038	0.11	0.31	0.010	0.39	0.0004	0.09	0.0021
12	76	0.071	0.0008	0.000	0.46	0.0003	0.0037	0.10	0.30	0.010	0.38	0.0003	0.08	0.0021
13	84	0.061	0.0007	0.000	0.43	0.0003	0.0033	0.09	0.27	0.009	0.34	0.0003	0.07	0.0020
14	90	0.053	0.0007	0.000	0.45	0.0003	0.0030	0.08	0.28	0.009	0.33	0.0003	0.07	0.0021
15	97	0.044	0.0007	0.000	0.47	0.0003	0.0027	0.06	0.28	0.009	0.32	0.0003	0.07	0.0021
16	104	0.030	0.0005	0.000	0.38	0.0002	0.0020	0.04	0.22	0.007	0.25	0.0002	0.05	0.0017
17	111	0.021	0.0006	0.000	0.46	0.0003	0.0018	0.03	0.26	0.009	0.27	0.0003	0.06	0.0021
18	118	0.014	0.0006	0.000	0.49	0.0003	0.0016	0.02	0.27	0.009	0.27	0.0003	0.06	0.0022
19	125	0.008	0.0005	0.000	0.48	0.0003	0.0013	0.01	0.26	0.009	0.25	0.0003	0.06	0.0021
20	132	0.004	0.0005	0.000	0.49	0.0003	0.0012	0.006	0.26	0.009	0.24	0.0003	0.06	0.0021
21	139	0.004	0.0006	0.000	0.55	0.0003	0.0013	0.007	0.30	0.010	0.27	0.0004	0.06	0.0024
22	146	0.004	0.0005	0.0003	0.48	0.0003	0.0012	0.006	0.26	0.008	0.22	0.0004	0.05	0.0021
23	153	0.004	0.0005	0.0003	0.47	0.0003	0.0012	0.007	0.26	0.008	0.21	0.0004	0.05	0.0021
24	161	0.004	0.0005	0.0003	0.48	0.0003	0.0012	0.007	0.26	0.008	0.21	0.0004	0.05	0.0022
25	167	0.004	0.0005	0.0003	0.50	0.0003	0.0012	0.008	0.28	0.008	0.21	0.0004	0.05	0.0023

Appendix 3.5-34 Table 7 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.004	0.0005	0.0003	0.51	0.0003	0.0013	0.008	0.28	0.008	0.21	0.0004	0.06	0.0023
27	181	0.004	0.0005	0.0003	0.50	0.0003	0.0012	0.009	0.28	0.007	0.19	0.0005	0.05	0.0023
28	188	0.004	0.0005	0.0003	0.49	0.0003	0.0012	0.009	0.27	0.007	0.19	0.0005	0.05	0.0023
29	195	0.004	0.0005	0.0003	0.47	0.0003	0.0012	0.009	0.26	0.006	0.17	0.0005	0.05	0.0022
30	202	0.004	0.0005	0.0002	0.45	0.0002	0.0011	0.009	0.25	0.006	0.15	0.0004	0.05	0.0021
31	209	0.004	0.0005	0.0002	0.44	0.0002	0.0011	0.009	0.25	0.006	0.15	0.0005	0.04	0.0021
32	217	0.004	0.0005	0.0002	0.45	0.0002	0.0012	0.010	0.26	0.005	0.14	0.0005	0.04	0.0022
33	223	0.004	0.0005	0.0002	0.47	0.0002	0.0012	0.011	0.27	0.005	0.14	0.0005	0.05	0.0023
34	230	0.005	0.0005		0.50	0.0003	0.0013	0.011	0.28	0.005	0.14	0.0006	0.05	0.0024
35	237	0.005	0.0006		0.53	0.0003	0.0014	0.012	0.30	0.006	0.15	0.0006	0.05	0.0025
36	244	0.005	0.0006		0.53	0.0003	0.0014	0.012	0.30	0.006	0.14	0.0006	0.05	0.0025
37	251	0.005	0.0006		0.53	0.0003	0.0014	0.012	0.30	0.006	0.14	0.0006	0.05	0.0026
38	258	0.005	0.0006		0.53	0.0003	0.0014	0.011	0.30	0.006	0.13	0.0006	0.05	0.0026
39	265													
40	272	0.004	0.0005		0.46	0.0002	0.0012	0.009	0.26	0.005	0.11	0.0005	0.04	0.0022
41	279	0.004	0.0005		0.44	0.0002	0.0011	0.008	0.26	0.005	0.10	0.0005	0.04	0.0021
42	286	0.004	0.0005		0.45	0.0002	0.0012	0.008	0.26	0.005	0.10	0.0005	0.04	0.0022
43	293	0.003	0.0004		0.41	0.0002	0.0011	0.007	0.24	0.004	0.09	0.0005	0.04	0.0020
44	300	0.004	0.0005		0.51	0.0003	0.0013	0.008	0.30	0.005	0.11	0.0006	0.04	0.0025
45	309	0.003	0.0005		0.44	0.0002	0.0011	0.007	0.26	0.005	0.09	0.0005	0.04	0.0022
46	315	0.003	0.0005		0.47	0.0003	0.0012	0.007	0.28	0.005	0.09	0.0006	0.04	0.0023
47	321	0.003	0.0005		0.46	0.0003	0.0012	0.006	0.27	0.005	0.08	0.0006	0.04	0.0023
48	328	0.003	0.0005		0.46	0.0003	0.0012	0.006	0.27	0.005	0.08	0.0006	0.04	0.0023
49	335	0.003	0.0005		0.47	0.0003	0.0012	0.006	0.28	0.005	0.08	0.0006	0.04	0.0023
50	342	0.003	0.0005		0.47	0.0003	0.0012	0.005	0.28	0.005	0.07	0.0006	0.04	0.0023
51	349	0.003	0.0005		0.46	0.0003	0.0011	0.004	0.27	0.005	0.07	0.0006	0.04	0.0023
52	356	0.003	0.0005		0.45	0.0003	0.0011	0.004	0.27	0.005	0.06	0.0006	0.03	0.0022
53	363	0.003	0.0005		0.45	0.0003	0.0011	0.004	0.27	0.005	0.06	0.0006	0.03	0.0023
54	370	0.002	0.0005		0.44	0.0003	0.0011	0.003	0.27	0.005	0.05	0.0006	0.03	0.0022
55	377				0.44		0.0011		0.27					0.0022
56	384													
57	391				0.40		0.0010		0.23					0.0020
58	398				0.40		0.0010		0.23					0.0020
59	405				0.37		0.0009		0.20					0.0019
60	412				0.36		0.0009		0.19					0.0019
61	419				0.44		0.0011		0.22					0.0023

Appendix 3.5-34 Table 7 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
62	427				0.38		0.0010		0.19					0.0021
63	434				0.36		0.0009		0.18					0.0020
64	441				0.38		0.0010		0.18					0.0021
65	447				0.37		0.0010		0.18					0.0021
66	455				0.35		0.0009		0.17					0.0020
67	463				0.34		0.0009		0.16					0.0019
68	470				0.35		0.0009		0.17					0.0021
69	476				0.34		0.0009		0.16					0.0020
70	483				0.33		0.0009		0.16					0.0020
71	490				0.35				0.17					
72	497				0.36				0.17					
73	503				0.36				0.18					
74	510				0.36				0.18					
75	517				0.36				0.18					
76	525				0.36				0.18					
77	532				0.37				0.18					
78	539				0.36				0.18					
79	552				0.31				0.15					
80	560				0.34				0.16					
81	566				0.34				0.17					
82	574				0.33				0.16					
83	581				0.34				0.17					
84	587				0.42				0.21					
85	594				0.41				0.21					
86	601				0.40				0.20					
87	608				0.42				0.21					
88	615				0.40				0.20					
89	622				0.38				0.19					
90	629				0.39				0.20					
91	636				0.38				0.19					
92	644				0.38				0.19					
93	650													
94	657				0.34				0.17					
95	664				0.34				0.17					
96	674				0.33				0.17					
97	678													

Appendix 3.5-34 Table 7 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685													
99	695				0.21				0.11					
100	699													
101	706				0.22				0.11					
102	713				0.30				0.15					
103	723				0.37				0.18					
104	730				0.42				0.20					

Appendix 3.5-34 Table 8

Oxidation and Neutralization Results
Skunk Lake Waste Rock Master Composite (WD-05)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	6	0.13		0.059	0.034	0.039	1.24	7		0.7
2	8	11	0.25	4.4	0.052	0.031	0.051	1.57	15	7.1	1.5
3	15	14	0.33	3.8	0.033	0.020	0.030	1.50	20	6.1	2.0
4	22	17	0.40	3.6	0.033	0.020	0.027	1.40	25	5.6	2.5
5	27	19	0.46	3.5	0.024	0.015	0.016	1.26	28	5.4	2.8
6	34	22	0.52	3.3	0.026	0.017	0.019	1.35	32	5.0	3.2
7	41	24	0.56	2.7	0.017	0.012	0.013	1.47	34	4.0	3.4
8	48	25	0.60	2.4	0.017	0.013	0.014	1.63	37	3.5	3.7
9	55	26	0.63	2.0	0.012	0.011	0.012	1.87	39	3.0	3.9
10	63	28	0.66	1.6	0.013	0.011	0.012	1.77	42	2.6	4.2
11	70	29	0.69	1.4	0.015	0.013	0.013	1.68	44	2.4	4.4
12	76	30	0.72	1.3	0.012	0.010	0.010	1.59	46	2.4	4.6
13	84	32	0.75	1.3	0.015	0.011	0.011	1.51	48	2.2	4.8
14	90	33	0.79	1.4	0.015	0.011	0.011	1.44	51	2.3	5.1
15	97	35	0.83	1.5	0.017	0.012	0.011	1.38	53	2.3	5.3
16	104	35	0.83	1.2	0.002	0.001	0.001	1.32	53	1.8	5.3
17	111	38	0.91	1.6	0.033	0.022	0.020	1.27	57	2.2	5.7
18	118	40	0.95	1.7	0.019	0.013	0.011	1.29	60	2.4	6.0
19	125	41	0.99	1.7	0.016	0.011	0.010	1.31	62	2.3	6.2
20	132	43	1.03	1.7	0.019	0.013	0.012	1.33	64	2.3	6.4
21	139	45	1.06	1.9	0.014	0.010	0.009	1.35	66	2.6	6.6
22	146	46	1.10	1.6	0.017	0.013	0.011	1.37	69	2.3	6.9
23	153	48	1.14	1.6	0.017	0.012	0.011	1.39	71	2.2	7.1
24	161	50	1.18	1.6	0.019	0.014	0.013	1.41	74	2.3	7.4
25	167	52	1.23	1.6	0.018	0.014	0.013	1.43	76	2.4	7.6

Appendix 3.5-34 Table 8 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	174	53	1.26	1.7	0.015	0.011	0.010	1.46	78	2.4	7.8
27	181	54	1.29	1.6	0.014	0.011	0.010	1.48	81	2.4	8.1
28	188	56	1.33	1.6	0.014	0.011	0.010	1.50	83	2.3	8.3
29	195	57	1.35	1.5	0.013	0.010	0.009	1.53	85	2.3	8.5
30	202	58	1.39	1.4	0.015	0.012	0.011	1.55	87	2.1	8.7
31	209	60	1.42	1.3	0.014	0.011	0.010	1.58	89	2.1	8.9
32	217	61	1.46	1.3	0.016	0.014	0.013	1.61	92	2.2	9.2
33	223	63	1.49	1.4	0.014	0.012	0.011	1.63	94	2.3	9.4
34	230	64	1.53	1.4	0.015	0.013	0.012	1.65	97	2.4	9.7
35	237	66	1.57	1.5	0.019	0.016	0.015	1.67	100	2.5	10.0
36	244	67	1.60	1.5	0.013	0.011	0.010	1.68	102	2.5	10.2
37	251	68	1.63	1.5	0.014	0.012	0.011	1.70	104	2.6	10.4
38	258	70	1.67	1.5	0.017	0.015	0.014	1.72	107	2.6	10.7
39	265										
40	272	72	1.72	1.2	0.011	0.019	0.019	3.49	114	2.9	11.4
41	279	73	1.74	1.2	0.010	0.009	0.009	1.77	116	2.8	11.6
42	286	74	1.77	1.2	0.015	0.013	0.013	1.79	119	2.9	11.9
43	293	75	1.80	1.1	0.010	0.010	0.009	1.81	120	2.7	12.0
44	300	77	1.83	1.1	0.013	0.012	0.012	1.83	123	2.5	12.3
45	309	78	1.86	1.2	0.016	0.015	0.014	1.85	126	2.2	12.6
46	315	79	1.89	1.2	0.012	0.011	0.011	1.87	128	2.3	12.8
47	321	80	1.91	1.2	0.011	0.010	0.010	1.79	130	2.3	13.0
48	328	82	1.95	1.3	0.016	0.010	0.010	1.23	132	2.3	13.2
49	335	83	1.99	1.4	0.017	0.013	0.013	1.56	134	2.3	13.4
50	342	84	2.01	1.3	0.010	0.011	0.011	2.14	137	2.3	13.7
51	349	85	2.04	1.3	0.011	0.011	0.011	2.13	139	2.3	13.9
52	356	87	2.08	1.4	0.020	0.011	0.011	1.09	141	2.2	14.1
53	363	89	2.11	1.3	0.012	0.010	0.010	1.64	143	2.3	14.3
54	370	90	2.13	1.2	0.011	0.012	0.013	2.23	146	2.2	14.6
55	377	91	2.16	1.2	0.010	0.011	0.011	2.18	148	2.2	14.8
56	384										
57	391	92	2.19	0.9	0.015	0.016	0.014	2.06	151	1.9	15.1
58	398	93	2.21	0.9	0.010	0.011	0.009	2.00	153	1.9	15.3
59	405	94	2.23	0.8	0.008	0.008	0.007	1.94	154	1.7	15.4
60	412	95	2.25	0.8	0.009	0.010	0.008	1.88	156	1.7	15.6

Appendix 3.5-34 Table 8 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	419	96	2.27	0.3	0.009	0.010	0.008	1.88	158	1.5	15.8
62	427	97	2.30	0.9	0.010	0.011	0.008	1.88	160	1.7	16.0
63	434	97	2.32	0.8	0.008	0.008	0.007	1.89	161	1.6	16.1
64	441	98	2.34	0.9	0.010	0.010	0.008	1.89	163	1.7	16.3
65	447	99	2.35	0.8	0.007	0.007	0.006	1.89	164	1.7	16.4
66	455	100	2.37	0.8	0.009	0.009	0.007	1.89	166	1.6	16.6
67	463	100	2.39	0.8	0.008	0.009	0.007	1.86	168	1.5	16.8
68	470	101	2.42	0.8	0.010	0.010	0.008	1.83	169	1.6	16.9
69	476	102	2.43	0.8	0.007	0.007	0.006	1.81	171	1.5	17.1
70	483	103	2.45	0.8	0.008	0.008	0.006	1.78	172	1.5	17.2
71	490	104	2.47	0.8	0.010	0.010	0.008	1.83	174	1.6	17.4
72	497	105	2.49	0.8	0.008	0.009	0.007	1.89	175	1.6	17.5
73	503	105	2.51	0.8	0.009	0.009	0.008	1.95	177	1.6	17.7
74	510	106	2.53	0.8	0.008	0.009	0.007	2.01	179	1.6	17.9
75	517	107	2.54	0.8	0.007	0.008	0.006	2.02	180	1.6	18.0
76	525	108	2.57	0.8	0.010	0.011	0.009	2.04	182	1.6	18.2
77	532	109	2.59	0.8	0.009	0.010	0.008	2.05	184	1.7	18.4
78	539	109	2.61	0.8	0.009	0.010	0.008	2.07	186	1.6	18.6
79	552	110	2.62	0.7	0.008	0.009	0.007	2.11	187	1.4	18.7
80	560	111	2.65	0.7	0.010	0.012	0.010	2.15	189	1.5	18.9
81	566	112	2.66	0.7	0.008	0.010	0.008	2.19	191	1.6	19.1
82	574	113	2.68	0.7	0.008	0.009	0.008	2.23	193	1.5	19.3
83	581	114	2.70	0.7	0.010	0.012	0.010	2.11	195	1.6	19.5
84	587	114	2.73	0.9	0.009	0.010	0.008	1.99	197	1.9	19.7
85	594	115	2.75	0.9	0.009	0.009	0.008	1.89	198	1.9	19.8
86	601	116	2.77	0.9	0.010	0.010	0.009	1.79	200	1.8	20.0
87	608	117	2.79	1.0	0.010	0.010	0.008	1.73	202	1.9	20.2
88	615	118	2.82	1.0	0.011	0.010	0.008	1.68	204	1.8	20.4
89	622	119	2.84	1.0	0.010	0.009	0.007	1.64	205	1.8	20.5
90	629	120	2.87	1.0	0.012	0.010	0.008	1.60	207	1.8	20.7
91	636	121	2.89	1.0	0.010	0.008	0.007	1.56	209	1.7	20.9
92	644	123	2.92	1.0	0.014	0.012	0.010	1.52	211	1.7	21.1
93	650										
94	657	124	2.96	1.0	0.007	0.012	0.010	3.31	215	2.0	21.5
95	664	125	2.99	1.0	0.013	0.011	0.009	1.48	217	2.0	21.7

Appendix 3.5-34 Table 8 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
96	674	127	3.02	1.0	0.013	0.010	0.008	1.46	219	1.9	21.9
97	678										
98	685										
99	695	128	3.04	0.6	0.009	0.008	0.007	1.62	221	1.0	22.1
100	699										
101	706	129	3.08	0.6	0.019	0.017	0.014	1.71	224	1.0	22.4
102	713	130	3.11	0.8	0.012	0.012	0.009	1.69	226	1.3	22.6
103	723	132	3.14	1.0	0.015	0.014	0.011	1.67	228	1.7	22.8
104	730	133	3.16	1.1	0.010	0.009	0.007	1.65	230	1.9	23.0

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 3.5-34 Tables 9-15.
Rice Lake Waste Rock Master Composite (WD-06) Data and Calculations.

Appendix 3.5-34 Table 9

Sample Characterization
Rice Lake Waste Rock Master Composite (WD-06)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	68000
Antimony	Sb	20
Arsenic	As	<40
Barium	Ba	340
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	7700
Carbon	C	3300
Chromium	Cr	11
Cobalt	Co	19
Copper	Cu	210
Gallium	Ga	14
Iron	Fe	62100
Lead	Pb	150
Lithium	Li	NA
Magnesium	Mg	36000
Manganese	Mn	1400
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	15
Phosphorus	P	NA
Potassium	K	12400
Selenium	Se	<3
Silicon	Si	285000
Silver	Ag	<0.01
Sodium	Na	5100
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	380
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	190
Sulfur	S	<100

ABA Results	
Paste pH	9.1
S (Total) (%)	0.05
SO4 (%)	NA
S (sulfide) (%)	0.05
AP (kg CaCO3/tonne)	1.6
NP (kg CaCO3/tonne)	1.6
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	0.0
NP/AP	1.0

Note: NA = not analyzed

Sample Mass (kg)	126.59

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 10

Parameters Measured Weekly
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)		ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	6.490	7.0		345	130			**43.5**	2
2-Nov-94	2	8	4.785	7.4		315	110			**35.4**	4
9-Nov-94	3	15	3.760	5.7	?	251	100			30	4
16-Nov-94	4	22	7.160	7.5		288	110			24	6
21-Nov-94	5	27	3.400	7.0		238	91			**18.9**	6
28-Nov-94	6	34	2.710	7.4		215	91			17	7
5-Dec-94	7	41	2.480	7.8		214	92			16	7
12-Dec-94	8	48	6.650	7.3		169	71			**14.1**	8
19-Dec-94	9	55	5.400	8.1		195	80			**27.8**	9
27-Dec-94	10	63	3.880	8.1		243	93			26	10
3-Jan-95	11	70	3.900	8.3		233	87			25	11
9-Jan-95	12	76	3.340	8.2		209	89			23	11
17-Jan-95	13	84	3.400	8.2		202	83			21	12
23-Jan-95	14	90	3.820	8.3		210	52			20	12
30-Jan-95	15	97	4.030	8.4		206	51			18	13
6-Feb-95	16	104	0.500	8.2		210	82			17	13
13-Feb-95	17	111	7.480	8.2		217	86			**15**	14
20-Feb-95	18	118	4.460	8.2		199	83			15	14
27-Feb-95	19	125	4.320	8.4		202	82			15	15
6-Mar-95	20	132	4.880	8.2		204	81			14	15
13-Mar-95	21	139	3.820	8.2		174	78			14	16
20-Mar-95	22	146	4.660	8.1		183	76			14	16
27-Mar-95	23	153	4.600	8.1		202	78			14	17
4-Apr-95	24	161	5.740	8.1		181	75			13	17
10-Apr-95	25	167	5.160	8.1		204	73			13	18
17-Apr-95	26	174	3.770	8.2		167	73			13	18
24-Apr-95	27	181	4.400	8.1		166	39	?		13	19
1-May-95	28	188	4.380	8.1		170	80			12	19
8-May-95	29	195	4.960	8.1		168	71			12	20
15-May-95	30	202	5.100	8.1		164	74			12	20
22-May-95	31	209	3.220	8.0		159	68			12	20
30-May-95	32	217	3.780	7.9		157	68			11	21
5-Jun-95	33	223	3.720	7.9		165	70			**11**	21
12-Jun-95	34	230	4.700	8.1		153	70			11	21
19-Jun-95	35	237	5.470	8.3		162	70			11	22
26-Jun-95	36	244	5.100	8.2		156	70			10	22
3-Jul-95	37	251	4.820	8.2		158				10	23
10-Jul-95	38	258	5.150	8.2		154				10	23
17-Jul-95	39	265	0.000								
24-Jul-95	40	272	7.180	8.0		162				9	24
31-Jul-95	41	279	4.480	8.1		158				9	24
7-Aug-95	42	286	4.780	8.1		154				9	24
14-Aug-95	43	293	4.960	8.1		152				9	25

Appendix 3.5-34 Table 10 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)		ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
21-Aug-95	44	300	4.750	8.1		154				8	25
30-Aug-95	45	309	5.620	8.1		157				8	25
5-Sep-95	46	315	4.360	8.2		154	65			**8**	26
11-Sep-95	47	321	4.780	8.0		158	60			**8**	26
18-Sep-95	48	328	4.360	7.9	?	155	65			**8.4**	26
25-Sep-95	49	335	4.340	7.7	?	156	43	?		8	26
2-Oct-95	50	342	3.860	7.6	?	156	64			**7**	27
9-Oct-95	51	349	3.940	7.4	?	157	66			**8**	27
16-Oct-95	52	356	3.880	7.4	?	151	62			**8.7**	27
23-Oct-95	53	363	3.820	7.4	?	153	62			**11**	28
30-Oct-95	54	370	3.840	7.5	?	160	61			**8**	28
6-Nov-95	55	377	3.660	7.4	?	157	61			**7**	28
13-Nov-95	56	384	0.000								
20-Nov-95	57	391	5.170	7.3	?	170	79			**8**	28
27-Nov-95	58	398	3.780	7.3	?	168	68			**7**	29
4-Dec-95	59	405	3.730	8.1		167	67			7	29
11-Dec-95	60	412	4.180	8.2		177	73			7	29
18-Dec-95	61	419	3.920	8.1		204	74			7	29
26-Dec-95	62	427	4.660	8.2		179	71			7	29
2-Jan-96	63	434	3.760	8.1		160	66			6	30
9-Jan-96	64	441	4.000	8.0		161	69			6	30
15-Jan-96	65	447	3.580	8.1		172				6	30
23-Jan-96	66	455	4.180	7.8		167	71			**6**	30
31-Jan-96	67	463	3.940	7.9		166				6	30
7-Feb-96	68	470	4.920	7.9		172				6	31
13-Feb-96	69	476	3.520	7.8		159				6	31
20-Feb-96	70	483	3.720	7.8		163	72			**6**	31
27-Feb-96	71	490	4.240	8.0		173				5	31
5-Mar-96	72	497	4.380	7.9		172				5	31
11-Mar-96	73	503	3.820	7.8		160				5	31
18-Mar-96	74	510	4.280	7.8		153	65			**5**	32
25-Mar-96	75	517	3.640	7.7		157				5	32
2-Apr-96	76	525	4.660	7.6		163				5	32
9-Apr-96	77	532	4.170	8.1		164				5	32
16-Apr-96	78	539	4.000	8.0		166	62			**5**	32
29-Apr-96	79	552	4.320	8.1		164				5	32
7-May-96	80	560	4.620	8.1		161				5	33
13-May-96	81	566	4.160	7.9		158				5	33
21-May-96	82	574	5.180	8.0		150	63			**5**	33
28-May-96	83	581	4.800	8.0		152				5	33
3-Jun-96	84	587	3.840	7.8		139				5	33
10-Jun-96	85	594	4.380	8.0		145				5	33
17-Jun-96	86	601	4.380	8.0		138	60			**5**	34
24-Jun-96	87	608	4.250	8.0		141				6	34
1-Jul-96	88	615	4.580	8.0		132				7	34
8-Jul-96	89	622	3.730	7.9		128				8	34
15-Jul-96	90	629	3.410	7.8		132				9	35
22-Jul-96	91	636	3.460	7.9		132				10	35
30-Jul-96	92	644	3.600	7.8		141	58			**11**	35
5-Aug-96	93	650	0.000								
12-Aug-96	94	657	4.860	7.7		126				7	35
19-Aug-96	95	664	4.560	7.9		135				5	36
29-Aug-96	96	674	4.990	8.2		135	63			**3**	36

Appendix 3.5-34 Table 10 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
2-Sep-96	97	678	0.000						
9-Sep-96	98	685	0.000						
19-Sep-96	99	695	3.800	8.3	217			5	36
23-Sep-96	100	699	0.000						
30-Sep-96	101	706	3.840	8.3	163	62		**7**	36
7-Oct-96	102	713	3.660	8.4	139			5	36
17-Oct-96	103	723	4.720	8.0	144			4	36
24-Oct-96	104	730	3.560	7.8	139	62		**2**	36
1-Nov-96	105	738	3.860	8.0	137				
7-Nov-96	106	744	3.000	8.4	138				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 11

Leachate Analysis
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *																		
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca		Chromium Cr	Copper Cu	Iron Fe		Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo		Nickel Ni	Potassium K	Sodium Na		Titanium Ti	Zinc Zn
1	0	**76**	**0.049**	**0.12**	**20**		**0.054**	**0.85**	**110**		**0.065**	**66**	**2.3**	**0.051**		**0.030**	**19.1**	**43**		**0.11**	**0.57**
2	8	**42**	**0.033**	**0.078**	**14**		**0.043**	**0.52**	**60**		**0.058**	**40**	**1.2**	**0.061**		**0.028**	**17.4**	**30**		**0.083**	**0.34**
3	15	32.3	0.031	0.063	14.0		0.030	0.410	46.7		0.052	33.7	0.940	0.047		0.025	14.90	23.3		0.072	0.270
4	22	22.7	0.028	0.048	14.0		0.018	0.300	33.3		0.046	27.3	0.680	0.034		0.023	12.40	16.7		0.061	0.200
5	27	**13**	**0.026**	**0.033**	**14**	<	**0.005**	**0.19**	**20**	<	**0.040**	**21**	**0.42**	< **0.020**	<	**0.020**	**9.9**	**10**	<	**0.050**	**0.13**
6	34	11.0	0.028	0.036	15.7		0.005	0.303	17.0		0.040	18.3	0.467	0.020		0.020	8.87	8.53		0.050	0.180
7	41	9.0	0.031	0.040	17.3		0.005	0.417	14.0		0.040	15.7	0.513	0.020		0.020	7.83	7.07		0.050	0.230
8	48	**7.0**	**0.033**	**0.043**	**19**		**0.005**	**0.53**	**11**	<	**0.040**	**13**	**0.56**	< **0.020**	<	**0.020**	**6.8**	**5.6**	<	**0.050**	**0.28**
9	55	**19**	**0.022**	**0.037**	**16**		**0.013**	**0.23**	**27**	<	**0.040**	**23**	**0.62**	< **0.020**	<	**0.020**	**9.7**	**5.0**	<	**0.050**	**0.16**
10	63	16.7	0.023	0.034	16.0		0.012	0.213	23.8		0.039	21.3	0.556				9.29	4.83			0.147
11	70	14.5	0.023	0.031	16.0		0.011	0.197	20.6		0.038	19.6	0.493				8.88	4.65			0.134
12	76	12.2	0.024	0.028	16.0		0.010	0.180	17.4		0.038	17.9	0.429				8.46	4.48			0.121
13	84	10.0	0.024	0.026	16.0		0.009	0.163	14.2		0.037	16.3	0.365				8.05	4.30			0.109
14	90	7.7	0.025	0.023	16.0		0.008	0.146	11.0		0.036	14.6	0.301				7.64	4.13			0.096
15	97	5.5	0.025	0.020	16.0		0.007	0.130	7.8		0.035	12.9	0.238				7.23	3.95			0.083
16	104	3.2	0.026	0.017	16.0		0.006	0.113	4.6		0.034	11.2	0.174				6.81	3.78			0.070
17	111	**0.99**	**0.026**	**0.014**	**16**	<	**0.005**	**0.096**	**1.4**		0.033	**9.5**	**0.11**				**6.4**	**3.6**			**0.057**
18	118	0.9	0.027	0.014	16.1		0.005	0.091	1.32		0.033	9.4	0.106				6.20	3.50			0.055
19	125	0.9	0.027	0.013	16.3		0.005	0.085	1.24		0.032	9.3	0.102				6.00	3.40			0.052
20	132	0.8	0.028	0.013	16.4		0.005	0.080	1.16		0.031	9.2	0.098				5.80	3.30			0.050
21	139	0.8	0.028	0.013	16.5		0.005	0.074	1.08		0.030	9.1	0.095				5.60	3.20			0.048
22	146	0.7	0.029	0.012	16.6		0.005	0.069	1.00		0.029	9.0	0.091				5.40	3.10			0.045
23	153	0.7	0.029	0.012	16.8		0.005	0.063	0.92		0.028	8.9	0.087				5.20	3.00			0.043
24	161	0.6	0.030	0.011	16.9		0.005	0.058	0.84		0.028	8.8	0.083				5.00	2.90			0.041
25	167	0.6	0.031	0.011	17.0		0.005	0.053	0.77		0.027	8.8	0.079				4.80	2.80			0.039
26	174	0.5	0.031	0.011	17.1		0.005	0.047	0.69		0.026	8.7	0.075				4.60	2.70			0.036
27	181	0.5	0.032	0.010	17.3		0.005	0.042	0.61		0.025	8.6	0.071				4.40	2.60			0.034
28	188	0.4	0.032	0.010	17.4		0.005	0.036	0.53		0.024	8.5	0.067				4.20	2.50			0.032
29	195	0.4	0.033	0.010	17.5		0.005	0.031	0.45		0.024	8.4	0.064				4.00	2.40			0.029
30	202	0.3	0.033	0.009	17.6		0.005	0.025	0.37		0.023	8.3	0.060				3.80	2.30			0.027

Appendix 3.5-34 Table 11 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
31	209	0.3	0.034	0.009	17.8	0.005	0.020	0.29	0.022	8.2	0.056			3.60	2.20		0.025
32	217	0.2	0.034	0.008	17.9	0.005	0.014	0.21	0.021	8.1	0.052			3.40	2.10		0.022
33	223	**0.18**	**0.035**	**0.008**	**18**	**< 0.005**	**0.009**	**0.13**	0.020	**8.0**	**0.048**			**3.2**	**2.0**	**<**	**0.020**
34	230	0.2	0.035	0.008	18.0	0.005	0.009	0.13	0.019	7.9	0.047			3.14	1.96		0.020
35	237	0.2	0.035	0.008	18.0	0.005	0.009	0.14	0.019	7.8	0.045			3.08	1.91		0.020
36	244	0.2	0.034	0.008	18.0	0.005	0.008	0.14	0.018	7.7	0.044			3.01	1.87		0.020
37	251	0.2	0.034	0.008	18.0	0.005	0.008	0.15	0.017	7.6	0.043			2.95	1.83		0.020
38	258	0.2	0.034	0.008	18.0	0.005	0.008	0.15	0.016	7.5	0.041			2.89	1.79		0.020
39	265																
40	272	0.2	0.034	0.007	18.0	0.005	0.008	0.16	0.015	7.3	0.039			2.77	1.70		0.020
41	279	0.2	0.033	0.007	18.0	0.005	0.007	0.17	0.014	7.2	0.037			2.70	1.66		0.020
42	286	0.2	0.033	0.007	18.0	0.005	0.007	0.17	0.013	7.1	0.036			2.64	1.61		0.020
43	293	0.2	0.033	0.007	18.0	0.005	0.007	0.18	0.012	7.0	0.035			2.58	1.57		0.020
44	300	0.2	0.033	0.007	18.0	0.005	0.007	0.18	0.011	7.0	0.033			2.52	1.53		0.020
45	309	0.2	0.033	0.007	18.0	0.005	0.007	0.19	0.010	6.9	0.032			2.46	1.49		0.020
46	315	0.2	0.033	0.007	18.0	0.005	0.007	0.19	0.010	6.8	0.031			2.40	1.44		0.020
47	321	0.2	0.032	0.007	18.0	0.005	0.006	0.20	0.009	6.7	0.029			2.33	1.40		0.020
48	328	0.2	0.032	0.007	18.0	0.005	0.006	0.20	0.008	6.6	0.028			2.27	1.36		0.020
49	335	0.2	0.032	0.006	18.0	0.005	0.006	0.21	0.007	6.5	0.027			2.21	1.31		0.020
50	342	0.2	0.032	0.006	18.0	0.005	0.006	0.21	0.006	6.4	0.025			2.15	1.27		0.020
51	349	0.2	0.032	0.006	18.0	0.005	0.006	0.22	0.005	6.3	0.024			2.09	1.23		0.020
52	356	0.2	0.031	0.006	18.0	0.005	0.005	0.22	0.005	6.2	0.023			2.02	1.19		0.020
53	363	0.2	0.031	0.006	18.0	0.005	0.005	0.23	0.004	6.1	0.021			1.96	1.14		0.020
54	370	**0.22**	**0.031**	**0.006**	18.0	**< 0.005**	**0.005**	**0.23**	**< 0.003**	**6.0**	**0.02**			**1.9**	**1.1**	**<**	**0.020**
55	377				18.0					6.0							
56	384																
57	391				18.0					6.1							
58	398				**18**					**6.1**							
59	405				18.4					6.1							
60	412				18.8					6.1							
61	419				19.1					6.0							
62	427				19.5					6.0							
63	434				19.9					6.0							
64	441				20.3					6.0							
65	447				20.6					5.9							
66	455				**21**					**5.9**							
67	463				20.8					5.7							
68	470				20.5					5.6							
69	476				20.3					5.4							
70	483				**20**					**5.2**							

Appendix 3.5-34 Table 11 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
71	490				19.8					5.2							
72	497				19.5					5.2							
73	503				19.3					5.2							
74	510				**19**					**5.2**							
75	517				19.3					5.3							
76	525				19.5					5.3							
77	532				19.8					5.4							
78	539				**20**					**5.4**							
79	552				20.3					5.3							
80	560				20.5					5.3							
81	566				20.8					5.2							
82	574				**21**					**5.1**							
83	581				20.5					5.0							
84	587				20.0					5.0							
85	594				19.5					4.9							
86	601				**19**					**4.8**							
87	608				19.2					4.8							
88	615				19.3					4.8							
89	622				19.5					4.9							
90	629				19.7					4.9							
91	636				19.8					4.9							
92	644				**20**					**4.9**							
93	650																
94	657				20.0					4.9							
95	664				20.0					4.8							
96	674				**20**					**4.8**							
97	678																
98	685																
99	695				20.6					5.5							
100	699																
101	706				**21**					**6.0**							
102	713				20.7					5.5							
103	723				20.3					5.0							
104	730				**20**					**4.5**							

* Measured values shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 12

Cumulative Mass Flux
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0	3.90	0.003	0.006	1.0	0.003	0.044	5.64	0.003	3.4	0.118	0.003	0.002	1.0	2.2	0.006	0.029
2	8	5.48	0.004	0.009	1.6	0.004	0.06	7.91	0.006	4.9	0.163	0.005	0.003	1.6	3.3	0.009	0.042
3	15	6.44	0.005	0.011	2.0	0.005	0.08	9.29	0.007	5.9	0.191	0.006	0.003	2.1	4.0	0.011	0.050
4	22	7.73	0.006	0.014	2.8	0.006	0.09	11.18	0.010	7.4	0.230	0.008	0.005	2.8	5.0	0.014	0.061
5	27	8.08	0.007	0.015	3.1	0.006	0.10	11.72	0.011	8.0	0.241	0.009	0.005	3.0	5.2	0.016	0.065
6	34	8.31	0.008	0.015	3.5	0.007	0.10	12.08	0.012	8.4	0.251	0.009	0.006	3.2	5.4	0.017	0.069
7	41	8.49	0.008	0.016	3.8	0.007	0.11	12.35	0.012	8.7	0.261	0.010	0.006	3.4	5.6	0.018	0.073
8	48	8.86	0.010	0.018	4.8	0.007	0.14	12.93	0.014	9.4	0.290	0.011	0.007	3.7	5.9	0.020	0.088
9	55	9.67	0.011	0.020	5.5	0.007	0.15	14.08	0.016	10.4	0.317	0.011	0.008	4.2	6.1	0.023	0.095
10	63	10.18	0.012	0.021	6.0	0.008	0.16	14.81	0.017	11.0	0.334			4.4	6.2		0.099
11	70	10.63	0.012	0.022	6.5	0.008	0.16	15.45	0.019	11.6	0.349			4.7	6.4		0.103
12	76	10.95	0.013	0.023	6.9	0.008	0.17	15.91	0.020	12.1	0.360			4.9	6.5		0.107
13	84	11.22	0.014	0.023	7.3	0.009	0.17	16.29	0.021	12.5	0.370			5.2	6.6		0.110
14	90	11.45	0.014	0.024	7.8	0.009	0.18	16.62	0.022	13.0	0.379			5.4	6.7		0.112
15	97	11.63	0.015	0.025	8.3	0.009	0.18	16.87	0.023	13.4	0.387			5.6	6.8		0.115
16	104	11.64	0.015	0.025	8.4	0.009	0.18	16.89	0.023	13.4	0.388			5.6	6.9		0.115
17	111	11.70	0.017	0.026	9.3	0.009	0.19	16.97	0.025	14.0	0.394			6.0	7.1		0.119
18	118	11.73	0.018	0.026	9.9	0.010	0.19	17.02	0.026	14.3	0.398			6.2	7.2		0.121
19	125	11.76	0.019	0.027	10.5	0.010	0.19	17.06	0.027	14.6	0.401			6.4	7.3		0.122
20	132	11.79	0.020	0.027	11.1	0.010	0.20	17.10	0.028	15.0	0.405			6.7	7.4		0.124
21	139	11.82	0.020	0.027	11.6	0.010	0.20	17.14	0.029	15.3	0.408			6.8	7.5		0.126
22	146	11.84	0.022	0.028	12.2	0.010	0.20	17.17	0.030	15.6	0.411			7.0	7.7		0.127
23	153	11.87	0.023	0.028	12.8	0.011	0.20	17.21	0.031	15.9	0.414			7.2	7.8		0.129
24	161	11.90	0.024	0.029	13.6	0.011	0.21	17.24	0.033	16.3	0.418			7.5	7.9		0.131
25	167	11.92	0.025	0.029	14.3	0.011	0.21	17.28	0.034	16.7	0.421			7.7	8.0		0.132
26	174	11.94	0.026	0.030	14.8	0.011	0.21	17.30	0.034	16.9	0.424			7.8	8.1		0.134
27	181	11.95	0.027	0.030	15.4	0.011	0.21	17.32	0.035	17.2	0.426			7.9	8.2		0.135
28	188	11.97	0.028	0.030	16.0	0.011	0.21	17.34	0.036	17.5	0.428			8.1	8.3		0.136

Appendix 3.5-34 Table 12 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
29	195	11.98	0.030	0.031	16.7	0.012	0.21	17.35	0.037	17.9	0.431			8.2	8.4		0.137
30	202	12.00	0.031	0.031	17.4	0.012	0.21	17.37	0.038	18.2	0.433			8.4	8.4		0.138
31	209	12.00	0.032	0.031	17.8	0.012	0.21	17.38	0.039	18.4	0.435			8.5	8.5		0.139
32	217	12.01	0.033	0.031	18.4	0.012	0.21	17.38	0.039	18.6	0.436			8.6	8.6		0.139
33	223	12.02	0.034	0.032	18.9	0.012	0.21	17.39	0.040	18.9	0.438			8.7	8.6		0.140
34	230	12.02	0.035	0.032	19.5	0.012	0.22	17.39	0.040	19.2	0.439			8.8	8.7		0.141
35	237	12.03	0.037	0.032	20.3	0.013	0.22	17.40	0.041	19.5	0.441			8.9	8.8		0.142
36	244	12.04	0.038	0.033	21.1	0.013	0.22	17.40	0.042	19.8	0.443			9.1	8.9		0.142
37	251	12.05	0.039	0.033	21.7	0.013	0.22	17.41	0.043	20.1	0.445			9.2	8.9		0.143
38	258	12.05	0.041	0.033	22.5	0.013	0.22	17.41	0.043	20.4	0.446			9.3	9.0		0.144
39	265	12.05	0.041	0.033	22.5	0.013	0.22	17.41	0.043	20.4	0.446			9.3	9.0		0.144
40	272	12.06	0.043	0.034	23.5	0.014	0.22	17.42	0.044	20.8	0.449			9.4	9.1		0.145
41	279	12.07	0.044	0.034	24.1	0.014	0.22	17.43	0.045	21.1	0.450			9.5	9.2		0.146
42	286	12.08	0.045	0.034	24.8	0.014	0.22	17.44	0.045	21.4	0.451			9.6	9.2		0.147
43	293	12.09	0.046	0.034	25.5	0.014	0.22	17.44	0.046	21.6	0.453			9.7	9.3		0.147
44	300	12.09	0.048	0.035	26.2	0.014	0.22	17.45	0.046	21.9	0.454			9.8	9.3		0.148
45	309	12.10	0.049	0.035	27.0	0.015	0.22	17.46	0.046	22.2	0.455			9.9	9.4		0.149
46	315	12.11	0.050	0.035	27.6	0.015	0.22	17.46	0.047	22.4	0.456			10.0	9.5		0.150
47	321	12.12	0.051	0.036	28.3	0.015	0.22	17.47	0.047	22.7	0.458			10.1	9.5		0.150
48	328	12.13	0.053	0.036	28.9	0.015	0.22	17.48	0.047	22.9	0.458			10.2	9.6		0.151
49	335	12.13	0.054	0.036	29.5	0.015	0.22	17.49	0.048	23.1	0.459			10.3	9.6		0.152
50	342	12.14	0.055	0.036	30.1	0.015	0.22	17.49	0.048	23.3	0.460			10.3	9.6		0.152
51	349	12.15	0.056	0.036	30.6	0.016	0.22	17.50	0.048	23.5	0.461			10.4	9.7		0.153
52	356	12.15	0.057	0.037	31.2	0.016	0.22	17.51	0.048	23.7	0.462			10.5	9.7		0.154
53	363	12.16	0.057	0.037	31.7	0.016	0.22	17.51	0.048	23.9	0.462			10.5	9.7		0.154
54	370	12.17	0.058	0.037	32.3	0.016	0.22	17.52	0.048	24.1	0.463			10.6	9.8		0.155
55	377				32.8					24.3							
56	384				32.8					24.3							
57	391				33.5					24.5							
58	398				34.1					24.7							
59	405				34.6					24.9							
60	412				35.2					25.1							
61	419				35.8					25.3							
62	427				36.5					25.5							
63	434				37.1					25.6							
64	441				37.8					25.8							
65	447				38.4					26.0							
66	455				39.0					26.2							

Appendix 3.5-34 Table 12 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
67	463				39.7					26.4							
68	470				40.5					26.6							
69	476				41.1					26.7							
70	483				41.6					26.9							
71	490				42.3					27.1							
72	497				43.0					27.3							
73	503				43.6					27.4							
74	510				44.2					27.6							
75	517				44.8					27.7							
76	525				45.5					27.9							
77	532				46.1					28.1							
78	539				46.8					28.3							
79	552				47.4					28.5							
80	560				48.2					28.6							
81	566				48.9					28.8							
82	574				49.7					29.0							
83	581				50.5					29.2							
84	587				51.1					29.4							
85	594				51.8					29.5							
86	601				52.4					29.7							
87	608				53.1					29.9							
88	615				53.8					30.0							
89	622				54.4					30.2							
90	629				54.9					30.3							
91	636				55.4					30.4							
92	644				56.0					30.6							
93	650				56.0					30.6							
94	657				56.8					30.8							
95	664				57.5					30.9							
96	674				58.3					31.1							
97	678				58.3					31.1							
98	685				58.3					31.1							
99	695				58.9					31.3							
100	699				58.9					31.3							
101	706				59.5					31.5							
102	713				60.1					31.6							
103	723				60.9					31.8							
104	730				61.5					32.0							

MLD2\93C049\WASTCHAR\REGTEST\WD6.XLS\10000

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 13

Cumulative Metal Extractions
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0	0.0057	0.0063	0.0018	0.01	0.025	0.0208	0.009	0.002	0.009	0.008	0.01	0.01	0.008	0.04	0.0015	0.015
2	8	0.0081	0.0094	0.003	0.02	0.040	0.030	0.013	0.004	0.014	0.012	0.02	0.02	0.013	0.07	0.0023	0.022
3	15	0.009	0.012	0.003	0.03	0.048	0.036	0.015	0.005	0.016	0.014	0.03	0.02	0.017	0.08	0.0029	0.026
4	22	0.011	0.016	0.004	0.04	0.057	0.044	0.018	0.006	0.021	0.016	0.04	0.03	0.022	0.10	0.0038	0.032
5	27	0.012	0.017	0.004	0.04	0.058	0.046	0.019	0.007	0.022	0.017	0.04	0.03	0.025	0.10	0.0041	0.034
6	34	0.012	0.019	0.005	0.05	0.059	0.050	0.019	0.008	0.023	0.018	0.05	0.04	0.026	0.11	0.0044	0.036
7	41	0.012	0.020	0.005	0.05	0.060	0.053	0.020	0.008	0.024	0.019	0.05	0.04	0.027	0.11	0.0047	0.039
8	48	0.013	0.025	0.005	0.06	0.063	0.067	0.021	0.010	0.026	0.021	0.05	0.05	0.030	0.11	0.0054	0.046
9	55	0.014	0.027	0.006	0.07	0.068	0.071	0.023	0.011	0.029	0.023	0.06	0.05	0.034	0.12	0.0059	0.050
10	63	0.015	0.029	0.006	0.08	0.071	0.074	0.024	0.012	0.031	0.024			0.036	0.12		0.052
11	70	0.016	0.031	0.006	0.08	0.074	0.077	0.025	0.012	0.032	0.025			0.038	0.12		0.054
12	76	0.016	0.032	0.007	0.09	0.077	0.080	0.026	0.013	0.034	0.026			0.040	0.13		0.056
13	84	0.016	0.034	0.007	0.10	0.079	0.082	0.026	0.014	0.035	0.026			0.042	0.13		0.058
14	90	0.017	0.036	0.007	0.10	0.081	0.084	0.027	0.014	0.036	0.027			0.043	0.13		0.059
15	97	0.017	0.038	0.007	0.11	0.083	0.086	0.027	0.015	0.037	0.028			0.045	0.13		0.061
16	104	0.017	0.038	0.007	0.11	0.083	0.086	0.027	0.015	0.037	0.028			0.046	0.13		0.061
17	111	0.017	0.042	0.008	0.12	0.086	0.089	0.027	0.017	0.039	0.028			0.049	0.14		0.062
18	118	0.017	0.044	0.008	0.13	0.087	0.090	0.027	0.017	0.040	0.028			0.050	0.14		0.063
19	125	0.017	0.046	0.008	0.14	0.089	0.092	0.027	0.018	0.041	0.029			0.052	0.14		0.064
20	132	0.017	0.049	0.008	0.14	0.091	0.093	0.028	0.019	0.042	0.029			0.054	0.15		0.065
21	139	0.017	0.051	0.008	0.15	0.092	0.094	0.028	0.019	0.042	0.029			0.055	0.15		0.066
22	146	0.017	0.054	0.008	0.16	0.094	0.095	0.028	0.020	0.043	0.029			0.057	0.15		0.067
23	153	0.017	0.056	0.008	0.17	0.095	0.096	0.028	0.021	0.044	0.030			0.058	0.15		0.068
24	161	0.017	0.060	0.008	0.18	0.098	0.098	0.028	0.022	0.045	0.030			0.060	0.15		0.069
25	167	0.018	0.063	0.009	0.19	0.099	0.099	0.028	0.022	0.046	0.030			0.062	0.16		0.070
26	174	0.018	0.065	0.009	0.19	0.101	0.099	0.028	0.023	0.047	0.030			0.063	0.16		0.070
27	181	0.018	0.068	0.009	0.20	0.102	0.100	0.028	0.024	0.048	0.030			0.064	0.16		0.071
28	188	0.018	0.071	0.009	0.21	0.104	0.101	0.028	0.024	0.049	0.031			0.065	0.16		0.071

Appendix 3.5-34 Table 13 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
29	195	0.018	0.074	0.009	0.22	0.106	0.101	0.028	0.025	0.050	0.031			0.066	0.16		0.072
30	202	0.018	0.077	0.009	0.23	0.108	0.102	0.028	0.025	0.051	0.031			0.068	0.17		0.073
31	209	0.018	0.080	0.009	0.23	0.109	0.102	0.028	0.026	0.051	0.031			0.068	0.17		0.073
32	217	0.018	0.082	0.009	0.24	0.110	0.102	0.028	0.026	0.052	0.031			0.069	0.17		0.073
33	223	0.018	0.085	0.009	0.25	0.111	0.102	0.028	0.027	0.052	0.031			0.070	0.17		0.074
34	230	0.018	0.088	0.009	0.25	0.113	0.102	0.028	0.027	0.053	0.031			0.071	0.17		0.074
35	237	0.018	0.092	0.010	0.26	0.115	0.103	0.028	0.028	0.054	0.032			0.072	0.17		0.074
36	244	0.018	0.095	0.010	0.27	0.117	0.103	0.028	0.028	0.055	0.032			0.073	0.17		0.075
37	251	0.018	0.098	0.010	0.28	0.119	0.103	0.028	0.028	0.056	0.032			0.074	0.18		0.075
38	258	0.018	0.102	0.010	0.29	0.120	0.103	0.028	0.029	0.057	0.032			0.075	0.18		0.076
39	265	0.018	0.102	0.010	0.29	0.120	0.103	0.028	0.029	0.057	0.032			0.075	0.18		0.076
40	272	0.018	0.107	0.010	0.31	0.123	0.103	0.028	0.029	0.058	0.032			0.076	0.18		0.076
41	279	0.018	0.110	0.010	0.31	0.125	0.103	0.028	0.030	0.059	0.032			0.077	0.18		0.077
42	286	0.018	0.113	0.010	0.32	0.126	0.103	0.028	0.030	0.059	0.032			0.078	0.18		0.077
43	293	0.018	0.116	0.010	0.33	0.128	0.104	0.028	0.030	0.060	0.032			0.079	0.18		0.078
44	300	0.018	0.119	0.010	0.34	0.130	0.104	0.028	0.031	0.061	0.032			0.079	0.18		0.078
45	309	0.018	0.123	0.010	0.35	0.132	0.104	0.028	0.031	0.062	0.033			0.080	0.18		0.078
46	315	0.018	0.125	0.010	0.36	0.133	0.104	0.028	0.031	0.062	0.033			0.081	0.19		0.079
47	321	0.018	0.129	0.010	0.37	0.135	0.104	0.028	0.031	0.063	0.033			0.082	0.19		0.079
48	328	0.018	0.131	0.011	0.38	0.137	0.104	0.028	0.032	0.064	0.033			0.082	0.19		0.080
49	335	0.018	0.134	0.011	0.38	0.138	0.104	0.028	0.032	0.064	0.033			0.083	0.19		0.080
50	342	0.018	0.136	0.011	0.39	0.140	0.104	0.028	0.032	0.065	0.033			0.083	0.19		0.080
51	349	0.018	0.139	0.011	0.40	0.141	0.104	0.028	0.032	0.065	0.033			0.084	0.19		0.081
52	356	0.018	0.141	0.011	0.40	0.142	0.105	0.028	0.032	0.066	0.033			0.084	0.19		0.081
53	363	0.018	0.144	0.011	0.41	0.144	0.105	0.028	0.032	0.066	0.033			0.085	0.19		0.081
54	370	0.018	0.146	0.011	0.42	0.145	0.105	0.028	0.032	0.067	0.033			0.085	0.19		0.081
55	377				0.43					0.067							
56	384				0.43					0.067							
57	391				0.44					0.068							
58	398				0.44					0.069							
59	405				0.45					0.069							
60	412				0.46					0.070							
61	419				0.47					0.070							
62	427				0.47					0.071							
63	434				0.48					0.071							
64	441				0.49					0.072							
65	447				0.50					0.072							
66	455				0.51					0.073							

Appendix 3.5-34 Table 13 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
67	463				0.52					0.073							
68	470				0.53					0.074							
69	476				0.53					0.074							
70	483				0.54					0.075							
71	490				0.55					0.075							
72	497				0.56					0.076							
73	503				0.57					0.076							
74	510				0.57					0.077							
75	517				0.58					0.077							
76	525				0.59					0.078							
77	532				0.60					0.078							
78	539				0.61					0.079							
79	552				0.62					0.079							
80	560				0.63					0.080							
81	566				0.63					0.080							
82	574				0.65					0.081							
83	581				0.66					0.081							
84	587				0.66					0.082							
85	594				0.67					0.082							
86	601				0.68					0.083							
87	608				0.69					0.083							
88	615				0.70					0.083							
89	622				0.71					0.084							
90	629				0.71					0.084							
91	636				0.72					0.085							
92	644				0.73					0.085							
93	650				0.73					0.085							
94	657				0.74					0.085							
95	664				0.75					0.086							
96	674				0.76					0.086							
97	678				0.76					0.086							
98	685				0.76					0.086							
99	695				0.76					0.087							
100	699				0.76					0.087							
101	706				0.77					0.087							
102	713				0.78					0.088							
103	723				0.79					0.088							
104	730				0.80					0.089							

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 14

Metal Extraction Rates
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0																
2	8	1.389	0.0011	0.0026	0.46	0.0014	0.0172	1.98	0.0019	1.32	0.040	0.0020	0.001	0.58	0.99	0.003	0.011
3	15	1.189	0.0010	0.0022	0.44	0.0012	0.0149	1.71	0.0017	1.17	0.034	0.0017	0.001	0.51	0.85	0.002	0.010
4	22	1.219	0.0012	0.0024	0.55	0.0011	0.0155	1.76	0.0020	1.29	0.036	0.0018	0.001	0.57	0.88	0.003	0.010
5	27	1.083	0.0012	0.0022	0.55	0.0009	0.0140	1.58	0.0019	1.20	0.032	0.0016	0.001	0.54	0.79	0.003	0.009
6	34	0.909	0.0010	0.0019	0.50	0.0008	0.0124	1.33	0.0017	1.03	0.027	0.0014	0.001	0.46	0.66	0.002	0.008
7	41	0.637	0.0009	0.0015	0.48	0.0005	0.0104	0.94	0.0015	0.81	0.021	0.0010	0.001	0.37	0.47	0.002	0.007
8	48	0.511	0.0011	0.0016	0.60	0.0003	0.0137	0.77	0.0016	0.74	0.021	0.0009	0.001	0.35	0.39	0.002	0.008
9	55	0.411	0.0010	0.0013	0.58	0.0002	0.0122	0.62	0.0014	0.62	0.018	0.0007	0.001	0.29	0.23	0.002	0.007
10	63	0.409	0.0009	0.0013	0.55	0.0003	0.0114	0.60	0.0013	0.59	0.018			0.27	0.19		0.007
11	70	0.450	0.0009	0.0013	0.58	0.0003	0.0114	0.65	0.0014	0.63	0.019			0.29	0.18		0.007
12	76	0.492	0.0009	0.0013	0.62	0.0004	0.0110	0.71	0.0014	0.68	0.020			0.31	0.18		0.007
13	84	0.459	0.0007	0.0010	0.49	0.0003	0.0061	0.65	0.0012	0.61	0.016			0.27	0.14		0.004
14	90	0.357	0.0007	0.0008	0.46	0.0003	0.0052	0.51	0.0011	0.52	0.012			0.25	0.13		0.004
15	97	0.298	0.0007	0.0008	0.48	0.0003	0.0049	0.42	0.0011	0.49	0.011			0.24	0.13		0.003
16	104	0.209	0.0006	0.0006	0.39	0.0002	0.0037	0.30	0.0009	0.37	0.008			0.19	0.10		0.002
17	111	0.150	0.0008	0.0006	0.49	0.0002	0.0038	0.21	0.0011	0.38	0.007			0.22	0.12		0.002
18	118	0.106	0.0008	0.0006	0.53	0.0002	0.0037	0.15	0.0011	0.37	0.006			0.22	0.12		0.002
19	125	0.062	0.0009	0.0005	0.53	0.0002	0.0033	0.09	0.0011	0.33	0.004			0.21	0.12		0.002
20	132	0.033	0.0009	0.0005	0.55	0.0002	0.0031	0.047	0.0011	0.32	0.004			0.21	0.12		0.002
21	139	0.036	0.0011	0.0005	0.64	0.0002	0.0034	0.050	0.0013	0.37	0.004			0.24	0.14		0.002
22	146	0.029	0.0010	0.0005	0.57	0.0002	0.0028	0.041	0.0011	0.32	0.003			0.20	0.12		0.002
23	153	0.028	0.0010	0.0004	0.58	0.0002	0.0026	0.038	0.0011	0.32	0.003			0.20	0.11		0.002
24	161	0.027	0.0011	0.0004	0.61	0.0002	0.0025	0.036	0.0011	0.33	0.003			0.20	0.11		0.002
25	167	0.026	0.0011	0.0004	0.64	0.0002	0.0024	0.035	0.0011	0.34	0.003			0.20	0.11		0.002
26	174	0.024	0.0011	0.0004	0.64	0.0002	0.0022	0.032	0.0010	0.33	0.003			0.19	0.11		0.002
27	181	0.022	0.0011	0.0004	0.64	0.0002	0.0020	0.029	0.0010	0.33	0.003			0.18	0.11		0.001
28	188	0.020	0.0011	0.0004	0.63	0.0002	0.0018	0.026	0.0010	0.32	0.003			0.17	0.10		0.001

Appendix 3.5-34 Table 14 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
29	195	0.018	0.0012	0.0004	0.64	0.0002	0.0015	0.022	0.0009	0.32	0.003			0.16	0.10		0.001
30	202	0.015	0.0012	0.0004	0.62	0.0002	0.0013	0.018	0.0009	0.30	0.002			0.15	0.09		0.001
31	209	0.013	0.0011	0.0003	0.61	0.0002	0.0011	0.016	0.0008	0.29	0.002			0.14	0.08		0.001
32	217	0.011	0.0011	0.0003	0.58	0.0002	0.0009	0.012	0.0008	0.27	0.002			0.13	0.08		0.001
33	223	0.010	0.0011	0.0003	0.58	0.0002	0.0007	0.010	0.0007	0.27	0.002			0.12	0.07		0.001
34	230	0.008	0.0011	0.0003	0.58	0.0002	0.0005	0.007	0.0007	0.26	0.002			0.11	0.07		0.001
35	237	0.007	0.0011	0.0003	0.59	0.0002	0.0004	0.006	0.0007	0.26	0.002			0.11	0.07		0.001
36	244	0.007	0.0012	0.0003	0.65	0.0002	0.0003	0.005	0.0007	0.28	0.002			0.11	0.07		0.001
37	251	0.007	0.0013	0.0003	0.70	0.0002	0.0003	0.005	0.0007	0.30	0.002			0.12	0.07		0.001
38	258	0.007	0.0014	0.0003	0.72	0.0002	0.0003	0.006	0.0007	0.31	0.002			0.12	0.07		0.001
39	265																
40	272	0.007	0.0012	0.0003	0.63	0.0002	0.0003	0.005	0.0006	0.26	0.001			0.10	0.06		0.001
41	279	0.007	0.0012	0.0003	0.62	0.0002	0.0003	0.005	0.0005	0.25	0.001			0.10	0.06		0.001
42	286	0.007	0.0011	0.0002	0.61	0.0002	0.0003	0.006	0.0005	0.25	0.001			0.09	0.06		0.001
43	293	0.007	0.0011	0.0002	0.61	0.0002	0.0003	0.006	0.0005	0.24	0.001			0.09	0.06		0.001
44	300	0.008	0.0014	0.0003	0.74	0.0002	0.0003	0.007	0.0005	0.30	0.001			0.11	0.07		0.001
45	309	0.007	0.0012	0.0003	0.66	0.0002	0.0003	0.007	0.0004	0.26	0.001			0.09	0.06		0.001
46	315	0.008	0.0012	0.0003	0.68	0.0002	0.0003	0.007	0.0004	0.26	0.001			0.09	0.06		0.001
47	321	0.008	0.0013	0.0003	0.70	0.0002	0.0003	0.007	0.0004	0.27	0.001			0.10	0.06		0.001
48	328	0.008	0.0012	0.0003	0.68	0.0002	0.0002	0.007	0.0004	0.26	0.001			0.09	0.05		0.001
49	335	0.008	0.0012	0.0002	0.67	0.0002	0.0002	0.007	0.0003	0.25	0.001			0.09	0.05		0.001
50	342	0.008	0.0012	0.0002	0.65	0.0002	0.0002	0.007	0.0003	0.24	0.001			0.08	0.05		0.001
51	349	0.007	0.0011	0.0002	0.62	0.0002	0.0002	0.007	0.0002	0.22	0.001			0.08	0.05		0.001
52	356	0.007	0.0010	0.0002	0.58	0.0002	0.0002	0.007	0.0002	0.21	0.001			0.07	0.04		0.001
53	363	0.007	0.0010	0.0002	0.56	0.0002	0.0002	0.007	0.0002	0.20	0.001			0.07	0.04		0.001
54	370	0.007	0.0010	0.0002	0.55	0.0002	0.0002	0.007	0.0001	0.19	0.001			0.06	0.04		0.001
55	377				0.54					0.19							
56	384																
57	391				0.47					0.16							
58	398				0.47					0.16							
59	405				0.47					0.16							
60	412				0.49					0.16							
61	419				0.61					0.20							
62	427				0.58					0.19							
63	434				0.60					0.19							
64	441				0.61					0.19							
65	447				0.62					0.19							
66	455				0.63					0.18							

Appendix 3.5-34 Table 14 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
67	463				0.61					0.18							
68	470				0.65					0.18							
69	476				0.66					0.18							
70	483				0.64					0.17							
71	490				0.65					0.17							
72	497				0.68					0.18							
73	503				0.65					0.17							
74	510				0.65					0.17							
75	517				0.64					0.17							
76	525				0.63					0.17							
77	532				0.63					0.17							
78	539				0.62					0.17							
79	552				0.54					0.15							
80	560				0.56					0.15							
81	566				0.58					0.15							
82	574				0.60					0.15							
83	581				0.63					0.16							
84	587				0.73					0.18							
85	594				0.74					0.18							
86	601				0.72					0.18							
87	608				0.69					0.17							
88	615				0.68					0.17							
89	622				0.65					0.16							
90	629				0.62					0.16							
91	636				0.60					0.15							
92	644				0.57					0.14							
93	650																
94	657				0.48					0.12							
95	664				0.52					0.13							
96	674				0.52					0.13							
97	678																
98	685																
99	695				0.39					0.10							
100	699																
101	706				0.27					0.08							
102	713				0.37					0.10							
103	723				0.48					0.13							
104	730				0.51					0.13							

Compiled by: RWL\MLD2
Checked by: JET

MLD2\93C049\WASTCHAR\REGTEST\WD6.XLS\10000

Appendix 3.5-34 Table 15

Oxidation and Neutralization Results
Rice Lake Waste Rock Master Composite (WD-06)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	2	0.15		0.023	0.026	0.139	7.10	16		1.0
2	8	4	0.24	1.17	0.014	0.013	0.062	5.41	24	6.60	1.5
3	15	4	0.30	1.04	0.009	0.010	0.041	5.57	29	5.93	1.8
4	22	6	0.39	1.15	0.014	0.020	0.064	5.80	38	6.70	2.3
5	27	6	0.42	1.07	0.005	0.009	0.023	6.17	41	6.30	2.5
6	34	7	0.45	0.92	0.004	0.008	0.016	6.36	43	5.51	2.7
7	41	7	0.47	0.73	0.003	0.008	0.013	6.59	45	4.52	2.8
8	48	8	0.52	0.70	0.008	0.025	0.028	6.88	51	4.56	3.2
9	55	9	0.60	0.66	0.012	0.017	0.040	4.65	56	4.00	3.5
10	63	10	0.65	0.66	0.008	0.012	0.027	4.68	60	3.80	3.8
11	70	11	0.70	0.74	0.008	0.012	0.025	4.71	64	4.04	4.0
12	76	11	0.74	0.82	0.006	0.011	0.019	4.75	67	4.34	4.2
13	84	12	0.78	0.76	0.006	0.011	0.018	4.79	70	3.74	4.4
14	90	12	0.82	0.67	0.006	0.012	0.018	4.84	73	3.30	4.6
15	97	13	0.86	0.64	0.006	0.013	0.017	4.90	76	3.21	4.7
16	104	13	0.86	0.50	0.001	0.002	0.002	4.98	76	2.51	4.8
17	111	14	0.92	0.54	0.009	0.024	0.023	5.06	81	2.77	5.1
18	118	14	0.96	0.55	0.005	0.014	0.014	5.14	84	2.84	5.2
19	125	15	0.99	0.51	0.005	0.014	0.013	5.23	86	2.69	5.4
20	132	15	1.03	0.50	0.006	0.016	0.015	5.31	89	2.71	5.6
21	139	16	1.05	0.57	0.004	0.012	0.011	5.40	92	3.11	5.7
22	146	16	1.09	0.50	0.005	0.015	0.014	5.50	95	2.76	5.9
23	153	17	1.12	0.49	0.005	0.015	0.013	5.59	98	2.77	6.1
24	161	17	1.16	0.50	0.006	0.019	0.017	5.69	101	2.87	6.3
25	167	18	1.20	0.51	0.006	0.017	0.015	5.80	104	2.98	6.5

Appendix 3.5-34 Table 15 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	174	18	1.22	0.50	0.004	0.013	0.011	5.91	107	2.97	6.7
27	181	19	1.25	0.49	0.005	0.015	0.012	6.02	109	2.94	6.8
28	188	19	1.28	0.47	0.004	0.015	0.012	6.14	112	2.91	7.0
29	195	20	1.31	0.46	0.005	0.017	0.014	6.26	115	2.89	7.2
30	202	20	1.34	0.44	0.005	0.018	0.014	6.38	118	2.80	7.4
31	209	20	1.36	0.42	0.003	0.011	0.009	6.52	120	2.73	7.5
32	217	21	1.38	0.39	0.003	0.013	0.010	6.66	123	2.57	7.7
33	223	21	1.40	0.38	0.003	0.013	0.010	6.80	125	2.56	7.8
34	230	21	1.43	0.36	0.004	0.017	0.012	6.91	128	2.53	8.0
35	237	22	1.46	0.36	0.005	0.019	0.014	7.03	131	2.56	8.2
36	244	22	1.49	0.39	0.004	0.018	0.013	7.15	134	2.78	8.4
37	251	23	1.51	0.41	0.004	0.017	0.012	7.27	137	2.99	8.6
38	258	23	1.54	0.41	0.004	0.018	0.013	7.41	140	3.06	8.8
39	265										
40	272	24	1.58	0.35	0.007	0.026	0.017	6.26	143	2.35	8.9
41	279	24	1.60	0.33	0.003	0.016	0.011	7.84	146	2.26	9.1
42	286	24	1.62	0.32	0.004	0.017	0.011	8.00	148	2.24	9.3
43	293	25	1.64	0.31	0.004	0.018	0.011	8.17	151	2.21	9.5
44	300	25	1.66	0.39	0.003	0.017	0.011	8.35	154	3.08	9.6
45	309	25	1.69	0.32	0.004	0.020	0.013	8.54	157	2.72	9.8
46	315	26	1.71	0.32	0.003	0.015	0.010	8.74	160	2.77	10.0
47	321	26	1.73	0.32	0.003	0.017	0.010	8.69	162	2.83	10.2
48	328	26	1.75	0.31	0.003	0.015	0.009	8.23	165	2.75	10.3
49	335	26	1.76	0.30	0.003	0.015	0.009	8.93	167	2.69	10.5
50	342	27	1.78	0.29	0.002	0.014	0.008	9.77	170	2.62	10.6
51	349	27	1.80	0.27	0.003	0.014	0.008	8.50	172	2.48	10.7
52	356	27	1.81	0.26	0.003	0.014	0.008	7.78	174	2.30	10.9
53	363	28	1.84	0.27	0.003	0.014	0.008	6.12	176	2.22	11.0
54	370	28	1.85	0.26	0.003	0.014	0.007	8.36	178	2.15	11.1
55	377	28	1.87	0.26	0.002	0.013	0.007	9.57	180	2.12	11.3
56	384										
57	391	28	1.89	0.22	0.002	0.018	0.010	18.06	186	2.35	11.6
58	398	29	1.90	0.20	0.002	0.013	0.007	9.61	188	2.34	11.7
59	405	29	1.91	0.19	0.002	0.014	0.007	9.91	190	2.34	11.9
60	412	29	1.93	0.19	0.002	0.015	0.008	10.21	192	2.41	12.0

Appendix 3.5-34 Table 15 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	419	29	1.94	0.20	0.002	0.015	0.008	10.52	194	2.33	12.2
62	427	29	1.96	0.21	0.002	0.018	0.009	10.85	197	2.24	12.3
63	434	30	1.97	0.21	0.002	0.015	0.007	11.19	199	2.26	12.5
64	441	30	1.98	0.20	0.002	0.016	0.008	11.54	202	2.31	12.6
65	447	30	2.00	0.20	0.002	0.015	0.007	11.90	204	2.34	12.7
66	455	30	2.01	0.19	0.002	0.017	0.008	12.28	206	2.33	12.9
67	463	30	2.02	0.18	0.002	0.016	0.007	12.07	209	2.26	13.1
68	470	31	2.04	0.19	0.002	0.020	0.009	11.85	212	2.39	13.2
69	476	31	2.05	0.19	0.002	0.014	0.006	11.64	214	2.39	13.4
70	483	31	2.06	0.19	0.002	0.015	0.006	11.42	216	2.31	13.5
71	490	31	2.07	0.19	0.002	0.017	0.007	13.59	218	2.34	13.6
72	497	31	2.08	0.19	0.002	0.017	0.007	13.47	221	2.43	13.8
73	503	31	2.09	0.18	0.002	0.015	0.006	13.35	223	2.34	13.9
74	510	32	2.10	0.17	0.002	0.016	0.007	13.23	225	2.33	14.1
75	517	32	2.11	0.17	0.001	0.014	0.006	13.39	227	2.31	14.2
76	525	32	2.13	0.16	0.002	0.018	0.008	13.55	230	2.29	14.4
77	532	32	2.14	0.16	0.002	0.016	0.007	13.71	232	2.28	14.5
78	539	32	2.15	0.16	0.002	0.016	0.007	13.87	234	2.25	14.6
79	552	32	2.16	0.14	0.002	0.017	0.007	13.93	237	1.95	14.8
80	560	33	2.17	0.14	0.002	0.019	0.008	13.99	239	2.01	15.0
81	566	33	2.18	0.14	0.002	0.017	0.007	14.05	242	2.08	15.1
82	574	33	2.20	0.15	0.002	0.021	0.009	14.11	245	2.14	15.3
83	581	33	2.21	0.15	0.002	0.019	0.008	13.81	248	2.21	15.5
84	587	33	2.22	0.18	0.002	0.015	0.006	13.51	250	2.59	15.6
85	594	33	2.23	0.18	0.002	0.017	0.007	13.21	252	2.61	15.8
86	601	34	2.24	0.18	0.002	0.016	0.007	12.91	254	2.52	15.9
87	608	34	2.25	0.18	0.002	0.016	0.007	10.84	257	2.44	16.0
88	615	34	2.27	0.20	0.003	0.017	0.007	9.36	259	2.39	16.2
89	622	34	2.29	0.21	0.002	0.014	0.006	8.25	261	2.29	16.3
90	629	35	2.30	0.22	0.003	0.013	0.005	7.38	263	2.19	16.4
91	636	35	2.32	0.24	0.003	0.014	0.005	6.69	265	2.11	16.6
92	644	35	2.34	0.26	0.003	0.014	0.006	6.12	267	1.99	16.7
93	650										
94	657	35	2.36	0.22	0.001	0.019	0.008	19.16	272	2.14	17.0
95	664	36	2.37	0.21	0.002	0.018	0.007	13.41	274	2.27	17.1

Appendix 3.5-34 Table 15 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
96	674	36	2.38	0.16	0.001	0.020	0.008	22.32	277	2.25	17.3
97	678										
98	685										
99	695	36	2.39	0.08	0.001	0.015	0.007	39.51	284	2.28	17.8
100	699										
101	706	36	2.41	0.08	0.001	0.016	0.007	16.92	289	2.57	18.1
102	713	36	2.42	0.09	0.002	0.015	0.007	13.37	291	2.26	18.2
103	723	36	2.42	0.10	0.001	0.019	0.008	18.70	294	2.15	18.4
104	730	36	2.43	0.11	0.001	0.014	0.005	32.89	296	2.27	18.5

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 3.5-34 Tables 16-22.
Upper Mole Lake Waste Rock Master Composite (WD-07) Data and Calculations.

Appendix 3.5-34 Table 16

Sample Characterization
Upper Mole Lake Waste Rock Master Composite (WD-07)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	71000
Antimony	Sb	30
Arsenic	As	<40
Barium	Ba	360
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	6
Calcium	Ca	13400
Carbon	C	5300
Chromium	Cr	12
Cobalt	Co	25
Copper	Cu	240
Gallium	Ga	15
Iron	Fe	65900
Lead	Pb	260
Lithium	Li	NA
Magnesium	Mg	32100
Manganese	Mn	1300
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	10
Phosphorus	P	NA
Potassium	K	11400
Selenium	Se	<3
Silicon	Si	285000
Silver	Ag	<0.01
Sodium	Na	6900
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	60
Titanium	Ti	690
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	190
Sulfur	S	400

ABA Results	
Paste pH	8.0
S (Total) (%)	0.10
SO4 (%)	NA
S (sulfide) (%)	0.10
AP (kg CaCO3/tonne)	3.1
NP (kg CaCO3/tonne)	48.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	44.9
NP/AP	15.5

Note: NA = not analyzed

Sample Mass (kg)	133.18

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 17

Parameters Measured Weekly
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	6.700	7.0	380	120		**48**	2.4
2-Nov-94	2	8	4.915	7.2	358	120		**44.7**	4.1
9-Nov-94	3	15	4.550	6.1	301	110		43	5.5
16-Nov-94	4	22	2.490	7.6	339	110		41	6.3
21-Nov-94	5	27	3.760	7.2	322	100		**39.8**	7.4
28-Nov-94	6	34	7.950	7.6	217	87		35	9.5
5-Dec-94	7	41	3.360	7.8	246	100		30	10.3
12-Dec-94	8	48	4.700	7.8	256	97		25	11.2
19-Dec-94	9	55	4.340	7.7	256	93		**20.6**	11.9
27-Dec-94	10	63	4.080	8.2	268	96		23	12.6
3-Jan-95	11	70	4.650	8.3	266	94		26	13.5
9-Jan-95	12	76	3.730	8.3	224	91		28	14.3
17-Jan-95	13	84	4.020	8.4	228	90		31	15.2
23-Jan-95	14	90	3.780	8.3	233	88		33	16.1
30-Jan-95	15	97	5.040	7.7	296	71		36	17.5
6-Feb-95	16	104	0.500	8.1	291	68		38	17.6
13-Feb-95	17	111	7.990	8.1	264	79		**41**	20.1
20-Feb-95	18	118	4.460	8.3	220	88		39	21.4
27-Feb-95	19	125	3.960	8.5	222	86		37	22.5
6-Mar-95	20	132	3.960	8.4	228	84		36	23.6
13-Mar-95	21	139	3.590	8.3	203	82		34	24.5
20-Mar-95	22	146	4.390	8.2	215	78		32	25.5
27-Mar-95	23	153	3.750	8.3	235	80		30	26.4
4-Apr-95	24	161	3.240	8.3	212	78		28	27.1
10-Apr-95	25	167	4.080	8.0	276	67		27	27.9
17-Apr-95	26	174	5.100	8.3	211	78		25	28.8
24-Apr-95	27	181	4.300	8.3	191	77		23	29.6
1-May-95	28	188	4.120	8.3	193	84		21	30.2
8-May-95	29	195	3.940	8.1	197	75		19	30.8
15-May-95	30	202	3.540	8.2	192	76		17	31.3
22-May-95	31	209	4.900	8.2	190	79		16	31.8
30-May-95	32	217	5.740	8.1	180	76		14	32.4
5-Jun-95	33	223	4.320	7.5	177	75		**12**	32.8
12-Jun-95	34	230	4.700	8.2	168	74		12	33.2
19-Jun-95	35	237	5.180	8.4	176	82		12	33.7
26-Jun-95	36	244	4.120	8.3	171	73		12	34.1
3-Jul-95	37	251	4.600	8.3	181			12	34.5
10-Jul-95	38	258	4.860	8.1	174			12	34.9
17-Jul-95	39	265	0.000						
24-Jul-95	40	272	7.230	8.1	182			11	35.5

Appendix 3.5-34 Table 17 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
31-Jul-95	41	279	4.080	8.2		175			11	35.9
7-Aug-95	42	286	4.670	8.2		172			11	36.3
14-Aug-95	43	293	4.450	8.3		172			11	36.6
21-Aug-95	44	300	4.700	8.2		170			11	37.0
30-Aug-95	45	309	5.100	8.2		173			11	37.4
5-Sep-95	46	315	3.960	8.3		176	70		**11**	37.8
11-Sep-95	47	321	3.900	8.2		184	67		**11**	38.1
18-Sep-95	48	328	4.340	8.1		176	69		**14**	38.5
25-Sep-95	49	335	4.800	7.9	?	182	68		12	39.0
2-Oct-95	50	342	5.160	7.8	?	176	71		**9**	39.3
9-Oct-95	51	349	4.730	7.6	?	172	70		15	39.8
16-Oct-95	52	356	4.700	7.7	?	167	69		**12**	40.3
23-Oct-95	53	363	4.600	7.6	?	168	69		**11**	40.6
30-Oct-95	54	370	5.020	7.7	?	183	55		**9**	41.0
6-Nov-95	55	377	4.800	7.5	?	175	65		**8**	41.3
13-Nov-95	56	384	0.000							
20-Nov-95	57	391	7.560	7.4	?	186	81		**8**	41.7
27-Nov-95	58	398	4.570	7.5	?	185	75		**8**	42.0
4-Dec-95	59	405	4.380	8.2		178	72			
11-Dec-95	60	412	4.320	8.2		189	77			
18-Dec-95	61	419	4.420	8.2		224	83			
26-Dec-95	62	427	4.840	8.3		193	86			
2-Jan-96	63	434	4.160	8.2		179	80			
9-Jan-96	64	441	4.360	8.0		176	74			
15-Jan-96	65	447	4.160	8.2		190				
23-Jan-96	66	455	4.670	8.0		183				
31-Jan-96	67	463	4.720	8.0		186				
7-Feb-96	68	470	4.200	8.0		186				
13-Feb-96	69	476	3.430	7.9		176				
20-Feb-96	70	483	3.370	8.0		177				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 18

Leachate Analysis
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Calcium Ca		Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn		Molybdenum Mo	Potassium K		Selenium Se	Sodium Na	Zinc Zn
1	0	**20**	**0.022**	**0.045**	**13**		**0.015**	**0.22**	**30**	**20**	**0.51**		**0.054**	**12.9**		**0.009**	**49**	**0.19**
2	8	**14**	**0.22**	**0.029**	**12**		**0.012**	**0.17**	**20**	**17**	**0.34**		**0.050**	**16.2**		**0.012**	**36**	**0.14**
3	15	10.3	0.151	0.024	13.3		0.010	0.126	14.8	15.7	0.260		0.046	14.70		0.011	30.00	0.108
4	22	6.5	0.081	0.020	14.7		0.007	0.081	9.53	14.3	0.180		0.043	13.20		0.009	24.00	0.075
5	27	**2.8**	**0.012**	**0.015**	**16**	<	**0.005**	**0.037**	**4.3**	**13**	**0.10**		**0.039**	**11.7**		**0.008**	**18**	**0.043**
6	34	5.1	0.019	0.019	16.5		0.006	0.055	7.48	14.3	0.153		0.034	11.18		0.008	15.40	0.057
7	41	7.4	0.026	0.023	17.0		0.007	0.074	10.65	15.5	0.205		0.030	10.65		0.008	12.80	0.071
8	48	9.7	0.033	0.026	17.5		0.007	0.092	13.83	16.8	0.258		0.025	10.13		0.008	10.20	0.085
9	55	**12**	**0.015**	**0.030**	**18**		**0.008**	**0.11**	**17**	**18**	**0.31**	<	**0.020**	**9.6**		**0.008**	**7.6**	**0.099**
10	63	10.7	0.015	0.029	18.4		0.008	0.105	15.20	17.3	0.299		0.021	9.26		0.008	7.19	0.262
11	70	9.4	0.014	0.028	18.8		0.007	0.099	13.40	16.5	0.288		0.023	8.93		0.007	6.78	0.424
12	76	8.1	0.014	0.026	19.1		0.007	0.094	11.60	15.8	0.276		0.024	8.59		0.007	6.36	0.587
13	84	6.8	0.013	0.025	19.5		0.007	0.088	9.80	15.0	0.265		0.025	8.25		0.007	5.95	0.750
14	90	5.5	0.013	0.024	19.9		0.006	0.083	8.00	14.3	0.254		0.026	7.91		0.006	5.54	0.912
15	97	4.2	0.012	0.023	20.3		0.006	0.077	6.20	13.5	0.243		0.028	7.58		0.006	5.13	1.075
16	104	2.9	0.012	0.021	20.6		0.005	0.072	4.40	12.8	0.231		0.029	7.24		0.005	4.71	1.237
17	111	**1.6**	**0.011**	**0.020**	**21**	<	**0.005**	**0.066**	**2.6**	**12**	**0.22**		**0.030**	**6.9**	<	**0.005**	**4.3**	**1.4**
18	118	1.5	0.012	0.019	20.9		0.005	0.062	2.44	11.8	0.207		0.029	6.74		0.005	4.17	1.315
19	125	1.4	0.012	0.018	20.8		0.005	0.059	2.29	11.6	0.194		0.029	6.57		0.006	4.04	1.230
20	132	1.3	0.013	0.017	20.6		0.005	0.055	2.13	11.4	0.181		0.028	6.41		0.006	3.91	1.145
21	139	1.2	0.013	0.017	20.5		0.005	0.051	1.97	11.2	0.169		0.028	6.25		0.006	3.78	1.060
22	146	1.1	0.014	0.016	20.4		0.005	0.047	1.82	10.9	0.156		0.027	6.09		0.007	3.64	0.974
23	153	1.1	0.014	0.015	20.3		0.005	0.044	1.66	10.7	0.143		0.026	5.93		0.007	3.51	0.889
24	161	1.0	0.015	0.014	20.1		0.005	0.040	1.50	10.5	0.130		0.026	5.76		0.007	3.38	0.804
25	167	0.9	0.016	0.013	20.0		0.005	0.036	1.35	10.3	0.117		0.025	5.60		0.008	3.25	0.719
26	174	0.8	0.016	0.012	19.9		0.005	0.032	1.19	10.1	0.104		0.024	5.44		0.008	3.12	0.634

Appendix 3.5-34 Table 18 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *														
		Aluminum Al	Arsenic As		Barium Ba	Calcium Ca		Chromium Cr		Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn		Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	181	0.7	0.017		0.011	19.8		0.005		0.029	1.03	9.9	0.091		0.024	5.28	0.008	2.99	0.549
28	188	0.6	0.017		0.010	19.6		0.005		0.025	0.88	9.7	0.078		0.023	5.11	0.008	2.86	0.464
29	195	0.5	0.018		0.010	19.5		0.005		0.021	0.72	9.5	0.066		0.023	4.95	0.009	2.73	0.379
30	202	0.4	0.018		0.009	19.4		0.005		0.017	0.56	9.2	0.053		0.022	4.79	0.009	2.59	0.293
31	209	0.3	0.019		0.008	19.3		0.005		0.014	0.41	9.0	0.040		0.021	4.63	0.009	2.46	0.208
32	217	0.2	0.019		0.007	19.1		0.005		0.010	0.25	8.8	0.027		0.021	4.46	0.010	2.33	0.123
33	223	**0.14**	**0.020**		**0.006**	**19**		0.005		**0.006**	**0.093**	**8.6**	**0.014**	<	**0.020**	**4.3**	**0.010**	**2.2**	**0.038**
34	230	0.1	0.020		0.006	19.0		0.005		0.006	0.09	8.5	0.014			4.20	0.010	2.15	0.038
35	237	0.1	0.020		0.006	19.1		0.005		0.006	0.10	8.5	0.014			4.10	0.010	2.10	0.037
36	244	0.1	0.020		0.006	19.1		0.005		0.006	0.10	8.4	0.013			4.00	0.010	2.06	0.037
37	251	0.1	0.020		0.006	19.2		0.005		0.006	0.10	8.4	0.013			3.90	0.010	2.01	0.037
38	258	0.1	0.020		0.006	19.2		0.005		0.006	0.10	8.3	0.013			3.80	0.010	1.96	0.036
39	265																		
40	272	0.1	0.019		0.006	19.3		0.005		0.006	0.10	8.2	0.013			3.60	0.010	1.87	0.036
41	279	0.1	0.019		0.006	19.4		0.005		0.006	0.10	8.1	0.012			3.50	0.010	1.82	0.035
42	286	0.1	0.019		0.006	19.4		0.005		0.006	0.10	8.0	0.012			3.40	0.010	1.77	0.035
43	293	0.1	0.019		0.006	19.5		0.005		0.006	0.11	8.0	0.012			3.30	0.010	1.72	0.035
44	300	0.1	0.019		0.005	19.5		0.005		0.005	0.11	7.9	0.012			3.20	0.010	1.68	0.034
45	309	0.1	0.019		0.005	19.6		0.005		0.005	0.11	7.9	0.012			3.10	0.010	1.63	0.034
46	315	0.1	0.019		0.005	19.6		0.005		0.005	0.11	7.8	0.012			3.00	0.010	1.58	0.034
47	321	0.1	0.019		0.005	19.7		0.005		0.005	0.11	7.7	0.011			2.90	0.010	1.53	0.033
48	328	0.1	0.019		0.005	19.7		0.005		0.005	0.11	7.7	0.011			2.80	0.010	1.49	0.033
49	335	0.1	0.018		0.005	19.8		0.005		0.005	0.11	7.6	0.011			2.70	0.010	1.44	0.033
50	342	0.1	0.018		0.005	19.8		0.005		0.005	0.11	7.5	0.011			2.60	0.010	1.39	0.032
51	349	0.1	0.018		0.005	19.9		0.005		0.005	0.12	7.5	0.011			2.50	0.010	1.34	0.032
52	356	0.1	0.018		0.005	19.9		0.005		0.005	0.12	7.4	0.010			2.40	0.010	1.30	0.032
53	363	0.1	0.018		0.005	20.0		0.005		0.005	0.12	7.4	0.010			2.30	0.010	1.25	0.031
54	370	**0.13**	**0.018**	<	**0.005**	**20**	<	**0.005**	<	**0.005**	**0.12**	**7.3**	**0.010**			**2.2**	**0.010**	**1.2**	**0.031**
55	377					20.3						7.4							
56	384																		
57	391					20.8						7.5							
58	398					**21**						**7.6**							

* Measured values shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 19

Cumulative Mass Flux
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	1.01	0.001	0.002	0.7	0.001	0.011	1.51	1.01	0.026	0.003	0.6	0.000	2.5	0.01
2	8	1.52	0.009	0.003	1.1	0.001	0.017	2.25	1.63	0.038	0.005	1.2	0.001	3.8	0.01
3	15	1.87	0.014	0.004	1.6	0.002	0.022	2.75	2.17	0.047	0.006	1.7	0.001	4.8	0.02
4	22	2.00	0.016	0.005	1.8	0.002	0.023	2.93	2.44	0.050	0.007	2.0	0.001	5.3	0.02
5	27	2.07	0.016	0.005	2.3	0.002	0.024	3.05	2.80	0.053	0.008	2.3	0.002	5.8	0.02
6	34	2.38	0.017	0.006	3.3	0.002	0.027	3.50	3.65	0.062	0.010	3.0	0.002	6.7	0.02
7	41	2.57	0.018	0.007	3.7	0.002	0.029	3.77	4.05	0.068	0.011	3.3	0.002	7.0	0.03
8	48	2.91	0.019	0.008	4.3	0.003	0.033	4.25	4.64	0.077	0.012	3.6	0.003	7.4	0.03
9	55	3.30	0.020	0.009	4.9	0.003	0.036	4.81	5.22	0.087	0.012	3.9	0.003	7.6	0.03
10	63	3.63	0.020	0.009	5.5	0.003	0.039	5.27	5.75	0.096	0.013	4.2	0.003	7.8	0.04
11	70	3.96	0.021	0.010	6.1	0.003	0.043	5.74	6.33	0.106	0.014	4.5	0.003	8.1	0.06
12	76	4.18	0.021	0.011	6.6	0.004	0.045	6.07	6.77	0.114	0.014	4.8	0.004	8.3	0.07
13	84	4.39	0.021	0.012	7.2	0.004	0.048	6.36	7.22	0.122	0.015	5.0	0.004	8.4	0.09
14	90	4.5	0.022	0.013	7.8	0.004	0.050	6.59	7.63	0.129	0.016	5.2	0.004	8.6	0.12
15	97	4.7	0.022	0.013	8.6	0.004	0.053	6.82	8.14	0.138	0.017	5.5	0.004	8.8	0.16
16	104	4.7	0.022	0.013	8.6	0.004	0.054	6.84	8.18	0.139	0.017	5.6	0.004	8.8	0.17
17	111	4.8	0.023	0.015	9.9	0.004	0.058	7.00	8.90	0.152	0.019	6.0	0.004	9.1	0.25
18	118	4.9	0.023	0.015	10.6	0.005	0.060	7.08	9.30	0.159	0.020	6.2	0.005	9.2	0.29
19	125	4.9	0.024	0.016	11.2	0.005	0.061	7.15	9.64	0.165	0.021	6.4	0.005	9.3	0.33
20	132	4.9	0.024	0.016	11.8	0.005	0.063	7.21	9.98	0.170	0.022	6.6	0.005	9.4	0.36
21	139	5.0	0.024	0.017	12.4	0.005	0.064	7.26	10.28	0.175	0.022	6.7	0.005	9.5	0.39
22	146	5.0	0.025	0.017	13.1	0.005	0.066	7.32	10.64	0.180	0.023	7.0	0.005	9.7	0.42
23	153	5.0	0.025	0.018	13.6	0.005	0.067	7.37	10.94	0.184	0.024	7.1	0.006	9.8	0.45
24	161	5.1	0.026	0.018	14.1	0.005	0.068	7.41	11.20	0.187	0.025	7.3	0.006	9.8	0.47
25	167	5.1	0.026	0.018	14.7	0.006	0.069	7.45	11.52	0.191	0.025	7.4	0.006	9.9	0.49

Appendix 3.5-34 Table 19 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	5.1	0.027	0.019	15.5	0.006	0.071	7.49	11.90	0.195	0.026	7.6	0.006	10.1	0.52
27	181	5.1	0.027	0.019	16.1	0.006	0.071	7.53	12.22	0.198	0.027	7.8	0.007	10.2	0.53
28	188	5.2	0.028	0.020	16.7	0.006	0.072	7.55	12.52	0.200	0.028	8.0	0.007	10.2	0.55
29	195	5.2	0.028	0.020	17.3	0.006	0.073	7.57	12.80	0.202	0.028	8.1	0.007	10.3	0.56
30	202	5.2	0.029	0.020	17.8	0.006	0.073	7.59	13.05	0.203	0.029	8.2	0.007	10.4	0.57
31	209	5.2	0.029	0.020	18.5	0.007	0.074	7.60	13.38	0.205	0.030	8.4	0.008	10.5	0.57
32	217	5.2	0.030	0.021	19.4	0.007	0.074	7.62	13.76	0.206	0.031	8.6	0.008	10.6	0.58
33	223	5.2	0.031	0.021	20.0	0.007	0.074	7.62	14.04	0.206	0.031	8.7	0.008	10.7	0.58
34	230	5.2	0.032	0.021	20.7	0.007	0.075	7.62	14.34	0.207		8.9	0.009	10.7	0.58
35	237	5.2	0.032	0.021	21.4	0.007	0.075	7.63	14.67	0.207		9.0	0.009	10.8	0.58
36	244	5.2	0.033	0.022	22.0	0.007	0.075	7.63	14.93	0.208		9.2	0.009	10.9	0.58
37	251	5.2	0.034	0.022	22.6	0.008	0.075	7.63	15.22	0.208		9.3	0.010	11.0	0.59
38	258	5.2	0.034	0.022	23.4	0.008	0.075	7.64	15.52	0.209		9.4	0.010	11.0	0.59
39	265	5.2	0.034	0.022	23.4	0.008	0.075	7.64	15.52	0.209		9.4	0.010	11.0	0.59
40	272	5.2	0.035	0.022	24.4	0.008	0.076	7.64	15.96	0.209		9.6	0.011	11.1	0.59
41	279	5.3	0.036	0.022	25.0	0.008	0.076	7.64	16.21	0.210		9.7	0.011	11.2	0.59
42	286	5.3	0.037	0.023	25.7	0.008	0.076	7.65	16.49	0.210		9.9	0.011	11.2	0.59
43	293	5.3	0.037	0.023	26.3	0.009	0.076	7.65	16.76	0.211		10.0	0.012	11.3	0.59
44	300	5.3	0.038	0.023	27.0	0.009	0.076	7.66	17.04	0.211		10.1	0.012	11.4	0.59
45	309	5.3	0.039	0.023	27.8	0.009	0.077	7.66	17.34	0.212		10.2	0.012	11.4	0.60
46	315	5.3	0.039	0.023	28.3	0.009	0.077	7.66	17.57	0.212		10.3	0.013	11.5	0.60
47	321	5.3	0.040	0.024	28.9	0.009	0.077	7.67	17.80	0.212		10.4	0.013	11.5	0.60
48	328	5.3	0.040	0.024	29.6	0.009	0.077	7.67	18.05	0.213		10.5	0.013	11.6	0.60
49	335	5.3	0.041	0.024	30.3	0.010	0.077	7.67	18.32	0.213		10.6	0.014	11.6	0.60
50	342	5.3	0.042	0.024	31.0	0.010	0.078	7.68	18.61	0.213		10.7	0.014	11.7	0.60
51	349	5.3	0.042	0.024	31.8	0.010	0.078	7.68	18.88	0.214		10.8	0.014	11.7	0.60
52	356	5.3	0.043	0.024	32.5	0.010	0.078	7.69	19.14	0.214		10.8	0.015	11.8	0.60
53	363	5.3	0.044	0.025	33.1	0.010	0.078	7.69	19.40	0.215		10.9	0.015	11.8	0.60
54	370	5.3	0.044	0.025	33.9	0.011	0.078	7.69	19.67	0.215		11.0	0.016	11.8	0.61
55	377				34.6				19.94						
56	384				34.6				19.94						
57	391				35.8				20.36						
58	398				36.5				20.62						

Appendix 3.5-34 Table 20

Cumulative Metal Extractions
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.001	0.003	0.0006	0.00	0.006	0.005	0.002	0.00	0.002	0.014	0.006	0.02	0.04	0.005
2	8	0.002	0.023	0.001	0.01	0.010	0.007	0.003	0.01	0.003	0.023	0.011	0.03	0.05	0.008
3	15	0.003	0.036	0.001	0.01	0.013	0.009	0.004	0.01	0.004	0.031	0.015	0.04	0.07	0.010
4	22	0.003	0.040	0.001	0.01	0.014	0.010	0.004	0.01	0.004	0.035	0.018	0.05	0.08	0.010
5	27	0.003	0.041	0.001	0.02	0.015	0.010	0.005	0.01	0.004	0.040	0.020	0.06	0.08	0.011
6	34	0.003	0.043	0.002	0.02	0.018	0.011	0.005	0.01	0.005	0.050	0.026	0.07	0.10	0.013
7	41	0.004	0.045	0.002	0.03	0.019	0.012	0.006	0.01	0.005	0.054	0.029	0.08	0.10	0.014
8	48	0.004	0.048	0.002	0.03	0.021	0.014	0.006	0.01	0.006	0.059	0.032	0.09	0.11	0.015
9	55	0.005	0.049	0.002	0.04	0.024	0.015	0.007	0.02	0.007	0.062	0.034	0.10	0.11	0.017
10	63	0.005	0.050	0.003	0.04	0.026	0.016	0.008	0.02	0.007	0.065	0.037	0.10	0.11	0.021
11	70	0.006	0.052	0.003	0.05	0.028	0.018	0.009	0.02	0.008	0.069	0.040	0.11	0.12	0.029
12	76	0.006	0.052	0.003	0.05	0.029	0.019	0.009	0.02	0.009	0.072	0.042	0.12	0.12	0.038
13	84	0.006	0.053	0.003	0.05	0.031	0.020	0.010	0.02	0.009	0.076	0.044	0.13	0.12	0.050
14	90	0.006	0.054	0.003	0.06	0.032	0.021	0.010	0.02	0.010	0.080	0.046	0.13	0.12	0.063
15	97	0.007	0.055	0.004	0.06	0.034	0.022	0.010	0.03	0.011	0.085	0.048	0.14	0.13	0.085
16	104	0.007	0.056	0.004	0.06	0.034	0.022	0.010	0.03	0.011	0.086	0.049	0.14	0.13	0.087
17	111	0.007	0.057	0.004	0.07	0.037	0.024	0.011	0.03	0.012	0.095	0.052	0.15	0.13	0.131
18	118	0.007	0.058	0.004	0.08	0.038	0.025	0.011	0.03	0.012	0.099	0.054	0.15	0.13	0.155
19	125	0.007	0.059	0.004	0.08	0.039	0.026	0.011	0.03	0.013	0.104	0.056	0.16	0.14	0.174
20	132	0.007	0.060	0.005	0.09	0.041	0.026	0.011	0.03	0.013	0.108	0.058	0.17	0.14	0.192
21	139	0.007	0.061	0.005	0.09	0.042	0.027	0.011	0.03	0.013	0.112	0.059	0.17	0.14	0.207
22	146	0.007	0.062	0.005	0.10	0.043	0.027	0.011	0.03	0.014	0.116	0.061	0.18	0.14	0.224
23	153	0.007	0.063	0.005	0.10	0.044	0.028	0.011	0.03	0.014	0.120	0.062	0.19	0.14	0.237
24	161	0.007	0.064	0.005	0.11	0.045	0.028	0.011	0.03	0.014	0.123	0.064	0.19	0.14	0.247
25	167	0.007	0.065	0.005	0.11	0.047	0.029	0.011	0.04	0.015	0.127	0.065	0.20	0.14	0.259

Appendix 3.5-34 Table 20 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.007	0.067	0.005	0.12	0.048	0.029	0.011	0.04	0.015	0.131	0.067	0.21	0.15	0.271
27	181	0.007	0.068	0.005	0.12	0.050	0.030	0.011	0.04	0.015	0.135	0.068	0.22	0.15	0.281
28	188	0.007	0.069	0.005	0.12	0.051	0.030	0.011	0.04	0.015	0.139	0.070	0.23	0.15	0.288
29	195	0.007	0.071	0.006	0.13	0.052	0.030	0.011	0.04	0.016	0.142	0.071	0.24	0.15	0.294
30	202	0.007	0.072	0.006	0.13	0.053	0.031	0.012	0.04	0.016	0.145	0.072	0.24	0.15	0.298
31	209	0.007	0.074	0.006	0.14	0.055	0.031	0.012	0.04	0.016	0.149	0.074	0.25	0.15	0.302
32	217	0.007	0.076	0.006	0.14	0.057	0.031	0.012	0.04	0.016	0.153	0.075	0.27	0.15	0.305
33	223	0.007	0.077	0.006	0.15	0.058	0.031	0.012	0.04	0.016	0.157	0.077	0.28	0.15	0.306
34	230	0.007	0.079	0.006	0.15	0.059	0.031	0.012	0.04	0.016		0.078	0.29	0.16	0.306
35	237	0.007	0.081	0.006	0.16	0.061	0.031	0.012	0.05	0.016		0.079	0.30	0.16	0.307
36	244	0.007	0.083	0.006	0.16	0.062	0.031	0.012	0.05	0.016		0.080	0.31	0.16	0.308
37	251	0.007	0.084	0.006	0.17	0.064	0.031	0.012	0.05	0.016		0.082	0.33	0.16	0.309
38	258	0.007	0.086	0.006	0.17	0.065	0.031	0.012	0.05	0.016		0.083	0.34	0.16	0.309
39	265	0.007	0.086	0.006	0.17	0.065	0.031	0.012	0.05	0.016		0.083	0.34	0.16	0.309
40	272	0.007	0.089	0.006	0.18	0.067	0.032	0.012	0.05	0.016		0.085	0.36	0.16	0.310
41	279	0.007	0.090	0.006	0.19	0.069	0.032	0.012	0.05	0.016		0.086	0.37	0.16	0.311
42	286	0.007	0.092	0.006	0.19	0.070	0.032	0.012	0.05	0.016		0.087	0.38	0.16	0.311
43	293	0.007	0.093	0.006	0.20	0.072	0.032	0.012	0.05	0.016		0.088	0.39	0.16	0.312
44	300	0.007	0.095	0.006	0.20	0.073	0.032	0.012	0.05	0.016		0.089	0.40	0.16	0.313
45	309	0.007	0.097	0.006	0.21	0.075	0.032	0.012	0.05	0.016		0.090	0.41	0.17	0.313
46	315	0.007	0.098	0.006	0.21	0.076	0.032	0.012	0.05	0.016		0.090	0.42	0.17	0.314
47	321	0.007	0.100	0.007	0.22	0.077	0.032	0.012	0.06	0.016		0.091	0.43	0.17	0.314
48	328	0.007	0.101	0.007	0.22	0.079	0.032	0.012	0.06	0.016		0.092	0.44	0.17	0.315
49	335	0.007	0.103	0.007	0.23	0.080	0.032	0.012	0.06	0.016		0.093	0.46	0.17	0.316
50	342	0.007	0.105	0.007	0.23	0.082	0.032	0.012	0.06	0.016		0.094	0.47	0.17	0.316
51	349	0.007	0.106	0.007	0.24	0.083	0.032	0.012	0.06	0.016		0.094	0.48	0.17	0.317
52	356	0.007	0.108	0.007	0.24	0.085	0.032	0.012	0.06	0.016		0.095	0.49	0.17	0.317
53	363	0.007	0.109	0.007	0.25	0.086	0.033	0.012	0.06	0.017		0.096	0.50	0.17	0.318
54	370	0.007	0.111	0.007	0.25	0.088	0.033	0.012	0.06	0.017		0.097	0.52	0.17	0.319
55	377				0.26				0.06						
56	384				0.26				0.06						
57	391				0.27				0.06						
58	398				0.27				0.06						

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 21

Metal Extraction Rates
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.452	0.0071	0.0009	0.39	0.0004	0.0055	0.646	0.55	0.0110	0.0016	0.52	0.0004	1.16	0.005
3	15	0.405	0.0062	0.0009	0.42	0.0004	0.0049	0.580	0.54	0.0100	0.0016	0.51	0.0004	1.10	0.004
4	22	0.315	0.0047	0.0007	0.37	0.0003	0.0038	0.452	0.46	0.0079	0.0013	0.43	0.0003	0.89	0.003
5	27	0.277	0.0039	0.0007	0.42	0.0003	0.0034	0.400	0.47	0.0072	0.0014	0.43	0.0003	0.86	0.003
6	34	0.283	0.0033	0.0008	0.54	0.0003	0.0034	0.409	0.55	0.0076	0.0015	0.48	0.0003	0.87	0.003
7	41	0.221	0.0019	0.0007	0.55	0.0002	0.0025	0.322	0.51	0.0062	0.0013	0.43	0.0003	0.68	0.002
8	48	0.219	0.0010	0.0007	0.58	0.0002	0.0023	0.319	0.52	0.0063	0.0012	0.40	0.0003	0.54	0.002
9	55	0.277	0.0008	0.0009	0.65	0.0002	0.0028	0.398	0.59	0.0077	0.0011	0.41	0.0003	0.50	0.003
10	63	0.302	0.0008	0.0009	0.62	0.0002	0.0030	0.432	0.57	0.0083	0.0010	0.37	0.0003	0.40	0.004
11	70	0.306	0.0006	0.0008	0.55	0.0002	0.0030	0.436	0.52	0.0085	0.0007	0.30	0.0002	0.27	0.006
12	76	0.323	0.0006	0.0009	0.59	0.0002	0.0032	0.460	0.54	0.0092	0.0007	0.30	0.0002	0.25	0.009
13	84	0.288	0.0004	0.0008	0.57	0.0002	0.0030	0.410	0.50	0.0088	0.0007	0.27	0.0002	0.21	0.013
14	90	0.249	0.0004	0.0008	0.58	0.0002	0.0029	0.356	0.48	0.0084	0.0007	0.26	0.0002	0.19	0.018
15	97	0.221	0.0004	0.0008	0.64	0.0002	0.0029	0.319	0.49	0.0087	0.0008	0.27	0.0002	0.19	0.025
16	104	0.156	0.0003	0.0006	0.52	0.0002	0.0022	0.226	0.38	0.0068	0.0007	0.21	0.0002	0.15	0.023
17	111	0.125	0.0004	0.0007	0.65	0.0002	0.0024	0.186	0.43	0.0077	0.0009	0.24	0.0002	0.16	0.036
18	118	0.097	0.0004	0.0007	0.69	0.0002	0.0024	0.147	0.43	0.0077	0.0010	0.24	0.0002	0.16	0.041
19	125	0.072	0.0004	0.0007	0.68	0.0002	0.0022	0.111	0.40	0.0072	0.0010	0.23	0.0002	0.15	0.042
20	132	0.048	0.0004	0.0006	0.65	0.0002	0.0019	0.077	0.37	0.0064	0.0009	0.21	0.0002	0.13	0.041
21	139	0.052	0.0004	0.0007	0.75	0.0002	0.0022	0.084	0.42	0.0072	0.0010	0.24	0.0002	0.15	0.045
22	146	0.041	0.0004	0.0005	0.63	0.0002	0.0017	0.065	0.35	0.0056	0.0009	0.20	0.0002	0.12	0.035
23	153	0.036	0.0004	0.0005	0.60	0.0001	0.0015	0.058	0.33	0.0050	0.0008	0.18	0.0002	0.11	0.031
24	161	0.032	0.0004	0.0004	0.56	0.0001	0.0013	0.050	0.30	0.0043	0.0007	0.17	0.0002	0.10	0.027
25	167	0.030	0.0004	0.0004	0.58	0.0001	0.0012	0.048	0.31	0.0041	0.0008	0.17	0.0002	0.10	0.025

Appendix 3.5-34 Table 21 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.029	0.0005	0.0004	0.62	0.0002	0.0012	0.046	0.32	0.0040	0.0008	0.18	0.0002	0.10	0.025
27	181	0.026	0.0005	0.0004	0.61	0.0002	0.0011	0.041	0.32	0.0035	0.0008	0.17	0.0002	0.10	0.022
28	188	0.024	0.0005	0.0004	0.62	0.0002	0.0010	0.037	0.32	0.0032	0.0008	0.17	0.0002	0.10	0.020
29	195	0.023	0.0006	0.0004	0.66	0.0002	0.0010	0.035	0.33	0.0031	0.0008	0.18	0.0003	0.10	0.018
30	202	0.019	0.0005	0.0003	0.62	0.0002	0.0008	0.028	0.31	0.0025	0.0007	0.16	0.0003	0.09	0.015
31	209	0.016	0.0006	0.0003	0.61	0.0002	0.0007	0.022	0.29	0.0020	0.0007	0.15	0.0003	0.08	0.012
32	217	0.013	0.0006	0.0003	0.63	0.0002	0.0005	0.017	0.30	0.0016	0.0007	0.15	0.0003	0.08	0.009
33	223	0.010	0.0006	0.0003	0.65	0.0002	0.0004	0.013	0.30	0.0013	0.0007	0.16	0.0003	0.08	0.007
34	230	0.008	0.0007	0.0002	0.67	0.0002	0.0004	0.009	0.31	0.0010		0.16	0.0003	0.08	0.005
35	237	0.007	0.0007	0.0002	0.71	0.0002	0.0003	0.007	0.32	0.0008		0.16	0.0004	0.08	0.003
36	244	0.006	0.0007	0.0002	0.69	0.0002	0.0002	0.005	0.31	0.0006		0.15	0.0004	0.08	0.002
37	251	0.005	0.0007	0.0002	0.68	0.0002	0.0002	0.003	0.30	0.0005		0.15	0.0004	0.07	0.001
38	258	0.005	0.0007	0.0002	0.67	0.0002	0.0002	0.003	0.30	0.0005		0.14	0.0004	0.07	0.001
39	265	0.004	0.0006	0.0002	0.54	0.0001	0.0002	0.003	0.24	0.0004		0.11	0.0003	0.06	0.001
40	272	0.004	0.0006	0.0002	0.60	0.0002	0.0002	0.003	0.26	0.0004		0.12	0.0003	0.06	0.001
41	279	0.004	0.0006	0.0002	0.60	0.0002	0.0002	0.003	0.26	0.0004		0.12	0.0003	0.06	0.001
42	286	0.004	0.0006	0.0002	0.61	0.0002	0.0002	0.003	0.26	0.0004		0.11	0.0003	0.06	0.001
43	293	0.004	0.0006	0.0002	0.60	0.0002	0.0002	0.003	0.25	0.0004		0.11	0.0003	0.06	0.001
44	300	0.005	0.0007	0.0002	0.73	0.0002	0.0002	0.004	0.30	0.0005		0.13	0.0004	0.07	0.001
45	309	0.004	0.0006	0.0002	0.64	0.0002	0.0002	0.003	0.26	0.0004		0.11	0.0003	0.06	0.001
46	315	0.005	0.0006	0.0002	0.65	0.0002	0.0002	0.004	0.26	0.0004		0.11	0.0003	0.06	0.001
47	321	0.004	0.0006	0.0002	0.65	0.0002	0.0002	0.004	0.26	0.0004		0.10	0.0003	0.05	0.001
48	328	0.004	0.0006	0.0002	0.65	0.0002	0.0002	0.004	0.26	0.0004		0.10	0.0003	0.05	0.001
49	335	0.004	0.0006	0.0002	0.65	0.0002	0.0002	0.004	0.26	0.0004		0.10	0.0003	0.05	0.001
50	342	0.005	0.0007	0.0002	0.70	0.0002	0.0002	0.004	0.27	0.0004		0.10	0.0004	0.05	0.001
51	349	0.005	0.0007	0.0002	0.70	0.0002	0.0002	0.004	0.27	0.0004		0.10	0.0004	0.05	0.001
52	356	0.005	0.0007	0.0002	0.71	0.0002	0.0002	0.004	0.27	0.0004		0.09	0.0004	0.05	0.001
53	363	0.005	0.0007	0.0002	0.72	0.0002	0.0002	0.004	0.27	0.0004		0.09	0.0004	0.05	0.001
54	370	0.005	0.0007	0.0002	0.72	0.0002	0.0002	0.004	0.27	0.0004		0.09	0.0004	0.05	0.001
55	377				0.72				0.26						
56	384				0.58				0.21						
57	391				0.67				0.24						
58	398				0.68				0.25						

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 22

Oxidation and Neutralization Results
Upper Mole Lake Waste Rock Master Composite (WD-07)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

		OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
CYCLE	DAYS	Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	2	0.08		0.025	0.016	0.041	2.30	6		0.01
2	8	4	0.14	1.44	0.017	0.011	0.026	2.15	9	3.23	0.02
3	15	6	0.18	1.46	0.015	0.011	0.022	2.18	13	3.28	0.03
4	22	6	0.21	1.24	0.008	0.007	0.011	2.22	15	2.81	0.03
5	27	7	0.25	1.30	0.012	0.011	0.015	2.26	17	2.97	0.04
6	34	10	0.32	1.46	0.022	0.025	0.035	2.74	23	3.59	0.05
7	41	10	0.34	1.32	0.008	0.011	0.016	3.38	26	3.48	0.05
8	48	11	0.37	1.20	0.009	0.015	0.024	4.26	30	3.62	0.06
9	55	12	0.40	1.18	0.007	0.015	0.024	5.55	34	4.06	0.07
10	63	13	0.42	1.00	0.007	0.014	0.022	4.85	37	3.91	0.08
11	70	13	0.45	0.77	0.009	0.016	0.024	4.29	41	3.52	0.09
12	76	14	0.48	0.79	0.008	0.013	0.018	3.83	44	3.72	0.09
13	84	15	0.51	0.78	0.010	0.015	0.019	3.44	48	3.49	0.10
14	90	16	0.54	0.85	0.010	0.014	0.017	3.12	51	3.43	0.11
15	97	17	0.58	1.01	0.014	0.019	0.021	2.84	55	3.62	0.11
16	104	18	0.59	0.86	0.002	0.002	0.002	2.60	55	2.88	0.12
17	111	20	0.67	1.17	0.026	0.031	0.030	2.39	61	3.39	0.13
18	118	21	0.71	1.28	0.014	0.017	0.016	2.47	65	3.49	0.13
19	125	23	0.75	1.28	0.012	0.015	0.014	2.56	68	3.37	0.14
20	132	24	0.79	1.22	0.011	0.015	0.014	2.65	71	3.15	0.15
21	139	24	0.82	1.37	0.009	0.014	0.012	2.76	73	3.60	0.15
22	146	26	0.85	1.09	0.011	0.017	0.015	2.88	76	3.01	0.16
23	153	26	0.88	1.00	0.009	0.014	0.012	3.02	79	2.87	0.16
24	161	27	0.90	0.89	0.007	0.012	0.011	3.17	81	2.65	0.17
25	167	28	0.93	0.86	0.008	0.015	0.013	3.35	84	2.71	0.18
26	174	29	0.96	0.87	0.010	0.019	0.016	3.55	88	2.89	0.18

Appendix 3.5-34 Table 22 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
27	181	30	0.99	0.81	0.008	0.016	0.013	3.78	91	2.83	0.19
28	188	30	1.01	0.77	0.007	0.015	0.012	4.05	93	2.85	0.19
29	195	31	1.03	0.77	0.006	0.014	0.012	4.37	96	3.00	0.20
30	202	31	1.04	0.67	0.005	0.013	0.010	4.76	98	2.81	0.20
31	209	32	1.06	0.60	0.006	0.018	0.014	5.24	101	2.74	0.21
32	217	32	1.08	0.56	0.006	0.021	0.016	5.84	105	2.80	0.22
33	223	33	1.09	0.52	0.004	0.015	0.011	6.63	108	2.87	0.22
34	230	33	1.11	0.49	0.004	0.017	0.012	6.66	111	2.93	0.23
35	237	34	1.12	0.49	0.005	0.019	0.014	6.70	114	3.12	0.24
36	244	34	1.14	0.45	0.004	0.015	0.011	6.73	116	3.00	0.24
37	251	34	1.15	0.42	0.004	0.017	0.012	6.76	119	2.93	0.25
38	258	35	1.16	0.41	0.004	0.018	0.012	6.79	122	2.91	0.25
39	265										
40	272	36	1.18	0.36	0.003	0.026	0.018	13.97	130	3.27	0.27
41	279	36	1.20	0.36	0.004	0.015	0.010	6.90	133	3.26	0.28
42	286	36	1.21	0.36	0.004	0.017	0.012	6.93	136	3.26	0.28
43	293	37	1.22	0.35	0.004	0.016	0.011	6.97	138	3.21	0.29
44	300	37	1.23	0.36	0.004	0.017	0.012	7.01	141	3.08	0.29
45	309	37	1.25	0.37	0.004	0.019	0.012	7.04	144	2.66	0.30
46	315	38	1.26	0.37	0.003	0.015	0.010	7.08	147	2.72	0.31
47	321	38	1.27	0.37	0.003	0.014	0.009	7.07	149	2.70	0.31
48	328	39	1.28	0.38	0.005	0.016	0.010	5.54	152	2.68	0.32
49	335	39	1.30	0.39	0.004	0.018	0.011	6.74	155	2.69	0.32
50	342	39	1.31	0.40	0.004	0.019	0.012	8.60	158	2.85	0.33
51	349	40	1.33	0.42	0.005	0.018	0.011	5.33	161	2.86	0.33
52	356	40	1.34	0.43	0.004	0.018	0.011	6.43	163	2.87	0.34
53	363	41	1.35	0.42	0.004	0.017	0.010	7.00	166	2.90	0.35
54	370	41	1.37	0.40	0.004	0.019	0.011	8.54	169	2.92	0.35
55	377	41	1.38	0.39	0.003	0.018	0.011	9.72	172	2.88	0.36
56	384										
57	391	42	1.39	0.29	0.002	0.029	0.018	21.23	181	3.45	0.38
58	398	42	1.40	0.27	0.003	0.018	0.011	10.05	183	3.47	0.38

* Rates of sulfate production and NP depletion are 5-week moving averages

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Tables 23-29.
Lower Mole Lake Waste Rock Master Composite (WD-08) Data and Calculations.

Appendix 3.5-34 Table 23

Sample Characterization
Lower Mole Lake Waste Rock Master Composite (WD-08)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	68300
Antimony	Sb	30
Arsenic	As	61
Barium	Ba	290
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	8
Calcium	Ca	9900
Carbon	C	4400
Chromium	Cr	9
Cobalt	Co	28
Copper	Cu	330
Gallium	Ga	13
Iron	Fe	70400
Lead	Pb	180
Lithium	Li	NA
Magnesium	Mg	28700
Manganese	Mn	1300
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	10
Phosphorus	P	NA
Potassium	K	11900
Selenium	Se	<3
Silicon	Si	273000
Silver	Ag	0.045
Sodium	Na	7300
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	620
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	360
Sulfur	S	2200

ABA Results	
Paste pH	8.8
S (Total) (%)	0.34
SO4 (%)	NA
S (sulfide) (%)	0.27
AP (kg CaCO3/tonne)	8.4
NP (kg CaCO3/tonne)	46.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	37.6
NP/AP	5.5

Note: NA = not analyzed

Sample Mass (kg)	77.73

Appendix 3.5-34 Table 24

Parameters Measured Weekly
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)		ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	5.690	7.2	595		120		**115**	8
2-Nov-94	2	8	4.655	6.7	431		91		**81**	13
9-Nov-94	3	15	4.700	6.1	342		89		69	17
16-Nov-94	4	22	4.780	7.4	294		75		58	21
21-Nov-94	5	27	4.360	6.8	286		76		**46**	24
28-Nov-94	6	34	5.300	7.5	227		75		41	26
5-Dec-94	7	41	3.795	7.6	206		76		35	28
12-Dec-94	8	48	4.840	7.7	224		77		30	30
19-Dec-94	9	55	3.730	7.9	323	?	79		**24.5**	31
27-Dec-94	10	63	4.320	8.0	230		83		25	32
3-Jan-95	11	70	4.840	8.1	226		81		25	34
9-Jan-95	12	76	3.880	8.3	191		75		25	35
17-Jan-95	13	84	3.950	8.3	195		71		25	37
23-Jan-95	14	90	4.100	8.3	197		73		25	38
30-Jan-95	15	97	5.290	8.4	199		76		25	40
6-Feb-95	16	104	0.500	8.3	214		70		25	40
13-Feb-95	17	111	8.500	8.2	213		72		**25**	42
20-Feb-95	18	118	5.580	8.3	194		73		25	44
27-Feb-95	19	125	3.940	8.4	196		73		24	45
6-Mar-95	20	132	5.460	8.3	198		72		24	47
13-Mar-95	21	139	4.530	8.2	180		76		23	48
20-Mar-95	22	146	4.510	8.1	188		68		23	50
27-Mar-95	23	153	4.540	8.3	206		71		22	51
4-Apr-95	24	161	4.620	8.2	188		66		22	52
10-Apr-95	25	167	5.490	8.2	204		64		22	54
17-Apr-95	26	174	4.140	8.2	217		62		21	55
24-Apr-95	27	181	4.720	8.2	188		63		21	56
1-May-95	28	188	5.000	8.2	180		74		20	58
8-May-95	29	195	4.540	8.1	177		62		20	59
15-May-95	30	202	5.040	8.1	175		64		19	60
22-May-95	31	209	3.580	8.2	167		64		19	61
30-May-95	32	217	5.100	8.1	167		62		18	62
5-Jun-95	33	223	3.790	7.8	164		61		**18**	63
12-Jun-95	34	230	4.280	8.1	149		60		18	64
19-Jun-95	35	237	4.300	8.3	175		60		18	65
26-Jun-95	36	244	4.160	8.2	166		62		18	66
3-Jul-95	37	251	3.680	8.1	167				18	67
10-Jul-95	38	258	4.860	8.1	167				18	68
17-Jul-95	39	265	0.000							
24-Jul-95	40	272	7.750	7.9	172				19	70
31-Jul-95	41	279	4.060	8.1	175				19	71
7-Aug-95	42	286	4.180	8.0	166				19	72
14-Aug-95	43	293	4.800	8.1	168				19	73

Appendix 3.5-34 Table 24 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
21-Aug-95	44	300	4.480	8.0		168			19	74
30-Aug-95	45	309	4.840	8.0		164			19	75
5-Sep-95	46	315	4.040	8.1		172	55		**19**	76
11-Sep-95	47	321	4.220	8.0		179	58		**21**	77
18-Sep-95	48	328	3.690	8.0		192	52		**25**	78
25-Sep-95	49	335	4.420	7.9	?	170	52		20	80
2-Oct-95	50	342	4.440	7.7	?	166	56		**15**	80
9-Oct-95	51	349	4.280	7.5	?	165	53		21	82
16-Oct-95	52	356	3.740	7.5	?	159	53		**26**	83
23-Oct-95	53	363	4.160	7.5	?	163	53		**25**	84
30-Oct-95	54	370	4.280	7.6	?	170	57		**14**	85
6-Nov-95	55	377	4.600	7.4	?	163	50		**14**	86
13-Nov-95	56	384	0.000							
20-Nov-95	57	391	5.360	7.3	?	170	61		**14**	87
27-Nov-95	58	398	4.790	7.3	?	187	62		**14**	88
4-Dec-95	59	405	3.860	8.1		196	60			
11-Dec-95	60	412	3.580	8.0		187	58			
18-Dec-95	61	419	4.480	8.0		198	59			
26-Dec-95	62	427	4.220	8.1		178	59			
2-Jan-96	63	434	4.120	8.1		176	59			
9-Jan-96	64	441	4.620	8.0		171	59			
15-Jan-96	65	447	3.310	8.0		181				
23-Jan-96	66	455	4.660	7.9		171				
31-Jan-96	67	463	4.480	7.9		170				
7-Feb-96	68	470	5.300	7.9		183				
13-Feb-96	69	476	3.670	7.9		170				
20-Feb-96	70	483	4.100	8.0		171				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 25

Leachate Analysis
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg		Molybdenum Mo	Potassium K		Selenium Se	Sodium Na	Zinc Zn
1	0	**4.9**	**0.11**	**0.017**	**26**	**0.11**	**7.9**	**20**	**0.24**	**0.0003**		**0.034**	**16.6**		**0.011**	**57**	**0.14**
2	8	**12**	**0.095**	**0.022**	**21**	**0.20**	**20**	**21**	**0.40**	**0.0002**		**0.024**	**13.4**		**0.009**	**36**	**0.20**
3	15	8.53	0.075	0.018	19.3	0.146	14.27	18.0	0.307	0.0002		0.023	12.00		0.008	27.7	0.148
4	22	5.07	0.055	0.013	17.7	0.091	8.53	15.0	0.213	0.0002		0.021	10.60		0.007	19.3	0.097
5	27	**1.6**	**0.035**	**0.009**	**16**	**0.037**	**2.8**	**12**	**0.12**	< **0.0002**	<	**0.020**	**9.2**		**0.006**	**11**	**0.045**
6	34	1.75	0.034	0.009	16.3	0.038	2.95	11.5	0.125	0.0003		0.020	8.65		0.006	9.38	0.050
7	41	1.90	0.034	0.009	16.5	0.040	3.10	11.0	0.130	0.0004		0.020	8.10		0.006	7.75	0.055
8	48	2.05	0.033	0.008	16.8	0.041	3.25	10.5	0.135	0.0004		0.020	7.55		0.005	6.13	0.060
9	55	**2.2**	**0.028**	**0.008**	**17**	**0.042**	**3.4**	**10**	**0.14**	**0.0005**	<	**0.020**	**7.0**	<	**0.005**	**4.5**	**0.065**
10	63	2.08	0.028	0.008	17.1	0.039	3.16	9.8	0.140	0.0005		0.020	6.75		0.005	4.26	0.065
11	70	1.95	0.027	0.008	17.3	0.037	2.93	9.7	0.140	0.0004		0.020	6.50		0.005	4.03	0.065
12	76	1.83	0.027	0.008	17.4	0.034	2.69	9.5	0.140	0.0004		0.020	6.25		0.005	3.79	0.064
13	84	1.70	0.026	0.008	17.5	0.032	2.45	9.3	0.140	0.0004		0.020	6.00		0.005	3.55	0.064
14	90	1.58	0.026	0.007	17.6	0.029	2.21	9.1	0.140	0.0003		0.020	5.75		0.005	3.31	0.064
15	97	1.45	0.025	0.007	17.8	0.026	1.98	9.0	0.140	0.0003		0.020	5.50		0.005	3.08	0.064
16	104	1.33	0.025	0.007	17.9	0.024	1.74	8.8	0.140	0.0002		0.020	5.25		0.005	2.84	0.063
17	111	**1.2**	**0.024**	**0.007**	**18**	**0.021**	**1.5**	**8.6**	**0.14**	< **0.0002**	<	**0.020**	**5.0**		**0.005**	**2.6**	**0.063**
18	118	1.14	0.024	0.007	18.2	0.020	1.42	8.5	0.133	0.0002			4.83		0.005	2.53	0.060
19	125	1.07	0.025	0.007	18.4	0.020	1.34	8.4	0.126	0.0002			4.65		0.005	2.46	0.058
20	132	1.01	0.025	0.007	18.6	0.019	1.25	8.2	0.120	0.0002			4.48		0.005	2.39	0.055
21	139	0.95	0.025	0.007	18.8	0.019	1.17	8.1	0.113	0.0002			4.30		0.005	2.33	0.052
22	146	0.88	0.026	0.006	18.9	0.018	1.09	8.0	0.106	0.0002			4.13		0.005	2.26	0.050
23	153	0.82	0.026	0.006	19.1	0.017	1.01	7.9	0.099	0.0002			3.95		0.005	2.19	0.047
24	161	0.76	0.026	0.006	19.3	0.017	0.93	7.7	0.092	0.0002			3.78		0.005	2.12	0.044
25	167	0.70	0.027	0.006	19.5	0.016	0.85	7.6	0.086	0.0002			3.60		0.005	2.05	0.042
26	174	0.63	0.027	0.006	19.7	0.015	0.76	7.5	0.079	0.0002			3.43		0.005	1.98	0.039
27	181	0.57	0.027	0.006	19.9	0.015	0.68	7.4	0.072	0.0002			3.25		0.005	1.91	0.036

Appendix 3.5-34 Table 25 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
28	188	0.51	0.027	0.006	20.1	0.014	0.60	7.2	0.065	0.0002		3.08	0.005	1.84	0.033
29	195	0.44	0.028	0.006	20.3	0.014	0.52	7.1	0.058	0.0002		2.90	0.005	1.78	0.031
30	202	0.38	0.028	0.005	20.4	0.013	0.44	7.0	0.051	0.0002		2.73	0.005	1.71	0.028
31	209	0.32	0.028	0.005	20.6	0.012	0.35	6.9	0.045	0.0002		2.55	0.005	1.64	0.025
32	217	0.25	0.029	0.005	20.8	0.012	0.27	6.7	0.038	0.0002		2.38	0.005	1.57	0.023
33	223	**0.19**	**0.029**	**< 0.005**	**21**	**0.011**	**0.19**	**6.6**	**0.031**	**< 0.0002**		**2.2**	**< 0.005**	**1.5**	**< 0.020**
34	230	0.19	0.029	0.005	21.0	0.011	0.19	6.6	0.030			2.17	0.005	1.47	
35	237	0.18	0.028	0.005	20.9	0.010	0.18	6.5	0.029			2.13	0.005	1.45	
36	244	0.18	0.028	0.005	20.9	0.010	0.18	6.5	0.028			2.10	0.005	1.42	
37	251	0.17	0.028	0.005	20.8	0.010	0.17	6.5	0.027			2.07	0.005	1.39	
38	258	0.17	0.028	0.005	20.8	0.010	0.17	6.4	0.026			2.03	0.005	1.37	
39	265														
40	272	0.16	0.027	0.005	20.7	0.009	0.16	6.4	0.025			1.97	0.006	1.31	
41	279	0.15	0.027	0.005	20.6	0.009	0.15	6.3	0.024			1.93	0.006	1.29	
42	286	0.15	0.026	0.005	20.6	0.008	0.15	6.3	0.023			1.90	0.006	1.26	
43	293	0.14	0.026	0.005	20.5	0.008	0.15	6.3	0.022			1.87	0.006	1.23	
44	300	0.14	0.026	0.005	20.5	0.008	0.14	6.2	0.021			1.83	0.006	1.21	
45	309	0.13	0.026	0.005	20.4	0.008	0.14	6.2	0.020			1.80	0.006	1.18	
46	315	0.13	0.025	0.005	20.4	0.007	0.13	6.2	0.019			1.77	0.006	1.15	
47	321	0.12	0.025	0.005	20.3	0.007	0.13	6.1	0.018			1.73	0.006	1.13	
48	328	0.12	0.025	0.005	20.3	0.007	0.12	6.1	0.017			1.70	0.006	1.10	
49	335	0.11	0.024	0.005	20.2	0.006	0.12	6.1	0.017			1.67	0.006	1.07	
50	342	0.11	0.024	0.005	20.2	0.006	0.11	6.0	0.016			1.63	0.006	1.05	
51	349	0.10	0.024	0.005	20.1	0.006	0.11	6.0	0.015			1.60	0.006	1.02	
52	356	0.10	0.024	0.005	20.1	0.006	0.10	6.0	0.014			1.57	0.007	0.99	
53	363	0.09	0.023	0.005	20.0	0.005	0.10	5.9	0.013			1.53	0.007	0.97	
54	370	**0.085**	**0.023**	**< 0.005**	**20**	**< 0.005**	**0.096**	**5.9**	**0.012**			**1.5**	**0.0067**	**0.94**	
55	377				20.5			6.1							
56	384														
57	391				21.5			6.6							
58	398				**22**			**6.8**							

* Measured values shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 26

Cumulative Mass Flux
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.36	0.008	0.001	1.9	0.008	0.58	1.5	0.018	0.0000	0.002	1.2	0.001	4.2	0.01
2	8	1.08	0.014	0.003	3.2	0.020	1.78	2.7	0.042	0.0000	0.004	2.0	0.001	6.3	0.02
3	15	1.59	0.018	0.004	4.3	0.029	2.64	3.8	0.060	0.0000	0.005	2.7	0.002	8.0	0.03
4	22	1.90	0.022	0.004	5.4	0.034	3.16	4.7	0.073	0.0001	0.007	3.4	0.002	9.2	0.04
5	27	1.99	0.024	0.005	6.3	0.037	3.32	5.4	0.080	0.0001	0.008	3.9	0.003	9.8	0.04
6	34	2.11	0.026	0.006	7.4	0.039	3.52	6.2	0.088	0.0001	0.009	4.5	0.003	10.4	0.04
7	41	2.21	0.028	0.006	8.2	0.041	3.67	6.7	0.095	0.0001	0.010	4.9	0.003	10.8	0.05
8	48	2.33	0.030	0.006	9.3	0.044	3.88	7.4	0.103	0.0001	0.011	5.4	0.004	11.2	0.05
9	55	2.44	0.031	0.007	10.1	0.046	4.04	7.9	0.110	0.0002	0.012	5.7	0.004	11.4	0.05
10	63	2.56	0.033	0.007	11.0	0.048	4.21	8.4	0.118	0.0002	0.013	6.1	0.004	11.7	0.06
11	70	2.68	0.034	0.008	12.1	0.050	4.40	9.0	0.126	0.0002	0.015	6.5	0.004	11.9	0.06
12	76	2.77	0.036	0.008	13.0	0.052	4.53	9.5	0.133	0.0002	0.016	6.8	0.005	12.1	0.06
13	84	2.85	0.037	0.009	13.9	0.053	4.66	10.0	0.141	0.0002	0.017	7.1	0.005	12.3	0.07
14	90	2.94	0.038	0.009	14.8	0.055	4.77	10.4	0.148	0.0003	0.018	7.4	0.005	12.5	0.07
15	97	3.04	0.040	0.009	16.0	0.057	4.91	11.0	0.157	0.0003	0.019	7.8	0.006	12.7	0.07
16	104	3.04	0.040	0.009	16.1	0.057	4.92	11.1	0.158	0.0003	0.019	7.8	0.006	12.7	0.07
17	111	3.18	0.043	0.010	18.1	0.059	5.08	12.0	0.174	0.0003	0.021	8.4	0.006	13.0	0.08
18	118	3.26	0.044	0.011	19.4	0.061	5.18	12.6	0.183	0.0003		8.7	0.006	13.1	0.09
19	125	3.31	0.046	0.011	20.3	0.062	5.25	13.1	0.190	0.0003		8.9	0.007	13.3	0.09
20	132	3.38	0.047	0.012	21.6	0.063	5.34	13.6	0.198	0.0003		9.3	0.007	13.4	0.09
21	139	3.44	0.049	0.012	22.7	0.064	5.41	14.1	0.205	0.0004		9.5	0.007	13.6	0.10
22	146	3.49	0.050	0.012	23.8	0.065	5.47	14.6	0.211	0.0004		9.7	0.008	13.7	0.10
23	153	3.54	0.052	0.013	24.9	0.066	5.53	15.0	0.217	0.0004		10.0	0.008	13.8	0.10
24	161	3.58	0.053	0.013	26.1	0.067	5.58	15.5	0.222	0.0004		10.2	0.008	14.0	0.10
25	167	3.63	0.055	0.013	27.5	0.068	5.64	16.0	0.228	0.0004		10.5	0.009	14.1	0.11

Appendix 3.5-34 Table 26 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum	Arsenic	Barium	Calcium	Copper	Iron	Magnesium	Manganese	Mercury	Molybdenum	Potassium	Selenium	Sodium	Zinc
		Al	As	Ba	Ca	Cu	Fe	Mg	Mn	Hg	Mo	K	Se	Na	Zn
26	174	3.66	0.057	0.014	28.5	0.069	5.68	16.4	0.232	0.0004		10.6	0.009	14.2	0.11
27	181	3.70	0.058	0.014	29.7	0.070	5.73	16.9	0.237	0.0004		10.8	0.009	14.3	0.11
28	188	3.73	0.060	0.014	31.0	0.071	5.76	17.3	0.241	0.0004		11.0	0.009	14.4	0.11
29	195	3.76	0.062	0.015	32.2	0.072	5.80	17.8	0.244	0.0005		11.2	0.010	14.5	0.12
30	202	3.78	0.064	0.015	33.5	0.072	5.82	18.2	0.248	0.0005		11.4	0.010	14.7	0.12
31	209	3.80	0.065	0.015	34.5	0.073	5.84	18.5	0.250	0.0005		11.5	0.010	14.7	0.12
32	217	3.81	0.067	0.016	35.8	0.074	5.86	19.0	0.252	0.0005		11.6	0.011	14.8	0.12
33	223	3.82	0.068	0.016	36.9	0.074	5.87	19.3	0.254	0.0005		11.8	0.011	14.9	0.12
34	230	3.83	0.070	0.016	38.0	0.075	5.88	19.7	0.255			11.9	0.011	15.0	
35	237	3.84	0.071	0.017	39.2	0.075	5.89	20.0	0.257			12.0	0.011	15.1	
36	244	3.85	0.073	0.017	40.3	0.076	5.90	20.4	0.258			12.1	0.012	15.1	
37	251	3.86	0.074	0.017	41.3	0.076	5.90	20.7	0.260			12.2	0.012	15.2	
38	258	3.87	0.076	0.017	42.6	0.077	5.92	21.1	0.261			12.3	0.012	15.3	
39	265	3.87	0.076	0.017	42.6	0.077	5.92	21.1	0.261			12.3	0.012	15.3	
40	272	3.89	0.079	0.018	44.6	0.078	5.93	21.7	0.264			12.5	0.013	15.4	
41	279	3.89	0.080	0.018	45.7	0.078	5.94	22.0	0.265			12.6	0.013	15.5	
42	286	3.90	0.081	0.018	46.8	0.079	5.95	22.4	0.266			12.7	0.013	15.6	
43	293	3.91	0.083	0.019	48.1	0.079	5.96	22.8	0.268			12.8	0.014	15.6	
44	300	3.92	0.085	0.019	49.3	0.080	5.96	23.1	0.269			13.0	0.014	15.7	
45	309	3.93	0.086	0.019	50.5	0.080	5.97	23.5	0.270			13.1	0.015	15.8	
46	315	3.93	0.087	0.020	51.6	0.081	5.98	23.8	0.271			13.2	0.015	15.8	
47	321	3.94	0.089	0.020	52.7	0.081	5.99	24.2	0.272			13.3	0.015	15.9	
48	328	3.94	0.090	0.020	53.7	0.081	5.99	24.5	0.273			13.3	0.016	16.0	
49	335	3.95	0.091	0.020	54.8	0.082	6.00	24.8	0.274			13.4	0.016	16.0	
50	342	3.96	0.093	0.021	56.0	0.082	6.01	25.1	0.275			13.5	0.016	16.1	
51	349	3.96	0.094	0.021	57.1	0.082	6.01	25.5	0.276			13.6	0.017	16.1	
52	356	3.97	0.095	0.021	58.0	0.083	6.02	25.8	0.276			13.7	0.017	16.2	
53	363	3.97	0.096	0.021	59.1	0.083	6.02	26.1	0.277			13.8	0.017	16.2	
54	370	3.98	0.098	0.022	60.2	0.083	6.03	26.4	0.278			13.8	0.018	16.3	
55	377				61.4			26.8							
56	384				61.4			26.8							
57	391				62.9			27.2							
58	398				64.3			27.6							

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 27

Cumulative Metal Extractions
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

		CUMULATIVE METAL EXTRACTIONS (%)													
CYCLE	DAYS	Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.001	0.013	0.0004	0.02	0.002	0.001	0.01	0.001	0.01	0.012	0.010	0.03	0.06	0.003
2	8	0.002	0.023	0.001	0.03	0.006	0.003	0.01	0.003	0.01	0.020	0.017	0.04	0.09	0.006
3	15	0.002	0.030	0.001	0.04	0.009	0.004	0.01	0.005	0.02	0.026	0.023	0.06	0.11	0.009
4	22	0.003	0.036	0.002	0.05	0.010	0.004	0.02	0.006	0.02	0.033	0.029	0.08	0.13	0.010
5	27	0.003	0.039	0.002	0.06	0.011	0.005	0.02	0.006	0.02	0.039	0.033	0.09	0.13	0.011
6	34	0.003	0.043	0.002	0.07	0.012	0.005	0.02	0.007	0.03	0.045	0.038	0.10	0.14	0.012
7	41	0.003	0.045	0.002	0.08	0.012	0.005	0.02	0.007	0.04	0.050	0.041	0.11	0.15	0.013
8	48	0.003	0.049	0.002	0.09	0.013	0.006	0.03	0.008	0.04	0.057	0.045	0.12	0.15	0.014
9	55	0.004	0.051	0.002	0.10	0.014	0.006	0.03	0.008	0.05	0.061	0.048	0.13	0.16	0.015
10	63	0.004	0.053	0.003	0.11	0.014	0.006	0.03	0.009	0.06	0.067	0.051	0.14	0.16	0.016
11	70	0.004	0.056	0.003	0.12	0.015	0.006	0.03	0.010	0.07	0.073	0.054	0.15	0.16	0.017
12	76	0.004	0.058	0.003	0.13	0.016	0.006	0.03	0.010	0.08	0.078	0.057	0.16	0.17	0.018
13	84	0.004	0.060	0.003	0.14	0.016	0.007	0.03	0.011	0.08	0.083	0.060	0.16	0.17	0.019
14	90	0.004	0.063	0.003	0.15	0.017	0.007	0.04	0.011	0.09	0.089	0.062	0.17	0.17	0.019
15	97	0.004	0.065	0.003	0.16	0.017	0.007	0.04	0.012	0.09	0.095	0.065	0.18	0.17	0.021
16	104	0.004	0.066	0.003	0.16	0.017	0.007	0.04	0.012	0.09	0.096	0.066	0.19	0.17	0.021
17	111	0.005	0.070	0.004	0.18	0.018	0.007	0.04	0.013	0.10	0.107	0.070	0.20	0.18	0.023
18	118	0.005	0.073	0.004	0.20	0.018	0.007	0.04	0.014	0.11		0.073	0.22	0.18	0.024
19	125	0.005	0.075	0.004	0.21	0.019	0.007	0.05	0.015	0.11		0.075	0.22	0.18	0.025
20	132	0.005	0.078	0.004	0.22	0.019	0.008	0.05	0.015	0.11		0.078	0.24	0.18	0.026
21	139	0.005	0.080	0.004	0.23	0.019	0.008	0.05	0.016	0.12		0.080	0.25	0.19	0.027
22	146	0.005	0.083	0.004	0.24	0.020	0.008	0.05	0.016	0.12		0.082	0.25	0.19	0.027
23	153	0.005	0.085	0.004	0.25	0.020	0.008	0.05	0.017	0.13		0.084	0.26	0.19	0.028
24	161	0.005	0.088	0.004	0.26	0.020	0.008	0.05	0.017	0.13		0.086	0.27	0.19	0.029
25	167	0.005	0.091	0.005	0.28	0.021	0.008	0.06	0.018	0.13		0.088	0.29	0.19	0.030

Appendix 3.5-34 Table 27 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.005	0.093	0.005	0.29	0.021	0.008	0.06	0.018	0.14		0.089	0.30	0.19	0.030
27	181	0.005	0.096	0.005	0.30	0.021	0.008	0.06	0.018	0.14		0.091	0.31	0.20	0.031
28	188	0.005	0.099	0.005	0.31	0.021	0.008	0.06	0.019	0.15		0.093	0.32	0.20	0.032
29	195	0.006	0.101	0.005	0.33	0.022	0.008	0.06	0.019	0.15		0.094	0.33	0.20	0.032
30	202	0.006	0.104	0.005	0.34	0.022	0.008	0.06	0.019	0.15		0.096	0.34	0.20	0.033
31	209	0.006	0.106	0.005	0.35	0.022	0.008	0.06	0.019	0.16		0.097	0.34	0.20	0.033
32	217	0.006	0.110	0.005	0.36	0.022	0.008	0.07	0.019	0.16		0.098	0.36	0.20	0.033
33	223	0.006	0.112	0.006	0.37	0.023	0.008	0.07	0.020	0.17		0.099	0.36	0.20	0.034
34	230	0.006	0.114	0.006	0.38	0.023	0.008	0.07	0.020			0.100	0.37	0.21	
35	237	0.006	0.117	0.006	0.40	0.023	0.008	0.07	0.020			0.101	0.38	0.21	
36	244	0.006	0.119	0.006	0.41	0.023	0.008	0.07	0.020			0.102	0.39	0.21	
37	251	0.006	0.122	0.006	0.42	0.023	0.008	0.07	0.020			0.103	0.40	0.21	
38	258	0.006	0.124	0.006	0.43	0.023	0.008	0.07	0.020			0.104	0.41	0.21	
39	265	0.006	0.124	0.006	0.43	0.023	0.008	0.07	0.020			0.104	0.41	0.21	
40	272	0.006	0.129	0.006	0.45	0.024	0.008	0.08	0.020			0.105	0.43	0.21	
41	279	0.006	0.131	0.006	0.46	0.024	0.008	0.08	0.020			0.106	0.44	0.21	
42	286	0.006	0.133	0.006	0.47	0.024	0.008	0.08	0.020			0.107	0.45	0.21	
43	293	0.006	0.136	0.006	0.49	0.024	0.008	0.08	0.021			0.108	0.46	0.21	
44	300	0.006	0.139	0.007	0.50	0.024	0.008	0.08	0.021			0.109	0.47	0.22	
45	309	0.006	0.141	0.007	0.51	0.024	0.008	0.08	0.021			0.110	0.49	0.22	
46	315	0.006	0.143	0.007	0.52	0.024	0.008	0.08	0.021			0.111	0.50	0.22	
47	321	0.006	0.146	0.007	0.53	0.025	0.009	0.08	0.021			0.111	0.51	0.22	
48	328	0.006	0.147	0.007	0.54	0.025	0.009	0.09	0.021			0.112	0.52	0.22	
49	335	0.006	0.150	0.007	0.55	0.025	0.009	0.09	0.021			0.113	0.53	0.22	
50	342	0.006	0.152	0.007	0.57	0.025	0.009	0.09	0.021			0.114	0.54	0.22	
51	349	0.006	0.154	0.007	0.58	0.025	0.009	0.09	0.021			0.114	0.55	0.22	
52	356	0.006	0.156	0.007	0.59	0.025	0.009	0.09	0.021			0.115	0.56	0.22	
53	363	0.006	0.158	0.007	0.60	0.025	0.009	0.09	0.021			0.116	0.57	0.22	
54	370	0.006	0.160	0.007	0.61	0.025	0.009	0.09	0.021			0.116	0.59	0.22	
55	377				0.62			0.09							
56	384				0.62			0.09							
57	391				0.64			0.09							
58	398				0.65			0.10							

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 28

Metal Extraction Rates
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.63	0.0050	0.0012	1.10	0.0105	1.05	1.10	0.021	<0.0001	0.0013	0.70	0.0005	1.89	0.010
3	15	0.58	0.0048	0.0011	1.13	0.0097	0.96	1.09	0.020	<0.0001	0.0013	0.71	0.0005	1.79	0.010
4	22	0.49	0.0043	0.0010	1.12	0.0084	0.82	1.04	0.018	<0.0001	0.0013	0.69	0.0005	1.60	0.009
5	27	0.42	0.0040	0.0010	1.14	0.0074	0.71	1.02	0.016	<0.0001	0.0014	0.70	0.0005	1.46	0.008
6	34	0.36	0.0037	0.0009	1.14	0.0064	0.61	0.97	0.015	<0.0001	0.0014	0.68	0.0004	1.29	0.007
7	41	0.24	0.0029	0.0007	1.07	0.0045	0.40	0.85	0.011	<0.0001	0.0013	0.61	0.0004	0.95	0.005
8	48	0.16	0.0024	0.0006	1.05	0.0031	0.26	0.76	0.009	<0.0001	0.0013	0.56	0.0004	0.68	0.004
9	55	0.11	0.0020	0.0005	0.99	0.0024	0.19	0.66	0.008	<0.0001	0.0012	0.49	0.0003	0.47	0.003
10	63	0.11	0.0017	0.0005	0.92	0.0022	0.17	0.58	0.007	<0.0001	0.0011	0.42	0.0003	0.36	0.003
11	70	0.11	0.0016	0.0004	0.91	0.0021	0.17	0.55	0.007	<0.0001	0.0011	0.39	0.0003	0.28	0.003
12	76	0.11	0.0016	0.0004	0.95	0.0021	0.17	0.55	0.008	<0.0001	0.0011	0.38	0.0003	0.25	0.004
13	84	0.10	0.0014	0.0004	0.89	0.0019	0.15	0.50	0.007	<0.0001	0.0010	0.34	0.0003	0.21	0.003
14	90	0.10	0.0014	0.0004	0.94	0.0019	0.15	0.51	0.008	<0.0001	0.0011	0.34	0.0003	0.21	0.003
15	97	0.10	0.0015	0.0004	1.02	0.0018	0.14	0.54	0.008	<0.0001	0.0012	0.35	0.0003	0.21	0.004
16	104	0.08	0.0012	0.0003	0.83	0.0014	0.11	0.43	0.007	<0.0001	0.0009	0.27	0.0002	0.16	0.003
17	111	0.08	0.0014	0.0004	1.02	0.0015	0.11	0.51	0.008	<0.0001	0.0011	0.31	0.0003	0.17	0.004
18	118	0.08	0.0016	0.0005	1.14	0.0015	0.11	0.55	0.009	<0.0001		0.33	0.0003	0.18	0.004
19	125	0.07	0.0015	0.0004	1.11	0.0013	0.10	0.53	0.008	<0.0001		0.31	0.0003	0.16	0.004
20	132	0.07	0.0015	0.0004	1.12	0.0013	0.09	0.52	0.008	<0.0001		0.30	0.0003	0.16	0.004
21	139	0.08	0.0018	0.0005	1.32	0.0014	0.10	0.60	0.009	<0.0001		0.34	0.0004	0.18	0.004
22	146	0.06	0.0015	0.0004	1.15	0.0012	0.08	0.51	0.007	<0.0001		0.28	0.0003	0.15	0.003
23	153	0.06	0.0015	0.0004	1.11	0.0011	0.07	0.48	0.007	<0.0001		0.25	0.0003	0.14	0.003
24	161	0.05	0.0015	0.0004	1.12	0.0011	0.06	0.47	0.006	<0.0001		0.24	0.0003	0.13	0.003
25	167	0.05	0.0016	0.0004	1.17	0.0010	0.06	0.48	0.006	<0.0001		0.24	0.0003	0.13	0.003

Appendix 3.5-34 Table 28 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.05	0.0016	0.0004	1.16	0.0010	0.06	0.46	0.006	<0.0001		0.23	0.0003	0.13	0.003
27	181	0.04	0.0016	0.0004	1.18	0.0010	0.05	0.46	0.005	<0.0001		0.22	0.0003	0.12	0.003
28	188	0.04	0.0017	0.0004	1.21	0.0009	0.05	0.46	0.005	<0.0001		0.21	0.0003	0.12	0.002
29	195	0.04	0.0017	0.0004	1.26	0.0009	0.04	0.47	0.005	<0.0001		0.21	0.0003	0.12	0.002
30	202	0.03	0.0017	0.0003	1.21	0.0008	0.04	0.44	0.004	<0.0001		0.18	0.0003	0.11	0.002
31	209	0.03	0.0016	0.0003	1.19	0.0008	0.03	0.42	0.003	<0.0001		0.17	0.0003	0.10	0.002
32	217	0.02	0.0016	0.0003	1.19	0.0008	0.03	0.41	0.003	<0.0001		0.16	0.0003	0.10	0.002
33	223	0.02	0.0016	0.0003	1.17	0.0007	0.02	0.39	0.003	<0.0001		0.15	0.0003	0.09	0.001
34	230	0.02	0.0016	0.0003	1.16	0.0007	0.02	0.38	0.002			0.14	0.0003	0.09	
35	237	0.01	0.0016	0.0003	1.13	0.0006	0.01	0.36	0.002			0.12	0.0003	0.08	
36	244	0.01	0.0016	0.0003	1.16	0.0006	0.01	0.37	0.002			0.12	0.0003	0.08	
37	251	0.01	0.0015	0.0003	1.12	0.0006	0.01	0.35	0.002			0.11	0.0003	0.08	
38	258	0.01	0.0015	0.0003	1.14	0.0006	0.01	0.36	0.002			0.11	0.0003	0.08	
39	265	0.01	0.0012	0.0002	0.91	0.0004	0.01	0.28	0.001			0.09	0.0002	0.06	
40	272	0.01	0.0014	0.0003	1.09	0.0005	0.01	0.34	0.001			0.11	0.0003	0.07	
41	279	0.01	0.0014	0.0003	1.08	0.0005	0.01	0.33	0.001			0.10	0.0003	0.07	
42	286	0.01	0.0014	0.0003	1.11	0.0005	0.01	0.34	0.001			0.11	0.0003	0.07	
43	293	0.01	0.0014	0.0003	1.10	0.0005	0.01	0.34	0.001			0.10	0.0003	0.07	
44	300	0.01	0.0017	0.0003	1.34	0.0006	0.01	0.41	0.001			0.12	0.0004	0.08	
45	309	0.01	0.0014	0.0003	1.12	0.0004	0.01	0.34	0.001			0.10	0.0003	0.07	
46	315	0.01	0.0014	0.0003	1.14	0.0004	0.01	0.35	0.001			0.10	0.0003	0.07	
47	321	0.01	0.0015	0.0003	1.18	0.0004	0.01	0.36	0.001			0.10	0.0003	0.07	
48	328	0.01	0.0014	0.0003	1.12	0.0004	0.01	0.34	0.001			0.10	0.0003	0.06	
49	335	0.01	0.0014	0.0003	1.11	0.0004	0.01	0.33	0.001			0.09	0.0003	0.06	
50	342	0.01	0.0014	0.0003	1.15	0.0004	0.01	0.35	0.001			0.10	0.0004	0.06	
51	349	0.01	0.0014	0.0003	1.13	0.0004	0.01	0.34	0.001			0.09	0.0004	0.06	
52	356	0.01	0.0013	0.0003	1.07	0.0003	0.01	0.32	0.001			0.09	0.0003	0.06	
53	363	0.01	0.0013	0.0003	1.09	0.0003	0.01	0.32	0.001			0.09	0.0003	0.06	
54	370	0.01	0.0013	0.0003	1.08	0.0003	0.01	0.32	0.001			0.08	0.0004	0.05	
55	377				1.09			0.32							
56	384				0.87			0.26							
57	391				0.97			0.29							
58	398				1.03			0.31							

Appendix 3.5-34 Table 29

Oxidation and Neutralization Results
Lower Mole Lake Waste Rock Master Composite (WD-08)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	8	0.08		0.088	0.048	0.060	1.23	11		0.02
2	8	13	0.13	4.24	0.051	0.031	0.052	1.65	19	7.28	0.04
3	15	17	0.17	4.22	0.044	0.029	0.045	1.69	27	7.34	0.06
4	22	21	0.21	4.01	0.037	0.027	0.038	1.76	33	7.07	0.07
5	27	24	0.23	3.93	0.027	0.022	0.028	1.87	38	7.06	0.08
6	34	26	0.26	3.69	0.029	0.028	0.032	2.08	44	6.84	0.10
7	41	28	0.28	3.14	0.018	0.020	0.022	2.36	48	6.18	0.10
8	48	30	0.29	2.65	0.019	0.026	0.027	2.73	54	5.74	0.12
9	55	31	0.31	2.14	0.012	0.020	0.020	3.28	58	5.21	0.13
10	63	32	0.32	1.73	0.014	0.024	0.022	3.25	62	4.70	0.14
11	70	34	0.33	1.49	0.016	0.027	0.025	3.23	67	4.53	0.15
12	76	35	0.35	1.43	0.013	0.022	0.019	3.21	71	4.64	0.16
13	84	37	0.36	1.28	0.013	0.022	0.019	3.18	76	4.29	0.16
14	90	38	0.37	1.34	0.014	0.023	0.020	3.16	80	4.47	0.17
15	97	40	0.39	1.45	0.018	0.030	0.025	3.13	85	4.79	0.19
16	104	40	0.39	1.16	0.002	0.003	0.002	3.11	86	3.84	0.19
17	111	42	0.42	1.43	0.028	0.049	0.039	3.09	95	4.66	0.21
18	118	44	0.43	1.58	0.018	0.033	0.025	3.14	101	5.13	0.22
19	125	45	0.44	1.51	0.013	0.023	0.017	3.20	105	4.94	0.23
20	132	47	0.46	1.51	0.017	0.033	0.024	3.25	110	4.96	0.24
21	139	48	0.47	1.75	0.014	0.027	0.019	3.31	115	5.79	0.25
22	146	50	0.49	1.47	0.014	0.027	0.019	3.37	120	4.96	0.26
23	153	51	0.50	1.37	0.014	0.028	0.019	3.44	124	4.74	0.27
24	161	52	0.51	1.35	0.014	0.029	0.019	3.50	129	4.74	0.28
25	167	54	0.53	1.36	0.016	0.034	0.022	3.57	135	4.88	0.29
26	174	55	0.54	1.31	0.012	0.026	0.016	3.65	139	4.80	0.30

Appendix 3.5-34 Table 29 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
27	181	56	0.55	1.30	0.013	0.030	0.018	3.72	144	4.84	0.31
28	188	58	0.56	1.30	0.014	0.032	0.019	3.80	149	4.93	0.32
29	195	59	0.58	1.31	0.012	0.030	0.017	3.88	154	5.06	0.33
30	202	60	0.59	1.22	0.013	0.033	0.019	3.97	159	4.82	0.35
31	209	61	0.60	1.17	0.009	0.024	0.013	4.06	162	4.70	0.35
32	217	62	0.61	1.12	0.013	0.034	0.018	4.15	168	4.64	0.36
33	223	63	0.62	1.07	0.009	0.026	0.013	4.25	172	4.52	0.37
34	230	64	0.63	1.04	0.010	0.029	0.015	4.22	176	4.47	0.38
35	237	65	0.64	0.99	0.010	0.029	0.015	4.19	180	4.31	0.39
36	244	66	0.65	1.01	0.010	0.028	0.014	4.15	185	4.42	0.40
37	251	67	0.65	0.97	0.009	0.025	0.013	4.12	188	4.24	0.41
38	258	68	0.67	1.00	0.012	0.032	0.017	4.09	193	4.32	0.42
39	265										
40	272	70	0.68	0.97	0.008 ?	0.052 ?	0.026 ?	10.18 ?	201	4.12	0.44
41	279	71	0.69	0.97	0.010	0.027	0.014	4.00	205	4.09	0.45
42	286	72	0.70	1.00	0.010	0.028	0.014	3.97	209	4.18	0.45
43	293	73	0.71	1.00	0.012	0.032	0.016	3.94	214	4.15	0.46
44	300	74	0.73	0.99	0.011	0.030	0.015	3.91	218	5.03	0.47
45	309	75	0.74	1.02	0.012	0.032	0.016	3.89	223	4.19	0.48
46	315	76	0.75	1.05	0.010	0.026	0.013	3.86	227	4.29	0.49
47	321	77	0.76	1.11	0.012	0.028	0.014	3.48	231	4.41	0.50
48	328	78	0.77	1.12	0.012	0.024	0.012	2.91	235	4.18	0.51
49	335	80	0.78	1.13	0.012	0.029	0.014	3.63	239	4.15	0.52
50	342	80	0.79	1.13	0.009	0.029	0.014	4.82	243	4.30	0.53
51	349	82	0.80	1.12	0.012	0.028	0.014	3.51	247	4.21	0.54
52	356	83	0.81	1.11	0.013	0.024	0.012	2.76	251	3.99	0.55
53	363	84	0.83	1.14	0.014	0.027	0.013	2.86	255	4.06	0.55
54	370	85	0.83	1.07	0.008	0.028	0.013	5.09	259	4.02	0.56
55	377	86	0.84	1.06	0.009	0.030	0.015	5.24	264	4.07	0.57
56	384										
57	391	87	0.85	0.78	-0.008	0.037	0.019	-6.89	282	6.14	0.61
58	398	88	0.86	0.69	0.009	0.034	0.017	5.69	287	6.37	0.62

* Rates of sulfate production and NP depletion are 5-week moving averages

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Tables 30-36.
Skunk Lake Waste Rock High Sulfur Composite (WD-09) Data and Calculations.

Appendix 3.5-34 Table 30

Sample Characterization
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	64300
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	230
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	9
Calcium	Ca	3800
Carbon	C	2400
Chromium	Cr	9
Cobalt	Co	13
Copper	Cu	160
Gallium	Ga	13
Iron	Fe	54900
Lead	Pb	160
Lithium	Li	NA
Magnesium	Mg	29800
Manganese	Mn	710
Mercury	Hg	0.7
Molybdenum	Mo	<20
Nickel	Ni	<5
Phosphorus	P	NA
Potassium	K	18000
Selenium	Se	4
Silicon	Si	303000
Silver	Ag	<0.01
Sodium	Na	1200
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	460
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	1300
Sulfur	S	39300

ABA Results	
Paste pH	8.7
S (Total) (%)	3.95
SO4 (%)	NA
S (sulfide) (%)	3.57
AP (kg CaCO3/tonne)	111.6
NP (kg CaCO3/tonne)	11.5
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-100.1
NP/AP	0.10

Note: NA = not analyzed

Sample Mass (kg)	73.64

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 31

Parameters Measured Weekly
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	5.875	6.2		1010	34		**516**	41
2-Nov-94	2	8	5.660	6.4		829	24		**381**	70
9-Nov-94	3	15	2.860	5.4	?	679	20		318	83
16-Nov-94	4	22	5.420	5.8		617	16		**254**	101
21-Nov-94	5	27	3.900	6.1		546	17		**212**	113
28-Nov-94	6	34	6.040	5.9		407	15		178	127
5-Dec-94	7	41	4.750	5.9		425	16		143	136
12-Dec-94	8	48	5.200	5.9		390	19		109	144
19-Dec-94	9	55	4.500	7.4		403	20		**74**	149
27-Dec-94	10	63	4.860	7.8		425	18		85	154
3-Jan-95	11	70	5.170	7.8		419	19		96	161
9-Jan-95	12	76	3.700	6.7		353	19		106	166
17-Jan-95	13	84	5.140	7.8		361	21		117	174
23-Jan-95	14	90	5.220	7.2		379	21		128	184
30-Jan-95	15	97	4.740	7.1		365	20		139	192
6-Feb-95	16	104	0.500	8.0		387	20		149	193
13-Feb-95	17	111	9.050	7.9		412	20		**160**	213
20-Feb-95	18	118	5.060	7.7		401	19		163	224
27-Feb-95	19	125	4.100	7.7		404	17		166	234
6-Mar-95	20	132	5.060	7.7		420	18		169	245
13-Mar-95	21	139	4.100	7.1		377	16		173	255
20-Mar-95	22	146	4.850	7.5		420	15		176	266
27-Mar-95	23	153	4.310	7.6		451	12		179	277
4-Apr-95	24	161	3.760	7.5		431	13		182	286
10-Apr-95	25	167	5.030	7.7		479	14		185	299
17-Apr-95	26	174	4.040	7.5		427	13		188	309
24-Apr-95	27	181	4.700	6.8		416	12		191	321
1-May-95	28	188	4.380	7.7		433	21		194	333
8-May-95	29	195	4.690	7.4		470	11		198	345
15-May-95	30	202	4.600	7.5		447	14		201	358
22-May-95	31	209	4.230	7.5		432	10		204	370
30-May-95	32	217	4.840	6.4		474	11		207	383
5-Jun-95	33	223	4.110	6.6		481	12		**210**	395
12-Jun-95	34	230	4.700	7.3		427	11		208	408
19-Jun-95	35	237	5.240	7.5		410	13		207	423
26-Jun-95	36	244	4.160	7.4		423	12		205	435
3-Jul-95	37	251	5.000	7.4		443	13		204	448
10-Jul-95	38	258	5.140	7.4		433	14		202	463
17-Jul-95	39	265	0.000							
24-Jul-95	40	272	7.690	7.2		444	18		199	483
31-Jul-95	41	279	4.560	7.4		470	14		198	496
7-Aug-95	42	286	4.900	7.3		459	17		196	509
14-Aug-95	43	293	4.710	7.4		442	12		195	521
21-Aug-95	44	300	4.880	7.4		436	12		193	534

Appendix 3.5-34 Table 31 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)		ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
30-Aug-95	45	309	5.630	7.3		411	13			192	549
5-Sep-95	46	315	4.700	7.5		431	13			**190**	561
11-Sep-95	47	321	4.240	7.4		443	<5	?		**210**	573
18-Sep-95	48	328	4.570	7.4		418	14			**280**	590
25-Sep-95	49	335	5.080	7.2		428	12			**270**	609
3-Oct-95	50	343	4.500	6.6	?	399	13			**170**	619
9-Oct-95	51	349	4.980	6.9	?	419	12			**180**	631
16-Oct-95	52	356	4.710	6.9	?	412	11			205	644
23-Oct-95	53	363	4.790	6.9	?	437	12			**230**	659
30-Oct-95	54	370	4.290	7.0	?	433	17			**180**	670
6-Nov-95	55	377	4.960	6.8	?	444	9	?		**180**	682
13-Nov-95	56	384	0.000								
20-Nov-95	57	391	7.120	6.7	?	446	16			**180**	699
27-Nov-95	58	398	4.820	6.8	?	482	17			**180**	711
4-Dec-95	59	405	4.580	7.3		462	15			183	723
11-Dec-95	60	412	4.370	7.3		501	19			185	734
18-Dec-95	61	419	4.590	7.3		499	13			188	745
26-Dec-95	62	427	5.020	7.3		468	13			190	758
2-Jan-96	63	434	4.540	7.2		466	12			193	770
9-Jan-96	64	441	4.520	7.2		468	12			195	782
15-Jan-96	65	447	3.680	7.0		505				198	792
23-Jan-96	66	455	3.970	7.0		501				200	803
31-Jan-96	67	463	4.080	7.0		516				203	814
7-Feb-96	68	470	4.140	7.1		540				205	825
13-Feb-96	69	476	3.110	7.0		514				208	834
20-Feb-96	70	483	3.010	7.1		534	8			**210**	843
27-Feb-96	71	490	2.990	6.8		613				230	852
5-Mar-96	72	497	2.900	6.8		677				250	862
11-Mar-96	73	503	3.100	6.6		632				270	873
18-Mar-96	74	510	3.790	6.7		632	6			**290**	888
25-Mar-96	75	517	3.720	6.7		649				285	901
2-Apr-96	76	525	4.500	6.6		625				280	916
9-Apr-96	77	532	3.720	6.8		619				275	928
16-Apr-96	78	539	4.800	6.8		626				**270**	943
29-Apr-96	79	552	4.150	6.7		614				268	956
7-May-96	80	560	4.700	6.8		590				265	971
13-May-96	81	566	4.260	6.5		585				263	984
21-May-96	82	574	4.890	6.6		557				**260**	999
28-May-96	83	581	4.560	6.4		594				268	1014
3-Jun-96	84	587	4.140	5.6		599				275	1027
10-Jun-96	85	594	4.940	5.6		617				283	1044
17-Jun-96	86	601	4.410	5.3		601				**290**	1059
24-Jun-96	87	608	4.800	5.1		656				298	1076
1-Jul-96	88	615	4.520	4.8		626				307	1092
8-Jul-96	89	622	4.270	4.6		672				315	1108
15-Jul-96	90	629	4.960	4.5		681				323	1127
22-Jul-96	91	636	4.900	4.4		684				332	1146
30-Jul-96	92	644	3.440	4.4		703				**340**	1160
5-Aug-96	93	650	0.000								
12-Aug-96	94	657	5.180	4.2		670				405	1185
19-Aug-96	95	664	4.170	4.0		699				438	1206
29-Aug-96	96	674	4.980	4.2		710				**470**	1234
2-Sep-96	97	678	0.000								
9-Sep-96	98	685	0.000								

Appendix 3.5-34 Table 31 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
19-Sep-96	99	695	3.710	3.9	929			422	1253
23-Sep-96	100	699	0.000						
30-Sep-96	101	706	6.620	3.8	866			**390**	1283
7-Oct-96	102	713	5.040	4.0	779			353	1304
17-Oct-96	103	723	6.910	3.9	738			317	1330
24-Oct-96	104	730	4.380	3.3	740			**280**	1345
1-Nov-96	105	738	5.500	3.3	861				
7-Nov-96	106	744	4.170	3.1	906				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 32

Leachate Analysis
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al		Arsenic As		Barium Ba	Calcium Ca		Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn		Potassium K		Selenium Se	Sodium Na	Zinc Zn
1	0	**6.1**		**0.012**		**0.027**	**82**		**0.042**	**0.16**	**6.7**	**79**	**2.1**		**28.6**		**0.025**	**14**	**0.58**
2	8	**4.2**		**0.010**		**0.018**	**65**		**0.017**	**0.10**	**4.5**	**58**	**1.6**		**19.0**		**0.018**	**6**	**0.32**
3	15	3.50		0.008		0.014	56.5		0.014	0.086	3.90	48.0	1.35		13.9		0.019	4.60	0.29
4	22	**2.8**		**0.006**		**0.009**	**48**	<	**0.010**	**0.072**	**3.3**	**38**	**1.1**		**8.8**		**0.020**	**2.9**	**0.25**
5	27	**1.2**	<	**0.005**		**0.010**	**42**	<	**0.010**	**0.034**	**1.4**	**31**	**0.93**		**7.3**		**0.016**	**2.0**	**0.16**
6	34	1.05		0.005		0.009	39.0		0.010	0.030	1.20	28.0	0.87		6.68		0.014	1.73	0.15
7	41	0.90		0.005		0.008	36.0		0.010	0.025	1.00	25.0	0.82		6.05		0.011	1.45	0.14
8	48	0.75		0.005		0.007	33.0		0.010	0.021	0.79	22.0	0.76		5.43		0.009	1.18	0.13
9	55	**0.60**	<	**0.005**		**0.006**	**30**	<	**0.010**	**0.016**	**0.59**	**19**	**0.70**	<	**4.8**	<	**0.006**	**0.90**	**0.12**
10	63	0.58		0.005		0.006	30.5		0.010	0.017	0.57	19.0	0.71		4.59		0.007	0.88	0.14
11	70	0.57		0.005		0.006	31.0		0.010	0.017	0.56	19.0	0.72		4.38		0.008	0.86	0.15
12	76	0.55		0.005		0.006	31.5		0.010	0.018	0.54	19.0	0.73		4.16		0.009	0.84	0.17
13	84	0.54		0.005		0.007	32.0		0.010	0.019	0.53	19.0	0.74		3.95		0.010	0.82	0.19
14	90	0.52		0.005		0.007	32.5		0.010	0.019	0.51	19.0	0.75		3.74		0.010	0.80	0.20
15	97	0.50		0.005		0.007	33.0		0.010	0.020	0.49	19.0	0.76		3.53		0.011	0.78	0.22
16	104	0.49		0.005		0.007	33.5		0.010	0.020	0.48	19.0	0.77		3.31		0.012	0.76	0.23
17	111	**0.47**	<	**0.005**		**0.007**	**34**		0.010	**0.021**	**0.46**	**19**	**0.78**		**3.1**		**0.013**	**0.74**	**0.25**
18	118	0.446		0.005		0.007	34.9		0.010	0.020	0.44	19.6	0.76		3.02		0.013	0.73	0.29
19	125	0.423		0.005		0.007	35.8		0.010	0.020	0.41	20.3	0.74		2.94		0.013	0.73	0.34
20	132	0.399		0.005		0.007	36.6		0.010	0.019	0.39	20.9	0.72		2.86		0.013	0.72	0.38
21	139	0.376		0.005		0.007	37.5		0.011	0.019	0.36	21.5	0.70		2.78		0.014	0.71	0.43
22	146	0.352		0.005		0.007	38.4		0.011	0.018	0.34	22.1	0.68		2.69		0.014	0.71	0.47
23	153	0.328		0.005		0.007	39.3		0.011	0.018	0.32	22.8	0.66		2.61		0.014	0.70	0.51
24	161	0.305		0.005		0.007	40.1		0.011	0.017	0.29	23.4	0.64		2.53		0.014	0.69	0.56
25	167	0.281		0.005		0.007	41.0		0.011	0.017	0.27	24.0	0.63		2.45		0.014	0.69	0.60
26	174	0.257		0.005		0.007	41.9		0.011	0.016	0.24	24.6	0.61		2.37		0.014	0.68	0.64

Appendix 3.5-34 Table 32 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al		Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	181	0.234		0.005	0.007	42.8	0.011	0.015	0.22	25.3	0.59	2.29	0.014	0.67	0.69
28	188	0.210		0.005	0.007	43.6	0.011	0.015	0.20	25.9	0.57	2.21	0.014	0.66	0.73
29	195	0.187		0.005	0.007	44.5	0.011	0.014	0.17	26.5	0.55	2.13	0.015	0.66	0.78
30	202	0.163		0.005	0.007	45.4	0.011	0.014	0.15	27.1	0.53	2.04	0.015	0.65	0.82
31	209	0.139		0.005	0.007	46.3	0.011	0.013	0.12	27.8	0.51	1.96	0.015	0.64	0.86
32	217	0.116		0.005	0.007	47.1	0.011	0.013	0.10	28.4	0.49	1.88	0.015	0.64	0.91
33	223	**0.092**	**<**	**0.005**	**0.007**	**48**	0.011	**0.012**	**0.077**	**29**	**0.47**	**1.8**	**0.015**	**0.63**	**0.95**
34	230	0.090		0.005	0.007	48.3	0.011	0.012	0.08	28.8	0.47	1.76	0.015	0.62	0.98
35	237	0.088		0.005	0.007	48.6	0.011	0.012	0.07	28.6	0.46	1.71	0.014	0.62	1.00
36	244	0.085		0.005	0.007	48.9	0.011	0.012	0.07	28.4	0.46	1.67	0.014	0.61	1.03
37	251	0.083		0.005	0.007	49.1	0.011	0.012	0.07	28.2	0.45	1.62	0.014	0.60	1.05
38	258	0.081		0.005	0.007	49.4	0.011	0.012	0.07	28.0	0.45	1.58	0.014	0.60	1.08
39	265														
40	272	0.077		0.005	0.007	50.0	0.011	0.012	0.07	27.7	0.44	1.49	0.013	0.58	1.13
41	279	0.074		0.005	0.007	50.3	0.011	0.012	0.07	27.5	0.43	1.45	0.013	0.58	1.16
42	286	0.072		0.005	0.007	50.6	0.011	0.012	0.07	27.3	0.43	1.40	0.013	0.57	1.19
43	293	0.070		0.005	0.007	50.9	0.012	0.012	0.06	27.1	0.42	1.36	0.012	0.56	1.21
44	300	0.068		0.005	0.006	51.1	0.012	0.011	0.06	26.9	0.42	1.31	0.012	0.56	1.24
45	309	0.066		0.005	0.006	51.4	0.012	0.011	0.06	26.7	0.41	1.27	0.012	0.55	1.26
46	315	0.064		0.005	0.006	51.7	0.012	0.011	0.06	26.5	0.41	1.22	0.012	0.54	1.29
47	321	0.061		0.005	0.006	52.0	0.012	0.011	0.06	26.3	0.40	1.18	0.011	0.54	1.32
48	328	0.059		0.005	0.006	52.3	0.012	0.011	0.06	26.1	0.40	1.14	0.011	0.53	1.34
49	335	0.057		0.005	0.006	52.6	0.012	0.011	0.06	26.0	0.39	1.09	0.011	0.52	1.37
50	343	0.055		0.005	0.006	52.9	0.012	0.011	0.06	25.8	0.39	1.05	0.010	0.52	1.40
51	349	0.053		0.005	0.006	53.1	0.012	0.011	0.05	25.6	0.38	1.00	0.010	0.51	1.42
52	356	0.050		0.005	0.006	53.4	0.012	0.011	0.05	25.4	0.38	0.96	0.010	0.50	1.45
53	363	0.048		0.005	0.006	53.7	0.012	0.011	0.05	25.2	0.37	0.91	0.010	0.50	1.47
54	370	**0.046**	**<**	**0.005**	**0.006**	**54**	**0.012**	**0.011**	**0.050**	**25**	**0.37**	**0.87**	**0.0094**	**0.49**	**1.5**
55	377					50.8				25.3					1.71
56	384														
57	391					44.3				25.8					2.14
58	398					**41**				**26**					2.35
59	405					41.4				26.3					2.56
60	412					41.8				26.7					2.78
61	419					42.3				27.0					2.99
62	427					42.7				27.3					3.20

Appendix 3.5-34 Table 32 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *											
		Aluminum	Arsenic	Barium	Calcium	Cobalt	Copper	Iron	Magnesium	Manganese	Potassium	Selenium	Sodium	Zinc
		Al	As	Ba	Ca	Co	Cu	Fe	Mg	Mn	K	Se	Na	Zn
63	434				43.1				27.7					3.41
64	441				43.5				28.0					3.63
65	447				43.9				28.3					3.84
66	455				44.3				28.7					4.05
67	463				44.8				29.0					4.26
68	470				45.2				29.3					4.48
69	476				45.6				29.7					4.69
70	483				**46**				**30**					**4.9**
71	490				49.0				32.5					
72	497				52.0				35.0					
73	503				55.0				37.5					
74	510				**58**				**40**					
75	517				57.8				39.5					
76	525				57.5				39.0					
77	532				57.3				38.5					
78	539				**57**				**38**					
79	552				55.0				37.3					
80	560				53.0				36.5					
81	566				51.0				35.8					
82	574				**49**				**35**					
83	581				50.5				36.0					
84	587				52.0				37.0					
85	594				53.5				38.0					
86	601				**55**				**39**					
87	608				56.2				40.2					
88	615				57.3				41.3					
89	622				58.5				42.5					
90	629				59.7				43.7					
91	636				60.8				44.8					
92	644				**62**				**46**					
93	650													
94	657				60.5				45.0					
95	664				59.8				44.5					
96	674				**59**				**44**					
97	678													
98	685													

Appendix 3.5-34 Table 32 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
99	695				70.4				38.0					
100	699													
101	706				**78**				**34**					
102	713				69.3				34.3					
103	723				60.7				34.7					
104	730				**52**				**35**					

* Measured values shown in bold

Appendix 3.5-34 Table 33

Cumulative Mass Flux
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.49	0.001	0.002	6.5	0.003	0.013	0.53	6.3	0.17	2.3	0.002	1.1	0.05
2	8	0.81	0.002	0.004	11.5	0.005	0.020	0.88	10.8	0.29	3.7	0.003	1.6	0.07
3	15	0.95	0.002	0.004	13.7	0.005	0.024	1.03	12.6	0.34	4.3	0.004	1.8	0.08
4	22	1.15	0.002	0.005	17.3	0.006	0.029	1.27	15.4	0.42	4.9	0.006	2.0	0.10
5	27	1.22	0.003	0.005	19.5	0.006	0.031	1.35	17.1	0.47	5.3	0.006	2.1	0.11
6	34	1.30	0.003	0.006	22.7	0.007	0.033	1.45	19.4	0.54	5.9	0.008	2.2	0.12
7	41	1.36	0.003	0.007	25.0	0.008	0.035	1.51	21.0	0.60	6.3	0.008	2.3	0.13
8	48	1.41	0.004	0.007	27.3	0.009	0.036	1.57	22.5	0.65	6.6	0.009	2.4	0.14
9	55	1.45	0.004	0.007	29.2	0.009	0.037	1.60	23.7	0.69	6.9	0.009	2.5	0.15
10	63	1.49	0.004	0.008	31.2	0.010	0.038	1.64	24.9	0.74	7.2	0.010	2.5	0.16
11	70	1.53	0.005	0.008	33.4	0.011	0.040	1.68	26.3	0.79	7.5	0.010	2.6	0.17
12	76	1.55	0.005	0.009	34.9	0.011	0.041	1.71	27.2	0.83	7.7	0.011	2.6	0.17
13	84	1.59	0.005	0.009	37.2	0.012	0.042	1.74	28.6	0.88	8.0	0.011	2.7	0.19
14	90	1.63	0.006	0.009	39.5	0.013	0.043	1.78	29.9	0.93	8.3	0.012	2.7	0.20
15	97	1.66	0.006	0.010	41.6	0.013	0.044	1.81	31.1	0.98	8.5	0.013	2.8	0.22
16	104	1.66	0.006	0.010	41.8	0.013	0.045	1.82	31.3	0.99	8.5	0.013	2.8	0.22
17	111	1.72	0.007	0.011	46.0	0.015	0.047	1.87	33.6	1.08	8.9	0.014	2.9	0.25
18	118	1.75	0.007	0.011	48.4	0.015	0.049	1.90	34.9	1.13	9.1	0.015	2.9	0.27
19	125	1.78	0.007	0.012	50.4	0.016	0.050	1.92	36.1	1.18	9.3	0.016	3.0	0.29
20	132	1.80	0.008	0.012	52.9	0.017	0.051	1.95	37.5	1.23	9.5	0.017	3.0	0.31
21	139	1.82	0.008	0.013	55.0	0.017	0.052	1.97	38.7	1.26	9.6	0.018	3.1	0.34
22	146	1.85	0.008	0.013	57.5	0.018	0.053	1.99	40.2	1.31	9.8	0.019	3.1	0.37
23	153	1.87	0.009	0.013	59.8	0.018	0.054	2.01	41.5	1.35	10.0	0.019	3.2	0.40
24	161	1.88	0.009	0.014	61.9	0.019	0.055	2.03	42.7	1.38	10.1	0.020	3.2	0.43
25	167	1.90	0.009	0.014	64.7	0.020	0.056	2.05	44.3	1.42	10.3	0.021	3.2	0.47

Appendix 3.5-34 Table 33 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	1.92	0.009	0.015	67.0	0.020	0.057	2.06	45.7	1.46	10.4	0.022	3.3	0.50
27	181	1.93	0.010	0.015	69.7	0.021	0.058	2.07	47.3	1.49	10.5	0.023	3.3	0.55
28	188	1.94	0.010	0.015	72.3	0.022	0.059	2.08	48.8	1.53	10.7	0.024	3.4	0.59
29	195	1.96	0.010	0.016	75.1	0.022	0.060	2.10	50.5	1.56	10.8	0.025	3.4	0.64
30	202	1.97	0.011	0.016	78.0	0.023	0.061	2.11	52.2	1.60	10.9	0.026	3.4	0.69
31	209	1.97	0.011	0.017	80.6	0.024	0.062	2.11	53.8	1.63	11.1	0.026	3.5	0.74
32	217	1.98	0.011	0.017	83.7	0.024	0.062	2.12	55.7	1.66	11.2	0.027	3.5	0.80
33	223	1.99	0.012	0.018	86.4	0.025	0.063	2.12	57.3	1.68	11.3	0.028	3.6	0.85
34	230	1.99	0.012	0.018	89.5	0.026	0.064	2.13	59.1	1.71	11.4	0.029	3.6	0.92
35	237	2.00	0.012	0.019	92.9	0.027	0.065	2.13	61.2	1.75	11.5	0.030	3.6	0.99
36	244	2.00	0.013	0.019	95.7	0.027	0.065	2.14	62.8	1.77	11.6	0.031	3.7	1.04
37	251	2.01	0.013	0.019	99.0	0.028	0.066	2.14	64.7	1.80	11.7	0.032	3.7	1.12
38	258	2.01	0.013	0.020	102.5	0.029	0.067	2.15	66.6	1.83	11.8	0.033	3.8	1.19
39	265	2.01	0.013	0.020	102.5	0.029	0.067	2.15	66.6	1.83	11.8	0.033	3.8	1.19
40	272	2.02	0.014	0.021	107.7	0.030	0.068	2.15	69.5	1.88	12.0	0.034	3.8	1.31
41	279	2.03	0.014	0.021	110.8	0.031	0.069	2.16	71.2	1.91	12.1	0.035	3.9	1.38
42	286	2.03	0.014	0.021	114.2	0.031	0.070	2.16	73.0	1.93	12.2	0.036	3.9	1.46
43	293	2.04	0.015	0.022	117.4	0.032	0.070	2.17	74.8	1.96	12.2	0.037	3.9	1.54
44	300	2.04	0.015	0.022	120.8	0.033	0.071	2.17	76.6	1.99	12.3	0.037	4.0	1.62
45	309	2.05	0.015	0.023	124.8	0.034	0.072	2.18	78.6	2.02	12.4	0.038	4.0	1.72
46	315	2.05	0.016	0.023	128.1	0.034	0.073	2.18	80.3	2.05	12.5	0.039	4.0	1.80
47	321	2.05	0.016	0.024	131.1	0.035	0.073	2.18	81.8	2.07	12.6	0.040	4.1	1.87
48	328	2.06	0.016	0.024	134.3	0.036	0.074	2.19	83.4	2.09	12.7	0.040	4.1	1.96
49	335	2.06	0.017	0.024	137.9	0.037	0.075	2.19	85.2	2.12	12.7	0.041	4.1	2.05
50	343	2.06	0.017	0.025	141.2	0.037	0.076	2.19	86.8	2.15	12.8	0.042	4.2	2.14
51	349	2.07	0.017	0.025	144.7	0.038	0.076	2.20	88.5	2.17	12.9	0.042	4.2	2.23
52	356	2.07	0.018	0.026	148.2	0.039	0.077	2.20	90.1	2.20	12.9	0.043	4.2	2.33
53	363	2.07	0.018	0.026	151.7	0.040	0.078	2.20	91.8	2.22	13.0	0.044	4.3	2.42
54	370	2.08	0.018	0.026	154.8	0.040	0.078	2.21	93.2	2.24	13.0	0.044	4.3	2.51
55	377				158.2				94.9					2.63
56	384				158.2				94.9					2.63
57	391				162.5				97.4					2.83
58	398				165.2				99.1					2.99
59	405				167.8				100.8					3.15
60	412				170.2				102.4					3.31
61	419				172.9				104.0					3.50

Appendix 3.5-34 Table 33 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)											
		Aluminum	Arsenic	Barium	Calcium	Cobalt	Copper	Iron	Magnesium	Manganese	Potassium	Selenium	Sodium	Zinc
		Al	As	Ba	Ca	Co	Cu	Fe	Mg	Mn	K	Se	Na	Zn
62	427				175.8				105.9					3.71
63	434				178.4				107.6					3.92
64	441				181.1				109.3					4.15
65	447				183.3				110.7					4.34
66	455				185.7				112.3					4.56
67	463				188.2				113.9					4.79
68	470				190.7				115.5					5.04
69	476				192.6				116.8					5.24
70	483				194.5				118.0					5.44
71	490				196.5				119.3					
72	497				198.6				120.7					
73	503				200.9				122.3					
74	510				203.9				124.4					
75	517				206.8				126.4					
76	525				210.3				128.7					
77	532				213.2				130.7					
78	539				216.9				133.2					
79	552				220.0				135.3					
80	560				223.4				137.6					
81	566				226.3				139.7					
82	574				229.6				142.0					
83	581				232.7				144.2					
84	587				235.6				146.3					
85	594				239.2				148.8					
86	601				242.5				151.2					
87	608				246.2				153.8					
88	615				249.7				156.3					
89	622				253.1				158.8					
90	629				257.1				161.7					
91	636				261.2				164.7					
92	644				264.1				166.9					
93	650				264.1				166.9					
94	657				268.3				170.0					
95	664				271.7				172.6					
96	674				275.7				175.5					
97	678				275.7				175.5					

Appendix 3.5-34 Table 33 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)											
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685				275.7				175.5					
99	695				279.2				177.4					
100	699				279.2				177.4					
101	706				286.2				180.5					
102	713				291.0				182.8					
103	723				296.7				186.1					
104	730				299.8				188.2					

Appendix 3.5-34 Table 34

Cumulative Metal Extractions
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0008	0.0016	0.0009	0.2	0.026	0.0080	0.001	0.02	0.024	0.013	0.05	0.09	0.004
2	8	0.0013	0.0028	0.002	0.3	0.036	0.013	0.002	0.04	0.041	0.021	0.08	0.13	0.005
3	15	0.001	0.003	0.002	0.4	0.040	0.015	0.002	0.04	0.048	0.024	0.10	0.15	0.006
4	22	0.002	0.004	0.002	0.5	0.046	0.018	0.002	0.05	0.060	0.027	0.14	0.17	0.008
5	27	0.002	0.004	0.002	0.5	0.050	0.019	0.002	0.06	0.067	0.030	0.16	0.17	0.008
6	34	0.002	0.005	0.003	0.6	0.056	0.021	0.003	0.06	0.077	0.033	0.19	0.19	0.009
7	41	0.002	0.006	0.003	0.7	0.061	0.022	0.003	0.07	0.084	0.035	0.21	0.19	0.010
8	48	0.002	0.006	0.003	0.7	0.066	0.023	0.003	0.08	0.092	0.037	0.22	0.20	0.011
9	55	0.002	0.007	0.003	0.8	0.071	0.023	0.003	0.08	0.098	0.039	0.23	0.21	0.011
10	63	0.002	0.007	0.003	0.8	0.076	0.024	0.003	0.08	0.104	0.040	0.24	0.21	0.012
11	70	0.002	0.008	0.004	0.9	0.082	0.025	0.003	0.09	0.111	0.042	0.26	0.22	0.013
12	76	0.002	0.008	0.004	0.9	0.085	0.025	0.003	0.09	0.117	0.043	0.27	0.22	0.013
13	84	0.002	0.009	0.004	1.0	0.091	0.026	0.003	0.10	0.124	0.045	0.28	0.22	0.014
14	90	0.003	0.009	0.004	1.0	0.097	0.027	0.003	0.10	0.131	0.046	0.30	0.23	0.016
15	97	0.003	0.010	0.004	1.1	0.102	0.028	0.003	0.10	0.138	0.047	0.32	0.23	0.017
16	104	0.003	0.010	0.004	1.1	0.102	0.028	0.003	0.10	0.139	0.047	0.32	0.23	0.017
17	111	0.003	0.011	0.005	1.2	0.112	0.029	0.003	0.11	0.152	0.050	0.36	0.24	0.019
18	118	0.003	0.012	0.005	1.3	0.117	0.030	0.003	0.12	0.160	0.051	0.38	0.25	0.021
19	125	0.003	0.012	0.005	1.3	0.122	0.031	0.004	0.12	0.166	0.052	0.40	0.25	0.022
20	132	0.003	0.013	0.005	1.4	0.127	0.032	0.004	0.13	0.173	0.053	0.43	0.25	0.024
21	139	0.003	0.013	0.005	1.4	0.132	0.033	0.004	0.13	0.178	0.054	0.44	0.26	0.026
22	146	0.003	0.014	0.006	1.5	0.137	0.033	0.004	0.13	0.184	0.055	0.47	0.26	0.028
23	153	0.003	0.014	0.006	1.6	0.142	0.034	0.004	0.14	0.190	0.055	0.49	0.26	0.031
24	161	0.003	0.015	0.006	1.6	0.146	0.034	0.004	0.14	0.195	0.056	0.50	0.27	0.033
25	167	0.003	0.015	0.006	1.7	0.152	0.035	0.004	0.15	0.201	0.057	0.53	0.27	0.036

Appendix 3.5-34 Table 34 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.003	0.016	0.006	1.8	0.156	0.036	0.004	0.15	0.205	0.058	0.55	0.27	0.039
27	181	0.003	0.016	0.007	1.8	0.162	0.036	0.004	0.16	0.211	0.059	0.57	0.28	0.042
28	188	0.003	0.017	0.007	1.9	0.167	0.037	0.004	0.16	0.215	0.059	0.59	0.28	0.045
29	195	0.003	0.017	0.007	2.0	0.172	0.037	0.004	0.17	0.220	0.060	0.61	0.28	0.049
30	202	0.003	0.018	0.007	2.1	0.177	0.038	0.004	0.18	0.225	0.061	0.64	0.29	0.053
31	209	0.003	0.018	0.007	2.1	0.182	0.038	0.004	0.18	0.229	0.061	0.66	0.29	0.057
32	217	0.003	0.019	0.007	2.2	0.188	0.039	0.004	0.19	0.233	0.062	0.68	0.29	0.062
33	223	0.003	0.019	0.008	2.3	0.192	0.039	0.004	0.19	0.237	0.063	0.70	0.30	0.066
34	230	0.003	0.020	0.008	2.4	0.198	0.040	0.004	0.20	0.241	0.063	0.73	0.30	0.070
35	237	0.003	0.020	0.008	2.4	0.204	0.040	0.004	0.21	0.246	0.064	0.75	0.30	0.076
36	244	0.003	0.021	0.008	2.5	0.209	0.041	0.004	0.21	0.250	0.064	0.77	0.31	0.080
37	251	0.003	0.021	0.008	2.6	0.215	0.041	0.004	0.22	0.254	0.065	0.80	0.31	0.086
38	258	0.003	0.022	0.009	2.7	0.221	0.042	0.004	0.22	0.258	0.066	0.82	0.31	0.092
39	265	0.003	0.022	0.009	2.7	0.221	0.042	0.004	0.22	0.258	0.066	0.82	0.31	0.092
40	272	0.003	0.023	0.009	2.8	0.230	0.043	0.004	0.23	0.265	0.067	0.86	0.32	0.101
41	279	0.003	0.023	0.009	2.9	0.235	0.043	0.004	0.24	0.268	0.067	0.88	0.32	0.106
42	286	0.003	0.024	0.009	3.0	0.241	0.044	0.004	0.25	0.272	0.068	0.90	0.32	0.112
43	293	0.003	0.024	0.009	3.1	0.247	0.044	0.004	0.25	0.276	0.068	0.92	0.33	0.118
44	300	0.003	0.025	0.010	3.2	0.253	0.044	0.004	0.26	0.280	0.069	0.94	0.33	0.125
45	309	0.003	0.025	0.010	3.3	0.260	0.045	0.004	0.26	0.285	0.069	0.96	0.33	0.132
46	315	0.003	0.026	0.010	3.4	0.265	0.045	0.004	0.27	0.288	0.070	0.98	0.34	0.138
47	321	0.003	0.026	0.010	3.4	0.271	0.046	0.004	0.27	0.292	0.070	0.99	0.34	0.144
48	328	0.003	0.027	0.010	3.5	0.276	0.046	0.004	0.28	0.295	0.070	1.01	0.34	0.151
49	335	0.003	0.027	0.011	3.6	0.282	0.047	0.004	0.29	0.299	0.071	1.03	0.35	0.158
50	343	0.003	0.028	0.011	3.7	0.288	0.047	0.004	0.29	0.302	0.071	1.04	0.35	0.164
51	349	0.003	0.028	0.011	3.8	0.294	0.048	0.004	0.30	0.306	0.071	1.06	0.35	0.172
52	356	0.003	0.029	0.011	3.9	0.300	0.048	0.004	0.30	0.309	0.072	1.08	0.35	0.179
53	363	0.003	0.030	0.011	4.0	0.306	0.049	0.004	0.31	0.313	0.072	1.09	0.36	0.186
54	370	0.003	0.030	0.011	4.1	0.311	0.049	0.004	0.31	0.316	0.072	1.11	0.36	0.193
55	377				4.2				0.32					0.202
56	384				4.2				0.32					0.202
57	391				4.3				0.33					0.218
58	398				4.3				0.33					0.230
59	405				4.4				0.34					0.242
60	412				4.5				0.34					0.255
61	419				4.5				0.35					0.269

Appendix 3.5-34 Table 34 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
62	427				4.6				0.36					0.286
63	434				4.7				0.36					0.302
64	441				4.8				0.37					0.319
65	447				4.8				0.37					0.334
66	455				4.9				0.38					0.351
67	463				5.0				0.38					0.369
68	470				5.0				0.39					0.388
69	476				5.1				0.39					0.403
70	483				5.1				0.40					0.419
71	490				5.2				0.40					
72	497				5.2				0.41					
73	503				5.3				0.41					
74	510				5.4				0.42					
75	517				5.4				0.42					
76	525				5.5				0.43					
77	532				5.6				0.44					
78	539				5.7				0.45					
79	552				5.8				0.45					
80	560				5.9				0.46					
81	566				6.0				0.47					
82	574				6.0				0.48					
83	581				6.1				0.48					
84	587				6.2				0.49					
85	594				6.3				0.50					
86	601				6.4				0.51					
87	608				6.5				0.52					
88	615				6.6				0.52					
89	622				6.7				0.53					
90	629				6.8				0.54					
91	636				6.9				0.55					
92	644				6.9				0.56					
93	650				6.9				0.56					
94	657				7.1				0.57					
95	664				7.1				0.58					
96	674				7.3				0.59					
97	678				7.3				0.59					

Appendix 3.5-34 Table 34 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685				7.3				0.59					
99	695				7.3				0.60					
100	699				7.3				0.60					
101	706				7.5				0.61					
102	713				7.7				0.61					
103	723				7.8				0.62					
104	730				7.9				0.63					

Appendix 3.5-34 Table 35

Metal Extraction Rates
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	8	0.282	0.0007	0.0012	4.37	0.001	0.007	0.30	3.90	0.108	1.28	0.0012	0.42	0.022
3	15	0.214	0.0005	0.0009	3.36	0.001	0.005	0.23	2.95	0.082	0.93	0.0010	0.31	0.017
4	22	0.212	0.0005	0.0008	3.41	0.001	0.005	0.24	2.90	0.082	0.84	0.0011	0.28	0.017
5	27	0.189	0.0005	0.0008	3.36	0.001	0.005	0.21	2.79	0.079	0.79	0.0012	0.25	0.016
6	34	0.168	0.0005	0.0008	3.32	0.001	0.004	0.19	2.69	0.078	0.74	0.0011	0.23	0.015
7	41	0.117	0.0004	0.0006	2.86	0.001	0.003	0.13	2.17	0.065	0.53	0.0010	0.16	0.013
8	48	0.099	0.0004	0.0006	2.89	0.001	0.003	0.11	2.10	0.065	0.50	0.0010	0.14	0.012
9	55	0.063	0.0004	0.0006	2.53	0.001	0.002	0.07	1.75	0.057	0.42	0.0008	0.10	0.010
10	63	0.053	0.0003	0.0005	2.27	0.001	0.001	0.06	1.53	0.052	0.37	0.0006	0.08	0.009
11	70	0.044	0.0003	0.0004	2.08	0.001	0.001	0.05	1.34	0.048	0.33	0.0005	0.07	0.009
12	76	0.039	0.0003	0.0004	1.99	0.001	0.001	0.04	1.25	0.046	0.30	0.0005	0.06	0.009
13	84	0.035	0.0003	0.0004	1.91	0.001	0.001	0.03	1.17	0.044	0.27	0.0005	0.05	0.009
14	90	0.036	0.0003	0.0004	2.06	0.001	0.001	0.04	1.24	0.048	0.27	0.0006	0.05	0.011
15	97	0.036	0.0003	0.0004	2.15	0.001	0.001	0.04	1.27	0.050	0.26	0.0006	0.05	0.012
16	104	0.028	0.0003	0.0004	1.74	0.001	0.001	0.03	1.03	0.040	0.21	0.0005	0.04	0.011
17	111	0.034	0.0003	0.0005	2.21	0.001	0.001	0.03	1.27	0.051	0.23	0.0008	0.05	0.015
18	118	0.033	0.0003	0.0005	2.31	0.001	0.001	0.03	1.31	0.053	0.23	0.0008	0.05	0.017
19	125	0.030	0.0003	0.0004	2.18	0.001	0.001	0.03	1.23	0.049	0.20	0.0008	0.05	0.017
20	132	0.029	0.0003	0.0005	2.26	0.001	0.001	0.028	1.27	0.049	0.19	0.0008	0.05	0.019
21	139	0.032	0.0004	0.0005	2.63	0.001	0.001	0.031	1.49	0.056	0.22	0.0010	0.05	0.024
22	146	0.025	0.0003	0.0004	2.30	0.001	0.001	0.024	1.31	0.045	0.18	0.0008	0.05	0.024
23	153	0.023	0.0003	0.0004	2.28	0.001	0.001	0.022	1.31	0.043	0.17	0.0008	0.04	0.026
24	161	0.021	0.0003	0.0004	2.23	0.001	0.001	0.020	1.29	0.040	0.16	0.0008	0.04	0.027
25	167	0.020	0.0003	0.0004	2.35	0.001	0.001	0.019	1.36	0.040	0.16	0.0008	0.04	0.031

Appendix 3.5-34 Table 35 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.018	0.0003	0.0004	2.39	0.001	0.001	0.018	1.39	0.039	0.15	0.0008	0.04	0.033
27	181	0.017	0.0003	0.0004	2.43	0.001	0.001	0.016	1.43	0.037	0.15	0.0008	0.04	0.036
28	188	0.015	0.0003	0.0004	2.49	0.001	0.001	0.014	1.47	0.036	0.14	0.0008	0.04	0.038
29	195	0.015	0.0003	0.0004	2.73	0.001	0.001	0.014	1.61	0.037	0.15	0.0009	0.04	0.044
30	202	0.013	0.0003	0.0004	2.66	0.001	0.001	0.012	1.58	0.034	0.13	0.0009	0.04	0.045
31	209	0.011	0.0003	0.0004	2.73	0.001	0.001	0.011	1.63	0.034	0.13	0.0009	0.04	0.047
32	217	0.010	0.0003	0.0004	2.73	0.001	0.001	0.009	1.63	0.032	0.12	0.0009	0.04	0.049
33	223	0.009	0.0003	0.0004	2.82	0.001	0.001	0.008	1.69	0.031	0.12	0.0009	0.04	0.053
34	230	0.007	0.0003	0.0004	2.87	0.001	0.001	0.006	1.72	0.030	0.12	0.0009	0.04	0.055
35	237	0.007	0.0003	0.0004	2.99	0.001	0.001	0.006	1.79	0.030	0.11	0.0009	0.04	0.059
36	244	0.006	0.0003	0.0004	3.01	0.001	0.001	0.005	1.79	0.029	0.11	0.0009	0.04	0.061
37	251	0.006	0.0003	0.0004	3.15	0.001	0.001	0.005	1.86	0.030	0.11	0.0009	0.04	0.065
38	258	0.006	0.0003	0.0005	3.22	0.001	0.001	0.005	1.87	0.030	0.11	0.0009	0.04	0.068
39	265													
40	272	0.005	0.0003	0.0004	2.95	0.001	0.001	0.004	1.67	0.027	0.09	0.0008	0.04	0.065
41	279	0.005	0.0003	0.0004	3.02	0.001	0.001	0.004	1.69	0.027	0.09	0.0008	0.04	0.067
42	286	0.005	0.0003	0.0004	3.03	0.001	0.001	0.004	1.67	0.026	0.09	0.0008	0.04	0.069
43	293	0.004	0.0003	0.0004	2.99	0.001	0.001	0.004	1.63	0.026	0.09	0.0008	0.03	0.069
44	300	0.005	0.0004	0.0005	3.67	0.001	0.001	0.005	1.98	0.031	0.10	0.0009	0.04	0.086
45	309	0.004	0.0003	0.0004	3.23	0.001	0.001	0.004	1.72	0.027	0.09	0.0008	0.04	0.077
46	315	0.004	0.0003	0.0004	3.35	0.001	0.001	0.004	1.76	0.027	0.09	0.0008	0.04	0.081
47	321	0.004	0.0003	0.0004	3.37	0.001	0.001	0.004	1.75	0.027	0.08	0.0008	0.04	0.083
48	328	0.004	0.0003	0.0004	3.37	0.001	0.001	0.004	1.73	0.027	0.08	0.0008	0.04	0.084
49	335	0.004	0.0003	0.0004	3.42	0.001	0.001	0.004	1.73	0.027	0.08	0.0007	0.04	0.087
50	343	0.004	0.0003	0.0004	3.38	0.001	0.001	0.004	1.69	0.026	0.07	0.0007	0.03	0.087
51	349	0.004	0.0003	0.0004	3.44	0.001	0.001	0.004	1.69	0.026	0.07	0.0007	0.03	0.090
52	356	0.004	0.0003	0.0004	3.42	0.001	0.001	0.004	1.67	0.025	0.07	0.0007	0.03	0.090
53	363	0.003	0.0003	0.0004	3.47	0.001	0.001	0.004	1.67	0.025	0.07	0.0007	0.03	0.093
54	370	0.003	0.0003	0.0004	3.38	0.001	0.001	0.003	1.60	0.024	0.06	0.0006	0.03	0.091
55	377				3.51				1.68					0.100
56	384													0.078
57	391				2.87				1.46					0.101
58	398				2.71				1.47					0.113
59	405				2.59				1.51					0.127
60	412				2.40				1.48					0.137
61	419				2.93				1.82					0.174

Appendix 3.5-34 Table 35 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
62	427				2.58				1.65					0.172
63	434				2.58				1.65					0.183
64	441				2.60				1.66					0.195
65	447				2.61				1.68					0.206
66	455				2.49				1.60					0.206
67	463				2.41				1.55					0.210
68	470				2.39				1.54					0.218
69	476				2.31				1.49					0.219
70	483				2.18				1.42					0.215
71	490				2.16				1.41					
72	497				2.14				1.41					
73	503				2.15				1.43					
74	510				2.31				1.56					
75	517				2.52				1.72					
76	525				2.76				1.88					
77	532				2.92				1.99					
78	539				3.12				2.11					
79	552				2.69				1.82					
80	560				2.70				1.83					
81	566				2.74				1.86					
82	574				2.73				1.88					
83	581				2.64				1.84					
84	587				3.13				2.21					
85	594				3.26				2.32					
86	601				3.24				2.30					
87	608				3.42				2.43					
88	615				3.50				2.50					
89	622				3.49				2.50					
90	629				3.58				2.58					
91	636				3.73				2.71					
92	644				3.48				2.54					
93	650													
94	657				3.04				2.25					
95	664				2.92				2.16					
96	674				2.68				1.99					
97	678													

Appendix 3.5-34 Table 35 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
98	685													
99	695				2.01				1.36					
100	699													
101	706				2.31				1.09					
102	713				3.06				1.46					
103	723				3.87				1.95					
104	730				4.11				2.15					

Appendix 3.5-34 Table 36

Oxidation and Neutralization Results
Skunk Lake High-Sulfur Waste Rock Composite (WD-09)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	41	0.03		0.429	0.164	0.259	0.99	42		0.4
2	8	70	0.06	25.6	0.305	0.125	0.183	1.01	73	27.0	0.6
3	15	83	0.07	19.4	0.128	0.055	0.077	1.02	86	20.5	0.8
4	22	101	0.09	19.2	0.195	0.088	0.115	1.04	107	20.5	0.9
5	27	113	0.10	18.5	0.117	0.056	0.068	1.05	119	19.9	1.0
6	34	127	0.11	17.7	0.152	0.080	0.095	1.15	136	19.4	1.2
7	41	136	0.12	14.0	0.096	0.058	0.066	1.29	149	16.1	1.3
8	48	144	0.12	13.0	0.080	0.058	0.064	1.53	161	15.9	1.4
9	55	149	0.13	10.0	0.047	0.046	0.048	1.99	170	13.5	1.5
10	63	154	0.13	8.1	0.058	0.050	0.052	1.75	181	12.0	1.6
11	70	161	0.14	6.6	0.070	0.054	0.055	1.57	192	10.7	1.7
12	76	166	0.14	6.0	0.056	0.040	0.039	1.42	199	10.1	1.7
13	84	174	0.15	5.9	0.085	0.056	0.055	1.30	210	9.6	1.8
14	90	184	0.15	7.0	0.094	0.058	0.055	1.20	222	10.3	1.9
15	97	192	0.16	7.9	0.093	0.053	0.050	1.11	232	10.6	2.0
16	104	193	0.16	6.7	0.011	0.006	0.005	1.04	233	8.6	2.0
17	111	213	0.18	9.4	0.205	0.104	0.096	0.98	253	10.8	2.2
18	118	224	0.19	10.3	0.117	0.060	0.055	0.99	265	11.2	2.3
19	125	234	0.20	10.0	0.096	0.050	0.046	1.00	274	10.5	2.4
20	132	245	0.21	10.6	0.121	0.063	0.059	1.01	287	10.9	2.5
21	139	255	0.22	12.3	0.100	0.052	0.049	1.01	297	12.7	2.6
22	146	266	0.22	10.7	0.120	0.063	0.060	1.02	309	11.2	2.7
23	153	277	0.23	10.5	0.109	0.057	0.055	1.03	320	11.1	2.8
24	161	286	0.24	10.2	0.097	0.051	0.049	1.04	330	10.9	2.9
25	167	299	0.25	10.7	0.132	0.070	0.067	1.04	344	11.5	3.0

Appendix 3.5-34 Table 36 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	174	309	0.26	10.9	0.108	0.057	0.056	1.05	355	11.7	3.1
27	181	321	0.27	11.0	0.127	0.068	0.066	1.06	369	12.0	3.2
28	188	333	0.28	11.2	0.120	0.065	0.063	1.06	382	12.3	3.3
29	195	345	0.29	12.2	0.131	0.071	0.069	1.07	396	13.5	3.4
30	202	358	0.30	11.8	0.131	0.071	0.070	1.08	410	13.1	3.6
31	209	370	0.31	12.1	0.122	0.066	0.066	1.08	423	13.5	3.7
32	217	383	0.32	12.1	0.142	0.077	0.077	1.09	438	13.5	3.8
33	223	395	0.33	12.4	0.122	0.067	0.067	1.09	452	14.0	3.9
34	230	408	0.34	12.6	0.139	0.077	0.076	1.10	467	14.3	4.1
35	237	423	0.36	13.0	0.153	0.086	0.084	1.11	484	14.9	4.2
36	244	435	0.37	13.0	0.121	0.069	0.066	1.12	498	14.9	4.3
37	251	448	0.38	13.4	0.144	0.083	0.079	1.13	514	15.5	4.5
38	258	463	0.39	13.5	0.147	0.086	0.081	1.13	530	15.7	4.6
39	265										
40	272	483	0.41	12.1	0.114	0.131	0.119	2.20	572	17.7	5.0
41	279	496	0.42	12.2	0.128	0.078	0.070	1.16	587	17.9	5.1
42	286	509	0.43	12.0	0.136	0.084	0.075	1.17	603	17.8	5.2
43	293	521	0.44	11.7	0.130	0.081	0.071	1.18	618	17.6	5.4
44	300	534	0.45	12.3	0.133	0.085	0.073	1.19	634	17.3	5.5
45	309	549	0.46	12.3	0.153	0.098	0.084	1.20	652	15.1	5.7
46	315	561	0.47	12.7	0.126	0.083	0.070	1.20	668	15.6	5.8
47	321	573	0.48	12.8	0.126	0.075	0.062	1.09	681	15.7	5.9
48	328	590	0.50	13.8	0.181	0.081	0.067	0.82	696	15.6	6.1
49	335	609	0.51	15.0	0.194	0.091	0.074	0.85	712	15.7	6.2
50	343	619	0.52	14.5	0.108	0.081	0.065	1.34	727	15.4	6.3
51	349	631	0.53	14.5	0.127	0.090	0.071	1.27	743	15.6	6.5
52	356	644	0.54	14.3	0.137	0.085	0.067	1.11	758	15.4	6.6
53	363	659	0.56	13.9	0.156	0.087	0.067	0.99	774	15.6	6.7
54	370	670	0.57	12.2	0.109	0.079	0.060	1.27	788	15.0	6.8
55	377	682	0.58	12.9	0.126	0.085	0.070	1.23	803	15.7	7.0
56	384										
57	391	699	0.59	11.0	0.091	0.107	0.102	2.31	852	18.7	7.4
58	398	711	0.60	10.4	0.123	0.067	0.070	1.12	865	18.3	7.5
59	405	723	0.61	10.5	0.118	0.064	0.067	1.11	879	18.2	7.6
60	412	734	0.62	10.3	0.114	0.062	0.065	1.11	891	17.6	7.8

Appendix 3.5-34 Table 36 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	419	745	0.63	10.9	0.122	0.066	0.069	1.11	905	14.8	7.9
62	427	758	0.64	11.4	0.135	0.073	0.077	1.11	920	13.2	8.0
63	434	770	0.65	11.4	0.124	0.066	0.070	1.10	933	13.2	8.1
64	441	782	0.66	11.6	0.125	0.067	0.071	1.10	947	13.3	8.2
65	447	792	0.67	11.7	0.103	0.055	0.058	1.10	958	13.4	8.3
66	455	803	0.68	11.2	0.112	0.060	0.064	1.10	971	12.8	8.4
67	463	814	0.69	10.8	0.117	0.062	0.066	1.10	984	12.4	8.6
68	470	825	0.70	10.8	0.120	0.063	0.068	1.09	997	12.3	8.7
69	476	834	0.70	10.4	0.091	0.048	0.052	1.09	1007	11.9	8.8
70	483	843	0.71	9.9	0.089	0.047	0.050	1.09	1016	11.3	8.8
71	490	852	0.72	9.9	0.097	0.050	0.054	1.07	1027	11.2	8.9
72	497	862	0.73	9.9	0.103	0.051	0.057	1.05	1038	11.1	9.0
73	503	873	0.74	10.2	0.118	0.058	0.065	1.04	1050	11.3	9.1
74	510	888	0.75	11.1	0.155	0.075	0.085	1.02	1066	12.2	9.3
75	517	901	0.76	11.9	0.131	0.073	0.082	1.19	1081	13.4	9.4
76	525	916	0.77	12.7	0.155	0.088	0.098	1.20	1100	14.6	9.6
77	532	928	0.78	13.2	0.126	0.072	0.080	1.21	1115	15.5	9.7
78	539	943	0.80	13.6	0.160	0.093	0.102	1.22	1135	16.5	9.9
79	552	956	0.81	11.3	0.137	0.077	0.086	1.20	1151	14.2	10.0
80	560	971	0.82	11.4	0.153	0.085	0.096	1.18	1169	14.3	10.2
81	566	984	0.83	11.7	0.138	0.074	0.085	1.15	1185	14.5	10.3
82	574	999	0.84	11.9	0.157	0.081	0.096	1.13	1203	14.6	10.5
83	581	1014	0.86	11.8	0.150	0.078	0.092	1.13	1220	14.2	10.6
84	587	1027	0.87	14.2	0.140	0.073	0.086	1.13	1236	16.9	10.7
85	594	1044	0.88	15.0	0.172	0.090	0.105	1.13	1255	17.7	10.9
86	601	1059	0.89	14.9	0.158	0.082	0.096	1.13	1273	17.6	11.1
87	608	1076	0.91	15.7	0.176	0.092	0.108	1.13	1293	18.5	11.2
88	615	1092	0.92	16.1	0.171	0.088	0.104	1.13	1312	19.0	11.4
89	622	1108	0.94	16.2	0.166	0.085	0.101	1.12	1331	19.0	11.6
90	629	1127	0.95	16.7	0.198	0.100	0.121	1.12	1353	19.6	11.8
91	636	1146	0.97	17.5	0.200	0.101	0.123	1.12	1375	20.5	12.0
92	644	1160	0.98	16.4	0.144	0.072	0.088	1.12	1391	19.2	12.1
93	650										
94	657	1185	1.00	15.4	0.129	0.106	0.130	1.84	1432	20.3	12.5
95	664	1206	1.02	15.9	0.225	0.085	0.104	0.84	1451	19.7	12.6

Appendix 3.5-34 Table 36 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
96	674	1234	1.04	16.2	0.288	0.100	0.122	0.77	1473	18.1	12.8
97	678										
98	685										
99	695	1253	1.06	12.5	0.064	0.089	0.079	2.60	1529	17.8	13.3
100	699										
101	706	1283	1.08	10.7	0.159	0.175	0.126	1.89	1977	110.2	17.2
102	713	1304	1.10	12.8	0.219	0.119	0.097	0.98	1999	101.0	17.4
103	723	1330	1.12	15.4	0.270	0.142	0.134	1.02	2027	94.7	17.6
104	730	1345	1.13	18.4	0.151	0.077	0.086	1.08	2043	102.7	17.8

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 3.5-34 Tables 37-43.
Rice Lake Waste Rock High Sulfur Composite (WD-10) Data and Calculations.

Appendix 3.5-34 Table 37

Sample Characterization
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	65600
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	270
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	1700
Carbon	C	500
Chromium	Cr	10
Cobalt	Co	16
Copper	Cu	490
Gallium	Ga	13
Iron	Fe	56100
Lead	Pb	220
Lithium	Li	NA
Magnesium	Mg	22500
Manganese	Mn	390
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	<5
Phosphorus	P	NA
Potassium	K	16300
Selenium	Se	5
Silicon	Si	313000
Silver	Ag	<0.01
Sodium	Na	2800
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	20
Titanium	Ti	440
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	200
Sulfur	S	33300

ABA Results	
Paste pH	8.0
S (Total) (%)	3.26
SO4 (%)	NA
S (sulfide) (%)	3.20
AP (kg CaCO3/tonne)	100.0
NP (kg CaCO3/tonne)	0.5
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-99.5
NP/AP	0.01

Note: NA = not analyzed

Sample Mass (kg)	81.14

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 38

Parameters Measured Weekly
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)		ALKALINITY (mg/L)	ACIDITY (mg/L)		SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	5.565	6.3	1400		<5			**743**	51
2-Nov-94	2	8	3.470	6.9	640	?	<5			**602**	77
9-Nov-94	3	15	7.120	4.8	1010			44		525	123
16-Nov-94	4	22	2.820	4.1	906			54		**448**	138
21-Nov-94	5	27	2.960	4.0	917			61		**448**	155
28-Nov-94	6	34	7.330	4.1	704			50		422	193
5-Dec-94	7	41	4.040	4.0	670			56		396	213
12-Dec-94	8	48	4.400	3.9	716			78		370	233
19-Dec-94	9	55	4.380	3.9	752			86		**344**	251
27-Dec-94	10	63	4.140	3.8	779			110		347	269
3-Jan-95	11	70	4.300	3.8	779			100		351	287
9-Jan-95	12	76	3.820	3.7	675			110		354	304
17-Jan-95	13	84	4.420	3.7	717			130		357	324
23-Jan-95	14	90	3.860	3.6	765			150		360	341
30-Jan-95	15	97	4.780	3.4	796			170		364	362
6-Feb-95	16	104	0.500	3.4	832			180		367	364
13-Feb-95	17	111	7.800	3.4	856			94	?	**370**	400
20-Feb-95	18	118	4.380	3.3	832			190		393	421
27-Feb-95	19	125	4.100	3.2	840			190		416	442
6-Mar-95	20	132	5.260	3.2	876			200		439	471
13-Mar-95	21	139	4.200	3.0	800			190		463	495
20-Mar-95	22	146	4.020	3.0	914			220		486	519
27-Mar-95	23	153	5.240	3.0	1060			250		509	552
4-Apr-95	24	161	4.160	2.9	1090			260		532	579
10-Apr-95	25	167	5.250	2.8	1410			320		555	615
17-Apr-95	26	174	3.840	2.7	1340			330		578	642
24-Apr-95	27	181	5.080	2.7	1480			400		601	680
1-May-95	28	188	4.480	2.7	1620			430		624	714
8-May-95	29	195	4.620	2.7	1750			450		648	751
15-May-95	30	202	4.100	2.7	1660			480		671	785
22-May-95	31	209	4.730	2.7	1700			490		694	825
30-May-95	32	217	4.900	2.8	1740			520		717	869
5-Jun-95	33	223	4.350	2.9	1790			530		**740**	908
12-Jun-95	34	230	4.740	2.7	1680			500		760	953
19-Jun-95	35	237	5.160	2.6	1560			440		780	1002
26-Jun-95	36	244	4.660	2.6	1630			450		800	1048
3-Jul-95	37	251	4.740	2.6	1700					820	1096
10-Jul-95	38	258	4.960	2.6	1680					840	1148
17-Jul-95	39	265	0.000								
24-Jul-95	40	272	7.720	2.7	1880					880	1231
31-Jul-95	41	279	4.140	2.6	1960					900	1277
7-Aug-95	42	286	4.190	2.7	1930					920	1325
14-Aug-95	43	293	5.010	2.7	2020					940	1383

Appendix 3.5-34 Table 38 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
21-Aug-95	44	300	4.260	2.7	2140			960	1433
30-Aug-95	45	309	5.850	2.7	2310			980	1504
5-Sep-95	46	315	4.320	2.5	2360		860	**1000**	1557
11-Sep-95	47	321	3.860	2.5	2570		870	**1000**	1605
18-Sep-95	48	328	4.960	2.0	2430		840	**1200**	1678
25-Sep-95	49	335	4.390	2.5	2440		810	**1400**	1754
3-Oct-95	50	343	5.070	2.6	2330		770	**905**	1810
9-Oct-95	51	349	4.640	2.6	2460		800	**920**	1863
16-Oct-95	52	356	4.640	2.6	2340		820	**1200**	1931
23-Oct-95	53	363	4.420	2.6	2420		760	**1400**	2008
30-Oct-95	54	370	4.460	2.6	2420		740	**860**	2055
6-Nov-95	55	377	4.800	2.6	2470		770	870	2106
13-Nov-95	56	384	0.000						
20-Nov-95	57	391	6.400	2.7	2610		830	**890**	2177
27-Nov-95	58	398	4.800	2.7	2750		720	**860**	2228
4-Dec-95	59	405	4.700	2.5	2490		710		
11-Dec-95	60	412	4.520	2.5	2730		760		
18-Dec-95	61	419	4.200	2.5	2650		720		
26-Dec-95	62	427	4.920	2.5	2410		680		
2-Jan-96	63	434	4.720	2.5	2430		640		
9-Jan-96	64	441	4.310	2.5	2380		650		
15-Jan-96	65	447	5.150	2.4	2380				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 39

Leachate Analysis
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe		Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	**4.2**	**0.047**	**80**	**0.49**	**2.7**	**5.5**	**<**	**0.040**	**100**	**2.8**	**0.023**	**37.6**	**0.044**	**46**	**2.5**
2	8	**3.9**	**0.043**	**71**	**0.47**	**2.9**	**4.4**		**0.15**	**90**	**3.1**	**0.027**	**33.7**	**0.032**	**27**	**2.5**
3	15	5.2	0.039	60	0.45	3.30	4.4		0.108	73.0	3.05	0.028	26.9	0.030	17.2	2.85
4	22	**6.4**	**0.035**	**48**	**0.43**	**3.7**	**4.4**		**0.065**	**56**	**3.0**	**0.029**	**20.1**	**0.027**	**7.4**	**3.2**
5	27	**6.0**	**0.039**	**48**	**0.47**	**4.6**	**2.2**	**<**	**0.040**	**55**	**3.0**	**0.043**	**18.3**	**0.024**	**5.6**	**4.0**
6	34	6.6	0.039	45	0.47	5.25	2.5		0.040	50.5	2.85	0.04	16.1	0.024	4.8	4.40
7	41	7.2	0.038	43	0.48	5.90	2.9		0.040	46.0	2.70	0.04	13.9	0.023	3.9	4.80
8	48	7.8	0.038	40	0.48	6.55	3.2		0.040	41.5	2.55	0.04	11.7	0.023	3.1	5.20
9	55	**8.4**	**0.037**	**37**	**0.48**	**7.2**	**3.5**	**<**	**0.040**	**37**	**2.4**	**0.039**	**9.5**	**0.022**	**2.2**	**5.6**
10	63	9.6	0.036	36	0.47	7.55	4.2		0.039	35.8	2.30	0.04	9.0	0.022	2.1	5.50
11	70	10.8	0.035	34	0.45	7.90	5.0		0.039	34.5	2.20	0.04	8.6	0.023	2.0	5.40
12	76	12.0	0.034	33	0.44	8.25	5.7		0.038	33.3	2.10	0.04	8.1	0.023	1.9	5.30
13	84	13.2	0.034	31	0.43	8.60	6.5		0.037	32.0	2.00	0.04	7.7	0.023	1.9	5.20
14	90	14.4	0.033	30	0.41	8.95	7.2		0.036	30.8	1.90	0.04	7.2	0.023	1.8	5.10
15	97	15.6	0.032	28	0.40	9.30	7.9		0.036	29.5	1.80	0.04	6.7	0.024	1.7	5.00
16	104	16.8	0.031	27	0.38	9.65	8.7		0.035	28.3	1.70	0.04	6.3	0.024	1.6	4.90
17	111	**18**	**0.030**	**25**	**0.37**	**10**	**9.4**		0.034	**27**	**1.6**	0.04	**5.8**	**0.024**	**1.5**	**4.8**
18	118	20.6	0.029	26	0.37	*9.91*	10.1		0.034	28.1	1.61	0.04	5.6	0.024	1.5	4.94
19	125	23.3	0.029	26	0.37	9.83	10.7		0.033	29.3	1.63	0.04	5.3	0.024	1.5	5.09
20	132	25.9	0.028	27	0.37	9.74	11.4		0.032	30.4	1.64	0.03	5.1	0.023	1.4	5.23
21	139	28.5	0.027	27	0.37	9.65	12.1		0.032	31.5	1.65	0.03	4.8	0.023	1.4	5.38
22	146	31.1	0.026	28	0.37	9.56	12.7		0.031	32.6	1.66	0.03	4.6	0.023	1.4	5.52
23	153	33.8	0.026	28	0.37	9.48	13.4		0.030	33.8	1.68	0.03	4.3	0.023	1.4	5.66
24	161	36.4	0.025	29	0.37	9.39	14.0		0.029	34.9	1.69	0.03	4.1	0.022	1.4	5.81
25	167	39.0	0.024	29	0.37	9.30	14.7		0.029	36.0	1.70	0.03	3.9	0.022	1.4	5.95
26	174	41.6	0.023	30	0.36	9.21	15.4		0.028	37.1	1.71	0.03	3.6	0.022	1.3	6.09

Appendix 3.5-34 Table 39 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni		Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	181	44.3	0.023	30	0.36	9.13	16.0	0.027	38.3	1.73	0.03		3.4	0.022	1.3	6.24
28	188	46.9	0.022	31	0.36	9.04	16.7	0.027	39.4	1.74	0.03		3.1	0.021	1.3	6.38
29	195	49.5	0.021	31	0.36	8.95	17.4	0.026	40.5	1.75	0.03		2.9	0.021	1.3	6.53
30	202	52.1	0.020	32	0.36	8.86	18.0	0.025	41.6	1.76	0.03		2.6	0.021	1.3	6.67
31	209	54.8	0.020	32	0.36	8.78	18.7	0.024	42.8	1.78	0.03		2.4	0.021	1.2	6.81
32	217	57.4	0.019	33	0.36	8.69	19.3	0.024	43.9	1.79	0.03		2.1	0.020	1.2	6.96
33	223	**60**	**0.018**	**33**	**0.36**	**8.6**	**20**	0.023	**45**	**1.8**	0.03		**1.9**	**0.020**	**1.2**	**7.1**
34	230	59.1	0.018	33	0.35	8.71	21.6	0.022	45.2	1.79	0.03		1.8	0.020	1.2	7.29
35	237	58.7	0.017	33	0.35	8.83	23.1	0.022	45.5	1.78	0.03		1.8	0.019	1.2	7.47
36	244	58.3	0.017	33	0.34	8.94	24.7	0.021	45.7	1.77	0.03		1.7	0.019	1.1	7.66
37	251	57.9	0.016	33	0.34	9.06	26.3	0.020	46.0	1.76	0.03		1.7	0.018	1.1	7.84
38	258	57.4	0.016	33	0.33	9.17	27.9	0.020	46.2	1.75	0.03		1.6	0.018	1.1	8.03
39	265															
40	272	57.0	0.015	32	0.32	9.40	31.0	0.018	46.7	1.73	0.03		1.5	0.017	1.0	8.40
41	279	56.6	0.015	32	0.31	9.51	32.6	0.017	46.9	1.72	0.03		1.4	0.017	1.0	8.59
42	286	56.1	0.014	32	0.31	9.63	34.1	0.017	47.1	1.71	0.03		1.3	0.017	1.0	8.77
43	293	55.7	0.014	32	0.30	9.74	35.7	0.016	47.4	1.70	0.03		1.3	0.016	1.0	8.96
44	300	55.3	0.013	32	0.30	9.86	37.3	0.015	47.6	1.70	0.03		1.2	0.016	1.0	9.14
45	309	54.9	0.013	32	0.29	9.97	38.9	0.015	47.9	1.69	0.03		1.2	0.015	0.9	9.33
46	315	54.4	0.012	32	0.29	10.09	40.4	0.014	48.1	1.68	0.03		1.1	0.015	0.9	9.51
47	321	54.0	0.012	32	0.28	10.20	42.0	0.013	48.3	1.67	0.02		1.0	0.015	0.9	9.70
48	328	53.6	0.012	32	0.27	10.31	43.6	0.012	48.6	1.66	0.02		1.0	0.014	0.9	9.89
49	335	53.1	0.011	31	0.27	10.43	45.1	0.012	48.8	1.65	0.02		0.9	0.014	0.8	10.07
50	343	52.7	0.011	31	0.26	10.54	46.7	0.011	49.0	1.64	0.02		0.8	0.014	0.8	10.26
51	349	52.3	0.010	31	0.26	10.66	48.3	0.010	49.3	1.63	0.02		0.8	0.013	0.8	10.44
52	356	51.9	0.010	31	0.25	10.77	49.9	0.010	49.5	1.62	0.02		0.7	0.013	0.8	10.63
53	363	51.4	0.009	31	0.25	10.89	51.4	0.009	49.8	1.61	0.02		0.7	0.012	0.8	10.81
54	370	**51**	**0.009**	**31**	**0.24**	**11**	**53**	**0.0082**	**50**	**1.6**	**0.022**	**<**	**0.60**	**0.012**	**0.73**	**11**
55	377			29.8					49.8							
56	384															
57	391			27.3					49.3							
58	398			**26**					**49**							

* Measured values shown in bold

Appendix 3.5-34 Table 40

Cumulative Mass Flux
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.29	0.003	5.5	0.03	0.185	0.38	0.003	6.9	0.19	0.00	2.6	0.003	3.2	0.17
2	8	0.45	0.005	8.5	0.05	0.31	0.57	0.009	10.7	0.32	0.00	4.0	0.004	4.3	0.28
3	15	0.91	0.008	13.7	0.09	0.60	0.95	0.019	17.1	0.59	0.01	6.4	0.007	5.8	0.53
4	22	1.13	0.010	15.4	0.11	0.73	1.10	0.021	19.1	0.70	0.01	7.1	0.008	6.1	0.64
5	27	1.35	0.011	17.2	0.13	0.90	1.18	0.022	21.1	0.81	0.01	7.7	0.009	6.3	0.79
6	34	1.94	0.015	21.3	0.17	1.37	1.41	0.026	25.6	1.06	0.01	9.2	0.011	6.7	1.18
7	41	2.30	0.016	23.4	0.19	1.66	1.55	0.028	27.9	1.20	0.01	9.9	0.012	6.9	1.42
8	48	2.73	0.019	25.5	0.22	2.02	1.73	0.030	30.2	1.34	0.02	10.5	0.013	7.1	1.70
9	55	3.18	0.021	27.5	0.24	2.41	1.92	0.032	32.2	1.47	0.02	11.0	0.014	7.2	2.01
10	63	3.67	0.022	29.3	0.27	2.79	2.13	0.034	34.0	1.58	0.02	11.5	0.016	7.3	2.29
11	70	4.24	0.024	31.1	0.29	3.21	2.40	0.036	35.8	1.70	0.02	12.0	0.017	7.4	2.57
12	76	4.81	0.026	32.7	0.31	3.60	2.66	0.038	37.4	1.80	0.02	12.3	0.018	7.5	2.82
13	84	5.53	0.028	34.4	0.34	4.07	3.02	0.040	39.1	1.91	0.03	12.8	0.019	7.6	3.11
14	90	6.2	0.029	35.8	0.35	4.49	3.36	0.042	40.6	2.00	0.03	13.1	0.020	7.7	3.35
15	97	7.1	0.031	37.4	0.38	5.04	3.82	0.044	42.3	2.10	0.03	13.5	0.022	7.8	3.64
16	104	7.2	0.031	37.6	0.38	5.10	3.88	0.044	42.5	2.11	0.03	13.5	0.022	7.8	3.67
17	111	9.0	0.034	40.0	0.42	6.06	4.78	0.047	45.1	2.27	0.03	14.1	0.024	7.9	4.13
18	118	10.1	0.036	41.3	0.44	6.60	5.32	0.049	46.6	2.36	0.04	14.4	0.025	8.0	4.40
19	125	11.3	0.037	42.7	0.45	7.09	5.87	0.051	48.1	2.44	0.04	14.7	0.027	8.1	4.66
20	132	12.9	0.039	44.4	0.48	7.73	6.61	0.053	50.1	2.54	0.04	15.0	0.028	8.2	5.00
21	139	14.4	0.040	45.8	0.50	8.22	7.23	0.055	51.7	2.63	0.04	15.2	0.029	8.3	5.28
22	146	15.9	0.042	47.1	0.52	8.70	7.86	0.056	53.3	2.71	0.04	15.5	0.030	8.3	5.55
23	153	18.1	0.043	48.9	0.54	9.31	8.72	0.058	55.5	2.82	0.04	15.7	0.032	8.4	5.92
24	161	20.0	0.045	50.4	0.56	9.79	9.44	0.060	57.3	2.91	0.05	16.0	0.033	8.5	6.21
25	167	22.5	0.046	52.3	0.58	10.39	10.39	0.061	59.6	3.02	0.05	16.2	0.034	8.6	6.60

Appendix 3.5-34 Table 40 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	24.5	0.047	53.7	0.60	10.83	11.12	0.063	61.4	3.10	0.05	16.4	0.035	8.6	6.89
27	181	27.3	0.049	55.6	0.62	11.40	12.12	0.065	63.8	3.20	0.05	16.6	0.037	8.7	7.28
28	188	29.8	0.050	57.2	0.64	11.90	13.04	0.066	65.9	3.30	0.05	16.8	0.038	8.8	7.63
29	195	32.7	0.051	59.0	0.66	12.41	14.03	0.067	68.2	3.40	0.06	16.9	0.039	8.9	8.00
30	202	35.3	0.052	60.6	0.68	12.86	14.94	0.069	70.3	3.49	0.06	17.1	0.040	8.9	8.34
31	209	38.5	0.053	62.5	0.70	13.37	16.03	0.070	72.8	3.59	0.06	17.2	0.041	9.0	8.73
32	217	42.0	0.054	64.4	0.72	13.89	17.20	0.072	75.5	3.70	0.06	17.3	0.043	9.1	9.15
33	223	45.2	0.055	66.2	0.74	14.35	18.27	0.073	77.9	3.80	0.06	17.4	0.044	9.1	9.54
34	230	48.6	0.056	68.1	0.76	14.86	19.53	0.074	80.5	3.90	0.06	17.5	0.045	9.2	9.96
35	237	52.4	0.057	70.2	0.79	15.42	21.00	0.076	83.4	4.02	0.07	17.6	0.046	9.3	10.44
36	244	55.7	0.058	72.1	0.81	15.94	22.42	0.077	86.1	4.12	0.07	17.7	0.047	9.3	10.88
37	251	59.1	0.059	74.0	0.82	16.47	23.96	0.078	88.7	4.22	0.07	17.8	0.048	9.4	11.33
38	258	62.6	0.060	76.0	0.85	17.03	25.66	0.079	91.6	4.33	0.07	17.9	0.049	9.5	11.82
39	265	62.6	0.060	76.0	0.85	17.03	25.66	0.079	91.6	4.33	0.07	17.9	0.049	9.5	11.82
40	272	68.0	0.062	79.1	0.88	17.92	28.61	0.081	96.0	4.49	0.07	18.1	0.051	9.6	12.62
41	279	70.9	0.062	80.7	0.89	18.41	30.27	0.082	98.4	4.58	0.08	18.1	0.052	9.6	13.06
42	286	73.8	0.063	82.4	0.91	18.90	32.04	0.083	100.8	4.67	0.08	18.2	0.053	9.7	13.52
43	293	77.2	0.064	84.3	0.93	19.51	34.24	0.084	103.8	4.77	0.08	18.3	0.054	9.7	14.07
44	300	80.1	0.065	86.0	0.94	20.02	36.20	0.084	106.3	4.86	0.08	18.4	0.054	9.8	14.55
45	309	84.1	0.066	88.3	0.96	20.74	39.00	0.085	109.7	4.98	0.08	18.4	0.056	9.9	15.22
46	315	87.0	0.066	90.0	0.98	21.28	41.15	0.086	112.3	5.07	0.08	18.5	0.056	9.9	15.73
47	321	89.6	0.067	91.5	0.99	21.77	43.15	0.087	114.6	5.15	0.08	18.5	0.057	9.9	16.19
48	328	92.8	0.068	93.4	1.01	22.40	45.81	0.088	117.5	5.25	0.09	18.6	0.058	10.0	16.79
49	335	95.7	0.068	95.1	1.02	22.96	48.26	0.088	120.2	5.34	0.09	18.7	0.059	10.0	17.34
50	343	99.0	0.069	97.1	1.04	23.62	51.18	0.089	123.2	5.45	0.09	18.7	0.060	10.1	17.98
51	349	102.0	0.069	98.9	1.05	24.23	53.94	0.089	126.1	5.54	0.09	18.8	0.060	10.1	18.58
52	356	105.0	0.070	100.7	1.07	24.84	56.79	0.090	128.9	5.63	0.09	18.8	0.061	10.2	19.18
53	363	107.8	0.071	102.4	1.08	25.44	59.59	0.090	131.6	5.72	0.09	18.8	0.062	10.2	19.77
54	370	110.6	0.071	104.1	1.09	26.04	62.50	0.091	134.4	5.81	0.09	18.9	0.062	10.3	20.38
55	377			105.8					137.3						
56	384			105.8					137.3						
57	391			108.0					141.2						
58	398			109.5					144.1						

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 41

Cumulative Metal Extractions
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

		CUMULATIVE METAL EXTRACTIONS (%)													
CYCLE	DAYS	Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0004	0.0012	0.3	0.21	0.04	0.001	0.001	0.03	0.05	0.03	0.016	0.06	0.11	0.09
2	8	0.0007	0.002	0.5	0.34	0.06	0.001	0.004	0.05	0.08	0.05	0.025	0.09	0.15	0.14
3	15	0.001	0.003	0.8	0.58	0.12	0.002	0.008	0.08	0.15	0.10	0.039	0.14	0.21	0.26
4	22	0.002	0.004	0.9	0.68	0.15	0.002	0.009	0.08	0.18	0.12	0.043	0.16	0.22	0.32
5	27	0.002	0.004	1.0	0.78	0.18	0.002	0.010	0.09	0.21	0.16	0.048	0.18	0.22	0.39
6	34	0.003	0.005	1.3	1.05	0.28	0.003	0.012	0.11	0.27	0.23	0.056	0.22	0.24	0.59
7	41	0.004	0.006	1.4	1.20	0.34	0.003	0.013	0.12	0.31	0.27	0.061	0.24	0.25	0.71
8	48	0.004	0.007	1.5	1.36	0.41	0.003	0.014	0.13	0.34	0.32	0.065	0.27	0.25	0.85
9	55	0.005	0.008	1.6	1.52	0.49	0.003	0.015	0.14	0.38	0.36	0.068	0.29	0.26	1.00
10	63	0.006	0.008	1.7	1.67	0.57	0.004	0.016	0.15	0.41	0.40	0.071	0.31	0.26	1.14
11	70	0.006	0.009	1.8	1.82	0.66	0.004	0.016	0.16	0.44	0.44	0.073	0.34	0.26	1.29
12	76	0.007	0.010	1.9	1.95	0.73	0.005	0.017	0.17	0.46	0.47	0.076	0.36	0.27	1.41
13	84	0.008	0.010	2.0	2.09	0.83	0.005	0.018	0.17	0.49	0.51	0.078	0.38	0.27	1.55
14	90	0.009	0.011	2.1	2.22	0.92	0.006	0.019	0.18	0.51	0.55	0.080	0.40	0.27	1.67
15	97	0.011	0.012	2.2	2.36	1.03	0.007	0.020	0.19	0.54	0.59	0.083	0.43	0.28	1.82
16	104	0.011	0.012	2.2	2.38	1.04	0.007	0.020	0.19	0.54	0.60	0.083	0.44	0.28	1.84
17	111	0.014	0.013	2.4	2.60	1.24	0.009	0.022	0.20	0.58	0.67	0.086	0.48	0.28	2.07
18	118	0.015	0.013	2.4	2.72	1.35	0.009	0.022	0.21	0.60	0.70	0.088	0.51	0.29	2.20
19	125	0.017	0.014	2.5	2.84	1.45	0.010	0.023	0.21	0.62	0.74	0.090	0.53	0.29	2.33
20	132	0.020	0.014	2.6	2.99	1.58	0.012	0.024	0.22	0.65	0.79	0.092	0.56	0.29	2.50
21	139	0.022	0.015	2.7	3.11	1.68	0.013	0.025	0.23	0.67	0.82	0.093	0.58	0.29	2.64
22	146	0.024	0.015	2.8	3.22	1.78	0.014	0.026	0.24	0.70	0.85	0.095	0.61	0.30	2.77
23	153	0.028	0.016	2.9	3.37	1.90	0.016	0.026	0.25	0.72	0.90	0.097	0.64	0.30	2.96
24	161	0.030	0.017	3.0	3.49	2.00	0.017	0.027	0.25	0.75	0.93	0.098	0.66	0.30	3.11
25	167	0.034	0.017	3.1	3.63	2.12	0.019	0.028	0.26	0.77	0.98	0.099	0.69	0.31	3.30

Appendix 3.5-34 Table 41 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	0.037	0.018	3.2	3.74	2.21	0.020	0.029	0.27	0.79	1.01	0.100	0.71	0.31	3.44
27	181	0.042	0.018	3.3	3.88	2.33	0.022	0.029	0.28	0.82	1.05	0.102	0.73	0.31	3.64
28	188	0.045	0.018	3.4	4.01	2.43	0.023	0.030	0.29	0.85	1.08	0.103	0.76	0.31	3.81
29	195	0.050	0.019	3.5	4.14	2.53	0.025	0.031	0.30	0.87	1.12	0.104	0.78	0.32	4.00
30	202	0.054	0.019	3.6	4.25	2.62	0.027	0.031	0.31	0.89	1.15	0.105	0.80	0.32	4.17
31	209	0.059	0.020	3.7	4.39	2.73	0.029	0.032	0.32	0.92	1.18	0.105	0.83	0.32	4.37
32	217	0.064	0.020	3.8	4.52	2.84	0.031	0.033	0.34	0.95	1.22	0.106	0.85	0.32	4.58
33	223	0.069	0.020	3.9	4.64	2.93	0.033	0.033	0.35	0.97	1.25	0.107	0.87	0.33	4.77
34	230	0.074	0.021	4.0	4.77	3.03	0.035	0.034	0.36	1.00	1.29	0.108	0.90	0.33	4.98
35	237	0.080	0.021	4.1	4.91	3.15	0.037	0.034	0.37	1.03	1.32	0.108	0.92	0.33	5.22
36	244	0.085	0.022	4.2	5.03	3.25	0.040	0.035	0.38	1.06	1.36	0.109	0.94	0.33	5.44
37	251	0.090	0.022	4.4	5.16	3.36	0.043	0.035	0.39	1.08	1.39	0.109	0.96	0.34	5.67
38	258	0.095	0.022	4.5	5.28	3.48	0.046	0.036	0.41	1.11	1.43	0.110	0.99	0.34	5.91
39	265	0.095	0.022	4.5	5.28	3.48	0.046	0.036	0.41	1.11	1.43	0.110	0.99	0.34	5.91
40	272	0.104	0.023	4.7	5.47	3.66	0.051	0.037	0.43	1.15	1.48	0.111	1.02	0.34	6.31
41	279	0.108	0.023	4.7	5.57	3.76	0.054	0.037	0.44	1.17	1.50	0.111	1.04	0.34	6.53
42	286	0.113	0.023	4.8	5.67	3.86	0.057	0.038	0.45	1.20	1.53	0.112	1.05	0.35	6.76
43	293	0.118	0.024	5.0	5.79	3.98	0.061	0.038	0.46	1.22	1.56	0.112	1.07	0.35	7.03
44	300	0.122	0.024	5.1	5.89	4.09	0.065	0.038	0.47	1.25	1.59	0.113	1.09	0.35	7.27
45	309	0.128	0.024	5.2	6.02	4.23	0.070	0.039	0.49	1.28	1.63	0.113	1.11	0.35	7.61
46	315	0.133	0.025	5.3	6.11	4.34	0.073	0.039	0.50	1.30	1.65	0.113	1.13	0.35	7.86
47	321	0.137	0.025	5.4	6.20	4.44	0.077	0.039	0.51	1.32	1.68	0.114	1.14	0.36	8.09
48	328	0.142	0.025	5.5	6.30	4.57	0.082	0.040	0.52	1.35	1.71	0.114	1.16	0.36	8.40
49	335	0.146	0.025	5.6	6.39	4.69	0.086	0.040	0.53	1.37	1.73	0.114	1.17	0.36	8.67
50	343	0.151	0.026	5.7	6.49	4.82	0.091	0.040	0.55	1.40	1.76	0.115	1.19	0.36	8.99
51	349	0.155	0.026	5.8	6.59	4.94	0.096	0.041	0.56	1.42	1.79	0.115	1.21	0.36	9.29
52	356	0.160	0.026	5.9	6.68	5.07	0.101	0.041	0.57	1.44	1.82	0.115	1.22	0.36	9.59
53	363	0.164	0.026	6.0	6.76	5.19	0.106	0.041	0.58	1.47	1.84	0.116	1.23	0.37	9.89
54	370	0.169	0.026	6.1	6.84	5.31	0.111	0.041	0.60	1.49	1.86	0.116	1.25	0.37	10.19
55	377			6.2					0.61						
56	384			6.2					0.61						
57	391			6.4					0.63						
58	398			6.4					0.64						

Appendix 3.5-34 Table 42

Metal Extraction Rates
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.15	0.002	2.66	0.018	0.11	0.16	0.006	3.37	0.116	0.001	1.26	0.0012	1.01	0.09
3	15	0.29	0.002	3.85	0.028	0.19	0.27	0.007	4.79	0.187	0.002	1.77	0.0018	1.24	0.17
4	22	0.27	0.002	3.16	0.024	0.17	0.23	0.006	3.88	0.161	0.001	1.43	0.0016	0.93	0.15
5	27	0.27	0.002	3.03	0.024	0.18	0.21	0.005	3.68	0.159	0.002	1.34	0.0015	0.81	0.16
6	34	0.34	0.002	3.25	0.028	0.24	0.21	0.005	3.86	0.179	0.002	1.36	0.0016	0.73	0.21
7	41	0.39	0.002	3.15	0.029	0.29	0.21	0.004	3.65	0.185	0.002	1.25	0.0016	0.55	0.24
8	48	0.39	0.002	2.50	0.026	0.30	0.16	0.002	2.77	0.158	0.002	0.88	0.0013	0.27	0.25
9	55	0.43	0.002	2.57	0.029	0.36	0.17	0.002	2.78	0.163	0.002	0.84	0.0014	0.24	0.29
10	63	0.45	0.002	2.37	0.028	0.37	0.18	0.002	2.51	0.151	0.002	0.73	0.0013	0.20	0.29
11	70	0.45	0.002	1.92	0.024	0.36	0.19	0.002	1.98	0.124	0.002	0.54	0.0011	0.13	0.27
12	76	0.50	0.002	1.86	0.024	0.39	0.22	0.002	1.89	0.120	0.002	0.49	0.0012	0.12	0.28
13	84	0.54	0.002	1.72	0.023	0.40	0.25	0.002	1.74	0.111	0.002	0.43	0.0011	0.10	0.27
14	90	0.61	0.002	1.65	0.022	0.42	0.29	0.002	1.68	0.106	0.002	0.41	0.0012	0.10	0.27
15	97	0.71	0.002	1.66	0.023	0.46	0.35	0.002	1.72	0.107	0.002	0.41	0.0012	0.10	0.28
16	104	0.62	0.001	1.32	0.018	0.39	0.31	0.002	1.38	0.085	0.002	0.32	0.0010	0.08	0.23
17	111	0.83	0.002	1.46	0.021	0.49	0.42	0.002	1.54	0.094	0.002	0.35	0.0012	0.09	0.26
18	118	0.94	0.002	1.44	0.021	0.52	0.48	0.002	1.54	0.092	0.002	0.34	0.0013	0.09	0.27
19	125	1.01	0.002	1.38	0.020	0.52	0.50	0.002	1.50	0.088	0.002	0.31	0.0013	0.08	0.26
20	132	1.16	0.002	1.39	0.020	0.54	0.56	0.002	1.55	0.088	0.002	0.30	0.0013	0.08	0.27
21	139	1.43	0.002	1.64	0.023	0.62	0.67	0.002	1.84	0.103	0.002	0.34	0.0015	0.09	0.32
22	146	1.40	0.002	1.43	0.020	0.53	0.62	0.002	1.64	0.089	0.002	0.27	0.0013	0.08	0.28
23	153	1.61	0.002	1.52	0.021	0.54	0.68	0.002	1.77	0.093	0.002	0.27	0.0013	0.08	0.30
24	161	1.70	0.001	1.51	0.020	0.52	0.70	0.002	1.79	0.091	0.002	0.25	0.0012	0.08	0.30
25	167	1.92	0.001	1.58	0.021	0.53	0.76	0.002	1.91	0.094	0.002	0.24	0.0013	0.08	0.32

Appendix 3.5-34 Table 42 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	174	2.02	0.001	1.58	0.020	0.52	0.78	0.002	1.93	0.094	0.002	0.23	0.0012	0.08	0.32
27	181	2.26	0.001	1.68	0.021	0.54	0.85	0.002	2.09	0.099	0.002	0.22	0.0013	0.08	0.35
28	188	2.34	0.001	1.66	0.020	0.52	0.86	0.002	2.09	0.096	0.002	0.20	0.0012	0.07	0.34
29	195	2.61	0.001	1.77	0.021	0.54	0.95	0.002	2.26	0.102	0.002	0.20	0.0013	0.08	0.37
30	202	2.56	0.001	1.66	0.020	0.49	0.91	0.001	2.15	0.095	0.002	0.17	0.0012	0.07	0.35
31	209	2.80	0.001	1.76	0.021	0.51	0.98	0.001	2.29	0.099	0.002	0.16	0.0012	0.07	0.37
32	217	2.86	0.001	1.72	0.020	0.48	0.99	0.001	2.28	0.096	0.002	0.14	0.0011	0.07	0.37
33	223	3.07	0.001	1.79	0.020	0.49	1.05	0.001	2.39	0.099	0.002	0.13	0.0011	0.07	0.38
34	230	3.19	0.001	1.82	0.020	0.49	1.10	0.001	2.46	0.100	0.002	0.12	0.0011	0.07	0.39
35	237	3.41	0.001	1.92	0.021	0.51	1.21	0.001	2.62	0.105	0.002	0.12	0.0012	0.07	0.42
36	244	3.44	0.001	1.92	0.021	0.51	1.28	0.001	2.64	0.105	0.002	0.11	0.0011	0.07	0.43
37	251	3.53	0.001	1.97	0.021	0.53	1.39	0.001	2.73	0.107	0.002	0.11	0.0012	0.07	0.45
38	258	3.49	0.001	1.96	0.021	0.53	1.48	0.001	2.73	0.106	0.002	0.10	0.0011	0.07	0.46
39	265	2.79	0.001	1.57	0.016	0.43	1.23	0.001	2.21	0.085	0.001	0.08	0.0009	0.05	0.37
40	272	3.13	0.001	1.77	0.018	0.50	1.52	0.001	2.51	0.095	0.002	0.09	0.0010	0.06	0.44
41	279	3.04	0.001	1.72	0.017	0.49	1.57	0.001	2.47	0.093	0.001	0.08	0.0009	0.06	0.44
42	286	2.94	0.001	1.67	0.017	0.49	1.62	0.001	2.42	0.090	0.001	0.08	0.0009	0.05	0.44
43	293	2.93	0.001	1.67	0.016	0.50	1.72	0.001	2.44	0.089	0.001	0.07	0.0009	0.05	0.45
44	300	3.51	0.001	2.01	0.019	0.60	2.11	0.001	2.94	0.107	0.002	0.08	0.0010	0.06	0.54
45	309	3.04	0.001	1.75	0.017	0.53	1.97	0.001	2.59	0.093	0.001	0.07	0.0009	0.05	0.49
46	315	3.13	0.001	1.81	0.017	0.56	2.12	0.001	2.70	0.096	0.001	0.07	0.0009	0.05	0.52
47	321	3.15	0.001	1.83	0.017	0.57	2.22	0.001	2.75	0.097	0.001	0.07	0.0009	0.05	0.53
48	328	3.12	0.001	1.82	0.016	0.58	2.31	0.001	2.76	0.096	0.001	0.06	0.0009	0.05	0.54
49	335	3.11	0.001	1.83	0.016	0.59	2.41	0.001	2.78	0.096	0.001	0.06	0.0008	0.05	0.56
50	343	3.07	0.001	1.81	0.016	0.59	2.51	0.001	2.79	0.095	0.001	0.06	0.0008	0.05	0.57
51	349	3.09	0.001	1.83	0.016	0.61	2.63	0.001	2.84	0.096	0.001	0.05	0.0008	0.05	0.59
52	356	3.08	0.001	1.83	0.015	0.62	2.73	0.001	2.87	0.096	0.001	0.05	0.0008	0.05	0.60
53	363	2.99	0.001	1.79	0.015	0.61	2.76	0.001	2.81	0.093	0.001	0.04	0.0008	0.05	0.60
54	370	2.97	0.001	1.79	0.014	0.62	2.85	0.001	2.83	0.093	0.001	0.04	0.0007	0.04	0.61
55	377			1.80					2.89						
56	384			1.39					2.25						
57	391			1.46					2.46						
58	398			1.43					2.49						

Appendix 3.5-34 Table 43

Oxidation and Neutralization Results
Rice Lake High-Sulfur Waste Rock Composite (WD-10)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	51	0.05		0.531	0.137	0.282	0.79	42		8.4
2	8	77	0.08	22.5	0.268	0.076	0.158	0.87	65	20.5	13.1
3	15	123	0.13	33.5	0.480	0.131	0.264	0.82	105	29.3	21.0
4	22	138	0.14	27.8	0.162	0.042	0.080	0.75	117	23.9	23.4
5	27	155	0.16	26.9	0.170	0.044	0.083	0.74	130	22.7	25.9
6	34	193	0.20	29.2	0.397	0.102	0.188	0.73	159	24.0	31.7
7	41	213	0.22	28.8	0.205	0.053	0.094	0.72	173	22.9	34.7
8	48	233	0.24	23.3	0.209	0.054	0.093	0.70	188	17.6	37.6
9	55	251	0.26	23.9	0.193	0.050	0.082	0.68	201	17.9	40.2
10	63	269	0.27	22.2	0.185	0.045	0.075	0.65	213	16.3	42.6
11	70	287	0.29	18.4	0.193	0.045	0.075	0.62	225	13.0	45.0
12	76	304	0.31	18.3	0.173	0.038	0.064	0.59	236	12.4	47.1
13	84	324	0.33	17.7	0.203	0.042	0.072	0.56	247	11.5	49.4
14	90	341	0.35	17.9	0.179	0.035	0.060	0.53	256	11.1	51.3
15	97	362	0.37	19.2	0.223	0.041	0.072	0.51	268	11.2	53.5
16	104	364	0.37	15.8	0.024	0.004	0.007	0.48	269	9.0	53.8
17	111	400	0.41	19.2	0.371	0.060	0.107	0.45	286	10.0	57.1
18	118	421	0.43	20.1	0.221	0.034	0.062	0.44	295	9.9	59.0
19	125	442	0.45	20.3	0.219	0.033	0.061	0.43	305	9.6	60.9
20	132	471	0.48	21.7	0.297	0.043	0.081	0.42	317	9.9	63.4
21	139	495	0.51	26.0	0.249	0.035	0.067	0.41	327	11.7	65.4
22	146	519	0.53	23.7	0.251	0.034	0.067	0.40	337	10.3	67.4
23	153	552	0.56	26.1	0.342	0.045	0.090	0.39	351	11.1	70.1
24	161	579	0.59	26.6	0.284	0.037	0.074	0.39	362	11.1	72.3
25	167	615	0.63	28.8	0.374	0.047	0.096	0.38	376	11.8	75.2
26	174	642	0.66	29.5	0.285	0.035	0.072	0.38	387	11.9	77.3

Appendix 3.5-34 Table 43 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
27	181	680	0.69	32.2	0.392	0.047	0.099	0.37	401	12.8	80.3
28	188	714	0.73	32.5	0.359	0.042	0.089	0.37	414	12.7	82.9
29	195	751	0.77	35.5	0.384	0.044	0.095	0.36	428	13.7	85.7
30	202	785	0.80	34.0	0.353	0.040	0.087	0.36	441	13.0	88.2
31	209	825	0.84	36.7	0.421	0.047	0.103	0.35	456	13.8	91.2
32	217	869	0.89	36.7	0.451	0.049	0.109	0.35	472	13.7	94.3
33	223	908	0.93	38.8	0.413	0.044	0.099	0.35	486	14.3	97.2
34	230	953	0.97	40.3	0.462	0.048	0.109	0.34	502	14.7	100.3
35	237	1002	1.02	43.5	0.517	0.052	0.119	0.33	519	15.6	103.8
36	244	1048	1.07	44.6	0.479	0.047	0.108	0.32	534	15.7	106.9
37	251	1096	1.12	46.8	0.499	0.048	0.110	0.32	550	16.2	110.0
38	258	1148	1.17	47.8	0.535	0.050	0.116	0.31	567	16.1	113.4
39	265										
40	272	1231	1.26	45.8	0.373 ?	0.077 ?	0.183 ?	0.70 ?	614	19.1	122.9
41	279	1277	1.31	45.8	0.478	0.041	0.098	0.29	628	18.8	125.7
42	286	1325	1.35	45.7	0.495	0.041	0.100	0.29	643	18.5	128.5
43	293	1383	1.41	47.0	0.605	0.049	0.120	0.28	660	18.6	131.9
44	300	1433	1.47	47.5	0.525	0.042	0.103	0.28	674	17.1	134.8
45	309	1504	1.54	51.6	0.736	0.057	0.142	0.27	694	15.0	138.8
46	315	1557	1.59	54.4	0.555	0.042	0.105	0.27	709	15.6	141.7
47	321	1605	1.64	56.0	0.496	0.038	0.095	0.27	722	15.9	144.4
48	328	1678	1.72	59.0	0.764	0.048	0.122	0.22	739	15.9	147.8
49	335	1754	1.79	64.1	0.789	0.043	0.109	0.19	754	16.0	150.8
50	343	1810	1.85	63.1	0.589	0.049	0.126	0.30	772	16.0	154.3
51	349	1863	1.90	63.0	0.548	0.045	0.116	0.29	788	16.3	157.5
52	356	1931	1.97	65.4	0.715	0.045	0.117	0.23	804	16.4	160.8
53	363	2008	2.05	66.0	0.794	0.042	0.112	0.19	819	16.0	163.8
54	370	2055	2.10	60.3	0.492	0.043	0.113	0.32	835	16.1	167.0
55	377	2106	2.15	61.0	0.536	0.044	0.121	0.31	851	16.4	170.3
56	384										
57	391	2177	2.23	49.0	0.299	0.054	0.160	0.71	896	18.5	179.3
58	398	2228	2.28	44.0	0.530	0.038	0.119	0.30	912	18.6	182.4

* Rates of sulfate production and NP depletion are 5-week moving averages

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Tables 44-50.
Upper Mole Lake Waste Rock High Sulfur Composite (WD-11) Data and Calculations.

Appendix 3.5-34 Table 44

Sample Characterization
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	66800
Antimony	Sb	20
Arsenic	As	46
Barium	Ba	330
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	3600
Carbon	C	1600
Chromium	Cr	9
Cobalt	Co	19
Copper	Cu	56
Gallium	Ga	15
Iron	Fe	65500
Lead	Pb	160
Lithium	Li	NA
Magnesium	Mg	26400
Manganese	Mn	480
Mercury	Hg	0.7
Molybdenum	Mo	<20
Nickel	Ni	<18
Phosphorus	P	NA
Potassium	K	18400
Selenium	Se	<3
Silicon	Si	286000
Silver	Ag	0.01
Sodium	Na	3000
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	650
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	180
Sulfur	S	44400

ABA Results	
Paste pH	7.9
S (Total) (%)	4.49
SO4 (%)	NA
S (Sulfide) (%)	3.78
AP (kg CaCO3/tonne)	118.1
NP (kg CaCO3/tonne)	6.8
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-111.3
NP/AP	0.06

Note: NA = not analyzed

Sample Mass (kg)	78.18

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 45

Parameters Measured Weekly
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)		SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
24-Oct-94	1	0	6.475	6.8	1630	23			**890**	74
2-Nov-94	2	9	2.435	7.1	1480	11			**821**	99
9-Nov-94	3	16	4.934	5.4	1280	9			759	147
16-Nov-94	4	23	2.360	5.7	1260	<5			**696**	168
21-Nov-94	5	28	3.050	5.3	1260	<5			**668**	194
28-Nov-94	6	35	5.120	5.1	1020	<5			574	232
5-Dec-94	7	42	4.930	5.0	948	<5			479	262
12-Dec-94	8	49	6.000	4.9	711	<5			385	291
19-Dec-94	9	56	5.500	4.7	650		10		**290**	312
27-Dec-94	10	64	5.680	4.5	646		19		296	333
3-Jan-95	11	71	3.740	4.4	659		18		303	348
9-Jan-95	12	77	3.700	4.2	665		30		309	363
17-Jan-95	13	85	4.040	4.2	767		30		315	379
23-Jan-95	14	91	4.860	4.1	815		32		321	399
30-Jan-95	15	98	5.640	4.1	747		28		328	422
6-Feb-95	16	105	0.500	4.1	764		36		334	425
13-Feb-95	17	112	8.160	4.1	768		130	?	**340**	460
20-Feb-95	18	119	3.480	4.0	829		30		355	476
27-Feb-95	19	126	3.630	4.0	905		36		370	493
6-Mar-95	20	133	4.100	4.0	957		34		385	513
13-Mar-95	21	140	3.410	3.9	862		35		400	531
20-Mar-95	22	147	4.300	3.8	962		48		415	553
27-Mar-95	23	154	4.680	3.9	1000		62		430	579
4-Apr-95	24	162	4.680	3.9	878		41		445	606
10-Apr-95	25	168	5.030	3.9	945		47		460	635
17-Apr-95	26	175	4.700	3.9	819		40		475	664
24-Apr-95	27	182	4.860	3.9	835		60		490	694
1-May-95	28	189	3.400	3.8	872		61		505	716
8-May-95	29	196	4.380	3.7	1000		67		520	746
15-May-95	30	203	3.040	3.7	988		56		535	766
22-May-95	31	210	3.020	3.7	989		81		550	788
30-May-95	32	218	3.800	3.8	1040		78		565	815
5-Jun-95	33	224	3.360	3.8	1120		78		**580**	840
12-Jun-95	34	231	5.280	3.7	1070		88		595	880
19-Jun-95	35	238	5.480	3.6	913		54		609	923
26-Jun-95	36	245	4.160	3.6	840		62		624	956
3-Jul-95	37	252	4.230	3.5	914				638	991
10-Jul-95	38	259	5.400	3.4	926				653	1036
17-Jul-95	39	266	0.000							
24-Jul-95	40	273	9.350	3.1	1170				682	1117

Appendix 3.5-34 Table 45 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
31-Jul-95	41	280	4.040	2.9	1410			697	1153
7-Aug-95	42	287	5.440	2.9	1540			712	1203
14-Aug-95	43	294	5.820	2.9	1580			726	1257
21-Aug-95	44	301	5.380	2.9	1600			741	1308
30-Aug-95	45	310	5.380	2.9	1600			755	1360
6-Sep-95	46	317	5.010	3.0	1680		280	**770**	1409
11-Sep-95	47	322	4.480	2.9	1860		310	**840**	1457
18-Sep-95	48	329	4.190	2.4	1880		340	**1300**	1527
25-Sep-95	49	336	4.640	2.8	2020		380	**970**	1585
3-Oct-95	50	344	4.400	2.8	2040		430	**970**	1639
9-Oct-95	51	350	3.830	2.8	2200		500	**1000**	1688
16-Oct-95	52	357	4.590	2.8	2280		500	**1400**	1770
23-Oct-95	53	364	3.800	2.8	2400		600	**1400**	1838
30-Oct-95	54	371	3.870	2.7	2430		540	**1200**	1898
6-Nov-95	55	378	4.500	2.7	2450		600	1267	1971
13-Nov-95	56	385	0.000						
20-Nov-95	57	392	5.700	2.8	2690		630	**1300**	2065
27-Nov-95	58	399	4.540	2.8	2950		600	**1300**	2141
4-Dec-95	59	406	4.170	2.7	2740		610		
11-Dec-95	60	413	3.600	2.7	2880		690		
18-Dec-95	61	420	4.120	2.6	3110		690		
26-Dec-95	62	428	5.290	2.7	2680		590		
2-Jan-96	63	435	3.960	2.7	2790		620		
9-Jan-96	64	442	3.970	2.7	2630		560		
15-Jan-96	65	448	4.240	2.6	2710				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 46

Leachate Analysis
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *												
		Aluminum Al		Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	**5.8**		**0.010**	**0.043**	**110**	**0.14**	**0.16**	**8.0**	**130**	**3.2**	**27.3**	**0.026**	**56**	**0.49**
2	9	**6.0**		**0.012**	**0.037**	**120**	**0.083**	**0.15**	**7.9**	**120**	**3.0**	**27.1**	**0.022**	**34**	**0.36**
3	16	4.7		0.009	0.032	115	0.081	0.13	6.7	106	2.95	23.3	0.022	24.5	0.38
4	23	**3.3**		**0.005**	**0.027**	**110**	**0.079**	**0.10**	**5.5**	**92**	**2.9**	**19.5**	**0.022**	**15**	**0.40**
5	28	**0.58**	<	**0.005**	**0.032**	**100**	**0.11**	**0.12**	**0.90**	**84**	**2.8**	**18.4**	**0.019**	**11**	**0.79**
6	35	0.7		0.014	0.031	88	0.097	0.19	0.9	71.3	2.53	15.8	0.017	8.7	0.78
7	42	0.9		0.024	0.030	76	0.085	0.27	1.0	58.5	2.25	13.3	0.015	6.5	0.76
8	49	1.0		0.033	0.029	63	0.072	0.34	1.0	45.8	1.98	10.7	0.012	4.2	0.75
9	56	**1.2**	<	**0.005**	**0.028**	**51**	**0.059**	**0.41**	**1.0**	**33**	**1.7**	**8.1**	**0.010**	**1.9**	**0.73**
10	64	1.3		0.005	0.027	52	0.064	0.45	1.0	33.4	1.84	7.8	0.010	1.8	0.80
11	71	1.4		0.005	0.027	53	0.068	0.50	1.0	33.8	1.98	7.5	0.010	1.7	0.87
12	77	1.5		0.005	0.026	54	0.073	0.54	1.0	34.1	2.11	7.2	0.010	1.6	0.94
13	85	1.7		0.005	0.026	55	0.077	0.59	1.0	34.5	2.25	7.0	0.011	1.5	1.02
14	91	1.8		0.005	0.025	56	0.082	0.63	1.0	34.9	2.39	6.7	0.011	1.4	1.09
15	98	1.9		0.005	0.024	57	0.086	0.67	1.0	35.3	2.53	6.4	0.011	1.3	1.16
16	105	2.0		0.005	0.024	58	0.091	0.72	1.0	35.6	2.66	6.1	0.011	1.2	1.23
17	112	**2.1**	<	**0.005**	**0.023**	**59**	**0.095**	**0.76**	**1.0**	**36**	**2.8**	**5.8**	**0.011**	**1.1**	**1.3**
18	119	2.4		0.005	0.023	62	0.103	0.81	1.2	37.9	3.08	5.7	0.011	1.1	1.51
19	126	2.7		0.005	0.023	65	0.111	0.85	1.4	39.9	3.36	5.6	0.012	1.1	1.73
20	133	3.1		0.005	0.024	69	0.118	0.90	1.6	41.8	3.64	5.5	0.012	1.1	1.94
21	140	3.4		0.005	0.024	72	0.126	0.95	1.8	43.8	3.93	5.4	0.013	1.1	2.15
22	147	3.7		0.005	0.024	75	0.134	0.99	2.0	45.7	4.21	5.3	0.013	1.1	2.36
23	154	4.0		0.005	0.024	78	0.142	1.04	2.2	47.6	4.49	5.2	0.014	1.1	2.58
24	162	4.3		0.005	0.024	81	0.150	1.08	2.4	49.6	4.77	5.1	0.014	1.1	2.79
25	168	4.7		0.005	0.025	85	0.158	1.13	2.6	51.5	5.05	5.0	0.015	1.1	3.00
26	175	5.0		0.005	0.025	88	0.165	1.18	2.7	53.4	5.33	4.9	0.015	1.1	3.21

Appendix 3.5-34 Table 46 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al		Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	182	5.3		0.005	0.025	91	0.173	1.22	2.9	55.4	5.61	4.8	0.015	1.1	3.43
28	189	5.6		0.005	0.025	94	0.181	1.27	3.1	57.3	5.89	4.7	0.016	1.1	3.64
29	196	5.9		0.005	0.025	97	0.189	1.32	3.3	59.3	6.18	4.6	0.016	1.1	3.85
30	203	6.2		0.005	0.025	100	0.197	1.36	3.5	61.2	6.46	4.5	0.017	1.1	4.06
31	210	6.6		0.005	0.026	104	0.204	1.41	3.7	63.1	6.74	4.4	0.017	1.1	4.28
32	218	6.9		0.005	0.026	107	0.212	1.45	3.9	65.1	7.02	4.3	0.018	1.1	4.49
33	224	**7.2**	**<**	**0.005**	**0.026**	**110**	**0.22**	**1.5**	**4.1**	**67**	**7.3**	**4.20**	**0.018**	**1.1**	**4.7**
34	231	7.1		0.005	0.025	112	0.222	1.57	4.8	69.0	7.37	4.1	0.018	1.1	4.78
35	238	7.0		0.005	0.025	114	0.224	1.64	5.5	71.1	7.44	4.0	0.018	1.1	4.86
36	245	7.0		0.005	0.024	116	0.226	1.71	6.2	73.1	7.51	3.9	0.017	1.1	4.94
37	252	6.9		0.005	0.024	118	0.228	1.79	6.9	75.2	7.59	3.7	0.017	1.1	5.02
38	259	6.8		0.005	0.023	120	0.230	1.86	7.6	77.2	7.66	3.6	0.017	1.0	5.10
39	266														
40	273	6.6		0.005	0.022	123	0.233	2.00	9.1	81.3	7.80	3.4	0.017	1.0	5.27
41	280	6.6		0.005	0.022	125	0.235	2.07	9.8	83.4	7.87	3.3	0.016	1.0	5.35
42	287	6.5		0.006	0.021	127	0.237	2.14	10.5	85.4	7.94	3.2	0.016	1.0	5.43
43	294	6.4		0.006	0.021	129	0.239	2.21	11.2	87.5	8.01	3.1	0.016	1.0	5.51
44	301	6.3		0.006	0.020	131	0.241	2.29	11.9	89.5	8.09	2.9	0.016	1.0	5.59
45	310	6.2		0.006	0.020	133	0.243	2.36	12.6	91.6	8.16	2.8	0.016	1.0	5.67
46	317	6.1		0.006	0.019	135	0.245	2.43	13.3	93.6	8.23	2.7	0.016	1.0	5.75
47	322	6.1		0.006	0.019	137	0.247	2.50	14.0	95.7	8.30	2.6	0.015	0.9	5.83
48	329	6.0		0.006	0.018	139	0.249	2.57	14.7	97.7	8.37	2.5	0.015	0.9	5.91
49	336	5.9		0.006	0.018	140	0.250	2.64	15.5	99.8	8.44	2.4	0.015	0.9	6.00
50	344	5.8		0.006	0.017	142	0.252	2.71	16.2	101.8	8.51	2.3	0.015	0.9	6.08
51	350	5.7		0.006	0.017	144	0.254	2.79	16.9	103.9	8.59	2.1	0.015	0.9	6.16
52	357	5.7		0.006	0.016	146	0.256	2.86	17.6	105.9	8.66	2.0	0.014	0.9	6.24
53	364	5.6		0.006	0.016	148	0.258	2.93	18.3	108.0	8.73	1.9	0.014	0.9	6.32
54	371	**5.5**		**0.0062**	**0.015**	**150**	**0.26**	**3.0**	**19**	**110**	**8.8**	**1.8**	**0.014**	**0.87**	**6.4**
55	378					148				110.0					
56	385														
57	392					143				110.0					
58	399					**140**				**110**					

* Measured values shown in bold

Appendix 3.5-34 Table 47

Cumulative Mass Flux
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.48	0.001	0.004	9.1	0.01	0.013	0.66	10.8	0.27	2.3	0.002	4.6	0.04
2	9	0.67	0.001	0.005	12.8	0.01	0.02	0.91	14.5	0.36	3.1	0.003	5.7	0.05
3	16	0.96	0.002	0.007	20.1	0.02	0.03	1.33	21.2	0.54	4.6	0.004	7.2	0.08
4	23	1.06	0.002	0.008	23.4	0.02	0.03	1.50	24.0	0.63	5.2	0.005	7.7	0.09
5	28	1.08	0.002	0.009	27.3	0.03	0.03	1.53	27.2	0.74	5.9	0.006	8.1	0.12
6	35	1.13	0.003	0.011	33.1	0.03	0.05	1.59	31.9	0.91	6.9	0.007	8.7	0.17
7	42	1.19	0.005	0.013	37.8	0.04	0.06	1.65	35.6	1.05	7.8	0.008	9.1	0.22
8	49	1.27	0.007	0.015	42.7	0.04	0.09	1.73	39.1	1.20	8.6	0.009	9.4	0.27
9	56	1.35	0.007	0.017	46.3	0.05	0.12	1.80	41.4	1.32	9.1	0.009	9.6	0.33
10	64	1.45	0.008	0.019	50.1	0.05	0.15	1.87	43.9	1.45	9.7	0.010	9.7	0.38
11	71	1.52	0.008	0.020	52.6	0.06	0.17	1.92	45.5	1.55	10.1	0.011	9.8	0.43
12	77	1.59	0.008	0.021	55.1	0.06	0.20	1.97	47.1	1.65	10.4	0.011	9.8	0.47
13	85	1.67	0.008	0.023	58.0	0.06	0.23	2.02	48.9	1.76	10.8	0.012	9.9	0.52
14	91	1.78	0.009	0.024	61.5	0.07	0.27	2.08	51.0	1.91	11.2	0.012	10.0	0.59
15	98	1.92	0.009	0.026	65.6	0.07	0.32	2.15	53.6	2.09	11.6	0.013	10.1	0.67
16	105	1.93	0.009	0.026	66.0	0.07	0.32	2.16	53.8	2.11	11.7	0.013	10.1	0.68
17	112	2.15	0.010	0.029	72.1	0.08	0.40	2.26	57.6	2.40	12.3	0.014	10.2	0.82
18	119	2.26	0.010	0.030	74.9	0.09	0.44	2.32	59.3	2.54	12.5	0.015	10.3	0.88
19	126	2.38	0.010	0.031	77.9	0.09	0.48	2.38	61.1	2.70	12.8	0.015	10.3	0.96
20	133	2.55	0.010	0.032	81.5	0.10	0.52	2.46	63.3	2.89	13.1	0.016	10.4	1.07
21	140	2.69	0.011	0.033	84.6	0.11	0.57	2.54	65.2	3.06	13.3	0.016	10.4	1.16
22	147	2.90	0.011	0.034	88.8	0.11	0.62	2.65	67.7	3.29	13.6	0.017	10.5	1.29
23	154	3.14	0.011	0.036	93.4	0.12	0.68	2.78	70.6	3.56	13.9	0.018	10.6	1.44
24	162	3.40	0.012	0.037	98.3	0.13	0.75	2.92	73.5	3.84	14.2	0.019	10.6	1.61
25	168	3.69	0.012	0.039	103.7	0.14	0.82	3.08	76.9	4.17	14.6	0.020	10.7	1.80

Appendix 3.5-34 Table 47 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	175	3.99	0.012	0.040	109.0	0.15	0.89	3.25	80.1	4.49	14.9	0.021	10.8	2.00
27	182	4.32	0.012	0.042	114.7	0.16	0.97	3.43	83.5	4.84	15.2	0.022	10.8	2.21
28	189	4.57	0.013	0.043	118.8	0.17	1.02	3.57	86.0	5.10	15.4	0.022	10.9	2.37
29	196	4.90	0.013	0.044	124.2	0.18	1.10	3.75	89.3	5.44	15.6	0.023	10.9	2.58
30	203	5.14	0.013	0.045	128.1	0.19	1.15	3.89	91.7	5.69	15.8	0.024	11.0	2.74
31	210	5.39	0.013	0.046	132.1	0.20	1.20	4.03	94.1	5.95	16.0	0.025	11.0	2.91
32	218	5.73	0.014	0.048	137.3	0.21	1.27	4.22	97.3	6.29	16.2	0.025	11.1	3.13
33	224	6.04	0.014	0.049	142.0	0.22	1.34	4.40	100.2	6.61	16.3	0.026	11.1	3.33
34	231	6.52	0.014	0.050	149.6	0.23	1.44	4.72	104.8	7.11	16.6	0.027	11.2	3.65
35	238	7.01	0.015	0.052	157.6	0.25	1.56	5.11	109.8	7.63	16.9	0.029	11.3	3.99
36	245	7.38	0.015	0.053	163.7	0.26	1.65	5.44	113.7	8.03	17.1	0.030	11.3	4.25
37	252	7.75	0.015	0.055	170.1	0.27	1.75	5.82	117.8	8.44	17.3	0.030	11.4	4.53
38	259	8.22	0.015	0.056	178.3	0.29	1.88	6.35	123.1	8.97	17.6	0.032	11.5	4.88
39	266	8.22	0.015	0.056	178.3	0.29	1.88	6.35	123.1	8.97	17.6	0.032	11.5	4.88
40	273	9.02	0.016	0.059	193.1	0.31	2.11	7.43	132.9	9.90	18.0	0.034	11.6	5.51
41	280	9.36	0.016	0.060	199.6	0.33	2.22	7.94	137.2	10.31	18.1	0.034	11.6	5.78
42	287	9.81	0.017	0.062	208.4	0.34	2.37	8.67	143.1	10.86	18.4	0.036	11.7	6.16
43	294	10.28	0.017	0.063	218.0	0.36	2.54	9.50	149.6	11.46	18.6	0.037	11.8	6.57
44	301	10.72	0.018	0.065	227.0	0.38	2.69	10.32	155.8	12.01	18.8	0.038	11.8	6.96
45	310	11.14	0.018	0.066	236.2	0.39	2.85	11.19	162.1	12.57	19.0	0.039	11.9	7.35
46	317	11.54	0.018	0.067	244.8	0.41	3.01	12.04	168.1	13.10	19.2	0.040	12.0	7.72
47	322	11.89	0.019	0.068	252.6	0.42	3.15	12.84	173.6	13.58	19.3	0.041	12.0	8.05
48	329	12.21	0.019	0.069	260.1	0.44	3.29	13.63	178.8	14.02	19.4	0.042	12.1	8.37
49	336	12.56	0.019	0.070	268.4	0.45	3.45	14.55	184.7	14.53	19.6	0.043	12.1	8.72
50	344	12.88	0.020	0.071	276.4	0.47	3.60	15.46	190.4	15.00	19.7	0.043	12.2	9.07
51	350	13.17	0.020	0.072	283.5	0.48	3.74	16.29	195.5	15.43	19.8	0.044	12.2	9.37
52	357	13.50	0.020	0.073	292.1	0.49	3.91	17.32	201.8	15.93	19.9	0.045	12.3	9.73
53	364	13.77	0.021	0.074	299.3	0.51	4.05	18.21	207.0	16.36	20.0	0.046	12.3	10.04
54	371	14.04	0.021	0.074	306.7	0.52	4.20	19.15	212.4	16.79	20.1	0.046	12.4	10.36
55	378				315.2				218.8					
56	385				315.2				218.8					
57	392				325.6				226.8					
58	399				333.7				233.2					

Appendix 3.5-34 Table 48

Cumulative Metal Extractions
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0007	0.00180	0.0011	0.3	0.06	0.02	0.001	0.04	0.06	0.012	0.07	0.15	0.02
2	9	0.0010	0.00261	0.001	0.4	0.07	0.03	0.001	0.05	0.07	0.017	0.09	0.19	0.03
3	16	0.001	0.00000	0.002	0.6	0.10	0.05	0.002	0.08	0.11	0.025	0.14	0.24	0.04
4	23	0.002	0.00000	0.002	0.7	0.11	0.05	0.002	0.09	0.13	0.028	0.16	0.26	0.05
5	28	0.002	0.00000	0.003	0.8	0.14	0.06	0.002	0.10	0.15	0.032	0.19	0.27	0.07
6	35	0.002	0.00000	0.003	0.9	0.17	0.08	0.002	0.12	0.19	0.038	0.22	0.29	0.09
7	42	0.002	0.00001	0.004	1.1	0.20	0.11	0.003	0.13	0.22	0.042	0.25	0.30	0.12
8	49	0.002	0.00001	0.005	1.2	0.23	0.16	0.003	0.15	0.25	0.047	0.29	0.31	0.15
9	56	0.002	0.00001	0.005	1.3	0.25	0.21	0.003	0.16	0.27	0.050	0.31	0.32	0.18
10	64	0.002	0.00001	0.006	1.4	0.27	0.27	0.003	0.17	0.30	0.053	0.33	0.32	0.21
11	71	0.002	0.00001	0.006	1.5	0.29	0.31	0.003	0.17	0.32	0.055	0.35	0.33	0.24
12	77	0.002	0.00001	0.006	1.5	0.31	0.36	0.003	0.18	0.34	0.057	0.37	0.33	0.26
13	85	0.003	0.00001	0.007	1.6	0.33	0.41	0.003	0.19	0.37	0.059	0.38	0.33	0.29
14	91	0.003	0.00001	0.007	1.7	0.36	0.48	0.003	0.19	0.40	0.061	0.41	0.33	0.33
15	98	0.003	0.00001	0.008	1.8	0.39	0.57	0.003	0.20	0.44	0.063	0.43	0.34	0.37
16	105	0.003	0.00001	0.008	1.8	0.39	0.58	0.003	0.20	0.44	0.064	0.44	0.34	0.38
17	112	0.003	0.00001	0.009	2.0	0.44	0.72	0.003	0.22	0.50	0.067	0.47	0.34	0.45
18	119	0.003	0.00001	0.009	2.1	0.47	0.78	0.004	0.22	0.53	0.068	0.49	0.34	0.49
19	126	0.004	0.00002	0.009	2.2	0.50	0.85	0.004	0.23	0.56	0.070	0.51	0.34	0.54
20	133	0.004	0.00002	0.010	2.3	0.53	0.94	0.004	0.24	0.60	0.071	0.53	0.35	0.59
21	140	0.004	0.00002	0.010	2.4	0.56	1.01	0.004	0.25	0.64	0.072	0.55	0.35	0.64
22	147	0.004	0.00002	0.010	2.5	0.60	1.11	0.004	0.26	0.69	0.074	0.57	0.35	0.72
23	154	0.005	0.00002	0.011	2.6	0.64	1.22	0.004	0.27	0.74	0.076	0.60	0.35	0.80
24	162	0.005	0.00002	0.011	2.7	0.69	1.33	0.004	0.28	0.80	0.077	0.63	0.35	0.90
25	168	0.006	0.00002	0.012	2.9	0.74	1.46	0.005	0.29	0.87	0.079	0.66	0.36	1.00

Appendix 3.5-34 Table 48 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	175	0.006	0.00002	0.012	3.0	0.79	1.59	0.005	0.30	0.94	0.081	0.69	0.36	1.11
27	182	0.006	0.00002	0.013	3.2	0.85	1.73	0.005	0.32	1.01	0.082	0.72	0.36	1.23
28	189	0.007	0.00002	0.013	3.3	0.89	1.82	0.005	0.33	1.06	0.083	0.74	0.36	1.32
29	196	0.007	0.00002	0.013	3.5	0.95	1.96	0.006	0.34	1.13	0.085	0.77	0.36	1.44
30	203	0.008	0.00002	0.014	3.6	0.99	2.05	0.006	0.35	1.19	0.086	0.80	0.37	1.52
31	210	0.008	0.00002	0.014	3.7	1.03	2.15	0.006	0.36	1.24	0.087	0.82	0.37	1.62
32	218	0.009	0.00002	0.014	3.8	1.08	2.27	0.006	0.37	1.31	0.088	0.85	0.37	1.74
33	224	0.009	0.00002	0.015	3.9	1.13	2.39	0.007	0.38	1.38	0.089	0.87	0.37	1.85
34	231	0.010	0.00002	0.015	4.2	1.21	2.58	0.007	0.40	1.48	0.090	0.91	0.37	2.03
35	238	0.010	0.00002	0.016	4.4	1.29	2.78	0.008	0.42	1.59	0.092	0.95	0.38	2.22
36	245	0.011	0.00002	0.016	4.5	1.36	2.95	0.008	0.43	1.67	0.093	0.98	0.38	2.36
37	252	0.012	0.00002	0.017	4.7	1.42	3.12	0.009	0.45	1.76	0.094	1.02	0.38	2.51
38	259	0.012	0.00002	0.017	5.0	1.51	3.35	0.010	0.47	1.87	0.095	1.05	0.38	2.71
39	266	0.012	0.00002	0.017	5.0	1.51	3.35	0.010	0.47	1.87	0.095	1.05	0.38	2.71
40	273	0.013	0.00002	0.018	5.4	1.65	3.78	0.011	0.50	2.06	0.098	1.12	0.39	3.06
41	280	0.014	0.00002	0.018	5.5	1.72	3.97	0.012	0.52	2.15	0.099	1.15	0.39	3.21
42	287	0.015	0.00003	0.019	5.8	1.80	4.23	0.013	0.54	2.26	0.100	1.19	0.39	3.42
43	294	0.015	0.00003	0.019	6.1	1.90	4.53	0.015	0.57	2.39	0.101	1.23	0.39	3.65
44	301	0.016	0.00003	0.020	6.3	1.98	4.81	0.016	0.59	2.50	0.102	1.26	0.39	3.87
45	310	0.017	0.00003	0.020	6.6	2.07	5.10	0.017	0.61	2.62	0.103	1.30	0.40	4.08
46	317	0.017	0.00003	0.020	6.8	2.15	5.38	0.018	0.64	2.73	0.104	1.33	0.40	4.29
47	322	0.018	0.00003	0.021	7.0	2.23	5.63	0.020	0.66	2.83	0.105	1.36	0.40	4.47
48	329	0.018	0.00003	0.021	7.2	2.30	5.88	0.021	0.68	2.92	0.106	1.39	0.40	4.65
49	336	0.019	0.00003	0.021	7.5	2.38	6.16	0.022	0.70	3.03	0.106	1.42	0.40	4.85
50	344	0.019	0.00003	0.022	7.7	2.45	6.43	0.024	0.72	3.13	0.107	1.45	0.41	5.04
51	350	0.020	0.00003	0.022	7.9	2.52	6.67	0.025	0.74	3.21	0.108	1.47	0.41	5.20
52	357	0.020	0.00003	0.022	8.1	2.60	6.97	0.026	0.76	3.32	0.108	1.50	0.41	5.41
53	364	0.021	0.00003	0.022	8.3	2.66	7.23	0.028	0.78	3.41	0.109	1.52	0.41	5.58
54	371	0.021	0.00003	0.023	8.5	2.73	7.49	0.029	0.80	3.50	0.109	1.54	0.41	5.75
55	378				8.8				0.83					
56	385				8.8				0.83					
57	392				9.0				0.86					
58	399				9.3				0.88					

Appendix 3.5-34 Table 49

Metal Extraction Rates
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	9	0.15	0.0003	0.001	2.91	0.002	0.00	0.19	2.91	0.073	0.66	0.0005	0.82	0.01
3	16	0.21	0.000	0.001	4.81	0.003	0.01	0.29	4.56	0.122	1.01	0.0009	1.14	0.02
4	23	0.18	0.000	0.001	4.36	0.003	0.00	0.25	4.02	0.112	0.88	0.0008	0.93	0.01
5	28	0.15	0.000	0.001	4.55	0.004	0.01	0.22	4.12	0.119	0.91	0.0009	0.87	0.02
6	35	0.13	0.000	0.001	4.79	0.004	0.01	0.19	4.23	0.128	0.93	0.0009	0.81	0.03
7	42	0.11	0.0007	0.002	5.30	0.005	0.01	0.16	4.48	0.146	0.99	0.0010	0.72	0.04
8	49	0.07	0.0011	0.002	4.79	0.005	0.01	0.08	3.80	0.139	0.85	0.0009	0.46	0.04
9	56	0.06	0.0012	0.002	4.85	0.005	0.02	0.06	3.70	0.146	0.84	0.0009	0.39	0.05
10	64	0.07	0.0011	0.002	4.42	0.005	0.02	0.07	3.23	0.138	0.74	0.0009	0.30	0.05
11	71	0.07	0.0010	0.002	3.79	0.004	0.02	0.06	2.64	0.125	0.61	0.0007	0.21	0.05
12	77	0.08	0.0007	0.002	3.46	0.004	0.03	0.06	2.30	0.120	0.53	0.0007	0.15	0.05
13	85	0.08	0.0003	0.002	2.97	0.004	0.03	0.06	1.90	0.110	0.43	0.0006	0.10	0.05
14	91	0.09	0.0003	0.001	3.04	0.004	0.03	0.06	1.92	0.119	0.41	0.0006	0.09	0.05
15	98	0.10	0.0003	0.001	3.20	0.005	0.03	0.06	2.00	0.132	0.40	0.0006	0.09	0.06
16	105	0.09	0.0002	0.001	2.75	0.004	0.03	0.05	1.72	0.116	0.33	0.0005	0.07	0.05
17	112	0.11	0.0003	0.001	3.39	0.005	0.04	0.06	2.10	0.151	0.38	0.0006	0.08	0.07
18	119	0.12	0.0003	0.001	3.48	0.005	0.04	0.06	2.14	0.160	0.36	0.0007	0.07	0.07
19	126	0.12	0.0003	0.001	3.29	0.005	0.04	0.06	2.01	0.157	0.32	0.0006	0.06	0.07
20	133	0.13	0.0003	0.001	3.19	0.005	0.04	0.06	1.94	0.159	0.29	0.0006	0.06	0.08
21	140	0.15	0.0003	0.001	3.74	0.006	0.05	0.08	2.28	0.190	0.33	0.0007	0.06	0.10
22	147	0.15	0.0002	0.001	3.33	0.006	0.04	0.08	2.03	0.177	0.27	0.0006	0.05	0.09
23	154	0.18	0.0003	0.001	3.71	0.007	0.05	0.09	2.26	0.204	0.28	0.0007	0.06	0.11
24	162	0.20	0.0003	0.001	3.96	0.007	0.05	0.10	2.42	0.223	0.28	0.0007	0.06	0.13
25	168	0.23	0.0003	0.001	4.45	0.008	0.06	0.12	2.71	0.256	0.29	0.0008	0.06	0.15

Appendix 3.5-34 Table 49 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
26	175	0.26	0.0003	0.001	4.87	0.009	0.06	0.14	2.97	0.286	0.30	0.0008	0.07	0.17
27	182	0.29	0.0003	0.002	5.18	0.010	0.07	0.16	3.16	0.310	0.31	0.0009	0.07	0.18
28	189	0.29	0.0003	0.001	5.06	0.010	0.07	0.16	3.09	0.307	0.28	0.0009	0.06	0.18
29	196	0.31	0.0003	0.001	5.33	0.010	0.07	0.17	3.25	0.329	0.28	0.0009	0.06	0.20
30	203	0.29	0.0003	0.001	4.87	0.009	0.07	0.16	2.97	0.305	0.25	0.0008	0.06	0.19
31	210	0.28	0.0002	0.001	4.62	0.009	0.06	0.16	2.81	0.292	0.22	0.0008	0.05	0.18
32	218	0.27	0.0002	0.001	4.40	0.009	0.06	0.15	2.68	0.283	0.20	0.0007	0.05	0.18
33	224	0.29	0.0002	0.001	4.66	0.009	0.06	0.17	2.84	0.302	0.20	0.0008	0.05	0.19
34	231	0.32	0.0002	0.001	5.08	0.010	0.07	0.19	3.10	0.333	0.20	0.0008	0.05	0.21
35	238	0.37	0.0003	0.001	5.89	0.012	0.08	0.24	3.63	0.387	0.22	0.0009	0.06	0.25
36	245	0.40	0.0003	0.001	6.32	0.012	0.09	0.28	3.92	0.415	0.23	0.0010	0.06	0.27
37	252	0.42	0.0003	0.001	6.75	0.013	0.10	0.33	4.22	0.441	0.24	0.0010	0.06	0.29
38	259	0.44	0.0003	0.002	7.26	0.014	0.11	0.39	4.59	0.472	0.24	0.0011	0.07	0.31
39	266	0.34	0.0003	0.001	5.75	0.011	0.09	0.32	3.66	0.372	0.19	0.0009	0.05	0.25
40	273	0.40	0.0003	0.001	7.11	0.014	0.11	0.46	4.60	0.454	0.21	0.0010	0.06	0.30
41	280	0.39	0.0003	0.001	7.17	0.014	0.11	0.50	4.69	0.456	0.21	0.0010	0.06	0.31
42	287	0.41	0.0003	0.001	7.66	0.014	0.12	0.57	5.06	0.484	0.21	0.0010	0.06	0.33
43	294	0.41	0.0003	0.001	7.94	0.015	0.13	0.63	5.30	0.498	0.20	0.0010	0.06	0.34
44	301	0.50	0.0004	0.002	9.74	0.018	0.16	0.79	6.53	0.609	0.25	0.0013	0.08	0.42
45	310	0.40	0.0004	0.001	8.15	0.015	0.14	0.71	5.53	0.506	0.19	0.0010	0.06	0.35
46	317	0.41	0.0004	0.001	8.56	0.016	0.15	0.78	5.85	0.529	0.19	0.0010	0.06	0.37
47	322	0.42	0.0004	0.001	8.85	0.016	0.16	0.84	6.09	0.543	0.19	0.0010	0.06	0.38
48	329	0.39	0.0004	0.001	8.41	0.015	0.15	0.83	5.84	0.514	0.17	0.0010	0.06	0.36
49	336	0.37	0.0004	0.001	8.27	0.015	0.15	0.85	5.79	0.503	0.16	0.0009	0.06	0.35
50	344	0.36	0.0004	0.001	8.29	0.015	0.15	0.88	5.84	0.501	0.15	0.0009	0.06	0.35
51	350	0.35	0.0003	0.001	8.20	0.015	0.15	0.90	5.82	0.493	0.14	0.0009	0.05	0.35
52	357	0.32	0.0003	0.001	7.89	0.014	0.15	0.90	5.64	0.472	0.13	0.0008	0.05	0.34
53	364	0.31	0.0003	0.001	7.84	0.014	0.15	0.91	5.64	0.467	0.12	0.0008	0.05	0.33
54	371	0.30	0.0003	0.001	7.66	0.013	0.15	0.92	5.55	0.454	0.11	0.0008	0.05	0.33
55	378				7.98				5.83					
56	385				6.34				4.65					
57	392				6.70				5.01					
58	399				6.89				5.24					

Appendix 3.5-34 Table 50

Oxidation and Neutralization Results
Upper Mole Lake High-Sulfur Waste Rock Composite (WD-11)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	74	0.05		0.768	0.228	0.443	0.87	67		1.0
2	9	99	0.07	19.9	0.266	0.093	0.154	0.93	92	19.2	1.4
3	16	147	0.11	32.1	0.499	0.181	0.275	0.92	137	30.8	2.0
4	23	168	0.12	28.7	0.219	0.083	0.114	0.90	157	27.4	2.3
5	28	194	0.14	30.1	0.271	0.098	0.135	0.86	180	28.3	2.7
6	35	232	0.17	31.6	0.391	0.144	0.192	0.86	214	29.4	3.2
7	42	262	0.19	34.5	0.315	0.119	0.152	0.86	241	31.7	3.6
8	49	291	0.22	30.6	0.307	0.121	0.144	0.86	268	27.6	4.0
9	56	312	0.23	30.5	0.213	0.090	0.096	0.87	286	27.4	4.2
10	64	333	0.25	27.1	0.224	0.094	0.100	0.87	306	24.3	4.5
11	71	348	0.26	22.6	0.151	0.063	0.066	0.86	319	20.3	4.7
12	77	363	0.27	20.1	0.152	0.064	0.066	0.86	332	18.1	4.9
13	85	379	0.28	17.0	0.170	0.071	0.073	0.85	346	15.2	5.1
14	91	399	0.30	17.4	0.208	0.087	0.089	0.85	364	15.5	5.4
15	98	422	0.31	18.3	0.246	0.103	0.105	0.84	384	16.2	5.7
16	105	425	0.32	15.8	0.022	0.009	0.009	0.84	386	13.9	5.7
17	112	460	0.34	19.5	0.370	0.154	0.155	0.83	417	17.1	6.2
18	119	476	0.35	20.0	0.165	0.069	0.069	0.84	431	17.5	6.4
19	126	493	0.37	18.8	0.179	0.076	0.076	0.85	446	16.5	6.6
20	133	513	0.38	18.2	0.210	0.090	0.090	0.86	464	16.0	6.9
21	140	531	0.39	21.2	0.182	0.078	0.079	0.86	480	18.7	7.1
22	147	553	0.41	18.7	0.238	0.103	0.103	0.87	501	16.7	7.4
23	154	579	0.43	20.7	0.268	0.117	0.117	0.87	524	18.6	7.8
24	162	606	0.45	21.9	0.277	0.122	0.122	0.88	548	19.9	8.1
25	168	635	0.47	24.4	0.308	0.136	0.136	0.88	576	22.3	8.5
26	175	664	0.49	26.7	0.297	0.132	0.132	0.89	602	24.4	8.9

Appendix 3.5-34 Table 50 (Continued)

CYCLE	DAYS	--------OXIDATION-------- Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	----MOLES EXTRACTED---- Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	MOLE RATIO [Ca + Mg] / [SO4]	--------NEUTRALIZATION-------- Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
27	182	694	0.52	28.2	0.317	0.141	0.142	0.89	630	25.9	9.3
28	189	716	0.53	27.4	0.229	0.102	0.103	0.90	651	25.4	9.6
29	196	746	0.55	28.8	0.303	0.136	0.137	0.90	678	26.7	10.0
30	203	766	0.57	26.2	0.217	0.098	0.098	0.90	698	24.4	10.3
31	210	788	0.58	24.7	0.221	0.100	0.100	0.91	718	23.1	10.6
32	218	815	0.61	23.5	0.286	0.130	0.130	0.91	744	22.0	11.0
33	224	840	0.62	24.7	0.260	0.118	0.118	0.91	767	23.3	11.4
34	231	880	0.65	26.9	0.418	0.189	0.192	0.91	805	25.5	11.9
35	238	923	0.69	31.3	0.445	0.199	0.205	0.91	846	29.6	12.5
36	245	956	0.71	33.7	0.346	0.154	0.160	0.91	877	31.9	13.0
37	252	991	0.74	36.1	0.360	0.159	0.167	0.91	910	34.2	13.5
38	259	1036	0.77	39.1	0.470	0.206	0.220	0.91	953	37.0	14.1
39	266										
40	273	1117	0.83	38.9	0.378	0.369 ?	0.400 ?	2.03 ?	1092	49.3	16.2
41	280	1153	0.86	39.5	0.375	0.162	0.177	0.90	1126	49.8	16.7
42	287	1203	0.89	42.4	0.516	0.221	0.245	0.90	1173	52.5	17.4
43	294	1257	0.93	44.2	0.563	0.240	0.268	0.90	1223	54.2	18.1
44	301	1308	0.97	45.4	0.531	0.225	0.254	0.90	1271	51.2	18.8
45	310	1360	1.01	45.9	0.541	0.229	0.259	0.90	1320	43.1	19.6
46	317	1409	1.05	48.4	0.514	0.216	0.247	0.90	1366	45.5	20.2
47	322	1457	1.08	50.9	0.501	0.196	0.226	0.84	1409	47.2	20.9
48	329	1527	1.13	54.0	0.726	0.186	0.216	0.55	1449	45.0	21.5
49	336	1585	1.18	55.3	0.600	0.208	0.244	0.75	1494	44.5	22.1
50	344	1639	1.22	57.5	0.569	0.200	0.236	0.77	1538	44.7	22.8
51	350	1688	1.25	59.2	0.510	0.177	0.209	0.76	1576	44.5	23.3
52	357	1770	1.31	62.6	0.856	0.215	0.256	0.55	1623	42.9	24.0
53	364	1838	1.36	62.3	0.709	0.180	0.216	0.56	1663	42.8	24.6
54	371	1898	1.41	62.6	0.619	0.186	0.224	0.66	1704	42.0	25.2
55	378	1971	1.46	68.3	0.759	0.212	0.261	0.62	1751	44.0	25.9
56	385										
57	392	2065	1.53	59.0	0.447	0.260	0.330	1.32	1856	46.5	27.5
58	399	2141	1.59	60.5	0.786	0.203	0.263	0.59	1902	47.9	28.2

* Rates of sulfate production and NP depletion are 5-week moving averages

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Tables 51-57.
Lower Mole Lake Waste Rock High Sulfur Composite (WD-09) Data and Calculations.

Appendix 3.5-34 Table 51

Sample Characterization
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	63500
Antimony	Sb	60
Arsenic	As	190
Barium	Ba	260
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	19
Calcium	Ca	6600
Carbon	C	3800
Chromium	Cr	9
Cobalt	Co	25
Copper	Cu	490
Gallium	Ga	12
Iron	Fe	78300
Lead	Pb	480
Lithium	Li	NA
Magnesium	Mg	19800
Manganese	Mn	640
Mercury	Hg	2.3
Molybdenum	Mo	<20
Nickel	Ni	<8
Phosphorus	P	NA
Potassium	K	21200
Selenium	Se	<3
Silicon	Si	280000
Silver	Ag	0.28
Sodium	Na	3500
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	60
Titanium	Ti	540
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	4200
Sulfur	S	44400

ABA Results	
Paste pH	5.8
S (Total) (%)	4.15
SO4 (%)	NA
S (Sulfide) (%)	3.53
AP (kg CaCO3/tonne)	110.3
NP (kg CaCO3/tonne)	21.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-89.3
NP/AP	0.19

Note: NA = not analyzed

Sample Mass (kg)	74.32

Compiled by: RWL
Checked by: JET

Appendix 3.5-34 Table 52

Parameters Measured Weekly
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
24-Oct-94	1	0	5.100	3.9	2870		830	**2100**	144
1-Nov-94	2	8	7.180	3.7	4910		1100	**1570**	296
9-Nov-94	3	16	3.440	4.0	3070		430	1980	387
16-Nov-94	4	23	6.120	3.8	3110		280	**2390**	584
21-Nov-94	5	28	3.820	3.9	2520		80	**1920**	683
28-Nov-94	6	35	4.860	4.1	2220		93	1753	798
5-Dec-94	7	42	3.580	4.0	2360		82	1587	874
12-Dec-94	8	49	6.660	4.2	2060		60	**1420**	1001
20-Dec-94	9	57	4.600	4.2	1600		38	**923**	1058
27-Dec-94	10	64	3.000	4.2	1750		68	970	1098
3-Jan-95	11	71	4.560	4.0	2050		50	1017	1160
9-Jan-95	12	77	4.580	4.0	1910		54	1064	1226
17-Jan-95	13	85	3.740	3.9	1950		70	1112	1281
23-Jan-95	14	91	3.820	3.9	2070		78	1159	1341
30-Jan-95	15	98	4.140	3.9	2160		82	1206	1408
6-Feb-95	16	105	0.500	3.9	2240		78	1253	1417
13-Feb-95	17	112	8.590	3.9	2290		110	**1300**	1567
20-Feb-95	18	119	5.760	3.9	2240		92	1276	1666
27-Feb-95	19	126	4.890	3.9	1980		95	1251	1748
6-Mar-95	20	133	5.100	3.9	2000		86	1227	1832
13-Mar-95	21	140	5.040	3.7	1770		88	1203	1914
20-Mar-95	22	147	5.140	3.7	1850		92	1178	1995
27-Mar-95	23	154	4.380	3.8	1940		110	1154	2063
4-Apr-95	24	162	4.160	3.8	1820		110	1129	2127
10-Apr-95	25	168	4.150	3.7	2030		110	1105	2188
17-Apr-95	26	175	3.320	3.7	1830		120	1081	2236
24-Apr-95	27	182	5.050	3.7	1970		160	1056	2308
1-May-95	28	189	4.860	3.7	1960		140	1032	2376
8-May-95	29	196	5.460	3.6	1970		170	1008	2450
15-May-95	30	203	5.320	3.7	1740		130	983	2520
22-May-95	31	210	5.020	3.7	1630		150	959	2585
30-May-95	32	218	6.240	3.7	1590		140	934	2663
5-Jun-95	33	224	4.530	3.9	1610		130	**910**	2719
12-Jun-95	34	231	4.690	3.7	1590		140	948	2779
19-Jun-95	35	238	4.630	3.7	1500		120	985	2840
26-Jun-95	36	245	4.340	3.7	1520		140	1023	2900
3-Jul-95	37	252	4.360	3.6	1740			1061	2962
10-Jul-95	38	259	4.460	3.6	1630			1098	3028
17-Jul-95	39	266	0.000						
24-Jul-95	40	273	5.620	3.5	1810			1174	3117

Appendix 3.5-34 Table 52 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
31-Jul-95	41	280	3.600	3.4	1930			1212	3175
7-Aug-95	42	287	4.180	3.3	1930			1249	3246
14-Aug-95	43	294	3.590	3.4	1960			1287	3308
21-Aug-95	44	301	3.780	3.3	2030			1325	3375
30-Aug-95	45	310	4.800	3.2	2180			1362	3463
6-Sep-95	46	317	3.900	3.2	2240		280	**1400**	3537
11-Sep-95	47	322	4.040	3.0	2410		300	**1300**	3607
18-Sep-95	48	329	4.350	2.6	2370		300	**2100**	3730
25-Sep-95	49	336	4.500	2.9	2410		350	**2300**	3869
3-Oct-95	50	344	4.490	2.9	2290		340	**1200**	3942
9-Oct-95	51	350	4.870	2.9	2390		370	**1300**	4027
16-Oct-95	52	357	4.640	3.0	2330		350	1267	4106
23-Oct-95	53	364	4.920	2.9	2450		910	1233	4188
30-Oct-95	54	371	4.880	2.9	2410		380	**1200**	4267
6-Nov-95	55	378	4.790	2.8	2430		410	1267	4348
13-Nov-95	56	385	0.000						
20-Nov-95	57	392	7.500	3.0	2600		410	**1400**	4490
27-Nov-95	58	399	4.840	2.9	2750		380	**1300**	4574
4-Dec-95	59	406	4.820	2.9	2530		380		
11-Dec-95	60	413	4.760	2.9	2740		440		
18-Dec-95	61	420	4.880	2.9	2730		410		
26-Dec-95	62	428	5.140	2.9	2410		350		
2-Jan-96	63	435	4.800	2.9	2470		350		
9-Jan-96	64	442	5.040	3.0	2430		360		
15-Jan-96	65	448	4.120	2.9	2390				

* Measured values of sulfate shown in bold

Appendix 3.5-34 Table 53

Leachate Analysis
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As		Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn		Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
1	0	**26**	**0.033**		**0.020**	**0.047**	**180**	**3.3**	**120**	**190**	**210**	**22**		**0.0008**	**0.51**	**0.17**	**11**	**54**
2	8	**34**	**0.029**		**0.008**	**0.070**	**320**	**6.1**	**200**	**180**	**500**	**55**		**0.0009**	**0.93**	**0.36**	**17**	**94**
3	16	21.1	0.033		0.007	0.051	320	4.35	124.0	109.0	395	42.50		0.0007	0.655	0.315	12.55	65.5
4	23	**8.2**	**0.037**	<	**0.005**	**0.032**	**320**	**2.6**	**48**	**38**	**290**	**30**		**0.00053**	**0.38**	**0.27**	**8.1**	**37**
5	28	**4.1**	**0.025**		**0.008**	**0.027**	**260**	**1.5**	**24**	**16**	**190**	**19**		**0.0004**	**0.23**	**0.21**	**4.4**	**22**
6	35	3.5	0.028		0.012	0.032	295	1.35	17.55	12.4	175	18.95		0.0009	0.180	0.245	5.55	21.0
7	42	2.8	0.031		0.012	0.029	278	1.11	12.93	9.1	148	16.48		0.0010	0.140	0.228	4.88	18.5
8	49	**2.0**	**0.034**		**0.012**	**0.027**	**260**	**0.88**	**8.3**	**5.8**	**120**	**14**		**0.0011**	**0.10**	**0.21**	**4.2**	**16**
9	57	**1.1**	**0.009**		**0.008**	**0.018**	**190**	**0.57**	**5.5**	**2.9**	**80**	**9.1**		**0.0008**	**0.07**	**0.14**	**1.7**	**12**
10	64	1.2	0.009		0.008	0.023	203	0.59	6.19	2.9	85	9.84		0.0007	0.073	0.150	1.70	14.4
11	71	1.2	0.009		0.008	0.028	215	0.61	6.88	2.9	90	10.58		0.0007	0.077	0.160	1.70	16.8
12	77	1.3	0.008		0.008	0.032	228	0.62	7.56	2.9	95	11.31		0.0006	0.080	0.170	1.70	19.1
13	85	1.4	0.008		0.008	0.037	240	0.64	8.25	2.9	100	12.05		0.0005	0.084	0.180	1.70	21.5
14	91	1.4	0.008		0.007	0.042	253	0.66	8.94	2.8	105	12.79		0.0004	0.087	0.190	1.70	23.9
15	98	1.5	0.008		0.007	0.047	265	0.68	9.63	2.8	110	13.53		0.0004	0.090	0.200	1.70	26.3
16	105	1.5	0.007		0.007	0.051	278	0.69	10.31	2.8	115	14.26		0.0003	0.094	0.210	1.70	28.6
17	112	**1.6**	**0.007**		**0.007**	**0.056**	**290**	**0.71**	**11**	**2.8**	**120**	**15**	<	**0.0002**	**0.097**	**0.22**	**1.7**	**31**
18	119	1.6	0.008		0.007	0.058	285	0.69	11.00	3.0	118	14.75		0.0002	0.094	0.214	1.65	31.8
19	126	1.6	0.008		0.007	0.060	280	0.67	11.00	3.1	116	14.50		0.0002	0.091	0.209	1.59	32.5
20	133	1.6	0.009		0.007	0.061	275	0.65	11.00	3.3	113	14.25		0.0002	0.088	0.203	1.54	33.3
21	140	1.7	0.009		0.007	0.063	270	0.63	11.00	3.5	111	14.00		0.0002	0.085	0.198	1.49	34.0
22	147	1.7	0.010		0.007	0.065	265	0.61	11.00	3.6	109	13.75		0.0002	0.082	0.192	1.43	34.8
23	154	1.7	0.010		0.007	0.067	260	0.59	11.00	3.8	107	13.50		0.0002	0.079	0.186	1.38	35.5
24	162	1.7	0.011		0.007	0.069	255	0.57	11.00	3.9	104	13.25		0.0002	0.076	0.181	1.32	36.3
25	168	1.7	0.012		0.008	0.071	250	0.55	11.00	4.1	102	13.00		0.0002	0.074	0.175	1.27	37.0
26	175	1.7	0.012		0.008	0.072	245	0.53	11.00	4.3	100	12.75		0.0002	0.071	0.169	1.22	37.8

Appendix 3.5-34 Table 53 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
27	182	1.7	0.013	0.008	0.074	240	0.51	11.00	4.4	98	12.50	0.0002	0.068	0.164	1.16	38.5
28	189	1.7	0.013	0.008	0.076	235	0.49	11.00	4.6	95	12.25	0.0002	0.065	0.158	1.11	39.3
29	196	1.8	0.014	0.008	0.078	230	0.47	11.00	4.8	93	12.00	0.0002	0.062	0.153	1.06	40.0
30	203	1.8	0.014	0.008	0.080	225	0.45	11.00	4.9	91	11.75	0.0002	0.059	0.147	1.00	40.8
31	210	1.8	0.015	0.008	0.081	220	0.43	11.00	5.1	89	11.50	0.0002	0.056	0.141	0.95	41.5
32	218	1.8	0.015	0.008	0.083	215	0.41	11.00	5.2	86	11.25	0.0002	0.053	0.136	0.89	42.3
33	224	**1.8**	**0.016**	**0.008**	**0.085**	**210**	**0.39**	**11**	**5.4**	**84**	**11**	**< 0.0002**	**0.050**	**0.13**	**0.84**	**43**
34	231	2.1	0.016	0.008	0.090	210	0.39	11.38	5.5	85	11.05	0.0002	0.051	0.128	0.84	45.3
35	238	2.4	0.016	0.008	0.096	210	0.39	11.76	5.6	86	11.10	0.0002	0.051	0.125	0.84	47.7
36	245	2.7	0.016	0.008	0.101	210	0.39	12.14	5.7	88	11.14	0.0002	0.052	0.123	0.84	50.0
37	252	3.0	0.016	0.007	0.107	210	0.38	12.52	5.8	89	11.19	0.0002	0.052	0.121	0.84	52.3
38	259	3.3	0.016	0.007	0.112	210	0.38	12.90	5.9	90	11.24	0.0002	0.053	0.119	0.84	54.7
39	266															
40	273	4.0	0.016	0.007	0.123	210	0.38	13.67	6.1	93	11.33	0.0002	0.054	0.114	0.84	59.3
41	280	4.3	0.016	0.007	0.129	210	0.38	14.05	6.2	94	11.38	0.0002	0.054	0.112	0.84	61.7
42	287	4.6	0.016	0.007	0.134	210	0.38	14.43	6.3	95	11.43	0.0002	0.055	0.109	0.84	64.0
43	294	4.9	0.016	0.007	0.140	210	0.38	14.81	6.4	96	11.48	0.0002	0.055	0.107	0.84	66.3
44	301	5.2	0.016	0.006	0.145	210	0.37	15.19	6.4	98	11.52	0.0002	0.056	0.105	0.83	68.7
45	310	5.5	0.016	0.006	0.151	210	0.37	15.57	6.5	99	11.57	0.0002	0.056	0.103	0.83	71.0
46	317	5.8	0.016	0.006	0.156	210	0.37	15.95	6.6	100	11.62	0.0002	0.057	0.100	0.83	73.3
47	322	6.1	0.016	0.006	0.162	210	0.37	16.33	6.7	101	11.67	0.0002	0.057	0.098	0.83	75.7
48	329	6.4	0.016	0.006	0.167	210	0.37	16.71	6.8	103	11.71	0.0002	0.058	0.096	0.83	78.0
49	336	6.8	0.016	0.006	0.173	210	0.37	17.10	6.9	104	11.76	0.0002	0.058	0.093	0.83	80.3
50	344	7.1	0.016	0.006	0.178	210	0.37	17.48	7.0	105	11.81	0.0002	0.059	0.091	0.83	82.7
51	350	7.4	0.016	0.005	0.184	210	0.36	17.86	7.1	106	11.86	0.0002	0.059	0.089	0.83	85.0
52	357	7.7	0.016	0.005	0.189	210	0.36	18.24	7.2	108	11.90	0.0002	0.060	0.087	0.83	87.3
53	364	8.0	0.016	0.005	0.195	210	0.36	18.62	7.3	109	11.95	0.0002	0.060	0.084	0.83	89.7
54	371	**8.3**	**0.016**	**< 0.005**	**0.20**	**210**	**0.36**	**19**	**7.4**	**110**	**12**	0.0002	**0.061**	**0.082**	**0.83**	**92**
55	378					208				108		0.0002				
56	385															
57	392					203				103		0.0002				
58	399					**200**				**100**		**< 0.0002**				

* Measured values shown in bold

Appendix 3.5-34 Table 54

Cumulative Mass Flux
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
1	0	1.8	0.002	0.001	0.003	12	0.2	8.2	13.0	14.4	1.5	0.0001	0.035	0.01	0.8	3.7
2	8	5.07	0.005	0.002	0.010	43.3	0.82	27.56	30.43	62.7	6.82	0.0001	0.12	0.046	2.4	12.8
3	16	6.05	0.007	0.002	0.012	58.1	1.02	33.30	35.47	81.0	8.79	0.0002	0.16	0.061	3.0	15.8
4	23	6.72	0.010	0.003	0.015	84.4	1.23	37.25	38.60	104.9	11.26	0.0002	0.19	0.083	3.6	18.9
5	28	6.93	0.011	0.003	0.016	97.8	1.31	38.48	39.42	114.6	12.24	0.0002	0.20	0.094	3.9	20.0
6	35	7.16	0.013	0.004	0.018	117.1	1.40	39.63	40.23	126.1	13.48	0.0003	0.21	0.110	4.2	21.4
7	42	7.29	0.014	0.005	0.020	130.5	1.45	40.25	40.67	133.2	14.27	0.0003	0.22	0.121	4.5	22.3
8	49	7.47	0.017	0.006	0.022	153.8	1.53	41.00	41.19	143.9	15.52	0.0004	0.23	0.140	4.8	23.7
9	57	7.54	0.018	0.006	0.023	165.5	1.56	41.34	41.37	148.9	16.09	0.0005	0.23	0.149	5.0	24.4
10	64	7.59	0.018	0.007	0.024	173.7	1.59	41.59	41.49	152.3	16.49	0.0005	0.23	0.155	5.0	25.0
11	71	7.66	0.019	0.007	0.026	186.9	1.62	42.01	41.66	157.9	17.13	0.0006	0.24	0.164	5.1	26.0
12	77	7.74	0.019	0.007	0.028	200.9	1.66	42.47	41.84	163.7	17.83	0.0006	0.24	0.175	5.2	27.2
13	85	7.81	0.020	0.008	0.030	213.0	1.70	42.89	41.98	168.7	18.44	0.0006	0.25	0.184	5.3	28.3
14	91	7.88	0.020	0.008	0.032	226.0	1.73	43.35	42.13	174.1	19.09	0.0006	0.25	0.194	5.4	29.5
15	98	7.96	0.020	0.009	0.035	240.7	1.77	43.89	42.28	180.3	19.85	0.0007	0.26	0.205	5.5	31.0
16	105	7.97	0.021	0.009	0.035	242.6	1.77	43.95	42.30	181.0	19.94	0.0007	0.26	0.206	5.5	31.2
17	112	8.16	0.021	0.009	0.041	276.1	1.85	45.23	42.63	194.9	21.68	0.0007	0.27	0.232	5.7	34.8
18	119	8.28	0.022	0.010	0.046	298.2	1.91	46.08	42.86	204.0	22.82	0.0007	0.28	0.248	5.8	37.2
19	126	8.39	0.022	0.010	0.050	316.6	1.95	46.80	43.06	211.6	23.78	0.0007	0.28	0.262	5.9	39.4
20	133	8.50	0.023	0.011	0.054	335.5	2.00	47.56	43.29	219.4	24.75	0.0007	0.29	0.276	6.0	41.7
21	140	8.62	0.024	0.011	0.058	353.8	2.04	48.30	43.52	226.9	25.70	0.0007	0.29	0.289	6.1	44.0
22	147	8.73	0.024	0.012	0.063	372.1	2.08	49.06	43.77	234.5	26.65	0.0008	0.30	0.303	6.2	46.4
23	154	8.83	0.025	0.012	0.067	387.4	2.12	49.71	43.99	240.7	27.45	0.0008	0.30	0.314	6.3	48.5
24	162	8.92	0.026	0.013	0.071	401.7	2.15	50.33	44.21	246.6	28.19	0.0008	0.31	0.324	6.4	50.5
25	168	9.02	0.026	0.013	0.075	415.7	2.18	50.94	44.44	252.3	28.92	0.0008	0.31	0.333	6.5	52.5

Appendix 3.5-34 Table 54 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
26	175	9.10	0.027	0.014	0.078	426.6	2.20	51.43	44.63	256.7	29.49	0.0008	0.32	0.341	6.5	54.2
27	182	9.21	0.028	0.014	0.083	442.9	2.24	52.18	44.93	263.3	30.34	0.0008	0.32	0.352	6.6	56.9
28	189	9.33	0.028	0.015	0.088	458.3	2.27	52.90	45.23	269.6	31.14	0.0008	0.32	0.363	6.7	59.4
29	196	9.45	0.029	0.015	0.093	475.2	2.30	53.71	45.58	276.4	32.02	0.0008	0.33	0.374	6.8	62.4
30	203	9.58	0.030	0.016	0.099	491.3	2.34	54.50	45.94	282.9	32.86	0.0009	0.33	0.384	6.8	65.3
31	210	9.70	0.032	0.016	0.105	506.2	2.36	55.24	46.28	288.9	33.64	0.0009	0.34	0.394	6.9	68.1
32	218	9.85	0.033	0.017	0.112	524.2	2.40	56.16	46.72	296.1	34.58	0.0009	0.34	0.405	7.0	71.6
33	224	9.96	0.034	0.017	0.117	537.0	2.42	56.83	47.05	301.2	35.25	0.0009	0.34	0.413	7.0	74.2
34	231	10.09	0.035	0.018	0.123	550.3	2.45	57.55	47.39	306.6	35.95	0.0009	0.35	0.421	7.1	77.1
35	238	10.24	0.036	0.018	0.129	563.3	2.47	58.28	47.74	312.0	36.64	0.0009	0.35	0.429	7.1	80.1
36	245	10.40	0.037	0.019	0.134	575.6	2.49	58.99	48.07	317.1	37.29	0.0009	0.35	0.436	7.2	83.0
37	252	10.58	0.038	0.019	0.141	587.9	2.52	59.73	48.41	322.3	37.95	0.0009	0.36	0.443	7.2	86.1
38	259	10.78	0.039	0.020	0.147	600.5	2.54	60.50	48.77	327.8	38.62	0.0010	0.36	0.450	7.3	89.3
39	266	10.78	0.039	0.020	0.147	600.5	2.54	60.50	48.77	327.8	38.62	0.0010	0.36	0.450	7.3	89.3
40	273	11.08	0.040	0.020	0.157	616.4	2.57	61.54	49.22	334.8	39.48	0.0010	0.36	0.459	7.3	93.8
41	280	11.29	0.041	0.021	0.163	626.6	2.59	62.22	49.52	339.3	40.03	0.0010	0.37	0.464	7.4	96.8
42	287	11.55	0.041	0.021	0.171	638.4	2.61	63.03	49.88	344.7	40.67	0.0010	0.37	0.471	7.4	100.4
43	294	11.78	0.042	0.021	0.177	648.5	2.63	63.74	50.18	349.3	41.23	0.0010	0.37	0.476	7.5	103.6
44	301	12.05	0.043	0.022	0.185	659.2	2.64	64.52	50.51	354.3	41.81	0.0010	0.37	0.481	7.5	107.1
45	310	12.41	0.044	0.022	0.194	672.8	2.67	65.52	50.93	360.7	42.56	0.0010	0.38	0.488	7.6	111.7
46	317	12.71	0.045	0.022	0.203	683.8	2.69	66.36	51.28	365.9	43.17	0.0010	0.38	0.493	7.6	115.5
47	322	13.04	0.046	0.023	0.211	695.2	2.71	67.25	51.65	371.4	43.80	0.0011	0.38	0.498	7.6	119.7
48	329	13.42	0.047	0.023	0.221	707.5	2.73	68.22	52.05	377.4	44.49	0.0011	0.39	0.504	7.7	124.2
49	336	13.83	0.048	0.023	0.232	720.2	2.75	69.26	52.47	383.7	45.20	0.0011	0.39	0.510	7.7	129.1
50	344	14.26	0.049	0.024	0.242	732.9	2.77	70.32	52.89	390.1	45.91	0.0011	0.40	0.515	7.8	134.1
51	350	14.74	0.050	0.024	0.254	746.7	2.80	71.49	53.36	397.0	46.69	0.0011	0.40	0.521	7.8	139.7
52	357	15.22	0.051	0.024	0.266	759.8	2.82	72.62	53.81	403.7	47.44	0.0011	0.40	0.526	7.9	145.1
53	364	15.75	0.052	0.025	0.279	773.7	2.84	73.86	54.29	410.9	48.23	0.0011	0.41	0.532	8.0	151.0
54	371	16.29	0.053	0.025	0.292	787.5	2.87	75.10	54.78	418.2	49.01	0.0011	0.41	0.537	8.0	157.1
55	378					800.8				425.1		0.0012				
56	385					800.8				425.1		0.0012				
57	392					821.3				435.4		0.0012				
58	399					834.3				442.0		0.0012				

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 55

Cumulative Metal Extractions
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
1	0	0.003	0.00000	0.001	0.02	0.2	0.9	1.7	0.017	0.07	0.24	0.002	0.44	0.4	0.02	0.09
2	8	0.008	0.00001	0.001	0.05	0.7	3.3	5.6	0.039	0.32	1.07	0.006	1.56	1.5	0.07	0.30
3	16	0.010	0.00001	0.001	0.06	0.9	4.07	6.80	0.045	0.41	1.37	0.008	1.94	2.0	0.09	0.38
4	23	0.011	0.00002	0.001	0.08	1.3	4.9	7.6	0.049	0.53	1.76	0.010	2.33	2.8	0.10	0.45
5	28	0.011	0.00002	0.001	0.09	1.5	5.2	7.9	0.050	0.58	1.91	0.010	2.48	3.1	0.11	0.48
6	35	0.011	0.00002	0.002	0.10	1.8	5.59	8.09	0.051	0.64	2.11	0.013	2.63	3.7	0.12	0.51
7	42	0.011	0.00002	0.002	0.10	2.0	5.80	8.21	0.052	0.67	2.23	0.015	2.71	4.0	0.13	0.53
8	49	0.012	0.00003	0.002	0.12	2.3	6.1	8.4	0.053	0.73	2.43	0.019	2.82	4.7	0.14	0.56
9	57	0.012	0.00003	0.002	0.12	2.5	6.3	8.4	0.053	0.75	2.51	0.021	2.88	5.0	0.14	0.58
10	64	0.012	0.00003	0.003	0.13	2.6	6.35	8.49	0.053	0.77	2.58	0.023	2.91	5.2	0.14	0.60
11	71	0.012	0.00003	0.003	0.14	2.8	6.50	8.57	0.053	0.80	2.68	0.024	2.97	5.5	0.15	0.62
12	77	0.012	0.00003	0.003	0.15	3.0	6.65	8.67	0.053	0.83	2.79	0.026	3.03	5.8	0.15	0.65
13	85	0.012	0.00003	0.003	0.16	3.2	6.78	8.75	0.054	0.85	2.88	0.027	3.09	6.1	0.15	0.67
14	91	0.012	0.00003	0.003	0.17	3.4	6.92	8.85	0.054	0.88	2.98	0.028	3.14	6.5	0.15	0.70
15	98	0.013	0.00003	0.003	0.18	3.6	7.07	8.96	0.054	0.91	3.10	0.029	3.20	6.8	0.16	0.74
16	105	0.013	0.00003	0.003	0.18	3.7	7.09	8.97	0.054	0.91	3.12	0.029	3.21	6.9	0.16	0.74
17	112	0.013	0.00003	0.004	0.22	4.2	7.4	9.23	0.054	0.98	3.39	0.030	3.35	7.7	0.16	0.83
18	119	0.013	0.00003	0.004	0.24	4.5	7.63	9.40	0.055	1.03	3.57	0.031	3.44	8.3	0.17	0.89
19	126	0.013	0.00004	0.004	0.26	4.8	7.80	9.55	0.055	1.07	3.71	0.031	3.52	8.7	0.17	0.94
20	133	0.013	0.00004	0.004	0.28	5.1	7.98	9.71	0.055	1.11	3.87	0.032	3.59	9.2	0.17	0.99
21	140	0.014	0.00004	0.004	0.31	5.4	8.15	9.86	0.056	1.15	4.02	0.032	3.67	9.6	0.18	1.05
22	147	0.014	0.00004	0.005	0.33	5.6	8.32	10.01	0.056	1.18	4.16	0.033	3.74	10.1	0.18	1.10
23	154	0.014	0.00004	0.005	0.35	5.9	8.46	10.15	0.056	1.22	4.29	0.034	3.80	10.5	0.18	1.15
24	162	0.014	0.00004	0.005	0.37	6.1	8.59	10.27	0.056	1.25	4.40	0.034	3.85	10.8	0.18	1.20
25	168	0.014	0.00004	0.005	0.39	6.3	8.71	10.40	0.057	1.27	4.52	0.035	3.90	11.1	0.18	1.25

Appendix 3.5-34 Table 55 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
26	175	0.014	0.00004	0.005	0.41	6.5	8.81	10.50	0.057	1.30	4.61	0.035	3.94	11.4	0.19	1.29
27	182	0.015	0.00004	0.005	0.44	6.7	8.95	10.65	0.057	1.33	4.74	0.036	4.00	11.7	0.19	1.35
28	189	0.015	0.00004	0.006	0.46	6.9	9.07	10.80	0.058	1.36	4.87	0.036	4.05	12.1	0.19	1.41
29	196	0.015	0.00005	0.006	0.49	7.2	9.21	10.96	0.058	1.40	5.00	0.037	4.11	12.5	0.19	1.48
30	203	0.015	0.00005	0.006	0.52	7.4	9.34	11.12	0.059	1.43	5.13	0.037	4.16	12.8	0.19	1.55
31	210	0.015	0.00005	0.006	0.55	7.7	9.46	11.27	0.059	1.46	5.26	0.038	4.21	13.1	0.20	1.62
32	218	0.016	0.00005	0.007	0.59	7.9	9.59	11.46	0.060	1.50	5.40	0.039	4.26	13.5	0.20	1.71
33	224	0.016	0.00005	0.007	0.61	8.1	9.69	11.60	0.060	1.52	5.51	0.039	4.30	13.8	0.20	1.77
34	231	0.016	0.00005	0.007	0.64	8.3	9.79	11.75	0.061	1.55	5.62	0.040	4.34	14.0	0.20	1.84
35	238	0.016	0.00006	0.007	0.68	8.5	9.88	11.89	0.061	1.58	5.72	0.040	4.38	14.3	0.20	1.91
36	245	0.016	0.00006	0.007	0.71	8.7	9.97	12.04	0.061	1.60	5.83	0.041	4.42	14.5	0.20	1.98
37	252	0.017	0.00006	0.007	0.74	8.9	10.06	12.19	0.062	1.63	5.93	0.041	4.46	14.8	0.21	2.05
38	259	0.017	0.00006	0.008	0.78	9.1	10.16	12.35	0.062	1.66	6.03	0.042	4.50	15.0	0.21	2.13
39	266	0.017	0.00006	0.008	0.78	9.1	10.16	12.35	0.062	1.66	6.03	0.042	4.50	15.0	0.21	2.13
40	273	0.017	0.00006	0.008	0.83	9.3	10.27	12.56	0.063	1.69	6.17	0.042	4.55	15.3	0.21	2.23
41	280	0.018	0.00006	0.008	0.86	9.5	10.34	12.70	0.063	1.71	6.25	0.043	4.58	15.5	0.21	2.31
42	287	0.018	0.00007	0.008	0.90	9.7	10.43	12.86	0.064	1.74	6.35	0.043	4.62	15.7	0.21	2.39
43	294	0.019	0.00007	0.008	0.93	9.8	10.50	13.01	0.064	1.76	6.44	0.044	4.65	15.9	0.21	2.47
44	301	0.019	0.00007	0.008	0.97	10.0	10.58	13.17	0.065	1.79	6.53	0.044	4.69	16.0	0.21	2.55
45	310	0.020	0.00007	0.008	1.02	10.2	10.67	13.37	0.065	1.82	6.65	0.045	4.73	16.3	0.22	2.66
46	317	0.020	0.00007	0.009	1.07	10.4	10.75	13.54	0.065	1.85	6.75	0.045	4.77	16.4	0.22	2.75
47	322	0.021	0.00007	0.009	1.11	10.5	10.83	13.72	0.066	1.88	6.84	0.046	4.81	16.6	0.22	2.85
48	329	0.021	0.00007	0.009	1.16	10.7	10.92	13.92	0.066	1.91	6.95	0.046	4.85	16.8	0.22	2.96
49	336	0.022	0.00008	0.009	1.22	10.9	11.01	14.13	0.067	1.94	7.06	0.047	4.90	17.0	0.22	3.07
50	344	0.022	0.00008	0.009	1.28	11.1	11.10	14.35	0.068	1.97	7.17	0.047	4.94	17.2	0.22	3.19
51	350	0.023	0.00008	0.009	1.34	11.3	11.19	14.59	0.068	2.01	7.30	0.048	4.99	17.4	0.22	3.33
52	357	0.024	0.00008	0.009	1.40	11.5	11.28	14.82	0.069	2.04	7.41	0.048	5.03	17.5	0.23	3.45
53	364	0.025	0.00008	0.010	1.47	11.7	11.38	15.07	0.069	2.08	7.54	0.049	5.09	17.7	0.23	3.60
54	371	0.026	0.00008	0.010	1.54	11.9	11.47	15.33	0.070	2.11	7.66	0.050	5.14	17.9	0.23	3.74
55	378					12.1				2.15		0.050				
56	385					12.1				2.15		0.050				
57	392					12.4				2.20		0.051				
58	399					12.6				2.23		0.052				

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 56

Metal Extraction Rates
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
1	0															
2	8	2.87	0.0025	0.0007	0.006	27.1	0.516	16.91	15.22	42.3	4.649	0.00008	0.079	0.030	1.44	7.95
3	16	1.86	0.0019	0.0005	0.004	20.0	0.346	10.96	9.82	29.1	3.185	0.00005	0.053	0.022	0.97	5.30
4	23	1.50	0.0022	0.0005	0.004	21.9	0.306	8.83	7.78	27.5	2.968	0.00005	0.046	0.022	0.88	4.61
5	28	1.29	0.0022	0.0005	0.003	21.4	0.270	7.56	6.60	25.1	2.682	0.00005	0.041	0.021	0.78	4.07
6	35	1.08	0.0021	0.0005	0.003	20.9	0.234	6.28	5.44	22.3	2.393	0.00005	0.035	0.020	0.70	3.53
7	42	0.46	0.0019	0.0005	0.002	17.9	0.131	2.61	2.11	14.5	1.533	0.00004	0.019	0.015	0.43	1.95
8	49	0.30	0.0023	0.0007	0.002	20.3	0.109	1.63	1.21	13.4	1.429	0.00006	0.015	0.017	0.40	1.67
9	57	0.17	0.0017	0.0007	0.002	16.7	0.069	0.84	0.57	9.1	0.994	0.00006	0.009	0.013	0.27	1.15
10	64	0.13	0.0014	0.0006	0.002	14.8	0.054	0.60	0.40	7.3	0.826	0.00006	0.007	0.012	0.22	0.98
11	71	0.10	0.0012	0.0006	0.001	13.6	0.044	0.46	0.28	6.2	0.711	0.00005	0.005	0.011	0.17	0.91
12	77	0.09	0.0010	0.0006	0.002	14.1	0.043	0.44	0.23	6.1	0.712	0.00005	0.005	0.011	0.15	0.99
13	85	0.07	0.0005	0.0004	0.001	11.5	0.032	0.37	0.15	4.8	0.566	0.00003	0.004	0.009	0.09	0.90
14	91	0.07	0.0004	0.0004	0.002	12.4	0.034	0.41	0.16	5.2	0.619	0.00003	0.004	0.009	0.09	1.05
15	98	0.08	0.0005	0.0004	0.002	13.8	0.037	0.47	0.16	5.8	0.692	0.00003	0.005	0.010	0.10	1.23
16	105	0.06	0.0004	0.0003	0.002	11.5	0.030	0.40	0.13	4.8	0.579	0.00002	0.004	0.009	0.08	1.06
17	112	0.08	0.0004	0.0004	0.003	15.0	0.038	0.55	0.16	6.2	0.769	0.00002	0.005	0.011	0.10	1.51
18	119	0.10	0.0005	0.0005	0.003	17.5	0.044	0.66	0.18	7.3	0.902	0.00002	0.006	0.013	0.11	1.84
19	126	0.10	0.0005	0.0005	0.004	18.1	0.044	0.69	0.19	7.5	0.936	0.00001	0.006	0.014	0.11	1.97
20	133	0.11	0.0005	0.0005	0.004	19.0	0.046	0.73	0.20	7.8	0.981	0.00001	0.006	0.014	0.11	2.13
21	140	0.13	0.0006	0.0006	0.005	22.2	0.053	0.87	0.24	9.2	1.152	0.00002	0.007	0.017	0.13	2.55
22	147	0.11	0.0006	0.0005	0.004	19.2	0.045	0.77	0.23	7.9	0.995	0.00001	0.006	0.014	0.11	2.32
23	154	0.11	0.0006	0.0005	0.004	17.9	0.042	0.73	0.23	7.3	0.926	0.00001	0.006	0.013	0.10	2.24
24	162	0.10	0.0006	0.0005	0.004	16.5	0.038	0.69	0.22	6.8	0.859	0.00001	0.005	0.012	0.09	2.16
25	168	0.10	0.0006	0.0005	0.004	16.0	0.036	0.68	0.23	6.6	0.833	0.00001	0.005	0.012	0.09	2.18

Appendix 3.5-34 Table 56 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Sodium Na	Zinc Zn
26	175	0.10	0.0006	0.0004	0.004	14.6	0.033	0.63	0.22	6.0	0.757	0.00001	0.004	0.010	0.08	2.06
27	182	0.10	0.0007	0.0004	0.004	14.2	0.031	0.62	0.23	5.8	0.736	0.00001	0.004	0.010	0.07	2.10
28	189	0.10	0.0007	0.0004	0.004	14.2	0.031	0.64	0.25	5.8	0.738	0.00001	0.004	0.010	0.07	2.19
29	196	0.11	0.0008	0.0005	0.005	15.1	0.032	0.70	0.28	6.1	0.788	0.00001	0.004	0.010	0.07	2.44
30	203	0.11	0.0009	0.0005	0.005	15.1	0.031	0.71	0.30	6.1	0.789	0.00001	0.004	0.010	0.07	2.54
31	210	0.12	0.0010	0.0005	0.005	15.9	0.032	0.76	0.33	6.4	0.830	0.00001	0.004	0.011	0.07	2.77
32	218	0.12	0.0010	0.0006	0.006	15.8	0.032	0.77	0.35	6.4	0.825	0.00001	0.004	0.010	0.07	2.87
33	224	0.13	0.0011	0.0006	0.006	15.7	0.031	0.79	0.36	6.3	0.823	0.00001	0.004	0.010	0.07	2.97
34	231	0.13	0.0011	0.0005	0.006	15.0	0.029	0.77	0.36	6.0	0.786	0.00001	0.004	0.009	0.06	2.95
35	238	0.13	0.0011	0.0005	0.006	14.4	0.027	0.76	0.36	5.8	0.756	0.00001	0.004	0.009	0.06	2.96
36	245	0.14	0.0010	0.0005	0.006	13.9	0.026	0.75	0.36	5.7	0.731	0.00001	0.003	0.008	0.06	2.98
37	252	0.15	0.0010	0.0005	0.006	13.1	0.024	0.73	0.35	5.4	0.693	0.00001	0.003	0.008	0.05	2.97
38	259	0.16	0.0010	0.0005	0.006	12.7	0.023	0.73	0.34	5.3	0.674	0.00001	0.003	0.007	0.05	3.02
39	266	0.14	0.0008	0.0004	0.005	10.1	0.018	0.59	0.27	4.2	0.535	0.00001	0.002	0.006	0.04	2.45
40	273	0.17	0.0008	0.0004	0.006	10.6	0.019	0.65	0.30	4.6	0.568	0.00001	0.003	0.006	0.04	2.75
41	280	0.18	0.0008	0.0003	0.006	10.2	0.019	0.64	0.29	4.4	0.548	0.00001	0.003	0.006	0.04	2.76
42	287	0.19	0.0008	0.0003	0.006	10.1	0.018	0.66	0.29	4.5	0.545	0.00001	0.003	0.005	0.04	2.87
43	294	0.20	0.0007	0.0003	0.006	9.6	0.017	0.65	0.28	4.3	0.521	0.00001	0.002	0.005	0.04	2.86
44	301	0.25	0.0009	0.0004	0.007	11.7	0.021	0.80	0.35	5.3	0.638	0.00001	0.003	0.006	0.05	3.55
45	310	0.25	0.0008	0.0003	0.007	10.7	0.019	0.75	0.32	4.9	0.583	0.00001	0.003	0.005	0.04	3.38
46	317	0.27	0.0008	0.0003	0.007	10.8	0.019	0.78	0.33	5.0	0.594	0.00001	0.003	0.005	0.04	3.54
47	322	0.30	0.0009	0.0003	0.008	11.4	0.020	0.84	0.35	5.4	0.626	0.00001	0.003	0.006	0.05	3.85
48	329	0.33	0.0009	0.0003	0.009	11.8	0.021	0.90	0.37	5.6	0.653	0.00001	0.003	0.006	0.05	4.12
49	336	0.36	0.0009	0.0003	0.009	12.2	0.021	0.95	0.39	5.9	0.678	0.00001	0.003	0.006	0.05	4.40
50	344	0.38	0.0009	0.0003	0.010	12.4	0.022	0.99	0.40	6.1	0.691	0.00001	0.003	0.006	0.05	4.61
51	350	0.43	0.0010	0.0004	0.011	13.3	0.023	1.09	0.44	6.6	0.747	0.00001	0.004	0.006	0.05	5.11
52	357	0.44	0.0010	0.0003	0.011	12.9	0.022	1.08	0.43	6.5	0.726	0.00001	0.004	0.006	0.05	5.09
53	364	0.47	0.0010	0.0003	0.012	13.2	0.023	1.13	0.45	6.7	0.747	0.00001	0.004	0.006	0.05	5.36
54	371	0.49	0.0010	0.0003	0.012	13.4	0.023	1.17	0.46	6.9	0.763	0.00001	0.004	0.006	0.05	5.60
55	378					14.0				7.2		0.00001				
56	385					10.8				5.6		0.00001				
57	392					12.3				6.3		0.00001				
58	399					12.1				6.2		0.00001				

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-34 Table 57

Oxidation and Neutralization Rates
Lower Mole Lake High-Sulfur Waste Rock Composite (WD-12)

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	144	0.12		1.501	0.309	0.593	0.60	90		0.4
2	8	296	0.24	132.7	1.580	0.773	1.988	1.75	366	241.6	1.7
3	16	387	0.31	106.5	0.955	0.370	0.752	1.18	479	169.9	2.3
4	23	584	0.47	134.0	2.050	0.659	0.983	0.80	643	168.1	3.1
5	28	683	0.55	134.7	1.028	0.334	0.402	0.72	716	156.5	3.4
6	35	798	0.64	130.7	1.194	0.482	0.471	0.80	812	144.3	3.9
7	42	874	0.70	119.0	0.796	0.334	0.292	0.79	874	104.6	4.2
8	49	1001	0.80	130.2	1.326	0.582	0.443	0.77	977	105.7	4.7
9	57	1058	0.85	97.6	0.595	0.294	0.204	0.84	1027	79.0	4.9
10	64	1098	0.88	80.6	0.408	0.204	0.141	0.85	1061	67.0	5.1
11	71	1160	0.93	70.5	0.650	0.330	0.227	0.86	1117	59.3	5.3
12	77	1226	0.98	70.3	0.683	0.350	0.241	0.87	1176	60.3	5.6
13	85	1281	1.03	54.5	0.583	0.302	0.207	0.87	1227	48.6	5.8
14	91	1341	1.08	58.2	0.620	0.324	0.222	0.88	1281	52.5	6.1
15	98	1408	1.13	64.0	0.700	0.369	0.252	0.89	1344	58.2	6.4
16	105	1417	1.14	52.8	0.088	0.047	0.032	0.89	1351	48.3	6.4
17	112	1567	1.26	68.3	1.565	0.838	0.571	0.90	1492	63.3	7.1
18	119	1666	1.34	79.1	1.030	0.552	0.376	0.90	1585	73.8	7.5
19	126	1748	1.40	81.4	0.858	0.461	0.313	0.90	1662	76.2	7.9
20	133	1832	1.47	84.8	0.877	0.472	0.320	0.90	1742	79.6	8.3
21	140	1914	1.54	99.4	0.849	0.458	0.310	0.90	1818	93.4	8.7
22	147	1995	1.60	85.7	0.849	0.458	0.310	0.90	1895	80.6	9.0
23	154	2063	1.66	79.5	0.708	0.383	0.258	0.91	1959	74.8	9.3
24	162	2127	1.71	73.6	0.658	0.357	0.240	0.91	2019	69.3	9.6
25	168	2188	1.76	71.2	0.643	0.349	0.234	0.91	2077	67.1	9.9
26	175	2236	1.80	64.5	0.503	0.274	0.183	0.91	2123	60.9	10.1

Appendix 3.5-34 Table 57 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
27	182	2308	1.85	62.6	0.748	0.408	0.273	0.91	2191	59.2	10.4
28	189	2376	1.91	62.5	0.703	0.384	0.256	0.91	2255	59.2	10.7
29	196	2450	1.97	66.5	0.771	0.422	0.281	0.91	2325	63.1	11.1
30	203	2520	2.02	66.4	0.733	0.403	0.267	0.91	2392	63.0	11.4
31	210	2585	2.08	69.7	0.675	0.372	0.246	0.92	2454	66.2	11.7
32	218	2663	2.14	69.0	0.817	0.451	0.298	0.92	2529	65.7	12.0
33	224	2719	2.18	68.6	0.578	0.320	0.211	0.92	2582	65.4	12.3
34	231	2779	2.23	65.8	0.623	0.331	0.221	0.89	2637	62.4	12.6
35	238	2840	2.28	64.0	0.639	0.327	0.222	0.86	2692	60.0	12.8
36	245	2900	2.33	63.0	0.622	0.307	0.211	0.83	2744	58.0	13.1
37	252	2962	2.38	61.5	0.648	0.308	0.215	0.81	2796	55.0	13.3
38	259	3028	2.43	61.8	0.687	0.315	0.223	0.78	2850	53.6	13.6
39	266										
40	273	3117	2.50	55.3	0.345 ?	0.397	0.288	1.98 ?	2979	57.4	14.2
41	280	3175	2.55	55.1	0.611	0.254	0.187	0.72	3023	55.8	14.4
42	287	3246	2.61	56.7	0.732	0.295	0.220	0.70	3075	55.7	14.6
43	294	3308	2.66	56.0	0.648	0.254	0.192	0.69	3119	53.8	14.9
44	301	3375	2.71	58.3	0.702	0.267	0.204	0.67	3166	51.2	15.1
45	310	3463	2.78	65.5	0.917	0.339	0.263	0.66	3227	46.8	15.4
46	317	3537	2.84	68.3	0.765	0.275	0.216	0.64	3276	47.8	15.6
47	322	3607	2.90	72.3	0.736	0.285	0.227	0.70	3327	50.4	15.8
48	329	3730	3.00	84.5	1.280	0.307	0.247	0.43	3382	52.6	16.1
49	336	3869	3.11	98.9	1.451	0.318	0.259	0.40	3440	54.7	16.4
50	344	3942	3.17	98.6	0.755	0.317	0.261	0.77	3498	55.9	16.7
51	350	4027	3.23	104.1	0.887	0.344	0.287	0.71	3561	60.5	17.0
52	357	4106	3.30	99.8	0.824	0.328	0.276	0.73	3621	58.9	17.2
53	364	4188	3.36	91.5	0.850	0.348	0.296	0.76	3686	60.7	17.6
54	371	4267	3.43	79.4	0.821	0.345	0.297	0.78	3750	62.0	17.9
55	378	4348	3.49	83.7	0.850	0.334	0.285	0.73	3812	64.6	18.2
56	385										
57	392	4490	3.61	76.7	-2.999	0.511	0.426	-0.31	4330	141.6	20.6
58	399	4574	3.67	77.3	0.882	0.326	0.268	0.67	4389	140.6	20.9

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 3.5-35

Tailings Kinetic Test Data and Calculations

- Appendix 3.5-35 Table 1. Parameters Measured Weekly in the Leachate Collected from the Tailings Composites.
- Appendix 3.5-35 Tables 2-8. TMA Fine Tailings (RS-18) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 9-15. TMA Whole Tailings (RS-13) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 16-22. TMA Whole Tailings (WD-13) (Leached Under Alternating Wet/Dry Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 23-29. TMA Lime Amended Whole Tailings (WD-14) (Leached Under Alternating Wet/Dry Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 30-36. Backfill Coarse Tailings (AL-15) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 37-43. Backfill Cemented Coarse Tailings (AL-17) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 44-50. Backfill Whole Tailings (AL-13) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.
- Appendix 3.5-35 Tables 51-57. Backfill Cemented Whole Tailings (AL-16) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.

Appendix 3.5-35 Table 1. Parameters Measured Weekly in the Leachate Collected from the Tailings Composites.

Appendix 3.5-35 Table 1

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

TMA Fine Tailings Composite (RS-18)

Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity/ Acidity (total, mg/L)
121494[a]	8	4,500	0.720	0.720	1,830	6.87	37[1]
011895[a]	9	4,500	0.720	1.440	1,920	7.52	52[1]
022195[b]	10	5,200	0.832	2.272	2,040	7.29	26[1]
022895[b]	11	4,420	0.707	2.979	1,480	7.20	20[1]
030795[b]	12	3,360	0.538	3.517	1,450	7.51	20[1]
031495[b]	13	5,050	0.808	4.325	939(?)	4.77(?)	5[2]
032195[b]	14	3,320	0.531	4.856	1,340	6.31	<5[1]
032895[b]	15	3,780	0.605	5.461	1,350	5.90	<5[1]
040495[b]	16	3,720	0.595	6.056	1,240	6.03	<5[1]
041195[b]	17	7,610	1.218	7.274	1,350	5.03	<5[1]
041895[b]	18	3,450	0.552	7.826	1,090	4.25	27[2]
042595[b]	19	3,380	0.541	8.367	1,140	4.08	33[2]
050295[b]	20	3,600	0.576	8.943	1,220	4.09	27[2]
051095[b]	21	3,900	0.624	9.567	1,070	4.02	30[2]
051795[b]	22	3,900	0.624	10.191	1,070	4.04	22[2]
052395[b]	23	3,600	0.576	10.767	1,060	4.03	35[2]
053195[b]	24	3,780	0.605	11.372	1,040	3.97	47[2]
060695[b]	25	3,840	0.614	11.986	1,030	3.98	23[2]
061295[b]	26	5,100	0.816	12.802	814	5.74(?)	<5[1](?)
062095[b]	27	4,240	0.678	13.480	896	4.07	21[2]
062795[b]	28	2,980	0.477	13.957	929	4.01	20[2]
070595[b]	29	4,580	0.733	14.690	1,100	4.12	28[2]
071195[b]	30	2,900	0.464	15.154	922	4.40	19[2]
071795[b]	31	0	0.000	15.154			
072595[b]	32	4,960	0.794	15.948	1,080	3.95	12[2]
080195[b]	33	2,220	0.355	16.303	796	3.45	15[2]
080895[b]	34	3,590	0.574	16.877	1,080	3.69	15[2]
081595[b]	35	4,140	0.662	17.539	1,110	3.94	<10[2]
082295[b]	36	3,350	0.536	18.075	1,060	4.59	<10[2]
083195[b]	37	4,280	0.685	18.760	938	5.65	<5[1]
090695[b]	38	4,360	0.698	19.458	952	6.86	8[1]

Appendix 3.5-35 Table 1 *(Continued)*

TMA Fine Tailings Composite (RS-18)
Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity/ Acidity (total, mg/L)
091295[b]	39	2,710	0.434	19.892	952	6.84	12[1]
091995[b]	40	4,540	0.726	20.618	923	6.82	12[1]
092695[b]	41	2,820	0.451	21.069	933	6.92	15[1]
100395[b]	42	4,820	0.771	21.840	793	6.80	35[1]
101095[b]	43	2,980	0.477	22.317	813	6.87	18[1]
101795[b]	44	2,980	0.477	22.794	747	6.88	19[1]
102495[b]	45	4,300	0.688	23.482	688	6.70	17[1]
103195[b]	46	3,100	0.496	23.978	717	6.79	61(?)[1]
110795[b]	47	3,480	0.557	24.535	606	6.77	15[1]
111495[b]	48	0	0.000	24.535			
112195[b]	49	3,500	0.560	25.095	539	6.34	15[1]
112895[b]	50	1,880	0.301	25.396	640	6.31	19[1]
120595[b]	51	3,860	0.618	26.014	562	7.15	15[1]
121295[b]	52	4,280	0.685	26.699	569	7.23	15[1]
121995[b]	53	2,160	0.346	27.045	655	7.41	18[1]
122795[b]	54	5,760	0.922	27.967	628	7.31	15[1]
010396[b]	55	3,460	0.554	28.521	326	7.05	8[1]
011096[b]	56	3,490	0.558	29.079	343	6.72	7[1]
011696[b]	57	2,410	0.386	29.465	528	6.93	NA
012396[b]	58	4,760	0.762	30.227	415	6.88	9[1]
013196[b]	59	2,860	0.458	30.685	340	6.50	NA
020896[b]	60	2,860	0.458	31.143	340	6.50	NA
021396[b]	61	4,740	0.758	31.901	414	6.53	NA
022096[b]	62	2,790	0.446	32.347	410	6.49	NA
022796[b]	63	4,680	0.749	33.096	360	6.88	5[1]
030596[b]	64	2,840	0.454	33.550	350	6.60	NA
031196[b]	65	2,640	0.422	33.972	206	5.73	NA
031896[b]	66	3,160	0.506	34.478	342	6.25	NA
032596[b]	67	3,640	0.582	35.060	354	6.10	NA
040296[b]	68	2,840	0.454	35.514	319	5.36	NA
040996[b]	69	3,820	0.611	36.125	334	5.32	NA
041696[b]	70	4,260	0.682	36.807	414	6.03	NA
042996[b]	71	3,910	0.626	37.433	392	5.81	NA
050796[b]	72	4,260	0.682	38.115	453	6.22	NA
051396[b]	73	3,260	0.522	38.637	346	5.87	NA
052196[b]	74	4,420	0.707	39.344	367	5.95	NA

Appendix 3.5-35 Table 1 *(Continued)*

TMA Fine Tailings Composite (RS-18)
Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity/ Acidity (total, mg/L)
052896[b]	75	2,400	0.384	39.728	577	6.59	NA
060396[b]	76	4,020	0.643	40.371	332	4.86	NA
061096[b]	77	3,800	0.608	40.979	398	4.96	NA
061796[b]	78	3,640	0.582	41.561	396	5.04	NA
062496[b]	79	3,960	0.634	42.195	396	4.88	NA
070196[b]	80	3,910	0.626	42.821	449	5.71	NA
070896[b]	89	3,800	0.608	43.429	478	5.75	NA
071596[b]	90	3,750	0.600	44.029	449	5.42	NA
072296[b]	91	0	0.000	44.029			
073096[b]	92	1,660	0.266	44.295	779	6.05	NA
080596[b]	93	0	0.000	44.295			
081296[b]	94	3,280	0.525	44.820	1,190	5.71	NA
081996[b]	95	2,670	0.427	45.247	852	6.28	NA
082996[b]	96	1,960	0.314	45.561	632	6.83	6[1]
090296[b]	97	0	0.000	45.561			
090996[b]	98	0	0.000	45.561			
091996[b]	99	1,300	0.208	45.769	1,100	5.93	NA
092396[b]	100	0	0.000	45.769			
100196[b]	101	4,160	0.666	46.435	688	5.49	20[1]
100796[b]	102	3,320	0.531	46.966	726	6.00	NA
101796[b]	103	3,700	0.592	47.558	726	5.36	NA
102496[b]	104	4,210	0.674	48.232	687	5.88	7[1]
110196[b]	105	3,760	0.602	48.834	688	6.08	NA
110796[b]	106	3,900	0.624	49.458	725	6.24	NA
111896[b]	107	0	0.000	49.458			
112196[b]	108	3,360	0.538	49.996	1,110	6.52	NA
112596[b]	109	0	0.000	49.996			
120696[b]	110	4,500	0.720	50.716	1,400	5.89	NA
120996[b]	111	0	0.000	50.716			
122096[b]	112	4,160	0.666	51.382	1,320	6.21	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

x^1 = Alkalinity value.
x^2 = Acidity value.

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (RS-13)
Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
121494[a]	8	3,400	0.960	0.961	3,120	6.77	86
011895[a]	9	4,500	1.271	2.232	3,070	7.20	79
022195[b]	10	4,320	1.220	3.452	3,310	7.42	40
022895[b]	11	4,200	1.186	4.638	2,490	7.50	62
030795[b]	12	3,380	0.955	5.593	1,820	7.68	59
031495[b]	13	4,700	1.328	6.921	1,440	7.40	51
032195[b]	14	3,520	0.994	7.915	1,280	7.46	50
032895[b]	15	3,520	0.994	8.909	1,170	7.41	46
040495[b]	16	3,440	0.972	9.881	1,280	7.53	48
041195[b]	17	7,380	2.085	11.966	1,420	7.13	32
041895[b]	18	3,410	0.963	12.929	1,040	7.15	38
042595[b]	19	3,470	0.980	13.909	1,040	7.26	45
050295[b]	20	3,540	1.000	14.909	1,400	7.43	54
051095[b]	21	3,580	1.011	15.920	1,500	7.40	47
051795[b]	22	3,810	1.076	16.996	1,290	7.39	51
052395[b]	23	3,580	1.011	18.007	1,120	7.39	57
053195[b]	24	3,620	1.023	19.030	1,110	7.37	56
060695[b]	25	3,800	1.073	20.103	974	7.53	53
061295[b]	26	4,480	1.266	21.369	909	7.09	49
062095[b]	27	3,800	1.073	22.442	905	7.47	46
062795[b]	28	3,780	1.068	23.510	900	7.61	56
070595[b]	29	3,660	1.034	24.544	888	7.67	50
071195[b]	30	3,800	1.073	25.617	826	7.61	53
071795[b]	31	0	0.000	25.617			
072595[b]	32	3,600	1.017	26.634	771	7.62	49
080195[b]	33	2,940	0.831	27.465	876	7.15	52
080895[b]	34	3,940	1.113	28.578	850	6.93	51
081595[b]	35	3,920	1.107	29.685	858	7.31	50
082295[b]	36	3,870	1.093	30.778	777	7.40	49
083195[b]	37	3,760	1.062	31.840	800	7.39	50
090695[b]	38	3,880	1.096	32.936	754	7.62	48
091295[b]	39	3,810	1.076	34.012	698	7.56	44
091995[b]	40	3,740	1.057	35.068	678	7.28	41
092695[b]	41	3,760	1.062	36.130	639	7.15	40

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (RS-13)
Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
100395[b]	42	3,760	1.062	37.192	649	7.04	42
101095[b]	43	3,750	1.059	38.251	636	7.21	43
101795[b]	44	3,320	0.938	39.189	649	7.10	41
102495[b]	45	3,340	0.944	40.133	565	6.85	36
103195[b]	46	3,360	0.949	41.082	636	6.91	40
110795[b]	47	3,520	0.994	42.076	556	6.90	35
111495[b]	48	0	0.000	42.076			
112195[b]	49	2,360	0.667	42.743	643	6.50	40
112895[b]	50	3,440	0.972	43.715	673	6.39	44
120595[b]	51	3,300	0.932	44.647	655	7.41	42
121295[b]	52	3,150	0.890	45.537	656	7.46	39
121995[b]	53	3,640	1.028	46.565	708	7.53	37
122795[b]	54	3,190	0.901	47.466	575	7.30	32
010396[b]	55	3,470	0.980	48.446	556	7.33	39
011096[b]	56	3,440	0.972	49.418	505	7.11	37
011696[b]	57	3,580	1.011	50.429	548	7.17	NA
012396[b]	58	3,300	0.932	51.361	540	7.20	39
013196[b]	59	3,170	0.895	52.256	552	6.69	NA
020896[b]	60	3,010	0.850	53.106	542	6.70	NA
021396[b]	61	4,230	1.195	54.301	521	6.75	NA
022096[b]	62	2,740	0.774	55.075	513	6.78	NA
022796[b]	63	4,040	1.141	56.216	529	7.15	38
030596[b]	64	2,960	0.836	57.052	622	7.10	NA
031196[b]	65	3,530	0.997	58.049	545	6.73	NA
031896[b]	66	3,080	0.870	58.919	498	6.75	35
032596[b]	67	3,340	0.944	59.863	568	6.81	NA
040296[b]	68	3,040	0.859	60.722	549	6.85	NA
040996[b]	69	3,380	0.955	61.677	563	6.91	NA
041696[b]	70	3,480	0.983	62.660	571	7.06	35
042996[b]	71	3,590	1.014	63.674	537	7.01	NA
050796[b]	72	3,460	0.977	64.651	557	7.00	NA
051396[b]	73	3,660	1.034	65.685	506	6.82	NA
052196[b]	74	3,740	1.057	66.741	484	7.08	33
052896[b]	75	3,080	0.870	67.611	576	6.82	NA

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (RS-13)
Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
060396[b]	76	3,640	1.028	68.639	466	6.70	NA
061096[b]	77	3,640	1.028	69.667	469	6.72	NA
061796[b]	78	3,690	1.042	70.709	466	6.69	34
062496[b]	79	3,740	1.057	71.765	494	6.75	NA
070196[b]	80	3,740	1.057	72.821	481	6.64	NA
070896[b]	89	3,800	1.073	73.894	480	6.51	NA
071596[b]	90	3,400	0.960	74.854	496	6.47	NA
072296[b]	91	0	0.000	74.854			
073096[b]	92	2,040	0.576	75.430	710	6.22	32
080596[b]	93	0	0.000	75.430			
081296[b]	94	3,900	1.102	76.532	849	6.36	NA
081996[b]	95	3,900	1.102	77.634	796	6.29	NA
082996[b]	96	2,450	0.692	78.326	694	7.38	22
090296[b]	97	0	0.000	78.326			
090996[b]	98	0	0.000	78.326			
091996[b]	99	1,640	0.463	78.789	1,180	6.62	NA
092396[b]	100	0	0.000	78.789			
100196[b]	101	3,160	0.893	79.682	1,270	6.76	NA
100796[b]	102	3,800	1.073	80.755	1,150	6.92	NA
101796[b]	103	3,280	0.927	81.682	1,070	6.63	NA
102496[b]	104	3,810	1.076	82.758	981	6.53	26
110196[b]	105	3,540	1.000	83.758	935	6.90	NA
110796[b]	106	3,840	1.085	84.843	883	7.28	NA
111896[b]	107	0	0.000	84.843			
112196[b]	108	3,360	0.949	85.792	1,200	6.79	NA
112596[b]	109	0	0.000	85.792			
120696[b]	110	4,410	1.246	87.038	950	6.08	NA
120996[b]	111	0	0.000	87.038			
122096[b]	112	3,190	0.901	87.939	1,610	7.08	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (WD-13)
Leached Under Alternating W/D Conditions

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	2,120	0.282	0.282	1,860	7.59	1000[1]
110294	2	4,510	0.600	0.882	1,400	6.50	380[1]
110994	3	4,570	0.608	1.49	936	5.50	200[1]
111694	4	4,020	0.535	2.02	921	6.15	22[1]
112294	5	4,750	0.632	2.66	1,160	5.88	30[1]
112994	6	5,220	0.694	3.35	1,680	5.96	46[1]
120694	7	4,620	0.614	3.96	2,310	7.25	75[1]
121394	8	5,570	0.741	4.71	2,510	7.11	82[1]
122194	9	4,460	0.593	5.30	3,150	7.62	51[1]
122894	10	4,720	0.628	5.93	2,980	7.55	100[1]
010495	11	4,700	0.625	6.55	2,600	7.29	92[1]
011095	12	4,330	0.576	7.13	2,260	6.82	79[1]
011795	13	3,640	0.484	7.61	2,230	7.21	71[1]
012495	14	2,960	0.394	8.01	2,000	7.15	34[1]
013195	15	3,060	0.407	8.41	2,070	6.96	26[1]
020895	16	3,400	0.452	8.86	1,790	6.68	31[1]
021595	17	5,120	0.681	9.55	1,600	7.04	20[1]
022195	18	3,780	0.503	10.0	1,370	7.14	29[1]
022895	19	3,460	0.460	10.5	1,280	6.48	20[1]
030795	20	3,240	0.431	10.9	1,320	6.37	17[1]
031495	21	3,520	0.468	11.4	1,060	6.53	12[1]
032195	22	3,540	0.471	11.9	1,090	6.33	17[1]
032895	23	3,500	0.465	12.3	1,090	6.32	16[1]
040495	24	3,600	0.479	12.8	1,540	6.44	24[1]
041195	25	3,430	0.456	13.3	1,720	6.56	35[1]
041895	26	3,120	0.415	13.7	1,380	6.39	20[1]
042595	27	3,200	0.426	14.1	1,260	6.23	11[1]
050295	28	3,290	0.438	14.6	1,360	6.22	10[1]
051095	29	3,200	0.426	15.0	1,380	6.21	9[1]
051795	30	3,640	0.484	15.5	1,390	6.41	16[1]
052395	31	3,480	0.463	15.9	1,470	6.64	29[1]
053195	32	3,420	0.455	16.4	1,260	6.22	15[1]
060695	33	3,960	0.527	16.9	1,400	6.96	28[1]
061295	34	3,850	0.512	17.4	1,440	6.16	33[1]

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (WD-13)
Leached Under Alternating W/D Conditions

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
062095	35	4,060	0.540	18.0	1,390	6.80	34[1]
062795	36	4,020	0.535	18.5	1,380	6.97	37[1]
070595	37	3,820	0.508	19.0	1,360	7.12	39[1]
071195	38	3,820	0.508	19.5	1,180	7.00	32[1]
071795	39	0	0.000	19.5			
072595	40	3,800	0.505	20.0	1,220	7.41	28[1]
080195	41	3,210	0.427	20.4	1,390	6.41	8[1]
080895	42	4,010	0.533	21.0	1,420	6.35	20[1]
081595	43	4,040	0.537	21.5	1,350	6.60	27[1]
082295	44	4,020	0.535	22.0	1,200	6.61	25[1]
083195	45	3,660	0.487	22.5	1,160	6.58	25[1]
090695	46	3,900	0.519	23.0	1,060	6.85	21[1]
091295	47	3,760	0.500	23.6	1,080	6.75	21[1]
091995	48	3,660	0.487	24.0	1,080	6.44	17[1]
092695	49	3,720	0.495	24.5	1,010	6.33	21[1]
100395	50	3,530	0.469	25.0	1,010	6.29	19[1]
101095	51	3,650	0.485	25.5	976	6.44	22[1]
101795	52	3,500	0.465	26.0	946	6.49	86(?)[1]
102495	53	3,360	0.447	26.4	979	6.21	18[1]
103195	54	3,380	0.450	26.8	1,040	5.85	22[1]
110795	55	3,340	0.444	27.3	979	5.96	14[1]
111495	56	0	0.000	27.3			
112195	57	2,030	0.270	27.6	1,380	3.62	80[2]
112895	58	3,420	0.455	28.0	2,550	3.55	280[2]
120595	59	3,350	0.446	28.5	2,440	3.99	290[2]
121295	60	3,340	0.444	28.9	2,440	3.84	330[2]
121995	61	3,680	0.489	29.4	2,060	4.16	210[2]
122795	62	3,260	0.434	29.8	1,990	3.85	170[2]
010396	63	3,020	0.402	30.2	1,890	3.69	160[2]
011096	64	3,440	0.457	30.7	1,640	3.85	130[2]
011696	65	3,530	0.469	31.2	1,530	3.83	NA
012396	66	3,440	0.457	31.6	1,560	3.71	100[2]
013196	67	3,210	0.427	32.0	1,560	3.37	NA
020796	68	3,520	0.468	32.5	1,590	3.28	NA

Appendix 3.5-35 Table 1 *(Continued)*

TMA Whole Tailings Composite (WD-13)
Leached Under Alternating W/D Conditions

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
021396	69	3,610	0.480	33.0	1,530	3.47	NA
022096	70	3,360	0.447	33.4	1,380	3.54	NA
052796	83	3,640	0.502	33.9	4,930	2.30	NA
071696	90	3,390	0.468	34.4	10,600	2.54	4,600[2]
072296	91	0	0.000	34.4			
073096	92	1,090	0.150	34.6	25,800	2.57	NA
080596	93	0	0.000	34.6			
081296	94	500	0.069	34.6	23,500	2.71	NA
081996	95	500	0.069	34.7	17,200	2.76	NA
082996	96	500	0.069	34.8	11,800	2.95	NA
090296	97	0	0.000	34.8			
090996	98	0	0.000	34.8			
091996	99	2,040	0.281	35.0	10,200	2.70	NA
092396	100	0	0.000	35.0			
100196	101	1,900	0.262	35.3	11,200	2.56	NA
100796	102	2,720	0.375	35.7	11,000	2.90	NA
101796	103	1,720	0.237	35.9	11,500	2.80	NA
102496	104	2,680	0.370	36.3	10,600	2.37	NA
110196	105	2,580	0.356	36.6	9,810	2.30	NA
110796	106	2,580	0.356	37.0	9,220	1.51	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

x^1 = Alkalinity value.
x^2 = Acidity value.

Note: Surface configuration of the composite was changed from flat to bowl shaped on 012395.

Appendix 3.5-35 Table 1 *(Continued)*

TMA Lime Amended Whole Tailings Composite (WD-14)
Leached Under Alternating W/D Conditions

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	1	3,010	0.337	0.337	800	11.61	17
110294	2	4,080	0.457	0.674	2,160	11.23	18
110994	3	4,360	0.489	1.13	1,250	11.17	23
111694	4	4,450	0.499	1.62	1,170	10.97	190
112294	5	4,870	0.546	2.12	896	10.88	200
112994	6	4,560	0.511	2.66	998	10.82	172
120694	7	4,120	0.462	3.18	1,000	10.72	146
121294	8	7,630	0.855	3.64	1,010	10.55	510(?)
122194	9	4,300	0.482	4.49	633	9.15	36
122894	10	4,710	0.528	4.98	727	10.24	78
010495	11	4,620	0.518	5.50	817	10.24	52
011095	12	4,160	0.466	6.02	886	10.85	73
011795	13	2,920	0.327	6.49	756	10.29	39
012495	14	1,000	0.112	6.81	1,380	10.99	150
013195	15	400	0.045	6.93	770	8.33	47
020895	16	2,520	0.283	6.97	980	8.81	24
021595	17	1,350	0.151	7.25	961	8.34	NA
022195	18	2,460	0.276	7.40	1,120	9.18	500(?)
022895	19	1,880	0.211	7.68	1,150	8.17	NA
030795	20	1,840	0.206	7.89	1,140	7.77	NA
031495	21	2,150	0.241	8.10	1,130	7.43	NA
032195	22	2,520	0.283	8.34	1,260	7.95	NA
032895	23	2,500	0.280	8.62	1,230	7.66	NA
040495	24	2,580	0.289	8.90	907	7.23	NA
041195	25	2,360	0.265	9.19	918	7.35	NA
041895	26	2,150	0.241	9.46	955	7.24	NA
042595	27	2,490	0.279	9.70	947	7.27	NA
050295	28	2,520	0.283	9.98	965	7.26	NA
051095	29	2,600	0.292	10.2	976	7.00	NA
051795	30	3,000	0.336	10.6	1,030	6.55	NA
052395	31	2,840	0.318	10.9	1,140	6.84	NA
053195	32	2,750	0.308	11.2	1,010	7.22	NA
060695	33	3,550	0.398	11.5	1,030	7.40	NA
061295	34	3,360	0.377	11.9	937	7.63	NA

Appendix 3.5-35 Table 1 *(Continued)*

TMA Lime Amended Whole Tailings Composite (WD-14)
Leached Under Alternating W/D Conditions

Date	Cycle (Wk)	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
062095	35	3,220	0.361	12.3	922	7.53	NA
062795	36	3,450	0.387	12.6	963	7.55	NA
070595	37	3,350	0.376	13.0	965	7.48	NA
071195	38	3,290	0.369	13.4	888	7.73	NA
071795	39	0	0.000	13.8			
072595	40	3,510	0.394	13.8	872	7.42	NA
080195	41	2,160	0.242	14.2	812	7.08	NA
080895	42	3,620	0.406	14.4	927	6.98	NA
081595	43	3,740	0.419	14.8	968	7.36	NA
082295	44	3,380	0.379	15.2	898	7.46	NA
083195	45	3,160	0.354	15.6	867	7.43	NA
090695	46	3,580	0.401	16.0	847	7.72	NA
091295	47	3,460	0.388	16.4	884	7.53	22
091995	48	3,230	0.362	16.8	911	7.18	25
092695	49	3,450	0.387	17.1	852	7.23	20
100395	50	3,120	0.350	17.5	897	7.26	89
101095	51	3,090	0.346	17.9	928	7.29	33
101795	52	3,050	0.342	18.2	871	7.29	23
102495	53	2,820	0.316	18.6	856	6.92	20
103195	54	2,720	0.305	18.9	943	7.02	29
110795	55	2,640	0.296	19.2	879	6.92	20
111495	56	0	0.000	19.5			
112195	57	1,300	0.146	19.5	782	6.22	8(?)
112895	58	2,750	0.308	19.6	1,070	6.41	26
120595	59	2,280	0.256	19.9	852	7.52	21
121295	60	2,520	0.283	20.2	1,050	7.49	24
121995	61	2,960	0.332	20.5	1,350	7.72	31
122795	62	2,060	0.231	20.8	991	7.25	19
010396	63	2,480	0.278	21.0	1,120	7.34	31
011096	64	2,540	0.285	21.3	858	6.79	19
011596	65	2,820	0.316	21.6	880	6.78	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Note: Surface configuration of the composite was changed from flat to bowl shaped on 012395.

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Coarse Tailings Composite (AL-15)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
101194[b]	1	4,500	0.797	0.797	3,830	6.32	NA
121494[b]	9	0	0.000	0.797			
122194[a]	10	4,400	0.779	1.58	2,610	6.04	70
122894[a]	11	4,500	0.797	2.37	2,430	6.47	24
010395[a]	12	400	0.071	2.44	2,750	6.97	44
011195[a]	13	4,500	0.797	3.24	773	6.60	71
011795[a]	14	2,750	0.487	3.73	829	6.64	86
012395[a]	15	500	0.089	3.82	916	6.65	87
013095[a]	16	500	0.089	3.91	876	6.69	96
020895[a]	17	4,500	0.797	4.70	617	7.22	110
021595[a]	18	500	0.089	4.79	815	6.77	72
022195[a]	19	500	0.089	4.88	688	7.04	90
022895[a]	20	500	0.089	4.97	848	7.02	100
030795[a]	21	500	0.089	5.06	764	7.00	110
031395[a]	22	500	0.089	5.15	697	7.00	110
032195[a]	23	500	0.089	5.24	704	7.00	120
032895[a]	24	500	0.089	5.33	681	7.13	110
040495[a]	25	4,500	0.797	6.12	708	7.03	120
041195[a]	26	500	0.089	6.21	678	7.12	80
041895[a]	27	500	0.089	6.30	737	7.42	96
042595[a]	28	500	0.089	6.39	704	7.47	110
050195[a]	29	500	0.089	6.48	724	7.35	110
050895[a]	30	500	0.089	6.57	736	7.20	110
051595[a]	31	500	0.089	6.66	665	7.13	110
052295[a]	32	500	0.089	6.75	642	7.25	110
053195[a]	33	500	0.089	6.84	639	7.22	110
060695[a]	34	500	0.089	6.92	655	7.37	100
061295[a]	35	500	0.089	7.01	655	7.00	100
062095[a]	36	500	0.089	7.10	660	7.17	97
062695[a]	37	500	0.089	7.19	684	7.09	100
070395[a]	38	500	0.089	7.28	693	7.22	NA
071195[a]	39	250	0.044	7.32	686	7.25	NA
071795[a]	40	0	0.000	7.32			
072595[a]	41	2,000	0.354	7.68	694	6.87	90

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Coarse Tailings Composite (AL-15)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
073195[a]	42	250	0.044	7.72	688	6.98	NA
080795[a]	43	250	0.044	7.77	724	6.77	NA
081495[a]	44	250	0.044	7.81	720	7.22	NA
082195[a]	45	250	0.044	7.85	673	7.02	NA
083095[a]	46	250	0.044	7.90	726	6.90	NA
090695[a]	47	2,000	0.354	8.25	715	7.13	81
091195[a]	48	2,000	0.354	8.61	744	6.92	66
091895[a]	49	2,000	0.354	8.96	683	7.20	66
092595[a]	50	2,000	0.354	9.31	633	7.00	62
100395[a]	51	2,000	0.354	9.67	572	6.95	64
101095[a]	52	2,000	0.354	10.0	517	6.93	66
101795[a]	53	2,000	0.354	10.4	478	7.02	67
102395[a]	54	2,000	0.354	10.7	485	7.07	67
103095[a]	55	2,000	0.354	11.1	458	7.05	65
110695[a]	56	2,000	0.354	11.4	472	6.91	65
111395[a]	57	0	0.000	11.4			
112095[a]	58	2,000	0.354	11.8	466	7.00	72
112795[a]	59	2,000	0.354	12.1	503	6.99	70
120595[a]	60	2,000	0.354	12.5	448	7.25	71
121195[a]	61	2,000	0.354	12.8	499	7.27	74
121895[a]	62	2,000	0.354	13.2	471	7.42	69
122695[a]	63	2,000	0.354	13.6	452	7.34	69
010296[a]	64	2,000	0.354	13.9	453	7.40	77
011096[a]	65	2,000	0.354	14.3	442	7.50	75
011596[a]	66	2,000	0.354	14.6	435	7.45	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Cemented Coarse Tailings Composite (AL-17)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
101194[b]	1	4,500	0.145	0.145	6,830	12.08	NA
121494[b]	9	4,500	0.145	0.290	4,210	11.37	350
122094[a]	10	4,500	0.145	0.435	4,330	11.95	510
122794[a]	11	4,500	0.145	0.580	3,970	9.98	550
010395[a]	12	400	0.013	0.593	3,860	10.44	470
011195[a]	13	4,500	0.145	0.738	3,290	11.97	560
011795[a]	14	2,750	0.088	0.826	3,190	12.12	NA
012395[a]	15	500	0.016	0.842	3,110	12.14	530
013095[a]	16	500	0.016	0.858	3,110	12.37	520
020895[a]	17	4,500	0.145	1.00	3,140	12.08	520
021595[a]	18	500	0.016	1.02	3,100	12.17	510
022195[a]	19	500	0.016	1.04	2,990	12.18	500
022895[a]	20	500	0.016	1.05	3,180	12.36	500
030795[a]	21	500	0.016	1.07	2,910	12.23	500
031395[a]	22	500	0.016	1.08	2,710	12.24	500
032195[a]	23	500	0.016	1.10	2,810	12.17	480
032895[a]	24	500	0.016	1.12	2,790	12.15	480
040495[a]	25	4,500	0.145	1.26	2,810	12.00	440
041195[a]	26	500	0.016	1.28	2,710	12.03	470
041895[a]	27	500	0.016	1.29	2,690	12.01	470
042595[a]	28	500	0.016	1.31	2,540	11.49	450
050195[a]	29	500	0.016	1.32	2,670	11.17	420
050895[a]	30	500	0.016	1.34	2,630	11.06	400
051595[a]	31	500	0.016	1.36	2,300	11.14	42(?)
052295[a]	32	500	0.016	1.37	2,310	11.16	410
053195[a]	33	500	0.016	1.39	2,250	11.11	390
060695[a]	34	500	0.016	1.40	2,380	11.31	380
061295[a]	35	500	0.016	1.42	2,220	11.87	370
062095[a]	36	500	0.016	1.44	2,220	11.90	370
062695[a]	37	500	0.016	1.45	2,190	11.87	340
070395[a]	38	500	0.016	1.47	2,160	11.80	NA
071195[a]	39	250	0.008	1.48	2,060	11.73	NA
071795[a]	40	0	0.000	1.48			
072595[a]	41	2,000	0.064	1.54	2,110	11.49	320

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Cemented Coarse Tailings Composite (AL-17)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
073195[a]	42	250	0.008	1.55	2,120	11.05	NA
080795[a]	43	250	0.008	1.56	2,050	10.82	NA
081495[a]	44	250	0.008	1.56	2,100	11.78	NA
082195[a]	45	250	0.008	1.57	2,040	11.30	NA
083095[a]	46	250	0.008	1.58	1,970	11.29	NA
090695[a]	47	2,000	0.064	1.64	1,920	11.41	300
091195[a]	48	2,000	0.064	1.71	2,130	11.28	300
091895[a]	49	2,000	0.064	1.77	2,190	11.78	310
092595[a]	50	2,000	0.064	1.84	2,150	11.16	300
100395[a]	51	2,000	0.064	1.90	2,110	11.28	300
101095[a]	52	2,000	0.064	1.96	2,050	11.53	300
101795[a]	53	2,000	0.064	2.03	1,920	11.17	300
102395[a]	54	2,000	0.064	2.09	2,050	11.09	290
103095[a]	55	2,000	0.064	2.16	1,980	11.00	290
110695[a]	56	2,000	0.064	2.22	2,070	11.23	300
111395[a]	57	0	0.000	2.22			
112095[a]	58	2,000	0.064	2.28	1,970	10.37	290
112795[a]	59	2,000	0.064	2.35	2,150	10.31	290
120595[a]	60	2,000	0.064	2.41	1,880	11.37	300
121195[a]	61	2,000	0.064	2.48	2,160	11.35	280
121895[a]	62	2,000	0.064	2.54	2,180	11.44	270
122695[a]	63	2,000	0.064	2.60	1,980	10.89	260
010296[a]	64	2,000	0.064	2.67	1,980	11.25	280
011096[a]	65	2,000	0.064	2.73	1,970	11.13	240
011596[a]	66	2,000	0.064	2.80	1,870	11.25	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Whole Tailings Composite (AL-13)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
101194[b]	1	4,500	0.936	0.936	2,530	7.24	NA
121494[b]	9	0	0.000	0.936			
122194[a]	10	4,400	0.915	1.85	1,990	6.97	74
122894[a]	11	4,500	0.936	2.79	1,380	7.18	76
010395[a]	12	400	0.083	2.87	2,030	6.50	34(?)
011195[a]	13	4,500	0.936	3.81	566	6.89	82
011795[a]	14	2,750	0.572	4.38	631	7.21	66
012395[a]	15	500	0.104	4.48	838	6.64	75
013095[a]	16	500	0.104	4.59	1,030	6.58	78
020895[a]	17	4,500	0.936	5.52	1,090	6.99	90
021595[a]	18	500	0.104	5.63	997	6.66	59
022195[a]	19	500	0.104	5.73	793	6.91	71
022895[a]	20	500	0.104	5.83	947	6.88	79
030795[a]	21	500	0.104	5.94	877	6.91	88
031395[a]	22	500	0.104	6.04	805	6.91	94
032195[a]	23	500	0.104	6.15	811	6.92	97
032895[a]	24	500	0.104	6.25	818	7.01	92
040495[a]	25	4,500	0.936	7.19	824	7.03	96
041195[a]	26	500	0.104	7.29	809	6.76	60
041895[a]	27	500	0.104	7.39	932	7.02	67
042595[a]	28	500	0.104	7.50	874	6.42	71
050195[a]	29	500	0.104	7.60	983	6.82	69
050895[a]	30	500	0.104	7.71	1,050	6.70	64
051595[a]	31	500	0.104	7.81	972	6.62	72
052295[a]	32	500	0.104	7.91	720(?)	6.95	63
053195[a]	33	500	0.104	8.02	823	6.75	73
060695[a]	34	500	0.104	8.12	830	7.00	89
061295[a]	35	500	0.104	8.23	792	6.63	76
062095[a]	36	500	0.104	8.33	797	6.88	76
062695[a]	37	500	0.104	8.43	849	6.67	69
070395[a]	38	500	0.104	8.54	902	6.61	NA
071195[a]	39	250	0.052	8.59	965	6.65	NA
071795[a]	40	0	0.000	8.59			
072595[a]	41	2,000	0.416	9.01	970	6.62	63

Backfill Whole Tailings Composite (AL-13)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
073195[a]	42	250	0.052	9.06	985	6.38	NA
080795[a]	43	250	0.052	9.11	1,080	6.36	NA
081495[a]	44	250	0.052	9.16	1,050	6.62	NA
082195[a]	45	250	0.052	9.21	1,100	6.64	NA
083095[a]	46	250	0.052	9.27	1,160	6.50	NA
090695[a]	47	2,000	0.416	9.68	775	7.15	49
091195[a]	48	2,000	0.416	10.1	834	6.71	51
091895[a]	49	2,000	0.416	10.5	762	6.70	59
092595[a]	50	2,000	0.416	10.9	696	6.69	60
100395[a]	51	2,000	0.416	11.3	619	6.66	74
101095[a]	52	2,000	0.416	11.8	609	6.75	64
101795[a]	53	2,000	0.416	12.2	520	6.85	66
102395[a]	54	2,000	0.416	12.6	502	6.92	59
103095[a]	55	2,000	0.416	13.0	490	6.92	62
110695[a]	56	2,000	0.416	13.4	522	6.75	70
111395[a]	57	0	0.000	13.4			
112095[a]	58	2,000	0.416	13.8	596	6.60	65
112795[a]	59	2,000	0.416	14.2	646	6.56	72
120595[a]	60	2,000	0.416	14.7	544	7.06	64
121195[a]	61	2,000	0.416	15.1	637	7.10	75
121895[a]	62	2,000	0.416	15.5	640	7.02	68
122695[a]	63	2,000	0.416	15.9	516	7.21	62
010296[a]	64	2,000	0.416	16.3	540	7.18	78
011096[a]	65	2,000	0.416	16.8	596	7.00	80
011596[a]	66	2,000	0.416	17.2	543	7.07	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Cemented Whole Tailings Composite (AL-16)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity/ Acidity (total, mg/L)
101194[b]	1	4,500	0.145	0.145	5,940	8.88	NA
121494[b]	2	4,500	0.145	0.290	5,090	6.92	<5[1](?)
122094[a]	3	4,500	0.145	0.435	4,420	6.22	<5[1](?)
122894[a]	4	4,500	0.145	0.580	3,850	6.59	<5[1](?)
010395[a]	5	400	0.013	0.593	3,960	3.95?	41[2](?)
011195[a]	6	4,500	0.145	0.738	3,130	7.30	17[1]
011795[a]	7	2,000	0.064	0.802	3,190	6.53	8[1]
012395[a]	8	500	0.016	0.818	3,140	6.63	12[1]
013095[a]	9	500	0.016	0.834	3,200	6.52	10[1]
020895[a]	10	4,500	0.145	0.979	2,970	9.09?	22[1]
021595[a]	11	500	0.016	0.995	2,890	7.77	24[1]
022195[a]	12	500	0.016	1.011	2,940	7.81	19[1]
022895[a]	13	500	0.016	1.027	3,150	7.59	17[1]
030795[a]	14	500	0.016	1.043	2,890	7.73	13[1]
031395[a]	15	500	0.016	1.059	2,720	7.69	13[1]
032195[a]	16	500	0.016	1.075	2,840	7.60	<5[1](?)
032895[a]	17	500	0.016	1.091	2,810	7.57	<5[1](?)
040495[a]	18	4,500	0.145	1.236	2,860	7.40	<5[1](?)
041195[a]	19	500	0.016	1.252	2,570	9.10	32[1]
041895[a]	20	500	0.016	1.268	2,660	9.02	37[1]
042595[a]	21	500	0.016	1.284	2,540	9.00	22[1]
050195[a]	22	500	0.016	1.300	2,690	8.74	20[1]
050895[a]	23	500	0.016	1.316	2,690	8.17	32[1]
051595[a]	24	500	0.016	1.332	2,490	8.02	14[1]
052295[a]	25	500	0.016	1.348	2,420	8.11	21[1]
053195[a]	26	500	0.016	1.364	2,400	8.01	17[1]
060695[a]	27	500	0.016	1.380	2,510	8.21	10[1]
061295[a]	28	500	0.016	1.396	2,430	7.56	13[1]
062095[a]	29	500	0.016	1.412	2,370	7.82	19[1]
062695[a]	30	500	0.016	1.428	2,360	7.70	16[1]
070395[a]	31	500	0.016	1.444	2,350	7.67	<5[1](?)
071195[a]	32	500	0.016	1.460	2,340	7.55	13[1]
071795[a]	33	0	0.000	1.460			
072595[a]	34	2,000	0.064	1.524	2,340	8.07	14[1]

Appendix 3.5-35 Table 1 *(Continued)*

Backfill Cemented Whole Tailings Composite (AL-16)
Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Week	Leachate Collected (mL)	Pore Volumes Leached	Cum. Pore Volumes Leached	Cond. (μS/cm)*	pH (su)	Alkalinity/ Acidity (total, mg/L)
073195[a]	35	500	0.016	1.540	2,340	8.60	17[1]
080795[a]	36	500	0.016	1.556	2,330	8.38	16[1]
081495[a]	37	500	0.016	1.572	2,370	8.60	15[1]
082195[a]	38	500	0.016	1.588	2,330	8.45	14[1]
083095[a]	39	500	0.016	1.604	2,310	8.15	5[1]
090695[a]	40	2,000	0.064	1.668	2,260	8.62	16[1]
091195[a]	41	2,000	0.064	1.732	2,420	8.83	18[1]
091895[a]	42	2,000	0.064	1.796	2,410	9.42	23[1]
092595[a]	43	2,000	0.064	1.860	2,450	9.36	20[1]
100395[a]	44	2,000	0.064	1.924	2,390	9.32	21[1]
101095[a]	45	2,000	0.064	1.988	2,380	9.51	32[1]
101795[a]	46	2,000	0.064	2.052	2,280	8.88	25[1]
102395[a]	47	2,000	0.064	2.116	2,430	9.53	21[1]
103095[a]	48	2,000	0.064	2.180	2,430	9.50	20[1]
110695[a]	49	2,000	0.064	2.244	2,480	9.36	21[1]
111395[a]	50	0	0.000	2.244			
112095[a]	51	2,000	0.064	2.308	2,460	9.44	20[1]
112795[a]	52	2,000	0.064	2.372	2,590	9.45	23[1]
120595[a]	53	2,000	0.064	2.436	2,300	9.51	24[1]
121195[a]	54	2,000	0.064	2.500	2,660	9.54	25[1]
121895[a]	55	2,000	0.064	2.564	2,630	9.64	24[1]
122695[a]	56	2,000	0.064	2.628	2,470	9.57	20[1]
010296[a]	57	2,000	0.064	2.692	2,490	9.60	21[1]
011096[a]	58	2,000	0.064	2.756	2,500	9.42	20[1]
011596[a]	59	2,000	0.064	2.820	2,400	9.55	NA

* Conductivity values corrected for temperature.
NA = not analyzed.

Date[a] = composite leached under saturated conditions.
Date[b] = composite leached under alternating wet and dry (W/D) conditions.

x^1 = Alkalinity value.
x^2 = Acidity value.

Prepared by: MLD2
Checked by: JET

Appendix 3.5-35 Tables 2-8. TMA Fine Tailings (RS-18) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.

Appendix 3.5-35 Table 2

Sample Characterization
Fine Tailings (RS-18) - Leached under saturated, followed by alternating wet/dry, conditions

Metals Analysis		Tails (ppm)	Process Water (mg/L)	
Aluminum	Al	48800	1.40	
Antimony	Sb	64	<0.1	
Arsenic	As	2300	<0.1	
Barium	Ba	60	0.0196	
Beryllium	Be	<50	<0.0006	
Bismuth	Bi	20	<0.1	
Cadmium	Cd	40	<0.0002	
Calcium	Ca	8600	299	
Carbon	C	5800	NA	
Chromium	Cr	210	0.056	
Cobalt	Co	55	0.041	
Copper	Cu	1400	0.063	
Gallium	Ga	21	NA	
Iron	Fe	177000	0.41	
Lead	Pb	6300	0.270	
Lithium	Li	NA	NA	
Magnesium	Mg	20500	0.15	
Manganese	Mn	670	0.0046	
Mercury	Hg	1.0	NA	
Molybdenum	Mo	<20	<0.04	
Nickel	Ni	40	0.006	
Phosphorus	P	NA	NA	
Potassium	K	13100	10.3	
Selenium	Se	30	0.287	
Silicon	Si	180000	NA	
Silver	Ag	29.4	0.003	
Sodium	Na	2700	30	
Strontium	Sr	NA	NA	
Thallium	Tl	20	<0.003	
Tin	Sn	28	<0.1	
Titanium	Ti	1700	<0.003	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	11200	0.445	
Sulfate	SO4	500	1200	*
Sulfur	S	176000	NA	

ABA Results	
Paste pH	6.5
S (Total) (%)	30.7
SO4 (%)	500
S (sulfide) (%)	27.0
AP (kg CaCO3/tonne)	959
NP (kg CaCO3/tonne)	30
CO2 (%)	1.53
CO3 NP (kg CaCO3/tonne)	34.7
Net NP (kg CaCO3/tonne)	-929
NP/AP	0.03

Sample Mass (kg)	18.20

* concentration estimated
Note: NA = Not Analyzed

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 3

Parameters Measured Weekly
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)		ACIDITY (mg/L)	SULFATE (mg/L)	CUMULATIVE SULFATE (mg/kg) **
14-Dec-94	1 *	56	4.500	6.9		1830	37			**717**	-119
18-Jan-95	2 *	91	4.500	7.5		1920	52			**3640**	484
21-Feb-95	3	125	5.200	7.3		2040	26			**840**	724
28-Feb-95	4	132	4.420	7.2		1480	20			**510**	848
7-Mar-95	5	139	3.360	7.5		1450	20			440	929
13-Mar-95	6	145	5.050	4.8	?	939				**370**	1032
21-Mar-95	7	153	3.320	6.3		1340	<5			485	1120
28-Mar-95	8	160	3.780	5.9		1350	<5			600	1245
4-Apr-95	9	167	3.720	6.0		1240	<5			715	1391
11-Apr-95	10	174	7.610	5.0		1350	<5			**830**	1738
18-Apr-95	11	181	3.450	4.3		1090			27	788	1887
25-Apr-95	12	188	3.380	4.1		1140			33	745	2026
2-May-95	13	195	3.600	4.1		1220			27	703	2164
10-May-95	14	203	3.900	4.0		1070			30	660	2306
17-May-95	15	210	3.900	4.0		1070			22	618	2438
23-May-95	16	216	3.600	4.0		1060			35	575	2552
31-May-95	17	224	3.780	4.0		1040			47	533	2663
6-Jun-95	18	230	3.840	4.0		1030			23	**490**	2766
12-Jun-95	19	236	5.100	5.7	?	814	<5	?		490	2903
20-Jun-95	20	244	2.980	4.1		929			21	490	2984
27-Jun-95	21	251	4.240	4.0		879			20	490	3098
5-Jul-95	22	259	4.580	4.1		1100			28	490	3221
11-Jul-95	23	265	2.900	4.4		922			19	490	3299
17-Jul-95	24	271	0.000								
25-Jul-95	25	279	4.960	4.0		1080			12	490	3433
1-Aug-95	26	286	2.220	3.5		780			15	490	3492
8-Aug-95	27	293	3.590	3.7		1080			15	490	3589
15-Aug-95	28	300	4.140	3.9		1110			10	490	3700
22-Aug-95	29	307	3.350	4.6		1060			<10	490	3791
31-Aug-95	30	316	4.280	5.7		938	<5			490	3906
6-Sep-95	31	322	4.360	6.9		952	8			**490**	4023
12-Sep-95	32	328	2.710	6.8		952	12			**490**	4096
19-Sep-95	33	335	4.540	6.8		923	12			510	4223
26-Sep-95	34	342	2.820	6.9		933	15			**530**	4306
3-Oct-95	35	349	4.820	6.8		793	35			**360**	4401
10-Oct-95	36	356	2.980	6.9		813	18			**340**	4457
17-Oct-95	37	363	2.980	6.9		747	19			**510**	4540
24-Oct-95	38	370	4.300	6.7		688	17			**480**	4653
31-Oct-95	39	377	3.100	6.8		717	61	?		**310**	4706
7-Nov-95	40	384	3.480	6.8		606	15			**250**	4754
14-Nov-95	41	391	0.000								
21-Nov-95	42	398	3.500	6.3		539	15			**210**	4794
28-Nov-95	43	405	1.880	6.3		640	19			**250**	4820
5-Dec-95	44	412	3.860	7.2		562	15			238	4871
12-Dec-95	45	419	4.280	7.2		569	15			225	4924

Appendix 3.5-35 Table 3 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L)	CUMULATIVE SULFATE (mg/kg) **
19-Dec-95	46	426	2.160	7.4	655	18		213	4949
27-Dec-95	47	434	5.760	7.3	628	15		200	5012
3-Jan-96	48	441	3.460	7.1	326	8		188	5048
10-Jan-96	49	448	3.490	6.7	343	7		175	5081
16-Jan-96	50	454	2.410	6.9	528			163	5103
23-Jan-96	51	461	4.760	6.9	415	9		**150**	5142
31-Jan-96	52	469	2.860	6.5	340			146	5165
8-Feb-96	53	477	2.860	6.5	340			142	5187
13-Feb-96	54	482	4.740	6.5	414			138	5223
20-Feb-96	55	489	2.790	6.5	410			134	5244
27-Feb-96	56	496	4.680	6.9	360	5		**130**	5277
5-Mar-96	57	503	2.840	6.6	350			130	5298
11-Mar-96	58	509	2.640	5.7	206			130	5316
18-Mar-96	59	516	3.160	6.3	342			**130**	5339
25-Mar-96	60	523	3.640	6.1	354			138	5366
2-Apr-96	61	531	2.840	5.4	319			145	5389
9-Apr-96	62	538	3.820	5.3	334			153	5421
16-Apr-96	63	545	4.260	3.1	414			**160**	5459
29-Apr-96	64	558	3.910	5.8	392			158	5492
7-May-96	65	566	4.260	6.2	453			155	5529
13-May-96	66	572	3.260	5.9	346			153	5556
21-May-96	67	580	4.420	6.0	367			**150**	5592
28-May-96	68	587	2.400	6.6	577			155	5613
3-Jun-96	69	593	4.020	4.9	332			160	5648
10-Jun-96	70	600	3.800	5.0	398			165	5683
17-Jun-96	71	607	3.640	5.0	396			**170**	5717
24-Jun-96	72	614	3.960	4.9	396			197	5759
1-Jul-96	73	621	3.910	5.7	449			223	5807
8-Jul-96	74	628	3.800	5.8	478			250	5860
15-Jul-96	75	635	3.750	5.4	449			277	5917
22-Jul-96	76	642	0.000						
30-Jul-96	77	650	1.660	6.1	779			**330**	5947
5-Aug-96	78	656	0.000						
12-Aug-96	79	663	3.280	5.7	1192			345	6009
19-Aug-96	80	670	2.670	6.3	852			353	6061
29-Aug-96	81	680	1.960	6.8	632	6		**360**	6099
2-Sep-96	82	684	0.000						
9-Sep-96	83	691	0.000						
19-Sep-96	84	701	1.300	5.9	1100			522	6137
23-Sep-96	85	705	0.000						
1-Oct-96	86	713	4.160	5.5	688	20		**630**	6281
7-Oct-96	87	719	3.320	6.0	726			513	6374
17-Oct-96	88	729	3.700	5.4	726			397	6455
24-Oct-96	89	736	4.210	5.9	687	7		**280**	6520
1-Nov-96	90	744	3.760	6.1	688				
7-Nov-96	91	750	3.900	6.2	725				
18-Nov-96	92	761	0.000						
21-Nov-96	93	764	3.360	6.5	1111				
25-Nov-96	94	768	0.000						
6-Dec-96	95	779	4.500	5.9	1401				
9-Dec-96	96	782	0.000						
20-Dec-96	97	793	4.160	6.2	1322				

* saturated conditions

** Measured values of sulfate shown in bold

Appendix 3.5-35 Table 4

Leachate Analysis
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	0.41	0.037	0.26	0.006	270	0.500	0.026	0.08	2.8	0.39	26	0.79	8.1	0.035	57	0.87
2 *	91	0.45	0.039	0.21	< 0.005	340	0.026	0.030	0.26	2.8	0.26	24	1.2	8.8	0.038	53	0.80
3	125	0.035	0.021	0.077	< 0.005	330	< 0.005	0.021	0.039	0.12	< 0.040	31	1.6	9.3	0.037	46	0.59
4	132	0.063	0.016	0.045	0.005	210	< 0.005	0.014	0.032	0.22	< 0.040	21	1.0	6.1	0.028	28	0.70
5	139	0.05	0.012	0.04	0.005	175	0.005	0.01	0.03	0.14	0.08	18.0	1.0	5.1	0.022	22.0	1.00
6	145	0.042	0.007	0.035	< 0.005	140	< 0.005	< 0.010	0.022	0.069	0.12	15	0.97	4.1	0.015	16	1.3
7	153	0.06	0.019	0.04	0.005	150	0.011	0.01	0.03	0.21	0.14	18.5	1.6	4.5	0.019	15.3	1.63
8	160	0.08	0.030	0.04	0.006	160	0.016	0.01	0.03	0.35	0.17	22.0	2.1	4.9	0.022	14.5	1.95
9	167	0.10	0.042	0.04	0.006	170	0.022	0.01	0.03	0.50	0.19	25.5	2.7	5.3	0.026	13.8	2.28
10	174	0.12	0.053	0.045	0.006	180	0.027	0.016	0.039	0.64	0.21	29	3.3	5.7	0.029	13	2.6
11	181	0.12	0.048	0.04	0.006	175	0.025	0.02	0.04	0.68	0.20	29.9	3.3	5.4	0.027	12.0	2.7
12	188	0.12	0.044	0.04	0.007	170	0.023	0.02	0.04	0.72	0.19	30.8	3.2	5.1	0.024	11.0	2.9
13	195	0.12	0.039	0.04	0.007	165	0.021	0.02	0.04	0.75	0.18	31.6	3.2	4.7	0.022	9.9	3.0
14	203	0.12	0.034	0.04	0.007	160	0.019	0.02	0.04	0.79	0.17	32.5	3.1	4.4	0.019	8.9	3.1
15	210	0.12	0.029	0.03	0.007	155	0.016	0.02	0.04	0.83	0.15	33.4	3.1	4.1	0.017	7.9	3.2
16	216	0.12	0.025	0.03	0.008	150	0.014	0.03	0.04	0.87	0.14	34.3	3.0	3.8	0.014	6.9	3.4
17	224	0.12	0.020	0.03	0.008	145	0.012	0.03	0.05	0.90	0.13	35.1	3.0	3.4	0.012	5.8	3.5
18	230	0.12	0.015	0.028	0.008	140	0.010	0.029	0.046	0.94	0.12	36	2.9	3.1	0.009	4.8	3.6
19	236	0.12	0.015	0.03	0.000	138	0.010	0.03	0.04	0.90	0.11	35.4	0.5	3.0	0.009	4.6	3.5
20	244	0.11	0.014	0.03	0.000	136	0.010	0.03	0.04	0.86	0.11	34.9	0.4	2.9	0.009	4.5	3.3
21	251	0.11	0.014	0.03	0.001	134	0.009	0.03	0.04	0.82	0.10	34.3	0.3	2.8	0.008	4.3	3.2
22	259	0.11	0.013	0.03	0.001	132	0.009	0.03	0.04	0.78	0.10	33.7	0.2	2.6	0.008	4.2	3.1
23	265	0.10	0.013	0.03	0.001	130	0.009	0.02	0.04	0.74	0.09	33.1	0.1	2.5	0.008	4.0	3.0
24	271																
25	279	0.09	0.012	0.03	0.002	126	0.008	0.02	0.04	0.66	0.08	32.0	2.2	2.3	0.008	3.7	2.7
26	286	0.09	0.011	0.03	0.002	124	0.008	0.02	0.03	0.62	0.08	31.4	2.1	2.2	0.007	3.5	2.6
27	293	0.09	0.011	0.03	0.002	122	0.008	0.02	0.03	0.57	0.07	30.9	2.0	2.1	0.007	3.4	2.4
28	300	0.08	0.010	0.02	0.002	120	0.008	0.02	0.03	0.53	0.07	30.3	1.9	2.0	0.007	3.2	2.3
29	307	0.08	0.010	0.02	0.003	118	0.007	0.02	0.03	0.49	0.06	29.7	1.8	1.9	0.007	3.1	2.2
30	316	0.08	0.009	0.02	0.003	116	0.007	0.02	0.03	0.45	0.05	29.1	1.7	1.7	0.007	2.9	2.1

Appendix 3.5-35 Table 4 (Continued)

| CYCLE | DAYS | LEACHATE ANALYSIS (mg/L) ** | | |

Appendix 3.5-35 Table 4 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
71	607					45						17					
72	614					54						21					
73	621					63						25					
74	628					73						29					
75	635					82						33					
76	642											37					
77	650					100						41					
78	656																
79	663					90						37					
80	670					85						35					
81	680					80						33					
82	684																
83	691											51					
84	701					116						60					
85	705											69					
86	713					140						78					
87	719					122						63					
88	729					103						49					
89	736					85						34					

* saturated conditions

Appendix 3.5-35 Table 5

Cumulative Mass Flux
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.24	-0.003	0.059	0.001	-7.2	0.110	0.00	0.004	0.59	0.030	6.4	0.194	-0.54	-0.062	6.7	0.11
2 *	91	-0.48	-0.018	0.11	0.003	3.0	0.102	-0.01	0.05	1.18	0.03	12.3	0.5	-0.91	-0.12	12.4	0.19
3	125	-0.470	-0.012	0.129	0.004	97	0.104	0.000	0.064	1.22	0.04	21.1	0.9	1.74	-0.113	25.5	0.4
4	132	-0.454	-0.008	0.139	0.005	148	0.105	0.003	0.072	1.27	0.05	26.2	1.2	3.22	-0.107	32.3	0.5
5	139	-0.445	-0.006	0.147	0.006	181	0.106	0.005	0.077	1.30	0.06	29.6	1.4	4.17	-0.103	36.4	0.7
6	145	-0.433	-0.004	0.157	0.008	219	0.107	0.008	0.083	1.32	0.10	33.7	1.6	5.30	-0.098	40.8	1.1
7	153	-0.422	-0.001	0.163	0.009	247	0.109	0.010	0.088	1.35	0.12	37.1	1.9	6.12	-0.095	43.6	1.4
8	160	-0.405	0.005	0.172	0.010	280	0.113	0.013	0.094	1.43	0.16	41.7	2.4	7.14	-0.090	46.6	1.8
9	167	-0.384	0.014	0.180	0.011	315	0.117	0.016	0.101	1.53	0.19	46.9	2.9	8.22	-0.085	49.4	2.2
10	174	-0.334	0.036	0.199	0.013	390	0.128	0.022	0.117	1.80	0.28	59.0	4.3	10.61	-0.073	54.8	3.3
11	181	-0.312	0.045	0.207	0.015	423	0.133	0.026	0.125	1.93	0.32	64.7	4.9	11.63	-0.068	57.1	3.8
12	188	-0.289	0.053	0.215	0.016	455	0.137	0.029	0.133	2.06	0.36	70.4	5.5	12.56	-0.064	59.1	4.4
13	195	-0.265	0.061	0.223	0.017	487	0.141	0.033	0.141	2.21	0.39	76.6	6.1	13.50	-0.059	61.1	5.0
14	203	-0.240	0.068	0.230	0.019	522	0.145	0.038	0.150	2.38	0.43	83.6	6.8	14.44	-0.055	63.0	5.6
15	210	-0.214	0.074	0.238	0.020	555	0.149	0.043	0.159	2.55	0.46	90.8	7.5	15.32	-0.052	64.7	6.3
16	216	-0.190	0.079	0.244	0.022	585	0.152	0.049	0.168	2.72	0.49	97.5	8.0	16.06	-0.049	66.1	7.0
17	224	-0.165	0.083	0.250	0.023	615	0.154	0.054	0.177	2.91	0.51	104.8	8.7	16.77	-0.047	67.3	7.7
18	230	-0.140	0.086	0.256	0.025	644	0.156	0.060	0.187	3.11	0.54	112.4	9.3	17.42	-0.045	68.3	8.5
19	236	-0.107	0.091	0.264	0.025	683	0.159	0.068	0.200	3.36	0.57	122.4	9.4	18.26	-0.042	69.6	9.4
20	244	-0.089	0.093	0.268	0.025	705	0.160	0.073	0.207	3.50	0.59	128.1	9.5	18.73	-0.041	70.3	10.0
21	251	-0.064	0.096	0.275	0.025	736	0.163	0.079	0.216	3.69	0.61	136.0	9.6	19.37	-0.039	71.3	10.7
22	259	-0.037	0.099	0.281	0.025	770	0.165	0.085	0.226	3.89	0.64	144.5	9.6	20.04	-0.037	72.4	11.5
23	265	-0.021	0.101	0.286	0.026	790	0.166	0.089	0.232	4.01	0.65	149.8	9.6	20.44	-0.035	73.0	12.0
24	271	-0.021	0.101	0.286	0.026	790	0.166	0.089	0.232	4.01	0.65	149.8	9.6	20.44	-0.035	73.0	12.0
25	279	0.005	0.104	0.293	0.026	825	0.169	0.095	0.242	4.19	0.68	158.5	10.2	21.07	-0.033	74.0	12.7
26	286	0.016	0.106	0.296	0.026	840	0.170	0.098	0.246	4.26	0.68	162.4	10.5	21.34	-0.032	74.5	13.0
27	293	0.033	0.108	0.301	0.027	864	0.171	0.102	0.252	4.37	0.70	168.5	10.9	21.75	-0.031	75.1	13.5
28	300	0.052	0.110	0.306	0.027	891	0.173	0.107	0.259	4.50	0.71	175.3	11.3	22.20	-0.029	75.9	14.0

Appendix 3.5-35 Table 5 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	0.067	0.112	0.311	0.028	913	0.174	0.110	0.265	4.59	0.72	180.8	11.6	22.54	-0.028	76.4	14.4
30	316	0.084	0.114	0.316	0.028	940	0.176	0.114	0.271	4.69	0.74	187.7	12.0	22.95	-0.027	77.1	14.9
31	322	0.102	0.116	0.322	0.029	967	0.178	0.118	0.278	4.79	0.75	194.5	12.4	23.34	-0.025	77.8	15.4
32	328	0.112	0.118	0.326	0.030	984	0.179	0.121	0.281	4.85	0.76	198.7	12.6	23.56	-0.024	78.2	15.7
33	335	0.128	0.120	0.331	0.031	1012	0.180	0.125	0.287	4.93	0.77	205.5	12.9	23.91	-0.023	78.8	16.1
34	342	0.138	0.121	0.335	0.031	1028	0.181	0.127	0.290	4.98	0.77	209.7	13.1	24.11	-0.022	79.1	16.3
35	349	0.153	0.123	0.341	0.032	1056	0.183	0.131	0.296	5.04	0.78	216.6	13.4	24.42	-0.020	79.7	16.7
36	356	0.162	0.124	0.344	0.033	1073	0.184	0.133	0.299	5.08	0.78	220.9	13.6	24.59	-0.019	80.0	16.9
37	363	0.170	0.125	0.348	0.034	1090	0.185	0.135	0.302	5.10	0.78	225.0	13.8	24.75	-0.018	80.3	17.1
38	370	0.181	0.126	0.353	0.035	1114	0.186	0.137	0.305	5.13	0.79	230.8	14.0	24.95	-0.017	80.7	17.3
39	377	0.188	0.127	0.357	0.036	1130	0.187	0.139	0.308	5.15	0.79	234.9	14.1	25.07	-0.016	81.0	17.5
40	384					1148						239.4					
41	391					1148						239.4					
42	398					1165						243.7					
43	405					1173						246.0					
44	412					1187						249.7					
45	419					1198						252.7					
46	426					1204						254.2					
47	434					1219						258.2					
48	441					1227						260.6					
49	448					1236						263.0					
50	454					1242						264.6					
51	461					1253						267.7					
52	469					1260						269.5					
53	477					1266						271.3					
54	482					1277						274.3					
55	489					1283						276.0					
56	496					1293						278.8					
57	503					1299						280.6					
58	509					1305						282.3					
59	516					1311						284.4					
60	523					1319						286.9					
61	531					1326						289.0					
62	538					1335						292.0					
63	545					1345						295.5					
64	558					1355						298.7					
65	566					1365						302.1					
66	572					1373						304.7					

Appendix 3.5-35 Table 5 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					1383						308.1					
68	587					1389						310.0					
69	593					1399						313.4					
70	600					1408						316.8					
71	607					1417						320.2					
72	614					1429						324.8					
73	621					1442						330.2					
74	628					1458						336.2					
75	635					1474						343.0					
76	642					1474						343.0					
77	650					1483						346.8					
78	656					1483						346.8					
79	663					1500						353.4					
80	670					1512						358.6					
81	680					1521						362.1					
82	684					1521						362.1					
83	691					1521						362.1					
84	701					1529						366.4					
85	705					1529						366.4					
86	713					1561						384.2					
87	719					1583						395.8					
88	729					1604						405.7					
89	736					1624						413.5					

* saturated conditions

Appendix 3.5-35 Table 6

Cumulative Metal Extractions
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.0005	0.000	0.099	0.004	-0.1	0.052	-0.007	0.000	0.000	0.000	0.031	0.03	-0.004	-0.208	0.247	0.001
2 *	91	-0.0010	-0.001	0.178	0.007	0.0	0.049	-0.012	0.004	0.001	0.000	0.060	0.07	-0.007	-0.413	0.458	0.002
3	125	-0.0010	-0.001	0.214	0.010	1.1	0.049	-0.001	0.005	0.001	0.001	0.103	0.14	0.013	-0.378	0.945	0.003
4	132	-0.0009	0.000	0.232	0.013	1.7	0.050	0.005	0.005	0.001	0.001	0.128	0.18	0.025	-0.355	1.196	0.005
5	139	-0.0009	0.000	0.245	0.016	2.1	0.050	0.009	0.005	0.001	0.001	0.144	0.20	0.032	-0.342	1.347	0.006
6	145	-0.0009	0.000	0.261	0.019	2.6	0.051	0.014	0.006	0.001	0.002	0.165	0.24	0.040	-0.328	1.511	0.010
7	153	-0.0009	0.000	0.272	0.021	2.9	0.052	0.018	0.006	0.001	0.002	0.181	0.29	0.047	-0.317	1.614	0.012
8	160	-0.0008	0.000	0.286	0.024	3.3	0.054	0.023	0.007	0.001	0.002	0.203	0.35	0.055	-0.301	1.726	0.016
9	167	-0.0008	0.001	0.301	0.027	3.7	0.056	0.029	0.007	0.001	0.003	0.229	0.44	0.063	-0.284	1.830	0.020
10	174	-0.0007	0.002	0.332	0.033	4.5	0.061	0.041	0.008	0.001	0.004	0.288	0.64	0.081	-0.244	2.031	0.030
11	181	-0.0006	0.002	0.346	0.036	4.9	0.063	0.047	0.009	0.001	0.005	0.315	0.73	0.089	-0.227	2.115	0.034
12	188	-0.0006	0.002	0.358	0.039	5.3	0.065	0.053	0.009	0.001	0.006	0.343	0.82	0.096	-0.212	2.191	0.039
13	195	-0.0005	0.003	0.371	0.043	5.7	0.067	0.061	0.010	0.001	0.006	0.374	0.92	0.103	-0.198	2.263	0.044
14	203	-0.0005	0.003	0.384	0.047	6.1	0.069	0.070	0.011	0.001	0.007	0.408	1.01	0.110	-0.184	2.334	0.050
15	210	-0.0004	0.003	0.396	0.050	6.5	0.071	0.079	0.011	0.001	0.007	0.443	1.11	0.117	-0.172	2.397	0.056
16	216	-0.0004	0.003	0.407	0.054	6.8	0.072	0.088	0.012	0.002	0.008	0.476	1.20	0.123	-0.163	2.447	0.062
17	224	-0.0003	0.004	0.417	0.058	7.1	0.073	0.099	0.013	0.002	0.008	0.511	1.29	0.128	-0.155	2.492	0.069
18	230	-0.0003	0.004	0.427	0.062	7.5	0.074	0.110	0.013	0.002	0.009	0.548	1.38	0.133	-0.149	2.529	0.076
19	236	-0.0002	0.004	0.440	0.063	7.9	0.076	0.124	0.014	0.002	0.009	0.597	1.41	0.139	-0.141	2.577	0.084
20	244	-0.0002	0.004	0.447	0.063	8.2	0.076	0.132	0.015	0.002	0.009	0.625	1.42	0.143	-0.136	2.604	0.089
21	251	-0.0001	0.004	0.458	0.063	8.6	0.077	0.143	0.015	0.002	0.010	0.664	1.43	0.148	-0.129	2.642	0.096
22	259	-0.0001	0.004	0.469	0.064	8.9	0.079	0.155	0.016	0.002	0.010	0.705	1.43	0.153	-0.123	2.681	0.103
23	265	0.0000	0.004	0.476	0.064	9.2	0.079	0.162	0.017	0.002	0.010	0.731	1.44	0.156	-0.118	2.704	0.107
24	271	0.0000	0.004	0.476	0.064	9.2	0.079	0.162	0.017	0.002	0.010	0.731	1.44	0.156	-0.118	2.704	0.107
25	279	0.0000	0.005	0.488	0.065	9.6	0.080	0.173	0.017	0.002	0.011	0.773	1.53	0.161	-0.111	2.742	0.114
26	286	0.0000	0.005	0.493	0.066	9.8	0.081	0.178	0.018	0.002	0.011	0.792	1.56	0.163	-0.108	2.758	0.116
27	293	0.0001	0.005	0.501	0.067	10.0	0.081	0.186	0.018	0.002	0.011	0.822	1.62	0.166	-0.104	2.782	0.121
28	300	0.0001	0.005	0.511	0.068	10.4	0.082	0.194	0.019	0.003	0.011	0.855	1.68	0.169	-0.098	2.810	0.125

Appendix 3.5-35 Table 6 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	0.0001	0.005	0.518	0.070	10.6	0.083	0.200	0.019	0.003	0.012	0.882	1.73	0.172	-0.094	2.831	0.129
30	316	0.0002	0.005	0.527	0.071	10.9	0.084	0.208	0.019	0.003	0.012	0.915	1.79	0.175	-0.089	2.856	0.133
31	322	0.0002	0.005	0.537	0.073	11.2	0.085	0.215	0.020	0.003	0.012	0.949	1.85	0.178	-0.083	2.880	0.137
32	328	0.0002	0.005	0.543	0.074	11.4	0.085	0.220	0.020	0.003	0.012	0.969	1.88	0.180	-0.080	2.895	0.140
33	335	0.0003	0.005	0.552	0.077	11.8	0.086	0.227	0.021	0.003	0.012	1.003	1.93	0.183	-0.075	2.917	0.144
34	342	0.0003	0.005	0.558	0.078	12.0	0.086	0.231	0.021	0.003	0.012	1.023	1.96	0.184	-0.072	2.930	0.146
35	349	0.0003	0.005	0.568	0.081	12.3	0.087	0.237	0.021	0.003	0.012	1.057	2.00	0.186	-0.067	2.951	0.149
36	356	0.0003	0.005	0.574	0.082	12.5	0.087	0.241	0.021	0.003	0.012	1.077	2.03	0.188	-0.064	2.963	0.151
37	363	0.0003	0.005	0.580	0.084	12.7	0.088	0.245	0.022	0.003	0.012	1.097	2.05	0.189	-0.061	2.974	0.153
38	370	0.0004	0.005	0.588	0.087	13.0	0.088	0.249	0.022	0.003	0.012	1.126	2.08	0.190	-0.057	2.989	0.155
39	377	0.0004	0.006	0.594	0.089	13.1	0.089	0.253	0.022	0.003	0.013	1.146	2.10	0.191	-0.054	2.998	0.156
40	384					13.4						1.168					
41	391					13.4						1.168					
42	398					13.5						1.189					
43	405					13.6						1.200					
44	412					13.8						1.218					
45	419					13.9						1.233					
46	426					14.0						1.240					
47	434					14.2						1.260					
48	441					14.3						1.271					
49	448					14.4						1.283					
50	454					14.4						1.291					
51	461					14.6						1.306					
52	469					14.6						1.315					
53	477					14.7						1.324					
54	482					14.8						1.338					
55	489					14.9						1.346					
56	496					15.0						1.360					
57	503					15.1						1.369					
58	509					15.2						1.377					
59	516					15.2						1.387					
60	523					15.3						1.400					
61	531					15.4						1.410					
62	538					15.5						1.425					
63	545					15.6						1.442					
64	558					15.8						1.457					
65	566					15.9						1.474					
66	572					16.0						1.486					

Appendix 3.5-35 Table 6 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					16.1						1.503					
68	587					16.2						1.512					
69	593					16.3						1.529					
70	600					16.4						1.545					
71	607					16.5						1.562					
72	614					16.6						1.584					
73	621					16.8						1.611					
74	628					16.9						1.640					
75	635					17.1						1.673					
76	642					17.1						1.673					
77	650					17.2						1.691					
78	656					17.2						1.691					
79	663					17.4						1.724					
80	670					17.6						1.749					
81	680					17.7						1.766					
82	684					17.7						1.766					
83	691					17.7						1.766					
84	701					17.8						1.787					
85	705					17.8						1.787					
86	713					18.2						1.874					
87	719					18.4						1.931					
88	729					18.7						1.979					
89	736					18.9						2.017					

* saturated conditions

Appendix 3.5-35 Table 7

Metal Extraction Rates
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56																
2 *	91	-0.047	-0.003	0.009	0.000	2.03	-0.0015	-0.001	0.010	0.12	0.000	1.18	0.06	-0.07	-0.012	1.14	0.02
3	125	-0.023	-0.001	0.007	0.000	10.59	-0.0006	0.000	0.006	0.06	0.001	1.50	0.08	0.23	-0.005	1.91	0.03
4	132	-0.019	0.000	0.007	0.000	14.32	-0.0004	0.001	0.006	0.06	0.002	1.83	0.09	0.35	-0.004	2.36	0.04
5	139	-0.017	0.000	0.007	0.000	15.83	-0.0003	0.001	0.006	0.06	0.003	1.95	0.10	0.40	-0.003	2.50	0.05
6	145	-0.015	0.000	0.008	0.000	17.82	-0.0002	0.001	0.006	0.06	0.005	2.15	0.11	0.46	-0.003	2.68	0.08
7	153	0.007	0.002	0.006	0.001	27.53	0.0008	0.002	0.004	0.02	0.011	2.80	0.16	0.79	0.003	3.53	0.13
8	160	0.013	0.004	0.009	0.001	36.55	0.0018	0.003	0.006	0.04	0.024	4.11	0.28	1.08	0.005	4.22	0.28
9	167	0.014	0.004	0.008	0.001	33.30	0.0024	0.003	0.006	0.05	0.029	4.13	0.35	1.00	0.004	3.42	0.34
10	174	0.022	0.008	0.010	0.001	41.89	0.0045	0.003	0.008	0.10	0.044	5.89	0.59	1.29	0.006	3.70	0.52
11	181	0.024	0.010	0.010	0.001	39.62	0.0050	0.003	0.008	0.12	0.044	6.02	0.64	1.23	0.006	3.17	0.54
12	188	0.027	0.011	0.010	0.001	41.60	0.0056	0.004	0.009	0.14	0.047	6.66	0.72	1.29	0.006	3.11	0.60
13	195	0.028	0.011	0.010	0.001	41.48	0.0057	0.004	0.009	0.16	0.047	6.99	0.75	1.27	0.006	2.90	0.64
14	203	0.028	0.011	0.010	0.002	40.24	0.0055	0.004	0.009	0.16	0.045	7.14	0.75	1.21	0.006	2.65	0.66
15	210	0.023	0.007	0.007	0.001	32.06	0.0040	0.004	0.008	0.15	0.034	6.17	0.61	0.92	0.004	1.92	0.58
16	216	0.024	0.007	0.007	0.001	32.28	0.0037	0.005	0.009	0.16	0.033	6.57	0.63	0.89	0.004	1.79	0.63
17	224	0.024	0.006	0.007	0.001	31.10	0.0033	0.005	0.009	0.17	0.031	6.70	0.61	0.82	0.003	1.58	0.65
18	230	0.025	0.005	0.007	0.002	31.36	0.0030	0.005	0.009	0.18	0.030	7.16	0.63	0.78	0.003	1.43	0.70
19	236	0.028	0.005	0.007	0.001	34.20	0.0029	0.006	0.011	0.21	0.031	8.22	0.55	0.81	0.003	1.39	0.81
20	244	0.026	0.004	0.006	0.001	30.94	0.0024	0.006	0.010	0.20	0.027	7.68	0.42	0.70	0.002	1.16	0.75
21	251	0.025	0.003	0.006	0.001	30.36	0.0022	0.006	0.010	0.19	0.025	7.70	0.30	0.66	0.002	1.05	0.75
22	259	0.026	0.003	0.006	0.000	30.98	0.0022	0.006	0.010	0.20	0.025	7.94	0.19	0.65	0.002	1.02	0.76
23	265	0.024	0.003	0.006	0.000	29.22	0.0020	0.006	0.009	0.18	0.023	7.48	0.07	0.60	0.002	0.95	0.70
24	271	0.017															
25	279	0.019	0.002	0.005	0.000	23.90	0.0016	0.005	0.007	0.14	0.017	6.09	0.15	0.47	0.001	0.74	0.55
26	286	0.016	0.002	0.004	0.000	20.68	0.0014	0.004	0.006	0.11	0.014	5.26	0.18	0.39	0.001	0.63	0.46
27	293	0.014	0.002	0.004	0.000	19.40	0.0013	0.003	0.005	0.10	0.012	4.93	0.26	0.35	0.001	0.57	0.41
28	300	0.015	0.002	0.004	0.000	20.17	0.0013	0.003	0.005	0.10	0.012	5.11	0.33	0.35	0.001	0.57	0.41

Appendix 3.5-35 Table 7 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	0.017	0.002	0.005	0.000	23.83	0.0015	0.004	0.006	0.11	0.014	6.03	0.39	0.41	0.001	0.66	0.48
30	316	0.015	0.002	0.004	0.000	21.85	0.0014	0.004	0.006	0.10	0.012	5.51	0.34	0.35	0.001	0.58	0.42
31	322	0.017	0.002	0.005	0.001	24.82	0.0016	0.004	0.006	0.10	0.013	6.25	0.37	0.39	0.001	0.64	0.46
32	328	0.016	0.002	0.005	0.001	24.06	0.0015	0.004	0.006	0.09	0.011	6.05	0.35	0.36	0.001	0.61	0.43
33	335	0.015	0.002	0.005	0.001	24.09	0.0015	0.004	0.006	0.09	0.010	6.04	0.33	0.34	0.001	0.58	0.41
34	342	0.014	0.002	0.005	0.001	23.09	0.0014	0.003	0.005	0.08	0.009	5.77	0.30	0.31	0.001	0.54	0.38
35	349	0.015	0.002	0.005	0.001	24.66	0.0014	0.003	0.005	0.07	0.009	6.15	0.30	0.31	0.001	0.55	0.38
36	356	0.012	0.001	0.005	0.001	21.81	0.0012	0.003	0.004	0.06	0.007	5.42	0.25	0.26	0.001	0.46	0.31
37	363	0.012	0.001	0.004	0.001	21.20	0.0012	0.003	0.004	0.05	0.006	5.26	0.23	0.24	0.001	0.43	0.29
38	370	0.011	0.001	0.004	0.001	20.43	0.0011	0.002	0.004	0.04	0.004	5.05	0.20	0.21	0.001	0.39	0.25
39	377	0.010	0.001	0.004	0.001	20.42	0.0011	0.002	0.003	0.03	0.003	5.04	0.19	0.19	0.001	0.37	0.24
40	384					18.40						4.54					
41	391																
42	398					14.97						3.74					
43	405					11.93						3.04					
44	412					11.35						2.96					
45	419					10.02						2.67					
46	426					11.14						2.98					
47	434					10.46						2.83					
48	441					10.50						2.85					
49	448					9.49						2.59					
50	454					8.66						2.37					
51	461					9.80						2.69					
52	469					8.19						2.26					
53	477					7.55						2.09					
54	482					8.41						2.33					
55	489					8.22						2.29					
56	496					7.97						2.23					
57	503					8.08						2.28					
58	509					8.38						2.40					
59	516					7.07						2.08					
60	523					7.45						2.25					
61	531					6.52						2.04					
62	538					7.13						2.28					
63	545					7.90						2.57					
64	558					7.27						2.39					
65	566					7.48						2.47					
66	572					8.07						2.67					

Appendix 3.5-35 Table 7 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					8.10						2.67					
68	587					7.30						2.41					
69	593					8.80						2.94					
70	600					8.85						3.03					
71	607					8.84						3.11					
72	614					9.37						3.44					
73	621					10.99						4.15					
74	628					11.76						4.56					
75	635					13.27						5.24					
76	642																
77	650					10.63						4.27					
78	656																
79	663					8.43						3.44					
80	670					7.56						3.11					
81	680					8.55						3.52					
82	684																
83	691																
84	701					5.41						2.39					
85	705																
86	713					8.55						4.69					
87	719					12.50						6.73					
88	729					15.38						8.02					
89	736					18.97						9.43					

* saturated conditions

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 8

Oxidation and Neutralization Results
Fine Tailings (RS-18)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1 **	56	-119	-0.01		-1.24	-0.18	0.26	-0.07	8		0.0
2 **	91	484	0.05	120.7	6.28	0.25	0.24	0.08	58	9.9	0.2
3	125	724	0.08	85.6	2.50	2.36	0.36	1.09	330	32.6	1.1
4	132	848	0.09	89.1	1.29	1.28	0.21	1.15	479	43.3	1.6
5	139	929	0.10	88.4	0.85	0.81	0.14	1.12	573	47.6	1.9
6	145	1032	0.11	90.5	1.07	0.97	0.17	1.07	687	53.4	2.3
7	153	1120	0.12	71.8	0.92	0.68	0.14	0.89	770	80.3	2.6
8	160	1245	0.14	104.2	1.30	0.83	0.19	0.78	872	108.3	2.9
9	167	1391	0.15	108.6	1.52	0.87	0.21	0.71	980	100.2	3.3
10	174	1738	0.19	161.8	3.62	1.88	0.50	0.66	1218	129.0	4.1
11	181	1887	0.20	166.4	1.55	0.83	0.23	0.68	1324	123.8	4.4
12	188	2026	0.22	181.1	1.44	0.79	0.24	0.71	1427	131.4	4.8
13	195	2164	0.24	184.0	1.45	0.82	0.26	0.74	1534	132.5	5.1
14	203	2306	0.25	177.9	1.47	0.86	0.29	0.78	1648	130.0	5.5
15	210	2438	0.26	136.2	1.38	0.83	0.29	0.82	1761	105.6	5.9
16	216	2552	0.28	133.0	1.18	0.74	0.28	0.86	1863	107.7	6.2
17	224	2663	0.29	123.9	1.15	0.75	0.30	0.91	1968	105.3	6.6
18	230	2766	0.30	120.3	1.08	0.74	0.31	0.98	2073	107.9	6.9
19	236	2903	0.32	126.7	1.43	0.97	0.41	0.96	2211	119.3	7.4
20	244	2984	0.32	112.3	0.84	0.56	0.23	0.95	2290	108.9	7.6
21	251	3098	0.34	109.1	1.19	0.78	0.33	0.93	2401	107.6	8.0
22	259	3221	0.35	111.7	1.28	0.83	0.35	0.92	2519	110.1	8.4
23	265	3299	0.36	106.6	0.81	0.52	0.22	0.90	2592	103.8	8.6
24	271										
25	279	3433	0.37	89.8	0.69	0.86	0.36	1.76	2714	84.8	9.0

Appendix 3.5-35 Table 8 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	286	3492	0.38	78.9	0.62	0.38	0.16	0.86	2768	73.4	9.2
27	293	3589	0.39	75.8	1.01	0.60	0.25	0.85	2853	68.8	9.5
28	300	3700	0.40	80.3	1.16	0.68	0.28	0.83	2949	71.4	9.8
29	307	3791	0.41	737.1	0.94	0.54	0.23	0.82	3026	84.4	10.1
30	316	3906	0.42	89.5	1.20	0.68	0.28	0.80	3123	77.3	10.4
31	322	4023	0.44	103.2	1.22	0.68	0.28	0.79	3219	87.8	10.7
32	328	4096	0.44	101.4	0.76	0.42	0.17	0.77	3278	85.0	10.9
33	335	4223	0.46	104.6	1.33	0.69	0.28	0.73	3375	85.1	11.2
34	342	4306	0.47	103.0	0.86	0.42	0.17	0.69	3434	81.5	11.4
35	349	4401	0.48	105.0	0.99	0.70	0.29	1.00	3532	86.9	11.8
36	356	4457	0.48	89.2	0.58	0.43	0.17	1.03	3592	76.9	12.0
37	363	4540	0.49	88.8	0.87	0.42	0.17	0.67	3651	74.6	12.2
38	370	4653	0.51	86.0	1.18	0.59	0.24	0.70	3734	71.9	12.4
39	377	4706	0.51	80.1	0.55	0.42	0.17	1.06	3793	71.8	12.6
40	384	4754	0.52	70.6	0.50	0.45	0.185	1.27	3856	64.7	12.9
41	391										
42	398	4794	0.52	50.9	0.21	0.41	0.178	2.77	3976	65.0	13.3
43	405	4820	0.52	33.4	0.27	0.21	0.09	1.13	4007	54.6	13.4
44	412	4871	0.53	32.9	0.52	0.34	0.15	0.95	4056	52.8	13.5
45	419	4924	0.53	33.9	0.55	0.28	0.13	0.74	4097	48.3	13.7
46	426	4949	0.54	35.0	0.26	0.14	0.06	0.77	4118	40.1	13.7
47	434	5012	0.54	42.3	0.66	0.37	0.16	0.81	4171	37.8	13.9
48	441	5048	0.55	44.2	0.37	0.22	0.10	0.85	4202	38.0	14.0
49	448	5081	0.55	41.0	0.35	0.21	0.10	0.89	4233	34.4	14.1
50	454	5103	0.55	35.8	0.22	0.15	0.07	0.94	4254	31.4	14.2
51	461	5142	0.56	38.6	0.41	0.28	0.13	1.00	4295	35.6	14.3
52	469	5165	0.56	30.6	0.24	0.17	0.08	1.01	4320	29.8	14.4
53	477	5187	0.56	27.1	0.23	0.16	0.07	1.02	4343	27.5	14.5
54	482	5223	0.57	29.2	0.37	0.26	0.12	1.03	4382	30.6	14.6
55	489	5244	0.57	28.2	0.21	0.15	0.07	1.04	4404	30.0	14.7
56	496	5277	0.57	27.0	0.35	0.25	0.12	1.05	4441	29.1	14.8
57	503	5298	0.58	27.3	0.21	0.15	0.07	1.06	4463	29.6	14.9
58	509	5316	0.58	28.2	0.20	0.14	0.07	1.06	4484	30.8	14.9
59	516	5339	0.58	23.8	0.24	0.16	0.09	1.07	4509	26.2	15.0
60	523	5366	0.58	25.3	0.29	0.20	0.10	1.06	4540	27.9	15.1

Appendix 3.5-35 Table 8 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	531	5389	0.59	22.4	0.24	0.16	0.09	1.05	4564	24.7	15.2
62	538	5421	0.59	24.7	0.33	0.23	0.12	1.05	4599	27.2	15.3
63	545	5459	0.59	27.6	0.39	0.26	0.14	1.05	4640	30.3	15.5
64	558	5492	0.60	25.6	0.35	0.24	0.13	1.05	4677	28.0	15.6
65	566	5529	0.60	26.4	0.38	0.26	0.14	1.05	4717	28.9	15.7
66	572	5556	0.60	28.5	0.28	0.19	0.11	1.05	4747	31.1	15.8
67	580	5592	0.61	28.6	0.38	0.26	0.14	1.06	4787	31.3	16.0
68	587	5613	0.61	25.7	0.21	0.14	0.08	1.05	4809	28.2	16.0
69	593	5648	0.61	31.2	0.37	0.24	0.14	1.04	4848	34.1	16.2
70	600	5683	0.62	31.7	0.36	0.23	0.14	1.04	4885	34.6	16.3
71	607	5717	0.62	32.1	0.35	0.23	0.14	1.03	4921	34.9	16.4
72	614	5759	0.63	34.4	0.45	0.29	0.19	1.08	4970	37.6	16.6
73	621	5807	0.63	40.1	0.50	0.34	0.22	1.12	5026	44.6	16.8
74	628	5860	0.64	42.3	0.54	0.38	0.25	1.15	5089	48.2	17.0
75	635	5917	0.64	46.8	0.59	0.42	0.28	1.18	5159	54.7	17.2
76	642										
77	650	5947	0.65	36.4	0.14	0.23	0.15	2.68	5252	54.9	17.5
78	656										
79	663	6009	0.65	29.9	0.32	0.41	0.27	2.11	5373	56.8	17.9
80	670	6061	0.66	28.8	0.54	0.31	0.21	0.97	5425	53.3	18.1
81	680	6099	0.66	30.6	0.40	0.22	0.15	0.90	5461	45.6	18.2
82	684										
83	691										
84	701	6137	0.67	23.5	0.13	0.21	0.18	2.98	5575	37.2	18.6
85	705										
86	713	6281	0.68	38.5	0.75	0.80	0.73	2.06	5824	77.0	19.4
87	719	6374	0.69	52.5	0.98	0.55	0.48	1.06	5927	85.7	19.8
88	729	6455	0.70	60.9	0.84	0.53	0.41	1.11	6021	89.2	20.1
89	736	6520	0.71	76.6	0.67	0.49	0.32	1.21	6102	105.4	20.3

* Rates of sulfate production and NP depletion are 5-week moving averages

** Saturated conditions

Appendix 3.5-35 Tables 9-15. TMA Whole Tailings (RS-13) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.

Appendix 3.5-35 Table 9

Sample Characterization
Whole Tailings (RS-13) - Leached under saturated, followed by alternating wet/dry, conditions

Metals Analysis		Tails (ppm)	Process Water (mg/L)	
Aluminum	Al	30600	1.40	
Antimony	Sb	68	<0.1	
Arsenic	As	2500	<0.1	
Barium	Ba	54	0.0196	
Beryllium	Be	<50	<0.0006	
Bismuth	Bi	<20	<0.1	
Cadmium	Cd	28	<0.0002	
Calcium	Ca	6800	299	
Carbon	C	5000	NA	
Chromium	Cr	100	0.056	
Cobalt	Co	69	0.041	
Copper	Cu	860	0.063	
Gallium	Ga	16	NA	
Iron	Fe	232000	0.41	
Lead	Pb	4300	0.270	
Lithium	Li	NA	NA	
Magnesium	Mg	14900	0.15	
Manganese	Mn	580	0.0046	
Mercury	Hg	1.6	NA	
Molybdenum	Mo	<20	<0.04	
Nickel	Ni	22	0.006	
Phosphorus	P	NA	NA	
Potassium	K	7600	10.3	
Selenium	Se	35	0.287	
Silicon	Si	160000	NA	
Silver	Ag	22.2	0.003	
Sodium	Na	1600	30	
Strontium	Sr	NA	NA	
Thallium	Tl	14	<0.003	
Tin	Sn	24	<0.1	
Titanium	Ti	1400	<0.003	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	8100	0.445	
Sulfate	SO4	1900	1200	*
Sulfur	S	249000	NA	

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	22.70

* concentration estimated
Note: NA = Not Analyzed

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 10

Parameters Measured Weekly
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
14-Dec-94	1 *	56	3.400	6.8	3120	86		**1550**	52
18-Jan-95	2 *	91	4.500	7.2	3070	79		**1910**	193
21-Feb-95	3	125	4.320	7.4	3310	40		**1700**	517
28-Feb-95	4	132	4.200	7.5	2490	62		**1100**	720
7-Mar-95	5	139	3.380	7.7	1820	59		875	851
13-Mar-95	6	145	4.700	7.4	1440	51		**650**	985
21-Mar-95	7	153	3.520	7.5	1280	50		700	1094
28-Mar-95	8	160	3.520	7.4	1170	46		750	1210
4-Apr-95	9	167	3.440	7.5	1280	48		800	1331
11-Apr-95	10	174	7.380	7.1	1420	32		**850**	1608
18-Apr-95	11	181	3.410	7.2	1040	38		800	1728
25-Apr-95	12	188	3.470	7.3	1040	45		750	1842
2-May-95	13	195	3.540	7.4	1400	54		700	1951
10-May-95	14	203	3.580	7.4	1500	47		650	2054
17-May-95	15	210	3.810	7.4	1290	51		600	2155
23-May-95	16	216	3.580	7.4	1120	57		550	2241
31-May-95	17	224	3.620	7.4	1110	56		500	2321
6-Jun-95	18	230	3.800	7.5	974	53		**450**	2397
12-Jun-95	19	236	4.480	7.1	909	49		441	2484
20-Jun-95	20	244	3.800	7.5	905	46		432	2556
27-Jun-95	21	251	3.780	7.6	900	56		422	2626
5-Jul-95	22	259	3.660	7.7	888	50		413	2693
11-Jul-95	23	265	3.800	7.6	826	53		404	2760
17-Jul-95	24	271	0.000						
25-Jul-95	25	279	3.600	7.6	771	49		385	2821
1-Aug-95	26	286	2.940	7.2	876	52		376	2870
8-Aug-95	27	293	3.940	6.9	850	51		367	2934
15-Aug-95	28	300	3.920	7.3	858	50		358	2996
22-Aug-95	29	307	3.870	7.4	777	49		348	3055
31-Aug-95	30	316	3.760	7.4	800	50		339	3111
6-Sep-95	31	322	3.880	7.6	754	48		**330**	3168
12-Sep-95	32	328	3.810	7.6	698	44		**300**	3218
19-Sep-95	33	335	3.740	7.3	678	41		300	3267
26-Sep-95	34	342	3.760	7.2	639	40		**300**	3317
3-Oct-95	35	349	3.760	7.0	649	42		**280**	3363
10-Oct-95	36	356	3.750	7.2	636	43		**250**	3405
17-Oct-95	37	363	3.320	7.1	649	41		**320**	3452
24-Oct-95	38	370	3.340	6.9	565	36		**390**	3509
31-Oct-95	39	377	3.360	6.9	636	40		**250**	3546
7-Nov-95	40	384	3.520	6.9	556	35		**220**	3580

Appendix 3.5-35 Table 10 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
14-Nov-95	41	391	0.000						
21-Nov-95	42	398	2.360	6.5	643	40		**240**	3605
28-Nov-95	43	405	3.440	6.4	673	44		**250**	3643
5-Dec-95	44	412	3.300	7.4	655	42		243	3678
12-Dec-95	45	419	3.150	7.5	656	39		235	3711
19-Dec-95	46	426	3.640	7.5	708	37		228	3747
27-Dec-95	47	434	3.190	7.3	575	32		220	3778
3-Jan-96	48	441	3.470	7.3	556	39		213	3811
10-Jan-96	49	448	3.440	7.1	505	37		205	3842
16-Jan-96	50	454	3.580	7.2	548			198	3873
23-Jan-96	51	461	3.300	7.2	540	39		**190**	3900
31-Jan-96	52	469	3.170	6.7	552			188	3927
8-Feb-96	53	477	3.010	6.7	542			186	3951
13-Feb-96	54	482	4.230	6.8	521			184	3986
20-Feb-96	55	489	2.740	6.8	513			182	4008
27-Feb-96	56	496	4.040	7.2	529	38		**180**	4040
5-Mar-96	57	503	2.960	7.1	622			183	4064
11-Mar-96	58	509	3.530	6.7	545			187	4093
18-Mar-96	59	516	3.080	6.8	498	35		**190**	4118
25-Mar-96	60	523	3.340	6.8	568			195	4147
2-Apr-96	61	531	3.040	3.9	549			200	4174
9-Apr-96	62	538	3.380	3.9	563			205	4204
16-Apr-96	63	545	3.480	7.1	571	35		**210**	4237
29-Apr-96	64	558	3.590	7.0	537			205	4269
7-May-96	65	566	3.460	7.0	557			200	4299
13-May-96	66	572	3.660	6.8	506			195	4331
21-May-96	67	580	3.740	7.1	484	33		**190**	4362
28-May-96	68	587	3.080	6.8	576			190	4388
3-Jun-96	69	593	3.640	6.7	466			190	4418
10-Jun-96	70	600	3.640	6.7	469			190	4449
17-Jun-96	71	607	3.690	6.7	466	34		**190**	4480
24-Jun-96	72	614	3.740	6.8	494			203	4513
1-Jul-96	73	621	3.740	6.6	481			217	4549
8-Jul-96	74	628	3.800	6.5	480			230	4588
15-Jul-96	75	635	3.400	6.5	496			243	4624
22-Jul-96	76	642	0.000						
30-Jul-96	77	650	2.040	6.2	710	32		**270**	4648
5-Aug-96	78	656	0.000						
12-Aug-96	79	663	3.900	6.4	849			350	4708
19-Aug-96	80	670	3.900	6.3	796			390	4775
29-Aug-96	81	680	2.450	7.4	694	22		**430**	4822
2-Sep-96	82	684	0.000						
9-Sep-96	83	691	0.000						
19-Sep-96	84	701	1.640	6.6	1177			358	4848
23-Sep-96	85	705	0.000						
1-Oct-96	86	713	3.160	6.8	1271			**310**	4891
7-Oct-96	87	719	3.800	6.9	1154			367	4952
17-Oct-96	88	729	3.280	6.6	1067			423	5013
24-Oct-96	89	736	3.810	6.5	981	26		**480**	5094
1-Nov-96	90	744	3.540	6.9	935				
7-Nov-96	91	750	3.840	7.3	883				

Appendix 3.5-35 Table 10 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
18-Nov-96	92	761	0.000						
21-Nov-96	93	764	3.360	6.8	1204				
25-Nov-96	94	768	0.000						
6-Dec-96	95	779	4.410	6.1	950				
9-Dec-96	96	782	0.000						
20-Dec-96	97	793	3.190	7.1	1610				

* saturated conditions

** Measured values of sulfate shown in bold

Appendix 3.5-35 Table 11

Leachate Analysis
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	0.20	0.033	0.074	0.023	480	0.011	0.15	0.017	2.9	1.5	95	14	0.11	9.6	0.13	49	31
2 *	91	0.63	0.14	0.052	0.097	550	< 0.005	0.16	0.64	5.7	0.91	95	14	0.10	9.8	0.19	50	32
3	125	0.19	0.032	0.039	0.049	610	< 0.005	0.088	0.013	1.0	0.56	97	9.8	0.056	14	0.14	53	21
4	132	0.11	0.024	0.031	0.021	420	< 0.005	0.037	0.015	0.67	0.22	54	5.2	0.036	10	0.068	29	8.8
5	139	0.08	0.018	0.03	0.02	330	0.005	0.03	0.01	0.36	0.17	43.0	4.2	0.028	8.5	0.054	22.0	7.30
6	145	0.044	0.012	0.031	0.017	240	< 0.005	0.023	0.007	0.059	0.11	32	3.2	0.020	7.0	0.040	15	5.8
7	153	0.04	0.012	0.03	0.02	225	0.005	0.02	0.01	0.06	0.10	32.8	3.2	0.020	6.2	0.044	13.0	5.93
8	160	0.04	0.012	0.03	0.02	210	0.005	0.02	0.01	0.06	0.09	33.5	3.2	0.020	5.5	0.049	10.9	6.05
9	167	0.04	0.012	0.03	0.02	195	0.005	0.02	0.01	0.06	0.08	34.3	3.1	0.020	4.7	0.053	8.9	6.18
10	174	0.036	0.012	0.025	0.016	180	< 0.005	0.018	< 0.005	0.065	0.066	35	3.1	< 0.020	3.9	0.057	6.8	6.3
11	181	0.04	0.012	0.02	0.02	176	0.005	0.02	0.01	0.07	0.06	35.4	3.1	0.020	3.7	0.054	6.5	6.0
12	188	0.03	0.011	0.02	0.01	173	0.005	0.02	0.01	0.07	0.06	35.8	3.1	0.020	3.4	0.050	6.3	5.7
13	195	0.03	0.011	0.02	0.01	169	0.005	0.02	0.01	0.07	0.06	36.1	3.1	0.020	3.2	0.047	6.0	5.4
14	203	0.03	0.011	0.02	0.01	165	0.005	0.02	0.01	0.07	0.06	36.5	3.2	0.020	3.0	0.043	5.8	5.1
15	210	0.03	0.010	0.02	0.01	161	0.005	0.01	0.01	0.07	0.06	36.9	3.2	0.020	2.7	0.040	5.5	4.7
16	216	0.03	0.010	0.02	0.01	158	0.005	0.01	0.01	0.07	0.06	37.3	3.2	0.020	2.5	0.036	5.2	4.4
17	224	0.03	0.009	0.02	0.01	154	0.005	0.01	0.01	0.07	0.05	37.6	3.2	0.020	2.2	0.033	5.0	4.1
18	230	< 0.030	0.009	0.020	0.010	150	0.005	0.012	< 0.005	0.066	0.053	38	3.2	< 0.020	2.0	0.029	4.7	3.8
19	236	0.03	0.009	0.02	0.01	146	0.005	0.01	0.01	0.07	0.05	37.6	3.2	0.020	1.9	0.028	4.5	3.7
20	244	0.03	0.009	0.02	0.01	143	0.005	0.01	0.01	0.07	0.05	37.1	3.1	0.020	1.9	0.027	4.4	3.6
21	251	0.03	0.008	0.02	0.01	139	0.005	0.01	0.01	0.07	0.05	36.7	3.1	0.020	1.8	0.026	4.2	3.5
22	259	0.03	0.008	0.02	0.01	136	0.005	0.01	0.01	0.08	0.04	36.3	3.1	0.020	1.7	0.025	4.0	3.4
23	265	0.03	0.008	0.02	0.01	132	0.005	0.01	0.01	0.08	0.04	35.9	3.0	0.020	1.7	0.024	3.8	3.3
24	271																	
25	279	0.04	0.008	0.02	0.01	125	0.005	0.01	0.01	0.08	0.04	35.0	3.0	0.020	1.5	0.022	3.5	3.2
26	286	0.04	0.008	0.02	0.01	121	0.005	0.01	0.01	0.09	0.04	34.6	2.9	0.020	1.5	0.021	3.3	3.1
27	293	0.04	0.007	0.02	0.01	118	0.005	0.01	0.01	0.09	0.03	34.1	2.9	0.020	1.4	0.020	3.2	3.0
28	300	0.04	0.007	0.02	0.01	114	0.005	0.01	0.01	0.09	0.03	33.7	2.9	0.020	1.3	0.019	3.0	2.9
29	307	0.04	0.007	0.02	0.01	111	0.005	0.01	0.01	0.09	0.03	33.3	2.8	0.020	1.3	0.017	2.8	2.8
30	316	0.04	0.007	0.02	0.01	107	0.005	0.01	0.01	0.10	0.03	32.9	2.8	0.020	1.2	0.016	2.6	2.7
31	322	0.04	0.007	0.02	0.01	104	0.005	0.01	0.01	0.10	0.02	32.4	2.8	0.020	1.1	0.015	2.5	2.6
32	328	0.04	0.006	0.02	0.01	100	0.005	0.01	0.01	0.10	0.02	32.0	2.7	0.020	1.1	0.014	2.3	2.5

Appendix 3.5-35 Table 11 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
33	335	0.04	0.006	0.02	0.01	96	0.005	0.01	0.01	0.10	0.02	31.6	2.7	0.020	1.0	0.013	2.1	2.4
34	342	0.04	0.006	0.02	0.01	93	0.005	0.01	0.01	0.11	0.02	31.1	2.7	0.020	0.9	0.012	2.0	2.4
35	349	0.04	0.006	0.02	0.01	89	0.005	0.01	0.01	0.11	0.02	30.7	2.6	0.020	0.9	0.011	1.8	2.3
36	356	0.05	0.006	0.02	0.01	86	0.005	0.01	0.01	0.11	0.01	30.3	2.6	0.020	0.8	0.010	1.6	2.2
37	363	0.05	0.005	0.02	0.01	82	0.005	0.01	0.01	0.11	0.01	29.9	2.6	0.020	0.7	0.009	1.4	2.1
38	370	0.05	0.005	0.02	0.01	79	0.005	0.01	0.01	0.12	0.01	29.4	2.5	0.020	0.7	0.008	1.3	2.0
39	377	**0.048**	**0.0051**	**0.017**	**< 0.005**	**75**	**< 0.005**	**< 0.010**	**< 0.005**	**0.12**	**0.0064**	**29**	**2.5**	**< 0.020**	**< 0.60**	**0.007**	**1.1**	**1.9**
40	384					74						29.0						
41	391																	
42	398					73						29.0						
43	405					**72**						**29**						
44	412					71						28.3						
45	419					69						27.5						
46	426					68						26.8						
47	434					66						26.0						
48	441					65						25.3						
49	448					63						24.5						
50	454					62						23.8						
51	461					**60**						**23**						
52	469					59						23.2						
53	477					58						23.4						
54	482					57						23.6						
55	489					56						23.8						
56	496					**55**						**24**						
57	503					54						23.7						
58	509					53						23.3						
59	516					**52**						**23**						
60	523					54						24						
61	531					57						25						
62	538					59						25						
63	545					**61**						**26**						
64	558					59						26						
65	566					57						25						
66	572					55						25						
67	580					**53**						**24**						
68	587					53						24						
69	593					52						24						
70	600					52						24						
71	607					**51**						**24**						
72	614					57						27						
73	621					63						30						
74	628					69						33						

Appendix 3.5-35 Table 11 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
75	635					**74**						35						
76	642																	
77	650					**86**						**41**						
78	656																	
79	663					**84**						40						
80	670					82						40						
81	680					**81**						**39**						
82	684																	
83	691																	
84	701					72						45						
85	705																	
86	713					**66**						**49**						
87	719					84						51						
88	729					102						53						
89	736					**120**						**55**						

* saturated conditions ** Measured values shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 12

Cumulative Mass Flux
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.18	-0.003	0.008	0.003	27.1	-0.007	0.02	-0.007	0.37	0.184	14.2	2.096	0.02	-0.10	-0.024	2.8	4.58
2 *	91	-0.33	0.005	0.01	0.023	76.9	-0.017	0.04	0.11	1.42	0.31	33.0	4.9	0.03	-0.20	-0.04	6.8	10.83
3	125	-0.30	0.011	0.02	0.032	193	-0.016	0.06	0.11	1.61	0.42	51.5	6.7	0.04	2.46	-0.02	16.9	14.8
4	132	-0.28	0.016	0.03	0.036	271	-0.015	0.06	0.11	1.74	0.46	61.5	7.7	0.05	4.31	0.00	22.3	16.5
5	139	-0.26	0.019	0.03	0.039	320	-0.014	0.07	0.11	1.79	0.48	67.9	8.3	0.06	5.58	0.00	25.5	17.5
6	145	-0.26	0.021	0.04	0.042	369	-0.013	0.07	0.12	1.80	0.51	74.5	9.0	0.06	7.03	0.01	28.6	18.7
7	153	-0.25	0.023	0.04	0.045	404	-0.012	0.08	0.12	1.81	0.52	79.6	9.5	0.06	7.99	0.02	30.7	19.7
8	160	-0.24	0.025	0.05	0.047	437	-0.012	0.08	0.12	1.82	0.53	84.8	10.0	0.07	8.84	0.03	32.3	20.6
9	167	-0.24	0.027	0.05	0.050	466	-0.011	0.08	0.12	1.83	0.55	90.0	10.4	0.07	9.54	0.04	33.7	21.5
10	174	-0.23	0.031	0.06	0.055	525	-0.009	0.09	0.12	1.85	0.57	101.3	11.4	0.08	10.81	0.05	35.9	23.6
11	181	-0.22	0.032	0.06	0.057	551	-0.009	0.09	0.12	1.86	0.58	106.6	11.9	0.08	11.36	0.06	36.9	24.5
12	188	-0.21	0.034	0.07	0.060	578	-0.008	0.09	0.12	1.87	0.59	112.1	12.4	0.08	11.89	0.07	37.8	25.4
13	195	-0.21	0.036	0.07	0.062	604	-0.007	0.10	0.12	1.88	0.60	117.7	12.9	0.08	12.38	0.08	38.8	26.2
14	203	-0.20	0.037	0.07	0.064	630	-0.006	0.10	0.12	1.89	0.61	123.5	13.4	0.09	12.85	0.08	39.7	27.0
15	210	-0.20	0.039	0.08	0.066	657	-0.005	0.10	0.12	1.90	0.62	129.7	13.9	0.09	13.30	0.09	40.6	27.8
16	216	-0.19	0.041	0.08	0.068	682	-0.005	0.10	0.12	1.91	0.62	135.6	14.4	0.09	13.69	0.10	41.4	28.5
17	224	-0.19	0.042	0.08	0.069	707	-0.004	0.10	0.13	1.92	0.63	141.6	14.9	0.10	14.05	0.10	42.2	29.1
18	230	-0.18	0.044	0.09	0.071	732	-0.003	0.11	0.13	1.94	0.64	147.9	15.5	0.10	14.39	0.11	43.0	29.8
19	236	-0.18	0.045	0.09	0.073	761	-0.002	0.11	0.13	1.95	0.65	155.3	16.1	0.10	14.77	0.11	43.9	30.5
20	244	-0.17	0.047	0.10	0.074	785	-0.001	0.11	0.13	1.96	0.66	161.6	16.6	0.11	15.08	0.12	44.6	31.1
21	251	-0.17	0.048	0.10	0.076	808	0.000	0.11	0.13	1.97	0.67	167.7	17.1	0.11	15.38	0.12	45.3	31.7
22	259	-0.16	0.049	0.10	0.077	830	0.001	0.11	0.13	1.99	0.68	173.5	17.6	0.11	15.66	0.12	46.0	32.2
23	265	-0.16	0.051	0.10	0.079	852	0.001	0.12	0.13	2.00	0.68	179.5	18.1	0.12	15.94	0.13	46.6	32.8
24	271	-0.16	0.051	0.10	0.079	852	0.001	0.12	0.13	2.00	0.68	179.5	18.1	0.12	15.94	0.13	46.6	32.8
25	279	-0.15	0.052	0.11	0.080	872	0.002	0.12	0.13	2.01	0.69	185.1	18.6	0.12	16.18	0.13	47.2	33.3
26	286	-0.15	0.053	0.11	0.081	887	0.003	0.12	0.13	2.02	0.69	189.6	19.0	0.12	16.37	0.13	47.6	33.7
27	293	-0.14	0.054	0.11	0.083	908	0.004	0.12	0.13	2.04	0.70	195.5	19.5	0.13	16.61	0.14	48.1	34.2
28	300	-0.13	0.056	0.12	0.084	927	0.005	0.12	0.13	2.05	0.70	201.3	20.0	0.13	16.84	0.14	48.7	34.7

Appendix 3.5-35 Table 12 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	-0.13	0.057	0.12	0.085	946	0.005	0.13	0.13	2.07	0.71	207.0	20.5	0.13	17.06	0.14	49.1	35.2
30	316	-0.12	0.058	0.12	0.086	964	0.006	0.13	0.14	2.09	0.71	212.4	20.9	0.14	17.26	0.15	49.6	35.7
31	322	-0.11	0.059	0.13	0.088	982	0.007	0.13	0.14	2.10	0.72	218.0	21.4	0.14	17.45	0.15	50.0	36.1
32	328	-0.10	0.060	0.13	0.089	999	0.008	0.13	0.14	2.12	0.72	223.3	21.8	0.14	17.63	0.15	50.4	36.5
33	335	-0.10	0.061	0.13	0.090	1014	0.009	0.13	0.14	2.14	0.72	228.5	22.3	0.15	17.80	0.15	50.7	36.9
34	342	-0.09	0.062	0.13	0.091	1030	0.010	0.13	0.14	2.16	0.73	233.7	22.7	0.15	17.95	0.16	51.1	37.3
35	349	-0.08	0.063	0.14	0.092	1045	0.010	0.14	0.14	2.17	0.73	238.8	23.2	0.15	18.09	0.16	51.4	37.7
36	356	-0.08	0.064	0.14	0.093	1059	0.011	0.14	0.14	2.19	0.73	243.8	23.6	0.16	18.23	0.16	51.6	38.1
37	363	-0.07	0.065	0.14	0.094	1071	0.012	0.14	0.14	2.21	0.73	248.1	24.0	0.16	18.33	0.16	51.8	38.4
38	370	-0.06	0.066	0.15	0.094	1082	0.013	0.14	0.14	2.23	0.73	252.5	24.4	0.16	18.43	0.16	52.0	38.7
39	377	-0.05	0.066	0.15	0.095	1093	0.013	0.14	0.14	2.24	0.74	256.8	24.7	0.17	18.52	0.16	52.2	38.9
40	384					1105						261.3						
41	391					1105						261.3						
42	398					1113						264.3						
43	405					1123						268.7						
44	412					1134						272.8						
45	419					1143						276.6						
46	426					1154						280.9						
47	434					1163						284.5						
48	441					1173						288.4						
49	448					1183						292.1						
50	454					1193						295.9						
51	461					1201						299.2						
52	469					1209						302.4						
53	477					1217						305.5						
54	482					1228						309.9						
55	489					1235						312.8						
56	496					1244						317.1						
57	503					1251						320.2						
58	509					1260						323.8						
59	516					1267						326.9						
60	523					1275						330.4						
61	531					1282						333.7						
62	538					1291						337.5						
63	545					1300						341.4						
64	558					1310						345.5						
65	566					1318						349.3						
66	572					1327						353.2						

Appendix 3.5-35 Table 12 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					1336						357.2						
68	587					1343						360.5						
69	593					1351						364.3						
70	600					1360						368.1						
71	607					1368						372.0						
72	614					1377						376.5						
73	621					1388						381.4						
74	628					1399						386.8						
75	635					1410						392.1						
76	642					1410						392.1						
77	650					1418						395.8						
78	656					1418						395.8						
79	663					1432						402.6						
80	670					1446						409.4						
81	680					1455						413.6						
82	684					1455						413.6						
83	691					1455						413.6						
84	701					1460						416.9						
85	705					1460						416.9						
86	713					1470						423.7						
87	719					1484						432.3						
88	729					1498						439.9						
89	736					1519						449.1						

* saturated conditions

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 13

Cumulative Metals Extraction
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.0006	0.000	0.015	0.012	0.4	-0.007	0.024	-0.0008	0.000	0.004	0.095	0.36	0.07	-0.001	-0.067	0.18	0.057
2 *	91	-0.0011	0.000	0.027	0.081	1.1	-0.017	0.058	0.012	0.001	0.007	0.222	0.84	0.16	-0.003	-0.122	0.43	0.134
3	125	-0.0010	0.000	0.041	0.114	2.8	-0.016	0.082	0.013	0.001	0.010	0.345	1.16	0.20	0.032	-0.046	1.06	0.183
4	132	-0.0009	0.001	0.051	0.128	4.0	-0.015	0.092	0.013	0.001	0.011	0.412	1.33	0.23	0.057	-0.010	1.39	0.203
5	139	-0.0009	0.001	0.060	0.138	4.7	-0.014	0.099	0.013	0.001	0.011	0.455	1.44	0.25	0.073	0.013	1.60	0.217
6	145	-0.0008	0.001	0.072	0.151	5.4	-0.013	0.105	0.013	0.001	0.012	0.500	1.55	0.27	0.092	0.037	1.79	0.231
7	153	-0.0008	0.001	0.080	0.160	5.9	-0.012	0.110	0.014	0.001	0.012	0.534	1.63	0.29	0.105	0.056	1.92	0.243
8	160	-0.0008	0.001	0.088	0.169	6.4	-0.012	0.115	0.014	0.001	0.012	0.569	1.72	0.30	0.116	0.078	2.02	0.254
9	167	-0.0008	0.001	0.096	0.178	6.9	-0.011	0.119	0.014	0.001	0.013	0.604	1.80	0.31	0.126	0.101	2.11	0.266
10	174	-0.0007	0.001	0.111	0.196	7.7	-0.009	0.128	0.014	0.001	0.013	0.680	1.97	0.34	0.142	0.153	2.24	0.291
11	181	-0.0007	0.001	0.118	0.205	8.1	-0.009	0.131	0.014	0.001	0.013	0.716	2.05	0.36	0.150	0.176	2.30	0.302
12	188	-0.0007	0.001	0.124	0.213	8.5	-0.008	0.135	0.014	0.001	0.014	0.752	2.14	0.37	0.156	0.198	2.36	0.313
13	195	-0.0007	0.001	0.131	0.220	8.9	-0.007	0.139	0.014	0.001	0.014	0.790	2.22	0.39	0.163	0.219	2.42	0.323
14	203	-0.0007	0.001	0.138	0.228	9.3	-0.006	0.142	0.014	0.001	0.014	0.829	2.31	0.40	0.169	0.238	2.48	0.333
15	210	-0.0006	0.002	0.144	0.235	9.7	-0.005	0.145	0.014	0.001	0.014	0.870	2.40	0.41	0.175	0.257	2.54	0.343
16	216	-0.0006	0.002	0.151	0.241	10.0	-0.005	0.149	0.015	0.001	0.015	0.910	2.48	0.43	0.180	0.274	2.59	0.352
17	224	-0.0006	0.002	0.157	0.247	10.4	-0.004	0.152	0.015	0.001	0.015	0.950	2.57	0.44	0.185	0.288	2.64	0.360
18	230	-0.0006	0.002	0.163	0.253	10.8	-0.003	0.154	0.015	0.001	0.015	0.993	2.66	0.46	0.189	0.302	2.69	0.368
19	236	-0.0006	0.002	0.170	0.260	11.2	-0.002	0.158	0.015	0.001	0.015	1.043	2.77	0.48	0.194	0.318	2.74	0.377
20	244	-0.0006	0.002	0.176	0.266	11.5	-0.001	0.161	0.015	0.001	0.015	1.084	2.86	0.49	0.198	0.331	2.79	0.384
21	251	-0.0005	0.002	0.182	0.272	11.9	0.000	0.164	0.015	0.001	0.016	1.125	2.95	0.51	0.202	0.343	2.83	0.391
22	259	-0.0005	0.002	0.188	0.277	12.2	0.001	0.166	0.015	0.001	0.016	1.165	3.04	0.52	0.206	0.355	2.87	0.398
23	265	-0.0005	0.002	0.194	0.282	12.5	0.001	0.169	0.015	0.001	0.016	1.205	3.12	0.54	0.210	0.366	2.91	0.405
24	271	-0.0005	0.002	0.194	0.282	12.5	0.001	0.169	0.015	0.001	0.016	1.205	3.12	0.54	0.210	0.366	2.91	0.405
25	279	-0.0005	0.002	0.200	0.287	12.8	0.002	0.172	0.015	0.001	0.016	1.242	3.21	0.55	0.213	0.376	2.95	0.411
26	286	-0.0005	0.002	0.204	0.290	13.0	0.003	0.174	0.015	0.001	0.016	1.272	3.27	0.56	0.215	0.383	2.98	0.416
27	293	-0.0005	0.002	0.210	0.295	13.3	0.004	0.177	0.015	0.001	0.016	1.312	3.36	0.58	0.219	0.393	3.01	0.423
28	300	-0.0004	0.002	0.216	0.300	13.6	0.005	0.179	0.016	0.001	0.016	1.351	3.44	0.59	0.222	0.402	3.04	0.429

Appendix 3.5-35 Table 13 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	-0.0004	0.002	0.222	0.305	13.9	0.005	0.182	0.016	0.001	0.016	1.389	3.53	0.61	0.224	0.411	3.07	0.435
30	316	-0.0004	0.002	0.228	0.309	14.2	0.006	0.185	0.016	0.001	0.017	1.426	3.61	0.63	0.227	0.418	3.10	0.440
31	322	-0.0004	0.002	0.233	0.313	14.4	0.007	0.187	0.016	0.001	0.017	1.463	3.69	0.64	0.230	0.426	3.13	0.446
32	328	-0.0003	0.002	0.239	0.317	14.7	0.008	0.190	0.016	0.001	0.017	1.499	3.77	0.66	0.232	0.433	3.15	0.451
33	335	-0.0003	0.002	0.244	0.321	14.9	0.009	0.192	0.016	0.001	0.017	1.534	3.84	0.67	0.234	0.439	3.17	0.456
34	342	-0.0003	0.002	0.250	0.324	15.1	0.010	0.195	0.016	0.001	0.017	1.568	3.92	0.69	0.236	0.445	3.19	0.461
35	349	-0.0003	0.003	0.255	0.328	15.4	0.010	0.197	0.016	0.001	0.017	1.603	4.00	0.70	0.238	0.450	3.21	0.465
36	356	-0.0002	0.003	0.260	0.331	15.6	0.011	0.200	0.016	0.001	0.017	1.636	4.07	0.72	0.240	0.455	3.23	0.470
37	363	-0.0002	0.003	0.265	0.334	15.7	0.012	0.202	0.016	0.001	0.017	1.665	4.13	0.73	0.241	0.459	3.24	0.474
38	370	-0.0002	0.003	0.270	0.337	15.9	0.013	0.204	0.017	0.001	0.017	1.694	4.20	0.74	0.243	0.462	3.25	0.477
39	377	-0.0002	0.003	0.274	0.340	16.1	0.013	0.206	0.017	0.001	0.017	1.723	4.26	0.76	0.244	0.465	3.26	0.481
40	384					16.3						1.753						
41	391					16.3						1.753						
42	398					16.4						1.774						
43	405					16.5						1.803						
44	412					16.7						1.831						
45	419					16.8						1.856						
46	426					17.0						1.885						
47	434					17.1						1.910						
48	441					17.3						1.936						
49	448					17.4						1.961						
50	454					17.5						1.986						
51	461					17.7						2.008						
52	469					17.8						2.030						
53	477					17.9						2.051						
54	482					18.1						2.080						
55	489					18.2						2.099						
56	496					18.3						2.128						
57	503					18.4						2.149						
58	509					18.5						2.173						
59	516					18.6						2.194						
60	523					18.7						2.218						
61	531					18.9						2.240						
62	538					19.0						2.265						
63	545					19.1						2.292						
64	558					19.3						2.319						
65	566					19.4						2.344						
66	572					19.5						2.371						

Appendix 3.5-35 Table 13 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					19.6						2.397						
68	587					19.8						2.419						
69	593					19.9						2.445						
70	600					20.0						2.471						
71	607					20.1						2.497						
72	614					20.3						2.527						
73	621					20.4						2.559						
74	628					20.6						2.596						
75	635					20.7						2.631						
76	642					20.7						2.631						
77	650					20.9						2.656						
78	656					20.9						2.656						
79	663					21.1						2.702						
80	670					21.3						2.748						
81	680					21.4						2.776						
82	684					21.4						2.776						
83	691					21.4						2.776						
84	701					21.5						2.798						
85	705					21.5						2.798						
86	713					21.6						2.844						
87	719					21.8						2.901						
88	729					22.0						2.952						
89	736					22.3						3.014						

* saturated conditions

Appendix 3.5-35 Table 14

Metal Extraction Rates
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56																	
2 *	91	-0.031	0.002	0.001	0.004	9.95	-0.0020	0.005	0.023	0.21	0.025	3.76	0.55	0.004	-0.02	-0.004	0.79	1.2511
3	125	-0.012	0.001	0.001	0.003	16.82	-0.0009	0.004	0.012	0.13	0.024	3.78	0.47	0.003	0.26	0.001	1.43	1.04
4	132	-0.009	0.002	0.002	0.003	22.43	-0.0008	0.004	0.011	0.13	0.025	4.35	0.52	0.003	0.41	0.002	1.79	1.09
5	139	-0.007	0.002	0.002	0.003	24.68	-0.0006	0.004	0.010	0.12	0.025	4.53	0.53	0.003	0.48	0.002	1.91	1.09
6	145	-0.006	0.002	0.002	0.003	26.93	-0.0005	0.004	0.010	0.11	0.025	4.74	0.54	0.003	0.56	0.003	2.03	1.11
7	153	0.009	0.002	0.003	0.003	36.98	0.0005	0.004	0.001	0.04	0.024	5.26	0.52	0.003	0.93	0.007	2.69	1.00
8	160	0.011	0.003	0.005	0.003	48.80	0.0009	0.005	0.002	0.04	0.023	6.66	0.65	0.004	1.28	0.009	3.09	1.15
9	167	0.008	0.002	0.005	0.003	39.17	0.0008	0.004	0.001	0.02	0.018	5.70	0.55	0.004	1.05	0.008	2.28	1.02
10	174	0.008	0.002	0.005	0.003	41.04	0.0010	0.004	0.001	0.01	0.017	6.69	0.62	0.004	1.05	0.010	2.07	1.21
11	181	0.007	0.002	0.005	0.003	35.39	0.0009	0.003	0.001	0.01	0.014	6.25	0.57	0.004	0.84	0.010	1.60	1.12
12	188	0.007	0.002	0.005	0.003	34.70	0.0009	0.003	0.001	0.01	0.013	6.51	0.58	0.004	0.78	0.010	1.44	1.14
13	195	0.007	0.002	0.005	0.003	33.45	0.0009	0.003	0.001	0.01	0.012	6.60	0.58	0.004	0.71	0.010	1.29	1.12
14	203	0.006	0.002	0.004	0.003	31.83	0.0009	0.003	0.001	0.01	0.012	6.52	0.57	0.004	0.64	0.009	1.17	1.06
15	210	0.005	0.002	0.004	0.002	25.71	0.0008	0.002	0.001	0.01	0.009	5.51	0.48	0.003	0.48	0.007	0.92	0.82
16	216	0.005	0.002	0.004	0.002	26.12	0.0008	0.002	0.001	0.01	0.009	5.78	0.50	0.003	0.47	0.007	0.91	0.80
17	224	0.005	0.002	0.003	0.002	25.04	0.0008	0.002	0.001	0.01	0.009	5.73	0.49	0.003	0.42	0.006	0.85	0.74
18	230	0.005	0.002	0.003	0.002	25.51	0.0008	0.002	0.001	0.01	0.009	6.04	0.51	0.003	0.40	0.006	0.85	0.72
19	236	0.006	0.002	0.004	0.002	27.67	0.0009	0.002	0.001	0.01	0.010	6.75	0.57	0.004	0.41	0.006	0.89	0.75
20	244	0.005	0.002	0.004	0.002	26.20	0.0009	0.002	0.001	0.01	0.009	6.56	0.55	0.003	0.37	0.005	0.83	0.69
21	251	0.005	0.002	0.003	0.002	25.13	0.0009	0.002	0.001	0.01	0.009	6.42	0.54	0.003	0.34	0.005	0.78	0.64
22	259	0.005	0.001	0.003	0.002	24.60	0.0009	0.002	0.001	0.01	0.008	6.39	0.54	0.003	0.32	0.005	0.75	0.62
23	265	0.006	0.001	0.003	0.002	24.00	0.0009	0.002	0.001	0.01	0.008	6.32	0.53	0.003	0.31	0.004	0.72	0.61
24	271																	
25	279	0.004	0.001	0.003	0.001	17.40	0.0007	0.002	0.001	0.01	0.006	4.70	0.40	0.003	0.22	0.003	0.51	0.44
26	286	0.004	0.001	0.002	0.001	15.91	0.0006	0.001	0.001	0.01	0.005	4.38	0.37	0.002	0.20	0.003	0.46	0.40
27	293	0.005	0.001	0.002	0.001	16.09	0.0006	0.001	0.001	0.01	0.005	4.52	0.38	0.003	0.20	0.003	0.45	0.41
28	300	0.005	0.001	0.002	0.001	15.15	0.0006	0.001	0.001	0.01	0.004	4.36	0.37	0.003	0.18	0.003	0.41	0.38

Appendix 3.5-35 Table 14 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
29	307	0.006	0.001	0.003	0.001	18.40	0.0008	0.002	0.001	0.01	0.005	5.34	0.45	0.003	0.22	0.003	0.49	0.47
30	316	0.006	0.001	0.003	0.001	17.51	0.0008	0.002	0.001	0.01	0.005	5.17	0.44	0.003	0.20	0.003	0.46	0.44
31	322	0.007	0.001	0.003	0.001	18.38	0.0008	0.002	0.001	0.02	0.005	5.52	0.47	0.003	0.21	0.003	0.47	0.47
32	328	0.007	0.001	0.003	0.001	18.17	0.0008	0.002	0.001	0.02	0.004	5.57	0.47	0.003	0.20	0.003	0.45	0.46
33	335	0.007	0.001	0.003	0.001	17.40	0.0008	0.002	0.001	0.02	0.004	5.45	0.46	0.003	0.19	0.003	0.42	0.44
34	342	0.007	0.001	0.003	0.001	16.70	0.0008	0.002	0.001	0.02	0.004	5.34	0.46	0.003	0.18	0.002	0.38	0.42
35	349	0.008	0.001	0.003	0.001	17.09	0.0009	0.002	0.001	0.02	0.003	5.59	0.48	0.004	0.18	0.002	0.38	0.43
36	356	0.007	0.001	0.003	0.001	15.85	0.0009	0.002	0.001	0.02	0.003	5.32	0.46	0.003	0.16	0.002	0.33	0.40
37	363	0.007	0.001	0.003	0.001	14.45	0.0008	0.002	0.001	0.02	0.002	4.96	0.43	0.003	0.14	0.002	0.29	0.37
38	370	0.007	0.001	0.003	0.001	13.58	0.0008	0.002	0.001	0.02	0.002	4.79	0.41	0.003	0.13	0.002	0.26	0.34
39	377	0.007	0.001	0.003	0.001	12.72	0.0008	0.002	0.001	0.02	0.002	4.62	0.40	0.003	0.11	0.001	0.22	0.32
40	384					12.07						4.50						
41	391																	
42	398					8.35						3.23						
43	405					8.22						3.24						
44	412					8.05						3.20						
45	419					7.66						3.07						
46	426					9.82						3.92						
47	434					9.88						3.94						
48	441					9.68						3.84						
49	448					9.54						3.76						
50	454					9.84						3.85						
51	461					9.42						3.66						
52	469					9.21						3.58						
53	477					8.54						3.33						
54	482					9.26						3.67						
55	489					8.41						3.39						
56	496					8.62						3.58						
57	503					8.63						3.65						
58	509					9.29						3.99						
59	516					8.01						3.50						
60	523					8.26						3.62						
61	531					7.58						3.32						
62	538					7.92						3.46						
63	545					7.91						3.43						
64	558					7.16						3.09						
65	566					7.11						3.07						
66	572					7.68						3.34						

Appendix 3.5-35 Table 14 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
67	580					7.50						3.29						
68	587					7.12						3.17						
69	593					8.35						3.76						
70	600					8.51						3.88						
71	607					8.15						3.76						
72	614					8.52						3.97						
73	621					9.18						4.30						
74	628					9.54						4.50						
75	635					10.12						4.79						
76	642																	
77	650					7.90						3.75						
78	656																	
79	663					6.64						3.17						
80	670					7.24						3.47						
81	680					8.28						3.97						
82	684																	
83	691																	
84	701					5.17						2.62						
85	705																	
86	713					3.05						2.14						
87	719					5.69						3.72						
88	729					7.96						4.84						
89	736					11.63						6.45						

* saturated conditions

Appendix 3.5-35 Table 15

Oxidation and Neutralization Results
Whole Tailings (RS-13)

Test: **Leached under saturated, followed by alternating wet/dry, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1 **	56	52	0.01		0.55	0.68	0.58	2.31	126		0.5
2 **	91	193	0.02	28.1	1.47	1.24	0.77	1.38	328	40.4	1.2
3	125	517	0.06	47.1	3.37	2.90	0.76	1.09	694	57.6	2.6
4	132	720	0.08	61.5	2.12	1.94	0.41	1.11	930	74.0	3.4
5	139	851	0.10	67.3	1.36	1.23	0.26	1.10	1079	80.3	4.0
6	145	985	0.11	73.4	1.40	1.24	0.27	1.08	1230	86.8	4.6
7	153	1094	0.12	101.7	1.13	0.87	0.21	0.96	1338	114.1	5.0
8	160	1210	0.14	138.6	1.21	0.81	0.21	0.85	1441	149.4	5.3
9	167	1331	0.15	122.2	1.26	0.74	0.21	0.75	1536	121.4	5.7
10	174	1608	0.18	151.4	2.88	1.46	0.47	0.67	1730	130.2	6.4
11	181	1728	0.19	144.4	1.25	0.66	0.22	0.70	1818	114.2	6.7
12	188	1842	0.21	149.7	1.19	0.66	0.22	0.74	1906	113.5	7.1
13	195	1951	0.22	148.3	1.14	0.66	0.23	0.78	1995	110.8	7.4
14	203	2054	0.23	140.6	1.07	0.65	0.24	0.83	2084	106.4	7.7
15	210	2155	0.24	106.4	1.05	0.68	0.25	0.89	2177	87.0	8.1
16	216	2241	0.25	102.8	0.90	0.62	0.24	0.95	2263	89.1	8.4
17	224	2321	0.26	93.1	0.83	0.61	0.25	1.04	2349	86.2	8.7
18	230	2397	0.27	89.0	0.78	0.63	0.26	1.13	2438	88.6	9.0
19	236	2484	0.28	91.1	0.91	0.72	0.31	1.13	2541	97.0	9.4
20	244	2556	0.29	82.6	0.75	0.60	0.26	1.13	2626	92.5	9.7
21	251	2626	0.29	76.9	0.73	0.58	0.25	1.14	2709	89.2	10.0
22	259	2693	0.30	74.3	0.69	0.55	0.24	1.14	2788	87.8	10.3
23	265	2760	0.31	72.8	0.70	0.55	0.25	1.14	2868	86.0	10.6
24	271										
25	279	2821	0.32	53.1	0.33	0.50	0.23	2.21	3017	78.2	11.2

Appendix 3.5-35 Table 15 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	286	2870	0.32	48.8	0.51	0.39	0.18	1.14	3075	73.1	11.4
27	293	2934	0.33	49.6	0.66	0.51	0.24	1.14	3150	74.6	11.7
28	300	2996	0.34	47.1	0.64	0.49	0.24	1.14	3224	71.1	11.9
29	307	3055	0.34	51.5	0.62	0.47	0.23	1.14	3294	68.0	12.2
30	316	3111	0.35	54.8	0.59	0.44	0.22	1.14	3361	65.1	12.4
31	322	3168	0.36	57.8	0.59	0.44	0.23	1.14	3428	68.7	12.7
32	328	3218	0.36	56.8	0.52	0.42	0.22	1.22	3492	68.3	12.9
33	335	3267	0.37	54.4	0.51	0.40	0.21	1.19	3553	65.9	13.2
34	342	3317	0.37	52.4	0.52	0.38	0.21	1.15	3613	63.7	13.4
35	349	3363	0.38	53.5	0.48	0.37	0.21	1.20	3671	65.7	13.6
36	356	3405	0.38	48.8	0.43	0.35	0.21	1.30	3727	61.5	13.8
37	363	3452	0.39	46.7	0.49	0.30	0.18	0.98	3775	56.5	14.0
38	370	3509	0.39	48.3	0.60	0.29	0.18	0.78	3821	53.7	14.2
39	377	3546	0.40	45.8	0.39	0.28	0.18	1.18	3867	50.8	14.3
40	384	3580	0.40	43.3	0.36	0.29	0.19	1.33	3914	48.7	14.5
41	391										
42	398	3605	0.40	30.7	0.13	0.19	0.12	2.41	4046	54.2	15.0
43	405	3643	0.41	26.8	0.39	0.27	0.18	1.15	4091	53.9	15.2
44	412	3678	0.41	26.4	0.37	0.26	0.17	1.16	4134	53.3	15.3
45	419	3711	0.42	26.1	0.34	0.24	0.16	1.17	4173	51.8	15.5
46	426	3747	0.42	30.9	0.38	0.27	0.18	1.18	4218	40.7	15.6
47	434	3778	0.42	33.7	0.32	0.23	0.15	1.19	4256	40.9	15.8
48	441	3811	0.43	32.6	0.34	0.25	0.16	1.20	4297	40.0	15.9
49	448	3842	0.43	31.8	0.32	0.24	0.15	1.21	4336	39.3	16.1
50	454	3873	0.43	32.4	0.32	0.24	0.15	1.22	4376	40.5	16.2
51	461	3900	0.44	30.6	0.29	0.22	0.14	1.24	4411	38.6	16.3
52	469	3927	0.44	29.7	0.27	0.21	0.13	1.24	4445	37.8	16.5
53	477	3951	0.44	27.4	0.26	0.19	0.13	1.25	4477	35.1	16.6
54	482	3986	0.45	29.6	0.36	0.27	0.18	1.25	4522	38.3	16.7
55	489	4008	0.45	27.0	0.23	0.17	0.12	1.26	4550	35.0	16.9
56	496	4040	0.45	27.8	0.33	0.24	0.18	1.26	4592	36.3	17.0
57	503	4064	0.46	28.2	0.25	0.18	0.13	1.22	4623	36.6	17.1
58	509	4093	0.46	30.9	0.30	0.21	0.15	1.18	4658	39.7	17.3
59	516	4118	0.46	27.3	0.27	0.18	0.13	1.14	4689	34.4	17.4
60	523	4147	0.47	28.7	0.30	0.20	0.14	1.15	4723	35.6	17.5

Appendix 3.5-35 Table 15 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	531	4174	0.47	26.8	0.28	0.19	0.14	1.16	4756	32.6	17.6
62	538	4204	0.47	28.2	0.32	0.22	0.15	1.17	4793	34.0	17.8
63	545	4237	0.48	28.0	0.34	0.23	0.16	1.19	4833	33.9	17.9
64	558	4269	0.48	25.1	0.34	0.23	0.17	1.18	4873	30.6	18.0
65	566	4299	0.48	24.8	0.32	0.22	0.16	1.18	4910	30.4	18.2
66	572	4331	0.49	26.8	0.33	0.22	0.16	1.17	4948	32.9	18.3
67	580	4362	0.49	26.3	0.33	0.22	0.16	1.17	4986	32.3	18.5
68	587	4388	0.49	25.2	0.27	0.18	0.13	1.16	5018	30.8	18.6
69	593	4418	0.50	29.9	0.32	0.21	0.16	1.16	5054	36.4	18.7
70	600	4449	0.50	30.8	0.32	0.21	0.16	1.15	5091	37.2	18.9
71	607	4480	0.50	29.8	0.32	0.21	0.16	1.14	5128	35.9	19.0
72	614	4513	0.51	31.1	0.35	0.23	0.18	1.19	5169	37.6	19.1
73	621	4549	0.51	33.2	0.37	0.26	0.20	1.24	5215	40.7	19.3
74	628	4588	0.51	33.8	0.40	0.29	0.22	1.27	5266	42.4	19.5
75	635	4624	0.52	35.0	0.38	0.28	0.22	1.31	5316	45.0	19.7
76	642										
77	650	4648	0.50	26.2	0.13	0.19	0.15	2.71	5392	43.4	20.0
78	656										
79	663	4708	0.51	24.2	0.32	0.36	0.28	2.03	5505	47.8	20.4
80	670	4775	0.52	30.3	0.70	0.35	0.28	0.91	5569	50.6	20.6
81	680	4822	0.52	34.2	0.48	0.22	0.17	0.81	5608	46.1	20.8
82	684										
83	691										
84	701	4848	0.53	25.7	0.09	0.13	0.13	3.04	5699	35.7	21.1
85	705										
86	713	4891	0.53	14.6	0.22	0.23	0.28	2.30	5789	38.4	21.4
87	719	4952	0.54	24.3	0.64	0.35	0.35	1.10	5859	43.3	21.7
88	729	5013	0.54	32.1	0.64	0.37	0.32	1.07	5927	46.9	22.0
89	736	5094	0.55	49.3	0.84	0.50	0.38	1.05	6016	63.3	22.3

* Rates of sulfate production and NP depletion are 5-week moving averages

** Saturated conditions

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Tables 16-22. TMA Whole Tailings (WD-13) (Leached Under Alternating Wet/Dry Conditions) Data and Calculations.

Appendix 3.5-35 Table 16

Sample Characterization
Whole Tailings (WD-13) - Leached under alternating wet/dry conditions

Metals Analysis		(ppm)
Aluminum	Al	30600
Antimony	Sb	68
Arsenic	As	2500
Barium	Ba	54
Beryllium	Be	<50
Bismuth	Bi	<20
Cadmium	Cd	28
Calcium	Ca	6800
Carbon	C	5000
Chromium	Cr	100
Cobalt	Co	69
Copper	Cu	860
Gallium	Ga	16
Iron	Fe	232000
Lead	Pb	4300
Lithium	Li	NA
Magnesium	Mg	14900
Manganese	Mn	580
Mercury	Hg	1.6
Molybdenum	Mo	<20
Nickel	Ni	22
Phosphorus	P	NA
Potassium	K	7600
Selenium	Se	35
Silicon	Si	160000
Silver	Ag	22.2
Sodium	Na	1600
Strontium	Sr	NA
Thallium	Tl	14
Tin	Sn	24
Titanium	Ti	1400
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	8100

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	30.10

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 17

Parameters Measured Weekly
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	2.120	7.6	1860	1000		**747**	53
2-Nov-94	2	8	4.510	6.5	1400	380		**564**	137
9-Nov-94	3	15	4.570	5.5	936	200		252	175
16-Nov-94	4	22	4.020	6.2	921	22		**356**	223
22-Nov-94	5	28	4.750	5.9	1160	30		**438**	292
29-Nov-94	6	35	5.220	6.0	1680	46		784	428
6-Dec-94	7	42	4.620	7.3	2310	75		1129	601
13-Dec-94	8	49	5.570	7.1	2510	82		1475	874
20-Dec-94	9	56	4.460	7.6	3150	51		**1820**	1144
27-Dec-94	10	63	4.720	7.6	2980	100		1715	1413
3-Jan-95	11	70	4.700	7.3	2600	92		1610	1664
10-Jan-95	12	77	4.330	6.8	2260	79		1505	1881
17-Jan-95	13	84	3.640	7.2	2230	71		**1400**	2050
24-Jan-95	14	91	2.960	7.2	2000	34		1235	2171
31-Jan-95	15	98	3.060	7.0	2070	26		1070	2280
8-Feb-95	16	106	3.400	6.7	1790	31		905	2382
15-Feb-95	17	113	5.120	7.0	1600	20		**740**	2508
21-Feb-95	18	119	3.780	7.1	1370	29		743	2601
28-Feb-95	19	126	3.460	6.5	1280	20		745	2687
7-Mar-95	20	133	3.240	6.4	1320	17		748	2768
14-Mar-95	21	140	3.520	6.5	1060	12		750	2855
21-Mar-95	22	147	3.540	6.3	1090	17		753	2944
28-Mar-95	23	154	3.500	6.3	1090	16		755	3032
4-Apr-95	24	161	3.600	6.4	1540	24		758	3122
11-Apr-95	25	168	3.430	6.6	1720	35		760	3209
18-Apr-95	26	175	3.120	6.4	1380	20		763	3288
25-Apr-95	27	182	3.200	6.2	1260	11		765	3369
2-May-95	28	189	3.290	6.2	1360	10		768	3453
10-May-95	29	197	3.200	6.2	1380	9		770	3535
17-May-95	30	204	3.640	6.4	1390	16		773	3628
23-May-95	31	210	3.480	6.6	1470	29		775	3718
31-May-95	32	218	3.420	6.2	1260	15		778	3806
6-Jun-95	33	224	3.960	7.0	1400	28		**780**	3909
12-Jun-95	34	230	3.850	6.2	1440	33		763	4006
20-Jun-95	35	238	4.060	6.8	1390	34		746	4107
27-Jun-95	36	245	4.020	7.0	1380	37		729	4204
5-Jul-95	37	253	3.820	7.1	1360	39		712	4295
11-Jul-95	38	259	3.800	7.0	1160	32		695	4383
17-Jul-95	39	265	0.000						
25-Jul-95	40	273	3.800	7.4	1220	28		662	4466
1-Aug-95	41	280	3.210	6.4	1390	8		645	4535
8-Aug-95	42	287	4.010	6.4	1420	20		628	4619

Appendix 3.5-35 Table 17 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
15-Aug-95	43	294	4.040	6.6	1350	27		611	4701
22-Aug-95	44	301	4.020	6.6	1200	25		594	4780
31-Aug-95	45	310	3.660	6.6	1160	25		577	4850
6-Sep-95	46	316	3.900	6.9	1060	21		**560**	4923
12-Sep-95	47	322	3.760	6.8	1080	21		**560**	4992
19-Sep-95	48	329	3.660	6.4	1080	17		575	5062
26-Sep-95	49	336	3.720	6.3	1010	21		**590**	5135
3-Oct-95	50	343	3.530	6.3	1010	19		**500**	5194
10-Oct-95	51	350	3.650	6.4	976	22		**700**	5279
17-Oct-95	52	357	3.500	6.5	946	86	?	**730**	5364
24-Oct-95	53	364	3.360	6.2	979	18		**680**	5440
31-Oct-95	54	371	3.380	5.9	1040	22		**480**	5494
7-Nov-95	55	378	3.340	6.0	979	14		**450**	5543
14-Nov-95	56	385	0.000						
21-Nov-95	57	392	2.030	3.6	1380		80	**660**	5588
28-Nov-95	58	399	3.420	3.6	2550		280	**1600**	5770
5-Dec-95	59	406	3.350	4.0	2440		290	1495	5936
12-Dec-95	60	413	3.340	3.8	2440		330	1390	6090
19-Dec-95	61	420	3.680	4.2	2060		210	1285	6248
27-Dec-95	62	428	3.260	3.9	1990		170	1180	6375
3-Jan-96	63	435	3.020	3.7	1890		160	1075	6483
10-Jan-96	64	442	3.440	3.9	1640		130	970	6594
16-Jan-96	65	448	3.530	3.8	1530			865	6695
23-Jan-96	66	455	3.440	3.7	1563		100	**760**	6782
31-Jan-96	67	463	3.210	3.4	1558				
7-Feb-96	68	470	3.520	3.3	1591				
13-Feb-96	69	476	3.610	3.5	1533				
20-Feb-96	70	483	3.360	3.5	1384				
27-May-96	83	580	3.640	2.3	4930				
16-Jul-96	90	630	3.390	2.5	10646		4600	**12000**	
22-Jul-96	91	636	0.000						
30-Jul-96	92	644	1.090	2.6	25800			**27000**	
5-Aug-96	93	650	0.000						
12-Aug-96	94	657	0.500	2.7	23520				
19-Aug-96	95	664	0.500	2.8	17200				
29-Aug-96	96	674	0.500	3.0	11800				
2-Sep-96	97	678	0.000						
9-Sep-96	98	685	0.000						
19-Sep-96	99	695	2.040	2.7	10200				
23-Sep-96	100	699	0.000						
1-Oct-96	101	707	1.900	2.6	11170				
7-Oct-96	102	713	2.720	2.9	10990				
17-Oct-96	103	723	1.720	2.8	11460				
24-Oct-96	104	730	2.680	2.4	10610				
1-Nov-96	105	738	2.580	2.3	9810				
7-Nov-96	106	744	2.580	1.5	9220				

* Measured values of sulfate shown in bold

Appendix 3.5-35 Table 18

Leachate Analysis
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.39	0.061	0.042	0.059	300	0.059	0.12	2.2	0.60	66	4.5	0.0005	0.044	7.0	0.061	< 0.005	11	22
2	8	0.40	0.052	0.030	0.044	220	0.035	0.15	2.1	0.43	51	3.5	0.0002	0.037	< 4.8	0.042	< 0.005	6.9	17
3	15	1.50	0.206	0.023	0.031	170	0.031	0.255	13.05	1.12	44.0	3.1	0.0003	0.030	4.80	0.039	0.009	5.30	15.0
4	22	2.6	0.36	0.016	0.017	120	0.027	0.36	24	1.8	37	2.7	0.00034	0.023	< 4.8	0.035	0.013	3.7	13
5	28	1.4	0.20	0.017	0.024	130	0.022	0.20	13	0.96	46	3.0	0.0002	0.034	< 4.8	0.043	< 0.005	4.0	11
6	35	1.07	0.152	0.020	0.022	230	0.024	0.162	10.08	0.77	62.0	5.0	0.0003	0.056	5.23	0.054	0.006	4.90	16.8
7	42	0.74	0.105	0.023	0.021	330	0.026	0.124	7.15	0.57	78.0	7.0	0.0003	0.077	5.65	0.064	0.006	5.80	22.5
8	49	0.40	0.057	0.025	0.019	430	0.028	0.085	4.23	0.38	94.0	9.0	0.0004	0.099	6.08	0.075	0.007	6.70	28.3
9	56	0.072	0.009	0.028	0.017	530	0.030	0.047	1.3	0.18	110	11	0.0004	0.12	6.5	0.085	0.007	7.6	34
10	63	0.07	0.013	0.028	0.019	518	0.030	0.055	1.10	0.20	95.5	10.3	0.0004	0.114	5.90	0.072	0.008	6.20	34.0
11	70	0.07	0.016	0.028	0.022	505	0.029	0.063	0.91	0.22	81.0	9.6	0.0003	0.108	5.30	0.059	0.008	4.80	34.0
12	77	0.08	0.020	0.028	0.024	493	0.029	0.070	0.71	0.24	66.5	8.8	0.0003	0.102	4.70	0.046	0.009	3.40	34.0
13	84	0.077	0.023	0.028	0.026	480	0.028	0.078	0.51	0.26	52	8.1	< 0.0002	0.096	4.1	0.033	0.009	2.0	34
14	91	0.07	0.021	0.027	0.030	423	0.037	0.065	0.39	0.22	50.0	7.8	0.0002	0.092	3.40	0.035	0.008	1.72	33.0
15	98	0.07	0.019	0.025	0.033	365	0.046	0.053	0.27	0.18	48.0	7.5	0.0002	0.088	2.70	0.037	0.007	1.44	32.0
16	106	0.06	0.016	0.024	0.037	308	0.055	0.040	0.14	0.14	46.0	7.1	0.0002	0.083	2.00	0.039	0.006	1.16	31.0
17	113	0.053	0.014	0.022	0.040	250	0.064	0.027	< 0.020	0.098	44	6.8	< 0.0002	0.079	1.3	0.041	< 0.005	0.88	30
18	119	0.05	0.014	0.022	0.039	246	0.062	0.030	0.03	0.12	46.6	7.0	0.0002	0.079	1.30	0.041	0.005	0.88	30.1
19	126	0.05	0.014	0.021	0.038	243	0.061	0.033	0.03	0.14	49.3	7.1	0.0002	0.079	1.30	0.042	0.005	0.87	30.3
20	133	0.05	0.014	0.021	0.037	239	0.059	0.036	0.04	0.15	51.9	7.3	0.0002	0.078	1.30	0.042	0.005	0.87	30.4
21	140	0.05	0.014	0.021	0.036	235	0.057	0.039	0.04	0.17	54.5	7.5	0.0002	0.078	1.30	0.043	0.005	0.87	30.5
22	147	0.05	0.013	0.020	0.035	231	0.055	0.042	0.05	0.19	57.1	7.6	0.0002	0.078	1.30	0.043	0.005	0.87	30.6
23	154	0.04	0.013	0.020	0.034	228	0.054	0.045	0.05	0.21	59.8	7.8	0.0002	0.078	1.30	0.043	0.005	0.87	30.8
24	161	0.04	0.013	0.019	0.033	224	0.052	0.048	0.06	0.23	62.4	7.9	0.0002	0.078	1.30	0.044	0.005	0.86	30.9
25	168	0.04	0.013	0.019	0.033	220	0.050	0.052	0.06	0.25	65.0	8.1	0.0002	0.078	1.30	0.044	0.005	0.86	31.0
26	175	0.04	0.013	0.019	0.032	216	0.048	0.055	0.07	0.27	67.6	8.3	0.0002	0.077	1.30	0.044	0.005	0.86	31.1
27	182	0.04	0.013	0.018	0.031	213	0.047	0.058	0.07	0.29	70.3	8.4	0.0002	0.077	1.30	0.045	0.005	0.86	31.3
28	189	0.04	0.013	0.018	0.030	209	0.045	0.061	0.08	0.31	72.9	8.6	0.0002	0.077	1.30	0.045	0.005	0.85	31.4
29	197	0.04	0.013	0.018	0.029	205	0.043	0.064	0.08	0.32	75.5	8.8	0.0002	0.077	1.30	0.046	0.005	0.85	31.5
30	204	0.03	0.012	0.017	0.028	201	0.041	0.067	0.09	0.34	78.1	8.9	0.0002	0.077	1.30	0.046	0.005	0.85	31.6
31	210	0.03	0.012	0.017	0.027	198	0.040	0.070	0.09	0.36	80.8	9.1	0.0002	0.076	1.30	0.046	0.005	0.85	31.8
32	218	0.03	0.012	0.016	0.026	194	0.038	0.073	0.10	0.38	83.4	9.2	0.0002	0.076	1.30	0.047	0.005	0.84	31.9
33	224	< 0.030	0.012	0.016	0.025	190	0.036	0.076	0.10	0.40	86	9.4	0.0002	0.076	1.3	0.047	< 0.005	0.84	32

Appendix 3.5-35 Table 18 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	0.08	0.013	0.016	0.025	186	0.036	0.113	0.19	0.47	85.0	9.2	0.0002	0.074	1.27	0.046	0.005	0.83	31.5
35	238	0.13	0.013	0.015	0.024	181	0.035	0.151	0.28	0.54	84.0	9.1	0.0002	0.072	1.23	0.045	0.005	0.82	31.0
36	245	0.18	0.014	0.015	0.024	177	0.035	0.188	0.37	0.61	83.0	8.9	0.0002	0.071	1.20	0.045	0.005	0.80	30.6
37	253	0.23	0.014	0.014	0.024	173	0.034	0.225	0.46	0.69	82.0	8.8	0.0002	0.069	1.17	0.044	0.005	0.79	30.1
38	259	0.28	0.015	0.014	0.023	169	0.034	0.263	0.55	0.76	81.0	8.6	0.0002	0.067	1.13	0.043	0.005	0.78	29.6
39	265																		
40	273	0.39	0.016	0.013	0.023	160	0.033	0.337	0.73	0.90	79.0	8.3	0.0002	0.063	1.07	0.041	0.005	0.75	28.7
41	280	0.44	0.016	0.013	0.022	156	0.033	0.375	0.82	0.97	78.0	8.1	0.0002	0.062	1.03	0.041	0.005	0.74	28.2
42	287	0.49	0.017	0.013	0.022	151	0.033	0.412	0.91	1.04	77.0	7.9	0.0002	0.060	1.00	0.040	0.005	0.73	27.7
43	294	0.54	0.017	0.012	0.022	147	0.032	0.449	1.00	1.11	76.0	7.8	0.0002	0.058	0.97	0.039	0.005	0.72	27.2
44	301	0.59	0.018	0.012	0.021	143	0.032	0.487	1.10	1.19	75.0	7.6	0.0002	0.056	0.93	0.038	0.005	0.70	26.8
45	310	0.64	0.018	0.011	0.021	139	0.031	0.524	1.19	1.26	74.0	7.5	0.0002	0.054	0.90	0.037	0.005	0.69	26.3
46	316	0.69	0.019	0.011	0.021	134	0.031	0.561	1.28	1.33	73.0	7.3	0.0002	0.052	0.87	0.036	0.005	0.68	25.8
47	322	0.74	0.019	0.011	0.020	130	0.031	0.599	1.37	1.40	72.0	7.1	0.0002	0.051	0.83	0.036	0.005	0.67	25.3
48	329	0.79	0.020	0.010	0.020	126	0.030	0.636	1.46	1.47	71.0	7.0	0.0002	0.049	0.80	0.035	0.005	0.65	24.9
49	336	0.85	0.020	0.010	0.020	121	0.030	0.673	1.55	1.54	70.0	6.8	0.0002	0.047	0.77	0.034	0.005	0.64	24.4
50	343	0.90	0.021	0.010	0.019	117	0.030	0.711	1.64	1.61	69.0	6.6	0.0002	0.045	0.73	0.033	0.005	0.63	23.9
51	350	0.95	0.021	0.009	0.019	113	0.029	0.748	1.73	1.69	68.0	6.5	0.0002	0.043	0.70	0.032	0.005	0.62	23.4
52	357	1.00	0.022	0.009	0.019	109	0.029	0.785	1.82	1.76	67.0	6.3	0.0002	0.042	0.67	0.032	0.005	0.60	23.0
53	364	1.05	0.022	0.008	0.018	104	0.028	0.823	1.91	1.83	66.0	6.2	0.0002	0.040	0.63	0.031	0.005	0.59	22.5
54	371	**1.1**	**0.023**	**0.008**	**0.018**	**100**	**0.028**	**0.86**	**2.0**	**1.9**	**65**	**6.0**	0.0002	**0.038**	**< 0.60**	**0.030**	**< 0.005**	**0.58**	**22**
55	378					143					86.3		0.0002						
56	385																		
57	392					228					128.8		0.0002						
58	399					**270**					**150**		**< 0.0002**						
59	406					253					142.4								
60	413					235					134.8								
61	420					218					127.1								
62	428					200					119.5								
63	435					183					111.9								
64	442					165					104.3								
65	448					148					96.6								
66	455					**130**					**89**								
83	580																		
90	630	**28**	**1.1**	**0.006**	**5.4**	**300**	**2.9**	**66**	**460**	**1.2**	**1500**	**180**		**1.9**		**1.1**	**0.028**	**4.70**	**2400**
91	644					**420**					**430**								

* Measured values shown in bold

Appendix 3.5-35 Table 19

Cumulative Mass Flux
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.03	0.004	0.00	0.00	21.1	0.00	0.01	0.15	0.042	4.6	0.3	0.0000	0.00	0.49	0.004	0.000	0.8	1.55
2	8	0.09	0.012	0.01	0.01	54.1	0.01	0.03	0.47	0.11	12.3	0.8	0.0001	0.01	1.21	0.011	0.001	1.8	4.10
3	15	0.32	0.043	0.01	0.02	79.9	0.01	0.07	2.45	0.28	19.0	1.3	0.0001	0.01	1.94	0.016	0.002	2.6	6.4
4	22	0.66	0.091	0.01	0.02	95.9	0.02	0.12	5.66	0.52	23.9	1.7	0.0002	0.02	2.58	0.021	0.004	3.1	8.1
5	28	0.88	0.123	0.02	0.02	116	0.02	0.15	7.71	0.67	31.2	2.1	0.0002	0.02	3.34	0.028	0.005	3.7	9.8
6	35	1.07	0.149	0.02	0.03	156	0.03	0.18	9.45	0.80	41.9	3.0	0.0002	0.03	4.25	0.037	0.006	4.6	12.8
7	42	1.18	0.165	0.02	0.03	207	0.03	0.20	10.55	0.89	53.9	4.1	0.0003	0.04	5.11	0.047	0.007	5.5	16.2
8	49	1.26	0.176	0.03	0.03	287	0.03	0.21	11.33	0.96	71.3	5.8	0.0003	0.06	6.24	0.061	0.008	6.7	21.4
9	56	1.27	0.177	0.03	0.03	365	0.04	0.22	11.53	0.98	87.6	7.4	0.0004	0.08	7.20	0.073	0.009	7.8	26.5
10	63	1.28	0.179	0.04	0.04	446	0.04	0.23	11.70	1.02	102.6	9.0	0.0005	0.10	8.13	0.085	0.010	8.8	31.8
11	70	1.29	0.182	0.04	0.04	525	0.05	0.24	11.84	1.05	115.2	10.5	0.0005	0.11	8.95	0.094	0.012	9.6	37.1
12	77	1.30	0.185	0.04	0.04	596	0.05	0.25	11.94	1.08	124.8	11.8	0.0005	0.13	9.63	0.100	0.013	10.1	42.0
13	84	1.31	0.187	0.05	0.05	654	0.06	0.26	12.00	1.12	131.1	12.7	0.0006	0.14	10.12	0.104	0.014	10.3	46.1
14	91	1.32	0.189	0.05	0.05	696	0.06	0.26	12.04	1.14	136.0	13.5	0.0006	0.15	10.46	0.108	0.015	10.5	49.4
15	98	1.32	0.191	0.05	0.05	733	0.06	0.27	12.07	1.16	140.9	14.3	0.0006	0.16	10.73	0.112	0.015	10.6	52.6
16	106	1.33	0.193	0.06	0.06	767	0.07	0.27	12.09	1.17	146.1	15.1	0.0006	0.17	10.96	0.116	0.016	10.7	56.1
17	113	1.34	0.195	0.06	0.06	810	0.08	0.28	12.09	1.19	153.5	16.2	0.0007	0.18	11.18	0.123	0.017	10.9	61.2
18	119	1.35	0.197	0.06	0.07	841	0.09	0.28	12.09	1.20	159.4	17.1	0.0007	0.19	11.34	0.128	0.017	11.0	65.0
19	126	1.35	0.199	0.06	0.07	869	0.10	0.29	12.10	1.22	165.1	17.9	0.0007	0.20	11.49	0.133	0.018	11.1	68.5
20	133	1.36	0.200	0.07	0.08	894	0.10	0.29	12.10	1.23	170.6	18.7	0.0007	0.21	11.63	0.138	0.019	11.2	71.7
21	140	1.36	0.202	0.07	0.08	922	0.11	0.29	12.10	1.26	177.0	19.6	0.0007	0.22	11.79	0.143	0.019	11.3	75.3
22	147	1.37	0.203	0.07	0.09	949	0.12	0.30	12.11	1.28	183.7	20.5	0.0008	0.23	11.94	0.148	0.020	11.4	78.9
23	154	1.37	0.205	0.07	0.09	976	0.12	0.30	12.12	1.30	190.7	21.4	0.0008	0.24	12.09	0.153	0.020	11.5	82.5
24	161	1.38	0.207	0.08	0.09	1002	0.13	0.31	12.12	1.33	198.1	22.3	0.0008	0.24	12.24	0.158	0.021	11.6	86.2
25	168	1.38	0.208	0.08	0.10	1027	0.13	0.32	12.13	1.36	205.6	23.2	0.0008	0.25	12.39	0.163	0.022	11.7	89.7
26	175	1.39	0.209	0.08	0.10	1050	0.14	0.32	12.14	1.39	212.6	24.1	0.0009	0.26	12.53	0.167	0.022	11.8	92.9
27	182	1.39	0.211	0.08	0.10	1072	0.14	0.33	12.14	1.42	220.0	25.0	0.0009	0.27	12.67	0.172	0.023	11.9	96.3
28	189	1.40	0.212	0.08	0.11	1095	0.15	0.33	12.15	1.45	228.0	25.9	0.0009	0.28	12.81	0.177	0.023	12.0	99.7
29	197	1.40	0.213	0.09	0.11	1117	0.15	0.34	12.16	1.48	236.0	26.9	0.0009	0.29	12.95	0.182	0.024	12.1	103.0
30	204	1.40	0.215	0.09	0.11	1141	0.16	0.35	12.17	1.53	245.5	27.9	0.0010	0.30	13.10	0.188	0.024	12.2	106.9
31	210	1.41	0.216	0.09	0.12	1164	0.16	0.36	12.18	1.57	254.8	29.0	0.0010	0.30	13.25	0.193	0.025	12.3	110.5
32	218	1.41	0.218	0.09	0.12	1186	0.17	0.37	12.19	1.61	264.3	30.0	0.0010	0.31	13.40	0.198	0.025	12.4	114.2
33	224	1.41	0.219	0.09	0.12	1211	0.17	0.38	12.20	1.66	275.6	31.3	0.0010	0.32	13.57	0.204	0.026	12.5	118.4

Appendix 3.5-35 Table 19 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	1.42	0.221	0.10	0.13	1235	0.18	0.39	12.23	1.72	286.5	32.5	0.0010	0.33	13.73	0.210	0.027	12.6	122.4
35	238	1.44	0.223	0.10	0.13	1259	0.18	0.41	12.27	1.80	297.8	33.7	0.0011	0.34	13.90	0.216	0.027	12.7	126.6
36	245	1.47	0.224	0.10	0.13	1283	0.19	0.44	12.32	1.88	308.9	34.9	0.0011	0.35	14.06	0.222	0.028	12.8	130.7
37	253	1.50	0.226	0.10	0.14	1305	0.19	0.46	12.37	1.97	319.3	36.0	0.0011	0.36	14.21	0.228	0.029	12.9	134.5
38	259	1.53	0.228	0.10	0.14	1326	0.19	0.50	12.44	2.06	329.5	37.1	0.0012	0.37	14.35	0.233	0.029	13.0	138.2
39	265	1.53	0.228	0.10	0.14	1326	0.19	0.50	12.44	2.06	329.5	37.1	0.0012	0.37	14.35	0.233	0.029	13.0	138.2
40	273	1.58	0.230	0.11	0.14	1346	0.20	0.54	12.54	2.18	339.5	38.1	0.0012	0.38	14.49	0.239	0.030	13.1	141.8
41	280	1.63	0.232	0.11	0.14	1363	0.20	0.58	12.62	2.28	347.8	39.0	0.0012	0.38	14.60	0.243	0.030	13.2	144.9
42	287	1.69	0.234	0.11	0.15	1383	0.21	0.63	12.75	2.42	358.1	40.0	0.0012	0.39	14.73	0.248	0.031	13.3	148.5
43	294	1.77	0.236	0.11	0.15	1403	0.21	0.69	12.88	2.57	368.3	41.1	0.0013	0.40	14.86	0.253	0.032	13.4	152.2
44	301	1.84	0.239	0.11	0.15	1422	0.21	0.76	13.03	2.73	378.3	42.1	0.0013	0.41	14.98	0.258	0.032	13.5	155.8
45	310	1.92	0.241	0.11	0.16	1439	0.22	0.82	13.17	2.88	387.3	43.0	0.0013	0.41	15.09	0.263	0.033	13.5	159.0
46	316	2.01	0.243	0.11	0.16	1456	0.22	0.90	13.34	3.05	396.7	43.9	0.0013	0.42	15.21	0.268	0.034	13.6	162.3
47	322	2.11	0.246	0.12	0.16	1473	0.23	0.97	13.51	3.23	405.7	44.8	0.0014	0.43	15.31	0.272	0.034	13.7	165.5
48	329	2.20	0.248	0.12	0.16	1488	0.23	1.05	13.69	3.40	414.4	45.7	0.0014	0.43	15.41	0.276	0.035	13.8	168.5
49	336	2.31	0.251	0.12	0.17	1503	0.23	1.13	13.88	3.60	423.0	46.5	0.0014	0.44	15.50	0.281	0.036	13.9	171.5
50	343	2.41	0.253	0.12	0.17	1517	0.24	1.21	14.07	3.78	431.1	47.3	0.0014	0.44	15.59	0.285	0.036	13.9	174.3
51	350	2.53	0.256	0.12	0.17	1530	0.24	1.31	14.28	3.99	439.4	48.1	0.0015	0.45	15.67	0.288	0.037	14.0	177.2
52	357	2.64	0.258	0.12	0.17	1543	0.24	1.40	14.49	4.19	447.1	48.8	0.0015	0.45	15.75	0.292	0.037	14.1	179.8
53	364	2.76	0.261	0.12	0.17	1555	0.25	1.49	14.70	4.40	454.5	49.5	0.0015	0.46	15.82	0.296	0.038	14.2	182.3
54	371	2.88	0.263	0.12	0.18	1566	0.25	1.59	14.93	4.61	461.8	50.2	0.0015	0.46	15.89	0.299	0.038	14.2	184.8
55	378					1582					471.4		0.0015						
56	385					1582					471.4		0.0015						
57	392					1597					480.1		0.0016						
58	399					1628					497.1		0.0016						
59	406					1656					513.0								
60	413					1682					527.9								
61	420					1708					543.4								
62	428					1730					556.4								
63	435					1748					567.6								
64	442					1767					579.5								
65	448					1784					590.9								
66	455					1799					601.0								

Appendix 3.5-35 Table 20

Cumulative Metal Extractions
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

		CUMULATIVE METAL EXTRACTIONS (%)																	
CYCLE	DAYS	Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.000	0.000	0.005	0.015	0.3	0.006	0.001	0.000	0.001	0.031	0.05	0.00001	0.01	0.01	0.01	0.002	0.05	0.02
2	8	0.000	0.000	0.014	0.038	0.8	0.014	0.004	0.000	0.002	0.082	0.15	0.00001	0.04	0.02	0.03	0.005	0.11	0.05
3	15	0.001	0.002	0.020	0.055	1.2	0.020	0.008	0.001	0.006	0.127	0.23	0.00002	0.06	0.03	0.05	0.011	0.16	0.08
4	22	0.002	0.004	0.024	0.063	1.4	0.026	0.014	0.002	0.012	0.160	0.29	0.00003	0.07	0.03	0.06	0.019	0.19	0.10
5	28	0.003	0.005	0.029	0.077	1.7	0.031	0.017	0.003	0.016	0.209	0.37	0.00003	0.10	0.04	0.08	0.022	0.23	0.12
6	35	0.003	0.006	0.036	0.090	2.3	0.037	0.021	0.004	0.019	0.281	0.52	0.00004	0.14	0.06	0.11	0.027	0.29	0.16
7	42	0.004	0.007	0.042	0.102	3.0	0.043	0.023	0.005	0.021	0.362	0.70	0.00005	0.20	0.07	0.13	0.031	0.34	0.20
8	49	0.004	0.007	0.051	0.114	4.2	0.050	0.025	0.005	0.022	0.478	0.99	0.00006	0.28	0.08	0.17	0.036	0.42	0.26
9	56	0.004	0.007	0.058	0.123	5.4	0.056	0.025	0.005	0.023	0.588	1.27	0.00007	0.36	0.09	0.21	0.041	0.49	0.33
10	63	0.004	0.007	0.066	0.134	6.6	0.063	0.026	0.005	0.024	0.688	1.55	0.00008	0.44	0.11	0.24	0.046	0.55	0.39
11	70	0.004	0.007	0.074	0.146	7.7	0.070	0.028	0.005	0.024	0.773	1.81	0.00009	0.52	0.12	0.27	0.052	0.60	0.46
12	77	0.004	0.007	0.082	0.158	8.8	0.076	0.029	0.005	0.025	0.837	2.03	0.00009	0.58	0.13	0.29	0.057	0.63	0.52
13	84	0.004	0.007	0.088	0.169	9.6	0.081	0.030	0.005	0.026	0.880	2.20	0.00010	0.64	0.13	0.30	0.062	0.64	0.57
14	91	0.004	0.008	0.093	0.180	10.2	0.086	0.031	0.005	0.026	0.913	2.33	0.00010	0.68	0.14	0.31	0.066	0.65	0.61
15	98	0.004	0.008	0.098	0.192	10.8	0.093	0.031	0.005	0.027	0.945	2.46	0.00010	0.72	0.14	0.32	0.069	0.66	0.65
16	106	0.004	0.008	0.103	0.206	11.3	0.102	0.032	0.005	0.027	0.980	2.60	0.00011	0.76	0.14	0.33	0.072	0.67	0.69
17	113	0.004	0.008	0.110	0.231	11.9	0.117	0.032	0.005	0.028	1.030	2.80	0.00011	0.82	0.15	0.35	0.076	0.68	0.76
18	119	0.004	0.008	0.115	0.248	12.4	0.129	0.033	0.005	0.028	1.070	2.95	0.00012	0.87	0.15	0.37	0.079	0.69	0.80
19	126	0.004	0.008	0.119	0.264	12.8	0.139	0.033	0.005	0.028	1.108	3.09	0.00012	0.91	0.15	0.38	0.081	0.69	0.85
20	133	0.004	0.008	0.123	0.278	13.2	0.148	0.034	0.005	0.029	1.145	3.22	0.00012	0.95	0.15	0.39	0.084	0.70	0.89
21	140	0.004	0.008	0.128	0.293	13.6	0.158	0.034	0.005	0.029	1.188	3.37	0.00013	0.99	0.16	0.41	0.086	0.71	0.93
22	147	0.004	0.008	0.132	0.308	14.0	0.167	0.035	0.005	0.030	1.233	3.53	0.00013	1.03	0.16	0.42	0.089	0.71	0.97
23	154	0.004	0.008	0.136	0.322	14.3	0.176	0.035	0.005	0.030	1.280	3.68	0.00014	1.07	0.16	0.44	0.092	0.72	1.02
24	161	0.005	0.008	0.141	0.337	14.7	0.185	0.036	0.005	0.031	1.330	3.85	0.00014	1.11	0.16	0.45	0.094	0.73	1.06
25	168	0.005	0.008	0.145	0.350	15.1	0.193	0.037	0.005	0.032	1.380	4.01	0.00015	1.15	0.16	0.47	0.097	0.73	1.11
26	175	0.005	0.008	0.148	0.361	15.4	0.201	0.037	0.005	0.032	1.427	4.15	0.00015	1.19	0.16	0.48	0.099	0.74	1.15
27	182	0.005	0.008	0.152	0.373	15.8	0.208	0.038	0.005	0.033	1.477	4.31	0.00015	1.23	0.17	0.49	0.102	0.74	1.19
28	189	0.005	0.008	0.155	0.385	16.1	0.215	0.039	0.005	0.034	1.530	4.47	0.00016	1.27	0.17	0.51	0.104	0.75	1.23
29	197	0.005	0.009	0.159	0.396	16.4	0.221	0.040	0.005	0.035	1.584	4.63	0.00016	1.30	0.17	0.52	0.107	0.75	1.27
30	204	0.005	0.009	0.163	0.408	16.8	0.229	0.041	0.005	0.035	1.647	4.82	0.00016	1.34	0.17	0.54	0.109	0.76	1.32
31	210	0.005	0.009	0.166	0.419	17.1	0.235	0.042	0.005	0.036	1.710	5.00	0.00017	1.38	0.17	0.55	0.112	0.77	1.36
32	218	0.005	0.009	0.170	0.429	17.4	0.242	0.042	0.005	0.037	1.774	5.18	0.00017	1.42	0.18	0.57	0.114	0.77	1.41
33	224	0.005	0.009	0.174	0.441	17.8	0.248	0.044	0.005	0.039	1.850	5.39	0.00018	1.47	0.18	0.58	0.117	0.78	1.46

Appendix 3.5-35 Table 20 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	0.005	0.009	0.177	0.452	18.2	0.255	0.045	0.005	0.040	1.923	5.60	0.00018	1.51	0.18	0.60	0.120	0.79	1.51
35	238	0.005	0.009	0.181	0.464	18.5	0.262	0.048	0.005	0.042	1.999	5.81	0.00019	1.56	0.18	0.62	0.123	0.79	1.56
36	245	0.005	0.009	0.185	0.475	18.9	0.269	0.051	0.005	0.044	2.073	6.01	0.00019	1.60	0.19	0.64	0.126	0.80	1.61
37	253	0.005	0.009	0.188	0.486	19.2	0.275	0.054	0.005	0.046	2.143	6.20	0.00019	1.64	0.19	0.65	0.129	0.81	1.66
38	259	0.005	0.009	0.192	0.497	19.5	0.281	0.058	0.005	0.048	2.211	6.39	0.00020	1.68	0.19	0.67	0.132	0.81	1.71
39	265	0.005	0.009	0.192	0.497	19.5	0.281	0.058	0.005	0.048	2.211	6.39	0.00020	1.68	0.19	0.67	0.132	0.81	1.71
40	273	0.005	0.009	0.195	0.507	19.8	0.287	0.063	0.005	0.051	2.278	6.57	0.00020	1.71	0.19	0.68	0.135	0.82	1.75
41	280	0.005	0.009	0.197	0.515	20.0	0.292	0.067	0.005	0.053	2.334	6.72	0.00021	1.74	0.19	0.69	0.137	0.82	1.79
42	287	0.006	0.009	0.200	0.526	20.3	0.299	0.074	0.005	0.056	2.403	6.90	0.00021	1.78	0.19	0.71	0.140	0.83	1.83
43	294	0.006	0.009	0.203	0.536	20.6	0.305	0.081	0.006	0.060	2.472	7.08	0.00022	1.82	0.20	0.72	0.143	0.84	1.88
44	301	0.006	0.010	0.206	0.546	20.9	0.311	0.088	0.006	0.063	2.539	7.26	0.00022	1.85	0.20	0.74	0.146	0.84	1.92
45	310	0.006	0.010	0.209	0.556	21.2	0.317	0.096	0.006	0.067	2.599	7.41	0.00022	1.88	0.20	0.75	0.149	0.85	1.96
46	316	0.007	0.010	0.212	0.565	21.4	0.322	0.104	0.006	0.071	2.663	7.58	0.00023	1.91	0.20	0.76	0.152	0.85	2.00
47	322	0.007	0.010	0.214	0.574	21.7	0.328	0.113	0.006	0.075	2.723	7.73	0.00023	1.94	0.20	0.78	0.155	0.86	2.04
48	329	0.007	0.010	0.216	0.583	21.9	0.333	0.122	0.006	0.079	2.781	7.88	0.00024	1.97	0.20	0.79	0.158	0.86	2.08
49	336	0.008	0.010	0.219	0.592	22.1	0.339	0.132	0.006	0.084	2.839	8.02	0.00024	1.99	0.20	0.80	0.160	0.87	2.12
50	343	0.008	0.010	0.221	0.600	22.3	0.344	0.141	0.006	0.088	2.893	8.16	0.00025	2.02	0.21	0.81	0.163	0.87	2.15
51	350	0.008	0.010	0.223	0.608	22.5	0.349	0.152	0.006	0.093	2.949	8.29	0.00025	2.04	0.21	0.82	0.166	0.88	2.19
52	357	0.009	0.010	0.225	0.616	22.7	0.354	0.162	0.006	0.098	3.001	8.42	0.00025	2.06	0.21	0.83	0.168	0.88	2.22
53	364	0.009	0.010	0.226	0.623	22.9	0.358	0.173	0.006	0.102	3.050	8.54	0.00026	2.08	0.21	0.84	0.171	0.88	2.25
54	371	0.009	0.011	0.228	0.630	23.0	0.363	0.184	0.006	0.107	3.099	8.65	0.00026	2.10	0.21	0.85	0.173	0.89	2.28
55	378					23.3					3.164		0.00027						
56	385					23.3					3.164		0.00027						
57	392					23.5					3.222		0.00027						
58	399					23.9					3.336		0.00027						
59	406					24.3					3.443								
60	413					24.7					3.543								
61	420					25.1					3.647								
62	428					25.4					3.734								
63	435					25.7					3.809								
64	442					26.0					3.889								
65	448					26.2					3.965								
66	455					26.5					4.034								

Appendix 3.5-35 Table 21

Metal Extraction Rates
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0																		
2	8	0.052	0.007	0.004	0.006	28.84	0.0046	0.0197	0.275	0.056	6.69	0.459	0.00003	0.0049	0.629	0.0055	0.0007	0.90	2.23
3	15	0.134	0.018	0.004	0.005	27.43	0.0046	0.0286	1.071	0.109	6.68	0.464	0.00003	0.0047	0.676	0.0057	0.0010	0.86	2.25
4	22	0.202	0.028	0.003	0.004	23.80	0.0043	0.0348	1.750	0.151	6.13	0.431	0.00004	0.0042	0.665	0.0053	0.0012	0.74	2.09
5	28	0.214	0.030	0.003	0.004	23.83	0.0043	0.0352	1.888	0.156	6.63	0.457	0.00004	0.0046	0.712	0.0059	0.0012	0.74	2.07
6	35	0.208	0.029	0.003	0.004	27.04	0.0042	0.0338	1.860	0.152	7.45	0.539	0.00004	0.0056	0.751	0.0066	0.0011	0.76	2.24
7	42	0.225	0.032	0.003	0.004	31.48	0.0041	0.0340	2.076	0.161	8.57	0.668	0.00004	0.0071	0.803	0.0075	0.0012	0.76	2.49
8	49	0.194	0.027	0.003	0.003	42.55	0.0042	0.0293	1.829	0.140	10.77	0.914	0.00005	0.0099	0.884	0.0091	0.0012	0.85	3.10
9	56	0.124	0.018	0.004	0.003	55.41	0.0044	0.0209	1.209	0.096	13.11	1.176	0.00005	0.0129	0.951	0.0108	0.0010	0.98	3.78
10	63	0.079	0.011	0.004	0.003	65.96	0.0045	0.0157	0.798	0.070	14.28	1.370	0.00005	0.0151	0.957	0.0114	0.0011	1.02	4.39
11	70	0.044	0.006	0.004	0.003	73.75	0.0046	0.0120	0.477	0.050	14.66	1.494	0.00005	0.0165	0.941	0.0113	0.0011	1.00	4.87
12	77	0.024	0.004	0.004	0.003	77.79	0.0046	0.0102	0.278	0.039	14.18	1.533	0.00005	0.0171	0.903	0.0107	0.0012	0.92	5.16
13	84	0.011	0.002	0.004	0.003	73.49	0.0042	0.0090	0.134	0.032	11.96	1.396	0.00004	0.0158	0.778	0.0087	0.0012	0.72	4.94
14	91	0.010	0.002	0.004	0.003	66.09	0.0041	0.0089	0.103	0.031	9.68	1.223	0.00004	0.0140	0.652	0.0069	0.0011	0.52	4.58
15	98	0.009	0.002	0.003	0.003	57.28	0.0041	0.0082	0.074	0.028	7.66	1.052	0.00003	0.0122	0.522	0.0054	0.0010	0.36	4.16
16	106	0.008	0.002	0.003	0.003	47.11	0.0043	0.0070	0.048	0.024	6.00	0.890	0.00002	0.0104	0.390	0.0043	0.0009	0.23	3.69
17	113	0.008	0.002	0.003	0.004	41.60	0.0056	0.0059	0.028	0.020	5.59	0.868	0.00002	0.0102	0.302	0.0044	0.0008	0.16	3.74
18	119	0.007	0.002	0.003	0.004	37.37	0.0066	0.0049	0.018	0.017	5.67	0.872	0.00002	0.0101	0.244	0.0048	0.0007	0.14	3.78
19	126	0.007	0.002	0.003	0.005	34.63	0.0073	0.0044	0.011	0.016	5.82	0.882	0.00003	0.0101	0.207	0.0050	0.0007	0.13	3.82
20	133	0.007	0.002	0.003	0.005	32.35	0.0076	0.0041	0.006	0.016	5.96	0.888	0.00003	0.0100	0.180	0.0052	0.0007	0.12	3.83
21	140	0.007	0.002	0.003	0.005	31.81	0.0080	0.0043	0.004	0.017	6.37	0.928	0.00003	0.0103	0.170	0.0055	0.0007	0.11	3.95
22	147	0.006	0.002	0.003	0.004	28.65	0.0071	0.0043	0.004	0.018	6.22	0.874	0.00002	0.0094	0.156	0.0051	0.0006	0.10	3.64
23	154	0.005	0.002	0.002	0.004	26.94	0.0065	0.0045	0.005	0.020	6.26	0.855	0.00002	0.0090	0.149	0.0049	0.0006	0.10	3.50
24	161	0.005	0.002	0.002	0.004	26.72	0.0064	0.0049	0.005	0.022	6.62	0.881	0.00002	0.0090	0.150	0.0050	0.0006	0.10	3.54
25	168	0.005	0.002	0.002	0.004	26.59	0.0063	0.0053	0.006	0.025	6.98	0.909	0.00002	0.0091	0.152	0.0051	0.0006	0.10	3.59
26	175	0.005	0.001	0.002	0.004	25.58	0.0059	0.0055	0.006	0.026	7.11	0.906	0.00002	0.0089	0.148	0.0050	0.0006	0.10	3.53
27	182	0.005	0.001	0.002	0.004	24.66	0.0056	0.0057	0.007	0.028	7.26	0.906	0.00002	0.0087	0.146	0.0049	0.0006	0.10	3.47
28	189	0.004	0.001	0.002	0.003	23.93	0.0053	0.0060	0.007	0.030	7.46	0.913	0.00002	0.0085	0.144	0.0049	0.0006	0.09	3.44
29	197	0.004	0.001	0.002	0.003	22.30	0.0049	0.0060	0.007	0.030	7.36	0.884	0.00002	0.0081	0.136	0.0047	0.0005	0.09	3.28
30	204	0.004	0.001	0.002	0.003	22.16	0.0047	0.0065	0.008	0.033	7.76	0.914	0.00002	0.0082	0.138	0.0048	0.0005	0.09	3.33
31	210	0.004	0.001	0.002	0.003	22.87	0.0048	0.0071	0.009	0.036	8.45	0.978	0.00002	0.0086	0.145	0.0051	0.0006	0.09	3.52
32	218	0.004	0.001	0.002	0.003	22.13	0.0045	0.0074	0.009	0.038	8.60	0.981	0.00002	0.0084	0.143	0.0050	0.0006	0.09	3.48
33	224	0.004	0.001	0.002	0.003	23.20	0.0046	0.0082	0.011	0.043	9.52	1.069	0.00002	0.0090	0.153	0.0054	0.0006	0.10	3.74

Appendix 3.5-35 Table 21 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	0.005	0.002	0.002	0.003	25.02	0.0049	0.0104	0.015	0.051	10.70	1.187	0.00003	0.0098	0.167	0.0060	0.0006	0.11	4.11
35	238	0.008	0.002	0.002	0.003	24.31	0.0047	0.0126	0.020	0.056	10.77	1.182	0.00003	0.0096	0.164	0.0059	0.0006	0.11	4.06
36	245	0.012	0.002	0.002	0.003	23.78	0.0046	0.0156	0.027	0.062	10.81	1.177	0.00003	0.0095	0.161	0.0059	0.0006	0.11	4.03
37	253	0.017	0.002	0.002	0.003	23.76	0.0046	0.0197	0.037	0.071	11.00	1.189	0.00003	0.0095	0.162	0.0059	0.0007	0.11	4.07
38	259	0.024	0.002	0.002	0.003	23.02	0.0045	0.0243	0.048	0.080	10.78	1.158	0.00003	0.0092	0.156	0.0058	0.0006	0.10	3.97
39	265	0.022	0.001	0.002	0.002	18.27	0.0036	0.0214	0.043	0.068	8.61	0.922	0.00002	0.0073	0.124	0.0046	0.0005	0.08	3.17
40	273	0.028	0.001	0.001	0.002	17.42	0.0035	0.0259	0.054	0.076	8.34	0.886	0.00002	0.0069	0.117	0.0044	0.0005	0.08	3.05
41	280	0.032	0.001	0.001	0.002	16.00	0.0033	0.0289	0.062	0.080	7.78	0.821	0.00002	0.0063	0.107	0.0041	0.0005	0.07	2.84
42	287	0.040	0.002	0.001	0.002	16.11	0.0034	0.0351	0.077	0.093	7.98	0.834	0.00002	0.0064	0.107	0.0042	0.0005	0.08	2.89
43	294	0.047	0.002	0.001	0.002	15.35	0.0033	0.0395	0.087	0.101	7.75	0.802	0.00002	0.0061	0.102	0.0040	0.0005	0.07	2.79
44	301	0.061	0.002	0.002	0.003	18.63	0.0040	0.0511	0.113	0.129	9.48	0.978	0.00002	0.0073	0.123	0.0049	0.0006	0.09	3.41
45	310	0.065	0.002	0.001	0.003	17.49	0.0038	0.0537	0.120	0.133	9.04	0.925	0.00002	0.0069	0.115	0.0046	0.0006	0.09	3.24
46	316	0.075	0.002	0.001	0.003	18.13	0.0040	0.0616	0.139	0.150	9.51	0.967	0.00003	0.0071	0.118	0.0048	0.0006	0.09	3.40
47	322	0.082	0.002	0.001	0.003	17.86	0.0040	0.0673	0.152	0.162	9.53	0.961	0.00003	0.0070	0.116	0.0048	0.0006	0.09	3.39
48	329	0.087	0.002	0.001	0.003	16.97	0.0039	0.0707	0.161	0.167	9.22	0.922	0.00003	0.0066	0.110	0.0046	0.0006	0.09	3.26
49	336	0.092	0.002	0.001	0.003	16.16	0.0038	0.0744	0.170	0.174	8.95	0.886	0.00002	0.0063	0.104	0.0044	0.0006	0.08	3.15
50	343	0.104	0.003	0.001	0.003	16.48	0.0040	0.0830	0.190	0.192	9.30	0.913	0.00003	0.0064	0.105	0.0046	0.0007	0.09	3.26
51	350	0.106	0.003	0.001	0.002	15.23	0.0037	0.0843	0.194	0.193	8.77	0.854	0.00003	0.0059	0.096	0.0043	0.0006	0.08	3.06
52	357	0.107	0.003	0.001	0.002	14.07	0.0035	0.0852	0.196	0.194	8.28	0.798	0.00002	0.0054	0.088	0.0040	0.0006	0.08	2.87
53	364	0.112	0.003	0.001	0.002	13.34	0.0034	0.0881	0.204	0.199	8.03	0.766	0.00002	0.0051	0.083	0.0038	0.0006	0.07	2.77
54	371	0.115	0.003	0.001	0.002	12.58	0.0033	0.0908	0.210	0.203	7.76	0.733	0.00002	0.0048	0.077	0.0037	0.0006	0.07	2.66
55	378					13.00					8.05		0.00002						
56	385					10.26					6.41		0.00002						
57	392					10.81					6.58		0.00002						
58	399					14.61					8.52		0.00002						
59	406					17.99					10.23								
60	413					20.04					11.30								
61	420					25.36					14.41								
62	428					25.88					14.84								
63	435					23.48					13.71								
64	442					21.68					12.95								
65	448					20.54					12.59								
66	455					18.20					11.52								

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 22

Oxidation and Neutralization Results
Whole Tailings (WD-13)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	53	0.01		0.55	0.53	0.19	1.31	72		0.3
2	8	137	0.02	73.94	0.88	0.82	0.31	1.29	186	99.62	0.7
3	15	175	0.02	57.29	0.40	0.65	0.27	2.31	278	96.07	1.0
4	22	223	0.03	54.19	0.50	0.40	0.20	1.22	338	84.72	1.3
5	28	292	0.03	59.86	0.72	0.51	0.30	1.13	419	86.86	1.6
6	35	428	0.05	75.06	1.42	1.00	0.44	1.02	563	98.28	2.1
7	42	601	0.07	95.55	1.81	1.27	0.49	0.97	739	113.94	2.7
8	49	874	0.10	143.85	2.84	1.99	0.72	0.95	1010	150.69	3.7
9	56	1144	0.13	189.58	2.81	1.96	0.67	0.94	1273	192.49	4.7
10	63	1413	0.16	224.13	2.80	2.03	0.62	0.94	1538	223.66	5.7
11	70	1664	0.19	247.23	2.62	1.97	0.52	0.95	1787	244.70	6.6
12	77	1881	0.21	255.87	2.26	1.77	0.39	0.96	2003	252.82	7.4
13	84	2050	0.23	235.16	1.76	1.45	0.26	0.97	2174	232.91	8.1
14	91	2171	0.24	205.52	1.27	1.04	0.20	0.98	2298	205.05	8.5
15	98	2280	0.26	173.48	1.13	0.93	0.20	1.00	2411	174.72	8.9
16	106	2382	0.27	139.66	1.06	0.87	0.21	1.02	2520	142.46	9.3
17	113	2508	0.28	122.04	1.31	1.06	0.31	1.05	2657	127.03	9.8
18	119	2601	0.29	110.31	0.97	0.77	0.24	1.04	2758	116.74	10.2
19	126	2687	0.30	103.15	0.89	0.70	0.23	1.04	2851	110.51	10.6
20	133	2768	0.31	97.49	0.84	0.64	0.23	1.04	2938	105.39	10.9
21	140	2855	0.32	97.37	0.91	0.69	0.26	1.04	3033	105.75	11.2
22	147	2944	0.33	89.67	0.92	0.68	0.28	1.04	3129	97.22	11.6
23	154	3032	0.34	86.02	0.91	0.66	0.29	1.04	3224	93.10	11.9
24	161	3122	0.35	87.01	0.94	0.67	0.31	1.03	3321	94.03	12.3
25	168	3209	0.36	88.24	0.90	0.63	0.30	1.03	3414	95.21	12.6

Appendix 3.5-35 Table 22 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	175	3288	0.37	86.51	0.82	0.56	0.29	1.03	3499	93.20	13.0
27	182	3369	0.38	85.07	0.85	0.56	0.31	1.03	3586	91.52	13.3
28	189	3453	0.39	84.29	0.87	0.57	0.33	1.03	3676	90.54	13.6
29	197	3535	0.40	80.25	0.85	0.54	0.33	1.03	3764	86.06	13.9
30	204	3628	0.41	81.58	0.97	0.61	0.39	1.02	3863	87.34	14.3
31	210	3718	0.42	86.02	0.93	0.57	0.38	1.02	3959	91.96	14.7
32	218	3806	0.43	84.99	0.92	0.55	0.39	1.02	4053	90.72	15.0
33	224	3909	0.44	91.17	1.07	0.62	0.47	1.02	4162	97.16	15.4
34	230	4006	0.45	100.03	1.02	0.59	0.45	1.02	4266	106.57	15.8
35	238	4107	0.46	98.58	1.05	0.61	0.47	1.03	4374	105.10	16.2
36	245	4204	0.47	97.32	1.01	0.59	0.46	1.03	4479	103.95	16.6
37	253	4295	0.48	97.73	0.94	0.55	0.43	1.04	4576	104.68	16.9
38	259	4383	0.49	94.77	0.91	0.53	0.42	1.04	4672	101.93	17.3
39	265										
40	273	4540	0.51	86.59	0.87	0.50	0.41	1.05	4844	94.02	17.9
41	280	4609	0.52	80.86	0.72	0.42	0.34	1.06	4920	88.22	18.2
42	287	4692	0.53	81.84	0.87	0.50	0.42	1.06	5012	89.78	18.6
43	294	4774	0.54	78.34	0.85	0.49	0.42	1.07	5104	86.43	18.9
44	301	4854	0.54	77.23	0.83	0.48	0.41	1.08	5193	85.60	19.2
45	310	4924	0.55	72.61	0.73	0.42	0.37	1.08	5272	80.94	19.5
46	316	4996	0.56	75.37	0.76	0.43	0.39	1.09	5354	84.48	19.8
47	322	5066	0.57	74.79	0.73	0.41	0.37	1.07	5432	83.89	20.1
48	329	5136	0.58	72.38	0.73	0.38	0.36	1.01	5506	80.37	20.4
49	336	5209	0.58	71.10	0.76	0.38	0.36	0.96	5579	77.21	20.7
50	343	5268	0.59	72.97	0.61	0.34	0.33	1.11	5646	79.45	20.9
51	350	5353	0.60	73.36	0.88	0.34	0.34	0.77	5715	74.17	21.2
52	357	5438	0.61	74.25	0.88	0.32	0.32	0.72	5778	69.26	21.4
53	364	5513	0.62	75.45	0.79	0.29	0.30	0.75	5838	66.39	21.6
54	371	5567	0.62	71.64	0.56	0.28	0.30	1.03	5896	63.39	21.8
55	378	5617	0.63	69.90	0.52	0.40	0.39	1.52	5975	65.64	22.1
56	385										
57	392	5748	0.65	62.09	0.46	0.38	0.36	1.60	6208	85.99	23.0
58	399	5930	0.67	83.27	1.89	0.77	0.70	0.78	6355	103.47	23.5
59	406	6096	0.68	105.76	1.73	0.70	0.65	0.78	6490	118.94	24.0
60	413	6250	0.70	126.62	1.61	0.65	0.62	0.79	6617	128.50	24.5

Appendix 3.5-35 Table 22 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
61	420	6408	0.72	140.81	1.64	0.66	0.64	0.80	6748	122.71	25.0
62	428	6535	0.73	153.09	1.33	0.54	0.53	0.81	6855	125.78	25.4
63	435	6643	0.75	138.71	1.12	0.46	0.46	0.82	6947	115.11	25.7
64	442	6754	0.76	127.92	1.15	0.47	0.49	0.83	7043	107.47	26.1
65	448	6855	0.77	121.01	1.06	0.43	0.47	0.85	7133	103.17	26.4
66	455	6942	0.78	106.96	0.90	0.37	0.42	0.87	7212	92.89	26.7

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 3.5-35 Tables 23-29. TMA Lime Amended Whole Tailings (WD-14) (Leached Under Alternating Wet/Dry Conditions) Data and Calculations.

Appendix 3.5-35 Table 23

Sample Characterization
Lime Amended Whole Tailings (WD-14) - Leached under alternating wet/dry conditions

Metals Analysis		(ppm)
Aluminum	Al	30600
Antimony	Sb	68
Arsenic	As	2500
Barium	Ba	54
Beryllium	Be	<50
Bismuth	Bi	<20
Cadmium	Cd	28
Calcium	Ca	6800
Carbon	C	5000
Chromium	Cr	100
Cobalt	Co	69
Copper	Cu	860
Gallium	Ga	16
Iron	Fe	232000
Lead	Pb	4300
Lithium	Li	NA
Magnesium	Mg	14900
Manganese	Mn	580
Mercury	Hg	1.6
Molybdenum	Mo	<20
Nickel	Ni	22
Phosphorus	P	NA
Potassium	K	7600
Selenium	Se	35
Silicon	Si	160000
Silver	Ag	22.2
Sodium	Na	1600
Strontium	Sr	NA
Thallium	Tl	14
Tin	Sn	24
Titanium	Ti	1400
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	8100

Note: NA = Not Analyzed

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	34.80

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 24

Parameters Measured Weekly
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct-94	1	0	3.010	11.6	800	17		**326**	28
2-Nov-94	2	8	4.080	11.2	2160	18		**169**	48
9-Nov-94	3	15	4.360	11.2	1250	23		134	65
16-Nov-94	4	22	4.450	11.0	1170	190		**98**	77
22-Nov-94	5	28	4.870	10.9	896	200		**91**	90
29-Nov-94	6	35	4.560	10.8	998	172		95	102
6-Dec-94	7	42	4.120	10.7	1000	146		100	114
12-Dec-94	8	48	7.630	10.6	1010	510	?	**104**	137
21-Dec-94	9	57	4.300	9.2	633	36		**115**	151
28-Dec-94	10	64	4.710	10.2	727	78		139	170
4-Jan-95	11	71	4.620	10.2	817	52		163	192
10-Jan-95	12	77	4.160	10.9	886	73		186	214
17-Jan-95	13	84	2.920	10.3	756	39		**210**	232
24-Jan-95	14	91	1.000	11.0	1380	150		216	238
31-Jan-95	15	98	0.400	8.3	770	47		222	240
8-Feb-95	16	106	2.520	8.8	980	24		228	257
15-Feb-95	17	113	1.350	8.3	961			234	266
21-Feb-95	18	119	2.460	9.2	1120	500	?	239	283
28-Feb-95	19	126	1.880	8.2	1150			245	296
7-Mar-95	20	133	1.840	7.8	1140			251	309
14-Mar-95	21	140	2.150	7.4	1130			257	325
21-Mar-95	22	147	2.520	8.0	1260			263	344
28-Mar-95	23	154	2.500	7.7	1230			269	364
4-Apr-95	24	161	2.580	7.2	907			275	384
11-Apr-95	25	168	2.360	7.8	918			281	403
18-Apr-95	26	175	2.150	7.2	955			286	421
25-Apr-95	27	182	2.490	7.3	947			292	442
2-May-95	28	189	2.520	7.3	965			298	463
10-May-95	29	197	2.600	7.0	976			304	486
17-May-95	30	204	3.000	6.6	1030			310	513
23-May-95	31	210	2.840	6.8	1140			316	538
31-May-95	32	218	2.750	7.2	1010			322	564
6-Jun-95	33	224	3.550	7.4	1030			328	597
12-Jun-95	34	230	3.360	7.6	937			334	629
20-Jun-95	35	238	3.220	7.5	922			339	661
27-Jun-95	36	245	3.450	7.6	963			345	695
5-Jul-95	37	253	3.350	7.5	965			351	729
11-Jul-95	38	259	3.290	7.7	888			357	763
17-Jul-95	39	265	0.000						
25-Jul-95	40	273	3.510	7.4	872			369	800

Appendix 3.5-35 Table 24 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
1-Aug-95	41	280	2.160	7.1	812			375	823
8-Aug-95	42	287	3.620	7.0	927			381	863
15-Aug-95	43	294	3.740	7.4	968			386	904
22-Aug-95	44	301	3.380	7.5	898			392	942
31-Aug-95	45	310	3.160	7.4	867			398	978
6-Sep-95	46	316	3.580	7.7	847			404	1020
12-Sep-95	47	322	3.460	7.5	884	22		**410**	1061
19-Sep-95	48	329	3.230	7.2	911	25		**610**	1117
26-Sep-95	49	336	3.450	7.2	852	20		**580**	1175
3-Oct-95	50	343	3.120	7.3	897	89		**420**	1213
10-Oct-95	51	350	3.090	7.3	928	33		**490**	1256
17-Oct-95	52	357	3.050	7.3	871	23		**580**	1307
24-Oct-95	53	364	2.820	6.9	856	20		**540**	1351
31-Oct-95	54	371	2.720	7.0	943	29		**420**	1384
7-Nov-95	55	378	2.640	6.9	879	20		**390**	1413
14-Nov-95	56	385	0.000						
21-Nov-95	57	392	1.300	6.2	782	8	?	**320**	1425
28-Nov-95	58	399	2.750	6.4	1070	26		**470**	1462
5-Dec-95	59	406	2.280	7.5	852	21			
12-Dec-95	60	413	2.520	7.5	1050	24			
19-Dec-95	61	420	2.960	7.7	1350	31			
27-Dec-95	62	428	2.060	7.3	991	19			
3-Jan-96	63	435	2.480	7.3	1120	31			
10-Jan-96	64	442	2.540	6.8	858	19			
16-Jan-96	65	448	2.820	6.8	880				

* Measured values of sulfate shown in bold

Appendix 3.5-35 Table 25

Leachate Analysis
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *																				
		Aluminum Al	Arsenic As	Barium Ba		Cadmium Cd	Calcium Ca		Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg		Manganese Mn		Mercury Hg		Nickel Ni		Potassium K	Selenium Se		Silver Ag	Sodium Na	Zinc Zn
1	0	0.14	0.21	0.066	<	0.005	760		0.011	0.92	0.59	53	0.33	<	0.005	<	0.0002		0.051		35.7	0.33	<	0.005	21	2.2
2	8	0.44	0.26	0.035	<	0.005	360	<	0.010	0.66	3.6	28	1.2		0.024	<	0.0002		0.031		19.2	0.22	<	0.005	10	0.46
3	15	2.72	0.730	0.026		0.005	260		0.02	0.760	47.8	19.5	6.1		0.19		0.0004		0.03		13.3	0.1900		0.009	7.1	2.23
4	22	5.0	1.2	0.016	<	0.005	160		0.025	0.86	92	11	11		0.36		0.00057	<	0.020		7.4	0.16		0.013	4.2	4.0
5	28	9.4	1.9	0.022		0.008	130		0.046	1.3	140	9	20		0.58		0.0014		0.039		6.5	0.15		0.018	3.5	7.1
6	35	8.00	1.733	0.021		0.009	140		0.04	1.333	120	8.97	22.3		0.72		0.0010		0.05		6.0	0.1567		0.016	3.4	6.60
7	42	6.60	1.567	0.020		0.010	150		0.04	1.367	100	8.93	24.7		0.85		0.0006		0.07		5.5	0.1633		0.014	3.3	6.10
8	48	5.2	1.4	0.019		0.011	160		0.030	1.4	80	8.9	27		0.99	<	0.0002		0.081		5.0	0.17		0.012	3.2	5.6
9	57	5.4	1.2	0.0016	<	0.005	120		0.030	0.91	90	3.5	13		0.36		0.0010		0.064	<	4.8	0.14		0.014	2.8	3.3
10	64	4.48	0.955	0.006		0.005	125		0.03	0.773	70.5	3.05	13.3		0.30		0.0008		0.06		5.0	0.1238		0.012	2.9	2.88
11	71	3.55	0.710	0.010		0.005	130		0.02	0.635	51.0	2.60	13.5		0.24		0.0006		0.07		5.3	0.1075		0.010	3.1	2.45
12	77	2.63	0.465	0.014		0.005	135		0.02	0.498	31.5	2.15	13.8		0.18		0.0004		0.07		5.5	0.0913		0.007	3.2	2.03
13	84	1.7	0.22	0.018	<	0.005	140	<	0.010	0.36	12	1.7	14		0.12	<	0.0002		0.066		5.7	0.075	<	0.005	3.3	1.6
14	91	1.67	0.215	0.018		0.005	140		0.01	0.352	11.7	1.66	14.7		0.12				0.07		5.6	0.0739		0.005	3.3	1.58
15	98	1.64	0.210	0.018		0.005	141		0.01	0.344	11.4	1.62	15.4		0.13				0.06		5.5	0.0727		0.005	3.3	1.57
16	106	1.61	0.205	0.018		0.005	141		0.01	0.336	11.1	1.58	16.0		0.13				0.06		5.4	0.0716		0.005	3.2	1.55
17	113	1.58	0.200	0.018		0.005	142		0.01	0.327	10.9	1.54	16.7		0.13				0.06		5.3	0.0704		0.005	3.2	1.54
18	119	1.55	0.194	0.018		0.005	142		0.01	0.319	10.6	1.50	17.4		0.13				0.06		5.2	0.0693		0.005	3.2	1.52
19	126	1.52	0.189	0.018		0.005	143		0.01	0.311	10.3	1.46	18.1		0.14				0.06		5.2	0.0681		0.005	3.2	1.50
20	133	1.50	0.184	0.018		0.005	143		0.01	0.303	10.0	1.42	18.8		0.14				0.06		5.1	0.0670		0.005	3.1	1.49
21	140	1.47	0.179	0.018		0.005	144		0.01	0.295	9.7	1.38	19.5		0.14				0.06		5.0	0.0658		0.005	3.1	1.47
22	147	1.44	0.174	0.018		0.005	144		0.01	0.287	9.4	1.34	20.1		0.15				0.06		4.9	0.0647		0.005	3.1	1.46
23	154	1.41	0.169	0.018		0.005	145		0.01	0.279	9.1	1.30	20.8		0.15				0.06		4.8	0.0635		0.005	3.1	1.44
24	161	1.38	0.164	0.017		0.005	145		0.01	0.270	8.8	1.26	21.5		0.15				0.06		4.7	0.0624		0.005	3.0	1.43
25	168	1.35	0.159	0.017		0.005	146		0.01	0.262	8.6	1.22	22.2		0.16				0.06		4.6	0.0612		0.005	3.0	1.41
26	175	1.32	0.153	0.017		0.005	146		0.01	0.254	8.3	1.18	22.9		0.16				0.06		4.5	0.0601		0.005	3.0	1.39
27	182	1.29	0.148	0.017		0.005	147		0.01	0.246	8.0	1.14	23.6		0.16				0.06		4.4	0.0590		0.005	3.0	1.38
28	189	1.26	0.143	0.017		0.005	147		0.01	0.238	7.7	1.10	24.2		0.16				0.06		4.3	0.0578		0.005	2.9	1.36
29	197	1.23	0.138	0.017		0.005	148		0.01	0.230	7.4	1.07	24.9		0.17				0.05		4.3	0.0567		0.005	2.9	1.35
30	204	1.20	0.133	0.017		0.005	148		0.01	0.222	7.1	1.03	25.6		0.17				0.05		4.2	0.0555		0.005	2.9	1.33
31	210	1.17	0.128	0.017		0.005	149		0.01	0.213	6.8	0.99	26.3		0.17				0.05		4.1	0.0544		0.005	2.9	1.31
32	218	1.14	0.123	0.017		0.005	149		0.01	0.205	6.6	0.95	27.0		0.18				0.05		4.0	0.0532		0.005	2.8	1.30
33	224	1.11	0.118	0.017		0.005	150		0.01	0.197	6.3	0.91	27.7		0.18				0.05		3.9	0.0521		0.005	2.8	1.28
34	230	1.09	0.112	0.017		0.005	150		0.01	0.189	6.0	0.87	28.3		0.18				0.05		3.8	0.0509		0.005	2.8	1.27
35	238	1.06	0.107	0.017		0.005	151		0.01	0.181	5.7	0.83	29.0		0.18				0.05		3.7	0.0498		0.005	2.8	1.25

Appendix 3.5-35 Table 25 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) * Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
36	245	1.03	0.102	0.017	0.005	151	0.01	0.173	5.4	0.79	29.7	0.19		0.05	3.6	0.0486	0.005	2.7	1.24
37	253	1.00	0.097	0.017	0.005	152	0.01	0.164	5.1	0.75	30.4	0.19		0.05	3.5	0.0475	0.005	2.7	1.22
38	259	0.97	0.092	0.017	0.005	152	0.01	0.156	4.8	0.71	31.1	0.19		0.05	3.4	0.0463	0.005	2.7	1.20
39	265																		
40	273	0.91	0.082	0.017	0.005	153	0.01	0.140	4.3	0.63	32.4	0.20		0.05	3.3	0.0440	0.005	2.6	1.17
41	280	0.88	0.077	0.017	0.005	154	0.01	0.132	4.0	0.59	33.1	0.20		0.05	3.2	0.0429	0.005	2.6	1.16
42	287	0.85	0.071	0.017	0.005	154	0.01	0.124	3.7	0.55	33.8	0.20		0.05	3.1	0.0418	0.005	2.6	1.14
43	294	0.82	0.066	0.017	0.005	155	0.01	0.116	3.4	0.51	34.5	0.21		0.04	3.0	0.0406	0.005	2.6	1.12
44	301	0.79	0.061	0.016	0.005	155	0.01	0.107	3.1	0.47	35.2	0.21		0.04	2.9	0.0395	0.005	2.5	1.11
45	310	0.76	0.056	0.016	0.005	156	0.01	0.099	2.8	0.43	35.9	0.21		0.04	2.8	0.0383	0.005	2.5	1.09
46	316	0.73	0.051	0.016	0.005	156	0.01	0.091	2.5	0.39	36.5	0.22		0.04	2.7	0.0372	0.005	2.5	1.08
47	322	0.70	0.046	0.016	0.005	157	0.01	0.083	2.2	0.35	37.2	0.22		0.04	2.6	0.0360	0.005	2.5	1.06
48	329	0.68	0.041	0.016	0.005	157	0.01	0.075	2.0	0.31	37.9	0.22		0.04	2.5	0.0349	0.005	2.4	1.05
49	336	0.65	0.036	0.016	0.005	158	0.01	0.067	1.7	0.27	38.6	0.23		0.04	2.5	0.0337	0.005	2.4	1.03
50	343	0.62	0.030	0.016	0.005	158	0.01	0.059	1.4	0.23	39.3	0.23		0.04	2.4	0.0326	0.005	2.4	1.01
51	350	0.59	0.025	0.016	0.005	159	0.01	0.050	1.1	0.19	40.0	0.23		0.04	2.3	0.0314	0.005	2.4	1.00
52	357	0.56	0.020	0.016	0.005	159	0.01	0.042	0.8	0.15	40.6	0.23		0.04	2.2	0.0303	0.005	2.3	0.98
53	364	0.53	0.015	0.016	0.005	160	0.01	0.034	0.5	0.11	41.3	0.24		0.04	2.1	0.0291	0.005	2.3	0.97
54	371	**0.50**	**0.010**	**0.016**	**< 0.005**	**160**	**< 0.010**	**0.026**	**0.24**	**0.073**	**42**	**0.24**		**0.037**	**2**	**0.028**	**< 0.005**	**2.3**	**0.95**
55	378					158					43.0								
56	385																		
57	392					153					45.0								
58	399					160					46								

* Measured vales shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 26

Cumulative Mass Flux
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.01	0.02	0.006	0.000	65.7	0.001	0.001	0.08	0.05	4.584	0.03	0.00	0.0000	0.00	3.09	0.029	0.000	1.82	0.19
2	8	0.06	0.05	0.010	0.001	107.9	0.001	0.002	0.16	0.47	7.87	0.17	0.00	0.0000	0.01	5.34	0.054	0.001	2.99	0.24
3	15	0.40	0.14	0.013	0.002	140.5	0.004	0.004	0.25	6.46	10.31	0.93	0.03	0.0001	0.01	7.01	0.078	0.002	3.88	0.52
4	22	1.04	0.29	0.015	0.002	161.0	0.009	0.008	0.36	18.23	11.72	2.34	0.07	0.0002	0.01	7.95	0.099	0.004	4.42	1.04
5	28	2.36	0.56	0.018	0.003	179.2	0.020	0.014	0.54	37.82	12.98	5.14	0.15	0.0004	0.02	8.86	0.120	0.006	4.91	2.03
6	35	3.41	0.79	0.021	0.005	197.5	0.030	0.019	0.72	53.54	14.15	8.07	0.25	0.0005	0.03	9.65	0.140	0.008	5.35	2.89
7	42	4.19	0.97	0.023	0.006	215.3	0.039	0.023	0.88	65.38	15.21	11.0	0.35	0.0006	0.03	10.30	0.159	0.010	5.74	3.62
8	48	5.33	1.28	0.027	0.008	250.4	0.055	0.030	1.19	82.92	17.16	16.9	0.57	0.0006	0.05	11.39	0.197	0.013	6.44	4.84
9	57	6.00	1.43	0.028	0.009	265.2	0.060	0.034	1.30	94.04	17.59	18.5	0.61	0.0007	0.06	11.99	0.214	0.014	6.79	5.25
10	64	6.60	1.56	0.028	0.009	282.1	0.065	0.037	1.40	103.58	18.01	20.3	0.65	0.0008	0.07	12.67	0.231	0.016	7.18	5.64
11	71	7.07	1.65	0.030	0.010	299.4	0.068	0.040	1.49	110.35	18.35	22.1	0.68	0.0009	0.08	13.36	0.245	0.017	7.59	5.97
12	77	7.39	1.71	0.031	0.011	315.5	0.071	0.042	1.55	114.12	18.61	23.7	0.70	0.0010	0.08	14.02	0.256	0.018	7.97	6.21
13	84	7.53	1.72	0.033	0.011	327.2	0.072	0.042	1.58	115.13	18.75	24.9	0.72	0.0010	0.09	14.50	0.262	0.019	8.25	6.34
14	91	7.58	1.73	0.033	0.011	331.3	0.077	0.043	1.59	115.46	18.80	25.3	0.72		0.09	14.66	0.264	0.019	8.34	6.39
15	98	7.60	1.73	0.034	0.011	332.9	0.078	0.043	1.59	115.60	18.82	25.5	0.72		0.09	14.72	0.265	0.019	8.38	6.41
16	106	7.71	1.75	0.035	0.012	343.1	0.088	0.044	1.62	116.40	18.93	26.7	0.73		0.10	15.12	0.270	0.019	8.61	6.52
17	113	7.77	1.76	0.036	0.012	348.7	0.093	0.044	1.63	116.82	18.99	27.3	0.73		0.10	15.32	0.273	0.019	8.74	6.58
18	119	7.88	1.77	0.037	0.012	358.7	0.101	0.045	1.65	117.57	19.10	28.6	0.74		0.10	15.69	0.278	0.020	8.96	6.69
19	126	7.97	1.78	0.038	0.013	366.4	0.107	0.045	1.67	118.12	19.18	29.5	0.75		0.11	15.97	0.282	0.020	9.13	6.77
20	133	8.05	1.79	0.039	0.013	374.0	0.113	0.046	1.68	118.65	19.25	30.5	0.76		0.11	16.24	0.285	0.020	9.30	6.85
21	140	8.14	1.80	0.040	0.013	382.9	0.120	0.046	1.70	119.25	19.34	31.7	0.77		0.11	16.55	0.289	0.021	9.49	6.94
22	147	8.24	1.81	0.041	0.013	393.4	0.127	0.047	1.72	119.93	19.43	33.2	0.78		0.12	16.90	0.294	0.021	9.71	7.04
23	154	8.34	1.83	0.042	0.014	403.8	0.133	0.048	1.74	120.59	19.53	34.7	0.79		0.12	17.25	0.299	0.021	9.93	7.15
24	161	8.44	1.84	0.044	0.014	414.6	0.140	0.049	1.76	121.25	19.62	36.3	0.80		0.13	17.60	0.303	0.022	10.16	7.25
25	168	8.54	1.85	0.045	0.015	424.4	0.145	0.049	1.78	121.83	19.70	37.8	0.81		0.13	17.91	0.307	0.022	10.36	7.35
26	175	8.62	1.86	0.046	0.015	433.5	0.150	0.050	1.80	122.34	19.78	39.2	0.82		0.14	18.19	0.311	0.022	10.54	7.43
27	182	8.71	1.87	0.047	0.015	444.0	0.155	0.051	1.82	122.91	19.86	40.9	0.83		0.14	18.51	0.315	0.023	10.76	7.53
28	189	8.80	1.88	0.048	0.016	454.7	0.159	0.051	1.83	123.47	19.94	42.6	0.84		0.14	18.82	0.319	0.023	10.97	7.63
29	197	8.89	1.89	0.050	0.016	465.7	0.164	0.052	1.85	124.02	20.02	44.5	0.86		0.15	19.14	0.324	0.023	11.19	7.73
30	204	9.00	1.90	0.051	0.016	478.5	0.168	0.053	1.87	124.63	20.11	46.7	0.87		0.15	19.50	0.328	0.024	11.43	7.85
31	210	9.09	1.91	0.053	0.017	490.6	0.172	0.054	1.89	125.19	20.19	48.9	0.89		0.16	19.83	0.333	0.024	11.67	7.95
32	218	9.18	1.92	0.054	0.017	502.4	0.175	0.054	1.90	125.71	20.26	51.0	0.90		0.16	20.15	0.337	0.025	11.89	8.06
33	224	9.30	1.93	0.056	0.018	517.7	0.178	0.055	1.92	126.35	20.35	53.8	0.92		0.17	20.54	0.342	0.025	12.18	8.19

Appendix 3.5-35 Table 26 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	9.40	1.94	0.057	0.018	532.2	0.181	0.056	1.94	126.93	20.44	56.5	0.93		0.17	20.91	0.347	0.026	12.45	8.31
35	238	9.50	1.95	0.059	0.019	546.2	0.183	0.057	1.96	127.45	20.51	59.2	0.95		0.18	21.25	0.352	0.026	12.70	8.42
36	245	9.60	1.96	0.060	0.019	561.1	0.185	0.058	1.97	127.99	20.59	62.2	0.97		0.18	21.61	0.357	0.027	12.97	8.55
37	253	9.70	1.97	0.062	0.020	575.8	0.186	0.059	1.99	128.48	20.66	65.1	0.99		0.19	21.95	0.361	0.027	13.24	8.66
38	259	9.79	1.98	0.064	0.020	590.1	0.187	0.060	2.00	128.94	20.73	68.0	1.01		0.19	22.28	0.366	0.028	13.49	8.78
39	265	9.79	1.98	0.064	0.020	590.1	0.187	0.060	2.00	128.94	20.73	68.0	1.01		0.19	22.28	0.366	0.028	13.49	8.78
40	273	9.88	1.99	0.065	0.021	605.6	0.195	0.061	2.02	129.37	20.80	71.3	1.03		0.19	22.61	0.370	0.028	13.76	8.90
41	280	9.93	1.99	0.066	0.021	615.1	0.199	0.062	2.03	129.61	20.83	73.4	1.04		0.20	22.80	0.373	0.028	13.92	8.97
42	287	10.02	2.00	0.068	0.021	631.2	0.207	0.063	2.04	130.00	20.89	76.9	1.06		0.20	23.13	0.377	0.029	14.19	9.09
43	294	10.11	2.01	0.070	0.022	647.8	0.213	0.064	2.05	130.36	20.94	80.6	1.08		0.21	23.45	0.382	0.029	14.46	9.21
44	301	10.19	2.02	0.072	0.022	662.8	0.219	0.065	2.06	130.66	20.99	84.0	1.10		0.21	23.73	0.385	0.030	14.71	9.31
45	310	10.26	2.02	0.073	0.023	677.0	0.224	0.066	2.07	130.92	21.03	87.3	1.12		0.21	23.98	0.389	0.030	14.94	9.41
46	316	10.33	2.03	0.075	0.023	693.0	0.228	0.067	2.08	131.18	21.07	91.0	1.15		0.22	24.26	0.393	0.031	15.20	9.52
47	322	10.40	2.03	0.076	0.024	708.6	0.232	0.068	2.09	131.40	21.10	94.7	1.17		0.22	24.53	0.396	0.031	15.44	9.63
48	329	10.47	2.03	0.078	0.024	723.2	0.236	0.069	2.10	131.59	21.13	98.2	1.19		0.23	24.76	0.399	0.032	15.67	9.73
49	336	10.53	2.04	0.079	0.025	738.8	0.239	0.070	2.10	131.75	21.16	102.1	1.21		0.23	25.00	0.403	0.032	15.91	9.83
50	343	10.59	2.04	0.081	0.025	753.0	0.241	0.071	2.11	131.88	21.18	105.6	1.23		0.23	25.22	0.406	0.033	16.13	9.92
51	350	10.64	2.04	0.082	0.026	767.0	0.242	0.072	2.11	131.97	21.20	109.1	1.25		0.24	25.42	0.409	0.033	16.34	10.01
52	357	10.69	2.04	0.084	0.026	781.0	0.243	0.072	2.12	132.04	21.21	112.7	1.27		0.24	25.61	0.411	0.034	16.54	10.09
53	364	10.73	2.05	0.085	0.027	793.9	0.244	0.073	2.12	132.09	21.22	116.0	1.29		0.24	25.78	0.414	0.034	16.73	10.17
54	371	10.77	2.05	0.086	0.027	806.4	0.244	0.074	2.12	132.11	21.23	119.3	1.31		0.25	25.93	0.416	0.034	16.91	10.25
55	378					818.4						122.6								
56	385					818.4						122.6								
57	392					824.1						124.3								
58	399					835.9						127.9								

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 27

Cumulative Metal Extractions
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.000	0.001	0.011	0.002	1.0	0.001	0.001	0.497	0.000	0.107	0.000	0.00	0.0000	0.02	0.04	0.08	0.002	0.11	0.00
2	8	0.000	0.002	0.018	0.004	1.6	0.001	0.003	0.981	0.000	0.183	0.001	0.00	0.0000	0.04	0.07	0.16	0.005	0.19	0.00
3	15	0.001	0.006	0.024	0.006	2.1	0.004	0.006	1.576	0.003	0.240	0.006	0.00	0.0000	0.05	0.09	0.22	0.010	0.24	0.01
4	22	0.003	0.012	0.028	0.008	2.4	0.009	0.011	2.263	0.008	0.272	0.016	0.01	0.0000	0.06	0.10	0.28	0.017	0.28	0.01
5	28	0.008	0.022	0.034	0.012	2.6	0.020	0.020	3.400	0.016	0.302	0.034	0.03	0.0001	0.09	0.12	0.34	0.029	0.31	0.03
6	35	0.011	0.031	0.039	0.016	2.9	0.030	0.028	4.492	0.023	0.329	0.054	0.04	0.0001	0.12	0.13	0.40	0.038	0.33	0.04
7	42	0.014	0.039	0.043	0.021	3.2	0.039	0.034	5.504	0.028	0.354	0.074	0.06	0.0001	0.16	0.14	0.46	0.045	0.36	0.04
8	48	0.017	0.051	0.051	0.029	3.7	0.055	0.044	7.422	0.036	0.399	0.113	0.10	0.0001	0.24	0.15	0.56	0.057	0.40	0.06
9	57	0.020	0.057	0.051	0.031	3.9	0.060	0.049	8.125	0.041	0.409	0.124	0.11	0.0001	0.27	0.16	0.61	0.065	0.42	0.06
10	64	0.022	0.062	0.053	0.034	4.1	0.065	0.054	8.778	0.045	0.419	0.136	0.11	0.0001	0.31	0.17	0.66	0.072	0.45	0.07
11	71	0.023	0.066	0.055	0.036	4.4	0.068	0.058	9.305	0.048	0.427	0.148	0.12	0.0002	0.35	0.18	0.70	0.078	0.47	0.07
12	77	0.024	0.068	0.058	0.038	4.6	0.071	0.060	9.677	0.049	0.433	0.159	0.12	0.0002	0.39	0.18	0.73	0.082	0.50	0.08
13	84	0.025	0.069	0.061	0.040	4.8	0.072	0.061	9.866	0.050	0.436	0.167	0.12		0.41	0.19	0.75	0.084	0.52	0.08
14	91	0.025	0.069	0.062	0.040	4.9	0.077	0.062	9.929	0.050	0.437	0.170	0.12		0.42	0.19	0.76	0.084	0.52	0.08
15	98	0.025	0.069	0.062	0.041	4.9	0.078	0.062	9.954	0.050	0.438	0.171	0.12		0.42	0.19	0.76	0.085	0.52	0.08
16	106	0.025	0.070	0.065	0.042	5.0	0.088	0.063	10.105	0.050	0.440	0.179	0.13		0.44	0.20	0.77	0.086	0.54	0.08
17	113	0.025	0.070	0.066	0.043	5.1	0.093	0.064	10.185	0.050	0.442	0.183	0.13		0.46	0.20	0.78	0.087	0.55	0.08
18	119	0.026	0.071	0.068	0.044	5.3	0.101	0.065	10.326	0.051	0.444	0.192	0.13		0.48	0.21	0.79	0.089	0.56	0.08
19	126	0.026	0.071	0.070	0.045	5.4	0.107	0.065	10.431	0.051	0.446	0.198	0.13		0.49	0.21	0.80	0.090	0.57	0.08
20	133	0.026	0.072	0.072	0.046	5.5	0.113	0.066	10.531	0.051	0.448	0.205	0.13		0.51	0.21	0.81	0.091	0.58	0.08
21	140	0.027	0.072	0.074	0.047	5.6	0.120	0.067	10.645	0.051	0.450	0.213	0.13		0.52	0.22	0.83	0.092	0.59	0.09
22	147	0.027	0.073	0.076	0.048	5.8	0.127	0.068	10.775	0.052	0.452	0.223	0.13		0.54	0.22	0.84	0.094	0.61	0.09
23	154	0.027	0.073	0.078	0.049	5.9	0.133	0.069	10.900	0.052	0.454	0.233	0.14		0.56	0.23	0.85	0.096	0.62	0.09
24	161	0.028	0.074	0.081	0.051	6.1	0.140	0.070	11.025	0.052	0.456	0.243	0.14		0.58	0.23	0.87	0.097	0.63	0.09
25	168	0.028	0.074	0.083	0.052	6.2	0.145	0.071	11.136	0.053	0.458	0.254	0.14		0.60	0.24	0.88	0.099	0.65	0.09
26	175	0.028	0.074	0.085	0.053	6.4	0.150	0.072	11.234	0.053	0.460	0.263	0.14		0.61	0.24	0.89	0.100	0.66	0.09
27	182	0.028	0.075	0.087	0.054	6.5	0.155	0.073	11.344	0.053	0.462	0.274	0.14		0.63	0.24	0.90	0.102	0.67	0.09
28	189	0.029	0.075	0.090	0.056	6.7	0.159	0.074	11.452	0.053	0.464	0.286	0.15		0.65	0.25	0.91	0.104	0.69	0.09
29	197	0.029	0.076	0.092	0.057	6.8	0.164	0.075	11.559	0.053	0.466	0.299	0.15		0.67	0.25	0.92	0.105	0.70	0.10
30	204	0.029	0.076	0.095	0.058	7.0	0.168	0.077	11.678	0.054	0.468	0.313	0.15		0.69	0.26	0.94	0.107	0.71	0.10
31	210	0.030	0.076	0.097	0.060	7.2	0.172	0.078	11.787	0.054	0.469	0.328	0.15		0.71	0.26	0.95	0.109	0.73	0.10
32	218	0.030	0.077	0.100	0.061	7.4	0.175	0.079	11.889	0.054	0.471	0.342	0.16		0.73	0.27	0.96	0.111	0.74	0.10
33	224	0.030	0.077	0.103	0.063	7.6	0.178	0.080	12.014	0.054	0.473	0.361	0.16		0.75	0.27	0.98	0.113	0.76	0.10

Appendix 3.5-35 Table 27 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
34	230	0.031	0.078	0.106	0.065	7.8	0.181	0.082	12.128	0.055	0.475	0.379	0.16		0.78	0.28	0.99	0.115	0.78	0.10
35	238	0.031	0.078	0.109	0.067	8.0	0.183	0.083	12.233	0.055	0.477	0.398	0.16		0.80	0.28	1.01	0.117	0.79	0.10
36	245	0.031	0.079	0.112	0.068	8.3	0.185	0.085	12.340	0.055	0.479	0.417	0.17		0.82	0.28	1.02	0.120	0.81	0.11
37	253	0.032	0.079	0.115	0.070	8.5	0.186	0.086	12.439	0.055	0.481	0.437	0.17		0.84	0.29	1.03	0.122	0.83	0.11
38	259	0.032	0.079	0.118	0.072	8.7	0.187	0.087	12.531	0.056	0.482	0.457	0.17		0.86	0.29	1.04	0.124	0.84	0.11
39	265	0.032	0.079	0.118	0.072	8.7	0.187	0.087	12.531	0.056	0.482	0.457	0.17		0.86	0.29	1.04	0.124	0.84	0.11
40	273	0.032	0.080	0.121	0.074	8.9	0.195	0.089	12.619	0.056	0.484	0.479	0.18		0.88	0.30	1.06	0.126	0.86	0.11
41	280	0.032	0.080	0.123	0.075	9.0	0.199	0.090	12.671	0.056	0.484	0.492	0.18		0.90	0.30	1.07	0.128	0.87	0.11
42	287	0.033	0.080	0.126	0.076	9.3	0.207	0.091	12.751	0.056	0.486	0.516	0.18		0.92	0.30	1.08	0.130	0.89	0.11
43	294	0.033	0.080	0.129	0.078	9.5	0.213	0.093	12.829	0.056	0.487	0.541	0.19		0.94	0.31	1.09	0.132	0.90	0.11
44	301	0.033	0.081	0.132	0.080	9.7	0.219	0.094	12.894	0.056	0.488	0.564	0.19		0.96	0.31	1.10	0.135	0.92	0.11
45	310	0.034	0.081	0.135	0.082	10.0	0.224	0.095	12.950	0.056	0.489	0.586	0.19		0.98	0.32	1.11	0.137	0.93	0.12
46	316	0.034	0.081	0.138	0.084	10.2	0.228	0.097	13.009	0.057	0.490	0.611	0.20		1.00	0.32	1.12	0.139	0.95	0.12
47	322	0.034	0.081	0.141	0.085	10.4	0.232	0.098	13.061	0.057	0.491	0.636	0.20		1.02	0.32	1.13	0.141	0.97	0.12
48	329	0.034	0.081	0.144	0.087	10.6	0.236	0.100	13.104	0.057	0.491	0.659	0.20		1.03	0.33	1.14	0.143	0.98	0.12
49	336	0.034	0.081	0.147	0.089	10.9	0.239	0.101	13.145	0.057	0.492	0.685	0.21		1.05	0.33	1.15	0.145	0.99	0.12
50	343	0.035	0.082	0.150	0.090	11.1	0.241	0.103	13.178	0.057	0.493	0.709	0.21		1.07	0.33	1.16	0.147	1.01	0.12
51	350	0.035	0.082	0.152	0.092	11.3	0.242	0.104	13.206	0.057	0.493	0.732	0.22		1.08	0.33	1.17	0.149	1.02	0.12
52	357	0.035	0.082	0.155	0.094	11.5	0.243	0.105	13.229	0.057	0.493	0.756	0.22		1.10	0.34	1.17	0.151	1.03	0.12
53	364	0.035	0.082	0.157	0.095	11.7	0.244	0.106	13.247	0.057	0.493	0.779	0.22		1.11	0.34	1.18	0.153	1.05	0.13
54	371	0.035	0.082	0.160	0.096	11.9	0.244	0.107	13.259	0.057	0.494	0.801	0.23		1.13	0.34	1.19	0.155	1.06	0.13
55	378					12.0						0.823								
56	385					12.0						0.823								
57	392					12.1						0.834								
58	399					12.3						0.858								

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 28

Metal Extraction Rates
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0																		
2	8	0.045	0.027	0.004	0.0005	36.93	0.0010	0.068	0.37	2.87	0.12	0.002	0.0000	0.003	1.970	0.023	0.001	1.03	0.05
3	15	0.183	0.057	0.003	0.0006	34.90	0.0016	0.081	2.99	2.67	0.42	0.013	0.0000	0.003	1.828	0.023	0.001	0.96	0.16
4	22	0.328	0.088	0.003	0.0006	30.30	0.0021	0.090	5.78	2.27	0.74	0.023	0.0000	0.003	1.548	0.022	0.001	0.83	0.27
5	28	0.587	0.135	0.003	0.0007	28.36	0.0032	0.116	9.44	2.10	1.28	0.039	0.0001	0.004	1.443	0.023	0.001	0.77	0.46
6	35	0.679	0.154	0.003	0.0008	26.36	0.0037	0.128	10.70	1.91	1.61	0.050	0.0001	0.004	1.312	0.022	0.002	0.71	0.54
7	42	0.849	0.190	0.003	0.0010	22.10	0.0044	0.149	13.36	1.51	2.23	0.071	0.0001	0.005	1.021	0.022	0.002	0.57	0.69
8	48	1.045	0.242	0.003	0.0014	23.30	0.0055	0.198	16.22	1.45	3.39	0.114	0.0001	0.009	0.931	0.025	0.002	0.54	0.92
9	57	0.990	0.227	0.003	0.0013	20.84	0.0052	0.188	15.16	1.18	3.23	0.108	0.0001	0.009	0.807	0.023	0.002	0.47	0.84
10	64	0.825	0.194	0.002	0.0012	20.01	0.0045	0.167	12.79	0.98	2.95	0.097	0.0001	0.010	0.740	0.022	0.002	0.44	0.70
11	71	0.713	0.168	0.002	0.0011	19.80	0.0040	0.150	11.05	0.82	2.73	0.085	0.0001	0.010	0.723	0.020	0.002	0.44	0.60
12	77	0.640	0.147	0.002	0.0010	20.04	0.0036	0.134	9.75	0.68	2.55	0.071	0.0001	0.010	0.744	0.019	0.002	0.45	0.52
13	84	0.428	0.087	0.001	0.0006	14.95	0.0024	0.076	6.26	0.31	1.56	0.029	0.0001	0.008	0.603	0.013	0.001	0.35	0.29
14	91	0.326	0.063	0.001	0.0005	13.61	0.0018	0.059	4.41	0.25	1.41	0.022		0.007	0.550	0.010	0.001	0.32	0.23
15	98	0.205	0.036	0.001	0.0004	10.46	0.0012	0.039	2.47	0.17	1.07	0.014		0.005	0.423	0.007	0.001	0.25	0.16
16	106	0.128	0.019	0.001	0.0003	8.76	0.0008	0.026	1.21	0.12	0.92	0.009		0.004	0.350	0.005	0.000	0.20	0.11
17	113	0.075	0.010	0.001	0.0002	6.45	0.0005	0.016	0.53	0.07	0.70	0.006		0.003	0.253	0.003	0.000	0.15	0.07
18	119	0.071	0.009	0.001	0.0002	6.30	0.0004	0.015	0.49	0.07	0.73	0.006		0.003	0.239	0.003	0.000	0.14	0.07
19	126	0.078	0.010	0.001	0.0002	7.03	0.0005	0.016	0.53	0.08	0.84	0.007		0.003	0.263	0.003	0.000	0.16	0.08
20	133	0.090	0.011	0.001	0.0003	8.22	0.0006	0.018	0.61	0.09	1.00	0.008		0.004	0.304	0.004	0.000	0.18	0.09
21	140	0.087	0.011	0.001	0.0003	8.19	0.0006	0.018	0.59	0.08	1.04	0.008		0.004	0.295	0.004	0.000	0.18	0.09
22	147	0.096	0.012	0.001	0.0003	9.21	0.0006	0.019	0.64	0.09	1.21	0.009		0.004	0.325	0.004	0.000	0.20	0.10
23	154	0.091	0.011	0.001	0.0003	9.01	0.0006	0.018	0.60	0.09	1.23	0.009		0.004	0.311	0.004	0.000	0.19	0.09
24	161	0.095	0.012	0.001	0.0003	9.62	0.0007	0.019	0.62	0.09	1.35	0.010		0.004	0.325	0.004	0.000	0.20	0.10
25	168	0.098	0.012	0.001	0.0003	10.08	0.0007	0.019	0.63	0.09	1.45	0.010		0.004	0.334	0.004	0.000	0.21	0.10
26	175	0.096	0.011	0.001	0.0003	10.11	0.0007	0.019	0.62	0.09	1.49	0.011		0.004	0.328	0.004	0.000	0.21	0.10
27	182	0.094	0.011	0.001	0.0003	10.12	0.0007	0.018	0.59	0.09	1.54	0.011		0.004	0.321	0.004	0.000	0.21	0.10
28	189	0.092	0.011	0.001	0.0003	10.18	0.0007	0.018	0.58	0.08	1.59	0.011		0.004	0.315	0.004	0.000	0.21	0.10
29	197	0.087	0.010	0.001	0.0003	9.95	0.0007	0.017	0.54	0.08	1.60	0.011		0.004	0.300	0.004	0.000	0.20	0.09
30	204	0.090	0.010	0.001	0.0004	10.51	0.0007	0.017	0.55	0.08	1.74	0.012		0.004	0.309	0.004	0.000	0.21	0.10
31	210	0.095	0.011	0.001	0.0004	11.43	0.0008	0.018	0.57	0.08	1.93	0.013		0.004	0.328	0.004	0.000	0.22	0.10

Appendix 3.5-35 Table 28 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
32	218	0.092	0.010	0.001	0.0004	11.36	0.0008	0.017	0.54	0.08	1.96	0.013		0.004	0.319	0.004	0.000	0.22	0.10
33	224	0.099	0.011	0.001	0.0004	12.61	0.0008	0.018	0.58	0.08	2.23	0.015		0.005	0.344	0.005	0.000	0.24	0.11
34	230	0.108	0.012	0.002	0.0005	14.11	0.0009	0.019	0.62	0.09	2.55	0.017		0.005	0.376	0.005	0.000	0.27	0.12
35	238	0.103	0.011	0.002	0.0005	13.93	0.0009	0.018	0.58	0.08	2.58	0.017		0.005	0.362	0.005	0.000	0.26	0.12
36	245	0.102	0.011	0.002	0.0005	14.10	0.0009	0.018	0.56	0.08	2.66	0.017		0.005	0.357	0.005	0.000	0.26	0.12
37	253	0.103	0.010	0.002	0.0005	14.67	0.0010	0.018	0.55	0.08	2.82	0.018		0.005	0.362	0.005	0.000	0.27	0.12
38	259	0.098	0.010	0.002	0.0005	14.49	0.0010	0.017	0.52	0.08	2.85	0.018		0.005	0.347	0.005	0.000	0.26	0.12
39	265	0.077	0.008	0.001	0.0004	11.59	0.0008	0.013	0.40	0.06	2.30	0.014		0.004	0.274	0.004	0.000	0.21	0.09
40	273	0.076	0.007	0.001	0.0004	11.89	0.0008	0.012	0.38	0.06	2.42	0.015		0.004	0.271	0.004	0.000	0.21	0.09
41	280	0.067	0.006	0.001	0.0004	10.80	0.0007	0.011	0.32	0.05	2.24	0.014		0.003	0.238	0.003	0.000	0.19	0.08
42	287	0.067	0.006	0.001	0.0004	11.41	0.0007	0.010	0.31	0.05	2.43	0.015		0.003	0.241	0.003	0.000	0.20	0.09
43	294	0.065	0.006	0.001	0.0004	11.53	0.0007	0.010	0.28	0.04	2.51	0.015		0.003	0.234	0.003	0.000	0.19	0.09
44	301	0.078	0.007	0.002	0.0005	14.14	0.0009	0.011	0.34	0.05	3.10	0.019		0.004	0.282	0.004	0.000	0.24	0.10
45	310	0.071	0.006	0.001	0.0004	13.51	0.0009	0.010	0.29	0.04	3.02	0.018		0.004	0.260	0.004	0.000	0.22	0.10
46	316	0.078	0.006	0.002	0.0005	15.15	0.0010	0.011	0.30	0.05	3.43	0.021		0.004	0.284	0.004	0.000	0.25	0.11
47	322	0.076	0.006	0.002	0.0005	15.49	0.0010	0.010	0.28	0.04	3.57	0.021		0.004	0.280	0.004	0.000	0.25	0.11
48	329	0.071	0.005	0.002	0.0005	15.08	0.0010	0.009	0.24	0.04	3.53	0.021		0.004	0.263	0.004	0.000	0.24	0.10
49	336	0.068	0.004	0.002	0.0005	15.19	0.0010	0.008	0.22	0.03	3.61	0.021		0.004	0.255	0.003	0.000	0.24	0.10
50	343	0.070	0.004	0.002	0.0005	16.12	0.0010	0.008	0.20	0.03	3.89	0.023		0.004	0.261	0.004	0.001	0.25	0.11
51	350	0.063	0.003	0.002	0.0005	15.24	0.0010	0.006	0.16	0.03	3.73	0.022		0.004	0.238	0.003	0.000	0.23	0.10
52	357	0.057	0.003	0.001	0.0005	14.48	0.0009	0.005	0.13	0.02	3.59	0.021		0.004	0.217	0.003	0.000	0.22	0.09
53	364	0.053	0.002	0.001	0.0004	14.15	0.0009	0.005	0.10	0.02	3.56	0.021		0.003	0.203	0.003	0.000	0.21	0.09
54	371	0.048	0.002	0.001	0.0004	13.52	0.0009	0.004	0.07	0.01	3.45	0.020		0.003	0.186	0.003	0.000	0.20	0.08
55	378					13.08					3.40								
56	385					10.26					2.69								
57	392					8.62					2.31								
58	399					8.40					2.37								

Appendix 3.5-35 Table 29

Oxidation and Neutralization Results
Lime Amended Whole Tailings (WD-14)

Test: **Leached under alternating wet/dry conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	28	0.00		0.29	1.64	0.00	5.60	164		0.6
2	8	48	0.01	17.34	0.21	1.06	0.01	5.14	271	92.83	1.0
3	15	65	0.01	17.05	0.17	0.81	0.03	4.85	355	88.98	1.3
4	22	77	0.01	15.61	0.13	0.51	0.06	4.36	412	78.79	1.5
5	28	90	0.01	15.45	0.13	0.45	0.12	4.30	469	76.15	1.7
6	35	103	0.01	14.97	0.14	0.46	0.12	4.26	527	72.50	2.0
7	42	115	0.01	13.76	0.12	0.44	0.12	4.59	583	64.41	2.2
8	48	138	0.02	15.47	0.24	0.88	0.24	4.72	695	72.19	2.6
9	57	152	0.02	14.92	0.15	0.37	0.07	2.95	739	65.41	2.7
10	64	171	0.02	15.68	0.20	0.42	0.07	2.54	789	62.17	2.9
11	71	192	0.02	17.34	0.22	0.43	0.07	2.25	839	60.74	3.1
12	77	214	0.02	19.93	0.23	0.40	0.07	2.03	886	60.61	3.3
13	84	232	0.03	18.36	0.18	0.29	0.05	1.86	921	43.79	3.4
14	91	238	0.03	17.80	0.06	0.10	0.02	1.83	932	39.80	3.5
15	98	241	0.03	14.46	0.03	0.04	0.01	1.80	937	30.56	3.5
16	106	257	0.03	13.02	0.17	0.26	0.05	1.77	968	25.66	3.6
17	113	266	0.03	10.10	0.09	0.14	0.03	1.74	984	18.99	3.6
18	119	283	0.03	10.24	0.18	0.25	0.05	1.72	1014	18.74	3.8
19	126	297	0.03	11.65	0.14	0.19	0.04	1.69	1038	21.03	3.8
20	133	310	0.03	13.80	0.14	0.19	0.04	1.67	1061	24.69	3.9
21	140	326	0.04	14.08	0.17	0.22	0.05	1.64	1088	24.75	4.0
22	147	345	0.04	16.14	0.20	0.26	0.06	1.62	1120	27.98	4.1
23	154	364	0.04	16.15	0.20	0.26	0.06	1.60	1152	27.57	4.3
24	161	384	0.04	17.58	0.21	0.27	0.07	1.58	1186	29.61	4.4
25	168	403	0.05	18.73	0.20	0.25	0.06	1.56	1217	31.18	4.5

Appendix 3.5-35 Table 29 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	175	421	0.05	19.09	0.18	0.23	0.06	1.54	1245	31.43	4.6
27	182	442	0.05	19.46	0.22	0.26	0.07	1.52	1278	31.65	4.7
28	189	464	0.05	19.92	0.22	0.27	0.07	1.51	1312	31.99	4.9
29	197	486	0.05	19.83	0.24	0.28	0.08	1.49	1347	31.44	5.0
30	204	513	0.06	21.32	0.28	0.32	0.09	1.47	1388	33.41	5.1
31	210	539	0.06	23.55	0.27	0.30	0.09	1.46	1428	36.52	5.3
32	218	564	0.06	23.77	0.26	0.29	0.09	1.44	1466	36.49	5.4
33	224	598	0.07	26.82	0.35	0.38	0.12	1.43	1516	40.71	5.6
34	230	630	0.07	30.45	0.34	0.36	0.11	1.42	1563	45.78	5.8
35	238	661	0.07	30.52	0.33	0.35	0.11	1.40	1609	45.44	6.0
36	245	696	0.08	31.34	0.36	0.37	0.12	1.39	1659	46.22	6.1
37	253	729	0.08	33.01	0.35	0.37	0.12	1.38	1707	48.28	6.3
38	259	763	0.09	33.08	0.35	0.36	0.12	1.37	1755	47.93	6.5
39	265										
40	273	841	0.09	35.96	0.39	0.39	0.13	1.34	1864	51.00	6.9
41	280	864	0.10	33.77	0.24	0.24	0.08	1.33	1896	47.54	7.0
42	287	904	0.10	35.95	0.41	0.40	0.14	1.32	1951	50.17	7.2
43	294	946	0.11	36.48	0.43	0.42	0.15	1.31	2008	50.49	7.4
44	301	984	0.11	34.94	0.40	0.38	0.14	1.30	2060	48.12	7.6
45	310	1020	0.11	33.80	0.38	0.35	0.13	1.29	2108	46.18	7.8
46	316	1061	0.12	38.30	0.43	0.40	0.15	1.28	2164	52.00	8.0
47	322	1102	0.12	39.63	0.42	0.39	0.15	1.28	2218	53.40	8.2
48	329	1159	0.13	42.64	0.59	0.36	0.14	0.86	2269	52.23	8.4
49	336	1216	0.14	46.52	0.60	0.39	0.16	0.91	2324	52.84	8.6
50	343	1254	0.14	49.66	0.39	0.35	0.14	1.27	2374	56.30	8.8
51	350	1297	0.15	48.60	0.45	0.35	0.15	1.10	2423	53.44	9.0
52	357	1348	0.15	49.22	0.53	0.35	0.15	0.93	2473	50.98	9.2
53	364	1392	0.16	46.65	0.46	0.32	0.14	1.01	2519	50.02	9.3
54	371	1425	0.16	41.72	0.34	0.31	0.14	1.31	2564	48.01	9.5
55	378	1454	0.16	40.10	0.31	0.30	0.13	1.40	2607	46.69	9.7
56	385										
57	392	1475	0.17	25.33	0.12 ?	0.30	0.15	3.58 ?	2665	36.47	9.9
58	399	1512	0.17	24.01	0.39	0.14	0.07	0.55	2686	33.41	9.9

* Rates of sulfate production and NP depletion are 5-week moving averages

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Tables 30-36. Backfill Coarse Tailings (AL-15) (Leached Under Saturated, Followed by Alternating Wet/Dry Conditions) Data and Calculations.

Appendix 3.5-35 Table 30

Sample Characterization
Backfill Coarse Tailings (AL-15) - Leached under alternating wet/dry, followed by saturated, conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)	
Aluminum	Al	18400	<0.03	
Antimony	Sb	70	<0.04	
Arsenic	As	2600	<0.005	
Barium	Ba	50	0.012	
Beryllium	Be	<50	<0.005	*
Bismuth	Bi	<20	<0.20	*
Cadmium	Cd	20	<0.005	
Calcium	Ca	5600	25.0	
Carbon	C	4400	NA	
Chromium	Cr	30	<0.005	
Cobalt	Co	79	<0.010	
Copper	Cu	500	0.027	
Gallium	Ga	13	NA	
Iron	Fe	268000	0.030	
Lead	Pb	2900	<0.04	
Lithium	Li	NA	NA	
Magnesium	Mg	11200	13.000	
Manganese	Mn	520	0.011	
Mercury	Hg	2.0	<0.0002	
Molybdenum	Mo	<20	<0.020	
Nickel	Ni	<20	<0.015	
Phosphorus	P	NA	NA	
Potassium	K	3900	0.750	
Selenium	Se	38	<0.005	
Silicon	Si	150000	NA	
Silver	Ag	17.4	<0.005	
Sodium	Na	800	1.90	
Strontium	Sr	NA	NA	
Thallium	Tl	10	<0.040	
Tin	Sn	22	<0.24	
Titanium	Ti	1200	<0.050	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	6000	0.44	
Sulfate	SO4	2900	9.90	
Sulfur	S	297000	NA	

Note: NA = Not Analyzed

ABA Results	
Paste pH	6.0
S (Total) (%)	29.0
SO4 (%)	2900
S (sulfide) (%)	28.3
AP (kg CaCO3/tonne)	906
NP (kg CaCO3/tonne)	25
CO2 (%)	1.29
CO3 NP (kg CaCO3/tonne)	30
Net NP (kg CaCO3/tonne)	-881
NP/AP	0.03

Sample Mass (kg)	8.12

* Value Estimated

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 31

Parameters Measured Weekly
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct-94	1*	7	4.500	6.3	3830			**2300**	1275
14-Dec-94	2*	63	0.000						1275
21-Dec-94	3	70	4.400	6.0	2610	70		**1480**	2071
28-Dec-94	4	77	4.500	6.5	2430	24		**1570**	2936
3-Jan-95	5	83	0.400	7.0	2750	44		1055	2987
11-Jan-95	6	91	4.500	6.6	773	71		**540**	3281
17-Jan-95	7	97	2.750	6.6	829	86		**370**	3403
23-Jan-95	8	103	0.500	6.7	916	87		332	3423
30-Jan-95	9	110	0.500	6.7	876	96		294	3440
8-Feb-95	10	119	4.500	7.2	617	110		**256**	3577
15-Feb-95	11	126	0.500	6.8	815	72		255	3592
21-Feb-95	12	132	0.500	7.0	688	90		255	3607
28-Feb-95	13	139	0.500	7.0	848	100		254	3622
7-Mar-95	14	146	0.500	7.0	764	110		253	3637
13-Mar-95	15	152	0.500	7.0	697	110		252	3652
21-Mar-95	16	160	0.500	7.0	704	120		252	3667
28-Mar-95	17	167	0.500	7.1	681	110		251	3682
4-Apr-95	18	174	4.500	7.0	708	120		**250**	3815
10-Apr-95	19	180	0.500	7.1	678	80		251	3829
18-Apr-95	20	188	0.500	7.4	737	96		253	3844
25-Apr-95	21	195	0.500	7.5	704	110		254	3859
1-May-95	22	201	0.500	7.4	724	110		255	3875
8-May-95	23	208	0.500	7.2	736	110		256	3890
15-May-95	24	215	0.500	7.1	665	110		258	3905
22-May-95	25	222	0.500	7.3	642	110		259	3920
31-May-95	26	231	0.500	7.2	639	110		260	3936
6-Jun-95	27	237	0.500	7.4	655	100		261	3951
12-Jun-95	28	243	0.500	7.0	655	100		263	3967
20-Jun-95	29	251	0.500	7.2	660	97		264	3982
26-Jun-95	30	257	0.500	7.1	684	100		265	3998
3-Jul-95	31	264	0.500	7.2	693			266	4014
11-Jul-95	32	272	0.250	7.1	686			268	4022
17-Jul-95	33	278	0.000						
25-Jul-95	34	286	2.000	6.9	694	90		**270**	4086
31-Jul-95	35	292	0.250	7.0	688			273	4094
7-Aug-95	36	299	0.250	6.8	724			277	4102
14-Aug-95	37	306	0.250	7.2	720			280	4110
21-Aug-95	38	313	0.250	7.0	673			283	4119
30-Aug-95	39	322	0.250	6.9	726			287	4127
6-Sep-95	40	329	2.000	7.1	715	81		**290**	4196
11-Sep-95	41	334	2.000	6.9	744	66		**300**	4268

Appendix 3.5-35 Table 31 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
18-Sep-95	42	341	2.000	7.2	683	66		267	4323
25-Sep-95	43	348	2.000	7.0	633	62		233	4370
3-Oct-95	44	356	2.000	7.0	572	64		**200**	4421
10-Oct-95	45	363	2.000	6.9	517	66		**220**	4473
17-Oct-95	46	370	2.000	7.0	478	67		**220**	4577
23-Oct-95	47	376	2.000	7.1	485	67		**430**	4614
30-Oct-95	48	383	2.000	7.1	458	65		**160**	4648
6-Nov-95	49	390	2.000	6.9	472	65		**150**	4646
13-Nov-95	50	397	0.000						
20-Nov-95	51	404	2.000	7.0	466	72		**150**	4680
27-Nov-95	52	411	2.000	7.0	503	70		**150**	4715
5-Dec-95	53	419	2.000	7.3	448	71			
11-Dec-95	54	425	2.000	7.3	499	74			
18-Dec-95	55	432	2.000	7.4	471	69			
26-Dec-95	56	440	2.000	7.3	452	69			
2-Jan-96	57	447	2.000	7.4	453	77			
10-Jan-96	58	455	2.000	7.5	442	75			
15-Jan-96	59	460	2.000	7.5	435				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 3.5-35 Table 32

Leachate Analysis
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	**2.4**	**0.53**	**0.13**	**0.33**	**440**	**0.027**	**0.70**	**0.17**	**44**	**1.2**	**220**	**27**	**0.37**	**8.8**	**0.16**	**0.022**	**43**	**240**
2*	63																		
3	70	**4.7**	**1.5**	**0.044**	**0.23**	**480**	**0.027**	**0.63**	**0.35**	**100**	**3.5**	**320**	**44**	**0.48**	**8.4**	**0.36**	**0.057**	**38**	**190**
4	77	**0.24**	**0.080**	**0.025**	**0.069**	**460**	**< 0.005**	**0.17**	**0.042**	**2.2**	**0.43**	**88**	**13**	**0.17**	**< 4.8**	**0.056**	**0.015**	**5.8**	**64**
5	83	0.32	0.086	0.027	0.052	350	0.005	0.12	0.041	2.50	0.46	65.0	9.10	0.12	4.80	0.043	0.010	4.60	43.0
6	91	**0.39**	**0.091**	**0.029**	**0.034**	**240**	**< 0.005**	**0.064**	**0.039**	**2.8**	**0.48**	**42**	**5.2**	**0.064**	**< 4.8**	**0.030**	**< 0.005**	**3.4**	**22**
7	97	**0.051**	**0.022**	**0.032**	**0.021**	**200**	**< 0.005**	**0.033**	**0.007**	**0.022**	**0.028**	**31**	**3.6**	**0.038**	**2.8**	**0.015**	**< 0.005**	**3.1**	**12**
8	103	0.04	0.022	0.033	0.016	165	0.005	0.03	0.007	0.02	0.04	28.3	3.03	0.03	3.47	0.012	0.005	3.20	9.1
9	110	0.04	0.021	0.033	0.011	131	0.005	0.02	0.008	0.02	0.06	25.7	2.47	0.03	4.13	0.008	0.005	3.30	6.3
10	119	**< 0.030**	**0.021**	**0.034**	**0.006**	**96**	**< 0.005**	**0.011**	**0.008**	**< 0.020**	**0.074**	**23**	**1.9**	**< 0.020**	**< 4.8**	**< 0.005**	**< 0.005**	**3.4**	**3.4**
11	126	0.03	0.024	0.03	0.006	95	0.005	0.01	0.008	0.02	0.07	24.3	1.91	0.02	4.3	0.005	0.005	3.50	3.1
12	132	0.03	0.028	0.03	0.006	95	0.005	0.01	0.007	0.02	0.07	25.5	1.93	0.02	3.9	0.005	0.005	3.60	2.9
13	139	0.03	0.031	0.03	0.006	94	0.005	0.01	0.007	0.03	0.06	26.8	1.94	0.02	3.4	0.005	0.005	3.70	2.6
14	146	0.03	0.034	0.03	0.006	94	0.005	0.01	0.007	0.03	0.06	28.0	1.95	0.02	3.0	0.005	0.005	3.80	2.4
15	152	0.03	0.037	0.03	0.005	93	0.005	0.01	0.006	0.03	0.05	29.3	1.96	0.02	2.5	0.005	0.005	3.90	2.1
16	160	0.03	0.041	0.03	0.005	93	0.005	0.01	0.006	0.03	0.05	30.5	1.98	0.02	2.0	0.005	0.005	4.00	1.8
17	167	0.03	0.044	0.03	0.005	92	0.005	0.01	0.005	0.03	0.04	31.8	1.99	0.02	1.6	0.005	0.005	4.10	1.6
18	174	**< 0.03**	**0.047**	**0.033**	**0.005**	92	**? < 0.005**	**< 0.010**	**< 0.005**	**0.036**	**< 0.040**	**33**	**2.0**	**< 0.020**	**1.1**	**< 0.005**	**< 0.005**	**4.2**	**1.3**
19	180	0.03	0.047	0.03	0.005	92	0.005	0.01	0.005	0.04	0.04	33.6	2.03	0.02	1.1	0.008	0.005	4.22	1.3
20	188	0.03	0.047	0.03	0.005	91	0.005	0.01	0.005	0.03	0.04	34.1	2.05	0.02	1.1	0.011	0.005	4.25	1.2
21	195	0.03	0.047	0.03	0.005	91	0.005	0.01	0.005	0.03	0.04	34.7	2.08	0.02	1.1	0.014	0.005	4.28	1.2
22	201	0.03	0.047	0.03	0.005	90	0.005	0.01	0.005	0.03	0.04	35.3	2.10	0.02	1.1	0.017	0.005	4.30	1.1
23	208	0.03	0.047	0.03	0.005	90	0.005	0.01	0.005	0.03	0.03	35.8	2.13	0.02	1.1	0.020	0.005	4.33	1.1
24	215	0.03	0.047	0.03	0.005	89	0.005	0.01	0.005	0.03	0.03	36.4	2.15	0.02	1.0	0.023	0.005	4.35	1.0
25	222	0.03	0.047	0.03	0.005	89	0.005	0.01	0.005	0.03	0.03	36.9	2.18	0.02	1.0	0.026	0.005	4.38	1.0
26	231	0.03	0.047	0.03	0.005	89	0.005	0.01	0.005	0.03	0.03	37.5	2.20	0.02	1.0	0.029	0.005	4.40	1.0
27	237	0.03	0.046	0.03	0.005	88	0.005	0.01	0.005	0.03	0.03	38.1	2.23	0.02	1.0	0.031	0.005	4.43	0.9
28	243	0.03	0.046	0.03	0.005	88	0.005	0.01	0.005	0.03	0.03	38.6	2.25	0.02	1.0	0.034	0.005	4.45	0.9
29	251	0.03	0.046	0.03	0.005	87	0.005	0.01	0.005	0.03	0.03	39.2	2.28	0.02	1.0	0.037	0.005	4.48	0.8
30	257	0.03	0.046	0.03	0.005	87	0.005	0.01	0.005	0.02	0.03	39.8	2.30	0.02	1.0	0.040	0.005	4.50	0.8
31	264	0.03	0.046	0.03	0.005	86	0.005	0.01	0.005	0.02	0.03	40.3	2.33	0.02	1.0	0.043	0.005	4.53	0.7
32	272	0.04	0.046	0.03	0.005	86	0.005	0.01	0.005	0.02	0.03	40.9	2.35	0.02	1.0	0.046	0.005	4.55	0.7
33	278																		
34	286	**0.036**	**0.046**	**0.030**	**< 0.005**	**85**	0.005	**< 0.010**	**< 0.005**	**< 0.020**	**0.023**	**42**	**2.4**	**< 0.020**	1.0	**0.052**	0.005	**4.6**	**0.62**
35	292	0.04	0.044	0.03	0.005	83	0.005	0.01	0.005	0.02	0.02	66.0	2.34	0.02	1.0	0.049	0.005	4.47	0.6
36	299	0.04	0.042	0.03	0.005	81	0.005	0.01	0.005	0.02	0.02	63.0	2.27	0.02	0.9	0.046	0.005	4.34	0.6
37	306	0.04	0.040	0.03	0.005	79	0.005	0.01	0.005	0.02	0.02	60.0	2.21	0.02	0.9	0.043	0.005	4.21	0.6
38	313	0.04	0.039	0.03	0.005	77	0.005	0.01	0.005	0.02	0.02	57.0	2.14	0.02	0.9	0.041	0.005	4.09	0.6

Appendix 3.5-35 Table 32 (Continued)

CYCLE	DAYS	Aluminum Al		Arsenic As	Barium Ba		Cadmium Cd	Calcium Ca		Chromium Cr	Cobalt Co		Copper Cu		Iron Fe		Lead Pb	Magnesium Mg	Manganese Mn		Nickel Ni	Potassium K	Selenium Se		Silver Ag	Sodium Na	Zinc Zn
39	322	0.04		0.037	0.03		0.005	75		0.005	0.01		0.005		0.02		0.02	54.0	2.08		0.02	0.9	0.038		0.005	3.96	0.5
40	329	0.04		0.035	0.03		0.005	73		0.005	0.01		0.005		0.02		0.02	51.0	2.01		0.02	0.9	0.035		0.005	3.83	0.5
41	334	0.04		0.033	0.03		0.005	71		0.005	0.01		0.005		0.02		0.02	48.0	1.95		0.02	0.9	0.032		0.005	3.70	0.5
42	341	0.04		0.031	0.03		0.005	69		0.005	0.01		0.005		0.02		0.02	45.0	1.89		0.02	0.9	0.029		0.005	3.57	0.5
43	348	0.04		0.029	0.03		0.005	67		0.005	0.01		0.005		0.02		0.02	42.0	1.82		0.02	0.9	0.026		0.005	3.44	0.5
44	356	0.04		0.027	0.03		0.005	65		0.005	0.01		0.005		0.02		0.02	39.0	1.76		0.02	0.9	0.023		0.005	3.31	0.5
45	363	0.04		0.026	0.03		0.005	63		0.005	0.01		0.005		0.02		0.02	36.0	1.69		0.02	0.9	0.021		0.005	3.19	0.5
46	370	0.04		0.024	0.03		0.005	61		0.005	0.01		0.005		0.02		0.02	33.0	1.63		0.02	0.9	0.018		0.005	3.06	0.4
47	376	0.04		0.022	0.03		0.005	59		0.005	0.01		0.005		0.02		0.02	30.0	1.56		0.02	0.8	0.015		0.005	2.93	0.4
48	383	**0.036**	**?**	**0.020**	**0.028**	**<**	**0.005**	**57**	**<**	**0.005**	**<**	**0.010**	**<**	**0.005**	**? <**	**0.020**	**?**	**0.016**	**27**	**1.5**	**<**	**0.020**	**0.84**	**0.012**	**<**	**0.005**	**2.8**	**0.42**
49	390							56										26.5									
50	397																										
51	404							55										25.5									
52	411							**54**										**25**									

* Wet dry cycles

** Measured values shown in bold

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 33

Cumulative Mass Flux
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	1.33	0.294	0.072	0.183	243.8	0.015	0.388	0.094	24.4	0.67	121.9	14.96	0.205	4.88	0.089	0.012	23.8	133.0
2*	63	1.33	0.294	0.072	0.183	243.8	0.015	0.388	0.094	24.4	0.67	121.9	14.96	0.205	4.88	0.089	0.012	23.8	133.0
3	70	3.87	1.105	0.089	0.306	490.4	0.028	0.727	0.269	78.6	2.55	288.3	38.80	0.461	9.02	0.282	0.042	43.4	235.7
4	77	3.99	1.148	0.097	0.343	731.5	0.030	0.818	0.278	79.8	2.78	329.8	46.00	0.551	11.27	0.312	0.049	45.6	270.9
5	83	4.01	1.152	0.097	0.345	747.5	0.030	0.824	0.278	79.9	2.80	332.4	46.45	0.557	11.47	0.314	0.049	45.7	273.0
6	91	4.22	1.201	0.107	0.363	866.6	0.031	0.856	0.285	81.4	3.05	348.5	49.32	0.588	13.71	0.329	0.050	46.5	285.0
7	97	4.23	1.208	0.114	0.369	925.9	0.032	0.866	0.278	81.4	3.06	354.6	50.54	0.598	14.40	0.334	0.051	46.9	288.9
8	103	4.23	1.209	0.115	0.370	934.5	0.032	0.867	0.277	81.4	3.06	355.5	50.72	0.600	14.57	0.334	0.051	47.0	289.4
9	110	4.23	1.210	0.116	0.371	941.0	0.032	0.868	0.276	81.4	3.06	356.3	50.87	0.601	14.78	0.334	0.052	47.1	289.8
10	119	4.24	1.220	0.128	0.372	980.4	0.034	0.871	0.265	81.4	3.09	361.8	51.92	0.608	17.02	0.336	0.053	47.9	291.4
11	126	4.24	1.222	0.130	0.373	984.7	0.034	0.872	0.264	81.4	3.09	362.5	52.04	0.609	17.25	0.336	0.053	48.0	291.6
12	132	4.24	1.223	0.131	0.373	989.0	0.034	0.872	0.263	81.4	3.10	363.3	52.16	0.609	17.44	0.336	0.053	48.1	291.8
13	139	4.24	1.225	0.132	0.373	993.3	0.034	0.872	0.262	81.4	3.10	364.1	52.27	0.610	17.60	0.336	0.053	48.2	291.9
14	146	4.24	1.227	0.134	0.373	997.5	0.034	0.873	0.260	81.4	3.10	365.1	52.39	0.611	17.74	0.336	0.054	48.4	292.0
15	152	4.24	1.229	0.135	0.373	1001.7	0.034	0.873	0.259	81.4	3.10	366.1	52.51	0.612	17.84	0.337	0.054	48.5	292.1
16	160	4.25	1.231	0.136	0.374	1005.9	0.035	0.873	0.258	81.4	3.11	367.1	52.63	0.612	17.92	0.337	0.054	48.6	292.2
17	167	4.25	1.234	0.138	0.374	1010.0	0.035	0.874	0.256	81.4	3.11	368.3	52.76	0.613	17.97	0.337	0.054	48.7	292.3
18	174	4.25	1.259	0.149	0.375	1047.2	0.036	0.876	0.244	81.4	3.12	379.4	53.86	0.620	18.17	0.338	0.055	50.0	292.7
19	180	4.26	1.261	0.150	0.375	1051.3	0.036	0.877	0.243	81.4	3.12	380.7	53.98	0.621	18.19	0.339	0.056	50.2	292.8
20	188	4.26	1.264	0.152	0.375	1055.4	0.036	0.877	0.241	81.4	3.12	382.0	54.11	0.622	18.21	0.339	0.056	50.3	292.8
21	195	4.26	1.267	0.153	0.376	1059.4	0.037	0.877	0.240	81.4	3.12	383.3	54.24	0.622	18.23	0.340	0.056	50.4	292.9
22	201	4.26	1.270	0.154	0.376	1063.4	0.037	0.878	0.239	81.4	3.12	384.7	54.36	0.623	18.25	0.341	0.056	50.6	292.9
23	208	4.26	1.272	0.155	0.376	1067.4	0.037	0.878	0.237	81.4	3.12	386.1	54.49	0.624	18.27	0.342	0.056	50.7	293.0
24	215	4.26	1.275	0.157	0.376	1071.4	0.037	0.878	0.236	81.4	3.12	387.5	54.63	0.625	18.29	0.343	0.056	50.9	293.0
25	222	4.26	1.278	0.158	0.376	1075.3	0.037	0.878	0.235	81.4	3.12	389.0	54.76	0.625	18.30	0.344	0.056	51.0	293.0
26	231	4.26	1.280	0.159	0.376	1079.2	0.037	0.879	0.233	81.4	3.13	390.5	54.89	0.626	18.32	0.346	0.057	51.2	293.1
27	237	4.26	1.283	0.160	0.377	1083.1	0.038	0.879	0.232	81.4	3.13	392.0	55.03	0.627	18.34	0.348	0.057	51.4	293.1
28	243	4.26	1.286	0.162	0.377	1087.0	0.038	0.879	0.231	81.4	3.13	393.6	55.17	0.628	18.35	0.350	0.057	51.5	293.1
29	251	4.27	1.289	0.163	0.377	1090.8	0.038	0.880	0.229	81.4	3.13	395.2	55.31	0.629	18.37	0.352	0.057	51.7	293.2
30	257	4.27	1.291	0.164	0.377	1094.6	0.038	0.880	0.228	81.4	3.13	396.9	55.45	0.629	18.38	0.354	0.057	51.8	293.2

Appendix 3.5-35 Table 33 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
31	264	4.27	1.294	0.165	0.377	1098.4	0.038	0.880	0.227	81.4	3.13	398.5	55.59	0.630	18.40	0.357	0.057	52.0	293.2
32	272	4.27	1.295	0.166	0.377	1100.3	0.038	0.880	0.226	81.4	3.13	399.4	55.66	0.630	18.41	0.358	0.057	52.1	293.2
33	278	4.27	1.295	0.166	0.377	1100.3	0.038	0.880	0.226	81.4	3.13	399.4	55.66	0.630	18.41	0.358	0.057	52.1	293.2
34	286	4.27	1.306	0.170	0.378	1115.0	0.039	0.882	0.220	81.4	3.13	406.5	56.25	0.634	18.46	0.370	0.058	52.7	293.2
35	292	4.27	1.307	0.171	0.378	1116.8	0.039	0.882	0.220	81.4	3.13	408.2	56.32	0.634	18.46	0.372	0.058	52.8	293.2
36	299	4.28	1.309	0.171	0.378	1118.6	0.039	0.882	0.219	81.4	3.13	409.7	56.39	0.634	18.47	0.373	0.058	52.9	293.3
37	306	4.28	1.310	0.172	0.378	1120.2	0.039	0.882	0.218	81.4	3.13	411.2	56.46	0.635	18.48	0.374	0.058	53.0	293.3
38	313	4.28	1.311	0.172	0.378	1121.8	0.039	0.882	0.218	81.4	3.13	412.5	56.53	0.635	18.48	0.375	0.058	53.0	293.3
39	322	4.28	1.312	0.173	0.378	1123.4	0.039	0.882	0.217	81.4	3.13	413.8	56.59	0.635	18.49	0.377	0.058	53.1	293.3
40	329	4.28	1.320	0.177	0.379	1135.2	0.040	0.884	0.212	81.4	3.13	423.1	57.08	0.639	18.53	0.385	0.059	53.6	293.3
41	334	4.29	1.327	0.181	0.379	1146.5	0.040	0.885	0.206	81.4	3.13	431.8	57.56	0.642	18.56	0.392	0.060	54.0	293.3
42	341	4.29	1.334	0.185	0.380	1157.4	0.041	0.886	0.201	81.4	3.13	439.6	58.02	0.645	18.60	0.398	0.060	54.4	293.3
43	348	4.30	1.341	0.189	0.381	1167.7	0.042	0.887	0.195	81.4	3.13	446.8	58.47	0.648	18.63	0.404	0.061	54.8	293.3
44	356	4.30	1.347	0.193	0.381	1177.5	0.042	0.889	0.190	81.4	3.13	453.2	58.90	0.651	18.66	0.409	0.062	55.2	293.3
45	363	4.31	1.353	0.197	0.382	1186.9	0.043	0.890	0.185	81.4	3.13	458.9	59.31	0.654	18.69	0.414	0.062	55.5	293.4
46	370	4.31	1.358	0.201	0.383	1195.8	0.044	0.891	0.179	81.4	3.13	463.8	59.71	0.657	18.72	0.418	0.063	55.8	293.4
47	376	4.32	1.363	0.205	0.383	1204.1	0.044	0.892	0.174	81.4	3.13	468.0	60.09	0.660	18.74	0.421	0.063	56.0	293.4
48	383	4.32	1.367	0.209	0.384	1212.0	0.045	0.894	0.168	81.4	3.12	471.4	60.46	0.663	18.76	0.423	0.064	56.2	293.3
49	390					1219.7						474.7							
50	397					1219.7						474.7							
51	404					1227.1						477.8							
52	411					1234.2						480.8							

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 34

Cumulative Metal Extractions
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.007	0.011	0.144	0.914	4.4	0.050	0.491	0.019	0.009	0.023	1.09	2.88	1.03	0.13	0.23	0.07	2.98	2.22
2*	63	0.007	0.011	0.144	0.914	4.4	0.050	0.491	0.019	0.009	0.023	1.09	2.88	1.03	0.13	0.23	0.07	2.98	2.22
3	70	0.021	0.043	0.179	1.531	8.8	0.094	0.920	0.054	0.029	0.088	2.57	7.46	2.31	0.23	0.74	0.24	5.42	3.93
4	77	0.022	0.044	0.193	1.715	13.1	0.099	1.035	0.056	0.030	0.096	2.94	8.85	2.76	0.29	0.82	0.28	5.69	4.52
5	83	0.022	0.044	0.195	1.727	13.3	0.099	1.042	0.056	0.030	0.097	2.97	8.93	2.78	0.29	0.83	0.28	5.71	4.55
6	91	0.023	0.046	0.213	1.814	15.5	0.104	1.084	0.057	0.030	0.105	3.11	9.48	2.94	0.35	0.87	0.29	5.81	4.75
7	97	0.023	0.046	0.227	1.846	16.5	0.107	1.096	0.056	0.030	0.105	3.17	9.72	2.99	0.37	0.88	0.29	5.87	4.82
8	103	0.023	0.047	0.230	1.850	16.7	0.107	1.097	0.055	0.030	0.105	3.17	9.75	3.00	0.37	0.88	0.30	5.88	4.82
9	110	0.023	0.047	0.232	1.853	16.8	0.108	1.099	0.055	0.030	0.106	3.18	9.78	3.00	0.38	0.88	0.30	5.89	4.83
10	119	0.023	0.047	0.257	1.862	17.5	0.112	1.103	0.053	0.030	0.107	3.23	9.98	3.04	0.44	0.88	0.30	5.99	4.86
11	126	0.023	0.047	0.259	1.863	17.6	0.113	1.103	0.053	0.030	0.107	3.24	10.01	3.04	0.44	0.88	0.31	6.00	4.86
12	132	0.023	0.047	0.262	1.864	17.7	0.113	1.104	0.053	0.030	0.107	3.24	10.03	3.05	0.45	0.88	0.31	6.02	4.86
13	139	0.023	0.047	0.265	1.865	17.7	0.114	1.104	0.052	0.030	0.107	3.25	10.05	3.05	0.45	0.88	0.31	6.03	4.86
14	146	0.023	0.047	0.267	1.866	17.8	0.114	1.105	0.052	0.030	0.107	3.26	10.08	3.05	0.45	0.89	0.31	6.04	4.87
15	152	0.023	0.047	0.270	1.867	17.9	0.115	1.105	0.052	0.030	0.107	3.27	10.10	3.06	0.46	0.89	0.31	6.06	4.87
16	160	0.023	0.047	0.273	1.868	18.0	0.115	1.105	0.052	0.030	0.107	3.28	10.12	3.06	0.46	0.89	0.31	6.08	4.87
17	167	0.023	0.047	0.275	1.869	18.0	0.116	1.106	0.051	0.030	0.107	3.29	10.15	3.07	0.46	0.89	0.31	6.09	4.87
18	174	0.023	0.048	0.298	1.876	18.7	0.120	1.109	0.049	0.030	0.108	3.39	10.36	3.10	0.47	0.89	0.32	6.25	4.88
19	180	0.023	0.049	0.301	1.876	18.8	0.121	1.110	0.049	0.030	0.108	3.40	10.38	3.10	0.47	0.89	0.32	6.27	4.88
20	188	0.023	0.049	0.304	1.877	18.8	0.121	1.110	0.048	0.030	0.108	3.41	10.41	3.11	0.47	0.89	0.32	6.29	4.88
21	195	0.023	0.049	0.306	1.878	18.9	0.122	1.110	0.048	0.030	0.108	3.42	10.43	3.11	0.47	0.89	0.32	6.31	4.88
22	201	0.023	0.049	0.309	1.879	19.0	0.123	1.111	0.048	0.030	0.108	3.43	10.45	3.12	0.47	0.90	0.32	6.32	4.88
23	208	0.023	0.049	0.311	1.879	19.1	0.123	1.111	0.047	0.030	0.108	3.45	10.48	3.12	0.47	0.90	0.32	6.34	4.88
24	215	0.023	0.049	0.313	1.880	19.1	0.124	1.112	0.047	0.030	0.108	3.46	10.51	3.12	0.47	0.90	0.32	6.36	4.88
25	222	0.023	0.049	0.316	1.881	19.2	0.124	1.112	0.047	0.030	0.108	3.47	10.53	3.13	0.47	0.91	0.32	6.38	4.88
26	231	0.023	0.049	0.318	1.882	19.3	0.125	1.112	0.047	0.030	0.108	3.49	10.56	3.13	0.47	0.91	0.33	6.40	4.88
27	237	0.023	0.049	0.321	1.883	19.3	0.125	1.113	0.046	0.030	0.108	3.50	10.58	3.13	0.47	0.92	0.33	6.42	4.88
28	243	0.023	0.049	0.323	1.883	19.4	0.126	1.113	0.046	0.030	0.108	3.51	10.61	3.14	0.47	0.92	0.33	6.44	4.89
29	251	0.023	0.050	0.325	1.884	19.5	0.126	1.114	0.046	0.030	0.108	3.53	10.64	3.14	0.47	0.93	0.33	6.46	4.89
30	257	0.023	0.050	0.328	1.885	19.5	0.127	1.114	0.046	0.030	0.108	3.54	10.66	3.15	0.47	0.93	0.33	6.48	4.89

Appendix 3.5-35 Table 34 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
31	264	0.023	0.050	0.330	1.886	19.6	0.127	1.114	0.045	0.030	0.108	3.56	10.69	3.15	0.47	0.94	0.33	6.50	4.89
32	272	0.023	0.050	0.331	1.886	19.6	0.127	1.115	0.045	0.030	0.108	3.57	10.70	3.15	0.47	0.94	0.33	6.51	4.89
33	278	0.023	0.050	0.331	1.886	19.6	0.127	1.115	0.045	0.030	0.108	3.57	10.70	3.15	0.47	0.94	0.33	6.51	4.89
34	286	0.023	0.050	0.340	1.889	19.9	0.129	1.116	0.044	0.030	0.108	3.63	10.82	3.17	0.47	0.97	0.33	6.59	4.89
35	292	0.023	0.050	0.341	1.889	19.9	0.130	1.116	0.044	0.030	0.108	3.64	10.83	3.17	0.47	0.98	0.33	6.60	4.89
36	299	0.023	0.050	0.342	1.890	20.0	0.130	1.116	0.044	0.030	0.108	3.66	10.84	3.17	0.47	0.98	0.33	6.61	4.89
37	306	0.023	0.050	0.343	1.890	20.0	0.130	1.117	0.044	0.030	0.108	3.67	10.86	3.17	0.47	0.99	0.34	6.62	4.89
38	313	0.023	0.050	0.344	1.891	20.0	0.130	1.117	0.044	0.030	0.108	3.68	10.87	3.18	0.47	0.99	0.34	6.63	4.89
39	322	0.023	0.050	0.345	1.891	20.1	0.131	1.117	0.043	0.030	0.108	3.69	10.88	3.18	0.47	0.99	0.34	6.64	4.89
40	329	0.023	0.051	0.354	1.894	20.3	0.133	1.119	0.042	0.030	0.108	3.78	10.98	3.19	0.48	1.01	0.34	6.70	4.89
41	334	0.023	0.051	0.362	1.897	20.5	0.135	1.120	0.041	0.030	0.108	3.86	11.07	3.21	0.48	1.03	0.34	6.75	4.89
42	341	0.023	0.051	0.370	1.900	20.7	0.137	1.122	0.040	0.030	0.108	3.93	11.16	3.22	0.48	1.05	0.35	6.80	4.89
43	348	0.023	0.052	0.379	1.903	20.9	0.139	1.123	0.039	0.030	0.108	3.99	11.24	3.24	0.48	1.06	0.35	6.85	4.89
44	356	0.023	0.052	0.387	1.906	21.0	0.141	1.125	0.038	0.030	0.108	4.05	11.33	3.25	0.48	1.08	0.35	6.89	4.89
45	363	0.023	0.052	0.395	1.909	21.2	0.143	1.126	0.037	0.030	0.108	4.10	11.41	3.27	0.48	1.09	0.36	6.93	4.89
46	370	0.023	0.052	0.403	1.913	21.4	0.145	1.128	0.036	0.030	0.108	4.14	11.48	3.29	0.48	1.10	0.36	6.97	4.89
47	376	0.023	0.052	0.411	1.916	21.5	0.147	1.130	0.035	0.030	0.108	4.18	11.56	3.30	0.48	1.11	0.36	7.00	4.89
48	383	0.024	0.053	0.419	1.919	21.6	0.149	1.131	0.034	0.030	0.108	4.21	11.63	3.32	0.48	1.11	0.37	7.03	4.89
49	390					21.8						4.24							
50	397					21.8						4.24							
51	404					21.9						4.27							
52	411					22.0						4.29							

* Wet dry cycles

Appendix 3.5-35 Table 35

Metal Extraction Rates
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																		
2*	63																		
3	70	0.282	0.090	0.002	0.0137	27.39	0.0015	0.0376	0.019	6.019	0.2095	18.48	2.65	0.0284	0.46	0.0215	0.0033	2.17	11.413
4	77	0.266	0.085	0.002	0.0160	48.76	0.0015	0.0430	0.018	5.537	0.2113	20.79	3.10	0.0346	0.64	0.0223	0.0036	2.17	13.794
5	83	0.247	0.079	0.002	0.0150	46.39	0.0014	0.0401	0.017	5.111	0.1966	19.39	2.90	0.0324	0.61	0.0208	0.0034	2.01	12.898
6	91	0.240	0.076	0.003	0.0150	51.90	0.0013	0.0390	0.016	4.753	0.1991	18.88	2.86	0.0319	0.74	0.0201	0.0032	1.89	12.666
7	97	0.597	0.188	0.009	0.0383	140.42	0.0035	0.0984	0.038	11.741	0.4925	47.90	7.32	0.0809	1.96	0.0504	0.0080	4.75	32.097
8	103	0.077	0.022	0.005	0.0135	94.21	0.0008	0.0298	0.002	0.606	0.1077	14.26	2.53	0.0294	1.18	0.0110	0.0021	0.77	11.395
9	110	0.050	0.013	0.004	0.0058	44.46	0.0006	0.0106	0.000	0.351	0.0600	5.61	1.03	0.0105	0.75	0.0047	0.0006	0.33	3.999
10	119	0.045	0.013	0.006	0.0053	45.29	0.0008	0.0093	-0.003	0.297	0.0567	5.72	1.06	0.0100	1.08	0.0042	0.0008	0.43	3.577
11	126	0.005	0.004	0.005	0.0020	23.62	0.0005	0.0031	-0.004	-0.002	0.0079	2.81	0.54	0.0041	0.71	0.0013	0.0005	0.30	1.323
12	132	0.003	0.003	0.003	0.0007	12.62	0.0004	0.0012	-0.003	-0.002	0.0079	1.75	0.32	0.0022	0.61	0.0005	0.0004	0.24	0.570
13	139	0.002	0.003	0.003	0.0006	11.42	0.0004	0.0010	-0.003	-0.001	0.0079	1.68	0.30	0.0020	0.59	0.0004	0.0004	0.24	0.476
14	146	0.002	0.003	0.003	0.0005	10.98	0.0004	0.0009	-0.003	-0.001	0.0079	1.71	0.30	0.0019	0.58	0.0004	0.0004	0.25	0.429
15	152	0.001	0.002	0.001	0.0002	4.52	0.0002	0.0004	-0.001	0.000	0.0027	0.90	0.13	0.0008	0.17	0.0002	0.0002	0.12	0.142
16	160	0.001	0.002	0.001	0.0002	4.36	0.0002	0.0003	-0.001	0.000	0.0023	0.95	0.12	0.0008	0.14	0.0002	0.0002	0.12	0.121
17	167	0.001	0.002	0.001	0.0002	4.21	0.0002	0.0003	-0.001	0.000	0.0020	1.00	0.12	0.0008	0.11	0.0002	0.0002	0.12	0.101
18	174	0.002	0.007	0.003	0.0004	10.79	0.0004	0.0008	-0.003	0.001	0.0037	3.05	0.32	0.0020	0.11	0.0004	0.0004	0.36	0.170
19	180	0.002	0.007	0.003	0.0004	11.08	0.0004	0.0008	-0.004	0.001	0.0036	3.21	0.33	0.0021	0.09	0.0004	0.0004	0.37	0.161
20	188	0.002	0.007	0.003	0.0004	10.43	0.0004	0.0008	-0.003	0.001	0.0032	3.09	0.31	0.0019	0.07	0.0005	0.0004	0.36	0.142
21	195	0.002	0.007	0.003	0.0004	10.71	0.0004	0.0008	-0.004	0.001	0.0032	3.23	0.32	0.0020	0.06	0.0006	0.0004	0.37	0.138
22	201	0.003	0.007	0.003	0.0004	10.99	0.0004	0.0008	-0.004	0.001	0.0032	3.37	0.33	0.0021	0.06	0.0008	0.0004	0.38	0.136
23	208	0.001	0.003	0.001	0.0002	4.17	0.0002	0.0003	-0.001	0.000	0.0011	1.37	0.13	0.0008	0.02	0.0007	0.0002	0.15	0.046
24	215	0.001	0.003	0.001	0.0002	4.02	0.0002	0.0003	-0.001	0.000	0.0010	1.37	0.13	0.0008	0.02	0.0009	0.0002	0.15	0.042
25	222	0.001	0.003	0.001	0.0002	4.11	0.0002	0.0003	-0.001	0.000	0.0009	1.45	0.13	0.0008	0.02	0.0011	0.0002	0.15	0.041
26	231	0.001	0.003	0.001	0.0001	3.86	0.0001	0.0003	-0.001	0.000	0.0008	1.40	0.13	0.0007	0.02	0.0012	0.0001	0.15	0.036
27	237	0.001	0.003	0.001	0.0001	3.83	0.0001	0.0003	-0.001	0.000	0.0008	1.43	0.13	0.0007	0.02	0.0014	0.0001	0.15	0.034
28	243	0.001	0.003	0.001	0.0002	3.91	0.0002	0.0003	-0.001	0.000	0.0007	1.51	0.13	0.0008	0.02	0.0016	0.0002	0.15	0.032
29	251	0.001	0.003	0.001	0.0001	3.78	0.0001	0.0003	-0.001	0.000	0.0006	1.50	0.13	0.0007	0.02	0.0017	0.0001	0.15	0.029
30	257	0.001	0.003	0.001	0.0002	3.86	0.0002	0.0003	-0.0014	0.000	0.0006	1.58	0.14	0.0008	0.02	0.0020	0.0002	0.16	0.027

Appendix 3.5-35 Table 35 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
31	264	0.001	0.003	0.001	0.0002	4.06	0.0002	0.0003	-0.0014	0.000	0.0005	1.71	0.15	0.0008	0.02	0.0023	0.0002	0.17	0.026
32	272	0.001	0.002	0.001	0.0001	3.43	0.0001	0.0003	-0.0012	0.000	0.0004	1.48	0.13	0.0007	0.01	0.0021	0.0001	0.14	0.020
33	278	0.001	0.002	0.001	0.0001	2.66	0.0001	0.0002	-0.0009	0.000	0.0003	1.16	0.10	0.0005	0.01	0.0017	0.0001	0.11	0.015
34	286	0.002	0.003	0.001	0.0002	4.85	0.0002	0.0004	-0.0018	-0.001	0.0003	2.27	0.19	0.0010	0.02	0.0037	0.0002	0.21	0.019
35	292	0.002	0.003	0.001	0.0002	4.44	0.0002	0.0004	-0.0016	-0.001	0.0003	2.26	0.17	0.0009	0.02	0.0035	0.0002	0.20	0.015
36	299	0.001	0.003	0.001	0.0002	4.03	0.0002	0.0003	-0.0015	-0.001	0.0002	2.23	0.16	0.0008	0.01	0.0033	0.0002	0.18	0.012
37	306	0.001	0.003	0.001	0.0002	4.11	0.0002	0.0003	-0.0015	-0.001	0.0002	2.42	0.16	0.0009	0.01	0.0033	0.0002	0.18	0.012
38	313	0.002	0.003	0.001	0.0002	4.31	0.0002	0.0004	-0.0016	-0.001	0.0002	2.62	0.17	0.0009	0.02	0.0035	0.0002	0.19	0.012
39	322	0.001	0.001	0.001	0.0001	1.62	0.0001	0.0001	-0.0007	0.000	0.0000	1.41	0.07	0.0004	0.01	0.0012	0.0001	0.07	0.004
40	329	0.001	0.002	0.001	0.0002	3.47	0.0002	0.0003	-0.0015	-0.001	0.0000	2.83	0.14	0.0009	0.01	0.0024	0.0002	0.14	0.007
41	334	0.002	0.004	0.002	0.0003	5.59	0.0003	0.0006	-0.0026	-0.001	0.0000	4.41	0.23	0.0015	0.02	0.0038	0.0003	0.22	0.011
42	341	0.003	0.005	0.003	0.0004	7.43	0.0004	0.0008	-0.0035	-0.002	-0.0001	5.70	0.31	0.0020	0.02	0.0048	0.0004	0.29	0.013
43	348	0.004	0.006	0.003	0.0005	9.17	0.0005	0.0010	-0.0045	-0.002	-0.0001	6.85	0.39	0.0025	0.03	0.0057	0.0005	0.35	0.015
44	356	0.005	0.007	0.004	0.0006	11.16	0.0006	0.0013	-0.0056	-0.003	-0.0003	8.11	0.48	0.0032	0.04	0.0068	0.0006	0.42	0.017
45	363	0.005	0.007	0.004	0.0006	10.65	0.0006	0.0013	-0.0056	-0.003	-0.0004	7.35	0.46	0.0032	0.03	0.0060	0.0006	0.39	0.013
46	370	0.005	0.006	0.004	0.0006	9.58	0.0006	0.0012	-0.0053	-0.002	-0.0005	6.23	0.42	0.0030	0.03	0.0050	0.0006	0.34	0.009
47	376	0.005	0.006	0.004	0.0006	9.36	0.0006	0.0012	-0.0054	-0.002	-0.0006	5.67	0.41	0.0031	0.03	0.0045	0.0006	0.32	0.006
48	383	0.005	0.005	0.004	0.0006	8.87	0.0006	0.0012	-0.0054	-0.002	-0.0007	4.93	0.40	0.0031	0.03	0.0037	0.0006	0.29	0.002
49	390					8.68						4.44							
50	397					6.76						3.27							
51	404					6.44						2.89							
52	411					6.01						2.56							

* Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 36

Oxidation and Neutralization Results
Backfill Coarse Tailings (AL-15)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	1275	0.15		13.28	6.10	5.02	0.84	1111		4.4
2**	63	1275	0.15								0.0
3	70	2071	0.24	88.5	8.30	6.16	6.85	1.57	1301	21.1	5.2
4	77	2936	0.34	166.1	9.01	6.03	1.71	0.86	2075	96.3	8.3
5	83	2987	0.34	157.7	0.54	0.40	0.11	0.94	2125	93.4	8.5
6	91	3281	0.38	167.2	3.06	2.98	0.66	1.19	2489	114.8	10.0
7	97	3403	0.39	438.2	1.27	1.48	0.25	1.36	2663	548.2	10.7
8	103	3423	0.39	286.7	0.21	0.22	0.04	1.23	2688	294.2	10.8
9	110	3440	0.40	107.0	0.18	0.16	0.03	1.07	2707	134.2	10.8
10	119	3577	0.41	114.6	1.42	0.98	0.23	0.85	2829	136.8	11.3
11	126	3592	0.41	62.2	0.16	0.11	0.03	0.87	2842	70.6	11.4
12	132	3607	0.41	40.8	0.16	0.11	0.03	0.89	2856	38.7	11.4
13	139	3622	0.42	38.7	0.16	0.11	0.03	0.90	2870	35.5	11.5
14	146	3637	0.42	38.2	0.16	0.11	0.04	0.92	2885	34.5	11.5
15	152	3652	0.42	15.9	0.16	0.11	0.04	0.94	2899	15.0	11.6
16	160	3667	0.42	15.4	0.15	0.10	0.04	0.96	2914	14.8	11.7
17	167	3682	0.42	14.9	0.15	0.10	0.05	0.98	2929	14.6	11.7
18	174	3815	0.44	38.5	1.39	0.93	0.46	1.00	3068	39.5	12.3
19	180	3829	0.44	39.6	0.15	0.10	0.05	1.00	3083	40.9	12.3
20	188	3844	0.44	37.4	0.16	0.10	0.05	1.00	3099	38.8	12.4
21	195	3859	0.44	38.5	0.16	0.10	0.05	1.00	3115	40.0	12.5
22	201	3875	0.45	39.7	0.16	0.10	0.06	1.00	3130	41.3	12.5
23	208	3890	0.45	15.5	0.16	0.10	0.06	1.00	3146	16.1	12.6
24	215	3905	0.45	15.1	0.16	0.10	0.06	1.00	3162	15.7	12.6
25	222	3920	0.45	15.6	0.16	0.10	0.06	1.00	3178	16.2	12.7

Appendix 3.5-35 Table 36 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	231	3936	0.45	14.8	0.16	0.10	0.06	1.00	3194	15.4	12.8
27	237	3951	0.45	14.9	0.16	0.10	0.06	1.00	3210	15.5	12.8
28	243	3967	0.46	15.4	0.16	0.10	0.06	1.00	3226	16.0	12.9
29	251	3982	0.46	15.0	0.16	0.10	0.07	1.00	3242	15.6	13.0
30	257	3998	0.46	15.6	0.16	0.10	0.07	1.00	3258	16.1	13.0
31	264	4014	0.46	16.6	0.16	0.09	0.07	1.00	3275	17.2	13.1
32	272	4022	0.46	14.1	0.08	0.05	0.04	0.99	3283	14.6	13.1
33	278										
34	286	4086	0.47	20.7	0.32 ?	0.37 ?	0.29 ?	2.07 ?	3414	34.3	13.7
35	292	4094	0.47	19.2	0.08	0.04	0.07	1.32	3425	33.3	13.7
36	299	4102	0.47	17.7	0.09	0.04	0.06	1.24	3435	32.1	13.7
37	306	4110	0.47	18.3	0.09	0.04	0.06	1.17	3445	33.5	13.8
38	313	4119	0.47	12.8	0.09	0.04	0.06	1.09	3455	21.6	13.8
39	322	4127	0.47	8.1	0.09	0.04	0.05	1.02	3464	9.8	13.9
40	329	4196	0.48	19.4	0.72	0.30	0.39	0.95	3532	20.3	14.1
41	334	4268	0.49	33.1	0.74	0.28	0.35	0.86	3596	32.1	14.4
42	341	4323	0.50	42.5	0.57	0.27	0.32	1.04	3656	42.0	14.6
43	348	4370	0.50	50.2	0.49	0.26	0.29	1.13	3711	51.1	14.8
44	356	4421	0.51	60.5	0.54	0.25	0.26	0.95	3762	61.3	15.0
45	363	4473	0.51	57.0	0.54	0.23	0.23	0.87	3808	56.9	15.2
46	370	4577	0.53	60.0	1.08	0.22	0.20	0.39	3851	49.6	15.4
47	376	4614	0.53	58.2	0.39	0.21	0.17	0.99	3889	46.7	15.6
48	383	4648	0.53	55.7	0.36	0.20	0.14	0.94	3923	42.4	15.7
49	390	4646	0.53	46.2	-0.03	0.19	0.14	-12.96	3956	40.0	15.8
50	397										
51	404	4680	0.54	21.3	-3.64 ?	0.18	0.13	-0.09 ?	4454	124.2	17.8
52	411	4715	0.54	20.2	0.36	0.18	0.12	0.84	4484	119.0	17.9

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Appendix 3.5-35 Tables 37-43. Backfill Cemented Coarse Tailings (AL-17) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.

Appendix 3.5-35 Table 37

Sample Characterization
Backfill Cemented Coarse Tailings (AL-17) - Leached under alternating wet/dry, followed by saturated, conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)	
Aluminum	Al	18400	<0.03	
Antimony	Sb	70	<0.04	
Arsenic	As	2600	<0.005	
Barium	Ba	50	0.012	
Beryllium	Be	<50	<0.005	*
Bismuth	Bi	<20	<0.20	*
Cadmium	Cd	20	<0.005	
Calcium	Ca	5600	25.0	
Carbon	C	4400	NA	
Chromium	Cr	30	<0.005	
Cobalt	Co	79	<0.010	
Copper	Cu	500	0.027	
Gallium	Ga	13	NA	
Iron	Fe	268000	0.030	
Lead	Pb	2900	<0.04	
Lithium	Li	NA	NA	
Magnesium	Mg	11200	13.000	
Manganese	Mn	520	0.011	
Mercury	Hg	2.0	<0.0002	
Molybdenum	Mo	<20	<0.020	
Nickel	Ni	<20	<0.015	
Phosphorus	P	NA	NA	
Potassium	K	3900	0.750	
Selenium	Se	38	<0.005	
Silicon	Si	150000	NA	
Silver	Ag	17.4	<0.005	
Sodium	Na	800	1.90	
Strontium	Sr	NA	NA	
Thallium	Tl	10	<0.040	
Tin	Sn	22	<0.24	
Titanium	Ti	1200	<0.050	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	6000	0.44	
Sulfate	SO4	2900	9.90	
Sulfur	S	297000	NA	

Note: NA = Not Analyzed

ABA Results	
Paste pH	6
S (Total) (%)	29
SO4 (%)	2900
S (sulfide) (%)	28.3
AP (kg CaCO3/tonne)	906
NP (kg CaCO3/tonne)	25
CO2 (%)	1.29
CO3 NP (kg CaCO3/tonne)	30
Net NP (kg CaCO3/tonne)	-881
NP/AP	0.03

Sample Mass (kg)	25.60

* Value Estimated

Appendix 3.5-35 Table 38

Parameters Measured Weekly
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct-94	1*	7	4.500	12.1	6830			**1190**	209
14-Dec-94	2*	63	4.500	11.4	4210	350		**1390**	454
21-Dec-94	3	70	4.500	12.0	4330	510		**1340**	687
28-Dec-94	4	77	4.500	10.0	3970	550		**915**	846
3-Jan-95	5	83	0.400	10.4	3860	470		738	858
11-Jan-95	6	91	4.500	11.9	3290	560		**561**	955
17-Jan-95	7	97	2.750	12.1	3190			507	1008
23-Jan-95	8	103	0.500	12.1	3110	530		453	1017
30-Jan-95	9	110	0.500	12.4	3120	520		398	1024
8-Feb-95	10	119	4.500	12.1	3145	520		**344**	1083
15-Feb-95	11	126	0.500	12.2	3100	510		342	1089
21-Feb-95	12	132	0.500	12.2	2990	500		341	1096
28-Feb-95	13	139	0.500	12.4	3180	500		339	1102
7-Mar-95	14	146	0.500	12.2	2910	500		337	1109
13-Mar-95	15	152	0.500	12.2	2710	500		335	1115
21-Mar-95	16	160	0.500	12.2	2810	480		334	1121
28-Mar-95	17	167	0.500	12.2	2790	480		332	1128
4-Apr-95	18	174	4.500	12.0	2810	440		**330**	1184
10-Apr-95	19	180	0.500	12.0	2710	470		334	1190
18-Apr-95	20	188	0.500	12.0	2690	470		339	1197
25-Apr-95	21	195	0.500	11.5	2540	450		343	1203
1-May-95	22	201	0.500	11.2	2670	420		348	1210
8-May-95	23	208	0.500	11.1	2630	400		352	1217
15-May-95	24	215	0.500	11.1	2300	42	?	356	1223
22-May-95	25	222	0.500	11.2	2310	410		361	1230
31-May-95	26	231	0.500	11.1	2350	390		365	1237
6-Jun-95	27	237	0.500	11.3	2380	380		369	1244
12-Jun-95	28	243	0.500	11.9	2220	370		374	1251
20-Jun-95	29	251	0.500	11.9	2220	370		378	1258
26-Jun-95	30	257	0.500	11.9	2190	340		383	1266
3-Jul-95	31	264	0.500	11.8	2160			387	1273
11-Jul-95	32	272	0.250	11.7	2060			391	1277
17-Jul-95	33	278	0.000						
25-Jul-95	34	286	2.000	11.5	2110	320		**400**	1307
31-Jul-95	35	292	0.250	11.1	2120			398	1311
7-Aug-95	36	299	0.250	10.8	2050			397	1315
14-Aug-95	37	306	0.250	11.8	2100			395	1319
21-Aug-95	38	313	0.250	11.3	2040			393	1322
30-Aug-95	39	322	0.250	11.3	1970			392	1326
6-Sep-95	40	329	2.000	11.4	1920	300		**390**	1356

Appendix 3.5-35 Table 38 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
11-Sep-95	41	334	2.000	11.3	2130	300		**400**	1386
18-Sep-95	42	341	2.000	11.8	2190	310		**640**	1435
25-Sep-95	43	348	2.000	11.2	2150	300		**530**	1476
3-Oct-95	44	356	2.000	11.3	2110	300		**360**	1503
10-Oct-95	45	363	2.000	11.5	2050	300		**345**	1530
17-Oct-95	46	370	2.000	11.2	1920	300		**460**	1565
23-Oct-95	47	376	2.000	11.1	2050	290		**530**	1605
30-Oct-95	48	383	2.000	11.0	1980	290		**360**	1633
6-Nov-95	49	390	2.000	11.2	2070	300		**350**	1659
13-Nov-95	50	397	0.000						
20-Nov-95	51	404	2.000	10.4	1970	290		**340**	1685
27-Nov-95	52	411	2.000	10.3	2150	290		**330**	1710
5-Dec-95	53	419	2.000	11.4	1880	300			
11-Dec-95	54	425	2.000	11.4	2160	280			
18-Dec-95	55	432	2.000	11.4	2180	270			
26-Dec-95	56	440	2.000	10.9	1980	260			
2-Jan-96	57	447	2.000	11.3	1980	280			
10-Jan-96	58	455	2.000	11.1	1970	240			
15-Jan-96	59	460	2.000	11.3	1870				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 3.5-35 Table 39

Leachate Analysis
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7	0.30	0.012	0.23	570	1.7	0.035	0.16	0.77	0.057	< 0.005	0.064	456	0.088	160	0.075
2*	63	0.14	0.011	0.060	250	0.017	0.009	0.23	< 0.040	1.3	0.021	0.030	244	0.034	65	0.037
3	70	0.11	0.014	0.091	440	0.006	< 0.005	0.061	0.078	0.044	< 0.005	0.041	256	0.032	82	0.18
4	77	0.10	0.012	0.084	410	< 0.005	0.008	0.16	0.075	0.073	< 0.005	0.034	197	0.040	56	0.190 ?
5	83	0.10	0.011	0.078	375	0.005	0.007	0.10	0.082	0.06	0.005	0.038	169	0.032	48.0	0.200
6	91	0.097	0.010	0.072	340	< 0.005	< 0.005	0.032	0.089	0.050	< 0.005	0.042	140	0.024	40.00	0.21
7	97	0.078	0.010	0.081	340	< 0.005	< 0.005	0.036	0.13	1.0	0.15	0.028	100	0.027	29.00	0.65
8	103	0.08	0.009	0.072	323	0.005	0.005	0.03	0.109	0.68	0.102	0.027	91.7	0.025	26.0	0.440
9	110	0.08	0.007	0.064	307	0.005	0.006	0.03	0.087	0.35	0.053	0.025	83.3	0.022	23.0	0.230
10	119	0.082	0.006	0.055	290	< 0.005	0.006	< 0.020	0.066	< 0.030	< 0.005	0.024	75.0	0.020	20	< 0.020
11	126	0.09	0.006	0.054	290	0.005	0.006	0.02	0.063	0.03	0.005	0.024	71.3	0.020	19.4	0.021
12	132	0.09	0.006	0.053	290	0.005	0.006	0.02	0.060	0.03	0.005	0.024	67.5	0.019	18.8	0.022
13	139	0.10	0.006	0.052	290	0.005	0.006	0.02	0.056	0.03	0.005	0.024	63.8	0.019	18.1	0.023
14	146	0.10	0.006	0.051	290	0.005	0.006	0.02	0.053	0.03	0.005	0.024	60.0	0.018	17.5	0.025
15	152	0.11	0.005	0.049	290	0.005	0.005	0.02	0.050	0.03	0.005	0.023	56.3	0.018	16.9	0.026
16	160	0.11	0.005	0.048	290	0.005	0.005	0.02	0.047	0.03	0.005	0.023	52.5	0.017	16.3	0.027
17	167	0.12	0.005	0.047	290	0.005	0.005	0.02	0.043	0.03	0.005	0.023	48.8	0.017	15.6	0.028
18	174	0.12 <	0.005	0.046	290	< 0.005	< 0.005	< 0.020	? < 0.040	< 0.030	< 0.005	0.023	45	0.016	15	0.029
19	180	0.12	0.005	0.046	292	0.005	0.005	0.02	0.039	0.03	0.011	0.023	43.9	0.016	14.8	0.028
20	188	0.12	0.005	0.046	294	0.005	0.005	0.02	0.037	0.03	0.016	0.023	42.9	0.017	14.6	0.028
21	195	0.12	0.005	0.047	296	0.005	0.005	0.02	0.036	0.03	0.022	0.023	41.8	0.017	14.4	0.027
22	201	0.12	0.006	0.047	298	0.005	0.005	0.02	0.034	0.03	0.028	0.023	40.8	0.017	14.3	0.027
23	208	0.12	0.006	0.047	299	0.005	0.005	0.02	0.033	0.03	0.034	0.023	39.7	0.018	14.1	0.026
24	215	0.12	0.006	0.047	301	0.005	0.005	0.02	0.031	0.03	0.039	0.023	38.6	0.018	13.9	0.026
25	222	0.12	0.006	0.047	303	0.005	0.005	0.02	0.030	0.03	0.045	0.023	37.6	0.018	13.7	0.025
26	231	0.12	0.006	0.048	305	0.005	0.005	0.02	0.029	0.03	0.051	0.024	36.5	0.019	13.5	0.025
27	237	0.11	0.006	0.048	307	0.005	0.005	0.02	0.027	0.03	0.057	0.024	35.4	0.019	13.3	0.024
28	243	0.11	0.006	0.048	309	0.005	0.005	0.02	0.026	0.03	0.062	0.024	34.4	0.019	13.1	0.023
29	251	0.11	0.006	0.048	311	0.005	0.005	0.02	0.024	0.03	0.068	0.024	33.3	0.019	12.9	0.023
30	257	0.11	0.007	0.048	313	0.005	0.005	0.02	0.023	0.03	0.074	0.024	32.3	0.020	12.8	0.022
31	264	0.11	0.007	0.048	314	0.005	0.005	0.02	0.021	0.03	0.079	0.024	31.2	0.020	12.6	0.022

Appendix 3.5-35 Table 39 (Continued)

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
32	272	0.11	0.007	0.049	316	0.005	0.005	0.02	0.020	0.03	0.085	0.024	30.1	0.020	12.4	0.021
33	278															
34	286	**0.11**	**0.007**	**0.049**	**320**	0.005	**< 0.005**	**< 0.020**	**0.017**	**< 0.030**	0.097	**0.024**	**28**	**0.021**	**12**	**< 0.020**
35	292	0.12	0.007	0.05	317	0.005		0.02	0.017	0.03	0.100		26.8	0.021	11.6	
36	299	0.13	0.007	0.05	314	0.005		0.02	0.018	0.03	0.104		25.6	0.020	11.1	
37	306	0.14	0.007	0.05	311	0.005		0.02	0.018	0.03	0.108		24.4	0.020	10.7	
38	313	0.15	0.007	0.05	309	0.005		0.02	0.018	0.03	0.112		23.1	0.020	10.2	
39	322	0.16	0.007	0.05	306	0.005		0.02	0.018	0.03	0.116		21.9	0.020	9.8	
40	329	0.17	0.007	0.05	303	0.005		0.02	0.019	0.03	0.119		20.7	0.019	9.3	
41	334	0.18	0.007	0.05	300	0.005		0.02	0.019	0.03	0.123		19.5	0.019	8.9	
42	341	0.19	0.007	0.05	297	0.005		0.02	0.019	0.03	0.127		18.3	0.019	8.5	
43	348	0.20	0.007	0.05	294	0.005		0.02	0.020	0.03	0.131		17.1	0.018	8.0	
44	356	0.21	0.008	0.05	291	0.005		0.02	0.020	0.03	0.135		15.9	0.018	7.6	
45	363	0.22	0.008	0.05	289	0.005		0.02	0.020	0.03	0.139		14.6	0.018	7.1	
46	370	0.23	0.008	0.05	286	0.005		0.02	0.020	0.03	0.142		13.4	0.018	6.7	
47	376	0.24	0.008	0.05	283	0.005		0.02	0.021	0.03	0.146		12.2	0.017	6.2	
48	383	**0.25**	**0.0077**	**0.045**	**280**	**< 0.005**		**< 0.020**	**? 0.021**	**< 0.030**	**? 0.15**		**11**	**0.017**	**5.8**	
49	390				273					0.03						
50	397															
51	404				258					0.03						
52	411				**250**					**< 0.030**	**?**					

* Wet dry cycles

Appendix 3.5-35 Table 40

Cumulative Mass Flux
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7	0.05	0.002	0.040	100.2	0.299	0.006	0.028	0.14	0.0	0.001	0.011	80.2	0.015	28.1	0.013
2*	63	0.08	0.004	0.051	144.1	0.302	0.008	0.069	0.14	0.2	0.005	0.017	123.0	0.021	39.6	0.020
3	70	0.09	0.006	0.065	217.1	0.302	0.004	0.074	0.15	-2.0	0.004	0.024	167.9	0.027	53.6	-0.026
4	77	0.11	0.008	0.078	284.8	0.303	0.001	0.097	0.16	-4.3	0.002	0.030	202.4	0.033	63.1	-0.070
5	83	0.11	0.008	0.079	290.2	0.303	0.000	0.098	0.16	-4.5	0.002	0.030	205.0	0.034	63.9	-0.074
6	91	0.12	0.009	0.089	345.6	0.303	-0.004	0.098	0.18	-6.8	0.001	0.038	229.5	0.037	70.6	-0.114
7	97	0.13	0.010	0.097	379.4	0.304	-0.006	0.099	0.19	-8.1	0.016	0.041	240.2	0.040	73.5	-0.092
8	103	0.13	0.010	0.098	385.3	0.304	-0.006	0.099	0.19	-8.3	0.018	0.041	241.9	0.041	73.9	-0.092
9	110	0.13	0.010	0.099	390.8	0.304	-0.007	0.099	0.19	-8.6	0.019	0.042	243.6	0.041	74.4	-0.096
10	119	0.15	0.011	0.106	437.4	0.304	-0.011	0.097	0.20	-10.8	0.018	0.046	256.6	0.044	77.5	-0.170
11	126	0.15	0.011	0.107	442.5	0.304	-0.011	0.097	0.20	-11.1	0.018	0.046	258.0	0.044	77.9	-0.178
12	132	0.15	0.011	0.108	447.7	0.304	-0.011	0.097	0.20	-11.4	0.018	0.047	259.3	0.045	78.2	-0.186
13	139	0.15	0.011	0.109	452.9	0.304	-0.012	0.096	0.20	-11.6	0.017	0.047	260.5	0.045	78.5	-0.194
14	146	0.15	0.011	0.109	458.1	0.304	-0.012	0.096	0.20	-11.9	0.017	0.048	261.7	0.045	78.8	-0.202
15	152	0.15	0.011	0.110	463.2	0.304	-0.013	0.096	0.20	-12.1	0.017	0.048	262.8	0.046	79.1	-0.210
16	160	0.16	0.011	0.111	468.4	0.304	-0.013	0.096	0.20	-12.4	0.017	0.049	263.8	0.046	79.4	-0.218
17	167	0.16	0.011	0.112	473.6	0.304	-0.013	0.096	0.20	-12.6	0.017	0.049	264.7	0.046	79.7	-0.226
18	174	0.18	0.012	0.117	520.2	0.305	-0.017	0.094	0.21	-14.9	0.016	0.053	272.5	0.048	82.0	-0.299
19	180	0.18	0.012	0.118	525.4	0.305	-0.018	0.094	0.21	-15.2	0.016	0.054	273.3	0.049	82.2	-0.307
20	188	0.18	0.012	0.119	530.6	0.305	-0.018	0.094	0.21	-15.4	0.016	0.054	274.2	0.049	82.5	-0.315
21	195	0.18	0.012	0.120	535.9	0.305	-0.019	0.093	0.21	-15.7	0.016	0.055	275.0	0.049	82.7	-0.323
22	201	0.18	0.012	0.120	541.2	0.305	-0.019	0.093	0.21	-15.9	0.017	0.055	275.7	0.050	83.0	-0.331
23	208	0.19	0.012	0.121	546.6	0.305	-0.020	0.093	0.21	-16.2	0.017	0.055	276.5	0.050	83.2	-0.339
24	215	0.19	0.012	0.122	552.0	0.305	-0.020	0.093	0.21	-16.4	0.018	0.056	277.2	0.050	83.4	-0.347
25	222	0.19	0.012	0.122	557.4	0.305	-0.020	0.093	0.21	-16.7	0.018	0.056	278.0	0.051	83.7	-0.355
26	231	0.19	0.012	0.123	562.9	0.305	-0.021	0.092	0.21	-16.9	0.019	0.057	278.7	0.051	83.9	-0.363
27	237	0.19	0.012	0.124	568.4	0.305	-0.021	0.092	0.21	-17.2	0.020	0.057	279.3	0.051	84.1	-0.371

Appendix 3.5-35 Table 40 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
28	243	0.20	0.012	0.124	573.9	0.305	-0.022	0.092	0.21	-17.4	0.021	0.058	280.0	0.051	84.3	-0.379
29	251	0.20	0.012	0.125	579.5	0.305	-0.022	0.092	0.21	-17.7	0.022	0.058	280.6	0.052	84.5	-0.388
30	257	0.20	0.012	0.126	585.1	0.306	-0.023	0.092	0.21	-17.9	0.023	0.059	281.2	0.052	84.8	-0.396
31	264	0.20	0.013	0.126	590.8	0.306	-0.023	0.091	0.21	-18.2	0.025	0.059	281.8	0.052	85.0	-0.404
32	272	0.20	0.013	0.127	593.6	0.306	-0.023	0.091	0.21	-18.3	0.025	0.059	282.1	0.053	85.1	-0.408
33	278	0.20	0.013	0.127	593.6	0.306	-0.023	0.091	0.21	-18.3	0.025	0.059	282.1	0.053	85.1	-0.408
34	286	0.21	0.013	0.130	616.7	0.306	-0.025	0.091	0.21	-19.3	0.032	0.061	284.3	0.054	85.9	-0.408
35	292	0.21	0.013	0.130	619.5	0.306		0.090	0.21	-19.5	0.033		284.5	0.054	85.9	
36	299	0.21	0.013	0.130	622.4	0.306		0.090	0.21	-19.6	0.034		284.8	0.054	86.0	
37	306	0.21	0.013	0.131	625.1	0.306		0.090	0.21	-19.7	0.035		285.0	0.055	86.1	
38	313	0.21	0.013	0.131	627.9	0.306		0.090	0.21	-19.8	0.036		285.2	0.055	86.2	
39	322	0.22	0.013	0.131	630.7	0.306		0.090	0.21	-20.0	0.037		285.4	0.055	86.3	
40	329	0.23	0.014	0.134	652.4	0.306		0.089	0.21	-21.0	0.045		287.0	0.056	86.9	
41	334	0.24	0.014	0.137	673.9	0.306		0.088	0.21	-22.0	0.054		288.4	0.058	87.4	
42	341	0.25	0.014	0.140	695.1	0.306		0.088	0.21	-23.0	0.063		289.8	0.059	87.9	
43	348	0.27	0.015	0.142	716.2	0.307		0.087	0.21	-24.0	0.072		291.1	0.060	88.4	
44	356	0.28	0.015	0.145	737.0	0.307		0.086	0.21	-25.0	0.082		292.3	0.061	88.8	
45	363	0.30	0.015	0.148	757.6	0.307		0.085	0.21	-26.0	0.092		293.3	0.062	89.3	
46	370	0.32	0.016	0.150	777.9	0.307		0.085	0.21	-27.1	0.102		294.3	0.064	89.6	
47	376	0.33	0.016	0.153	798.1	0.307		0.084	0.21	-28.1	0.113		295.2	0.065	90.0	
48	383	0.35	0.017	0.155	818.0	0.308		0.083	0.21	-29.1	0.124		296.0	0.066	90.3	
49	390				837.3					-30.1						
50	397				837.3					-30.1						
51	404				855.5					-31.1						
52	411				873.1					-32.1						

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Appendix 3.5-35 Table 41

Cumulative Metal Extractions
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7	0.000	0.000	0.081	1.8	1.00	0.001	0.0000	0.005	0.000	0.000	0.06	2.06	0.04	3.5	0.000
2*	63	0.000	0.000	0.102	2.6	1.01	0.002	0.0000	0.005	0.002	0.001	0.08	3.16	0.06	4.9	0.000
3	70	0.001	0.000	0.130	3.9	1.01	0.001	0.0000	0.005	-0.018	0.001	0.12	4.31	0.07	6.7	0.000
4	77	0.001	0.000	0.155	5.1	1.01	0.000	0.0000	0.006	-0.038	0.000	0.15	5.19	0.09	7.9	-0.001
5	83	0.001	0.000	0.157	5.2	1.01	0.000	0.0000	0.006	-0.040	0.000	0.15	5.26	0.09	8.0	-0.001
6	91	0.001	0.000	0.178	6.2	1.01	-0.001	0.0000	0.006	-0.061	0.000	0.19	5.88	0.10	8.8	-0.002
7	97	0.001	0.000	0.193	6.8	1.01	-0.001	0.0000	0.006	-0.072	0.003	0.20	6.16	0.11	9.2	-0.002
8	103	0.001	0.000	0.195	6.9	1.01	-0.001	0.0000	0.007	-0.074	0.003	0.21	6.20	0.11	9.2	-0.002
9	110	0.001	0.000	0.197	7.0	1.01	-0.001	0.0000	0.007	-0.076	0.004	0.21	6.25	0.11	9.3	-0.002
10	119	0.001	0.000	0.213	7.8	1.01	-0.002	0.0000	0.007	-0.097	0.003	0.23	6.58	0.12	9.7	-0.003
11	126	0.001	0.000	0.214	7.9	1.01	-0.002	0.0000	0.007	-0.099	0.003	0.23	6.62	0.12	9.7	-0.003
12	132	0.001	0.000	0.216	8.0	1.01	-0.002	0.0000	0.007	-0.101	0.003	0.23	6.65	0.12	9.8	-0.003
13	139	0.001	0.000	0.217	8.1	1.01	-0.002	0.0000	0.007	-0.104	0.003	0.24	6.68	0.12	9.8	-0.003
14	146	0.001	0.000	0.219	8.2	1.01	-0.002	0.0000	0.007	-0.106	0.003	0.24	6.71	0.12	9.9	-0.003
15	152	0.001	0.000	0.220	8.3	1.01	-0.003	0.0000	0.007	-0.108	0.003	0.24	6.74	0.12	9.9	-0.004
16	160	0.001	0.000	0.222	8.4	1.01	-0.003	0.0000	0.007	-0.110	0.003	0.24	6.76	0.12	9.9	-0.004
17	167	0.001	0.000	0.223	8.5	1.01	-0.003	0.0000	0.007	-0.113	0.003	0.25	6.79	0.12	10.0	-0.004
18	174	0.001	0.000	0.235	9.3	1.02	-0.003	0.0000	0.007	-0.133	0.003	0.27	6.99	0.13	10.2	-0.005
19	180	0.001	0.000	0.236	9.4	1.02	-0.004	0.0000	0.007	-0.135	0.003	0.27	7.01	0.13	10.3	-0.005
20	188	0.001	0.000	0.238	9.5	1.02	-0.004	0.0000	0.007	-0.138	0.003	0.27	7.03	0.13	10.3	-0.005
21	195	0.001	0.000	0.239	9.6	1.02	-0.004	0.0000	0.007	-0.140	0.003	0.27	7.05	0.13	10.3	-0.005
22	201	0.001	0.000	0.240	9.7	1.02	-0.004	0.0000	0.007	-0.142	0.003	0.27	7.07	0.13	10.4	-0.006
23	208	0.001	0.000	0.242	9.8	1.02	-0.004	0.0000	0.007	-0.144	0.003	0.28	7.09	0.13	10.4	-0.006
24	215	0.001	0.000	0.243	9.9	1.02	-0.004	0.0000	0.007	-0.147	0.003	0.28	7.11	0.13	10.4	-0.006
25	222	0.001	0.000	0.244	10.0	1.02	-0.004	0.0000	0.007	-0.149	0.004	0.28	7.13	0.13	10.5	-0.006
26	231	0.001	0.000	0.246	10.1	1.02	-0.004	0.0000	0.007	-0.151	0.004	0.28	7.15	0.13	10.5	-0.006

Appendix 3.5-35 Table 41 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	237	0.001	0.000	0.247	10.1	1.02	-0.004	0.0000	0.007	-0.153	0.004	0.29	7.16	0.13	10.5	-0.006
28	243	0.001	0.000	0.249	10.2	1.02	-0.004	0.0000	0.007	-0.156	0.004	0.29	7.18	0.14	10.5	-0.006
29	251	0.001	0.000	0.250	10.3	1.02	-0.004	0.0000	0.007	-0.158	0.004	0.29	7.20	0.14	10.6	-0.006
30	257	0.001	0.000	0.252	10.4	1.02	-0.005	0.0000	0.007	-0.160	0.004	0.29	7.21	0.14	10.6	-0.007
31	264	0.001	0.000	0.253	10.5	1.02	-0.005	0.0000	0.007	-0.162	0.005	0.30	7.23	0.14	10.6	-0.007
32	272	0.001	0.000	0.254	10.6	1.02	-0.005	0.0000	0.007	-0.164	0.005	0.30	7.23	0.14	10.6	-0.007
33	278	0.001	0.000	0.254	10.6	1.02	-0.005	0.0000	0.007	-0.164	0.005	0.30	7.23	0.14	10.6	-0.007
34	286	0.001	0.000	0.259	11.0	1.02	-0.005	0.0000	0.007	-0.173	0.006	0.31	7.29	0.14	10.7	-0.007
35	292	0.001	0.000	0.260	11.1	1.02		0.0000	0.007	-0.174	0.006		7.30	0.14	10.7	
36	299	0.001	0.001	0.261	11.1	1.02		0.0000	0.007	-0.175	0.006		7.30	0.14	10.8	
37	306	0.001	0.001	0.262	11.2	1.02		0.0000	0.007	-0.176	0.007		7.31	0.14	10.8	
38	313	0.001	0.001	0.262	11.2	1.02		0.0000	0.007	-0.177	0.007		7.31	0.14	10.8	
39	322	0.001	0.001	0.263	11.3	1.02		0.0000	0.007	-0.178	0.007		7.32	0.14	10.8	
40	329	0.001	0.001	0.268	11.6	1.02		0.0000	0.007	-0.187	0.009		7.36	0.15	10.9	
41	334	0.001	0.001	0.274	12.0	1.02		0.0000	0.007	-0.196	0.010		7.40	0.15	10.9	
42	341	0.001	0.001	0.279	12.4	1.02		0.0000	0.007	-0.205	0.012		7.43	0.15	11.0	
43	348	0.001	0.001	0.285	12.8	1.02		0.0000	0.007	-0.214	0.014		7.46	0.16	11.1	
44	356	0.002	0.001	0.290	13.2	1.02		0.0000	0.007	-0.224	0.016		7.49	0.16	11.1	
45	363	0.002	0.001	0.295	13.5	1.02		0.0000	0.007	-0.233	0.018		7.52	0.16	11.2	
46	370	0.002	0.001	0.301	13.9	1.02		0.0000	0.007	-0.242	0.020		7.55	0.17	11.2	
47	376	0.002	0.001	0.306	14.3	1.02		0.0000	0.007	-0.251	0.022		7.57	0.17	11.2	
48	383	0.002	0.001	0.311	14.6	1.03		0.0000	0.007	-0.260	0.024		7.59	0.17	11.3	
49	390				15.0					-0.269						
50	397				15.0					-0.269						
51	404				15.3					-0.278						
52	411				15.6					-0.287						

* Wet dry cycles

Appendix 3.5-35 Table 42

Metal Extraction Rates
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7															
2*	63															
3	70	0.005	0.0004	0.003	12.99	0.0004	-0.0003	0.005	0.0019	-0.23	0.0003	0.0014	9.75	0.0012	2.83	-0.004
4	77	0.006	0.0006	0.004	18.46	0.0004	-0.0006	0.007	0.0027	-0.43	0.0002	0.0018	12.23	0.0018	3.50	-0.008
5	83	0.005	0.0005	0.004	17.50	0.0004	-0.0005	0.006	0.0026	-0.42	0.0001	0.0018	11.50	0.0017	3.29	-0.008
6	91	0.006	0.0006	0.004	20.45	0.0004	-0.0008	0.006	0.0033	-0.57	0.0000	0.0022	12.45	0.0018	3.54	-0.011
7	97	0.011	0.0012	0.009	48.44	0.0004	-0.0028	0.006	0.0092	-1.71	0.0024	0.0050	24.11	0.0038	6.98	-0.023
8	103	0.008	0.0009	0.007	35.67	0.0003	-0.0022	0.005	0.0077	-1.33	0.0031	0.0037	15.70	0.0029	4.31	-0.014
9	110	0.005	0.0005	0.004	22.49	0.0002	-0.0016	0.000	0.0059	-0.90	0.0035	0.0025	8.73	0.0016	2.38	-0.005
10	119	0.007	0.0006	0.005	28.61	0.0002	-0.0021	0.000	0.0068	-1.23	0.0030	0.0030	10.03	0.0020	2.66	-0.019
11	126	0.004	0.0003	0.004	19.38	0.0002	-0.0015	0.000	0.0048	-0.86	0.0033	0.0017	5.70	0.0014	1.46	-0.013
12	132	0.003	0.0002	0.002	13.65	0.0001	-0.0011	0.000	0.0025	-0.65	0.0003	0.0012	3.82	0.0009	0.95	-0.019
13	139	0.003	0.0002	0.002	13.15	0.0001	-0.0010	0.000	0.0023	-0.64	-0.0001	0.0012	3.61	0.0009	0.89	-0.020
14	146	0.003	0.0002	0.002	13.08	0.0001	-0.0010	0.000	0.0021	-0.64	-0.0003	0.0012	3.52	0.0008	0.87	-0.021
15	152	0.002	0.0001	0.001	5.49	0.0001	-0.0004	0.000	0.0008	-0.27	-0.0001	0.0005	1.31	0.0003	0.34	-0.009
16	160	0.002	0.0001	0.001	5.33	0.0001	-0.0004	0.000	0.0007	-0.26	-0.0001	0.0005	1.19	0.0003	0.31	-0.008
17	167	0.002	0.0001	0.001	5.18	0.0000	-0.0004	0.000	0.0006	-0.25	-0.0001	0.0005	1.08	0.0003	0.29	-0.008
18	174	0.005	0.0001	0.002	13.46	0.0001	-0.0011	-0.001	0.0011	-0.66	-0.0003	0.0012	2.39	0.0007	0.69	-0.021
19	180	0.005	0.0001	0.002	13.86	0.0001	-0.0011	-0.001	0.0011	-0.68	-0.0003	0.0012	2.40	0.0007	0.70	-0.022
20	188	0.005	0.0001	0.002	13.10	0.0001	-0.0011	0.000	0.0010	-0.64	-0.0002	0.0011	2.22	0.0007	0.65	-0.020
21	195	0.005	0.0001	0.002	13.50	0.0001	-0.0011	-0.001	0.0010	-0.66	-0.0002	0.0012	2.24	0.0007	0.66	-0.021
22	201	0.005	0.0001	0.002	13.93	0.0001	-0.0012	-0.001	0.0010	-0.68	-0.0001	0.0012	2.27	0.0007	0.68	-0.022
23	208	0.002	0.0001	0.001	5.44	0.0001	-0.0004	0.000	0.0003	-0.26	0.0002	0.0005	0.83	0.0003	0.25	-0.008
24	215	0.002	0.0001	0.001	5.32	0.0000	-0.0004	0.000	0.0003	-0.25	0.0003	0.0005	0.78	0.0003	0.24	-0.008
25	222	0.002	0.0001	0.001	5.52	0.0001	-0.0004	0.000	0.0003	-0.26	0.0005	0.0005	0.78	0.0003	0.24	-0.008
26	231	0.002	0.0001	0.001	5.25	0.0000	-0.0004	0.000	0.0002	-0.25	0.0005	0.0004	0.72	0.0003	0.23	-0.008

Appendix 3.5-35 Table 42 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
27	237	0.002	0.0001	0.001	5.28	0.0000	-0.0004	0.000	0.0002	-0.25	0.0006	0.0004	0.70	0.0003	0.22	-0.008
28	243	0.002	0.0001	0.001	5.47	0.0000	-0.0004	0.000	0.0002	-0.25	0.0008	0.0005	0.70	0.0003	0.23	-0.008
29	251	0.002	0.0001	0.001	5.35	0.0000	-0.0004	0.000	0.0001	-0.25	0.0009	0.0004	0.66	0.0003	0.22	-0.008
30	257	0.002	0.0001	0.001	5.54	0.0000	-0.0004	0.000	0.0001	-0.25	0.0010	0.0005	0.66	0.0003	0.22	-0.008
31	264	0.002	0.0001	0.001	5.92	0.0001	-0.0005	0.000	0.0001	-0.27	0.0012	0.0005	0.67	0.0004	0.23	-0.009
32	272	0.002	0.0001	0.001	5.05	0.0000	-0.0004	0.000	0.0001	-0.23	0.0011	0.0004	0.56	0.0003	0.19	-0.007
33	278	0.001	0.0001	0.000	3.94	0.0000	-0.0003	0.000	0.0000	-0.18	0.0009	0.0003	0.43	0.0002	0.15	-0.006
34	286	0.002	0.0001	0.001	7.43	0.0001	-0.0006	0.000	0.0000	-0.33	0.0020	0.0006	0.73	0.0005	0.26	-0.004
35	292	0.002	0.0001	0.001	6.88	0.0001		0.000	0.0000	-0.30	0.0019		0.65	0.0004	0.24	
36	299	0.002	0.0001	0.001	6.31	0.0001		0.000	-0.0001	-0.28	0.0018		0.58	0.0004	0.22	
37	306	0.002	0.0001	0.001	6.49	0.0001		0.000	-0.0001	-0.29	0.0019		0.59	0.0004	0.22	
38	313	0.002	0.0001	0.001	6.86	0.0001		0.000	-0.0001	-0.30	0.0021		0.61	0.0004	0.23	
39	322	0.001	0.0000	0.000	2.72	0.0000		0.000	0.0000	-0.12	0.0009		0.22	0.0002	0.08	
40	329	0.003	0.0001	0.001	6.21	0.0001		0.000	0.0000	-0.29	0.0023		0.47	0.0004	0.17	
41	334	0.006	0.0002	0.001	10.30	0.0001		0.000	0.0000	-0.48	0.0040		0.74	0.0006	0.27	
42	341	0.008	0.0002	0.002	13.99	0.0001		-0.001	-0.0001	-0.66	0.0057		0.96	0.0008	0.36	
43	348	0.011	0.0003	0.002	17.65	0.0002		-0.001	-0.0001	-0.84	0.0073		1.18	0.0011	0.44	
44	356	0.014	0.0004	0.003	21.89	0.0002		-0.001	-0.0001	-1.04	0.0093		1.41	0.0013	0.53	
45	363	0.015	0.0004	0.003	21.66	0.0002		-0.001	0.0000	-1.04	0.0096		1.31	0.0013	0.49	
46	370	0.015	0.0004	0.003	20.24	0.0002		-0.001	0.0000	-0.99	0.0094		1.15	0.0012	0.43	
47	376	0.016	0.0004	0.003	20.59	0.0002		-0.001	0.0000	-1.01	0.0100		1.09	0.0012	0.41	
48	383	0.017	0.0004	0.003	20.37	0.0002		-0.001	0.0000	-1.01	0.0103		0.99	0.0012	0.37	
49	390				20.66					-1.04						
50	397				16.42					-0.83						
51	404				15.97					-0.83						
52	411				15.00					-0.81						

* Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 43

Oxidation and Neutralization Rates
Backfill Cemented Coarse Tailings (AL-17)

Test: **Leached under alternating wet/dry, followed by saturated, conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	209	0.02		2.18	2.50	0.00	1.15	251		1.0
2**	63	454	0.05		4.72	3.60	0.01	0.76	361		1.4
3	70	687	0.08	53.1	2.44	1.82	-0.09	0.71	534	31.5	2.1
4	77	846	0.10	63.7	1.66	1.69	-0.09	0.96	694	44.4	2.8
5	83	858	0.10	59.7	0.12	0.14	-0.01	1.08	707	42.0	2.8
6	91	955	0.11	62.1	1.01	1.38	-0.09	1.28	836	48.8	3.3
7	97	1008	0.12	114.2	0.56	0.85	-0.05	1.43	915	114.1	3.7
8	103	1017	0.12	69.9	0.09	0.15	-0.01	1.51	929	83.7	3.7
9	110	1024	0.12	37.7	0.08	0.14	-0.01	1.61	942	52.5	3.8
10	119	1083	0.12	43.8	0.61	1.16	-0.09	1.75	1049	66.4	4.2
11	126	1089	0.13	27.0	0.07	0.13	-0.01	1.76	1061	44.9	4.2
12	132	1096	0.13	17.6	0.07	0.13	-0.01	1.77	1073	31.4	4.3
13	139	1102	0.13	16.7	0.07	0.13	-0.01	1.78	1084	30.2	4.3
14	146	1109	0.13	16.4	0.07	0.13	-0.01	1.79	1096	30.1	4.4
15	152	1115	0.13	6.8	0.07	0.13	-0.01	1.80	1108	12.6	4.4
16	160	1121	0.13	6.6	0.07	0.13	-0.01	1.81	1120	12.2	4.5
17	167	1128	0.13	6.4	0.07	0.13	-0.01	1.82	1132	11.9	4.5
18	174	1184	0.14	16.3	0.59	1.16	-0.09	1.83	1239	30.9	5.0
19	180	1190	0.14	16.8	0.07	0.13	-0.01	1.82	1251	31.9	5.0
20	188	1197	0.14	15.9	0.07	0.13	-0.01	1.81	1263	30.1	5.1
21	195	1203	0.14	16.4	0.07	0.13	-0.01	1.80	1275	31.0	5.1
22	201	1210	0.14	16.9	0.07	0.13	-0.01	1.79	1288	32.0	5.2
23	208	1217	0.14	6.7	0.07	0.13	-0.01	1.78	1300	12.5	5.2
24	215	1223	0.14	6.6	0.07	0.13	-0.01	1.77	1312	12.3	5.2
25	222	1230	0.14	6.9	0.07	0.14	-0.01	1.76	1325	12.7	5.3

Appendix 3.5-35 Table 43 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	231	1237	0.14	6.6	0.07	0.14	-0.01	1.75	1338	12.1	5.4
27	237	1244	0.14	6.7	0.07	0.14	-0.01	1.74	1350	12.2	5.4
28	243	1251	0.14	6.9	0.07	0.14	-0.01	1.73	1363	12.6	5.5
29	251	1258	0.14	6.8	0.07	0.14	-0.01	1.72	1376	12.4	5.5
30	257	1266	0.15	7.1	0.08	0.14	-0.01	1.71	1389	12.8	5.6
31	264	1273	0.15	7.6	0.08	0.14	-0.01	1.71	1402	13.7	5.6
32	272	1277	0.15	6.5	0.04	0.07	-0.01	1.70	1409	11.7	5.6
33	278										
34	286	1307	0.15	9.8	0.15 ?	0.58 ?	-0.04	3.60 ?	1526	29.9	6.1
35	292	1311	0.15	9.1	0.04	0.07	-0.01	1.67	1532	28.6	6.1
36	299	1315	0.15	8.4	0.04	0.07	-0.01	1.66	1539	27.3	6.2
37	306	1319	0.15	8.6	0.04	0.07	-0.01	1.65	1545	28.1	6.2
38	313	1322	0.15	5.9	0.04	0.07	-0.01	1.64	1552	15.9	6.2
39	322	1326	0.15	3.7	0.04	0.07	-0.01	1.63	1558	6.3	6.2
40	329	1356	0.16	8.5	0.31	0.54	-0.04	1.62	1608	14.3	6.4
41	334	1386	0.16	14.3	0.32	0.54	-0.04	1.56	1658	23.8	6.6
42	341	1435	0.16	23.4	0.51	0.53	-0.04	0.96	1707	32.3	6.8
43	348	1476	0.17	30.8	0.42	0.53	-0.04	1.14	1755	40.7	7.0
44	356	1503	0.17	36.5	0.28	0.52	-0.04	1.68	1803	50.4	7.2
45	363	1530	0.18	35.8	0.27	0.51	-0.04	1.73	1850	49.8	7.4
46	370	1565	0.18	34.7	0.37	0.51	-0.04	1.28	1897	46.5	7.6
47	376	1605	0.18	34.0	0.42	0.50	-0.04	1.09	1943	47.3	7.8
48	383	1633	0.19	31.3	0.28	0.50	-0.04	1.60	1989	46.8	8.0
49	390	1659	0.19	32.1	0.28	0.48	-0.04	1.60	2033	47.4	8.1
50	397										
51	404	1685	0.19	24.8	0.13 ?	0.45	-0.04	3.27 ?	2103	42.4	8.4
52	411	1710	0.20	20.9	0.26	0.44	-0.04	1.53	2142	39.9	8.6

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Appendix 3.5-35 Tables 44-50. Backfill Whole Tailings (AL-13) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.

Appendix 3.5-35 Table 44

Sample Characterization
Backfill Whole Tailings (AL-13) - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)	
Aluminum	Al	30600	<0.03	
Antimony	Sb	68	<0.04	
Arsenic	As	2500	<0.005	
Barium	Ba	54	0.012	
Beryllium	Be	<50	<0.005	*
Bismuth	Bi	<20	<0.20	*
Cadmium	Cd	28	<0.005	
Calcium	Ca	6800	25.0	
Carbon	C	5000	NA	
Chromium	Cr	100	<0.005	
Cobalt	Co	69	<0.010	
Copper	Cu	860	0.027	
Gallium	Ga	16	NA	
Iron	Fe	232000	0.030	
Lead	Pb	4300	<0.04	
Lithium	Li	NA	NA	
Magnesium	Mg	14900	13.000	
Manganese	Mn	580	0.011	
Mercury	Hg	1.6	<0.0002	
Molybdenum	Mo	<20	<0.020	
Nickel	Ni	22	<0.015	
Phosphorus	P	NA	NA	
Potassium	K	7600	0.750	
Selenium	Se	35	<0.005	
Silicon	Si	160000	NA	
Silver	Ag	22.2	<0.005	
Sodium	Na	1600	1.90	
Strontium	Sr	NA	NA	
Thallium	Tl	14	<0.040	
Tin	Sn	24	<0.24	
Titanium	Ti	1400	<0.050	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	8100	0.44	
Sulfate	SO4	1900.0	9.90	
Sulfur	S	249000.0	NA	

Note: NA = Not Analyzed

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	7.08

* Value Estimated

Compiled by: RWL
Checked by: JET

Appendix 3.5-35 Table 45

Parameters Measured Weekly
Backfill Whole Tailings (AL-13)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)		ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct-94	1*	7	4.500	7.2	2530				**1150**	731
14-Dec-94	2*	63	0.000							731
21-Dec-94	3	70	4.400	7.0	1990		74		**1440**	1620
28-Dec-94	4	77	4.500	7.2	1380		76		**608**	2000
3-Jan-95	5	83	0.400	6.5	2030		34	?	452	2025
11-Jan-95	6	91	4.500	6.9	566		82		**295**	2206
17-Jan-95	7	97	2.750	7.2	631		66		**260**	2303
23-Jan-95	8	103	0.500	6.6	838		75		274	2322
30-Jan-95	9	110	4.500	6.6	1030		78		287	2498
8-Feb-95	10	119	4.500	7.0	1090		90		**301**	2683
15-Feb-95	11	126	0.500	6.7	997				301	2704
21-Feb-95	12	132	0.500	6.9	793		71		301	2724
28-Feb-95	13	139	0.500	6.9	947		79		301	2745
7-Mar-95	14	146	0.500	6.9	877		88		301	2765
13-Mar-95	15	152	0.500	6.9	805		94		300	2786
21-Mar-95	16	160	0.500	6.9	811		97		300	2806
28-Mar-95	17	167	0.500	7.0	818		92		300	2827
4-Apr-95	18	174	4.500	7.0	824		96		**300**	3011
11-Apr-95	19	181	0.500	6.8	809		60		303	3032
18-Apr-95	20	188	0.500	7.0	932		67		306	3053
25-Apr-95	21	195	0.500	6.4	874		71		309	3074
1-May-95	22	201	0.500	6.8	983		69		313	3095
8-May-95	23	208	0.500	6.7	1050		64		316	3117
15-May-95	24	215	0.500	6.6	972		72		319	3139
22-May-95	25	222	0.500	7.0	720	?	63		322	3161
31-May-95	26	231	0.500	6.8	823		73		325	3183
6-Jun-95	27	237	0.500	7.0	830		89		328	3205
12-Jun-95	28	243	0.500	6.6	792		76		331	3228
20-Jun-95	29	251	0.500	6.7	849		76		334	3251
26-Jun-95	30	257	0.500	6.9	780		69		338	3274
3-Jul-95	31	264	0.500	6.6	902				341	3298
11-Jul-95	32	272	0.250	6.7	965				344	3309
17-Jul-95	33	278	0.000							
25-Jul-95	34	286	2.000	6.6	970		63		**350**	3405
31-Jul-95	35	292	0.250	6.4	985				348	3417
7-Aug-95	36	299	0.250	6.4	1080				347	3429
14-Aug-95	37	306	0.250	6.6	1050				345	3441
21-Aug-95	38	313	0.250	6.6	1100				343	3453
30-Aug-95	39	322	0.250	6.5	1160				342	3465
6-Sep-95	40	329	2.000	7.2	775		49		**340**	3558
11-Sep-95	41	334	2.000	6.7	834		51		**370**	3660

Appendix 3.5-35 Table 45 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **		CUMULATIVE SULFATE (mg/kg)
18-Sep-95	42	341	2.000	6.7	762	59		385	?	3766
25-Sep-95	43	348	2.000	6.7	696	60		**400**		3876
3-Oct-95	44	356	2.000	6.7	619	74		**240**		3941
10-Oct-95	45	363	2.000	6.8	609	64		**230**		4003
17-Oct-95	46	370	2.000	6.9	520	66		**270**		4076
23-Oct-95	47	376	2.000	6.9	502	59		**460**		4204
30-Oct-95	48	383	2.000	6.9	490	62		**170**		4249
6-Nov-95	49	390	2.000	6.8	522	70		**160**		4291
13-Nov-95	50	397	0.000							
20-Nov-95	51	404	2.000	6.6	596	65		**210**		4348
27-Nov-95	52	411	2.000	6.6	646	72		**200**		4401
5-Dec-95	53	419	2.000	7.1	544	64				
11-Dec-95	54	425	2.000	7.1	637	75				
18-Dec-95	55	432	2.000	7.0	640	68				
26-Dec-95	56	440	2.000	7.2	516	62				
2-Jan-96	57	447	2.000	7.2	540	78				
10-Jan-96	58	455	2.000	7.0	596	80				
15-Jan-96	59	460	2.000	7.1	543					

* Wet dry cycles

** measured values of sulfate shown in bold

Appendix 3.5-35 Table 46

Leachate Analysis
Backfill Whole Tailings (AL-13)

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	18	3.6	0.25	0.052	410	0.21	0.16	1.3	250	8.3	110	6.6	0.065	6.7	0.20	0.092	40	20
2*	63																		
3	70	3	0.36	0.028	0.036	270	0.032	0.064	0.35	22	1.8	80	7.3	0.074	7.2	0.070	0.006	23	19
4	77	1.6	0.24	0.032	0.014	230	0.020	0.031	0.20	14	0.85	42	2.9	< 0.036	4.8	0.030	0.005	8.1	6.9
5	83	1.75	0.250	0.038	0.016	205	0.021	0.03	0.20	14.50	0.98	37.5	2.75	0.04	4.80	0.021	0.005	6.50	6.7
6	91	1.9	0.26	0.044	0.018	180	0.022	0.022	0.20	15	1.1	33	2.6	< 0.037	4.8	0.012	0.005	4.9	6.5
7	97	1.54 ?	0.22 ?	0.036	0.055	120	0.02 ?	0.034	0.17 ?	12.10 ?	0.92 ?	39	3.5	0.052	2.6	0.033	0.005	3.1	6.13 ?
8	103	1.18	0.17	0.032	0.039	127	0.02	0.03	0.13	9.20	0.74	35.7	3.13	0.04	3.33	0.027	0.005	3.40	5.75
9	110	0.81	0.13	0.027	0.023	133	0.01	0.02	0.10	6.30	0.56	32.3	2.77	0.03	4.07	0.021	0.005	3.70	5.38
10	119	0.45	0.086	0.023	0.007	140	0.008	0.018	0.060	3.4	0.38	29	2.4	< 0.020	< 4.8	0.015	< 0.005	4.0	5.0
11	126	0.40	0.079	0.02	0.007	135	0.008	0.02	0.053	3.00	0.34	28.8	2.33	0.02	4.4	0.014	0.005	4.01	4.6
12	132	0.35	0.073	0.02	0.007	130	0.007	0.02	0.046	2.60	0.30	28.5	2.25	0.02	4.1	0.013	0.005	4.03	4.2
13	139	0.29	0.066	0.02	0.006	125	0.007	0.02	0.039	2.20	0.25	28.3	2.18	0.02	3.7	0.011	0.005	4.04	3.7
14	146	0.24	0.059	0.03	0.006	120	0.007	0.01	0.033	1.80	0.21	28.0	2.10	0.02	3.3	0.010	0.005	4.05	3.3
15	152	0.19	0.052	0.03	0.006	115	0.006	0.01	0.026	1.40	0.17	27.8	2.03	0.02	2.9	0.009	0.005	4.06	2.9
16	160	0.14	0.046	0.03	0.006	110	0.006	0.01	0.019	1.00	0.13	27.5	1.95	0.02	2.6	0.008	0.005	4.08	2.5
17	167	0.08	0.039	0.03	0.005	105	0.005	0.01	0.012	0.60	0.08	27.3	1.88	0.02	2.2	0.006	0.005	4.09	2.0
18	174	< 0.030	0.032	0.027	< 0.005	100	< 0.005	< 0.010	< 0.005	0.20	< 0.040	27	1.8	< 0.020	1.8	< 0.005	< 0.005	4.1	1.6
19	181	0.05	0.040	0.03	0.006	103	0.005	0.01	0.01	0.50	0.05	28.2	1.91	0.020	1.79	0.005	0.005	4.23	1.7
20	188	0.08	0.048	0.03	0.006	105	0.005	0.01	0.01	0.80	0.05	29.4	2.03	0.020	1.79	0.005	0.005	4.36	1.9
21	195	0.10	0.056	0.03	0.007	108	0.005	0.01	0.01	1.10	0.06	30.6	2.14	0.020	1.78	0.005	0.005	4.49	2.0
22	201	0.13	0.064	0.03	0.007	110	0.005	0.01	0.01	1.40	0.07	31.8	2.25	0.020	1.78	0.005	0.005	4.63	2.2
23	208	0.15	0.072	0.03	0.008	113	0.005	0.01	0.01	1.70	0.08	32.9	2.36	0.020	1.77	0.005	0.005	4.76	2.3
24	215	0.18	0.080	0.03	0.008	115	0.005	0.01	0.01	2.00	0.08	34.1	2.48	0.020	1.76	0.005	0.005	4.89	2.5
25	222	0.20	0.088	0.03	0.009	118	0.005	0.01	0.02	2.30	0.09	35.3	2.59	0.020	1.76	0.005	0.005	5.02	2.6
26	231	0.23	0.096	0.03	0.010	120	0.005	0.02	0.02	2.60	0.10	36.5	2.70	0.020	1.75	0.005	0.005	5.15	2.8
27	237	0.25	0.104	0.03	0.010	123	0.005	0.02	0.02	2.90	0.11	37.7	2.81	0.020	1.74	0.005	0.005	5.28	2.9
28	243	0.27	0.112	0.03	0.011	125	0.005	0.02	0.02	3.20	0.12	38.9	2.93	0.020	1.74	0.005	0.005	5.41	3.0
29	251	0.30	0.120	0.02	0.011	128	0.005	0.02	0.02	3.50	0.12	40.1	3.04	0.020	1.73	0.005	0.005	5.54	3.2
30	257	0.32	0.128	0.02	0.012	130	0.005	0.02	0.02	3.80	0.13	41.3	3.15	0.020	1.73	0.005	0.005	5.68	3.3
31	264	0.35	0.136	0.02	0.012	133	0.005	0.02	0.03	4.10	0.14	42.4	3.26	0.020	1.72	0.005	0.005	5.81	3.5
32	272	0.37	0.144	0.02	0.013	135	0.005	0.02	0.03	4.40	0.15	43.6	3.38	0.020	1.71	0.005	0.005	5.94	3.6
33	278																		
34	286	0.42	0.16	0.024	0.014	140	< 0.005	0.021	0.030	5	0.160	46	3.6	0.020	1.7	< 0.005	< 0.005	6.2	3.9
35	292	0.49	0.163	0.02	0.014	134	0.006	0.02		5.36	0.16	44.5	3.44	0.020	1.62	0.005	0.005	5.94	3.8
36	299	0.56	0.166	0.02	0.013	128	0.007	0.02		5.71	0.16	43.0	3.27	0.020	1.54	0.005	0.005	5.67	3.7
37	306	0.63	0.169	0.02	0.013	122	0.007	0.02		6.07	0.16	41.5	3.11	0.020	1.46	0.006	0.005	5.41	3.6
38	313	0.70	0.171	0.02	0.013	116	0.008	0.02		6.43	0.16	40.0	2.94	0.020	1.39	0.006	0.005	5.14	3.6
39	322	0.77	0.174	0.02	0.013	110	0.009	0.02		6.79	0.16	38.5	2.78	0.020	1.31	0.006	0.005	4.88	3.5
40	329	0.84	0.177	0.02	0.012	104	0.010	0.02		7.14	0.16	37.0	2.61	0.020	1.23	0.006	0.005	4.61	3.4

Appendix 3.5-35 Table 46 (Continued)

| CYCLE | DAYS | LEACHATE ANALYSIS (mg/L) ** | | |

Appendix 3.5-35 Table 47

Cumulative Mass Flux
Backfill Whole Tailings (AL-13)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	11.44	2.288	0.159	0.033	260.6	0.133	0.102	0.826	158.9	5.28	69.9	4.19	0.041	4.26	0.127	0.058	25.4	12.7
2*	63	11.44	2.288	0.159	0.033	260.6	0.133	0.102	0.826	158.9	5.28	69.9	4.19	0.041	4.26	0.127	0.058	25.4	12.7
3	70	13.30	2.510	0.169	0.054	412.9	0.152	0.138	1.027	172.6	6.382	111.6	8.72	0.083	8.27	0.169	0.061	38.5	24.2
4	77	14.30	2.661	0.182	0.061	543.1	0.163	0.155	1.137	181.4	6.909	130.0	10.56	0.101	10.84	0.187	0.062	42.5	28.4
5	83	14.40	2.675	0.183	0.062	553.3	0.164	0.156	1.147	182.2	6.963	131.4	10.72	0.102	11.07	0.188	0.062	42.7	28.7
6	91	15.60	2.839	0.203	0.072	651.8	0.176	0.167	1.257	191.8	7.650	144.1	12.36	0.121	13.64	0.194	0.064	44.6	32.6
7	97	16.19	2.922	0.213	0.092	688.7	0.183	0.178	1.310	196.5	8.00	154.2	13.72	0.138	14.36	0.205	0.065	45.1	34.8
8	103	16.27	2.934	0.214	0.095	695.9	0.183	0.180	1.318	197.1	8.05	155.8	13.94	0.141	14.55	0.207	0.065	45.2	35.1
9	110	16.78	3.015	0.224	0.108	764.8	0.189	0.191	1.361	201.1	8.39	168.1	15.69	0.156	16.65	0.219	0.067	46.4	38.3
10	119	17.06	3.068	0.231	0.111	837.9	0.193	0.200	1.382	203.2	8.62	178.2	17.21	0.163	19.23	0.227	0.068	47.7	41.2
11	126	17.08	3.073	0.232	0.111	845.6	0.193	0.201	1.384	203.4	8.64	179.4	17.37	0.164	19.49	0.228	0.068	47.8	41.5
12	132	17.11	3.078	0.232	0.111	853.0	0.193	0.201	1.385	203.6	8.66	180.4	17.53	0.165	19.72	0.228	0.069	48.0	41.7
13	139	17.13	3.083	0.233	0.112	860.1	0.194	0.202	1.386	203.8	8.68	181.5	17.68	0.166	19.93	0.229	0.069	48.1	42.0
14	146	17.14	3.087	0.234	0.112	866.8	0.194	0.203	1.386	203.9	8.69	182.6	17.83	0.167	20.11	0.230	0.069	48.3	42.2
15	152	17.15	3.090	0.235	0.112	873.2	0.194	0.203	1.386	204.0	8.70	183.6	17.97	0.168	20.26	0.230	0.069	48.4	42.3
16	160	17.16	3.093	0.236	0.112	879.2	0.194	0.204	1.386	204.1	8.71	184.6	18.11	0.169	20.39	0.230	0.069	48.6	42.5
17	167	17.17	3.096	0.237	0.112	884.8	0.195	0.204	1.384	204.1	8.72	185.7	18.24	0.170	20.49	0.231	0.070	48.8	42.6
18	174	17.18	3.115	0.247	0.114	932.5	0.196	0.207	1.371	204.2	8.73	194.6	19.38	0.178	21.16	0.232	0.071	50.2	43.3
19	181	17.18	3.117	0.248	0.114	938.0	0.196	0.208	1.369	204.2	8.73	195.6	19.51	0.178	21.23	0.232	0.071	50.3	43.4
20	188	17.18	3.120	0.249	0.114	943.6	0.197	0.208	1.368	204.3	8.73	196.8	19.65	0.179	21.30	0.233	0.071	50.5	43.5
21	195	17.19	3.124	0.250	0.115	949.4	0.197	0.209	1.367	204.4	8.74	198.0	19.80	0.180	21.38	0.233	0.072	50.7	43.6
22	201	17.20	3.129	0.251	0.115	955.4	0.197	0.209	1.365	204.5	8.74	199.3	19.96	0.181	21.45	0.233	0.072	50.9	43.8
23	208	17.21	3.133	0.252	0.115	961.6	0.197	0.210	1.364	204.6	8.74	200.8	20.13	0.182	21.52	0.233	0.072	51.1	43.9
24	215	17.22	3.139	0.253	0.116	968.0	0.197	0.211	1.363	204.7	8.75	202.2	20.30	0.183	21.59	0.233	0.072	51.3	44.0
25	222	17.23	3.145	0.254	0.116	974.5	0.197	0.211	1.363	204.9	8.75	203.8	20.48	0.184	21.66	0.233	0.072	51.5	44.2
26	231	17.25	3.152	0.255	0.117	981.2	0.198	0.212	1.362	205.1	8.76	205.5	20.67	0.185	21.73	0.234	0.073	51.7	44.3
27	237	17.26	3.159	0.256	0.117	988.1	0.198	0.213	1.361	205.3	8.77	207.2	20.87	0.186	21.80	0.234	0.073	52.0	44.5
28	243	17.28	3.166	0.257	0.118	995.2	0.198	0.214	1.361	205.5	8.77	209.1	21.08	0.186	21.87	0.234	0.073	52.2	44.70
29	251	17.30	3.175	0.258	0.119	1002.4	0.198	0.214	1.361	205.7	8.78	211.0	21.29	0.187	21.94	0.234	0.073	52.5	44.90

Appendix 3.5-35 Table 47 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
30	257	17.32	3.184	0.258	0.119	1009.8	0.198	0.215	1.360	206.0	8.79	213.0	21.51	0.188	22.01	0.234	0.073	52.7	45.10
31	264	17.35	3.193	0.259	0.120	1017.4	0.199	0.216	1.360	206.3	8.80	215.0	21.74	0.189	22.08	0.235	0.073	53.0	45.32
32	272	17.36	3.198	0.260	0.120	1021.3	0.199	0.217	1.360	206.4	8.80	216.1	21.86	0.190	22.11	0.235	0.074	53.2	45.43
33	278	17.36	3.198	0.260	0.120	1021.3	0.199	0.217	1.360	206.4	8.80	216.1	21.86	0.190	22.11	0.235	0.074	53.2	45.43
34	286	17.47	3.243	0.263	0.123	1053.8	0.200	0.221	1.361	207.9	8.84	225.4	22.87	0.193	22.38	0.235	0.074	54.4	46.41
35	292	17.49	3.248	0.264	0.124	1057.6	0.200	0.222		208.0	8.84	226.6	23.00	0.194	22.41	0.235	0.074	54.5	46.52
36	299	17.51	3.254	0.264	0.124	1061.3	0.200	0.222		208.2	8.85	227.6	23.11	0.194	22.44	0.235	0.074	54.7	46.64
37	306	17.53	3.260	0.264	0.125	1064.7	0.200	0.223		208.5	8.85	228.6	23.22	0.194	22.47	0.236	0.074	54.8	46.75
38	313	17.56	3.266	0.265	0.125	1067.9	0.200	0.223		208.7	8.86	229.6	23.32	0.195	22.49	0.236	0.075	54.9	46.86
39	322	17.58	3.272	0.265	0.125	1070.9	0.200	0.224		208.9	8.86	230.5	23.42	0.195	22.51	0.236	0.075	55.0	46.97
40	329	17.82	3.321	0.269	0.128	1093.2	0.202	0.227		210.9	8.90	237.3	24.16	0.199	22.64	0.237	0.075	55.8	47.80
41	334	18.07	3.371	0.273	0.131	1113.9	0.205	0.230		213.0	8.94	243.6	24.85	0.202	22.76	0.238	0.076	56.5	48.61
42	341	18.34	3.422	0.276	0.133	1132.8	0.207	0.233		215.2	8.98	249.5	25.49	0.206	22.85	0.239	0.077	57.1	49.39
43	348	18.63	3.474	0.280	0.136	1150.0	0.210	0.235		217.6	9.02	255.0	26.08	0.209	22.92	0.240	0.077	57.6	50.15
44	356	18.95	3.527	0.284	0.138	1165.5	0.213	0.238		220.0	9.06	260.1	26.63	0.213	22.96	0.242	0.078	58.1	50.89
45	363	19.28	3.580	0.288	0.141	1179.4	0.216	0.240		222.5	9.10	264.8	27.14	0.216	22.99	0.243	0.079	58.5	51.60
46	370	19.63	3.634	0.292	0.143	1191.5	0.219	0.241		225.1	9.14	269.0	27.59	0.220	22.99	0.244	0.080	58.8	52.29
47	376	20.00	3.689	0.296	0.145	1202.0	0.223	0.243		227.8	9.18	272.8	28.01	0.224	22.97	0.246	0.080	59.0	52.95
48	383	20.39	3.745	0.299	0.147	1210.7	0.227	0.245		230.6	9.22	276.2	28.37	0.227	22.93	0.247	0.081	59.2	53.59
49	390					1220.3						279.9							
50	397					1220.3						279.9							
51	404					1231.4						284.1							
52	411					1243.2						288.7							

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 48

Cumulative Metal Extractions
Backfill Whole Tailings (AL-13)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.037	0.092	0.294	0.118	3.8	0.133	0.147	0.096	0.068	0.123	0.469	0.72	0.19	0.056	0.363	0.263	1.589	0.157
2*	63	0.037	0.092	0.294	0.118	3.8	0.133	0.147	0.096	0.068	0.123	0.469	0.72	0.19	0.056	0.363	0.263	1.589	0.157
3	70	0.043	0.100	0.313	0.192	6.1	0.152	0.201	0.119	0.074	0.148	0.749	1.50	0.38	0.109	0.483	0.273	2.409	0.299
4	77	0.047	0.106	0.336	0.218	8.0	0.163	0.224	0.132	0.078	0.161	0.872	1.82	0.46	0.143	0.533	0.280	2.655	0.350
5	83	0.047	0.107	0.339	0.221	8.1	0.164	0.226	0.133	0.079	0.162	0.882	1.85	0.47	0.146	0.536	0.281	2.671	0.354
6	91	0.051	0.114	0.377	0.256	9.6	0.176	0.242	0.146	0.083	0.178	0.967	2.13	0.55	0.180	0.553	0.288	2.790	0.402
7	97	0.053	0.117	0.394	0.329	10.1	0.183	0.258	0.152	0.085	0.186	1.035	2.36	0.63	0.189	0.587	0.293	2.819	0.429
8	103	0.053	0.117	0.396	0.338	10.2	0.183	0.261	0.153	0.085	0.187	1.046	2.40	0.64	0.191	0.592	0.293	2.826	0.434
9	110	0.055	0.121	0.414	0.385	11.2	0.189	0.278	0.158	0.087	0.195	1.128	2.70	0.71	0.219	0.626	0.300	2.898	0.473
10	119	0.056	0.123	0.427	0.395	12.3	0.193	0.290	0.161	0.088	0.201	1.196	2.97	0.74	0.253	0.648	0.308	2.981	0.508
11	126	0.056	0.123	0.429	0.396	12.4	0.193	0.291	0.161	0.088	0.201	1.204	2.99	0.75	0.256	0.651	0.308	2.990	0.512
12	132	0.056	0.123	0.430	0.397	12.5	0.193	0.292	0.161	0.088	0.201	1.211	3.02	0.75	0.259	0.653	0.309	3.000	0.515
13	139	0.056	0.123	0.432	0.398	12.6	0.194	0.293	0.161	0.088	0.202	1.218	3.05	0.76	0.262	0.654	0.310	3.009	0.518
14	146	0.056	0.123	0.434	0.399	12.7	0.194	0.294	0.161	0.088	0.202	1.225	3.07	0.76	0.265	0.656	0.311	3.019	0.521
15	152	0.056	0.124	0.436	0.400	12.8	0.194	0.295	0.161	0.088	0.202	1.232	3.10	0.76	0.267	0.657	0.312	3.028	0.523
16	160	0.056	0.124	0.437	0.401	12.9	0.194	0.295	0.161	0.088	0.203	1.239	3.12	0.77	0.268	0.658	0.312	3.038	0.524
17	167	0.056	0.124	0.439	0.401	13.0	0.195	0.296	0.161	0.088	0.203	1.246	3.14	0.77	0.270	0.659	0.313	3.047	0.526
18	174	0.056	0.125	0.457	0.407	13.7	0.196	0.301	0.159	0.088	0.203	1.306	3.34	0.81	0.278	0.663	0.320	3.135	0.535
19	181	0.056	0.125	0.459	0.408	13.8	0.196	0.301	0.159	0.088	0.203	1.313	3.36	0.81	0.279	0.664	0.321	3.145	0.536
20	188	0.056	0.125	0.461	0.409	13.9	0.197	0.302	0.159	0.088	0.203	1.321	3.39	0.82	0.280	0.664	0.322	3.156	0.537
21	195	0.056	0.125	0.463	0.410	14.0	0.197	0.303	0.159	0.088	0.203	1.329	3.41	0.82	0.281	0.665	0.323	3.167	0.539
22	201	0.056	0.125	0.465	0.411	14.1	0.197	0.303	0.159	0.088	0.203	1.338	3.44	0.82	0.282	0.665	0.324	3.179	0.540
23	208	0.056	0.125	0.466	0.412	14.1	0.197	0.304	0.159	0.088	0.203	1.347	3.47	0.83	0.283	0.666	0.324	3.192	0.542
24	215	0.056	0.126	0.468	0.414	14.2	0.197	0.305	0.159	0.088	0.203	1.357	3.50	0.83	0.284	0.666	0.325	3.205	0.544
25	222	0.056	0.126	0.470	0.415	14.3	0.197	0.306	0.158	0.088	0.204	1.368	3.53	0.84	0.285	0.667	0.326	3.219	0.545
26	231	0.056	0.126	0.472	0.417	14.4	0.198	0.307	0.158	0.088	0.204	1.379	3.56	0.84	0.286	0.667	0.327	3.233	0.548
27	237	0.056	0.126	0.474	0.419	14.5	0.198	0.308	0.158	0.088	0.204	1.391	3.60	0.84	0.287	0.668	0.328	3.248	0.550
28	243	0.056	0.127	0.475	0.421	14.6	0.198	0.310	0.158	0.089	0.204	1.403	3.63	0.85	0.288	0.668	0.328	3.264	0.552
29	251	0.057	0.127	0.477	0.423	14.7	0.198	0.311	0.158	0.089	0.204	1.416	3.67	0.85	0.289	0.669	0.329	3.280	0.554
30	257	0.057	0.127	0.479	0.426	14.9	0.198	0.312	0.158	0.089	0.204	1.429	3.71	0.86	0.290	0.670	0.330	3.296	0.557

Appendix 3.5-35 Table 48 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
31	264	0.057	0.128	0.480	0.428	15.0	0.199	0.314	0.158	0.089	0.205	1.443	3.75	0.86	0.291	0.670	0.331	3.314	0.559
32	272	0.057	0.128	0.481	0.429	15.0	0.199	0.314	0.158	0.089	0.205	1.450	3.77	0.86	0.291	0.670	0.331	3.323	0.561
33	278	0.057	0.128	0.481	0.429	15.0	0.199	0.314	0.158	0.089	0.205	1.450	3.77	0.86	0.291	0.670	0.331	3.323	0.561
34	286	0.057	0.130	0.487	0.441	15.5	0.200	0.321	0.158	0.090	0.206	1.513	3.94	0.88	0.294	0.672	0.334	3.399	0.573
35	292	0.057	0.130	0.488	0.442	15.6	0.200	0.322		0.090	0.206	1.520	3.96	0.88	0.295	0.673	0.335	3.407	0.574
36	299	0.057	0.130	0.489	0.444	15.6	0.200	0.322		0.090	0.206	1.528	3.98	0.88	0.295	0.673	0.335	3.416	0.576
37	306	0.057	0.130	0.490	0.445	15.7	0.200	0.323		0.090	0.206	1.534	4.00	0.88	0.296	0.673	0.335	3.424	0.577
38	313	0.057	0.131	0.491	0.447	15.7	0.200	0.324		0.090	0.206	1.541	4.02	0.89	0.296	0.673	0.336	3.431	0.579
39	322	0.057	0.131	0.491	0.448	15.7	0.200	0.324		0.090	0.206	1.547	4.04	0.89	0.296	0.674	0.336	3.437	0.580
40	329	0.058	0.133	0.498	0.458	16.1	0.202	0.329		0.091	0.207	1.592	4.16	0.90	0.298	0.677	0.339	3.485	0.590
41	334	0.059	0.135	0.505	0.467	16.4	0.205	0.333		0.092	0.208	1.635	4.28	0.92	0.299	0.680	0.343	3.528	0.600
42	341	0.060	0.137	0.512	0.477	16.7	0.207	0.337		0.093	0.209	1.675	4.39	0.94	0.301	0.683	0.346	3.567	0.610
43	348	0.061	0.139	0.519	0.486	16.9	0.210	0.341		0.094	0.210	1.712	4.50	0.95	0.302	0.687	0.349	3.601	0.619
44	356	0.062	0.141	0.526	0.494	17.1	0.213	0.344		0.095	0.211	1.746	4.59	0.97	0.302	0.691	0.352	3.630	0.628
45	363	0.063	0.143	0.533	0.503	17.3	0.216	0.347		0.096	0.212	1.777	4.68	0.98	0.302	0.694	0.355	3.655	0.637
46	370	0.064	0.145	0.540	0.511	17.5	0.219	0.350		0.097	0.213	1.806	4.76	1.00	0.302	0.699	0.359	3.675	0.646
47	376	0.065	0.148	0.547	0.519	17.7	0.223	0.352		0.098	0.213	1.831	4.83	1.02	0.302	0.703	0.362	3.690	0.654
48	383	0.067	0.150	0.555	0.526	17.8	0.227	0.354		0.099	0.214	1.854	4.89	1.03	0.302	0.707	0.365	3.701	0.662
49	390					17.9						1.879							
50	397					17.9						1.879							
51	404					18.1						1.907							
52	411					18.3						1.937							

* Wet dry cycles

Appendix 3.5-35 Table 49

Metal Extraction Rates
Backfill Whole Tailings (AL-13)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																		
2*	63																		
3	70	0.206	0.025	0.001	0.002	16.92	0.0020	0.004	0.022	1.517	0.123	4.63	0.50	0.0046	0.45	0.0047	0.0002	1.46	1.282
4	77	0.286	0.037	0.002	0.003	28.26	0.0029	0.005	0.031	2.253	0.163	6.01	0.64	0.0059	0.66	0.0059	0.0004	1.71	1.564
5	83	0.273	0.036	0.002	0.003	26.96	0.0028	0.005	0.030	2.151	0.155	5.66	0.60	0.0056	0.63	0.0056	0.0004	1.59	1.473
6	91	0.347	0.046	0.004	0.003	32.60	0.0036	0.005	0.036	2.739	0.198	6.18	0.68	0.0067	0.78	0.0055	0.0005	1.60	1.654
7	97	0.978	0.131	0.011	0.012	88.15	0.0101	0.016	0.100	7.732	0.561	17.35	1.96	0.0200	2.08	0.0161	0.0013	4.05	4.541
8	103	0.631	0.090	0.010	0.009	60.04	0.0067	0.009	0.062	5.207	0.354	9.38	1.11	0.0123	1.33	0.0081	0.0009	1.42	2.311
9	110	0.525	0.075	0.009	0.010	47.01	0.0056	0.008	0.047	4.169	0.315	8.08	1.09	0.0116	1.23	0.0069	0.0009	0.82	2.105
10	119	0.516	0.076	0.009	0.009	55.33	0.0056	0.008	0.046	4.079	0.323	9.11	1.26	0.0119	1.59	0.0076	0.0012	0.96	2.425
11	126	0.297	0.047	0.006	0.008	38.76	0.0033	0.007	0.025	2.335	0.199	7.05	1.00	0.0086	1.17	0.0068	0.0009	0.64	1.782
12	132	0.183	0.031	0.004	0.004	32.86	0.0022	0.005	0.015	1.433	0.133	5.25	0.76	0.0054	1.07	0.0046	0.0007	0.58	1.393
13	139	0.166	0.029	0.004	0.003	31.93	0.0020	0.004	0.013	1.297	0.123	5.01	0.73	0.0049	1.05	0.0042	0.0007	0.57	1.326
14	146	0.070	0.014	0.002	0.001	19.84	0.0009	0.002	0.005	0.547	0.058	2.82	0.42	0.0022	0.67	0.0021	0.0004	0.38	0.756
15	152	0.021	0.005	0.001	0.000	7.49	0.0003	0.001	0.001	0.163	0.017	1.14	0.16	0.0009	0.22	0.0007	0.0002	0.16	0.246
16	160	0.016	0.004	0.001	0.000	6.91	0.0003	0.001	0.000	0.129	0.014	1.09	0.15	0.0009	0.19	0.0005	0.0002	0.16	0.208
17	167	0.012	0.004	0.001	0.000	6.36	0.0003	0.001	0.000	0.097	0.010	1.04	0.14	0.0009	0.15	0.0004	0.0002	0.15	0.172
18	174	0.010	0.006	0.003	0.000	14.48	0.0005	0.001	-0.003	0.088	0.010	2.61	0.34	0.0023	0.25	0.0006	0.0005	0.40	0.273
19	181	0.008	0.006	0.003	0.000	14.23	0.0005	0.001	-0.003	0.069	0.007	2.61	0.34	0.0023	0.22	0.0006	0.0005	0.40	0.251
20	188	0.006	0.006	0.003	0.000	13.70	0.0005	0.001	-0.004	0.059	0.006	2.56	0.33	0.0022	0.20	0.0005	0.0004	0.40	0.231
21	195	0.006	0.006	0.003	0.001	14.05	0.0005	0.001	-0.004	0.062	0.005	2.67	0.34	0.0023	0.20	0.0005	0.0005	0.41	0.231
22	201	0.006	0.007	0.003	0.001	14.54	0.0005	0.001	-0.004	0.076	0.005	2.82	0.35	0.0024	0.20	0.0005	0.0005	0.43	0.240
23	208	0.006	0.004	0.001	0.000	6.00	0.0002	0.001	-0.001	0.078	0.003	1.28	0.15	0.0009	0.07	0.0002	0.0002	0.19	0.116
24	215	0.008	0.004	0.001	0.000	6.18	0.0002	0.001	-0.001	0.100	0.004	1.36	0.16	0.0009	0.07	0.0002	0.0002	0.20	0.126
25	222	0.010	0.005	0.001	0.000	6.36	0.0002	0.001	-0.001	0.121	0.004	1.45	0.17	0.0009	0.07	0.0002	0.0002	0.21	0.137
26	231	0.011	0.005	0.001	0.000	6.18	0.0002	0.001	-0.001	0.135	0.004	1.45	0.17	0.0009	0.07	0.0002	0.0002	0.21	0.139
27	237	0.013	0.006	0.001	0.000	6.35	0.0002	0.001	-0.001	0.156	0.005	1.53	0.18	0.0009	0.07	0.0002	0.0002	0.21	0.149
28	243	0.015	0.007	0.001	0.000	6.71	0.0002	0.001	-0.001	0.181	0.006	1.66	0.19	0.0009	0.07	0.0002	0.0002	0.23	0.163
29	251	0.016	0.007	0.001	0.001	6.69	0.0002	0.001	-0.001	0.197	0.006	1.70	0.19	0.0009	0.07	0.0002	0.0002	0.23	0.168
30	257	0.018	0.008	0.001	0.001	7.06	0.0002	0.001	-0.0005	0.224	0.007	1.83	0.21	0.0009	0.07	0.0002	0.0002	0.25	0.183

Appendix 3.5-35 Table 49 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
31	264	0.021	0.009	0.001	0.001	7.68	0.0002	0.001	-0.0004	0.260	0.008	2.03	0.23	0.0009	0.07	0.0002	0.0002	0.27	0.205
32	272	0.019	0.008	0.001	0.001	6.64	0.0002	0.001	-0.0002	0.235	0.007	1.78	0.20	0.0008	0.06	0.0002	0.0002	0.24	0.181
33	278	0.016	0.006	0.001	0.000	5.23	0.0002	0.001	-0.0001	0.191	0.006	1.41	0.16	0.0006	0.05	0.0001	0.0001	0.19	0.145
34	286	0.034	0.014	0.001	0.001	10.28	0.0003	0.001	0.0001	0.422	0.012	2.90	0.32	0.0011	0.09	0.0002	0.0002	0.38	0.301
35	292	0.033	0.013	0.001	0.001	9.56	0.0003	0.001		0.407	0.011	2.72	0.30	0.0011	0.08	0.0002	0.0002	0.36	0.284
36	299	0.033	0.012	0.001	0.001	8.77	0.0002	0.001		0.389	0.011	2.52	0.27	0.0010	0.07	0.0002	0.0002	0.33	0.265
37	306	0.035	0.013	0.001	0.001	8.93	0.0003	0.001		0.413	0.011	2.57	0.28	0.0010	0.07	0.0002	0.0002	0.33	0.273
38	313	0.039	0.014	0.001	0.001	9.32	0.0003	0.001		0.446	0.012	2.69	0.29	0.0011	0.07	0.0002	0.0002	0.35	0.287
39	322	0.021	0.006	0.000	0.000	3.33	0.0002	0.000		0.207	0.005	0.98	0.11	0.0004	0.02	0.0001	0.0001	0.12	0.110
40	329	0.061	0.014	0.001	0.001	6.73	0.0005	0.001		0.546	0.011	2.02	0.22	0.0010	0.04	0.0003	0.0002	0.24	0.242
41	334	0.112	0.023	0.002	0.001	10.52	0.0010	0.002		0.959	0.019	3.20	0.35	0.0017	0.06	0.0005	0.0003	0.36	0.394
42	341	0.162	0.032	0.002	0.002	13.62	0.0014	0.002		1.359	0.026	4.18	0.45	0.0023	0.08	0.0007	0.0005	0.46	0.528
43	348	0.216	0.042	0.003	0.002	16.42	0.0019	0.002		1.776	0.033	5.10	0.55	0.0029	0.09	0.0009	0.0006	0.54	0.658
44	356	0.281	0.052	0.004	0.003	19.48	0.0026	0.003		2.276	0.041	6.11	0.66	0.0036	0.09	0.0012	0.0007	0.64	0.807
45	363	0.301	0.053	0.004	0.003	17.74	0.0028	0.003		2.380	0.041	5.67	0.61	0.0036	0.07	0.0013	0.0007	0.56	0.782
46	370	0.303	0.051	0.004	0.002	15.11	0.0028	0.002		2.346	0.038	4.94	0.53	0.0034	0.05	0.0013	0.0007	0.46	0.715
47	376	0.332	0.053	0.004	0.002	13.84	0.0031	0.002		2.514	0.040	4.66	0.50	0.0035	0.02	0.0013	0.0007	0.39	0.711
48	383	0.352	0.054	0.004	0.002	12.15	0.0034	0.002		2.615	0.040	4.24	0.46	0.0035	0.00	0.0014	0.0007	0.32	0.687
49	390					11.27						4.07							
50	397					8.42						3.11							
51	404					8.20						3.11							
52	411					8.25						3.16							

* Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 50

Oxidation and Neutralization Rates
Backfill Whole Tailings (AL-13)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	731	0.08		7.61	6.51	2.88	1.23	939		3.5
2**	63	731	0.08						939		3.5
3	70	1620	0.18	98.8	9.26	3.81	1.71	0.60	1491	61.3	5.5
4	77	2000	0.22	126.9	3.96	3.26	0.76	1.01	1893	95.4	7.0
5	83	2025	0.23	119.2	0.26	0.25	0.06	1.20	1924	90.7	7.1
6	91	2206	0.25	122.9	1.89	2.46	0.52	1.58	2223	106.9	8.2
7	97	2303	0.26	323.7	1.01	0.92	0.42	1.32	2356	291.8	8.7
8	103	2322	0.26	148.9	0.19	0.18	0.07	1.26	2381	188.7	8.8
9	110	2498	0.28	105.7	1.84	1.72	0.51	1.21	2604	150.8	9.6
10	119	2683	0.30	128.0	1.93	1.83	0.42	1.17	2828	175.8	10.5
11	126	2704	0.30	99.5	0.21	0.19	0.05	1.12	2852	125.9	10.6
12	132	2724	0.31	84.2	0.21	0.19	0.05	1.08	2875	103.8	10.6
13	139	2745	0.31	82.2	0.21	0.18	0.04	1.03	2897	100.4	10.7
14	146	2765	0.31	51.9	0.21	0.17	0.04	0.99	2918	61.2	10.8
15	152	2786	0.31	21.8	0.21	0.16	0.04	0.94	2939	23.4	10.9
16	160	2806	0.31	21.1	0.21	0.15	0.04	0.90	2958	21.8	11.0
17	167	2827	0.32	20.5	0.21	0.14	0.04	0.86	2976	20.2	11.0
18	174	3011	0.34	53.3	1.92	1.19	0.37	0.81	3132	46.9	11.6
19	181	3032	0.34	53.3	0.22	0.14	0.04	0.84	3150	46.3	11.7
20	188	3053	0.34	51.9	0.22	0.14	0.05	0.87	3169	44.8	11.7
21	195	3074	0.35	53.5	0.22	0.15	0.05	0.89	3189	46.1	11.8
22	201	3095	0.35	55.3	0.22	0.15	0.05	0.92	3209	47.9	11.9
23	208	3117	0.35	21.8	0.22	0.15	0.06	0.94	3230	20.2	12.0
24	215	3139	0.35	22.0	0.23	0.16	0.06	0.97	3252	21.1	12.0
25	222	3161	0.35	22.2	0.23	0.16	0.06	0.99	3275	21.9	12.1

Appendix 3.5-35 Table 50 (Continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
26	231	3183	0.36	21.2	0.23	0.17	0.07	1.02	3299	21.4	12.2
27	237	3205	0.36	21.4	0.23	0.17	0.07	1.04	3323	22.2	12.3
28	243	3228	0.36	22.3	0.24	0.18	0.08	1.06	3348	23.6	12.4
29	251	3251	0.36	21.8	0.24	0.18	0.08	1.09	3374	23.7	12.5
30	257	3274	0.37	22.7	0.24	0.19	0.08	1.11	3401	25.2	12.6
31	264	3298	0.37	24.3	0.24	0.19	0.09	1.13	3428	27.5	12.7
32	272	3309	0.37	20.8	0.12	0.10	0.04	1.15	3443	23.9	12.8
33	278										
34	286	3405	0.38	30.9	2.20 ?	0.81 ?	0.38 ?	0.54 ?	3302	-14.3	12.2
35	292	3417	0.38	28.6	0.12	0.10	0.05	1.14	3317	-16.9	12.3
36	299	3429	0.38	26.3	0.12	0.09	0.04	1.09	3330	-19.7	12.3
37	306	3441	0.39	27.1	0.12	0.09	0.04	1.03	3343	-20.6	12.4
38	313	3453	0.39	51.8	0.12	0.08	0.04	0.97	3355	34.4	12.4
39	322	3465	0.39	11.5	0.12	0.08	0.04	0.92	3366	12.4	12.5
40	329	3558	0.40	26.6	0.97	0.56	0.28	0.86	3450	25.2	12.8
41	334	3660	0.41	46.1	1.06	0.52	0.26	0.73	3527	39.5	13.1
42	341	3766	0.42	64.9	1.10	0.47	0.24	0.65	3599	51.3	13.3
43	348	3876	0.43	84.6	1.15	0.43	0.23	0.57	3665	62.0	13.6
44	356	3941	0.44	98.0	0.68	0.39	0.21	0.88	3725	73.8	13.8
45	363	4003	0.45	91.6	0.65	0.35	0.19	0.83	3778	67.7	14.0
46	370	4076	0.46	81.0	0.77	0.30	0.17	0.62	3826	58.1	14.2
47	376	4204	0.47	87.6	1.32	0.26	0.16	0.32	3868	53.8	14.3
48	383	4249	0.48	74.6	0.47	0.22	0.14	0.76	3904	47.8	14.5
49	390	4291	0.48	72.1	0.44	0.24	0.15	0.88	3943	44.9	14.6
50	397										
51	404	4348	0.49	55.9	0.74	0.28	0.17	0.61 ?	3970	29.6	14.7
52	411	4401	0.49	39.6	0.56	0.30	0.19	0.86	4018	30.0	14.9

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Tables 51-57. Backfill Cemented Whole Tailings (AL-16) (Leached Under Alternating Wet/Dry Followed by Saturated Conditions) Data and Calculations.

Appendix 3.5-35 Table 51

Sample Characterization
Backfill Cemented Whole Tailings (AL-16) - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)	
Aluminum	Al	30600	<0.03	
Antimony	Sb	68	<0.04	
Arsenic	As	2500	<0.005	
Barium	Ba	54	0.012	
Beryllium	Be	<50	<0.005	*
Bismuth	Bi	<20	<0.20	*
Cadmium	Cd	28	<0.005	
Calcium	Ca	6800	25.0	
Carbon	C	5000	NA	
Chromium	Cr	100	<0.005	
Cobalt	Co	69	<0.010	
Copper	Cu	860	0.027	
Gallium	Ga	16	NA	
Iron	Fe	232000	0.030	
Lead	Pb	4300	<0.04	
Lithium	Li	NA	NA	
Magnesium	Mg	14900	13.000	
Manganese	Mn	580	0.011	
Mercury	Hg	1.6	<0.0002	
Molybdenum	Mo	<20	<0.020	
Nickel	Ni	22	<0.015	
Phosphorus	P	NA	NA	
Potassium	K	7600	0.750	
Selenium	Se	35	<0.005	
Silicon	Si	160000	NA	
Silver	Ag	22.2	<0.005	
Sodium	Na	1600	1.90	
Strontium	Sr	NA	NA	
Thallium	Tl	14	<0.040	
Tin	Sn	24	<0.24	
Titanium	Ti	1400	<0.050	
Tungsten	W	NA	NA	
Vanadium	V	NA	NA	
Zinc	Zn	8100	0.44	
Sulfate	SO4	1900.0	9.90	
Sulfur	S	249000.0	NA	

Note: NA = Not Analyzed

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	25.30

* Value Estimated

Appendix 3.5-35 Table 52

Parameters Measured Weekly
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH		CONDUCT. (uS/cm)	ALKALINITY (mg/L)		ACIDITY (mg/L)		SULFATE (mg/L) **		CUMULATIVE SULFATE (mg/kg)
19-Oct-94	1*	7	4.500	8.9		5940					**1620**		288
14-Dec-94	2*	63	4.500	6.9		5090	<5	?			**1640**		580
21-Dec-94	3	70	4.500	6.2		4420	<5	?			**1690**		879
28-Dec-94	4	77	4.500	6.6		3850	<5	?			**2000**		1233
3-Jan-95	5	83	0.400	4.0	?	3960			41.0	?	1860		1262
11-Jan-95	6	91	4.500	7.3		3130	17				**1720**		1566
17-Jan-95	7	97	2.000	6.5		3190	8				**1500**		1684
23-Jan-95	8	103	0.500	6.6		3140	12				1509		1713
30-Jan-95	9	110	0.500	6.5		3200	10				1518		1743
8-Feb-95	10	119	4.500	9.1	?	2971	22				1527	?	2013
15-Feb-95	11	126	0.500	7.8		2890	24				1536		2043
21-Feb-95	12	132	0.500	7.8		2940	19				1545		2074
28-Feb-95	13	139	0.500	7.6		3150	17				1555		2104
7-Mar-95	14	146	0.500	7.7		2890	13				1564		2135
13-Mar-95	15	152	0.500	7.7		2720	13				1573		2166
21-Mar-95	16	160	0.500	7.6		2840	<5	?			1582		2197
28-Mar-95	17	167	0.500	7.6		2810	<5	?			1591		2228
4-Apr-95	18	174	4.500	7.4		2860	<5	?			**1600**		2511
11-Apr-95	19	181	0.500	9.1		2570	32				1594		2542
18-Apr-95	20	188	0.500	9.0		2660	37				1588		2573
25-Apr-95	21	195	0.500	9.0		2540	22				1581		2604
1-May-95	22	201	0.500	8.7		2690	20				1575		2635
8-May-95	23	208	0.500	8.2		2690	32				1569		2666
15-May-95	24	215	0.500	8.0		2490	14				1563		2697
22-May-95	25	222	0.500	8.1		2420	21				1556		2727
31-May-95	26	231	0.500	8.0		2400	17				1550		2758
6-Jun-95	27	237	0.500	8.2		2510	10				1544		2788
12-Jun-95	28	243	0.500	7.6		2430	13				1538		2818
20-Jun-95	29	251	0.500	7.8		2370	19				1531		2848
26-Jun-95	30	257	0.500	7.7		2460	16				1525		2878
3-Jul-95	31	264	0.500	7.7		2350					1519		2908
11-Jul-95	32	272	0.500	7.6		2340	13				1513		2938
17-Jul-95	33	278	0.000										
25-Jul-95	34	286	2.000	8.1		2340	14				**1500**		3056
31-Jul-95	35	292	0.500	8.6		2340	17				1500		3085
7-Aug-95	36	299	0.500	8.4		2320	16				1500		3115
14-Aug-95	37	306	0.500	8.6		2370	15				1500		3144
21-Aug-95	38	313	0.500	8.5		2330	14				1500		3174
30-Aug-95	39	322	0.500	8.2		2310	5	?			1500		3203
6-Sep-95	40	329	2.000	8.6		2260	16				**1500**		3321
11-Sep-95	41	334	2.000	8.8		2420	18				**1700**		3454
18-Sep-95	42	341	2.000	9.4		2410	23				**1800**		3596

Appendix 3.5-35 Table 52 (Continued)

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
25-Sep-95	43	348	2.000	9.4	2450	20		**2100**	3761
3-Oct-95	44	356	2.000	9.3	2390	21		**1500**	3879
10-Oct-95	45	363	2.000	9.5	2380	32		**1500**	3997
17-Oct-95	46	370	2.000	8.9	2280	25		**2200**	4170
23-Oct-95	47	376	2.000	9.5	2430	21		**2500**	4367
30-Oct-95	48	383	2.000	9.5	2430	20		**1400**	4477
6-Nov-95	49	390	2.000	9.4	2480	21		1267	4576
13-Nov-95	50	397	0.000						
20-Nov-95	51	404	2.000	9.4	2460	20		**1000**	4654
27-Nov-95	52	411	2.000	9.5	2590	23		**1500**	4772
5-Dec-95	53	419	2.000	9.5	2300	24			
11-Dec-95	54	425	2.000	9.5	2660	25			
18-Dec-95	55	432	2.000	9.6	2630	24			
26-Dec-95	56	440	2.000	9.6	2470	20			
2-Jan-96	57	447	2.000	9.6	2490	21			
10-Jan-96	58	455	2.000	9.4	2500	20			
15-Jan-96	59	460	2.000	9.6	2400				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 3.5-35 Table 53

Leachate Analysis
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) ** Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	**0.31**	**0.021**	**0.47**	**860**	**0.60**	**0.026**	**0.076**	**1.1**	**0.12**	**4.6**	**0.26**	**0.12**	**525**	**0.14**	**0.041**	**170**	**0.18**
2*	63	**0.31**	**0.030**	**0.093**	**720**	**0.044**	**0.022**	**0.040**	**2.2**	**0.28**	**11**	**1.1**	**< 0.020**	**321**	**0.14**	**0.031**	**94**	**0.35**
3	70	**0.40**	**0.034**	**0.098**	**840**	**0.090**	**0.022**	**0.11**	**1.3**	**0.18**	**8.0**	**1.5**	**0.050**	**264**	**0.15**	**0.035**	**80**	**0.20**
4	77	**0.24**	**0.013**	**0.079**	**790**	**0.022**	**0.030**	**0.17**	**0.47**	**0.047**	**5.3**	**1.6**	**0.056**	**196**	**0.15**	**0.040**	**54**	**0.10**
5	83	0.21	0.011	0.073	770	0.016	0.03	0.14	0.37	0.04	4.50	1.600	0.0	166	0.120	0.036	44.0	0.088
6	91	**0.18**	**0.009**	**0.067**	**750**	**0.010**	**0.023**	**0.10**	**0.26**	**< 0.040**	**3.7**	**1.6**	**0.037**	**135**	**0.090**	**0.031**	**34**	**0.075**
7	97	**0.080**	**0.011**	**0.057**	**730**	**< 0.005**	**0.014**	**0.053**	**0.14**	**0.044**	**3.8**	**0.97**	**0.061**	**100**	**0.067**	**0.014**	**22**	0.064 ?
8	103	0.08	0.010	0.056	717	0.005	0.01	0.05	0.10	0.04	3.27	0.890	0.062	95.9	0.063	0.012	20.0	0.053
9	110	0.08	0.008	0.054	703	0.005	0.01	0.05	0.06	0.04	2.73	0.810	0.064	91.9	0.058	0.010	18.0	0.041
10	119	**0.082**	**0.007**	**0.053**	**690**	**0.005**	**< 0.010**	**0.047**	**0.023**	**< 0.040**	**2.2**	**0.73**	**0.065**	**87.8**	**0.054**	**0.008**	**16**	**0.030**
11	126	0.08	0.008	0.052	693	0.005	0.010	0.042	0.02	0.04	2.13	0.660	0.071	82.3	0.054	0.008	15.25	0.029
12	132	0.08	0.009	0.050	695	0.005	0.010	0.037	0.02	0.04	2.05	0.590	0.076	76.9	0.054	0.007	14.50	0.029
13	139	0.08	0.011	0.049	698	0.005	0.010	0.031	0.02	0.04	1.98	0.520	0.082	71.4	0.054	0.007	13.75	0.028
14	146	0.07	0.012	0.048	700	0.005	0.010	0.026	0.02	0.04	1.90	0.450	0.088	65.9	0.054	0.007	13.00	0.027
15	152	0.07	0.013	0.046	703	0.005	0.010	0.021	0.02	0.04	1.83	0.380	0.093	60.4	0.054	0.006	12.25	0.026
16	160	0.07	0.015	0.045	705	0.005	0.010	0.016	0.02	0.04	1.75	0.310	0.099	55.0	0.054	0.006	11.50	0.026
17	167	0.07	0.016	0.043	708	0.005	0.010	0.010	0.02	0.04	1.68	0.240	0.104	49.5	0.054	0.005	10.75	0.025
18	174	**0.067**	**0.017**	**0.042**	**710**	**< 0.005**	**< 0.010**	**< 0.005**	**0.020**	**< 0.040**	**1.6**	**0.17**	**0.11**	**44**	**0.054**	**< 0.005**	**10**	**0.024**
19	181	0.07	0.016	0.041	708	0.005	0.010	0.005	0.02	0.038	1.55	0.161	0.108	42.8	0.055	0.005	9.95	0.024
20	188	0.07	0.015	0.041	706	0.005	0.010	0.005	0.02	0.035	1.50	0.152	0.105	41.5	0.055	0.005	9.90	0.024
21	195	0.07	0.015	0.040	704	0.005	0.010	0.005	0.02	0.033	1.46	0.142	0.103	40.3	0.056	0.005	9.85	0.023
22	201	0.07	0.014	0.040	703	0.005	0.010	0.005	0.02	0.031	1.41	0.133	0.100	39.0	0.056	0.005	9.80	0.023
23	208	0.07	0.013	0.039	701	0.005	0.010	0.005	0.02	0.028	1.36	0.124	0.098	37.8	0.057	0.005	9.75	0.023
24	215	0.07	0.012	0.039	699	0.005	0.010	0.005	0.02	0.026	1.31	0.115	0.095	36.5	0.057	0.005	9.70	0.023
25	222	0.07	0.011	0.038	697	0.005	0.010	0.005	0.02	0.024	1.26	0.106	0.093	35.3	0.058	0.005	9.65	0.022
26	231	0.07	0.011	0.038	695	0.005	0.010	0.005	0.02	0.022	1.22	0.097	0.090	34.0	0.058	0.005	9.60	0.022
27	237	0.07	0.010	0.037	693	0.005	0.010	0.005	0.02	0.019	1.17	0.087	0.088	32.8	0.059	0.005	9.55	0.022
28	243	0.07	0.009	0.036	691	0.005	0.010	0.005	0.02	0.017	1.12	0.078	0.085	31.5	0.059	0.005	9.50	0.022
29	251	0.07	0.008	0.036	689	0.005	0.010	0.005	0.02	0.015	1.07	0.069	0.083	30.3	0.060	0.005	9.45	0.021
30	257	0.07	0.007	0.035	688	0.005	0.010	0.005	0.02	0.012	1.02	0.060	0.080	29.0	0.060	0.005	9.40	0.021
31	264	0.07	0.006	0.035	686	0.005	0.010	0.005	0.02	0.010	0.97	0.051	0.078	27.8	0.061	0.005	9.35	0.021
32	272	0.07	0.006	0.034	684	0.005	0.010	0.005	0.02	0.008	0.93	0.041	0.075	26.5	0.061	0.005	9.30	0.021
33	278																	
34	286	**0.076**	**0.004**	**0.033**	**680**	**< 0.005**	**< 0.010**	**< 0.005**	**0.023**	**< 0.003**	**0.83**	**0.023**	**0.070**	**24**	**0.062**	0.005	**9.2**	**< 0.020**
35	292	0.08	0.005	0.032	676	0.005	0.010	0.005	0.03	0.003	0.87	0.025		23.0	0.061	0.005	8.81	0.020
36	299	0.08	0.007	0.032	671	0.005	0.010	0.005	0.03	0.003	0.91	0.028		22.0	0.060	0.005	8.43	0.020

Appendix 3.5-35 Table 53 (Continued)

| CYCLE | DAYS | LEACHATE ANALYSIS (mg/L) ** | | |

Appendix 3.5-35 Table 54

Cumulative Mass Flux
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.06	0.004	0.084	151	0.107	0.005	0.014	0.2	0.02	0.8	0.05	0.021	93.4	0.025	0.007	30.2	0.032
2*	63	0.11	0.009	0.100	279	0.115	0.009	0.021	0.6	0.07	2.8	0.24	0.025	150.5	0.050	0.013	47.0	0.094
3	70	0.18	0.015	0.115	424	0.130	0.012	0.035	0.8	0.10	1.9	0.51	0.033	197.3	0.076	0.019	60.8	0.052
4	77	0.22	0.017	0.127	560	0.134	0.016	0.061	0.9	0.10	0.5	0.79	0.042	232.0	0.102	0.025	70.1	-0.009
5	83	0.22	0.017	0.128	572	0.134	0.016	0.063	0.9	0.10	0.4	0.81	0.043	234.6	0.104	0.026	70.8	-0.014
6	91	0.25	0.018	0.138	701	0.135	0.020	0.076	0.9	0.11	-1.3	1.10	0.049	258.5	0.120	0.031	76.5	-0.079
7	97	0.26	0.019	0.142	757	0.135	0.020	0.078	0.9	0.11	-2.0	1.17	0.053	266.4	0.125	0.032	78.1	-0.109
8	103	0.26	0.019	0.143	770	0.135	0.020	0.078	0.9	0.11	-2.2	1.19	0.055	268.2	0.126	0.032	78.4	-0.117
9	110	0.26	0.019	0.143	784	0.135	0.021	0.078	0.9	0.11	-2.4	1.21	0.056	270.0	0.127	0.032	78.8	-0.125
10	119	0.27	0.020	0.151	902	0.136	0.021	0.082	0.9	0.11	-4.3	1.33	0.067	285.5	0.136	0.033	81.3	-0.198
11	126	0.27	0.020	0.151	915	0.136	0.022	0.082	0.9	0.12	-4.5	1.35	0.068	287.1	0.137	0.033	81.5	-0.206
12	132	0.27	0.020	0.152	929	0.136	0.022	0.083	0.9	0.12	-4.8	1.36	0.069	288.6	0.138	0.033	81.8	-0.214
13	139	0.27	0.020	0.153	942	0.136	0.022	0.083	0.9	0.12	-5.0	1.37	0.071	290.0	0.139	0.033	82.0	-0.222
14	146	0.28	0.020	0.154	955	0.136	0.022	0.083	0.9	0.12	-5.2	1.38	0.072	291.3	0.140	0.033	82.2	-0.230
15	152	0.28	0.020	0.154	969	0.136	0.022	0.082	0.9	0.12	-5.4	1.38	0.074	292.5	0.141	0.034	82.4	-0.238
16	160	0.28	0.021	0.155	982	0.136	0.022	0.082	0.9	0.12	-5.6	1.39	0.076	293.6	0.142	0.034	82.6	-0.247
17	167	0.28	0.021	0.156	995	0.136	0.022	0.082	0.9	0.12	-5.9	1.39	0.078	294.5	0.143	0.034	82.8	-0.255
18	174	0.29	0.023	0.161	1117	0.137	0.023	0.078	0.9	0.12	-7.9	1.42	0.097	302.2	0.153	0.034	84.2	-0.329
19	181	0.29	0.024	0.161	1131	0.137	0.023	0.078	0.9	0.12	-8.1	1.43	0.099	303.1	0.154	0.034	84.4	-0.337
20	188	0.29	0.024	0.162	1144	0.137	0.023	0.077	0.9	0.12	-8.4	1.43	0.101	303.9	0.155	0.034	84.6	-0.345
21	195	0.29	0.024	0.163	1158	0.137	0.023	0.077	0.9	0.12	-8.6	1.43	0.103	304.6	0.156	0.034	84.7	-0.353
22	201	0.29	0.024	0.163	1171	0.137	0.023	0.076	0.9	0.12	-8.8	1.43	0.105	305.4	0.157	0.034	84.9	-0.362
23	208	0.29	0.025	0.164	1184	0.137	0.024	0.076	0.9	0.12	-9.0	1.44	0.107	306.1	0.158	0.034	85.0	-0.370
24	215	0.29	0.025	0.164	1198	0.137	0.024	0.075	0.9	0.12	-9.3	1.44	0.108	306.8	0.159	0.034	85.2	-0.378
25	222	0.30	0.025	0.165	1211	0.137	0.024	0.075	0.9	0.12	-9.5	1.44	0.110	307.5	0.160	0.034	85.3	-0.386
26	231	0.30	0.025	0.165	1224	0.137	0.024	0.075	0.9	0.12	-9.7	1.44	0.112	308.2	0.161	0.034	85.5	-0.395
27	237	0.30	0.025	0.166	1237	0.137	0.024	0.074	0.9	0.12	-10.0	1.44	0.114	308.8	0.162	0.035	85.6	-0.403
28	243	0.30	0.025	0.166	1251	0.137	0.024	0.074	0.9	0.12	-10.2	1.44	0.115	309.4	0.163	0.035	85.8	-0.411
29	251	0.30	0.026	0.167	1264	0.137	0.024	0.073	0.9	0.12	-10.4	1.45	0.117	310.0	0.164	0.035	85.9	-0.419

Appendix 3.5-35 Table 54 (Continued)

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
30	257	0.30	0.026	0.167	1277	0.137	0.024	0.073	0.9	0.12	-10.7	1.45	0.118	310.6	0.166	0.035	86.1	-0.428
31	264	0.30	0.026	0.168	1290	0.137	0.024	0.072	0.9	0.12	-10.9	1.45	0.120	311.1	0.167	0.035	86.2	-0.436
32	272	0.30	0.026	0.168	1303	0.137	0.024	0.072	0.9	0.12	-11.2	1.45	0.121	311.6	0.168	0.035	86.4	-0.444
33	278	0.30	0.026	0.168	1303	0.137	0.024	0.072	0.9	0.12	-11.2	1.45	0.121	311.6	0.168	0.035	86.4	-0.444
34	286	0.31	0.026	0.170	1355	0.138	0.025	0.070	0.9	0.12	-12.1	1.45	0.126	313.4	0.173	0.035	87.0	-0.444
35	292	0.31	0.026	0.170	1368	0.138	0.025	0.070	0.9	0.12	-12.4	1.45		313.9	0.174	0.035	87.1	-0.478
36	299	0.31	0.026	0.170	1380	0.138	0.025	0.069	0.9	0.12	-12.6	1.45		314.3	0.175	0.035	87.2	-0.486
37	306	0.31	0.026	0.171	1393	0.138	0.025	0.069	0.9	0.12	-12.8	1.45		314.7	0.176	0.035	87.3	-0.494
38	313	0.31	0.026	0.171	1406	0.138	0.025	0.068	0.9	0.12	-13.1	1.45		315.1	0.177	0.035	87.5	-0.502
39	322	0.32	0.026	0.172	1418	0.138	0.025	0.068	0.9	0.12	-13.3	1.45		315.4	0.178	0.035	87.6	-0.511
40	329	0.32	0.027	0.173	1468	0.138	0.026	0.066	0.9	0.12	-14.2	1.45		316.8	0.182	0.035	88.0	-0.519
41	334	0.33	0.028	0.174	1517	0.138	0.026	0.065	0.9	0.12	-15.2	1.46		318.1	0.186	0.036	88.3	-0.552
42	341	0.34	0.029	0.175	1566	0.138	0.026	0.063	0.9	0.11	-16.1	1.46		319.2	0.190	0.036	88.7	-0.585
43	348	0.34	0.030	0.177	1615	0.139	0.027	0.061	0.9	0.11	-17.1	1.46		320.4	0.194	0.036	89.0	-0.619
44	356	0.35	0.032	0.178	1664	0.139	0.027	0.060	0.9	0.11	-18.0	1.46		321.4	0.198	0.036	89.2	-0.652
45	363	0.36	0.033	0.179	1712	0.139	0.028	0.058	0.9	0.11	-18.9	1.47		322.3	0.202	0.036	89.5	-0.685
46	370	0.37	0.034	0.180	1759	0.139	0.028	0.056	1.0	0.11	-19.8	1.47		323.2	0.206	0.037	89.7	-0.718
47	376	0.38	0.036	0.181	1807	0.139	0.028	0.055	1.0	0.11	-20.8	1.47		324.0	0.209	0.037	89.9	-0.751
48	383	0.39	0.038	0.182	1854	0.140	0.029	0.053	1.0	0.11	-21.7	1.48		324.7	0.213	0.037	90.0	-0.785
49	390				1900						-22.6							
50	397				1900						-22.6							
51	404				1943						-23.5							
52	411				1985						-24.5							

* Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.5-35 Table 55

Cumulative Metal Extractions
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.000	0.000	0.155	2.2	0.107	0.007	0.002	0.000	0.000	0.005	0.01	0.11	1.229	0.071	0.033	1.890	0.000
2*	63	0.000	0.000	0.185	4.1	0.115	0.012	0.002	0.000	0.002	0.019	0.04	0.12	1.980	0.142	0.058	2.935	0.001
3	70	0.001	0.001	0.214	6.2	0.130	0.017	0.004	0.000	0.002	0.013	0.09	0.17	2.596	0.217	0.084	3.803	0.001
4	77	0.001	0.001	0.236	8.2	0.134	0.023	0.007	0.000	0.002	0.003	0.14	0.21	3.053	0.292	0.114	4.382	0.000
5	83	0.001	0.001	0.238	8.4	0.134	0.024	0.007	0.000	0.002	0.002	0.14	0.22	3.087	0.298	0.116	4.424	0.000
6	91	0.001	0.001	0.256	10.3	0.135	0.028	0.009	0.000	0.003	-0.009	0.19	0.24	3.401	0.342	0.139	4.781	-0.001
7	97	0.001	0.001	0.262	11.1	0.135	0.029	0.009	0.000	0.003	-0.014	0.20	0.27	3.505	0.357	0.143	4.880	-0.001
8	103	0.001	0.001	0.264	11.3	0.135	0.030	0.009	0.000	0.003	-0.015	0.21	0.27	3.529	0.360	0.144	4.902	-0.001
9	110	0.001	0.001	0.265	11.5	0.135	0.030	0.009	0.000	0.003	-0.016	0.21	0.28	3.553	0.363	0.145	4.922	-0.002
10	119	0.001	0.001	0.279	13.3	0.136	0.031	0.010	0.000	0.003	-0.029	0.23	0.33	3.757	0.389	0.149	5.079	-0.002
11	126	0.001	0.001	0.280	13.5	0.136	0.031	0.010	0.000	0.003	-0.031	0.23	0.34	3.778	0.392	0.149	5.095	-0.003
12	132	0.001	0.001	0.282	13.7	0.136	0.031	0.010	0.000	0.003	-0.032	0.23	0.35	3.798	0.395	0.150	5.111	-0.003
13	139	0.001	0.001	0.283	13.9	0.136	0.031	0.010	0.000	0.003	-0.033	0.24	0.35	3.816	0.398	0.150	5.126	-0.003
14	146	0.001	0.001	0.284	14.0	0.136	0.032	0.010	0.000	0.003	-0.035	0.24	0.36	3.833	0.401	0.151	5.139	-0.003
15	152	0.001	0.001	0.286	14.2	0.136	0.032	0.010	0.000	0.003	-0.036	0.24	0.37	3.849	0.404	0.151	5.152	-0.003
16	160	0.001	0.001	0.287	14.4	0.136	0.032	0.010	0.000	0.003	-0.038	0.24	0.38	3.863	0.407	0.151	5.164	-0.003
17	167	0.001	0.001	0.288	14.6	0.136	0.032	0.010	0.000	0.003	-0.039	0.24	0.39	3.875	0.410	0.151	5.175	-0.003
18	174	0.001	0.001	0.298	16.4	0.137	0.033	0.009	0.000	0.003	-0.053	0.25	0.48	3.977	0.436	0.153	5.265	-0.004
19	181	0.001	0.001	0.299	16.6	0.137	0.033	0.009	0.000	0.003	-0.055	0.25	0.50	3.988	0.439	0.154	5.275	-0.004
20	188	0.001	0.001	0.300	16.8	0.137	0.034	0.009	0.000	0.003	-0.056	0.25	0.51	3.998	0.442	0.154	5.285	-0.004
21	195	0.001	0.001	0.301	17.0	0.137	0.034	0.009	0.000	0.003	-0.058	0.25	0.51	4.008	0.445	0.154	5.295	-0.004
22	201	0.001	0.001	0.302	17.2	0.137	0.034	0.009	0.000	0.003	-0.059	0.25	0.52	4.018	0.448	0.154	5.304	-0.004
23	208	0.001	0.001	0.303	17.4	0.137	0.034	0.009	0.000	0.003	-0.061	0.25	0.53	4.028	0.451	0.155	5.314	-0.005
24	215	0.001	0.001	0.304	17.6	0.137	0.034	0.009	0.000	0.003	-0.062	0.25	0.54	4.037	0.454	0.155	5.324	-0.005
25	222	0.001	0.001	0.305	17.8	0.137	0.034	0.009	0.000	0.003	-0.064	0.25	0.55	4.046	0.457	0.155	5.333	-0.005
26	231	0.001	0.001	0.306	18.0	0.137	0.034	0.009	0.000	0.003	-0.065	0.25	0.56	4.055	0.460	0.155	5.343	-0.005
27	237	0.001	0.001	0.307	18.2	0.137	0.035	0.009	0.000	0.003	-0.067	0.25	0.57	4.063	0.463	0.155	5.352	-0.005
28	243	0.001	0.001	0.308	18.4	0.137	0.035	0.009	0.000	0.003	-0.068	0.25	0.58	4.071	0.466	0.156	5.362	-0.005
29	251	0.001	0.001	0.309	18.6	0.137	0.035	0.009	0.000	0.003	-0.070	0.25	0.58	4.079	0.470	0.156	5.371	-0.005

Appendix 3.5-35 Table 55 (Continued)

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
30	257	0.001	0.001	0.310	18.8	0.137	0.035	0.008	0.000	0.003	-0.072	0.25	0.59	4.086	0.473	0.156	5.380	-0.005
31	264	0.001	0.001	0.310	19.0	0.137	0.035	0.008	0.000	0.003	-0.073	0.25	0.60	4.093	0.476	0.156	5.389	-0.005
32	272	0.001	0.001	0.311	19.2	0.137	0.035	0.008	0.000	0.003	-0.075	0.25	0.61	4.100	0.479	0.157	5.399	-0.005
33	278	0.001	0.001	0.311	19.2	0.137	0.035	0.008	0.000	0.003	-0.075	0.25	0.61	4.100	0.479	0.157	5.399	-0.005
34	286	0.001	0.001	0.314	19.9	0.138	0.036	0.008	0.000	0.003	-0.081	0.25	0.63	4.124	0.493	0.157	5.435	-0.005
35	292	0.001	0.001	0.315	20.1	0.138	0.036	0.008	0.000	0.003	-0.083	0.25		4.130	0.496	0.158	5.443	-0.006
36	299	0.001	0.001	0.316	20.3	0.138	0.036	0.008	0.000	0.003	-0.085	0.25		4.135	0.499	0.158	5.451	-0.006
37	306	0.001	0.001	0.316	20.5	0.138	0.036	0.008	0.000	0.003	-0.086	0.25		4.141	0.503	0.158	5.459	-0.006
38	313	0.001	0.001	0.317	20.7	0.138	0.036	0.008	0.000	0.003	-0.088	0.25		4.146	0.506	0.158	5.466	-0.006
39	322	0.001	0.001	0.318	20.9	0.138	0.037	0.008	0.000	0.003	-0.089	0.25		4.150	0.509	0.159	5.473	-0.006
40	329	0.001	0.001	0.320	21.6	0.138	0.037	0.008	0.000	0.003	-0.096	0.25		4.168	0.521	0.159	5.497	-0.006
41	334	0.001	0.001	0.323	22.3	0.138	0.038	0.008	0.000	0.003	-0.102	0.25		4.185	0.533	0.160	5.520	-0.007
42	341	0.001	0.001	0.325	23.0	0.138	0.038	0.007	0.000	0.003	-0.108	0.25		4.201	0.544	0.161	5.541	-0.007
43	348	0.001	0.001	0.327	23.8	0.139	0.039	0.007	0.000	0.003	-0.114	0.25		4.215	0.555	0.162	5.560	-0.008
44	356	0.001	0.001	0.329	24.5	0.139	0.040	0.007	0.000	0.003	-0.121	0.25		4.229	0.566	0.163	5.577	-0.008
45	363	0.001	0.001	0.331	25.2	0.139	0.040	0.007	0.000	0.003	-0.127	0.25		4.241	0.577	0.164	5.592	-0.008
46	370	0.001	0.001	0.333	25.9	0.139	0.041	0.007	0.000	0.003	-0.133	0.25		4.253	0.588	0.165	5.605	-0.009
47	376	0.001	0.001	0.335	26.6	0.139	0.041	0.006	0.000	0.003	-0.139	0.25		4.263	0.598	0.166	5.616	-0.009
48	383	0.001	0.002	0.337	27.3	0.140	0.042	0.006	0.000	0.002	-0.145	0.25		4.272	0.608	0.167	5.626	-0.010
49	390				27.9						-0.152							
50	397				27.9						-0.152							
51	404				28.6						-0.158							
52	411				29.2						-0.164							

* Wet dry cycles

Appendix 3.5-35 Table 56

Metal Extraction Rates
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																	
2*	63																	
3	70	0.014	0.0012	0.004	30.34	0.0026	0.001	0.0024	0.069	0.0087	0.119	0.051	0.001	11.55	0.006	0.0013	3.40	0.002
4	77	0.016	0.0013	0.004	40.91	0.0027	0.001	0.0047	0.070	0.0083	-0.030	0.074	0.002	13.86	0.008	0.0018	3.99	-0.004
5	83	0.015	0.0012	0.004	38.76	0.0025	0.001	0.0045	0.065	0.0077	-0.040	0.071	0.002	13.01	0.007	0.0017	3.73	-0.004
6	91	0.016	0.0012	0.005	45.82	0.0024	0.001	0.0052	0.062	0.0072	-0.174	0.088	0.002	13.76	0.008	0.0020	3.85	-0.009
7	97	0.030	0.0019	0.009	98.31	0.0043	0.002	0.0117	0.074	0.0080	-0.983	0.192	0.006	23.86	0.015	0.0039	6.41	-0.042
8	103	0.017	0.0008	0.006	73.44	0.0011	0.002	0.0090	0.029	0.0023	-0.865	0.145	0.005	15.05	0.011	0.0028	3.73	-0.036
9	110	0.009	0.0005	0.003	47.42	0.0004	0.001	0.0037	0.012	0.0014	-0.617	0.088	0.003	8.06	0.005	0.0015	1.83	-0.025
10	119	0.010	0.0006	0.004	64.17	0.0004	0.001	0.0038	0.010	0.0019	-0.913	0.101	0.005	9.90	0.006	0.0014	2.04	-0.036
11	126	0.004	0.0004	0.003	42.86	0.0002	0.000	0.0014	0.002	0.0013	-0.652	0.050	0.004	5.72	0.004	0.0005	1.01	-0.025
12	132	0.003	0.0003	0.002	34.36	0.0001	0.000	0.0010	0.000	0.0010	-0.550	0.037	0.003	4.46	0.003	0.0003	0.74	-0.021
13	139	0.003	0.0003	0.002	33.33	0.0001	0.000	0.0009	0.000	0.0010	-0.539	0.035	0.003	4.24	0.003	0.0003	0.69	-0.020
14	146	0.003	0.0003	0.002	33.32	0.0001	0.000	0.0008	0.000	0.0010	-0.542	0.033	0.003	4.14	0.003	0.0003	0.68	-0.021
15	152	0.001	0.0002	0.001	14.10	0.0001	0.000	0.0001	0.000	0.0004	-0.231	0.011	0.002	1.48	0.001	0.0001	0.25	-0.009
16	160	0.001	0.0002	0.001	13.73	0.0001	0.000	0.0000	0.000	0.0004	-0.226	0.009	0.002	1.33	0.001	0.0001	0.23	-0.008
17	167	0.001	0.0002	0.001	13.39	0.0000	0.000	-0.0001	0.000	0.0004	-0.221	0.007	0.002	1.18	0.001	0.0001	0.20	-0.008
18	174	0.003	0.0007	0.002	35.10	0.0001	0.000	-0.0009	0.000	0.0010	-0.583	0.011	0.005	2.44	0.003	0.0001	0.45	-0.021
19	181	0.003	0.0007	0.002	35.13	0.0001	0.000	-0.0010	-0.001	0.0010	-0.584	0.010	0.005	2.35	0.003	0.0001	0.43	-0.021
20	188	0.003	0.0007	0.002	34.17	0.0001	0.000	-0.0010	0.000	0.0010	-0.569	0.009	0.005	2.21	0.003	0.0001	0.41	-0.021
21	195	0.003	0.0007	0.002	35.14	0.0001	0.000	-0.0011	-0.001	0.0010	-0.587	0.008	0.005	2.21	0.003	0.0001	0.42	-0.021
22	201	0.003	0.0007	0.002	36.16	0.0001	0.000	-0.0012	-0.001	0.0010	-0.605	0.008	0.006	2.24	0.003	0.0001	0.43	-0.022
23	208	0.001	0.0002	0.001	13.82	0.0001	0.000	-0.0004	0.000	0.0003	-0.235	0.003	0.002	0.80	0.001	0.0001	0.16	-0.008
24	215	0.001	0.0002	0.001	13.78	0.0001	0.000	-0.0004	0.000	0.0002	-0.236	0.002	0.002	0.78	0.001	0.0001	0.16	-0.008
25	222	0.001	0.0002	0.001	13.74	0.0001	0.000	-0.0004	0.000	0.0002	-0.237	0.002	0.002	0.75	0.001	0.0001	0.16	-0.008
26	231	0.001	0.0002	0.001	12.95	0.0000	0.000	-0.0004	0.000	0.0001	-0.225	0.002	0.002	0.69	0.001	0.0000	0.15	-0.008
27	237	0.001	0.0002	0.001	12.91	0.0000	0.000	-0.0004	0.000	0.0001	-0.226	0.002	0.002	0.66	0.001	0.0000	0.15	-0.008
28	243	0.001	0.0002	0.001	13.24	0.0000	0.000	-0.0004	0.000	0.0000	-0.233	0.002	0.002	0.66	0.001	0.0000	0.15	-0.008
29	251	0.001	0.0001	0.000	12.84	0.0000	0.000	-0.0004	0.000	0.0000	-0.227	0.001	0.002	0.61	0.001	0.0000	0.15	-0.008

Appendix 3.5-35 Table 56 (Continued)

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
30	257	0.001	0.0001	0.000	13.17	0.0000	0.000	-0.0004	0.000	-0.0001	-0.235	0.001	0.002	0.61	0.001	0.0000	0.15	-0.008
31	264	0.001	0.0001	0.000	13.93	0.0001	0.000	-0.0005	0.000	-0.0001	-0.250	0.001	0.002	0.62	0.001	0.0001	0.16	-0.009
32	272	0.001	0.0001	0.000	13.09	0.0000	0.000	-0.0004	0.000	-0.0002	-0.237	0.001	0.002	0.56	0.001	0.0000	0.15	-0.008
33	278	0.001	0.0001	0.000	10.46	0.0000	0.000	-0.0003	0.000	-0.0001	-0.190	0.001	0.001	0.44	0.001	0.0000	0.12	-0.007
34	286	0.002	0.0001	0.001	18.19	0.0001	0.000	-0.0006	0.000	-0.0004	-0.335	0.001	0.002	0.69	0.002	0.0001	0.20	-0.005
35	292	0.002	0.0001	0.001	18.14	0.0001	0.000	-0.0006	0.000	-0.0004	-0.336	0.001		0.66	0.002	0.0001	0.20	-0.010
36	299	0.002	0.0001	0.001	18.09	0.0001	0.000	-0.0006	0.000	-0.0005	-0.336	0.000		0.64	0.002	0.0001	0.20	-0.010
37	306	0.002	0.0001	0.001	18.55	0.0001	0.000	-0.0006	0.000	-0.0005	-0.346	0.000		0.64	0.002	0.0001	0.20	-0.010
38	313	0.002	0.0001	0.001	20.54	0.0001	0.000	-0.0007	0.000	-0.0005	-0.383	0.000		0.69	0.002	0.0001	0.22	-0.012
39	322	0.001	0.0001	0.000	12.34	0.0000	0.000	-0.0004	0.000	-0.0003	-0.231	0.000		0.39	0.001	0.0000	0.12	-0.013
40	329	0.002	0.0002	0.001	18.98	0.0001	0.000	-0.0006	0.000	-0.0005	-0.358	0.001		0.55	0.002	0.0001	0.16	-0.008
41	334	0.004	0.0004	0.001	27.39	0.0001	0.000	-0.0009	0.000	-0.0007	-0.519	0.001		0.75	0.002	0.0001	0.22	-0.013
42	341	0.005	0.0006	0.001	34.67	0.0001	0.000	-0.0012	0.001	-0.0009	-0.658	0.002		0.91	0.003	0.0001	0.26	-0.018
43	348	0.006	0.0008	0.001	41.89	0.0002	0.000	-0.0014	0.001	-0.0011	-0.798	0.002		1.06	0.003	0.0002	0.30	-0.023
44	356	0.007	0.0011	0.001	50.51	0.0002	0.000	-0.0017	0.001	-0.0014	-0.964	0.003		1.23	0.004	0.0002	0.34	-0.029
45	363	0.008	0.0012	0.001	50.16	0.0002	0.000	-0.0017	0.002	-0.0014	-0.961	0.003		1.14	0.004	0.0002	0.31	-0.034
46	370	0.008	0.0012	0.001	47.05	0.0002	0.000	-0.0016	0.002	-0.0013	-0.904	0.003		1.00	0.004	0.0002	0.26	-0.032
47	376	0.008	0.0014	0.001	48.05	0.0002	0.000	-0.0017	0.002	-0.0013	-0.927	0.003		0.95	0.004	0.0002	0.24	-0.033
48	383	0.008	0.0015	0.001	47.71	0.0002	0.000	-0.0017	0.002	-0.0013	-0.923	0.003		0.87	0.004	0.0002	0.21	-0.033
49	390				48.59						-0.950							
50	397				38.70						-0.759							
51	404				37.83						-0.763							
52	411				35.73						-0.747							

* Wet dry cycles

Appendix 3.5-35 Table 57

Oxidation and Neutralization Rates
Backfill Cemented Whole Tailings (AL-16)

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	288	0.03		3.00	3.78	0.03	1.27	381		1.4
2**	63	580	0.07						381		1.4
3	70	879	0.10	65.6	3.11	3.62	-0.04	1.15	740	39.9	2.7
4	77	1233	0.14	94.5	3.69	3.40	-0.06	0.91	1075	69.3	4.0
5	83	1262	0.14	89.7	0.30	0.29	-0.01	0.95	1103	66.5	4.1
6	91	1566	0.18	106.5	3.17	3.22	-0.07	1.00	1419	86.5	5.3
7	97	1684	0.19	227.3	1.23	1.39	-0.03	1.11	1555	241.7	5.8
8	103	1713	0.19	177.1	0.31	0.34	-0.01	1.08	1589	180.0	5.9
9	110	1743	0.20	108.3	0.31	0.34	-0.01	1.05	1621	116.0	6.0
10	119	2013	0.23	146.1	2.81	2.96	-0.08	1.02	1909	156.7	7.1
11	126	2043	0.23	95.5	0.31	0.33	-0.01	1.02	1941	104.5	7.2
12	132	2074	0.23	78.0	0.32	0.33	-0.01	1.02	1973	83.6	7.3
13	139	2104	0.24	76.0	0.32	0.33	-0.01	1.02	2006	81.1	7.4
14	146	2135	0.24	76.2	0.32	0.33	-0.01	1.01	2038	81.1	7.5
15	152	2166	0.24	32.4	0.32	0.33	-0.01	1.01	2071	34.3	7.7
16	160	2197	0.25	31.6	0.32	0.34	-0.01	1.01	2104	33.4	7.8
17	167	2228	0.25	30.9	0.33	0.34	-0.01	1.01	2136	32.6	7.9
18	174	2511	0.28	81.3	2.95	3.05	-0.08	1.01	2433	85.3	9.0
19	181	2542	0.29	81.5	0.33	0.34	-0.01	1.01	2465	85.4	9.1
20	188	2573	0.29	79.3	0.32	0.34	-0.01	1.01	2498	83.1	9.3
21	195	2604	0.29	81.5	0.32	0.34	-0.01	1.01	2531	85.4	9.4
22	201	2635	0.30	83.9	0.32	0.33	-0.01	1.01	2563	87.9	9.5
23	208	2666	0.30	32.0	0.32	0.33	-0.01	1.01	2596	33.6	9.6

Appendix 3.5-35 Table 57 (continued)

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO	NEUTRALIZATION		
		Cumualtive Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)	[Ca + Mg] / [SO4]	Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
24	215	2697	0.30	31.8	0.32	0.33	-0.01	1.01	2628	33.5	9.7
25	222	2727	0.31	31.7	0.32	0.33	-0.01	1.01	2660	33.4	9.9
26	231	2758	0.31	29.8	0.32	0.33	-0.01	1.01	2692	31.4	10.0
27	237	2788	0.31	29.7	0.32	0.33	-0.01	1.01	2724	31.3	10.1
28	243	2818	0.32	30.4	0.31	0.33	-0.01	1.02	2756	32.1	10.2
29	251	2848	0.32	29.5	0.31	0.33	-0.01	1.02	2788	31.2	10.3
30	257	2878	0.32	30.2	0.31	0.33	-0.01	1.02	2820	32.0	10.4
31	264	2908	0.33	31.9	0.31	0.33	-0.01	1.02	2852	33.8	10.6
32	272	2938	0.33	29.9	0.31	0.33	-0.01	1.02	2883	31.8	10.7
33	278										
34	286	3056	0.34	41.5	-6.54 ?	1.29 ?	-0.04	-0.19 ?	3786	199.5	14.0
35	292	3085	0.35	41.4	0.31	0.32	-0.01	1.02	3817	199.4	14.1
36	299	3115	0.35	41.3	0.31	0.32	-0.01	1.01	3848	199.3	14.3
37	306	3144	0.35	42.4	0.31	0.32	-0.01	1.00	3879	205.0	14.4
38	313	3174	0.36	-102.1	0.31	0.32	-0.01	1.00	3909	49.8	14.5
39	322	3203	0.36	28.6	0.31	0.31	-0.01	0.99	3940	29.9	14.6
40	329	3321	0.37	44.6	1.23	1.24	-0.04	0.98	4060	46.0	15.0
41	334	3454	0.39	67.9	1.39	1.24	-0.04	0.86	4180	66.4	15.5
42	341	3596	0.40	90.4	1.47	1.23	-0.04	0.81	4299	84.0	15.9
43	348	3761	0.42	117.5	1.72	1.22	-0.04	0.69	4417	101.5	16.4
44	356	3879	0.44	139.2	1.23	1.21	-0.04	0.95	4534	122.3	16.8
45	363	3997	0.45	139.2	1.23	1.20	-0.04	0.95	4650	121.5	17.2
46	370	4170	0.47	139.1	1.80	1.19	-0.04	0.64	4766	113.9	17.7
47	376	4367	0.49	154.2	2.05	1.18	-0.04	0.56	4880	116.3	18.1
48	383	4477	0.50	143.1	1.14	1.18	-0.04	0.99	4994	115.5	18.5
49	390	4576	0.51	143.5	1.03	1.15	-0.04	1.07	5105	117.6	18.9
50	397										
51	404	4654	0.52	99.7	48.48 ?	1.09	-0.04	0.02 ?	105	-959.6	0.4
52	411	4772	0.54	81.1	1.23	1.06	-0.04	0.83	207	-934.7	0.8

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Compiled by: RWL\MLD2
Checked by: JET

Appendix 3.6-1

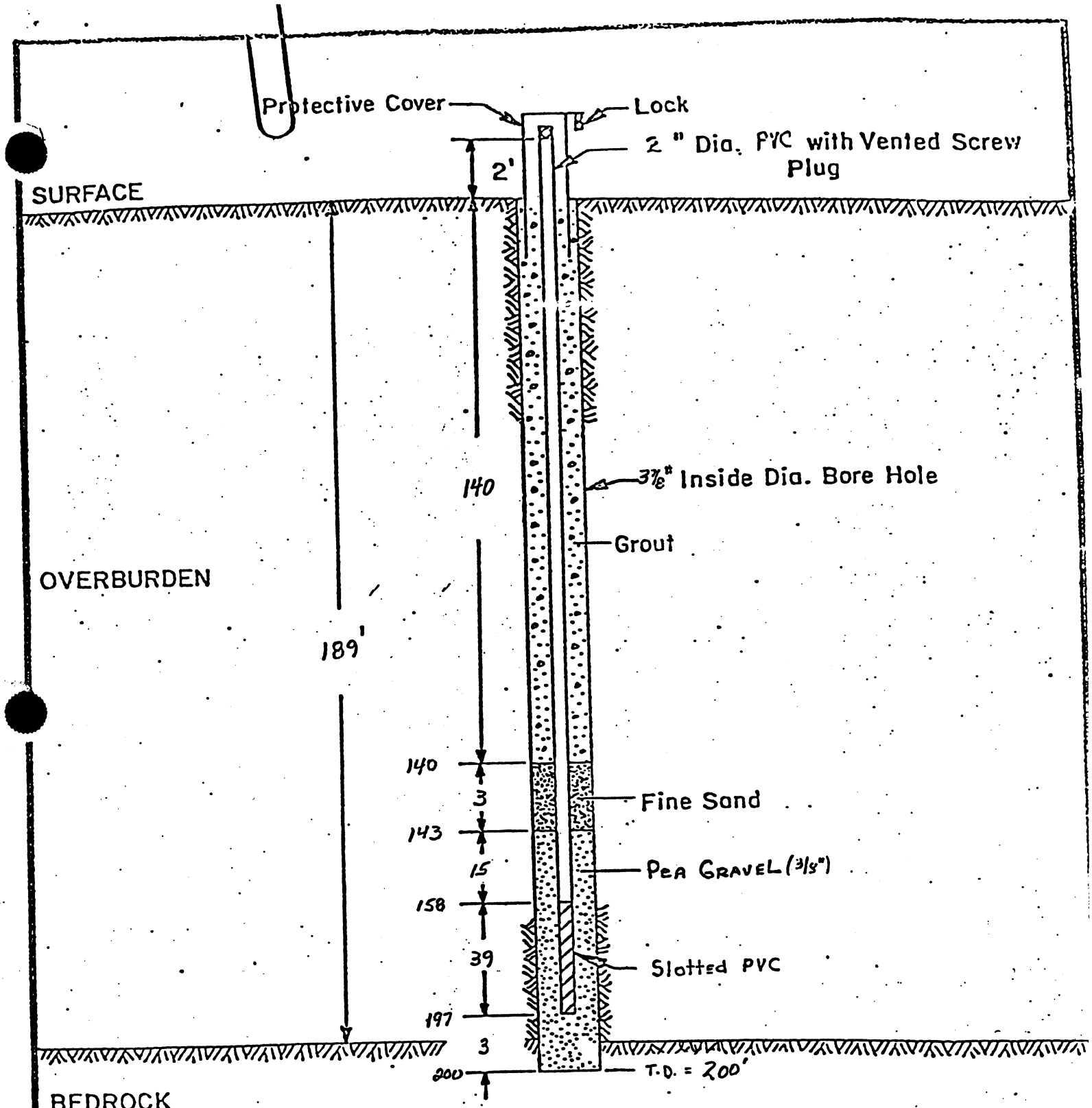
Well Completion Records

- Braun Engineering BE Series Well Construction Reports for 1981 Ore Body Pump Test Program
- STS Consultants, Ltd. Well Construction Reports for 1984 EX Series Wells and WP Series Wells
- STS Consultants, Ltd. Well Construction Reports for 1984 Oak, Deep Hole, Duck and Skunk Lakes Drilling Program
- WTD Environmental Drilling Well Construction, Development, and Abandonment Reports for 1994 Lake Bed and Wetland Drilling Program
- WTD Environmental Drilling Well Construction and Development Reports and Drill Water Laboratory Analysis for 1994 Groundwater Verification Wells
- WTD Environmental Drilling and Total Drilling Well Construction and Development Reports for 1994 Saprolite Investigation
- Completion Records for 1994 and 1995 Foth & Van Dyke Sand Point Installation Program
- Miscellaneous Well Construction Reports

Braun Engineering BE Series Well Construction Reports For 1981 Ore Body Pump Test Program

Ore Body Pump Test Program

BE
- 211-1
- 211-2U, 2L
- 211-3U, 3L
- 213-1
- 213-2
- 213-3U, 3L
- 216-1 includes Abandonment Forms.
- 216-2
- 216-3U, 3L includes Abandonment Form for 3U



WELL # 211-1

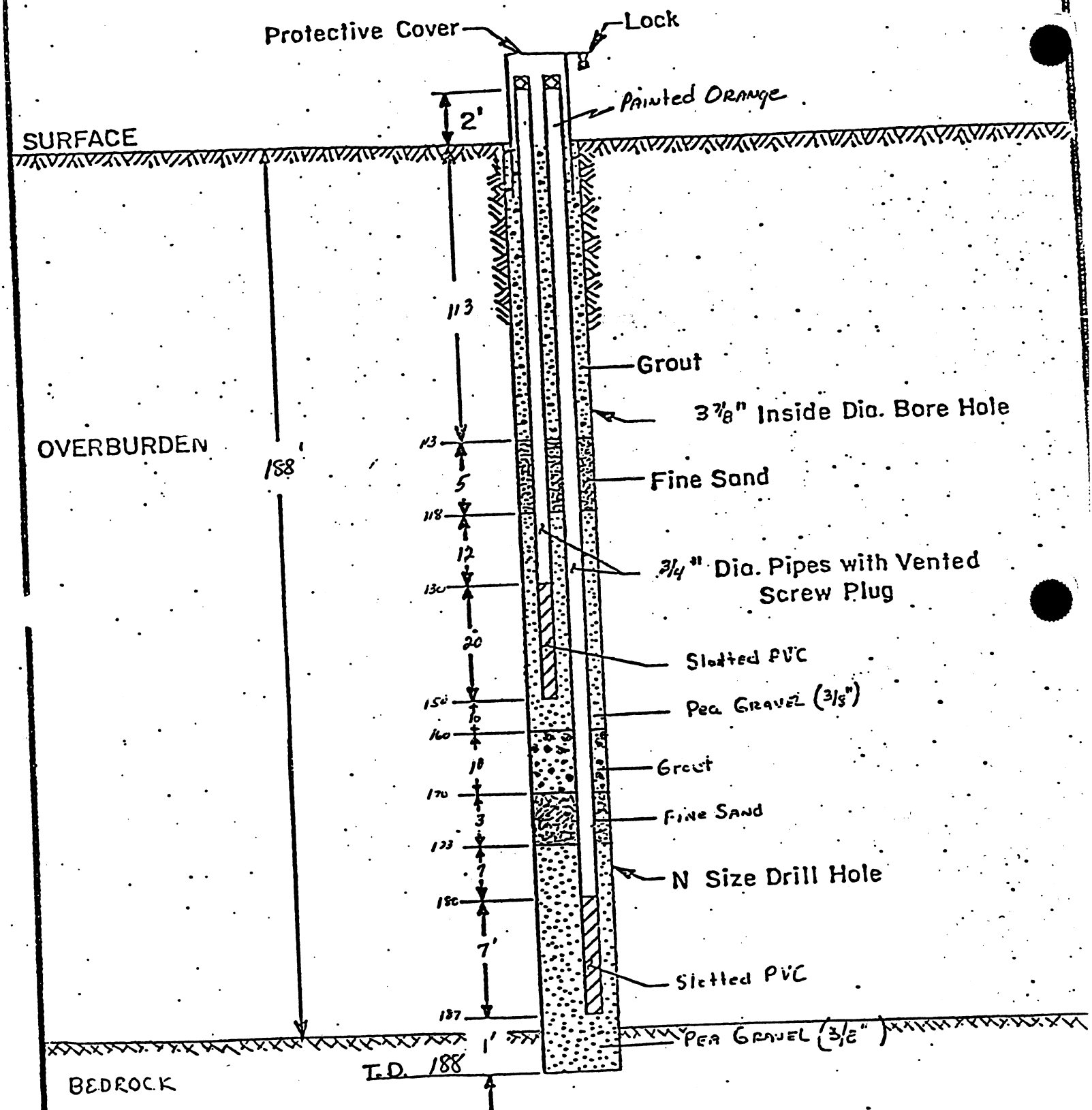
PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

Signed or initialed for identification:

Exxon

Contractor

Not to Scale 3.6-1-2

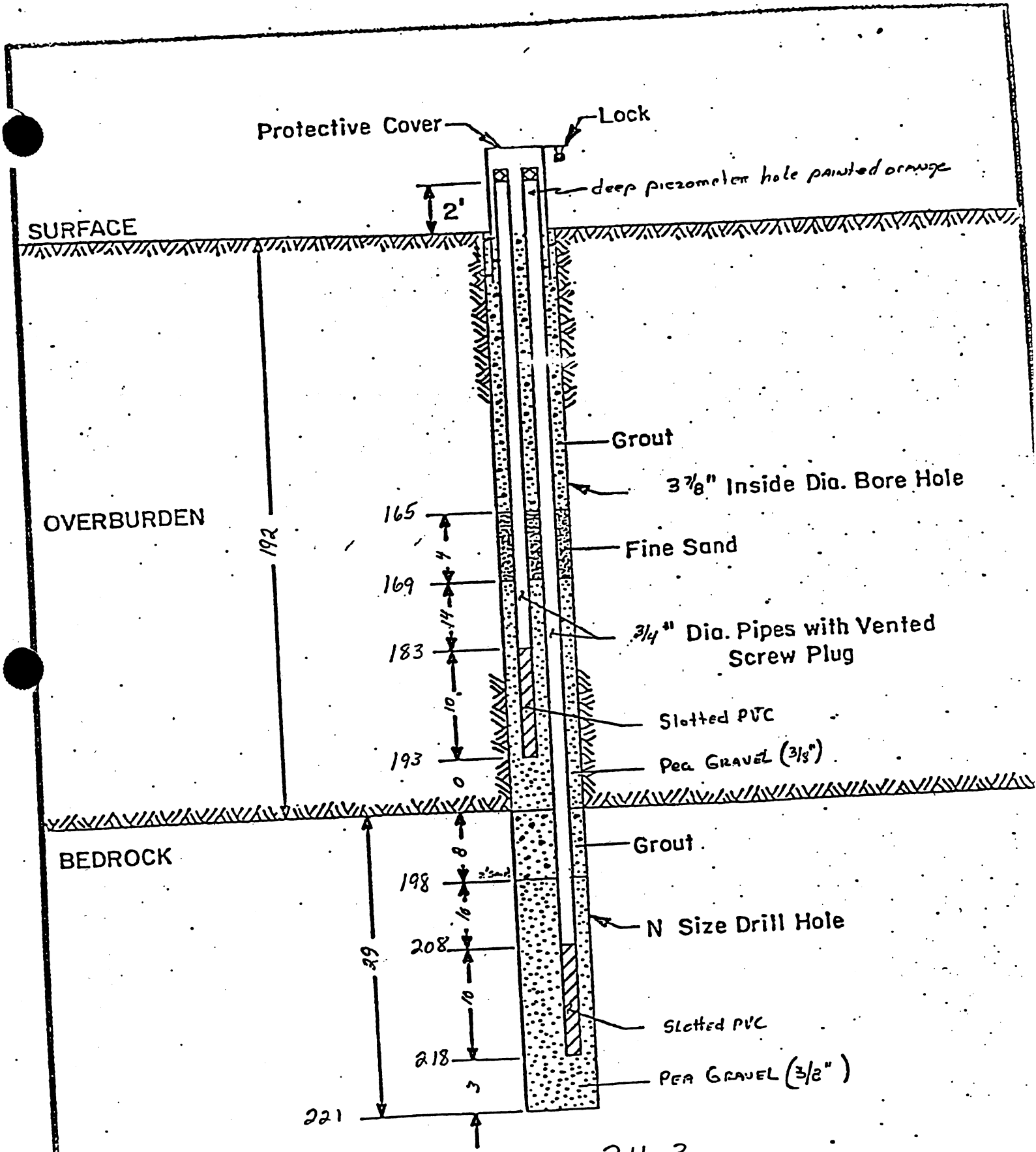


WELL # BE 211-2

INSTALLATION OF BEDROCK AND OVERBURDEN
PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

Signed or initialed for identification:
Exxon

3.6-1-3
Not to Scale



WELL # 211-3

INSTALLATION OF BEDROCK AND OVERBURDEN
PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

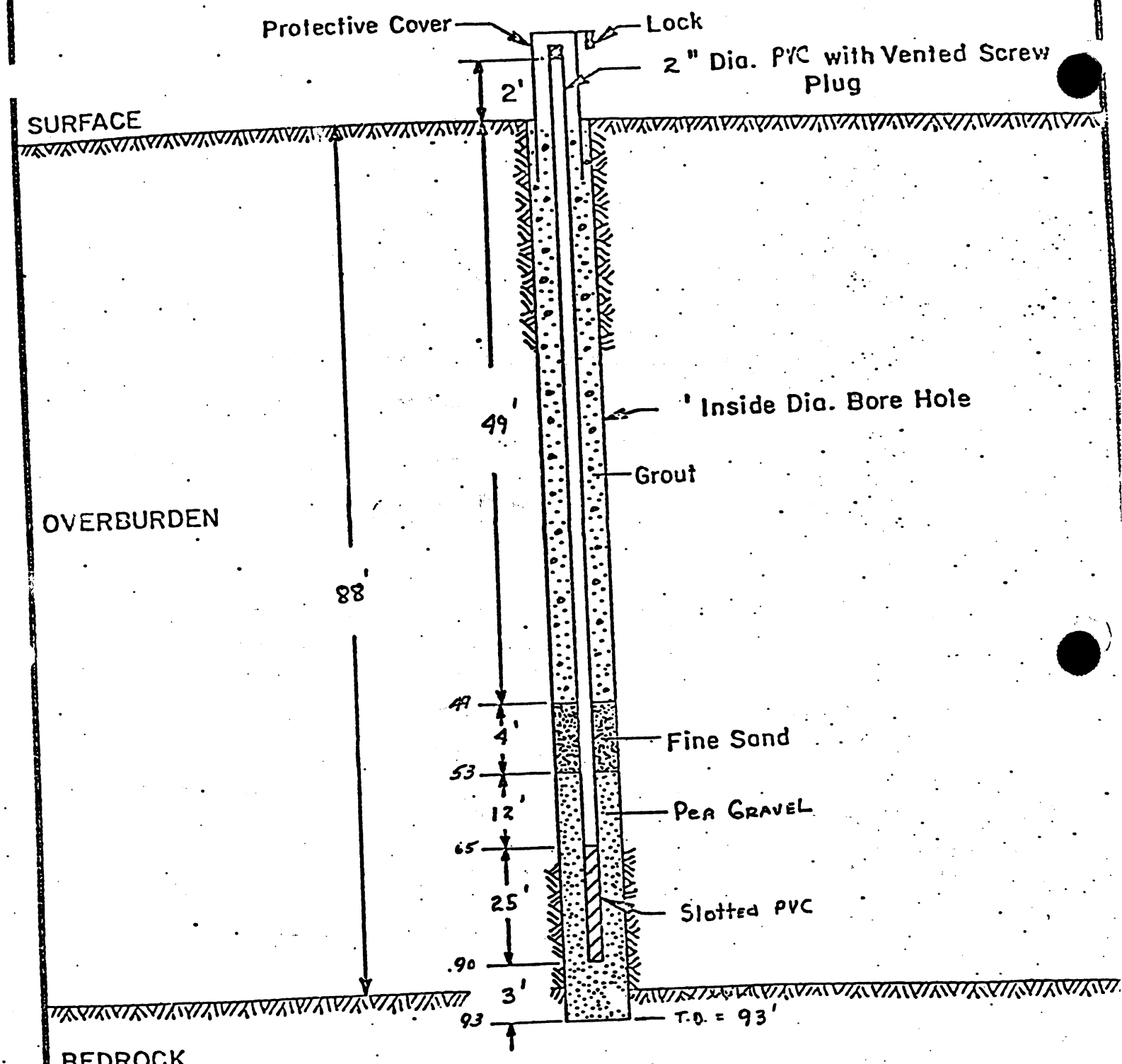
3.6-1-4

Not to Scale

Signed or initialed for identification:

Exxon

Contractor



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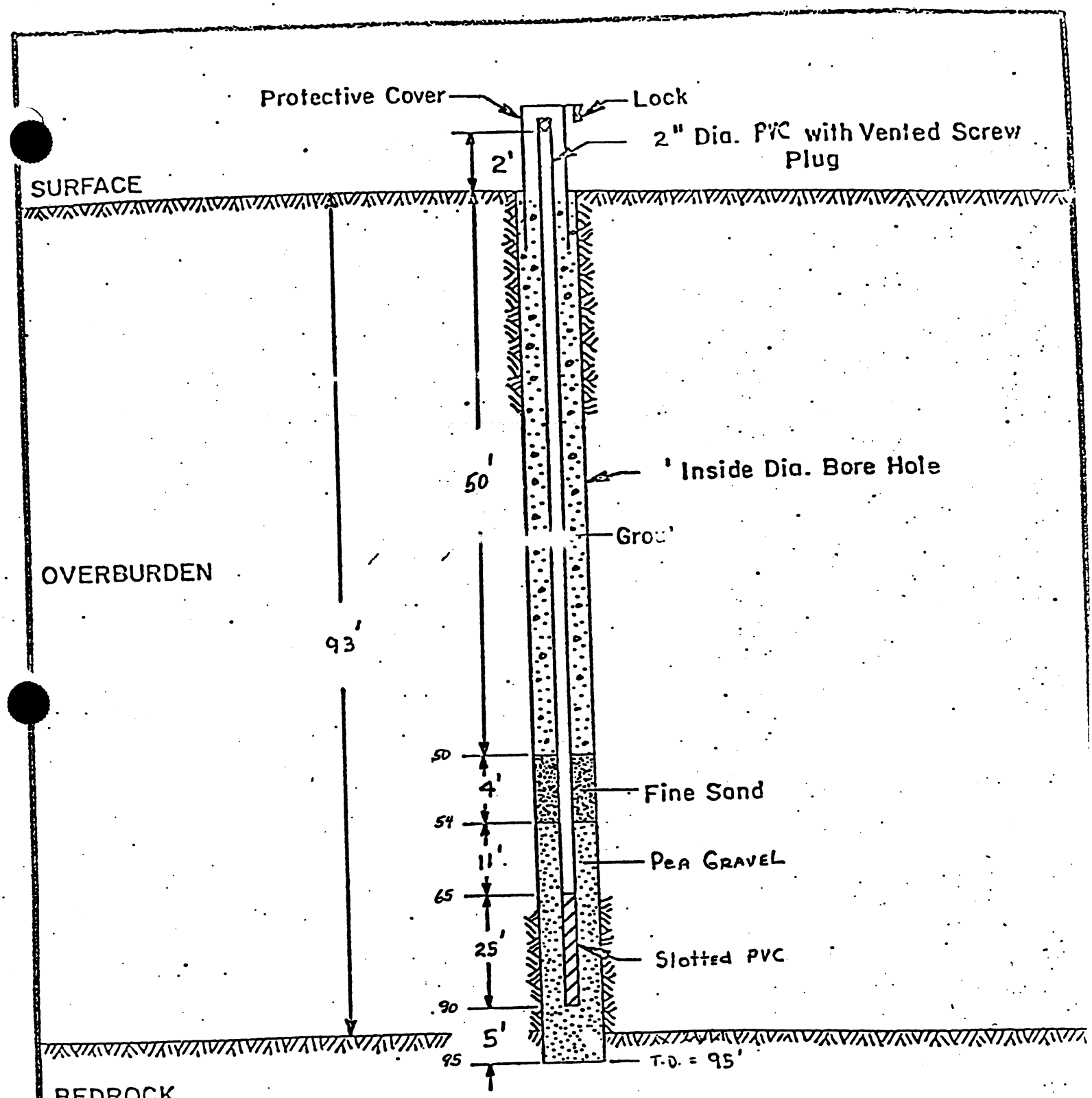
PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

Not to Scale 3.6-1-5

Signed or initialed for identification:

Exxon

Contractor



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CRANDON, WISCONSIN

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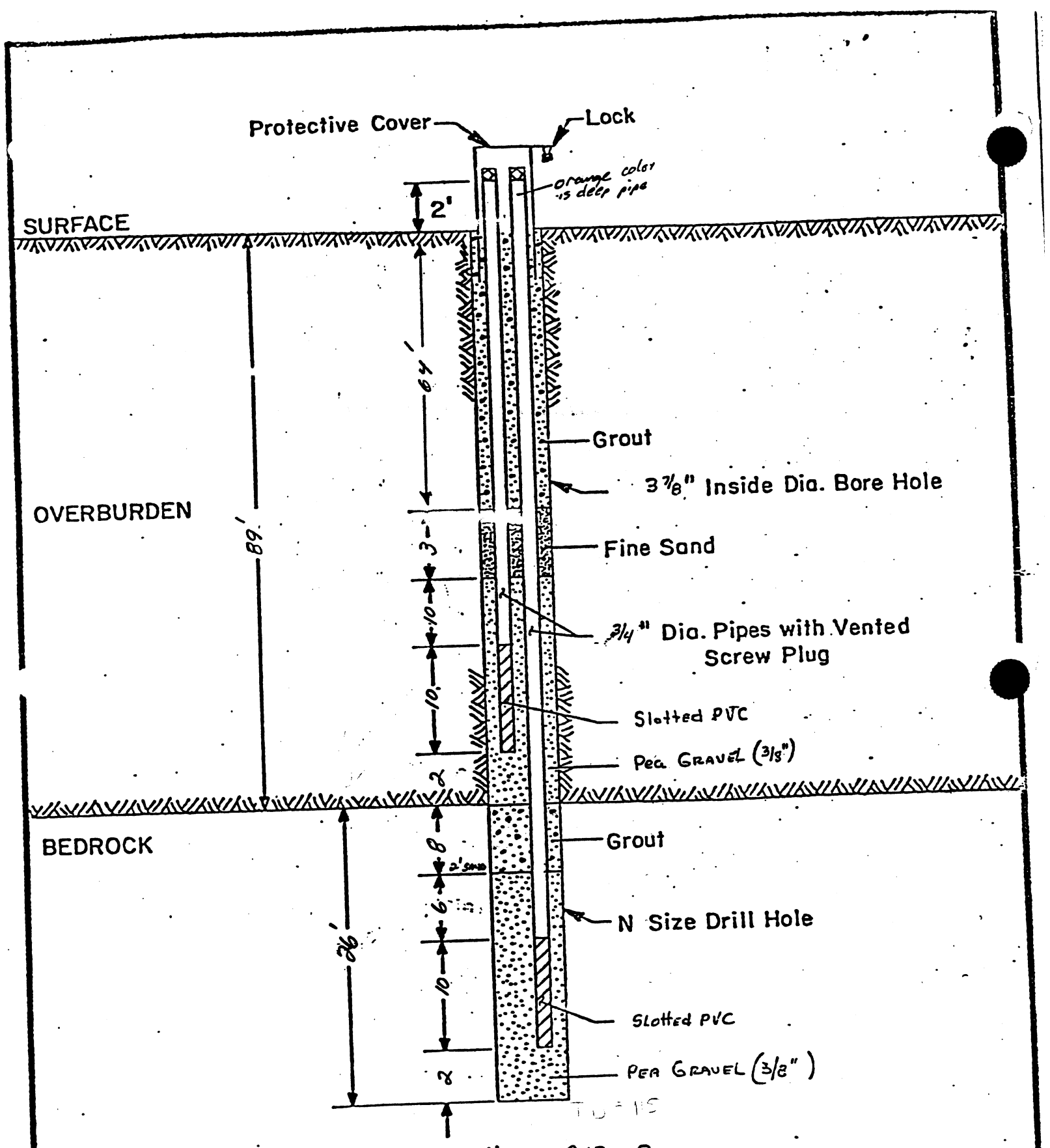
Exxon

Contractor



WELL # 213-3

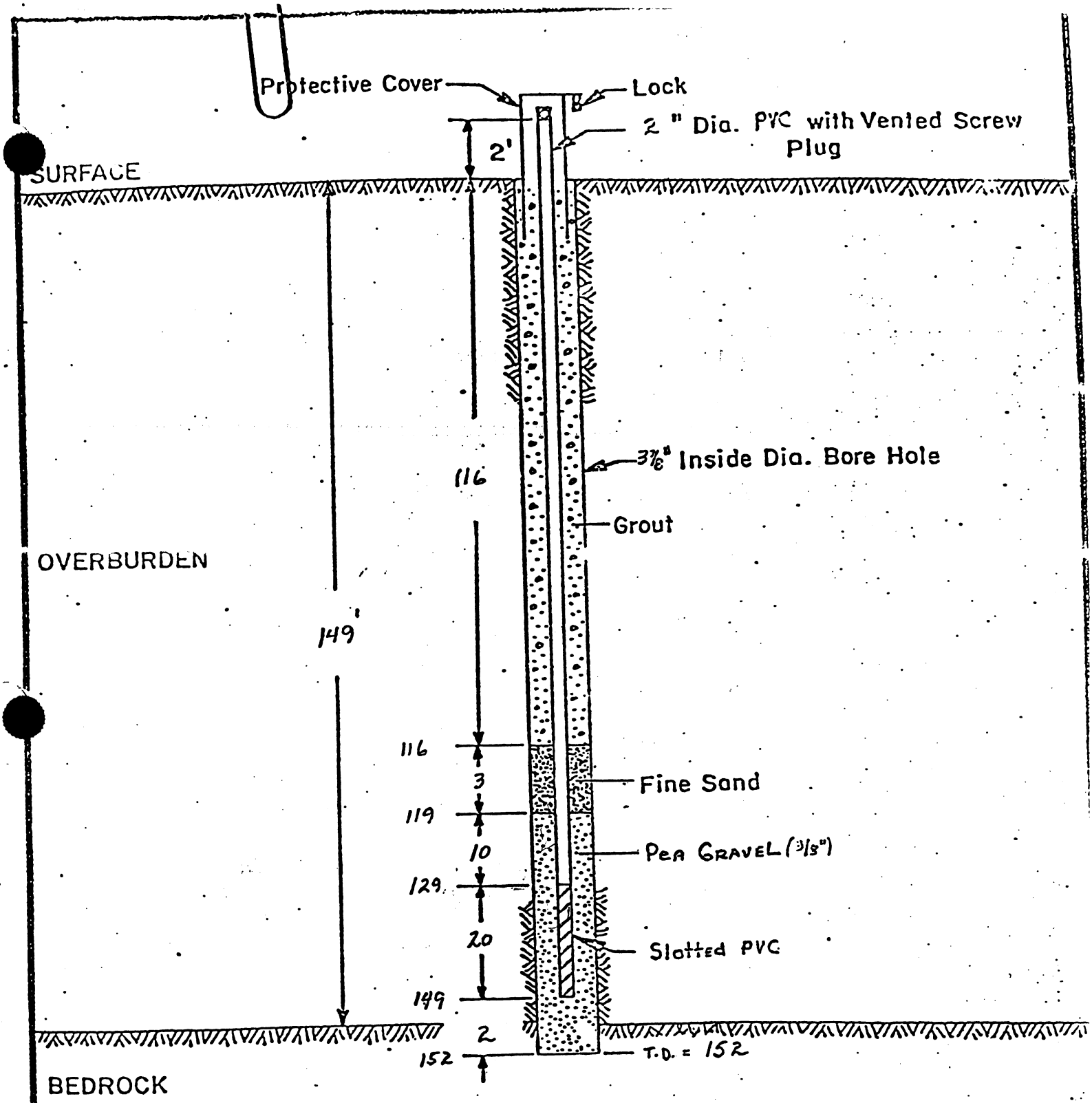
INSTALLATION OF BEDROCK AND OVERBURDEN PIEZOMETER OBSERVATION WELL CRANDON, WISCONSIN

Not to Scale 3.6-1-7

Signed or initialed for identification:

Exxon

Contractor



WELL # 216-1

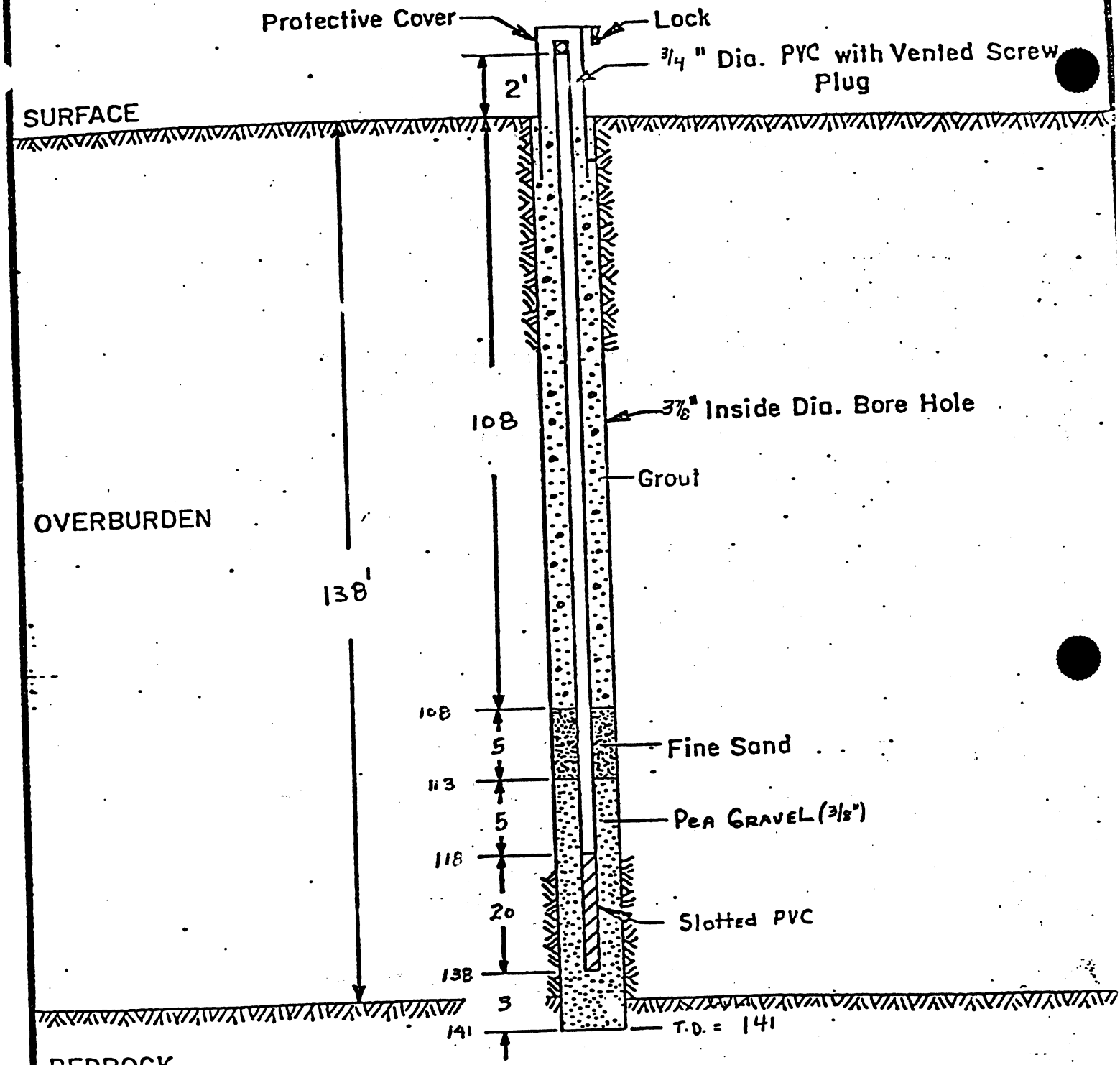
PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

Signed or initialed for identification:

Exxon

Contractor

Not to Scale 3.6-1-8



WELL # 216-2

PIEZOMETER OBSERVATION WELL
CRANDON, WISCONSIN

Not to Scale 3.6-1-9

Signed or initialed for identification:

Exxon

Contractor

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B Rev. 3-94

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

SE 1/4 of SW 1/4 of Sec. 30 ; T. 35 N; R. 13 ☒ E ☐ W

(If applicable) Gov't Lot _____ Grid Number _____

Grid Location _____ ft. ☐ N. ☐ S., _____ ft. ☐ E. ☐ W.

Civil Town Name: Nashville

Street Address of Well

City, Village

(2) FACILITY NAME

Original Well Owner (If Known)

Present Well Owner: Crandon Mining Co.

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501

Facility Well No. and/or Name (If Applicable): 216-1

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: no longer used

Date of Abandonment: 10-21-94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 3-10-81

☒ Monitoring Well
☐ Water Well
☐ Drillhole
☐ Borehole

Construction Report Available? ☒ Yes ☐ No

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) 152 (From groundsurface)

Casing Diameter (in.) 2

Casing Depth (ft.) 149

Lower Drillhole Diameter (in.) _____

Was Well Annular Space Grouted? ☒ Yes ☐ No ☐ Unknown

If Yes, To What Depth? 116 Feet

(4) Depth to Water (Feet) _____

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☐ Yes	☐ No	☒ Not Applicable
Casing Left in Place?	☒ Yes	☐ No	

If No, Explain _____

Was Casing Cut Off Below Surface?	☐ Yes	☒ No
Did Sealing Material Rise to Surface?	☒ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☒ No
If Yes, Was Hole Retopped?	☐ Yes	☐ No

(5) Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☒ Conductor Pipe-Pumped
☐ Dump Bailer ☐ Other (Explain)

(6) Sealing Materials
☒ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

For monitoring wells and monitoring well boreholes only
☐ Bentonite Pellets
☐ Granular Bentonite
☐ Bentonite - Cement Grout

(7) Material Used To Fill Well/Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (Circle One)	Mix Ratio or Mud Weight
Cement	Surface	149	3 bags	5 gal - 94#

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work

Signature of Person Doing Work: Keith Morgan

Date Signed: 1-27-95

TD Drilling, Inc.

Street or Route: 7391 S. Porcupine Lk Rd.

Telephone Number: (414 829-5690

City, State, Zip Code: Lena, WI 54139

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	☐ Complying Work ☐ Noncomplying Work
Follow-up Necessary	

D1

WELL/DRILL HOLE OWNER

3.6-1-10

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B Rev. 3-94

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

SE 1/4 of SW 1/4 of Sec. 30 ; T. 35 N; R. 13 [X] E [ ] W

(If applicable) _____ Gov't Lot _____ Grid Number

Grid Location _____ ft. [ ] N. [ ] S., _____ ft. [ ] E. [ ] W.

Civil Town Name: Nashville

Street Address of Well

City, Village

(2) FACILITY NAME

Original Well Owner (If Known)

Present Well Owner: Crandon Mining Co.

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501

Facility Well No. and/or Name (If Applicable): 216-2

WI Unique Well No.

Reason For Abandonment: no longer used

Date of Abandonment: 12-28-94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 3-11-81

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify) _____

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 141 (From groundsurface)

Casing Diameter (in.) 2/4

Casing Depth (ft.) 138

Lower Drillhole Diameter (in.) _____

Was Well Annular Space Grouted? [X] Yes [ ] No [ ] Unknown
If Yes, To What Depth? _____ Feet

(4) Depth to Water (Feet) _____

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Casing Left in Place?	[X] Yes	[ ] No	

If No, Explain _____

Was Casing Cut Off Below Surface?	[ ] Yes	[X] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[X] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[ ] Conductor Pipe-Gravity [X] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[X] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[ ] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[ ] Granular Bentonite
[ ] Bentonite - Cement Grout

(7) Material Used To Fill Well/Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (Circle One)	Mix Ratio or Mud Weight
Cement	Surface	138	90 gallons	5 gal. to 94#

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work

Signature of Person Doing Work

Date Signed: 1-27-95

TD Drilling, Inc.

Street or Route: 7291 S. Porcupine Lk Rd.

Telephone Number: (414) 839-5600

City, State, Zip Code: Iron, WI 54139

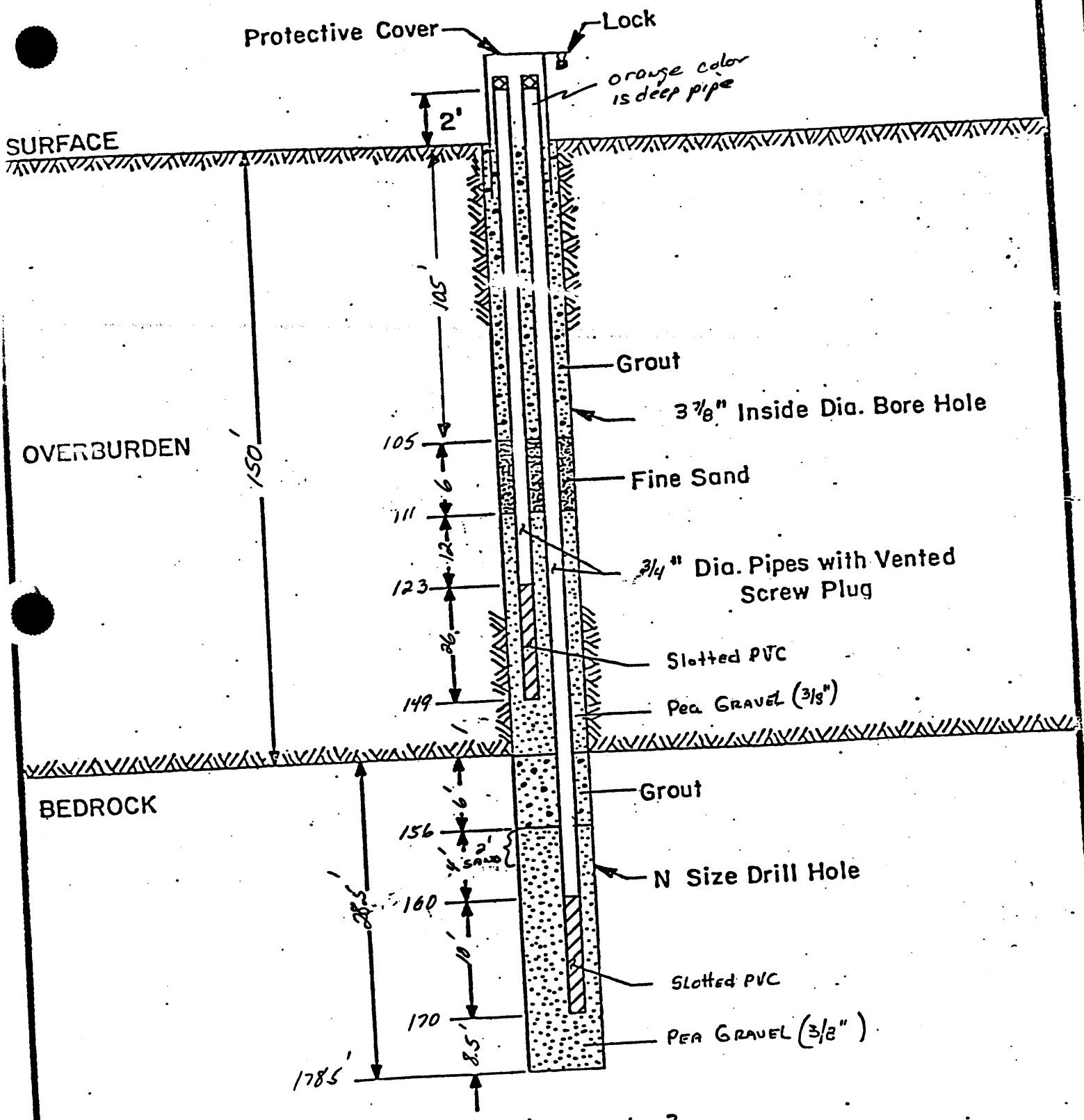
D2

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	[ ] Complying Work [ ] Noncomplying Work
Follow-up Necessary	

WELL/DRILL HOLE OWNER

3.6-1-11



WELL # 216-3

INSTALLATION OF BEDROCK AND OVERBURDEN PIEZOMETER OBSERVATION WELL CRANDON, WISCONSIN

Not to Scale 3.6-1-12

Signed or initialed for identification:

Exxon

Contractor

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5B Rev. 3-94

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

SE 1/4 of ~~SW~~ 1/4 of Sec. ~~SW~~ 30; T. ~~39N~~ 35 N; R. ~~10E~~ 13 [X] E [ ] W

(If applicable) _____ Gov't Lot _____ Grid Number

Grid Location _____ ft. [ ] N. [ ] S., _____ ft. [ ] E. [ ] W.

Civil Town Name: Nashville

Street Address of Well

City, Village

(2) FACILITY NAME

Original Well Owner (If Known)

Present Well Owner: Crandon Mining Co.

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501

Facility Well No. and/or Name (If Applicable): 21B-3 U

WI Unique Well No.

Reason For Abandonment: no longer used

Date of Abandonment: 10-21-94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 4-14-81

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify) _____

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 149 (From groundsurface)

Casing Diameter (in.) 3/4

Casing Depth (ft.) 149

Lower Drillhole Diameter (in.) _____

Was Well Annular Space Grouted? [X] Yes [ ] No [ ] Unknown

If Yes, To What Depth? 105 Feet

(4) Depth to Water (Feet) _____

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Casing Left in Place?	[X] Yes	[ ] No	

If No, Explain _____

Was Casing Cut Off Below Surface?	[ ] Yes	[X] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[X] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[ ] Conductor Pipe-Gravity [X] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[X] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[ ] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[ ] Granular Bentonite
[ ] Bentonite - Cement Grout

(7)

Material Used To Fill Well/Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (Circle One)	Mix Ratio or Mud Weight
Cement	Surface	149	20 gallons	5 gallons-94#

(8) Comments: _____

(9) Name of Person or Firm Doing Sealing Work

Signature of Person Doing Work: TD dRilling Inc. Date Signed: 1-27-95

Street or Route: 7391 S. Pardoonne Lv Rd Telephone Number: (414) 829-5600

City, State, Zip Code: Lena, WI 54139

D3

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	[ ] Complying Work [ ] Noncomplying Work
Follow-up Necessary	

WELL/DRILL HOLE OWNER

3.6-1-13

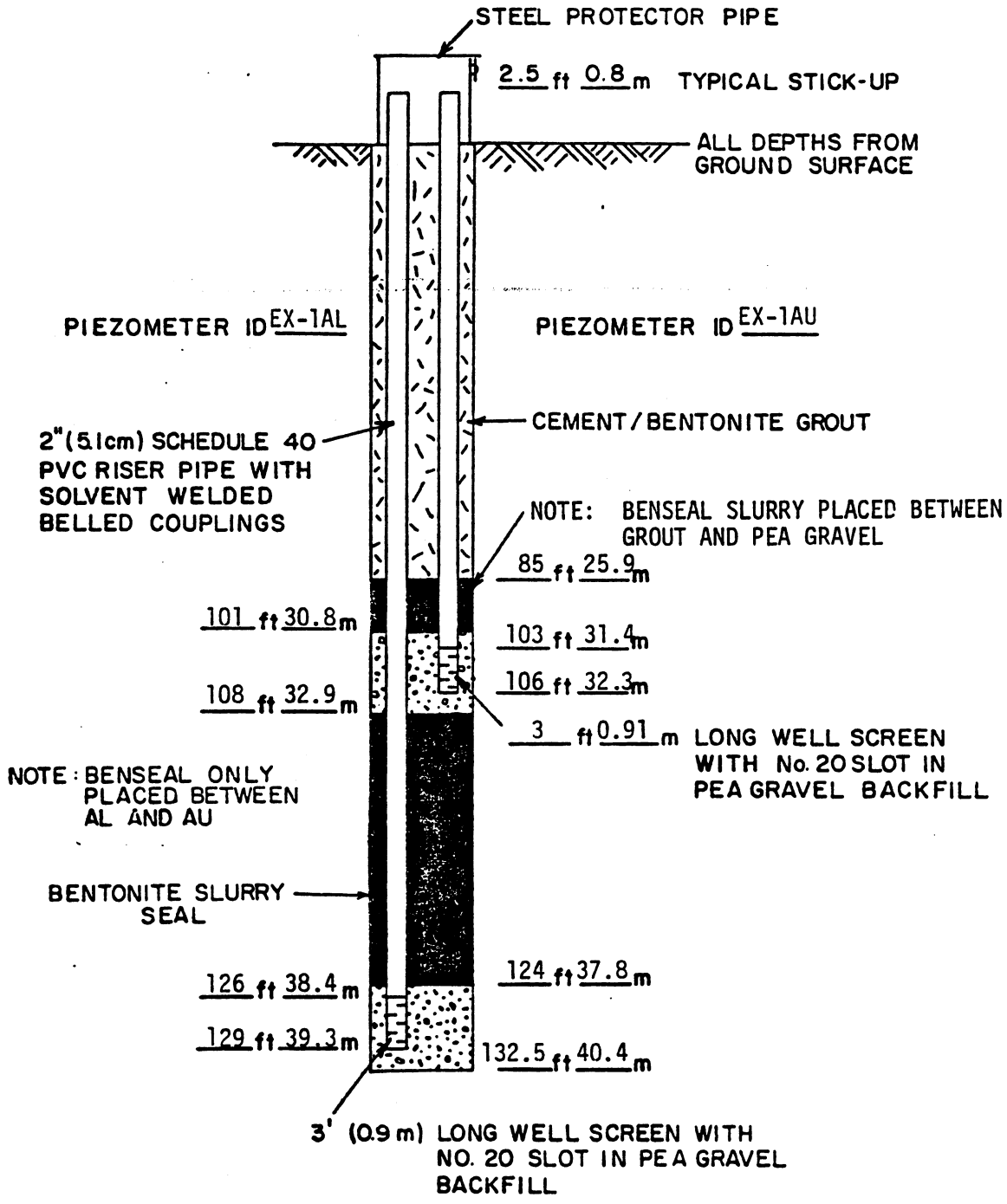
STS Consultants Ltd. Well Construction Reports for 1984
Ex-Series Wells and WP-Series Well Points

EX
- 1 AL, AU, BL, BU
- 2 BL, AL, AU, CL
- 3 AL, AU, BL, BU, CL
- 4 AL, AU, BL, BU, CL
- 5 AL, AU, BL, BU, CL
- 6 AL, AU, BL, BU
- 7 AL, BL, BU, CL
- 8 AL, AU, BL, BU
- 9 AL, AU, BL, BU
- 10 AL, AU, BL, BU
- 11 AL, AU, BL, BU, CL
- 12 AL, AU, BL, BU
- 13 AL, BL, BU, CL, DL
- 14 AL, AU, BL, BU
- 15 AL, AU, BL
- 16 AL, AU, BL

WP
- 1L, 1U
- 2L, 2U
- 3L, 3U
- 4L, 4U
- 5L, 5U
- 6L, 6U
- 7L, 7U

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-1AL & AU DATE INSTALLED 2/29-3/1/84 DRILL RIG Schramm

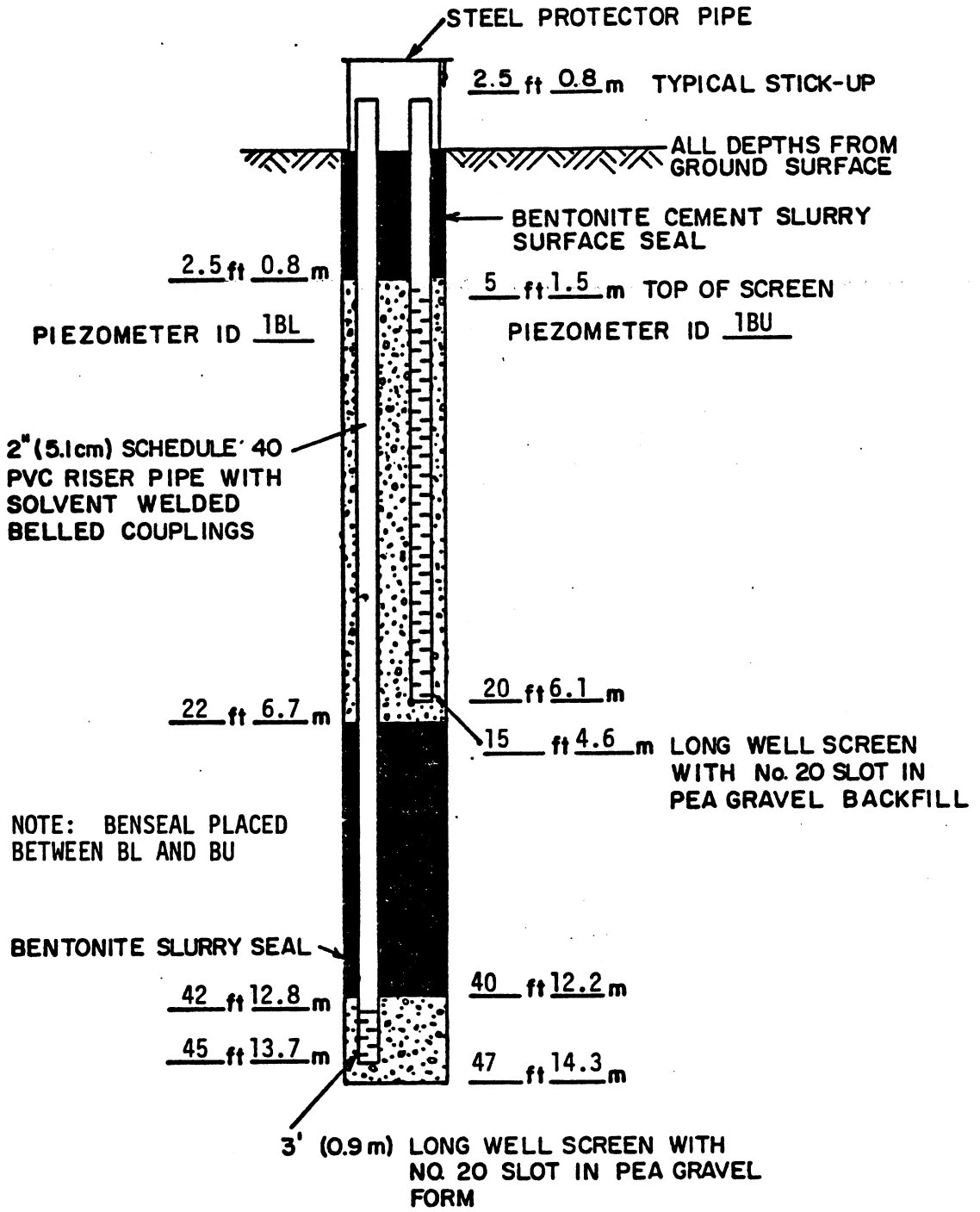
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-1BL & BU DATE INSTALLED 3-1-84 DRILL RIG Schramm

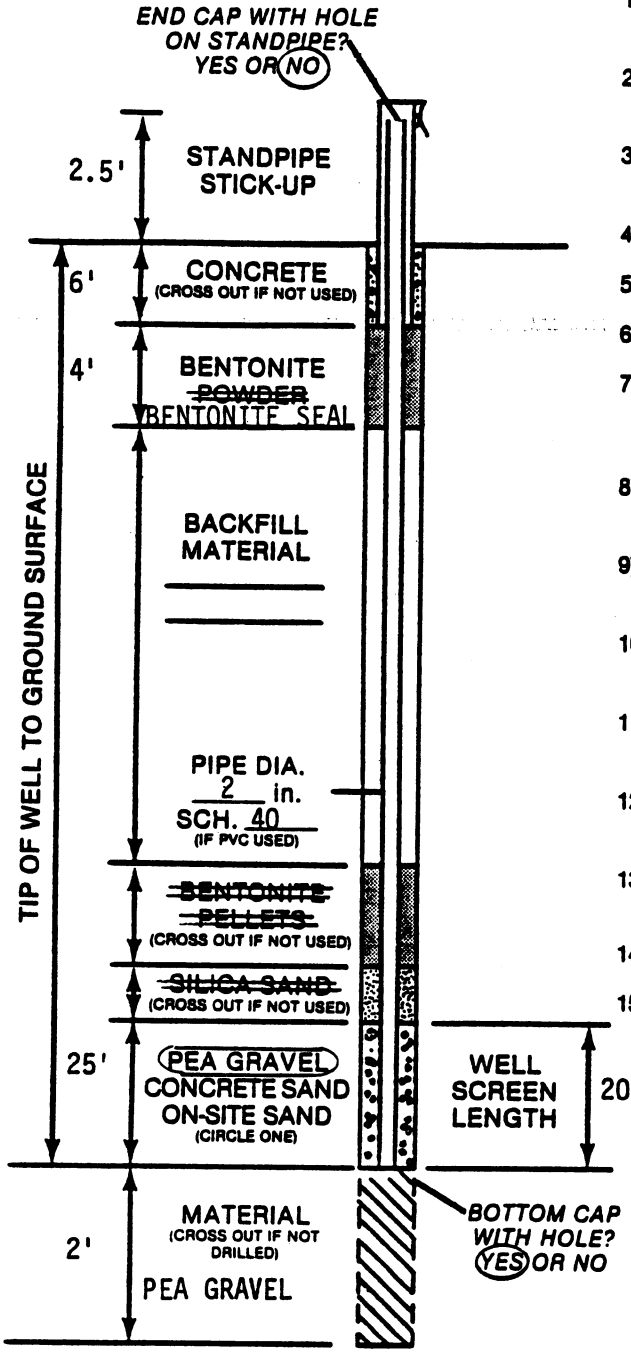
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE 4-27-84, Dry Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

NOTE: WELL REPLACED BY EX-2CL

Well No. EX-2BL DATE INSTALLED 3-27-84 DRILL RIG Schramm

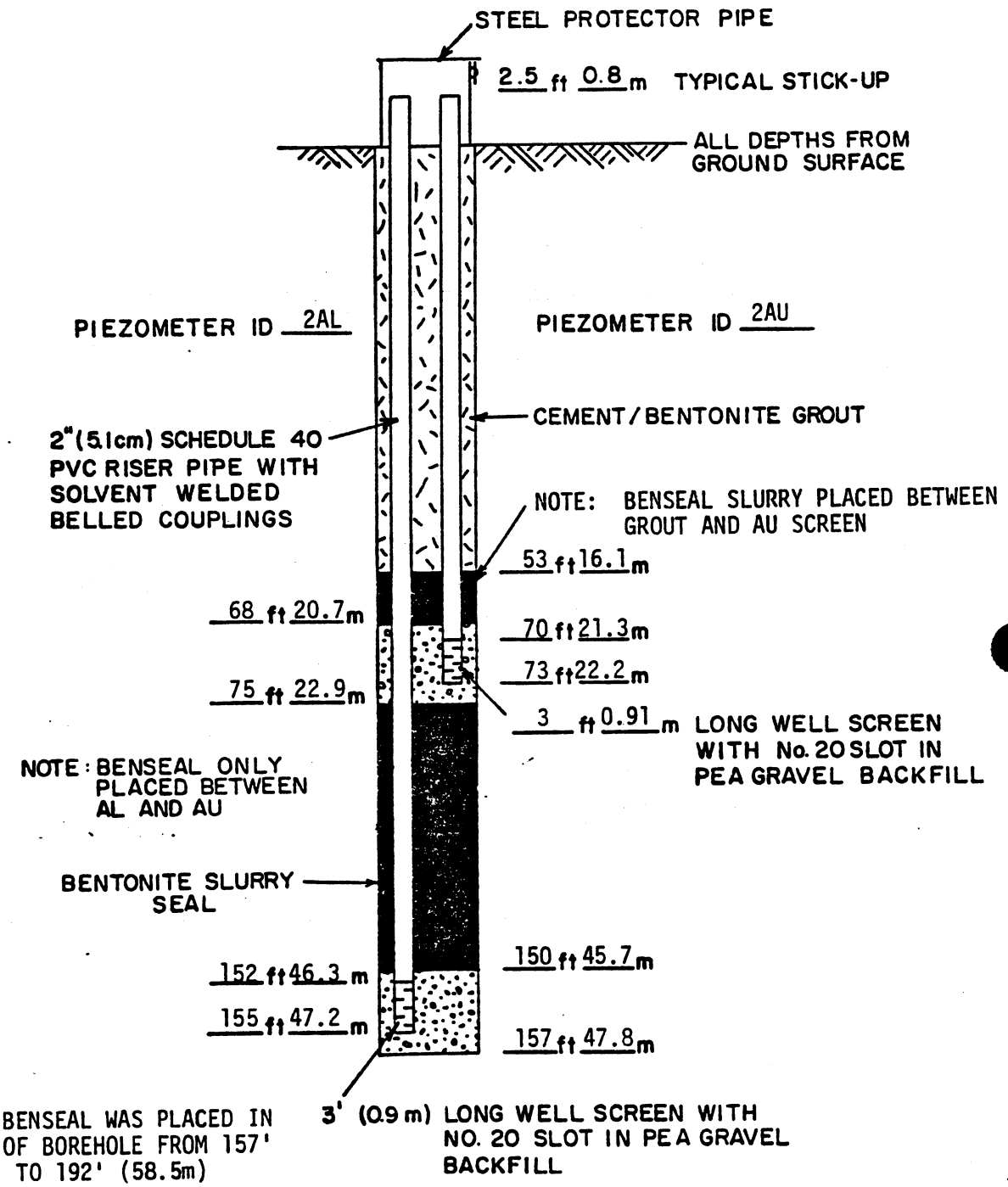
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-2AL & AU DATE INSTALLED 3-27-84 DRILL RIG Schramm

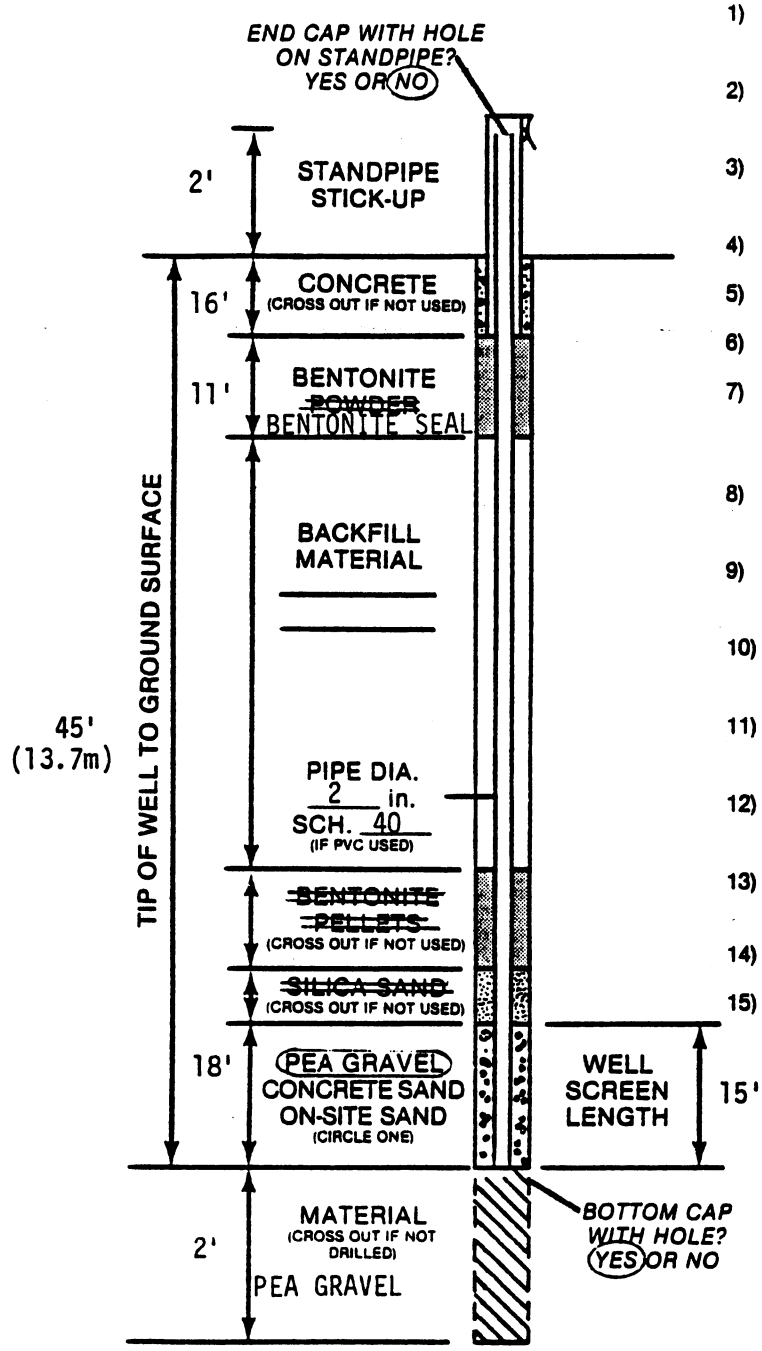
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon- Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-2CL DATE INSTALLED 5-17-84 DRILL RIG Schramm

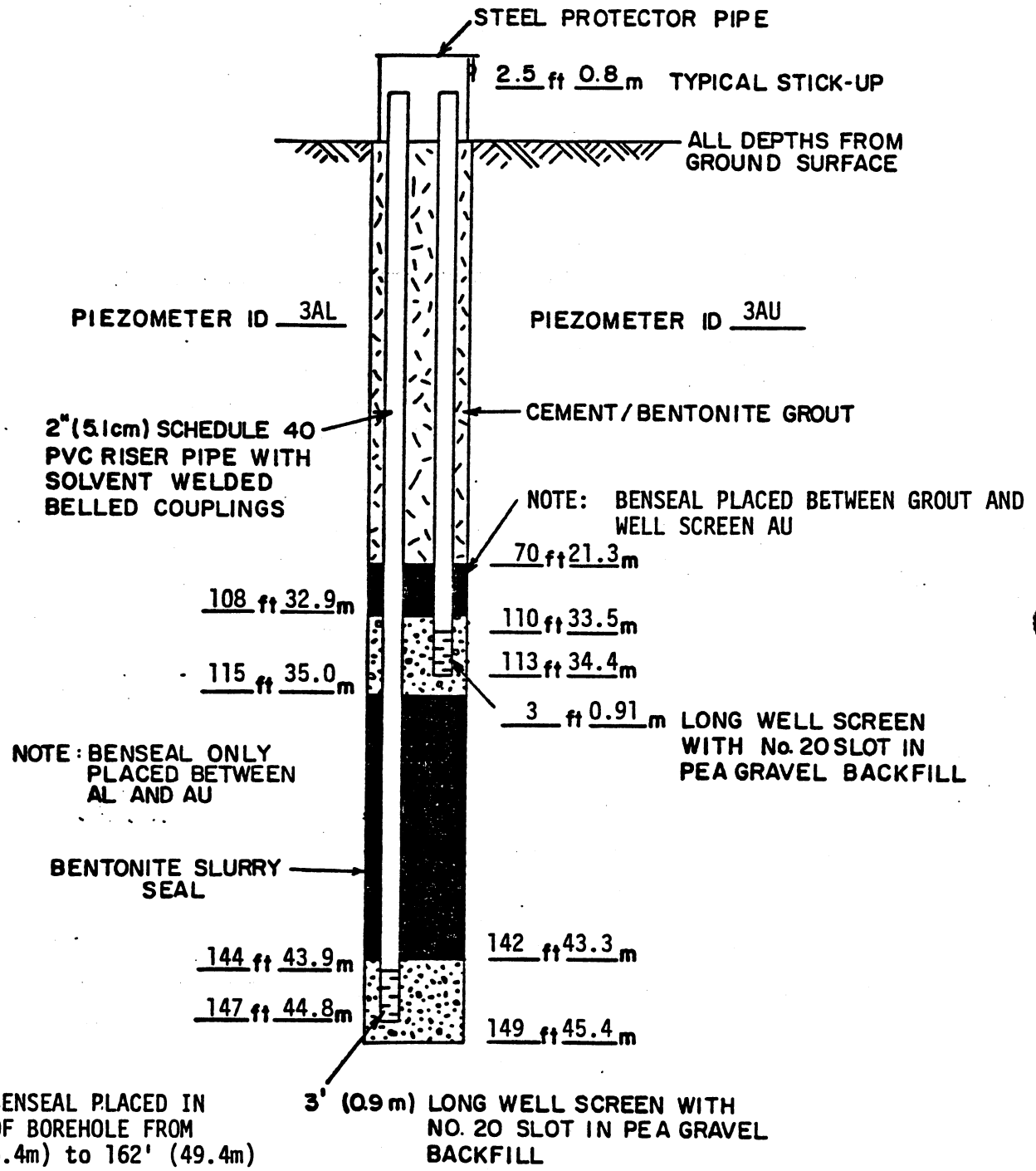
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-3AL & AU DATE INSTALLED 3-30-84 DRILL RIG Schramm

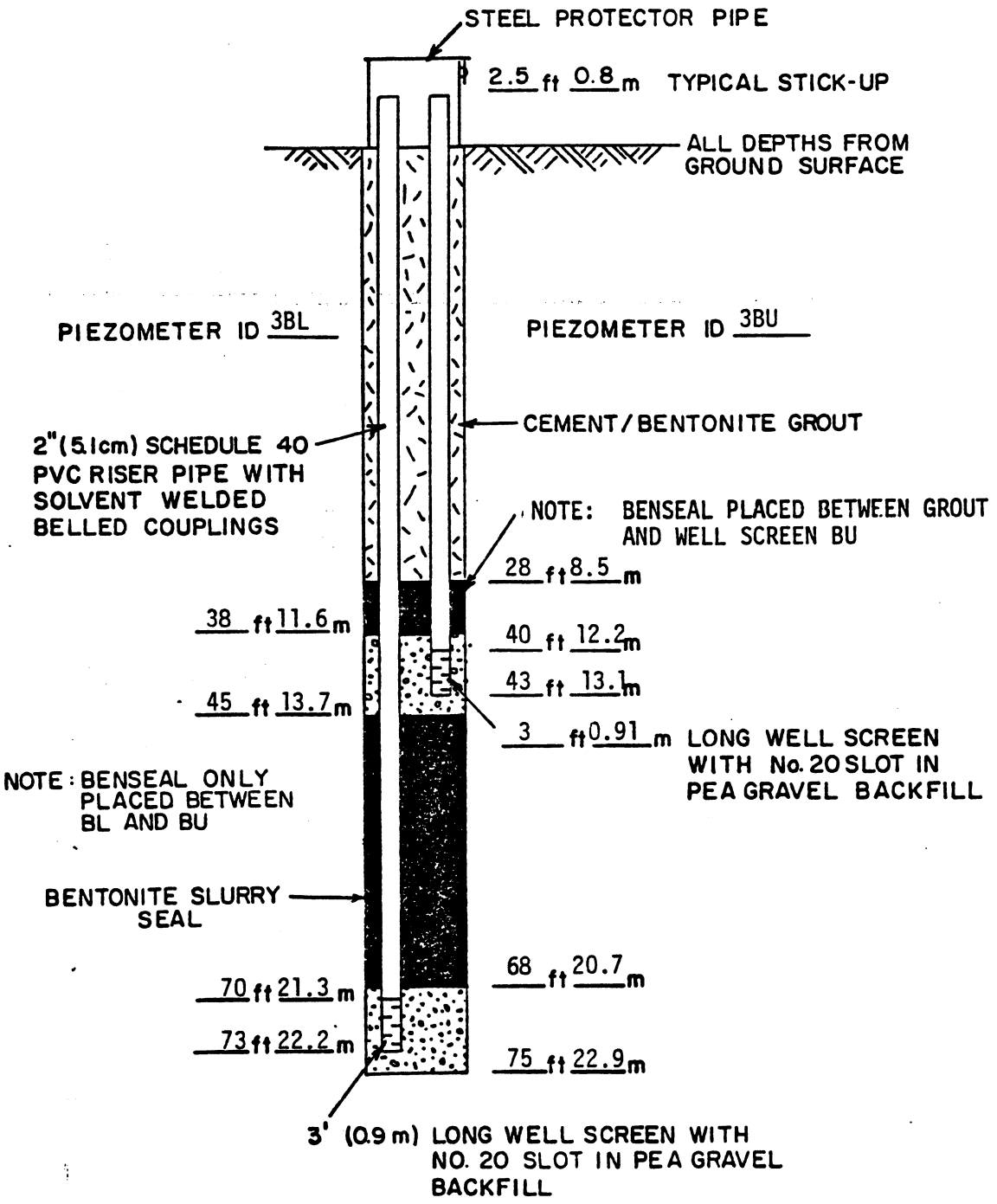
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-3BL & BU DATE INSTALLED 3-30-84 DRILL RIG Schramm

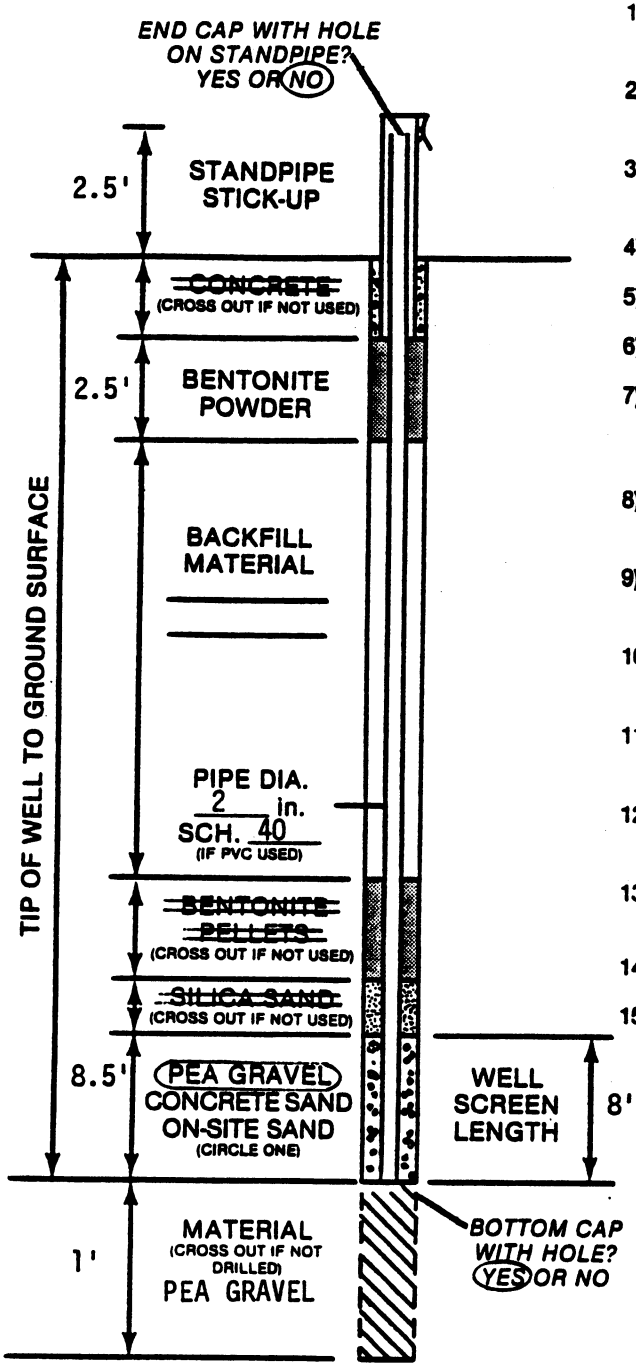
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC), GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED), COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.), OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID), OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR), TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-3CL DATE INSTALLED 3-31-84 DRILL RIG Schramm

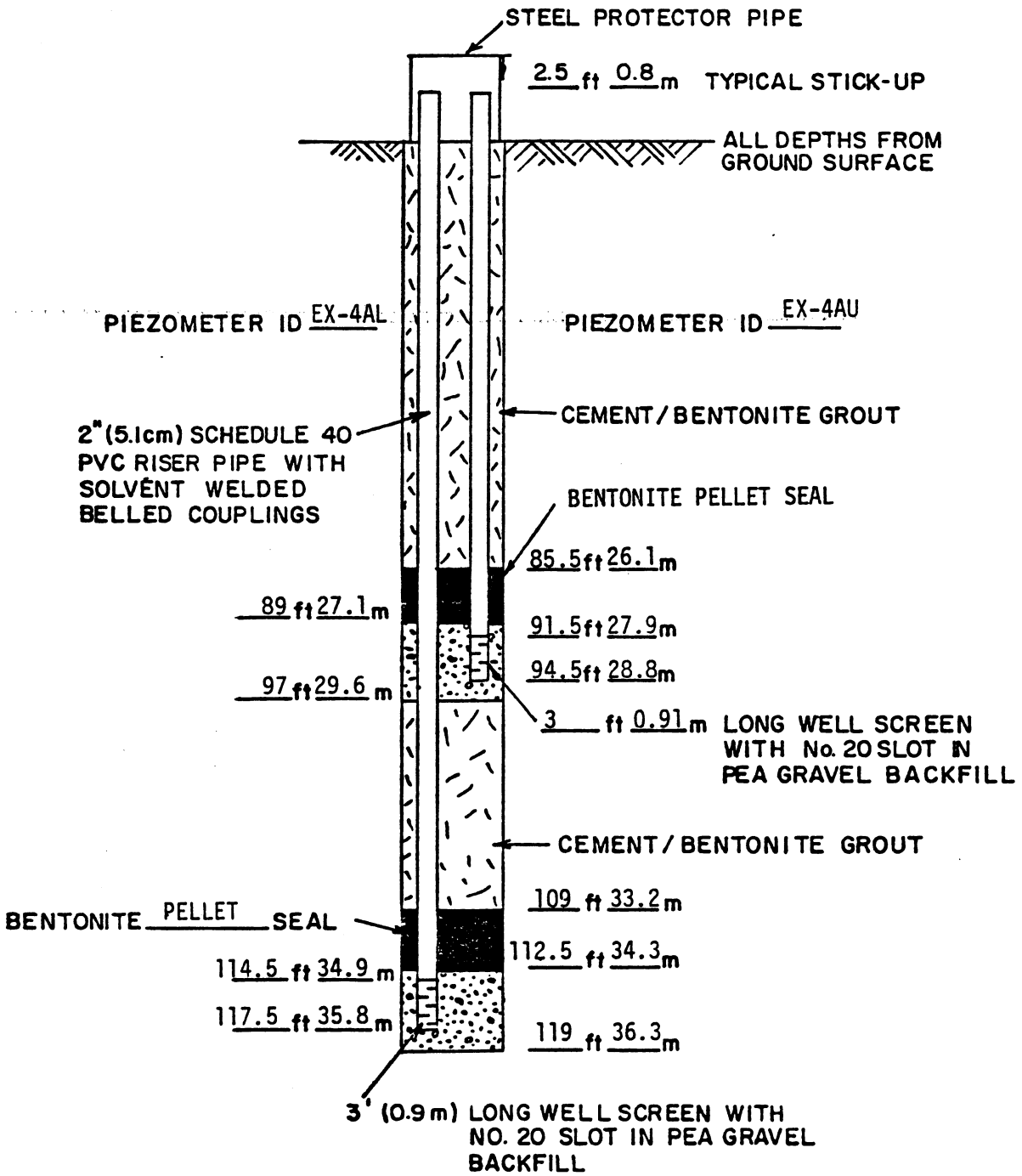
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-4AL & AU DATE INSTALLED 2/6-2/8/84 DRILL RIG Schramm

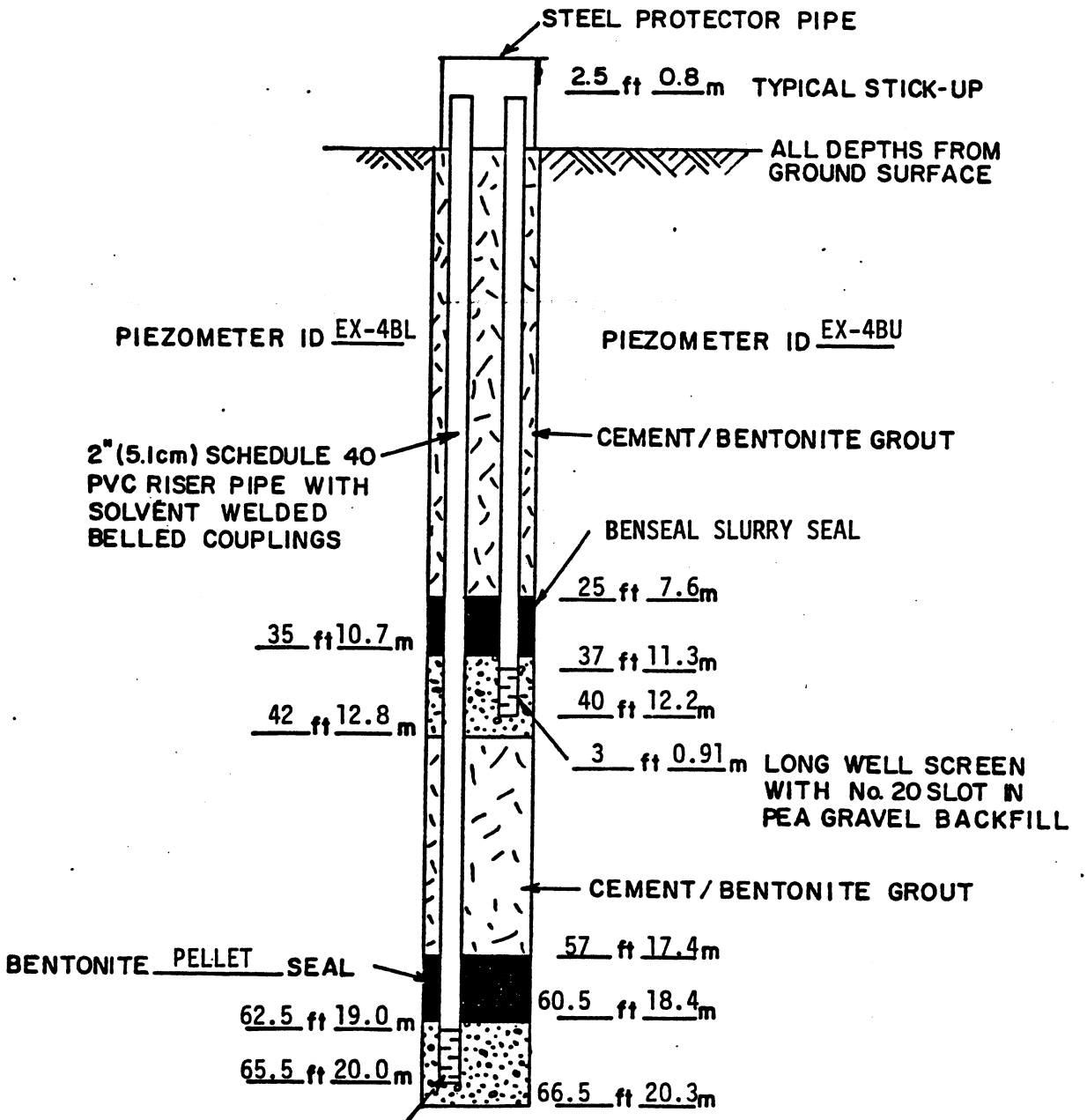
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: CEMENT GROUT PLACED IN BOTTOM OF BOREHOLE FROM 66.5' (20.3m) TO 117' (35.7m) - BOREHOLE OBSTRUCTION BELOW BL WELL SCREEN

Well No. EX-4BL & BU DATE INSTALLED 2/6-2/8/84 DRILL RIG Schramm

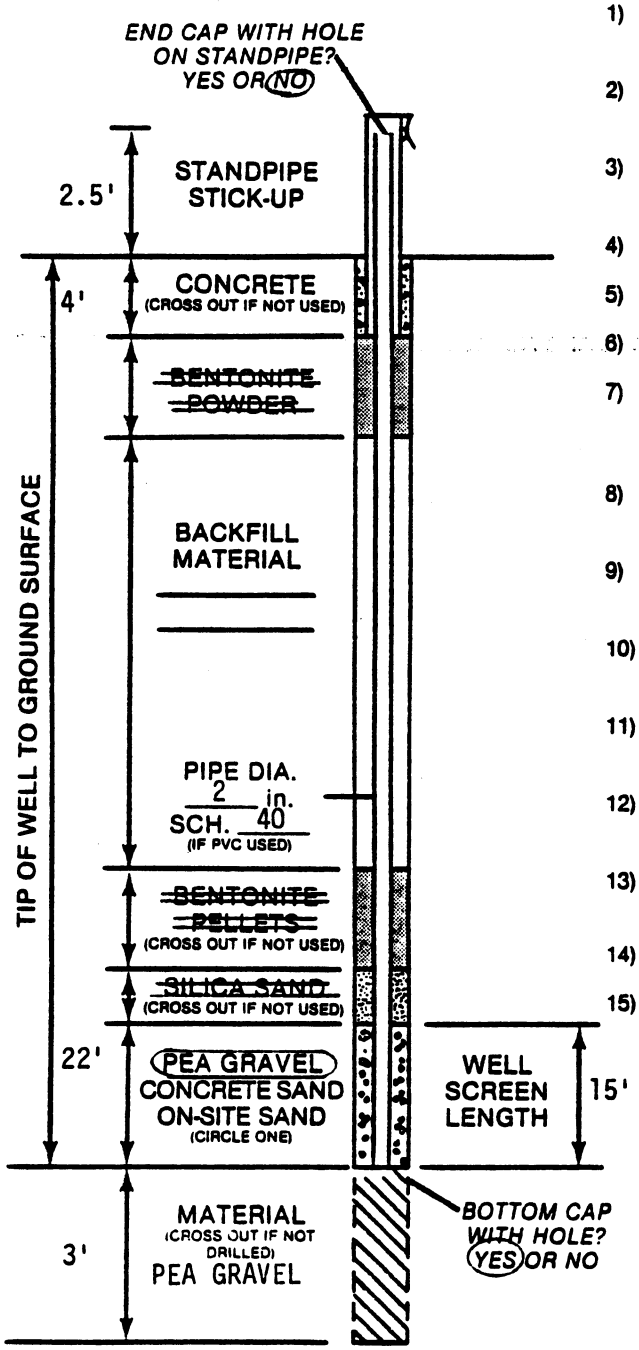
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC.) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED.) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC.) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID.) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR.) TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-4CL DATE INSTALLED 2-7-84 DRILL RIG Schramm

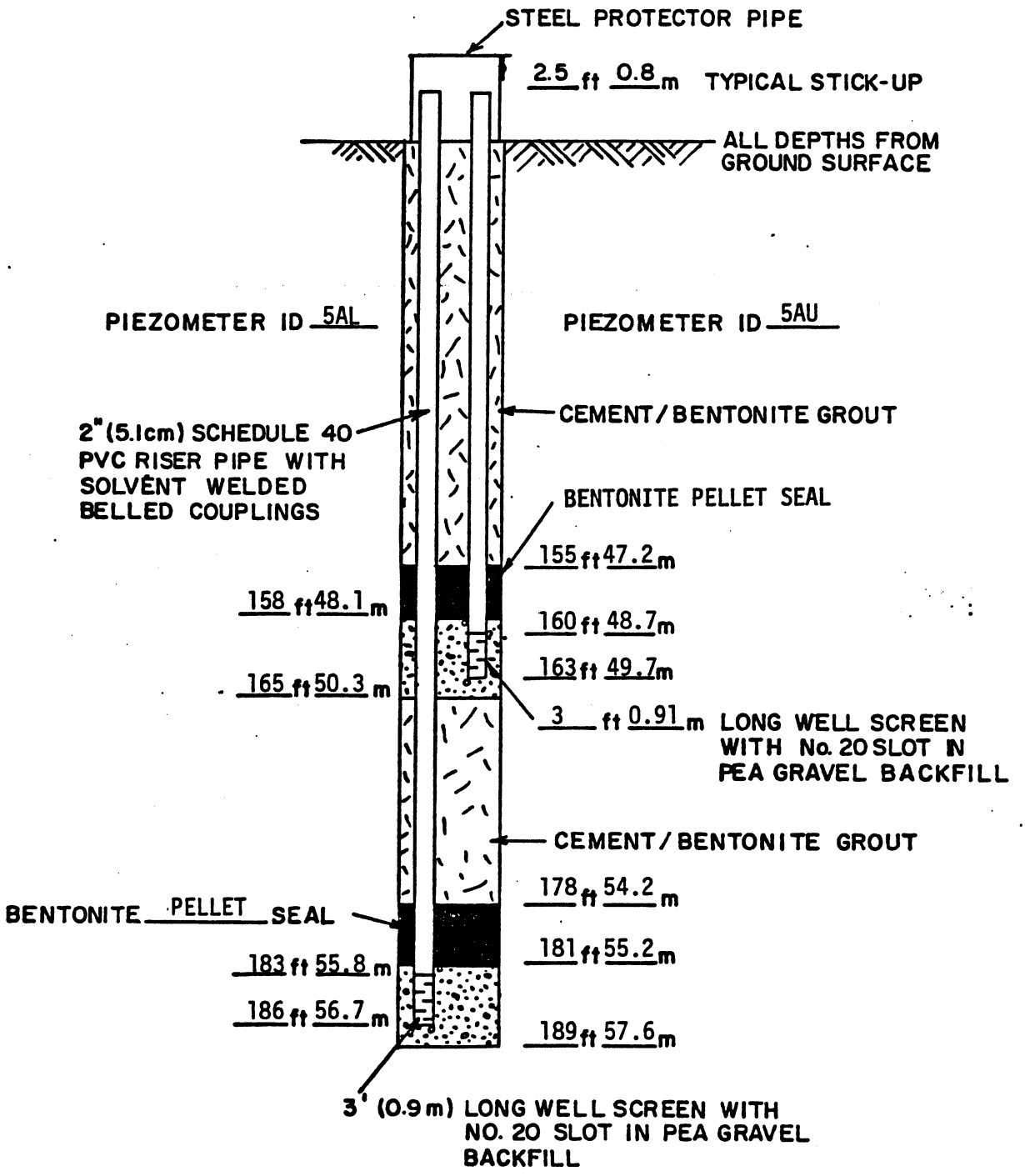
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-5AL & AU DATE INSTALLED 2/7-2/8/84 DRILL RIG Schramm

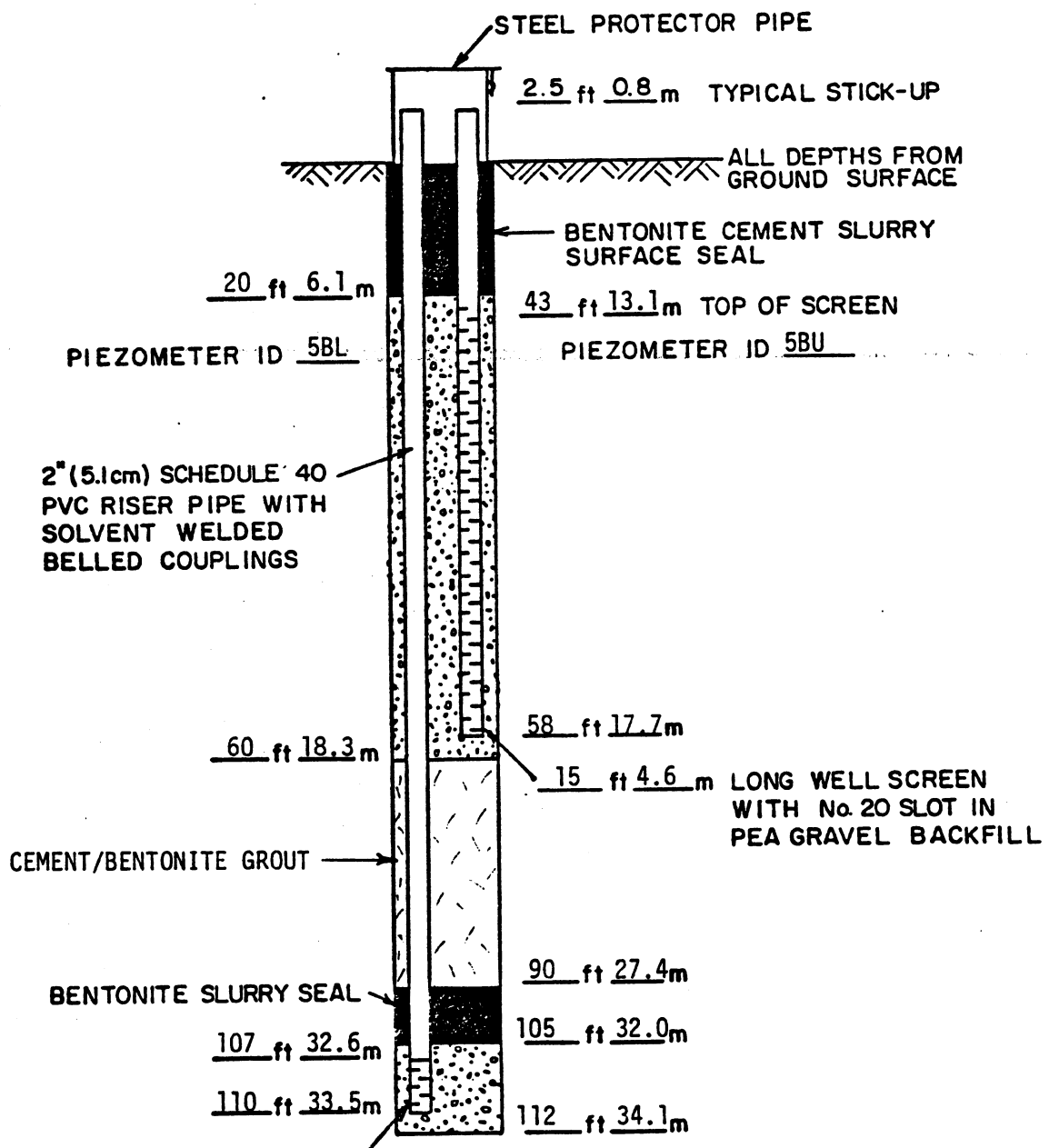
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: 5BU DRY - REPLACED BY 5CL

Well No. EX-5BL & BU DATE INSTALLED 2/15-2/16/84 DRILL RIG Schramm

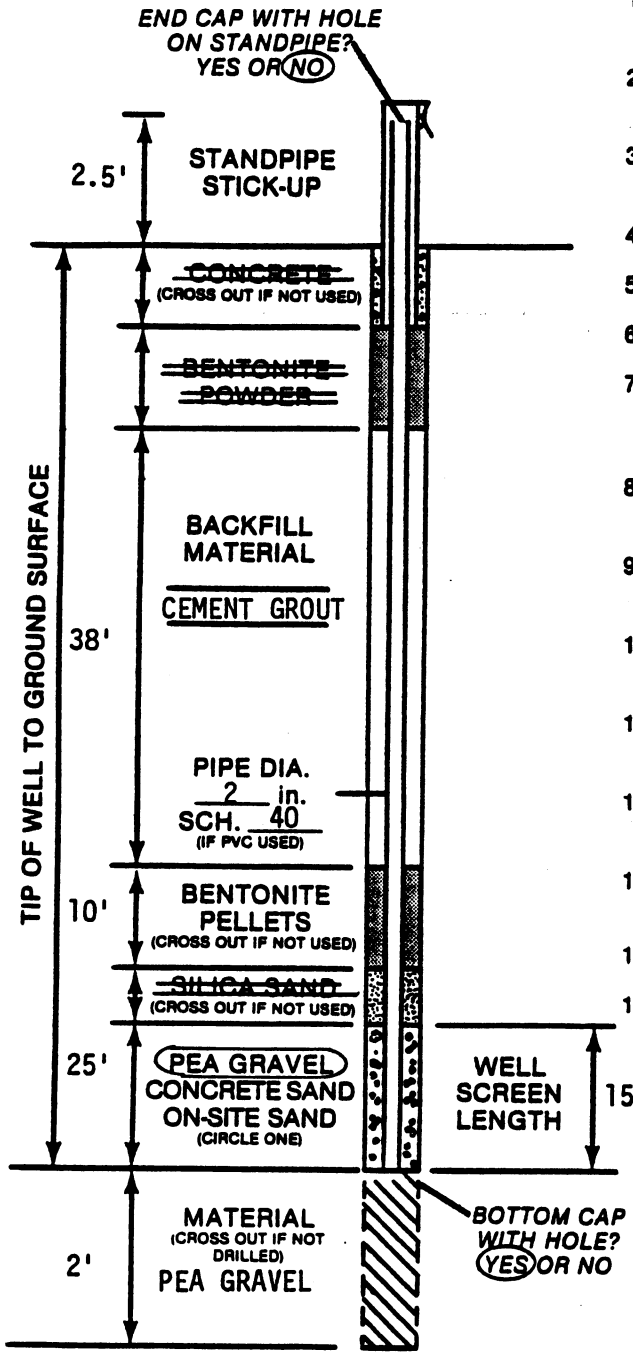
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-5CL DATE INSTALLED 4-3-84 DRILL RIG Schramm

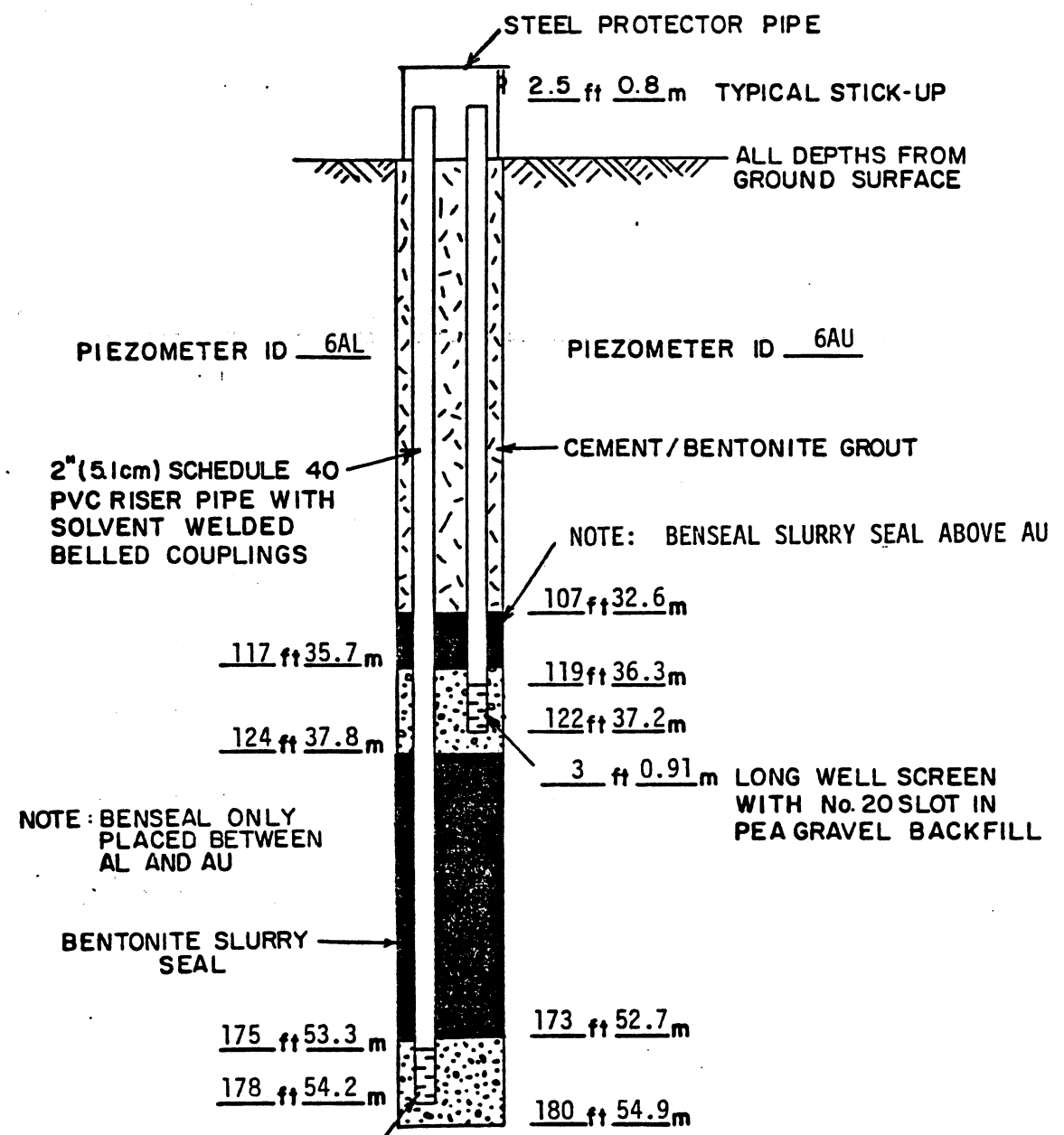
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-6AL & AU DATE INSTALLED 3/6-3/7/84 DRILL RIG Schramm

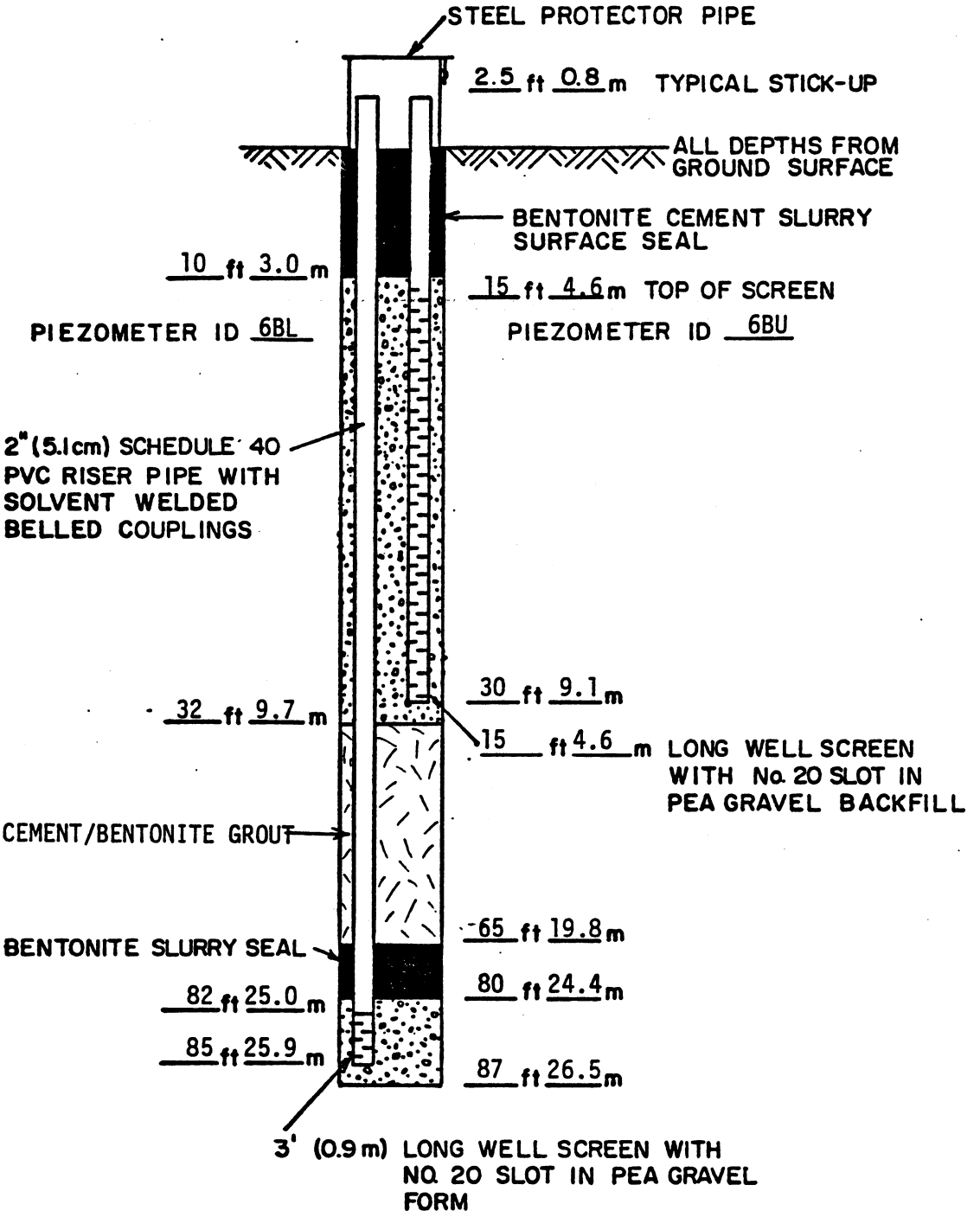
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-6BL & BU DATE INSTALLED 3-7-84 DRILL RIG Schramm

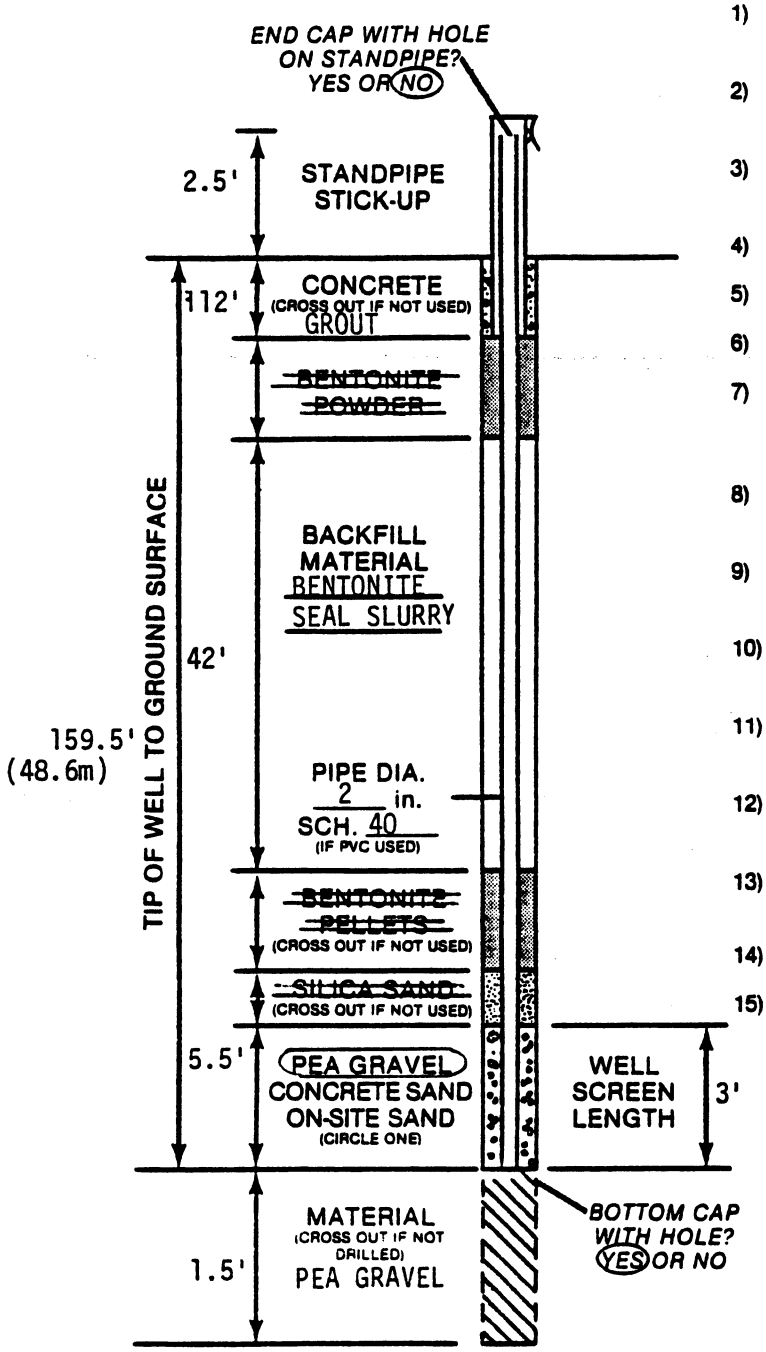
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC), GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED), COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.), OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID), OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR), TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-7AL DATE INSTALLED 3-8-84 DRILL RIG Schramm

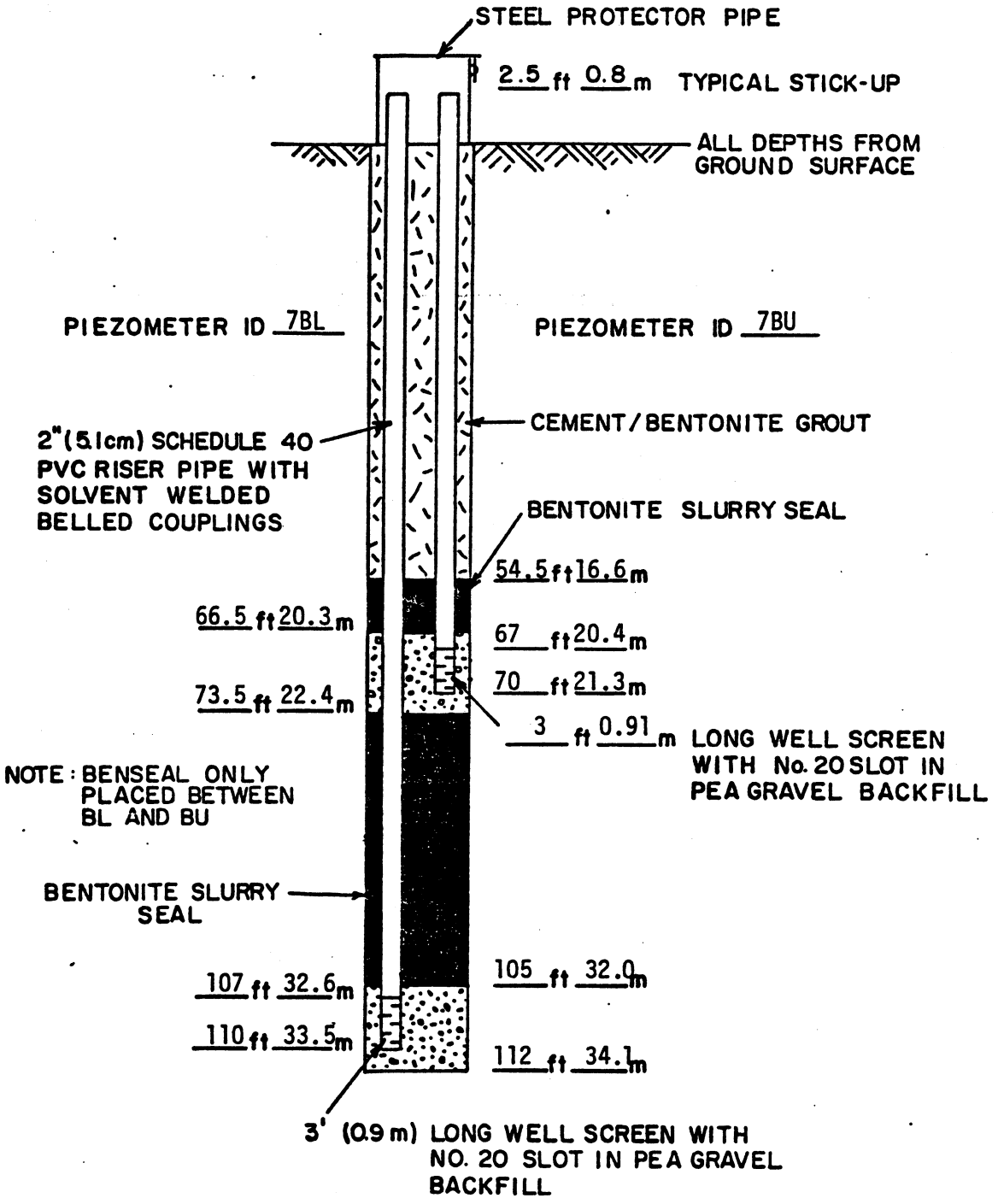
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-7BL & BU DATE INSTALLED 3-9-84 DRILL RIG Schramm

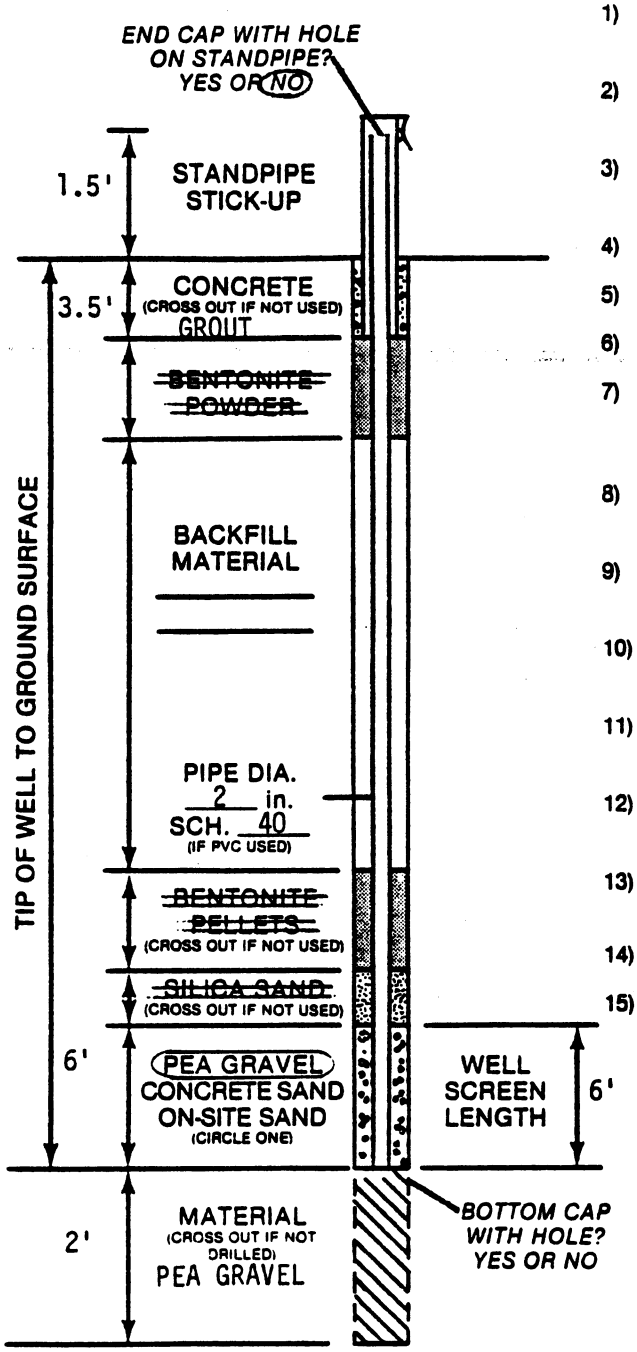
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC), GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED), COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No - Air Rotary
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.), OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
(CLEAR), TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR), TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. Well Point At EX-7 (EX-7CL) DATE INSTALLED 3-8-84 DRILL RIG Schramm

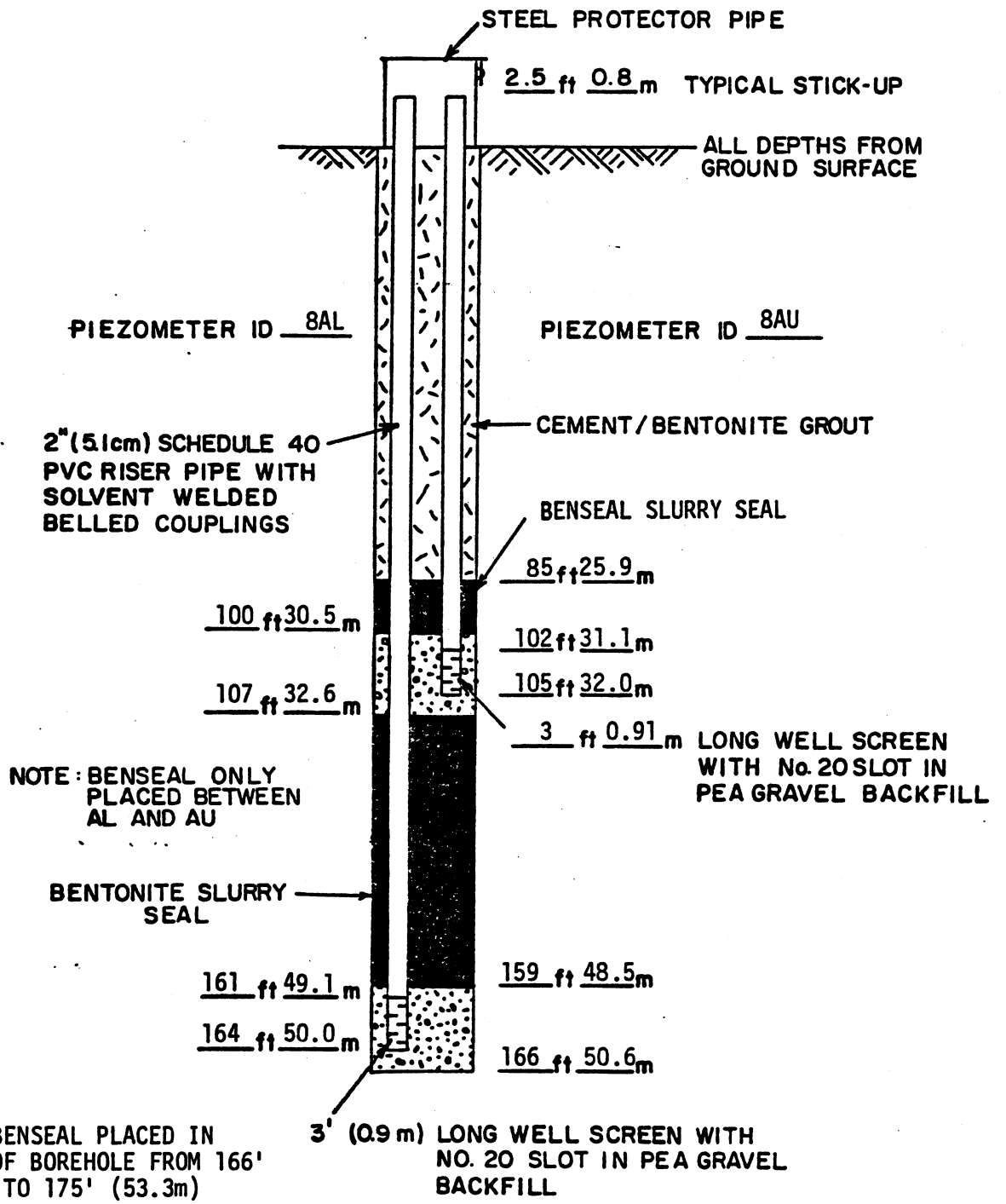
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-8AL & AU DATE INSTALLED 3-14-84 DRILL RIG Schramm

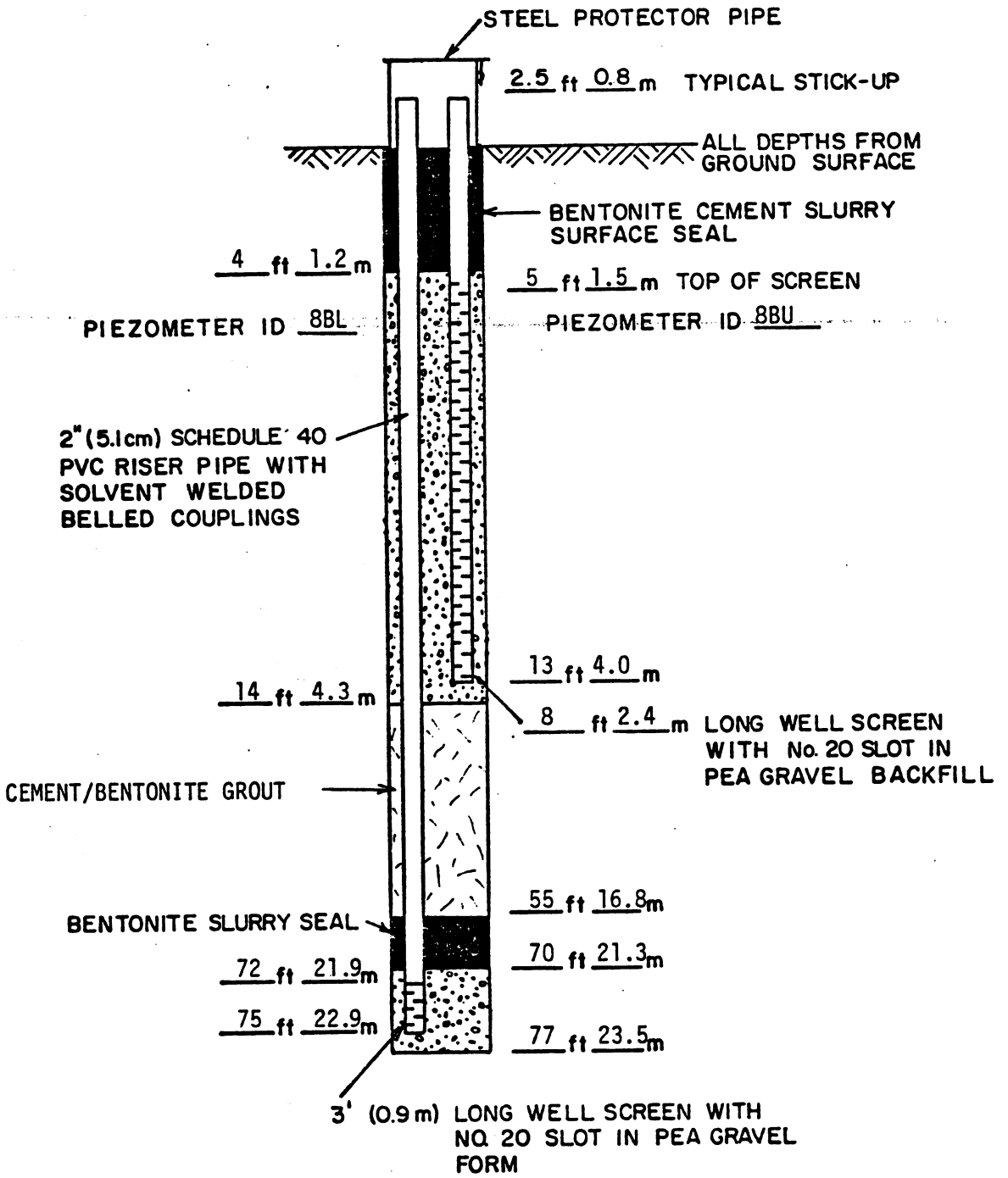
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-8BL & BU DATE INSTALLED 3-12-84 DRILL RIG Schramm

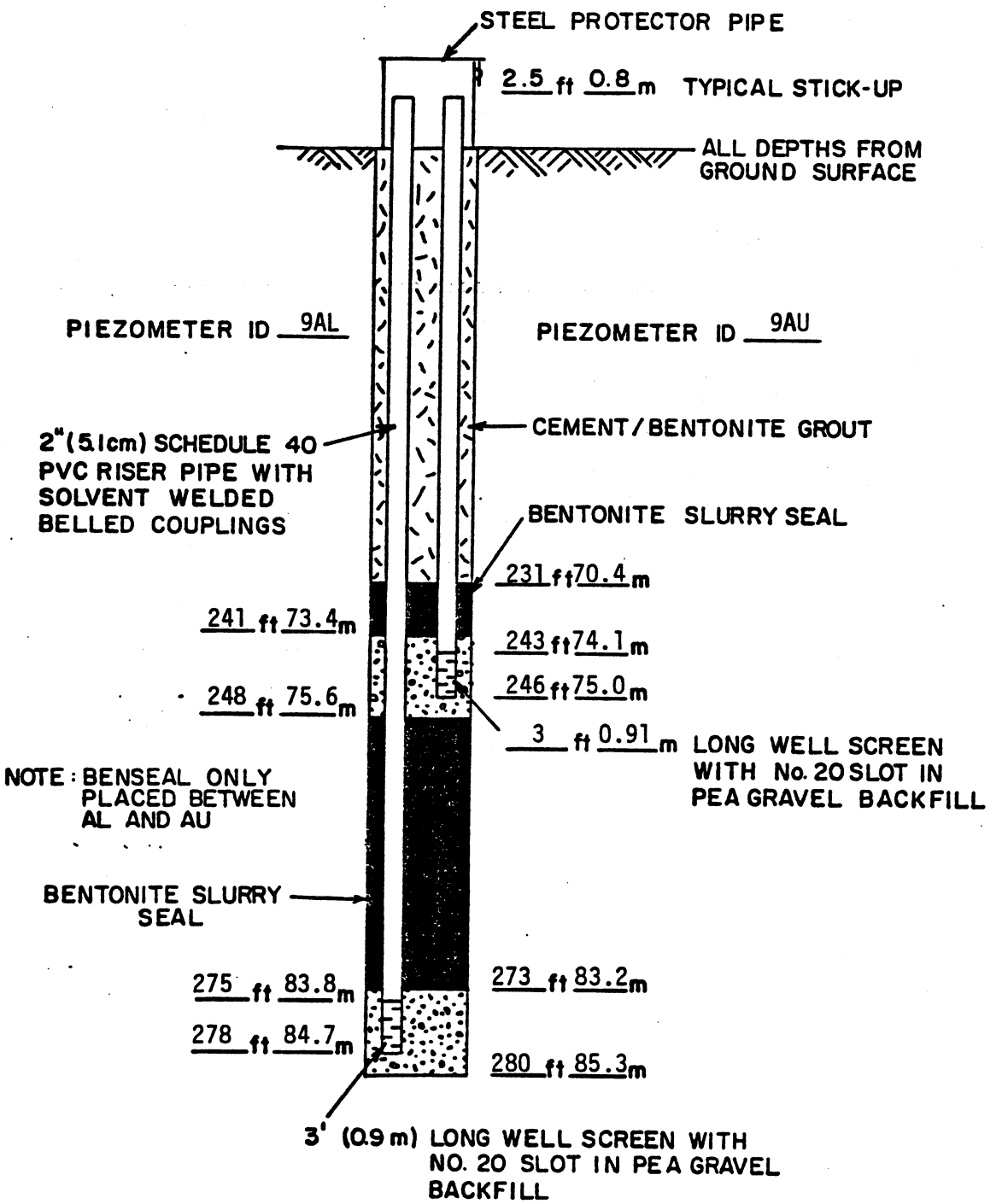
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-9AL & AU DATE INSTALLED 3-21-84 DRILL RIG Schramm

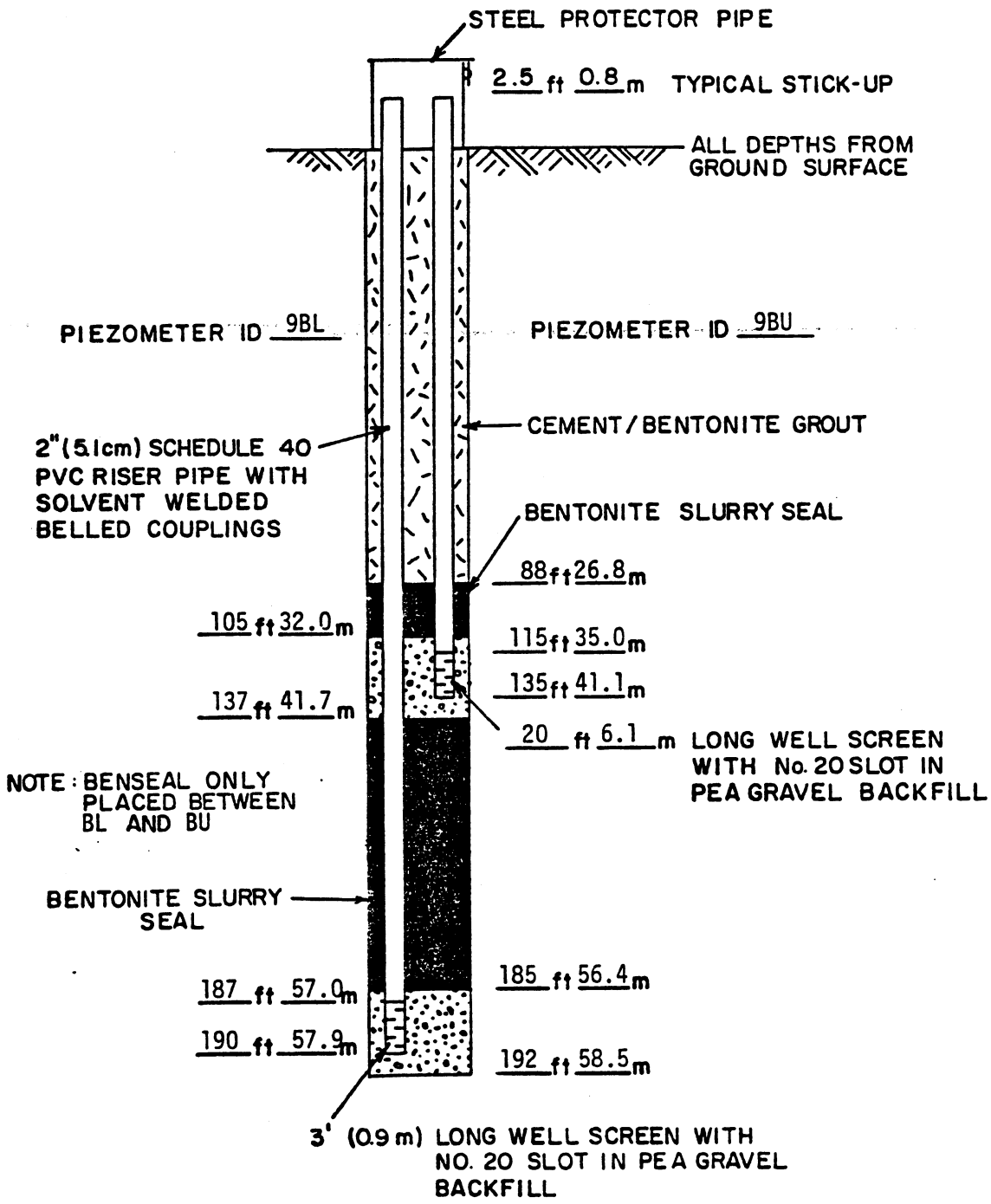
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-9BL & BU DATE INSTALLED 3-30-84 DRILL RIG Schramm

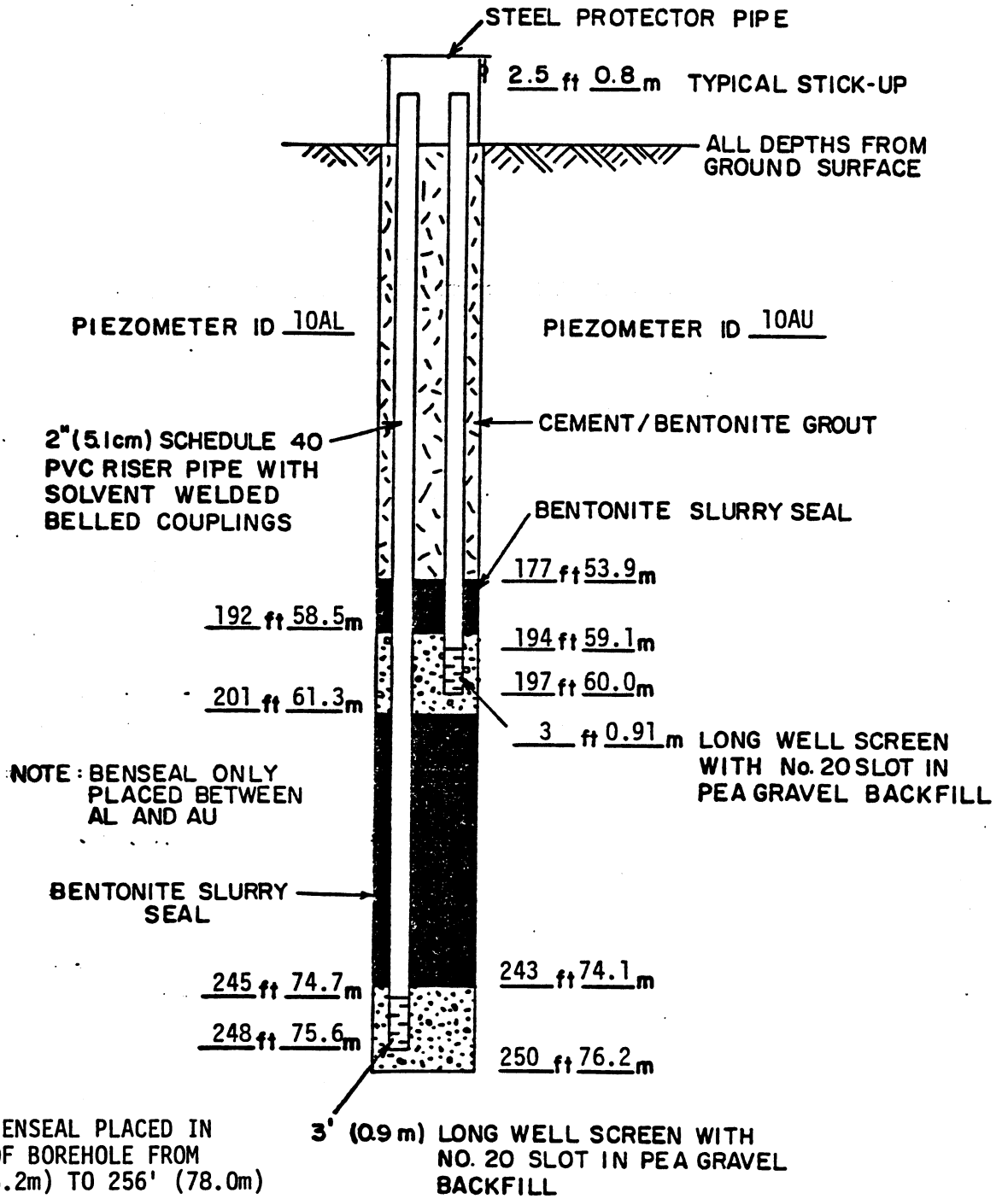
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-10AL & AU DATE INSTALLED 3-16-84 DRILL RIG Schramm

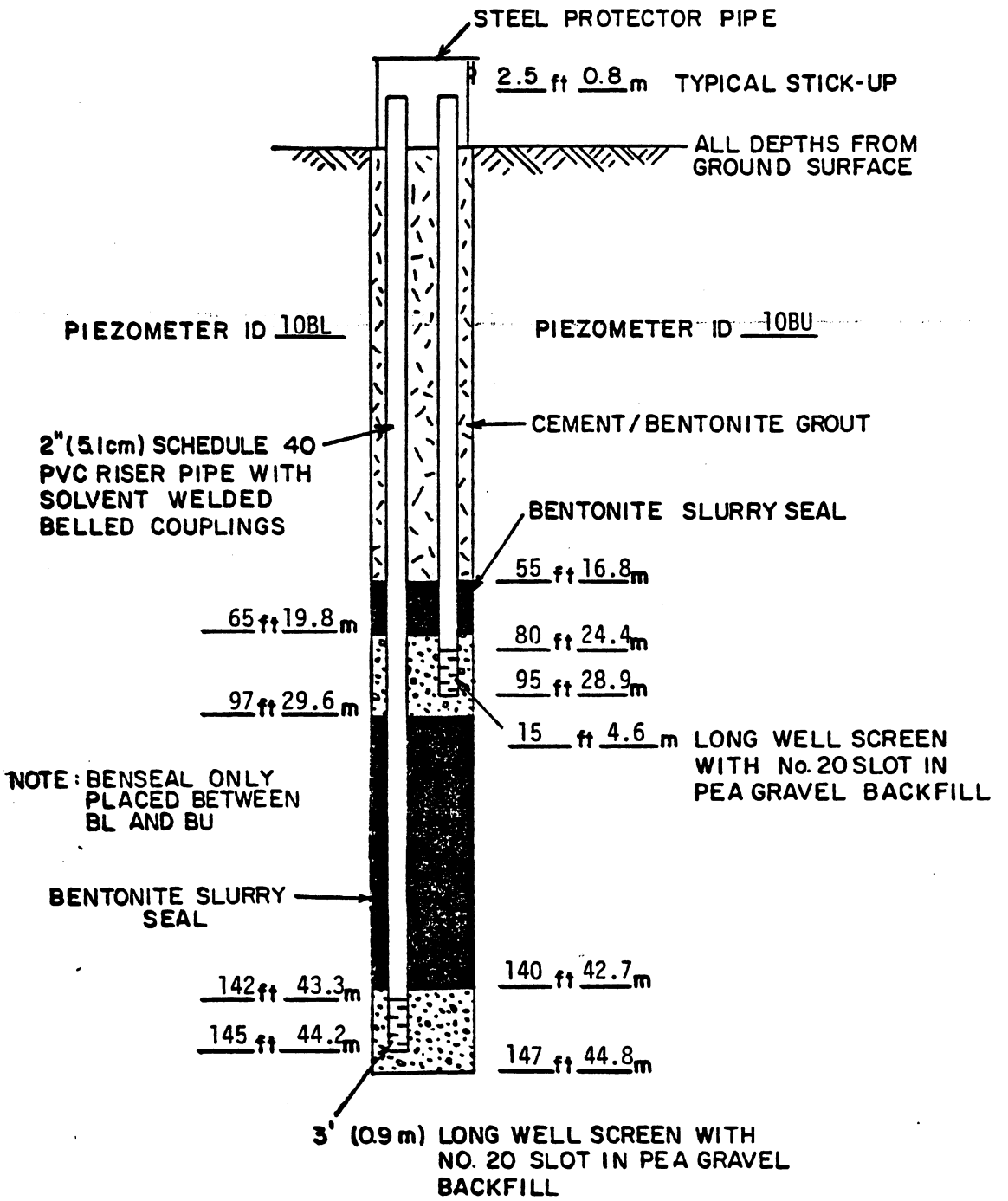
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-10BL & BU DATE INSTALLED 3-16-84 DRILL RIG Schramm

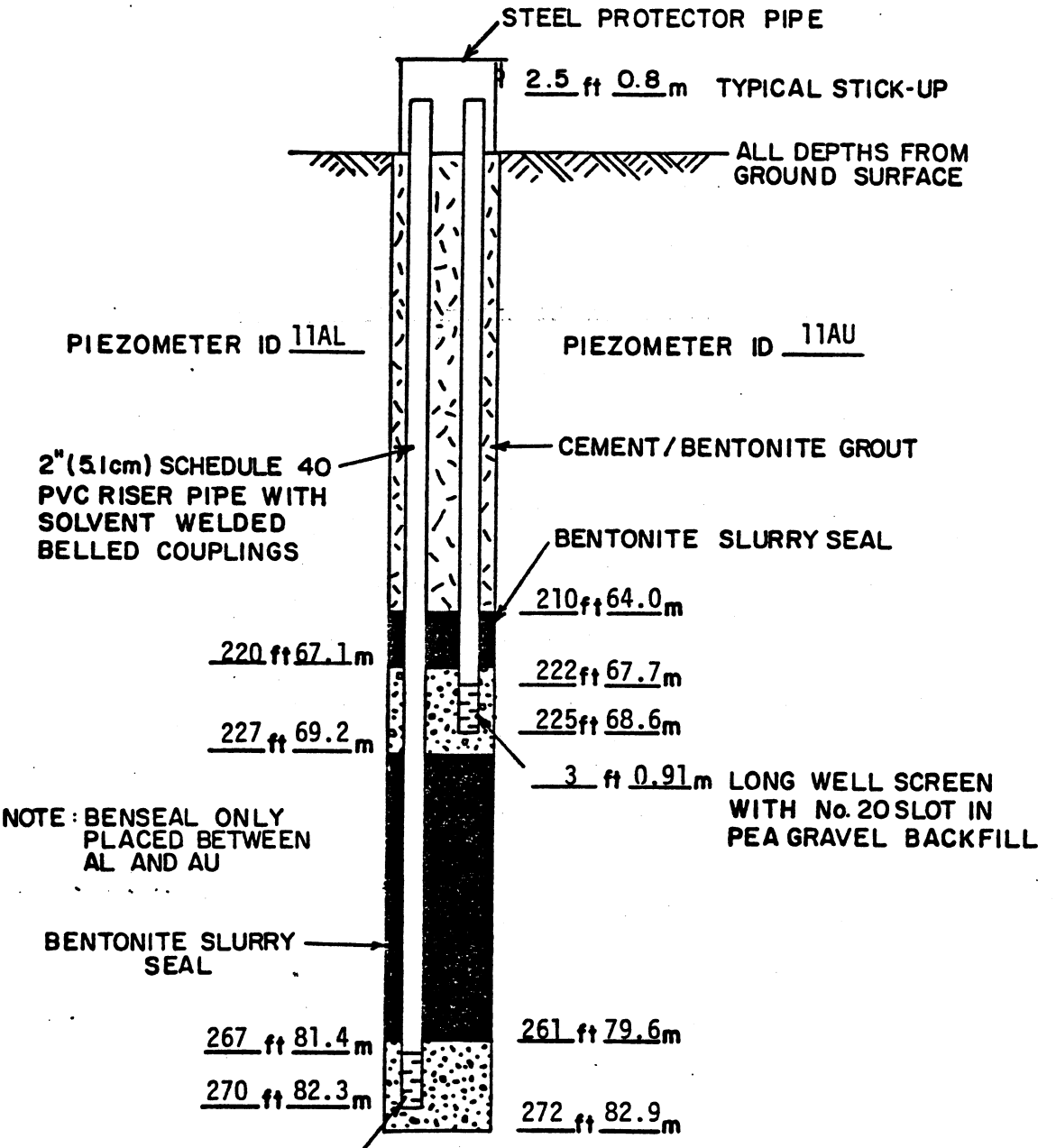
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-11AL & AU DATE INSTALLED 3-24-84 DRILL RIG Schramm

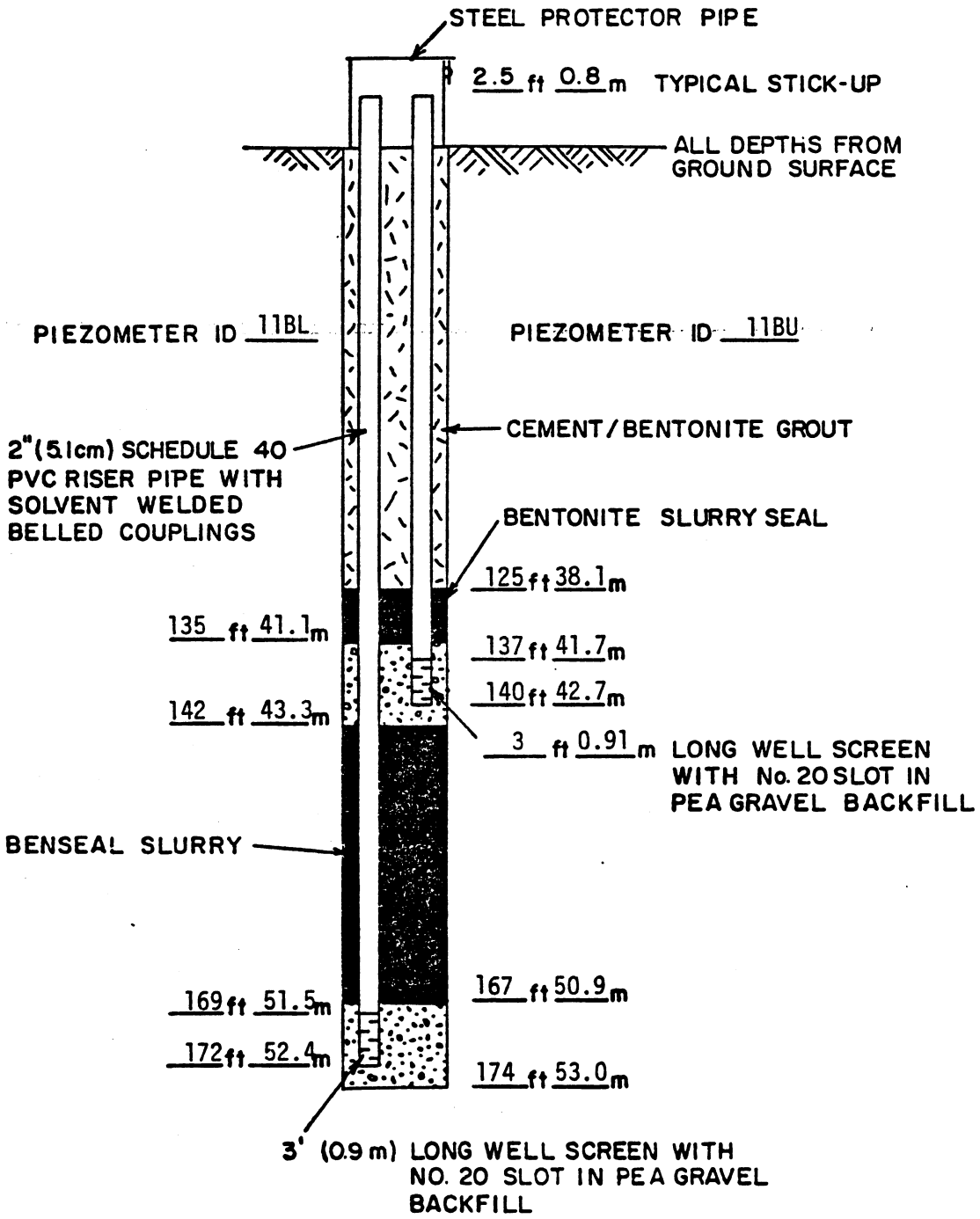
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-11BL & BU DATE INSTALLED 3-25-84 DRILL RIG Schramm

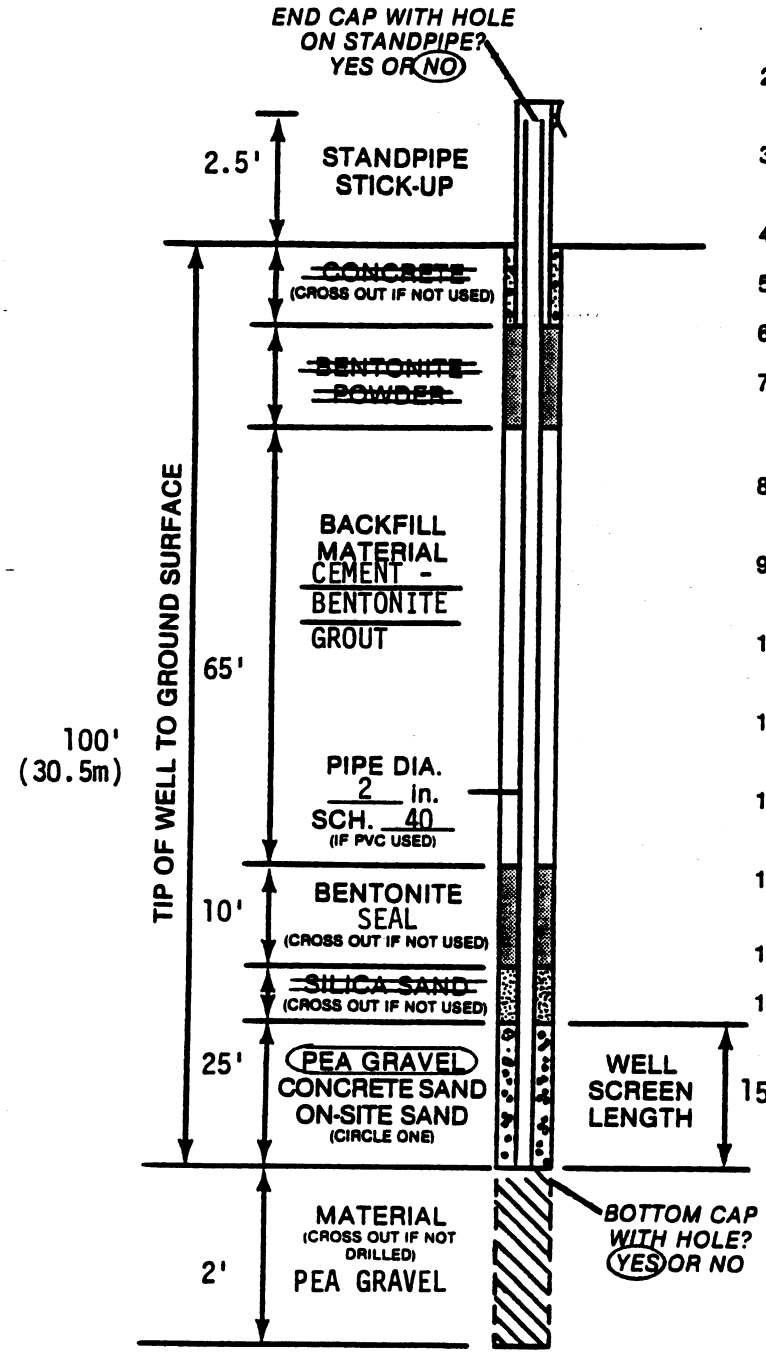
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-11CL DATE INSTALLED 3-27-84 DRILL RIG Schramm

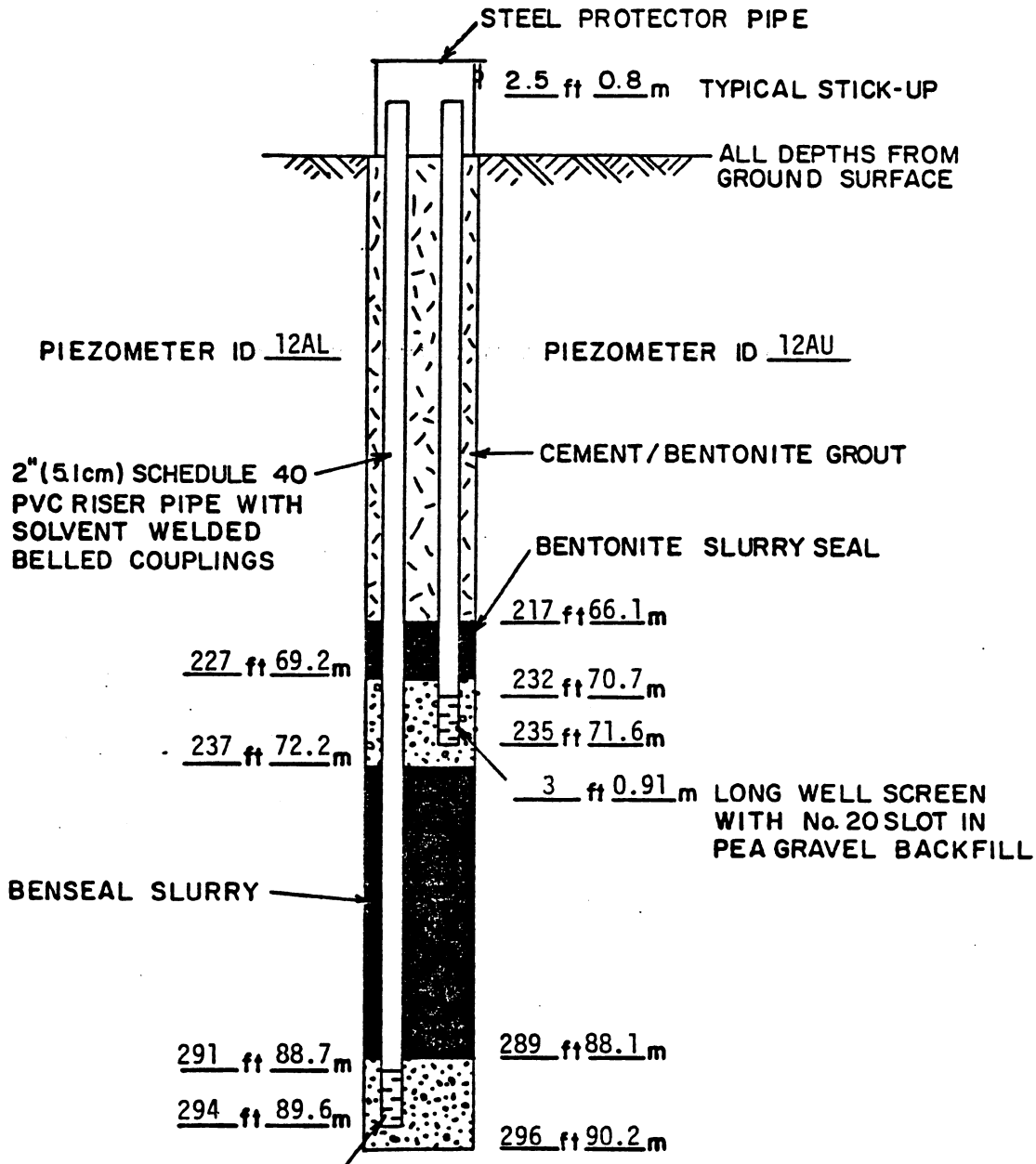
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 296' (90.2m) TO 305' (93.0m)

Well No. EX-12AL & AU DATE INSTALLED 3/2-3/7/84 DRILL RIG Schramm

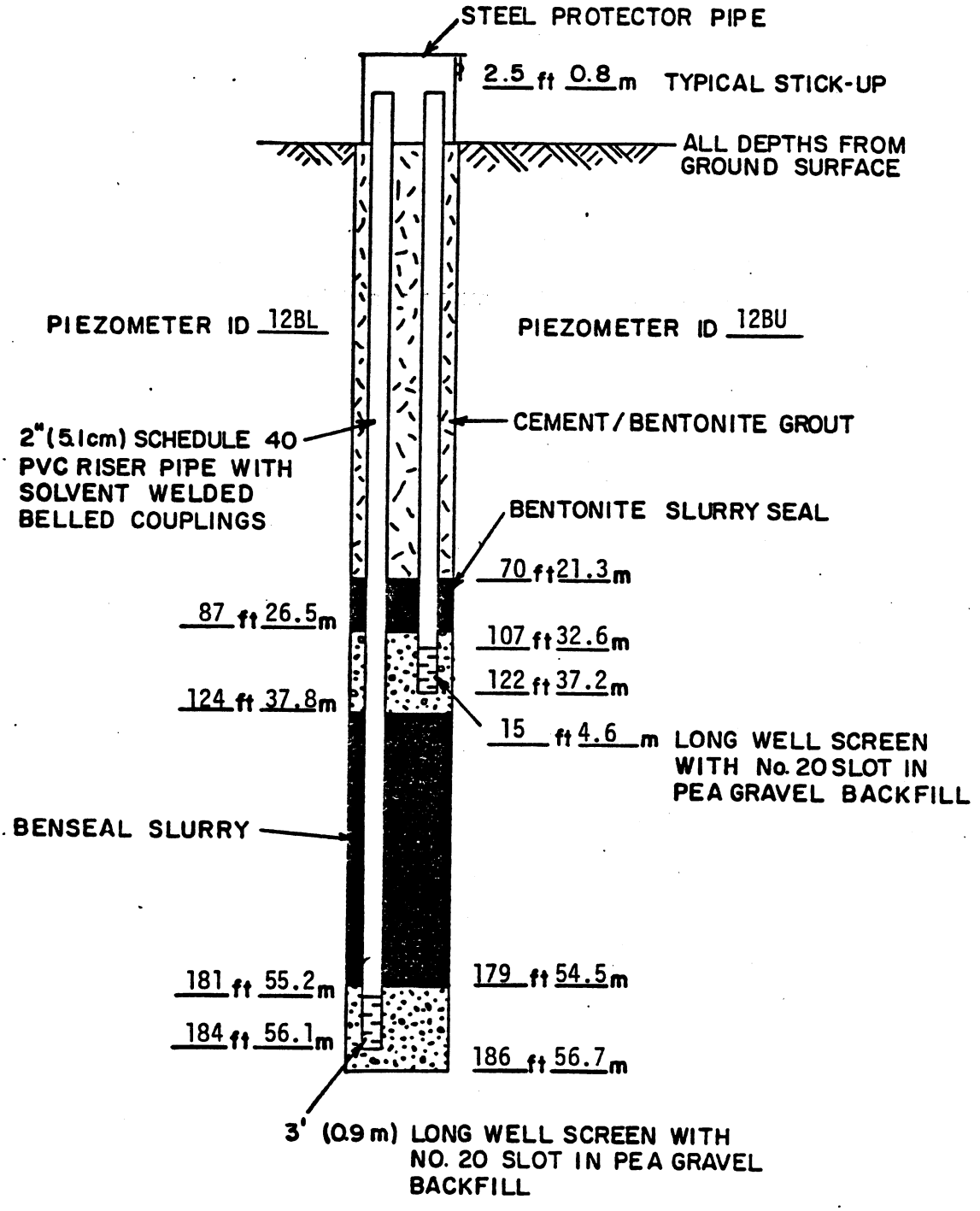
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-12BL & BU DATE INSTALLED 3-7-84 DRILL RIG Schramm

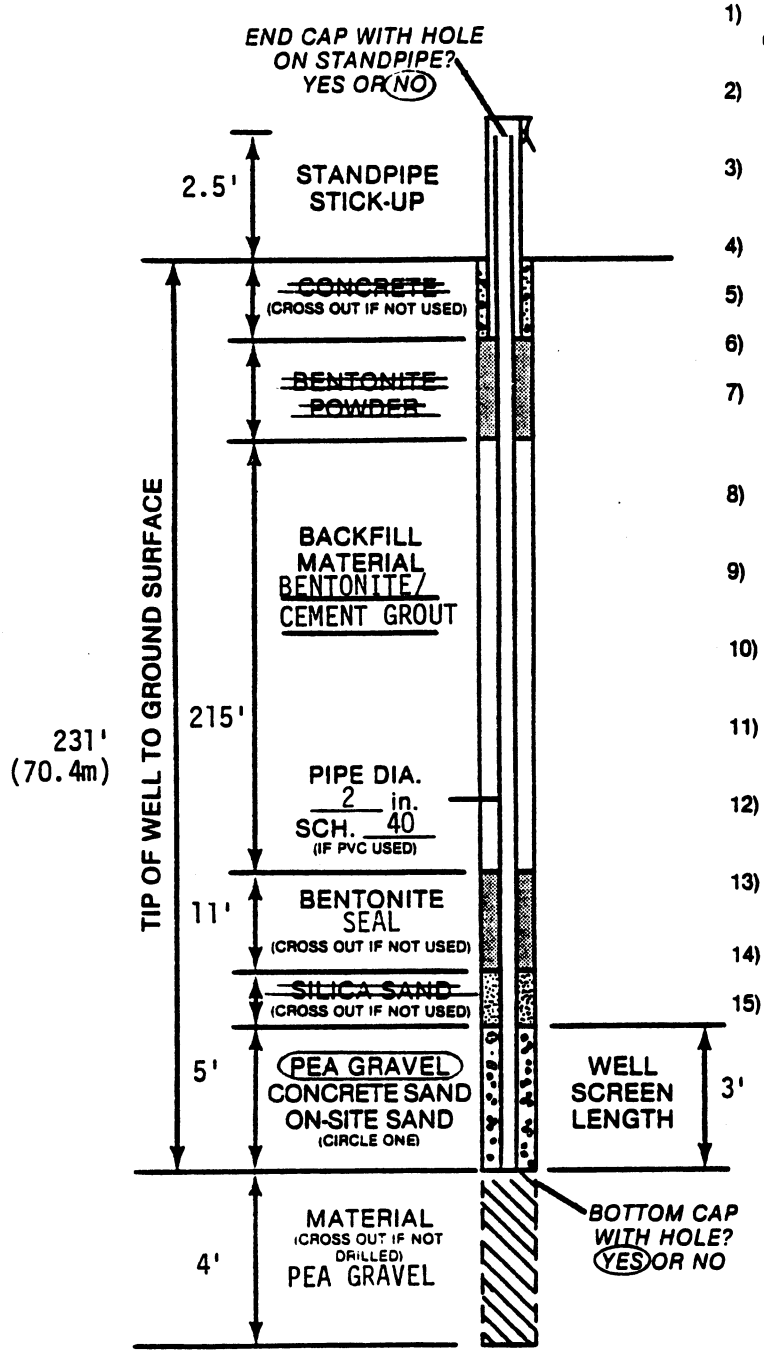
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13AL DATE INSTALLED 2-20-84 DRILL RIG Schramm

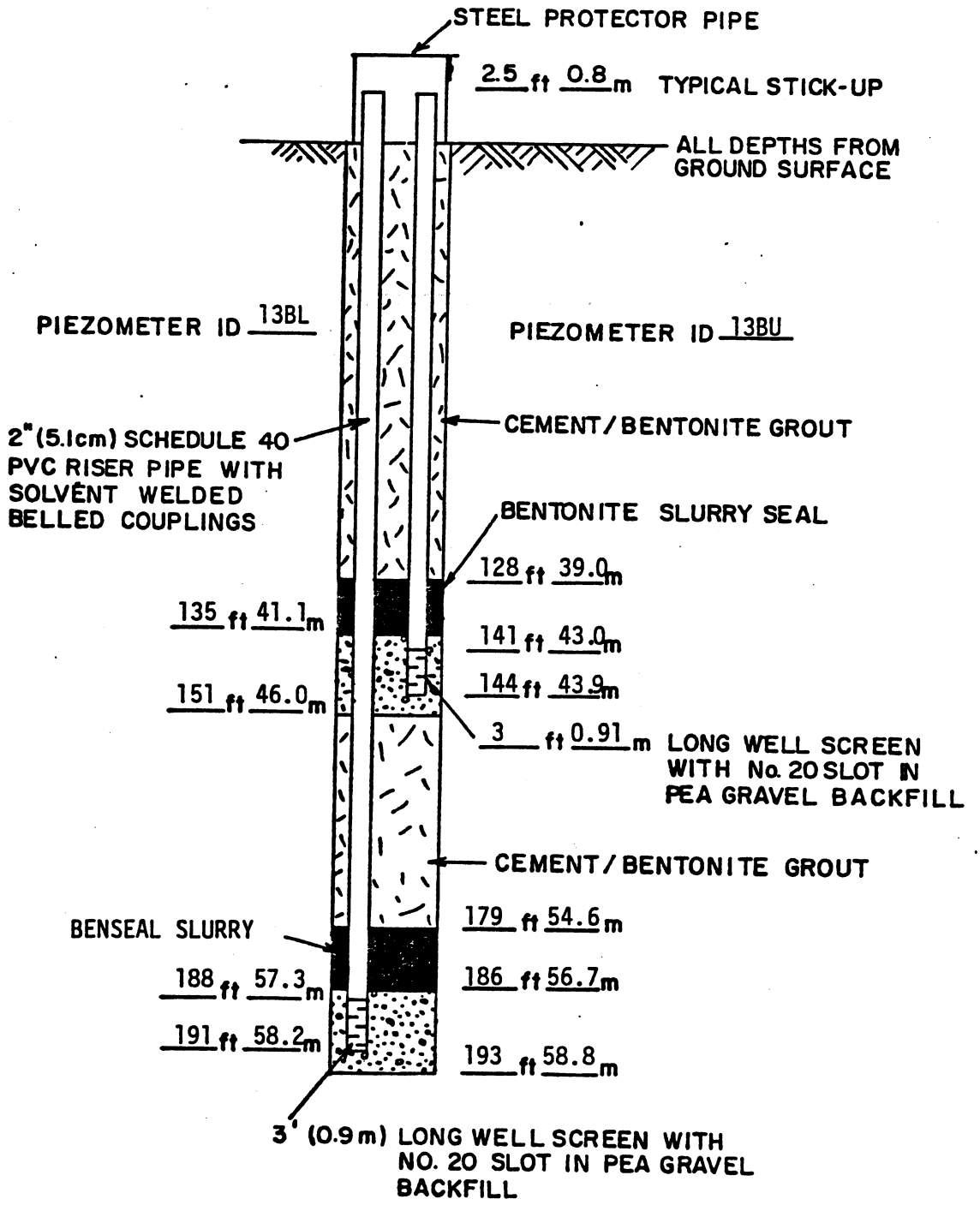
DRILLER Lusier DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-13BL & BU DATE INSTALLED 2/21-2/22/84 DRILL RIG Schramm

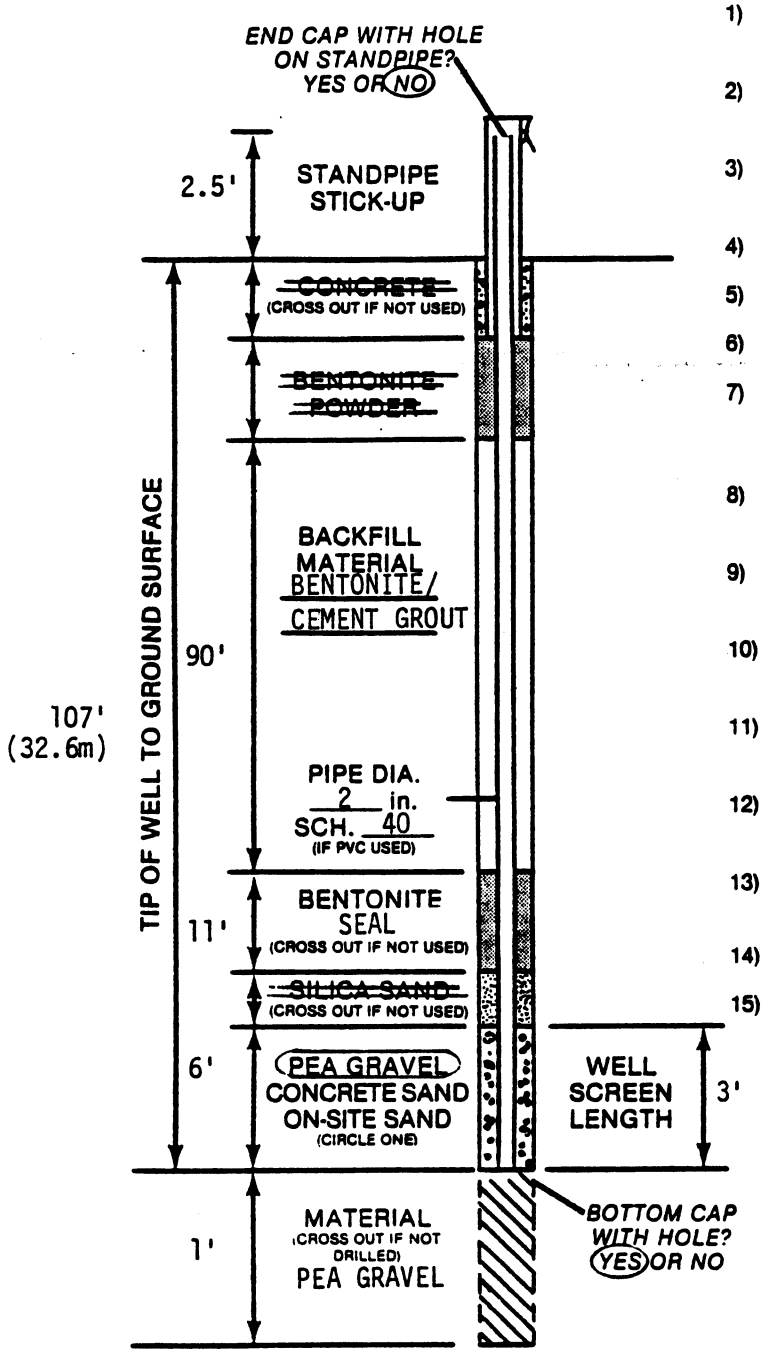
DRILLER Lusiers DRILL CREW Ken

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13CL DATE INSTALLED 2-27-84 DRILL RIG Schramm

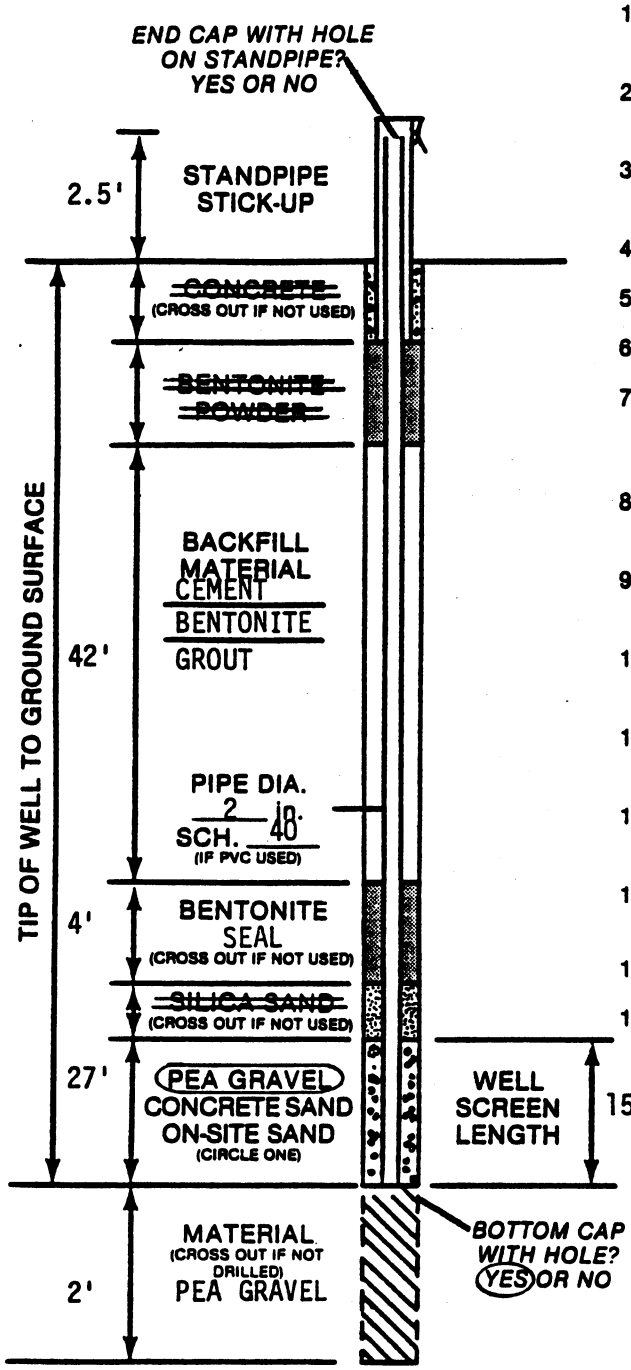
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13DL DATE INSTALLED 2-29-84 DRILL RIG Schramm

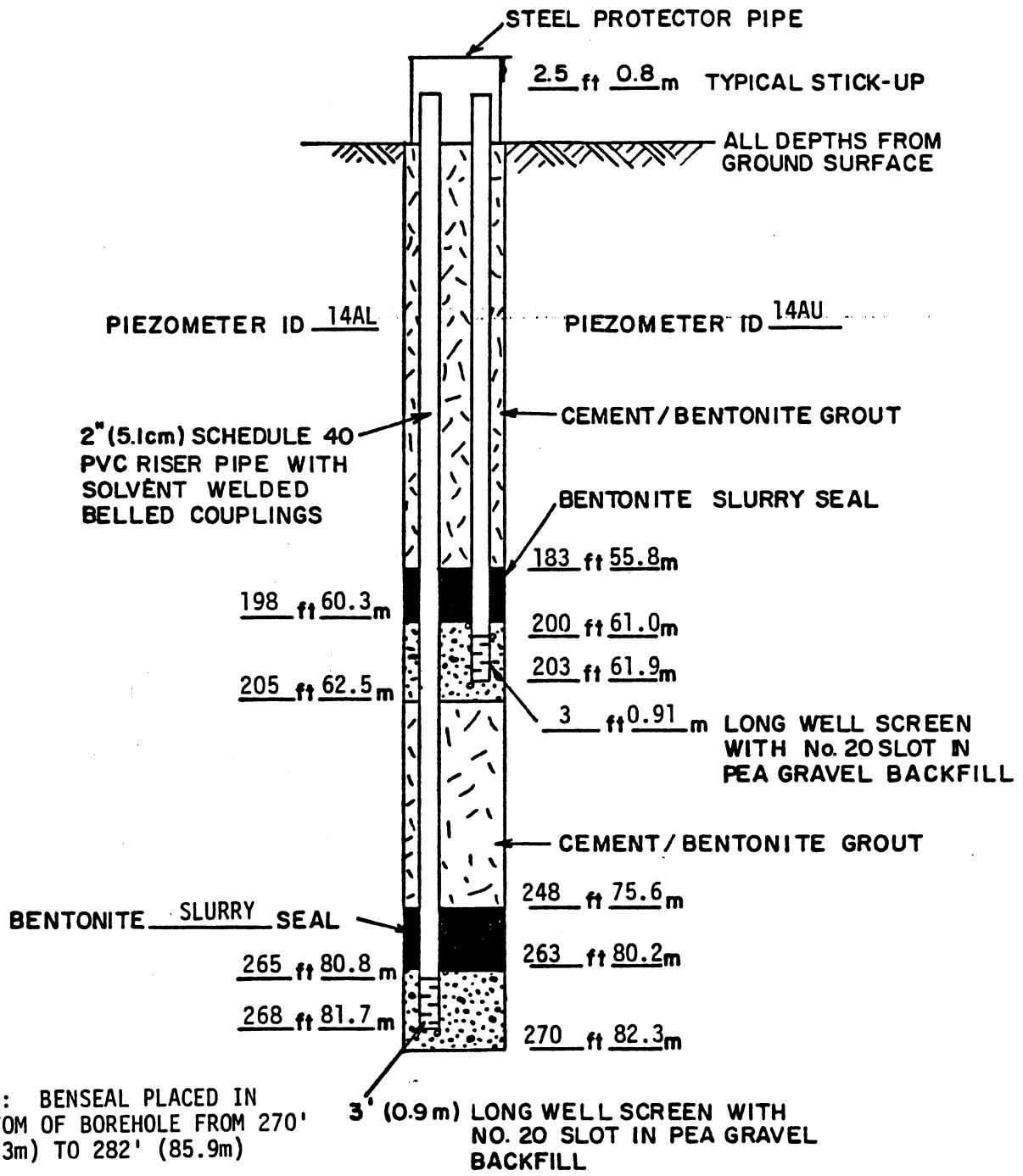
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-14AL & AU DATE INSTALLED 2-23-84 DRILL RIG Schramm

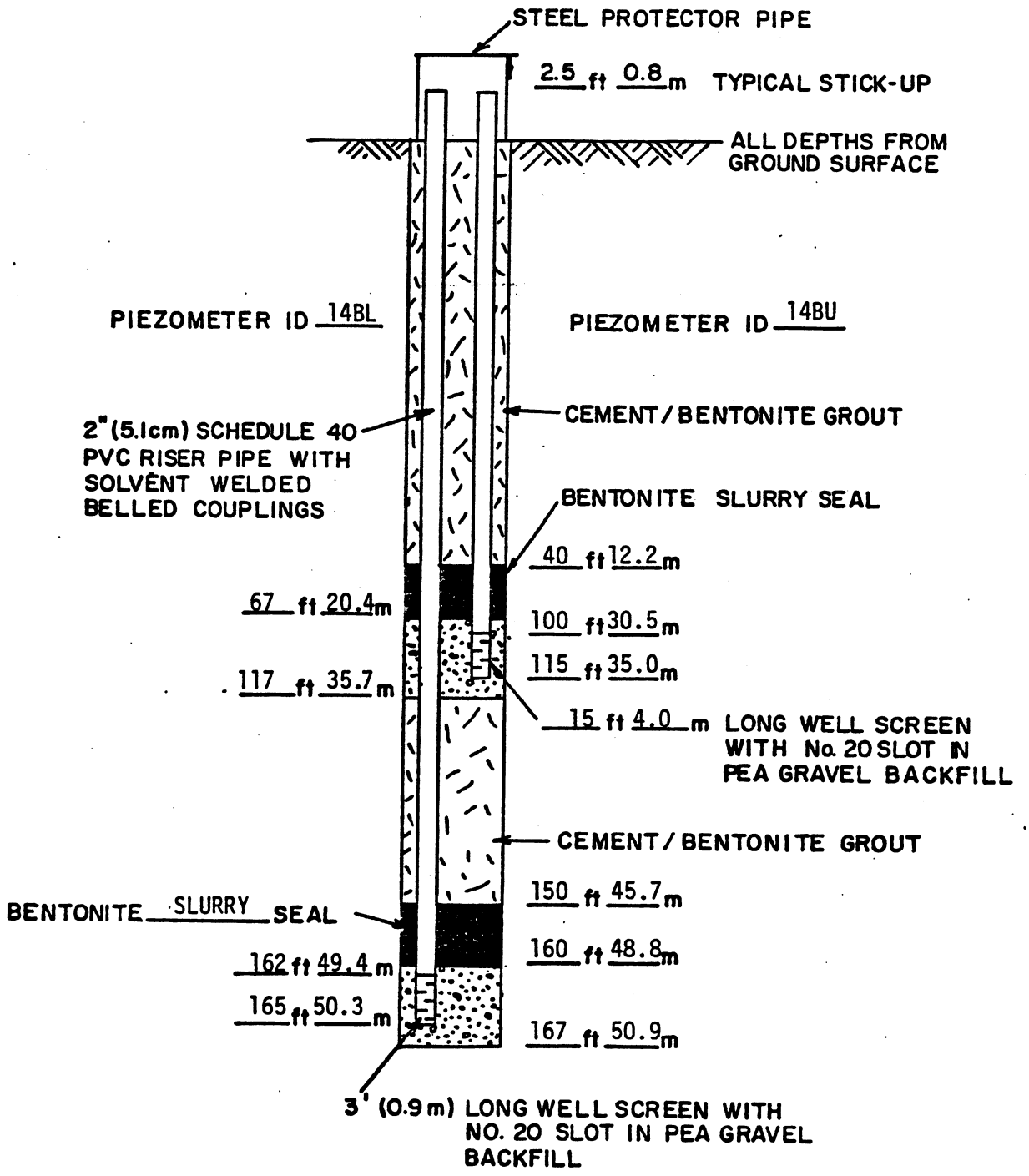
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-14BL & BU DATE INSTALLED 2-25-84 DRILL RIG Schramm

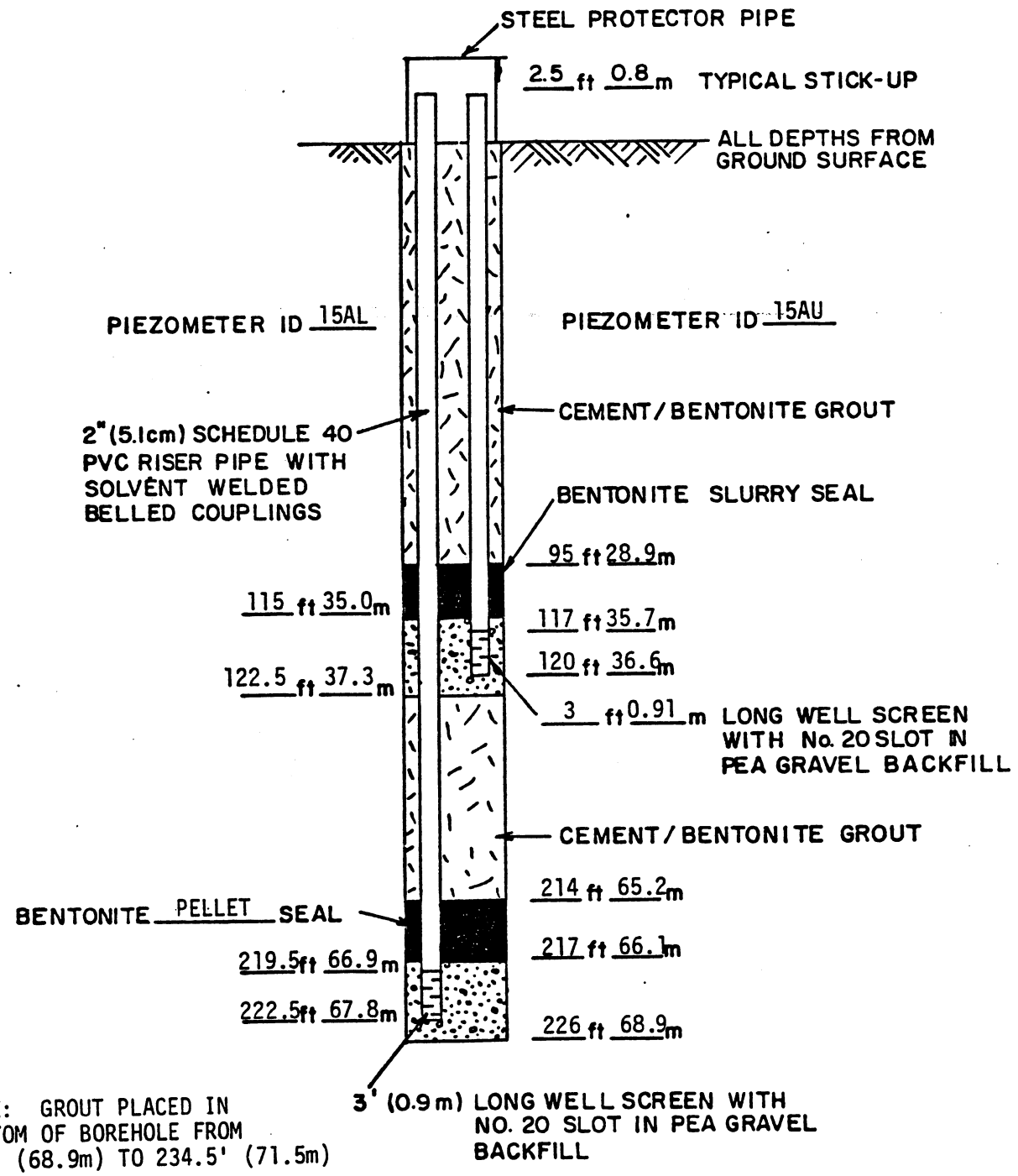
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: GROUT PLACED IN BOTTOM OF BOREHOLE FROM 226' (68.9m) TO 234.5' (71.5m)

Well No. EX-15AL & AU DATE INSTALLED 2/10-2/12/84 DRILL RIG Schramm

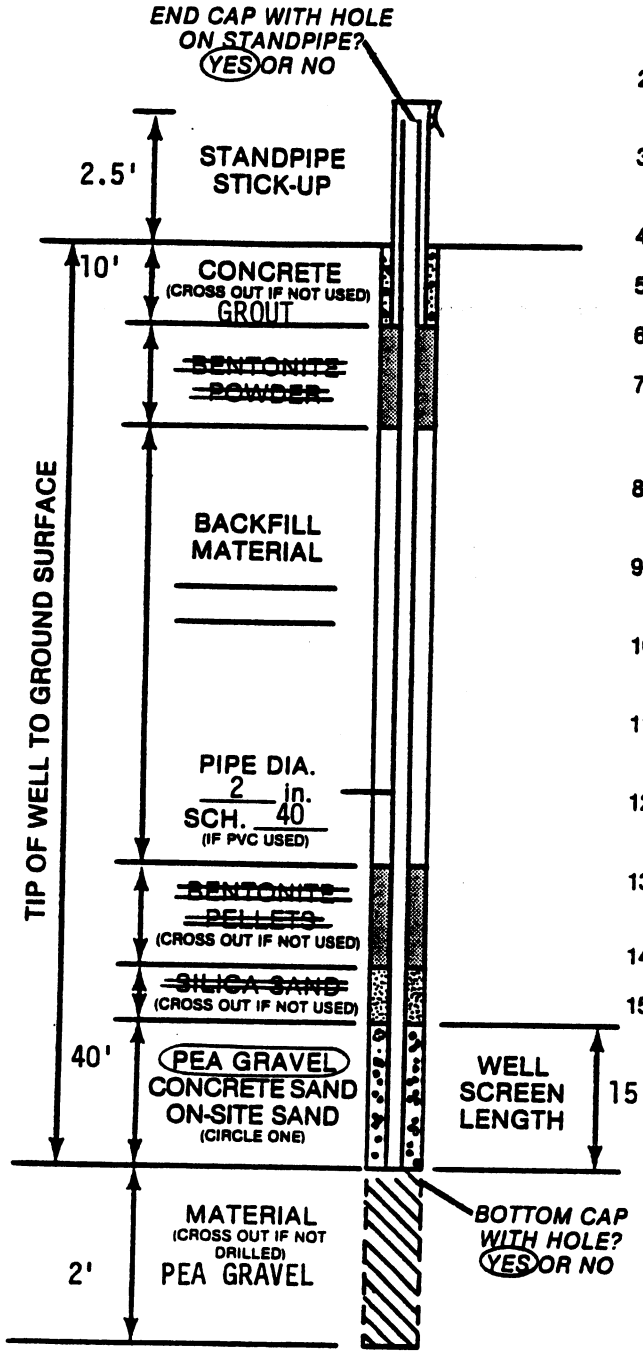
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-15BL DATE INSTALLED 2-11-84 DRILL RIG Schramm

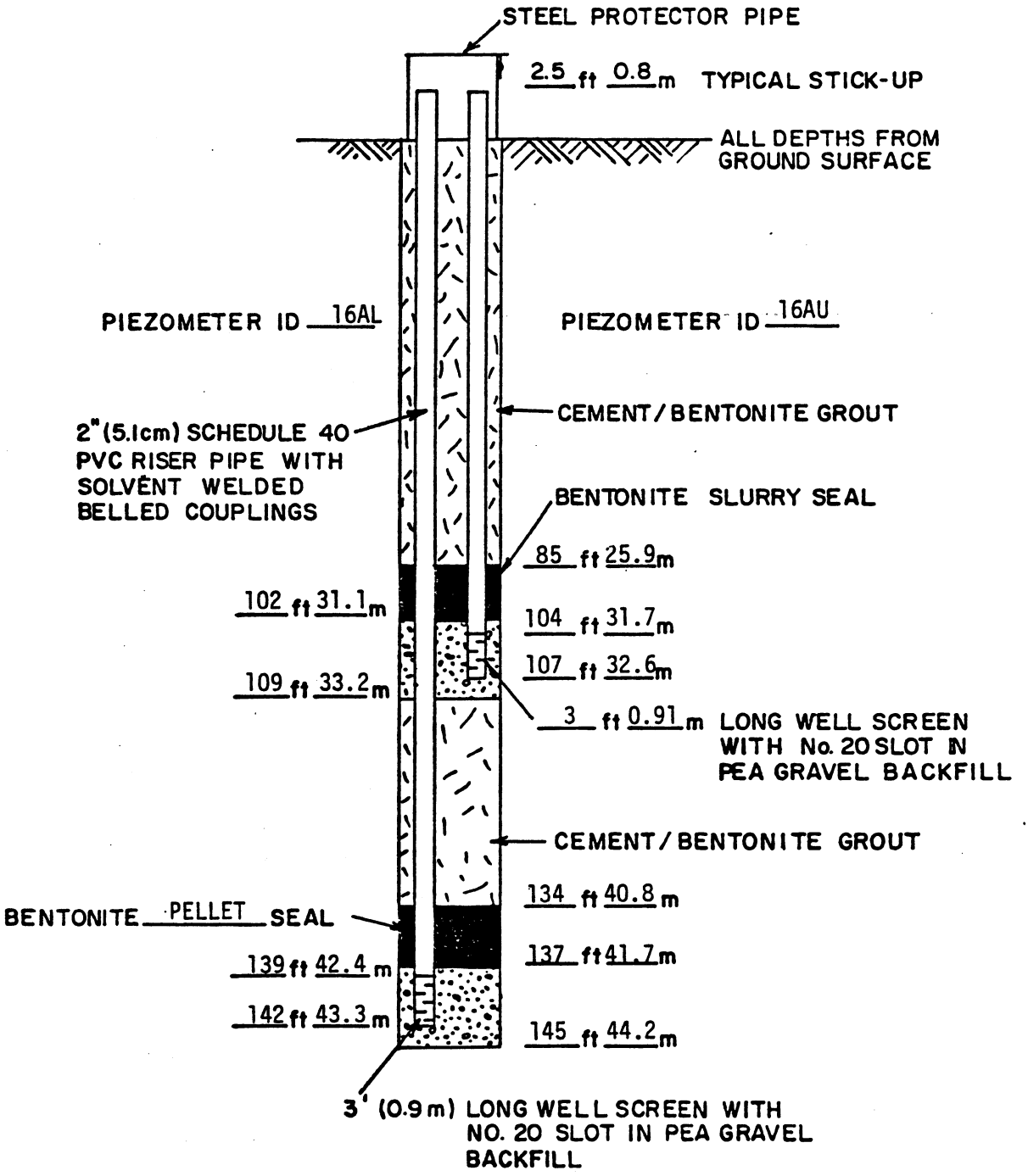
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-16AL & AU DATE INSTALLED 2/13-2/14/84 DRILL RIG Schramm

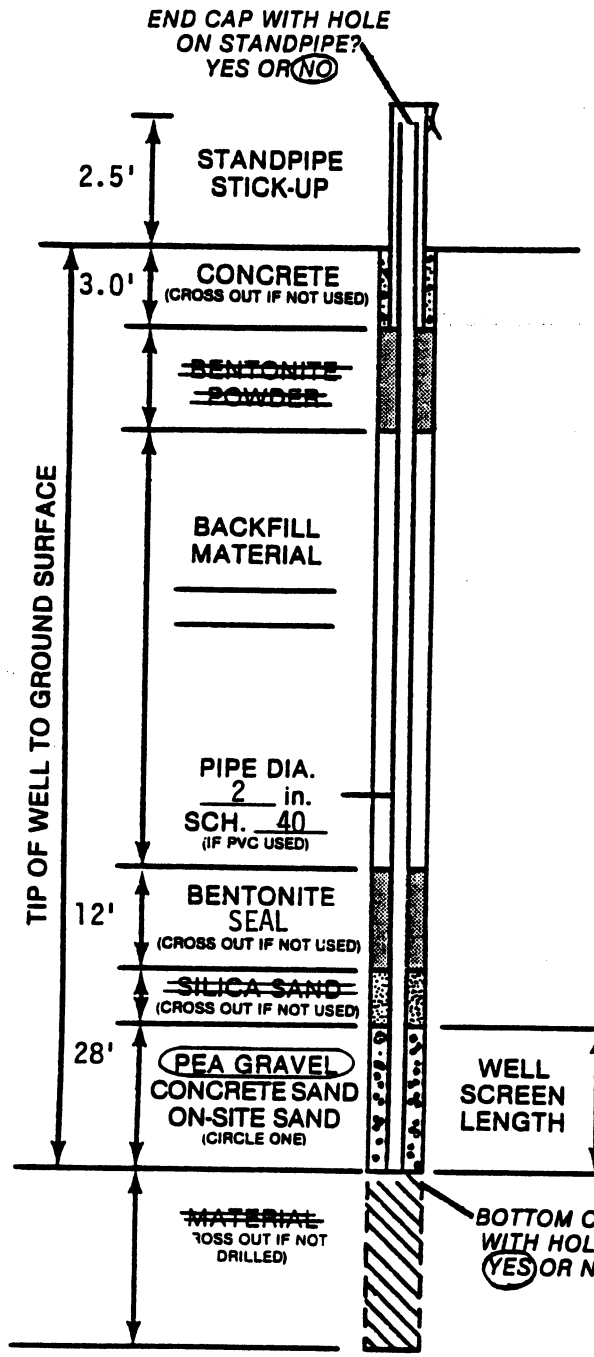
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC), GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED), COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-16BL DATE INSTALLED 3-1-84 DRILL RIG Schramm

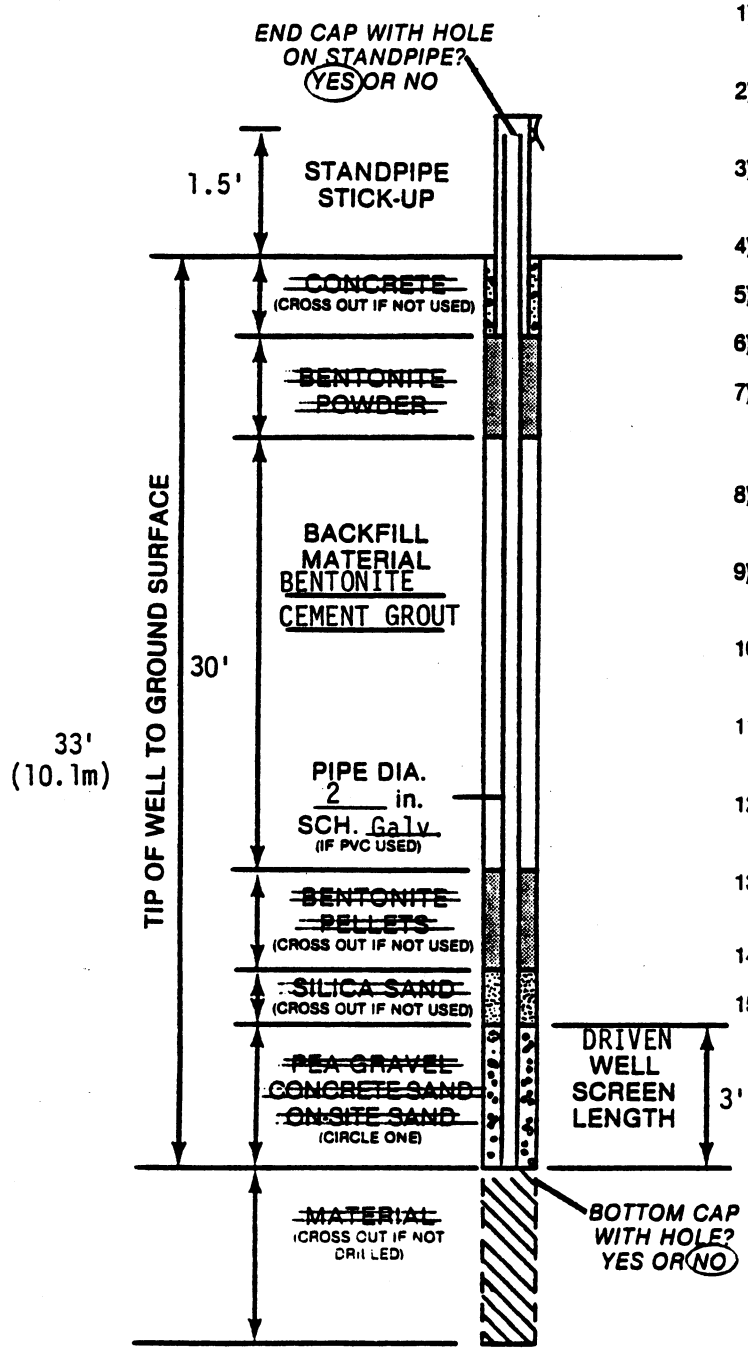
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-1L DATE INSTALLED 3-15-84 DRILL RIG Bomb 55

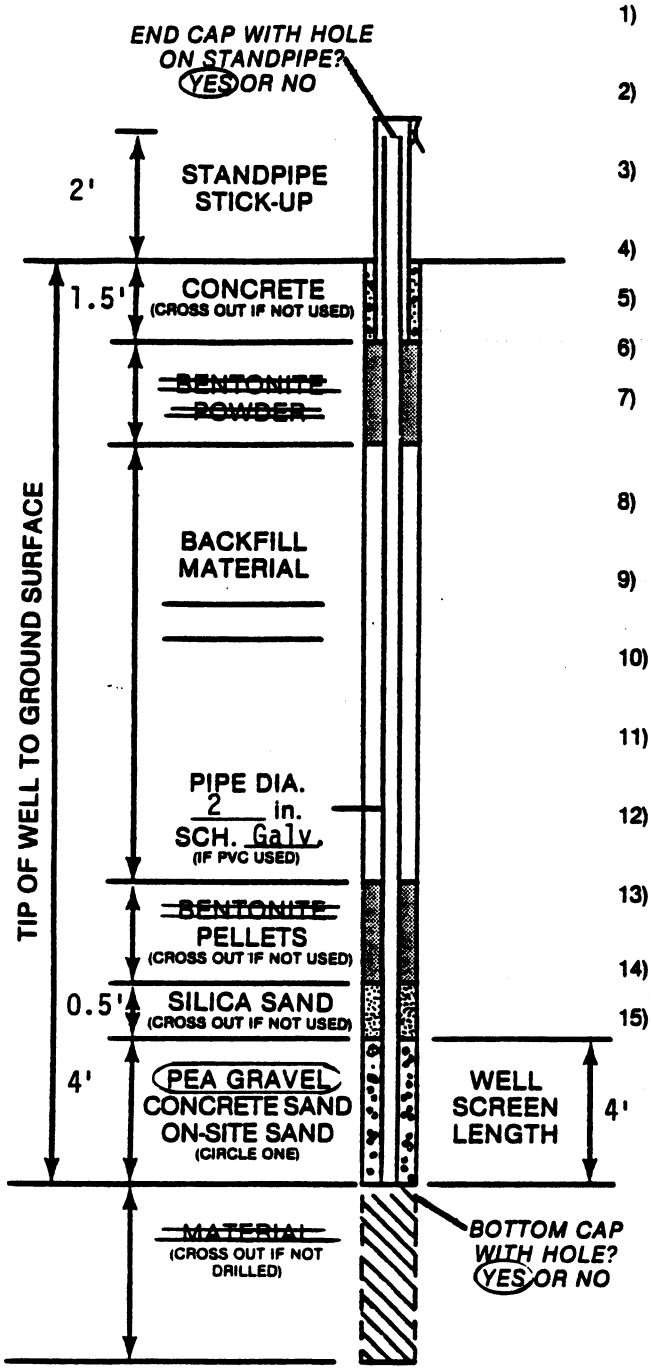
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED) OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
(SOLID AUGER) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-1U DATE INSTALLED 3-15-84 DRILL RIG Bomb 55

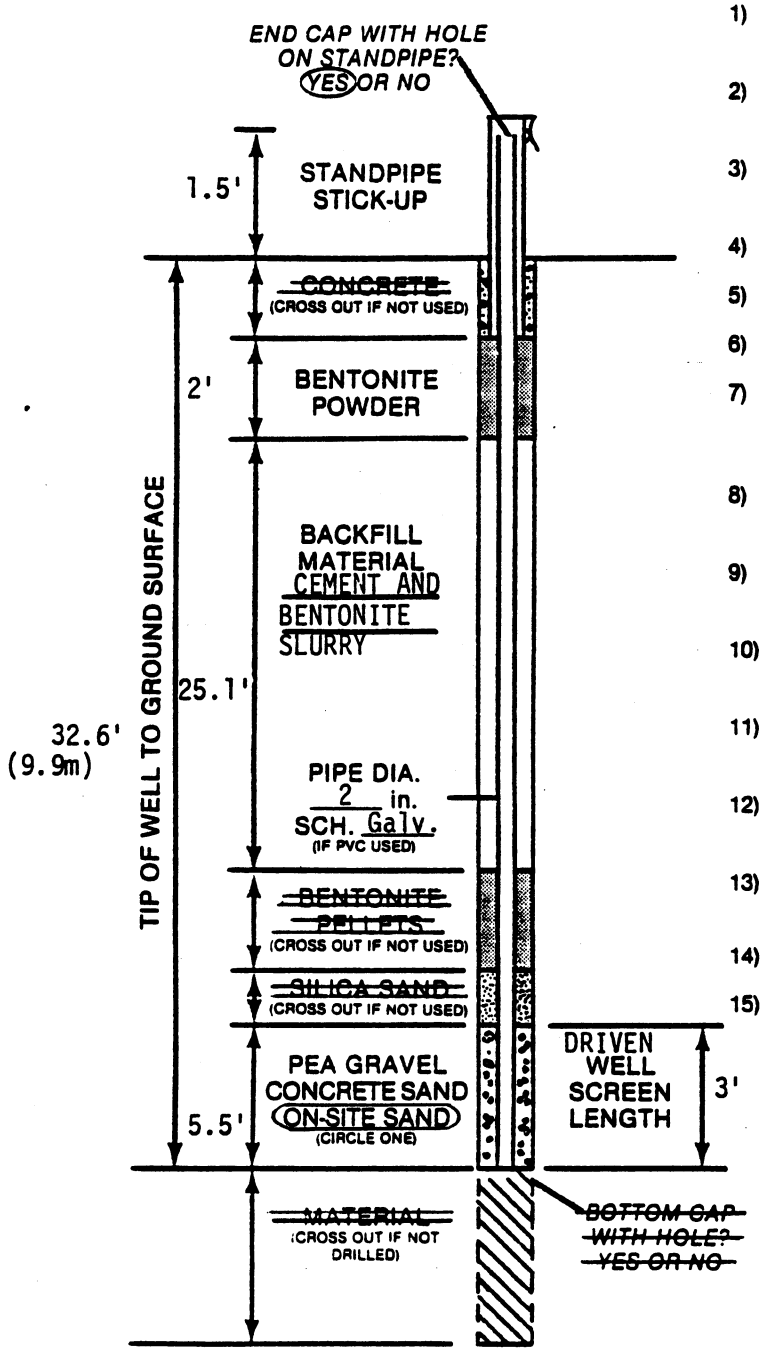
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED), STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED), OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS), OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER), HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-2L DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

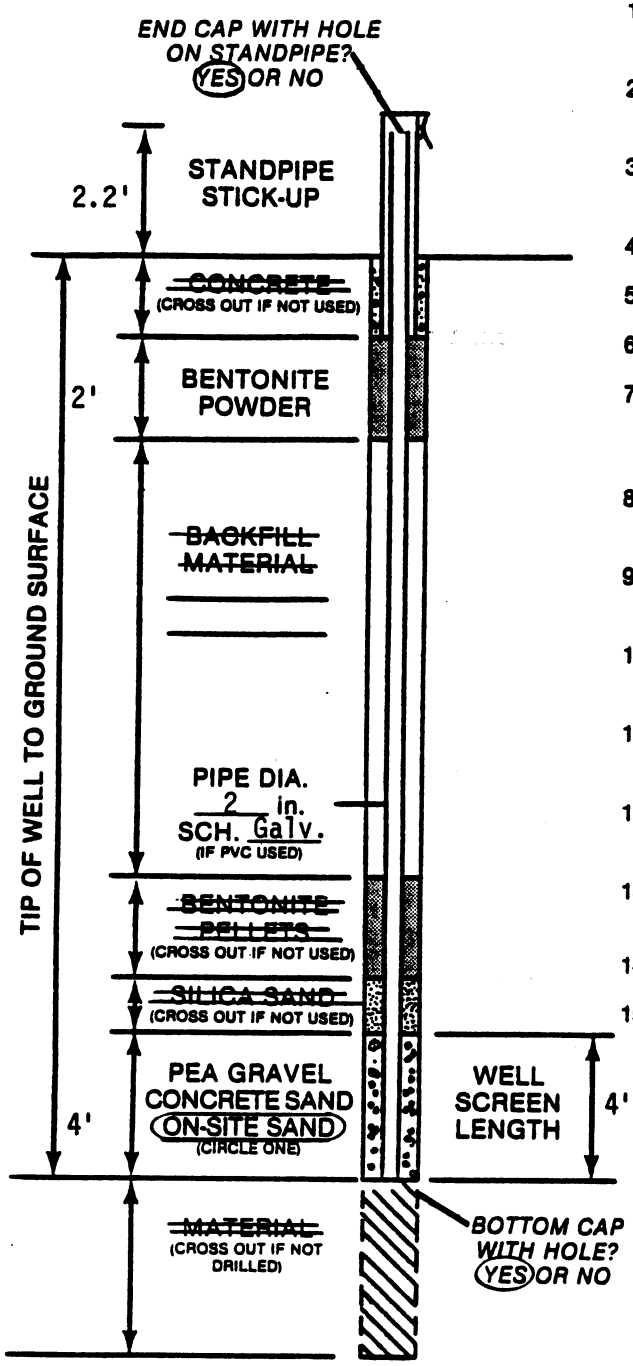
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-2U DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

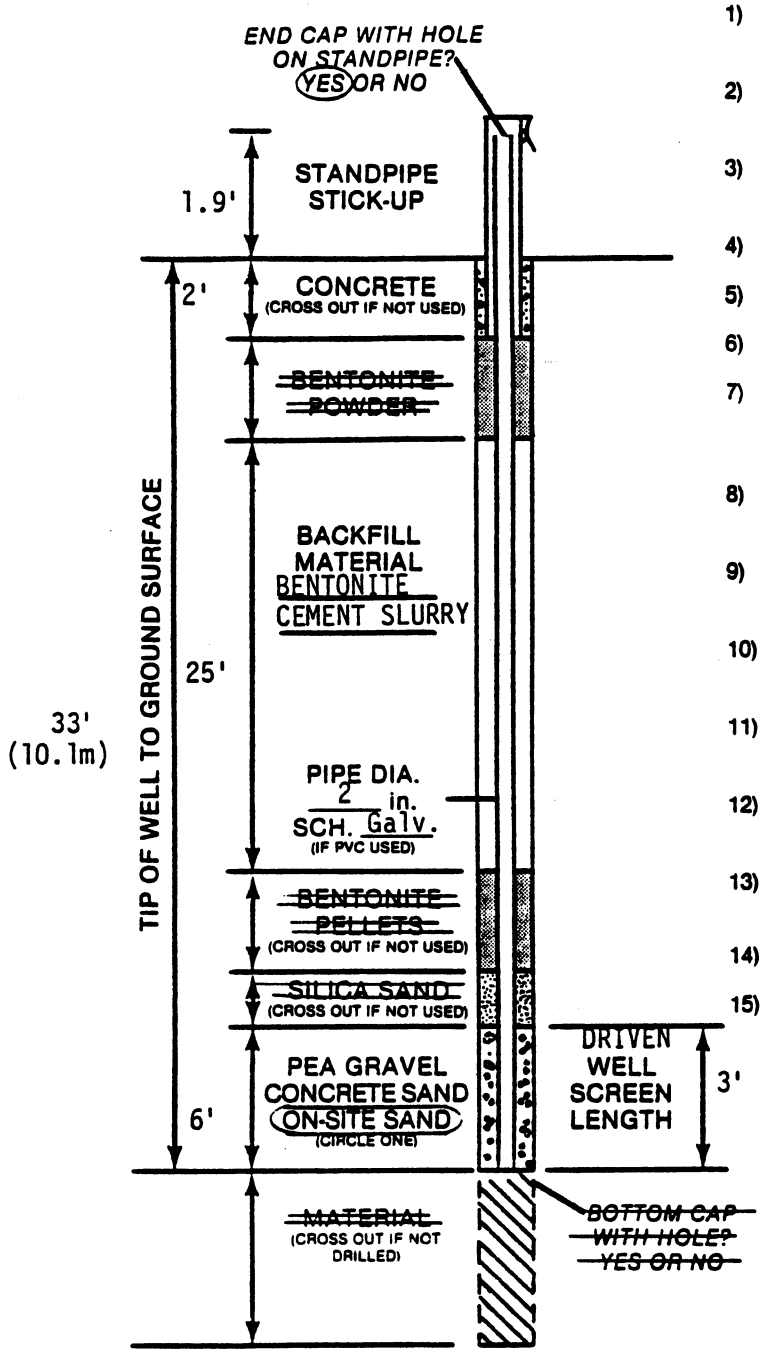
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST PIPE

Well No. WP-3L DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

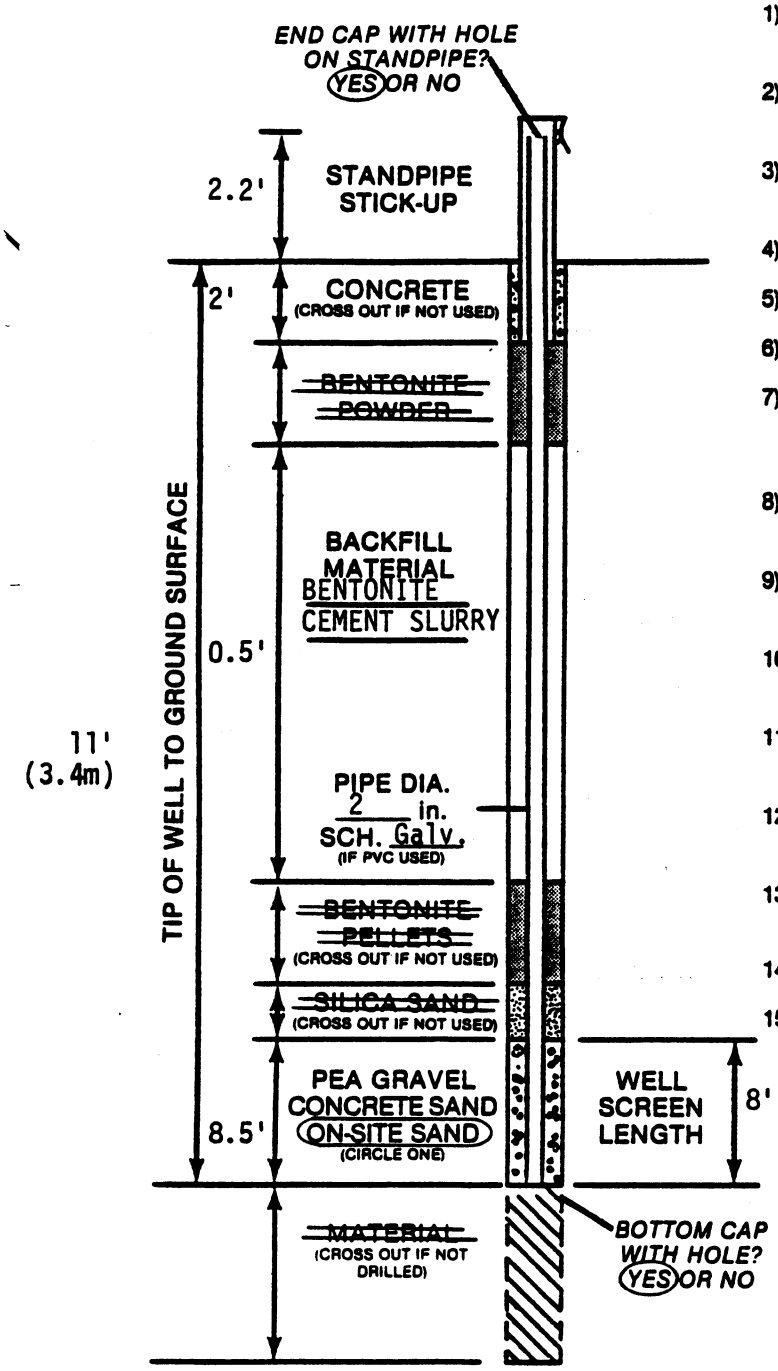
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-3U DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

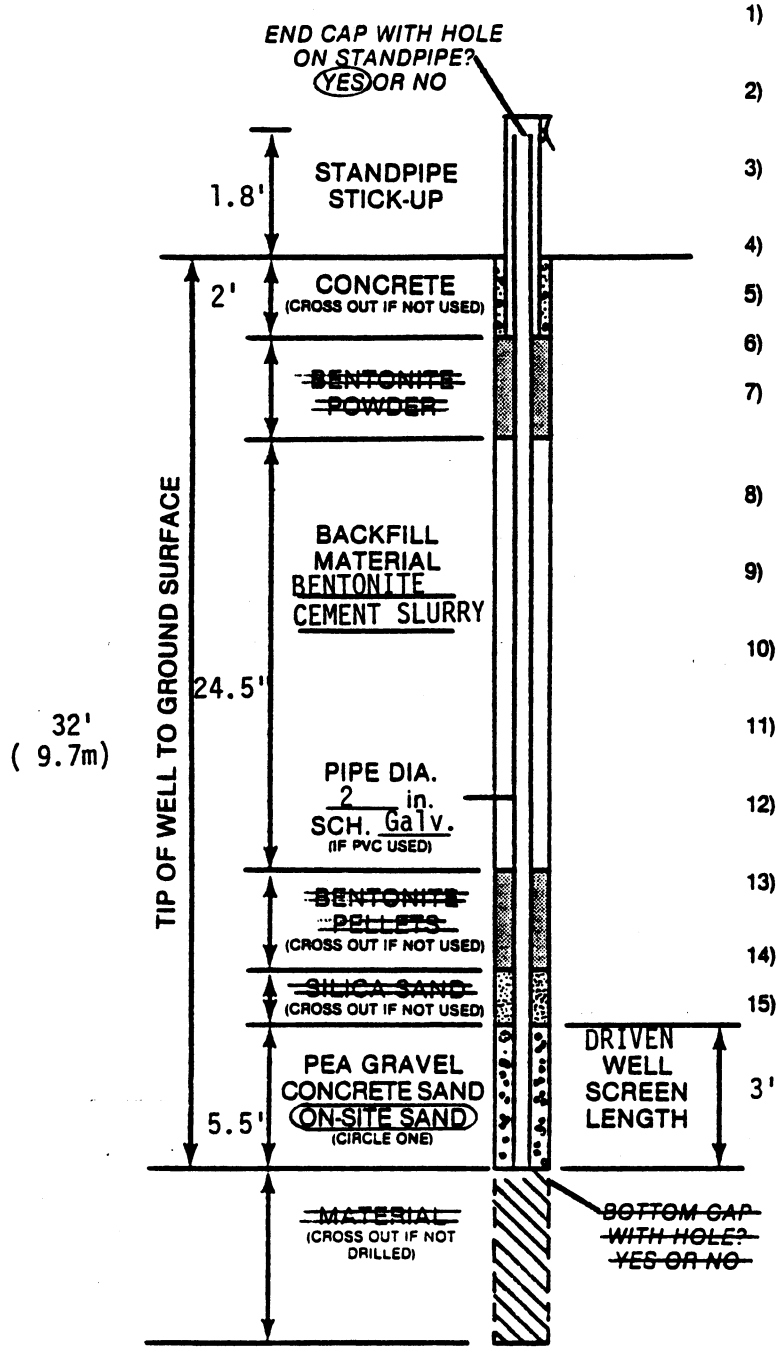
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-4 Lower DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

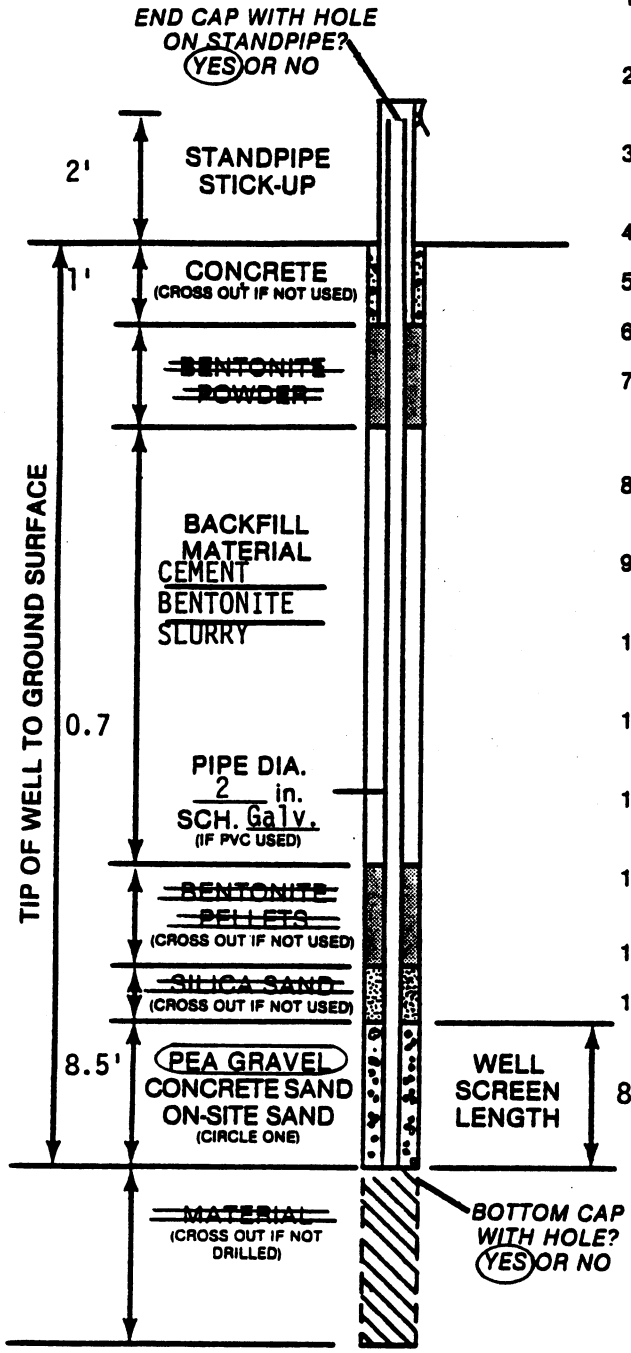
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER,
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-4U DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

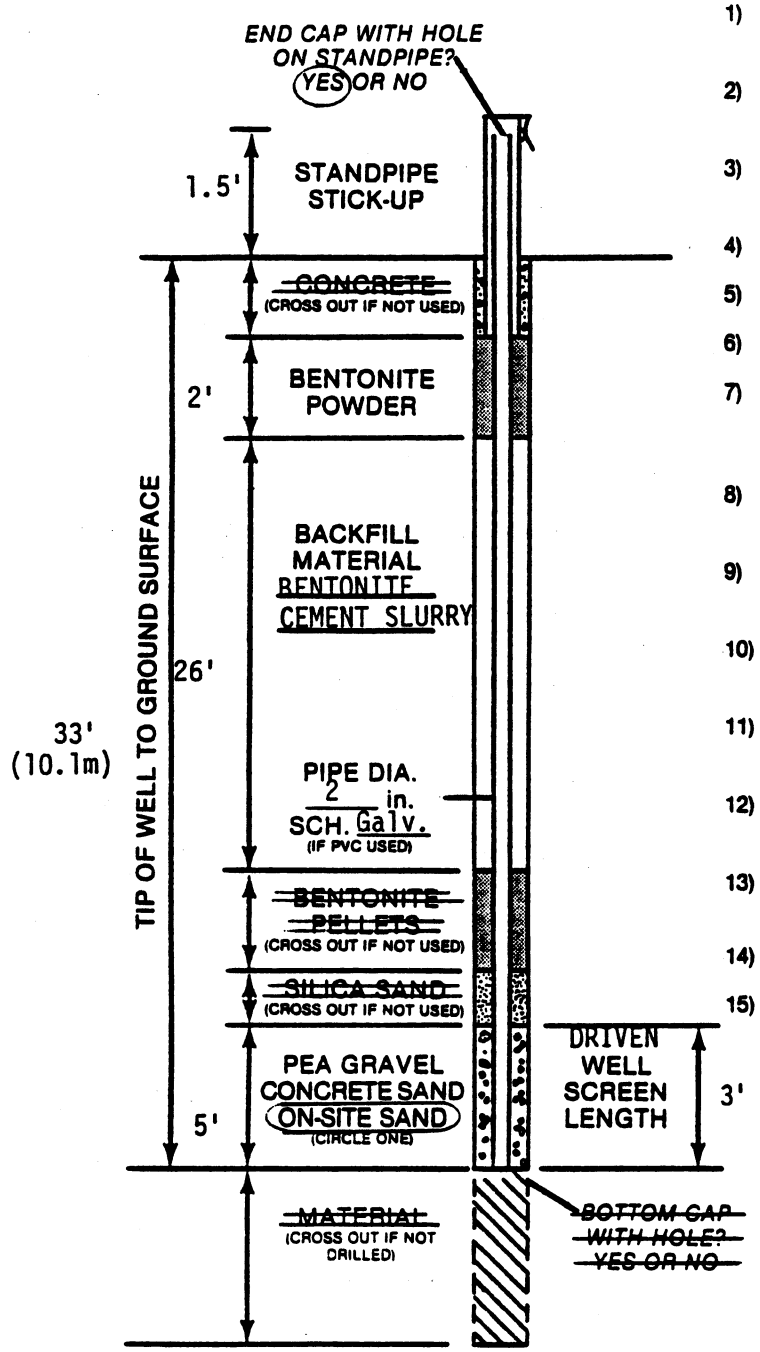
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
FLOWING Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-5L DATE INSTALLED 4-2-84 DRILL RIG Bomb 55

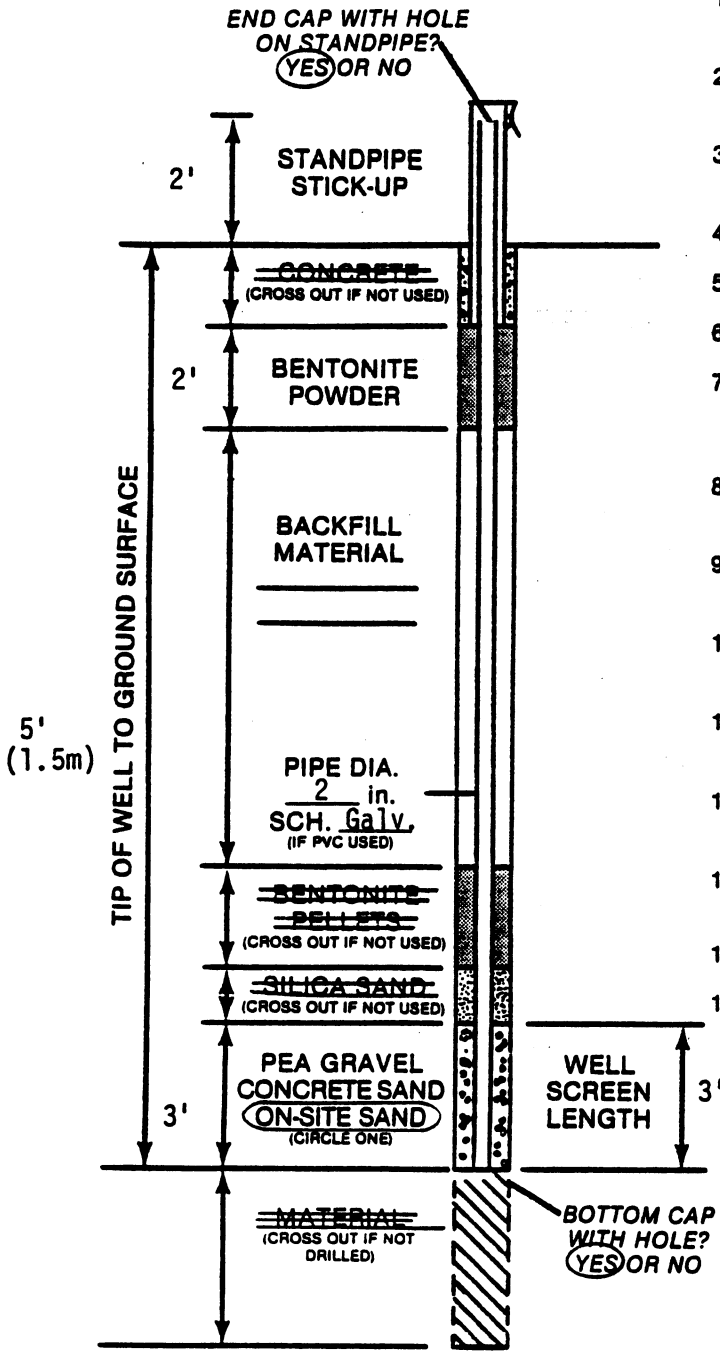
DRILLER T.T. DRILL CREW W.K.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-5U DATE INSTALLED 4-2-84 DRILL RIG CME -55

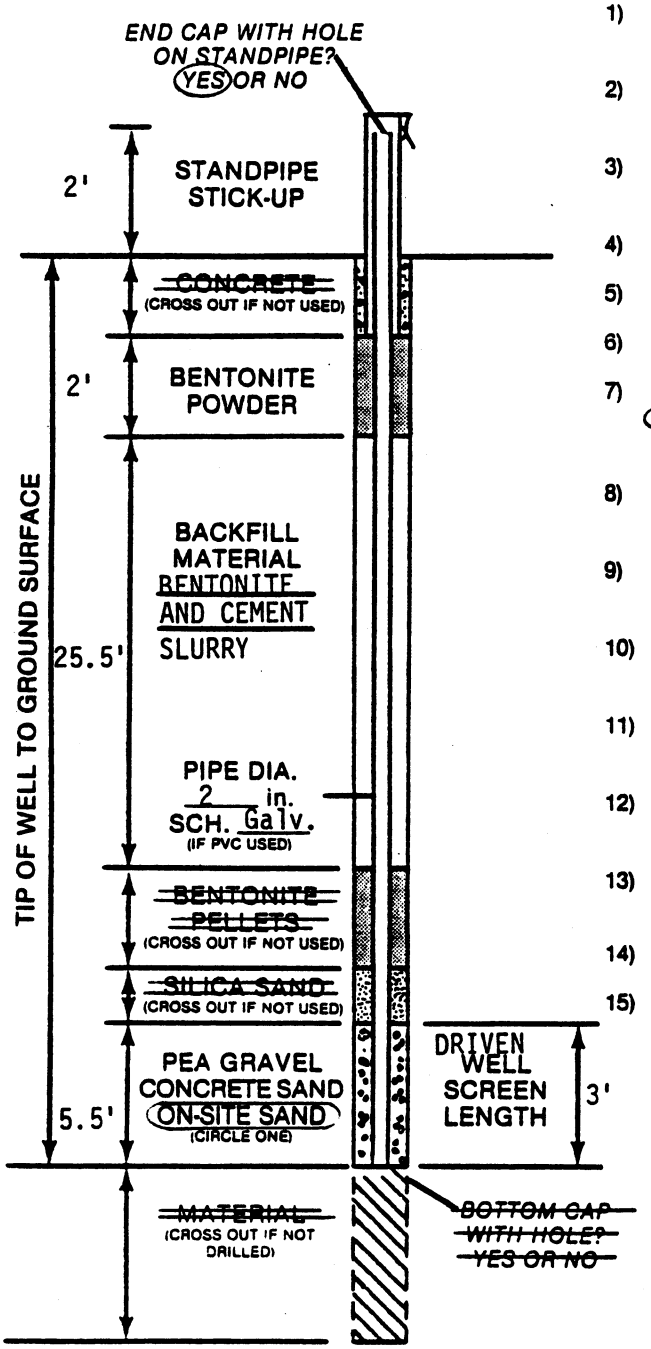
DRILLER T.T. DRILL CREW W.K.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED), STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED), OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS), OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER), HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-6L DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

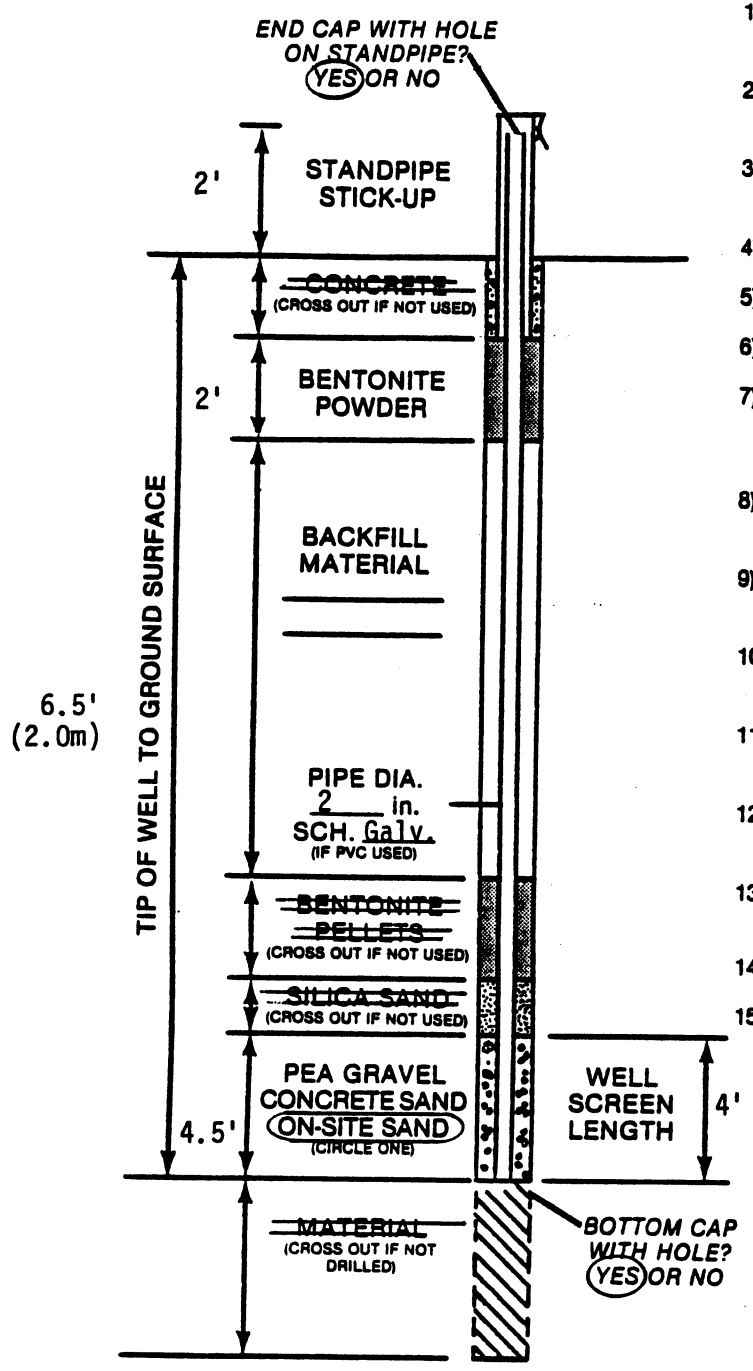
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-6U DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

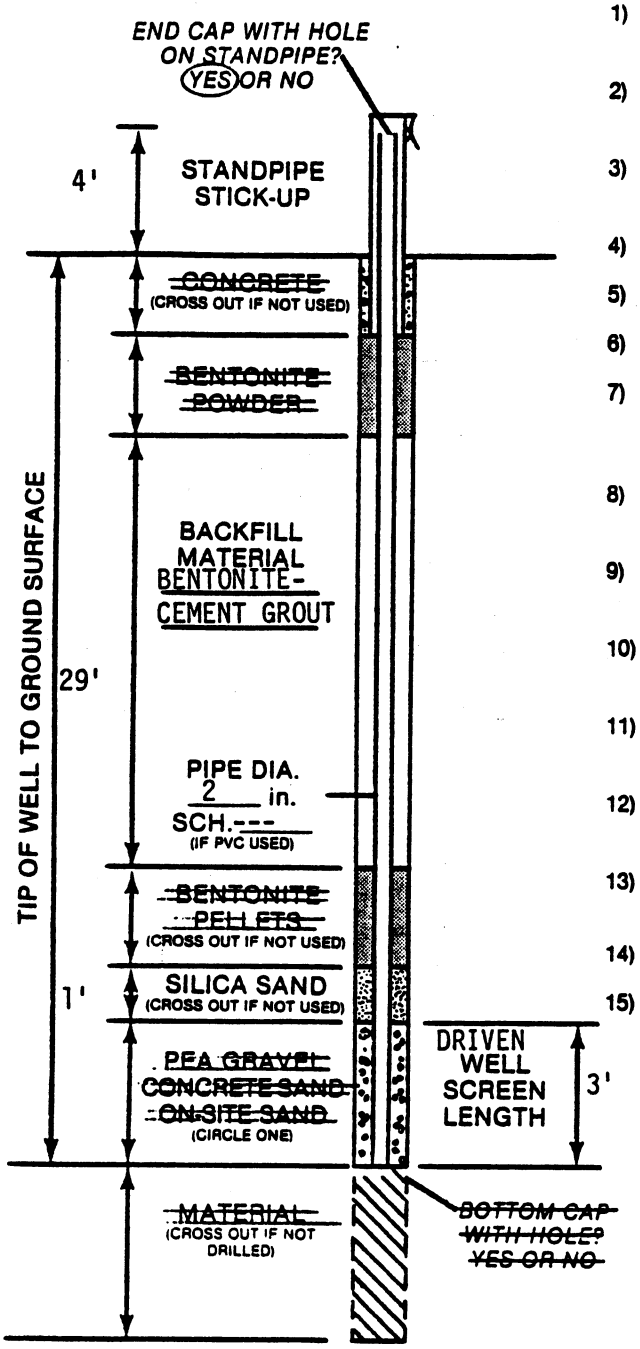
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED), STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED), OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS), OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
SOLID AUGER, HOLLOW STEM AUGER,
(WATER), REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-7L DATE INSTALLED 3-14-84 DRILL RIG Bomb 55

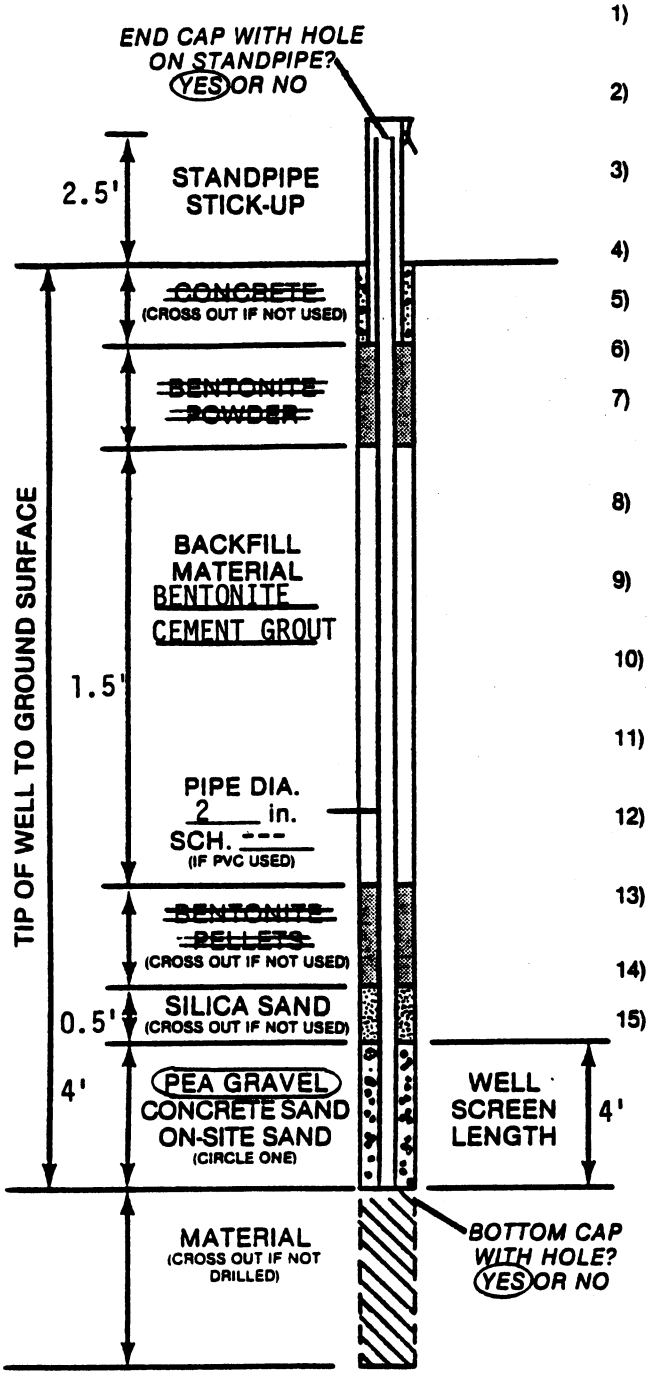
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No
SOLID AUGER, (HOLLOW STEM AUGER,)
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-7U DATE INSTALLED 3-14-84 DRILL RIG Bomb 55

DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

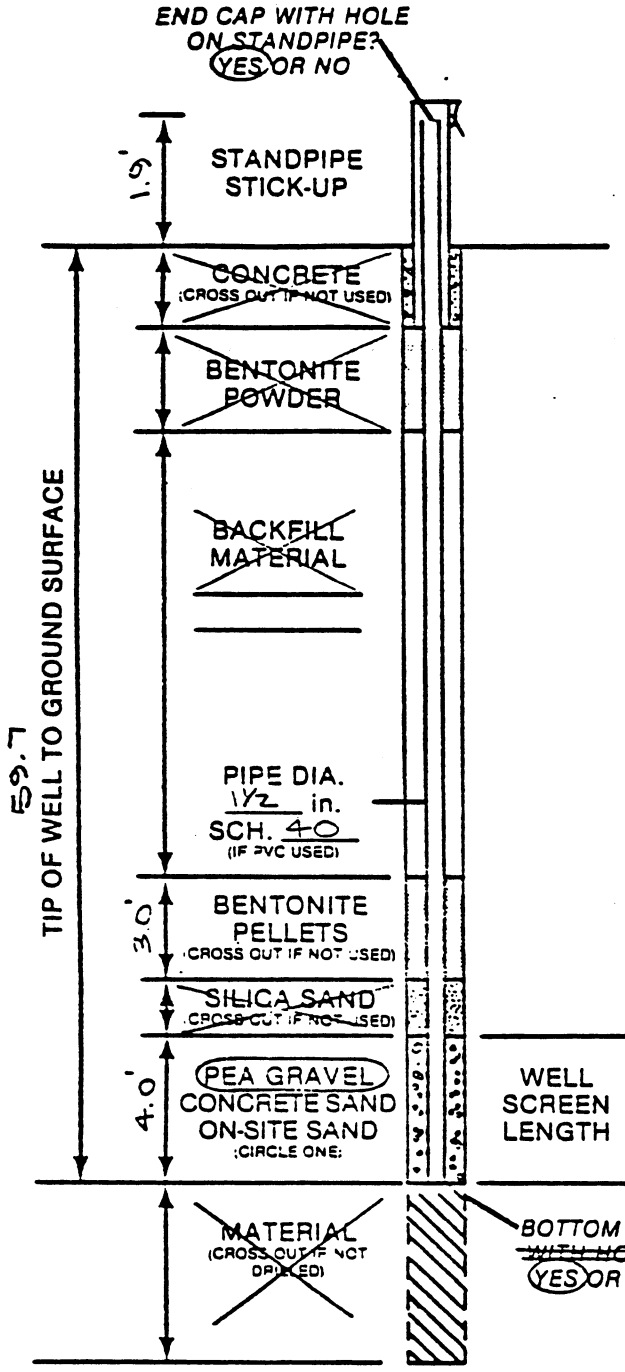
FW: 1-983

STS Consultants Ltd. Well Construction Reports for 1984
Oak, Deep Hole, Duck and Skunk Lakes Drilling Program

STS
- DL-1
- SL-1
- OL-1
- DHL-1

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS) THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE 0.020"

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
(WATER), REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
(BAILING) PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER 10 MIN. ON 2-11-

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED
5 gal., (10 gal), 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
19.5' Ft. or DRY

2) OTHER MEASUREMENTS:

DATE AFTER INSTALLED 19' Ft. FROM T. ST. PIPE
DATE 2-11-84 BEFORE BAILING 19.4' Ft. FROM T. ST. PIPE
DATE 2-13-84 19.2' Ft. FROM T. ST. PIPE
DATE 2-28-84 19.0' Ft. FROM T. ST. PIPE

CASING RAISED TO 54.0 FT.

Well No. DL-1 DATE INSTALLED 2-8-84 DRILL RIG BOMB 45

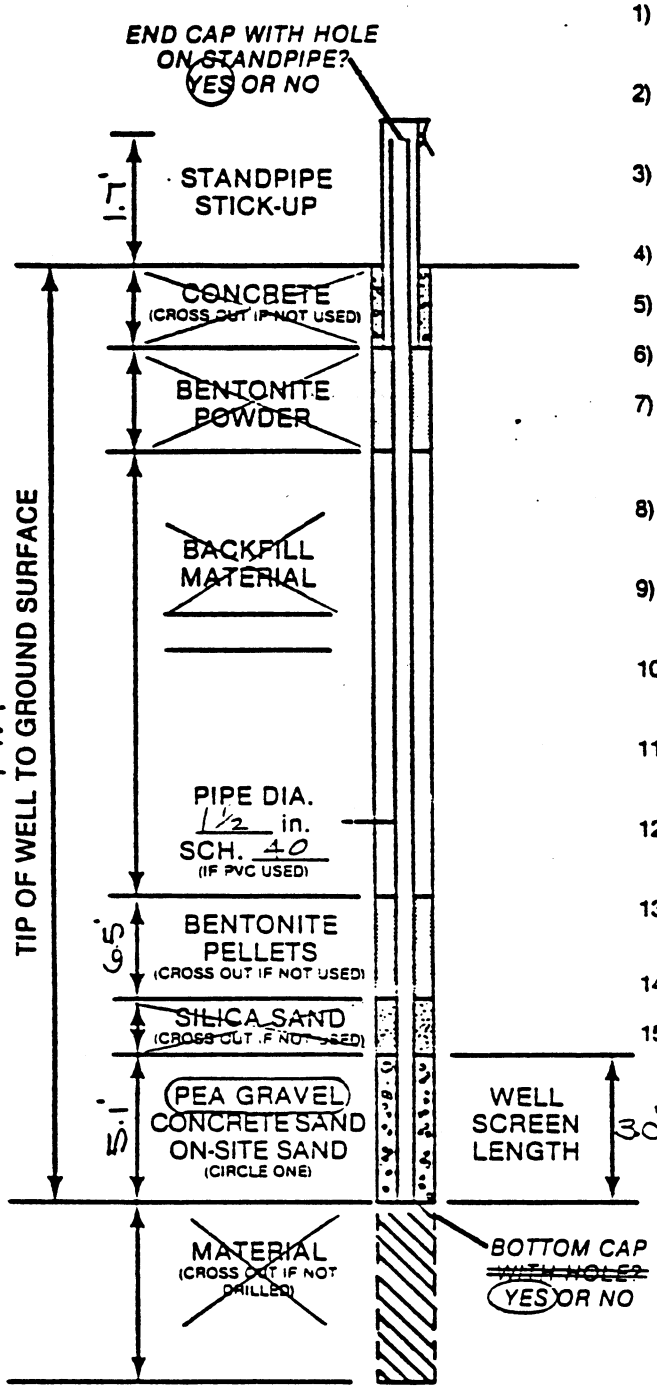
DRILLER EVH DRILL CREW BZ., G.T.

JOB/CLIENT EXXON STS JOB No. 12949

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS) THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE 0.020"

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
(WATER) REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
(BAILING) PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
(5 min.) 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., (10 gal.) 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

14) DID THE WATER SMELL? (YES) OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
5.7 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE BEFORE CASING 5.0' Ft. FROM T. ST. PIPE
DATE 2-11-84 5.8' Ft. FROM T. ST. PIPE
DATE 2-13-84 6.2' Ft. FROM T. ST. PIPE
DATE 2-27-84 5.5' Ft. FROM T. ST. PIPE

CASING RAISED TO 9.2 FT.

Well No. SL-1 DATE INSTALLED 2-9-84 DRILL RIG EMB 45

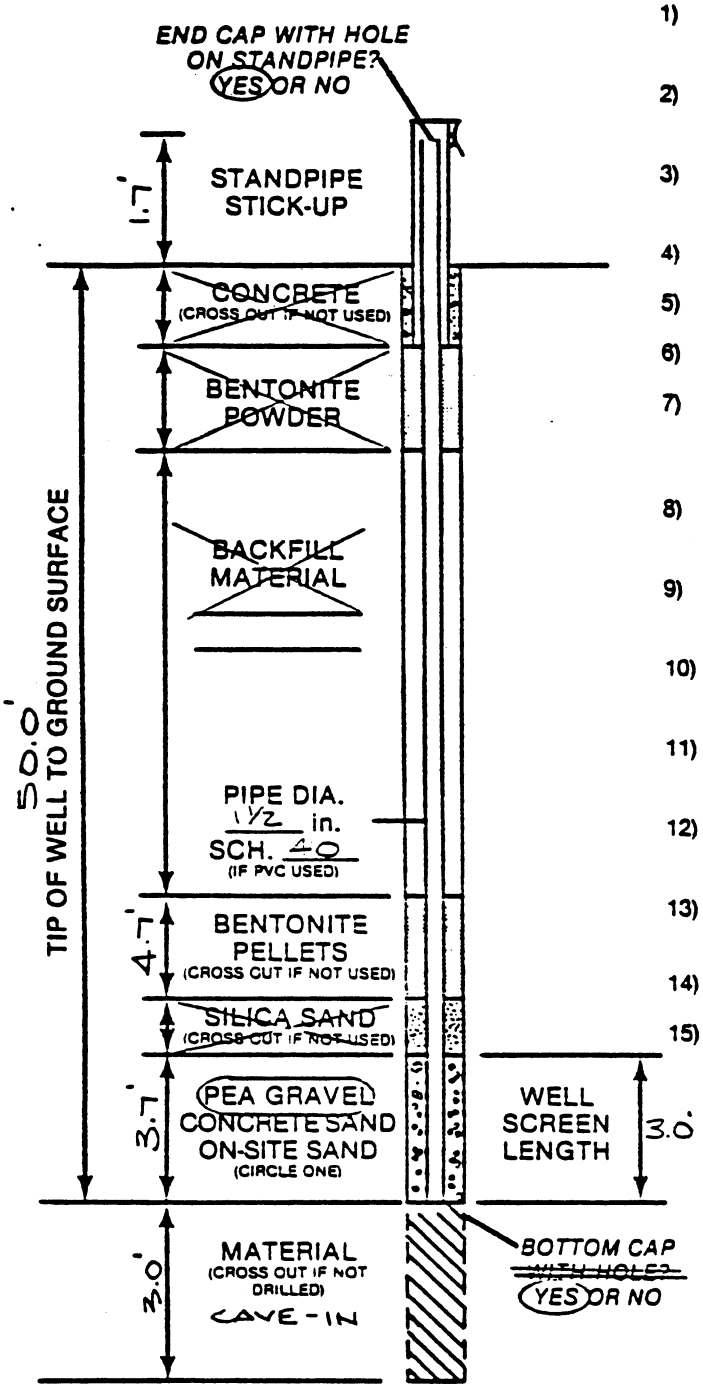
DRILLER EVH DRILL CREW BZ, G.T.

JOB/CLIENT Exxon STS JOB No. 12949

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC.) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS.) THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC.) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE 0.020"

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
(WATER.) REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
(BAILING.) PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER 45 MIN. ON 2-11

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED
5 gal., 10 gal., 15 gal., OTHER 20 GAL.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID.) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID.) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
50.7' Ft. or DRY

2) OTHER MEASUREMENTS:

DATE AFTER INSTALLED 8.7' Ft. FROM T. ST. PIPE

DATE 2 HRS AB, 16.4' Ft. FROM T. ST. PIPE

DATE 2-11-84, 47.3' Ft. FROM T. ST. PIPE

DATE 2-14-84, DRY Ft. FROM T. ST. PIPE
2-23-84, DRY

CASING RAISED TO 44.1 FT.

Well No. OL-1 DATE INSTALLED 2-10-84 DRILL RIG BOMB 45

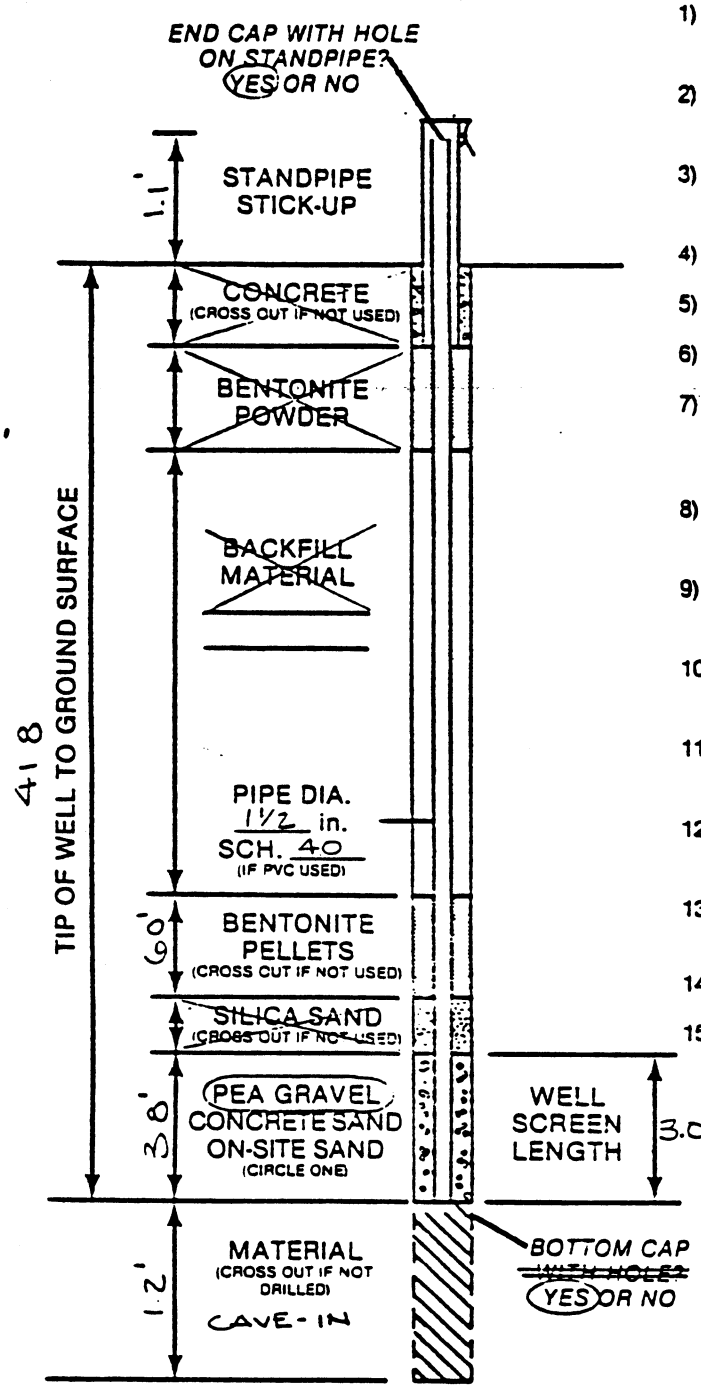
DRILLER E.V.H. DRILL CREW B.Z., G.T.

JOB/CLIENT EXXON STS JOB No. 12949

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC.) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS) THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC.) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE 0.020

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
(WATER) REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, (PUMPING) SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
(5 min), 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED
5 gal., (10 gal), 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
16.5 Ft. or DRY

2) OTHER MEASUREMENTS:

DATE AFTER INSTALLED 6.4' Ft. FROM T. ST. PIPE
DATE 2-14-84 15.7' Ft. FROM T. ST. PIPE
DATE 2-23-84 18.6' Ft. FROM T. ST. PIPE
DATE _____ _____ Ft. FROM T. ST. PIPE

CASING RAISED TO 33.0 FT.

Well No. DHL-1 DATE INSTALLED 2-13-84 DRILL RIG BOMB 45

DRILLER E.V.H. DRILL CREW B.Z., G.T.

JOB/CLIENT EXXON STS JOB No. 12949

FW: 1-983

WTD Environmental Drilling Well Construction, Development and Abandonment Reports for 1994 Lake Bed and Wetland Drilling Program

CMC-LSL-102A
LSL-102B
LSL-104A
LSL-104B
SL-103A
SL-103B
DL-103A
DL-103B
BO-101A
BO-101B
SCC-102A
SCC-102B

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 4-90

Facility/Project Name
CMC Hydrogeologic Investigation

Facility License, Permit or Monitoring Number
_____

Type of Well Water Table Observation Well ☐ 11
Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary
NA ft.

Is Well A Point of Enforcement Std. Application?
NA ☐ Yes ☐ No

Local Grid Location of Well
114,399.1 ft. ☒ N. ☐ S. 2,278,953.7 ft. ☒ E. ☐ W.

Grid Origin Location
Lat. _____ Long. _____ or
St. Plane _____ ft. N. _____ ft. E.

Section Location of Waste/Source
SE 1/4 of NW 1/4 of Sec. 31 T. 35 N. R. 13 ☒ E. ☐ W.

Location of Well Relative to Waste/Source
u ☐ Upgradient s ☐ Sidegradient
d ☐ Downgradient n ☐ Not Known
NA

Well Name
CMC-LSL-102A

Wis. Unique Well Number **DNR Well Number**

Date Well Installed 02 / 15 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
Dan Tinnacour
WTD Environmental Drilling

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation 1595.19 ft. MSL
C. Land surface elevation 1592.1 ft. MSL
D. Surface seal, bottom NA ft. MSL or NA ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

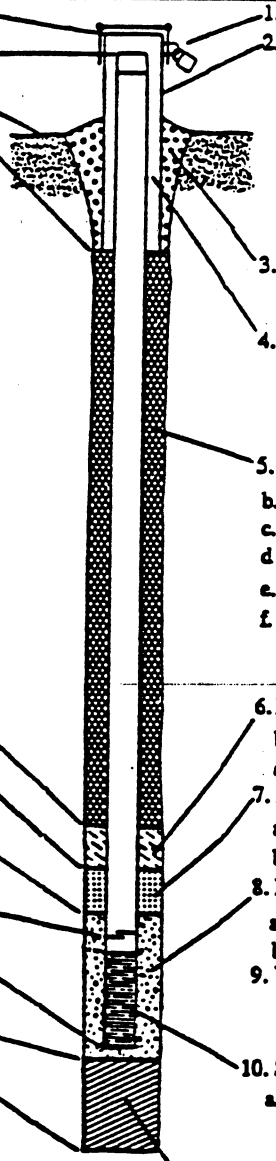
14. Drilling method used: Rotary ☒ 50
Hollow Stem Auger ☐ 41
_____ Other ☐

15. Drilling fluid used: Water ☒ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis):
Little Sand Lake

E. Bentonite seal, top 1589.2 ft. MSL or _____ ft.
F. Fine sand, top 1577.0 ft. MSL or _____ ft.
G. Filter pack, top 1576.5 ft. MSL or _____ ft.
H. Screen joint, top 1575.9 ft. MSL or _____ ft.
I. Well bottom 1573.9 ft. MSL or _____ ft.
J. Filter pack, bottom 1573.9 ft. MSL or _____ ft.
K. Borehole, bottom 1574.1 ft. MSL or _____ ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.20 in.
N. I.D. well casing 2.0 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04
_____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
NA Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐
Red Flint Sand Other ☒
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Chipped Bentonite Tremie pumped ☐ 02
Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. Chipped Bentonite 100 lbs Other ☒
7. Fine sand material: Manufacturer, product name & mesh size
a. BB #7 Badger Mining
b. Volume added 15 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 Am. Materials
b. Volume added 25 lbs ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23
Flush threaded PVC schedule 80 ☐ 24
Black Pipe, ASTM A53B Other ☒
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11
Continuous slot ☐ 01
_____ Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 2.0 ft.
11. Backfill material (below filter pack): None ☐ 14
_____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC-Hydrogeologic Investigation	Forrest	CMC-LSL-102A
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 213 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing ~4.0 gal.

7. Volume of water removed from well ~120 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 2.79 ft.	Dry ft.
Date	b. 02/15/94 (m m d d y y)	02/15/94 (m m d d y y)
Time	c. 14:00 ☐ a.m. ☒ p.m.	16:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	Very Dark Grey	Lt. Grey

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	NA mg/l	NA mg/l
15. COD	NA mg/l	NA mg/l

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Roy Teunissen

Firm: WTD Environmental Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: S V D

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5W 11-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

SE 1/4 of NW 1/4 of Sec. 31 ; T. 35 N; R. 13 [X] E [ ] W

(If applicable) Gov't Lot _____ Grid Number _____

Grid Location: 114,399.1 ft. [X] N. [ ] S., 2,278,953.7 ft. [X] E. [ ] W.

Civil Town Name: Lincoln

Street Address of Well: Little Sand Lake

City, Village:

(2) FACILITY NAME

Original Well Owner (If Known): Crandon Mining Company

Present Well Owner: Crandon Mining Company

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501-0856

Facility Well No. and/or Name (If Applicable): CMC-LSL-102A

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: Temporary Well

Date of Abandonment: 03/08/94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 02/15/94

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify)

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 18.3 Casing Diameter (ins.) 2"
(From groundsurface)

Casing Depth (ft.) 16.3

Was Well Annular Space Grouted? [X] Yes [ ] No [ ] Unknown
If Yes, To What Depth? 15.2 Feet

(4) Depth to Water (Feet) 4.5

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[X] Yes	[ ] No	[ ] Not Applicable
Casing Left in Place?	[ ] Yes	[X] No	

If No, Explain: Casing extracted

Was Casing Cut Off Below Surface?	[ ] Yes	[X] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[ ] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[ ] Conductor Pipe-Gravity [X] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[ ] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[ ] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[X] Granular Bentonite
[ ] Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
20 lbs bentonite/20 gallons water/20 lbs	Surface	18.5	15 gal.	
granular bentonite				

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work: Scott Buttke, WTD Drilling

Signature of Person Doing Work: Scott Buttke (BW) Date Signed: 3-15-94

Street or Route: 101 Alderson Street Telephone Number: (715) 359-7090

City, State, Zip Code: Schofield, WI 54476

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected | District/County

Reviewer/Inspector

Follow-up Necessary

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Hydrogeologic Investigation	Local Grid Location of Well: 114,284.9 ft. ☒ N. ☐ S. — 2279,010.6 ft. ☒ E. ☐ W.	Well Name: CMC-LSL-102B
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ___ Long. ___ or St. Plane ___ ft. N. ___ ft. E.	Wis. Unique Well Number — DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: SE 1/4 of NW 1/4 of Sec. 31, T. 35 N, R. 13 ☒ E. ☐ W.	Date Well Installed: 02 / 14 / 94 (m m d d y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient NA; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Dan Tinnacour; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation 1594.70 ft. MSL
C. Land surface elevation 1592.1 ft. MSL
D. Surface seal, bottom NA ft. MSL or NA ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

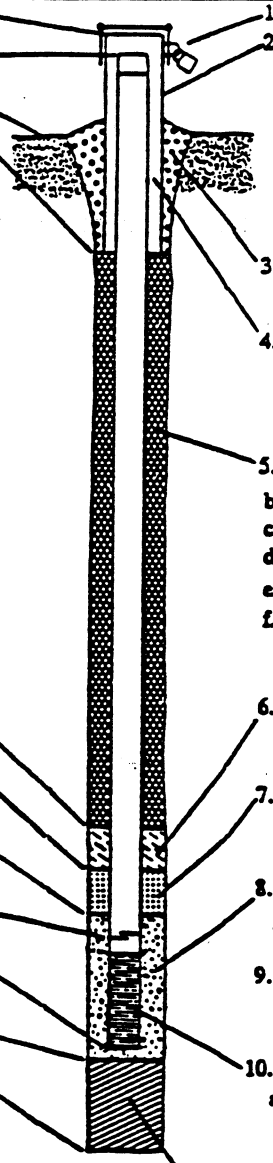
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis):
Little Sand Lake

E. Bentonite seal, top 1587.5 ft. MSL or ____ ft.
F. Fine sand, top 1561.9 ft. MSL or ____ ft.
G. Filter pack, top 1561.3 ft. MSL or ____ ft.
H. Screen joint, top 1560.8 ft. MSL or ____ ft.
I. Well bottom 1559.8 ft. MSL or ____ ft.
J. Filter pack, bottom 1559.8 ft. MSL or ____ ft.
K. Borehole, bottom 1559.8 ft. MSL or ____ ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.20 in.
N. I.D. well casing 2.0 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Tripod w/reflectors
3. Surface seal: Bentonite ☐ 30; Concrete ☐ 01; NA; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Red Flint #30; Other ☒ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Chipped Bentonite; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" chipped bentonite 350 lbs Other ☒ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. BB#7 Badger Mining
b. Volume added 12 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 Am. Materials
b. Volume added 20 lbs ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Black Pipe ASTM A53B Other ☒ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; ____ Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 1.0 ft.
11. Backfill material (below filter pack): None ☒ 14; ____ Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Steve McDonald Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC-Hydrogeologic Investigation	Forest	CMC-LSL-102B
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	[illegible]

3. Time spent developing well: 30 min.

4. Depth of well (from top of well casing): 34.8 ft.

5. Inside diameter of well: 2.0 in.

6. Volume of water in filter pack and well casing: ~5.0 gal.

7. Volume of water removed from well: ~15.0 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results) NA

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 5.15 ft.	34.35 ft.
Date	b. 02 / 15 / 94 (m m d d y y)	02 / 15 / 94 (m m d d y y)
Time	c. 14 : 00 ☐ a.m. ☒ p.m.	16 : 30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	Dark Brown	Lt. Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	NA mg/l	NA mg/l
15. COD	NA mg/l	NA mg/l

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Roy Teunissen

Firm: WTD Environmental Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5W 11-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

SE 1/4 of NW 1/4 of Sec. 31 ; T. 35 N; R. 13 [X] E [ ] W

(If applicable) Gov't Lot _____ Grid Number _____

Grid Location: 114,284.9 ft. [X] N. [ ] S., 2,279,010.6 ft. [X] E. [ ] W.

Civil Town Name: Lincoln

Street Address of Well: Little Sand Lake

City, Village:

(2) FACILITY NAME

Original Well Owner (If Known): Crandon Mining Company

Present Well Owner: Crandon Mining Company

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501-0856

Facility Well No. and/or Name (If Applicable): CMC-LSL-102B

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: Temporary Well

Date of Abandonment: 03/09/94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 02/14/94

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify)

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 32.7 Casing Diameter (ins.) 2"
(From groundsurface)

Casing Depth (ft.) 31.7

Was Well Annular Space Grouted? [X] Yes [ ] No [ ] Unknown
If Yes, To What Depth? 30.6 Feet

(4) Depth to Water (Feet) 6.9

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[ ] Yes	[X] No	[ ] Not Applicable
Casing Left in Place?	[X] Yes	[ ] No	

If No, Explain: Casing grouted in place. Upper 10' of riser pipe removed.

Was Casing Cut Off Below Surface?	[X] Yes	[ ] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[X] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[X] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[ ] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[X] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[ ] Granular Bentonite
[ ] Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
Hole plug 3/8" chipped bentonite	Surface	8'	35 lbs.	

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work
Scott Buttke, WTD Drilling

Signature of Person Doing Work: Scott Buttke SOD
Date Signed: 3-15-94

Street or Route: 101 Alderson Street
Telephone Number: (715) 359-7090

City, State, Zip Code: Schofield, WI 54476

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected
District/County
Reviewer/Inspector
Follow-up Necessary

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC Hydrogeologic Investigation	Local Grid Location of Well: 112,076.2 ft. ☒N ☐S, 2,275,937.4 ft. ☒E ☐W	Well Name: CMC-LSL-104A
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location: NE 1/4 of SE 1/4 of Sec. 36, T. 35 N, R. 12 ☒E ☐W	Date Well Installed: 02 / 13 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known NA	Well Installed By: (Person's Name and Firm): Dan Tinnacour; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation 1594.72 ft. MSL
C. Land surface elevation 1592.1 ft. MSL
D. Surface seal, bottom NA ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

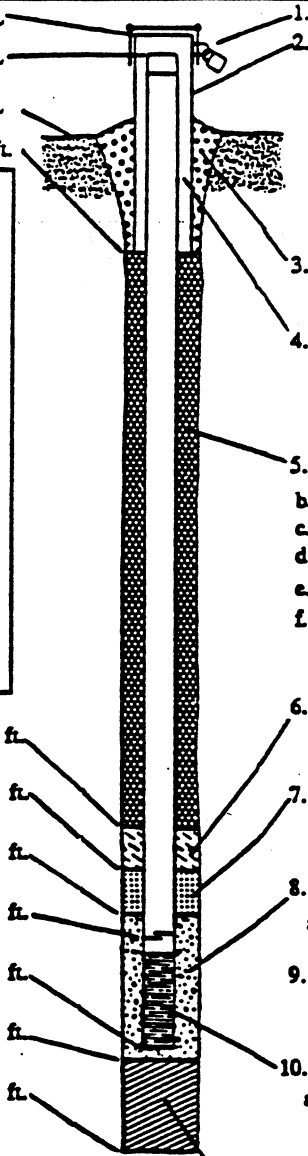
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☒ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe Little Sand Lake

17. Source of water (attach analysis):

E. Bentonite seal, top 1583.4 ft. MSL or ____ ft.
F. Fine sand, top 1578.4 ft. MSL or ____ ft.
G. Filter pack, top 1578.9 ft. MSL or ____ ft.
H. Screen joint, top 1577.4 ft. MSL or ____ ft.
I. Well bottom 1575.4 ft. MSL or ____ ft.
J. Filter pack, bottom 1575.4 ft. MSL or ____ ft.
K. Borehole, bottom 1574.1 ft. MSL or ____ ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.2 in.
N. I.D. well casing 2.0 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 10.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Tripod w/reflectors
3. Surface seal: Bentonite ☐ 30; Concrete ☐ 01; NA; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☒ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Chipped Bentonite; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. BB#7 Badger Mining
b. Volume added 15 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 Am. Materials
b. Volume added 30 lbs ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Black Pipe ASTM A53B Other ☒ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 2.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Cuttings Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Steve Wood Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☑ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeologic Investigation	Forest	CMC-LSL-104A
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

	Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No	
2. Well development method		
surged with bailer and bailed ☐ 41		
surged with bailer and pumped ☐ 61		
surged with block and bailed ☐ 42		
surged with block and pumped ☐ 62		
surged with block, bailed and pumped ☐ 70		
compressed air ☐ 20		
bailed only ☒ 10		
pumped only ☐ 51		
pumped slowly ☐ 50		
Other _____ ☐ [redacted]		
11. Depth to Water (from top of well casing)	a. 4.94 ft.	Dry ft.
Date	b. 02 / 14 / 94 (m m d d y y)	02 / 14 / 94 (m m d d y y)
Time	c. 14 : 00 ☐ a.m. ☒ p.m.	15 : 00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	0.2 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	Grey	Lt. Grey
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	NA mg/l	NA mg/l
15. COD	NA mg/l	NA mg/l

3. Time spent developing well: 45 min.

4. Depth of well (from top of well casing): 19.5 ft.

5. Inside diameter of well: 2.0 in.

6. Volume of water in filter pack and well casing: ~3.0 gal.

7. Volume of water removed from well: ~6.0 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results) NA

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Erik Silvola

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5W 11-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

NE 1/4 of SE 1/4 of Sec. 36 ; T. 35 N; R. 12 [X] E [ ] W

(If applicable) Gov't Lot _____ Grid Number _____

Grid Location: 112,076.2 ft. [X] N. [ ] S., 2,275,945.8 ft. [X] E. [ ] W.

Civil Town Name: Nashville

Street Address of Well: Little Sand Lake

City, Village:

(2) FACILITY NAME

Original Well Owner (If Known): Crandon Mining Company

Present Well Owner: Crandon Mining Company

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501-0856

Facility Well No. and/or Name (If Applicable): CMC-LSL-104A

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: Temporary Well

Date of Abandonment: 03/09/94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 02/13/94

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify)

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 16.7 Casing Diameter (ins.) 2"
(From groundsurface)

Casing Depth (ft.) 14.7

Was Well Annular Space Grouted? [ ] Yes [ ] No [ ] Unknown
If Yes, To What Depth? _____ Feet

(4) Depth to Water (Feet) 5.7

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[X] Yes	[ ] No	[ ] Not Applicable
Casing Left in Place?	[ ] Yes	[X] No	

If No, Explain: Well extracted, hole backfilled with bentonite as casing was removed.

Was Casing Cut Off Below Surface?	[ ] Yes	[X] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[X] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[X] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[ ] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[X] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[ ] Granular Bentonite
[ ] Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
Hole plug 3/8" chipped bentonite	Surface	16.7	20 lbs	

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work
Scott Buttke, WTD Drilling

Signature of Person Doing Work: Scott Buttke Date Signed: 3-15-94

Street or Route: 101 Alderson Street

Telephone Number: (715) 359-7090

City, State, Zip Code: Schofield, WI 54476

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected	District/County
Reviewer/Inspector	
Follow-up Necessary	

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name CMC Hydrogeologic Investigation	**Local Grid Location of Well** 112,072 .7 ft. ☒ N ☐ S. 2,275,937.4 ft. ☒ E. ☐ W.	**Well Name** CMC-LSL-104B
Facility License, Permit or Monitoring Number _____	**Grid Origin Location** Lat. _____ Long. _____ or	**Wis. Unique Well Number / DNR Well Number** _____ _____
Type of Well Water Table Observation Well ☐ 11 Piezometer ☒ 12	St. Plane _____ ft. N. _____ ft. E.	**Date Well Installed** 02 / 13 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary NA ft.	**Section Location** NE 1/4 of SE 1/4 of Sec. 36 T. 35 N. R. 12 ☒ E. ☐ W.	**Well Installed By: (Person's Name and Firm)** Dan Tinnacour
Is Well A Point of Enforcement Std. Application? NA ☐ Yes ☐ No	**Location of Well Relative to Waste/Source** u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known NA	WTD Environmental Drilling

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation 1594.69 ft. MSL
C. Land surface elevation 1592.1 ft. MSL
D. Surface seal, bottom NA ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

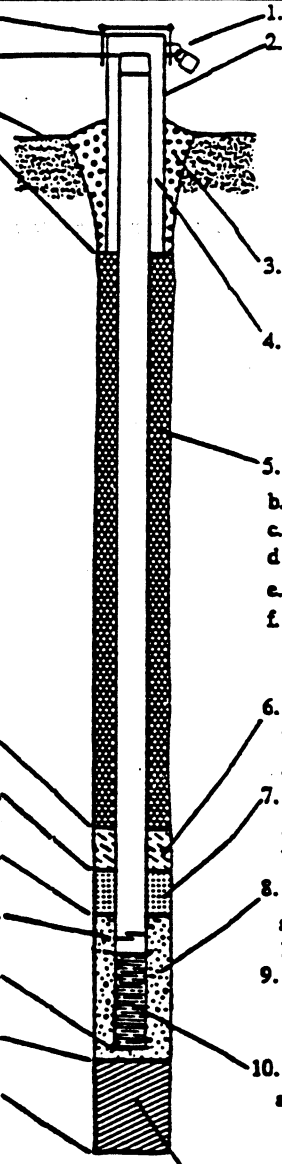
14. Drilling method used: Rotary ☒ 50
Hollow Stem Auger ☐ 41
_____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis):
Little Sand Lake

E. Bentonite seal, top 1582.0 ft. MSL or _____ ft.
F. Fine sand, top 1571.0 ft. MSL or _____ ft.
G. Filter pack, top 1570.5 ft. MSL or _____ ft.
H. Screen joint, top 1570,0 ft. MSL or _____ ft.
I. Well bottom 1567.0 ft. MSL or _____ ft.
J. Filter pack, bottom 1567.0 ft. MSL or _____ ft.
K. Borehole, bottom 1564.0 ft. MSL or _____ ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.2 in.
N. I.D. well casing 2.0 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04
_____ Other ☐
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Tripod w/reflectors
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
NA Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐
Red Flint #30 Other ☒
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite .... ..Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
Chipped Bentonite Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite 300 lbs Other ☒
7. Fine sand material: Manufacturer, product name & mesh size
a. BB#7 Badger Mining
b. Volume added 12 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 Am. Materials
b. Volume added 40 lbs ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23
Flush threaded PVC schedule 80 ☐ 24
Black Pipe ASTM A53B Other ☒
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11
Continuous slot ☐ 01
_____ Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 3.0 ft.
11. Backfill material (below filter pack): None ☐ 14
Cuttings Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Steve Wood Firm Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad/Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC- Hydrogeologic Investigation	Forest	CMC-LGL-104B

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	2 1		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 20 min.

4. Depth of well (from top of well casing) 27.5 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing ~3.5 gal.

7. Volume of water removed from well ~8.5 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 13.04 ft.	27.28 ft.
Date	b. 02/14/94 (m m d d y y)	02/14/94 (m m d d y y)
Time	c. 14:00 ☐ a.m. ☒ p.m.	15:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt. Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	NA mg/l	NA mg/l
15. COD	NA mg/l	NA mg/l

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Mike Mueller

Firm: WTD Environmental Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: S V D

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5W 11-89

All abandonment work shall be performed in accordance with the provisions of Chapters NR 111, NR 112 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION

Well/Drillhole/Borehole Location

County: Forest

NE 1/4 of SE 1/4 of Sec. 36 ; T. 35 N; R. 12 [X] E [ ] W

(If applicable) Gov't Lot _____ Grid Number _____

Grid Location: H2,072.7 ft. [X] N. [ ] S., 2,275,937.4 ft. [X] E. [ ] W.

Civil Town Name: Nashville

Street Address of Well: Little Sand Lake

City, Village:

(2) FACILITY NAME

Original Well Owner (If Known): Crandon Mining Company

Present Well Owner: Crandon Mining Company

Street or Route: 7 North Brown Street

City, State, Zip Code: Rhinelander, WI 54501-0856

Facility Well No. and/or Name (If Applicable): CMC-LSL-104B

WI Unique Well No.: _ _ _ _ _ _

Reason For Abandonment: Temporary Well

Date of Abandonment: 03/09/94

WELL/DRILLHOLE/BOREHOLE INFORMATION

(3) Original Well/Drillhole/Borehole Construction Completed On

(Date) 02/13/94

[X] Monitoring Well
[ ] Water Well
[ ] Drillhole
[ ] Borehole

Construction Report Available? [X] Yes [ ] No

Construction Type:
[X] Drilled [ ] Driven (Sandpoint) [ ] Dug
[ ] Other (Specify)

Formation Type:
[X] Unconsolidated Formation [ ] Bedrock

Total Well Depth (ft.) 25 Casing Diameter (ins.) 2"
(From groundsurface)

Casing Depth (ft.) 22

Was Well Annular Space Grouted? [X] Yes [ ] No [ ] Unknown
If Yes, To What Depth? 21 Feet

(4) Depth to Water (Feet) 14.7

Pump & Piping Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Liner(s) Removed?	[ ] Yes	[ ] No	[X] Not Applicable
Screen Removed?	[X] Yes	[ ] No	[ ] Not Applicable
Casing Left in Place?	[ ] Yes	[X] No	

If No, Explain: Well extracted, Hole backfilled w/bentonite as casing was removed.

Was Casing Cut Off Below Surface?	[ ] Yes	[X] No
Did Sealing Material Rise to Surface?	[X] Yes	[ ] No
Did Material Settle After 24 Hours?	[ ] Yes	[X] No
If Yes, Was Hole Retopped?	[ ] Yes	[ ] No

(5) Required Method of Placing Sealing Material
[X] Conductor Pipe-Gravity [ ] Conductor Pipe-Pumped
[ ] Dump Bailer [ ] Other (Explain)

(6) Sealing Materials
[ ] Neat Cement Grout
[ ] Sand-Cement (Concrete) Grout
[ ] Concrete
[ ] Clay-Sand Slurry
[ ] Bentonite-Sand Slurry
[X] Chipped Bentonite

For monitoring wells and monitoring well boreholes only
[ ] Bentonite Pellets
[ ] Granular Bentonite
[ ] Bentonite - Cement Grout

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	Mix Ratio or Mud Weight
Holeplug 3/8" chipped bentonite	Surface	25	25 lbs.	

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work: Scott Buttke, WTD Drilling

Signature of Person Doing Work: Scott Buttke (SUB) Date Signed: 3-15-94

Street or Route: 101 Alderson Street Telephone Number: (715) 359-7090

City, State, Zip Code: Schofield, WI 54476

(10) FOR DNR OR COUNTY USE ONLY

Date Received/Inspected | District/County

Reviewer/Inspector

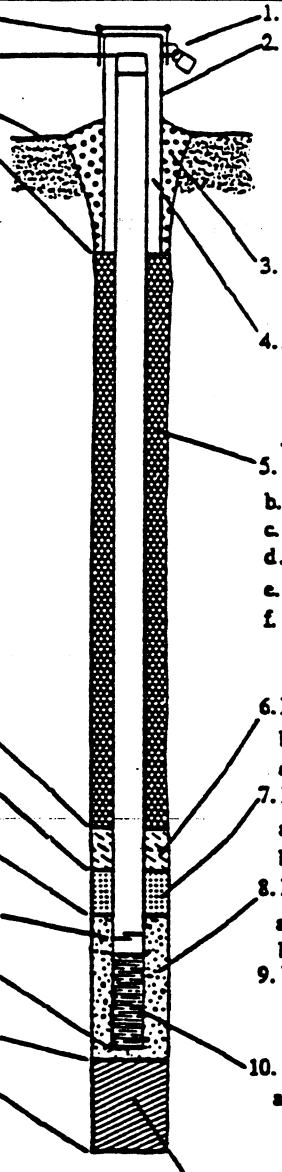
Follow-up Necessary

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name CMC-Hydrogeologic Investigation	**Local Grid Location of Well** 117,856.6 ft. ☒ N. ☐ S. 2,281,146.9 ft. ☒ E. ☐ W.	**Well Name** CMC-SL-103A
Facility License, Permit or Monitoring Number _____	**Grid Origin Location** Lat. _____ Long. _____ or St. Plane _____ ft. N. _____ ft. E.	**Wis. Unique Well Number** / **DNR Well Number** _____ / _____
Type of Well Water Table Observation Well ☐ 11 Piezometer ☒ 12	**Section Location of Well/Source** NE 1/4 of SE 1/4 of Sec. 30, T. 35 N, R. 13 ☐ E. ☐ W.	**Date Well Installed** 02 / 08 / 94 m m / d d / y y
Distance Well Is From Waste/Source Boundary NA ft.	**Location of Well Relative to Waste/Source** u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known NA	**Well Installed By: (Person's Name and Firm)** Dan Tinnacour WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? NA ☐ Yes ☐ No		



A. Protective pipe, top elevation 1,602.52 ft. MSL
B. Well casing, top elevation 1,602.41 ft. MSL
C. Land surface elevation 1,599.3 ft. MSL
D. Surface seal, bottom 1,593.9 ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe NA

17. Source of water (attach analysis):
NA

E. Bentonite seal, top 1,584.9 ft. MSL or _____ ft.
F. Fine sand, top 1,579.9 ft. MSL or _____ ft.
G. Filter pack, top 1,577.9 ft. MSL or _____ ft.
H. Screen joint, top 1,575.9 ft. MSL or _____ ft.
I. Well bottom 1,570.9 ft. MSL or _____ ft.
J. Filter pack, bottom 1,569.9 ft. MSL or _____ ft.
K. Borehole, bottom 1,568.9 ft. MSL or _____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04
_____ Other ☐ _____
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Tripod w/reflectors
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
Bentonite/Soil Other ☒ _____
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐ _____
Red Flint Sand Other ☒ _____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
3/8" Chipped Bentonite Tremie pumped ☐ 02
6-50 lb bags Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☒ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. RB#7 Badger Mining
b. Volume added 75 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint #30 Am. Materials
b. Volume added 200 lbs ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11
Continuous slot ☐ 01
_____ Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14
Cuttings Other ☒ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☒ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon mine-hydrogeologic investigation	Forest	CMC-SL-103A
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☒ 50
Other _____	☐

3. Time spent developing well 50 min.

4. Depth of well (from top of well casing) 31.5 ft.

5. Inside diameter of well 2.05 in.

6. Volume of water in filter pack and well casing ~6.6 gal.

7. Volume of water removed from well ~92.0 gal.

8. Volume of water added (if any) 0. gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 7.68 ft.	DRY. ft.
Date	b. 03/04/94 (mm/dd/yy)	03/04/94 (mm/dd/yy)
Time	c. 11:30 ☒ a.m. ☐ p.m.	12:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Lt.brown slightly turbid	Clear ☐ 20 Turbid ☒ 25 (Describe) slightly turbid

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____. mg/l	____. mg/l
15. COD	____. mg/l	____. mg/l

16. Additional comments on development:

Well was repeatedly pumped dry.

Well developed by: Person's Name and Firm

Name: Scott D. Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Scott D Janssen

Print Initials: S V D

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Hydrogeologic Investigation	Local Grid Location of Well: 117,848.7 ft. ☒ N 2,281,133.9 ft. ☒ E. ☐ S. ☐ W.	Well Name: CMC- SL-103B
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NE 1/4 of SE 1/4 of Sec. 30 T. 35 N. R. 13 ☒ E. ☐ W.	Date Well Installed: 02 / 09 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known — NA	Well Installed By: (Person's Name and Firm): Dan Tinnacour / WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? NA ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,602.41 ft. MSL
B. Well casing, top elevation 1,602.28 ft. MSL
C. Land surface elevation 1,599.1 ft. MSL
D. Surface seal, bottom 1,596.5 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

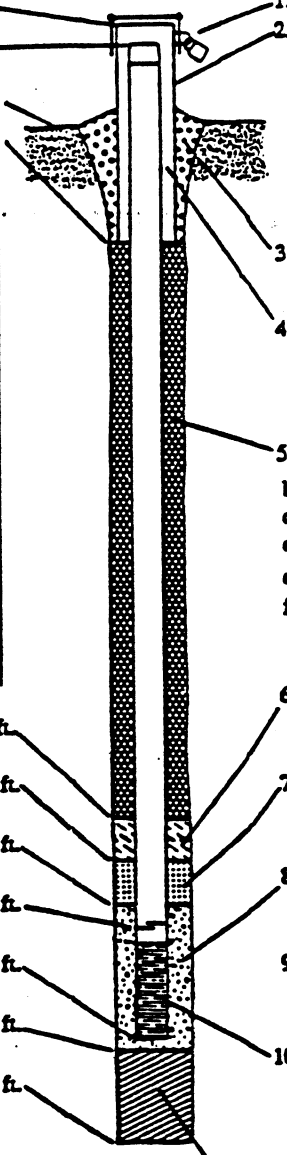
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe NA

17. Source of water (attach analysis):
NA

E. Bentonite seal, top 1,568.5 ft. MSL or ____ ft.
F. Fine sand, top 1,563.5 ft. MSL or ____ ft.
G. Filter pack, top 1,561.5 ft. MSL or ____ ft.
H. Screen joint, top 1,556.7 ft. MSL or ____ ft.
I. Well bottom 1,551.7 ft. MSL or ____ ft.
J. Filter pack, bottom 1,550.7 ft. MSL or ____ ft.
K. Borehole, bottom 1,550.7 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☒ Yes ☐ No
If yes, describe: Tripod w/ reflectors
3. Surface seal: Bentonite ☐ 30; Concrete ☐ 01; Other ☒ ____
Soil/Bentonite Mixture
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☒ ____
Red Flint Sand
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
3/8" Chipped Bentonite 10-50 lb bags
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☒ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. BB#7 Badger Mining
b. Volume added 75 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Natural sand & gravel due to cave
b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC-Hydrogeologic Investigation	Forest	CMC-SL-103B
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	21	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☒ 50
Other	☐

3. Time spent developing well: 60 min.

4. Depth of well (from top of well casing): 50.6 ft.

5. Inside diameter of well: 2.05 in.

6. Volume of water in filter pack and well casing: ~ 9.6 gal.

7. Volume of water removed from well: ~ 150 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)
NA

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 7.81 ft.	Dry ft.
Date	b. 03 / 04 / 94 (m m d d y y)	03 / 04 / 94 (m m d d y y)
Time	c. 11 : 30 ☐ a.m. ☒ p.m.	12 : 30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	0.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Dk Brown High Turbidity	Clear ☒ 20 Turbid ☐ 25 (Describe) No Turbidity

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	NA mg/l	NA mg/l
15. COD	NA mg/l	NA mg/l

16. Additional comments on development:

Well was repeatedly pumped dry.

Well developed by: Person's Name and Firm

Name: Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Steph VWandt

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC Hydrogeologic Investigation	Local Grid Location of Well: 113,334.6 ft. ☒N ☐S, 2,281,957.0 ft. ☒E ☐W	Well Name: CMC-DL-103A
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NW 1/4 of SW 1/4 of Sec. 32 T. 35 N, R. 13 ☒E ☐W	Date Well Installed: 02/11/94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known — NA	Well Installed By: (Person's Name and Firm): Chuck Blunt / WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation 1,616.45 ft. MSL
B. Well casing, top elevation 1,616.41 ft. MSL
C. Land surface elevation 1,613.6 ft. MSL
D. Surface seal, bottom 1,613.1 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☒ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

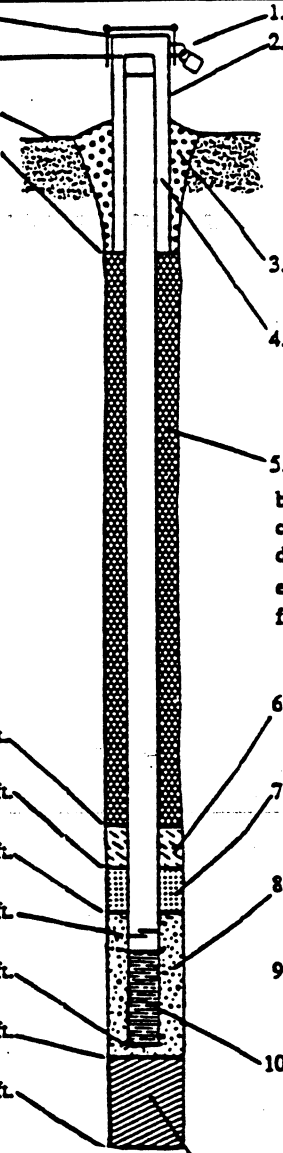
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top ____ ft. MSL or ____ ft.
F. Fine sand, top ____ ft. MSL or ____ ft.
G. Filter pack, top 1,611.4 ft. MSL or ____ ft.
H. Screen joint, top 1,610.9 ft. MSL or ____ ft.
I. Well bottom 1,605.9 ft. MSL or ____ ft.
J. Filter pack, bottom 1,605.8 ft. MSL or ____ ft.
K. Borehole, bottom 1,604.9 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.5 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Soil/Bentonite Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: a. Granular Bentonite (Chipped) ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 0.9 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. ____
b. Volume added -- ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. #30 Red Flint Filter Sand
b. Volume added 1.8 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Hole Plug Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Steve Woods Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeologic Investigation	Forest	CMC-DL-103A
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

1. Can this well be purged dry? ☐ Yes ☐ No
Well is dry

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well _____ min.

4. Depth of well (from top of well casing) __10.5 ft.

5. Inside diameter of well ___.___ in.

6. Volume of water in filter pack and well casing ____.__ gal.

7. Volume of water removed from well ____.__ gal.

8. Volume of water added (if any) ____.__ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. Dry ft.	____.__ ft.
Date	b. __/__/__ m m d d y y	__/__/__ m m d d y y
Time	c. __:__ ☐ a.m. ☐ p.m.	__:__ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	___.__ inches	___.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Steph K Wonsh

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name
CMC Hydrogeologic Investigation

Facility License, Permit or Monitoring Number
_____

Type of Well Water Table Observation Well ☒ 11
Piezometer ☐ 12

Distance Well Is From Waste/Source Boundary
NA ft.

Is Well A Point of Enforcement Std. Application?
NA ☐ Yes ☐ No

Local Grid Location of Well
113,333.3 ft. ☒ N. ☐ S. 2,281,954.3 ft. ☒ E. ☐ W.

Grid Origin Location
Lat. _____ Long. _____ or
St. Plane _____ ft. N. _____ ft. E.

Section Location of Waste/Source
NW 1/4 of SW 1/4 of Sec. 32 T. 35 N. R. 13 ☒ E. ☐ W.

Location of Well Relative to Waste/Source
u ☐ Upgradient s ☐ Sidegradient
d ☐ Downgradient n ☐ Not Known

Well Name
CMC-DL-103B

Wis. Unique Well Number **DNR Well Number**
_____ _____

Date Well Installed
02 / 11 / 94
m m d d y y

Well Installed By: (Person's Name and Firm)
Chuck Blunt
WTD Environmental Drilling

A. Protective pipe, top elevation 1,616.58 ft. MSL
B. Well casing, top elevation 1,616.49 ft. MSL
C. Land surface elevation 1,613.6 ft. MSL
D. Surface seal, bottom 1,608.9 ft. MSL or _____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

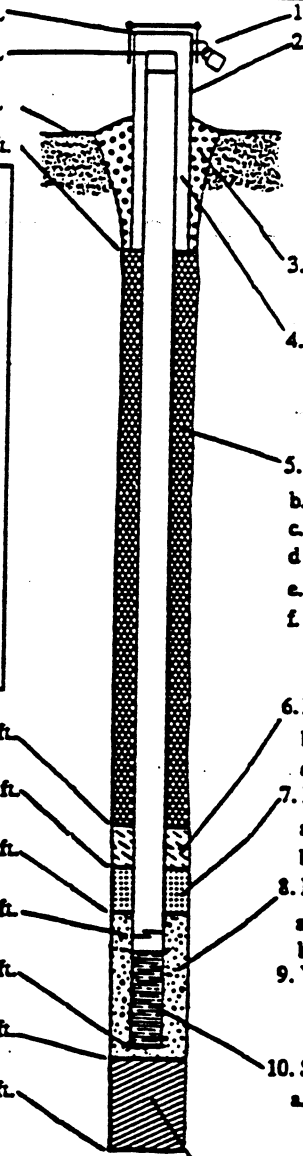
14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
_____ Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis):
_____

E. Bentonite seal, top 1,605.9 ft. MSL or _____ ft.
F. Fine sand, top 1,600.9 ft. MSL or _____ ft.
G. Filter pack, top 1,598.9 ft. MSL or _____ ft.
H. Screen joint, top 1,596.9 ft. MSL or _____ ft.
I. Well bottom 1,591.9 ft. MSL or _____ ft.
J. Filter pack, bottom 1,589.9 ft. MSL or _____ ft.
K. Borehole, bottom 1,577.4 ft. MSL or _____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 7.0 in.
b. Length: 4.0 ft.
c. Material: Steel ☒ 04
_____ Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☐ 30
Concrete ☐ 01
Bentonite/Soil Other ☒
4. Material between well casing and protective pipe:
Bentonite ☐ 30
Annular space seal ☐
_____ Other ☐
5. Annular space seal: Chipped a. Granular Bentonite ☒ 33
b. _____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight . . . . . Bentonite slurry ☐ 31
d. _____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. 4.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☐ 02
3/8" Chipped Bentonite Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☒ 32
3/8" Chipped Bentonite c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BL #7
b. Volume added 0.7 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. #30 Red Flint Filter Sand
b. Volume added 2.4 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
_____ Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11
Continuous slot ☐ 01
_____ Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14
Hole Plug Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeological Investigation	Forest	CMC-DL-103B
Facility License, Permit or Monitoring Number	County Code: 2 1	Wis. Unique Well Number / DNR Well Number

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☒ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 30 min.

4. Depth of well (from top of well casing): 24.6 ft.

5. Inside diameter of well: 2.05 in.

6. Volume of water in filter pack and well casing: ~ 1.0 gal.

7. Volume of water removed from well: ~ 26 gal.

8. Volume of water added (if any): 0.0 gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)
NA

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 22.43 ft.	23.3 ft.
Date	b. 03 / 04 / 94 (m m d d y y)	03 / 04 / 94 (m m d d y y)
Time	c. 13 : 50 ☐ a.m. ☒ p.m.	14 : 20 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	0.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Dark brown V. Turbid	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Scott L. VanDyke

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC Hydrogeologic Investigation	Local Grid Location of Well: 117,361.7 ft. ☒N ☐S 2,283,366.8 ft. ☒E ☐W	Well Name: CMC-BO-101A
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N, _____ ft. E.	Wis. Unique Well Number / DNR Well Number: _____
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 29, T. 35 N, R. 13 ☒E ☐W	Date Well Installed: 02 / 07 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known NA	Well Installed By: (Person's Name and Firm): WTD Environmental Drilling; Dan Tinnacour
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation 1640.85 ft. MSL
B. Well casing, top elevation 1640.73 ft. MSL
C. Land surface elevation 1637.3 ft. MSL
D. Surface seal, bottom 1635.6 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

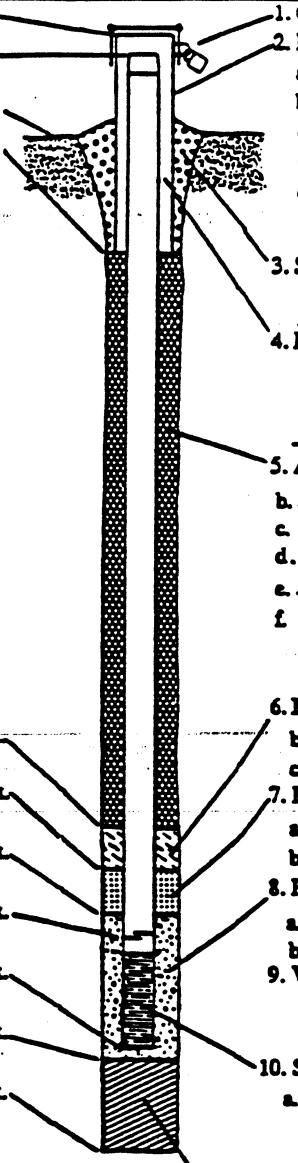
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis):

E. Bentonite seal, top ____ ft. MSL or ____ ft.
F. Fine sand, top 1,628.6 ft. MSL or ____ ft.
G. Filter pack, top 1,627.6 ft. MSL or ____ ft.
H. Screen joint, top 1,626.6 ft. MSL or ____ ft.
I. Well bottom 1,621.6 ft. MSL or ____ ft.
J. Filter pack, bottom 1,621.4 ft. MSL or ____ ft.
K. Borehole, bottom 1,621.4 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 04; Other ☐ _____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ Bentonite/soil
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ _____; Other ☐ Chipped Bentonite
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. 90 lbs Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. 50 lbs BB#7 Badger Mining
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. 200 lbs Red Flint #30 Am.Material
b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: _____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Co Hydrogeologic Investigaion	Forest	CMC-BO-101A

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	21		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☒ 50
Other _____	☐

3. Time spent developing well 20 min.

4. Depth of well (from top of well casing) 19.1 ft.

5. Inside diameter of well 2.10 in.

6. Volume of water in filter pack and well casing ~3.7 gal.

7. Volume of water removed from well ~10.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 12.39 ft.	Dry ft.
Date	b. 03 / 04 / 94 (m m d d y y)	03 / 04 / 94 (m m d d y y)
Time	c. 12 : 35 ☐ a.m. ☒ p.m.	01 : 15 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Dk Brown V. High Turbidity	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt Brown Low Turbidity
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Stephen H. Vonet

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Hydrogeological Invest.	Local Grid Location of Well: 117,357.7 ft. ☒N ☐S, 2,283,369.5 ft. ☒E ☐W	Well Name: CMC-BO-101B
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N. _____ ft. E.	Wis. Unique Well Number / DNR Well Number: _____
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location: NE 1/4 of SW 1/4 of Sec. 29, T. 35 N, R. 13 ☐E ☐W	Date Well Installed: 02 / 01 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known NA	Well Installed By: (Person's Name and Firm): Dan Tinnacour; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation 1,640.77 ft. MSL
B. Well casing, top elevation 1,640.69 ft. MSL
C. Land surface elevation 1,637.3 ft. MSL
D. Surface seal, bottom 1,632.7 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

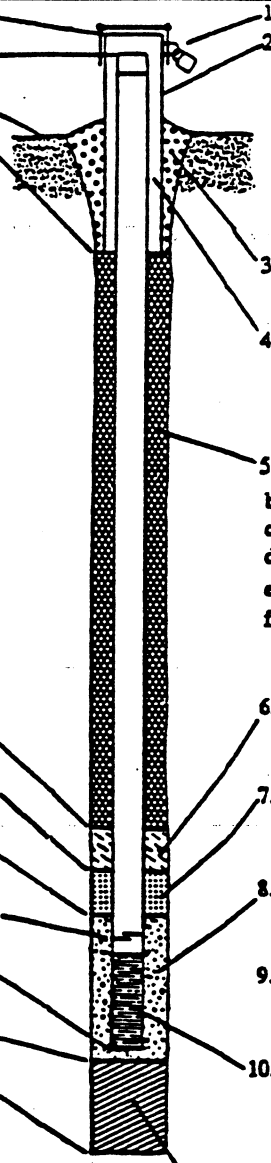
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe NA

17. Source of water (attach analysis):
NA

E. Bentonite seal, top 1,611.8 ft. MSL or ____ ft.
F. Fine sand, top 1,606.8 ft. MSL or ____ ft.
G. Filter pack, top 1,605.2 ft. MSL or ____ ft.
H. Screen joint, top 1,603.2 ft. MSL or ____ ft.
I. Well bottom 1,598.2 ft. MSL or ____ ft.
J. Filter pack, bottom 1,596.2 ft. MSL or ____ ft.
K. Borehole, bottom 1,596.2 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☒ Bentonite/soil
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33; b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35; c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31; d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50; e. ____ Ft^3 volume added for any of the above; f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
3/8" Chipped Bentonite
8 - 50 lb bags
6. Bentonite seal: a. Bentonite granules ☐ 33; b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32; c. 3/8" Chipped Bentonite Other ☒ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. BB#7 Am. Materials
b. Volume added 75 lbs ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Sand #30 Badger Mining
b. Volume added 200 lbs ft^3 BP#7
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ Slough

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: _____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeologic Investigation	Forest	CMC-BO-101B
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	_____ / _____

1. Can this well be purged dry? ☐ Yes ☐ No
Well is dry.

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well _____ min.

4. Depth of well (from top of well casing) 42.5 ft.

5. Inside diameter of well ____.__ in.

6. Volume of water in filter pack and well casing ____.__ gal.

7. Volume of water removed from well ____.__ gal.

8. Volume of water added (if any) ____.__ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. ____.__ ft.	____.__ ft.
Date	b. __/__/__ m m d d y y	__/__/__ m m d d y y
Time	c. __:__ ☐ a.m. ☐ p.m.	__:__ ☐ a.m. ☐ p.m.
12. Sediment in well bottom	__.__ inches	__.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Dry well.

Well developed by: Person's Name and Firm

Name: _____

Firm: _____

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Steven K Wood

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC Hydrogeologic Investigation	Local Grid Location of Well: 120,038.8 ft. ☒ N ☐ S. 2,280,679.9 ft. ☐ E. ☐ W	Well Name: CMC-SCC-102A
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N. _____ ft. E.	Wis. Unique Well Number / DNR Well Number: _____
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of NE 1/4 of Sec. 30 T. 35 N, R. 13 ☒ E. ☐ W.	Date Well Installed: 02 / 07 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known NA	Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No		

A. Protective pipe, top elevation 1,587.48 ft. MSL
B. Well casing, top elevation 1,587.41 ft. MSL
C. Land surface elevation 1,583.7 ft. MSL
D. Surface seal, bottom 1,583.2 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

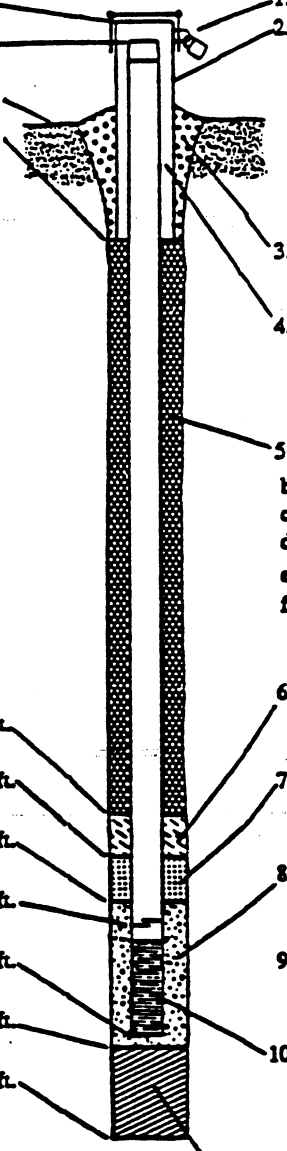
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis): _____

E. Bentonite seal, top 1,583.2 ft. MSL or ____ ft.
F. Fine sand, top 1,579.7 ft. MSL or ____ ft.
G. Filter pack, top 1,579.5 ft. MSL or ____ ft.
H. Screen joint, top 1,579.0 ft. MSL or ____ ft.
I. Well bottom 1,574.0 ft. MSL or ____ ft.
J. Filter pack, bottom 1,572.7 ft. MSL or ____ ft.
K. Borehole, bottom 1,572.7 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: Chipped
a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 1.6 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. 3/8" Chipped Bentonite Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BL #7
b. Volume added .17 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. # 30 Red Flint Filter
b. Volume added 2.1 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: _____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeologic Investigation	Forest	CMC-SCC-102A

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	21		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method
- surged with bailer and bailed ☐ 41
- surged with bailer and pumped ☐ 61
- surged with block and bailed ☐ 42
- surged with block and pumped ☐ 62
- surged with block, bailed and pumped ☐ 70
- compressed air ☐ 20
- bailed only ☒ 10
- pumped only ☐ 51
- pumped slowly ☐ 50
- Other _____ ☐

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 13.4 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing ~7.0 gal.

7. Volume of water removed from well ~8.0 gal.

8. Volume of water added (if any) NA. gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)
NA

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 1.20 ft.	12.40 ft.
Date	b. 05 / 24 / 94 (m m d d y y)	05 / 24 / 94 (m m d d y y)
Time	c. 08 : 45 ☒ a.m. ☐ p.m.	09 : 15 ☐ a.m. ☐ p.m.
12. Sediment in well bottom	1.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____. mg/l	_____. mg/l
15. COD	_____. mg/l	_____. mg/l

16. Additional comments on development:

Well was repeatedly bailed dry.

Well developed by: Person's Name and Firm

Name: Brad Helmandollar

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Stephen Helmandollar

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC Hydrogeologic Investigation	Local Grid Location of Well: ☒ N ☐ S 120,042.7 ft. ☒ E ☐ W 2,280,678.3 ft.	Well Name: CMC-SCC-102B
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane ____ ft. N, ____ ft. E	Date Well Installed: 02 / 07 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: NA ft.	Section Location of Waste/Source: NE 1/4 of NE 1/4 of Sec. 30, T. 35 N, R. 13 ☒ E ☐ W	Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☒ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 1,587.27 ft. MSL
B. Well casing, top elevation 1,587.17 ft. MSL
C. Land surface elevation 1,583.7 ft. MSL
D. Surface seal, bottom 1,575.7 ft. MSL or ____ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☐ No

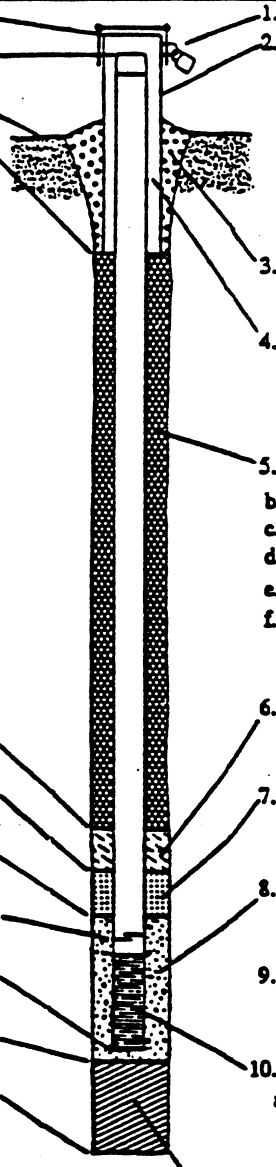
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☒ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,575.9 ft. MSL or ____ ft.
F. Fine sand, top 1,570.9 ft. MSL or ____ ft.
G. Filter pack, top 1,568.9 ft. MSL or ____ ft.
H. Screen joint, top 1,566.9 ft. MSL or ____ ft.
I. Well bottom 1,561.9 ft. MSL or ____ ft.
J. Filter pack, bottom 1,561.2 ft. MSL or ____ ft.
K. Borehole, bottom 1,561.2 ft. MSL or ____ ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.25 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Soil/Bentonite Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: Chipped a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite .... Bentonite-cement grout ☐ 50
e. 4.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BL#7
b. Volume added 0.7 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. # 30 Red Flint Filter
b. Volume added 3.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Mark W. Wandke | Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC Hydrogeologic Investigation	Forest	CMC-SCC-102B
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	21	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 135 min.

4. Depth of well (from top of well casing) 25.2 ft.

5. Inside diameter of well 2.00 in.

6. Volume of water in filter pack and well casing ~7.5 gal.

7. Volume of water removed from well ~75.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results) NA

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 1.42 ft.	10.05 ft.
Date	b. 05 / 24 / 94 (m m d d y y)	05 / 24 / 94 (m m d d y y)
Time	c. 09 : 15 ☒ a.m. ☐ p.m.	11 : 30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	2.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt. Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____ mg/l	_____ mg/l
15. COD	_____ mg/l	_____ mg/l

16. Additional comments on development:

Well developed by: Person's Name and Firm

Name: Brad Helmandollar

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Stephen K Van Dyke

Print Initials: SVD

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

WTD Environmental Drilling Well Construction and Development Reports and Drill Water Laboratory Analysis for 1994 Groundwater Verification Wells

CMC
- 01
- 01R
- 01P
- 02
- 02R
- 02P
- 03
- 03R
- 03RR
- 03P
- 04
- 05
- 06P
- 07
- 08
- 08P
- 09
- 09P
- 10
- 10P

TABLE 1: QUANTITATIVE RESULTS DATA

EPA METHOD - 6010/7000 SERIES METALS (AR72)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility Sample Point	Date	Joblink
MF6494	FOTIL & VAN DYKE	FVDGRNBCMD L WW-2	940518	811125

Compound	Results					
	Sample Concen. mg/L	Report DL mg/L	Blank Concen. mg/L	Batch #	Prep Date	Analysis Date
Aluminum	ND	.200	ND	QI40980	940602	940603
Antimony	ND	.050	ND	QI40980	940602	940603
Arsenic	ND	.005	ND	QG40980	940602	940603
Barium	ND	.010	ND	QI40980	940602	940603
Cadmium	ND	.001	ND	QG40980	940602	940603
Calcium	26.6	1.00	ND	QI40980	940602	940603
Chromium	ND	.005	ND	QG40980	940602	940604
Cobalt	ND	.010	ND	QI40980	940602	940603
Copper	ND	.030	ND	QI40980	940602	940603
Lead	ND	.001	ND	QG40980	940602	940606
Magnesium	12.0	.500	ND	QI40980	940602	940603
Mercury	ND	.0002	ND	QM40980	940602	940603
Molybdenum	ND	.020	ND	QI40980	940602	940603
Nickel	ND	.030	ND	QI40980	940602	940603
Selenium	ND	.005	ND	QG40980	940602	940603
Silver	ND	.010	ND	QI40980	940602	940603
Zinc	.051	.020	ND	QI40980	940602	940603

TABLE 1: QUANTITATIVE RESULTS DATA

CONVENTIONALS (AR55)

Chain of Custody Data Required for ETC Data Management Summary Reports

ETC Sample No.	Company	Facility Sample Point	Date	Joblink
MF6494	FOTH & VAN DYKE	FVDGRNBCMC L WW-2	940518	811125

Compound	Results					
	Sample Concen. mg/L	Report DL mg/L	Blank Concen. mg/L	Batch #	Prep Date	Analysis Date
Cyanide, Total	ND	.020	ND	QRZ10821	940529	940529
Alkalinity as CaCO3	114	20.0	ND	QRZ10899		940524
Chemical Oxygen Demand (COD)	ND	10.0	ND	QRZ10868		940602
Chloride	1.24	.500	ND	QRZ10895		940528
Fluoride	ND	.100	ND	QRZ10823		940526
Hardness as CaCO3	119	5.00	ND	QRZ10869		940601
Nitrate+Nitrite	1.00	.500	ND	QRZ10895		940528
Nitrogen, Total Kjeldahl (TKN)	ND	.200	ND	QRZ10891	940603	940602
Sulfate as SO4	8.0	2.0	ND	QCV41155		940602
Total Dissolved Solids (TDS)	139	5.00	ND	QRZ10901		940524

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 116,166.6 ft. ☒N ☐S, 2,282,677 ft. ☒E ☐W	Well Name: CMC-01
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☐ 12	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 29, T. 35 N, R. 13 ☐E ☐W	Date Well Installed: 03 / 31 / 94 (m m d d y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation: 1653.16 ft. MSL
B. Well casing, top elevation: 1653.15 ft. MSL
C. Land surface elevation: 1650.2 ft. MSL
D. Surface seal, bottom: 1645.2 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

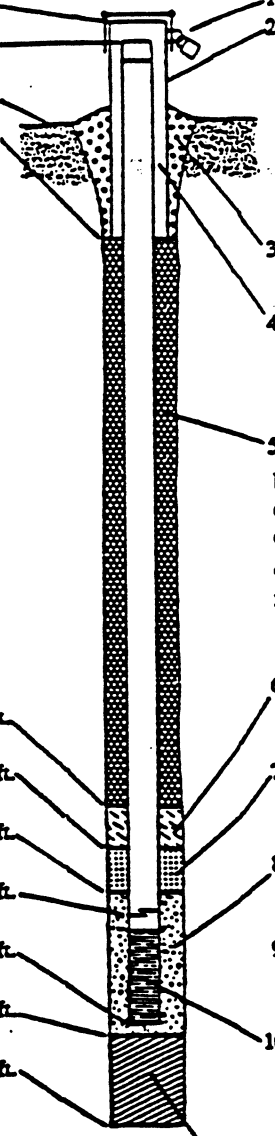
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top: 1645.2 ft. MSL or 5.0 ft.
F. Fine sand, top: 1577.2 ft. MSL or 73.0 ft.
G. Filter pack, top: 1575.2 ft. MSL or 75.0 ft.
H. Screen joint, top: 1573.2 ft. MSL or 77.0 ft.
I. Well bottom: 1558.2 ft. MSL or 92.0 ft.
J. Filter pack, bottom: 1557.7 ft. MSL or 92.5 ft.
K. Borehole, bottom: 1557.7 ft. MSL or 92.5 ft.
L. Borehole, diameter: 6.0 in.
M. O.D. well casing: 2.38 in.
N. I.D. well casing: 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: chips a. ~~Granular~~ Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 11.8 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added ____ ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-01
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	7 1	

	Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No	
2. Well development method		
surged with bailer and bailed ☐ 41		
surged with bailer and pumped ☐ 61		
surged with block and bailed ☐ 42		
surged with block and pumped ☐ 62		
surged with block, bailed and pumped ☒ 70		
compressed air ☐ 20		
bailed only ☐ 10		
pumped only ☐ 51		
pumped slowly ☐ 50		
Other nitrogen lift & surge ☒ 80		
3. Time spent developing well	440 min.	
4. Depth of well (from top of well casing)	94.4 ft.	
5. Inside diameter of well	2.01 in.	
6. Volume of water in filter pack and well casing	19.6 gal.	
7. Volume of water removed from well	230.0 gal.	
8. Volume of water added (if any)	N/A gal.	
9. Source of water added	N/A	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No	
11. Depth to Water (from top of well casing)	a. 57.3 ft.	89.68 ft.
Date	b. 03 / 31 / 94 (m m d d y y)	04 / 13 / 94
Time	c. 13 : 50 ☐ a.m. ☒ p.m.	16 : 10 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	2.0 inches	< 1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)	Brown	
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____ mg/l	_____ mg/l
15. COD	_____ mg/l	_____ mg/l

16. Additional comments on development:

03/31/94	04/13/94
Surge & Nitrogen Lift 95gallons removed light brown-clear	Bailed 20 gallons with 5' PVC bailer, surge & purge with Grundfos Rediflow II pump. Went dry, 5 gallon/minute. Cut back to 1 gallon/minute. Stabilization readings taken. Remove 135 gallons.

Well developed by: Person's Name and Firm

Name: Chad H./Scott Janssen/Erik Silvola

Firm: WID/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: E S L

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number: _____

Local Grid Location of Well: 116,156.5 ft. ☒ N ☐ S, 2,282,675.1 ft. ☒ E ☐ W
Grid Origin Location: Lat. _____ Long. _____ or
St. Plane _____ ft. N, _____ ft. E.
Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 29, T. 35 ☐ N, R. 13 ☐ E ☐ W.

Well Name: CMC-01R
Wis. Unique Well Number: _____ DNR Well Number: _____
Date Well Installed: 05 / 03 / 94 (m m / d d / y y)

Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12
Distance Well Is From Waste/Source Boundary: _____ ft.
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Installed By: (Person's Name and Firm)
Mike Mueller
WTD Environmental Drilling

A. Protective pipe, top elevation: 1,653.15 ft. MSL
B. Well casing, top elevation: 1,653.07 ft. MSL
C. Land surface elevation: 1,650.1 ft. MSL
D. Surface seal, bottom: 1,645.1 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

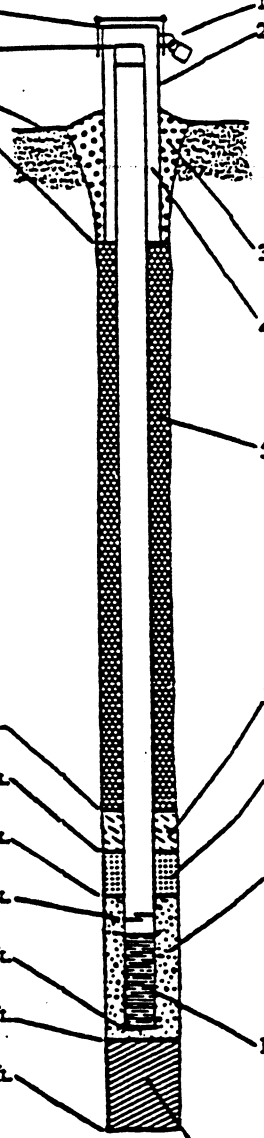
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis): _____

E. Bentonite seal, top: 1,645.1 ft. MSL or 5.0 ft.
F. Fine sand, top: 1,606.1 ft. MSL or 44.0 ft.
G. Filter pack, top: 1,604.1 ft. MSL or 46.0 ft.
H. Screen joint, top: 1,602.1 ft. MSL or 48.0 ft.
I. Well bottom: 1,587.1 ft. MSL or 63.0 ft.
J. Filter pack, bottom: 1,582.1 ft. MSL or 68.0 ft.
K. Borehole, bottom: 1,582.1 ft. MSL or 68.0 ft.
L. Borehole, diameter: 6.0 in.
M. O.D. well casing: 2.38 in.
N. I.D. well casing: 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 10.0 ft.
c. Material: Steel ☒ 04; Other ☐ _____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ _____; Other ☐ _____
5. Annular space seal: Chipped a. ~~Granular~~ Bentonite ☒ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 7.65 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB
b. Volume added 0.5 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2.5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: _____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-01R
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☒ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other	☐		
11. Depth to Water (from top of well casing)		a. 33.42 ft.	Dry ft.
Date		b. 05/04/94 (m m d d y y)	05/12/94 (m m d d y y)
Time		c. 9:15 ☒ a.m. ☐ p.m.	13:16 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		1.0 inches	1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Brown
3. Time spent developing well	63 min.		
4. Depth of well (from top of well casing)	65.0 ft.		
5. Inside diameter of well	2.01 in.		
6. Volume of water in filter pack and well casing	18.3 gal.		
7. Volume of water removed from well	18.1 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____. mg/l	____. mg/l
15. COD	____. mg/l	____. mg/l

16. Additional comments on development:

5/4/94
Bailed with 5' PVC bailer
Removed 13.6 gallons - Dry

5/12/94
Bailed with 5' PVC bailer
Removed 4.5 gallons - Dry

Well developed by: Person's Name and Firm

Name: Erick Silvola, Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Erick Silvola

Print Initials: E A S

Firm: Foth & Van Dyke

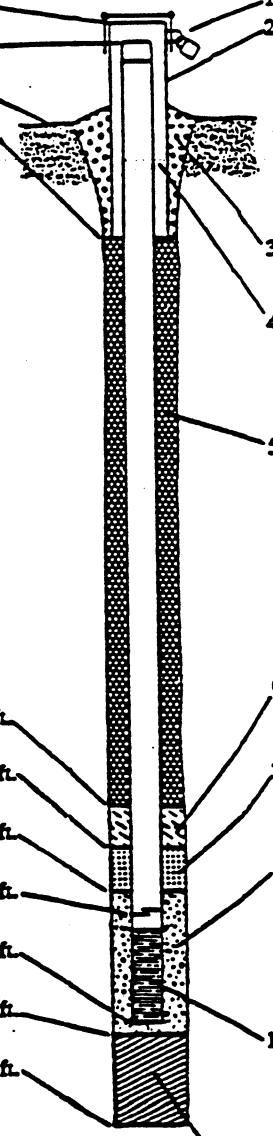
NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☑ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 116,168.3 ft. ☒N ☐S, 2,282,682.7 ft. ☒E ☐W
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☑ 12	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 29 T. 35 N. R. 13 ☒E ☐W
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	
Well Name: CMC-01P	
Wis. Unique Well Number: DNR Well Number:	
Date Well Installed: 03 / 28 / 94 (m m / d d / y y)	
Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling	



A. Protective pipe, top elevation 1,653.72 ft. MSL
B. Well casing, top elevation 1,653.67 ft. MSL
C. Land surface elevation 1,650.1 ft. MSL
D. Surface seal, bottom 1,645.1 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,645.1 ft. MSL or 5.0 ft.
F. Fine sand, top 1,513.6 ft. MSL or 136.5 ft.
G. Filter pack, top 1,511.3 ft. MSL or 138.8 ft.
H. Screen joint, top 1,509.1 ft. MSL or 141.0 ft.
I. Well bottom 1,504.1 ft. MSL or 146.0 ft.
J. Filter pack, bottom 1,500.3 ft. MSL or 149.8 ft.
K. Borehole, bottom 1,448.1 ft. MSL or 202.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: a. Granular Bentonite ☒ 33; b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35; c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31; d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50; e. 18.07 Ft³ volume added for any of the above; f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33; b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite Chips ☒ 32; c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size: a. Badger Mining Fine Silica 2040/BBZ; b. Volume added 1.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size: a. Red Flint Filter Sand #30; b. Volume added 1 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): 3/8" hole plug; None ☐ 14; Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Eric Foth | Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis. Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-01P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☒ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other Nitrogen Lift & Surge	☒		
11. Depth to Water (from top of well casing)		a. 41.1 ft.	109.10 ft.
Date		b. 03/31/94 (m m d d y y)	04/13/94 (m m d d y y)
Time		c. 14:50 ☐ a.m. ☒ p.m.	12:20 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2. inches	<1. inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)		Brown	

3. Time spent developing well	115 min.
4. Depth of well (from top of well casing)	149.8 ft.
5. Inside diameter of well	1.87 in.
6. Volume of water in filter pack and well casing	30.2 gal.
7. Volume of water removed from well	313.0 gal.
8. Volume of water added (if any)	NA. gal.
9. Source of water added	NA
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

3/31/94
Surge & Purge with nitrogen lift
removed 187 gallons

4/13/94
Surge & Purge with Grundflos Rediflow II pump
Stabilization readings taken, 135 gallons removed.

Well developed by: Person's Name and Firm

Name: Chad H/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 115299.21 ft. ☒ N ☐ S, 2286062.48 ft. ☒ E ☐ W	Well Name: CMC-02R
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N, _____ ft. E.	Wis. Unique Well Number / DNR Well Number: _____
Type of Well: Water Table Observation Well ☑ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of NE 1/4 of Sec. 32 T. 35 N. R. 13 ☐ E ☑ W	Date Well Installed: 09 / 08 / 94 (mm dd yy)
Distance Well Is From Waste/Source Boundary: _____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Jon Anderson / NorthStar
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1770.35 ft. MSL
B. Well casing, top elevation 1770.15 ft. MSL
C. Land surface elevation 1697.6 ft. MSL
D. Surface seal, bottom 1696.6 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☑
SM ☑ SC ☐ ML ☐ MH ☐ CL ☑ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☐ 41; Other ☐ Rotasonic

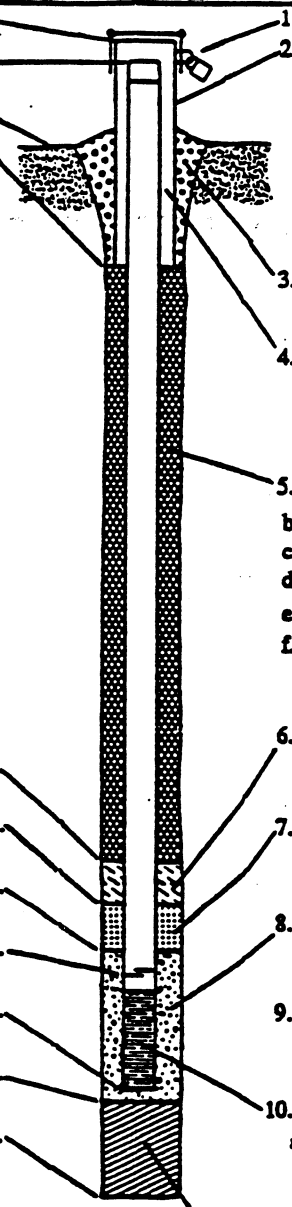
15. Drilling fluid used: Water ☑ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No

Describe _____

Source of water (attach analysis): _____

E. Bentonite seal, top 1696.6 ft. MSL or 1.0 ft.
F. Fine sand, top 1604.6 ft. MSL or 93.0 ft.
G. Filter pack, top 1602.6 ft. MSL or 95.0 ft.
H. Screen joint, top 1597.6 ft. MSL or 100.0 ft.
I. Well bottom 1582.6 ft. MSL or 115.0 ft.
J. Filter pack, bottom 1578.6 ft. MSL or 119.0 ft.
K. Borehole, bottom 1577.6 ft. MSL or 120.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☑ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☑ 04; Other ☐ _____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☑ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ _____; Other ☐ _____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. _____ lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.8 lbs/gal mud weight ..... Bentonite slurry ☑ 31
d. 14.6 % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft³ volume added for any of the above
f. How installed: Tremie ☑ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" Bentonite Chips Other ☑ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 0.6 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter #3
b. Volume added 5.8 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☑ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☑ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☑ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm F & VD

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-02R
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	__	

1. Can this well be purged dry? ☑ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☑ 10
pumped only	☑ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 100 min.

4. Depth of well (from top of well casing): 123.0 ft.

5. Inside diameter of well: 1.87 in.

6. Volume of water in filter pack and well casing: 10.4 gal.

7. Volume of water removed from well: 24.0 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 104.24 ft.	Dry ft.
Date	b. 09 / 30 / 94 (m m d d y y)	10 / 06 / 94 (m m d d y y)
Time	c. 8:00 ☑ a.m. ☐ p.m.	14:30 ☐ a.m. ☑ p.m.
12. Sediment in well bottom	None inches	None inches
13. Water clarity	Clear ☐ 10 Turbid ☑ 15 (Describe) Lt brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Lt brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:
Well bailed dry twice and pumped dry twice.

Well developed by: Person's Name and Firm

Name: Erik Silvola / Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 115308.7 ft. ☒ N. ☐ S. 2286070.1 ft. ☒ E. ☐ W.	Well Name: CMC-02
Facility License, Permit or Monitoring Number: [redacted]	Grid Origin Location: Lat. _____ Long. _____ or St. Plane _____ ft. N. _____ ft. E.	Wis. Unique Well Number / DNR Well Number: [redacted]
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of NE 1/4 of Sec. 32 T. 35 N, R. 13 ☒ E. ☐ W.	Date Well Installed: 03 / 28 / 94 (m m d d y y)
Distance Well Is From Waste/Source Boundary: _____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Dan Tinnancour / WID Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation ___N/A___ ft. MSL
B. Well casing, top elevation ___N/A___ ft. MSL
C. Land surface elevation _1697.9_ ft. MSL
D. Surface seal, bottom _1696.9_ ft. MSL or _1.0_ ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No

Describe _____

17. Source of water (attach analysis): _____

E. Bentonite seal, top _1696.9_ ft. MSL or _1.0_ ft.
F. Fine sand, top _1623.9_ ft. MSL or _715_ ft.
G. Filter pack, top _1621.9_ ft. MSL or _735_ ft.
H. Screen joint, top _1619.9_ ft. MSL or _780_ ft.
I. Well bottom _1604.9_ ft. MSL or _930_ ft.
J. Filter pack, bottom _1602.9_ ft. MSL or _950_ ft.
K. Borehole, bottom _1602.9_ ft. MSL or _950_ ft.
L. Borehole, diameter _6.0_ in.
M. O.D. well casing _2.38_ in.
N. I.D. well casing _2.10_ in.

1. Cap and lock? ☐ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ _____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ _____; Other ☐ _____
5. Annular space seal: a. Granular Bentonite ☒ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35 (Chipped)
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 23.8 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" Bentonite Chips Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7
b. Volume added 0.6 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter #30
b. Volume added S.S. ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-02
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☒ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well ___180___ min.

4. Depth of well (from top of well casing) ___960 ft.

5. Inside diameter of well ___2.10___ in.

6. Volume of water in filter pack and well casing ___NA___ gal.

7. Volume of water removed from well ___17.2___ gal.

8. Volume of water added (if any) ___NA___ gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 74.3 ft.	Dry ft.
Date	b. 03/30/94 (m m d d y y)	04/12/94 (m m d d y y)
Time	c. NA: ☐ a.m. ☐ p.m.	N/A: ☐ a.m. ☐ p.m.
12. Sediment in well bottom	NA inches	N/A inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____ mg/l	_____ mg/l
15. COD	_____ mg/l	_____ mg/l

16. Additional comments on development:

Well bailed dry twice - remained dry.

Well developed by: Person's Name and Firm

Name: Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: EAS

Firm: Foth & Van Dyke

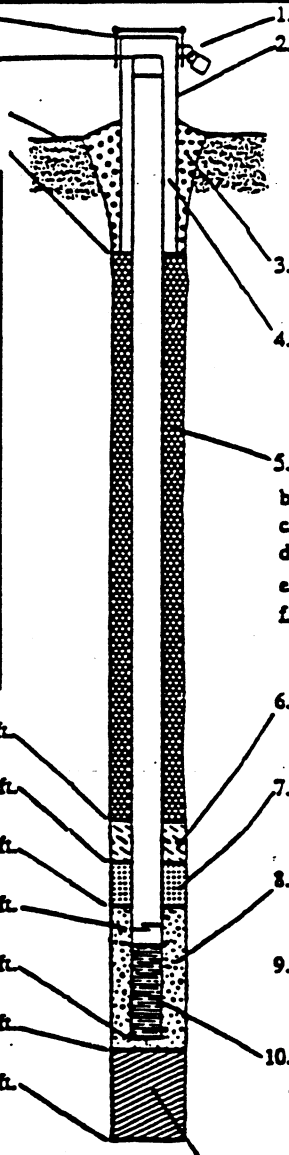
NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 115,306.8 ft. ☒N ☐S. 2,286,077.3 ft. ☒E ☐W	Well Name: CMC-02P
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane ____ ft. N. ____ ft. E.	Date Well Installed: 03 / 22 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Section Location of Waste/Source: NE 1/4 of NE 1/4 of Sec. 32 T. ___ N. R. ___ ☐E ☐W	Well Installed By: (Person's Name and Firm): Dan Tinnancour; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Applicanon? ☐ Yes ☐ No	Location of Well Relanve to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	



A. Protective pipe, top elevation 1,701.09 ft. MSL
B. Well casing, top elevation 1,700.96 ft. MSL
C. Land surface elevation 1,697.7 ft. MSL
D. Surface seal, bottom 1,692.7 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,692.7 ft. MSL or 5.0 ft.
F. Fine sand, top 1,516.7 ft. MSL or 181.0 ft.
G. Filter pack, top 1,514.7 ft. MSL or 183.0 ft.
H. Screen joint, top 1,512.7 ft. MSL or 185.0 ft.
I. Well bottom 1,507.7 ft. MSL or 190.0 ft.
J. Filter pack, bottom 1,506.6 ft. MSL or 191.1 ft.
K. Borehole, bottom 1,506.6 ft. MSL or 191.1 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: Chip a. ~~Granular~~ Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 19.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite ~~pellets~~ Chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.8 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 1.2 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-02P
Facility License, Permit or Monitoring Number	County Code: 7 1	Wis. Unique Well Number / DNR Well Number

	Initial Before Development	Final After Development
11. Depth to Water (from top of well casing)	a. 113.3 ft.	132.11 ft.
Date	b. 03/30/94 (m m / d d / y y)	04/13/94 (m m / d d / y y)
Time	c. 14:25 ☐ a.m. ☒ p.m.	10:00 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	2.0 inches	<1. inches
13. Water clarity	Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)	Dark Brown	

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☒ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other Nitrogen Lift & Surge	☒

3. Time spent developing well: 390 min.

4. Depth of well (from top of well casing): 193.3 ft.

5. Inside diameter of well: 1.87 in.

6. Volume of water in filter pack and well casing: 18.8 gal.

7. Volume of water removed from well: 235.0 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

Fill in if drilling fluids were used and well is at solid waste facility:

	Initial	Final
14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:

03/30/94
Surge & Purge Nitrogen Lift
Removed 115 gallons

04/13/94
Surge & Purge with Grundfos RediFlow II pump.
Stabilization readings taken, removed 110 gallon

Well developed by: Person's Name and Firm

Name: Chad H./Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number:

Local Grid Location of Well: 113,463.6 ft. ☒ N ☐ S, 2,286,751.7 ft. ☒ E ☐ W
Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.
Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 32 T. 35 N. R. 13 ☐ E ☒ W.
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-03
Wis. Unique Well Number: DNR Well Number:
Date Well Installed: 03 / 24 / 94 (m m / d d / y y)
Well Installed By: (Person's Name and Firm)
Chuck Blunt
WTD Environmental Drilling

Type of Well: Water Table Observation Well ☒ 11 Piezometer ☐ 12
Distance Well Is From Waste/Source Boundary: ft.
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation ____ ft. MSL
C. Land surface elevation 1,705.2 ft. MSL
D. Surface seal, bottom 1,700.2 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

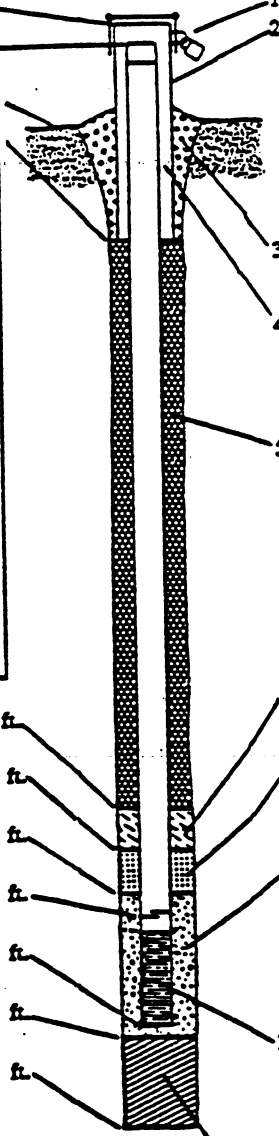
14. Drilling method used: Rotary ☒ 50 Hollow Stem Auger ☐ 41 Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,700.2 ft. MSL or 5.0 ft.
F. Fine sand, top 1,641.2 ft. MSL or 64.0 ft.
G. Filter pack, top 1,639.2 ft. MSL or 66.0 ft.
H. Screen joint, top 1,637.2 ft. MSL or 68.0 ft.
I. Well bottom 1,622.2 ft. MSL or 83.0 ft.
J. Filter pack, bottom 1,619.2 ft. MSL or 86.0 ft.
K. Borehole, bottom 1,619.2 ft. MSL or 86.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30 Annular space seal ☐ Other ☐
5. Annular space seal: chips a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 12.51 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☒ 32 chips
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 3 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Eric Hall
Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-03
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	_____ / _____

	Initial Before Development	Final After Development
11. Depth to Water (from top of well casing)	a. 58.71 ft.	Dry. ft.
Date	b. 03 / 25 / 94 (m m d d y y)	03 / 28 / 94 (m m d d y y)
Time	c. 11 : 35 ☒ a.m. ☐ p.m.	10 : 25 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	___.__ inches	___.1 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Brown
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well ___85 min.

4. Depth of well (from top of well casing) __85.5 ft.

5. Inside diameter of well __2.01 in.

6. Volume of water in filter pack and well casing ___8.9 gal.

7. Volume of water removed from well __20.4 gal.

8. Volume of water added (if any) __NA__.__ gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development:

03/25/94
Bailed with 5' PVC bailer
Removed 15.4 gallons. Dry

03/28/94
Bailed with 5' PVC bailer.
Removed 5 gallons - Dry

Well developed by: Person's Name and Firm

Name: Jon Weeks/Erik Silvola

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 113,562.6 ft. ☒N ☐S 2,286,751.7 ft. ☒E ☐W	Well Name: CMC-03R
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 32 T. 35 N. R. 13 ☒E ☐W	Date Well Installed: 04/04/94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Dan Tinnancour; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation _____ ft. MSL
C. Land surface elevation 1,705.2 ft. MSL
D. Surface seal, bottom 1,700.2 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

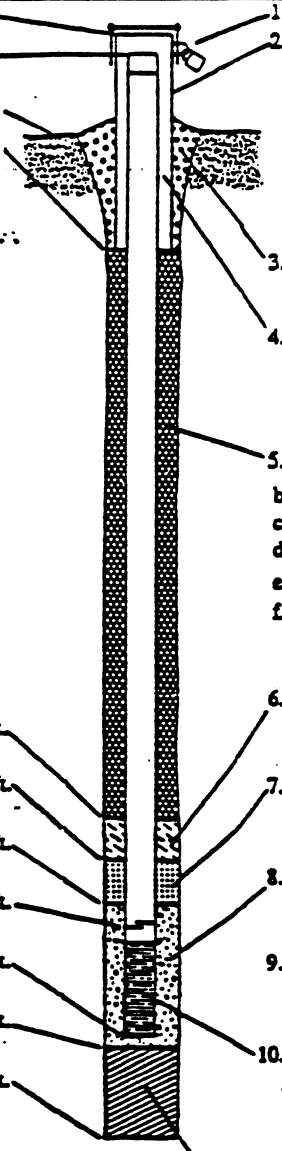
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,700.2 ft. MSL or 5.0 ft.
F. Fine sand, top 1,628.7 ft. MSL or 76.5 ft.
G. Filter pack, top 1,626.5 ft. MSL or 78.7 ft.
H. Screen joint, top 1,624.2 ft. MSL or 81.0 ft.
I. Well bottom 1,609.2 ft. MSL or 96.0 ft.
J. Filter pack, bottom 1,607.2 ft. MSL or 98.0 ft.
K. Borehole, bottom 1,607.2 ft. MSL or 98.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: chip a. Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 9.04 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☒ 32 (chips)
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BBT
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 3.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-03R
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

	Initial Before Development	Final After Development
11. Depth to Water (from top of well casing)	a. 68.3 ft.	Dry ft.
Date	b. 03 / 25 / 94 (m m d d y y)	04 / 12 / 94 (m m d d y y)
Time	c. 13 : 30 ☐ a.m. ☒ p.m.	4 : 40 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	1. inches	0 0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other ____	☐

3. Time spent developing well 70 min.

4. Depth of well (from top of well casing) 99.2 ft.

5. Inside diameter of well 1.78 in.

6. Volume of water in filter pack and well casing 18.6 gal.

7. Volume of water removed from well 14.2 gal.

8. Volume of water added (if any) NA gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development:

04/06/94
Bailed with 5' PVC bailer.
Removed 14 gallons - Dry

04/12/94
Bailed with 5' PVC bailer.
Removed 0.2 gallons - Dry

Well developed by: Person's Name and Firm

Name: Dan Tinnancour/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 113,563.6 ft. ☐N ☐S 2,286,751.7 ft. ☒E ☐W	Well Name: OMC-03RR
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 32 T. 35 N. R. 13 ☒E ☐W	Date Well Installed: 04 / 27 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,707.97 ft. MSL
B. Well casing, top elevation 1,707.90 ft. MSL
C. Land surface elevation 1,705.2 ft. MSL
D. Surface seal, bottom 1,700.2 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

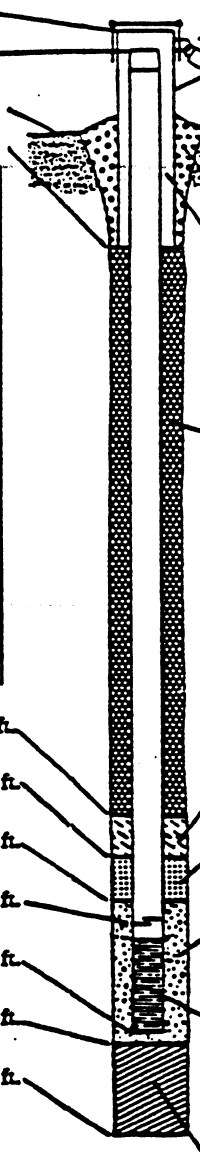
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,700.2 ft. MSL or 5.0 ft.
F. Fine sand, top 1,601.1 ft. MSL or 104.0 ft.
G. Filter pack, top 1,599.1 ft. MSL or 106.0 ft.
H. Screen joint, top 1,597.1 ft. MSL or 108.0 ft.
I. Well bottom 1,582.1 ft. MSL or 123.0 ft.
J. Filter pack, bottom 1,577.2 ft. MSL or 128.0 ft.
K. Borehole, bottom 1,577.2 ft. MSL or 128.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: Chips Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 11.12 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets (chips) ☒ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 3.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-03RR
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	71	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No		
11. Depth to Water (from top of well casing)	a.	112.16 ft.	116.87 ft.
Date	b. mm/dd/yy	05/04/94	05/04/94
Time	c.	11:20 ☒ a.m. ☐ p.m.	14:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		1.8 inches	<1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)

2. Well development method

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☒	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	

3. Time spent developing well: 190 min.

4. Depth of well (from top of well casing): 125.8 ft.

5. Inside diameter of well: 1.87 in.

6. Volume of water in filter pack and well casing: 12.1 gal.

7. Volume of water removed from well: 127.5 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

05/04/94
Bailed with 5' PVC bailer - 5 gallons
Pumped with Grundflos Rediflow II pump
Removed 122.5 gallons

Well developed by: Person's Name and Firm

Name: Mike Mueller, Pat Jansen/Erik Silvola

Firm: WTD Environmental Drillig/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12
Distance Well Is From Waste/Source Boundary: ft.
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: 113,560.1 ft. ☒ N ☐ S, 2,286,745.3 ft. ☒ E ☐ W
Grid Origin Location: Lat. ____ Long. ____ or
St. Plane ____ ft. N, ____ ft. E.
Section Location of Waste/Source: NE 1/4 of SW 1/4 of Sec. 32, T. 35 N. R. 13 ☐ E. W.
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-03P
Wis. Unique Well Number: DNR Well Number:
Date Well Installed: 03 / 22 / 94 (m m / d d / y y)
Well Installed By: (Person's Name and Firm)
Chuck Blunt
WTD Environmental Drilling

A. Protective pipe, top elevation 1,708.70 ft. MSL
B. Well casing, top elevation 1,708.61 ft. MSL
C. Land surface elevation 1,705.2 ft. MSL
D. Surface seal, bottom 1,700.2 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

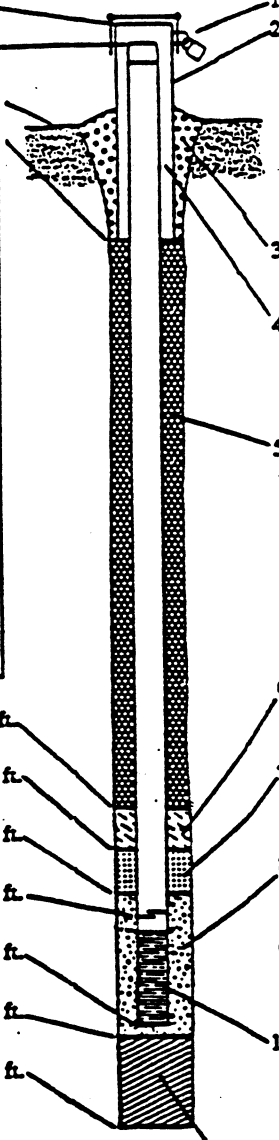
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,700.2 ft. MSL or 5.0 ft.
F. Fine sand, top 1,519.2 ft. MSL or 186.0 ft.
G. Filter pack, top 1,517.2 ft. MSL or 188.0 ft.
H. Screen joint, top 1,515.2 ft. MSL or 190.0 ft.
I. Well bottom 1,510.2 ft. MSL or 195.0 ft.
J. Filter pack, bottom 1,504.2 ft. MSL or 201.0 ft.
K. Borehole, bottom 1,504.2 ft. MSL or 201.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.1 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 73.6 Ft^3 volume added for any of the above
f. How installed: Tremie ☒ 01; Tremie pumped ☐ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-03P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

	Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☐ No	
2. Well development method		
surged with bailer and bailed	☐ 41	
surged with bailer and pumped	☐ 61	
surged with block and bailed	☐ 42	
surged with block and pumped	☒ 62	
surged with block, bailed and pumped	☐ 70	
compressed air	☐ 20	
bailed only	☐ 10	
pumped only	☐ 51	
pumped slowly	☐ 50	
Other Nitrogen Lift & Surge	☒	
11. Depth to Water (from top of well casing)	a. 108.9 ft.	166.48 ft.
Date	b. 03 / 29 / 94 (m m d d y y)	04 / 12 / 94 (m m d d y y)
Time	c. 09 : 50 ☒ a.m. ☐ p.m.	14 : 25 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	4. inches	<2. inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	Dark Brown	Light Brown

3. Time spent developing well	600 min.
4. Depth of well (from top of well casing)	197.5 ft.
5. Inside diameter of well	1 87 in.
6. Volume of water in filter pack and well casing	23.6 gal.
7. Volume of water removed from well	290. gal.
8. Volume of water added (if any)	NA gal.
9. Source of water added	NA
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____. mg/l	____. mg/l
15. COD	____. mg/l	____. mg/l

16. Additional comments on development:

03/29/94
Surge & Purge with Nitrogen Lift
Removed 150 gallons

04/12/94
Surge and purge with Grundfos Rediflow II pump.
Removed 140 gallons

Well developed by: Person's Name and Firm

Name: Jon Weeks/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number: _____

Local Grid Location of Well: 111,448.5 ft. ☒ N ☐ S. 2,285,112.2 ft. ☒ E ☐ W
Grid Origin Location: Lat. _____ Long. _____ or
St. Plane _____ ft. N. _____ ft. E.
Section Location of Waste/Source: SW1/4 of SE 1/4 of Sec. 32, T. 35 N. R. 13 ☐ E. ☒ W.
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-04
Wis. Unique Well Number: DNR Well Number:

Date Well Installed: 03 / 10 / 94 (m m / d d / y y)
Well Installed By: (Person's Name and Firm)
Mike Mueller
WTD Environmental Drilling

Type of Well: Water Table Observation Well ☒ 11 Piezometer ☐ 12
Distance Well Is From Waste/Source Boundary: _____ ft.
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

A. Protective pipe, top elevation 1,687.13 ft. MSL
B. Well casing, top elevation 1,687.10 ft. MSL
C. Land surface elevation 1,683.9 ft. MSL
D. Surface seal, bottom 1,678.9 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

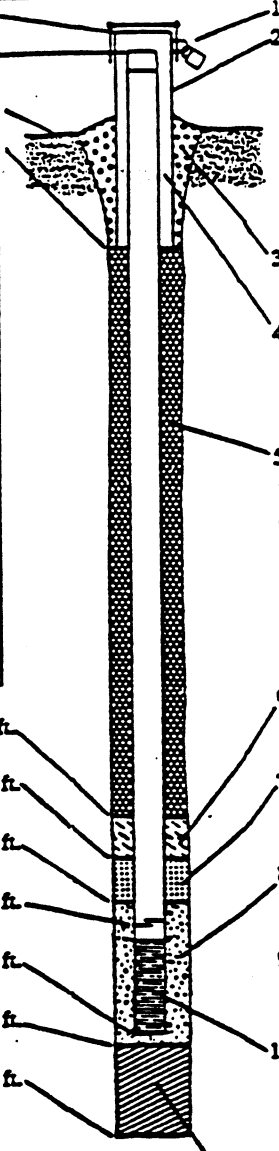
14. Drilling method used: Rotary ☒ 50 Hollow Stem Auger ☐ 41 Other ☐ _____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe _____

17. Source of water (attach analysis):
_____

E. Bentonite seal, top 1,678.9 ft. MSL or 5.0 ft.
F. Fine sand, top 1,592.9 ft. MSL or 91.0 ft.
G. Filter pack, top 1,590.9 ft. MSL or 93.0 ft.
H. Screen joint, top 1,588.9 ft. MSL or 95.0 ft.
I. Well bottom 1,573.9 ft. MSL or 110.0 ft.
J. Filter pack, bottom 1,570.9 ft. MSL or 113.0 ft.
K. Borehole, bottom 1,570.9 ft. MSL or 113.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04 Other ☐ _____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30 Annular space seal ☐ _____ Other ☐ _____
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 23.6 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. _____ Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.4 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2.4 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23 Flush threaded PVC schedule 80 ☒ 24 Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐ _____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-04
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	7 1	

	Initial Before Development	Final After Development
1. Can this well be purged dry? ☒ Yes ☐ No		
2. Well development method		
surged with bailer and bailed ☐ 41		
surged with bailer and pumped ☐ 61		
surged with block and bailed ☐ 42		
surged with block and pumped ☐ 62		
surged with block, bailed and pumped ☐ 70		
compressed air ☐ 20		
bailed only ☒ 10		
pumped only ☐ 51		
pumped slowly ☐ 50		
Other _____ ☐ ___		
11. Depth to Water (from top of well casing)	a. 92.5 ft.	Dry ft.
Date	b. 03 / 28 / 94 (m m d d y y)	04 / 15 / 94 (m m d d y y)
Time	c. 08 : 50 ☒ a.m. ☐ p.m.	8 : 30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	3. inches	≤1. inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Light Brown
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____. mg/l	_____. mg/l
15. COD	_____. mg/l	_____. mg/l

3. Time spent developing well: 150 min.

4. Depth of well (from top of well casing): 112.3 ft.

5. Inside diameter of well: 1.87 in.

6. Volume of water in filter pack and well casing: 16.9 gal.

7. Volume of water removed from well: 39.4 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

16. Additional comments on development:

03/28/94
Bailed dry with 5' PVC bailer
Removed 20 gallons

04/12/94
Bailed dry with 5' PVC bailer
Removed 10.9 gallons

04/15/94
Bailed dry with 5' PVC bailer
Removed 8.5 gallons

Well developed by: Person's Name and Firm

Name: Jon Weeks/Erik Silvola, Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☒ 11 Piezometer ☐ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: 111,541.2 ft. ☒ N ☐ S, 2,283,490.7 ft. ☒ E ☐ W

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.

Section Location of Waste/Source: SE1/4 of SW 1/4 of Sec. 32 T. 35 N, R. 13 ☒ E ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-05

Wis. Unique Well Number / DNR Well Number:

Date Well Installed: 03 / 10 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
DAN TINNANCOUR
WTD Environmental Drilling

A. Protective pipe, top elevation 1,660.23 ft. MSL
B. Well casing, top elevation 1,660.17 ft. MSL
C. Land surface elevation 1,656.9 ft. MSL
D. Surface seal, bottom 1,651.9 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

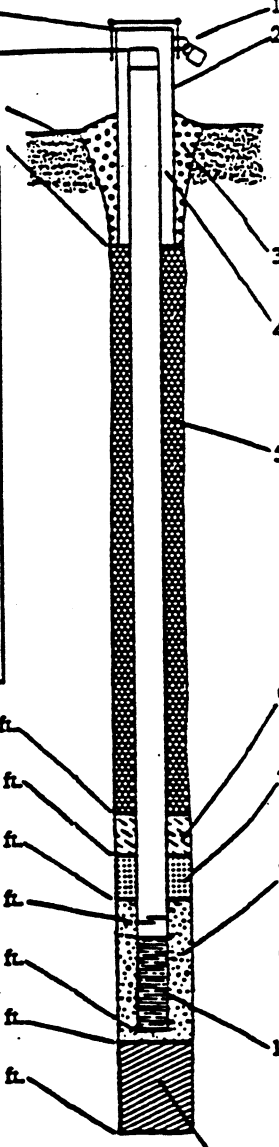
14. Drilling method used: Rotary ☒ 50 Hollow Stem Auger ☐ 41 Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,651.9 ft. MSL or 5.0 ft.
F. Fine sand, top 1,597.9 ft. MSL or 59.0 ft.
G. Filter pack, top 1,595.9 ft. MSL or 61.0 ft.
H. Screen joint, top 1,593.9 ft. MSL or 63.0 ft.
I. Well bottom 1,578.9 ft. MSL or 78.0 ft.
J. Filter pack, bottom 1,577.9 ft. MSL or 79.0 ft.
K. Borehole, bottom 1,577.9 ft. MSL or 79.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: ___ in.
b. Length: ___ ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30 Annular space seal ☐ Other ☐
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 11.12 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2.6 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15. ft.
11. Backfill material (below filter pack): None ☒ 14 Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-05
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

	Initial Before Development	Final After Development
1. Can this well be purged dry?	☒ Yes ☐ No	
11. Depth to Water (from top of well casing)	a. 65.4 ft.	Dry ft.
Date	b. 03 / 22 / 94 (m m d d y y)	04 / 15 / 94 (m m d d y y)
Time	c. 12 : 30 ☐ a.m. ☒ p.m.	08 : 15 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	1 inches	<1 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Light Brown

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other	☐

3. Time spent developing well: 70 min.

4. Depth of well (from top of well casing): 80.9 ft.

5. Inside diameter of well: 2.01 in.

6. Volume of water in filter pack and well casing: 11.2 gal.

7. Volume of water removed from well: 17.6 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Additional comments on development:

03/22/94
Bailed dry with 5' PVC bailer
Removed 5 gallons

04/12/94
Bailed dry with 5' PVC bailer
Removed 5.6 gallons

04/15/94
Bailed dry with 5' PVC bailer
Removed 7.0 gallons

Well developed by: Person's Name and Firm

Name: Jon Weeks/Erik Silvola, Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: 112,380.3 ft. ☒ N ☐ S, 2,283,011.5 ft. ☒ E ☐ W

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.

Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 32 T. 35 N. R. 13 ☒ E ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-06P

Wis. Unique Well Number: ____ DNR Well Number: ____

Date Well Installed: 03 / 10 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
Chuck Blunt
WTD Environmental Drilling

A. Protective pipe, top elevation 1,669.71 ft. MSL
B. Well casing, top elevation 1,669.64 ft. MSL
C. Land surface elevation 1,666.5 ft. MSL
D. Surface seal, bottom 1,661.5 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

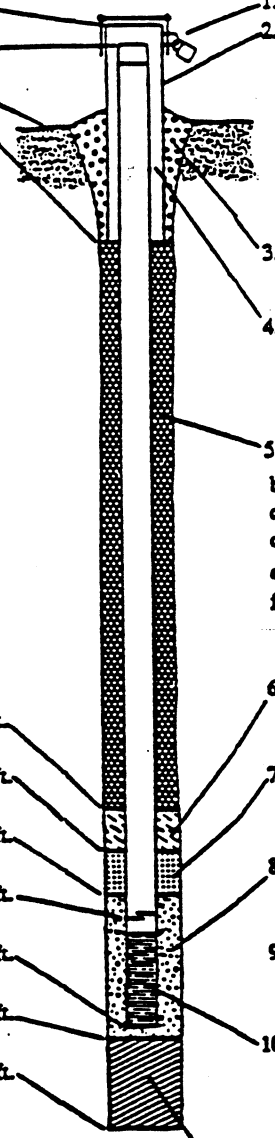
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis):

E. Bentonite seal, top 1,661.5 ft. MSL or 5.0 ft.
F. Fine sand, top 1,531.2 ft. MSL or 135.3 ft.
G. Filter pack, top 1,529.0 ft. MSL or 137.5 ft.
H. Screen joint, top 1,523.5 ft. MSL or 143.0 ft.
I. Well bottom 1,518.5 ft. MSL or 148.0 ft.
J. Filter pack, bottom 1,514.5 ft. MSL or 152.0 ft.
K. Borehole, bottom 1,514.5 ft. MSL or 152.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: Chip a. ☒ Bentonite 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite .... Bentonite-cement grout ☐ 50
e. 23.63 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BBZ
b. Volume added 0.4 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 1.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-06P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	_____ / _____

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☒ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other Nitrogen Lift & Surge	☒ [redacted]		
11. Depth to Water (from top of well casing)		a. 75.4 ft.	86.02 ft.
Date		b. 03 / 22 / 94 (m m d d y y)	04 / 12 / 94 (m m d d y y)
Time		c. 15 : 50 ☐ a.m. ☒ p.m.	10 : 30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2. inches	1. inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)		Brown	Slightly cloudy very light brown
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		_____. mg/l	_____. mg/l
15. COD		_____. mg/l	_____. mg/l

3. Time spent developing well: 430 min.

4. Depth of well (from top of well casing): 149.9 ft.

5. Inside diameter of well: 1.87 in.

6. Volume of water in filter pack and well casing: 20.9 gal.

7. Volume of water removed from well: 250.0 gal.

8. Volume of water added (if any): NA ___. gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

16. Additional comments on development:

03/22/94
Surge and purge with nitrogen lift
Removed 130 gallons

04/12/94
Surge and purge with Grundflos Rediflow II pump
Removed 102 gallons, stabilization readings taken

Well developed by: Person's Name and Firm

Name: Jon Weeks/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company
Facility License, Permit or Monitoring Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☐ 12
Distance Well Is From Waste/Source Boundary: ft.
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: 114,389.2 ft. ☒ N ☐ S. 2,282,896.0 ft. ☒ E ☐ W
Grid Origin Location: Lat. ____ Long. ____ or
St. Plane ____ ft. N. ____ ft. E.
Section Location of Waste/Source: SW1/4 of NW 1/4 of Sec. 32 T. 35 N. R. 13 ☒ E ☐ W.
Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known

Well Name: CMC-07
Wis. Unique Well Number: DNR Well Number:
Date Well Installed: 03 / 28 / 94 (m m / d d / y y)
Well Installed By: (Person's Name and Firm)
Chuck Blunt
WTD Environmental Drilling

A. Protective pipe, top elevation 1,630.47 ft. MSL
B. Well casing, top elevation 1,630.41 ft. MSL
C. Land surface elevation 1,626.9 ft. MSL
D. Surface seal, bottom 1,621.9 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

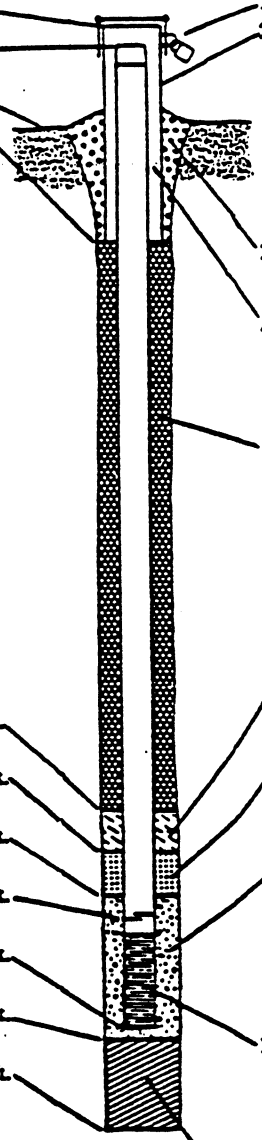
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,621.9 ft. MSL or 5.0 ft.
F. Fine sand, top 1,598.9 ft. MSL or 28.0 ft.
G. Filter pack, top 1,597.0 ft. MSL or 29.9 ft.
H. Screen joint, top 1,594.9 ft. MSL or 32.0 ft.
I. Well bottom 1,579.9 ft. MSL or 47.0 ft.
J. Filter pack, bottom 1,575.9 ft. MSL or 51.0 ft.
K. Borehole, bottom 1,575.9 ft. MSL or 51.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite .... ..Bentonite-cement grout ☐ 50
e. 6.3 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite pellets chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BBZ
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 4.2 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Eric Lund
Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-07

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	7 1		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☒ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 135 min.

4. Depth of well (from top of well casing) 50.3 ft.

5. Inside diameter of well 2.01 in.

6. Volume of water in filter pack and well casing 11.9 gal.

7. Volume of water removed from well 55.5 gal.

8. Volume of water added (if any) NA gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Initial Before Development	Final After Development
11. Depth to Water (from top of well casing)	a. 33.7 ft.	Dry ft.
Date	b. 03 / 31 / 94 (m m d d y y)	04 / 15 / 94 (m m d d y y)
Time	c. 16 : 45 ☐ a.m. ☒ p.m.	10 : 35 ☒ a.m. ☐ p.m.
12. Sediment in well bottom	<1. inches	0. inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Light Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____. mg/l	____. mg/l
15. COD	____. mg/l	____. mg/l

16. Additional comments on development:

03/31/94
Bailed with 5' PVC bailer
Removed 11 gallons - Dry

04/15/94
Bailed with 5' PVC Bailer
Removed 20.5 gallons - Dry

04/13/94
Pumped slowly with Grandflos Rediflow II pump
Removed 24 gallons - Dry

Well developed by: Person's Name and Firm

Name: Jon Weeks/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 117,115.9 ft. ☒N ☐S 2,278,213.6 ft. ☐E ☐W	Well Name: CMC-08
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30 T. 35 N. R. 13 ☒E ☐W	Date Well Installed: 03 / 01 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Dan Tinnancour / WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,665.85 ft. MSL
B. Well casing, top elevation 1,665.76 ft. MSL
C. Land surface elevation 1,662.5 ft. MSL
D. Surface seal, bottom 1,657.5 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

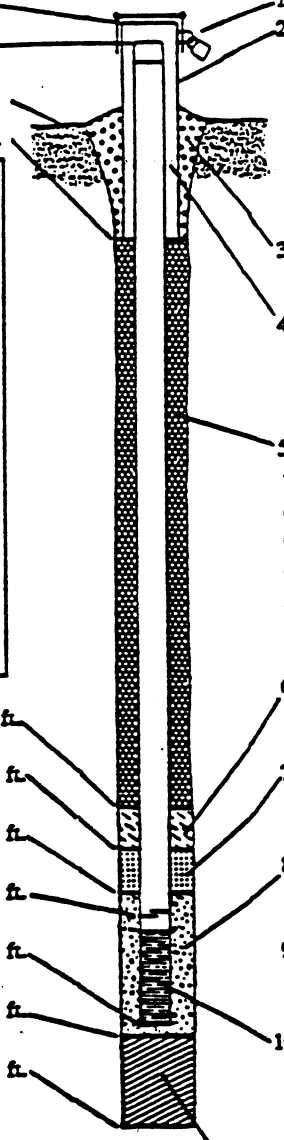
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,657.5 ft. MSL or 5.0 ft.
F. Fine sand, top 1,607.9 ft. MSL or 55.0 ft.
G. Filter pack, top 1,605.9 ft. MSL or 57.0 ft.
H. Screen joint, top 1,603.9 ft. MSL or 59.0 ft.
I. Well bottom 1,588.9 ft. MSL or 74.0 ft.
J. Filter pack, bottom 1,587.5 ft. MSL or 75.0 ft.
K. Borehole, bottom 1,587.5 ft. MSL or 75.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: Chip a. Granular/Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 14.0 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☒3/8 in. ☐1/2 in. Bentonite chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 2.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-08

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	7 1		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well 185 min.

4. Depth of well (from top of well casing) 76.9 ft.

5. Inside diameter of well 2.01 in.

6. Volume of water in filter pack and well casing 8.0 gal.

7. Volume of water removed from well 23.1 gal.

8. Volume of water added (if any) NA gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Initial Before Development	Final After Development
11. Depth to Water (from top of well casing)	a. 76.63 ft.	Dry ft.
Date	b. 03/01/94 (m m d d y y)	04/14/94 (m m d d y y)
Time	c. 13:40 ☐ a.m. ☒ p.m.	13:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.5 inches	<1. inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Light Brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____. mg/l	_____. mg/l
15. COD	_____. mg/l	_____. mg/l

16. Additional comments on development:

03/01/94
Bailed dry with 5' PVC bailer
Removed 13.6 gallons

03/24/94
Bailed with 5' PVC bailer
Removed 3 gallons - Dry

04/14/94
Bailed dry with 5' PVC bailer
Removed 6.5 gallons

Well developed by: Person's Name and Firm

Name: Erik Silvola and Scott Janssen

Firm: Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: 117,107.05 ft. ☒ N ☐ S, 2,278,200.2 ft. ☒ E ☐ W

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.

Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30 T. 35 N. R. 13 ☒ E. ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-08P

Wis. Unique Well Number / DNR Well Number:

Date Well Installed: 04 / 16 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
Mike Mueller
WTD Environmental Drilling

A. Protective pipe, top elevation 1,665.67 ft. MSL

B. Well casing, top elevation 1,665.60 ft. MSL

C. Land surface elevation 1,662.5 ft. MSL

D. Surface seal, bottom 1,657.5 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01 Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,657.5 ft. MSL or 5.0 ft.

F. Fine sand, top 1,576.5 ft. MSL or 86.0 ft.

G. Filter pack, top 1,574.5 ft. MSL or 88.0 ft.

H. Screen joint, top 1,572.5 ft. MSL or 90.0 ft.

I. Well bottom 1,567.5 ft. MSL or 95.0 ft.

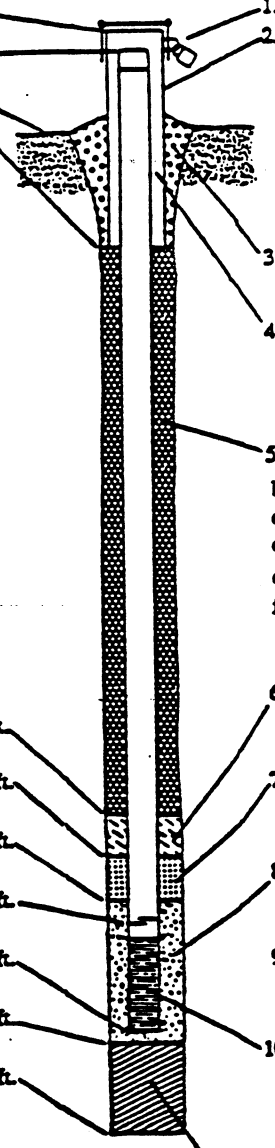
J. Filter pack, bottom 1,561.5 ft. MSL or 101.0 ft.

K. Borehole, bottom 1,549.0 ft. MSL or 113.5 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐

4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐

5. Annular space seal: chip a. ~~Granular~~ Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 7.0 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.3 ft³

8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 1.75 ft³

9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ 14; Other ☒
Bentonite & Native

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Eric Dick Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-08P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☒ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
3. Time spent developing well	1 10 min.		
4. Depth of well (from top of well casing)	9 8 . 1 ft.		
5. Inside diameter of well	1 . 8 7 in.		
6. Volume of water in filter pack and well casing	1 1 . 2 gal.		
7. Volume of water removed from well	1 7 . 2 gal.		
8. Volume of water added (if any)	N A . gal.		
9. Source of water added	NA		
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		
11. Depth to Water (from top of well casing)		a. 6 9 . 5 6 ft.	Dry . ft.
Date		b. 04 / 29 / 94 (m m / d d / y y)	05 / 04 / 94 (m m / d d / y y)
Time		c. 10 : 30 ☒ a.m. ☐ p.m.	9 : 00 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		1 . 0 inches	. 0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Light Brown
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		. mg/l	. mg/l
15. COD		. mg/l	. mg/l

16. Additional comments on development:

04/29/94
Bailed with 5' PVC bailer 4 times
Removed 12 gallons - Dry

05/04/94
Bailed with 5' bailer
Removed 5.2 gallons - Dry

Well developed by: Person's Name and Firm

Name: Mike Mueller/Erik Silvola

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Erik Silvola

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 116,258.8 ft. ☒ N. ☐ S. 2,274,907.3 ft. ☒ E. ☐ W.	Well Name: CMC-09
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: SW1/4 of SE 1/4 of Sec. 25 T. 35 N. R. 12 ☒ E. ☐ W.	Date Well Installed: 03/30/94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Chuck Blunt / WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,656.98 ft. MSL
B. Well casing, top elevation 1,656.96 ft. MSL
C. Land surface elevation 1,653.5 ft. MSL
D. Surface seal, bottom 1,648.5 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☑
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

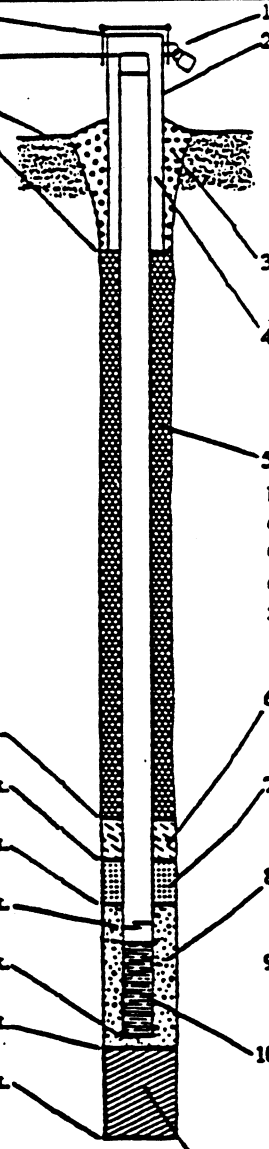
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,648.5 ft. MSL or 5.0 ft.
F. Fine sand, top 1,587.0 ft. MSL or 66.5 ft.
G. Filter pack, top 1,585.0 ft. MSL or 68.5 ft.
H. Screen joint, top 1,582.5 ft. MSL or 71.0 ft.
I. Well bottom 1,567.5 ft. MSL or 86.0 ft.
I. Filter pack, bottom 1,563.5 ft. MSL or 90.0 ft.
K. Borehole, bottom 1,563.5 ft. MSL or 90.0 ft.
L. Borehole, diameter 8.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 12.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.75 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 4.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-09
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☒ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other	☐		
11. Depth to Water (from top of well casing)		a. 67.3 ft.	Dry ft.
Date		b. 03 / 24 / 94 (m m d d y y)	04 / 14 / 94 (m m d d y y)
Time		c. 09 : 10 ☐ a.m. ☐ p.m.	15 : 35 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2.0 inches	≤1. inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Brown	Clear ☒ 20 Turbid ☐ 25 (Describe)
3. Time spent developing well	275 min.		
4. Depth of well (from top of well casing)	89.3 ft.		
5. Inside diameter of well	2.01 in.		
6. Volume of water in filter pack and well casing	10.7 gal.		
7. Volume of water removed from well	132.5 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		____ mg/l	____ mg/l
15. COD		____ mg/l	____ mg/l
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		

16. Additional comments on development:

03/24/94
Bailed dry with 5' PVC bailer
12.5 gallons removed
Dry

04/14/94
Surged and pumped with Grunflos Rediflow II pump
Removed 120 gallons, stabilization readings taken

Well developed by: Person's Name and Firm

Name: Chad H./Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 116,258.8 ft. ☒ N ☐ S, 2,274,914.7 ft. ☒ E ☐ W	Well Name: CMC-09P
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N, ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: SW 1/4 of SE 1/4 of Sec. 25 T. 35 N, R. 12 ☒ E ☐ W	Date Well Installed: 04 / 15 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Mike Mueller; WTD Environmental Drilling
Is Well A Point of Enforcement Std. Applicanon? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,656.17 ft. MSL
B. Well casing, top elevation 1,656.11 ft. MSL
C. Land surface elevation 1,653.3 ft. MSL
D. Surface seal, bottom 1,648.3 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

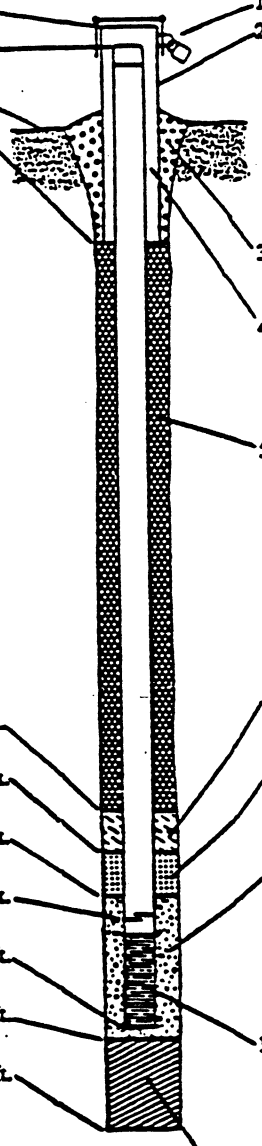
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,648.3 ft. MSL or 5.0 ft.
F. Fine sand, top 1,520.3 ft. MSL or 133.0 ft.
G. Filter pack, top 1,518.3 ft. MSL or 135.0 ft.
H. Screen joint, top 1,516.3 ft. MSL or 137.0 ft.
I. Well bottom 1,511.3 ft. MSL or 142.0 ft.
J. Filter pack, bottom 1,504.8 ft. MSL or 148.5 ft.
K. Borehole, bottom 1,484.8 ft. MSL or 168.5 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 18.07 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BBT
b. Volume added 0.3 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 1.5 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☒ ____
3/8" hole plug

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-09P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

	Initial Before Development	Final After Development
1. Can this well be purged dry?	☒ Yes ☐ No	
2. Well development method		
surged with bailer and bailed ☐ 41		
surged with bailer and pumped ☐ 61		
surged with block and bailed ☐ 42		
surged with block and pumped ☐ 62		
surged with block, bailed and pumped ☐ 70		
compressed air ☐ 20		
bailed only ☒ 10		
pumped only ☒ 51		
pumped slowly ☐ 50		
Other Nitrogen Lift ☒		
3. Time spent developing well	108 min.	
4. Depth of well (from top of well casing)	144.9 ft.	
5. Inside diameter of well	1.87 in.	
6. Volume of water in filter pack and well casing	19.0 gal.	
7. Volume of water removed from well	32.0 gal.	
8. Volume of water added (if any)	NA gal.	
9. Source of water added	NA	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No	
11. Depth to Water (from top of well casing) a.	74.15 ft.	Dry ft.
Date b.	04/29/94 (m m d d y y)	05/11/94 (m m d d y y)
Time c.	08:00 ☒ a.m. ☐ p.m.	16:36 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.5 inches	.1 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) Red	Clear ☒ 20 Turbid ☐ 25 (Describe)
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

04/29/94
Bail 5 gallons with 5' PVC bailer
Nitrogen lift 9 gallons - Dry

05/11/94
Pumped 18 gallons with Grundflow Rediflow II pump - Dry

Well developed by: Person's Name and Firm

Name: Mike Mueller, Pat Jensen/Erik Silvola, Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: E A S

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company	Local Grid Location of Well: 116,056.6 ft. ☒N ☐S 2,278,575.4 ft. ☒E ☐W	Well Name: CMC-10
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☒ 11; Piezometer ☐ 12	Section Location of Waste/Source: NE 1/4 of NW 1/4 of Sec. 31, T. 35 N, R. 13 ☐E ☐W	Date Well Installed: 03 / 30 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm) Dan Tinnancour / WTD Environmental Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1,624.43 ft. MSL
B. Well casing, top elevation 1,624.34 ft. MSL
C. Land surface elevation 1,621.1 ft. MSL
D. Surface seal, bottom 1,616.1 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

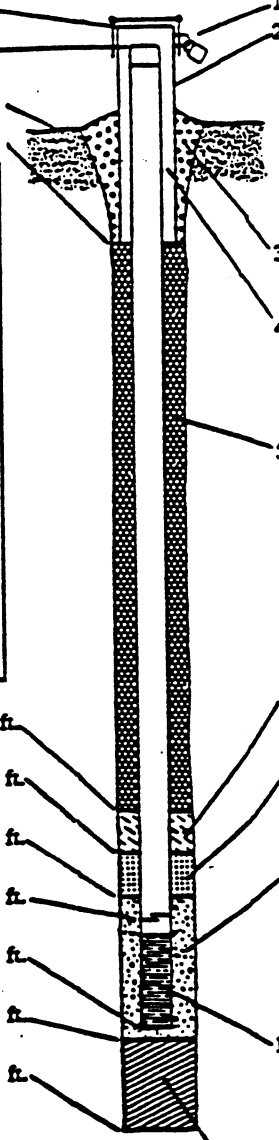
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1,616.1 ft. MSL or 5.0 ft.
F. Fine sand, top 1,592.6 ft. MSL or 28.5 ft.
G. Filter pack, top 1,590.1 ft. MSL or 31.0 ft.
H. Screen joint, top 1,588.1 ft. MSL or 33.0 ft.
I. Well bottom 1,573.1 ft. MSL or 48.0 ft.
J. Filter pack, bottom 1,571.1 ft. MSL or 50.0 ft.
K. Borehole, bottom 1,571.1 ft. MSL or 50.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.01 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 10.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☐ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: chip a. Granular Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 5.9 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BB7
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 3.0 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-10
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☒ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐ [redacted]		
11. Depth to Water (from top of well casing)		a. 32.6 ft.	36.38 ft.
Date		b. 03/31/94 (m m d d y y)	04/15/94 (m m d d y y)
Time		c. 16:50 ☐ a.m. ☒ p.m.	11:50 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		1. inches	.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
		(Describe) Brown	(Describe)
3. Time spent developing well	310 min.		
4. Depth of well (from top of well casing)	51.0 ft.		
5. Inside diameter of well	2.01 in.		
6. Volume of water in filter pack and well casing	13.6 gal.		
7. Volume of water removed from well	170.0 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		mg/l	mg/l
15. COD		mg/l	mg/l

16. Additional comments on development:

03/31/94
Bailed with 5' PVC bailer
Removed 30 gallons

04/15/94
Bailed with 5' PVC bailer
Removed 20 gallons
Surged and purged with Grunflow RediFlow II pump
Removed 120 gallons, stabilization readings taken

Well developed by: Person's Name and Firm

Name: Jon Weeks/Erik Silvola, Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: Crandon Mining Company

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: ☒ N ☐ S 116,046.9 ft. ☒ E ☐ W 2,278,514.2 ft.

Grid Origin Location: Lat. ____ Long. ____ or St. Plane ____ ft. N. ____ ft. E.

Section Location of Waste/Source: NE 1/4 of NW 1/4 of Sec. 31, T. 35 N, R. 13 ☐ E ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known

Well Name: CMC-10P

Wis. Unique Well Number: DNR Well Number:

Date Well Installed: 03/02/94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
Mike Mueller
WTD Environmental Drilling

A. Protective pipe, top elevation 1,624.07 ft. MSL
B. Well casing, top elevation 1,624.02 ft. MSL
C. Land surface elevation 1,620.8 ft. MSL
D. Surface seal, bottom 1,615.8 ft. MSL or 5.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

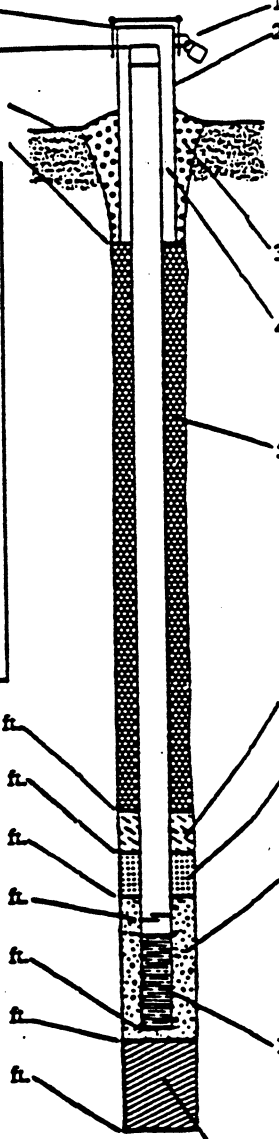
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis):

E. Bentonite seal, top 1,615.8 ft. MSL or 5.0 ft.
F. Fine sand, top 1,544.8 ft. MSL or 76.0 ft.
G. Filter pack, top 1,542.8 ft. MSL or 78.0 ft.
H. Screen joint, top 1,540.8 ft. MSL or 80.0 ft.
I. Well bottom 1,535.8 ft. MSL or 85.0 ft.
J. Filter pack, bottom 1,531.8 ft. MSL or 89.0 ft.
K. Borehole, bottom 1,519.3 ft. MSL or 101.5 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.87 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☐ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐; Other ☐
5. Annular space seal: chip a. ~~Granular~~ Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 18.07 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite ~~pellets~~ chips ☒ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining Fine Silica 2040/BBZ
b. Volume added 0.5 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Red Flint Filter Sand #30
b. Volume added 1.3 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Eric J. Foth Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
Crandon Mining Company	Forest	CMC-10P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
	7 1	

		Initial Before Development	Final After Development
1. Can this well be purged dry?	☐ Yes ☒ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☒ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☐ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other Nitrogen Lift & Surge	☒		
11. Depth to Water (from top of well casing)		a. 35.5 ft.	85.83 ft.
Date		b. 03/28/94 (m m d d y y)	04/15/94 (m m d d y y)
Time		c. 16:30 ☐ a.m. ☒ p.m.	10:30 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		2.5 inches	.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Red	Clear ☒ 20 Turbid ☐ 25 (Describe) Light Red
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		____.__ mg/l	____.__ mg/l
15. COD		____.__ mg/l	____.__ mg/l

3. Time spent developing well	312 min.
4. Depth of well (from top of well casing)	87.6 ft.
5. Inside diameter of well	1.87 in.
6. Volume of water in filter pack and well casing	14.9 gal.
7. Volume of water removed from well	367.0 gal.
8. Volume of water added (if any)	NA .__ gal.
9. Source of water added	NA
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No

16. Additional comments on development:

03/28/94
Nitrogen lift and surge
Removed 160 gallons

04/15/95
Surged and purged with Grundflos Rediflow II pump
Removed 207 gallons, stabilization readings taken

Well developed by: Person's Name and Firm

Name: Jon Weeks/Scott Janssen

Firm: WTD/Foth & Van Dyke

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Erik Stell

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

WTD Environmental Drilling and Total Drilling Well Construction and Development Reports for 1994 Saprolite Investigation

CMC
- 10PP
- 11P
- 12P
- 13P
- 14P
- OWA-1
- OWA-2
- OWA-3
- OWA-4
- OWA-5
- PWA
- PWAR
- PWB

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name CMC-Saprolite Investigation	**Local Grid Location of Well** ____ ft. ☐N ☐S ____ ft. ☐E ☐W	**Well Name** CMC-10PP
Facility License, Permit or Monitoring Number _____	**Grid Origin Location** Lat. ____ Long. ____ or	**Wis. Unique Well Number / DNR Well Number** _____
Type of Well Water Table Observation Well ☐ 11 Piezometer ☒ 12	**St. Plane** 116050.24 ft. N, 2278600.21 ft. E.	**Date Well Installed** 10 / 18 / 94 m m / d d / y y
Distance Well Is From Waste/Source Boundary ____ ft.	**Section Location of Waste/Source** NE 1/4 of NW 1/4 of Sec. 31, T. 35 N, R. 13 ☒E ☐W	**Well Installed By: (Person's Name and Firm)** Chuck Blunt WID
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	**Location of Well Relative to Waste/Source** u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 1621.80 ft. MSL
B. Well casing, top elevation 1621.67 ft. MSL
C. Land surface elevation 1619.7 ft. MSL
D. Surface seal, bottom 1618.7 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

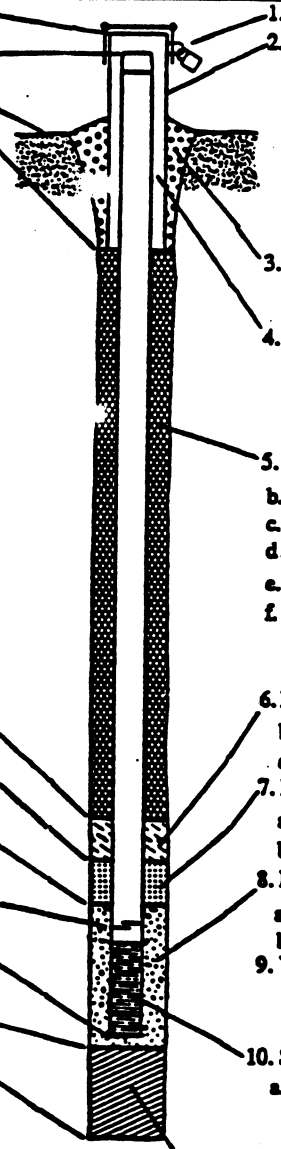
14. Drilling method used: Rotary ☒ 50
Hollow Stem Auger ☐ 41
_____ Other ☐

15. Drilling fluid used: Water ☒ 02 Air ☐ 01
Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe _____

17. Source of water (attach analysis):
_____

E. Bentonite seal, top 1532.7 ft. MSL or 87.0 ft.
F. Fine sand, top 1520.7 ft. MSL or 99.0 ft.
G. Filter pack, top 1519.7 ft. MSL or 100.0 ft.
H. Screen joint, top 1518.7 ft. MSL or 101.0 ft.
I. Well bottom 1517.7 ft. MSL or 102.0 ft.
J. Filter pack, bottom 1510.7 ft. MSL or 103.0 ft.
K. Borehole, bottom 1509.7 ft. MSL or 110.0 ft.
L. Borehole, diameter 6.3 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04
_____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: _____
3. Surface seal: Bentonite ☒ 30
Concrete ☐ 01
With Native Other ☐
4. Material between well casing and protective pipe:
Bentonite ☒ 30
Annular space seal ☐
_____ Other ☐
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. 10.5 Lbs/gal mud weight . . . . . Bentonite slurry ☒ 31
d. ____ % Bentonite . . . . . Bentonite-cement grout ☐ 50
e. 17.2 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01
Tremie pumped ☒ 02
Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Bentonite Chips Other ☒
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.52 ft^3
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 0.77 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☐ 23
Flush threaded PVC schedule 80 ☒ 24
_____ Other ☐
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11
Continuous slot ☐ 01
_____ Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 10 ft.
11. Backfill material (below filter pack): None ☐ 14
3/8" Chipped Bentonite Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature _____ Firm Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-10PP

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	71		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	

3. Time spent developing well 135 min.

4. Depth of well (from top of well cas) 104.1 ft.

5. Inside diameter of well 1.91 in.

6. Volume of water in filter pack and well casing 125. gal.

7. Volume of water removed from well 70.0 gal.

8. Volume of water added (if any) NA gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 31.70 ft.	85.50 ft.
Date	b. 10/20/94 (m m d d y y)	10/21/94 (m m d d y y)
Time	c. 12:00 ☐ a.m. ☒ p.m.	13:52 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	2.0 inches	<1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	muddy	cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

Surged and bailed on 10/20/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S, ____ ft. ☐E ☐W	Well Name: CMC-11P
Facility License, Permit or Monitoring Number: ____	Grid Origin Location: Lat. ____ Long. ____ or St. Plane 116228.68 ft. N, 2275939.77 ft. E	Wis. Unique Well Number / DNR Well Number: ____
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 30, T. 35 N, R. 13 ☒E ☐W	Date Well Installed: 10 / 15 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Chuck Blunt / WID
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1646.08 ft. MSL
B. Well casing, top elevation 1645.89 ft. MSL
C. Land surface elevation 1643.5 ft. MSL
D. Surface seal, bottom 1642.5 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

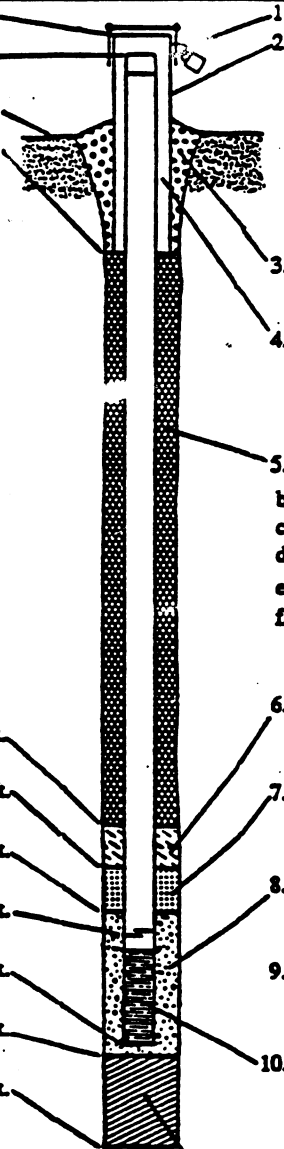
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1473.5 ft. MSL or 170.0 ft.
F. Fine sand, top 1446.0 ft. MSL or 197.5 ft.
G. Filter pack, top 1444.8 ft. MSL or 198.7 ft.
H. Screen joint, top 1441.5 ft. MSL or 202.0 ft.
I. Well bottom 1440.5 ft. MSL or 203.0 ft.
J. Filter pack, bottom 1438.5 ft. MSL or 205.0 ft.
K. Borehole, bottom 1433.5 ft. MSL or 210.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ With Native
4. Material between well casing and protective pipe: Bentonite ☐ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 11.0 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite .... Bentonite-cement grout ☐ 50
e. 33.2 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chiiped Bentonite Other ☒
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.31 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 0.77 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 1.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☒ 3/8" Bentonite Chips

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-11P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

		Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
[illegible]ed air	☐ 20		
bailed only	☒ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
11. Depth to Water (from top of well casing)		a. 57.60 ft.	Dry. ft.
Date		b. 10/19/94 (mm/dd/yy)	10/21/94 (mm/dd/yy)
Time		c. 10:15 ☒ a.m. ☐ p.m.	16:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		1.5 inches	<1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) muddy	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy
3. Time spent developing well	319 min.		
4. Depth of well (from top of well casing)	205.4 ft.		
5. Inside diameter of well	1.91 in.		
6. Volume of water in filter pack and well casing	25.4 gal.		
7. Volume of water removed from well	70.0 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		_____ mg/l	_____ mg/l
15. COD		_____ mg/l	_____ mg/l

16. Additional comments on development:

Bailed dry on 10/19/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-12P
Facility License, Permit or Monitoring Number: _____	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane 116478.66 ft. N. 2276322.76 ft. E.	Date Well Installed: 10 / 13 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Section Location of Waste/Source: SW 1/4 of SW 1/4 of Sec. 30 T. 35 N, R. 13 ☒E ☐W	Well Installed By: (Person's Name and Firm): Chuck Blunt / WID
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 1650.58 ft. MSL
B. Well casing, top elevation 1650.44 ft. MSL
C. Land surface elevation 1648.0 ft. MSL
D. Surface seal, bottom 1647.0 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

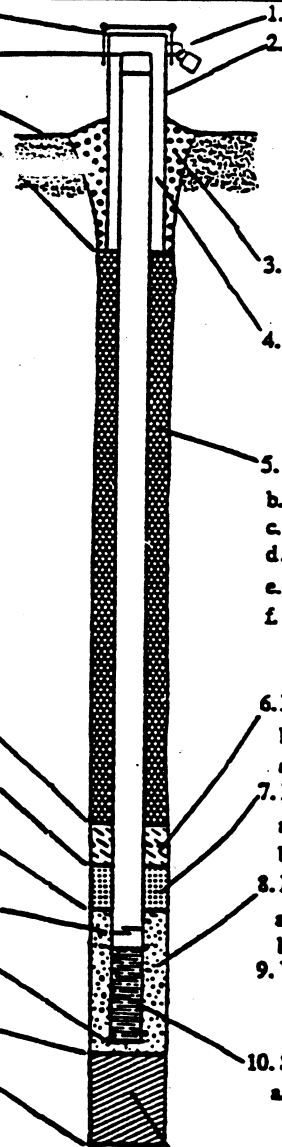
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1465.0 ft. MSL or 183.0 ft.
F. Fine sand, top 1458.0 ft. MSL or 190.0 ft.
G. Filter pack, top 1456.0 ft. MSL or 192.0 ft.
H. Screen joint, top 1454.0 ft. MSL or 194.0 ft.
I. Well bottom 1453.0 ft. MSL or 195.0 ft.
J. Filter pack, bottom 1452.0 ft. MSL or 196.0 ft.
K. Borehole, bottom 1444.0 ft. MSL or 204.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 12.4 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 74.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☒ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.52 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 0.67 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; 3/8" Chipped Bentonite Other ☒ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-12P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

		Before Development	After Development
1. Can this well be purged dry?	☒ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☒ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
11. Depth to Water (from top of well casing)		a. 68.5 ft.	Dry ft.
Date		b. 10 / 19 / 94 (m m d d y y)	10 / 20 / 94 (m m d d y y)
Time		c. 8:30 ☒ a.m. ☐ p.m.	17:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		2.0 inches	< 1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
		(Describe) muddy	(Describe) cloudy
3. Time spent developing well	275 min.		
4. Depth of well (from top of well casing)	197.4 ft.		
5. Inside diameter of well	1.91 in.		
6. Volume of water in filter pack and well casing	21.7 gal.		
7. Volume of water removed from well	56.0 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		_____ mg/l	_____ mg/l
15. COD		_____ mg/l	_____ mg/l

16. Additional comments on development:

Bailed dry on 10/19/94 and 10/20/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

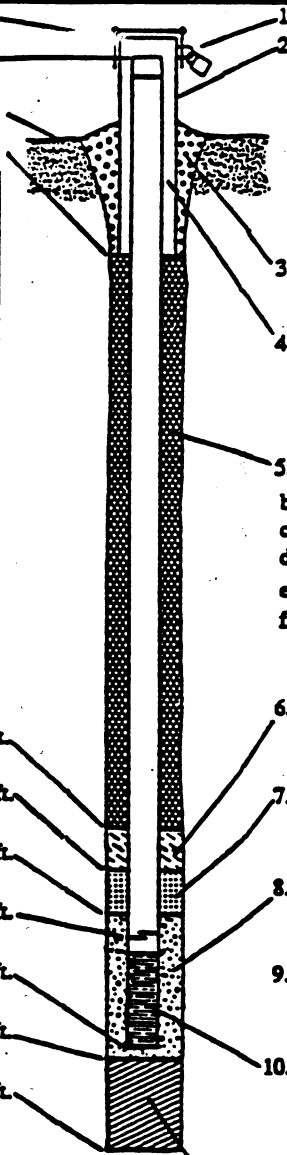
NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-13P
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane 116352.22 ft. N, 2276978.09 ft. E.	Date Well Installed: 10 / 03 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ft.	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30, T. 35 N, R. 13 ☒E ☐W	Well Installed By: (Person's Name and Firm): Larry Erdman; WID
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	



A. Protective pipe, top elevation 1686.91 ft. MSL
B. Well casing, top elevation 1686.77 ft. MSL
C. Land surface elevation 1684.4 ft. MSL
D. Surface seal, bottom 1683.4 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1484.4 ft. MSL or 200.0 ft.
F. Fine sand, top 1476.0 ft. MSL or 208.4 ft.
G. Filter pack, top 1474.8 ft. MSL or 209.6 ft.
H. Screen joint, top 1473.4 ft. MSL or 211.0 ft.
I. Well bottom 1472.4 ft. MSL or 212.0 ft.
J. Filter pack, bottom 1471.4 ft. MSL or 213.0 ft.
K. Borehole, bottom 1462.4 ft. MSL or 222.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.

1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.9 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 28.7 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. Pure Gold - Med. Chips Other ☒ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.21 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 0.41 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; Other ☒ Pure Gold Bentonite Med. Chips

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

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State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-13P

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
_____	71		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☒ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 384 min.

4. Depth of well (from top of well casing): 215.5 ft.

5. Inside diameter of well: 1.91 in.

6. Volume of water in filter pack and well casing: 19.5 gal.

7. Volume of water removed from well: 51.0 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 100.10 ft.	Dry ft.
Date	b. 10/20/94 (mm/dd/yy)	10/21/94 (mm/dd/yy)
Time	c. 8:04 ☒ a.m. ☐ p.m.	16:56 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	2.5 inches	<1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) muddy	Clear ☐ 20 Turbid ☒ 25 (Describe) muddy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

Bailed dry on 10/20/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-14P
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane 115996.51 ft. N. 2278987.85 ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NW 1/4 of NE 1/4 of Sec. 31, T. 35 N, R. 13 ☒E ☐W	Date Well Installed: 10 / 07 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Jon Weeks / WTD
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1611.44 ft. MSL
B. Well casing, top elevation 1611.31 ft. MSL
C. Land surface elevation 1608.9 ft. MSL
D. Surface seal, bottom 1607.9 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41

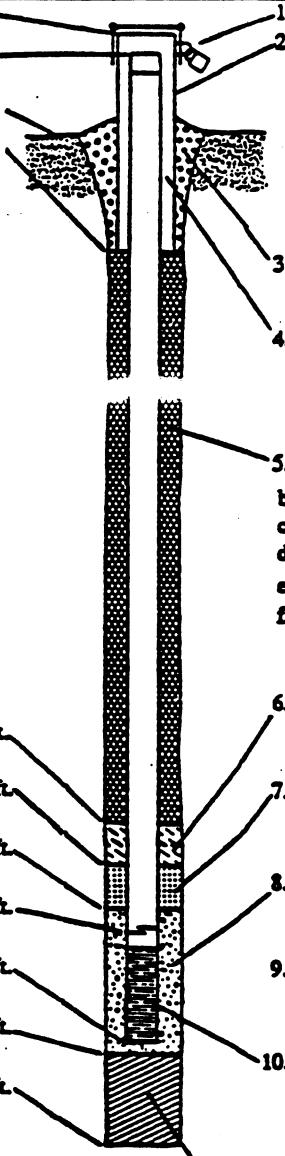
15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No

Describe ____

17. Source of water (attach analysis):

E. Bentonite seal, top 1524.9 ft. MSL or 84.0 ft.
F. Fine sand, top 1519.9 ft. MSL or 89.0 ft.
G. Filter pack, top 1517.9 ft. MSL or 91.0 ft.
H. Screen joint, top 1515.9 ft. MSL or 93.0 ft.
I. Well bottom 1514.9 ft. MSL or 94.0 ft.
J. Filter pack, bottom 1513.9 ft. MSL or 95.0 ft.
K. Borehole, bottom 1498.9 ft. MSL or 110.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.05 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.5 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 31.1 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.47 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 1.03 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 14; 3/8" Hole Plug Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-14P
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	_____ / _____

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☒	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
[illegible]	☐	20
bailed only	☐	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	[illegible]

3. Time spent developing well: 165 min.

4. Depth of well (from top of well casing): [illegible]2 ft.

5. Inside diameter of well: 2.05 in.

6. Volume of water in filter pack and well casing: 13.5 gal.

7. Volume of water removed from well: 80.0 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 21.70 ft.	21.50 ft.
Date	b. 10 / 20 / 94 (m m / d d / y y)	10 / 21 / 94 (m m / d d / y y)
	c. 11 : [illegible] ☒ a.m. ☐ p.m.	13 : 00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.0 inches	<1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) muddy	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Surged and bailed on 10/20/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WTD

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC–Saprolite Investigation

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: ft. ☐ N. ☐ S. ft. ☐ E. ☐ W.

Grid Origin Location: Lat. ___ Long. ___ or St. Plane 116229.25 ft. N. 227761.24 ft. E.

Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30 T. 35 N. R. 13 ☒ E. ☐ W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known

Well Name: CMC–OWA–1

Wis. Unique Well Number / DNR Well Number:

Date Well Installed: 10 / 17 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm): Keith Meyer; Total Drilling

A. Protective pipe, top elevation 1660.17 ft. MSL

B. Well casing, top elevation 1660.10 ft. MSL

C. Land surface elevation 1657.6 ft. MSL

D. Surface seal, bottom 1656.6 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02 Air ☐ 01; Drilling Mud ☒ 03 None ☐ 99

16. Drilling additives used? ☒ Yes ☐ No
Describe: Quick Gel

17. Source of water (attach analysis):

E. Bentonite seal, top 1496.6 ft. MSL or 161.0 ft.

F. Fine sand, top 1480.6 ft. MSL or 177.0 ft.

G. Filter pack, top 1478.6 ft. MSL or 179.0 ft.

H. Screen joint, top 1476.6 ft. MSL or 181.0 ft.

I. Well bottom 1471.6 ft. MSL or 186.0 ft.

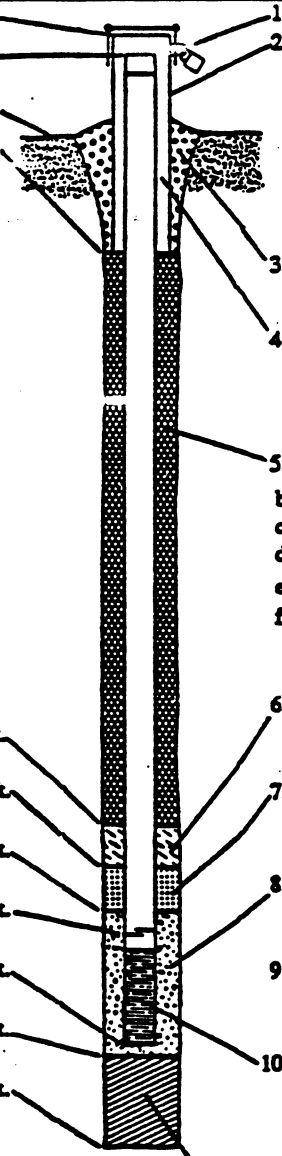
J. Filter pack, bottom 1467.6 ft. MSL or 190.0 ft.

K. Borehole, bottom 1452.6 ft. MSL or 205.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native; Other ☐

4. Material between well casing and protective pipe: Bentonite ☒ 30; Other ☐

5. Annular space seal: a. Granular Bentonite ☐ 33
b. ___ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 12.1 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ___ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 38.9 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☒

7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.52 ft³

8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 2.58 ft³

9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch. 144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-OWA1
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method

surged with bailer and bailed	☒ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well ____180____ min.

4. Depth of well (from top of well casing) ____192.5____ ft.

5. Inside diameter of well ____1.91____ in.

6. Volume of water in filter pack and well casing ____20____.1 gal.

7. Volume of water removed from well ____45____.0 gal.

8. Volume of water added (if any) NA ____.__ gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. ____72.80____ ft.	____124.30____ ft.
Date	b. 10 / 22 / 94 (m m / d d / y y)	10 / 23 / 94 (m m / d d / y y)
Time	c. ____:____ ☐ a.m. ☐ p.m.	15 : 30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	____.__ inches	____.__ inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) red brown	Clear ☐ 20 Turbid ☒ 25 (Describe) red brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	____.__ mg/l	____.__ mg/l
15. COD	____.__ mg/l	____.__ mg/l

16. Additional comments on development:

Surged and bailed on 10/22/94 and 10/23/94.

Well developed by: Person's Name and Firm

Name: Keith Meyers

Firm: TD Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation

Facility License, Permit or Monitoring Number:

Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12

Distance Well Is From Waste/Source Boundary: ft.

Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No

Local Grid Location of Well: ft. ☐N ☐S, ft. ☐E ☐W

Grid Origin Location: Lat. ___ Long. ___ or

St. Plane 116283.02 ft. N, 2277645.76 ft. E.

Section Location of Waste/Source: SE1/4 of SW 1/4 of Sec. 30 T. 35 N. R. 13 ☒E ☐W.

Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known

Well Name: CMC-OWA-2

Wis. Unique Well Number: DNR Well Number:

Date Well Installed: 10 / 20 / 94 (m m / d d / y y)

Well Installed By: (Person's Name and Firm)
Keith Meyers
Total Drilling

A. Protective pipe, top elevation 1661.20 ft. MSL

B. Well casing, top elevation 1661.07 ft. MSL

C. Land surface elevation 1658.7 ft. MSL

D. Surface seal, bottom 1657.7 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☒ Yes ☐ No
Describe: Quick Gel

17. Source of water (attach analysis):

E. Bentonite seal, top 1483.7 ft. MSL or 175.0 ft.

F. Fine sand, top 1477.7 ft. MSL or 181.0 ft.

G. Filter pack, top 1475.7 ft. MSL or 183.0 ft.

H. Screen joint, top 1473.7 ft. MSL or 185.0 ft.

I. Well bottom 1468.7 ft. MSL or 190.0 ft.

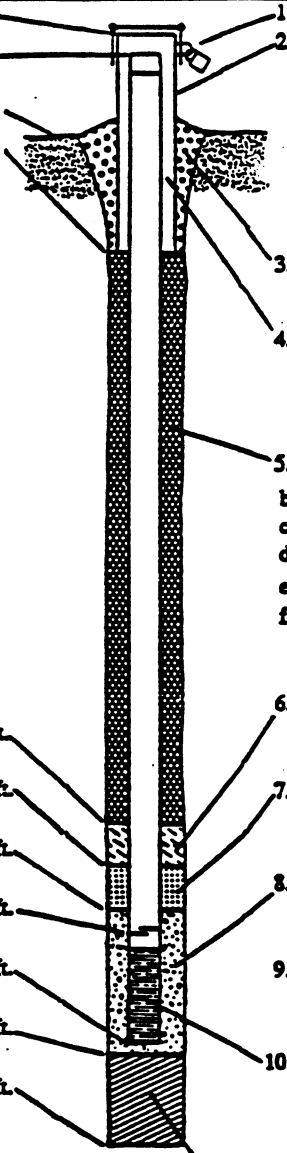
J. Filter pack, bottom 1468.2 ft. MSL or 190.5 ft.

K. Borehole, bottom 1467.7 ft. MSL or 191.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native Other ☐

4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; Other ☐

5. Annular space seal: a. Granular Bentonite ☐ 33
b. ___ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 12.2 lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ___ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 38.2 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☒

7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.52 ft³

8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 1.80 ft³

9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☒ 14; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-OWA-2
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	_____ / _____

1. Can this well be purged dry? ☐ Yes ☐ No

2. Well development method

surged with bailer and bailed	☒ 41
surged with bailer and pumped	☐ 61
surged with block and bailed	☐ 42
surged with block and pumped	☐ 62
surged with block, bailed and pumped	☐ 70
compressed air	☐ 20
bailed only	☐ 10
pumped only	☐ 51
pumped slowly	☐ 50
Other _____	☐

3. Time spent developing well: 210 min.

4. Depth of well (from top of well casing): 192.4 ft.

5. Inside diameter of well: 1.91 in.

6. Volume of water in filter pack and well casing: 19.3 gal.

7. Volume of water removed from well: 60.0 gal.

8. Volume of water added (if any): NA gal.

9. Source of water added: NA

10. Analysis performed on water added? ☐ Yes ☐ No (If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 73.2 ft.	85.7 ft.
Date	b. 10 / 22 / 94 (m m d d y y)	10 / 23 / 94 (m m d d y y)
Time	15:30 ☐ a.m. ☒ p.m.	15:50 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	<0.5 inches	<0.5 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) dark red	Clear ☐ 20 Turbid ☒ 25 (Describe) dark red

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Surged and bailed on 10/22/94 and 10/23/94.

Well developed by: Person's Name and Firm

Name: Keith Meyers

Firm: TD Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-OWA-3
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane 116218.57 ft. N, 2277666.07 ft. E.	Date Well Installed: 10 / 18 / 94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30, T. 35 N, R. 13 ☐E ☐W	Well Installed By: (Person's Name and Firm): Keith Meyers; Total Drilling
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 1660.15 ft. MSL
B. Well casing, top elevation 1660.05 ft. MSL
C. Land surface elevation 1657.8 ft. MSL
D. Surface seal, bottom 1656.8 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

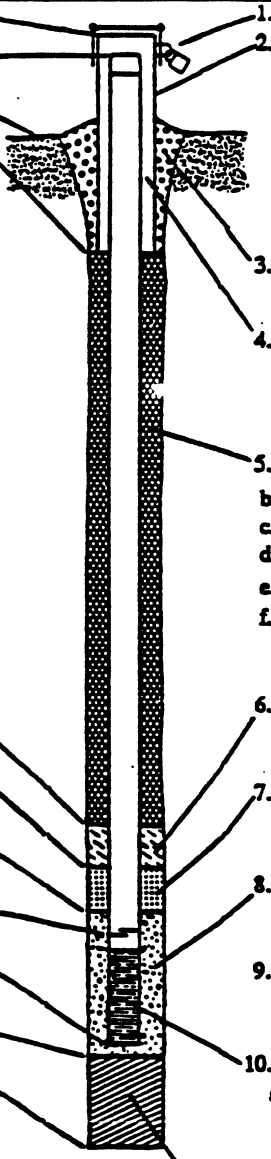
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☒ Yes ☐ No
Describe: Quick Gel

17. Source of water (attach analysis):

E. Bentonite seal, top 1547.8 ft. MSL or 110.0 ft.
F. Fine sand, top 1536.8 ft. MSL or 121.0 ft.
G. Filter pack, top 1534.8 ft. MSL or 123.0 ft.
H. Screen joint, top 1532.8 ft. MSL or 125.0 ft.
I. Well bottom 1527.8 ft. MSL or 130.0 ft.
J. Filter pack, bottom 1526.8 ft. MSL or 131.0 ft.
K. Borehole, bottom 1526.8 ft. MSL or 131.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; With Native; Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 11.9 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 27.7 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Bentonite Chips; Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.52 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 1.55 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer: Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 50 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-OWA-3
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed and pumped	☐	70
compressed a.	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
Other _____	☐	

3. Time spent developing well 290 min.

4. Depth of well (from top of well casing) 132.3 ft.

5. Inside diameter of well 1.91 in.

6. Volume of water in filter pack and well casing 10.7 gal.

7. Volume of water removed from well 28.0 gal.

8. Volume of water added (if any) NA gal.

9. Source of water added NA

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 72.8 ft.	125.0 ft.
Date	b. 10 / 22 / 94 (m m d d y y)	10 / 23 / 94 (m m d d y y)
Time	c. 10:24 ☒ a.m. ☐ p.m.	13:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	5.0 inches	1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) brown	Clear ☐ 20 Turbid ☒ 25 (Describe) light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	_____.__ mg/l	_____.__ mg/l
15. COD	_____.__ mg/l	_____.__ mg/l

16. Additional comments on development:

Surged and bailed on 10/22/94 and 10/23/94.

Well developed by: Person's Name and Firm

Name: Keith Meyers

Firm: TD Drilling

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC_Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-OWA-4
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	St. Plane 116357.71 ft. N, 2277607.17 ft. E.	Date Well Installed: 10 / 11 / 94 (mm / dd / yy)
Distance Well Is From Waste/Source Boundary: ____ ft.	Section Location of Waste/Source: SE 1/4 of SW 1/4 of Sec. 30, T. 35 N, R. 13 ☒E ☐W	Well Installed By: (Person's Name and Firm): Jon Weeks / WID
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	

A. Protective pipe, top elevation 1663.97 ft. MSL
B. Well casing, top elevation 1663.85 ft. MSL
C. Land surface elevation 1661.2 ft. MSL
D. Surface seal, bottom 1660.2 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

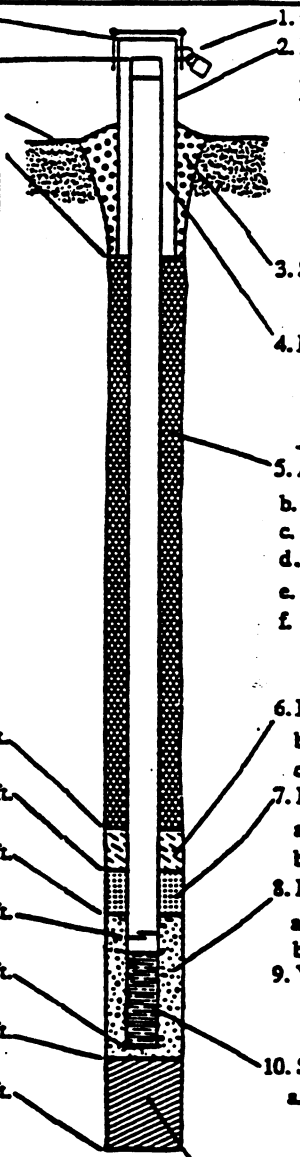
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1570.4 ft. MSL or 90.8 ft.
F. Fine sand, top 1546.0 ft. MSL or 115.2 ft.
G. Filter pack, top 1543.2 ft. MSL or 118.0 ft.
H. Screen joint, top 1541.2 ft. MSL or 120.0 ft.
I. Well bottom 1536.2 ft. MSL or 125.0 ft.
J. Filter pack, bottom 1535.2 ft. MSL or 126.0 ft.
K. Borehole, bottom 1535.2 ft. MSL or 126.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ With Native
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.6 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. 22.7 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Chipped Bentonite Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added 0.26 ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added 0.78 ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT
Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-OWA-4
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

		Before Development	After Development
1. Can this well be purged dry?	☐ Yes ☐ No		
2. Well development method			
surged with bailer and bailed	☐ 41		
surged with bailer and pumped	☐ 61		
surged with block and bailed	☐ 42		
surged with block and pumped	☐ 62		
surged with block, bailed and pumped	☐ 70		
compressed air	☐ 20		
bailed only	☒ 10		
pumped only	☐ 51		
pumped slowly	☐ 50		
Other _____	☐		
11. Depth to Water (from top of well casing)		a. 75.30 ft.	Dry ft.
Date		b. 10/20/94 (mm dd yy)	10/21/94 (mm dd yy)
Time		c. 17:00 ☐ a.m. ☒ p.m.	18:38 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		<2.0 inches	<1.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) muddy	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy
3. Time spent developing well	190 min.		
4. Depth of well (from top of well casing)	128.2 ft.		
5. Inside diameter of well	1.91 in.		
6. Volume of water in filter pack and well casing	11.9 gal.		
7. Volume of water removed from well	24.0 gal.		
8. Volume of water added (if any)	NA gal.		
9. Source of water added	NA		
Fill in if drilling fluids were used and well is at solid waste facility:			
14. Total suspended solids		_____ mg/l	_____ mg/l
15. COD		_____ mg/l	_____ mg/l
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No		

16. Additional comments on development:

Bailed dry on 10/20/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

State of Wisconsin
Department of Natural Resources

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☒ Mining

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 4-90

Facility/Project Name: CMC-Saprolite Investigation	Local Grid Location of Well: ____ ft. ☐N ☐S ____ ft. ☐E ☐W	Well Name: CMC-OWA-5
Facility License, Permit or Monitoring Number:	Grid Origin Location: Lat. ____ Long. ____ or St. Plane 115990.28 ft. N, 2277837.12 ft. E.	Wis. Unique Well Number / DNR Well Number:
Type of Well: Water Table Observation Well ☐ 11; Piezometer ☒ 12	Section Location of Waste/Source: NE 1/4 of NW 1/4 of Sec. 31 T. 35 N, R. 13 ☒E ☐W	Date Well Installed: 10/15/94 (m m / d d / y y)
Distance Well Is From Waste/Source Boundary: ____ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient; d ☐ Downgradient n ☐ Not Known	Well Installed By: (Person's Name and Firm): Jon Weeks; WID:
Is Well A Point of Enforcement Std. Application? ☐ Yes ☐ No		

A. Protective pipe, top elevation 1651.39 ft. MSL
B. Well casing, top elevation 1651.29 ft. MSL
C. Land surface elevation 1648.6 ft. MSL
D. Surface seal, bottom 1647.6 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☒ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☒ Yes ☐ No

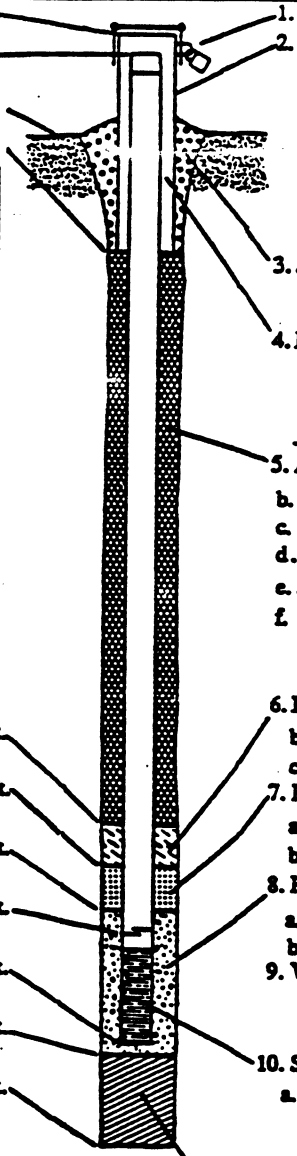
14. Drilling method used: Rotary ☒ 50; Hollow Stem Auger ☐ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☒ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☐ No
Describe ____

17. Source of water (attach analysis): ____

E. Bentonite seal, top 1550.6 ft. MSL or 98.0 ft.
F. Fine sand, top 1527.8 ft. MSL or 120.8 ft.
G. Filter pack, top 1525.6 ft. MSL or 123.0 ft.
H. Screen joint, top 1523.6 ft. MSL or 125.0 ft.
I. Well bottom 1518.6 ft. MSL or 130.0 ft.
J. Filter pack, bottom 1518.6 ft. MSL or 130.0 ft.
K. Borehole, bottom 1516.6 ft. MSL or 132.0 ft.
L. Borehole, diameter 6.0 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 1.91 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 3.8 in.
b. Length: 7.0 ft.
c. Material: Steel ☒ 04; Other ☐ ____
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; Other ☐ With Native
4. Material between well casing and protective pipe: Bentonite ☒ 30; Annular space seal ☐ ____; Other ☐ ____
5. Annular space seal: a. Granular Bentonite ☐ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. 10.5 Lbs/gal mud weight ..... Bentonite slurry ☒ 31
d. ____ % Bentonite .... Bentonite-cement grout ☐ 50
e. 22.3 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite pellets ☐ 32
c. 3/8" Bentonite Chips Other ☐ ____
7. Fine sand material: Manufacturer, product name & mesh size
a. Badger Mining BB#7 Silica
b. Volume added ____ ft³
8. Filter pack material: Manufacturer, product name and mesh size
a. Badger Mining 20/40 Silica
b. Volume added ____ ft³
9. Well casing: Flush threaded PVC schedule 40 ☐ 23; Flush threaded PVC schedule 80 ☒ 24; Other ☐ ____
10. Screen material: PVC
a. Screen type: Factory cut ☒ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer Northern Air
c. Slot size: 0.006 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: Foth & Van Dyke

Please complete both sides of this form and return to the appropriate DNR office listed at the top of this form as required by chs. 144, 147 and 160, Wis. Stats., and ch. NR 141, Wis. Ad. Code. In accordance with ch.144, Wis Stats., failure to file this form may result in a forfeiture of not less than $10, nor more than $5000 for each day of violation. In accordance with ch. 147, Wis. Stats., failure to file this form may result in a forfeiture of not more than $10,000 for each day of violation. NOTE: Shaded areas are for DNR use only. See instructions for more information including where the completed form should be sent.

C19

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 4-90

Route to: Solid Waste ☐ Haz. Waste ☐ Wastewater ☐
Env. Response & Repair ☐ Underground Tanks ☐ Other ☐ _____

Facility/Project Name	County Name	Well Name
CMC - Saprolite Investigation	Forest	CMC-OWA-5
Facility License, Permit or Monitoring Number	**County Code**	**Wis. Unique Well Number** / **DNR Well Number**
_____	71	

	Before Development	After Development
1. Can this well be purged dry?	☐ Yes ☒ No	
2. Well development method		
surged with bailer and bailed	☒ 41	
surged with bailer and pumped	☐ 61	
surged with block and bailed	☐ 42	
surged with block and pumped	☐ 62	
surged with block, bailed and pumped	☐ 70	
compressed air	☐ 20	
bailed only	☐ 10	
pumped only	☐ 51	
pumped slowly	☐ 50	
Other _____	☐	
11. Depth to Water (from top of well casing)	a. 65.75 ft.	123.40 ft.
Date	b. 10/20/94 (m m d d y y)	10/21/94 (m m d d y y)
Time	c. 13:00 ☐ a.m. ☒ p.m.	15:07 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	1.5 inches	1.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe) muddy	Clear ☐ 20 Turbid ☒ 25 (Describe) cloudy
3. Time spent developing well	108 min.	
4. Depth of well (from top of well casing)	132.2 ft.	
5. Inside diameter of well	1.91 in.	
6. Volume of water in filter pack and well casing	14.3 gal.	
7. Volume of water removed from well	66.0 gal.	
8. Volume of water added (if any)	NA gal.	
9. Source of water added	NA	
10. Analysis performed on water added? (If yes, attach results)	☐ Yes ☐ No	
Fill in if drilling fluids were used and well is at solid waste facility:		
14. Total suspended solids	_____ mg/l	_____ mg/l
15. COD	_____ mg/l	_____ mg/l

16. Additional comments on development:

Surged and bailed on 10/20/94 and 10/21/94.

Well developed by: Person's Name and Firm

Name: Chuck Blunt/Mark Thuot

Firm: WID

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Initials: E A S

Firm: Foth & Van Dyke

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

Well Construction Report For WISCONSIN UNIQUE WELL NUMBER TC 088

State of Wisconsin — e # 21-3-0001
Private Water Supply - WS/2
Department of Natural Resources
Box 7921
Madison, WI 53707 (Please type or print using a black pen.)

Property Owner	PWA Crandon Mining Co.
Telephone Number	(715) 478-3393
Mailing Address	7 North Brown Street
City	Rhinelander
State	WI
Zip Code	54501
County of Well Location	Forest
Co. Well Permit No.	W
Well Completion Date (mm-dd-yy)	09 - 28 - 94

1. Well Location Please use decimals instead of fractions.

☐ Town ☐ City ☐ Village of Nashville — Fire # (If avail.)

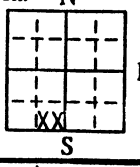
Grid or Street Address or Road Name and Number (If avail.)

Subdivision Name — Lot # — Block #

Gov't Lot # ____ or SE 1/4 of SW 1/4 of Section 30, T 35 N; R 13 ☒ E ☐ W

Well Constructor (Business Name)	TD Drilling, Inc.
License #	
Address	7391 S. Porcupine Lake Rd.
City	Lena, WI
State	
Zip Code	54139

2. Mark well location with a dot in correct 40-acre parcel of section.



3. Well Type ☒ New ☐ Replacement ☐ Reconstruction

of previous unique well # ____ constructed in 19 ____

Reason for new, replaced or reconstructed well? ____

4. Well serves ____ # of homes and or test well bacteria sample taken (Ex: barn, restaurant, church, school, industry, etc.)

High Capacity: Well? ☒ Yes ☐ No Property? ☒ Yes ☐ No

☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other ____

5. Well located on highest point of property, consistent with the general layout and surroundings? ☐ Yes ☐ No If no, explain on back side.

Well located in floodplain? ☐ Yes ☐ No

Distance in Feet From Well To Nearest:

____ 1. Landfill
____ 2. Building Overhang
____ 3. Septic or Holding Tank (circle one)
____ 4. Sewage Absorption Unit
____ 5. Nonconforming Pit
____ 6. Buried Home Heating Oil Tank
____ 7. Buried Petroleum Tank
____ 8. Shoreline/Swimming Pool
____ 9. Downspout/Yard Hydrant
____ 10. Privy
____ 11. Foundation Drain to Clearwater
____ 12. Foundation Drain to Sewer
____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 15. Collector or Street Sewer
____ 16. Clearwater Sump
____ 17. Wastewater Sump
____ 18. Paved Animal Barn Pen
____ 19. Animal Yard or Shelter
____ 20. Silo - Type ____
____ 21. Barn Gutter
____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 23. Other Manure Storage ____ Other NR 112 Waste Source
____ 24. ____

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
10"	surface	180
6"	180	228

Method of constructing upper enlarged drillhole only.

☒ 1. Rotary - Mud Circulation
☐ 2. Rotary - Air
☐ 3. Rotary - Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain ____
☐ 7. Other ____

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6"	Sawhill T&C A-53B 19.18	surface	180

Dia. (in.)	screen type, material & slot size	From	To

8. Grout or Other Sealing Material

Method pumped

Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Cement	surface	180	75

9. Geology

DNR USE ONLY	Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
	Brown silty sand w/gravel	Surface	85
	Orange silty sand w/gravel	85	130
	Red massive saprolite	130	158
	Grey weathered bedrock	158	230

10. Static Water Level

____ ft. above ground surface
____ ft. below ground surface

11. Pump Test

Pumping Level ____ ft. below surface
Test Well Was Never Pumped
Pumping at ____ GPM for ____ hours

12. Well Is:

____ in. ☐ Above ☐ Below Grade
Developed? ☐ Yes ☐ No
Disinfected? ☐ Yes ☐ No
Capped? ☐ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☐ No If no, explain ____

14. Signature of Point Driver or Licensed Supervisory Driller Date Signed 12-15-94

Signature of Drill Rig Operator (Mandatory unless same as above) Date Signed

Make additional comments on reverse side about geology, additional screens, water quality, etc. C21

WELL CONSTRUCTION REPORT

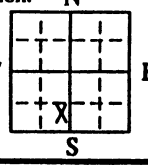
Well Construction Report For WISCONSIN UNIQUE WELL NUMBER IC 087

Private Water Supply - WS/2
Department of Natural Resources
Box 7921
Madison, WI 53707 (Please type or print using a black pen.)

Property Owner	PWAR Crandon Mining Co.
Telephone Number	(715) 478-3393
Mailing Address	7 North Brown Street
City	Rhinelander
State	WI
Zip Code	54501
County of Well Location	Forest
Co. Well Permit No.	W
Well Completion Date (mm-dd-yy)	10 - 04 - 94

Well Constructor (Business Name): TD Drilling, Inc. — License #:
Address: 7391 S. Porcupine Lake Rd.
City: Lena, WI — State: — Zip Code: 54139

2. Mark well location with a dot in correct 40-acre parcel of section.



1. Well Location Please use decimals instead of fractions.
☐ Town ☐ City ☐ Village of Nashville — Fire # (If avail.)
Grid or Street Address or Road Name and Number (If avail.)
Subdivision Name — Lot # — Block #
Gov't Lot # ____ or SE 1/4 of SW 1/4 of
Section 30, T 35 N; R 13 ☒ E ☐ W

3. Well Type ☒ New ☐ Replacement ☐ Reconstruction
of previous unique well # ____ constructed in 19 ____
Reason for new, replaced or reconstructed well?

☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other ____

4. Well serves ____ # of homes and or test well
(Ex: barn, restaurant, church, school, industry, etc.) no bacteria sample

High Capacity: Well? ☒ Yes ☐ No — Property? ☒ Yes ☐ No

5. Well located on highest point of property, consistent with the general layout and surroundings? ☐ Yes ☐ No If no, explain on back side.

Well located in floodplain? ☐ Yes ☐ No
Distance in Feet From Well To Nearest:

____ 1. Landfill
____ 2. Building Overhang
____ 3. Septic or Holding Tank (circle one)
____ 4. Sewage Absorption Unit
____ 5. Nonconforming Pit
____ 6. Buried Home Heating Oil Tank
____ 7. Buried Petroleum Tank
____ 8. Shoreline/Swimming Pool
____ 9. Downspout/Yard Hydrant
____ 10. Privy
____ 11. Foundation Drain to Clearwater
____ 12. Foundation Drain to Sewer
____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other
____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 15. Collector or Street Sewer
____ 16. Clearwater Sump
____ 17. Wastewater Sump
____ 18. Paved Animal Barn Pen
____ 19. Animal Yard or Shelter
____ 20. Silo - Type ____
____ 21. Barn Gutter
____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 23. Other Manure Storage ____ Other NR 112 Waste Source
____ 24. ____

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
10"	surface	219
6"	219	270

Method of constructing upper enlarged drillhole only.
☒ 1. Rotary - Mud Circulation
☐ 2. Rotary - Air
☐ 3. Rotary - Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit ____ in. dia.
☐ 6. Temp. Outer Casing ____ in. dia. Removed? ☐ Yes ☐ No If no, explain ____
☐ 7. Other ____

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	T & C Sawhill A-53B	surface	219
	19.18		

Dia. (in.)	screen type, material & slot size	From	To

8. Grout or Other Sealing Material

Method	Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
pumped	Cement	surface	219	122

DNR USE ONLY	9. Geology Type, Caving/Noncaving, Color, Hardness, Etc.	From (ft.)	To (ft.)
	Brown silty sand w/gravel	Surface	130
	Red brown silty sand	130	159
	Red massive saprolite	159	181
	Structured Saprolite	181	196
	Grey weathered bedrock	196	270

10. Static Water Level
____ ft. above ground surface
65' ft. below ground surface

11. Pump Test
Pumping Level 60 ft. below surface
Pumping at 60 GPM for 17 days hours

12. Well Is:
12 in. ☒ Above ☐ Below Grade
Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells? ☐ Yes ☐ No If no, explain ____

14. Signature of Point Driver or Licensed Supervisory Driller — Date Signed 12-15-94
Signature of Drill Rig Operator (Mandatory unless same as above) Date Signed

Make additional comments on reverse side about geology, additional screens, water quality, etc. — Comments on reverse side (Check if yes)

C22 WELL CONSTRUCTION REPORT Form 3300-77A Rev. 7-92

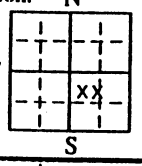
Well Construction Report For WISCONSIN UNIQUE WELL NUMBER TG 086

State of Wisconsin File # 21-3-0001
Private Water Supply - WS/2
Department of Natural Resources
Box 7921
Madison, WI 53707 (Please type or print using a black pen.)

Property Owner: PWB Crandon Mining Co.	Telephone Number: (715) 478-3393
Mailing Address: 7 North Brown Street	
City: Rhinelander	State: WI Zip Code: 54501
County of Well Location: Forest	Co. Well Permit No.: W_____
Well Completion Date (mm-dd-yy): 10 - 07 - 94	

Well Constructor (Business Name): TD Drilling, Inc. License #:
Address: 7391 S. Porcupine Lake Rd.
City: Lena, State: WI Zip Code: 54139

2. Mark well location with a dot in correct 40-acre parcel of section.



1. Well Location — Please use decimals instead of fractions.
☐ Town ☐ City ☐ Village of Nashville
Fire # (If avail.)
Grid or Street Address or Road Name and Number (If avail.)
Subdivision Name Lot # Block #
Gov't Lot #_____ or SW 1/4 of SE 1/4 of
Section 30, T 35 N; R 13 ☒ E ☐ W

3. Well Type ☒ New
☐ Replacement ☐ Reconstruction
of previous private well # _____ constructed in 19 ____
Reason for new, replaced or reconstructed well?

4. Well serves ____ # of homes and or test well (no bacteria sample taken)
(Ex: barn, restaurant, church, school, industry, etc.)

High Capacity: Well? ☒ Yes ☐ No; Property? ☒ Yes ☐ No

☒ Drilled ☐ Driven Point ☐ Jetted ☐ Other _____

5. Well located on highest point of property, consistent with the general layout and surroundings? ☐ Yes ☐ No If no, explain on back side.

Well located in floodplain? ☐ Yes ☐ No
Distance in Feet From Well To Nearest:

____ 1. Landfill	____ 9. Downspout/Yard Hydrant	____ 17. Wastewater Sump
____ 2. Building Overhang	____ 10. Privy	____ 18. Paved Animal Barn Pen
____ 3. Septic or Holding Tank (circle one)	____ 11. Foundation Drain to Clearwater	____ 19. Animal Yard or Shelter
____ 4. Sewage Absorption Unit	____ 12. Foundation Drain to Sewer	____ 20. Silo - Type _____
____ 5. Nonconforming Pit	____ 13. Building Drain ☐ Cast Iron or Plastic ☐ Other	____ 21. Barn Gutter
____ 6. Buried Home Heating Oil Tank	____ 14. Building Sewer ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other	____ 22. Manure Pipe ☐ Gravity ☐ Pressure ☐ Cast Iron or Plastic ☐ Other
____ 7. Buried Petroleum Tank	____ 15. Collector or Street Sewer	____ 23. Other Manure Storage _____ Other NR 112 Waste Source
____ 8. Shoreline/Swimming Pool	____ 16. Clearwater Sump	____ 24. _____

6. Drillhole Dimensions

Dia. (in.)	From (ft.)	To (ft.)
10"	surface	180
6"	180	400

Method of constructing upper enlarged drillhole only.
☒ 1. Rotary - Mud Circulation
☐ 2. Rotary - Air
☐ 3. Rotary - Foam
☐ 4. Reverse Rotary
☐ 5. Cable-tool Bit _____ in. dia.
☐ 6. Temp. Outer Casing _____ in. dia.
Removed? ☐ Yes ☐ No
If no, explain _____
☐ 7. Other _____

7. Casing, Liner, Screen

Dia. (in.)	Material, Weight, Specification Manufacturer & Method of Assembly	From (ft.)	To (ft.)
6	T & C Sawhill A-53B	surface	180
	19.18		

Dia. (in.)	screen type, material & slot size	From	To

8. Grout or Other Sealing Material

Method: pumped Kind of Sealing Material	From (ft.)	To (ft.)	# Sacks Cement
Cement	surface	180	79

DNR USE ONLY

9. Geology — Type, Caving/Noncaving, Color, Hardness, Etc.

From (ft.)	To (ft.)	
Surface	85	Brown silty sand w/ gravel
85	95	Red silty sand w/gravel
95	115	Red massive saprolite
115	220	Structured Saprolite
220	400	Grey weathered bedrock

10. Static Water Level
____ ft. above ground surface
25 ft. below ground surface

11. Pump Test
Pumping Level 70 ft. below surface
Pumping at 4 GPM for 8 hours

12. Well Is:
☒ Above ☐ Below Grade
12 in.
Developed? ☒ Yes ☐ No
Disinfected? ☒ Yes ☐ No
Capped? ☒ Yes ☐ No

13. Did you permanently seal all unused, noncomplying, or unsafe wells?
☐ Yes ☐ No If no, explain _____

14. Signature of Point Driver or Licensed Supervisory Driller: Keith Mc... Date Signed: 12-15-94
Signature of Drill Rig Operator (Mandatory unless same as above) Date Signed

Make additional comments on reverse side about geology, additional screens, water quality, etc. C23 WELL CONSTRUCTION REPORT

Completion Records for 1994 and 1995 Foth & Van Dyke Sandpoint Installation Program

CMC - SP
- 01
- 02
- 03A
- 03B
- 04
- 05A
- 05B
- 06
- 07
- 08
- 09
- 10
- 11A
- 11B

State of Wisconsin
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM
Chapter 144, Wis. Stats.
Form 4400-89

Rev. 1-90

Facility Name: CRANDON MINE SITE -LITTLE SAND LAKE | Facility ID Number: | Date: 1-25-95 | Completed By (Name and Firm): Stephen V. Donohue - Foth & Van Dyke

Well Name	DNR Well ID Number	Well Location	N	S	E	W	Date Established	Well Casing Diam	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Reference MSL (√)	Reference Site Datum (√)	Screen Length	Well Depth	Type of Well (√) PIEZ	OW	PW	LYS	Other	Abandoned	Enf. Stds Apply	Gradient U, S, D or N
CMC-SP-01		114244.4	X				12/2/94	1.25"	G	1597.30	1595.15	✓		3'	7.80					Sand Point		NA	NA
		2279412.2			X																		
CMC-SP-02		114181.3	X				12/1/94	1.25"	G	1596.95	1594.75	✓		3'	7.75					Sand Point		NA	NA
		2279306.4			X																		
CMC-SP-03A		114628.8	X				12/1/94	1.25"	G	1597.20	1594.45	✓		3'	7.79					Sand Point		NA	NA
		2278974.6			X																		
CMC-SP-03B		114627.6	X				12/2/94	1.25"	G	1596.04	1594.39	✓		3'	22.97					Sand Point		NA	NA
		2278975.8			X																		
CMC-SP-04		114726.9	X				12/1/94	1.25"	G	1596.19	1593.49	✓		3'	7.70					Sand Point		NA	NA
		2279029.4			X																		
CMC-SP-05 A		114907.4	XX				12/1/94	1.25"	G	1597.28	1592.63	✓		3'	7.77					Sand Point		NA	NA
		2278578.4			X																		
CMC-SP-05B		114908.8	X				12/1/94	1.25"	G	1594.84	1593.79	✓		3'	22.49					Sand Point		NA	NA
		2278580.5			X																		
CMC-SP-06		114977.8		X			12/1/94	1.25"	G	1597.55	1594.55	✓		3'	7.79					Sand Point		NA	NA
		2278619.2			XX																		
CMC-SP-07		115104.1	XX				12/1/94	1.25"	G	1597.64	1594.52	✓		3'	7.75					Sand Point		NA	NA
		2278023.5			XX																		
CMC-SP-08		115222.1	X				12/1/94	1.25"	G	1596.92	1595.82	✓		3'	7.77					Sand Point		NA	NA
		2278024.2			X																		
CMC-SP-09		115000.5		X			12/1/94	1.25"	G	1597.70	1596.70	✓		3'	7.53					Sand Point		NA	NA
		2279719.9			X																		

3.6-1 1-91

Location Coordinates Are:

Remarks: NA= Not Applicable
G = Galvanized Pipe

PSS Use:

File Maint. Completed:

Facility Name: CRANDON MINE SITE-LITTLE SAND LAKE | Facility ID Number: | Date: 1-25-95 | Completed By (Name and Firm): Stephen V. Donohue - Foth & Van Dyke

Well Name	DNR Well ID Number	Well Location	N	S	E	W	Date Established	Well Casing Diam.	Well Casing Type	Elevations Top of Well Casing	Elevations Ground Surface	Reference MSL (√)	Reference Site Datum (√)	Screen Length	Well Depth	Type of Well (√) PIEZ	OW	PW	LYS	Other	Abandoned	Enf. Stds Apply	Gradient U, S, D or N
CMC-SP-10		109595.2	X				2/16/95	1.25	G	1608.46	1606.4	✓		3	25.33					Sand Point		NA	NA
		2278780.3			X																		
CMC-SP-11A		113325.8	X				2/27/95	1.25	G	1597.01	1593.16	✓		3	7.75					Sand Point		NA	NA
		2278711.5			X																		
MC-SP-11B		113325.5	X				2/27/95	1.25	G	1595.18	1593.28	✓		3	23.05					Sand Point		NA	NA
		2278712.5			X																		

3.6-1-172

Location Coordinates Are:

☐ Local Grid System (preferred) ☐ State Plane Coordinate ☐ Northern ☐ Central

Remarks: NA = Not Applicable

G = Galvanized Pipe

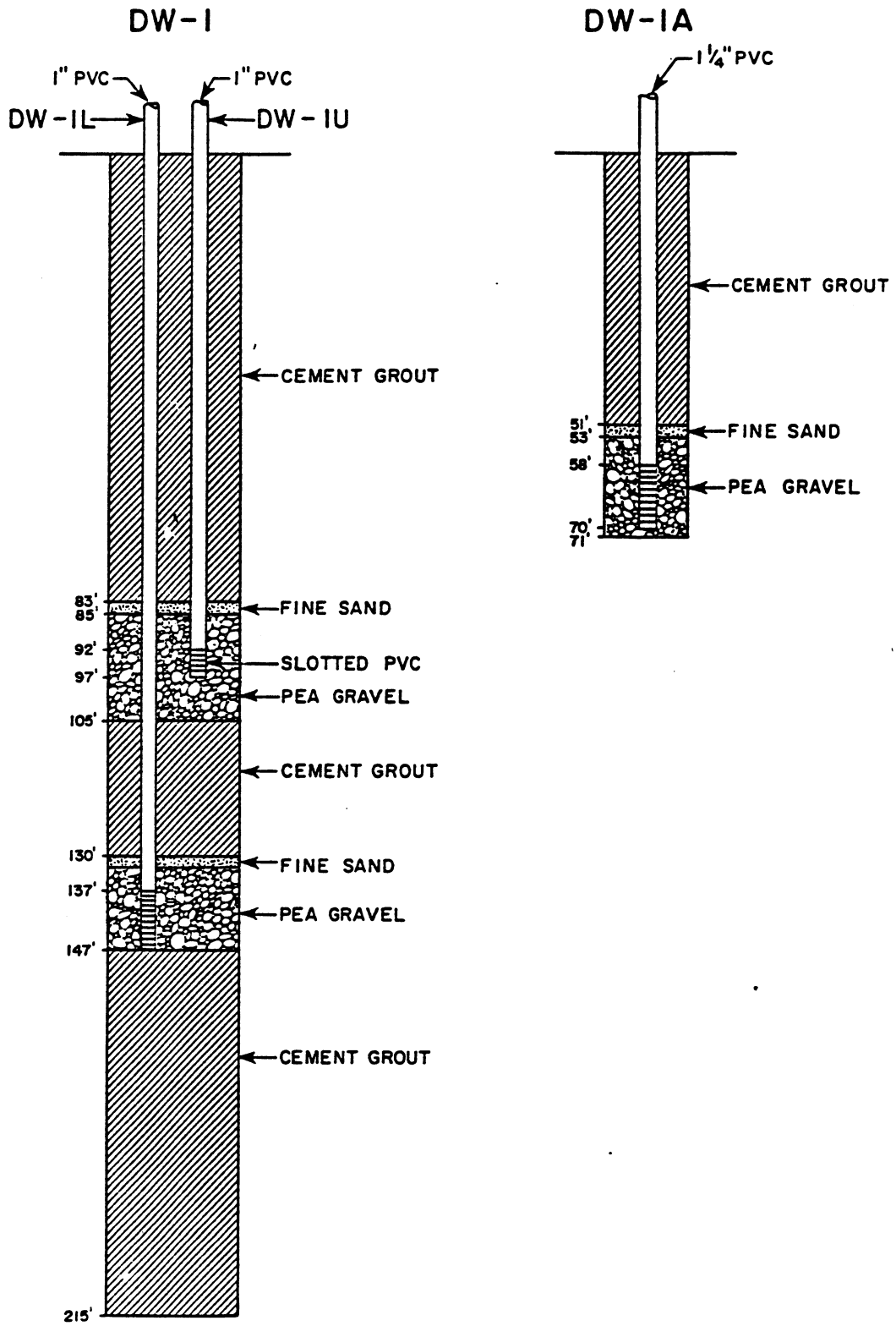
PSS Use:

File Maint. Completed: _____

Other

Miscellaneous Well Construction Reports

DW - 1L, 1U
DW - 1A
DW - 2
DW - 3
TW - 1
TW - 2
TW - 41
STS - WVS
STS - EVS

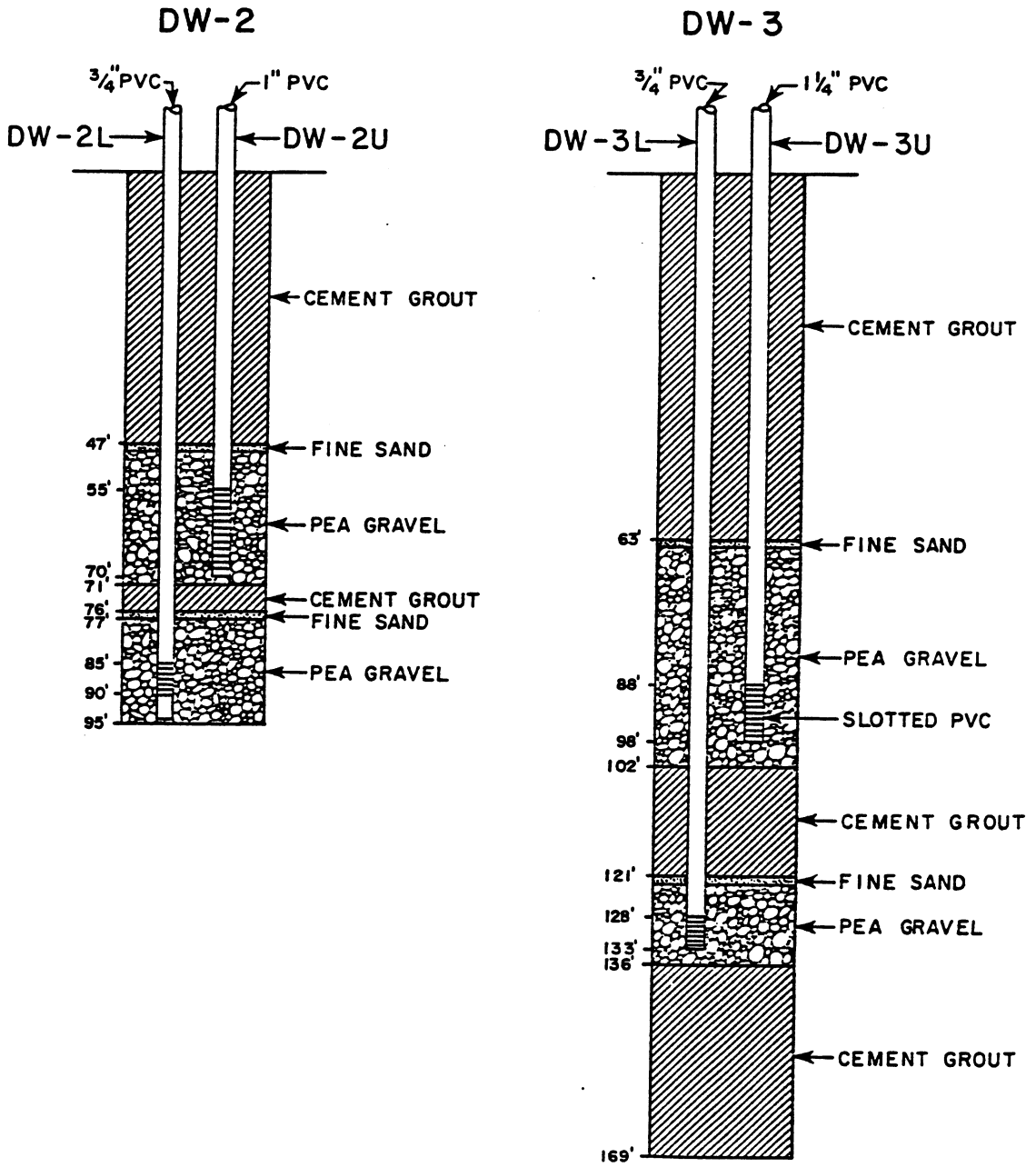


PIEZOMETER DETAILS

3.6-1-174

DAMES & MC

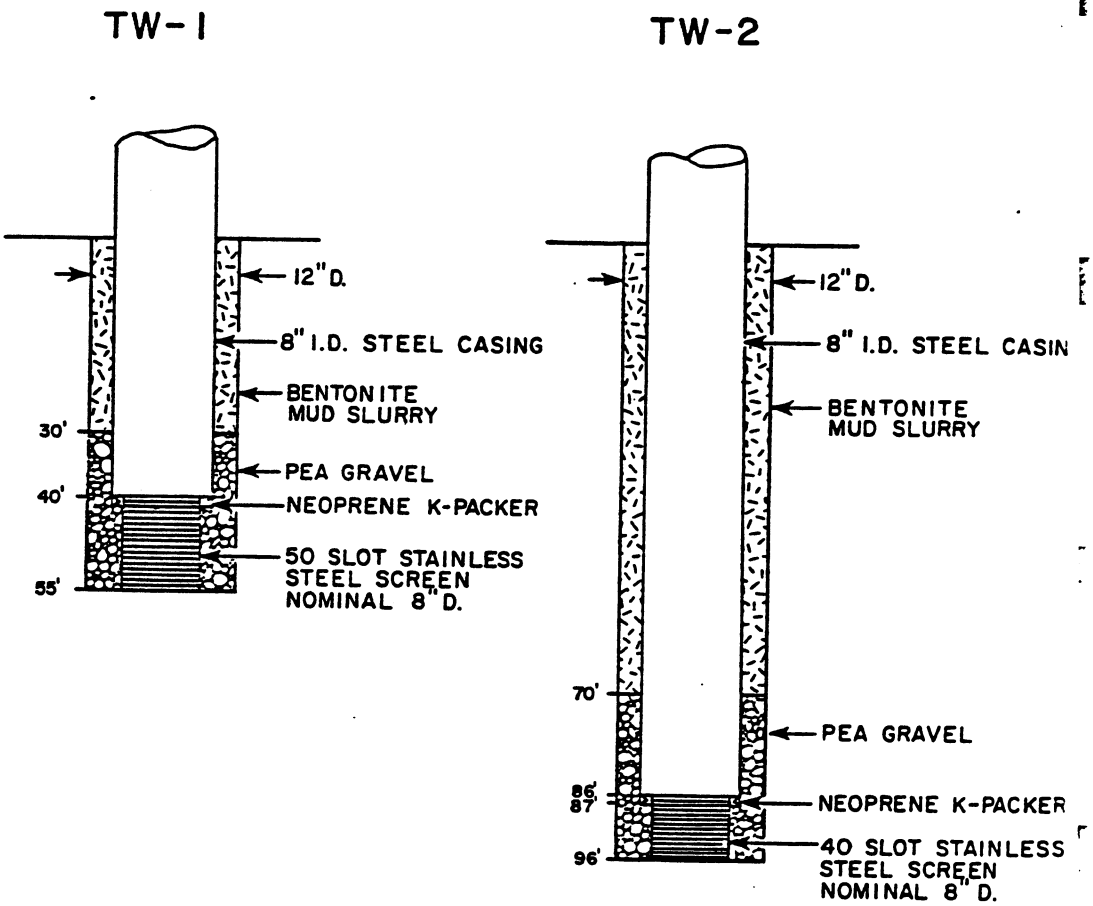
FIGURE 3



PIEZOMETER DETAILS

DAMES & MOORE

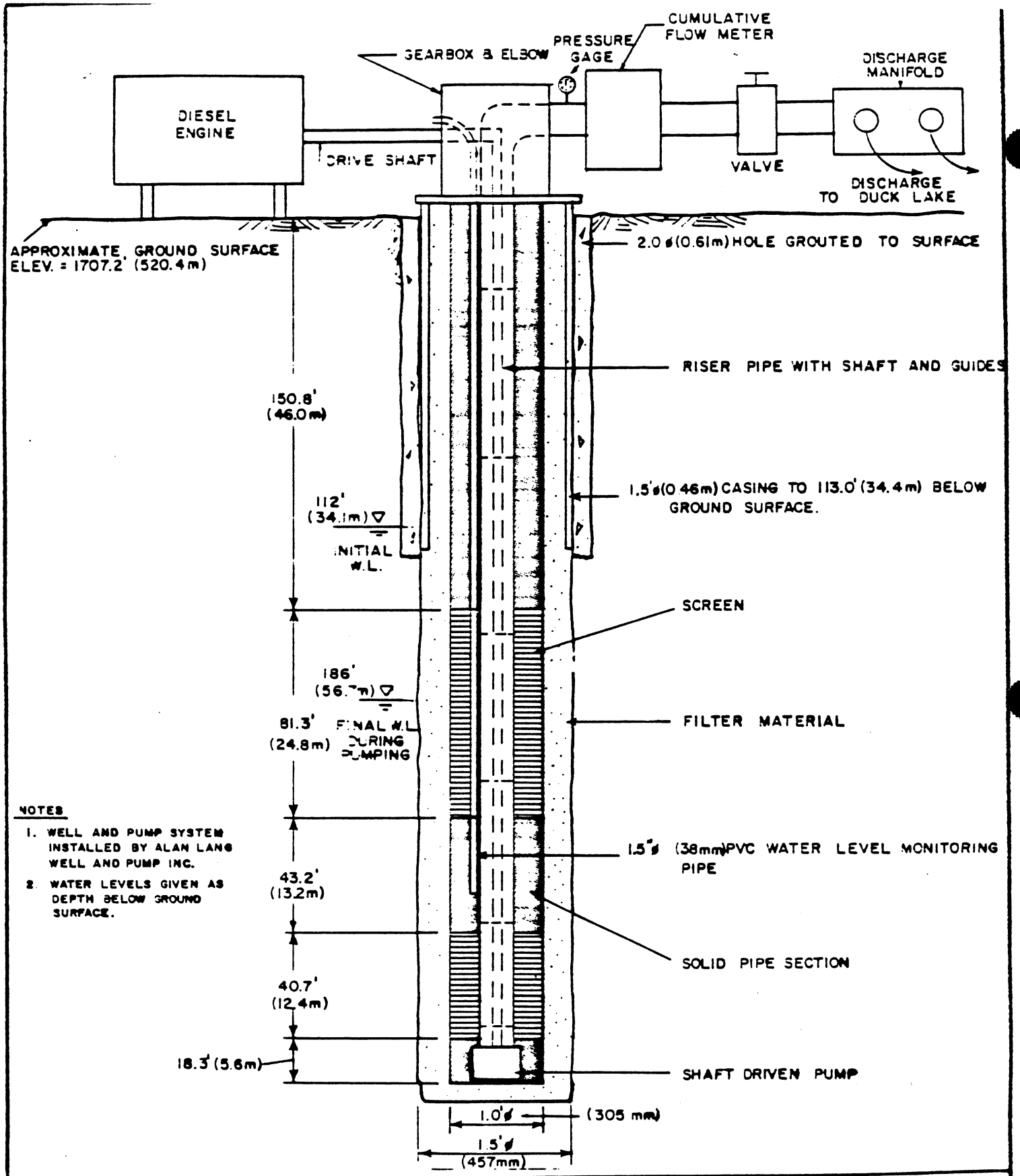
FIGURE 4



TEST WELL CONSTRUCTION DETAILS

DAMES & MOOR

FIGURE 5



NOTES

1. WELL AND PUMP SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP INC.
2. WATER LEVELS GIVEN AS DEPTH BELOW GROUND SURFACE.

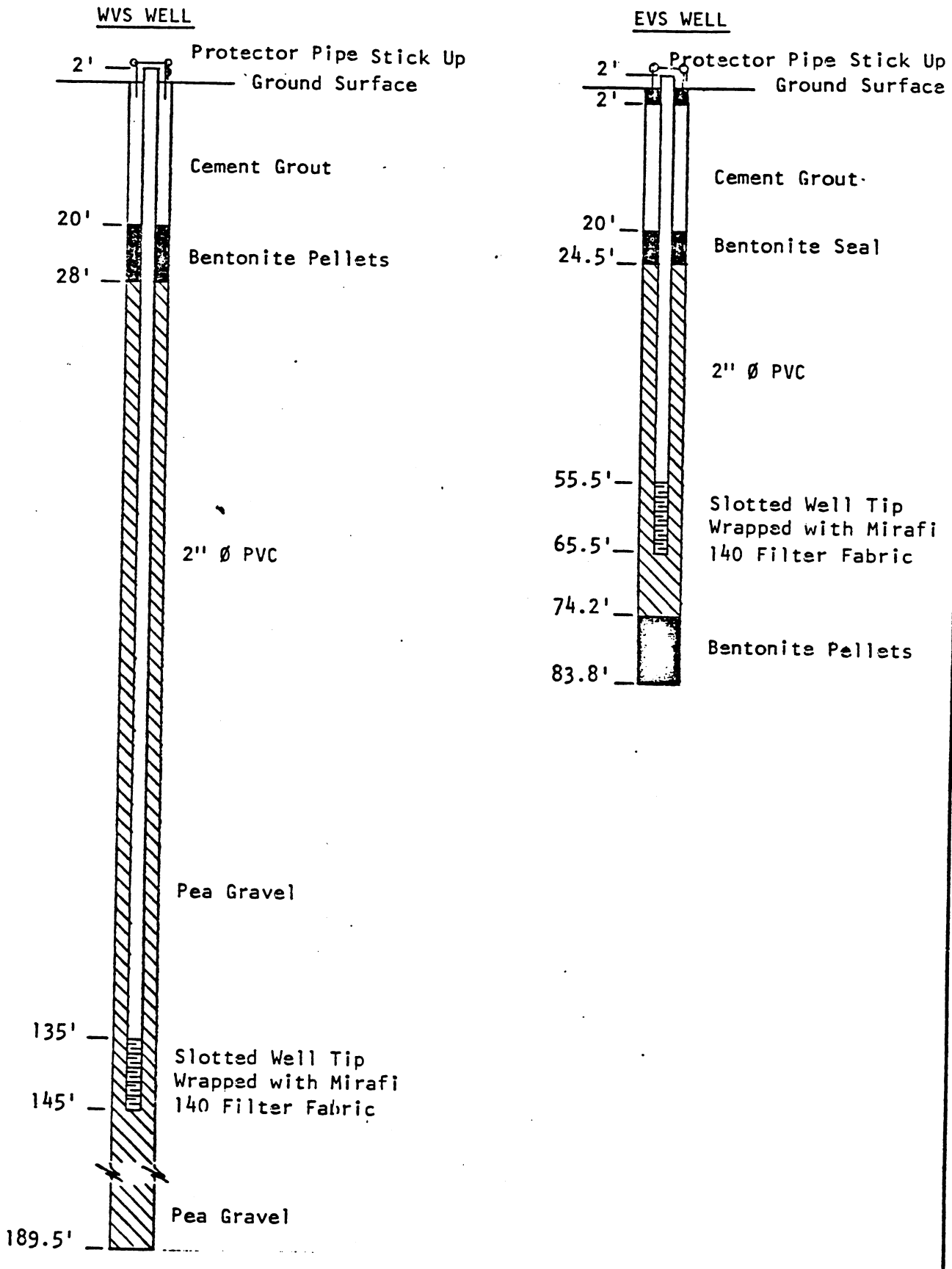
SCHEMATIC OF TEST WELL SETUP

FIGURE TW-41

Scale AS SHOWN
Date 1-21-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC



Observation Well Diagrams
Exxon Mine Development
Crandon, Wisconsin

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

CRB	4-12-78	8736

Appendix 3.6-2

Dames & Moore Glacial Overburden Slug Test Results

DMB - 1A
- 2
- 4
- 5
- 5A
- 6
- 7
- 8
- 9A
- 9B
- 9C
- 10
- 12
- 15
- 18
- 20
- 20A
- 21
- 23
- 25
- 27
- 28
- 29

No record available for: DMA-IN, -15, -3, -4, -19, -43, DMB-3, -13, -14, -19, -22, -24 and -26.

B = 3.875"
P = 2.0"
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET ___ OF ___

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = (DMC-1A) 41-E-1

INITIAL WATER LEVEL = 37.94

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

BY KAJ DATE 8/9/76
CHECKED BY
COPY TO EO

1335

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	FINISHED 10 GAL. POUR	3:37 3.62	37.77	8:18 8.30	37.93
0:24.6 0.41	22.12	3:47 3.78	37.79	8:42 8.70	37.93
0:36.6 0.61	25.72	3:57 3.95	37.81	9:30 9.50	37.93
0:58.3 0.97	30.42	4:07 4.12	37.83	10:31 10.52	37.94
1:12.5 1.21	32.58	4:19 4.32	37.85	11:23 11.39	37.94
1:22.0 1.37	33.63	4:30 4.5	37.86		
1:39.5 1.66	35.22	4:39 4.65	37.87		
1:55.8 1.93	36.16	4:50 4.83	37.88		
2:09.0 2.15	36.71	5:05 5.00	37.89		
2:17.6 2.29	36.97	5:20 5.33	37.89		
2:27.8 2.46	37.20	5:42 5.70	37.90		
2:52.0 2.87	37.52	6:31 6.52	37.91		
3:03 3.05	37.62	6:54 6.90	37.92		
3:15 3.25	37.70	7:24 7.40	37.92		
3:26 3.43	37.74	7:56 7.93	37.92		

COMMENTS:

DAMES & MOORE

085 3

FILE 8837-040,044

SUBJECT

SHEET 01

$D = 3.875'' = 0.323'$

$d = 2.0'' = 0.167'$

$L = 10'$

$K_H = 5.7 \times 10^{-4}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-1A (41-E-1)

INITIAL WATER LEVEL = 37.94

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED =

$-0.782T$

$H = 5.11e$

$r^2 = 0.841$ $r = 0.917$

$\ln H = -0.782T + \ln 5.11$

Slope $= -0.782$ ft/min

REVISIONS BY DATE TO EO

BY DATE TO EO

$= 6.81e^{-.84T}$

Slope $= -0.84$ ft/min

$r^2 = .90$

$K = 1.20 \times 10^{-3}$ ft/sec

6.12×10^{-4} cm/sec

2.97 gal/day·ft²

Calculated 7-9-80 WEK

TIME (min)	ΔH WATER LEVEL	TIME (min)	ΔH WATER LEVEL	TIME (min)	ΔH WATER LEVEL
0		3.62	0.17	8.30	0.01
0.41	15.82	378	0.15	8.70	0.01
0.61	12.22	3.95	0.13	9.50	0.01
0.97	7.52	4.12	0.11	~~10.52~~	0.0
1.21	5.36	4.32	0.09		
1.37	4.26	4.50	0.08		
1.66	2.72	4.65	0.07		
1.93	1.78	4.83	0.06		
2.15	1.23	5.08	0.05		
2.29	0.97	5.33	0.05		
2.46	0.74	5.70	0.04		
2.87	0.42	6.52	0.03		
3.05	0.32	6.90	0.02		
3.25	0.24	7.40	0.02		
3.43	0.20	7.93	0.02		

BY DATE CHECKED BY COPY TO EO

COMMENTS:

FILE 8831-040,044

SUBJECT

SHEET ___ OF

B = 3.875" $\ln H = 0.001 T + \ln 87.22$ or $H = 87.22e^{0.001T}$

P = 2.0" $r^2 = 0.786$ $r = 0.886$

L = 10' Slope = 0.001 ft/min

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-2 (41-D)

INITIAL WATER LEVEL = DRY (100.2')

GALLONS: WATER ADDED = 20

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS

BY ___ DATE ___ TO EO ___

BY ___ DATE ___ TO EO ___

BY KAJ DATE 9/1/78

CHECKED BY

COPY TO EO

1535

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	—	130:00	95.89		
17:00	85.76	225:00	97.36		
18:00	86.21	1570:00	DRY		
19:00	86.70				
20:00	87.18				
21:00	87.58				
22:00	87.97				
23:00	88.35				
24:00	88.70				
25:00	89.07				
26:00	89.36				
28:00	89.92				
30:00	90.43				
50:00	92.66				
105:00	95.23				

COMMENTS: POURED IN 10 GAL + WAITED ~15 MIN FOR SATURATION, POURED IN ANOTHER 10 GAL + RAN FALLING HEAD

DAMES & MOORE

945.3

3.6-2-3

FILE 8837-040,044

SUBJECT

SHEET C

$D = 3.875'' = 0.323'$

$d = 2.0'' = 0.167'$

$L = 10'$

$K_H = 5.8 \times 10^{-6}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB2 (41-D)

INITIAL WATER LEVEL = Dry (100.2')

GALLONS: WATER ADDED = 20

SOURCE: WATER ADDED =

$H = 13.99 e^{-0.008T}$

$r^2 = 0.927$ $r = 0.963$

Slope = −0.008 ft/min

REVISIONS BY DATE TO EO BY DATE TO EO

$= 13.99 e^{-.008T}$

slope = −0.008

$r^2 = .93$

$K_H = 1.15 \times 10^{-5}$ ft/min

5.83×10^{-6} cm/sec

.12 gal/day·ft²

Calculated 7-9-80 WCK

BY DATE CHECKED BY COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
17	14.44	225	2.84		
18	13.99				
19	13.50				
20	13.02				
21	12.62				
22	12.23				
23	11.85				
24	11.50				
25	11.13				
26	10.84				
28	10.28				
30	9.77				
50	7.54				
105	4.97				--
130	4.31				

COMMENTS:

DAMES & MOORE

B = 5" = .438'
P = 2" = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET 1 OF ?

FALLING HEAD PERMEABILITY TEST

1546
1646.03

PIEZOMETER NO. = DMB-4 (41-A)

INITIAL WATER LEVEL = 55.29

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2
– BAILED 11½ gallons after test

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KMJ DATE 7/31/80
CHECKED BY ____
COPY TO EO ____

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	FINISHED POUR IN 10 GALLONS	7:30	45.62	15:00	52.87
0:30	15.96	8:00	46.58	15:30	53.10
1:00	20.74	8:30	47.29	16:00	53.28
1:30	23.78	9:00	47.99	16:30	53.49
2:00	26.92	9:30	48.63	17:00	53.66
2:30	29.66	10:00	49.23	17:30	53.78
3:00	31.95	10:30	49.84	18:00	53.92
3:30	34.31	11:00	50.22	18:30	54.03
4:00	36.44	11:30	50.74	19:00	54.14
4:30	38.03	12:00	51.10	19:30	54.23
5:00	39.63	12:30	51.47	20:00	54.34
5:30	41.07	13:00	51.78	21:00	54.43
6:00	42.37	13:30	52.13	22:00	54.59
6:30	43.46	14:00	52.41	23:00	54.72
7:00	44.59	14:30	52.68	24:00	54.81

COMMENTS:

FILE 8837-040, 044

SUBJECT

SHEET 2 OF

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-4 (41-A)

INITIAL WATER LEVEL = 55.29

GALLONS: WATER ADDED =

SOURCE: WATER ADDED =

$H = 38.60e^{-0.18T}$

slope = -0.18 ft/min

$r^2 = 1.00$

$K_H = 2.42 \times 10^{-4}$ ft/min

1.23×10^{-4} cm/sec

2.61 gal/day·ft²

Calculated
7-8-80
WCK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAJ DATE 7/21/80
CHECKED BY
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
25:00	54.90				
30:00	55.12				
35:00	55.20				

COMMENTS:

FILE 8001-040, 047

SUBJECT

SHEET ___ OF

Bz = 5.25" $\ln H = 2.9 \times 10^{-4} T + \ln 64.11$ or $H = 64.11 e$

P = 2.0" $r^2 = 0.592$ $r = 0.769$

L = 10' slope $= 2.9 \times 10^{-4}$ ft/min

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-5 41-G

INITIAL WATER LEVEL = DRY (98.4')

GALLONS: WATER ADDED = 20

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS

BY ____ DATE ____ TO EO ____

BY ____ DATE ____ TO EO ____

BY KAJ DATE 9/11/20 1700

CHECKED BY ____

COPY TO EO ____

MIN:SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	57.60	5:09 5.15	63.35	1520:00	95.34
0:28 0.47	58.58	5:24 5.40	63.57		
0:51 0.85	59.09	5:50 5.83	63.91		
1:16 1.27	59.52	6:12 6.20	64.71		
1:36 1.60	59.95	7:22 7.37	65.00		
2:05 2.08	60.43	8:27 8.45	65.63		
2:34 2.57	61.00	9:25 9.42	66.19		
2:46 2.77	61.22	10:25 10.42	66.71		
2:56 2.93	61.38	11:25 11.42	67.22		
3:22 3.37	61.83	12:20 12.33	67.61		
3:36 3.60	62.02	13:20 13.33	68.08		
3:50 3.83	62.23	16:20 16.33	69.17		
4:05 4.08	62.47	23:20 23.33	70.77		
4:18 4.30	62:65	63:00	75.19		
4:38 4.63	62.94	143:00	79.88		

COMMENTS: POURED 10 GAL + WAITED ~ 15 MIN FOR SATURATION, POURED ANOTHER 10 GAL & RAN FALLING HEAD

DAMES & MOORE

945.3

3.6-2-7

FILE 8837-040,044

SUBJECT

SHEET 0

$K_H = 1.4 \times 10^{-6}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB 5 (A16)

INITIAL WATER LEVEL = Dry (98.40')

GALLONS: WATER ADDED =

SOURCE: WATER ADDED =

$-0.002T$

$H = 34.43e$

$r^2 = 0.926$ $r = 0.962$

Slope = -0.002 ft/min

REVISIONS BY DATE TO EO

BY DATE TO EO

(min) TIME	ΔH WATER LEVEL	(min) TIME	ΔH WATER LEVEL	(min) TIME	ΔH WATER LEVEL
0	40.80	5.15	35.05	1520	3.06
0.47	39.82	5.40	34.83		
0.85	39.21	5.63	34.49		
1.27	38.88	6.20	33.69		
1.60	38.45	7.37	33.40		
2.08	37.97	8.45	32.77		
2.57	37.40	9.42	32.21		
2.77	37.18	10.42	31.69		
2.93	37.02	11.42	31.18		
3.37	36.57	12.33	30.79		
3.60	36.38	13.33	30.32		
3.83	36.17	16.33	29.23		
4.08	35.93	23.33	27.63		
4.30	35.75	63	23.21		
4.63	35.46	143	18.52		

$= 34.44e^{-1.62 \times 10^{-3} T}$

Slope $= -1.62 \times 10^{-3}$ ft/min

$r^2 = .93$

$k = 2.17 \times 10^{-6}$ ft/min

1.10×10^{-6} cm/sec

$.02$ gal/day·ft²

Calculated 7-9-80 WEK

BY DATE

CHECKED BY

COPY TO EO

COMMENTS:

DAMES & MOORE

045 2

B = 0.438'
P = 0.167'
L = 10.0'

FILE 8831-040, 047
SUBJECT
SHEET 1

✓ -0.030T
H = 17.25e

checked 7-8-80 WEK

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-5A

Slope = -0.030 ft/min ✓
r = 0.997

INITIAL WATER LEVEL = 101.12

GALLONS: WATER ADDED = 5

SOURCE: WATER ADDED = EXXON WW-2

$K_H = 4.0 \times 10^{-5}$ ft/min ✓ 2.0×10^{-5} cm/sec ✓ 0.43 gal/day-ft² ✓

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAT DATE 1435 1/11/79
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	17.62 83.50	15:00	11.57 90.07		
1:00	16.92 84.20	20:00	10.92 91.20		
2:00	16.39 84.73				
3:00	15.84 85.28				
4:00	15.31 85.81				
5:00	14.81 86.31				
6:00	14.38 86.74				
7:00	13.92 87.20				
8:00	13.49 87.63				
9:00	13.11 88.01				
10:00	12.70 88.42				
11:00	12.34 88.78				
12:00	11.98 89.14				
13:00	11.67 89.45				
14:00	11.37 89.75				

COMMENTS:

B = 5.25"
D = 2.0"
L = 10'

FILE 8837-040,044
SUBJECT
SHEET ___ OF.

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-6 (41-F)

INITIAL WATER LEVEL = 77.95

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

BAILED OUT 4 GALLONS AFTER TEST (8/10/78)
(VERY SLOW RECHARGE)

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

BY KAT DATE 8/9/78
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	48.20	18:00	53.58		
0:30	48.50	20:00	54.05		
2:00	49.03	22:00	54.50		
3:00	49.34	24:00	54.90		
4:00	49.63	26:00	55.26		
5:00	49.97	28:00	55.63		
6:00	50.26	30:00	56.00		
7:00	50.57	35:00	56.94		
8:00	50.86	40:00	57.63		
9:00	51.16	45:00	58.45		
10:00	51.46	50:00	59.09		
11:00	51.76	55:00	59.58		
12:00	52.05	60:00	60.02		
14:00	52.56	1400:00	75.42		
16:00	53.08				

COMMENTS:

DAMES & MOORE

FILE 8837-040,044
SUBJECT
SHEET OF

$K_H = 6.1 \times 10^{-6}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB - 6 (41-F)

INITIAL WATER LEVEL = 71.95

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED =

$-0.009T$
$H = 29.01e$
$r^2 = 0.987$ $r = 0.993$
Slope $= -0.009$

REVISIONS DATE BY TO EO
DATE BY TO EO

-1.67×10^{-3} T
e
$pe = -1.67 \times 10^{-3}$ ft/min
$= .93$
$= 2.23 \times 10^{-6}$ ft/min.
1.13×10^{-6} cm/sec
.02 gal/day·ft²

calculated 7-9-80 WEK

DATE BY CHECKED BY COPY TO EO

TIME (min)	WATER LEVEL ΔH	TIME	WATER LEVEL	TIME	WATER LEVEL
0.0	29.75	18	24.37		
0.5	29.45	20	23.90		
2	28.92	22	23.45		
3	28.61	24	23.05		
4	28.32	26	22.69		
5	27.98	28	22.32		
6	27.69	30	21.95		
7	27.38	35	21.01		
8	27.09	40	20.32		
9	26.79	45	19.50		
10	26.49	50	18.05		
11	26.19	55	18.37		
12	25.90	60	17.93		
14	25.39				
16	24.87				

COMMENTS:

DAMES & MOORE

B = 5½ = 458'
P = 2' = 167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET OF
BEST COPY AVAILABLE ✓

FALLING HEAD PERMEABILITY TEST

REVISIONS
BY DATE TO EO
BY DATE TO EO

PIEZOMETER NO. = DMB-7 (41-N)

INITIAL WATER LEVEL = 67.11

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

- BAILED OUT 12 GALLONS WATER TEST

$H = 0.10 e^{-0.84T}$

slope = -0.84

$r^2 = .69$

$k_u = 1.12 \times 10^{-3}$ ft/min
5.71×10^{-4} cm/sec
12.1 gal/day/ft²

calculated on 7-8-88
by WLK

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0	FINISHED POUR IN 10 GALLONS				
0:45	67.00				
1:15	67.09				
1:45	67.09				
2:15	67.10				
3:15	67.10				
5:00	67.11				
10:00	67.11				

BY KAJ DATE 7/21/88
CHECKED BY
COPY TO EO

COMMENTS: WATER LEVEL FELL VERY FAST, WILL RUN AGAIN

DAMES & MOORE

945.3

D = .438'
d = .167'
L = 5'

FILE 8837-040,044
SUBJECT
SHEET 1 OF

1

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-8 (41-H)

INITIAL WATER LEVEL = 34.93

GALLONS: WATER ADDED = ~10 (FILLED TO TOP)

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KOT DATE 8/2/78 0855
CHECKED BY
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	0.00	10:00	22.34	25:00	31.82
0:30	2.48	11:00	23.48	26:00	32.10
1:00	4.34	12:00	24.51	27:00	32.32
1:30	6.27	13:00	25.45	28:00	32.57
2:00	7.78	14:00	26.33	29:00	32.82
2:30	9.00	15:00	27.08	30:00	32.95
3:00	10.28	16:00	27.78	31:00	33.14
3:30	11.50	17:00	28.37	32:00	33.29
4:00	12.65	18:00	28.96	33:00	33.43
4:30	13.68	19:00	29.53	34:00	33.55
5:00	14.72	20:00	30.07	35:00	33.64
6:00	15.90	21:00	30.47	36:00	33.80
7:00	18.27	22:00	30.90	37:00	33.88
8:00	19.90	23:00	31.24	38:00	33.95
9:00	21.10	24:00	31.55	39:00	34.03

COMMENTS:

FILE 8837-040,044
SUBJECT
SHEET 2 OF

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-8 (41-H)

INITIAL WATER LEVEL = 34.93

GALLONS: WATER ADDED = ~10 (FILLED TO TOP OF CASING)

SOURCE: WATER ADDED = EXXON WW-2

$H = 4.55 e^{-0.02T}$

Slope = -0.02

$r^2 = .46$

$K_H = 5.01 \times 10^{-5}$ ft/min
2.55×10^{-5} cm/sec
.54 gal/day·ft²

calculated 7-8-80 WEK

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
40:00	34.09	55:00	34.65	70:00	34.73 ?
41:00	34.15	56:00	34.63 (?)	71:00	34.74 ?
42:00	34.21	57:00	34.65	72:00	34.74 ?
43:00	—	58:00	34.64 (?)	75:00	34.78
44:00	34.28 (?)	59:00	34.65	80:00	34.78
45:00	34.23	60:00	34.68	85:00	34.80
46:00	34.23	61:00	34.68	90:00	34.80
47:00	34.24	62:00	34.69	135:00	34.84
48:00	—	63:00	34.71	150:00	34.84
49:00	34.48	64:00	34.72	210:00	34.84
50:00	34.48	65:00	34.72	405:00	34.84
51:00	34.55	66:00	34.72		
52:00	34.55	67:00	34.74		
53:00	34.56	68:00	34.77		
54:00	34.61	69:00	34.73 (?)		

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KOT DATE 8/2/80 0855
CHECKED BY
COPY TO EO

COMMENTS:

DAMES & MOORE

B = 6.25"
P = 1.0"
L = 10'

FILE 8837-040,044
SUBJECT 2.02CT
SHEET

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-9 (41-I-1 : A)

INITIAL WATER LEVEL = 74.38

GALLONS: WATER ADDED = 5 + 5 (2 trials)

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAT DATE 9/11/92
CHECKED BY
COPY TO EO

	MIN : SEC TIME		WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
TRIAL 1	0:00		69.56				
	0:53	0.883	74.35				
	1:57	1.75	74.38				
TRIAL 2	0:00		68.77				
	0:25	0.42	70.30				
	0:42	0.70	71.00				
	0:50	0.83	72.00				
	1:02	1.03	73.00				
	1:22	1.37	74.24				
	1:38	1.63	74.34				
	1:50	1.83	74.35				
	2:01	2.02	74.36				
	2:12	2.20	74.38				
	2:40	2.67	74.38				

COMMENTS:

DAMES & MOORE

FILE 8837-040,044

SUBJECT

SHEET ___ OF ___

D= 6.25" = 0.521'

d= 1" = 0.083'

L= 10'

$K_H = 5.3 \times 10^{-4}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-9 (4I-1:A)

INITIAL WATER LEVEL = 74.38

GALLONS: WATER ADDED = 5+5 (2Tmils)

SOURCE: WATER ADDED = Exxon WW2

-3.31

H= 16.90e

r^2= 0.915 r= 0.956

Slope = -3.31 ft/min

REVISIONS BY ___ DATE ___ TO EO ___ BY ___ DATE ___ TO EO ___

8.01e -2.37T

pe = -2.37 ft/min

= .61

= 7.51×10^{-4} ft/min

3.82×10^{-1} cm/sec

8.09 gal/day·ft²

alculated

-9-80

WEK

TIME (min)	ΔH WATER LEVEL	TIME (min)	ΔH WATER LEVEL	TIME	WATER LEVEL
0.0	5.61				
0.42	4.08				
0.70	3.38				
0.83	2.38				
1.03	1.38		r^2= 0.957	6.26 × 10⁻¹	
1.37	0.14		I= 39.99		
1.63	0.04		S= -3.896		
1.83	0.03				
2.02	0.02				

BY ___ DATE ___ CHECKED BY ___ COPY TO EO ___

COMMENTS: 3.6-2-16 0.915 .03 =.01

DAMES & MOORE

B= 6.25" ln H= 0.010T + ln 56.70 or H= 56.70e^0.010T

P= 1.0" r^2=0.336 r= 0.579

L= 10' Slope= 0.010 ft/min

FILE 8837-040,044

SUBJECT

SHEET ___ OF ___

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-9 (41-I-1 : B)

INITIAL WATER LEVEL = 74.28

GALLONS: WATER ADDED = 5

SOURCE: WATER ADDED = EXXON WW-2

REVISIONS BY ___ DATE ___ TO EO ___ BY ___ DATE ___ TO EO ___

BY KAJ DATE 9/1/78 1900

CHECKED BY

COPY TO EO

MW : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00.0	30.13	5:09 5.15	64.30	14:26 14.43	72.83
0:22.8 0.38	35.02	5:24 5.40	64.92	15:17 15.28	73.00
0:37.6 0.63	38.25	5:53 5.88	66.00	16:13 16.22	73.11
1:00.4 1.01	42.34	6:05 6.08	66.44	17:52 17.87	73.32
1:26 1.43	46.25	6:19 6.32	66.85	21:45 21.75	73.64
1:36 1.60	47.53	6:42 6.70	67.57	23:45 23.75	73.78
1:48 1.80	49.17	7:07 7.12	68.20	28:45 28.75	73.92
2:45 2.75	55.22	7:52 7.87	69.21	34:00	74.04
3:20 3.33	58.05	8:45 8.75	70.18	54:00	74.15
3:40 3.67	59.41	9:47 9.78	71.00		
3:54 3.90	60.35	10:27 10.45	71.43		
4:06 4.10	61.00	11:12 11.30	71.78		
4:12 4.20	61.42	11:55 11.92	72.10		
4:35 4.58	62.71	12:42 12.70	72.36		
4:54 4.90	63.59	13:27 13.45	72.58		

COMMENTS:

FILE 8837-040, 044

SUBJECT

SHEET 0

D = 6.25" = 0.521'

d = 1.0" = 0.083'

L = 10'

$K_H = 2.1 \times 10^{-5}$ cm/sec

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-9 (41-I-1 :B)

INITIAL WATER LEVEL = 74.28

GALLONS: WATER ADDED = 5

SOURCE: WATER ADDED =

$H = 18.88e^{-0.13T}$

$r^2 = 0.86$ $r = 0.925$

$\ln H = -0.13T + \ln 18.88$

Slope = −0.130 ft/min

REVISIONS BY DATE TO EO

BY DATE TO EO

$18.60e^{-0.13T}$

Slope = −0.13 ft/min

= .85

$= 4.11 \times 10^{-5}$ ft/min

2.09×10^{-5} cm/sec

.44 gal/day·ft²

calculated

7-80

WEK

BY DATE

CHECKED BY

COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0	44.15	5.15	9.98	14.43	1.45
0.38	39.26	5.40	9.36	15.28	1.28
0.63	36.03	5.88	8.28	16.22	1.17
1.01	31.94	6.08	7.84	17.87	0.96
1.43	28.03	6.32	7.43	21.75	0.64
1.60	26.75	6.70	6.71	23.75	0.50
1.80	25.11	7.12	6.08	28.75	0.36
2.75	19.22	7.87	5.07	34	0.24
3.33	16.23	8.75	4.10	54	0.13
3.67	14.87	9.78	3.28		
3.90	13.93	10.45	2.85		
4.10	13.28	11.20	2.50		
4.20	12.86	11.92	2.18		
4.58	11.57	12.70	1.92		
4.90	10.69	13.45	1.70		

COMMENTS:

DAMES & MOORE

D = .521'
d = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET ___ OF

BEST COPY AVAILABLE

FALLING HEAD PERMEABILITY TEST

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

PIEZOMETER NO. = DMB-9C (41-I-C)

INITIAL WATER LEVEL = 74.48

GALLONS: WATER ADDED = 10

A = 74.60
B = 74.48
C = 74.48

SOURCE: WATER ADDED = EXXON WW-2

$H = 26.65e^{-.22T}$ slope = -0.22 $r^2 = .98$ $K_H = 2.85 \times 10^{-4}$ ft/min = 1.45×10^{-4} cm/sec
= 3.07 gal/day · ft²
calculated by WEK on 7-8-80

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	27.00	10:00	72.08	25:00	74.39
0:30	41.00	11:00	72.68	30:00	74.44
1:00	45.36	12:00	73.11	35:00	74.46
1:30	49.33	13:00	73.43	40:00	74.47
2:00	52.50	14:00	73.31	45:00	74.46
2:30	55.48	15:00	73.81		
3:00	57.78	16:00	73.97		
3:30	60.03	17:00	74.07		
4:00	61.95	18:00	74.14		
4:30	63.59	19:00	74.22		
5:00	65.07	20:00	74.27		
6:00	67.42	21:00	74.31		
7:00	69.13	22:00	74.34		
8:00	70.42	23:00	74.35		
9:00	71.38	24:00	74.36		

BY KOT DATE 8/2/78 1555
CHECKED BY
COPY TO EO

COMMENTS:

3.6-2-19

DAMES & MOORE

FILE 8837-040,044

SUBJECT

SHEET 1 OF

B = 5"/4 = .438'

P = 2" = .167'

L = 10'

FALLING HEAD PERMEABILITY TEST

Trial 2

$H = .85e^{-.24T}$

slope = -.24

$r^2 = .60$

$K_H = 3.19 \times 10^{-4} \frac{ft}{min}$

$= 1.62 \times 10^{-4} \frac{cm}{sec}$

$= 3.44 \frac{gal}{day \cdot ft^2}$

PIEZOMETER NO. = DMB-10 (40-A)

INITIAL WATER LEVEL = 60.38

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

Calculated on 7-8-80 by WEK

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0	FINISHED POURING 10 gal				
0:30	28.48				
1:30	53.34				
2:30	60.45				
4:30	60.12				
5:30	60.11				
6:30	60.17				

COMMENTS: IRREGULAR DATA, WILL

REVISIONS

BY ____ DATE ____ TO EO ____

BY ____ DATE ____ TO EO ____

BY ____ DATE ____

CHECKED BY ____

COPY TO EO ____

DAMES & MOORE

3.6-2-20

B= 5½" = .438'
P= 2" = .167'
L= 10'

FILE 8837-040,044
SUBJECT
SHEET 1 OF

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. =DMB-10 (40-A)

INITIAL WATER LEVEL = 60.35

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2
-24 gallons blown out after test

BEST COPY AVAILABLE

REVISIONS 1
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAJ DATE 7/20/83 1515
CHECKED BY
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0	FINISHED POUR W 10 GALLONS	7:45	60.32		
0:45	45.70	8:15	60.32		
1:15	56.84	10:00	60.32		
1:45	58.55	15:00	60.33		
2:15	59.20	20:00	60.33		
2:45	59.68	25:00	60.34		
3:15	59.90				
3:45	60.10				
4:15	60.16				
4:45	60.20				
5:15	60.24				
5:45	60.27				
6:15	60.29				
6:45	60.31				
7:15	60.32				

COMMENTS: DIFFICULT TO GET STABLE READING DURING FIRST MINUTE DUE TO NEEDLE JUMPING

FILE 8837-040,044

SUBJECT

SHEET 1 OF 1

B = 5½ = .438'

P = 2" = .167'

L = 10'

ln H = -0.006T + ln 73.83 H = 73.83e^-0.006T r² = 0.945 r = 0.972 ✓

RISING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-10 (40-A)

INITIAL WATER LEVEL = 60.37

WATER REMOVAL METHOD = COMPRESSOR BLOWN TO 99'

GALLONS REMOVED = 65 gallons

DISCHARGE = 1 gal/1.5 min first hour
1 gal/3. min second hour + 15 min

H = 15.74e^-0.06T
slope = -.06
r² = 1.00

K_H = 7.35 x 10^-5 ft/min
= 3.74 x 10^-5 cm/sec
= .79 gal/day

7-8-80 WEK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	COMPRESSOR SHUT OFF				
2:00 0	74.45	14.08			
6:00 4	71.70	11.33			
7:00 5	71.00	10.63			
8:00 6	70.52	10.15			
9:00 7	70.01	9.64			
10:00 8	69.53	9.16			
11:00 9	69.04	8.67			
12:00 10	68.60	8.23			
17:00 15	66.18	5.81			
30:00 25	63.43	3.06			

BY KAJ DATE 7/14/80 1430
CHECKED BY 1
COPY TO EO

COMMENTS = MINOR PROBLEM W/ INDICATOR ; NO READINGS BETWEEN 2:00 & 6:00 MINUTES

DmB-10

Calculation Sheet

BEST COPY AVAILABLE

Static Water Level - St (cm)
(Depth Below Top of Casing) 60.37

Initial Head - h (cm) at initial time (t_o) 14.08

h = St - D

sed Time inutes)	Water Depth - D (cm) (Depth Below Top of Casing)	Head - H (cm) at time t_1, t_2... H = St - D	Head Ratio $\frac{H}{h}$
0	74.45	14.08	1.00
4	71.70	11.33	.80
5	71.00	10.63	.75
6	70.52	10.15	.72
7	70.01	9.64	.68
8	69.53	9.16	.65
9	69.04	8.67	.62
10	68.60	8.23	.58
15	66.18	5.81	.41
28	63.43	3.06	.22

D = .323'
d = .167'
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET 1 OF 1

RISING HEAD PERMEABILITY TEST

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

PIEZOMETER NO. = DMB-12 (40-N)

$H = .29e^{-.55T}$ Perm. Calc.
slope = -.55 7-8-80
$r^2 = .57$ WEK

INITIAL WATER LEVEL = 22.16

WATER REMOVAL METHOD = BAILING w/ 1" PVC BAILER

GALLONS REMOVED = 16 GALLONS; ~~then~~ 1 gallon quickly

DISCHARGE = 1 gal/3 minutes

$K_H = 7.91 \times 10^{-4}$ ft/min
$= 4.02 \times 10^{-4}$ cm/sec
$= 8.52$ gal/day ft²

MINUTES: SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
10 MINUTES AFTER 16 GAL	22.20				
0:00	PULLING PVC BAILER OUT ~~with~~ 1 gallon				
0:20	22.90				
0:40	22.46				
1:00	22.34				
1:20	22.26				
1:40	22.21				
2:00	22.20				
3:00	22.20				
5:00	22.20				

BY KAT DATE 8/3/70 1535
CHECKED BY ____
COPY TO EO ____

COMMENTS = WATER NEARLY CLEAR, (SL CLOUDY)

D = .438'
d = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET ___ OF.

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-15 (40-D)

INITIAL WATER LEVEL = 72.65

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

BAILED OUT 10 GALLONS AFTER TEST

$H = 1.83e^{-2.10T}$
slope = -2.10 ft/min.
$r^2 = .95$
$K_H = 2.80 \times 10^{-3}$ ft/min
1.42×10^{-3} cm/sec
30.11 gal/day-ft
Calculated 7-8-80 WEK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAT DATE 8/9/78 1130
CHECKED BY
COPY TO EO

TIME		WATER LEVEL	TIME		WATER LEVEL	TIME	Perm WATER LEVEL
0:00		FINISHED 10 GAL. POUR	2:52	2.867	72.65		
0:10.3	.172	70.00	3:10	3.183	72.65		
0:13.2	.220	71.00	4:22	1.367	72.65		
0:31.4	.523	72.00					
0:37.1	.618	72.20					
0:50.4	.840	72.42					
0:57.2	.753	72.48					
1:06.3	1.105	72.54					
1:16.0	1.267	72:57					
1:26.7	1.445	72.58					
1:40.0	1.667	72.60					
1:50.8	1.847	72.61					
2:09.5	2.158	72.62					
2:18	2.300	72:63					
2:33	2.550	72.64					

COMMENTS:

B = 5¼ = .438'
R = 2" = .167'
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET 1 OF

FALLING HEAD PERMEABILITY TEST

✓ calculated 7-8-80 WEK

PIEZOMETER NO. = DMB-15 (40-D)

INITIAL WATER LEVEL = 72.75

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

— BAILED OUT 15 gal AFTER TEST; WATER CLOUDY

$H = 5.67 e^{-1.63T}$
slope = -1.63 ft/min
$r^2 = .99$
$K_H = 2.17 \times 10^{-3}$ ft/min
1.10×10^{-3} cm/sec
23.33 gal/day-ft

REVISIONS 1 — DATE — TO EO
BY — DATE — TO EO
BY — DATE — TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	FINISHED POUR IN 10 GALLONS				
1:00	71.70				
1:30	72.23				
2:00	72.48				
3:00	72.72				
4:00	72.74				
5:00	72.75				
6:00	72.75				
10:00	72.75				
		3.6-2-26			

BY KAJ DATE 7/19/78
CHECKED BY
COPY TO EO

COMMENTS: ALOT OF BUBBLING UP TO 1:00 MINUTE

DAMES & MOORE

D=.438'
d=.167'
L=10'

FILE 8837-040,044
SUBJECT
SHEET OF

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-15 (40-D)

INITIAL WATER LEVEL = 72.67

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

$H = 0.15e^{-1.95T}$
slope = -1.95 ft/min
$r^2 = .97$
$K_H = 2.57 \times 10^{-3}$ ft/min
1.32×10^{-3} cm/sec
27.29 gal/day·ft
calculated 7-8-80
WEK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	72.53				
0:30	72.60				
1:00	72.65				
1:30	72.67				
2:00	72.67				

BY KOT DATE 8/2/78
CHECKED BY
COPY TO EO

COMMENTS:

DAMES & MOORE

B = 5½ = .438
P = 2" = .167'
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET 1 OF 1

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-18 (40-H)

INITIAL WATER LEVEL = 45.65

GALLONS: WATER ADDED = 10

SOURCE: WATER ADDED = EXXON WW-2

90 gallons blown out after test; water still cloudy (trace cl)

$H = 12.20\,e^{-0.26T}$

Slope = -0.26 ft/min

$r^2 = .97$

$K_H = 3.5 \times 10^{-4}$ ft/min

1.78×10^{-4} cm/sec

3.78 gal/day · ft²

Calculated 7-8-80 WCK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAJ DATE 7/19/78
CHECKED BY
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	FINISHED POUR IN 10 GALLONS	15:00	45.48		
0:30	23.90	16:00	45.52		
1:30	31.89	17:00	45.55		
2:30	36.44	18:00	45.57		
3:30	39.35	19:00	45.59		
4:30	41.24	20:00	45.60		
5:30	42.56	22:30	45.62		
6:30	43.44	25:00	45.63		
7:30	44.08	27:30	45.63		
8:30	44.57	30:00	45.64		
9:30	44.92				
10:30	45.10				
11:30	45.27				
12:30	45.35				
13:30	45.40				

COMMENTS:

FILE 8837-040,044

SUBJECT

SHEET 1 OF 2

B = 5¼ = .438'

r = 3" = .167'

L = 10'

RISING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-18 (40-H)

INITIAL WATER LEVEL = 45.70

WATER REMOVAL METHOD = compressor; blown out

GALLONS REMOVED = 60 gallons

DISCHARGE = 1 gal/minute

K_H = 9.5x10⁻⁴ ft/min

4.08x10⁻⁴ cm/sec

9.08 ft/day

r² = .97

W.L. 7-8-80

* ~5 MINUTES AFTER COMPRESSOR SHUT OFF FIRST READING RECORDED (APPARATUS WOULD NOT UNSCREW)

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00*	47.70				
0:30	47.20				
1:00	46.87				
1:30	46.60				
2:30	46.17				
3:30	46.05				
4:30	45.87				
5:30	45.80				
6:30	45.75				
7:30	45.71				
10:00	45.68				
~~25:00~~	45.65				

COMMENTS = water still cloudy after blown out

REVISIONS

BY ____ DATE ____ 1 TO EO ____

BY ____ DATE ____ ' TO EO ____

BY KMT DATE 7/14/82 / 1230

CHECKED BY ____

COPY TO EO ____

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FILE 8837-040,044

SUBJECT

SHEET 1 OF 3

DAMES & MOODE

JUL 8 19..

RISING HEAD PERMEABILITY TEST

PIEZOMETER NO. = MW-20 (20-B)

INITIAL WATER LEVEL = 26.50

WATER REMOVAL METHOD = [illegible]

GALLONS REMOVED = [illegible] 2½ gallons bailer

DISCHARGE = 6½ minutes/gal [illegible]
4 minutes/gal bailer

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY LLT DATE 7/12/
CHECKED BY J
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
[illegible]	26.50	5:30	32.15	17:30	30.22
[illegible]	[illegible]	7:00	33.53	18:30	30.47
[illegible]	35.83	7:30	33.39	19:30	30.05
[illegible]	35.66	[illegible]	33.22	[illegible]	[illegible]
2:30	35.41	9:30	32.89	21:30	[illegible]
3:00	35.20	10:30	32.36	22:30	29.47
3:30	34.95	11:30	32.05	23:30	29.29
4:00	34.74	12:30	31.75	24:30	29.09
4:30	[illegible]	13:30	31.47	25:30	[illegible]
5:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	15:30	[illegible]	[illegible]	[illegible]
6:00	33.47	16:30	30.73	28:30	28.45

COMMENTS = WATER STILL CLOUDY AFTER BLOWING AND BAILING 8½ TOTAL GALLONS

FILE 8837-040,044

SUBJECT

SHEET 2 OF 2

BEST COPY AVAILABLE

RISING HEAD PERMEABILITY TEST

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

PIEZOMETER NO. = DMB-20 (40-E)

INITIAL WATER LEVEL = 23.50

WATER REMOVAL METHOD =

GALLONS REMOVED =

DISCHARGE =

$H = 10.28 e^{-0.06T}$

slope = 0.06

$r^2 = .99$

$K = 7.49 \times 10^{-5}$ cm/sec

3.81×10^{-5} cm/sec

0.81 gal/day·ft²

Permeameter
7-8-80
Work

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
29:30	23.33				
30:30	23.17				
35:30	27.76				
41:30	27.60				

BY AJS DATE 7/17/80

CHECKED BY ____

COPY TO EO ____

COMMENTS =

DMB-20
(40B)

Calculation Sheet

Static Water Level - St (cm) (Depth Below Top of Casing) 26.50

Initial Head - h (cm) at initial time (t_o) ~~26.50~~ 9.80

h = St - D

BEST COPY AVAILABLE

sed Time inutes)	Water Depth - D (cm) (Depth Below Top of Casing)	Head - H (cm) at time t_1, t_2... H = St - D	Head Ratio $\frac{H}{h}$
½	36.30	9.80	1.00
1	36.09	9.59	.98
1½	35.88	9.38	.96
2	35.66	9.16	.93
2½	35.41	8.91	.91
3	35.20	8.70	.89
4	34.74	8.24	.84
5	34.34	7.84	.80
7	33.58	7.08	.72
10½	32.36	5.86	.60
15½	30.97	4.47	.46
20½	29.88	3.38	.34
25½	28.92	2.42	.25
30½	28.17	1.67	.17
40½	27.60	1.10	.11

FILE 8837-040,044

SUBJECT

SHEET 1 OF

DAMES & MOORE

JUL

RISING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-20 (40-B) BEST COPY AVAILABLE

INITIAL WATER LEVEL = 26.50

WATER REMOVAL METHOD = blown w/ compressed air; bailed

GALLONS REMOVED = 6 gallons blown
2½ gallons bailed

DISCHARGE = 6½ minutes/gal blown
4 minutes/gal bailed

REVISIONS
BY ____ DATE ____ 1 TO EO ____
BY ____ DATE ____ ' TO EO ____

BY KMT DATE 7/19/83
CHECKED BY 1
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	26.50	6:30	33.78	17:30	30.50
1:00	30.09	7:00	33.58	18:30	30.29
1:30	35.88	7:30	33.39	19:30	30.03
2:00	35.66	8:30	33.02	20:30	29.82
2:30	35.41	9:30	32.69	21:30	29.68
3:00	35.20	10:30	32.36	22:30	29.47
3:30	34.98	11:30	32.05	23:30	29.28
4:00	34.74	12:30	31.75	24:30	29.09
4:30	34.55	13:30	31.47	25:30	28.92
5:00	34.34	14:30	31.22	26:30	28.76
5:30	34.14	15:30	30.97	27:30	28.60
6:00	33.97	16:30	30.73	28:30	28.45

COMMENTS = WATER STILL CLOUDY AFTER BLOWING AND BAILING 8½ TOTAL GALLONS

DAMES & MOORE

945 3

FILE 8837-040, 044
SUBJECT
SHEET 1 OF

RISING HEAD PERMEABILITY TEST

REVISIONS
BY DATE 1 TO EO
BY DATE TO EO

PIEZOMETER NO. = DMB-20 (40-E)
INITIAL WATER LEVEL = 26.50
WATER REMOVAL METHOD =
GALLONS REMOVED =
DISCHARGE =

BEST COPY AVAILABLE

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
09:30	26.30				
30:30	26.17				
35:30	27.76				
40:30	27.60				

BY KAT DATE 7/17/73
CHECKED BY
COPY TO EO

COMMENTS =

B = 3¼ = .38'
r = 2" = .167'
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET ___ OF

BEST COPY AVAILABLE

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = D-20 (40-D)

INITIAL WATER LEVEL = 23.50

GALLONS: WATER ADDED = 5

SOURCE: WATER ADDED = [illegible]

After test: 6 gallons blown out, 2½ gallons bailed out

$H = 17.10e^{-0.78T}$
Slope = -0.78 ft/min
$r^2 = .96$
$K_H = 1.05 \times 10^{-3}$ ft/min
5.31×10^{-4} cm/sec
11.26 gal/day·ft²
calculated 7-8-80 WEK

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY MAT DATE 7/8/80
CHECKED BY ____
COPY TO EO ____

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
[illegible]	AT FINISH OF [illegible]	[illegible]	26.80	[illegible]	27.14
[illegible]	15.07	[illegible]	26.87		
[illegible]	18.10	[illegible]	26.93		
1:15	20.57	[illegible]	26.98		
[illegible]	22.26	[illegible]	27.01		
[illegible]	23.29	[illegible]	27.03		
[illegible]	24.27	[illegible]	27.05		
[illegible]	25.00	[illegible]	27.07		
[illegible]	25.35	[illegible]	27.09		
[illegible]	25.69	[illegible]	27.10		
[illegible]	25.97	[illegible]	27.11		
[illegible]	26.21	[illegible]	27.11		
[illegible]	26.41	[illegible]	27.12		
[illegible]	26:58	17:30	27.13		
[illegible]	26.71	20:30	27.13		

COMMENTS:

3.6-2-35

DAMES & MOORE

DAE 2

FILE 8801-040, 077

SUBJECT

SHEET

B = 0.438'
P = 0.167'
L = 5.0'

FALLING HEAD PERMEABILITY TEST Trial 2

$H = 4.56e^{-0.890}$ ✓

$r = 0.989$ ✓

PIEZOMETER NO. = DMB-20A

INITIAL WATER LEVEL = 44.99

Slope = -0.890 ft/min ✓

GALLONS: WATER ADDED = 10 (2 TRIALS)

SOURCE: WATER ADDED = EXXON WW-2

checked 7-8-80 WEK

$K_H = 1.9 \times 10^{-3}$ ft/min ✓ 9.9×10^{-4} cm/sec ✓ 20.90 gal/day·ft²

REVISIONS DATE TO EO
BY DATE TO EO
BY

BY KAJ DATE 1000 1/12/79
CHECKED BY
COPY TO EO

TRIAL 1 MIN : SEC TIME	WATER LEVEL	TRIAL 2 MIN : SEC TIME	WATER LEVEL		TIME	WATER LEVEL
0:00	44.55	0:00	37.60	7.39	~~7:30~~	44.97
0:30	44.87	0:40	41.71	3.28		
1:00	44.93	1:00	43.00	1.99		
1:30	44.95	1:30	43.92	1.07		
2:00	44.98	2:00	44.35	0.69		
2:30	44.98	2:30	44.58	0.41		
3:00	44.99	3:00	44.75	0.29		
3:30	44.99	3:30	44.85	0.14		
4:00	44.99	4:00	44.89	0.10		
		4:30	44.92	0.03		
		5:00	44.94	0.02		
		5:30	44.95	0.01		
		6:00	44.96	0.01		
		6:30	44.97	0.01		
		~~7:00~~	~~44.97~~			

DAMES & MOOR

COMMENTS:

D = .438'
d = .167'
L = 10'

FILE 8837-040, 044
SUBJECT
SHEET ___ OF ___

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-21 (40-J)

INITIAL WATER LEVEL = 5.80

GALLONS: WATER ADDED = 3 (FILLED TO TOP OF 2" PVC)

SOURCE: WATER ADDED = EXXON WW-2

50 GALLONS BLOWN OUT AFTER 2ND TRIAL

$-4.35T$
$H = 4.43e$
Slope = -4.35 ft/min
$r^2 = 1.00$
$K_H = .01$ ft/min
2.95×10^{-3} cm/sec
62.45 gal/day·ft²
calculated 7-8-80 WEK

MINUTES : SEC TIME		WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00		TOP OF PVC 0.06' BTOC				
0:04.8	.080	2.00'				
0:07.8	.130	3.00'				
0:12.4	.207	4.00'				
0:22.4	.373	5.00'				
0:28.6	.477	5.30				
0:38.4	.640	5.57				
0:46.2	.770	5.66				
0:56.0	.933	5.73				
1:05.9	1.098	5.76				
1:15.8	1.263	5.78				
1:25.2	1.420	5.79				
1:37.8	1.630	5.80				
2:02.0	2.033	5.80				

BY ___ DATE ___
CHECKED BY ___
COPY TO EO ___

COMMENTS: TRIAL 1

DAMES & MOORE

D = .438'
d = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET ___ OF

FALLING HEAD PERMEABILITY TEST

$H = 3.76 e^{-3.84T}$
slope = $-3.84 \frac{ft}{min}$
$r^2 = .99$
$K_H = .01$ ft/min
$2.60 \times 10^{-3} \frac{cm}{sec}$
$55.10 \frac{gal}{day \cdot ft}$
Calculated 7-8-80 WEK

PIEZOMETER NO. = DMB-21 (40-J)

INITIAL WATER LEVEL = 5.80'

GALLONS: WATER ADDED = 3 (FILLED TO TOP OF 2" PVC)

SOURCE: WATER ADDED = EXXON WW-2

50 GALLONS BLOWN OUT AFTER 2ND TRIAL

REVISIONS
BY ___ DATE ___ TO EO ___
BY ___ DATE ___ TO EO ___

BY MAJ DATE 8/4/80
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	TOP OF PVC 0.06' BTOC	1:46.0 1.767	5.80		
0:04.7 .078	2.00'	2:00.0	5.80		
0:07.3 .122	3.00'				
0:12.7 .212	4.00'				
0:23.4 .390	5.00'				
0:27.0 .450	5.20'				
0:35.5 .592	5.45'				
0:43.0 .717	5.62'				
0:49.1 .818	5.67'				
0:55.8 .930	5.71'				
1:02.6 1.043	5.74'				
1:10.4 1.173	5.76'				
1:17.3 1.288	5.77'				
1:26.0 1.433	5.78'				
1:35.2 1.587	5.79				

COMMENTS: 2ND TRIAL

DAMES & MOORE

3.6-2-38

B=5"
P=2"

FILE 8837-040, 044
SUBJECT
SHEET 1 OF 1

RISING HEAD PERMEABILITY TEST ✓

REVISIONS BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

PIEZOMETER NO. = DMB-23 (40-F)
INITIAL WATER LEVEL = 10.40
WATER REMOVAL METHOD = BLOWN w/ AIR COMPRESSOR TO 98.5 FEET
GALLONS REMOVED = 120 gallons
DISCHARGE = 10 gal/min
- WATER CLEAN + CLEAR AFTER BLOWN OUT

1.4×10^{-3}
7.2×10^{-4}
159

27.95
-1.063
0.999

	TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
FIRST READING	* 0:00	40.00				
	0:17 .35	31.00				
	0:32 .53	26.00				
	0:53 0.65	21.00				
	1:31 1.52	16.00				
	1:53 1.88	14.00				
	2:45 2.75	12.00				
	3:02 3.03	11.50				

BY KAJ + MPM DATE 6/30/76 830
CHECKED BY ____
COPY TO EO ____

COMMENTS = H Intercept 27.25 ✓ $K = 1.4 \times 10^{-3}$ ft/min ✓
Slope = 1.050 ✓ 7.2×10^{-4} cm/sec ✓
$r^2 = 0.999$ ✓ 3.6-2-39
15.2 cal/day-ft ✓

checked

DAMES & MOORE

DMB-23

Calculation Sheet

BEST COPY AVAILABLE

Static Water Level - St (cm) (Depth Below Top of Casing) 10.40

Initial Head - h (cm) at initial time (t_o) 29.60

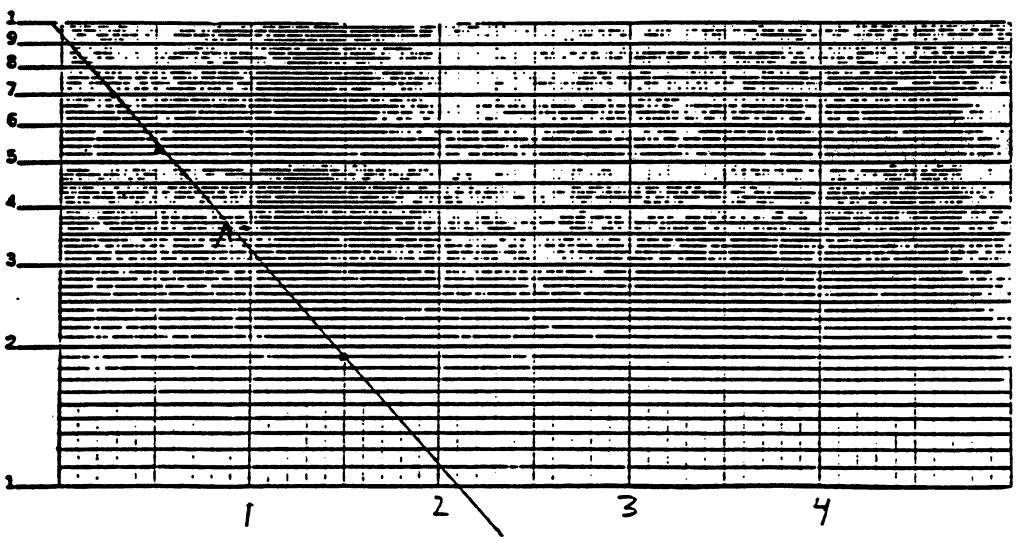
h = St - D

sed Time inutes)-	Water Depth - D (cm) (Depth Below Top of Casing)	Head - H (cm) at time t_1, t_2... H = St - D	Head Ratio $\frac{H}{h}$
:0	40.00	29.60	1.00
:17	31.00	20.60	.70
:32	26.00	15.60	.53
:53	21.00	10.60	.36
1:31	16.00	5.60	.19
1:53	14.00	3.60	.12
2:45	12.00	1.60	
3:02	11.50	1.10	

DMB-23

$$K_1 = \frac{.00068}{T(min)} = \frac{.00068}{.90} = 7.56 * 10^{-4} \text{ cm/sec}$$

T = .90 min



D = .438'
d = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET 1 OF

RISING HEAD PERMEABILITY TEST

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

PIEZOMETER NO. = DMB-23 (40-F)

INITIAL WATER LEVEL = 10.20

WATER REMOVAL METHOD = BLOWN w/ AIR COMPRESSOR

GALLONS REMOVED = 100

DISCHARGE = 10 GPM

MIN : SEC TIME		WATER LEVEL	TIME		WATER LEVEL	TIME		WATER LEVEL
0:00		COMPRESSOR SHUT OFF (STOP AIR FLOW)	3:51	3.850	13.56	6:47	6.783	10.60
1:21.0	1.350	32.13	4:03	4.050	13.06	6:57	6.950	10.55
1:41.2	1.687	27.25	4:25	4.417	12.36	7:15	7.250	10.52
1:51.0	1.850	25.34	4:46	4.767	11.83	7:38	7.633	10.48
2:03	2.050	23.23	5:02	5.033	11.51	7:52	7.867	10.44
2:28	2.467	19.57	5:10	5.167	11.38	8:01	8.017	10.41
2:42	2.700	18.11	5:23	5.383	11.21	8:10	8.167	10.39
2:53	2.883	17.25	5:34	5.567	11.07	8:25	8.417	10.37
3:03	3.050	16.37	5:45		10.94	8:40	8.667	10.35
3:13	3.217	15.73	5:54	5.900	10.83	9:02	9.033	10.33
3:24	3.400	14.95	6:16	6.267	10.72	9:32	9.533	10.32
3:36	3.600	14.30	6:27	6.450	10.69	9:59	9.983	10.31

BY AJT DATE 8/17/83
CHECKED BY 1
COPY TO EO

COMMENTS =

D = .138'
d = .167'
L = 10'

FILE 8837-040,044
SUBJECT
SHEET 2 OF

RISING HEAD PERMEABILITY TEST ✓

REVISIONS
BY ____ DATE ____ 1 TO EO ____
BY ____ DATE ____ - TO EO ____

PIEZOMETER NO. = DMB-23 (40-F)

Perm calc.
7-8-80
WEK

INITIAL WATER LEVEL = 10.20

WATER REMOVAL METHOD = BLOWN W/ AIR COMPRESSOR

GALLONS REMOVED = 100

DISCHARGE = 10 GPM

$H = 14.74 e^{-0.44T}$
slope = -0.44
$r^2 = .94$
$K_H = 5.90 \times 10^{-4}$ ft/min
3.00×10^{-4} cm/sec
6.36 gal/day-ft²

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
10:17 (18.283)	10.30	16:40 (16.667)	10.22		
11:00	10.29	17:20 (17.333)	10.21		
11:29 (11.483)	10.28	18:51	10.21		
12:00	10.27	20:12 (20.200)	10.20		
12:39 (12.650)	10.26	21:21 (21.350)	10.20		
13:16 (13.267)	10.25				
13:45	10.24				
13:59 (13.983)	10.24				
14:15	10.24				
14:40 (14.667)	10.23				
15:11 (15.183)	10.23				
15:44 (15.733)	10.22				

BY KAT DATE 8/11/8
CHECKED BY 1
COPY TO EO

COMMENTS =

D = .438'

d = .167'

L = 10'

FILE 8837-040,044

SUBJECT

SHEET 1 OF

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-23 (40-F)

INITIAL WATER LEVEL = 10.20

GALLONS: WATER ADDED = 5

SOURCE: WATER ADDED = EXXON WW-2

$H = 1.72e^{-0.73T}$

Slope = -0.73 ft/min

$r^2 = .81$

$K_H = 9.71 \times 10^{-4}$ ft/min

4.93×10^{-4} cm/sec

10.96 gal/day·ft

calculated 7-8-80 WEK

REVISIONS

BY ____ DATE ____ TO EO ____

BY ____ DATE ____ TO EO ____

BY KAT DATE 8/7/78

CHECKED BY

COPY TO EO

MIN. : SEC TIME		WATER LEVEL	TIME		WATER LEVEL	TIME	WATER LEVEL
0:00.0		TOP OF PVC 0.07 BTOC	2:05.8	2.097	10.07		
0:03.2	.053	2.00	2:26.7	2.415	10.11		
0:05.0	.083	3.00	2:51.7	2.862	10.13		
0:06.8	.113	4.00	3:14.6	3.243	10.15		
0:09.0	.150	5.00	3:38.4	3.640	10.16		
0:11.7	.195	6.00	4:07	4.117	10.16		
0:16.5	.275	7.00	4:45		10.17		
0:24.3	.405	8.00	5:27	5.450	10.17		
0:37.7	.628	9.00	5:53	5.883	10.18		
0:44.3	.738	9.29	6:22	6.361	10.18		
0:57.4	.957	9.67	7:04	7.067	10.18		
1:08.1	1.135	9.82	8:12	8.200	10.19		
1:20.8	1.347	9.92	9:19	9.317	10.19		
1:33.0	1.550	9.99	10:10	10.167	10.20		
1:48.8	1.813	10.03	11:21	11.350	10.20		

COMMENTS:

3.6-2-44

DAMES & MOORE

B = 0.438'
P = 0.167'
L = 5.0'

FILE 8801-040, 077
SUBJECT
SHEET
$H = 25.51 e^{-0.006T}$ ✓ $r = 1.000$ ✓

FALLING HEAD PERMEABILITY TEST

REVISIONS BY DATE TO EO
BY DATE TO EO

PIEZOMETER NO. = DMB-40Q DMB 25

INITIAL WATER LEVEL = 97.10

GALLONS: WATER ADDED = 5

Slope = −0.006 ft/sec ✓

SOURCE: WATER ADDED = EXXON WW-2 ✓

K_H = 1.3×10^{-5} ft/min 6.6×10^{-4} cm/sec ✓

checked 7-8-80 WEK

BY KAJ DATE 1130 11/5/79
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	71.55	7:30	72.71		
0:30	71.64	8:00	72.78		
1:00	71.73	8:30	72.84		
1:30	71.80	9:00	72.91		
2:00	71.88	9:30	72.98		
2:30	71.97	10:00	73.05		
3:00	72.05	10:30	73.12		
3:30	72.11	11:00	73.19		
4:00	72.19	11:30	73.26		
4:30	72.26	12:00	73.33		
5:00	72.34	13:00	73.45		
5:30	72.41	14:00	73.58		
6:00	72.49	15:00	73.71		
6:30	72.56				
7:00	72.64				

COMMENTS:

FILE 8801-040, 077

SUBJECT

SHEET

D = 0.438
P = 0.167'
L = 10.0'

H = 20.08e −0.011 ✓ r = 0.999 ✓

FALLING HEAD PERMEABILITY TEST

PIEZOMETER NO. = DMB-41K DMB 27

INITIAL WATER LEVEL = 64.25

GALLONS: WATER ADDED = 5

Slope = −0.011 ft/min ✓

SOURCE: WATER ADDED = EXXON WW-2 ✓

checked 7-8-80 WCK

K_H = 1.5×10^{-5} ft/min 7.4×10^{-6} cm/sec ✓

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAJ DATE 1315 11/2/79
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	20.17 44.08	7:30	18.48 45.77		
0:30	20.0 44.25	8:00	18.38 45.87		
1:00	19.87 44.38	8:30	18.29 45.96		
1:30	19.75 44.50	9:00	18.20 46.05		
2:00	19.63 44.62	9:30	18.11 46.14		
2:30	19.51 44.74	10:00	18.02 46.23		
3:00	19.39 44.86				
3:30	19.29 44.96				
4:00	19.19 45.06				
4:30	19.09 45.16				
5:00	18.98 45.27				
5:30	18.88 45.37				
6:00	18.78 45.47				
6:30	18.68 45.57				
7:00	18.58 45.67				

COMMENTS:

DAMES & MOOR

FILE 8831-040, UTT
SUBJECT
SHEET

B = 0.438'
P = 0.167'
L = 5.0'

$H = 3.91 e^{-5.25}$ ✓ $r = 1.000$ ✓

FALLING HEAD PERMEABILITY TEST

checked 7-9-80 WCK

PIEZOMETER NO. = DMB-41M DMB 28 ✓

INITIAL WATER LEVEL = 57.10

GALLONS: WATER ADDED = 5

Slope = −5.25 ft/sec

SOURCE: WATER ADDED = EXXON MW-2 ✓

K_H = 1.1×10^{-2} ft/min ✓ 5.8×10^{-3} cm/sec 123.25 30 /da

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____

BY KAJ DATE 1/15 1/12/79
CHECKED BY
COPY TO EO

MIN : SEC TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	3.80 53.30				
0:30	0.30 56.80				
1:00	0.28 57.08				
~~1:30~~	57.10				
2:00	~~57.10~~				

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COMMENTS:

B: 0.438'
P: 0.167'
L: 5.0'

FILE 8801-040, UTT
SUBJECT
SHEET

$H = 23.41 e^{-0.032T}$ ✓ $r = 0.998$ ✓

FALLING HEAD PERMEABILITY TEST $r^2 = 0.997$ ✓

PIEZOMETER NO. = DMC-41Q DMB 29

INITIAL WATER LEVEL = 44.30

GALLONS: WATER ADDED = 5

Slope = −0.032 ft/min ✓

SOURCE: WATER ADDED = EXXON WW-2

Checked 7-9-80 WEK

$K_H = 7.0 \times 10^{-5}$ ft/min ✓ $= 3.5 \times 10^{-5}$ cm/sec ✓ 0.74 gal/day ft²

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____
BY KAT DATE 1430 1/12/79
CHECKED BY
COPY TO EO

TIME	WATER LEVEL	TIME	WATER LEVEL	TIME	WATER LEVEL
0:00	20.60	7:30	[illegible]		
0:30	21.10	8:00	[illegible]		
1:00	21.53	8:30	26.33		
1:30	21.98	9:00	26.60		
2:00	22.34	10:00	[illegible]		
2:30	22.74				
3:00	23.10				
3:30	23.45				
[illegible]	23.78				
[illegible]	24.09				
[illegible]	24.39				
5:30	24.69				
6:00	24.99				
6:30	25.28				
7:00	25.55				

BEST COPY AVAILABLE

COMMENTS:

Appendix 3.6-3

Bedrock Packer and Slug Test Hydraulic Conductivity Data

- Dames & Moore. 1978 Results of Permeability Tests and Analyses of Water Samples From Deep Exploration Holes, Crandon Ore Body.
- Landers, R.A., 1981. Mine Hydrology Tests: Results of Phase 1. Exxon Coal and Minerals Company.
- Exxon, 1983. Crandon Project Ore Body Permeability Tests.
- STS Consultants Ltd., 1984. Bedrock Slug Tests.

Dames & Moore 1978. Results of Permeability Tests and Analyses of Water Samples From Deep Exploration Holes, Crandon Ore Body

Core Holes - 165
- 155
- 77
- 66
- 70
- 91

#2

REPORT

RESULTS OF PERMEABILITY TESTS AND ANALYSES OF WATER SAMPLES FROM DEEP EXPLORATION HOLES, CRANDON OREBODY CRANDON, WISCONSIN

Prepared By

DAMES & MOORE

FILE MAIN HYD
Sub AT
Sub BR
Keywords

April 19, 1978
8837-069-07

3.6-3-2

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1550 NORTHWEST HIGHWAY · PARK RIDGE, ILLINOIS 60068 · (312) 297-6120
CABLE: DAMEMORE TELEX: 28-2491

April 19, 1978

Exxon Minerals Company, U.S.A.
P.O. Box 326
Crandon, Wisconsin 54520

Attention: Mr. Lewis Blair

Re: Report
Results of Permeability Tests and Analyses
of Water Samples from Deep Exploration Holes,
Crandon Orebody
Crandon, Wisconsin

Dames & Moore is pleased to submit five (5) copies of the above referenced report. This report describes the method of investigation and the results of testing of deep exploration boreholes. The work was done in accordance to Exxon Mineral Company, U.S.A. Contract For Services dated February 15, 1978.

The results of permeability tests indicates that the rocks themselves are generally very tight and transmit very little water. The water that was pumped is believed to come almost entirely from secondary openings in the rock such as fractures or fault zones. The water quality is generally good in the rocks to a depth of 1500 to 2200 feet. Below that depth the water becomes brackish.

We have additional unanalyzed water samples in storage if Exxon Minerals Company, U.S.A. would like any additional water samples analyzed.

It has been Dames & Moore's pleasure in performing this work for you. If you have any questions, please do not hesitate to contact us.

Respectfully submitted,

DAMES & MOORE

Dean O. Gregg
Associate

Peter J. Conroy
Associate

PJC/DOG/bh

3.6-3-3

Enclosure

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RESULTS OF PERMEABILITY TESTS AND ANALYSES OF WATER SAMPLES FROM DEEP EXPLORATION HOLES, CRANDON OREBODY CRANDON, WISCONSIN

INTRODUCTION

PURPOSE

Tests were made in 6 deep exploration holes to assess the water-producing ability, permeability of the orebody and the rocks, and to obtain water samples for chemical analyses. These tests were performed using inflatable packers to isolate selected zones between two packers or between a single packer and the bottom of the hole. The results of the permeability tests can be used to evaluate potential water handling problems during construction and prospecting of the orebody, and during the mining operation. The water quality information will be useful in evaluating necessary treatment, if any, of water from the orebody before disposing.

SCOPE

During this investigation, Dames & Moore furnished a Lynes Injector Packer, supervised operation of the packer, made permeability tests of selected zones, and collected water samples. Exxon Minerals Company, U.S.A. selected certain zones in Holes 155, 165, 70, 66, 91 and 77 for testing. Dames & Moore was instructed not to make an extensive interpretative report.

METHOD OF INVESTIGATION

The injection straddle packer is manufactured by Lynes Incorporated of Houston, Texas and owned by Dames & Moore. The packer consists of 2 water-inflatable rubber elements separated by a spacer or mandrel. The unit can be operated either as a single packer or as a straddle packer depending upon the orientation of internal valves.

In general the operation was as follows:

1 - The hole to be tested and sampled was sounded by Exxon Minerals Company, U.S.A. to determine if the hole was open to the drilled depth and to assess the condition of the fluids in the hole;

2 - The hole was investigated by borehole geophysical logging to determine hole conditions and rock and fluid characteristics;

3 - The hole was flushed by running in a string of hollow drilling rods and injecting air or water to remove the fluids from the hole. Air flushing was the preferred method;

4 - The packer assembly, predressed with new O-rings and the valves oriented so as to operate the assembly either as a single or as a straddle packer, was run (tripped) into the hole on N-rods to the lowest desired test depth for the particular hole;

5 - A Bean positive displacement pump was connected to the N-rods and water under about 800 to 1000 psi pressure was forced into the system to inflate the packer(s);

6 - The N-rods were rotated to lock the pressure into the packer elements and then raised to disengage and by-pass the valves so as to establish continuity with the borehole through a port located below the top packer;

7 - Additional pressure was applied to assess if the port was open and if the packers had inflated and sealed against the walls of the borehole. If a seal was not made, bubbles and water would rise up the borehole above the packer assembly;

8 - If this test was satisfied, the pressure was released from the N-rods and the connection with the pump removed;

9 - A string of A-rods, up to 800-900 feet long, were then placed in the N-rods, packer position permitting;

10 - The ground water levels in the A-rods were then monitored until a trend or equilibrium was established;

11 - Compressed air was injected through the A-rods under pressure to 400 psi. This creates an air-lift pumping phenomenon, whereas the water-air mist rises in the annulus between the N-rods and the A-rods. The air pressure was adjusted and possibly the A-rods lowered into the hole depending upon the productivity of the zone below the top packer and the depth of the packer. If too much air pressure was applied, a back pressure would result because of the limited annular area above the bottom of the A-rods. This back pressure would equilibrate in the hole and largely prevent water from rising through the annulus;

12 - The hole would be "pumped" by air lift for sufficient time to remove the water in the drilling rods above the packer and to withdraw water from the test zone;

13 - The quantity of water air lifted from the hole was monitored by volume changes as a function of time in a calibrated tank receiving the discharge or by catching the discharge in a bucket and timing with a stopwatch. Water samples were also collected from the discharge and the field conductivity was measured. The pH of several water samples was also measured;

14 - At the cessation of the air lift pumping, the water levels in the hole were measured through the A-rods with respect to time for a period of about 2½ hours. These data were then used to assess the permeability of a selected zone in the hole;

15 - The collected bulk water samples were filtered as soon as practical and placed in "treat" or "no treat" sample bottles and refrigerated until shipped to Aqualab of Streamwood, Illinois, a certified laboratory, for chemical analyses; and,

16 - At the completion of monitoring water level recovery, the A-rods were removed from within the N-rods, the packer released by reversing the setting procedure, and the packer assembly raised to the next test position and the method repeated.

RESULTS OF TESTS

PERMEABILITY

The air lift pumping lowered the water level from the borehole below the single packer or within the straddle packer interval. This created drawdown of water levels during the pumping. Because of the depth, small borehole diameter, air lift pumping, and types of equipment used, it was not possible to monitor the drawdown. It was possible, however, to monitor the recover of water levels as a function of time.

These water level recovery data were plotted on semi-logarithmic paper as shown on the plots of data in the Appendix. Ideally, the points should describe a straight line. In practice, however, entrance losses and casing storage effects commonly create a nonlinear water level recovery for the early time periods. According to calculations using permeability, hole and casing geometry, and an equation presented by Schafer (1978, p. 4), some casing storage effects would be in the data for the first 6 to 8 hours after recovery. It was not practical, however, to pump the test zones for long periods of time and to monitor the water level recovery for 8 to 12 hours in order to refine the data more precisely.

After plotting the water level recovery data as a function of time, the best fitting straight line was drawn through the later time data. These water level recovery plots are presented in the Appendix. The selection of the points to use was based in part on professional judgment and experience. The slope of the straight line was used as input to the modified Theis non-equilibrium equation (Ferris and others, 1962, p. 101).

$$T = \frac{264\ Q}{\Delta s}$$

where: T = transmissivity, in gallons per day per foot, is a measure of the ability of an aquifer to transmit water through a vertical column of water extending the full saturated thickness of the aquifer under a gradient of 100 percent. The transmissivity is the product of the permeability and the saturated thickness of the aquifer.

Q = rate of discharge in gallons per minute (gpm).

Δs = the change in feet in the drawdown or recovery over 1 log cycle of time.

This equation is based on the assumption that the aquifer is isotopic, homogeneous, and of infinite areal extent, the transmissivity is uniform, and the well receives water from the entire thickness of the aquifer. Obviously in the "real world" these conditions are not fully realized, but experience has shown the method to be fairly accurate.

It should be noted that Δs is usually expressed as residual drawdown which takens into account the projected drawdown at a given time after pumping ceased plus the measured recovery at that same time. Inasmuch as it was not practical to measure drawdown, the residual drawdown could not be calculated and the graph represents only the recovery of water levels expressed as depth of water below land surface. The theoretical change in residual drawdown in recovery per log cycle is somewhat larger than used in the calculations and thus the actual transmissivities, T, are probably 20 to 30 percent less than those resulting from these calculations.

Table 1 is a summary table of the results of physical tests of the aquifer properties. The permeability, an average value, was calculated by dividing the transmissivity by the length of the zone tested. The calculcated permeability range from about 10^{-7} cm/sec to 10^{-5} cm/sec. Several of the high 10^{-5} cm/sec permeability values (Hole 155, test intervals 2710-2723 feet, 2712-2725 feet, and 2202-2215 feet) are believed to be abnormally high

because of suspected leakage around the packer elements during the testing. The 10^{-5} cm/sec permeability values for the entire open hole portions of Holes 66 and 91 may be large because of possible leakage around the uncemented casing from the overlying glacial material.

In general the test results indicate that the rocks are tight and likely produce only low to moderate quantities of water from fracture or fault zones. It is somewhat likely that the fractures become tighter and have lower effective permeability with increasing depth. The test results, except those noted above, are believed to be accurate within an order of magnitude.

Any inaccuracies in data and results introduced by the methodology are considered minor because of the characteristic of the water-bearing materials. The permeability is a secondary phenomenon of fracturing and faulting of the rocks. The fracturing or faulting is not evenly distributed throughout the rock and orebody, thus significant variation in spatial permeability is expected. To more precisely identify the fracture permeability would likely entail more test holes, larger diameter test holes, and much longer periods of pumping. This more elaborate testing would require an extensive investment of time, money, equipment and personnel. It would be difficult to justify this elaborate an investigation because of the relatively low water-yielding ability of the rocks.

WATER QUALITY

Exxon Minerals Company, U.S.A. selected the water samples for analyses. The results of the water quality testing, as shown on Table 2, indicate that the pH is usually slightly basic and that there are low concentrations of heavy metals. Several water samples from the deep zones, such as the 2920-to 2971-foot interval in Hole 165 and the 2202-to 2215-foot and the 942-to 2202-foot intervals in Hole 155 contained very high concentrations of total dissolved solids, of which chlorides were notably high. This is probably the result of very little circulation of ground water in the deeper zones; it is not unlikely that some of this water is pre-glacial in age. The top of the brackish water is believed to occur below a depth estimated to be as shallow as 1500 feet to as deep as 2200 feet.

BIBLIOGRAPHY

Ferris, J.G., and others, 1962, Theory of Aquifer Tests: U.S. Geol. Survey Water Supply Paper 1536E.

Schaefer, D.C., 1978, Casing Storage Can Affect Pumping Test Data: Johnson Drillers Journal, Jan.-Feb.

TABLE 1

SUMMARY OF HOLE CONSTRUCTION AND TEST RESULTS

HOLE NUMBER	INTERVAL TESTED (FEET)	HOLE CONSTRUCTION TOTAL DEPTH	CASING	ACTIVITY	RECOVERY TEST SUMMARY TOTAL PUMPING TIME (MINUTES)	TOTAL PUMPAGE GALLONS	AVERAGE RATE OF PUMPING (GPM)	CALCULATED PERMEABILITY (CM/SEC)	TIME DATE	WATER SAMPLE SUMMARY TEMP °C	COND UMHOS	pH	GALLONS PUMPED
165	1600-2971	2971	4" casing to 1600 feet. HQ (3.78 inch) hole 1600 to 2971 feet.	2/16 & 2/17 Open hole blow out using 800 feet of A-rods.	346	3010	8.7	1.4×10^{-6}					
	2920-2971		Casing not cemented.	2/17 & 2/18 Recovery test at 2970 feet using single packer.	35	120	3.4 (0.25 sustained)	1.2×10^{-7}	0128 2-18-78	7	4400		120
	2297-2971			2/19 Recover test at 2300 feet using single packer.	90	465	5.2 (0.25 sustained)	5.8×10^{-7}	2000 2-19-78	9	4400		351
									2050 2-19-78	7	4700		465
155	161-3050	3050	4.5" casing to 161 feet not cemented. HQ hole 161 to 3050 feet.	2/21 Open hole blow out. Started with 780 feet of N-rods. Added rods to 1260 feet.	238	5000	21	5.8×10^{-7}					
	2710-2723			2/22 Recovery test using straddle packer on interval from 2710 to 2723 feet.	157 193	723	4.6	6.0×10^{-5}*	1540 2-22-78	16	4290		709
	2712-2725			2/24 Recovery test using straddle packer on interval from 2712 to 2725 feet.	100	838	8.4	6.3×10^{-5}*	0835 2-24-78	11.5	4700		838
	2202-2215			2/23 Recovery test using straddle packer on interval from 2201 to 2215 feet.	296	1101	3.75	3.8×10^{-5}	2035 2-23-78	11.5	4700		1101

*Some leakage around packers on these tests because of open fractures.

TABLE 1 - Continued

HOLE NUMBER	INTERVAL TESTED (FEET)	HOLE CONSTRUCTION TOTAL DEPTH	CASING	ACTIVITY	RECOVERY TEST SUMMARY TOTAL PUMPING TIME (MINUTES)	TOTAL PUMPAGE GALLONS	AVERAGE RATE OF PUMPING (GPM)	CALCULATED PERMEABILITY (CM/SEC)	TIME DATE	WATER SAMPLE SUMMARY TEMP °C	COND UMHOS	pH	GALLONS PUMPED
155 (Cont.)	2102-3050	3050	4.5" casing to 161 feet not cemented. HQ hole 161 to 3050 feet.	2/25/78 Recovery test using a single packer set at 2102 feet.	145	1023	7.1	7.9×10^{-7}	0755 2-25-78	10.5	5000		1023
	1372-3050			2/25/78 Recovery test using a single packer set at 1372 feet.	176	1300	7.4	5.4×10^{-7}	2010 2-25-78	12.0	6000		1300
	1042-3050			2/26/78 Recovery test using a single packer set at 1042 feet.	180	1344	7.5	4.8×10^{-7}	2000 2-26-78	10.5	6800		1344
	942-3050			2/27/78 Recovery test using a single packer set at 942 feet.	183	1310	7.2	3.9×10^{-7}	0715 2-27-78	12.5	7500		1310
	842-3050			2/27/78 Recovery test using a single packer set at 842 feet. 740 feet of A-rods used.	188	1228	6.5	4.7×10^{-7}	1700 2-27-78	14.2	8800		1228
	562-3050			2/28/78 Recovery test using a single packer set at 562 feet. 500 feet of A-rods used.	167	975	5.8	4.3×10^{-7}	0159 2-28-78	9.0	7700		940
	362-3050			2/28/78 Recovery test using a single packer set at 362 feet. 300 feet of A-rods used.	199	645	3.2	4.9×10^{-7}	1315 2-28-78	9.8	700		625

TABLE 1 - CONTINUED

HOLE NUMBER	INTERVAL TESTED (FEET)	HOLE CONSTRUCTION TOTAL DEPTH	CASING	ACTIVIY	RECOVERY TEST SUMMARY TOTAL PUMPING TIME (MINUTES)	TOTAL PUMPAGE GALLONS	AVERAGE RATE OF PUMPING (GPM)	CALCULATED PERMEABILITY (CM/SEC)	WATER SAMPLE SUMMARY TIME DATE	TEMP °C	COND UMHOS	pH	GALLONS PUMPED
155 (Cont.)	161-3050	3050	4.5" casing to 161 feet not cemented. HQ hole 161 to 3050 feet.	2/28/78 Attempted recovery test with packer at 161 feet failed due to lack of sufficient discharge.									
77	261-1049	1049	4" casing to to 151 feet, HQ casing from 151-261 feet, and HQ hole 261 to 1049. Casings are not cemented.	3/01/78 Open hole blow out starting with 850 feet of A-rods in the hole and added rods to 990 feet.	120 @ 850' 40 @ 910' 90 @ 990' 250 total	Unable to measure discharge due to lack of appropriate collection equipment.			0845 3-01-78		275		
	602-1049			3/01/78 Recovery test using a single packer set at 602 feet.	170	634	3.7	5.7×10^{-6}	1940	12.5	278		604
66	228-1078	1078	NW casing to 228 feet and NQ hole 228 to 1078 feet. Casing not cemented.	3/2/78 Open hole blow out starting with 850 feet of A-rod in the hole adding rods in 3 steps to 1060 feet in the hole.	40 @ 850' 40 @ 910' 20 @ 990' 84 @ 1060' 184 total	738 @ 850' 641 @ 910' 389 @ 990' 1676@1060' 3444 total	18.7	1.8×10^{-5}	1615 3-02-78	9.0	200		3400
	402-1078			3/2 & 3/3/78 Recovery test using a single packer set at 402 feet	71	419	5.9	9.0×10^{-6}	0013 3-03-78	8.5	200		419

TABLE 1 - Continued

HOLE NUMBER	HOLE CONSTRUCTION: INTERVAL TESTED (FEET)	HOLE CONSTRUCTION: TOTAL DEPTH	HOLE CONSTRUCTION: CASING	RECOVERY TEST SUMMARY: ACTIVITY	RECOVERY TEST SUMMARY: TOTAL PUMPING TIME (MINUTES)	RECOVERY TEST SUMMARY: TOTAL PUMPAGE GALLONS	RECOVERY TEST SUMMARY: AVERAGE RATE OF PUMPING (GPM)	RECOVERY TEST SUMMARY: CALCULATED PERMEABILITY (CM/SEC)	WATER SAMPLE SUMMARY: TIME DATE	WATER SAMPLE SUMMARY: TEMP °C	WATER SAMPLE SUMMARY: COND UMHOS	WATER SAMPLE SUMMARY: pH	WATER SAMPLE SUMMARY: GALLONS PUMPED
70	176-1334	1334	4" casing to 165 feet, HQ casing from 165 to 176 feet, and NQ hole from 176 to 1334 feet. Casings not cemented.	3/4/78 Open hole blow out starting with 850 feet of A-rods in the hole and adding rods in 4 steps to 1190 feet.	77 @ 850' 78 @ 950' 46 @ 1050' 63 @ 1150' 52 @ 1190' 316 total	1434 @ 850' 1100 @ 950' 843 @ 1150' 1253 @ 1150' 898 @ 1190' 5528 total	17.5	inconclusive	1155 3-04-78	9.7	231	8.80	5528
	552-1334			3/4/78 Recovery test using a single packer set at 552 feet.	127	890	7.0	8.6×10^{-6}	2245 3-04-78	8.3	220	8.05	877
	302-1334			3/5/78 Recover test using a single packer set at 302 feet.	136	538	4.0	1.2×10^{-5}	0615 3-04-78	6.0	200	8.15	520
91	179-1415	1415	4" casing to 73 feet. HQ casing from 73 to 179 feet and NQ hole from 179 to 1415 feet. Casings not cemented.	3/5/78 Open hole blow out with 850 feet of A-rod in the holes.	109	3435	31.5	1.3×10^{-5}	1913 3-05-78	9.6	205	8.05	3200
	852-1415			3/6/78 Recovery test using a single packer at 852 feet.	73	1350	18.5	1.9×10^{-5}	0405 3-06-78	8.0	225	8.10	1270

TABLE 2

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER SAMPLES

HOLE NUMBER	91	155	155	165
ZONES (FEET)	852' - 1415'	2202' - 2215'	942' - 3050'	2920' - 2971'
DATE/TIME COLLECTED	3/6/78 0405 Hr.	2/23/78 2035 Hr.	2/27/78 1700 Hr.	2/18/78 0128 Hr.
pH	8.12 @25°C	7.36 @25°C	7.27 @25°C	5.89 @25°C
Alkalinity	164. mg/l	86. mg/l	80. mg/l	12. mg/l
Hardness	196. mg/l	961. mg/l	1,532. mg/l	1,930. mg/l
Solids, Tot. Dis.	164. mg/l	3,524. mg/l	6,112. mg/l	5,194. mg/l
Conductivity	313. µmhos	6,500. µmhos	10,000. µmhos	7,200. µmhos
Nitrogen, Nitrate	0.15 mg/l	2.29 mg/l	<0.05 mg/l	<0.05 mg/l
Phosphorus	0.05 mg/l	0.06 mg/l	0.01 mg/l	0.02 mg/l
Chloride	12. mg/l	2,200. mg/l	3,600. mg/l	2,650. mg/l
Sulfate	5. mg/l	5. mg/l	8. mg/l	<1. mg/l
Iron	0.03 mg/l	2.36 mg/l	1.15 mg/l	77. mg/l
Manganese	0.146 mg/l	0.421 mg/l	0.526 mg/l	0.306 mg/l
Magnesium	22.0 mg/l	75.0 mg/l	127. mg/l	185. mg/l
Zinc	0.048 mg/l	0.051 mg/l	0.144 mg/l	1.46 mg/l
Cadmium	<0.001 mg/l	0.007 mg/l	0.012 mg/l	0.027 mg/l
Copper	<0.001 mg/l	0.004 mg/l	0.006 mg/l	0.269 mg/l
Arsenic	0.012 mg/l	<0.001 mg/l	<0.001 mg/l	0.004 mg/l
Aluminum	0.02 mg/l	0.48 mg/l	0.14 mg/l	5.86 mg/l
Chromium	<0.001 mg/l	0.010 mg/l	0.003 mg/l	0.018 mg/l
Cobalt	<0.01 mg/l	<0.01 mg/l	0.02 mg/l	0.04 mg/l
Lead	0.03 mg/l	0.10 mg/l	0.03 mg/l	0.39 mg/l
Mercury	<0.0001 mg/l	<0.0001 mg/l	0.0042 mg/l	0.0003 mg/l
Molybdenum	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	0.02 mg/l
Nickel	0.01 mg/l	0.05 mg/l	0.05 mg/l	0.34 mg/l
Selenium	0.001 mg/l	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l
Calcium	42.2 mg/l	261. mg/l	404. mg/l	468. mg/l
Cyanide	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	0.003 mg/l
Thallium	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l

TABLE 2

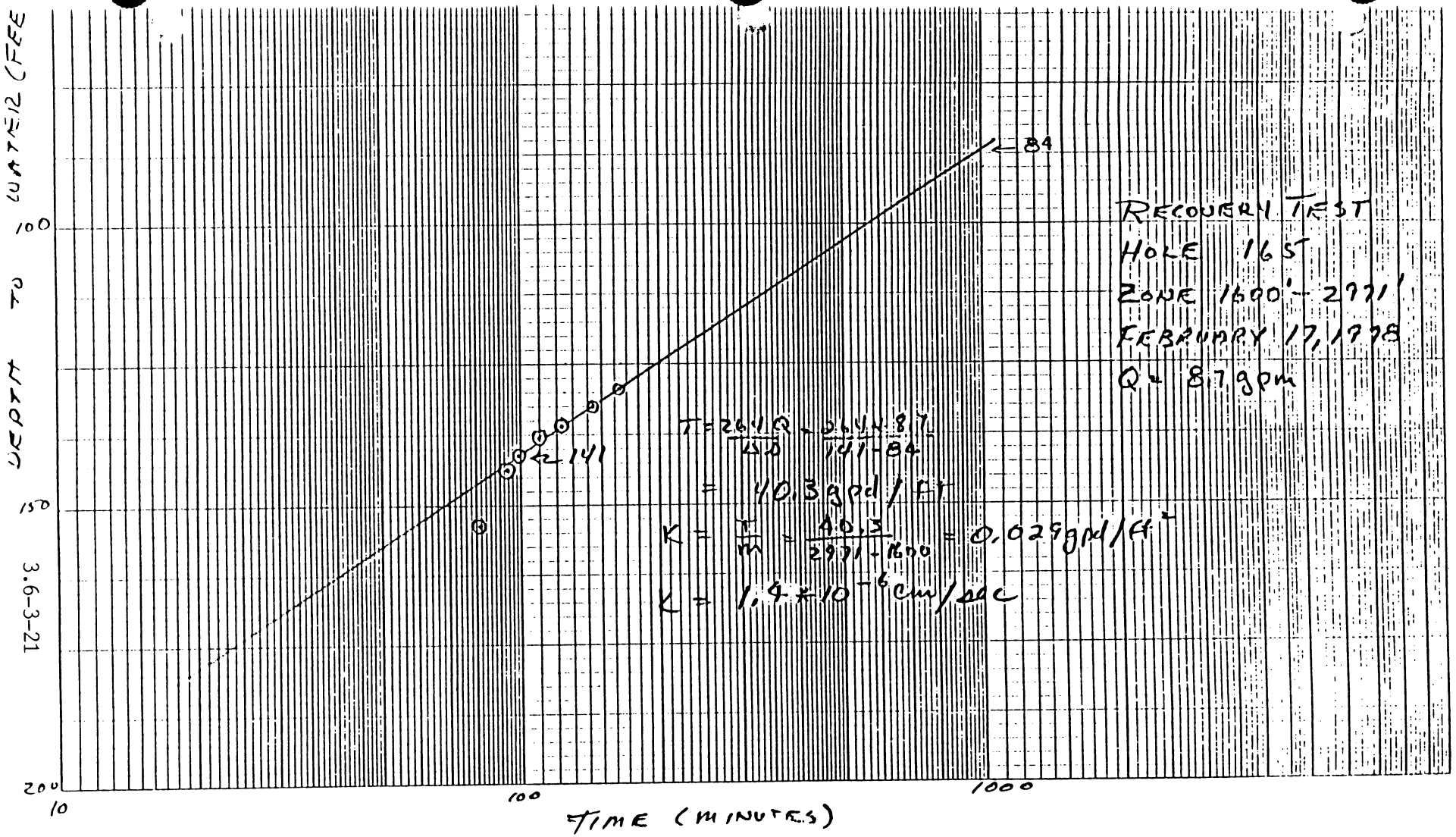
RESULTS OF CHEMICAL ANALYSES OF GROUND WATER SAMPLES

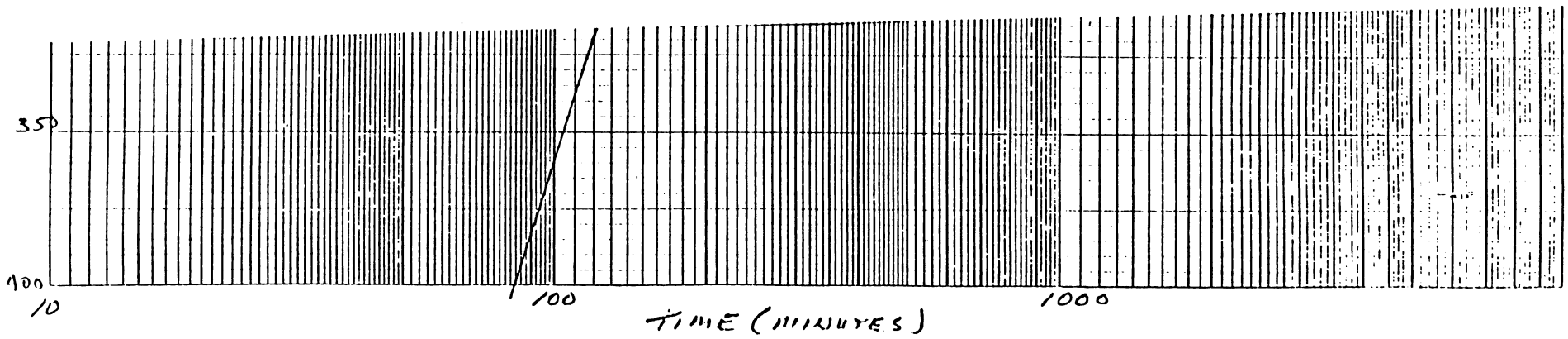
HOLE NUMBER	66	70	70*	70	77
ZONES (FEET)	402' - 1078'	552' - 1334'	552' - 1334'	302' - 1334'	602' - 1049'
DATE/TIME COLLECTED	3/2/78 2413 Hr.	3/4/78 2245 Hr.	3/4/78 2245 Hr.	3/5/78 0615 Hr.	3/1/78 1940 Hr.
pH	8.11 @25°C	7.98 @25°C	7.99 @25°C	7.83 @25°C	7.75 @25°C
Alkalinity	142. mg/l	160. mg/l	160. mg/l	156. mg/l	134. mg/l
Hardness	175. mg/l	194. mg/l	194. mg/l	193. mg/l	170. mg/l
Solids, Tot. Dis.	198. mg/l	170. mg/l	178. mg/l	188. mg/l	170. mg/l
Conductivity	289. µmhos	312. µmhos	310. µmhos	295. µmhos	298. µmhos
Nitrogen, Nitrate	0.34 mg/l	0.15 mg/l	0.15 mg/l	0.24 mg/l	<0.05 mg/l
Phosphorus	0.01 mg/l	0.08 mg/l	0.08 mg/l	0.01 mg/l	0.01 mg/l
Chloride	2. mg/l	8. mg/l	8. mg/l	6. mg/l	20. mg/l
Sulfate	18. mg/l	16. mg/l	15. mg/l	8. mg/l	2. mg/l
Iron	0.02 mg/l	0.02 mg/l	0.02 mg/l	0.03 mg/l	0.02 mg/l
Manganese	0.121 mg/l	0.119 mg/l	0.120 mg/l	0.090 mg/l	0.102 mg/l
Magnesium	19.3 mg/l	23.4 mg/l	23.4 mg/l	22.8 mg/l	20.5 mg/l
Zinc	0.042 mg/l	0.062 mg/l	0.060 mg/l	0.045 mg/l	0.041 mg/l
Cadmium	<0.001 mg/l	0.009 mg/l	0.008 mg/l	0.003 mg/l	0.004 mg/l
Copper	0.015 mg/l	0.006 mg/l	0.005 mg/l	0.001 mg/l	0.003 mg/l
Arsenic	0.017 mg/l	0.008 mg/l	0.009 mg/l	0.004 mg/l	<0.001 mg/l
Aluminum	0.07 mg/l	<0.01 mg/l	<0.01 mg/l	0.10 mg/l	0.11 mg/l
Chromium	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l
Cobalt	0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Lead	0.03 mg/l	<0.01 mg/l	<0.01 mg/l	0.03 mg/l	0.04 mg/l
Mercury	<0.0001 mg/l	<0.0001 mg/l	<0.0001 mg/l	<0.0001 mg/l	<0.0001 mg/l
Molybdenum	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l	<0.01 mg/l
Nickel	0.01 mg/l	0.01 mg/l	0.01 mg/l	0.01 mg/l	<0.01 mg/l
Selenium	0.016 mg/l	0.009 mg/l	0.009 mg/l	0.007 mg/l	<0.001 mg/l
Calcium	38.6 mg/l	39.1 mg/l	39.2 mg/l	39.5 mg/l	34.6 mg/l
Cyanide	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l	<0.001 mg/l
Thallium	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l	<0.25 mg/l

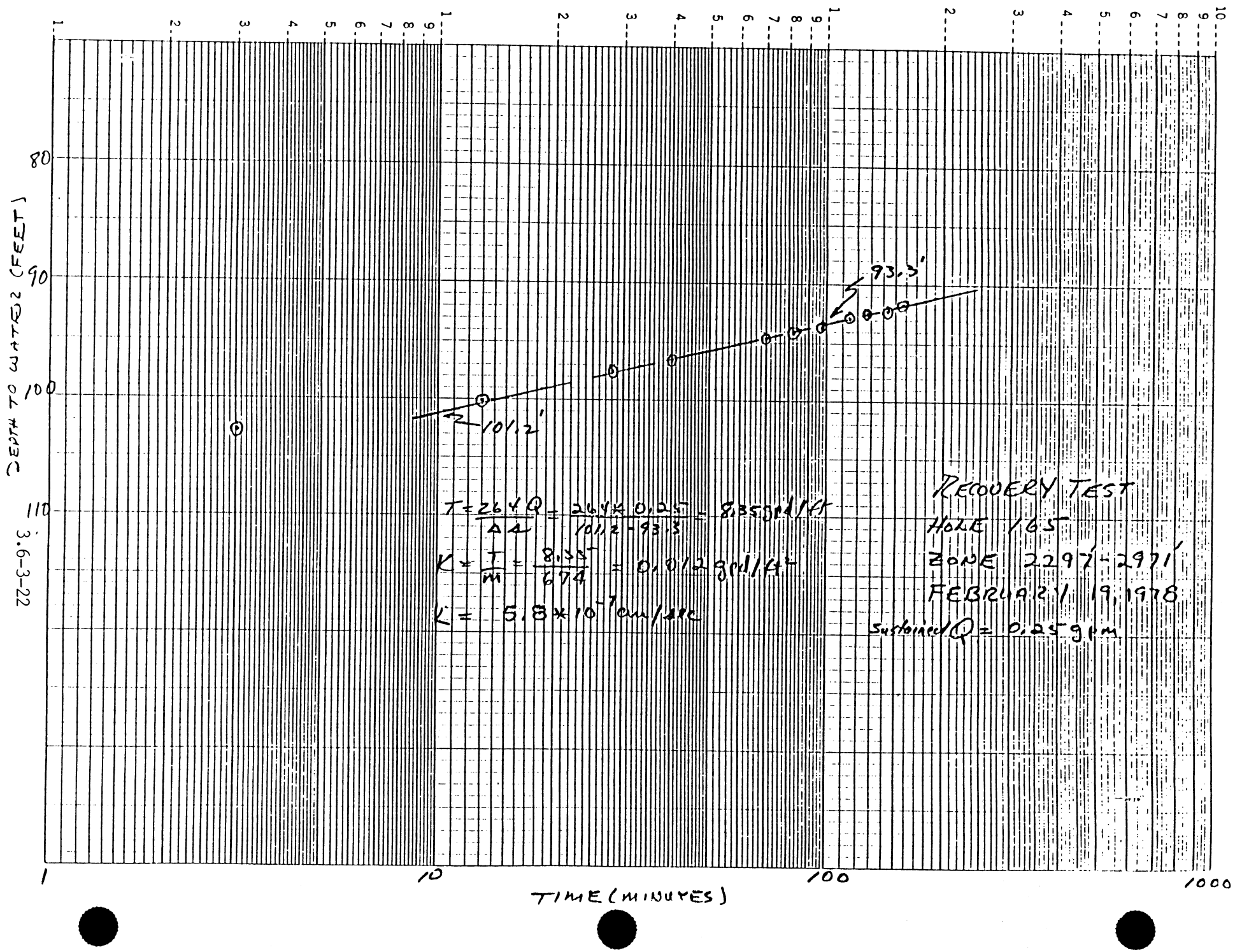
*Quality assurance check duplicate sample analyses.

WATER LEVEL RECOVERY DATA

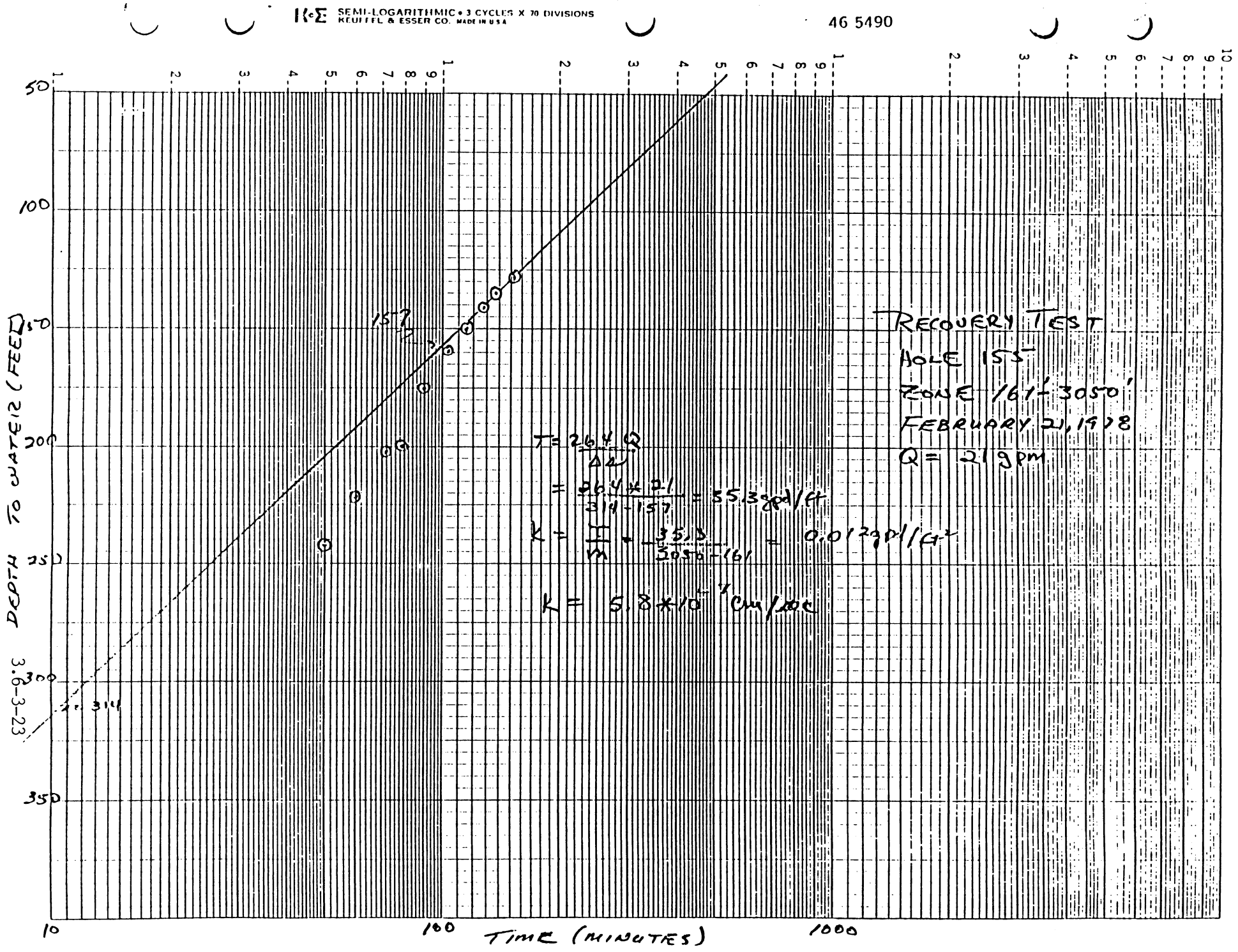
HOLE NUMBER	INTERVAL TESTED
165	1600'-2971'
165	2920'-2971'
165	2297'-2971'
155	161'-3050'
155	2710'-2723'
155	2712'-2725'
155	2202'-2215'
155	2102'-3050'
155	1372'-3050'
155	1042'-3050'
155	942'-3050'
155	842'-3050'
155	562'-3050'
155	362'-3050'
77	602'-1049'
66	228'-1078'
66	402'-1078'
70	176'-1334'
70	552'-1334'
70	302'-1334'
91	179'-1415'
91	852'-1415'

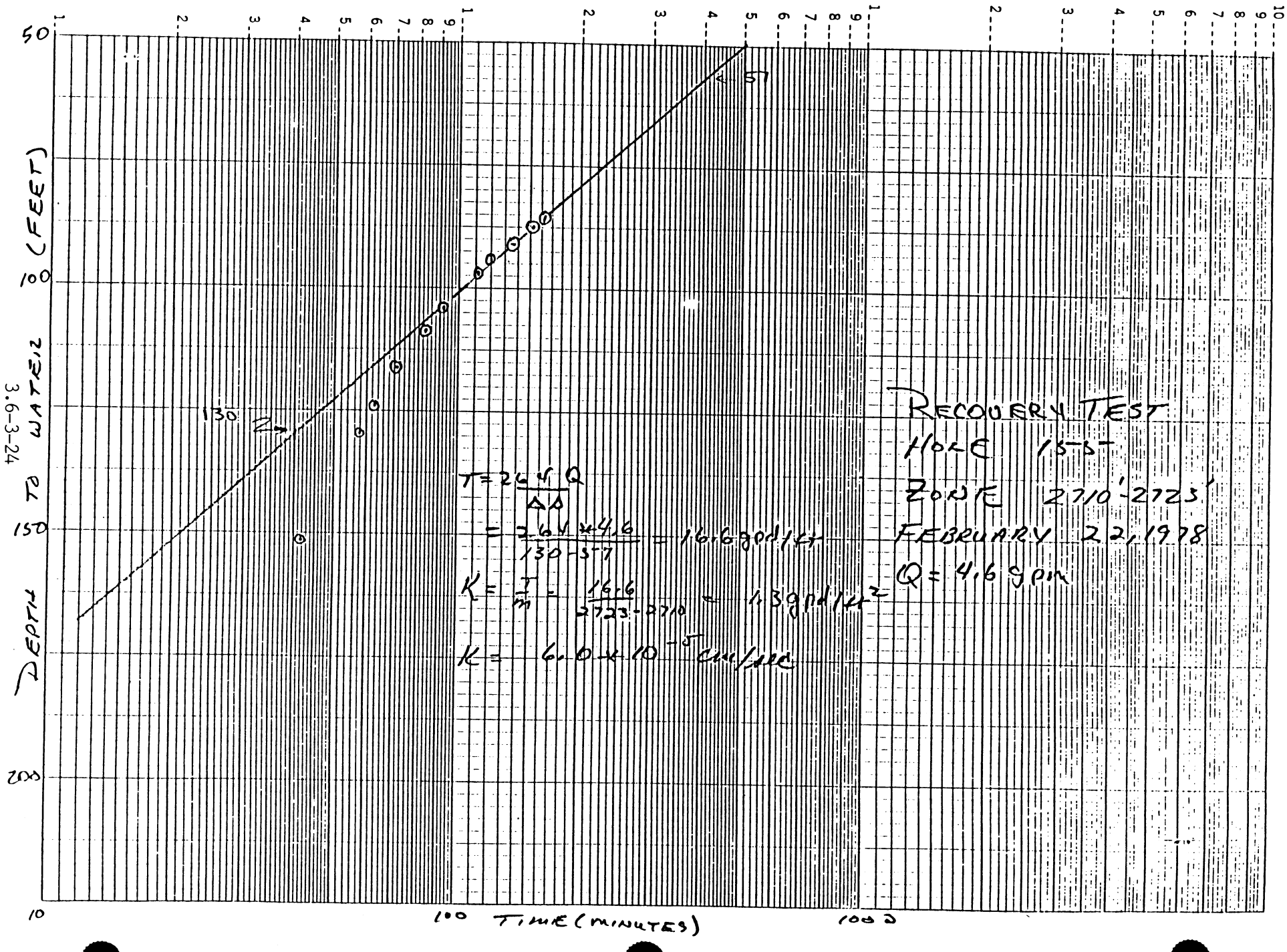

WATER LEVEL (FEET)
100
150
200
3.6-3-21
84
141
RECOVERY TEST
HOLE 16ST
ZONE 1600' - 2771'
FEBRUARY 17, 1978
Q = 8.7 GPM
T = 264 Q / Δs = 264 × 8.7 / 141 - 84
= 40.3 gpd/ft
K = T/m = 40.3 / 2771 - 1600 = 0.029 gpd/ft²
K = 1.4 × 10⁻⁶ cm/sec
10
100
1000
TIME (MINUTES)

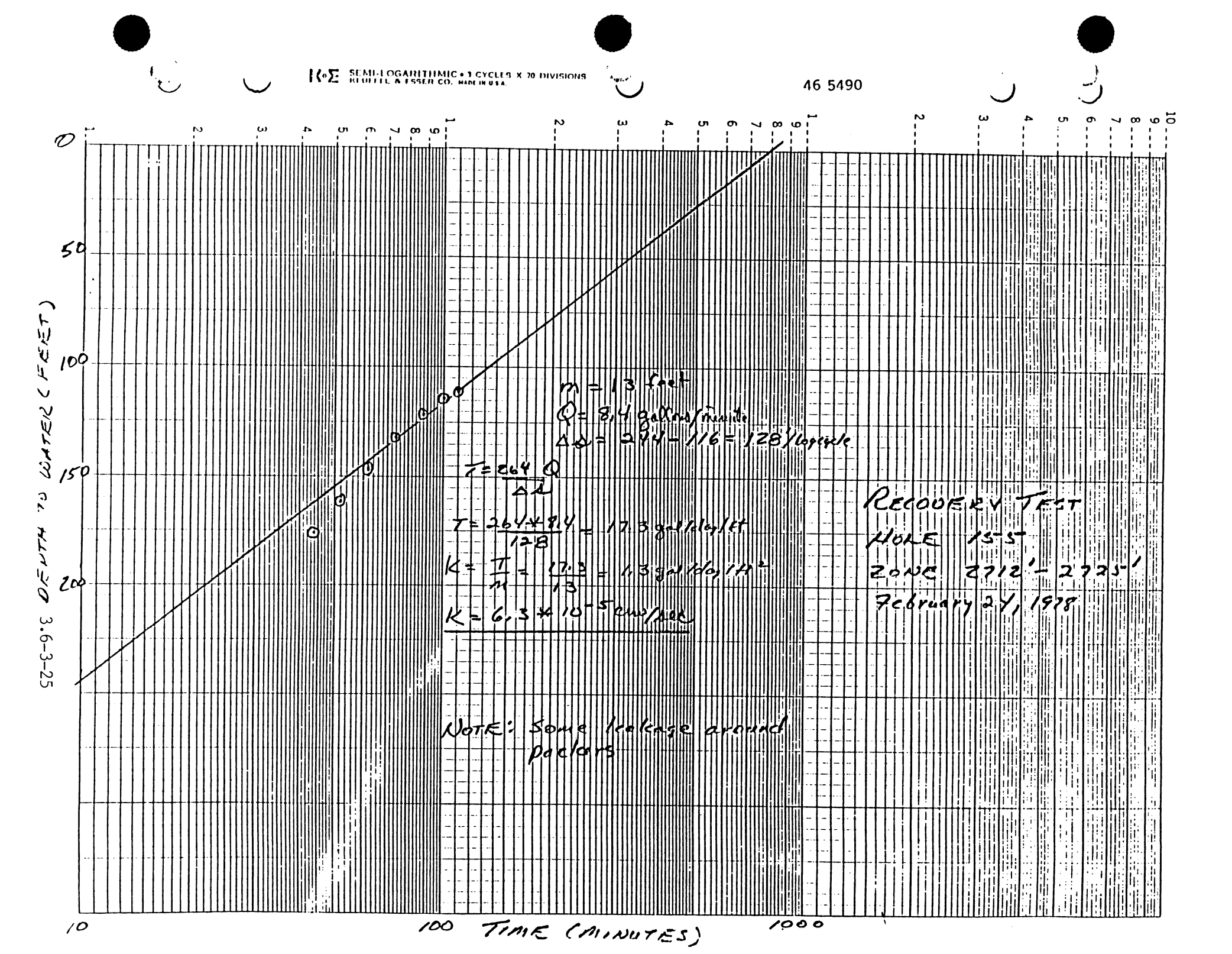

350
100
10
100
1000
TIME (MINUTES)


80
90
100
110
DEPTH TO WATER (FEET)
1
10
100
1000
TIME (MINUTES)
93.3'
101.2'
RECOVERY TEST
HOLE 165
ZONE 2297'-2971'
FEBRUARY 19, 1978
Sustained Q = 0.25 gpm
T = 264 Q / Δs = 264 × 0.25 / 101.2 - 93.3 = 8.35 gpd/ft
K = T/m = 8.35 / 694 = 0.0129 gpd/ft²
K = 5.8 × 10⁻⁷ cm/sec

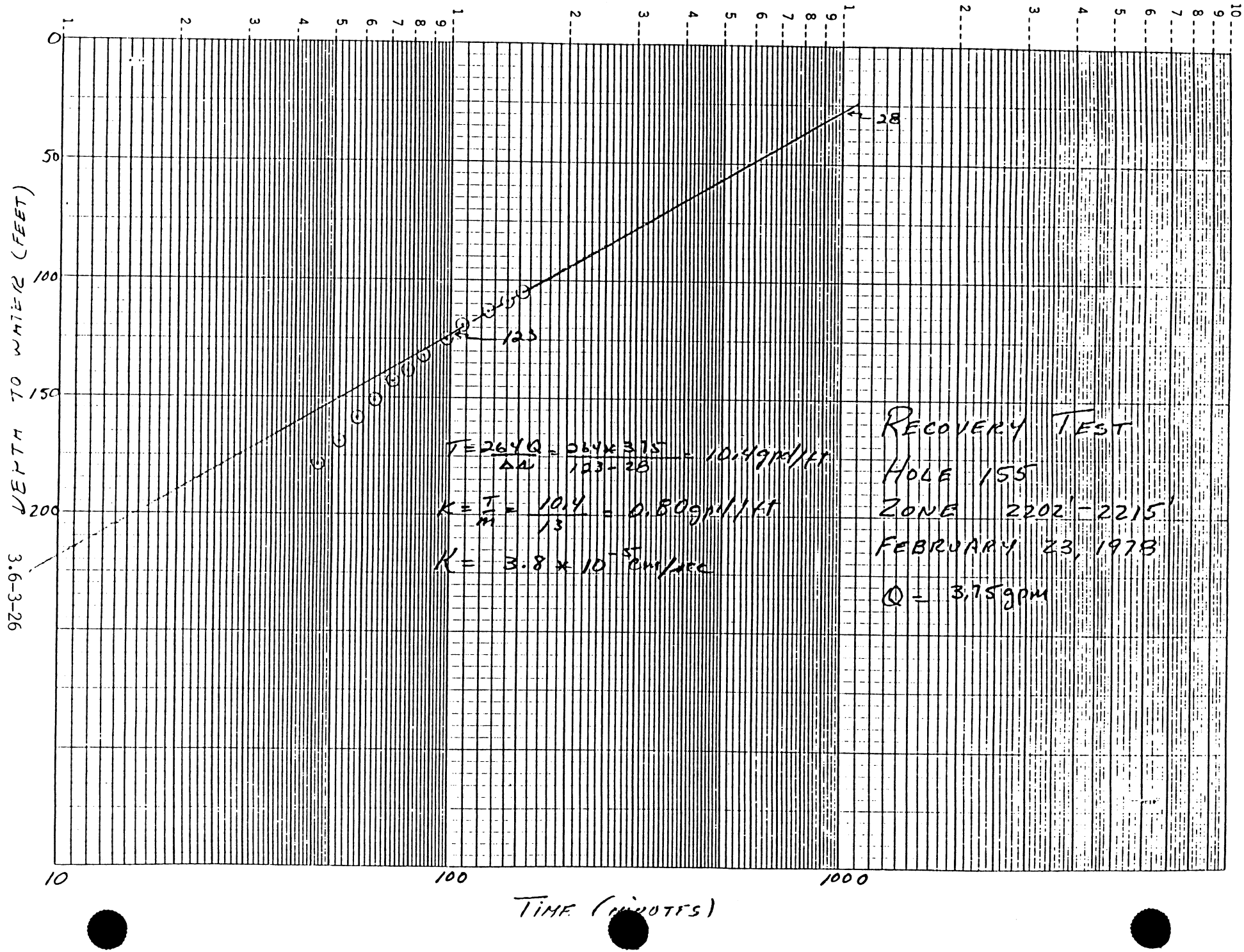
3.6-3-22

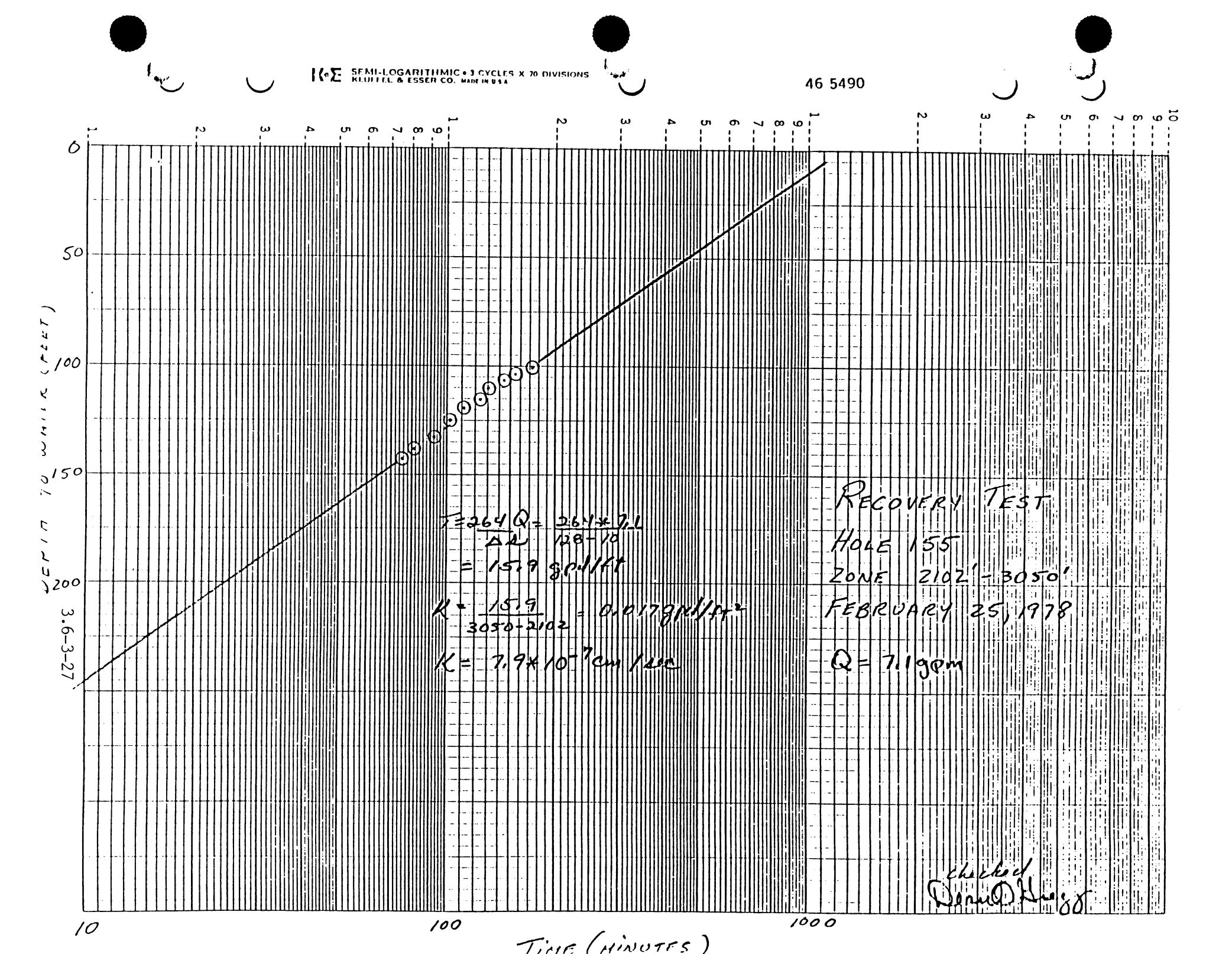

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DEPTH TO WATER (FEET)
TIME (MINUTES)
50
100
200
250
300
350
10
100
1000
157
3.6-3-23
RECOVERY TEST
HOLE 157
ZONE 161'-3050'
FEBRUARY 21, 1978
Q = 21 gpm
T = 264 Q/Δd
= 264 × 21 / 313 - 157 = 35.3 gpd/ft
K = T/m = 35.3 / 3050 - 161 = 0.012 gpd/ft²
K = 5.8 × 10⁻⁴ cm/sec


50
100
150
200
DEPTH TO WATER (FEET)
1
2
3
4
5
6
7
8
9
10
100
1000
TIME (MINUTES)
130 ft
57
3-6-3-24
RECOVERY TEST
HOLE 15-5T
ZONE 2710'-2723'
FEBRUARY 22, 1978
Q = 4.6 GPM
$T = \frac{264 Q}{\Delta D}$
$= \frac{264 \times 4.6}{130 - 57} = 16.6 \text{ gpd/ft}$
$K = \frac{T}{m} = \frac{16.6}{2723 - 2710} = 1.3 \text{ gpd/ft}^2$
$K = 6.0 \times 10^{-5} \text{ cm/sec}$

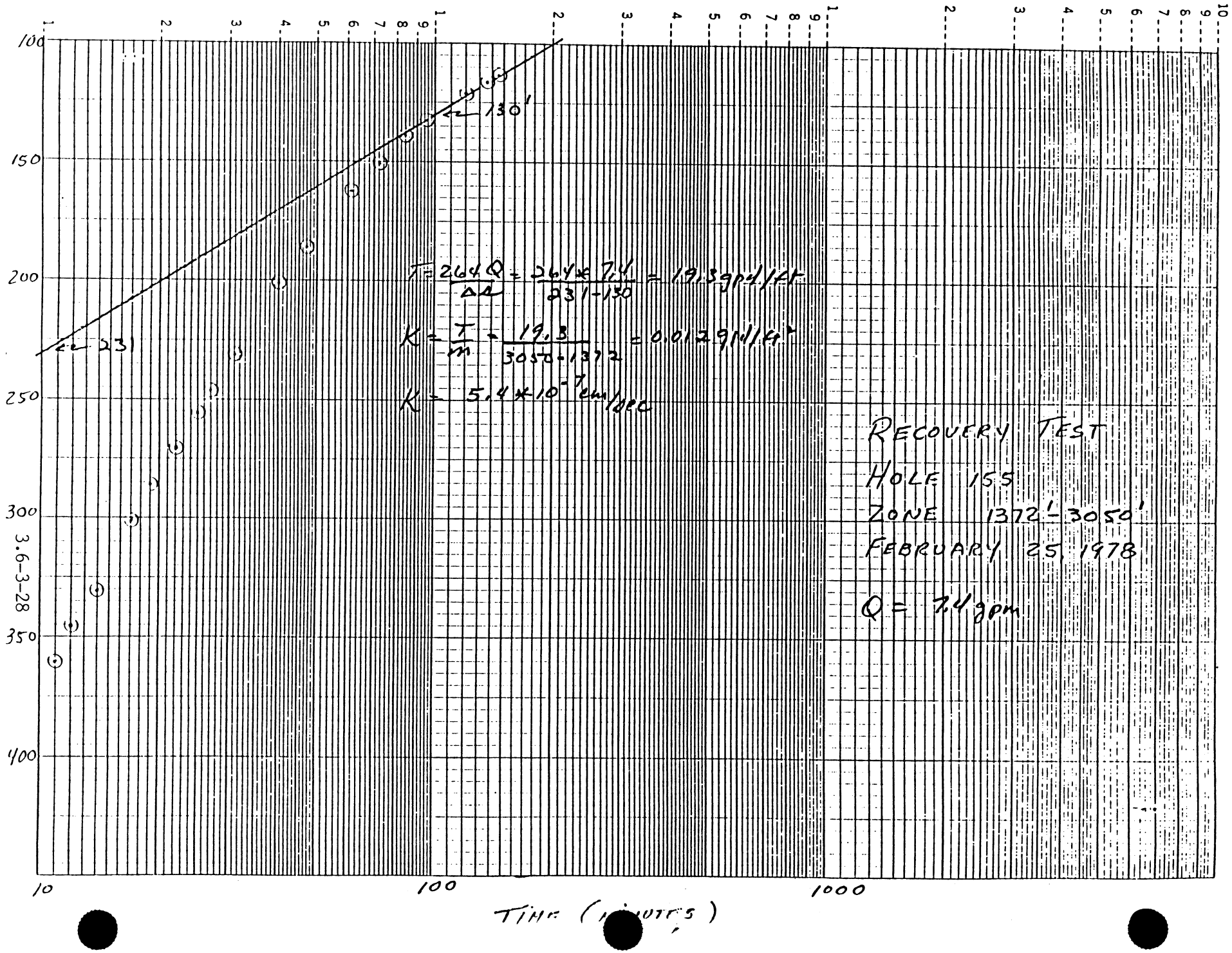

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DEPTH TO WATER (FEET)
0
50
100
150
200
10
100
1000
TIME (MINUTES)
m = 13 feet
Q = 8.4 gallons/minute
Δd = 3.94 - 1.16 = 1.28/logcycle
T = 264 Q / Δd
T = 264 * 8.4 / 1.28 = 1733 gal/day/ft
K = T / m = 173 / 13 = 13 gal/day/ft²
K = 6.3 * 10⁻⁵ cm/sec
RECOVERY TEST
HOLE 15-57
ZONE 2712' - 2725'
February 24, 1978
NOTE: Some leakage around packers

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

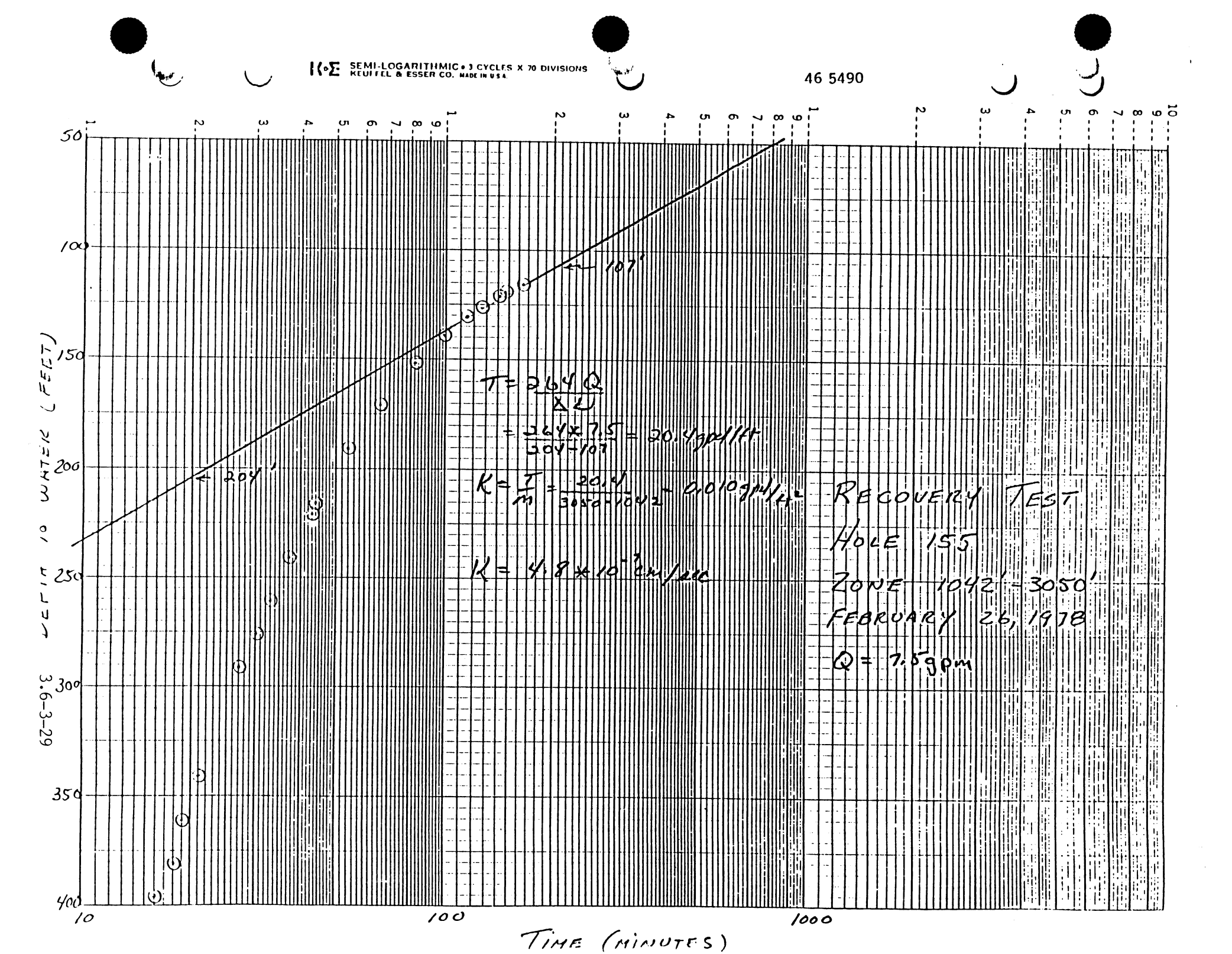


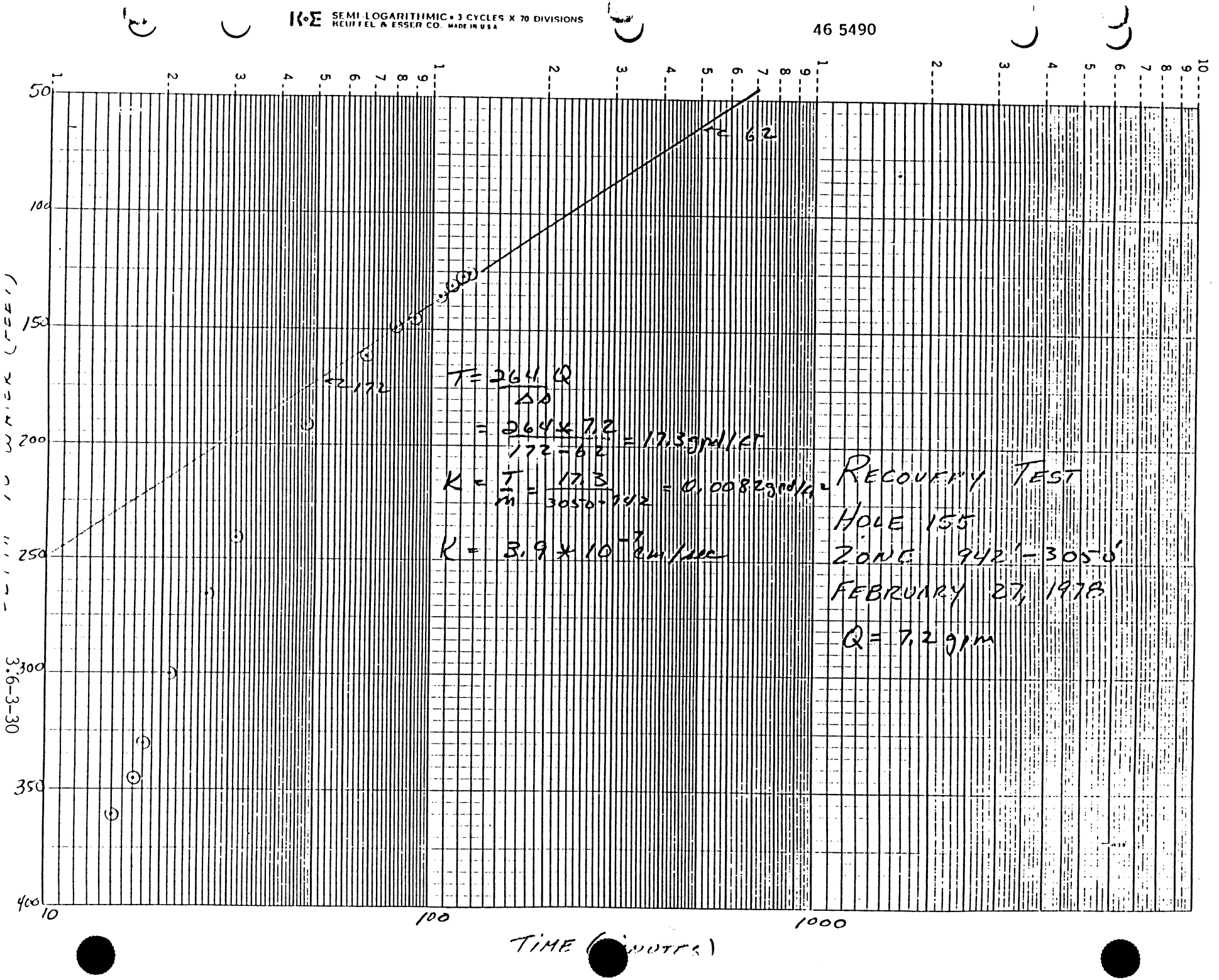

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DRAWN TO WATER (FEET)
0
50
100
150
200
3.6-3-27
10
100
1000
TIME (MINUTES)
T=264 Q/Δs = 264*7.1/(128-10)
= 15.9 gpd/ft
K = 15.9/(3050-2102) = 0.0178 gpd/ft²
K = 7.9*10⁻³ cm/sec
RECOVERY TEST
HOLE 155
ZONE 2102'-3050'
FEBRUARY 25, 1978
Q = 7.1 gpm
checked
Donald Hurst

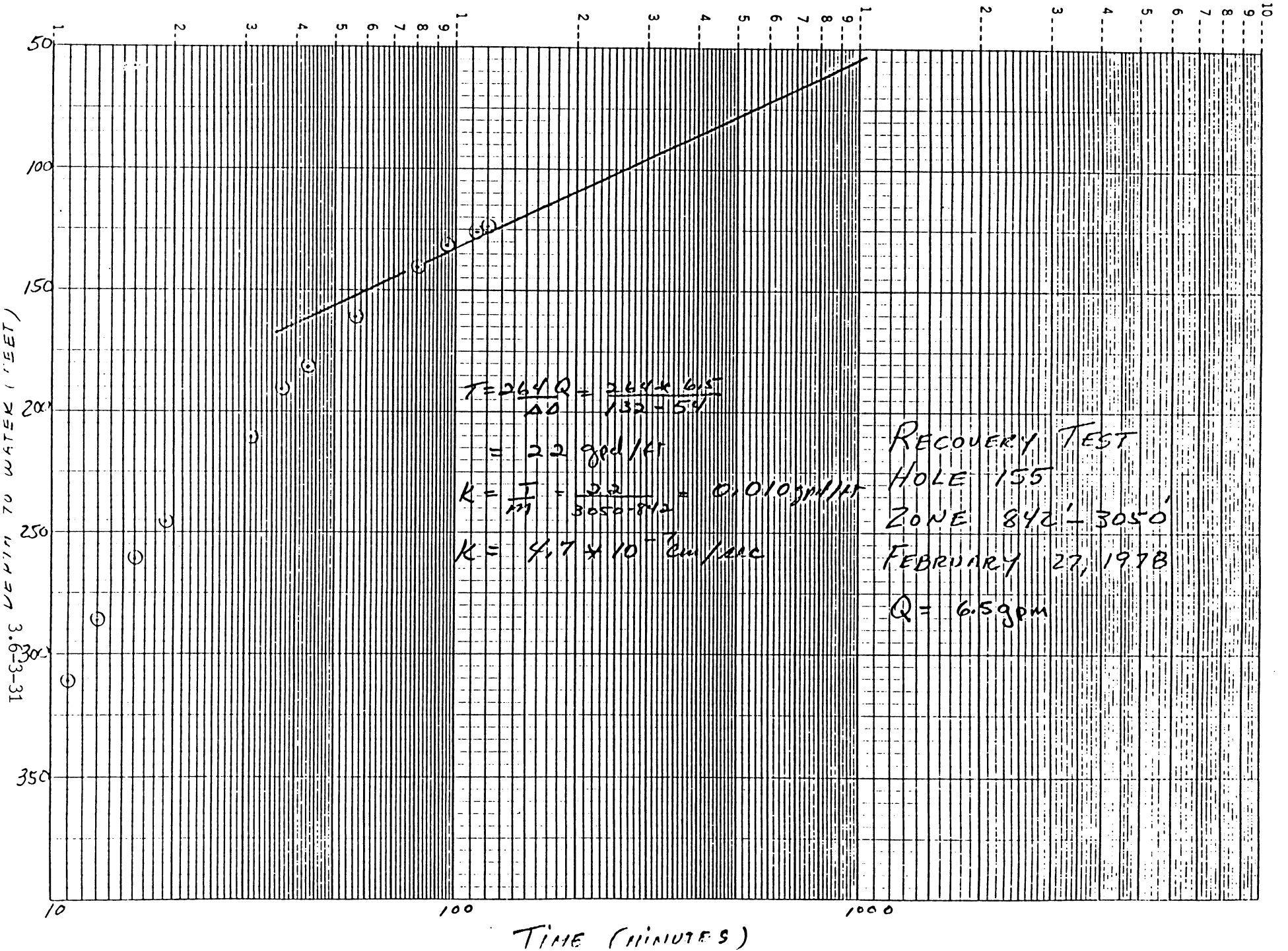
KEUFFEL & ESSER CO. SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS MADE IN U.S.A.
46 5490

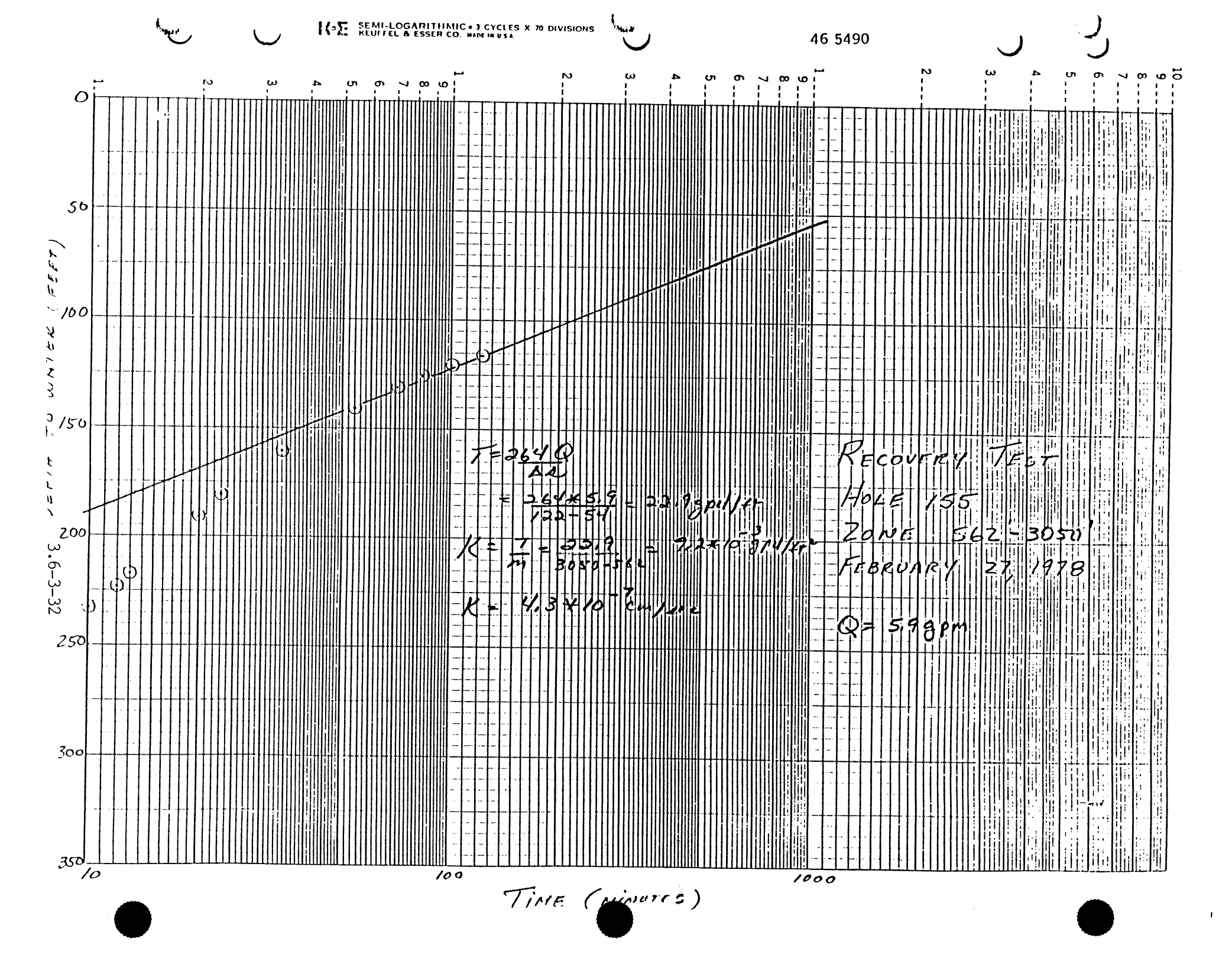


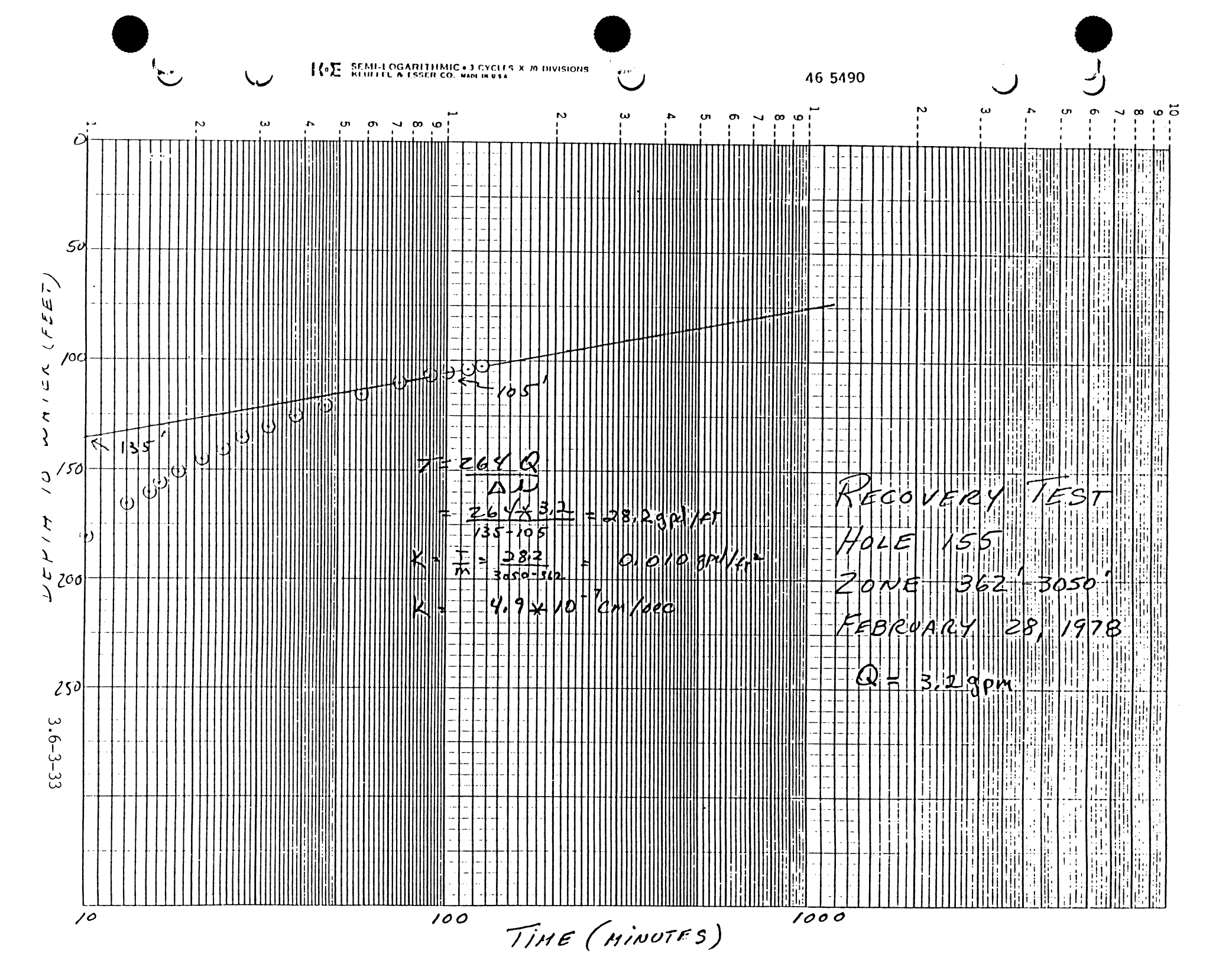
3.6-3-28


K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DRAWDOWN (FEET)
TIME (MINUTES)
10
100
1000
50
100
150
200
250
300
350
400
107'
204'
T = 264 Q / Δ J
= 264 x 7.5 / 204 - 107 = 20.4 gpd/ft
K = T / m = 20.4 / 3050 - 1042 = 0.0109 gpd/ft²
K = 4.8 * 10⁻³ cm/sec
RECOVERY TEST
HOLE 155
ZONE 1042' - 3050'
FEBRUARY 26, 1978
Q = 7.5 gpm
3.6-3-29


K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
50
100
150
200
250
300
350
400
10
100
1000
TIME (MINUTES)
3.6-3-30
+2.62
+2.172
T = 264 Q / Δs
= 264 × 7.2 / 172 − 62 = 17.3 gpd/ft
K = T / m = 17.3 / 3050 − 942 = 0.00829 gpd/ft²
K = 8.9 × 10⁻⁴ cm/sec
RECOVERY TEST
HOLE 155
ZONE 942 - 3050'
FEBRUARY 27, 1978
Q = 7.2 gpm

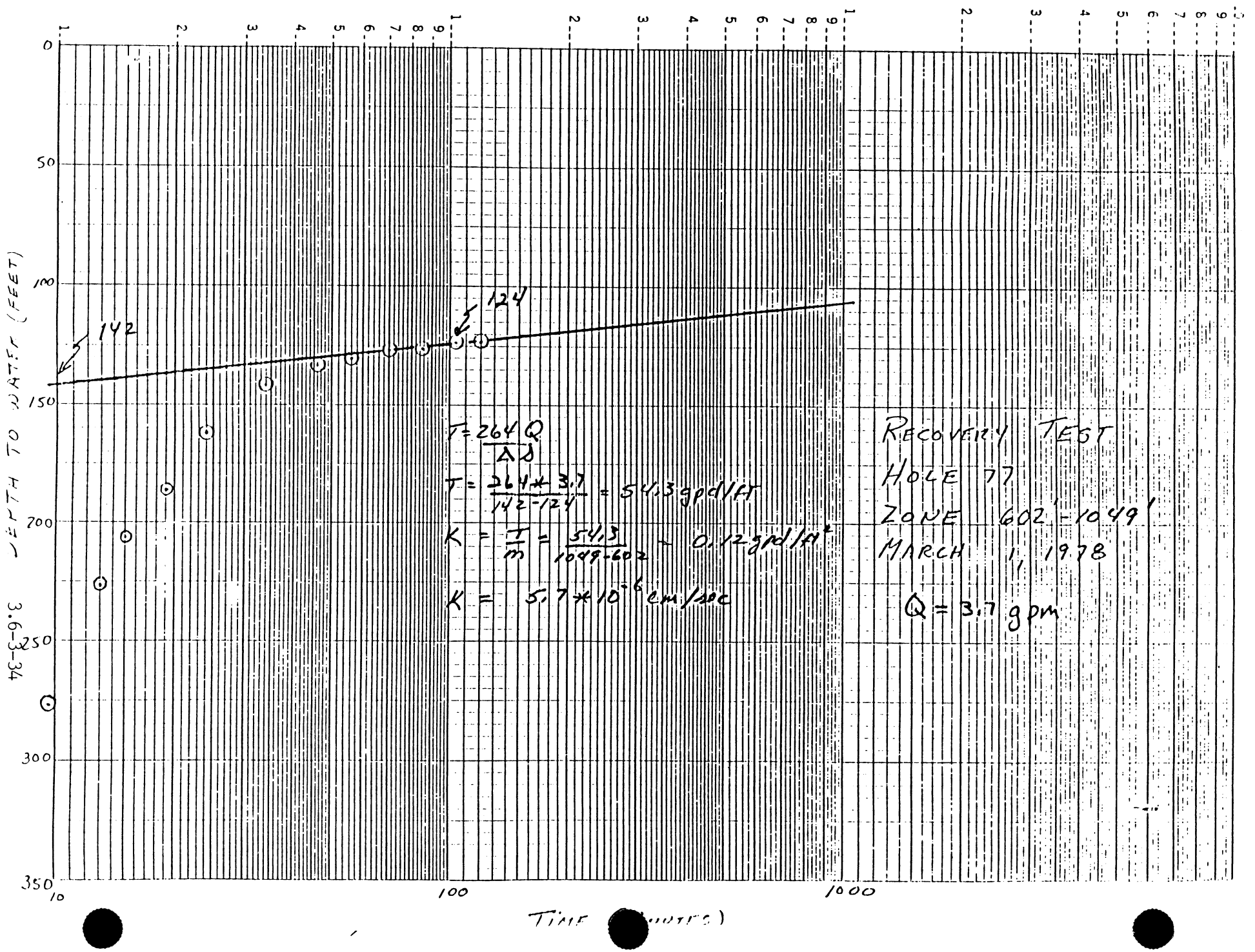

K+E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DRAWN TO WATER LEVEL (FEET)
3.6-3-31
TIME (MINUTES)
$T = \frac{264Q}{\Delta D} = \frac{264 * 6.5}{132 - 15} =$
$= 22$ gpd/ft
$K = \frac{T}{m} = \frac{22}{3050 - 812} = 0.0103$ gpd/ft
$K = 4.7 * 10^{-5}$ cm/sec
RECOVERY TEST
HOLE 155
ZONE 842' - 3050'
FEBRUARY 27, 1978
Q = 6.5 gpm

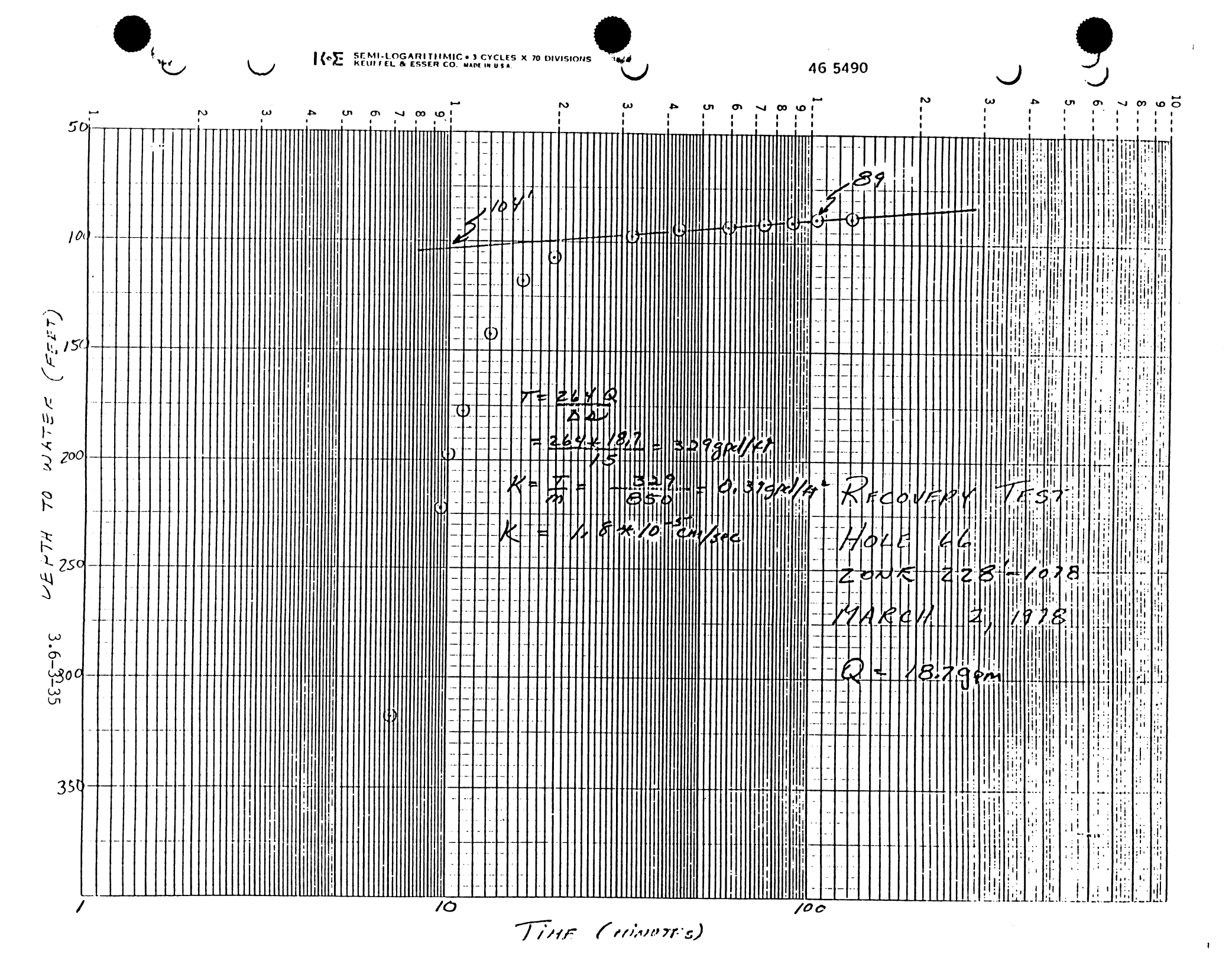

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DRAWDOWN (FEET)
3.6-3-32
TIME (MINUTES)
10
100
1000
T = 264 Q / Δs
= 264 × 5.5 / 132 - 54 = 22.9 gpd/ft
K = T/m = 22.9 / 3050 - 562 = 9.2 × 10⁻³ gpd/ft²
K = 4.3 × 10⁻⁷ cm/sec
RECOVERY TEST
HOLE 155
ZONE 562 - 3050'
FEBRUARY 27, 1978
Q = 5.9 gpm


K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
DRAWDOWN (FEET)
TIME (MINUTES)
10
100
1000
0
50
100
150
200
250
135'
105'
T = 264 Q / Δh
= 264 x 3.2 / 135-105 = 28.2 gpd/ft
K = T / h = 2812 / 3050-3512 = 0.010 gpd/ft²
K = 4.9 x 10⁻⁷ cm/sec
RECOVERY TEST
HOLE 155
ZONE 3621-3050'
FEBRUARY 28, 1978
Q = 3.2 gpm
3.6-3-33

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

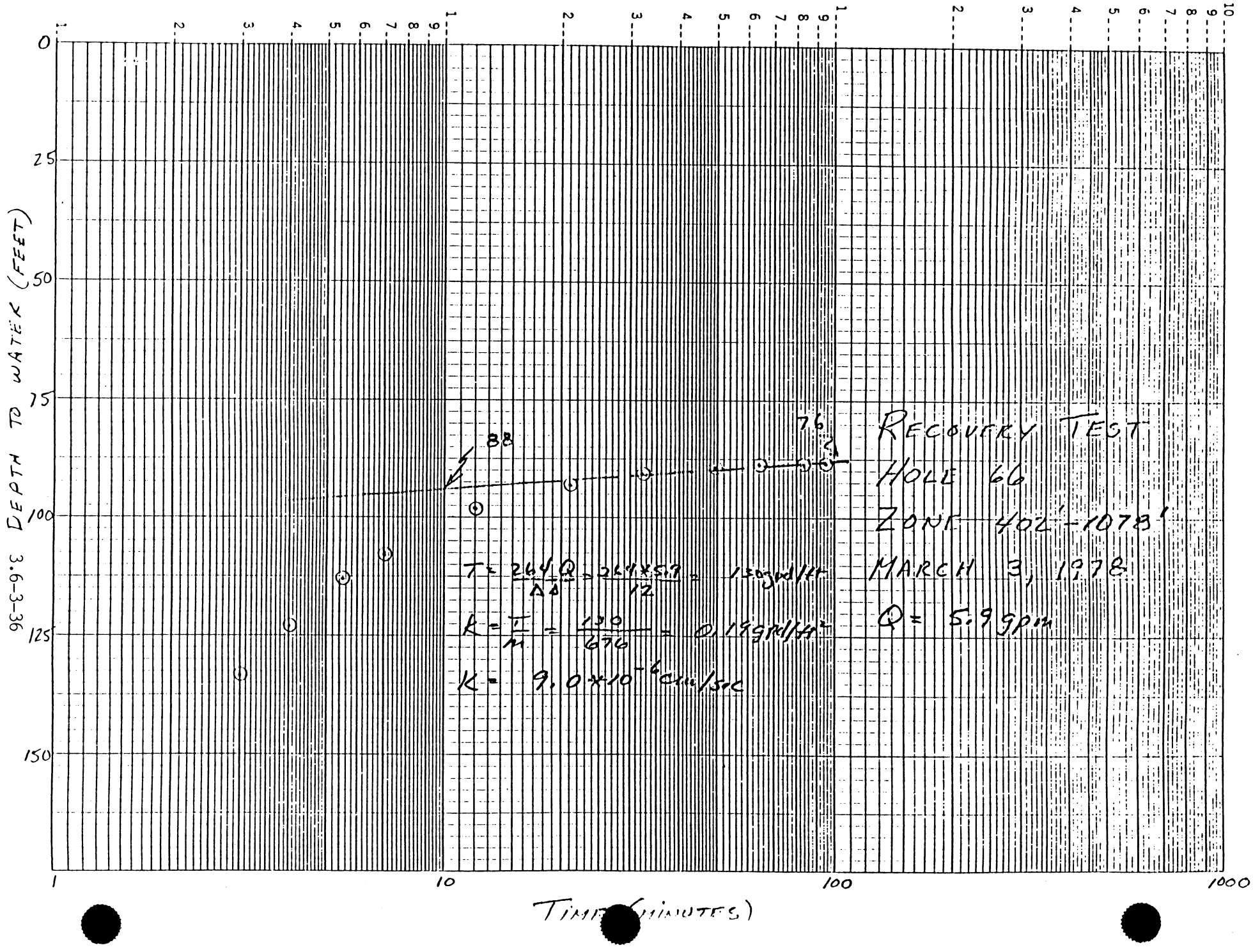
46 5190

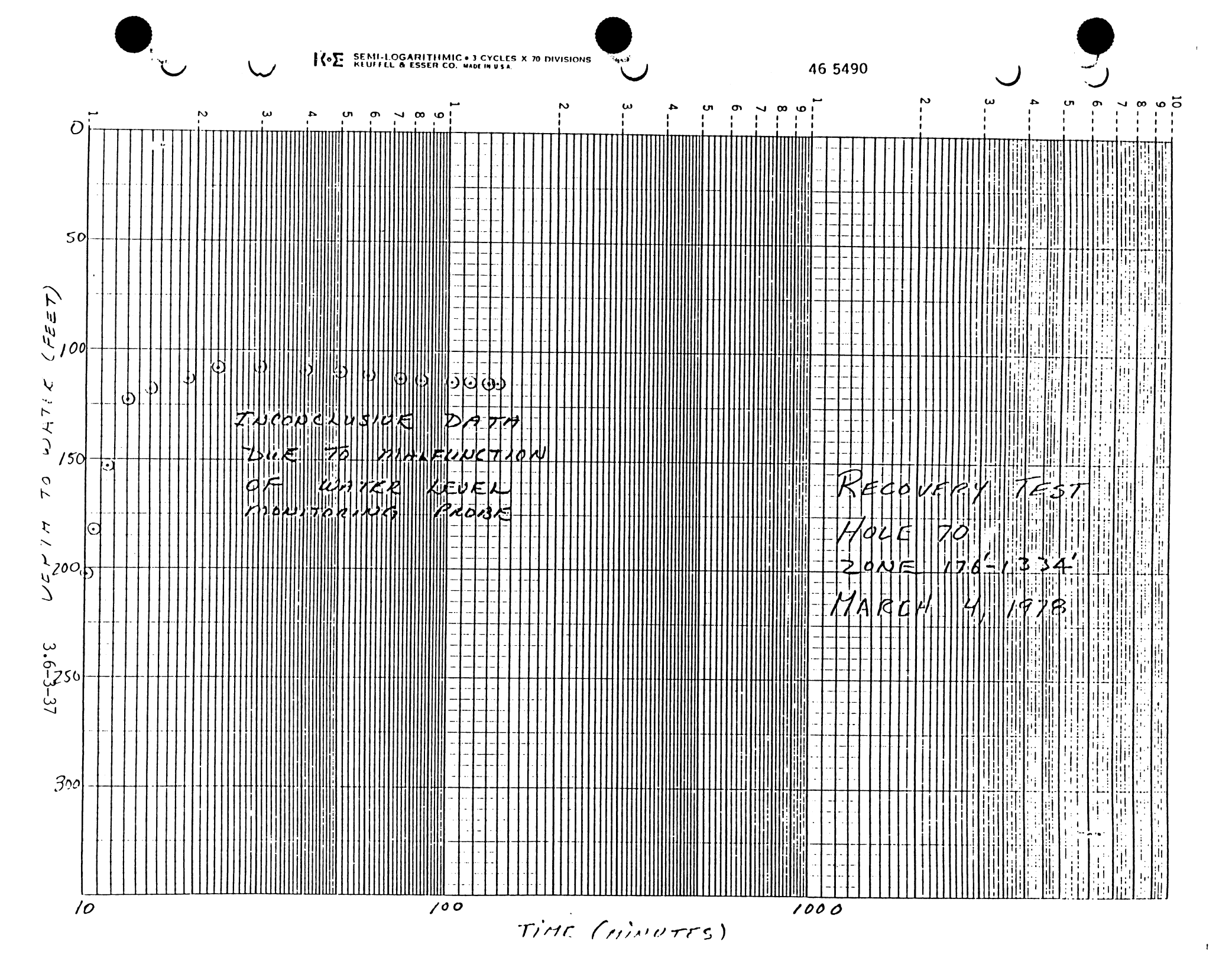


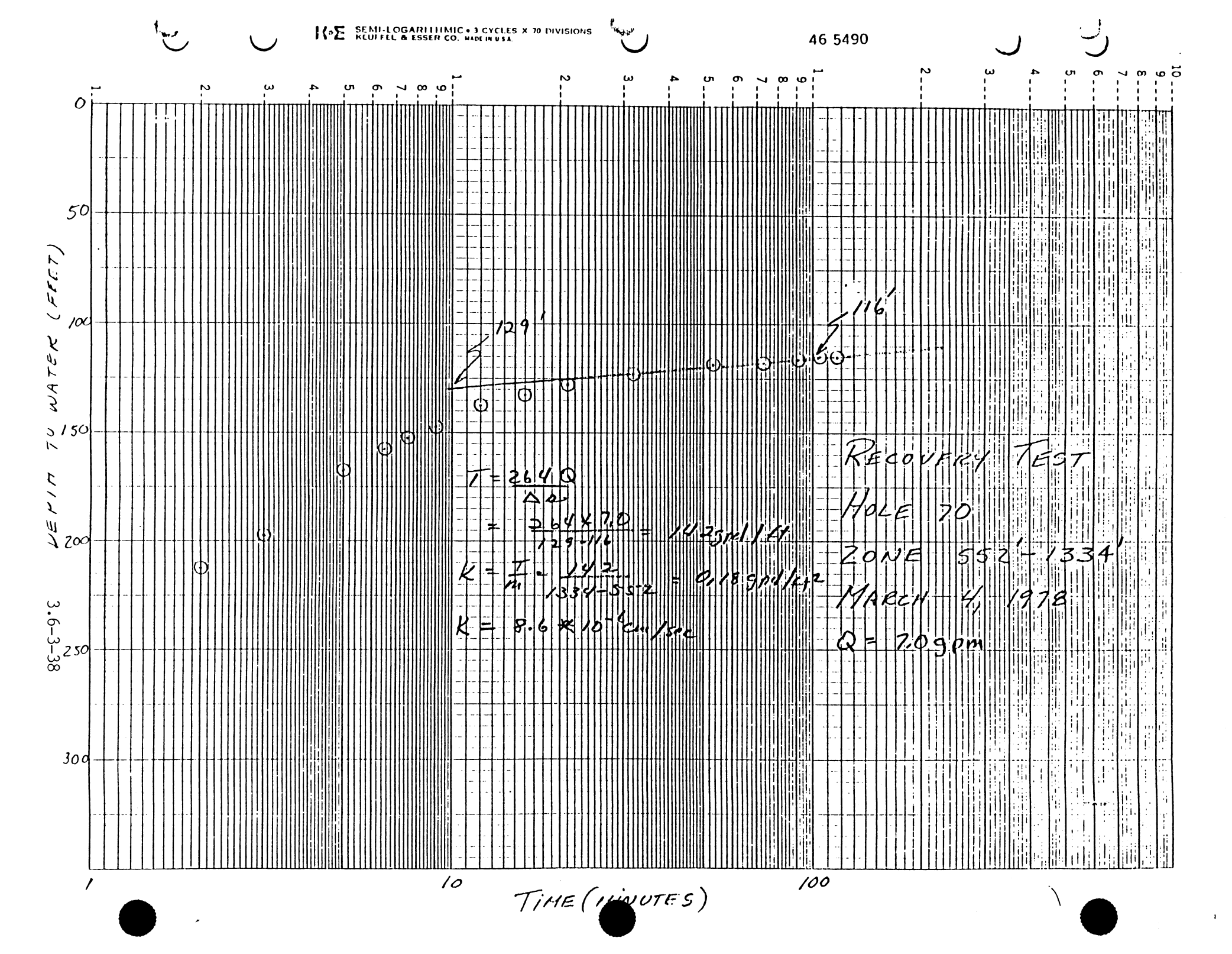

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
104'
89
T = 264 Q / Δs
= 264 × 18.7 / 15 = 329 gpd/ft
K = T/m = 329 / 850 = 0.39 gpd/ft²
K = 1.8 × 10⁻³ cm/sec
RECOVERY TEST
HOLE GG
ZONE 228-1078
MARCH 21, 1978
Q = 18.7 gpm
DEPTH TO WATER (FEET)
TIME (MINUTES)
3.6-3-35

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 5490

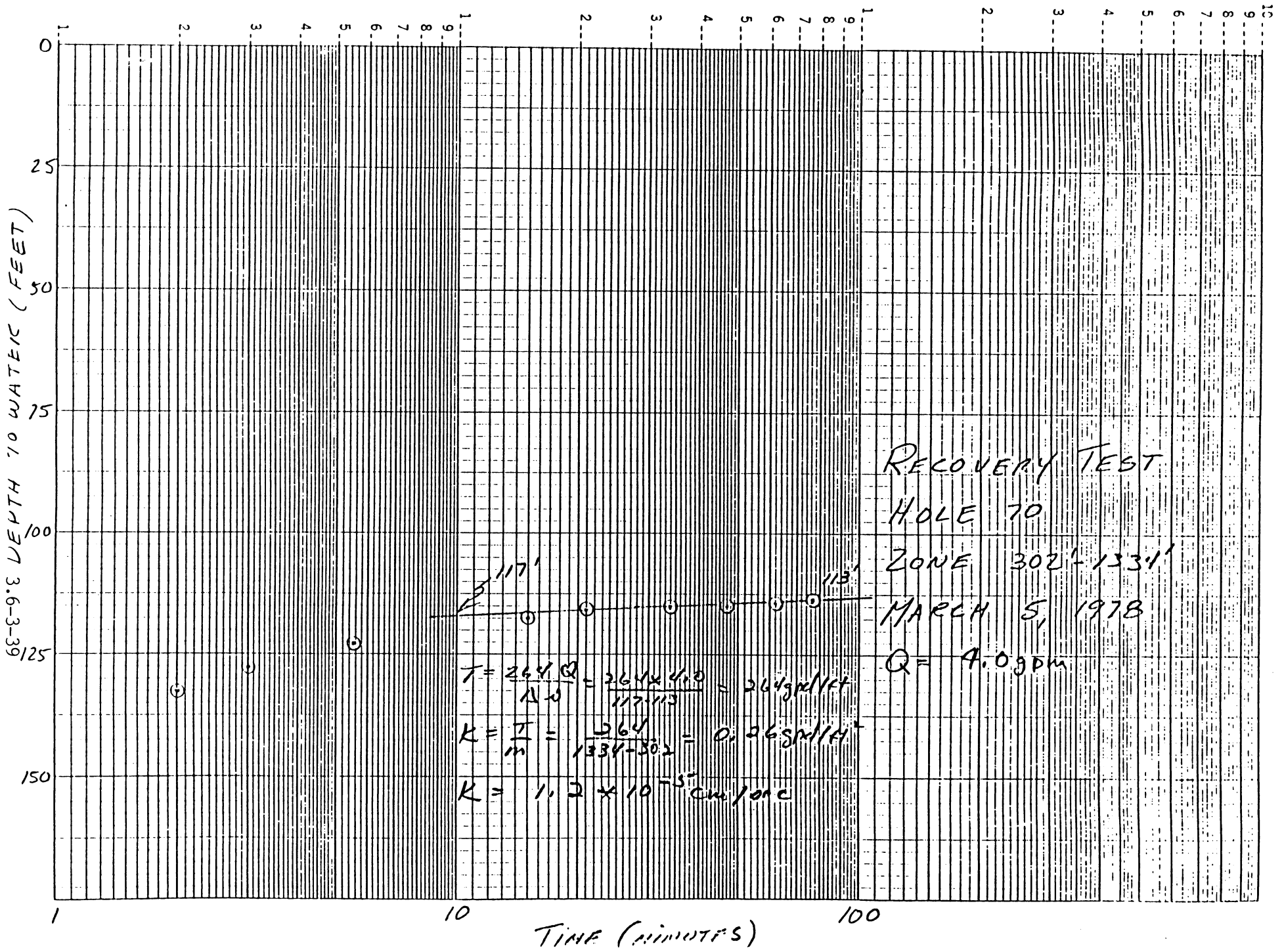



K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
VERTICAL TO WATER (FEET)
0
50
100
150
200
250
300
10
100
1000
TIME (MINUTES)
INCONCLUSIVE DATA
DUE TO MALFUNCTION
OF WATER LEVEL
MONITORING PROBE
RECOVERY TEST
HOLE 70
ZONE 1176-1334'
MARCH 4, 1978
3-6-37

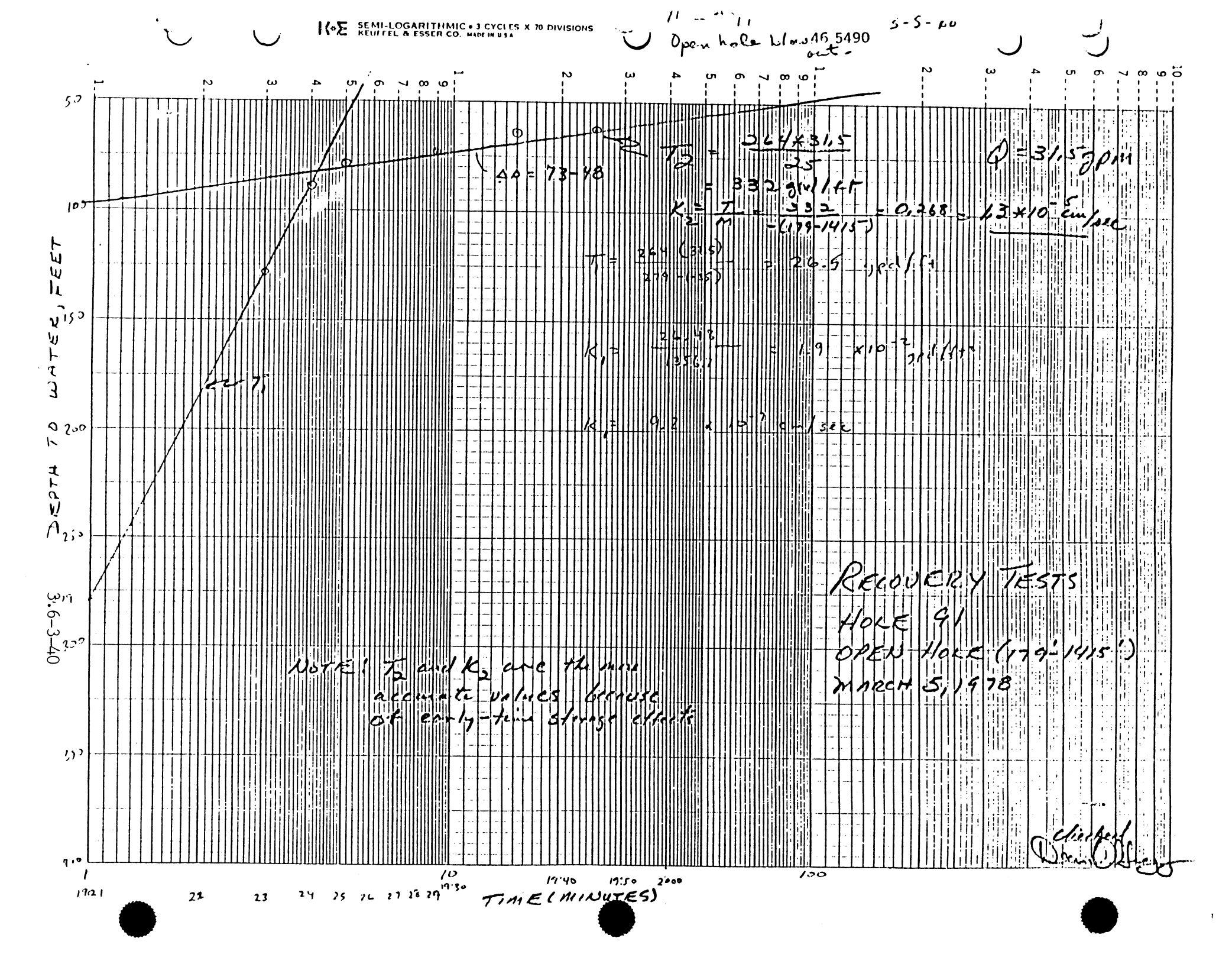

K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 5490
0
50
100
150
200
250
300
VERTICAL TO WATER (FEET)
3.6-3-38
1
10
100
TIME (MINUTES)
129'
116'
RECOVERY TEST
HOLE 70
ZONE 552'-1334'
MARCH 4, 1978
Q = 7.0 gpm
T = 264 Q / Δ
= 264 x 7.0 / 129-116 = 142.5 gpd/ft
K = T/m · 1/z = 142.5 / 1334-552 = 0.18 gpd/ft²
K = 8.6 x 10⁻⁴ cm/sec

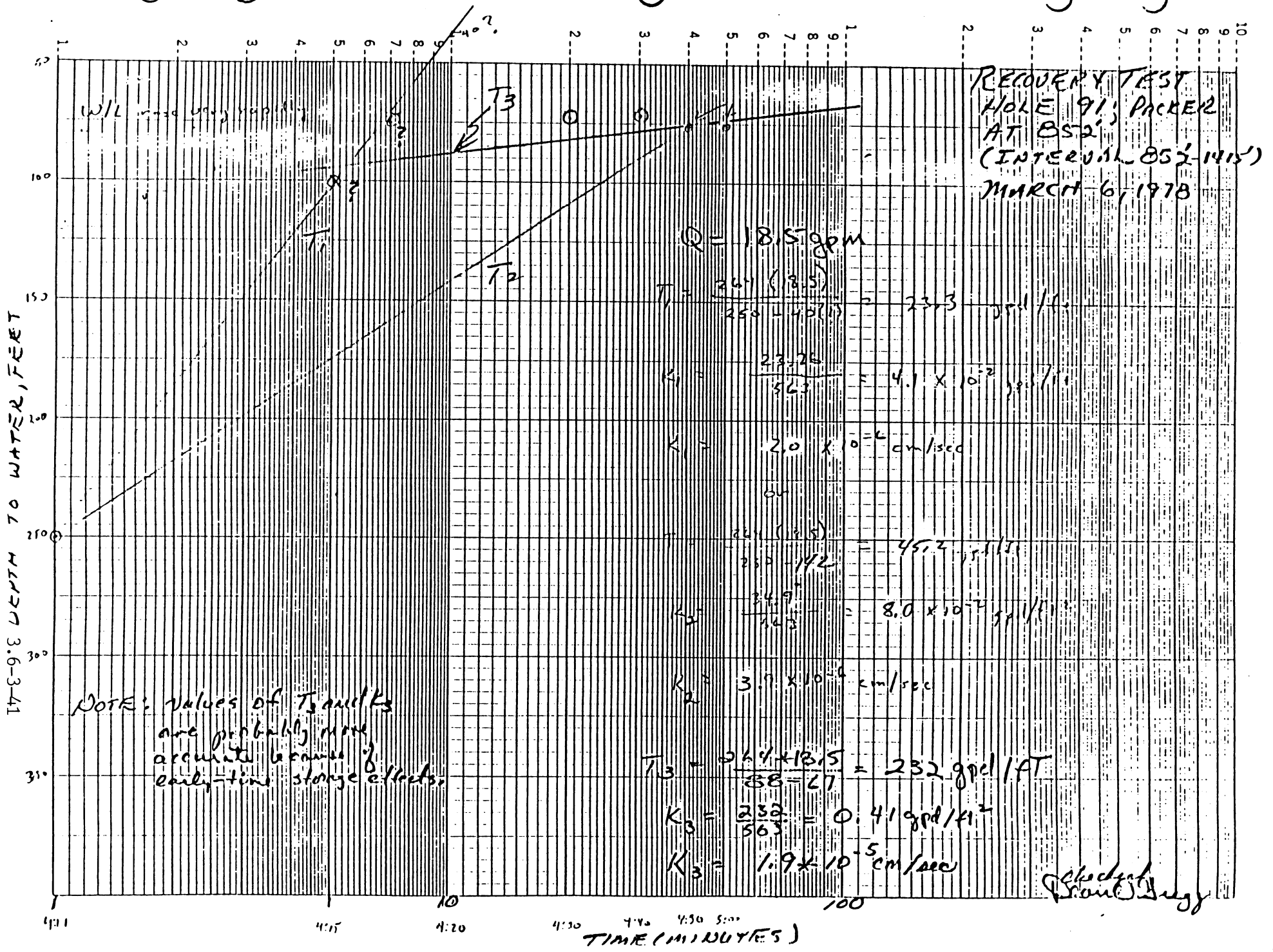
K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 5490

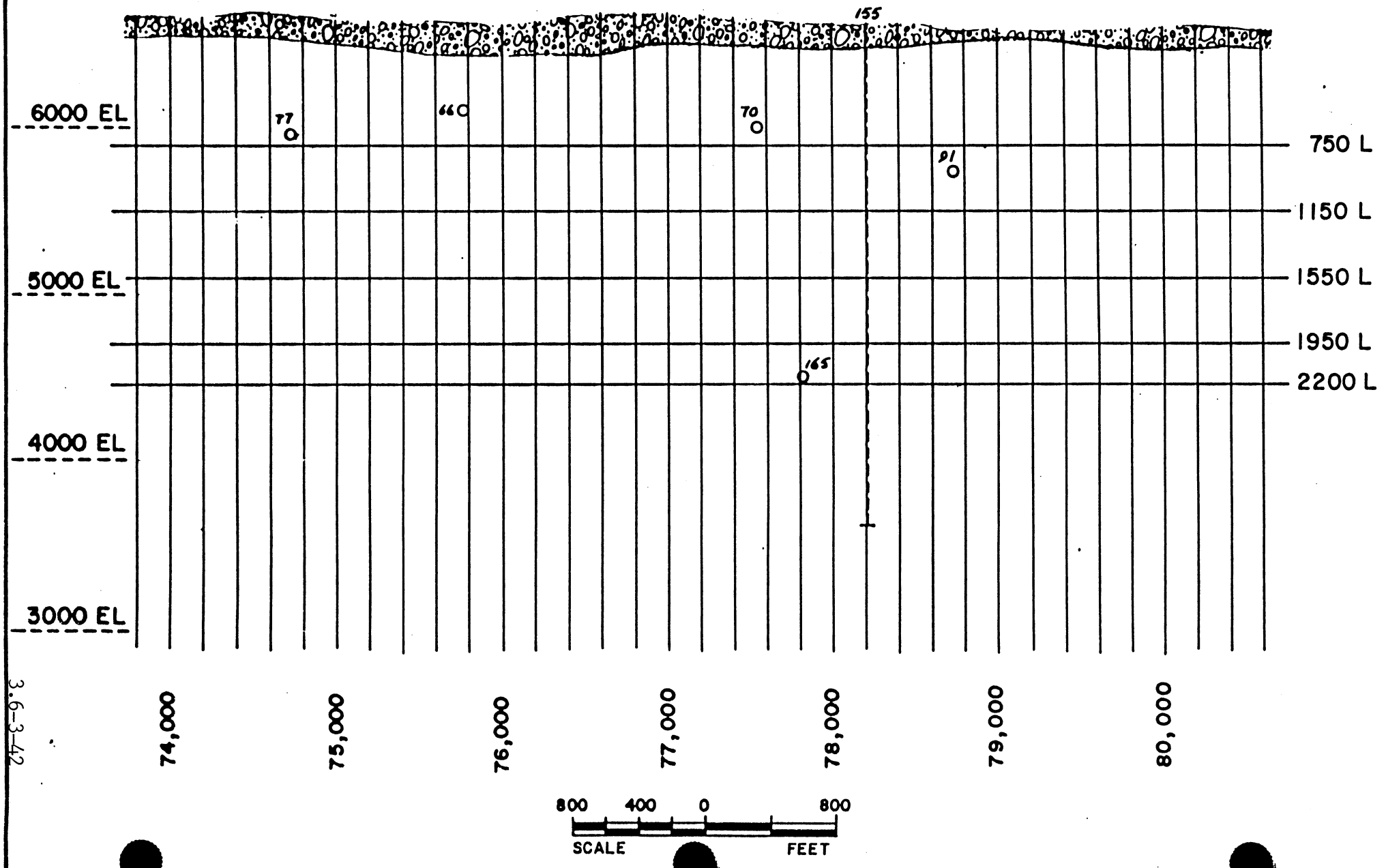


3.6-3-39


K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
Open hole blow 16 5490 out
5-5-00
DEPTH TO WATER, FEET
TIME (MINUTES)
Δs = 73-48
T = 274 * 31.5 / 25
T = 332 gpd/ft
K2 = T/m = 332 / (179-141.5') = 0.268 = 1.3 * 10^-5 cm/sec
Q = 31.5 gpm
T = 264 (37.5) / (279-145) = 26.5 gpd/ft
K1 = 26.5 / 1356.1 = 1.9 x 10^-2 gpd/ft^2
K1 = 9.2 x 10^-7 cm/sec
RECOVERY TESTS
HOLE 91
OPEN HOLE (179-141.5')
MARCH 5, 1978
NOTE! T2 and K2 are the more accurate values because of early-time storage effects
Clint Bell


K&E SEMI-LOGARITHMIC • 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
RECOVERY TEST
HOLE 91; PACKER
AT 852'
(INTERVAL 852'-1415')
MARCH 6, 1978
Q = 18.5 gpm
T1 = 23.3 gpd/ft
K1 = 4.1 x 10⁻² gpd/ft²
K1 = 2.0 x 10⁻⁵ cm/sec
T2 = 45.2 gpd/ft
K2 = 8.0 x 10⁻² gpd/ft²
K2 = 3.9 x 10⁻⁵ cm/sec
T3 = 96.4 + 18.5 = 232 gpd/ft
K3 = 232/563 = 0.41 gpd/ft²
K3 = 1.9 x 10⁻⁵ cm/sec
NOTE: Values of T3 and K3 are probably more accurate because early-time storage effects.
WATER LEVEL ELEVATION IN FEET
3.6-3-41
DEPTH TO WATER, FEET
TIME (MINUTES)
4:11
4:15
4:20
4:30
4:50
5:00
1
10
100

WATER TEST HOLES
CRANDON PROJECT



3.6-3-42

Landers, R.A., 1981. Mine Hydrology Tests:
Results of Phase 1. Exxon Coal and Minerals Company

Core Hole 213

990-0072-1A

MEMORANDUM

TO	SUBJECT
E. R. May	Results of Crandon Phase 1 - Mine Hydrology Tests
R. A. Landers RAL	DATE: 1/30/81
	FILE NO. RECEIVED FEB 2 1981 EXXON MINERALS CRANDON PROJECT

The Phase 1 field tests of the Crandon Mine Hydrology evaluation were carried out between 9 December 1980 and 14 December 1980. The ojectives and design of this program were detailed in my memorandum to you dated 10 October 1980. Presented below is a summary of the execution of these tests, a discussion of their results and the technical conclusions reached.

CONCLUSIONS

The following is the principal hydraulic conclusion of these tests, being a profile of permeability and storage coefficient as a function of depth in hole 213 and between hole 213 and 217.

DEPTH INTERVAL METERS (Below Casing)	DEPTH TO STATIC WATER LEVEL METERS (Level Below Casing)	PERMEABILITY (cm/sec)	STORAGE COEFFICIENT	TYPE OF CONNECTION TO HOLE 217 AND NOTES
43.9 - 70.7	15.3	2.7E - 5*	N/A	Linear, Fracture
70.7 - 95.1	15.2	5.0E - 6	N/A	None Recorded
95.1 - 119.5	15.6	2.0E - 5	N/A	Linear, Fracture
119.5 - 143.9	15.7	2.2E - 5	N/A	None Recorded
143.9 - 168.2	15.6	3.8E - 5	N/A	Linear, Fracture (160M = Hanging Wall Contact)
168.2 - 192.6	15.6	3.4E - 3	1.4E-4	Radial, Significant (190M = 185 Level)
192.6 - 220.7	15.7	3.4E - 3	7.5E-5	Radial, Significant
220.7 - 246.3	15.7	2.4E - 3	9.6E-5	Radial, Significant (239M = 230 Level)
246.3 - 268.2	15.7	1.0E - 4*	N/A	None Recorded

NOTES: NA = Could not be calculated
* = Low Confidience Results

FILE MAIN H-4D
Sub AT
Sub BR
Keywords

BE A WINNER EVERYDAY — Take the extra step FOR SAFETY

It is my preliminary conclusion from this first phase of tests, that ground-water inflow will be significant in at least the 185 meter level of the Crandon mine in the vicinity of holes 213 and 217. These holes intercept the hanging wall contacts of the ore body at coordinates Elevation 2322 m x 94,486 m East x 35,442 m North and at Elevation 2344 m x 94,502 m East x 35,437 m North, respectively. This conclusion is based on:

(1) The significant permeabilities and storage coefficients, reported above, in the interval 168 to 246 meters (you have mapped this as moderately weathered massive siliceous sulphide + pyritic chert).

(2) The hydraulic interconnection of the two holes in this interval and in three shallower intervals; and

(3) The fact that the locations of the hanging wall intercepts of these two holes are such that these permeabilities partially reflect the vertical permeabilities of the leached zone at the 185 level. This is the single hydraulic parameter which will be most critical in determining the rate of water inflow to the upper mine level.

SUMMARY OF TEST EXECUTION

Test No. 1

A single packer was set at 468 feet below the casing and injection started at 0947 hours on 11 December. This was a multiple rate test designed to measure the variation of well speific injectivity (GPM per foot of pressure build-up) as a function of injection rate during build-up. The pressure recovery curve was then used to calculate bulk transmissivity (permeability times thickness) of the test interval. Four steps of increasing injection rate was performed: 42 GPM for 45 minutes; 53 GPM for 59 minutes; 72 GPM for 40 minutes; and 75 GPM for 21 minutes. The injection was ended at 1212 hours when the water truck could no longer keep up with the injection. Pressure recovery was complete by 1443 hours and the packer deflated.

Test No. 2

The same single packer was lowered down the hole to 808 feet and inflated to test the permeability of the lowest part of the hole. Injection was started at 1721 hours and continued until 1729 hours. Very irregular injection rates and a 1 1/2 minute failure of the pump produced erratic results during pressure build up although the drill rods became pressurized after only 30 seconds of injection at 45 GPM. Recovery was complete by 1815 hours and the packer deflated. Due to the very low permeability of this lowest test interval, a single packer was used again on the next higher test interval.

Test No. 3

The single packer was raised to 725 feet and reinflated between 0800 and 0900 hours on 12 December. Injection was started at 0922 at 10 GPM, but response was very small and injection stopped at 0942. After complete recovery, test 3B was started at 1003 hours. Injection was at 57 GPM until 1033 hours and response was measured both in hole 213 and in hole 217. Pressure recovery took until 1140 hours and the tools brought out of the hole to set-up the straddle packer

system for the rest of the tests. A down-hole pressure recorder was placed so as to measure pressure below the lower packer to monitor for packer leakage. Pressures between the packers and in hole 217 were monitored with the electric piezometers set at 100 feet below the top of the casing. Leakage of the upper packer was monitored with an "electric-tape" water level sounder. The length of the test interval was, in all cases, 96 feet. Sequential tests were made by pulling up the hole 80 feet therefore producing an overlap 16 feet at the bottom of each test interval with the previously tested interval.

Test No. 4

This test was conducted in the interval 624 to 720 feet with injection starting at 1630 hours on 12 December. Injection at 70 GPM was performed until 1705 hours and response occurred in hole 217. Recovery was complete by 1740 hours and the packers deflated.

Test No. 5

This test was conducted in the interval 544 to 640 feet with injection starting at 1900 hours at 65 GPM until 1930 hours. Response occurred again in hole 217 and recovery was complete by 1952 hours.

Test No. 6

This test was conducted in the interval 464 to 560 feet with injection starting at 0950 hours, on 13 December, at 9 GPM until 1015 hours. Response occurred in hole 217 and recovery was complete by 1041 hours.

Test No. 7

This test was conducted in the interval 384 to 480 feet with injection starting at 1355 hours and lasting until 1418 hours at 5 GPM. No response was observed in hole 217. Recovery was complete by 1500 hours.

Test No. 8

This test was conducted in the interval 304 to 400 feet with injection starting at 1610 hours and lasting until 650 hours at 10 GPM. Hole 217 did respond to this injection at hole 213. Water level recovery was completed by 1753 hours.

Test No. 9

This test was conducted in the interval 224 to 320 feet with injection starting at 1820 hours and lasting until 1850 hours at an average of 6 GPM. Hole 217 did not respond to this test and recovery was completed in hole 213 by 1954 hours.

Test No. 10

This test was conducted in the interval 144 to 240 feet. Injection started at 2050 hours and continued until 2120 hours at an average of 11 GPM. Hole 217 responded to this test and recovery was completed by 2139 hours. The tools were pulled from the hole and the down-hole pressure recorder recovered and the testing program terminated at 2330 hours on 13 December 1980.

TEST ANALYSIS

Several different analytical techniques were applied to the results of these ten injection tests. The geology of the tested intervals led to the hypothesis that linear flow might occur around hole 213 or between hole 213 and hole 217 within fracture zones. Since only one observation well was available, and since the usable analytical methods for such tests are based on the assumption of effectively radial flow, the first step in the analysis was to determine whether or not linear flow dominated the system hydrology for each test. Using conclusions of Earlougher (1977), this test was made by plotting pressure build-up and recovery versus t on arithmatic graph paper. A linear relation on this graph is characteristic of linear flow.

Test No. 1 pressure build up was used to calculate the ratio of equilbrium pressure build-up to injection rate. Attempts were then made to quantitatively determine well loss using methods of Rorabaugh (1953) and Sheahan (1971). Pressure recovery from Test No. 1 was analyzed to determine bulk transmissivity using methods of Harrill (1970).

Test No. 2 through No. 10 were all analyzed with the following approach:

1. Pressure build up and recovery in hole 213 for all tests, and in hole 217 when response was measured there, was analyzed first using the "semi-log" approach for ideal artesan aquifers (Cooper and Jacob, 1946). Straight line fits were not possible in some cases and calculated values of U were not found to be ≤ 0.01 in other cases. In both situations, this simple approach was not sufficient or reliable.

2. Pressure build up in both wells was analyzed by the type-curve approach matching to the ideal Theis curve or to type curves for hydrologic barriers (Lohman, 1972)

3. Finally, for those test where the injection tubing became pressurized and equilibrium build up pressures and injection rates were apparently reached, the data was analyzed using pressure-injection methods (Bureau Reclamation, 1977)

RESULTS AND DISCUSSION

The attached table summarizes, for each test, the test conditions, results of analysis and conclusions. The conclusions of this analysis, presented in that table, were derived through the reasoning discussed in the attached appendix. The interpretive conclusions presented at the beginning of this memorandum were developed using two further assumptions.

1. The overlap of test intervals were averaged and adjacient results equated to half of the overlap.

2. Test 3B results (T = 7600 in the observation well) was assumed to be essentially a reflection of that part of the hole below 728 feet and above the interval tested in Test No. 2 and found to have a very low permeability. A permeability of 4.6E - 3 cm/sec was therefore assigned to the interval 728 to 808 feet.

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Earlougher, R. C., 1977, Advances in Well Test Analysis: A.I.M.E., Society Petroleum Engineering, Monograph 5

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U.S. Bureau Reclamation, 1977, Ground-Water Manual: U.S. Department of Interior, Washington

RAL/ssr

cc: R. A. Ford
M. Smith
J. D. Patton
J. A. DeMarte
L. N. Blair
R. P. Herbst

S503:70

APPENDIX: DISCUSSION OF RESULTS

Test No. 1

Build-up Analysis:
Step test reults of LC/Q for four steps are erratic in log plot and do not fit well to type curve approach of Sheahan (1970)

Highest Q rate of 75 GPM gave build-up of 0.707 FT/GPM

For a pump test at (E. G.) 300 GPM, assume significant well losses and a LC/Q of 1.0 FT/GPM for drawdown total of 300 feet at the pump well. Boundary effects will probably increase this number somewhat.

Recovery Anaysis:

Harrill's method gave a good fit to a straight line after t^*/t = 8.0 (t' = 4.0 min). Therefore the resulting T = 5210 GPD/FT is a meaningful averaged value for interval of 468 to TD

Results of later tests indicate almost no permeability for:

464 to 560 Ft (Test 6)
808 to 880 Ft (Test 2)

Therefore, to get lumped, averaged K for the significant K zone of 560 to 808, use Test No. 1.
Result $K = \frac{T}{B} = \frac{5210}{248} = 21.0$ GPD/FT^2 = 1E - 3 cm/sec

Test No. 2

Widely fluctuating Q, pressurized LC Drill rods and probably too short a duration result in this being a definately inferior test to all the others. Nevertheless, very low T values are indicated.

As a conclusion use the average of the two calculated T values, i.e.

T = 180 GPD/FT, For 808 - 880 Ft, So

K = 2.5 GPD/FT^2 = 1.2E - 4 cm/sec

Test No. 3B

Fairly Constant Discharge:

Build-up Analysis:

Injection well pressurized after only 7 data points taken (0.58 min); However injection rate remained constant. Jacob-Cooper analysis indicates an effective recharge boundary with later fit of data to T = 7524 or K = 50 GPD/Ft^2/ Build-up Theis match does not give fit probably because of Q fluctuations.

Test No. 3 Continued

Therefore, in vicinity of Hole 213 average 2 Cooper analyses 7524 and 7170 (noted low confidence because of rapid pressurization and discharge fluctuations).

Average T = 7350 GPD/FT

$K = T/(880 - 728) = 48$ GPD/FT^2

Observation well Results:

No Linear flow effects and an excellent fit to the non-leaky Theis type curve so this build-up result is the best T value

T = 7600 (Rounded) GPD/Ft

$K = 7600/(880 - 728) = 50$ GPD/FT^2 = 2.4E - 3 cm/sec

Storage coefficient from Theis type curve: S = 9.6E - 5

Test No. 4

Discharge fluctuated 60 - 81 GPM during test build-up:

Injection well pressurized after 1.8 min. (12 Data Points) therefore, build-up data interprectation of low confidence even for Theis curve match. No linear flow apparent either at injection or recovery well; injection well recovery analysis of Jacob-Cooper gives the most reliable value of T = 7390 GPD/FT. This is further substntiated by observation well recovery T of 7390 GPD/FT. Therefore:

T = 7390 GPD/FT

$K = T/6 = 7390/96 = 77$ GPD/FT^2

K = 3.6 E - 3 cm/sec

Observation Hole Data:

Build-up Theis analysis gives very different T than Jacob-Cooper analysis of build-up or recovery, which agree well with each other. The Theis fit is to a single-boundary Theis curve (from Lohman) which is one hypothesis

Therefore, accept the average of the Jacob-Cooper build-up and recovered values

T = 6880 GPD/FT

$K = 6880/96 = 72$ GPD/FT^2

$K = 3.4 \times 10^{-3}$ cm/sec.

APPENDIX: DISCUSSION OF RESULTS

Test No. 4 Continued

Storage Coefficient:

Use average of Theis and Cooper values from build-up

S = 7.5E - 5

Test No. 5

Injection rate fluctuated significantly from 54 GPM (t = 12 - 24) to 78 GPM (t = 24 - 30). Injection well pressurized after 1.5 minutes.

Injection Well Data:

Build-up (Jacob-Cooper) shows apparent recharge boundary with T = 264 before it and T = 3300 after, theis build-up fits to recharging image well curve (Lohman) with K = 1.1 and results in a calculated T = 287 for early time and T = 37 for later time. Because of discharge fluctuations, later recovery data judged to be most representative:

T = 4120 GPD/FT (Cooper and Jacob)

K = 42.9 GPD/FT^2

K = 2E - 3 cm/sec

No indications of linear flow

Observation Well Data:

Theis analysis matches very well to a single boundary type curve and the Jacob-Cooper recovery analysis fits fairly well to a straight line. Jacob-Cooper analysis of build-up after tx (t at which U = 0.01) matches straight line. Therefore, adopt the average of these three results, i.e.:

T = 6820 GPD/Ft

K = 71 GPD/FT^2

K = 3.4 E-3 cm/sec

S = 1.4 E-4

Test No. 6

Injection Well:

Injection rates fluctuated drastically (7 to 17 GPM), injection well pressured after 0.3 minutes so Cooper analysis not useful on build-up nor is Theis analysis (only 3 Data Points) for early curve fit.

Test No. 6 Continued

Recovery data fit Jacob-Cooper straight line very well so its result was averaged with Bu Rec (pressurized well equilibrium method) to use:

$T = 76$ GPD/FT

$K = 0.79$ GPD/FT^2

$K = 3.8$ E - 5 cm/sec

Observation Well Data:

Plot of build-up versus t shows a definite straight line indicative of linear flow. With only one observation well, hydraulic parameters can not be calculated and Theis or Jacob analyses lead to false conclusions since flow wasn't radial. Response was, however, definite in Hole 217, therefore there exists a hydraulic connection to the 464 - 560 interval of Hole 213 (Postulated fractures)

Test No. 7

Injection rates relatively constant at 5 - 9 GPM and a significant amount of data before the drill rods pressurized; good fit to Theis ideal curve; build-up Jacob and Cooper plot vary erratic and only a fair fit to a straight line on recovery curve; indications of possible linear flow on build-up versus t plot. No response in Hole 217.

Conclusion:

Most representative hydraulic parameters are an average of the three calculated T values (13, 24 and 95)

$T = 44$ GPD/FT

$K = 0.46$ GPD

S cannot be measured accurately since no response in Hole 217

Test No. 8

Injection rate fairly constant at 5 - 10 GPM except 15 GPM for first 8 minutes, out of a total duration of 40 minutes. No indication of linear flow from injection well, build-up pressurized after 0.5 min so only 6 data points to fit to Theis curve. Likewise Jacob-Cooper plot of build-up very erratic. Recovery plot (on Jacob-Cooper) fits fairly well to straight line for late recovery. Theis and recovery results almost identical, so adopted for near well 213:

Test No. 8 Continued

T = 40 GPD/FT

K = 0.42 GPD/FT^2 = 2E - 5 cm/sec

Observation Well did have definite response but also definitely linear flow characteristics therefore, calculated results from Theis or Jacob methods are not usable so no T or S can be calculated for observation well data although response does indicate hydraulic inter-connection (fractures?)

Test No. 9

Injection rate fairly constant at 3.7 to 4.1 GPM during last of test

No response in Hole 217 and no indications of linear flow near Hole 213.

Build-up in Hole 213 pressurized after 1.5 min. But 14 datapoints fit fairly well to Theis curve (T = 1.7); Jacob and Cooper plot indicates possible boundary on build-up but good fit on recovery

Conclusion:

Adopt average of 3 calculated T values

T = 10.2 GPD/FT

K = 0.11 GPD/FT^2

K = 5E - 6 cm/sec

S can not be calculated

Test No. 10

Injection rate constant at 9.6 to 11.2 GPM over 22 out of 30 min of test

No indication of linear flow near injection hole; build-up analysis by theis curve gave very poor fit since pressurized very rapidly; early and middle time data fit well to straight line on semi-log, but late time data indicate very erratic response. Injected well recovery data good Jacob/Cooper fit. Again average of calculated T values used. But with lower confidence due to wide range (4.2, 6, 12, 155):

T = 54 GPD/FT

K = 0.56 GPD/FT^2 = 2.7E - 5 cm/sec

Response in Hole 217 but definite linear flow, therefore, no available T, K, S but connection does exist to Hole 213.

CRANDON MINE HYDROLOGY

PHASE 1 TEST SUMMARY

			Test 1	Test 2	Test 3B	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
1. TEST CONDITIONS												
Interval Tested in Feet	Top		468	808	728	624	544	464	384	304	224	144
Below Casing	Bottom		880	880	880	720	640	560	480	400	320	240
Type of Test: SP = Single Packer, DP = Double Packer			SP	SP	SP	DP	DP	DP	DP	DP	DP	DP
SR = Single Rate, MR = Multi-Rate			MR	SR	SR	SR	SR	SR	SR	SR	SR	SR
Injection Rage in GPM: Overall Average/Duration in Min				6/7.5	57/30	70/35	65/30	9/25	5/26	10/40	6/30	11/30
Step 1 GPM/Minutes Injecting			42/45									
Step 2 GPM/Minutes Injecting			53/59									
Step 3 GPM/Minutes Injecting			72/40									
Step 4 GPM/Minutes Injecting			75/21									
Drill Rods Pressured During Injection			No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Static Water Level in Test Interval, Feet Below Casing			51.3	33	51.6	51.5	51.1	51.2	51.5	51.3	49.8	50.2
Response in Hole 217: NM = Not Measured			NM	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Packer Leakage U = Upper L = Lower P = Possible N = No SL = Slight			UN	USL	UN	LSL, USL	LSL, USL	LSL, UN	LN,UN	LN, UNM	LN, UNM	LN, UNM
NM = Not Measured												
2. RESULTS OF ANALYSIS												
Injection Well												
Recovery, Harrill's Equation	T in GPD/FT		5210									
	K in GPD/FT^2		12.6									
Recovery, Jacob & Cooper Method	T in GPD/FT		NA	260	7170	7390	4120	32	13	39	23	42
	K in GPD/FT^2			3.6	47	77	42.9	0.32	0.13	0.41	0.24	0.44
Build-Up Theis Curve Matching	T in GPD/FT		NM	NM	40	178	287	NM	24	41	1.7	6
	K in GPD/FT^2				0.3	1.8	3.0		0.25	0.43	0.02	0.06
Build-Up Jacob & Cooper Method	T in GPD/FT		NM	NM	7524	232	3300	NM	NM	NM	6.0	12
	K in GPD/FT^2				49	2.4	34				0.06	0.13
Build-Up BuRec Pressure Test Method	T in GPD/FT		NA	100	1020	1840	1240	121	95	177	49	155
	K in GPD/FT^2							1.26	0.99	1.8	0.51	1.6
Linear Flow Hypothesis on Build-Up			No	No	No	No	No	No	Possible	No	No	No
Observation Well			NA	NM					NM		NM	
Build-Up Theis Curve Matching	T in GPD/FT				7595	1930	6590	7020		6400-6550		10,000
Build-Up Theis Curve Matching	K in GPD/FT^2				50	20.1	68	73.1		66.7-68.2		104
Build-Up Theis Curve Matching	S				9.6E-5	8.5E-5	1.1E-4	1.8E-1		2.8E-4		1.8E-4
Build-Up Jacob & Cooper Method	T in GPD/FT				8850	6370	5280	4170		12,500		11,000
Build-Up Jacob & Cooper Method	K in GPD/FT^2				58.2	66.3	55	43		130		115
Build-Up Jacob & Cooper Method	S				8.0E-5	6.5E-5	1.7E-4	2.0E-4		1.1E-4		1.6E-4
Recovery Jacob & Cooper Method	T in GPD/FT				8360	7390	8600	NM		8000		10,000
Recovery Jacob & Cooper Method	K in GPD/FT^2				55	77.0	89.6			83		104

PHASE 1 TEST SUMMARY

		Test 1	Test 2	Test 3B	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10
Linear Flow Hypothesis on Build-Up				No	No	No	Yes		Yes		Yes
3. CONCLUSIONS OF ANALYSIS (See Notes)											
Most Representative Hydraulic Parameters											
In Immediate Area of Injection Well	T in GPD/FT	5210	180	7350	7390	4120	76	44	40	10	54
	K in GPD/FT^2	21*	2.5	48	77	43	0.70	0.46	0.42	0.11	0.54
	K in CM/Sec	1E-3*	1E-4	2.3E-3	3.6E-3	2.0E-3	3.8E-5	2.2E-5	2E-5	5E-6	2.7E-5
In Area Between Hole 213 and Hole 217	T in GPD/FT	NA	NA	7600	6880	6820	NA	NM	NA	NM	NA
	K in GPD/FT^2	NA	NA	50	72	71	NA	NM	NA	NM	NA
	K in CM/Sec	NA	NA	2.4E-3	3.4E-3	3.4E-3	NA	NM	NA	NM	NA
	S	NA	NA	9.6E-5	7.5E-5	1.4E-4	NA	NM	NA	NM	NA
Notes and Cautions			Low Confidence overall	Low Confidence near injection well							Low Confidence

Notes: NA = Not Applicable NM = Not Measurable All K Values Assume T/Full Test Interval
* Permeability Based on Only Inflow from 560 - 808 FT

Exxon, 1983. Crandon Project Ore Body Permeability Tests

Core Holes	253
	254
	255
	256
	257

CRANDON PROJECT
OREBODY PERMEABILITY TESTS

JANUARY 5, 1983

Submitted to:
Exxon Minerals Company, Crandon Project
Rhinelander, WI

Prepared by:
Exxon Minerals Company, Mine Engineering Division
Houston, Texas

FILE MAIN HYD
Sub AT
Sub BR
Keywords

CRANDON PROJECT
OREBODY PERMEABILITY TESTS

Submitted to:
Exxon Minerals Company, Crandon Project
Rhinelander, Wisconsin

Prepared by:
Exxon Minerals Company, Mine Engineering Division
Houston, Texas

January 5, 1983

CRANDON PROJECT
OREBODY PERMEABILITY TESTS

PURPOSE

In situ measurements of weathered zones in the Crandon Project ore body are needed to facilitate accurate computer modeling of the hydrogeology of the ore body. This program was designed to obtain approximate values for the permeabilities of three of the degrees of weathering by single well slug tests. The single well method was chosen over more sophisticated methods because of the limited amount of time and funds available.

TECHNICAL APPROACH

Theory

The instantaneous addition or removal of a finite volume of water, through a well, to an aquifer results in a stress being put on the aquifer to respectively absorb or replace the volume of water. This stress is relieved when the prestressed, potentiometric level of the aquifer is restored.

The test method consists of stressing the aquifer, by injection or pumping, until the water level is above or below the prestressed potentiometric level and measuring the rate of decline or recovery of the water level in the well. The data are plotted on semilog graph paper as decline or recovery versus time. The resulting graphical representation is analogous to the steady state of stress resulting from a long term pumping test. From the graph, data are measured which are then used to calculate the transmissivity and permeability of the aquifer.

Analytical solutions for the analysis of these tests are documented in the literature. For a more detailed explanation of this theory, consult the references given at the end of this report.

Application

In the program performed at the Crandon mine site the slug, or injection, test method was chosen as being the most adaptable to the situation. A slug test consists of pouring a known volume of water into the well. This process results in an increase in the hydraulic head in the well which will decline with time, as the water is pushed out into the aquifer. The advantage of this type of test over a pumping test is that it is not dependent on having specialized pumping equipment available.

At the Crandon mine site the wells were cased through the glacial overburden and then drilled into the bedrock by the air percussion drilling method.

These test sections of the wells were left as open holes, with no screen or casing. Following drilling, and after the drilling tools were removed from

the well, the wells were filled with water to the top of the casing and the rate of decline of the water level was measured with an electric water level indicator. The next test section was then drilled and the procedure repeated. Water level decline was measured for 30 minutes or until static water level was attained, whichever came first.

Data obtained from the field tests was plotted as drawdown (decline) in feet versus log time on semi-log graph paper. A best fit, straight line was drawn through the straightest portion of the plot, usually the latter portion, and the drawdown over one log cycle was measured. The Jacob's straight line approximation method yields the transmissivity of the aquifer from the following equation (Fetter, 1980):

$$T = \frac{264Q}{s}$$

Where: T = transmissivity, in gallons per day per foot
Q = rate of flow into the well, measured, in gallons per minute.
s = drawdown over one log cycle, in feet.

The constant is a conversion of units.

The horizontal permeability of the test section is then calculated from the equation (Fetter, 1980):

$$K = \frac{T}{M}$$

Where: K = coefficient of permeability, in gallons per day per square foot.
T = transmissivity, in gallons per day per foot.
M = thickness of the test section, in feet.

Test Analyses

The following table summarizes the results of the tests for each type of weathering that was tested:

SUMMARY OF SLUG TEST ANALYSES

Well Number	Degree of Weathering				
	Weak	Low	Moderate	Strong	Strong
HW 253+ H/w	4.8 1.7 X 10^{-8} (258-375)		13 6.4 X 10^{-8} (167-258)		
FW 254 SS		14 7.0 X 10^{-8} (315-435)	7.8 3.4 X 10^{-8} (217-315		
255*				H/w 13 HW 1.7 X 10^{-7} (252-300)	MS 1867 MS 8.9 X 10^{-6} (300-426)
MS 256 MS			139 9.8 X 10^{-7} (282-394)	290 2.5 X 10^{-6} (167-282)	
FW 257 f/w		(Averaged) 8.1 7.6 X 10^{-8}			

NOTES:

+ Revised 8/10/82 to conform with R. Rowe's interpretation of bedrock weathering.

* Both tests in Well 255 were in strongly weathered rock. The lower zone was a strongly leached, gossan.

LEGEND

Transmissivity (gpd/ft)

Permeability (meters/sec)

(Test Interval, feet)

In the first section tested the transmissivity and permeability are calculated directly from the data. When the well is deepened and the extended section tested, the transmissivity of the total test section is obtained from the data. The transmissivity of the upper section must then be subtracted out of the total to obtain the transmissivity of the lower section. Permeabilities for the second and third zones tested are then calculated using the corrected value of tranmissivity and the thickness of the section tested.

All of these tests were analyzed as though the permeability of the rock was uniform throughout the test section. In actuality, the permeability of the section could be accounted for by one or two open joints or fractures. The well construction methods did not yield any information regarding fracturing and no geophysical or geologic logs were made of the wells.

CONCLUSIONS AND RECOMMENDATIONS

Permeabilities of the various weathered zones are within ranges that are reasonable for the type of rock and degrees of weathering that were encountered. Values obtained for each classification of weathering tested are in general agreement with those values used by Thomas A. Prickett and Associates in their modeling of the hydrogeologic impacts of mining. The only significant difference is in the mild weathering zone the permeabilities are generally one order of magnitude lower than the ones used in the model. This difference is the moderate zone would probably result in a slight reduction of inflow to the mine, but the reduction in flow should not be significant. It should also be recognized that the permeability values obtained by these slug tests are point values, whereas the permeabilities used in the hydrogeologic model of the mine impacts were based on averages over the area of the mine.

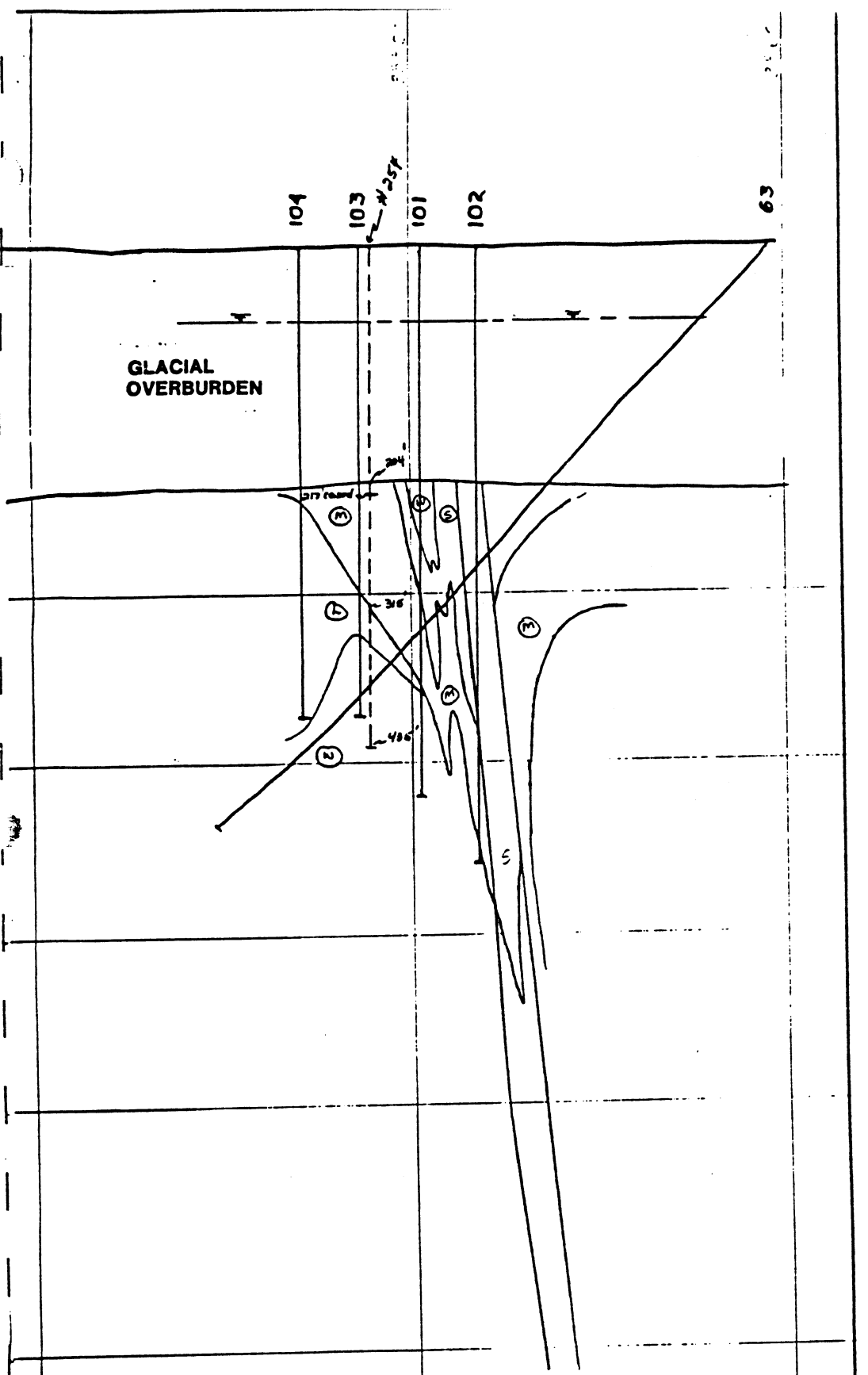
The analyses performed in this study are approximations. In order to obtain accurate values of permeability for future mine inflow studies, a program of pumping tests in the ore body, accompanied by a comprehensive geophysical logging program, must be implemented. These tests should be implemented as soon as possible to avoid repeated redesign of mining plans to accommodate new hydrology data.

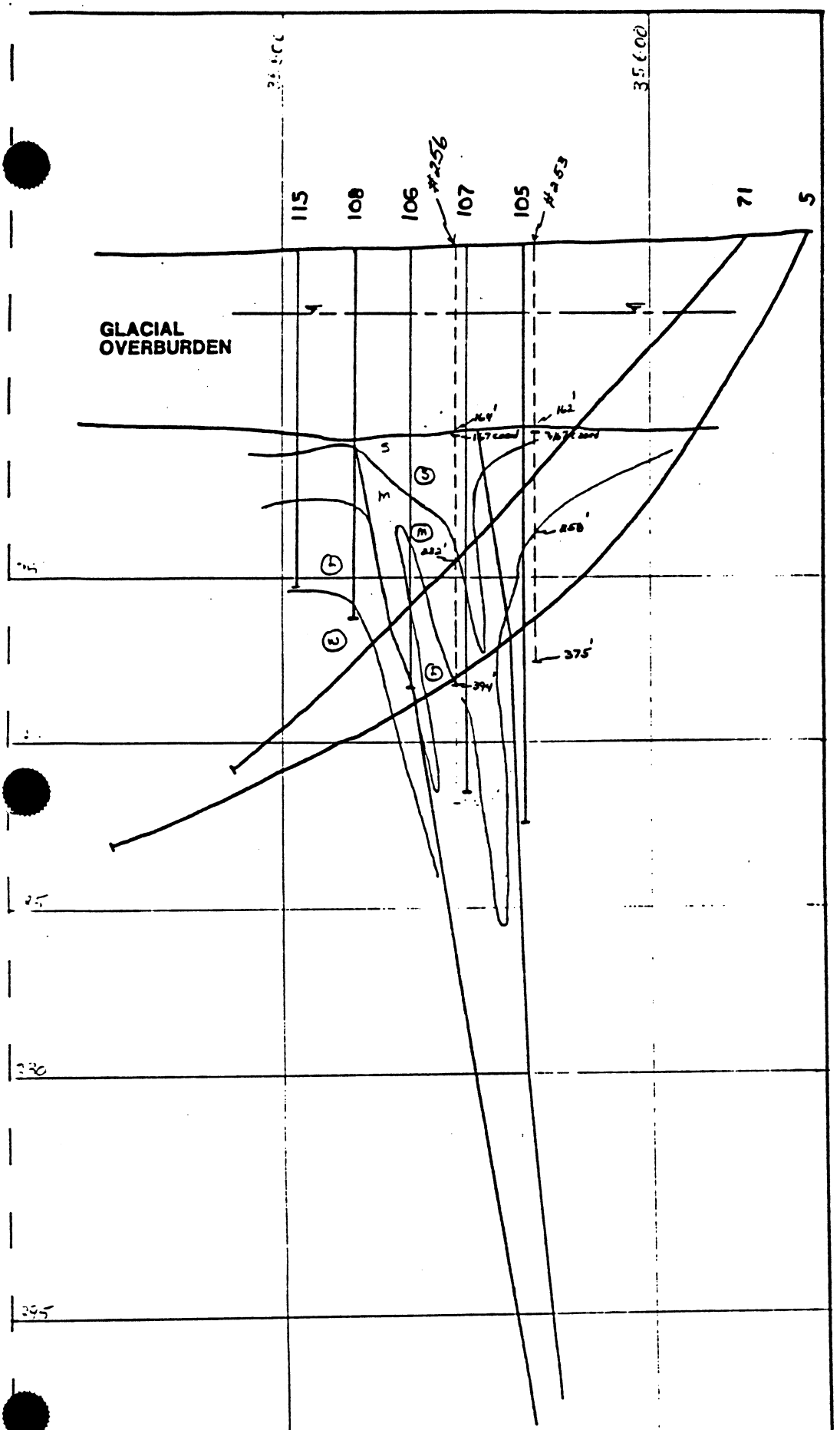
References

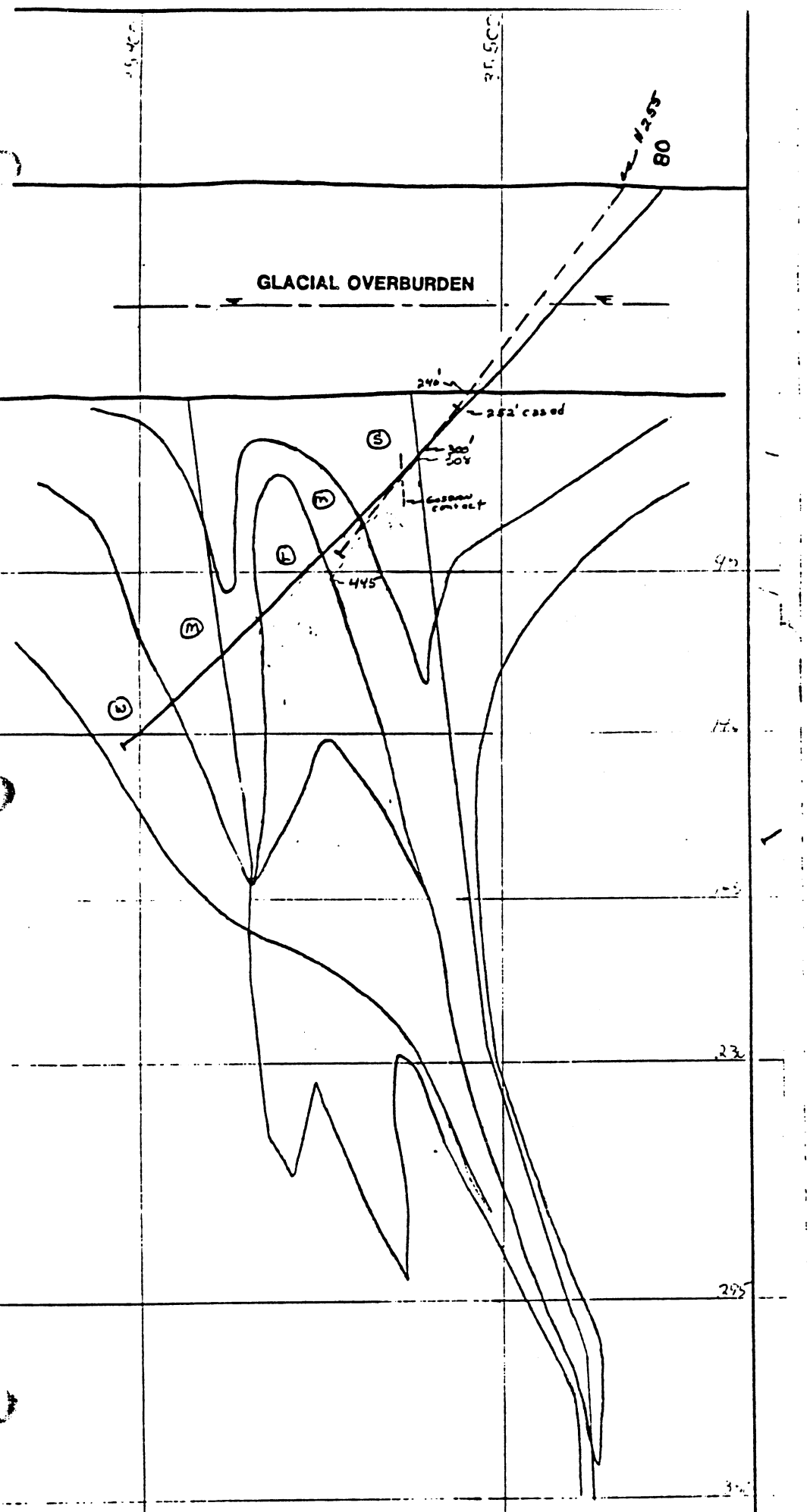
Bouwer, H., 1978, Groundwater Hydrology, McGraw-Hill, New York, N.Y.

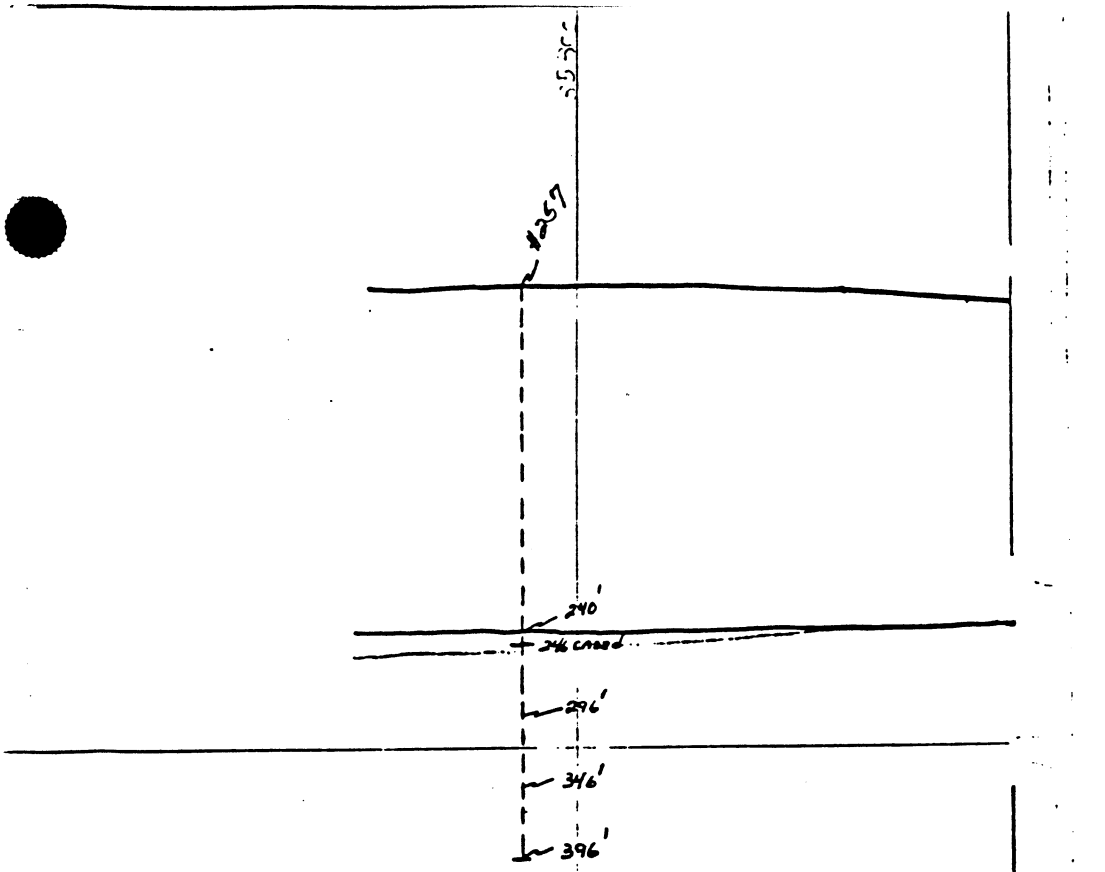
Fetter, C. W. Jr., 1980, Applied Hydrogeology, C. E. Merrill Publishing Co., Columbus, OH

Freeze, R. A. and J. A. Cheery, 1979, Groundwater, Prentice-Hall Inc., Englewood Cliff, N.J.


104
103
N-35E
101
102
63
GLACIAL
OVERBURDEN
394'
375' round
M
W
S
L
316'
M
M
486'
Z
S


3500
115
108
106
#256
107
105
#253
71
5
GLACIAL
OVERBURDEN
442'
462'
458'
382'
375'
394'
350


N25E
80
GLACIAL OVERBURDEN
240'
252' cased
300'
50%
445
S
M
L
M
S


1257
240'
346 casing
296'
346'
396'

STS Consultants, Ltd. 1984 Bedrock Slug Tests

Wells EX-5AU
EX-5AL
EX-9AL

TEST DATE 4/17/84

STS CONSULTANTS LTD. - FIELD ENGINEERING SERVICES
SINGLE WELL HYDRAULIC CONDUCTIVITY TEST

STS JOB NO.: 12959
PROJECT/LOCATION: EXXON/CRANDON
PROJECT MANAGER: JAS
TEST TECHNICIAN: JCG
DATA ANALYST: PMB

TEST INFORMATION

TYPE: FALLING HEAD METHOD: SLUG

PIEZOMETER ID: EX5AL
SCREEN LENGTH: 3.0000 feet
SLOT SIZE (est.): 0.0200 inches
STANDPIPE RADIUS: 1.0000 inches
BOREHOLE RADIUS: 3.1250 inches
GRAVEL PACK LENGTH: 8.0000 feet
GRAVEL PACK PERM.: 0.35E-01 ft./sec.
SCREEN PERMEABILITY: 0.35E-02 ft./sec.

LENGTH USED FOR CALCULATION: 8.00 ft.

THE GRAVEL LENGTH WILL BE USED FOR CALC.

SLUG LENGTH: 20.00 feet
SLUG RADIUS: 0.50 inches

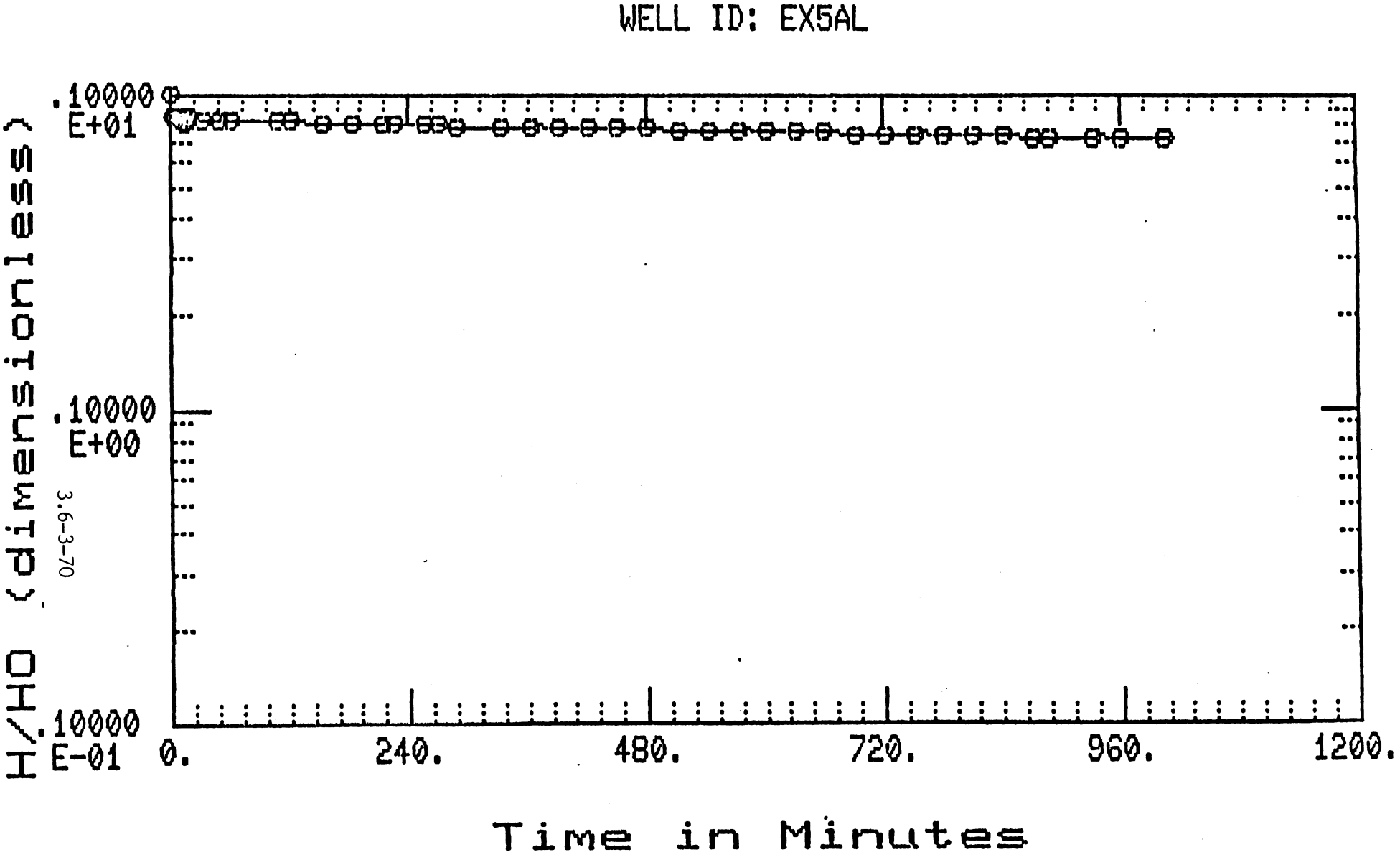
TRANSDUCER USED: 25.00 psi
INITIAL READING: 50.40% of 25.00 psi

DATA POINTS SELECTED

1. TIME: 32.50 minutes HEAD: 56.62 % of 25.00 psi
2. TIME: 1007.50 minutes HEAD: 55.72 % of 25.00 psi

HYDRAULIC CONDUCTIVITY OF TEST INTERVAL:

0.12E-06 cm/sec 0.40E-08 ft/sec 0.12E-08 m/sec


WELL ID: EX5AL
.10000 E+01
.10000 E+00
.10000 E-01
H/HO (dimensionless)
0.
240.
480.
720.
960.
1200.
Time in Minutes

3.6-3-70

WELL ID: EXSAL

TEST DATA:

MEASUREMENT NUMBER	TIME (HH:MM:SS)	TRANSDUCER READING (% of 25.00 psi)	HEAD RATIO (H/HO)
1	0:10:30	57.90	1.0000
2	0:11: 0	56.72	0.8427
3	0:11:45	56.75	0.8467
4	0:13:15	56.77	0.8493
5	0:15: 0	56.80	0.8533
6	0:16: 0	56.75	0.8467
7	0:17: 0	56.67	0.8360
8	0:19: 0	56.65	0.8333
9	0:21: 0	56.62	0.8293
10	0:24: 0	56.45	0.8067
11	0:25: 0	56.65	0.8333
12	0:27: 0	56.62	0.8293
13	0:29: 0	56.72	0.8427
14	0:43: 0	56.62	0.8293
15	0:58: 0	56.60	0.8267
16	1:13: 0	56.52	0.8160
17	1:58: 0	56.50	0.8133
18	2:13: 0	56.47	0.8093
19	2:43: 0	56.45	0.8067
20	3:13: 0	56.42	0.8027
21	3:43: 0	56.40	0.8000
22	3:58: 0	56.37	0.7960
23	4:28: 0	56.35	0.7933
24	4:43: 0	56.32	0.7893
25	4:58: 0	56.30	0.7867
26	5:43: 0	56.27	0.7827
27	6:13: 0	56.25	0.7800
28	6:43: 0	56.22	0.7760
29	7:13: 0	56.20	0.7733
30	7:43: 0	56.17	0.7693
31	8:13: 0	56.15	0.7667
32	8:43: 0	56.12	0.7627
33	9:13: 0	56.10	0.7600
34	9:43: 0	56.07	0.7560
35	10:13: 0	56.05	0.7533
36	10:43: 0	56.02	0.7493
37	11:13: 0	56.00	0.7467
38	11:43: 0	55.97	0.7427
39	12:13: 0	55.95	0.7400
40	12:43: 0	55.92	0.7360
41	13:13: 0	55.90	0.7333
42	13:43: 0	55.87	0.7293
43	14:13: 0	55.85	0.7267
44	14:43: 0	55.82	0.7227
45	14:58: 0	55.80	0.7200
46	15:43: 0	55.77	0.7160
47	16:13: 0	55.75	0.7133
48	16:58: 0	55.72	0.7093
49	16:58: 0	55.72	0.7093

SINGLE WELL HYDRAULIC CONDUCTIVITY TEST

STS JOB NO.: 12959
PROJECT/LOCATION: EXXON/CRANDON
PROJECT MANAGER: JAS
TEST TECHNICIAN: JCG
DATA ANALYST: PMB/JRT

TEST INFORMATION

TYPE: FALLING HEAD METHOD: SLUG

PIEZOMETER ID: EX5AU
SCREEN LENGTH: 3.0000 feet
SLOT SIZE (est.): 0.0200 inches
STANDPIPE RADIUS: 1.0000 inches
BOREHOLE RADIUS: 3.1250 inches
GRAVEL PACK LENGTH: 7.0000 feet
GRAVEL PACK PERM.: 0.35E-01 ft./sec.
SCREEN PERMEABILITY: 0.35E-02 ft./sec.

LENGTH USED FOR CALCULATION: 7.00 ft.

THE GRAVEL LENGTH WILL BE USED FOR CALC.

SLUG LENGTH: 15.00 feet
SLUG RADIUS: 0.50 inches

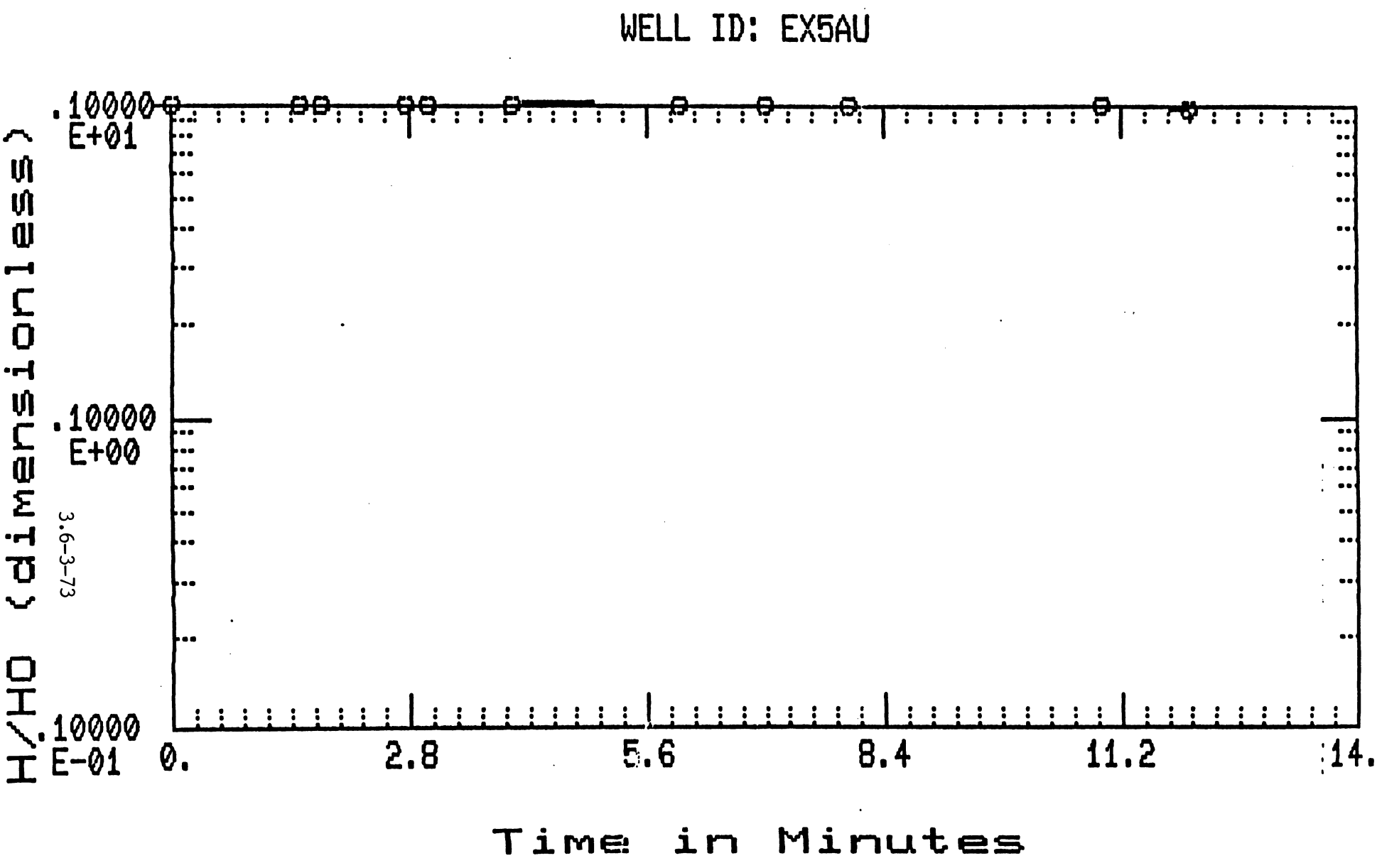
TRANSDUCER USED: 25.00 psi
INITIAL READING: 30.05% of 25.00 psi

DATA POINTS SELECTED

1. TIME: 3.00 minutes HEAD: 36.45 % of 25.00 psi
2. TIME: 12.00 minutes HEAD: 36.30 % of 25.00 psi

HYDRAULIC CONDUCTIVITY OF TEST INTERVAL:

0.22E-05 cm/sec 0.72E-07 ft/sec 0.22E-07 m/sec


WELL ID: EX5AU
.10000 E+01
.10000 E+00
.10000 E-01
H/HO (dimensionless)
3.6-3-73
0.
2.8
5.6
8.4
11.2
14.
Time in Minutes

WELL ID: EX5AU

TEST DATA:

MEASUREMENT NUMBER	TIME (HH:MM:SS)	TRANSDUCER READING (% of 25.00 psi)	HEAD RATIO (H/HO)
1	17:25: 0	36.45	1.0000
2	17:26:30	36.45	1.0000
3	17:26:45	36.42	0.9953
4	17:27:45	36.45	1.0000
5	17:28: 0	36.45	1.0000
6	17:29: 0	36.40	0.9922
7	17:31: 0	36.35	0.9844
8	17:32: 0	36.32	0.9797
9	17:33: 0	36.35	0.9844
10	17:36: 0	36.32	0.9797
11	17:37: 0	36.30	0.9766

TEST DATE 4/16/84

STS CONSULTANTS LTD. - FIELD ENGINEERING SERVICES
SINGLE WELL HYDRAULIC CONDUCTIVITY TEST

STS JOB NO.: 12959
PROJECT/LOCATION: EXXON/CRANDON
PROJECT MANAGER: JAS
TEST TECHNICIAN: JCG
DATA ANALYST: PMB

TEST INFORMATION

TYPE: FALLING HEAD METHOD: SLUG

PIEZOMETER ID: EX9AL
SCREEN LENGTH: 3.0000 feet
SLOT SIZE (est.): 0.0200 inches
STANDPIPE RADIUS: 1.0000 inches

BOREHOLE RADIUS: 3.1250 inches
GRAVEL PACK LENGTH: 7.0000 feet
GRAVEL PACK PERM.: 0.35E-01 ft./sec.
SCREEN PERMEABILITY: 0.35E-02 ft./sec.

LENGTH USED FOR CALCULATION: 7.00 ft.

THE GRAVEL LENGTH WILL BE USED FOR CALC.

SLUG LENGTH: 20.00 feet

SLUG RADIUS: 0.50 inches

TRANSDUCER USED: 25.00 psi

INITIAL READING: 52.32% of 25.00 psi

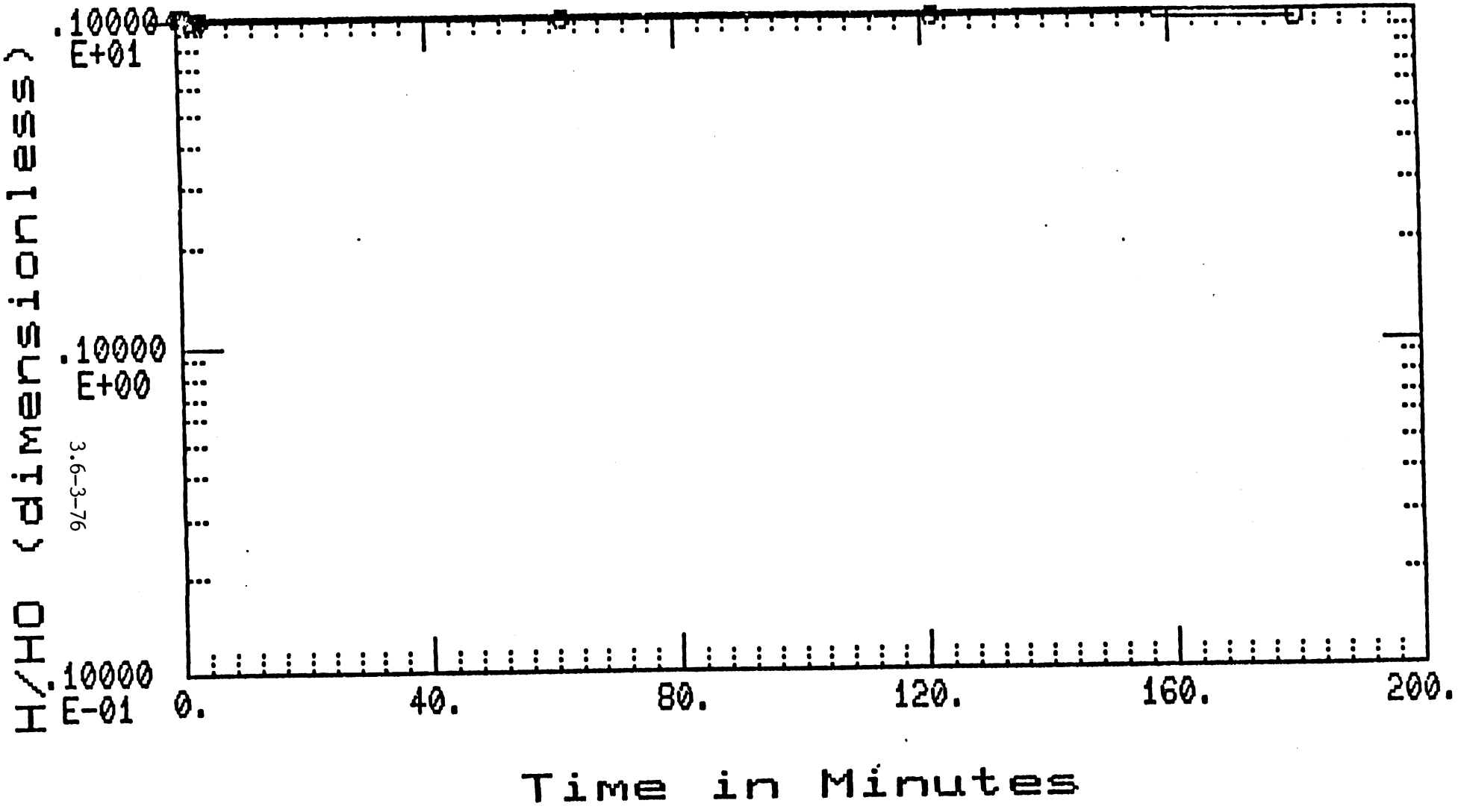
DATA POINTS SELECTED

1. TIME: 62.00 minutes HEAD: 56.30 % of 25.00 psi
2. TIME: 180.75 minutes HEAD: 56.29 % of 25.00 psi

HYDRAULIC CONDUCTIVITY OF TEST INTERVAL:

0.18E-07 cm/sec 0.58E-09 ft/sec 0.18E-09 m/sec

WELL ID: EX9AL



3.6-3-76

L ID: EX9AL

EST DATA:

MEASUREMENT NUMBER	TIME (HH:MM:SS)	TRANSDUCER READING (% of 25.00 psi)	HEAD RATIO (H/HO)
1	10:28: 0	56.50	1.0000
2	10:28:30	56.48	0.9952
3	10:28:45	56.46	0.9904
4	10:29:15	56.42	0.9809
5	10:30: 0	56.40	0.9761
6	10:30:30	56.32	0.9569
7	10:32: 0	56.30	0.9522
8	11:30: 0	56.30	0.9522
9	12:30: 0	56.30	0.9522
10	13:28:45	56.29	0.9498

Appendix 3.6-4

Golder Associates 1981 Pump Test Analyses, Crandon Project Waste Disposal System

HYD-AT-OB-6

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

Report on

PUMP TEST AND ANALYSES
CRANDON PROJECT
WASTE DISPOSAL SYSTEM
PROJECT REPORT 4

Submitted to:

Exxon Minerals Company
Post Office Box 813
Rhinelander, Wisconsin 54501

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786085

September, 1981

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Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

September 30, 1981

786085/MA/320
F/N 175.1

Exxon Minerals Company
P. O. Box 813
Rhinelander, Wisconsin 54501

Attention: Mr. C. E. Fowler

Re: Waste Disposal System
Crandon Project
Crandon, Wisconsin

Gentlemen:

We are pleased to present the final draft of Project Report 4, Pump Test and Analyses, Crandon Project Waste Disposal System. This report presents a detailed description of the test well installation, observation well installations, procedures used in performing the flow velocity test and pump test, and analyses of the data. A conceptual model of the hydrologic system around the test well is described and hydraulic parameters for the groundwater system presented.

We appreciate the continuing opportunity to provide services to Exxon Minerals Company for the Crandon Project and extend our thanks to you and the Exxon staff for their excellent cooperation.

Very truly yours,

GOLDER ASSOCIATES

Gary H. Collison

Gary H. Collison, P.E.
Associate

GHC:dap

3.6-4-2

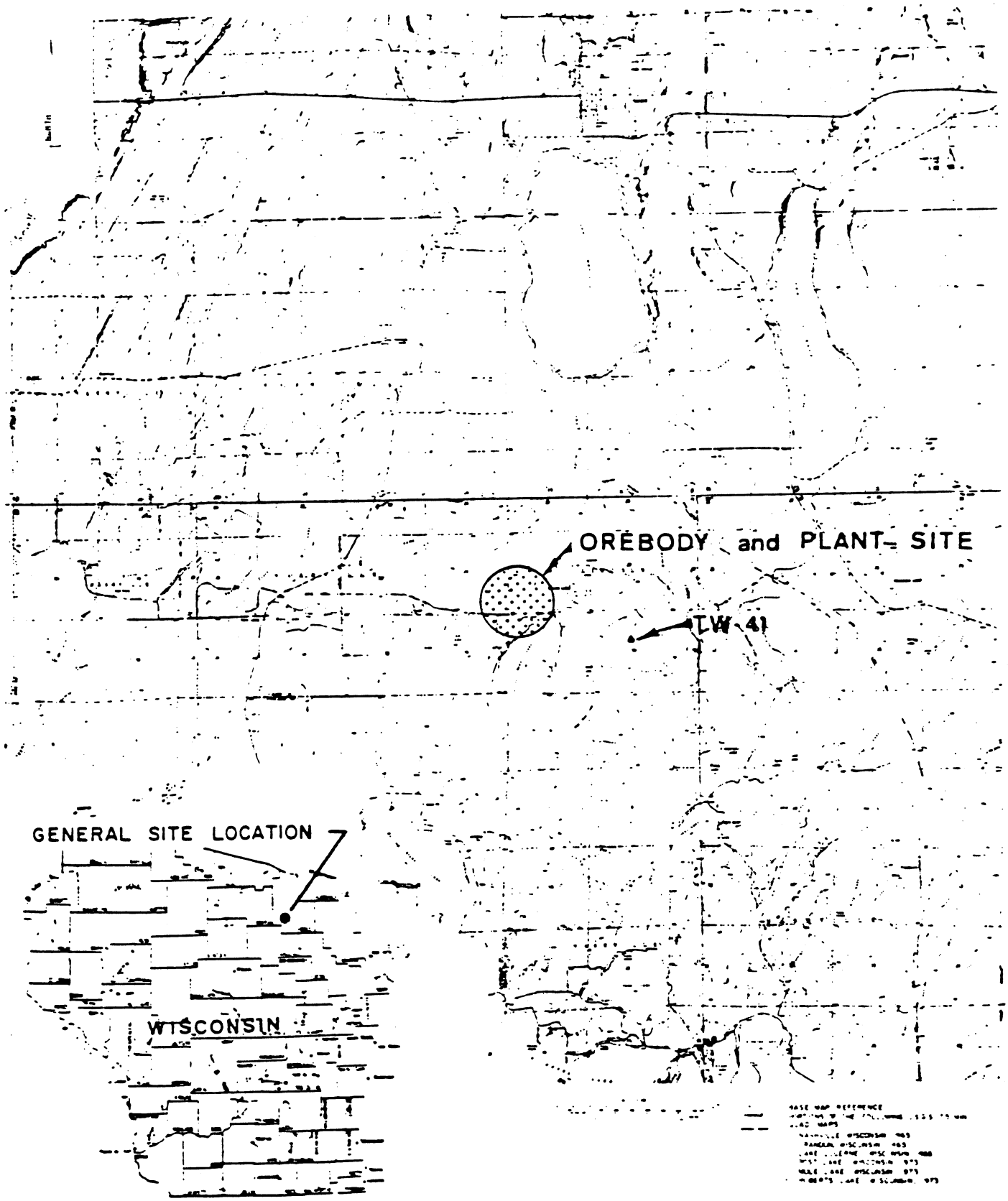
MANAGEMENT SUMMARY

Exxon Minerals Company is evaluating the feasibility of developing a waste disposal facility for a copper/lead/zinc mine and mill complex in an area south of Crandon, Wisconsin. As a part of the investigation of the geohydrologic system a major pump test was conducted in the summer of 1980 at one of the potential disposal areas known as Site 41. The location of the test site is shown on Figure S-1.

The geology of the pump test site is essentially as follows:

- An upper layer of till, 190 ft. (57.9 meters) thick, of which the lower 80 ft. (24.4 meters) is saturated.
- A middle layer of stratified drift, 70 ft. (21.3 meters) thick, of higher hydraulic conductivity than the till.
- A lower layer of till, and some fine stratified drift, 70 ft. (21.3 meters) thick, of lower hydraulic conductivity than the middle layer.
- A base of bedrock, of substantially lower hydraulic conductivity than any of the granular materials overlying it.

The installations for the pump test were comprised of a test well, 13 primary observation wells which were read regularly, and 16 secondary observation wells which were read less frequently. The test well and most of the primary observation wells were installed specifically for the test, while the remainder of the observation wells had been installed as part of previous subsurface exploration and monitoring programs. The test well and observation well locations are shown on Figure S-2.



SITE LOCATION PLAN

FIGURE 5-1

Scale GRAPHIC
Date 7-31-81
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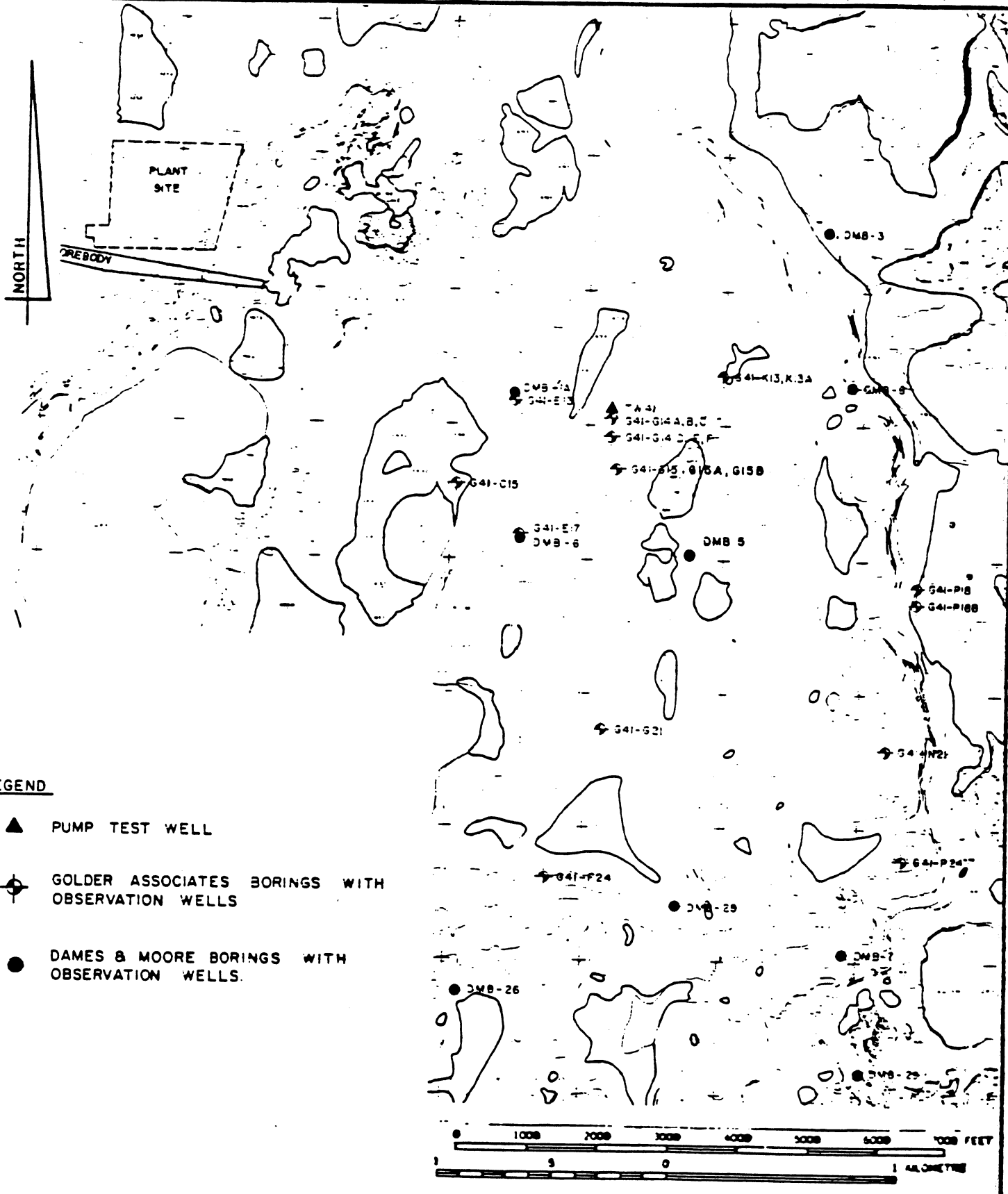

LEGEND

- ▲ PUMP TEST WELL
- ⌖ GOLDER ASSOCIATES BORINGS WITH OBSERVATION WELLS
- ● DAMES & MOORE BORINGS WITH OBSERVATION WELLS.

PUMP TEST LOCATION PLAN

FIGURE S-2

Scale GRAPHIC
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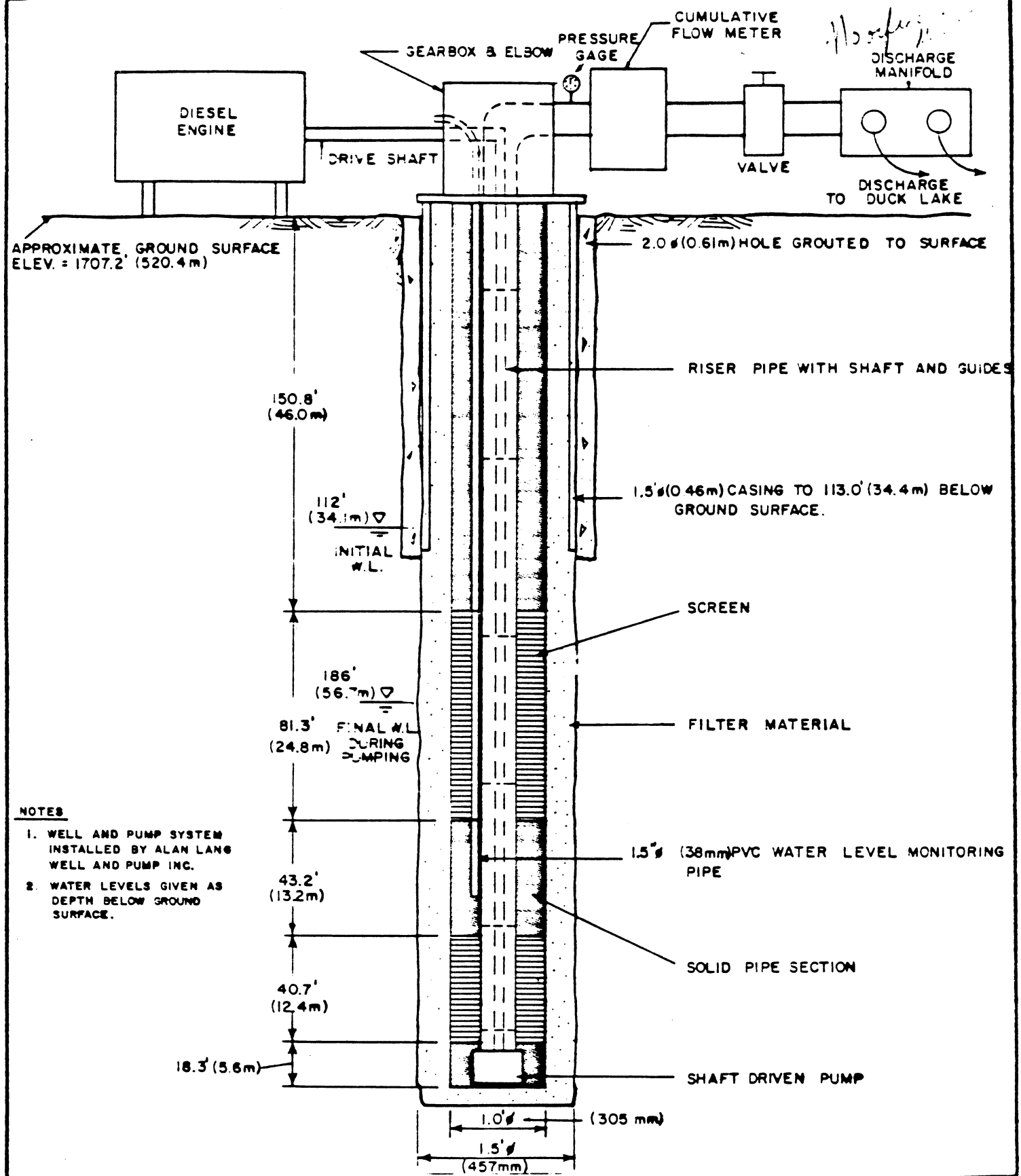
Checked JFC
Reviewed GHC

The test well construction and pump arrangement are shown in Figure S-3. The well is screened over essentially the full depth of saturated material, gravel packed, and has grouted surface casing through the unsaturated till material. A shaft driven diesel powered pump with a flow capacity of 1500 gpm (0.095 cubic meters per second) was used in the main test, while a smaller, nominal 400 gpm (0.025 cubic meters per second), submersible electric pump was used in preliminary testing.

Observation wells were completed at various elevations and various distances from the test well so as to observe the behavior of the entire system during the test. Some observation wells were completed so as to monitor water pressures at essentially one level in the groundwater system, by sealing a screened standpipe tip at that location. Typical installation details are shown in Figure S-4.

Prior to the beginning of the main pump test, a flow velocity profile of the test well was obtained in order to evaluate the hydraulic conductivity of the materials penetrated by the well. This test was performed on June 6, 1980, using the Johnson flow profiler at a well production of about 530 gpm (0.033 cubic meters per second).

The main well test was conducted over the period from June 6, 1980 to September 10, 1980. The well was pumped at an average rate of 1420 gpm (0.090 cubic meters per second) for 24 days, starting on June 27, 1980, producing a maximum drawdown of 73 ft. (22 meters) at the well. The observation



NOTES

1. WELL AND PUMP SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP INC.
2. WATER LEVELS GIVEN AS DEPTH BELOW GROUND SURFACE.

SCHEMATIC OF TEST WELL SETUP

FIGURE S-3

Scale AS SHOWN
Date 1-21-81
Job No. 786085

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3.6-4-5

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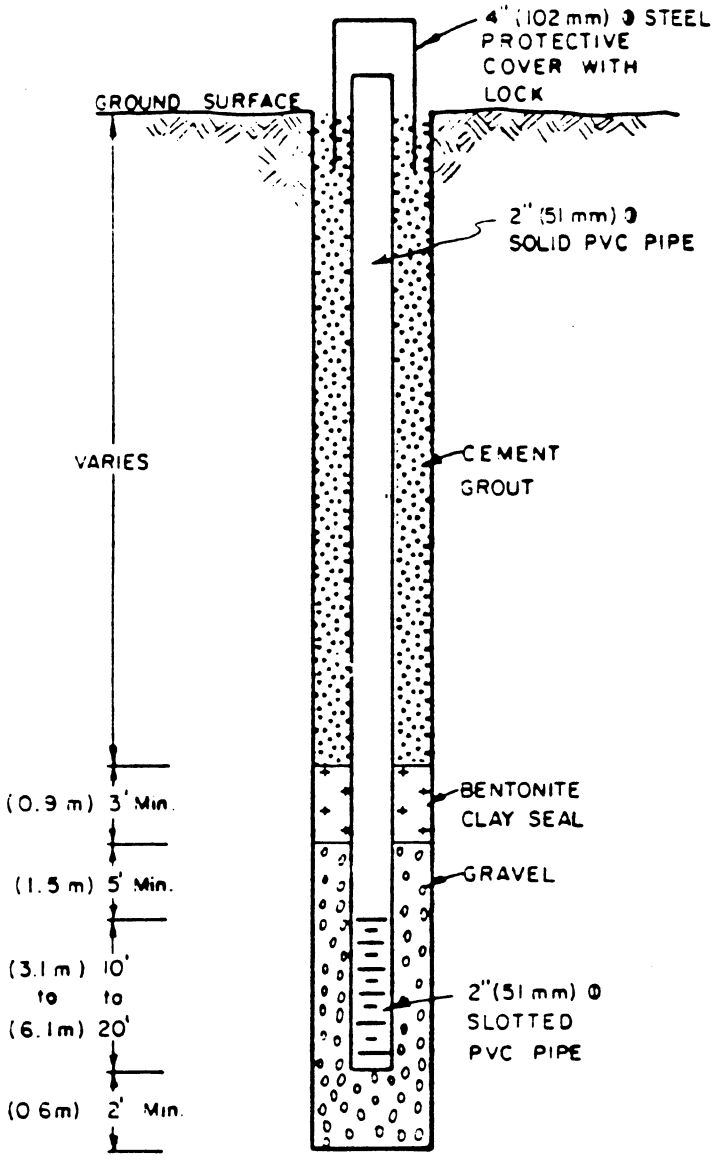
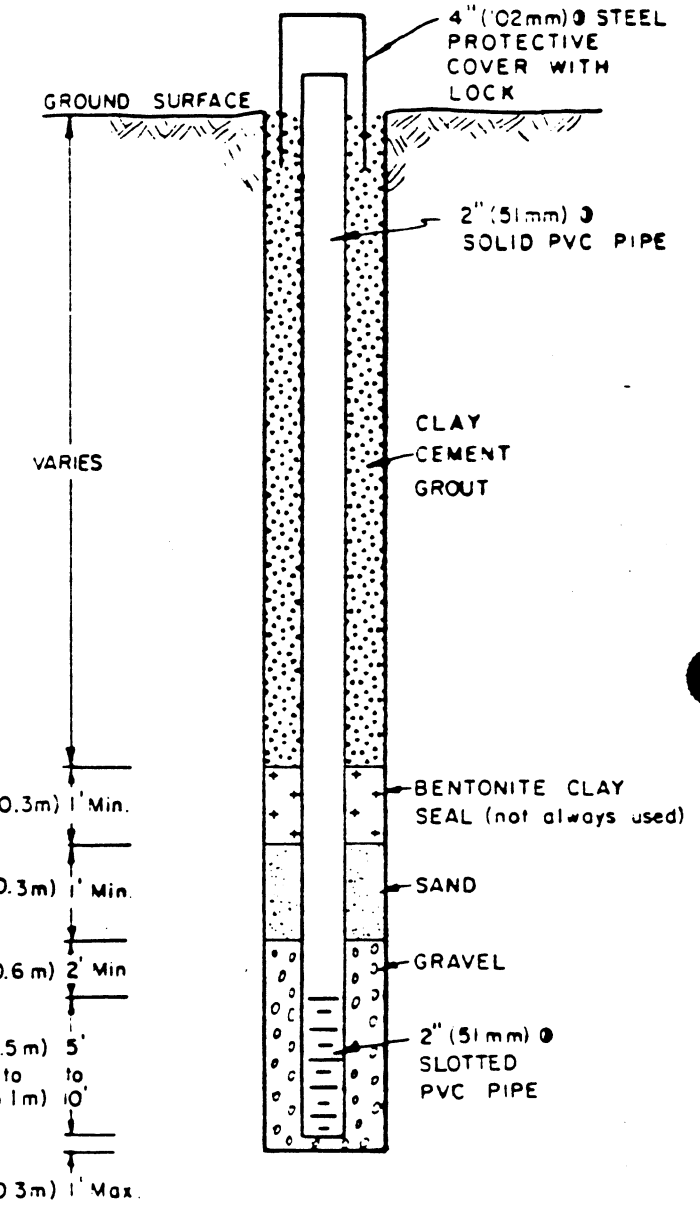
Golder Associates



Dames & Moore



TYPICAL OBSERVATION WELL INSTALLATIONS

FIGURE S-4

Scale Not to Scale
Date 1-20-81
Job No. 786085

Golder Associates

3.6-4-6

Drawn S K B
Checked M R B
Reviewed J F C

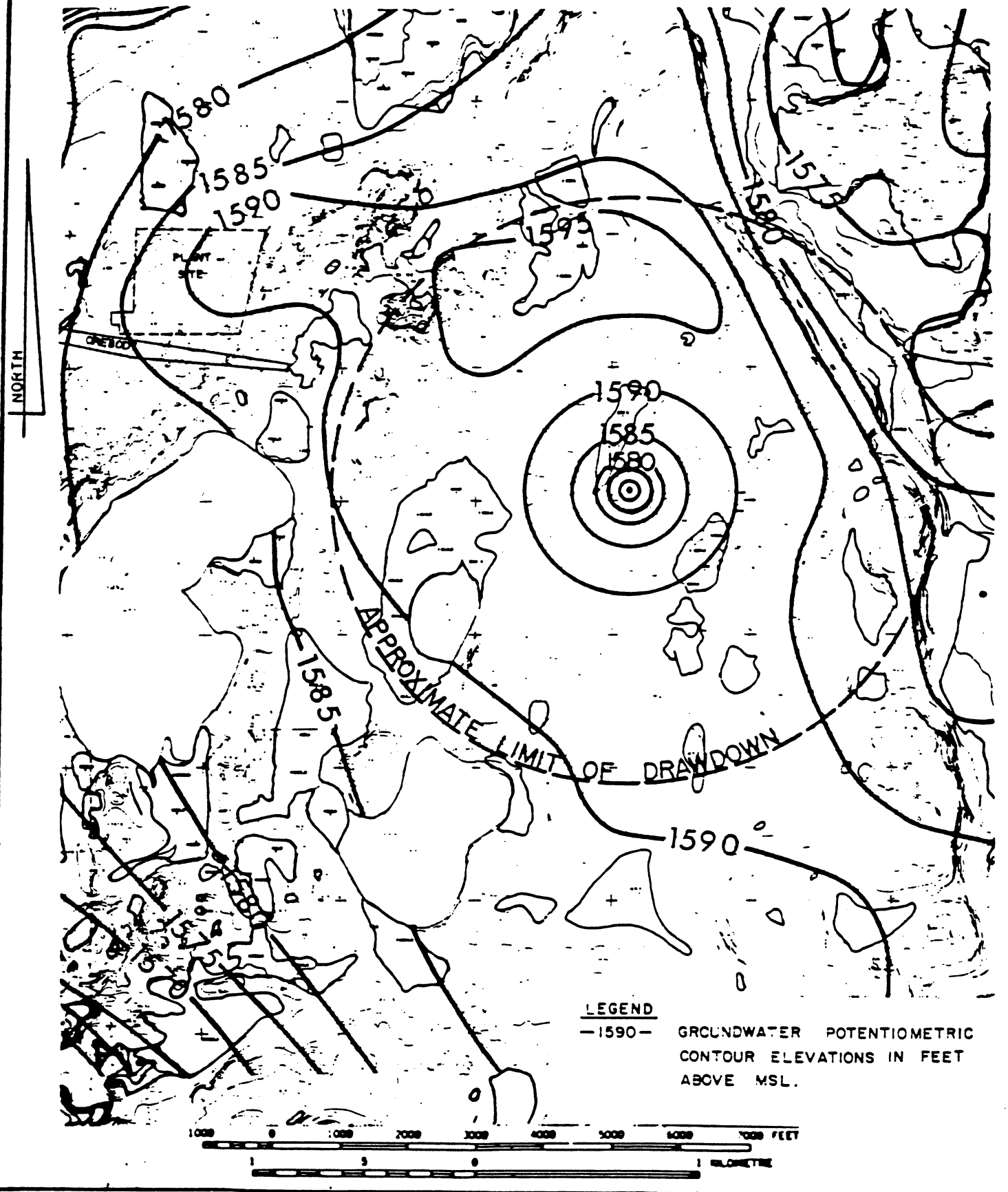
wells responded to the pumping for a distance up to 4000 ft. (1220 meters) from the well. The approximate potentiometric map in the stratified drift layer at the end of the pumping period for the test is shown on Figure S-5. Recovery was monitored for 52 days after the pump was turned off.

Detailed analyses of all the data collected during the test was performed to develop an understanding of the dynamic behavior of the groundwater system at the site, and to develop the hydrogeologic parameters which characterize each material. The results of these analyses were then combined to produce a geohydrologic model of the test site, which is presented in Figure S-6.

The performance of this pump test and analyses of the results has:

- established the geohydrologic conditions at the test site for use in regional model calibration and local seepage studies,
- demonstrated the feasibility of altering the potentiometric surface by well pumping,
- demonstrated the availability of a sustained yield of up to 950 gpm (0.060 cubic meters per second) of water from the test well, and a maximum yield of 3000 gpm (0.189 cubic meters per second),
- provided a monitoring system in one potential disposal area near the mine site.

The method of performance of the tests, and the extensive instrumentation of the groundwater system allow a high degree of confidence in the results.



EFFECT OF PUMP TEST ON POTENTIOMETRIC MAP

FIGURE S-5

Scale GRAPHIC
Date 2 - 17 - 81
Job No. 786085

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3.6-4-8

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Checked JFC
Reviewed GHC

A. ENGLISH UNITS					
GEOLOGY	THICKNESS (ft)	PARAMETERS			
		k_h (ft/sec)	k_v (ft/sec)	S_s (ft^{-1})	n_d (%)
TILL	110	ABOVE NATURAL GROUNDWATER LEVEL			
TILL	80	9.3×10^{-6}	3.1×10^{-6}	4.6×10^{-6}	5.4
COARSE GRAINED STRATIFIED DRIFT	70	4.3×10^{-4}	4.3×10^{-5}	4.6×10^{-6}	7.0
TILL	70	9.3×10^{-6}	3.1×10^{-6}	4.6×10^{-6}	5.4
BEDROCK		FUNCTIONALLY IMPERMEABLE			

B. SYSTEM INTERNATIONAL					
GEOLOGY	THICKNESS (m)	PARAMETERS			
		k_h (m/s)	k_v (m/s)	S_s (m^{-1})	n_d (%)
TILL	35	ABOVE NATURAL GROUNDWATER LEVEL			
TILL	25	2.8×10^{-6}	9.4×10^{-7}	1.5×10^{-5}	5.4
COARSE GRAINED STRATIFIED DRIFT	20	1.3×10^{-4}	1.3×10^{-5}	1.5×10^{-5}	7.0
TILL	20	2.8×10^{-6}	9.4×10^{-7}	1.5×10^{-5}	5.4
BEDROCK		FUNCTIONALLY IMPERMEABLE			

LEGEND:

(1) k_h = horizontal hydraulic conductivity
k_v = vertical hydraulic conductivity
S_s = specific storage
n_d = drainable porosity (specific yield)

(2) Unshaded Values: Results obtained directly from pump test
Shaded Values: Inferred or estimated from the pump test results

BEHAVIORAL PARAMETERS AND HYDROGEOLOGIC MODEL

FIGURE S-6

Scale NO SCALE
Date 2-17-81
Job No. 786085

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Checked GHC
Reviewed GHC

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

PUMP TEST AND ANALYSES

CRANDON PROJECT

WASTE DISPOSAL SYSTEM

PROJECT REPORT 4

Prepared for:

Exxon Minerals Company
Post Office Box 813
Rhinelander, Wisconsin 54501

By:
Golder Associates

Adrian Brown
Principal

Gary H. Collison
Associate

John F. Clerici
Senior Engineer

786085

3.6-4-10

September, 1981

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1.0 INTRODUCTION

Exxon Minerals Company proposes to mine a copper/lead/zinc orebody near Crandon, Wisconsin using underground techniques. Golder Associates was retained by Exxon to develop preliminary designs for the waste disposal facilities. A long term pumping test was performed to provide an understanding of the groundwater system parameters and aquifer characteristics in support of the geohydrologic modeling and evaluation for the Crandon Project. This report presents the details, performance, analysis, and results of this pump test.

The well extended 334 feet (101.8 m) below the ground surface, and tapped all but a small section of the saturated glacial strata. The well was pumped for 24 days at an average rate of 1420 gpm (0.090 m^3/s). Prior to, during, and after the pumping period, the groundwater levels were monitored through a series of observation wells. The data from the test have been analyzed to provide an understanding of the behavior of groundwater regime.

2.0 PERMIT REQUIREMENTS

A request for approval of the well and pump installation was made on March 7, 1980, to the Private Water Supply Section of the Bureau of Water Quality of the Wisconsin Department of Natural Resources as required by Wisconsin Administrative Code NR 112.26(1) High Capacity Well Approvals. This application was subsequently approved by letter dated April 29, 1980, from Mr. Kevin Kessler of the Private Water Supply Section to Mr. Robert L. Russell, Manager, Crandon Project.

An inquiry determination of need for a WPDES permit for test well water discharge was submitted with a completed WPDES Wastewater Discharge Permit Application on April 15, 1980, to Mr. Kenneth Wiesner, Industrial Wastewater Section, Bureau of Water Quality, Wisconsin Department of Natural Resources. A discharge permit was not required for the test well discharge as confirmed by letter dated May 16, 1980, from Ms. Stephanie Regal, Bureau of Water Quality Permit Coordinator to Mr. Robert L. Russell.

3.0 SITE CONDITIONS

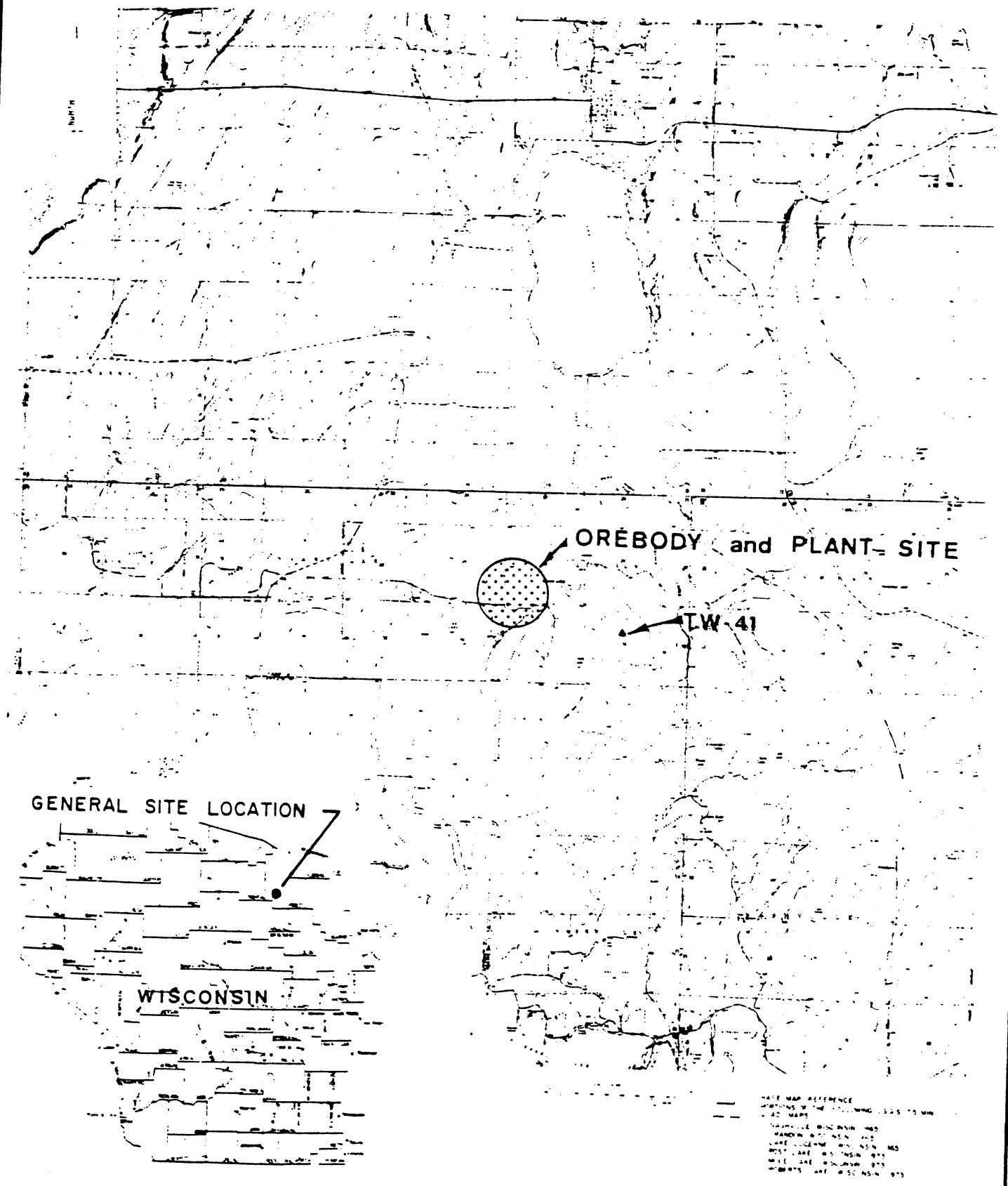
3.1 Location

The Crandon orebody is located about 6.2 miles (10 km) south of Crandon, Wisconsin as shown on Figure 3.1. The test well is located within the proposed Site 41 waste disposal area, and is shown on Figure 3.2. This area was selected for the test well because Site 41 is presently considered the preferred waste disposal site, based on earlier siting studies. The test well was situated on a topographic ridge in order to minimize the potential of future disturbance of the well during site development. It is planned that this well will be available as a water supply well and/or a groundwater monitoring well for the project.

The test well was also located so that some of the groundwater observation wells installed during the initial subsurface exploration programs for the waste disposal area could be used for monitoring. Several additional observation wells, G41-G14A through F, were installed specifically for pump test monitoring. The locations of the groundwater observation wells used in monitoring the pump test program are shown on Figure 3.2. Observation wells used for frequent monitoring were those within about 1500 feet (457.2 m) of the test well and those with screened openings in the various subsurface materials below the groundwater level. The detailed locations of these 13 primary observation wells are shown on Figure 3.3. The test well is far enough from the lakes and major wetlands so that the test was not significantly influenced by their presence.

3.2 Subsurface Materials

The overburden soils in the Crandon Project area are predominantly very dense glacial till, stratified drift, and outwash. Below the glacial soils the basement rock is pri-



SITE LOCATION PLAN

FIGURE 3.1

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Date 7-31-81
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3.6-4-19

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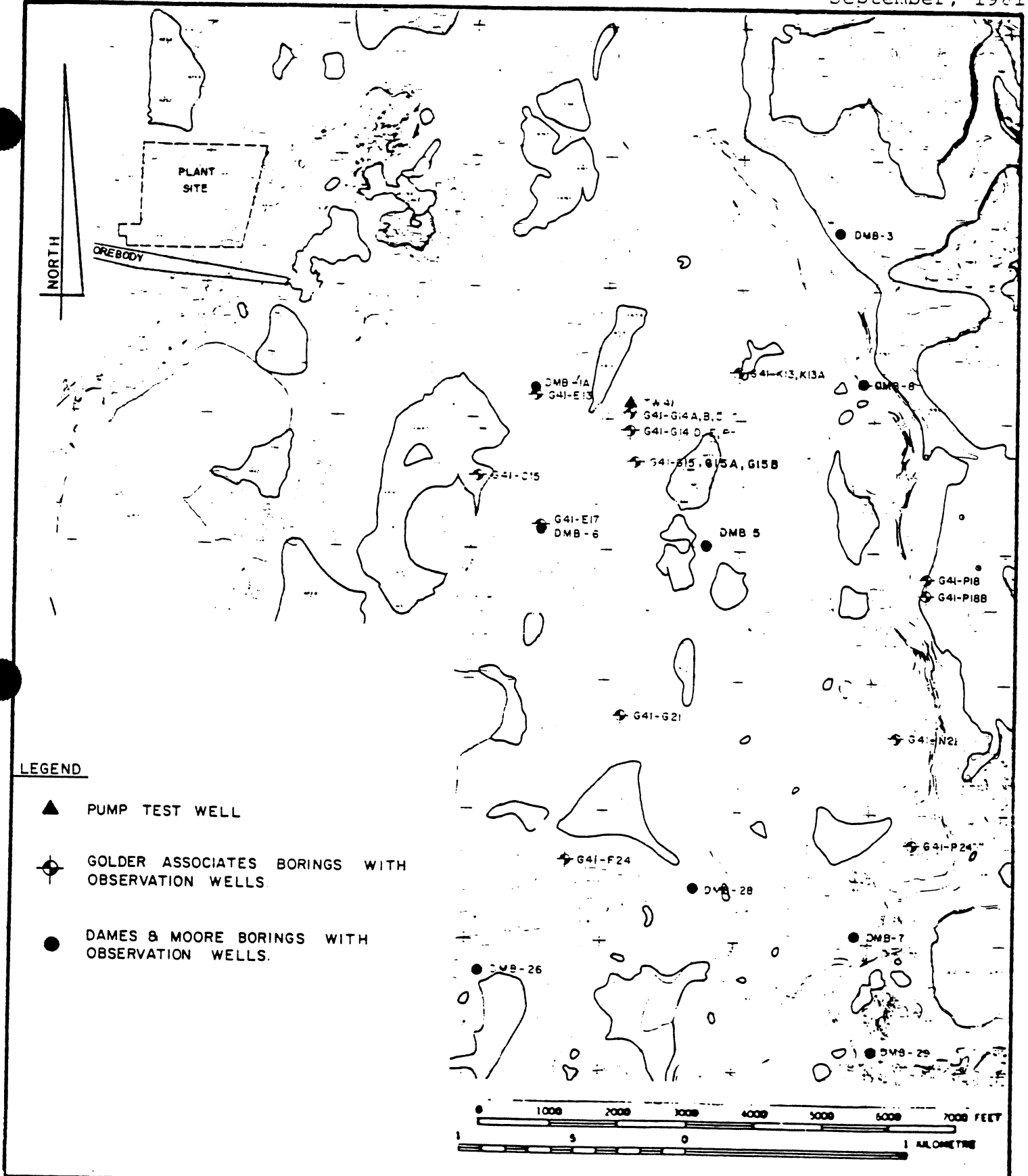

LEGEND

- ▲ PUMP TEST WELL
- ⊕ GOLDER ASSOCIATES BORINGS WITH OBSERVATION WELLS.
- ● DAMES & MOORE BORINGS WITH OBSERVATION WELLS.

PUMP TEST LOCATION PLAN

FIGURE 3.2

Scale GRAPHIC
Date 1-21-81
Job No. 786085

Golder Associates
3.6-4-20

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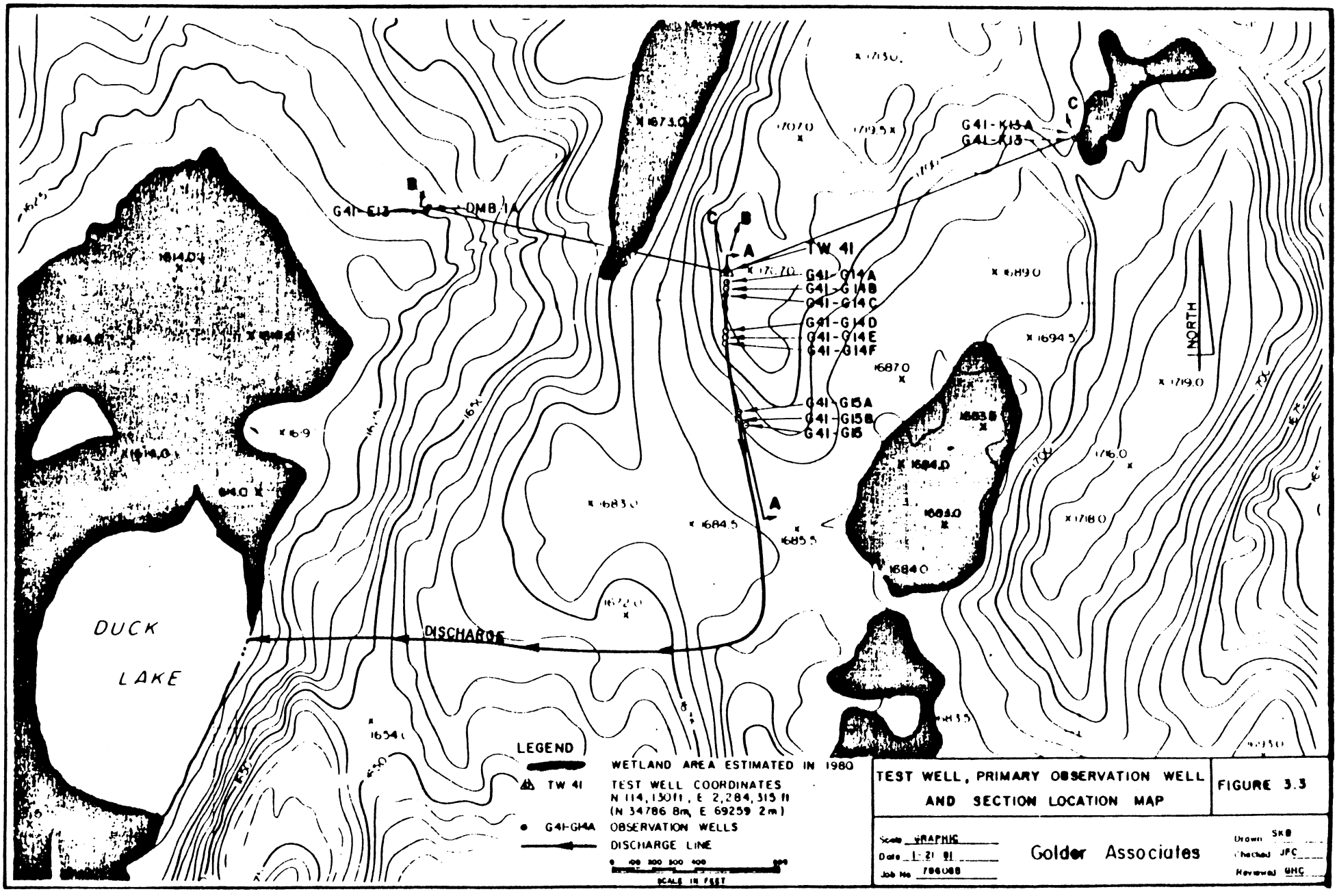

G41-G13
DMB/1A
TW 41
G41-G14A
G41-G14B
G41-G14C
G41-G14D
G41-G14E
G41-G14F
G41-G15A
G41-G15B
G41-G15
G41-K13A
G41-K13
NORTH
DUCK
LAKE
DISCHARGE
LEGEND
WETLAND AREA ESTIMATED IN 1980
TW 41 TEST WELL COORDINATES N 114,13011, E 2,284,315 ft (N 34786 8m, E 69259 2m)
G41-GI4A OBSERVATION WELLS
DISCHARGE LINE
SCALE IN FEET
TEST WELL, PRIMARY OBSERVATION WELL AND SECTION LOCATION MAP
FIGURE 3.3
Golder Associates

marily metavolcanic tuff with its upper surface weathered to a clayey soil in some areas.

At Site 41, the succession of glacial soils was found to be till underlain by coarse grained stratified drift which is underlain by till and/or fine grained stratified drift. The outwash material has been mapped primarily in the low lying wetlands surrounding the Project area but has not been encountered beneath the surface within the proposed waste disposal areas. In general, the coarse grained stratified drift has less than 10 percent fines (silts and clays, which are those materials finer than a #200 U.S. Standard sieve screen opening). The fine grained stratified drift and till characteristically have a range of 10 to 40 percent fines but most samples contained 15 to 20 percent fines. Boring data suggests the coarse grained stratified drift material extends over the entire Crandon Project area and is continuous with the coarse grained stratified drift and the outwash mapped at the surface in most low lying areas.

In the vicinity of the pump test well, primary observation wells, and along the ridge line next to Ground Hemlock Slough glacial till was found beneath the coarse grained stratified drift and it extended to bedrock. Exploration in other areas of Site 41 encountered fine grained stratified drift between the coarse grained stratified drift and bedrock. Based on the grain size characteristics of the fine grained stratified drift and the till, their hydraulic conductivities are not expected to be equal, but both are expected to be significantly lower than the hydraulic conductivity of the coarse grained stratified drift. Therefore, these two materials below the coarse grained stratified drift have not been differentiated in the

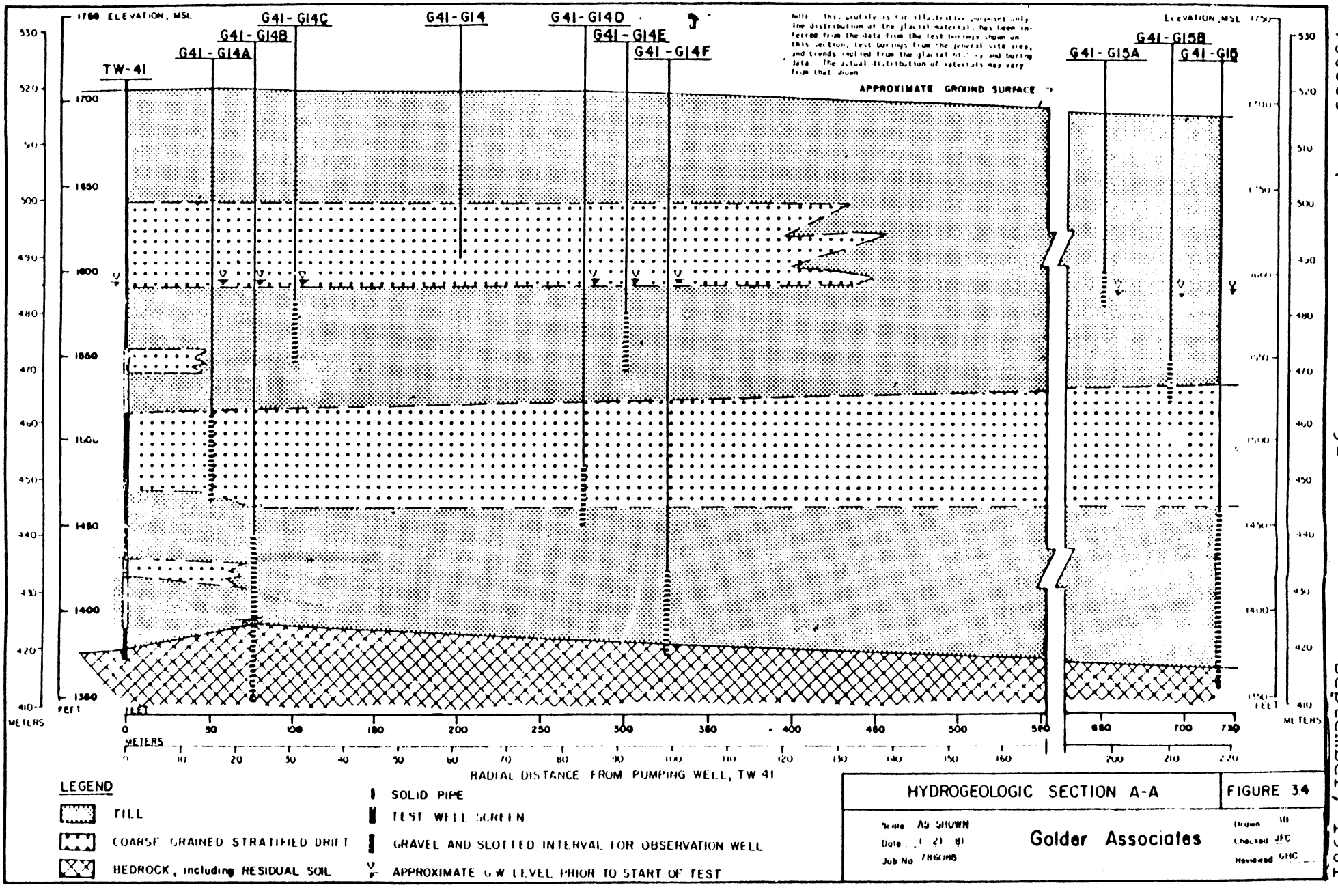
marily metavolcanic tuff with its upper surface weathered to a clayey soil in some areas.

At Site 41, the succession of glacial soils was found to be till underlain by coarse grained stratified drift which is underlain by till and/or fine grained stratified drift. The outwash material has been mapped primarily in the low lying wetlands surrounding the Project area but has not been encountered beneath the surface within the proposed waste disposal areas. In general, the coarse grained stratified drift has less than 10 percent fines (silts and clays, which are those materials finer than a #200 U.S. Standard sieve screen opening). The fine grained stratified drift and till characteristically have a range of 10 to 40 percent fines but most samples contained 15 to 20 percent fines. Boring data suggests the coarse grained stratified drift material extends over the entire Crandon Project area and is continuous with the coarse grained stratified drift and the outwash mapped at the surface in most low lying areas.

In the vicinity of the pump test well, primary observation wells, and along the ridge line next to Ground Hemlock Slough glacial till was found beneath the coarse grained stratified drift and it extended to bedrock. Exploration in other areas of Site 41 encountered fine grained stratified drift between the coarse grained stratified drift and bedrock. Based on the grain size characteristics of the fine grained stratified drift and the till, their hydraulic conductivities are not expected to be equal, but both are expected to be significantly lower than the hydraulic conductivity of the coarse grained stratified drift. Therefore, these two materials below the coarse grained stratified drift have not been differentiated in the

analysis of this pump test. A more comprehensive description of the site geology and subsurface conditions, including interpretative geologic sections, are presented in Reference 1.

Geologic profiles from the test well to the primary groundwater observation wells are shown on Figures 3.4, 3.5, and 3.6. The plan location of these profiles is shown on Figure 3.3. These profiles show the interpreted stratigraphy between the primary observation wells and the test well, the groundwater level prior to pumping, and the vertical location of the slotted sections and gravel pack in each observation well.



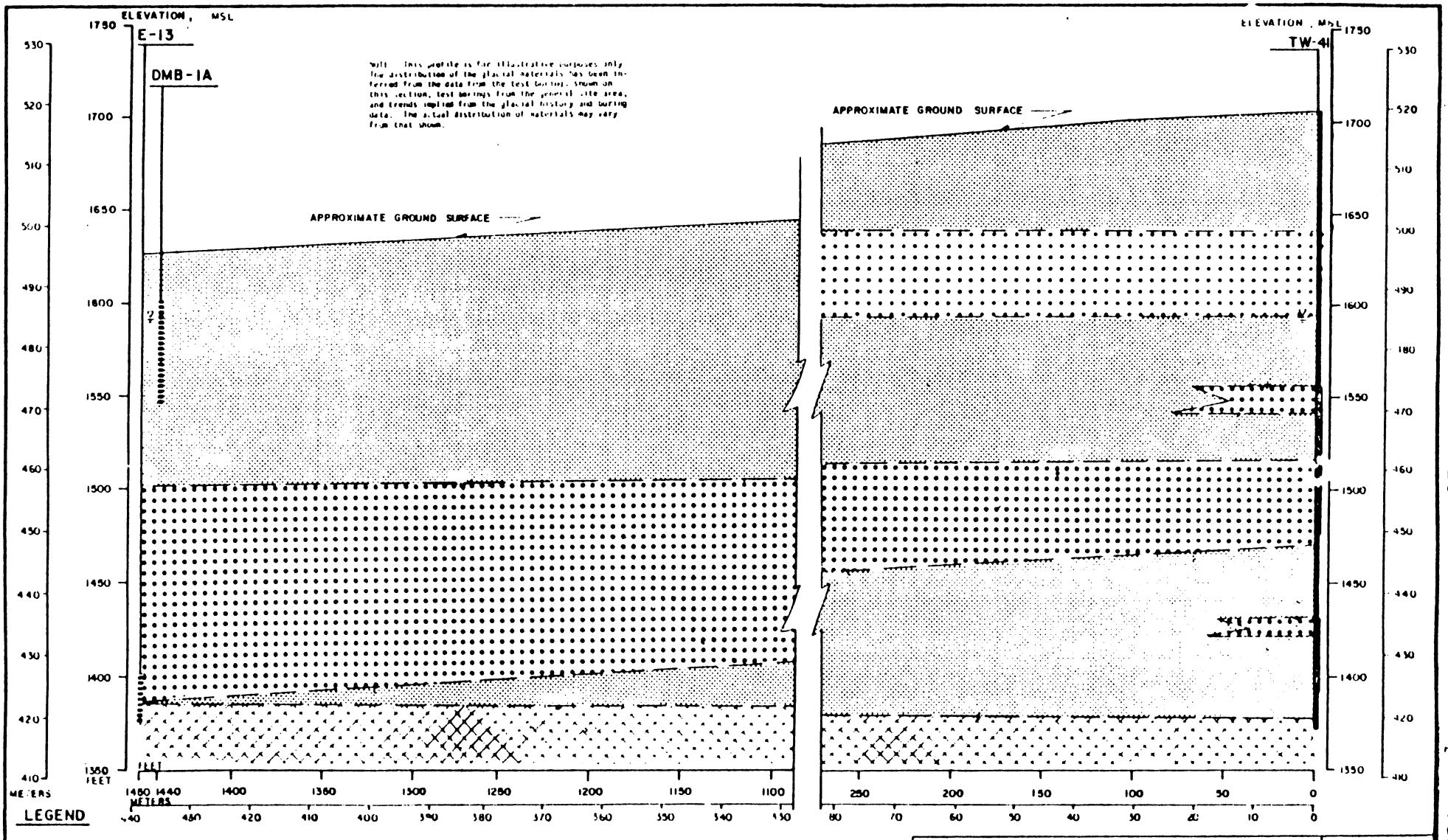
HYDROGEOLOGIC SECTION A-A

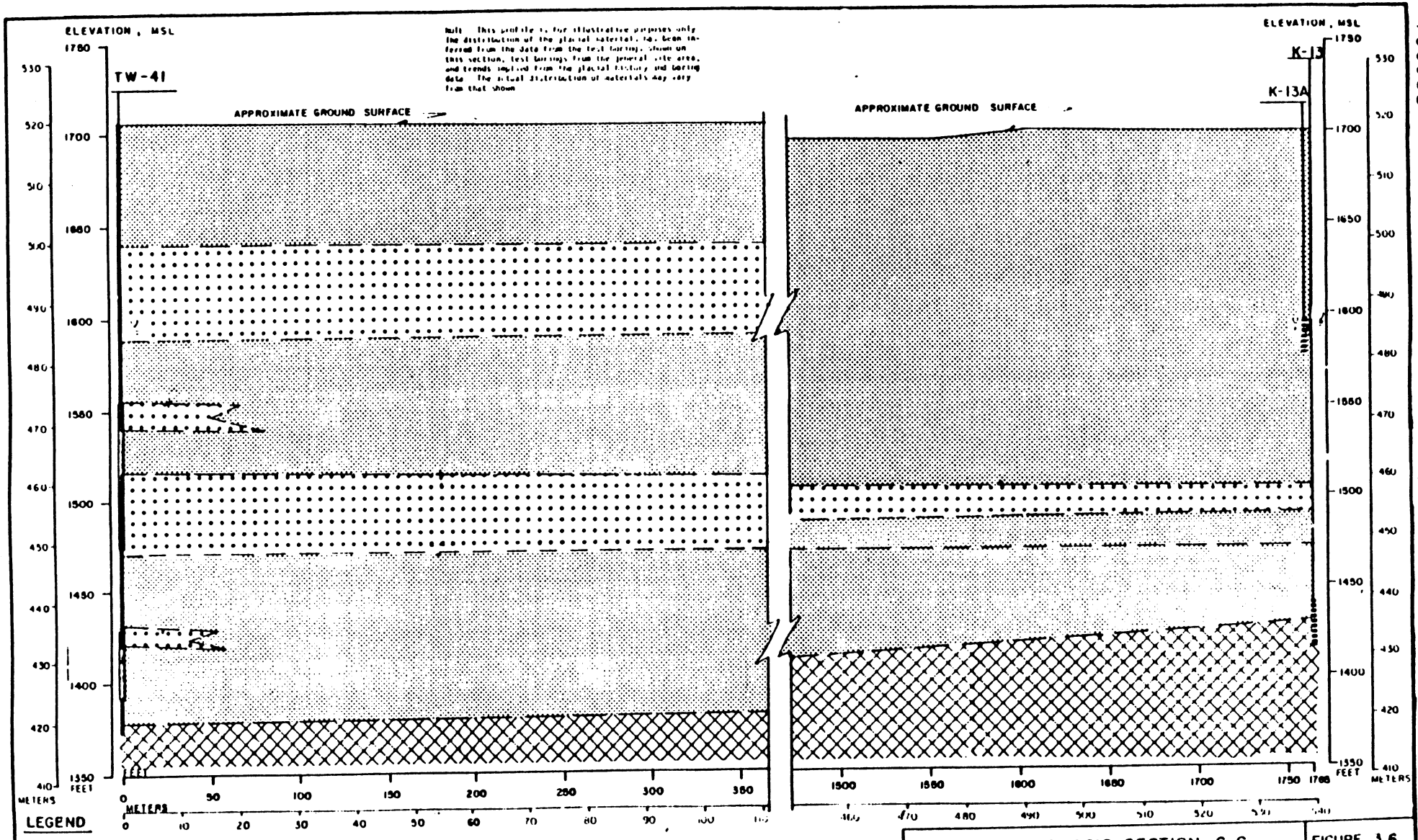
FIGURE 34

Scale AS SHOWN
Date 1 21 81
Job No 786085

Golder Associates

Drawn MB
Checked JFC
Reviewed GHC


ELEVATION, MSL
E-13
DMB-1A
TW-41
APPROXIMATE GROUND SURFACE
APPROXIMATE GROUND SURFACE
Note: This profile is for illustrative purposes only. The distribution of the glacial materials has been inferred from the data from the test borings shown on this section, test borings from the general site area, and trends implied from the glacial history and boring data. The actual distribution of materials may vary from that shown.
1750
1700
1650
1600
1550
1500
1450
1400
1360 FEET
530
520
510
500
490
480
470
460
450
440
430
420
410 METERS
1480 1440 1400 1360 1300 1280 1200 1150 1100 FEET
540 480 420 410 400 390 380 370 360 350 340 330 METERS
250 200 150 100 50 0
80 70 60 50 40 30 20 10 0
LEGEND
TILL
COARSE GRAINED STRATIFIED DRIFT
BEDROCK, including RESIDUAL SOIL
NOTE: SEE SECTION A-A FOR WELL LEGEND
RADIAL DISTANCE FROM PUMPING WELL, TW 41
HYDROGEOLOGIC SECTION B-B
FIGURE 35
Scale AS SHOWN
Date 1-21-81
Job No 786088
Golder Associates
Drawn CAB
Checked JFG
Reviewed GMG



HYDROGEOLOGIC SECTION C-C

FIGURE 3.6

Scale AS SHOWN
Date 1-21-80
Job No 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC

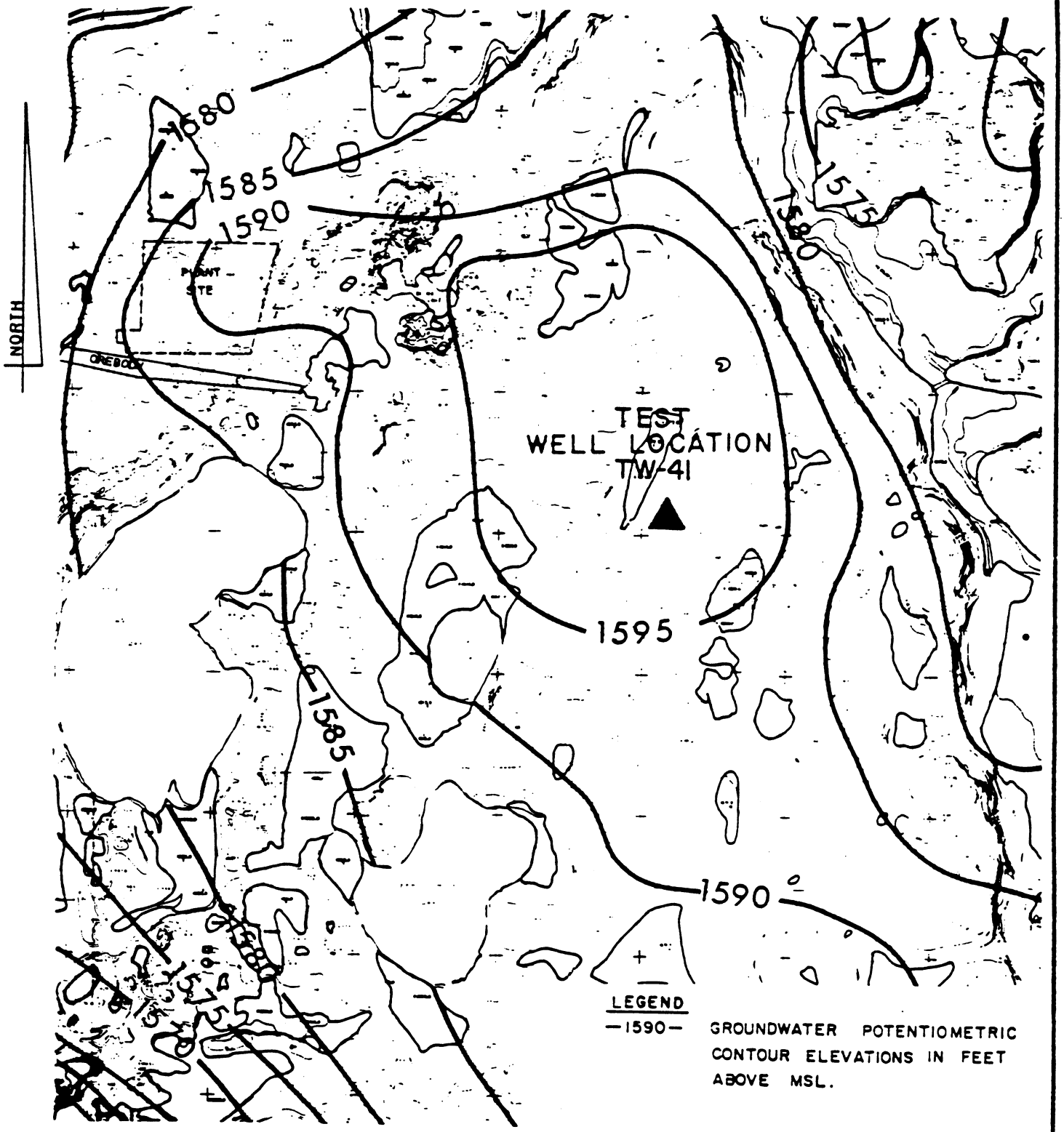
3.3 Groundwater

Groundwater levels over the Crandon Project site have been primarily determined by measurements in observation wells installed in test borings. Groundwater observation wells have been installed at various times over the past 3 years under the supervision of Golder Associates and Dames & Moore. These observation wells have been installed at various depths and locations to evaluate the groundwater conditions at the site. Many of the observation wells have been monitored over long periods to measure fluctuations in groundwater levels and groundwater chemistry. The results of these activities have been assembled by Dames & Moore and are reported in References 2 and 3. A brief review of the groundwater hydrology system is presented below to establish the context for the pump test.

The glacial soils at the test site may be considered to be a connected system of granular materials of varying hydraulic conductivity. Water from precipitation infiltrates from the surface and flows essentially vertically in an unsaturated mode to the water table. While some perched groundwater tables in the region are believed to exist (References 2 and 3), generally the undisturbed water pressures exhibit hydrostatic conditions with a defined water table.

Once water has entered the saturated portion of the groundwater system it flows essentially horizontally from the recharge areas of the system to discharge areas. This lateral flow is concentrated in the materials which exhibit the higher hydraulic conductivities, in the coarse grained stratified drift materials. Some water also enters the bedrock groundwater system, but this pathway is not generally believed to carry a significant portion of the groundwater flow.

A detailed evaluation of the potentiometric conditions in the glacial material has been made in order to define the undisturbed groundwater conditions onsite (Reference 6). The relevant portion of this potentiometric map for the pump test site is shown on Figure 3.7. As can be seen from this map, the test well is located at a potentiometric high point in the system, with natural groundwater flow moving away from the site in all directions. This water eventually discharges to Swamp Creek, Ground Hemlock Creek, Upper Pickerel Creek, Rice Lake, Rolling Stone Lake, Crane Lake, Ground Hemlock Lake, the wetlands associated with these features, and the extensive wetland between Rolling Stone Lake and Mole Lake. The lakes and wetlands nearer the pump test site than these features are believed to be perched above the water table, and thus not discharge points for groundwater (Reference 2 and 3). These nearer features include Skunk, Oak, Little Sand, Duck, and Deep Hole Lakes, and their associated wetlands.



NOTE: GROUNDWATER POTENTIOMETRIC CONTOURS SHOWN ARE THOSE PRIOR TO PUMPING. (REF NO 6)

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 .0 1 KILOMETRE

GROUNDWATER POTENTIOMETRIC MAP OF PUMP TEST SITE

FIGURE 3.7

Scale GRAPHIC
Date 9-28-81
Job No. 786085

Golder Associates
3.6-4-30

Drawn S.K.B.
Checked J.F.C.
Reviewed G.H.C.

4.0 TEST AND OBSERVATION WELL DETAILS

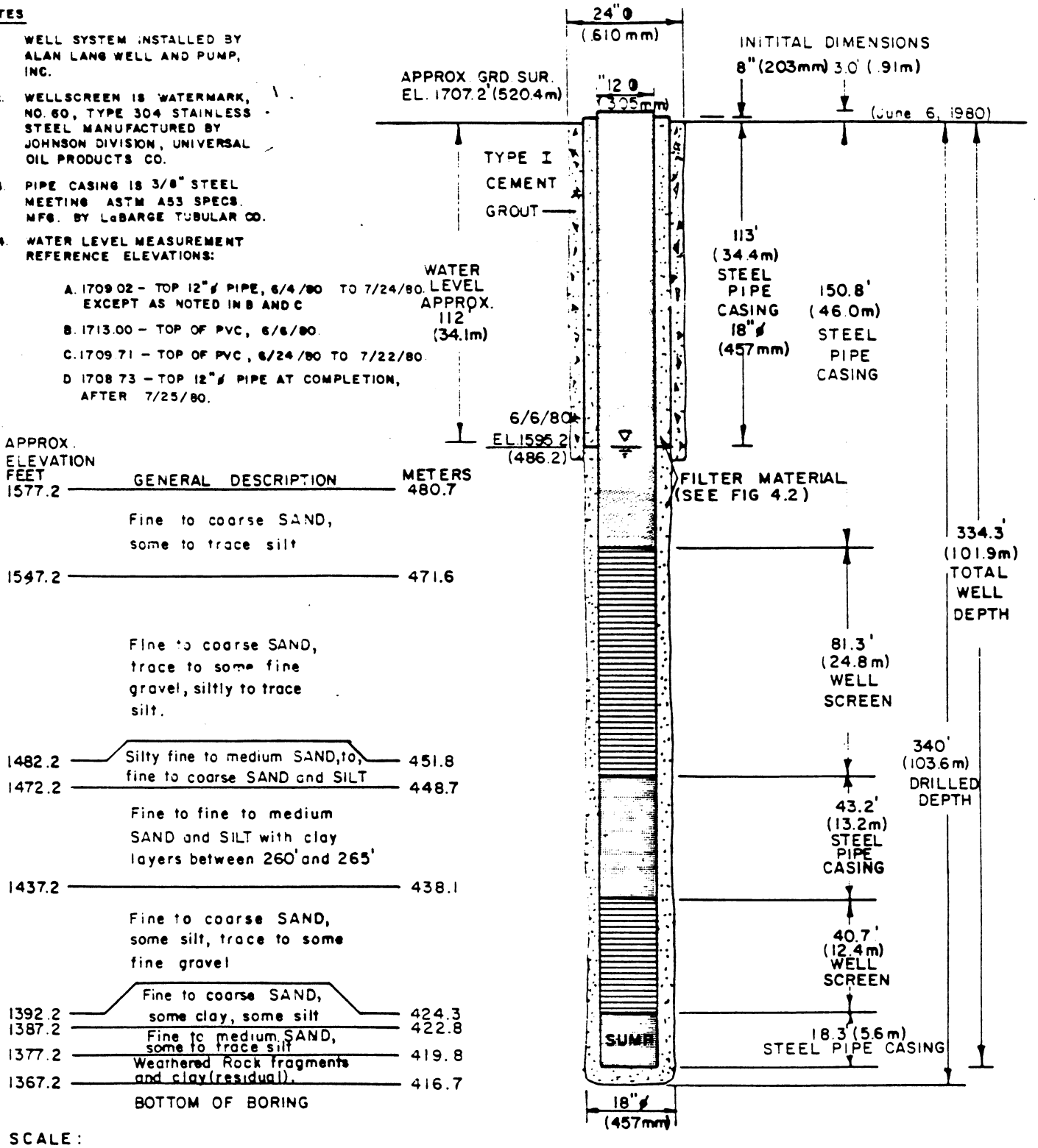
4.1 Test Well Details

The test well was constructed in two sections; an upper 18 inch (457 mm) diameter section and a full depth 12 inch (305 mm) diameter section. Details of the well construction and stratigraphy based on visual identification of the material washed from the hole during drilling are shown on Figure 4.1. The upper section of the hole was drilled at a diameter of about 24 inches (610 mm), using bentonite drilling mud, to a depth of approximately 115 feet (35.0 m) below the ground surface. This section of the hole was then cased with 113 feet (34.4 m) of 18 inch (457 mm) diameter steel pipe casing. The annulus between the hole and the casing was then fully grouted using Type I Portland Cement.

The lower hole was drilled about 18 inches (457 mm) in diameter to a depth of 340 feet (103.6 m) by the reverse circulation method. Liquid chlorine was added to the circulating fluid in the mud pit under the direction of the DNR field representative. The hole was then cased with a 12 inch (305 mm) diameter string of solid casing and well screen extending from above the surface to about 6 feet (1.8 m) from the bottom of the hole. The lowest portion of solid casing was used as a sump during the drawdown pump test. The solid casing is 3/8 inch (9.5 mm) thick steel pipe meeting ASTM A53 specifications. The bottom of the 12 inch (305 mm) diameter pipe has a steel plate cover welded in place. Watermark, Type 304, 0.060 inch slot well screen (by Johnson Division, Universal Oil Products, Inc.) was installed from 151 feet to 232 feet (46.0 to 70.7 m) and 274 feet to 315 feet (83.5 to 96.0 m) below the ground surface. This well screen is spiral wrapped stainless steel with slot sizes of 0.06 inches (1.5 mm).

NOTES

1. WELL SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP, INC.
2. WELLSCREEN IS WATERMARK, NO. 60, TYPE 304 STAINLESS STEEL MANUFACTURED BY JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS CO.
3. PIPE CASING IS 3/8" STEEL MEETING ASTM A53 SPECS. MFG. BY LaBARGE TUBULAR CO.
4. WATER LEVEL MEASUREMENT REFERENCE ELEVATIONS:
   - A. 1709.02 – TOP 12"ø PIPE, 6/4/80 TO 7/24/80. EXCEPT AS NOTED IN B AND C
   - B. 1713.00 – TOP OF PVC, 6/6/80.
   - C. 1709.71 – TOP OF PVC, 6/24/80 TO 7/22/80.
   - D. 1708.73 – TOP 12"ø PIPE AT COMPLETION, AFTER 7/25/80.



APPROX. ELEVATION FEET	GENERAL DESCRIPTION	METERS
1577.2		480.7
	Fine to coarse SAND, some to trace silt	
1547.2		471.6
	Fine to coarse SAND, trace to some fine gravel, silty to trace silt.	
1482.2	Silty fine to medium SAND, to, fine to coarse SAND and SILT	451.8
1472.2		448.7
	Fine to fine to medium SAND and SILT with clay layers between 260' and 265'	
1437.2		438.1
	Fine to coarse SAND, some silt, trace to some fine gravel	
1392.2	Fine to coarse SAND, some clay, some silt	424.3
1387.2	Fine to medium SAND, some to trace silt	422.8
1377.2	Weathered Rock fragments and clay (residual).	419.8
1367.2		416.7
	BOTTOM OF BORING	

SCALE:
VERTICAL: 1" = 50'
HORIZONTAL: NONE

WELL STRATIGRAPHY AND CONSTRUCTION

FIGURE 4.1

Scale AS SHOWN
Date 1-29-81
Job No. 786085

Golder Associates
3.6-4-32

Drawn S.K.B., C.A.B.
Checked J.F.C.
Approved G.H.C.

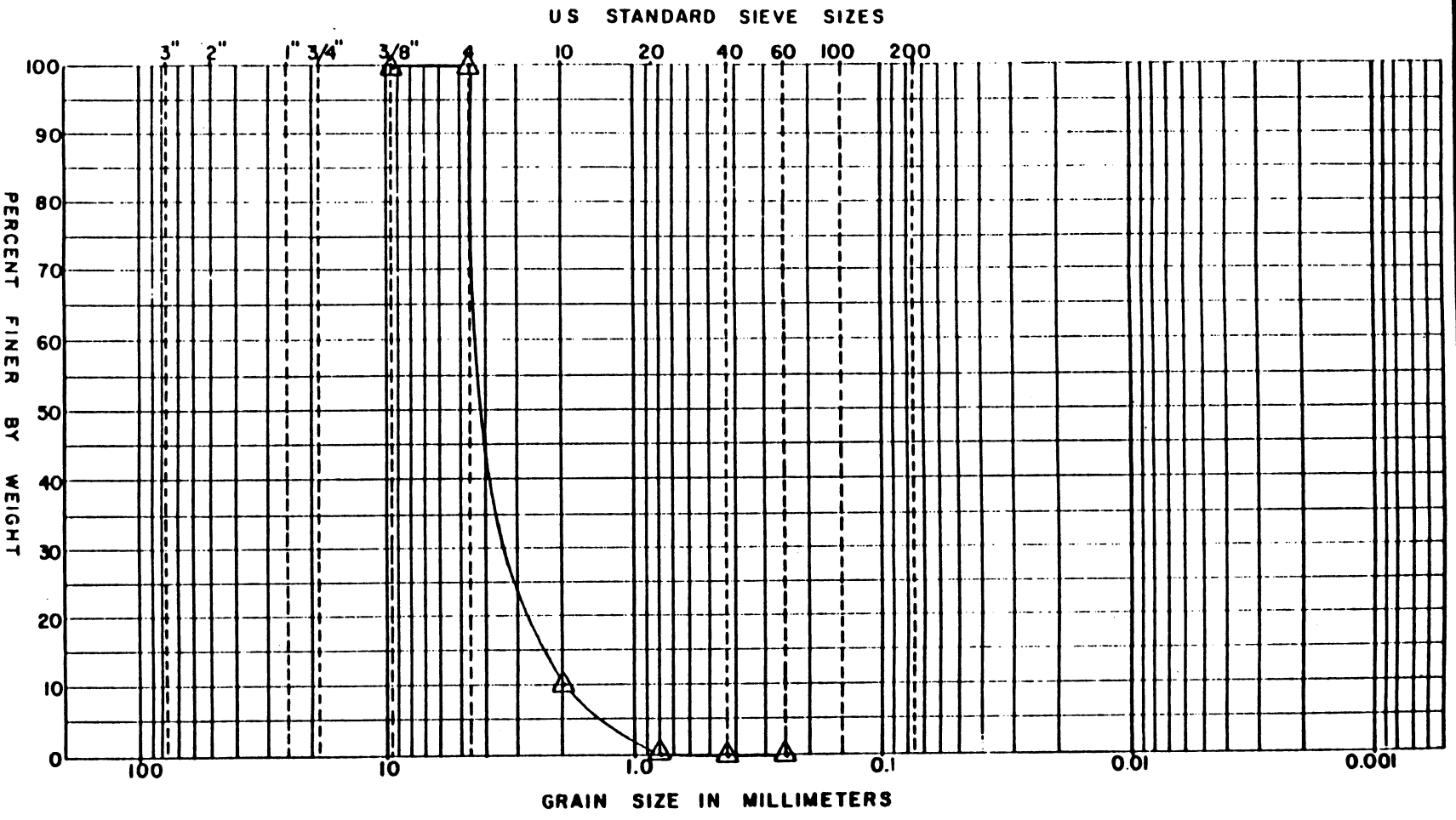
Solid pipe was installed between the upper and lower screen sections because of the fine grained nature of the soil encountered at that depth. Granular filter material was placed around the 12 inch (305 mm) diameter pipe for its full length. A plot of the filter gradation is shown on Figure 4.2.

Following the initial filter material placement the well was fully developed by first surging with air and then jetting. Air development was performed by flushing air down the hole and then sucking water out through the screen. This was done for the entire length of the screened sections in 2 foot (0.6 m) increments for about 5 minutes per increment. After development by air, the well was developed by jetting with water at about 250 psi (1700 kPa). The jetting was done for approximately 15 minutes for each 20 feet (6.1 m) of installed screen. The well was then flushed after completion of development and filter material was added to top off the filter column. After the pump test was completed, the pump was removed, the annulus around the 12 inch (305 mm) diameter pipe topped off with filter material, and the well capped with a hinged overlapping steel cover which was locked.

4.2 Observation Well Details

Groundwater observation wells were installed in boreholes and their installation was supervised by either Dames & Moore (boring identification starting with the letter DM) or Golder Associates personnel (boring identification starting with the letter G). The observation wells are 2 inch (50 mm) diameter PVC pipe with the lower 5 to 20 feet (1.5 to 6.1 m) slotted and surrounded by gravel. Most observation wells had bentonite seals above the gravel and all were grouted to the surface. Each observation well has a

GRAIN SIZE DISTRIBUTION OF FILTER MATERIAL



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
TW 41 Filter		-	-	-	-	Medium to coarse SAND (SP)

FIGURE 4.2

Golder Associates

3.6-4-34

Date 1-21-81

Job No 786085

Drawn CAB

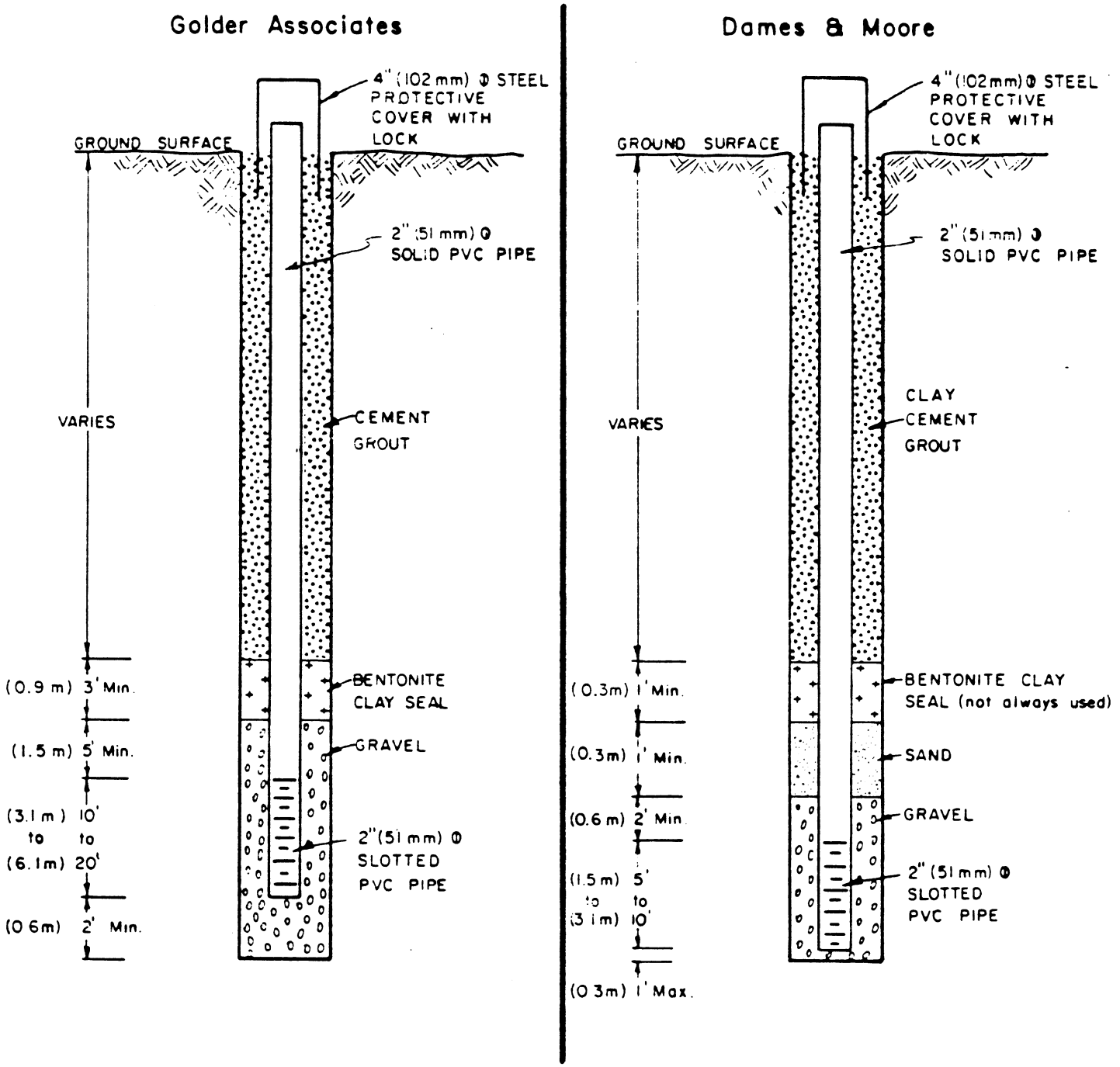
Checked JFC

Reviewed GHC

4 inch (100 mm) diameter protective cap with a lock. Typical installation details are shown on Figure 4.3. Specific details for each of the primary observation wells (locations of which were shown on Figures 3.2 and 3.3) are included with the boring logs in Appendix B. Table 4.1 includes salient information about all of the wells used during the pump test.

It should be pointed out that there exists the possibility of a misunderstanding developing over the use of the term "observation well" to describe the installations shown in Figure 4.3. The installations measure the groundwater head or pressure conditions over a relatively small section of the total saturated thickness of the glacial materials, and might therefore be more properly described as "piezometers". However, they utilize the pore fluid of the formation (water) as the measuring device rather than directly measuring water pressure in the formation so that some authorities would call them wells. In this report the term "observation well" is used for this type of installation, and this term has also been used in proceeding reports (References 1, 2, 3, and 7).

The primary observation wells were located so that a single line of observation points would extend south from the well. Observation wells were located in groups of three; one with a completion just above bedrock, one completed in the coarse grained stratified drift layer near the center of the saturated material, and one a little below the top of the saturated material. The groups were spaced approximately 75, 300, and 700 feet (23, 91 and 213 meters) from the test well. In addition, two pairs of wells were located approximately on an east-west line through the test well; one pair about 1450 feet (442 m) to the west and the other about 1760 feet (536 m) to the east. Completions were



TYPICAL OBSERVATION WELL INSTALLATIONS

FIGURE 4.3

Scale Not to Scale
Date 1-20-81
Job No. 786085

Golder Associates
3.6-4-36

Drawn S K B
Checked M R B
Reviewed J F C

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS

Observation Well No.	Distance from TW 41 ft. (m)	Coordinates		Elevation ft. (m) (above MSL)				
		North ft. (m)	East ft. (m)	Ground Surface	Top of Casing	Screened Interval	Gravel Interval	Bottom of Boring
G41-C15	2450 (746.8)	113135 (34483.5)	2282080 (695578.0)	1615.61 (492.44)	1617.30 (492.95)	1411-1421 (429.8-432.2)	1398-1426 (426.1-434.6)	1398 (426.1)
G41-E13*	1450 (442.0)	114395 (34867.6)	2282890 (695824.9)	1627.28 (495.99)	1629.45 (496.66)	1390-1400 (423.7-426.7)	1377-1402 (419.7-427.3)	1377 (419.7)
G41-E17	2180 (664.5)	112385 (34254.9)	2283005 (695860.0)	1666.36 (507.91)	1668.49 (508.56)	1421-1431 (433.1-436.2)	1406-1438 (428.5-438.3)	1406 (428.5)
G41-F24	6930 (2112.3)	107255 (32691.3)	2283465 (696000.1)	1653.50 (503.99)	1656.61 (504.93)	1560-1570 (475.5-478.5)	1411-1578 (430.1-481.3)	1411 (430.1)
G41-G14A*	50 (15.2)	114080 (34771.6)	2284315 (696259.2)	1706.91 (520.27)	1708.62 (520.79)	1466-1486 (446.8-452.9)	HOLE[1] CAVED	1466 (446.8)
G41-G14B*	75 (22.9)	114055 (34764.0)	2284315 (696259.2)	1706.80 (520.23)	1708.87 (520.86)	1415-1435 (431.3-437.4)	1347-1444 (410.6-440.1)	1347 (410.6)
G41-G14C*	100 (30.5)	114030 (34756.3)	2284315 (696259)	1706.33 (520.09)	1708.68 (520.86)	1555-1575 (474.-480.1)	1556-1582[2] (474.3-482.2)	1546 (471.2)
G41-G14D*	275 (83.8)	113855 (34703.0)	2284315 (696259.2)	1705.56 (519.85)	1707.60 (520.48)	1464-1484 (446.2-452.3)	1464-1491 (446.2-454.5)	1449 (441.7)
G41-G14E*	300 (91.4)	113830 (34695.4)	2284315 (696259.2)	1705.61 (519.87)	1708.00 (520.60)	1552-1572 (473.-479.1)	1552-1577 (473.-480.7)	1541 (469.7)
G41-G14F*	325 (99.1)	113805 (34688.7)	2284315 (696259.2)	1703.47 (519.22)	1706.92 (520.27)	1394-1414 (424.9-430.7)	1404-1423[3] (428.-433.4)	1372 (418.2)

*Observation wells monitored frequently during pump tests.

(1) Caved in material around PVC from 1466 to 1517 feet (466.8 to 462.4 m).

(2) Bottom 1.0 ft. (0.3 m) of screen in caved in material.

(3) Bottom 10.0 ft. (3.0 m) of screen in caved in material.

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS (Continued)

Observation Well No.	Distance from TW 41 ft. (m)	Coordinates		Elevation ft. (m) (above MSL)				
		North ft. (m)	East ft. (m)	Ground Surface	Top of Casing	Screened Interval	Gravel Interval	Bottom of Boring
G41-G15*	720 (219.5)	113415 (34568.9)	2284420 (696291.2)	1691.47 (515.56)	1694.24 (516.41)	1442-1452 (439.2-442.3)	1354-1458 (412.7-444.1)	1354 (418.2)
G41-G15A*	650 (198.1)	113480 (34588.7)	2284390 (696282.1)	1692.75 (515.95)	1695.71 (516.85)	1581-1591 (481.9-484.9)	1580-1601 (481.6-488.)	1580 (481.6)
G41-G15B*	690 (210.3)	113440 (34576.5)	2284385 (696280.6)	1692.09 (515.75)	1694.72 (516.55)	1524-1534 (464.5-467.6)	1522-1546 (463.9-471.2)	1522 (463.9)
G41-G21	4640 (1414.3)	109495 (33374.1)	2284265 (696244.0)	1664.83 (507.44)	1666.91 (508.07)	1566-1575 (477.3-480.0)	1564-1598 (476.7-487.1)	1564 (476.7)
G41-K13*	1765 (538.0)	114755 (34977.3)	2285965 (696762.1)	1699.67 (518.06)	1702.92 (519.05)	1430-1440 (435.9-438.9)	1415-1460 (431.3-445.)	1415 (431.3)
G41-K13A*	1760 (536.4)	114770 (34981.9)	2285955 (696759.1)	1699.87 (518.12)	1702.99 (519.07)	1581-1591 (481.9-484.9)	1578-1594 (481.0-485.9)	1578 (481.0)
G41-N21	6432 (1960.5)	109170 (33275.0)	2288410 (697507.4)	1727.36 (526.50)	1729.50 (527.15)	1579-1589 (481.3-484.3)	1629-1651 (4) (496.5-503.2)	1577 (480.7)
G41-P18	5149 (1569.5)	111645 (34029.4)	2288825 (697633.9)	1588.88 (484.29)	1591.51 (485.09)	1479-1489 (450.8-453.8)	1459-1494 (444.7-455.4)	1459 (444.7)
G41-P18B	5273 (1607.2)	111390 (33951.7)	2288820 (697632.3)	1589.05 (484.34)	1591.27 (485.02)	1549-1554 (472.1-473.7)	1549-1556 (472.1-474.3)	1544 (470.6)
G41-P24	7885 (2403.4)	107550 (32781.2)	2288660 (697583.3)	1681.95 (512.66)	1684.37 (513.40)	1569-1579 (478.2-481.3)	1337-1587 407.5-483.7)	1337 (407.5)

*Observation wells monitored frequently during pump tests.
(4) Caved in material from 1577 to 1629 feet (480.7 to 496.5 m).

TABLE 4.1 SUMMARY OF GROUNDWATER OBSERVATION WELL COMPLETIONS (Continued)

Observation Well No.	Distance from TW 41 ft. (m)	Coordinates		Elevation ft. (m) (above MSL)				
		North ft. (m)	East ft. (m)	Ground Surface	Top of Casing	Screened Interval	Gravel Interval	Bottom of Boring
DMB 1A*	1440 (438.9)	114405 (34870.6)	2282900 (695827.3)	1627.94 (496.20)	1629.70 (496.73)	1549-1559 (472.1-475.2)	1549-1598 (472.1-487.1)	1549 (472.1)
DMB 3	4191 (1277.4)	116895 (35629.6)	2287465 (697219.3)	1587.93 (484.00)	1589.48 (484.47)	1528-1533 (465.7-467.3)	1527-1538 (465.4-468.8)	1526 (484.6)
DMB 5	2341 (713.6)	112135 (34178.7)	2285540 (696632.6)	1688.77 (514.74)	1690.37 (515.22)	1590-1600 (484.6-488.0)	1590-1621 (484.6-494.1)	1590 (484.6)
DMB 6	2176 (663.2)	112385 (34254.9)	2283015 (695863.0)	1666.47 (507.94)	1668.26 (508.49)	1581-1591 (481.9-484.9)	1581-1605 (481.9-489.2)	1581 (481.9)
DMB 7	8726 (2659.7)	106150 (32354.5)	2287845 (697335.2)	1653.67 (504.04)	1655.08 (504.5)	1575-1585 (480.1-483.1)	1575-1595 (480.1-486.2)	1575 (480.1)
DMB 8	3556 (1083.7)	114595 (34928.6)	2287840 (697333.6)	1622.74 (494.61)	1624.57 (495.17)	1573-1578 (479.5-481.0)	1573-1583 (479.5-482.5)	1572 (479.1)
DMB 26	8854 (2698.8)	105520 (32162.5)	2282250 (695629.8)	1712.98 (522.1)	1714.49 (522.6)	1579-1589 (481.3-484.3)	1579-1596 (481.3-486.5)	1579 (481.3)
DMB 28	7374 (2247.6)	106840 (32564.8)	2285425 (696597.5)	1642.13 (500.22)	1643.88 (501.05)	1573-1578 (479.4-480.9)	1572-1579 (479.2-481.3)	1572 (479.2)
DMB 29	10458 (3176.6)	104385 (31816.5)	2288110 (697415.9)	1629.98 (496.82)	1631.48 (497.28)	1561-1566 (475.8-477.3)	1562-1570 (476.1-478.5)	1562 (476.1)

*Observation wells monitored frequently during pump tests.

at different levels for each pair. These 13 observation wells were monitored intensively and constitute the primary source of data for the pump tests. In addition to these 13 primary observation wells, occasional measurements were taken in other observation wells located in the Site 41 test area.

The observation well network described above provided a detailed three dimensional view of the behavior of the groundwater system around the test well, both prior to the test and during the pumping and recovery periods. The detailed data from the 13 primary observation wells were used to help understand the behavior of the saturated soil system. Data from the other observation wells were used to help understand the extent of pumping effects, and how gradients distant from the well were affected by the test.

5.0 FLOW VELOCITY TEST

5.1 Purpose

A flow velocity test was performed on June 6, 1980, before the main pumping test. This test was performed to aid evaluation of the well with respect to flow contribution.

Because the well is screened over almost the full length of the saturated material it is not possible to determine the quantity of flow from each strata in a standard well test. In a properly constructed well the results of a flow velocity test define the relative permeability of the material adjacent to the hole. This test was performed by the Johnson Well Division of Universal Oil Products, Inc. Their report and the operations manual for the test are presented in Appendix A to this report.

5.2 Test Description and Equipment Calibration

The flow velocity test measured the vertical velocity of water flowing in the well casing/screen as the well was being pumped. The equipment for this test was the Johnson Velocity Meter System which uses a turbine type flow meter. The water velocity was measured at various depths in the well with the total flow from the well being held constant. The results were obtained as a relationship between flow and depth which indicated the relative contribution to total flow from each measured increment.

The Johnson Velocity Meter System turbine flow meter probe is set in a centralizer. The probe consists of a 6 inch (152 mm) diameter impeller mounted in jewelled bearings. A magnetic switch is activated for each revolution of the probe shaft. The probe is connected to a surface con-

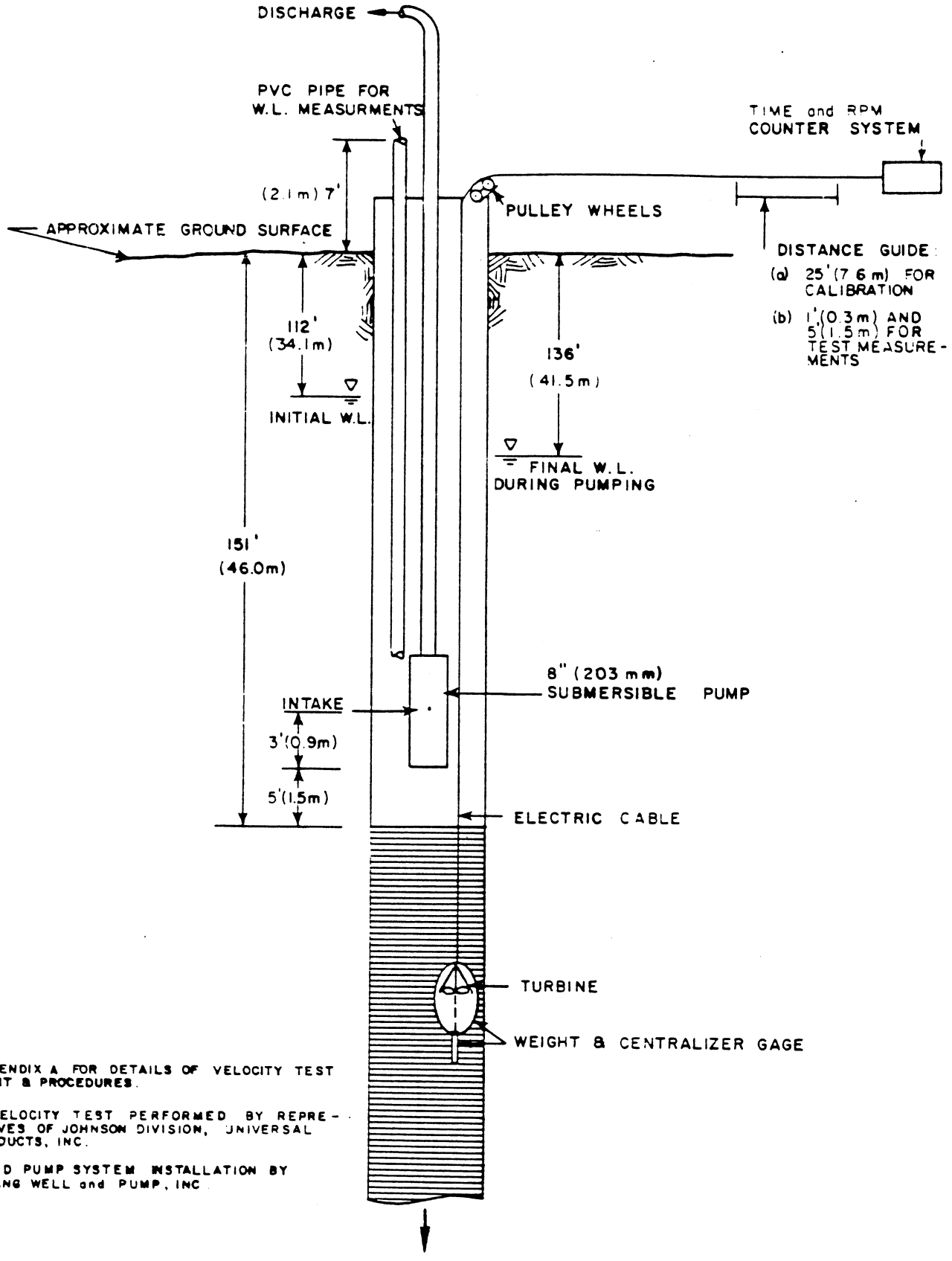
sole by a logging cable. The surface console records the number of revolutions and elapsed time. A schematic diagram of the test set-up is shown on Figure 5.1.

Flow rates were obtained by relating the revolutions per minute of the probe during pumping to a previous calibration. The probe was calibrated by lowering it a distance of 25 feet (7.6 m) at different time rates thus providing a velocity. The revolutions of the probe for this time increment were then calibrated directly to velocity. Since the well casing has a constant cross-section area, the flow for any velocity can be calculated, thus providing the conversion from revolutions per minute to flow rate.

The rate of decent (velocity) was progressively decreased until the threshold of the instrument (velocity so slow that readings could no longer be obtained) was reached. This threshold velocity was 0.056 ft./sec. (0.017 m/s). The instrument was calibrated both before and after the test with excellent correlation. The calibration curve for the flow velocity test is shown on Figure 5.2.

5.3 Test Procedure

The velocity probe was placed at the bottom of the well and the pump placed about 5 feet (1.5 m) above the top screen section. The well was pumped for approximately 3 hours. During this time the probe was raised in 5 foot (1.5 m) increments through the screened sections of the well and the revolutions for a one minute duration counted to determine flow rate. The total flow was obtained by taking a measurement in the solid casing above the top screen. These measurements are shown as Segment 1 of the flow versus depth plot shown on Figure 5.3. Following this initial sur-



NOTES

1. SEE APPENDIX A FOR DETAILS OF VELOCITY TEST EQUIPMENT & PROCEDURES.
2. FLOW VELOCITY TEST PERFORMED BY REPRESENTATIVES OF JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS, INC.
3. WELL AND PUMP SYSTEM INSTALLATION BY ALAN LANG WELL and PUMP, INC.

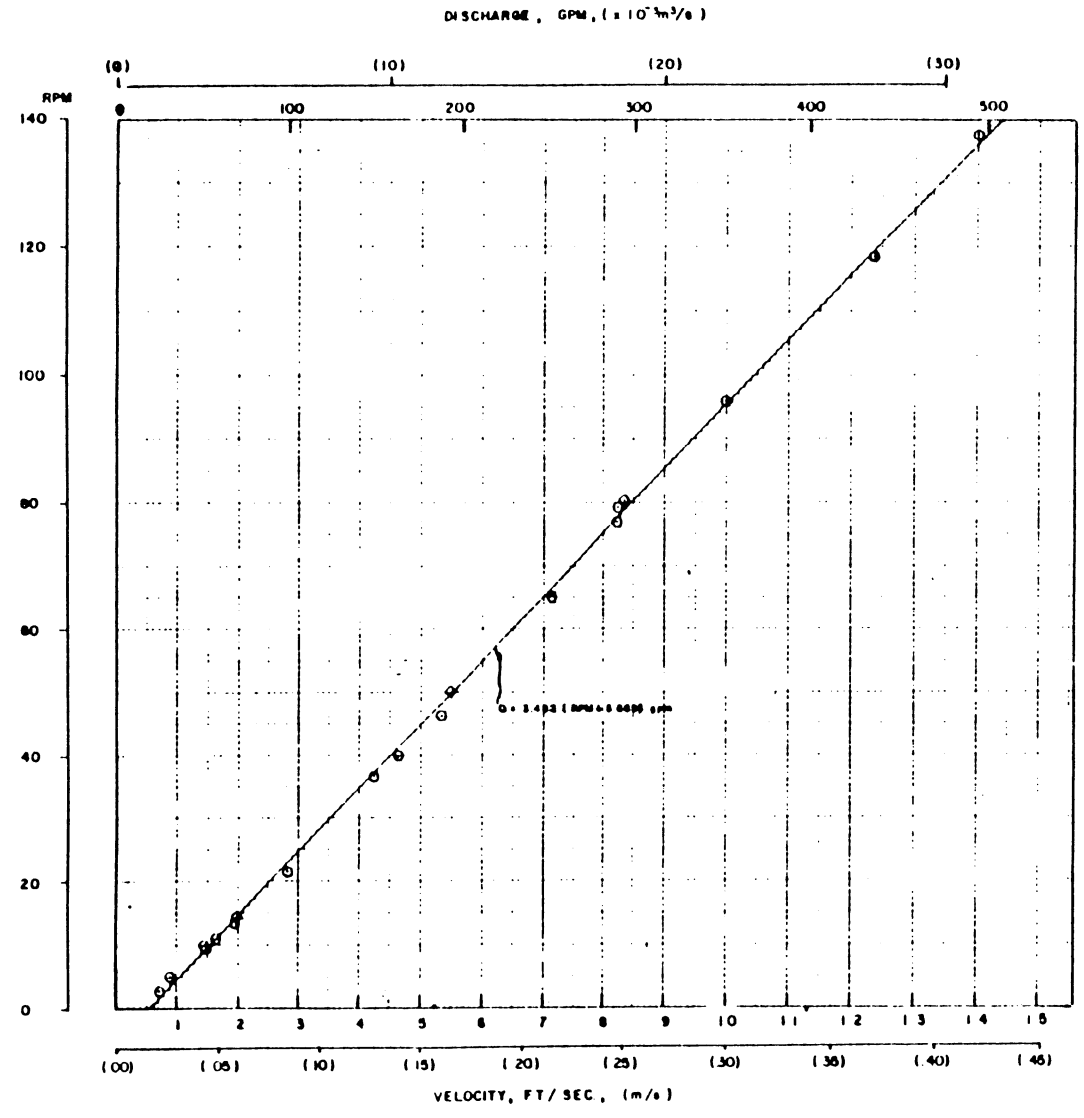
SCHEMATIC OF FLOW VELOCITY TEST SETUP

FIGURE 5.1

Scale NONE
Date 1-21-81
Job No 786085

Golder Associates
3.6-4-43

Drawn CAB
Checked JFC
Reviewed GHC



LEGEND

○ INITIAL CALIBRATION
□ FINAL CALIBRATION

NOTE

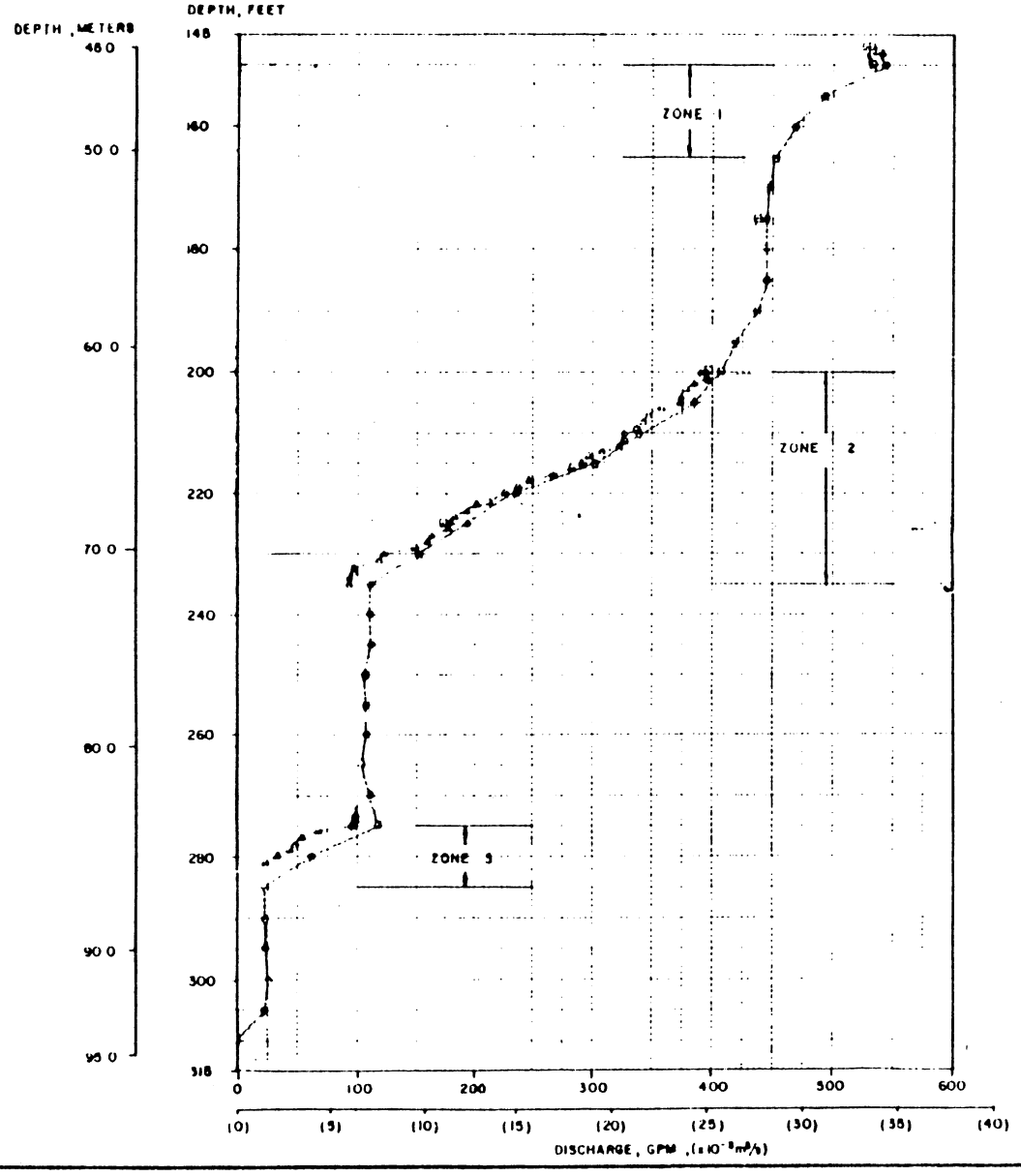
FLOW TEST SETUP AND CALIBRATION PERFORMED BY REPRESENTATIVE OF:
JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS, INC., JUNE 6, 1980

"THRESHOLD" FOR SPINNER (TURBINE)

V = 0.056 fps (0.017 m/s)

Q = 19.7 gpm ($1.24 \times 10^{-3} m^3/s$)

FLOW VELOCITY METER CALIBRATION		FIGURE 5.2
Scale AS SHOWN Date 2/16/81 Job No 786085	Golder Associates	Drawn CAB Checked JHC Reviewed GHC



SEGMENT LEGEND

- O SEGMENT 1 - INITIAL VELOCITY SURVEY FROM BOTTOM OF WELL SCREEN (315 ft.) TO TOP OF WELL SCREEN (150 ft.) AT 5 ft. INTERVALS.
- △ SEGMENT 2 - DETAIL VELOCITY SURVEY AT 1 ft. INTERVALS THROUGH SECTIONS OF HIGH FLOW INDICATED IN THE SEGMENT 1 SURVEY.

  DUE TO A CHANGE IN THE PUMP DISCHARGE ARRANGEMENT THE FLOWS IN SEGMENT 2 WERE DIFFERENT THAN IN SEGMENT 1.
- □ SEGMENT 3 - FINAL CHECK ON FLOWS FROM SEGMENT 2. DISCHARGE ARE THE SAME AS FOR SEGMENT 2.

NOTE

FLOW VELOCITY TEST SETUP, CALIBRATION AND PERFORMED BY REPRESENTATIVE OF: JOHNSON DIVISION, UNIVERSAL OIL PRODUCTS, INC. JUNE 6, 1980.

FLOW VELOCITY TEST RESULTS	FIGURE 5.3
Scale AS SHOWN Date 2-16-80 Job No 786008	Golder Associates Drawn CAB Checked JPS Reviewed GHG

vey the probe was lowered in 1 foot (0.3 m) increments through the screened sections identified in Segment 1 as being main contributors to the total flow from the well. This more detailed survey at 1 foot (0.3 m) increments is identified as Segment 2 on Figure 5.3 and was performed as the probe was lowered to the bottom of the well. The flow rate for Segment 1 was 540 gpm (0.034 m^3/s). Due to a change in the pump discharge arrangement during the test the flow rate for Segment 2 was 530 gpm (0.033 m^3/s). Because of this arrangement change and the resulting flow change an additional survey (Segment 3) was performed at the same flow rate as Segment 2, as a check, again raising the probe from the bottom of the well.

5.4 Results

Figure 5.3 shows three zones of significant flow velocity, as indicated by rapidly increasing flow to the well. These velocities can be converted into hydraulic conductivities using the approximate laminar flow formula:

$$k = \frac{\Delta Q}{LH}$$

where

k = hydraulic conductivity
ΔQ = flow from a given portion of the well
L = length of the well portion
H = head drop in well

The head drop in the well was between 18 and 24 feet (5.5 and 7.3 m) during the test. Hydraulic conductivity estimates were made for the high permeability zones using the above formula and are included in Table 5.1. These estimates were made using the data shown on Figure 5.3, and the maximum drawdown in the test well produced during the

TABLE 5.1
FLOW-VELOCITY HYDRAULIC CONDUCTIVITY ESTIMATES

A. ENGLISH UNITS

Zone #	Well Portion Depth Interval ft.	Flow Q gpm	Length L ft.	Hydraulic Conductivity k ft./sec.
1	150 to 165	90	15	5.6×10^{-4}
2	200 to 235	300	35	8.0×10^{-4}
3	275 to 285	100	10	9.3×10^{-4}

B. SYSTEM INTERNATIONAL UNITS

Zone #	Well Portion Depth Interval m	Flow Q m^3/s	Length L m	Hydraulic Conductivity k m/s
1	45.7 to 50.3	0.0057	4.6	1.7×10^{-4}
2	61.0 to 71.6	0.0189	10.7	2.4×10^{-4}
3	83.8 to 86.9	0.0631	3.0	2.9×10^{-4}

velocity test. The remainder of the material has hydraulic conductivities at least a factor of five lower than these values.

In addition to evaluating the hydraulic conductivity of the formation in which the well was completed, the test allowed an assessment of the maximum flow which could be produced from the well on a sustained basis. Using the available drawdown produced, peak flow estimates range from 2400 gpm to 2900 gpm (0.15 m^3/s to 0.18 m^3/s). This was well beyond the capacity of readily available pumps which would fit in the installed well screen.

6.0 PUMP TEST DESCRIPTION & RESULTS

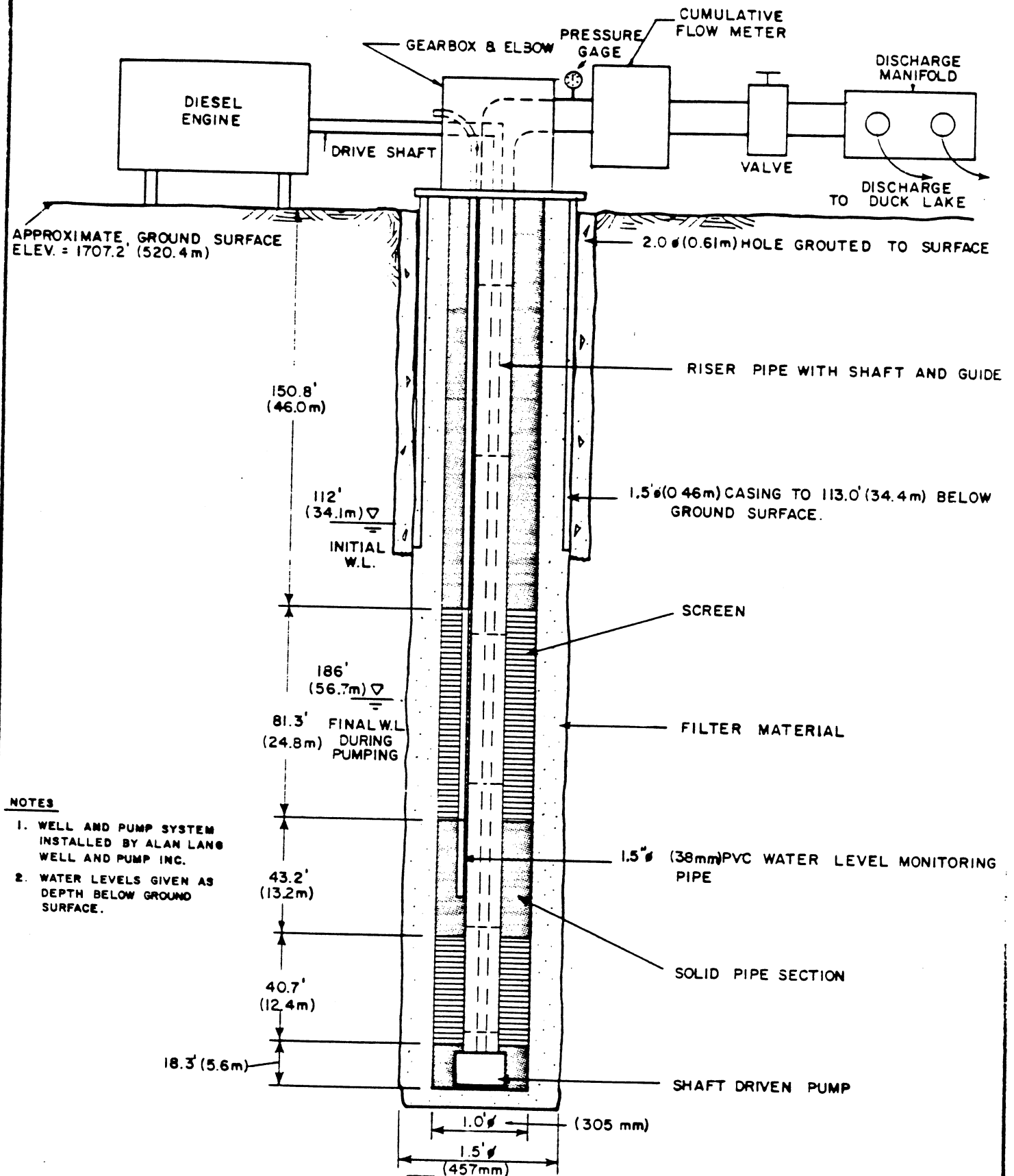
6.1 Pretest Period

Before the main test was performed, water levels in all the observation wells in the vicinity of the test location were measured. The water levels in the thirteen observation wells in which repeated water level measurements were to be taken during the test were monitored on a number of occasions to evaluate any trends in the groundwater levels in the area of the test. This period extended from the end of the flow velocity test on June 6, 1980, to the beginning of the pump test on June 27, 1980. In addition, numerous wells were observed periodically from mid-April to September, 1980, to evaluate long term trends and the impact of the pump test.

The arrangement of the test well equipment is shown on Figures 6.1 and 6.2. Water was pumped from the well with a 1500 gpm (0.095 m^3/s) capacity, shaft driven pump. The water then passed through a cumulative flowmeter, valve, and manifold, and was piped to Duck Lake in two 6 inch (152 mm) diameter, lightweight pipes. This pipeline was about 0.8 miles (1.4 km) in length. A plan view of this arrangement is shown on Figure 6.2.

At Duck Lake the discharge system was arranged to distribute a spray of water over a large area, permitting aeration. Lake levels, flows, and water quality were monitored by representatives of the Wisconsin Department of Natural Resource (DNR) and by Exxon's environmental consultants.

Climatic monitoring equipment was located at the pump test site to document meteorologic effects. Data collected



NOTES

1. WELL AND PUMP SYSTEM INSTALLED BY ALAN LANG WELL AND PUMP INC.
2. WATER LEVELS GIVEN AS DEPTH BELOW GROUND SURFACE.

SCHEMATIC OF TEST WELL SETUP

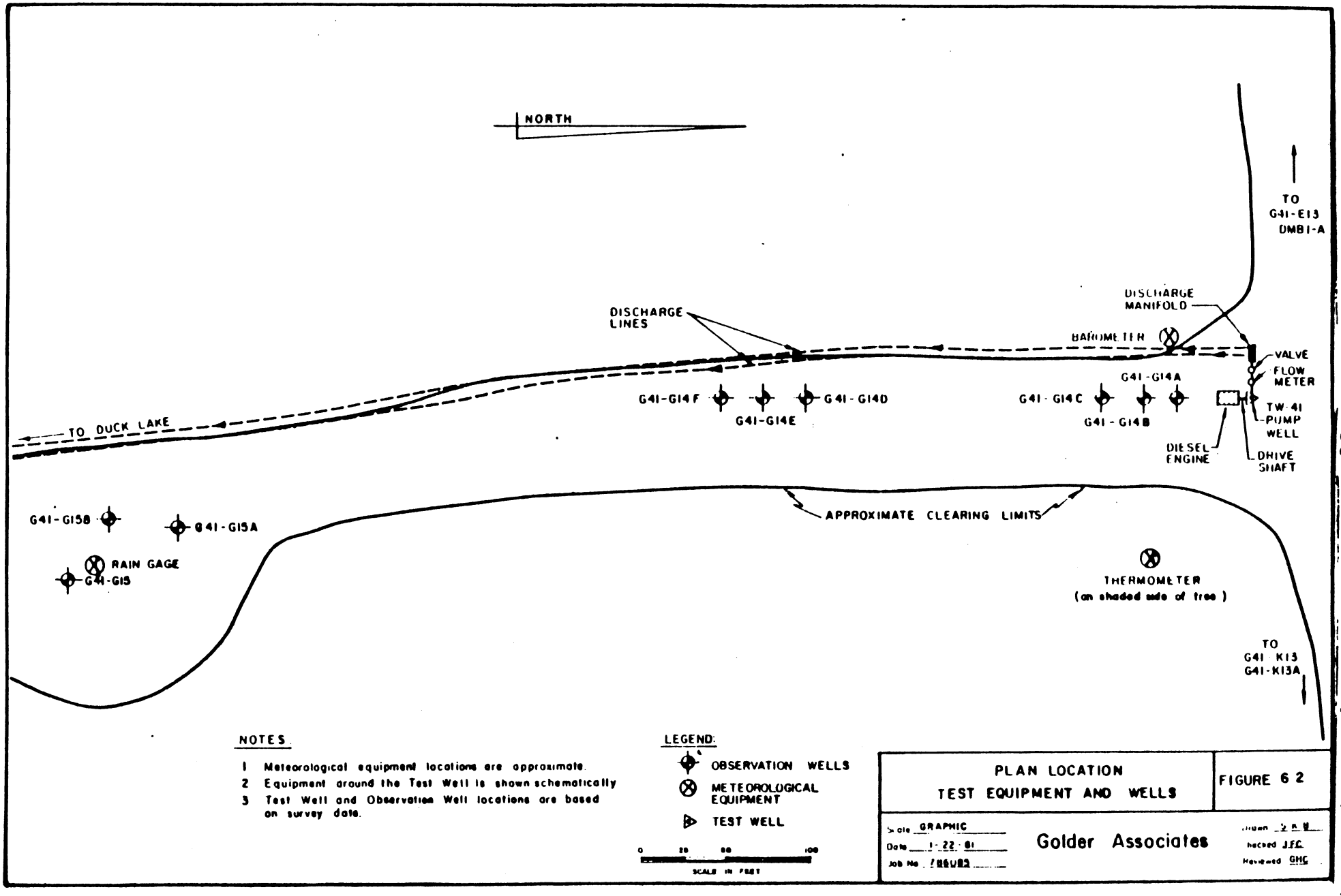
FIGURE 6.1

Scale AS SHOWN
Date 1-21-81
Job No. 786085

Golder Associates

3.6-4-50

Drawn CAB
Checked JFC
Reviewed GHC

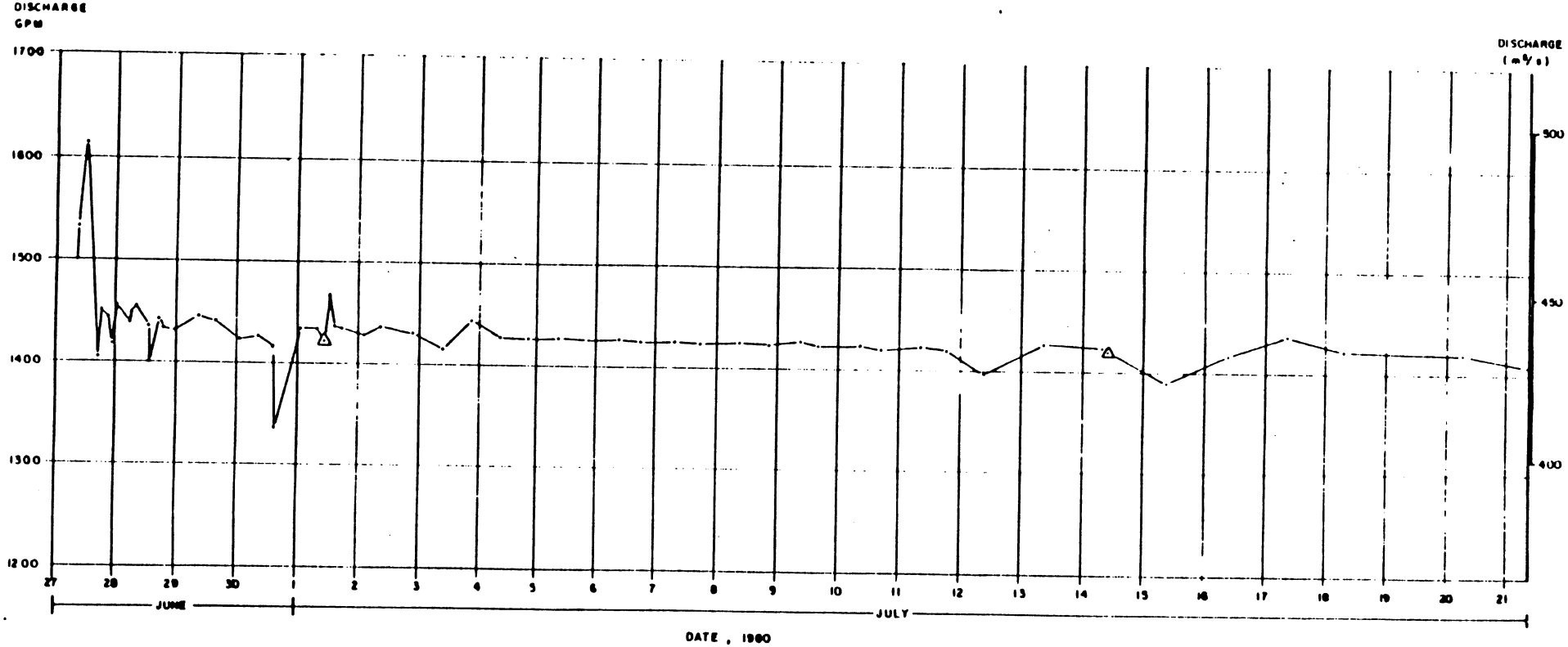

NORTH
TO G41-E13 DMB1-A
DISCHARGE MANIFOLD
DISCHARGE LINES
BAROMETER
VALVE
FLOW METER
G41-G14A
G41-G14F
G41-G14E
G41-G14D
G41-G14C
G41-G14B
TW-41 PUMP WELL
DIESEL ENGINE
DRIVE SHAFT
TO DUCK LAKE
APPROXIMATE CLEARING LIMITS
G41-G15B
G41-G15A
RAIN GAGE G41-G15
THERMOMETER (on shaded side of tree)
TO G41-K13 G41-K13A
NOTES
1 Meteorological equipment locations are approximate.
2 Equipment around the Test Well is shown schematically
3 Test Well and Observation Well locations are based on survey date.
LEGEND:
OBSERVATION WELLS
METEOROLOGICAL EQUIPMENT
TEST WELL
0 20 50 100
SCALE IN FEET
PLAN LOCATION TEST EQUIPMENT AND WELLS
FIGURE 6.2
Scale GRAPHIC
Date 1-22-81
Job No. 781083
Golder Associates
Drawn K.A.W.
Checked J.F.C.
Reviewed G.H.C.

included rainfall, temperature, and barometric pressure. These equipment locations are shown on Figure 6.2.

Water level sounders (electric continuity meters) with graduated cables were used to determine the depth to water in each well. The cable was lowered downhole until the tip was in contact with the water, thus completing the electrical circuit and causing a meter at the surface to register. The depth was then read from the marked cable. Each cable was calibrated on the surface using a metal measuring tape which was accurate to 0.01 feet. Checks using various instruments to measure the same water levels generally showed a reproducability of readings to within $\pm$0.01 feet. Absolute accuracy of the water level readings was not directly evaluated. To speed measurements and reduce errors, cables were permanently located in the G41-G14 series and G41-G15 series observation wells. G41-E13 and DMA-1A observation wells also had instruments placed in them when the pump test began, but they were removed after one week. Other observation well measurements were obtained using the same type sounders on cables that were reeled down and up the observation well each time water levels were measured. Water level indicator calibration constants are included in Appendix B.

6.2 The Drawdown Period

The pump was started at 10:05 AM on June 27, 1980 at a flow rate approaching 1500 gpm (0.095 m^3/s). This rate dropped quickly to about 1440 gpm (0.091 m^3/s) and then gradually reduced with time over the length of the test to 1420 gpm (0.090 m^3/s). The flow rate is plotted on Figure 6.3 and the total flow on Figure 6.4. Data for these plots are contained in Table B.2 of Appendix B. A total volume at about 49 million gallons (1.9×10^5 m^3) was removed from the ground during the period of pumping.



NOTE,

1 DATA PLOTTED FROM TABLE C-2.

2 TEST BEGAN JUNE 27, 1980 AT 10 05 AM. AND ENDED JULY 21, 1980 AT 10:08 AM

LEGEND

▲ PUMP SHUT OFF FOR OIL CHANGE

PUMP DISCHARGE RATE

FIGURE 6.3

Scale AS SHOWN

Date 1-29-80

Job No 786085

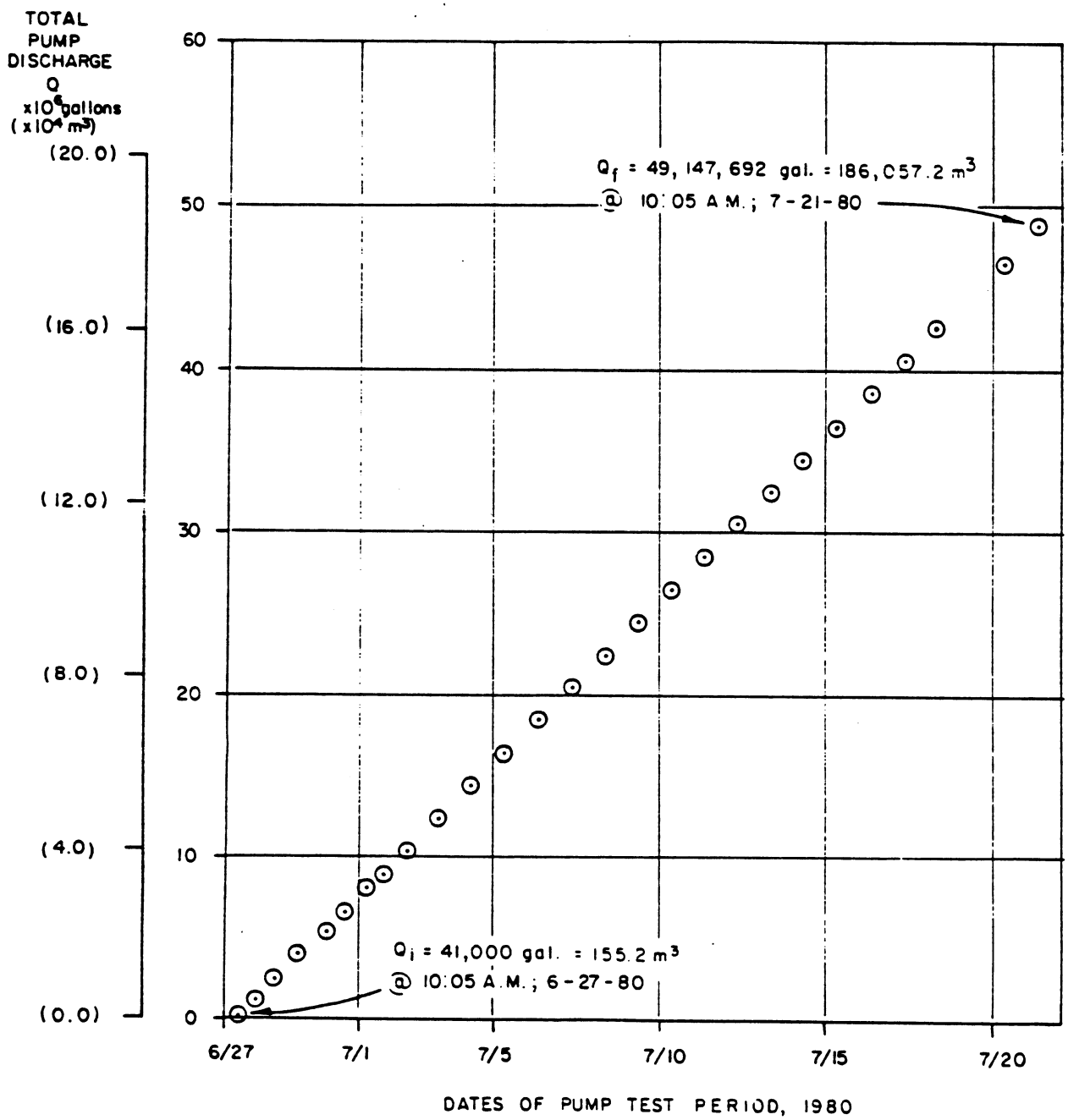
Golder Associates

Drawn S.R.B.

Checked J.E.C.

Reviewed G.H.C.

3.6-4-53



CUMULATIVE DISCHARGE FROM PUMP TEST

FIGURE 6.4

Scale AS SHOWN
Date 11-24-80
Job No. 786065

Golder Associates

3.6-4-54

Drawn S K B.
Checked J.F.C.
Reviewed GHC

The pumping well and primary observation wells were monitored frequently during pumping, starting with measurements every few minutes, and reducing to about one measurement per several days at the end of the pumping period. Details are given in Appendix B.

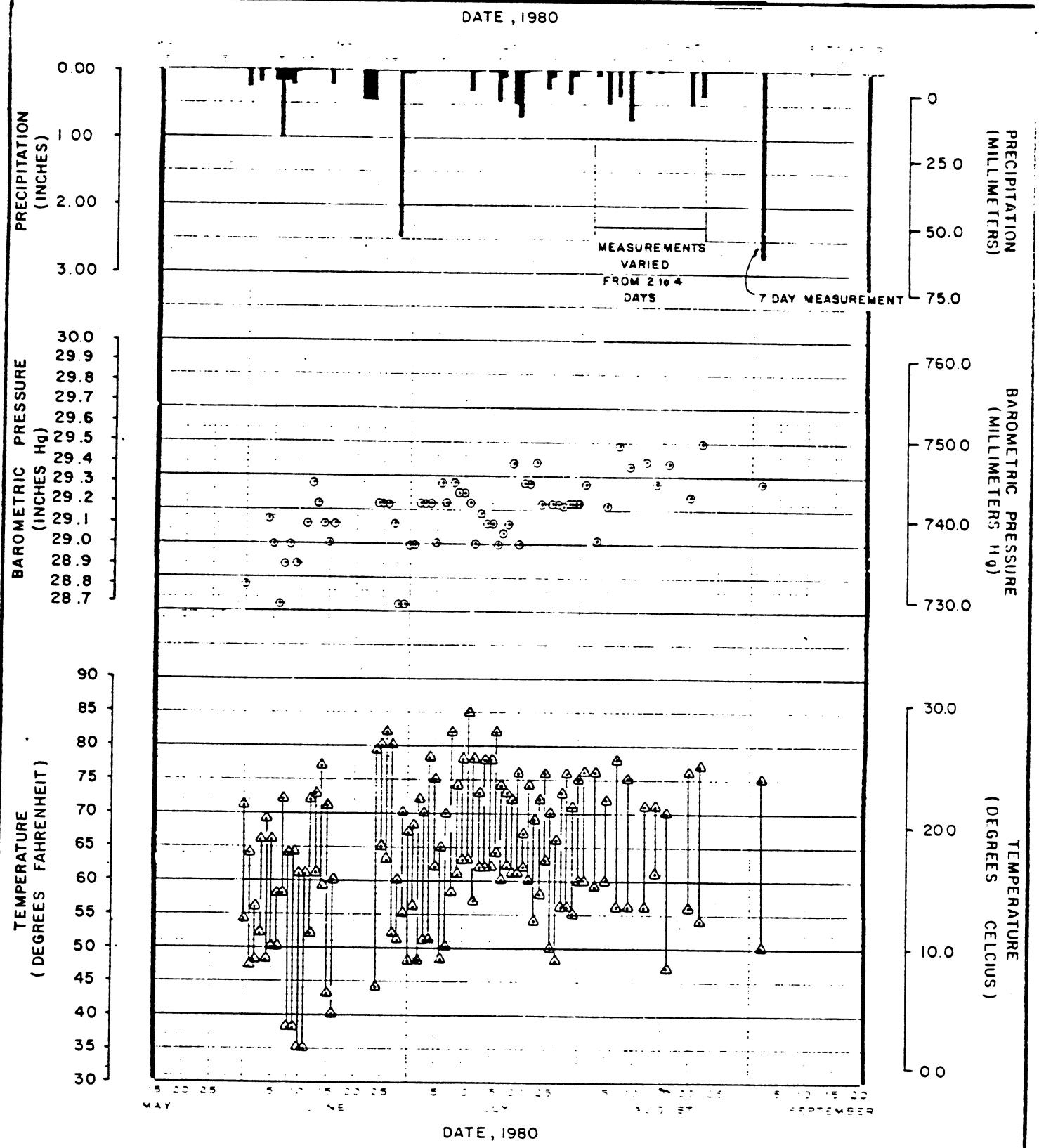
The test was stopped on July 21, 1980 at 10:05 AM, after 24 days. The reason for halting the test short of the planned 30 day duration was that the water level in Duck Lake had risen nearly 1 foot (0.3 m); the pre-determined maximum level acceptable to the Wisconsin DNR.

6.3 The Recovery Period

Data were collected during the recovery period on a similar but somewhat less detailed basis as that used for the drawdown period. As part of this program data collection continued for 52 days (approximately twice the pumping period), until September 10, 1980. On September 10 and 11, 1980, personnel from Golder Associates and Dames & Moore obtained water level measurements from all of the accessable observation wells installed as of that date. The water level response during recovery is discussed in Sections 6.6 and 7.2 of this report. Plots of the water levels during part of the recovery period are shown on Figures 6.6 and 6.11. The recovery period measurements and data analyses are provided for each of the primary observation wells in Appendix B.

6.4 Climatic Monitoring

Measurements of rainfall, maximum and minimum temperature, and barometric pressure were taken daily using relatively simple equipment which was located as shown on Figure 6.2. Data are presented in Appendix B and shown graphically on Figure 6.5.



NOTE

CLIMATIC INSTRUMENTS READ DAILY AT ABOUT 8.00 AM.

CLIMATOLOGICAL DATA

FIGURE 6.5

Scale AS SHOWN
Date 1-21-81
Job No. 786085

Golder Associates
3.6-4-56

Drawn CAB
Checked JFC
Approved GHC

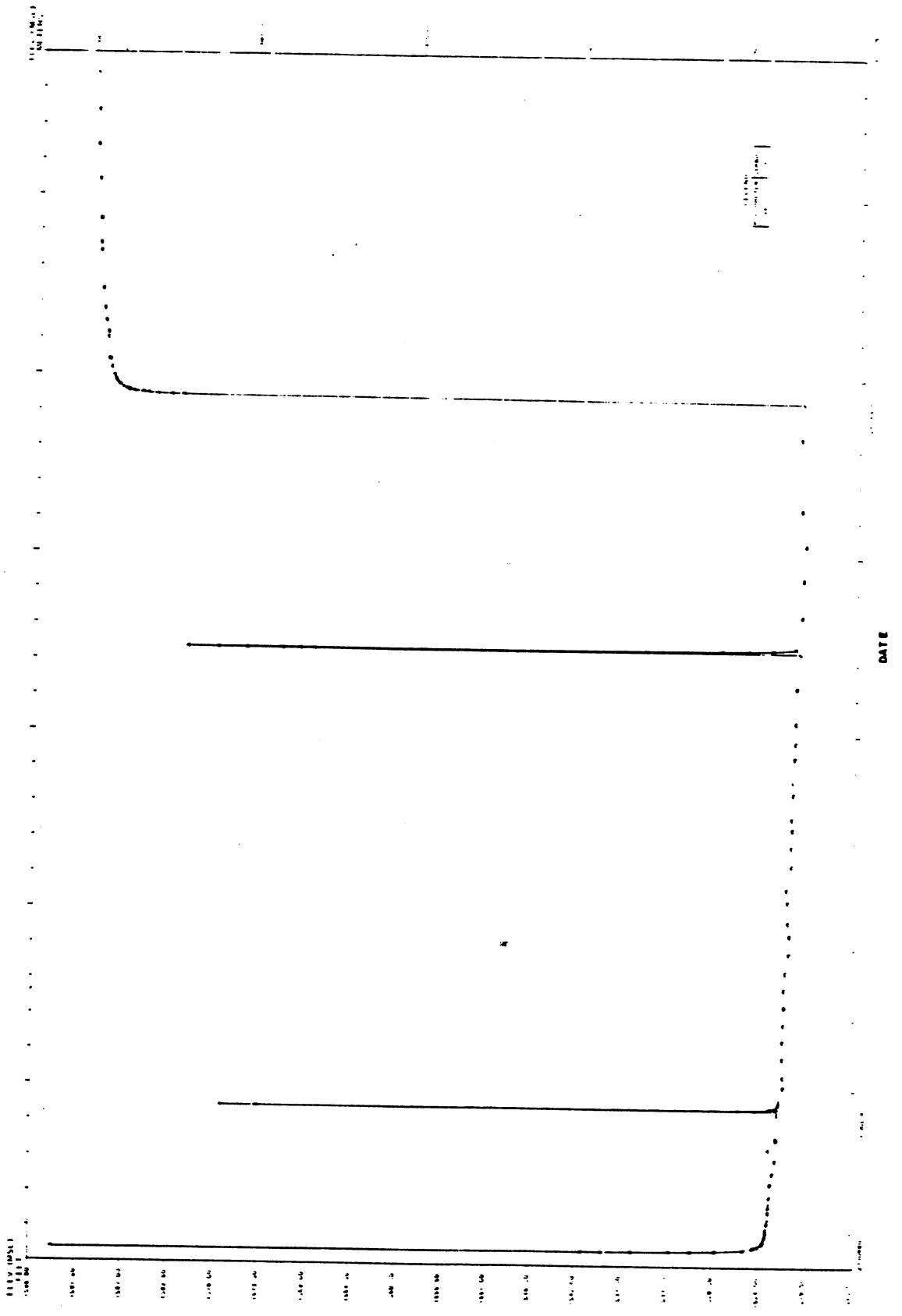
6.5 Pumping Well and Observation Well Results

Water level measurements and other data collected are presented in Appendix B. Plots of water elevations versus time have been prepared for each group of observation wells located at various distances from the test well and with completions in different strata. The well groups were generally at distances of 75 feet (23 mm), 300 feet (91 m),700 feet (213 m), 1450 feet (442 m), and 1760 feet (536 m) from the test well. These data are grouped and presented as follows:

Figure 6.6 Water Level History; Pumping Well TW-41
Figure 6.7 Water Level History; G41-G14A, B & C
Figure 6.8 Water Level History; G41-G14D, E & F
Figure 6.9 Water Level History; G41-G15, G15A & B
Figure 6.10 Water Level History; G41-E13 & DMB-1A
Figure 6.11 Water Level History; G41-K13 & K13A

These data are largely as expected. The well drew down a total of about 73 feet (22 m), and the nearby observation wells drew down by lesser amounts depending on the distance of the observation well from test well and the depth at which the observation well was completed. The variation of drawdown with distance was normal, approximately logarithmic, and therefore needs little detailed explanation. Detailed analyses for aquifer parameters are presented in Section 7. The vertical variation in drawdown is less well appreciated in pump tests of this sort, and is explained in the following paragraph.

When a well is fully open to the formation, water is drawn from the entire section. The response of any given point in the formation to this hydraulic stress is dependent



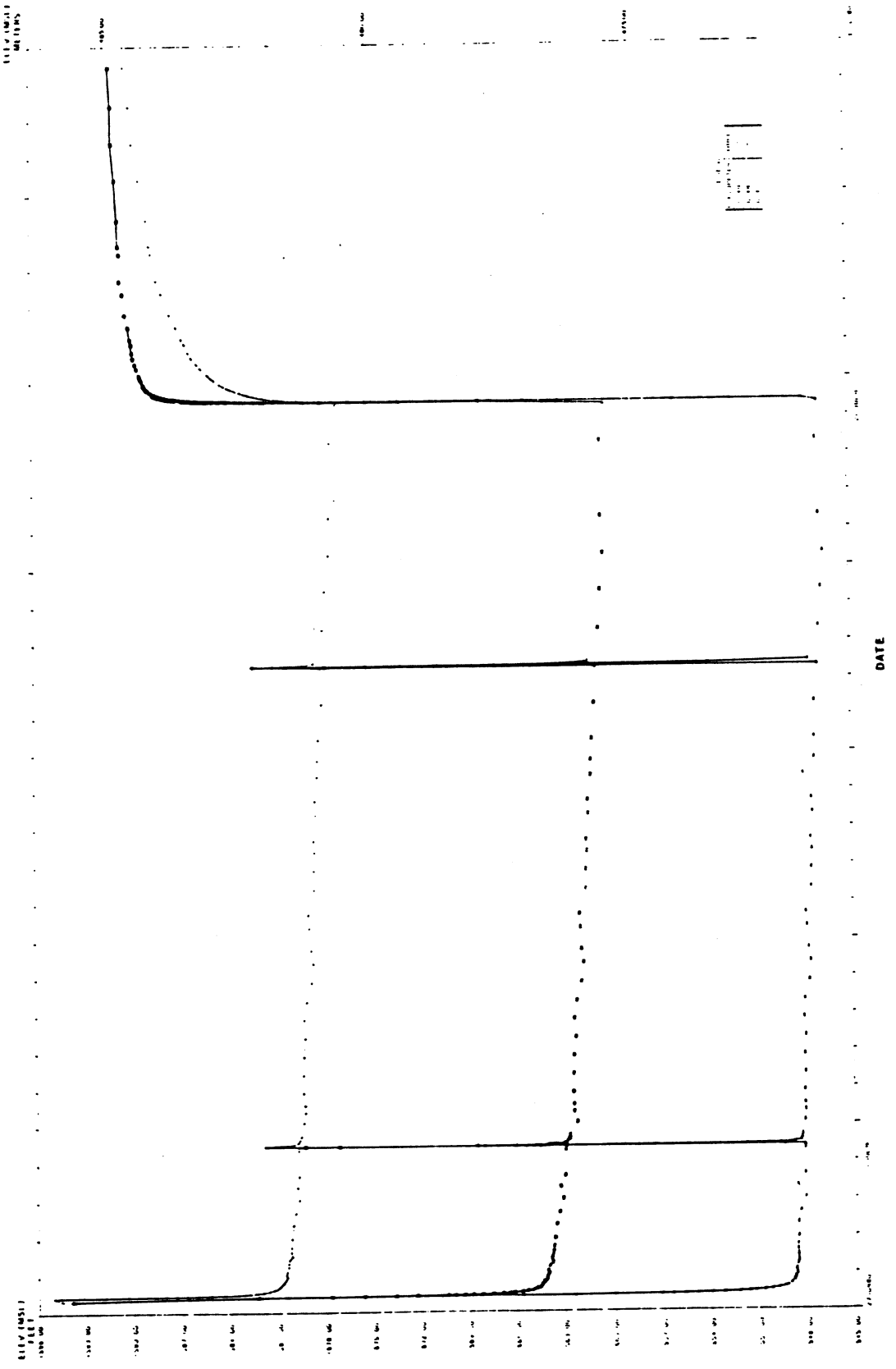
WATER LEVEL HISTORY PUMPING WELL TW-41

FIGURE 6.6

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-58

Drawn CAB
Checked JFC
Reviewed GHC



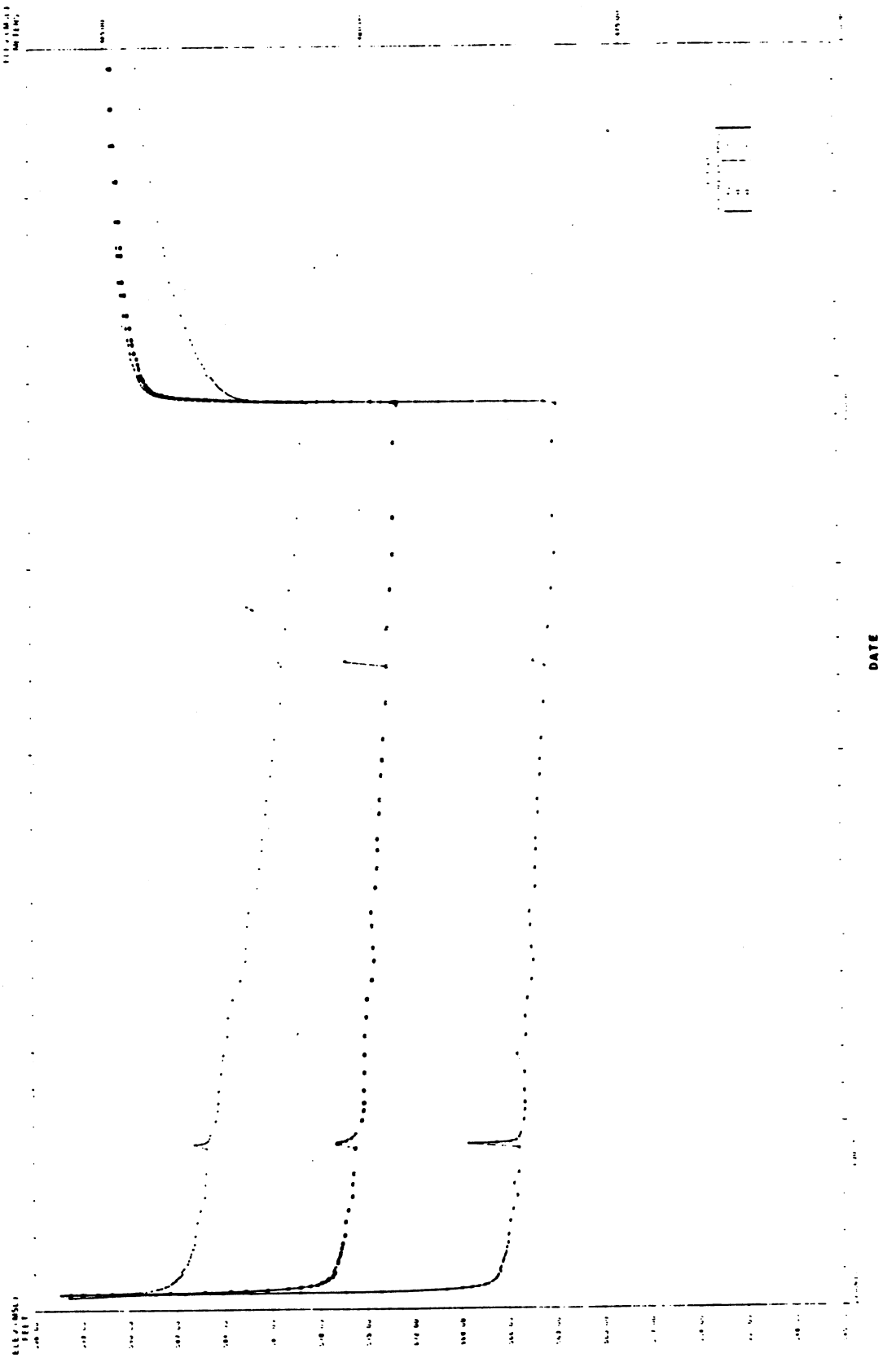
WATER LEVEL HISTORY; G41-G14 A,B & C

FIGURE 6.7

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-59

Drawn CAB
Checked JFC
Reviewed GHC



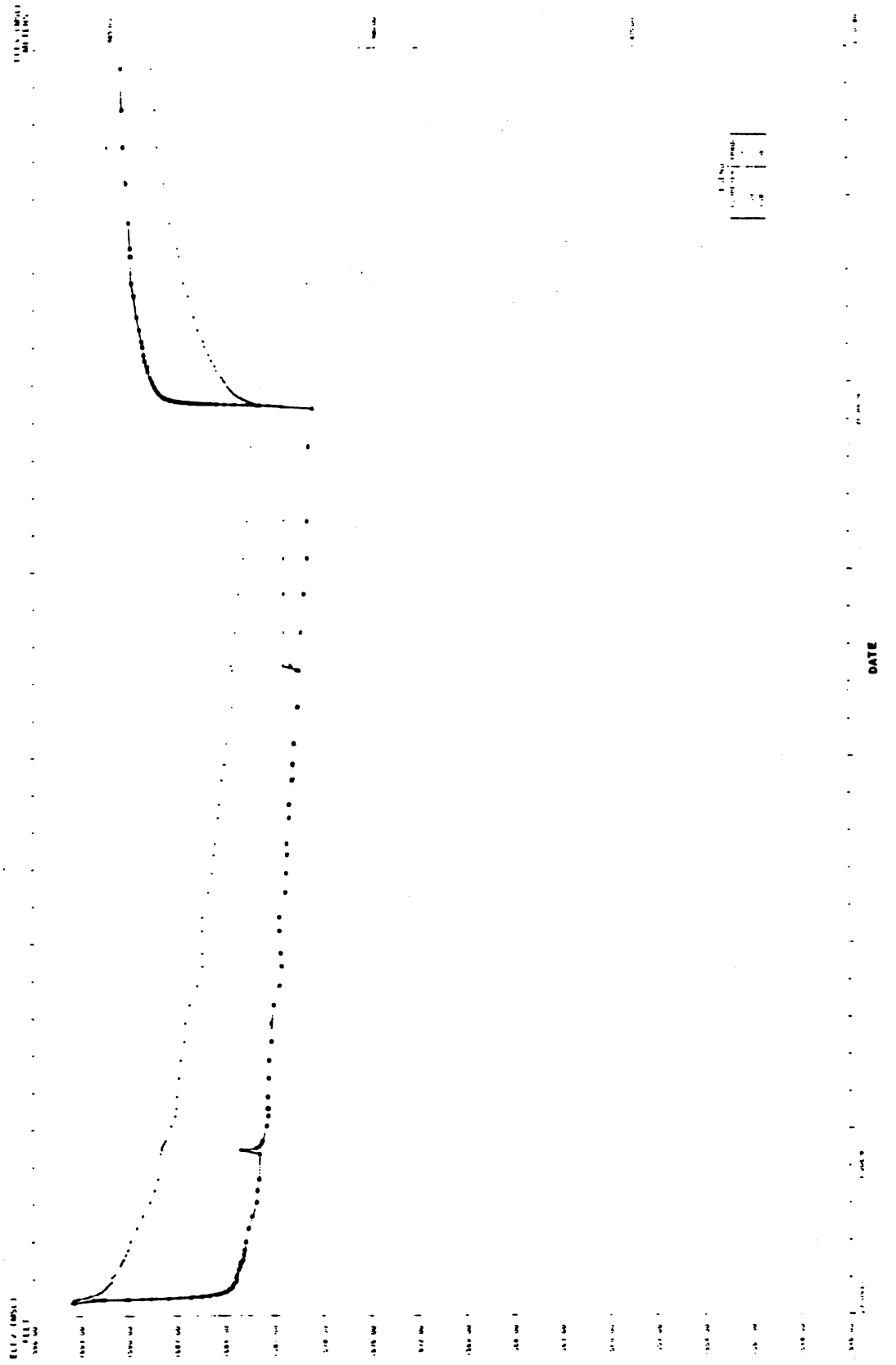
WATER LEVEL HISTORY; G41-G14 D, E & F

FIGURE 6.8

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-60

Drawn CAB
Checked JFC
Reviewed GHC



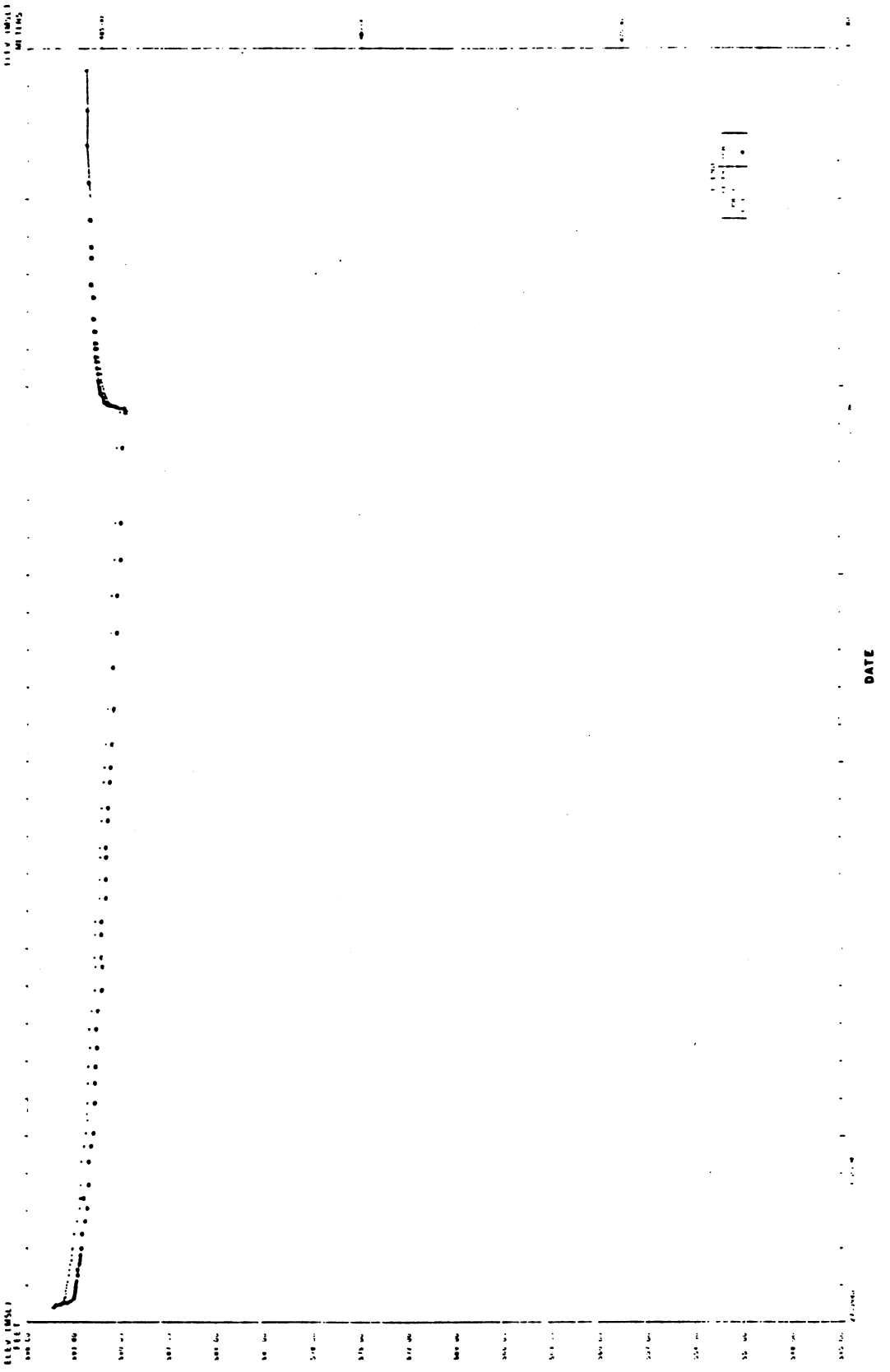
WATER LEVEL HISTORY; G41-G15, G15A, B

FIGURE 6.9

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-61

Drawn CAB
Checked JFC
Reviewed GHC



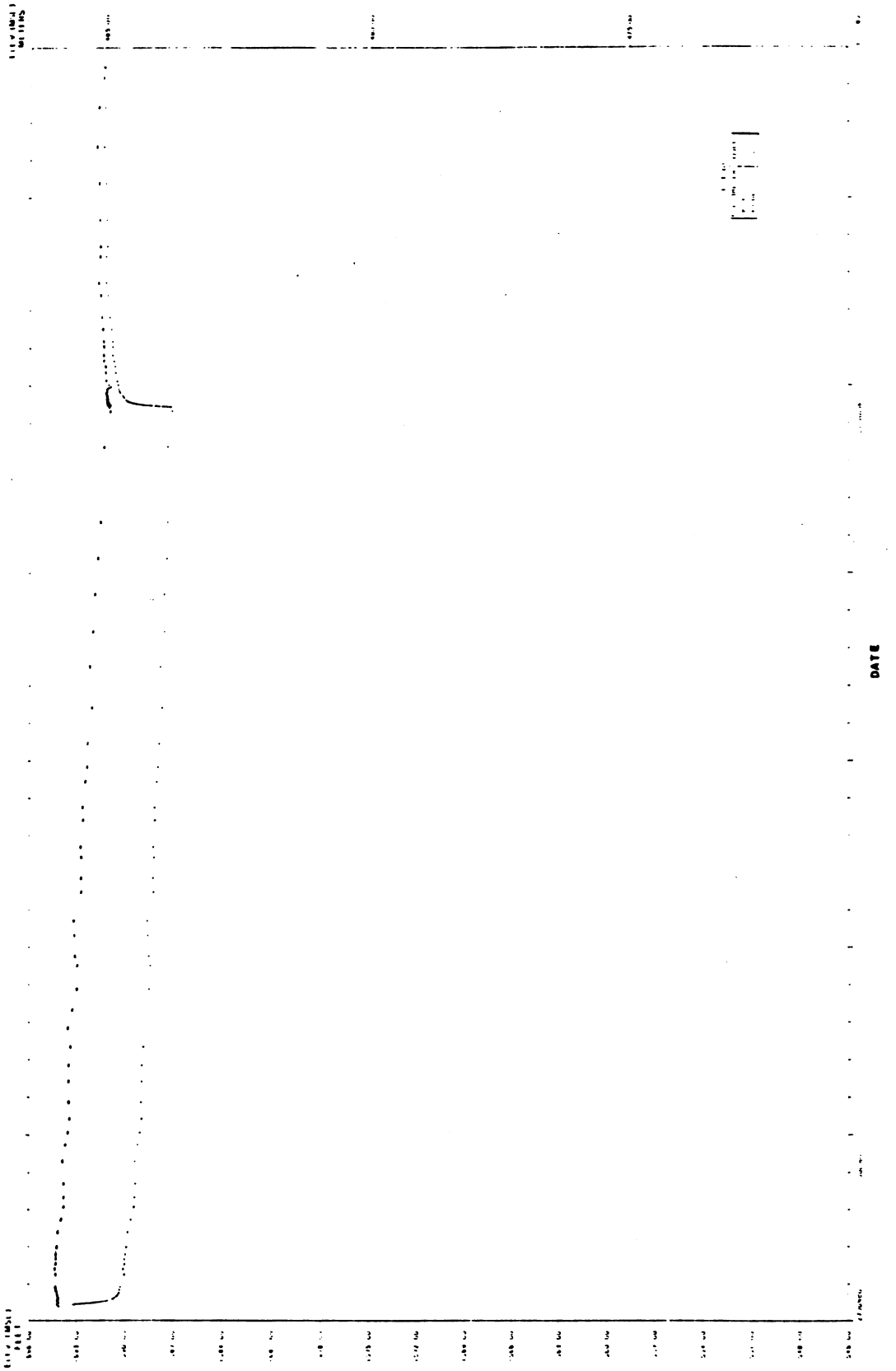
WATER LEVEL HISTORY; G41-E13 & DMB-1A

FIGURE 6.10

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-62

Drawn CAB
Checked JFC
Reviewed GHC



WATER LEVEL HISTORY; G41-K13 & K13A

FIGURE 6.11

Scale AS SHOWN
Date 2-27-81
Job No. 786085

Golder Associates
3.6-4-63

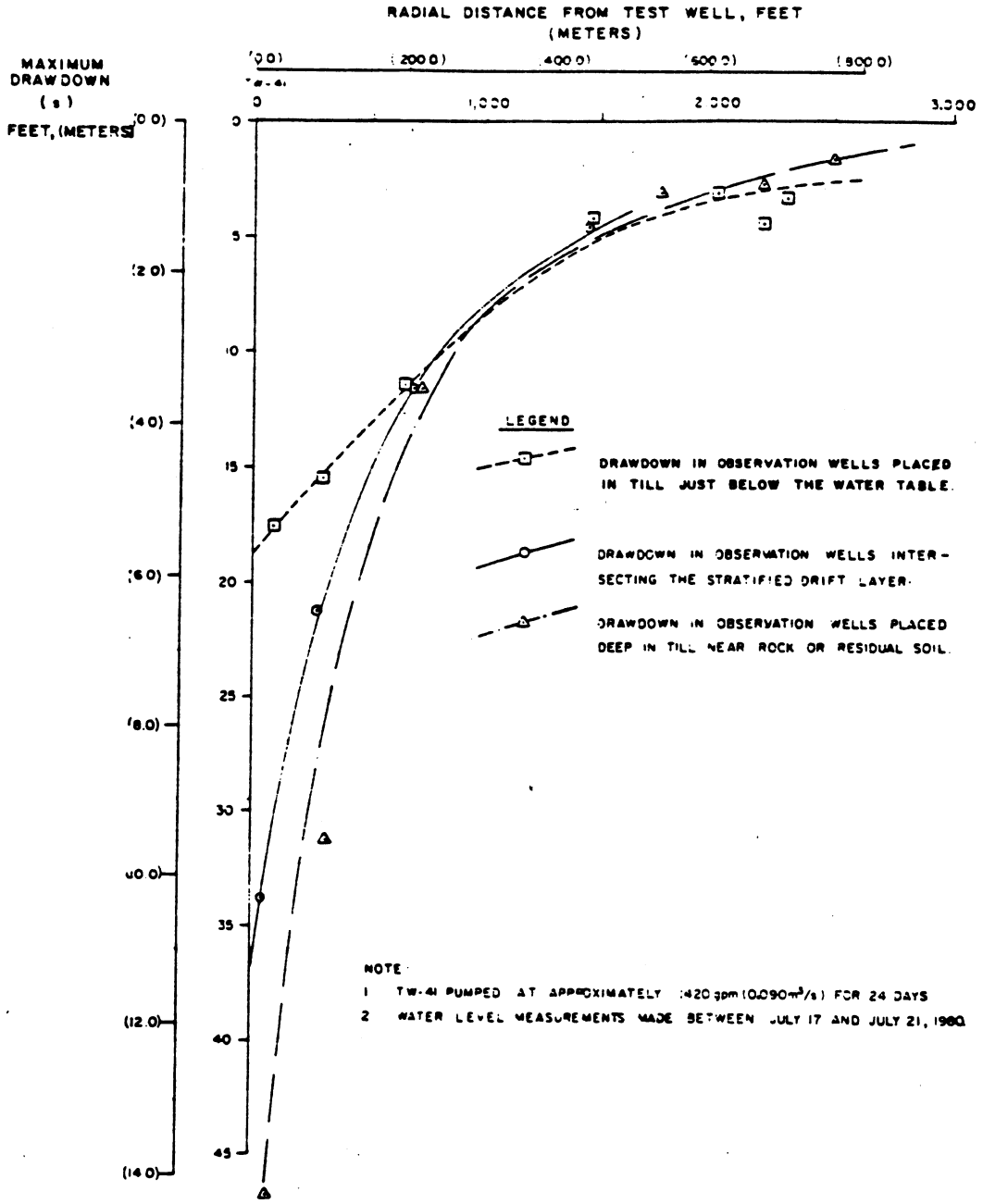
Drawn CAB
Checked JFC
Reviewed GHC

on the depth of that point below the top of the saturated zone. Near the top of the saturated zone the system behaves like a water table aquifer and draws down very slowly due to the large quantity of water which must be removed from this part of the system in order to physically desaturate the formation. Deeper in the system, however, the degree of confinement is considerably greater so that head changes are propogated laterally more quickly and further due to the limited impact of the water table on these strata. Thus, at any given plan location, drawdowns tend to be greater with increasing depth. This effect is more marked in systems where the horizontal hydraulic conductivity is very much higher than the vertical hydraulic conductivity, and is more marked close to the pumping well. This effect can be used to evaluate vertical hydraulic conductivity.

6.6 Drawdown Pattern

The drawdown pattern with depth has been evaluated for the end of the 24th day of pumping, and is presented in Figure 6.12. This data shows remarkable consistency and also indicates the phenomenon of differing drawdowns with depth close to the well. An approximate drawdown cone for the coarse grained stratified drift layer has been drawn on a plan of the project area; presented as Figure 6.13. This cone, produced after a relatively short pumping period, has reversed the groundwater gradient for a radius of at least 2000 feet (610 m) from the well. This causes groundwater to flow towards the well from an area which is comparable in size to much of the area of the proposed tailings disposal facility.

The approximate radius of influence for this pump test was about 4000 feet (1220 m). This can be seen on Figure 6.14, where water levels before the test started, at



DRAWDOWN WITH DEPTH vs. DISTANCE FROM TEST WELL

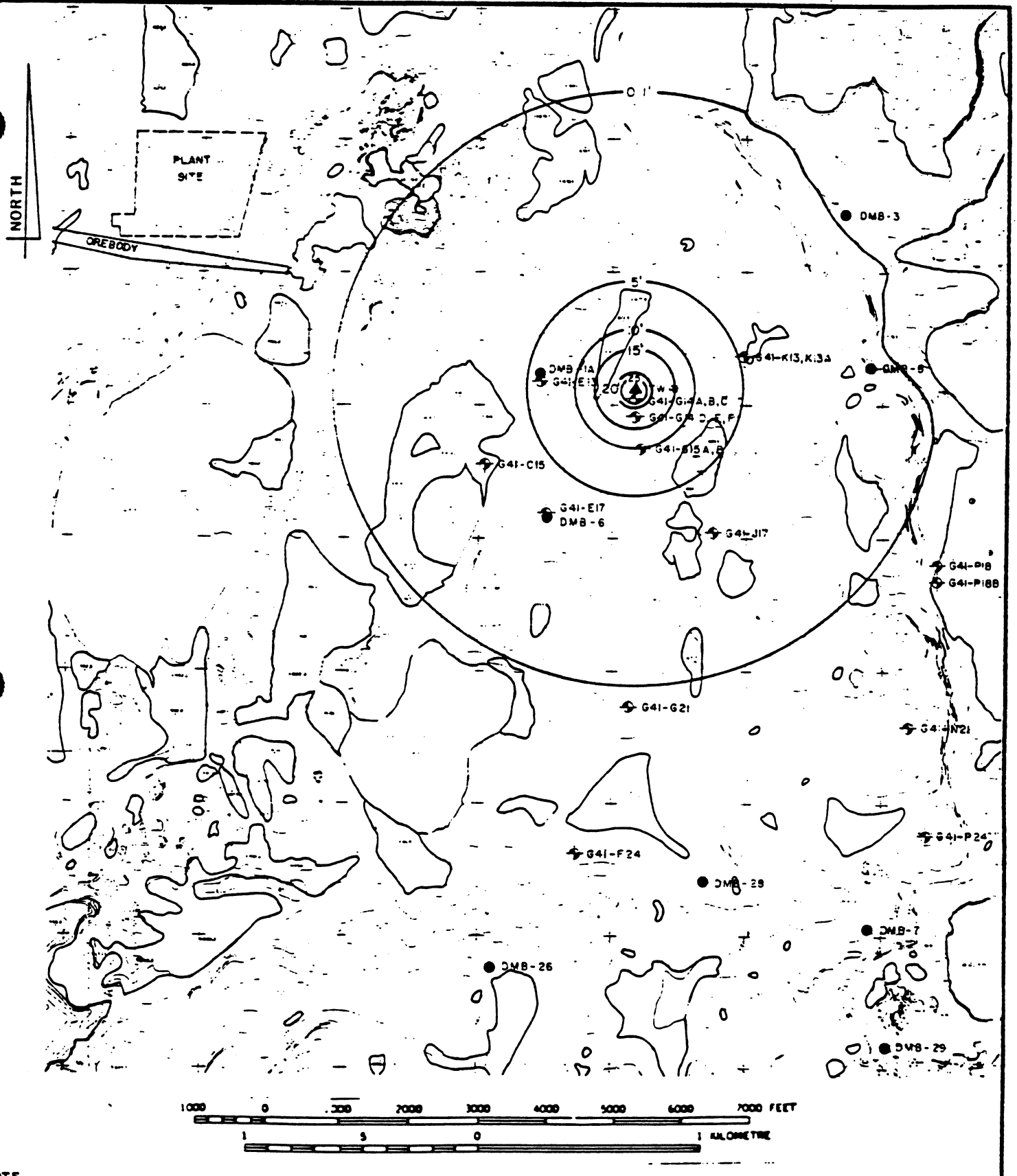
FIGURE 6.12

Scale AS SHOWN
Date 2-16-81
Job No. 786085

Golder Associates

Drawn CAB
Checked JFC
Reviewed GHC

3.6.4.65



NOTE RADIAL DRAWDOWN PATTERNS IN FEET. DATA SHOWN ON FIGURE 6.12.

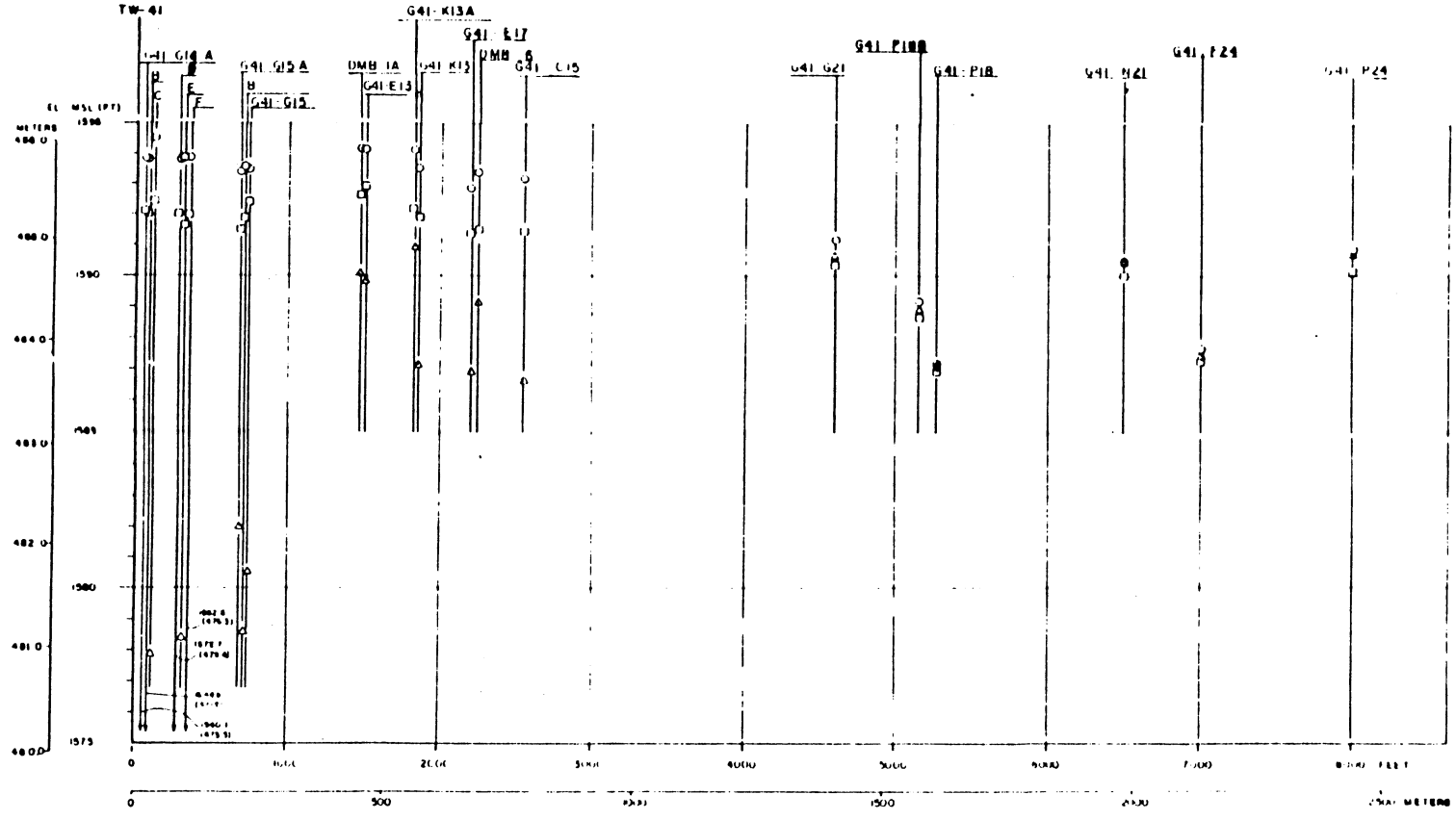
ESTIMATED RADIAL DRAWDOWN PATTERN AT END OF PUMP TEST IN STRATIFIED DRIFT

FIGURE 6.13

Scale GRAPHIC
Date 2-17-81
Job No. 786085

Golder Associates
3.6-4-66

Drawn CAB
Checked JFC
Reviewed GHC



NOTES

PUMPING STARTED 6/27/80
STOPPED 7/21/80
AVG RATE = 1420 gpm (0.090 m³/s)

O WATER ELEVATION NEAR START OF PUMPING (5/22/80 - 6/28/80)

Δ WATER ELEVATION NEAR TIME OF MAXIMUM DRAWDOWN (7/17/80 - 7/21/80)

□ WATER ELEVATION ON SEPT. 10, 1980

LOWEST AND HIGHEST WATER LEVELS DURING PUMPING PERIOD

FIGURE 6.14

Scale AS SHOWN
Date 1-21-81
Job No 786086

Golder Associates

Drawn SAB
Checked JFC
Reviewed GHC

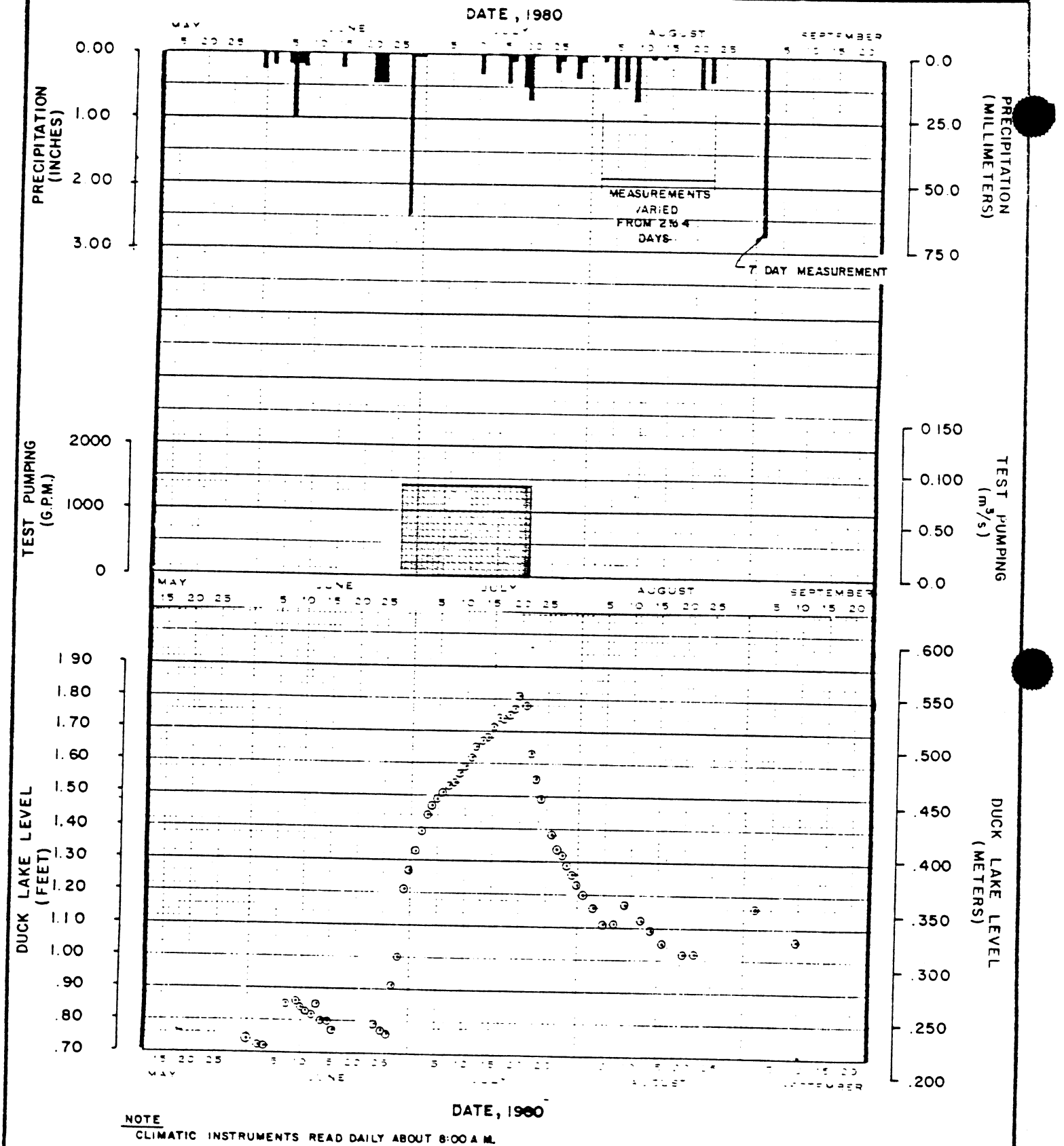
pump shut down, and at a period well into recovery were plotted to ascertain the radial distance affected by pumping.

As is also shown in Figure 6.14, very small changes which were observed at distances greater than 4000 feet (1220 m) seemed to be within the range of apparent normal water level deviations.

Figure 6.14 also indicates that wells significantly affected by the pump test did not fully recover during the 52 day recovery monitoring period. There was about a 1.5 ft. to 2.5 ft. (0.5 m to 0.8 m) difference after pumping. With a 4000 foot (1220 m) radius of influence, an assumed drainable porosity of 6%, and a 2.0 foot (0.6 m) average water level drop, the volume of water removed was calculated to be about 45 million gallons (1.7×10^5 m^3). This is very close to the measured 49 million gallons (1.9×10^5 m^3) removed.

6.7 Behavior of Duck Lake

The behavior of Duck Lake during the test was monitored about daily using a staff gage installed by Golder Associates. As shown in Figure 6.15, the water level rose in response to precipitation and in response to the considerable inflow from the pump test.



NOTE
CLIMATIC INSTRUMENTS READ DAILY ABOUT 8:00 A.M.

DUCK LAKE RESPONSE TO PRECIPITATION AND PUMP TEST DISCHARGE

FIGURE 6.15

Scale AS SHOWN
Date 1-21-80
Job No. 786085

Golder Associates
3.6-4-69

Drawn CAB
Checked JFC
Approved GHC

7.0 PARAMETER ANALYSES

7.1 Data Reduction

Data from the pump test were input to a computer program developed by Golder Associates to reduce pump test data. The program, using the data directly from the field books, reduces the measurements to elevations, plots elevation against time, and prepares report printouts. The data and analysis plots for the main 13 wells analyzed are shown in Appendix B.

7.2 Water Level Changes

The plots of water levels versus time show large initial changes in almost all observation wells. Deep observation well water levels dropped rapidly for the first few days, but afterwards all water levels dropped at about the same rate.

During the periods of pump shutdown for oil changes on July 2 and July 14, large fluctuations in the nine observation wells south of the test well were observed. Small water level fluctuations can be seen in all the primary observation wells.

Recovery curves were generally similar to the drawdown curves. The observation wells placed at medium depths (generally in the coarse grained stratified drift) and the deep observation wells behaved almost identically and the recovery curves were almost inverses of the drawdown curves. The shallow observation wells, installed to just below the original groundwater level, indicated a distinctly different response during recovery as compared to the drawdown response. This reflects the different mechanism of desaturation and re-saturation.

Drawdown values were estimated from the last water level measurements before the beginning of the pumping test, at 10:05 AM on June 27, 1980. Long term plots of water levels in observation wells over a period of about 6 months (Figure 7.1) show little change in the water level unless directly impacted by the pump test. Therefore, for the period of the pump test, 24 days, the base line water level was considered constant for each observation well.

The recovery test was treated as a constant recharge superimposed on the discharge at the same location as the pump well. Water level changes were estimated as the difference between the measured water levels and projections of the drawdown curves from the pump test. This technique is considered valid for short periods after pumping ceases, and was therefore only used to evaluate the period between July 21, and July 31, 1980.

7.3 Parameters

Analyses were performed primarily to evaluate the parameters which describe the simplified system shown in Figure 7.2. These parameters are:

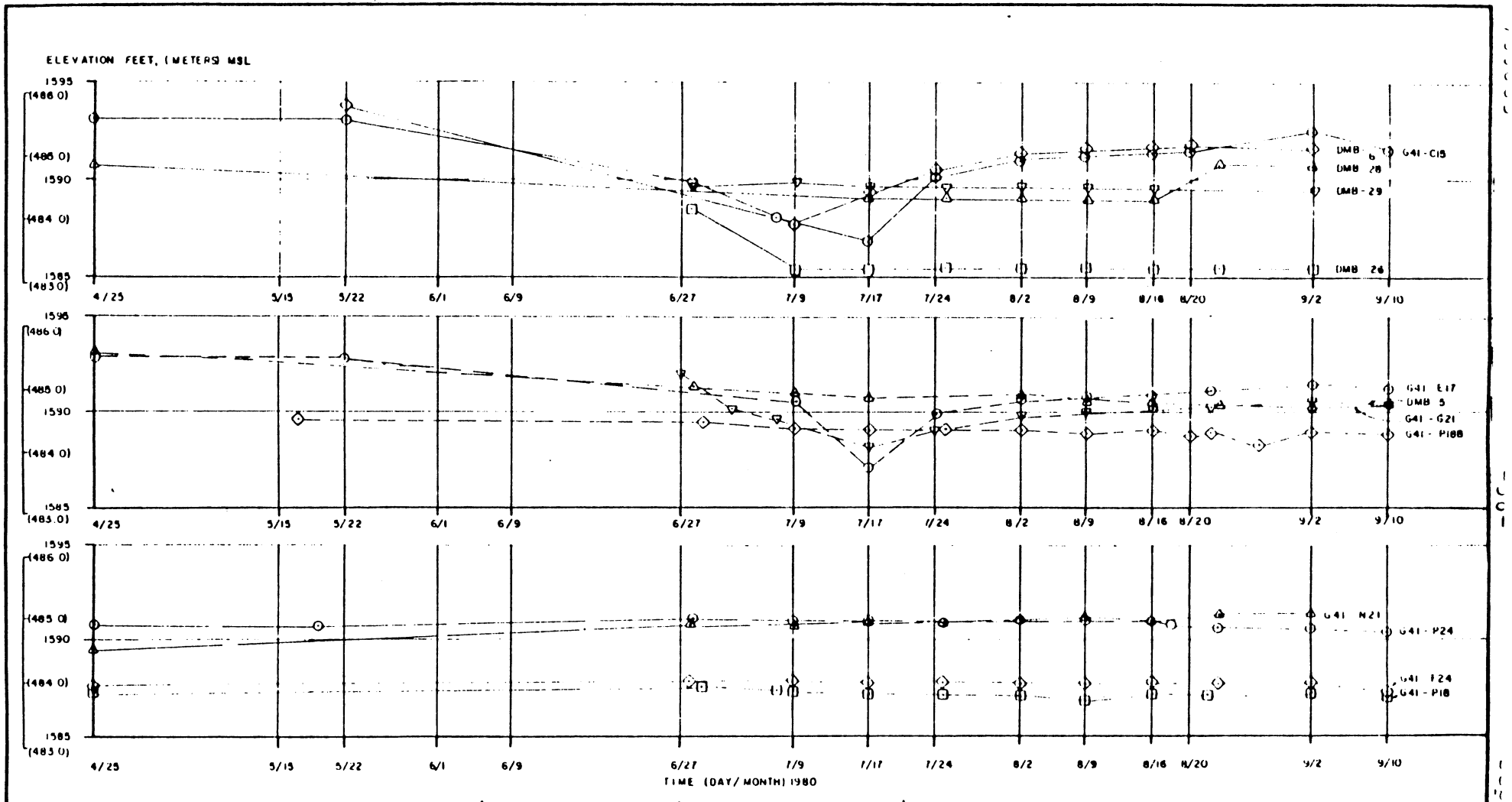
a) Horizontal hydraulic conductivity of the primary contributing layer

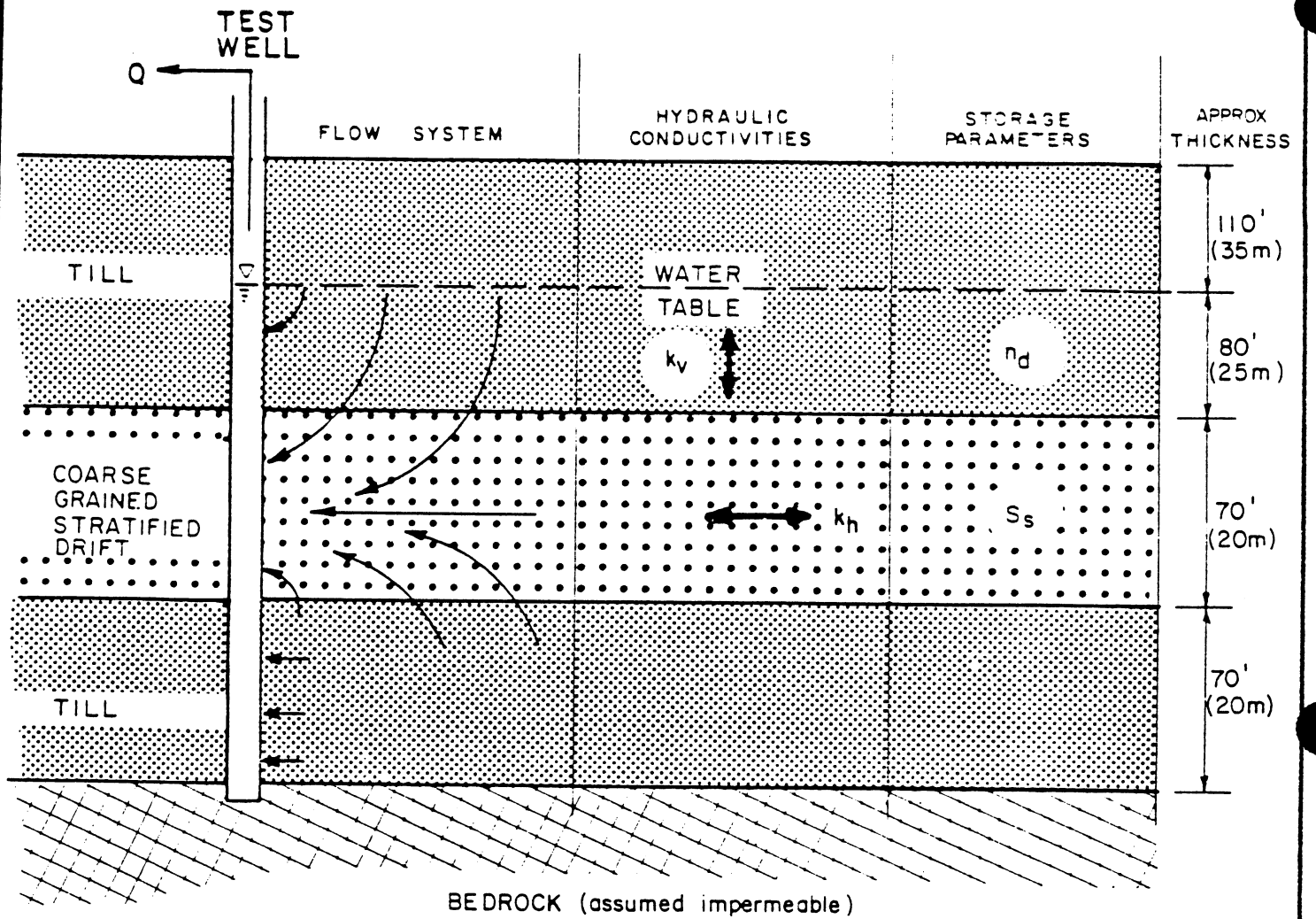
b) Vertical hydraulic conductivity of the confining layer

c) Specific storage of the primary contributing layer

d) Drainable porosity of the confining layer

Traditional analysis methods are generally set up to produce values for transmissivity and storage coefficient of a unit. The definitions of hydraulic conductivity, trans-


ELEVATION FEET, (METERS) MSL
1595
(486.0)
1590
(484.0)
1585
(483.0)
4/25
5/15
5/22
6/1
6/9
6/27
7/9
7/17
7/24
8/2
8/9
8/16
8/20
9/2
9/10
DMB 6
DMB 28
DMB 29
DMB 26
G41 - C15
G41 E17
DMB 5
G41 - G21
G41 - P18B
G41 N21
G41 - P24
G41 P24
G41 - P18
TIME (DAY/MONTH) 1980
NOTE
OBSERVATION WELLS MONITORED AND NOT HEAVILY AFFECTED BY THE PUMP TEST INCLUDE
DMB - 28 G41 - J17
29 P24
N21
P18B
P18
FLOW VEL TEST
6/6/80
START PUMP TEST
10 05
6/27/80
START RECOVERY
10 05
7/21/80
LONG TERM WATER LEVEL PLOTS FROM SELECTED OBSERVATION WELLS
FIGURE 7.1
Scale AS SHOWN
Date 1-21-81
Job No 785085
Golder Associates
Drawn CAB
Checked VFC
Reviewed GHC



NOTES

Assumptions Made for Analysis:

1. Uniform Thickness Units of Infinite Extent.
2. Homogeneous, Laterally Isotropic Units.
3. Fully Penetrating Well.

LEGEND

(1) k_h = horizontal hydraulic conductivity of primary contributing layer.

k_v = vertical hydraulic conductivity of leaky layer.

S_s = specific storage of primary contributing layer.

n_d = drainable porosity (specific yield) of leaky layer.

CONCEPTUAL FLOW MODEL FOR PUMP TEST ANALYSIS

FIGURE 7.2

Scale NO SCALE
Date 2-16-81
Job No. 786085

Golder Associates
3.6-4-73

Drawn CAB
Checked GHC
Reviewed GHC

missivity, specific storage, storage coefficient, and drainable porosity are given below to classify the relationships between them.

- Hydraulic Conductivity (k)

  Hydraulic conductivity is a measure of the ease of movement of groundwater through aquifers and aquitards, and is defined as the rate of flow of water, through a unit cross-sectional area of the aquifer under a unit hydraulic gradient at the prevailing temperature of the water. It is the coefficient of proportionality defined in Darcy's Law, $v=ki$ where v is the discharge velocity and i is the hydraulic gradient. Hydraulic conductivity has the units length per unit time. (L/T)

- Transmissivity (T)

  Transmissivity of an aquifer is a measure of the capacity of an aquifer to transmit water through its entire thickness and is equal to the hydraulic conductivity multiplied by the saturated thickness of the aquifer. Transmissivity is defined as the rate of flow of water through a vertical strip of the aquifer of unit width and extending the full saturated thickness under a unit hydraulic gradient at the prevailing temperature of the water. Transmissivity, has units length squared per unit time. (L^2/T)

- Specific Storage (S_s)

  The specific storage is defined as the volume of water released from (taken up by) a unit volume of material, when the water head decreases (increases) by one unit. It has the units of inverse length. L^{-1}

- Storage Coefficient (S)

  Storage coefficient of an aquifer is defined as the volume of water the aquifer releases from (takes into) storage per unit surface area of the aquifer per unit decline (rise) of head. The volume of water released from storage in the aquifer prism divided by the product of the prism's cross-sectional area and the change in head results in a dimensionless number which is the coefficient of storage. Storage coefficient is equal to the specific storage multiplied by the aquifer thickness in confined systems.

- Drainable Porosity (n_d)

  Drainable porosity of a material is defined as the volume of water which will drain under gravity from an initially saturated unit volume of the material. It is also frequently called the specific yield (S_y). Drainable porosity approximately equals the storage coefficient of unconfined systems.

7.4 Method of Analysis

The drawdown and recovery tests were analyzed by four different methods, each discussed below. Detailed discussion of the analysis methods, equations, and development can be found in References 4 and 5 cited at the end of this report.

The data indicated the system responded as a semi-unconfined aquifer bounded by aquitards (lower permeability layers but not impervious layers). Therefore, leaky aquifer theory analysis was applied. Unconfined analysis was also performed for steady state conditions to confirm that the system acts as a leaky aquifer. In general, all of the analysis techniques make the following assumptions:

a) The aquifer has an infinite areal extent.

b) The aquifer is homogeneous, isotropic, and of uniform thickness over the area influenced by the pumping test.

c) The aquifer is pumped at a constant discharge rate.

d) The pumped well penetrates the entire aquifer and thus receives water from the entire thickness of the aquifer by horizontal flow.

The pumping test performed at Site 41 satisfies all of the above assumptions reasonably well. Assumption b), uniform thickness, heavily influenced selection of pairs of wells for the well-to-well steady state analyses and will be discussed in more detail.

Boundary effects do not appear to influence the test results. Swamp Creek and Hemlock Creek are groundwater discharge streams, but they did not influence the test because of their relatively large distance from the pumped well.

7.4.1 Boulton Method

The Boulton method of analysis involves fitting the observed response in piezometers to the standard type curves for a leaky, delayed yield system. Such a system behaves initially as a leaky unconfined aquifer, but as time progresses, the primary source of water becomes desaturation of the medium. In addition to the general assumptions, the Boulton Method also assumes:

a) The aquifer is unconfined but showing delayed yield phenomena or the aquifer is semi-unconfined.

b) The flow to the well is an unsteady state.

c) The diameter of the well is small, i.e., the storage in the well can be neglected.

Such an analysis closely conforms to this pump test, and allows evaluation of:

a) Horizontal hydraulic conductivity of the primary contributing layer,

b) Specific storage of the primary contributing layer (from the early test behavior),

c) Vertical hydraulic conductivity of the confining layer,

d) Drainable porosity of the confining layer.

As can be seen in Figure 7.2, these are all of the parameters of interest. Further, they are all of the physical hydrologic parameters of significance to mass transport in the saturated zone. The other important parameters relate to chemistry, dispersion, and attenuation, and unsaturated zone parameters. For this reason, the Boulton method is the primary analytical tool used for this study.

7.4.2 Hantush Method I

The Hantush method I is the first of three methods proposed by Hantush for analyzing pump well data. This method has the following additional assumptions.

a) The aquifer is semi-confined.

b) The flow to the well is an unsteady state, i.e. the drawdown differences with time are not negligible nor is the hydraulic gradient constant with time.

c) The water removed from storage is discharged instantaneously with decline of head.

d) The well diameter is very small, so that the storage in the well can be neglected.

e) Steady state drawdowns should be approximately known.

All of these assumptions were met in this pump test, except possibly item e. Since this technique can not consider delayed yield, this portion of the data was ignored. Therefore, estimated maximum drawdown (steady state) without delayed yield was used in the analysis. Checks with these estimated maximum drawdowns indicated accuracy within ± 0.1 feet. These maximum drawdowns were also used in the next two analysis methods.

Hantush method I uses a linear-logrithmetic plot of drawdown vs. time. The straight line portion of this plot represents the region where the well function variat (u) is less than 0.01. The slope of the straight line portion of the curve and an estimated inflection point are used to evaluate the aquifer response and to calculate T and S.

7.4.3 Ernst's Modification of the Thiem Method

Ernst's modification to the Thiem method has the following additional assumptions:

a) The aquifer is semi-confined.

b) The flow to the well is steady state.

c) The contribution to total flow due to leakage can be estimated.

The well discharge, Q, is assumed to be composed of a quantity of water withdrawn from the tested aquifer and a quantity of phreatic water delivered by the semi-pervious layer. Application of the Thiem formula is appropriate if

the well discharge is corrected by subtracting from the total discharge the amount of phreatic water delivered by the semi-pervious layer.

The amount of phreatic water was estimated by assuming a storage coefficient and the average drop in the phreatic surface at the end of pumping. This phreatic water (Q') is subtracted from the total discharge (Q) and then T is calculated from:

$$T = \frac{(Q-Q')\ \ln(r_2/r_1)}{2\pi\ (s_1-s_2)}$$

where

T = transmissivity

Q = flow from well

Q' = estimated flow from storage

r = radius from well

s = drawdown

Observation well to observation well data is necessary for application of this method. In addition, estimated maximum drawdowns, neglecting drainage effects, and storage coefficients from the previous two analysis methods were used in this analysis. Since the average drawdown at the end of the test was used to evaluate Q, only wells exhibiting approximately equal drawdown rates (as estimated from the slope of the time-drawdown curves) were analysed together. Finally, only wells within the same vertical section from the G14 and G15 series wells were used.

7.4.4 Thiem - Dupuit Method

The Thiem-Dupuit method has the following additional assumptions:

a) The velocity of flow is proportional to the tangent of the hydraulic gradient instead of the sine as is actually the case.

b) The flow is horizontal and uniform everywhere in a vertical section through the axis of the well.

c) The aquifer is unconfined.

d) The flow to the well is in steady state.

This equation fails to give an accurate description of the drawdown curve near the well, where the strong curvature of the water table contradicts the Dupuit assumptions. The influence of the seepage zone above the water level in the well, the influence of the groundwater movement in the capillary zone, and the influence of the vertical velocity components which reach their maximum in the vicinity of the well, have been ignored.

This method is a well-to-well steady state analysis technique. Estimated maximum drawdowns were used, neglecting drainage effects. Only wells at the same relative depth from the G14 and G15 series were analysed together. For selected wells the transmissivity was calculated from:

$$T = \frac{Q \ln(r_2/r_1)}{2\pi(s'_1 - s'_2)}$$

where

$s' = s - s^2/2m$

m = aquifer thickness and all other terms are as previously described

7.5 Results

7.5.1 Boulton Analysis

The results of the Boulton analyses are presented in Table 7.1. Only those piezometers located in or below the main contributing layer have been included, as the analysis is not valid for piezometers in the leaky layer. As is clear from the table, the parameters obtained are remarkably consistent, and geometric mean values are as follows:

Transmissivity = 0.030 ft.^{2}/sec. (0.0028 m^2/s)
Early Storage Coefficient = 3.2×10^{-4}
Late Storage Coefficient = 0.054
Vertical Hydraulic Conductivity of leaky layer = 3.1×10^{-6} ft./sec. (9.4×10^{-7} m/s)

These values may be translated into the fundamental parameters using the definition and the geometry shown in Figure 7.2, to produce the results shown in Table 7.2. These values are the best estimates available from this test. In order to understand the precision of these values, a statistical range of 2 standard deviations each way from the mean has also been presented. With 95% confidence, the range between highest and lowest values, when expressed as a multiple, is as follows:

k_h = 3.0
k_v = 12.0
S_s = 7.6
n_d = 9.4

These values are generally considered acceptable for multiple piezometer analyses and in the case of the horizontal hydraulic conductivity, excellent. They give a high degree of confidence that the analytical method used is appropriate.

TABLE 7.1
SUMMARY OF RESULTS OF BOULTON ANALYSIS

Obs. Well No.	Test	Relative Depth	Transmissivity, T $ft.^2/sec.$	Early Storage Coef. S_e $(X10^{-4})$	Late Storage Coef. S_1	Leaky Layer Vert. Hyd. Cond. ft./sec. $(X10^{-6})$	Leaky Layer Vert. Hyd. Cond. m/s $(X10^{-6})$
G41-G14A	Drawdown	M	0.050	5.8	0.10	4.0	1.2
G41-G14B	Drawdown	D	0.025	5.8	0.58	3.6	1.1
G41-G14C	Drawdown	S	--	--	--	--	--
G41-G14D	Drawdown	M	0.023	17.0	0.51	6.9	2.1
G41-G14E	Drawdown	S	--	--	--	--	--
G41-G14F	Drawdown	D	0.026	2.0	0.09	1.1	0.55
G41-G15A	Drawdown	S	--	--	--	--	--
G41-G15B	Drawdown	M	0.028	2.8	0.07	3.0	0.92
G41-G15	Drawdown	D	0.038	3.5	0.05	2.1	0.88
G41-E13	Drawdown	D	0.074	0.57	0.05	6.3	1.9
DMB1A	Drawdown	S	--	--	--	--	--
G41-K13	Drawdown	D	0.033	1.8	0.04	1.9	0.58
G41-K13A	Drawdown	S	--	--	--	--	--
G41-G14A	Recovery	M	0.059	4.9	0.06		
G41-G14B	Recovery	D	0.014	25.0	1.31		
G41-G14C	Recovery	S	--	--	--		
G41-G14D	Recovery	M	0.018	21.0	0.27		
G41-G14E	Recovery	S	--	--	--		
G41-G14F	Recovery	D	0.022	2.6	0.09		
G41-G15A	Recovery	S	--	--	--		
G41-G15B	Recovery	M	0.030	3.4	0.05		
G41-G15	Recovery	D	0.026	5.3	0.10		
G41-E13	Recovery	D	0.14	7.7	0.02		
DMB1A	Recovery	S	--	--	--		
G41-K13	Recovery	D	0.066	2.5	0.02		
G41-K13A	Recovery	S	--	--	--		

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well

TABLE 7.2
CONCLUSIONS FROM BOULTON ANALYSIS

A. ENGLISH UNITS

Parameter (1)	Units	Geometric Mean (2)	Range (95% Confidence)	Comments
k_h	ft./sec.	4.3×10^{-4}	2.5×10^{-4} to 7.6×10^{-4}	Ignores G41-E13
k_v	ft./sec.	3.1×10^{-6}	0.9×10^{-6} to 9.9×10^{-6}	Drawdown only
S_s	$ft.^{-1}$	4.6×10^{-6}	1.7×10^{-6} to 12.8×10^{-6}	Drawdown without G41-E13 and G14D
n_d	%	5.4	1.8 to 16.7	Ignores values greater than 20%

B. SYSTEM INTERNATIONAL UNITS

Parameter (1)	Units	Geometric Mean (2)	Range (95% Confidence)	Comments
k_h	m/s	1.3×10^{-4}	0.8×10^{-4} to 2.3×10^{-4}	Ignores G41-E13
k_v	m/s	9.4×10^{-7}	2.7×10^{-7} to 30.2×10^{-7}	Drawdown only
S_s	m^{-1}	1.5×10^{-5}	0.6×10^{-5} to 4.2×10^{-5}	Drawdown without G41-E13 and G14D
n_d	%	5.4	1.8 to 16.7	Ignores values greater than 20%

NOTES:

(1) k_h = horizontal hydraulic conductivity of primary contributing layer
k_v = vertical hydraulic conductivity of leaky layer
S_s = specific storage of primary contributing layer
n_d = drainable porosity (specific yield) of leaky layer

(2) Geometric mean used because all values must be greater than zero and the spread is relatively large.

7.5.2 Other Analyses

The results of the other analyses are presented in Tables 7.3 through 7.5, and are summarized in Table 7.6.

Based on the summary in Table 7.6, it would appear that only the mean of the Dupuit result falls outside the expected range. However, because of the high variability of the Dupuit result, the difference between it and Boulton is not statistically significant.

It would appear, therefore, that the secondary methods of analysis, each of which is less appropriate than Boulton, produce results which support the Boulton analysis.

7.6 Meteorological Effects

Data from the pump test was reviewed with respect to various meteorologic effects. Throughout the well drilling and pump testing period, meteorological data (precipitation, barometric pressure, temperature) was obtained on about a daily basis. Visual comparison of periods with intense rainfall and/or barometric fluctuations do not indicate appreciable water level change in any of the observation wells. Temperature effects could not be seen, as was expected. Plots of precipitation, barometric pressure, and temperature obtained during this period are shown on Figure 6.5 and the data are presented in Appendix B.

TABLE 7.3
SUMMARY OF RESULTS FOR HANTUSH (I) ANALYSIS

Obs. Well No.	Test	Relative Depth	Transmissivity, T ft.^{2}/sec.	Early Storage Coef. S_e (X10^{-4})
G41-G14A	Drawdown	M	0.059	4.6
G41-G14B	Drawdown	D	0.024	5.7
G41-G14C	Drawdown	S	--	--
G41-G14D	Drawdown	M	0.020	18.0
G41-G14E	Drawdown	S	--	--
G41-G14F	Drawdown	D	0.018	28.0
G41-G15A	Drawdown	S	--	--
G41-G15B	Drawdown	M	0.029	2.9
G41-G15	Drawdown	D	0.055	3.3
G41-E13	Drawdown	D	0.14	7.7
DMB1A	Drawdown	S	--	--
G41-K13	Drawdown	D	0.077	2.5
G41-K13A	Drawdown	S	--	--
G41-G14A	Recovery	M	0.057	7.8
G41-G14B	Recovery	D	0.014	27.0
G41-G14C	Recovery	S	--	--
G41-G14D	Recovery	M	0.019	21.0
G41-G14E	Recovery	S	--	--
G41-G14F	Recovery	D	0.022	2.8
G41-G15A	Recovery	S	--	--
G41-G15B	Recovery	M	0.023	3.2
G41-G15	Recovery	D	0.031	5.7
G41-E13	Recovery	D	0.25	9.1
DMB1A	Recovery	S	--	--
G41-K13	Recovery	D	0.07	2.5
G41-K13A	Recovery	S	--	--

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well

TABLE 7.4
SUMMARY OF RESULTS FOR ERNST'S MODIFICATION
TO THIEM ANALYSIS

Obs. Well No.	Test	Relative Depth	Transmissivity, T $ft.^2/sec.$
G41-G14A & G41-G14D	Drawdown	M	0.068
G41-G14D & G41-G15B	Drawdown	M	0.058
G41-G14A & G41-G15B	Drawdown	M	0.064
G41-G14B & G41-G14F	Drawdown	D	0.041
G41-G14E & G41-G15A	Drawdown	S	--
G41-G14B & G41-E13	Recovery	D	0.034
G41-G14A & G41-G14D	Recovery	M	0.060
G41-G14D & G41-G15B	Recovery	M	0.074
G41-G14A & G41-G15B	Recovery	M	0.065
G41-G14B & G41-G15	Recovery	D	0.031
G41-G14B & G41-G14F	Recovery	D	0.044
G41-G14F & G41-G15	Recovery	D	0.020

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well
An average "leakage" flow of 100 gpm (0.0063 m^3/sec) was used in these analyses.

TABLE 7.5
SUMMARY OF RESULTS FOR THIEM - DUPUIT ANALYSIS

Obs. Well No.	Test	Relative Depth	Transmissivity, T ft.^{2}/sec.
G41-G14F & G41-G15	Drawdown	D	0.031
G41-G14D & G41-G15B	Drawdown	M	0.079
G41-G14C & G41-G14E	Drawdown	S	--.
G41-G14A & G41-G14D	Drawdown	M	0.11
G41-G14E & G41-G15A	Drawdown	S	--
G41-G14C & G41-G15A	Drawdown	S	--
G41-G14A & G41-G15	Drawdown	M & D	0.098
G41-G14F & G41-G15	Recovery	D	0.029
G41-G14D & G41-G15B	Recovery	M	0.098
G41-G14A & G41-G14D	Recovery	M	0.095
G41-G14A & G41-G15	Recovery	M & D	0.088

NOTES:
S = Shallow in Till
M = Main Stratified Drift Layer
D = Deep in Till
-- = Analysis not valid for this well
An aquifer thickness of 70 ft. (21 m)was used in these analyses.

TABLE 7.6
SUMMARY OF ANALYTICAL RESULTS

A. ENGLISH UNITS

Parameter	Units	Analysis Method					
		Boulton			Hantush	Ernst	Dupuit
		Low	Mean	High	Mean	Mean	Mean
k_h	ft./sec.	2.5×10^{-4}	4.3×10^{-4}	7.6×10^{-4}	5.6×10^{-4}	6.8×10^{-4}	10.1×10^{-4}
k_v	ft./sec.	0.9×10^{-6}	3.1×10^{-6}	9.9×10^{-6}	---	--	
S_s	$ft.^{-1}$	1.7×10^{-6}	4.6×10^{-6}	12.8×10^{-6}	7.3×10^{-6}	--	--
n_d	%	1.8	5.4	16.7	---	--	

B. SYSTEM INTERNATIONAL UNITS

Parameter	Units	Analysis Method					
		Boulton			Hantush	Ernst	Dupuit
		Low	Mean	High	Mean	Mean	Mean
k_h	m/s	0.76×10^{-4}	1.3×10^{-4}	2.3×10^{-4}	1.7×10^{-4}	2.1×10^{-4}	3.1×10^{-4}
k_v	m/s	0.27×10^{-6}	0.94×10^{-6}	3.0×10^{-6}	--	--	--
S_s	m^{-1}	0.56×10^{-5}	1.5×10^{-5}	4.2×10^{-5}	2.4×10^{-5}	--	--
n_d	%	1.8	5.4	16.7	--	--	--

8.0 CONCLUSIONS

8.1 Model

A conceptual model of the hydrologic system around the pump test well is shown on Figure 7.2. Water flowed horizontally to the well through a reasonably uniform 70 ft. (21 m) thick layer of coarse grained stratified drift. This layer behaved as a semi-unconfined aquifer with pronounced leakage and delayed yield effects.

Leakage to the coarse grained stratified drift layer came from above and below. The leakage from below was primarily a pressure release. This lower till layer was behaving as a confined aquifer, with it's behavior controlled by the highly dominant overlying stratified drift. Because leakage was primarily due to pressure release, the head in this layer, corrected for depth and head loss, was the same as that in the coarse grained stratified drift. The pump test did not produce desaturation of the lower layer. Therefore, hydraulic conductivity and storage coefficient for this lower layer could not be directly measured from the test. However, the flow contribution per foot of thickness for the upper and lower till layers was essentially equal during the flow velocity test (Figure 5.3). Therefore, it is reasonable to use the same hydraulic characteristics for these two layers.

The upper till layer overlying the stratified drift behaved in an unconfined manner. The response of the observation wells in this layer generally indicated vertical drainage to the coarse grained stratified drift. The measured pressure release was less pronounced in these observation wells, as discussed in Section 6.6, and the main mechanism for water level change was drainage of the pore spaces.

8.2 Analogue Results

One objective of the test was to evaluate the degree of influence a pumped well could have on the potentiometric levels. The results of this evaluation are shown on Figure 6.13, and when combined with Figure 3.7, the potentiometric map shown in Figure 8.1 was derived. This diagram dramatically shows the area which this one well can control, even when being pumped at about half its potential maximum rate.

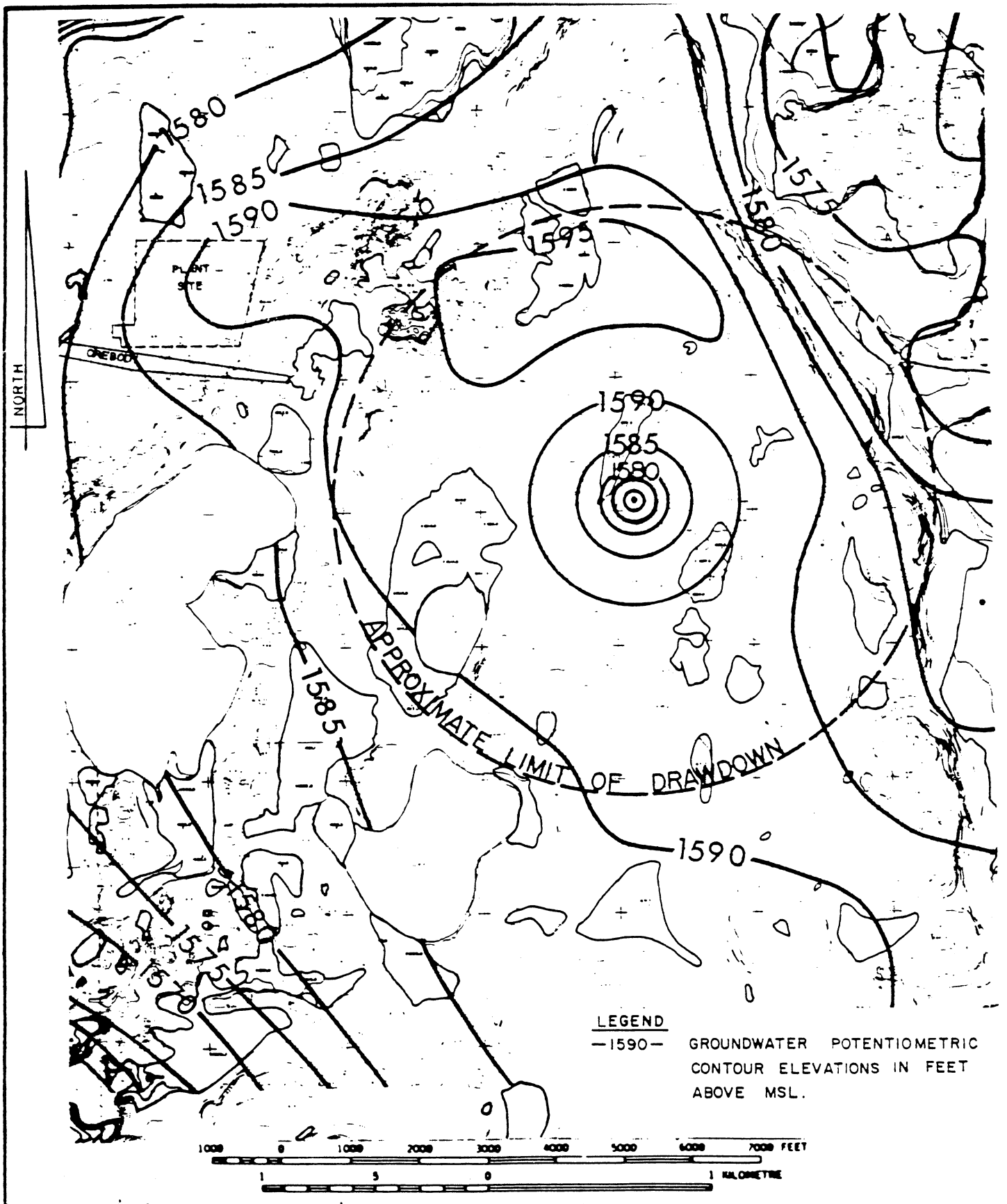
8.3 Parameters

The behavioral parameters for the groundwater system at Crandon are given on Figure 8.2, together with the hydrogeologic model of the conditions beneath Site 41. A British and metric unit version of the figure have been presented separately to minimize confusion.

The figure shows data from the pump test unshaded, and estimated parameters shaded. The bases for these estimates are as follows:

- Vertical Hydraulic Conductivity of the Coarse Grained Stratified Drift--This material is water deposited and stratified. It is common in groundwater hydrology to estimate the difference between vertical and horizontal hydraulic conductivity by an order of magnitude; the vertical hydraulic conductivity being the lower. Therefore, the vertical hydraulic conductivity of this layer is estimated at one tenth that of the measured horizontal hydraulic conductivity.

- Horizontal Hydraulic Conductivity of the Upper Till--The till soils are not water deposited in a layered manner. Therefore, the ratio of horizontal to vertical hydraulic conductivity for this soil will certainly not be as great as for the stratified drift. For this analysis a ratio of 3 is believed reasonable to account for some minor layering.



EFFECT OF PUMP TEST ON POTENTIOMETRIC MAP | FIGURE 8.1

Scale GRAPHIC
Date 2 - 17 - 81
Job No. 786085

Golder Associates

Drawn S K B
Checked JFC
Reviewed GHC

A. ENGLISH UNITS					
GEOLOGY	THICKNESS (ft)	PARAMETERS			
		k_h (ft/sec)	k_v (ft/sec)	S_s (ft^{-1})	n_d %
TILL	110	ABOVE NATURAL GROUNDWATER LEVEL			
TILL	80	9.3×10^{-6}	3.1×10^{-6}	4.6×10^{-6}	5.4
COARSE GRAINED STRATIFIED DRIFT	70	4.3×10^{-4}	4.3×10^{-5}	4.6×10^{-6}	7.0
TILL	70	9.3×10^{-6}	3.1×10^{-6}	4.6×10^{-6}	5.4
BEDROCK		FUNCTIONALLY IMPERMEABLE			

B. SYSTEM INTERNATIONAL					
GEOLOGY	THICKNESS (m)	PARAMETERS			
		k_h (m/s)	k_v (m/s)	S_s (m^{-1})	n_d (%)
TILL	35	ABOVE NATURAL GROUNDWATER LEVEL			
TILL	25	2.8×10^{-6}	9.4×10^{-7}	1.5×10^{-5}	5.4
COARSE GRAINED STRATIFIED DRIFT	20	1.3×10^{-4}	1.3×10^{-5}	1.5×10^{-5}	7.0
TILL	20	2.8×10^{-6}	9.4×10^{-7}	1.5×10^{-5}	5.4
BEDROCK		FUNCTIONALLY IMPERMEABLE			

LEGEND:

(1) k_h = horizontal hydraulic conductivity
k_v = vertical hydraulic conductivity
S_s = specific storage
n_d = drainable porosity (specific yield)

(2) Unshaded Values: Results obtained directly from pump test
Shaded Values: Inferred or estimated from the pump test results

BEHAVIORAL PARAMETERS AND HYDROGEOLOGIC MODEL

FIGURE 8.2

Scale NO SCALE
Date 2-17-81
Job No. 786085

Golder Associates

3.6-4-92

Drawn SKB
Checked GHC
Reviewed GHC

- Lower Till Layer--The pump test did not directly evaluate the hydraulic parameters of the lower till layer (discussed in Section 8.1 of this report). Because the flow velocity test did show essentially equal horizontal hydraulic conductivities for the upper and lower till layers, the same values for all hydraulic parameters are used for these two layers.

- Specific Storage--The specific storage of all units was assumed to be the same, as it is largely a function of material and loading history, which are similar.

- Porosity, Drift--The coarse grained stratified drift is somewhat coarser than the till, so a slightly higher porosity was assumed.

- Bedrock--The bedrock was considered to be functionally impervious for this study. This is in line with present geological interpretation.

It is important to note that the parameters for which assumptions have been made are not of major importance to the groundwater flow system. All of the primary parameters were directly evaluated by the pump test.

8.4 Directional Effects

The system did not exhibit directionality with respect to material properties in plan, i.e. there was no apparent anisotropy in a north-south direction as opposed to an east-west direction. However, some noticeable differences were observed in the amounts of drawdown. Most important was the greater drawdown at G41-K13 (1,765 feet or 538 meters from the well) as compared to G41-E13 (1,450 feet or 442 meters from the well), the opposite of what would be expected from a completely uniform system. Review of the site geology indicates local vertical expansion of the coarse grained stratified drift layer at G41-E13, from about 70 feet to

about 115 feet (21 to 35 m) and also indicates local reduction in this layer thickness at G41-K13, from about 70 feet to about 15 feet (21 to 5 m). With a smaller coarse grained stratified drift thickness the well response drawdown was greater since the pressure response was more pronounced. The reverse is true for a thicker layer, explaining the apparent discrepancy in drawdown values between G41-E13 and G41-K13.

8.5 Conclusions

The conclusions from the pump test are:

1) Beneath Site 41 there is a 70 foot (20 m) thick sheet of coarse grained stratified drift which exhibits a hydraulic conductivity of about 4×10^{-4} ft./sec. (1.3×10^{-4} m/s). This sheet appears to be very extensive.

2) This coarse grained stratified drift is overlain at the well site by about 190 feet (60 m) of till, of which about 80 feet (25 m) is saturated. This material acts as a leaky confining layer for the drift. It exhibits a vertical hydraulic conductivity of about 3×10^{-6} ft./sec. (9×10^{-7} m/s) and a drainable porosity of about 5%.

3) These two units are underlain by 70 foot (20 m) glacial till (similar to the upper till) and fine grained stratified drift; and these in turn are underlain by effectively impermeable rock.

4) The behavior of this system is well understood as a result of this test.

GOLDER ASSOCIATES

Gary H. Collison, P.E.
Associate

JFC:AB:GHC:dap

REFERENCES

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2. Dames & Moore, Crandon Project Environmental Report, Preliminary Draft #2, Section 2.2 Surface Water, September, 1980.

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4. S.W. Lohman, "Ground-Water Hydraulics", U.S.G.S. Professional Paper 708, 1979. 1972

5. G.P. Kruseman and N.A. DeRidder, Analysis and Evaluation of Pumping Test Data, Bulletin 11, International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands, 1979.

6. Golder Associates, Groundwater Potentiometric Contours, Crandon Project Waste Disposal System, Project Report 7, September, 1981.

Appendix A

APPENDIX A

1. Letter report on flow velocity test by Johnson Division Universal Oil Products.

2. Johnson Velocity Meter System equipment and operations details.

Johnson Division
P O Box 43118 • St. Paul, Minnesota 55164
Telephone 612-636-3900 • Telex 29-7451

June 13, 1980

Mr. John F. Clerici
Golder Associates
5125 Peachtree Road
Atlanta, Georgia 30341

Dear Mr. Clerici:

The following is my report on the water well velocity survey performed recently near Crandon, Wisconsin, by Johnson personnel.

LOCATION

Exxon Property near Crandon, Wisconsin

DATE

June 6, 1980

WELL DATA

Casing Dia.	-	12 inches
Screen Dia.	-	12 inches
Total Depth	-	334 feet
Screen Settings	-	150' to 235', 270' to 315'
Static Water Level	-	111 feet
Pump	-	8" Submersible
Pump Setting	-	145 feet

VELOCITY MEASURING INSTRUMENT

Prototype VL3 built by Johnson Division. Free-spinning vertical-axis water turbine mounted in sapphire bearings. Permanent magnet mounted in turbine hub actuates magnetic reed switch in probe head to indicate revolutions.

Revolution pulses counted by electro-mechanical counter in surface unit. Manual on-off switch activates counting circuit, counter, and timer in surface unit.

Surface unit connected to down-hole probe with Johnson-Keck geophysical cable.

Centralizing bows and stabilizing weight attached to probe.

continued . . .

CALIBRATION

Calibration of this instrument is performed by manually lowering the probe through static water a fixed distance, observing and recording the time and revolutions. This procedure is repeated at varying rates, yielding data which can be plotted as rotational speed (RPM) vs. descent speed (fps). Since the diameter of the conduit or casing is known, descent speed can be expressed as equivalent Q (GPM).

Table 1 contains calibration data as observed and computed. Figure 1 is the plot of RPM vs fps or Q. Note that calibration runs 17, 18, and 19 were made following the completion of the velocity survey. These three points are plotted as diamonds on Figure 1, and indicate that there was no appreciable change in the calibration of the instrument during the test.

VELOCITY SURVEY

With the velocity probe suspended in the well, the pump was set at the 145-foot level. The pump discharge was stabilized at approximately 540 GPM. This rate was measured by positioning the velocity probe in the casing just beneath the pump, measuring RPM, and using the instrument calibration plot.

The survey was made in three segments: first, RPM was measured at 5-foot intervals, starting at the bottom of the lower screen and working up. Second, a reading was taken within the casing, followed by detail readings at 1-foot intervals covering the zones 200 feet to 235 feet, and 273 feet to 282 feet. Third, check readings were made at 25 foot intervals from 275 feet to 150 feet with a final reading taken within the casing.

Data for the 3 survey segments are presented in Table 2. The information is plotted in Figure 2.

RESULTS AND COMMENTS

The primary result of the survey is that 61% of the inflow to this well is between 185 feet and 235 feet. The zone of greatest contribution is between 205 and 235 feet, in which 52% of the flow enters the well at a rate of 9.33 GPM/Ft.

continued . . .

Results and Comments (cont'd . . .)

Segments 2 and 3 of the survey generally yielded a slightly lower flow rate at any given depth. Since the recalibration of the instrument following the test virtually matched the initial calibration, this shift can be attributed to a slight change in the pump discharge caused by the rearrangement, interruption, and removal of the discharge hose following the completion of segment 1 of testing. The shift could also represent continued development of the well by pumping.

The slight increases in flow followed by decreases at 150 feet and 275 feet can be explained by the slight reduction in inside diameter at the welded joint between the screens and casing. Some turbulence exists immediately above these points, especially between 150 feet and the pump inlet at 145 feet.

Sincerely,

E. N. Colburn
Director,
Research & Development

ENC*jh

cc: Adrian Brown, c/o J.F. Clerici
Alan Lang, Lang Drilling, c/o Dana Larson
Dana Larson
Chuck Howe
Gary Erickson

Enclosures

TABLE 1 CALIBRATION DATA

Descent: 25 feet $V = .408 \frac{Q}{D^2}$

Casing I.D.: 12 inches

Run	Rev	Time (sec)	RPM	Velocity (fps)	Q (GPM)
1	39	30.4	77.0	.822	290
2	36	58.9	36.7	.424	150
3	32	88.7	21.6	.282	100
4	40	20.2	118.8	1.238	437
5	29	128.3	13.6	.195	69
6	28	151.8	11.1	.165	58
7	27	168.9	9.6	.148	52
8	23	277.7	5.0	.090	32
9	17	351.8	2.9	.071	25
10	36	46.9	46.1	.533	188
11	36	54.0	40.0	.463	163
12	28	172.1	9.8	.145	51
13	41	17.9	137.4	1.400	494
14	40	30.3	79.2	.825	291
15	40	25.0	96.0	1.000	353
16	38	35.0	65.1	.714	252
17	40	29.9	80.3	.836	295
18	38	45.5	50.1	.549	194
19	30	126.0	14.3	.198	70

E. N. Colburn
June 13, 1980

TABLE 2. VELOCITY SURVEY

Segment 1				Segment 2				Segment 3			
Depth (ft)	RPM	Velocity (fps)	Q (GPM)	Depth (ft)	RPM	Velocity (fps)	Q (GPM)	Depth (ft)	RPM	Velocity (fps)	Q (GPM)
315	0	0	0	148	150	1.555	548.8	275	22	.275	97
310	0	0	0	200	107	1.125	397.0	250	25	.305	107
305	1	.065	22.9	201	108	1.135	400.5	225	44	.495	174
300	2	.075	26.5	202	105	1.105	390.0	200	108	1.135	400
295	1	.065	22.9	203	103	1.085	382.9	175	120	1.255	442
290	1	.065	22.9	204	102	1.075	379.4	150	147	1.525	538
285	1	.065	22.9	205	102	1.075	379.4	147	145	1.505	531
280	12	.175	61.8	206	97	1.025	361.7				
275	28	.335	118.2	207	94	.995	351.1				
270	26	.315	111.2	208	93	.985	347.6				
265	24	.295	104.1	209	91	.965	340.5				
260	25	.305	107.6	210	88	.935	330.0				
255	25	.305	107.6	211	88	.935	330.0				
250	25	.305	107.6	212	87	.920	324.7				
245	26	.315	111.2	213	83	.885	312.3				
240	26	.315	111.2	214	80	.855	301.7				
235	26	.315	111.2	215	78	.835	294.7				
230	38	.435	153.5	216	74	.795	280.6				
225	50	.555	195.9	217	71	.765	270.0				
220	62	.675	238.2	218	66	.715	252.3				
215	81	.865	305.3	219	63	.685	241.7				
210	92	.975	344.1	220	60	.655	231.1				
205	105	1.105	390.0	221	56	.615	217.0				
200	111	1.165	411.1	222	53	.585	206.4				
195	115	1.205	425.2	223	50	.555	195.9				
190	120	1.255	442.9	224	47	.525	185.3				
185	122	1.275	449.9	225	46	.515	181.7				
180	122	1.275	449.9	226	45	.505	178.2				
175	122	1.275	449.9	227	41	.465	164.1				
170	123	1.285	453.5	228	40	.455	160.6				
165	124	1.295	457.0	229	37	.425	150.0				
160	129	1.345	474.7	230	29	.345	121.8				
155	136	1.415	499.4	231	28	.335	118.2				
150	151	1.565	552.3	232	22	.275	97.0				
147	147	1.525	538.2	233	22	.275	97.0				
148	148	1.535	541.7	234	21	.265	93.5				
149	146	1.515	534.6	235	21	.265	93.5				
				273	23	.285	100.6				
				274	23	.285	100.6				
				275	22	.275	97.0				
				276	14	.195	68.8				
				277	10	.155	54.7				
				278	8	.135	47.6				
				279	7	.125	44.1				
				280	4	.095	33.5				
				281	1	.065	22.9				
				282	0	0	0				

E. N. Colburn
June 13, 1980

K·E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

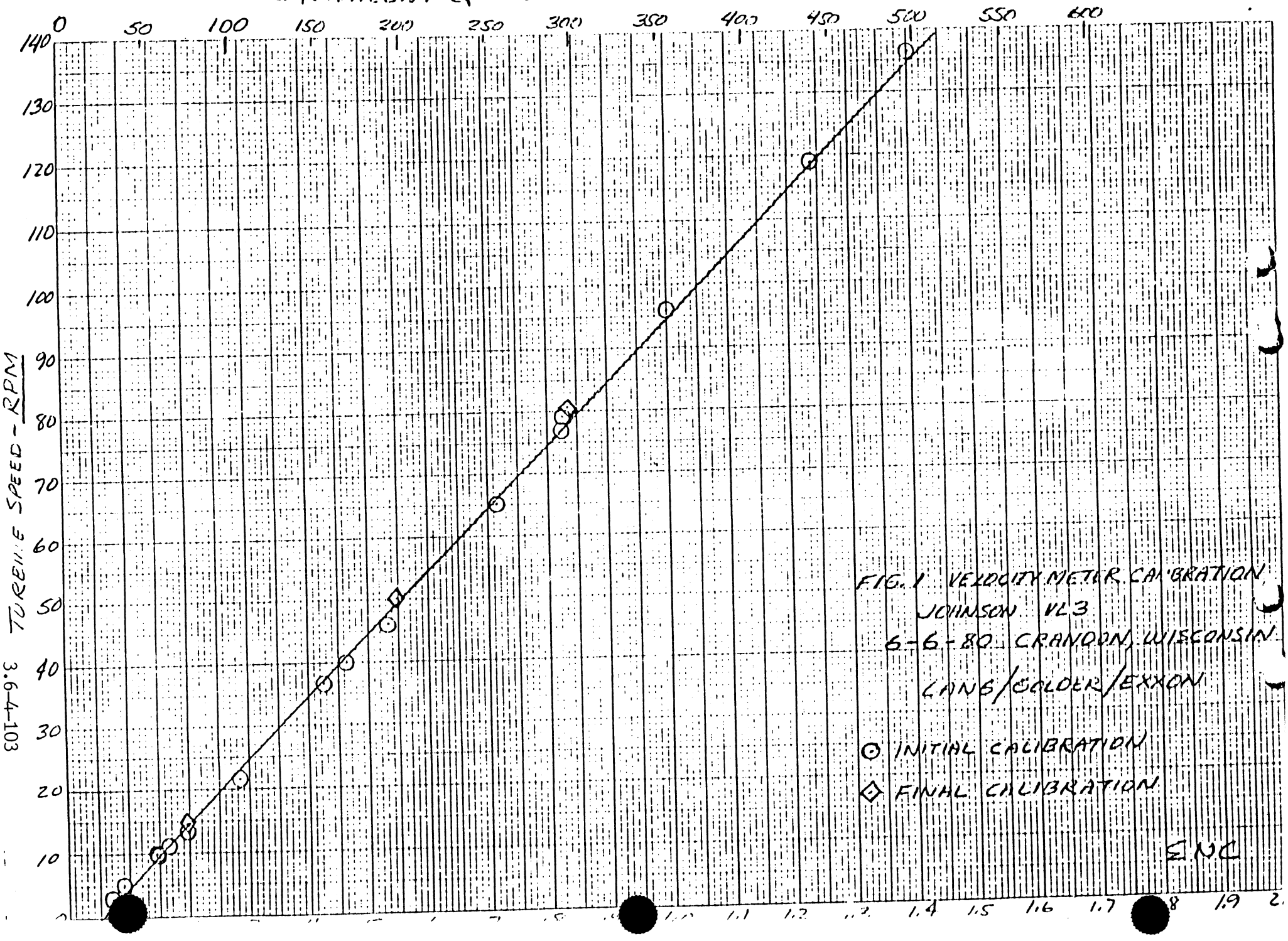


FIG. 1 VELOCITY METER CALIBRATION
JOHNSON VL3
6-6-80 CRANDON, WISCONSIN
GANS/COLOEN/EXXON

ENC

3.6-4-103

Johnson Division
P.O. Box 43118 • St. Paul, Minnesota 55164
Telephone 612-636-3900 • Telex 29-7451

September 20, 1979

Gary Collisen
Golder and Associates
5125 Peachtree Road
Atlanta, Georgia 30341

Dear Gary:

Thank you for your request for information concerning the Johnson Velocity Meter System. Ted and I enjoyed talking wi th you and hearing about the Exxon Project at Crandon.

Enclosed are a picture of the equipment and literature describing the parts and operation of the system.

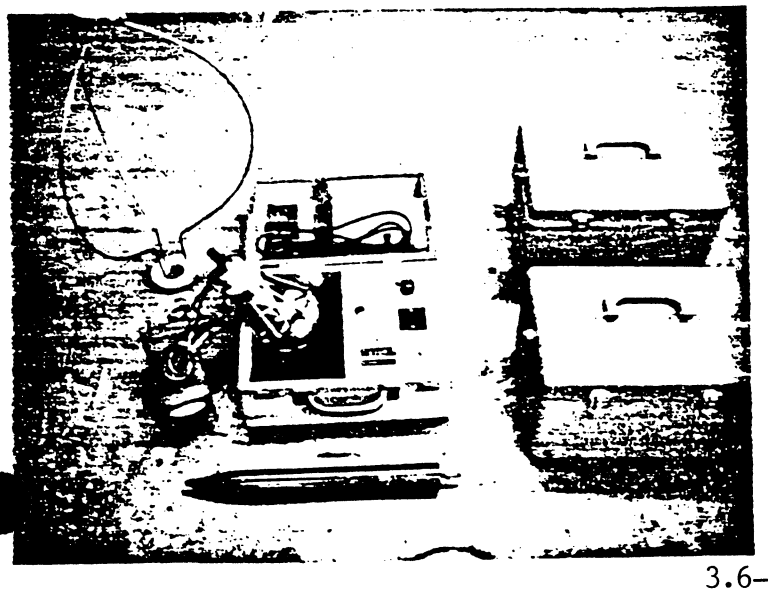
You may wish to contact Rockwell International concerning a flow meter. They have a meter called a 4" Turbo, their Model W-1000, which may be usable for this job. The phone number for their Midwest Sales Office is 312-325-8972.

Now that you've found us, we hope we can continue to be of service to you.

Very truly yours,

Dana

Dana C. Larson
Geologist



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RECEIVED
SEP 24 1979
GOLDER ASSOC.

JOHNSON VELOCITY METER SYSTEM

INTRODUCTION

The Johnson Velocity Meter System is a turbine-type flow meter which can be used to measure vertical flow velocity in pumping wells. When such velocity is measured at various depths in a water-producing zone of a borehole, a plot or graph can be made showing flow versus depth. Such a graph will show the upper and lower limits of a water-producing strata, and the proportion of total flow contributed by each stratum.

The Johnson system consists of a borehole probe, or turbine unit, a logging cable, and an above-aground operator's console. The operator reads and records the turbine RPM at each desired depth while the well is being pumped. These data are later used to plot the above-mentioned graph or "velocity profile."

SYSTEM COMPONENTS

Probe - The probe unit is 4.75 inches in diameter and contains a 5 bladed impeller, running in jewelled bearings. A magnetic reed switch is actuated once during each revolution of the shaft. The probe is connected to the logging cable by a heavy-duty sealed connector. Provision is made for attaching weights to the bottom of the probe. Corrosion-resistant materials are used throughout.

Surface Electronics Console - The probe, connecting cables and surface electronics are contained in the varnished wood case. The operator's control panel includes the revolution counter, timer, switch, and cable connections.

Logging Cable - The down-hole cable is supplied in 600 foot lengths on reels mounted in aluminum carrying cases.

Adapter - This unit includes a cable-to-probe adapter which must be used between the probe and the keck cable. The adapter is packed in the console.

Centralizer - A bow-type adjustable centralizer is supplied with the system. It may be adjusted from a maximum diameter of 15 inches to a minimum diameter of approximately 10 inches. The centralizer is to be used in wells of 12 inch diameter and larger. The centralizer is mounted above the probe unit as shown in the assembly photo. To slip the cable through the centralizer, first remove the split, threaded hub from the upper collar of the centralizer. Reassemble on the cable. The lower collar snaps on the probe head.

Connecting Cable - A short length of cable is provided to connect the winch to the console.

Counter, Timer, and Switch - The toggle switch on console activates the counting circuit. When the switch is on, the timer runs, reading in seconds, and the pulse counter indicates each revolution of the turbine shaft. Both timer and pulse counter are provided with push-button reset.

Power Cable - An electric cord is included which connects to the power input on the console and then plugs into any 110-120 VAC outlet.

Inverter - For remote applications, where 110-120 VAC power is not readily available, an inverter can be supplied as an extra cost option. This unit connects to a 12 VDC supply such as a vehicle battery, and provides power sufficient to operate the system. Specific instructions for using the inverter are packaged with the inverter.

Stabilizing Weight - A lead-filled weight is supplied. This weight is used to stabilize the probe and prevent it from rising under conditions of high flow velocity. When borehole velocities greater than 2.5 feet per second (fps) are anticipated, fix the weight to the probe by screwing the threaded center shaft of the weight into the tapped hole in the bottom of the probe frame. Secure with jam nuts. See photo of assembled system.

PREPARATION

P 1 Install weight (if necessary) on probe unit.

P 2 Determine depths and measurement intervals if possible. Generally, lengthy water-producing zones are surveyed at 5 or 10 foot intervals. Short zones may require more frequent measurements.

P 3 Remove pump from well.

P 4 Install centralizer if necessary.

P 5 Connect logging cable to probe unit securely.

P 6 Pay out length of cable sufficient for anticipated need.

P 7 Connect cable reel to console with connecting cable.

P 8 Connect power cable first to console, then to 110-120 VAC source. OBSERVE SAFETY PRECAUTION: ALWAYS connect power cord first to console, then to power source. If DC-AC inverter is used, connect leads to 12 volt vehicle battery. Run vehicle engine during testing.

P 9 Check power source by turning toggle switch on. The timer power light should come on, and the timer should start reading seconds.

P 10 Check system. With power connected, and toggle switch on, gently spin the turbine with the fingers. The pulse counter should function by counting revolutions. If the system fails to work, check to see that all cable connections are properly made. If all connections are good and the system still fails to function, a circuitry problem is indicated. If power and system check out, proceed with the following steps.

P 11 Lower the probe unit into the standing water.

P 12 Check system operation. With power connected and toggle switch on, lower unit at a rate of approximately 1 foot per second in standing water. The pulse counter should count revolutions. If system fails, retrieve probe unit and check for damage, interference, or leaky connections. If no problems are apparent, check system again manually above ground per paragraph P 10.

P 13 If the system works above ground, but fails in the well, suspect a damaged cable or leaky cable-to-probe connection. Such condition will cause a short in the down-hole circuit. This will be indicated by a half-count on the revolution counter each time the toggle switch is operated.

P 14 Lower unit to a depth 3 to 6m beneath pump setting level. Note depth markers on cable. Secure cable.

P 15 Allow cable to rest against edge of casing. It is advisable to protect cable by wrapping with rags where it bends over the edge of the casing. Be sure any such rags cannot be dropped into hole.

P 16 Set pump. Very, very carefully! It is important not to pinch, cut or otherwise damage the logging cable, nor to drop <u>anything</u> into the hole.

P 17 Re-check system operation per paragraph P 12. Always leave toggle switch off between operations.

P 18 Start the pump.

SURVEYING VELOCITY

S 1 — When flow from well is stable, measure output as accurately as possible. Well flow at surface should be monitored during testing. If any variations in pumping rate occur, velocity readings will be affected. A good velocity survey requires a steady pumping rate from beginning to end.

S 2 — Position probe unit in well at a depth where total flow occurs, and screen or borehole diameter is the same as in the producing zone to be surveyed. The probe unit should never be closer to the pump intake than [illegible] feet. If a screen is used of a smaller diameter than the casing, the probe unit should be positioned 1-3 feet into the top of the screen.

S 3 — Zero Timer.

S 4 — Zero Pulse Counter.

BEST COPY AVAILABLE

S 5 — Note Depth.

S 6 — Turn on toggle switch and observe timer. Keep switch on for exactly 60 seconds, then turn off. The timer wheels will "coast" for .[illegible] to .[illegible] seconds after the switch is off, but the system will be de-energized at the instant the switch is thrown.

S 7 — Read the pulse counter. This will equal the number of revolutions of the turbine shaft during the time interval measured by the timer. Record pulse counter reading.

S 8 — Zero Timer and Pulse Counter.

S 9 — Repeat steps S 6 - S 8 several times. The operator should be able to time 60 seconds with regularity, and pulse counts for 60 seconds should be repeatable within 1 or 2%.

S 10 — Lower the probe unit to the next depth level.

S 11 — Zero timer and pulse counter.

S 12 — Note depth.

S 13 — Read and record turbine speed per steps S6 - S8.

S 14 — Repeat Steps S10 - S13 until a depth is reached at which the turbine speed erases or becomes erratic, or until entire borehole zone has been surveyed.

S 15 — Repeat step P 11.

S 16 — Remove pump --- carefully, please!

S 17 Retrieve probe unit from well, drying cable as it is returned to the reel.

NOTES

1. Different time intervals may be chosen for pulse counting if 60 seconds is inconvenient. It is important that whatever time interval is selected, it is consistently and accurately used throughout each test.

2. If very high velocities are anticipated, the survey should be started at about the middle of the producing zone, first working down, and then surveying the upper half of the zone by working up from the middle.

Such an operation should be carefully monitored. If, during the survey of the upper part of the zone, the counting rate should decrease, the pump should be stopped and the test cut short.

A decreasing count while raising the turbine in a pumping well indicates the turbine is being lifted by the pump. If such a case arises, reduce the pumping rate or add more weight to the turbine.

3. If a salt water well is surveyed, thoroughly wash all downhole equipment with fresh water upon completion of survey.

4. The components of this system are delicate, precision instruments, and should be treated accordingly.

5. Probe Assembly and Bearing Adjustment: When properly adjusted, a little looseness can be felt in the bearings. If dirt, grit, or damage to the cage causes the bearings to tighten, disassemble the cage to get at the bearings. Mark the two halves of the cage and the probe head to preserve alignment. Take the cage apart at its waistline, and remove the top half of the cage from the plastic probe head.

Be careful not to drop the impeller-shaft assembly to avoid bending the shaft and damaging the jewel bearing in the bottom end or the bearing point on the top end. The jewels (one in the probe head; one in the bottom end of the shaft) should be cleaned out very carefully -- use a tooth brush. The bearing points (top shaft and bottom of cage) can be cleaned with a little fine steel wool. When reassembling, make sure the cage goes back together as it was.

After reassembling, adjust bearing tightness with the lower bearing point by loosening the lock nut and turning the point one way or the other to achieve the desired tightness.

BEST COPY AVAILABLE

6. Avoid lengthy periods of immersion. Try to plan velocity surveys so that instrument installation, pump setting, and velocity surveying are all accomplished in a minimum span of time, preferably one day. Long periods of immersion increase exposure of the instrument to leakage and damage.

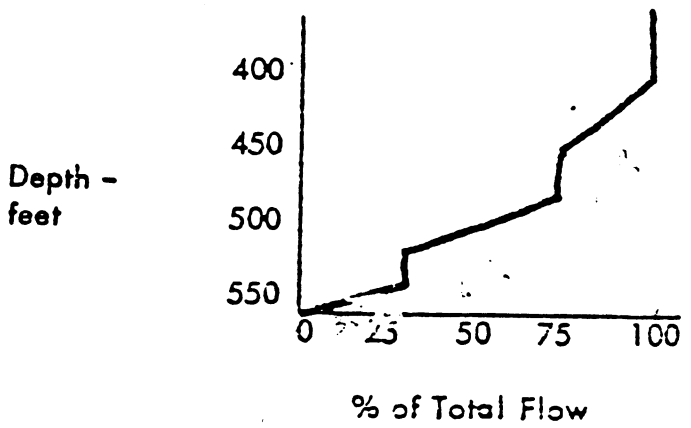
BEST COPY AVAILABLE

PRESENTATION AND INTERPRETATION OF DATA

The following data will be known following a velocity meter survey:

1. Turbine RPM
2. Depth
3. Total flow rate of well
4. Casing, screen, or borehole diameters

Presentation of data is best made as a graph having depth on the vertical axis and flow rate or % of total flow rate on the horizontal axis. An example of such a graph is given below:



This graph shows that 25% of the water enters between 415 and 450 feet, 45% enters between 480 and 520 feet, and 35% enters between 550 and 565 feet.

Two basic characteristics of this instrument should be discussed at this time. They are output linearity and threshold of operation.

Laboratory tests have shown that, for any given conduit diameter, the output of the instrument is linear. That is, turbine RPM vs flow rate is a straight-line function.

Threshold of operation can be described as the least flow velocity that will actuate the turbine. In the case of the Johnson instrument, the threshold is between zero and 0.05 feet per second. For example, a flow velocity of 0.05 feet per second in a 6-inch pipe will produce a turbine speed of 8 to 10 RPM. In actual practice, this threshold of operation can be termed negligible.

The importance of the above characteristics is that, with a linear output, RPM data can be plotted directly as flow, and with a negligible threshold of operation, no "zero offset" adjustments to data need be made.

Example

The following example should help to explain the handling and presentation of data:

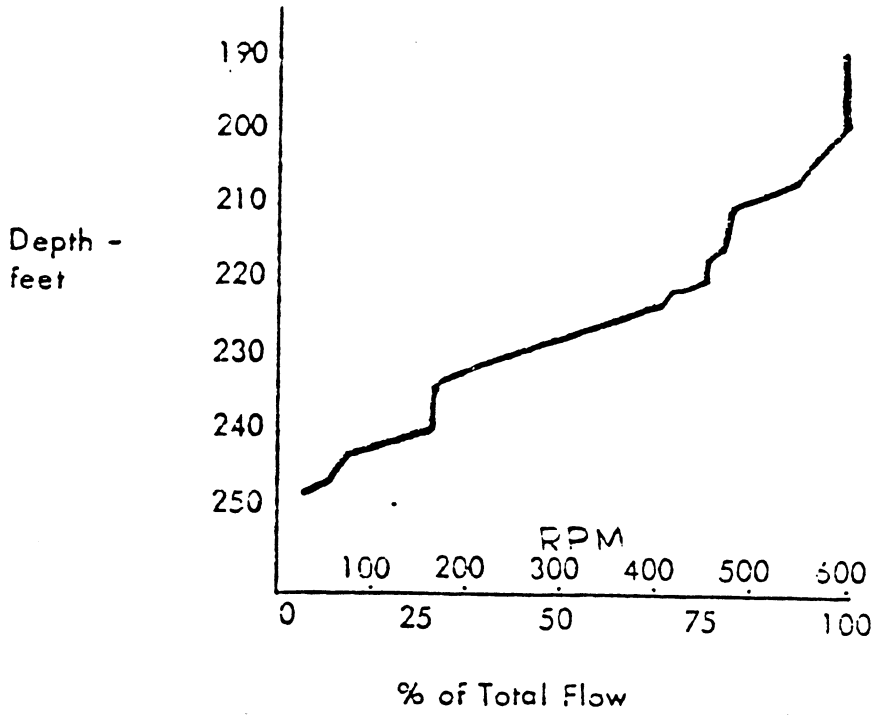
1. Observed Data

Total flow - 200 GPM
Screen inside diameter - 5 inches
Screen set from 200 to 250 feet
Measuring interval - 2 feet

Depth	Counts per Minute (RPM)
196	600
198	600
200	600
202	590
204	570
206	550
208	510
210	485
212	480
214	473
216	475
218	475
220	475
222	430
224	410
226	350
228	310
230	285
232	250
234	195
236	160
238	160
240	160
242	110
244	80
246	65
248	37
250	--

Note: Because the stabilizing weight was used, the maximum instrument depth was 248 feet.

2. Plot data on graph paper to any convenient scale



Note: Since 600 RPM represents 100% of the total flow, and the instrument is known to be linear, a % scale can simply be marked off along the RPM scale. The 100% point is at 600 RPM, 50% at 300 RPM, 0% at 0 RPM, etc.

3. Interpretation

In the example, the graph shows nonproductive zones between 210 and 220 feet, and between 235 and 240 feet. The zone between 220 and 235 feet yields 55% of the total flow. Twenty per cent of the water comes from the top 10 feet of screen, and 25% from the bottom 10 feet of screen.

4. Data Conversion

If it is desired to express the flow in GPM, simply apply the various percentages to the total gallonage. In the above example, the yield between 220 and 235 feet is 110 GPM. The horizontal scale of the graph can be expressed in GPM, if desired.

Flow velocity in feet per second may be computed using the following formula:

$$V = \frac{Q}{D^2} (.408)$$

where: V = Velocity in feet per second
Q = Flow rate in U.S. gallons per minute
D = Inside diameter of pipe or screen in inches.

5. Borehole Diameter Changes

In the event of a change in borehole diameter within the production zone, a profile is drawn which is essentially a composite of profiles of producing zones of each diameter. Exact depths of diameter changes should be known. The instrument will usually indicate such changes by a rather abrupt change in RPM.

Such a hole is plotted from the top down. The uppermost zone or diameter is first plotted as in the above example. Whatever flow is present at the depth of the diameter change is then 100% of the flow of the next lower zone, which is plotted separately, but on the same graph. Successive changes in diameter are treated similarly.

A change in screen or casing diameter at a given flow rate will always cause a change in flow velocity and hence a change in RPM. The change in RPM observed may not correspond precisely to the difference in conduit diameters. This is due to different ratios of water flowing through the turbine to water bypassing the turbine in different conduit diameters. The fact remains that, for a given conduit diameter, the output of the instrument is linear over its operating range of zero to 1000 RPM. Therefore, each borehole diameter is considered separately.

Appendix B

APPENDIX B

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APPENDIX B

B-1

Table B.1 Climatic and Duck Lake Data
Table B.2 Pump Discharge
Water Level Indicator Calibration Constants
Water Level Measurements TW 41

TABLE B.1
CLIMATIC AND DUCK LAKE DATA

Date	Time	Precip. Ins.	Barometric Pressure In. Hg.	Temperature °F Maximum	Minimum	Duck La Level Ft.
5/31/80	7:30 AM	0.25	--	71	54	0.74
6/1/80	8:00 AM	0.00	--	64	47	--
6/2/80	8-9:00 AM	0.18	28.8	56	48	0.725
6/3/80	8-9:30 AM	--	--	66	52	0.72
6/4/80	1:30 AM	--	29.1	--	--	--
6/4/80	8-9:15 AM	0.00	29.2	69	48	--
6/5/80	8:00 AM	0.18	29.0	66	50	--
6/6/80	8:00 AM	1.08	28.7	58	50	--
6/7/80	8:00 AM	0.18	28.9	72	58	0.85
6/8/80	8-8:30 AM	0.21	29.0	64	38	--
6/9/80	8:00 AM	0.015	28.9	64	38	0.86
6/10/80	8:00 AM	0.00	29.9	61	35	0.84
6/11/80	8:00 AM	0.00	29.1	61	35	0.83
6/12/80	8:00 AM	0.00	29.3	72	52	0.82
6/13/80	8:00 AM	0.00	29.2	73	61	0.85
6/14/80	8:00 AM	0.00	29.1	77	59	0.80
6/15/80	8:00 AM	0.22	29.0	71	43	0.80
6/16/80	8:00 AM	0.00	29.1	60	40	0.77
6/24/80	8:00 AM	1.30*(1)	29.2	79	44	0.79
6/25/80	8:00 AM	0.00	29.2	80	65	0.77
6/26/80	8:00 AM	0.00	29.2	82	63	0.76
6/27/80	8:00 AM*(2)	0.00	29.1	80	52	0.91
6/28/80	9:00 AM	2.48	28.7	60	51	1.00
6/29/80	8:00 AM	0.02	28.7	70	55	1.21
6/30/80	8:00 AM	0.01	29.0	67	48	1.27
7/1/80	8:00 AM	0.00	29.0	68	56	1.33
7/2/80	8:00 AM	0.00	29.2	72	48	1.39
7/3/80	8:00 AM	0.00	29.2	70	51	1.44
7/4/80	8:00 AM	0.00	29.2	78	51	1.47
7/5/80	8:00 AM	0.00	29.0	75	62	1.49
7/6/80	8:00 AM	0.00	29.3	65	48	1.51
7/7/80	8:00 AM	0.00	29.2	70	50	1.53
7/8/80	8:00 AM	0.00	29.3	82	58	1.54
7/9/80	8:00 AM	0.00	29.25	74	61	1.57
7/10/80	8:00 AM	0.00	29.25	78	63	1.59
7/11/80	8:00 AM	0.305	29.2	85	63	1.62
7/12/80	8:00 AM	0.02	29.0	78	57	1.65
7/13/80	8:00 AM	0.00	29.15	73	62	1.67
7/14/80	8:00 AM	0.01	29.1	78	62	1.68
7/15/80	8:00 AM	0.01	29.1	78	62	1.70

TABLE B.1
CLIMATIC AND DUCK LAKE DATA (Continued)

Date	Time	Precip. Ins.	Barometric Pressure In. Hg.	Temperature °F Maximum	Minimum	Duck La- Level' Ft.
7/16/80	8:00 AM	0.45	29.0	82	64	1.74
7/17/80	8:00 AM	0.08	29.05	74	60	1.74
7/18/80	8:00 AM	0.00	29.10	73	62	1.75
7/19/80	8:00 AM	0.50	29.40	72	61	1.77
7/20/80	8:00 AM	0.68	29.0	76	61	1.81
7/21/80	8:00 AM*(3)	0.01	29.3	67	62	1.78
7/22/80	8:50 AM	--	29.3	74	60	1.63
7/23/80	11:00 AM	0.00	29.4	69	54	1.55
7/24/80	8:00 AM	0.00	29.2	72	58	1.49
7/25/80	9:30 AM	0.26	--	76	63	--
7/26/80	8:00 AM	0.09	29.2	70	50	1.38
7/27/80	9:10 AM	0.00	29.20	66	48	1.34
7/28/80	9:17 AM	0.00	29.19	73	56	1.32
7/29/80	9:15 AM	0.07	29.2	76	56	1.29
7/30/80	11:08 AM	0.07	29.2	71	55	1.26
7/31/80	2:30 PM	0.00	29.2	75	60	1.23
8/1/80	12:25 PM	0.00	29.3	76	60	1.20
8/3/80	7:50 AM	0.07	29.05	76	54	1.16
8/5/80	2:30 PM	0.47	29.19	72	60	1.15
8/7/80	2:38 PM	0.40	29.49	78	56	1.14
8/9/80	9:45 AM	0.72	29.37	75	56	1.17
8/12/80	1:34 PM	0.04	29.42	71	56	1.12
8/14/80	11:35 AM	0.03	29.30	71	61	1.09
8/16/80	11:15 AM	0.00	29.40	70	47	1.05
8/20/80	2:42 PM	0.48	29.23	76	56	1.02
8/22/80	1:16 PM	0.35	29.50	77	54	1.02
9/2/80	9:52 AM	2.75	29.30	75	50	1.16

** Golder Associates installed staff gage to measure relative Lake levels. Elevation 0.0 on gage = approximately elevation 1601.8 feet (MSL).
*(1) Rain from 6/21 to 6/23.
*(2) Pump test begun at 10:05 AM.
*(3) Pump test stopped at 10:05 AM.

TABLE B.2
PUMP DISCHARGE

Date	Time	Total Flow x1000 Gal.	Flow Rate GPM
6/27	10:05	41.000	1500
	10:25	71	1500
	10:40	94	1533
	12:00	223	1613
	16:43	621	1406
	18:14	753	1451
	19:12	837	1448
	21:05	1,000	1442
	22:01	1,082	1464
	22:45	1,144	1409
6/28	00:06	1,262	1457
	5:36	1,737	1439
	6:25	1,808	1449
	8:00	1,946	1453
	13:35	2,426	1433
	13:40	2,433	1400
	13:55	2,454	1400
	14:39	2,517	1432
	16:23	2,667	1442
	16:40	2,691	1412
	18:51	2,879	1435
	23:51	3,309	1433
6/29	8:41	4,076	1447
	15:56	4,703	1441
6/30	00:30	5,434	1422
	8:12	6,093	1426
	14:01	6,588	1418
	14:21	6,616	1400
	14:30	6,629	1444
	14:51	6,659	1429
	14:54	6,663	1333
7/1	00:04	7,452	1435
	7:44	8,112	1435
	10:18	8,331	1422
	10:20	PUMP SHUT OFF	--
	10:30	PUMP TURN ON	--
	11:24	8,412	--
	12:13	8,484	1469
	12:59	8,549	1413
	13:31	8,595	1438
	17:01	8,896	1433

TABLE B.2
PUMP DISCHARGE (Continued)

Date	Time	Total Flow x1000 Gal.	Flow Rate GPM
7/2	1:52	9,655	1429
	8:35	10,234	1437
	21:11	11,315	1430
7/3	8:57	12,315	1416
	20:35	13,322	1443
7/4	8:39	14,356	1428
	20:33	15,374	1426
7/5	8:05	16,362	1428
	20:37	17,434	1426
7/6	9:07	18,504	1427
	17:49	19,247	1423
7/7	7:43	20,435	1424
	16:22	21,173	1422
7/8	8:29	22,549	1423
	20:54	23,609	1423
7/9	8:40	24,613	1426
	15:57	25,234	1421
7/10	8:37	26,655	1421
	17:17	27,393	1419
7/11	8:44	28,710	1421
	19:04	29,590	1419
7/12	8:44	30.735	1396
7/13	8:12	32,742	1425
7/14	7:55	34,764	1421
	8:58	PUMP TURN OFF	--
	10:48	PUMP TURN ON	--
7/15	8:18	36,796	1389
7/16	8:58	38,880	1414
7/17	8:04	40,873	1432
7/18	7:53	42,888	1410

TABLE B.2
PUMP DISCHARGE (Continued)

Date	Time	Total Flow x1000 Gal.	Flow Rate GPM
7/20	7:57	46,945	1407
7/21	8:23	49,004	1405
	10:05	49,147.692	1409

WATER LEVEL INDICATOR CALIBRATION CONSTANTS

Sixteen water level indicators were used during the pump test program. Each unit was fully calibrated over its length depending on the length of the tape needed for a particular measurement. Instrument calibrations were made by measuring on the surface, 5.00 foot increments on the water level indicators to the nearest 0.01 foot using a steel measuring tape. More than one instrument was often used to measure the water levels in a particular observation well. To reduce the field data a series of calibration constants were input to the computer along with an appropriate code number to match the field reading with the correct calibration constant. The code number is listed under the heading "CON" on each observation well. The value of each numbered constant is shown below. This value must be applied to the field reading in order to obtain the correct depth from the well collar to the water level.

Code	Constant	Code	Constant
1	-.11 FEET	46	.02 FEET
2	.73 FEET	47	.03 FEET
3	.14 FEET	48	.04 FEET
4	-.22 FEET	49	.06 FEET
5	1.00 FEET	51	-176.05 FEET
6	.04 FEET	52	-176.03 FEET
7	-158.00 FEET	53	-176.01 FEET
8	-234.74 FEET	56	-234.77 FEET
9	-.08 FEET	61	-.08 FEET
10	.20 FEET	62	-.07 FEET
11	3.04 FEET	64	-.09 FEET
12	3.45 FEET	65	.10 FEET
13	-.03 FEET	66	.14 FEET
14	0.00 FEET	67	.15 FEET
15	0.00 FEET	68	-.03 FEET
16	0.00 FEET	69	.16 FEET
17	0.00 FEET	70	.21 FEET
20	0.00 FEET	76	3.50 FEET
21	-.13 FEET	77	3.56 FEET
22	-.16 FEET	81	-1.82 FEET
23	-.14 FEET	82	-.03 FEET
24	-.15 FEET	83	-2.29 FEET
25	.72 FEET	84	-2.02 FEET
26	.70 FEET	85	-1.91 FEET
27	.69 FEET	86	-.09 FEET
28	.68 FEET	87	-2.04 FEET
29	.66 FEET	88	.03 FEET
30	.64 FEET	89	.02 FEET
31	.21 FEET	90	-1.93 FEET
32	.22 FEET	91	-2.06 FEET
33	.03 FEET	92	-2.20 FEET
34	-.02 FEET	93	-2.21 FEET
35	-.05 FEET	94	-1.88 FEET
36	-.06 FEET	95	-2.18 FEET
37	-.12 FEET	96	-2.13 FEET
38	-.04 FEET	97	-2.58 FEET
39	0.00 FEET		
41	1.02 FEET		

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW81 ***

DATE	TIME	FIRST READING	SECOND READING	ALG	CON	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
06JUN80	1000.00	127.80	.69	1	69	-30245.00	1578.06	14CLEAR HOLE W/RIG PUMP
06JUN80	1200.00	131.00	.69	1	69	-30125.00	1577.86	14CLEAR HOLE W/RIG PUMP
06JUN80	1520.00	119.00	-3.29	1	67	-29925.00	1593.85	14 BEFORE VEL TEST
06JUN80	1540.00	134.00	-3.29	1	69	-29905.00	1578.84	14 VELOCITY TEST
06JUN80	1600.00	136.00	-3.29	1	69	-29885.00	1576.84	14 VELOCITY TEST
06JUN80	1658.00	137.00	-3.29	1	69	-29827.00	1575.84	14 VELOCITY TEST
06JUN80	1715.00	143.00	-3.29	1	69	-29810.00	1569.84	14 VELOCITY TEST
06JUN80	1832.00	125.00	-3.29	1	69	-29733.00	1587.84	14 PUMP OFF
09JUN80	1000.00	114.69	.69	1	66	-25925.00	1594.19	14
10JUN80	820.00	114.78	.69	1	66	-24585.00	1594.10	14
11JUN80	845.00	114.92	.69	1	66	-23120.00	1593.96	14
12JUN80	835.00	114.84	.69	1	66	-21690.00	1594.04	14
13JUN80	812.00	114.60	.69	1	66	-20273.00	1594.28	14
26JUN80	1620.00	114.85	.69	1	66	-1065.00	1594.03	14
27JUN80	934.00	116.00	0.00	1	39	-31.00	1593.71	13 BEFORE START PUMP, PUMP G=41K
27JUN80	1008.00	168.50	0.00	1	39	3.00	1541.21	13 10 NOTE 2.46 IN.RAIN IN 16 HRS.
27JUN80	1010.00	170.50	0.00	1	13	5.00	1539.24	13 AVG FLOW 1500 GPM
27JUN80	1014.00	173.41	0.00	1	13	9.00	1536.33	13 1500 GPM
27JUN80	1025.00	177.17	0.00	1	36	20.00	1532.60	13 Q=71K
27JUN80	1040.00	179.26	0.00	1	36	35.00	1530.51	13 Q=99K@ 1500 GPM
27JUN80	1100.00	181.67	0.00	1	35	55.00	1528.09	13 Q=123K
27JUN80	1200.00	184.41	0.00	1	35	115.00	1525.35	13 Q=223K
27JUN80	1328.00	185.37	0.00	1	13	203.00	1524.37	13 Q=339K
27JUN80	1423.00	185.79	0.00	1	13	258.00	1523.95	13 Q=420K
27JUN80	1510.00	186.15	0.00	1	13	365.00	1523.59	13 Q=570K ,TIME CORR.
27JUN80	1642.00	186.30	0.00	1	13	397.00	1523.44	13 Q=621K
27JUN80	1735.00	186.33	0.00	1	13	450.00	1523.41	13 Q=700K
27JUN80	1912.00	186.39	0.00	1	13	547.00	1523.35	13 Q=857K
27JUN80	2100.00	186.50	0.00	1	13	655.00	1523.24	13 Q=1000K
27JUN80	2243.00	186.58	0.00	1	13	758.00	1523.16	13 Q=1144K
28JUN80	5.00	186.57	0.00	1	13	840.00	1523.17	13 Q=1262K
28JUN80	155.00	186.58	0.00	1	13	950.00	1523.16	13 Q=1418K
28JUN80	536.00	186.67	0.00	1	13	1171.00	1523.07	13 Q=1737K
28JUN80	860.00	186.78	0.00	1	13	1315.00	1522.96	13 Q=1946K
28JUN80	1336.00	186.79	0.00	1	13	1651.00	1522.95	13 Q=2425K
28JUN80	1622.00	186.81	0.00	1	13	1817.00	1522.93	13 Q=2666K
28JUN80	1852.00	186.89	0.00	1	13	1968.00	1522.85	13 Q=2879K
28JUN80	2354.00	186.90	0.00	1	13	2269.00	1522.84	13 Q=3310K
29JUN80	845.00	186.97	0.00	1	13	2800.00	1522.77	13 Q=4070K AT 9
29JUN80	1555.00	187.17	0.00	1	13	3230.00	1522.57	13 Q=4703K
30JUN80	34.00	187.44	0.00	1	13	3749.00	1522.30	13 Q=5434K
30JUN80	815.00	186.69	0.00	1	13	4210.00	1523.05	13
30JUN80	1433.00	187.53	0.00	1	13	4588.00	1522.21	13 Q=6629K @1926GPM

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 7860R5 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW4I ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COMN	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS** COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL TIME PUMP TEST BEGAN = 27JUN80-1005.00
30JUN80	1444.00	187.50	0.00	1	13	4599.00	1522.24	13
30JUN80	1525.00	187.49	0.00	1	13	4638.00	1522.25	13
01JUL80	745.00	187.57	0.00	1	13	5620.00	1522.17	13 Q=R112K
01JUL80	1017.00	187.60	0.00	1	13	5772.00	1522.14	13 Q=8331K PUMP SHUTOFF
01JUL80	1024.00	136.10	0.00	1	36	5779.00	1573.67	13
01JUL80	1029.00	132.48	0.00	1	35	5784.00	1577.28	13
01JUL80	1037.00	183.74	0.00	1	35	5792.00	1526.02	13 PUMP TURN ON
01JUL80	1045.00	185.37	0.00	1	13	5800.00	1524.37	13
01JUL80	1103.00	186.60	0.00	1	13	5818.00	1523.14	13
01JUL80	1109.00	186.84	0.00	1	13	5824.00	1522.90	13
01JUL80	1119.00	187.06	0.00	1	13	5834.00	1522.68	13 Q=R412 K AT 11
01JUL80	1150.00	187.43	0.00	1	13	5865.00	1522.31	13 Q=8434K AT 12
01JUL80	1300.00	187.62	0.00	1	13	5935.00	1522.12	13
01JUL80	1437.00	187.67	0.00	1	13	6032.00	1522.07	13
01JUL80	1658.00	187.79	0.00	1	13	6173.00	1521.95	13 Q=8696K
02JUL80	155.00	188.13	0.00	1	13	6710.00	1521.61	13 Q=9655K
02JUL80	834.00	188.09	0.00	1	13	7109.00	1521.65	13 Q=10234K
02JUL80	2113.00	188.00	0.00	1	13	7868.00	1521.74	13 Q=11315K
03JUL80	858.00	188.04	0.00	1	13	8573.00	1521.70	13 Q=12325K
03JUL80	2036.00	188.07	0.00	1	13	9271.00	1521.67	13 Q=13323K
04JUL80	841.00	188.12	0.00	1	13	9996.00	1521.62	13 Q=14357K
04JUL80	2032.00	188.06	0.00	1	13	10707.00	1521.68	13 Q=15374K
05JUL80	806.00	188.19	0.00	1	13	11401.00	1521.55	13 Q=16362K
05JUL80	2035.00	188.54	0.00	1	13	12150.00	1521.20	13 Q=17434K
06JUL80	908.00	188.58	0.00	1	13	12903.00	1521.16	13 Q=18504K
06JUL80	1748.00	188.40	0.00	1	13	13423.00	1521.34	13 Q=19247K
07JUL80	744.00	188.38	0.00	1	13	14259.00	1521.36	13 Q=20435K
07JUL80	1625.00	188.24	0.00	1	13	14780.00	1521.50	13 Q=21175K
08JUL80	831.00	188.73	0.00	1	13	15746.00	1521.01	13 Q=22549K
08JUL80	2056.00	188.72	0.00	1	13	16491.00	1521.02	13 Q=23609K
09JUL80	842.00	188.78	0.00	1	13	17197.00	1520.96	13 Q=24615K
09JUL80	1600.00	188.68	0.00	1	13	17635.00	1521.06	13 Q=25235K
10JUL80	838.00	188.84	0.00	1	13	18633.00	1520.90	13 Q=26656K
10JUL80	1718.00	188.75	0.00	1	13	19153.00	1520.99	13 Q=27395K
11JUL80	848.00	188.95	0.00	1	13	20083.00	1520.79	13 Q=28710K
11JUL80	1904.00	188.99	0.00	1	13	20699.00	1520.75	13 Q=29590K
12JUL80	844.00	188.99	0.00	1	13	21519.00	1520.75	13 Q=30735K
13JUL80	812.00	189.05	0.00	1	13	22927.00	1520.69	13 Q=32742K
14JUL80	755.00	189.42	0.00	1	13	24350.00	1520.32	13 Q=34764K

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW4I ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
14JUL80	820.00	141.23	0.00	1	37	24375.00	1568.60	13
14JUL80	821.00	139.81	0.00	1	36	24376.00	1569.96	13
14JUL80	823.00	138.08	0.00	1	36	24378.00	1571.69	13
14JUL80	828.00	134.59	0.00	1	35	24383.00	1575.17	13
14JUL80	834.00	131.78	0.00	1	35	24389.00	1577.98	13
14JUL80	847.00	128.72	0.00	1	34	24402.00	1581.01	13
14JUL80	858.00	174.30	0.00	1	13	24413.00	1535.44	13 PUMP TURN ~~ON~~ Off
14JUL80	905.00	181.75	0.00	1	35	24420.00	1528.01	13
14JUL80	914.00	184.26	0.00	1	35	24429.00	1525.50	13
14JUL80	933.00	186.69	0.00	1	13	24448.00	1523.05	13
14JUL80	1048.00	188.89	0.00	1	13	24523.00	1520.85	13 PUMP TURN ~~OFF~~ On
15JUL80	818.00	189.49	0.00	1	13	25813.00	1520.25	13 Q=36796K
16JUL80	858.00	189.58	0.00	1	13	27293.00	1520.16	13 Q=38888K
17JUL80	804.00	189.78	0.00	1	13	28679.00	1519.96	13 Q=40875K
18JUL80	753.00	189.31	0.00	1	13	30108.00	1520.43	13 Q=42888K
20JUL80	757.00	189.21	0.00	1	13	32992.00	1520.53	13 Q=46945K
21JUL80	823.00	189.43	0.00	1	13	34458.00	1520.31	13 Q=49004K
21JUL80	1045.00	127.92	0.00	1	34	34680.00	1581.81	13 PUMP OFF @ 10
								Q=49147692 GAL
21JUL80	1057.00	126.74	0.00	1	34	34612.00	1582.99	13
21JUL80	1118.00	125.28	0.00	1	34	34633.00	1584.45	13
21JUL80	1141.00	124.29	0.00	1	33	34656.00	1585.39	13
21JUL80	1200.00	123.74	0.00	1	33	34675.00	1585.94	13 13
21JUL80	1247.00	122.91	0.00	1	33	34722.00	1586.77	13
21JUL80	1321.00	122.43	0.00	1	33	34756.00	1587.25	13
21JUL80	1346.00	122.21	0.00	1	33	34761.00	1587.47	13
21JUL80	1445.00	121.83	0.00	1	33	34840.00	1587.85	13
21JUL80	1619.00	121.47	0.00	1	33	34934.00	1588.21	13
21JUL80	1714.00	121.33	0.00	1	33	34989.00	1588.35	13
21JUL80	1827.00	121.18	0.00	1	33	35062.00	1588.50	13
21JUL80	1923.00	121.04	0.00	1	33	35118.00	1588.64	13
21JUL80	2020.00	120.99	0.00	1	33	35175.00	1588.69	13
21JUL80	2248.00	120.85	0.00	1	33	35323.00	1588.83	13
22JUL80	809.00	120.58	0.00	1	33	35644.00	1589.10	13
22JUL80	940.00	120.38	0.00	1	33	35975.00	1589.30	13 LAST READ FROM PVC

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

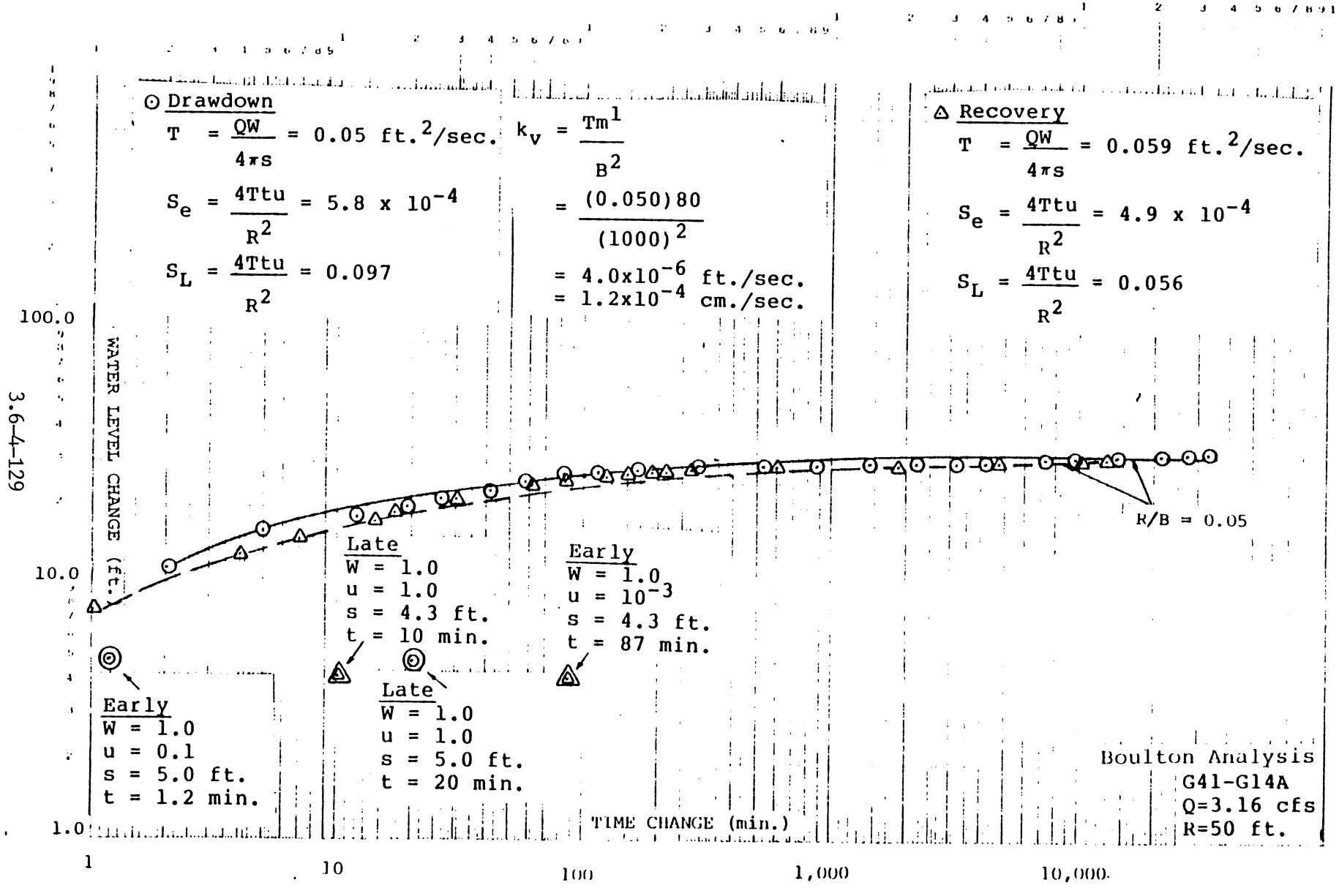
CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***TW4I ***

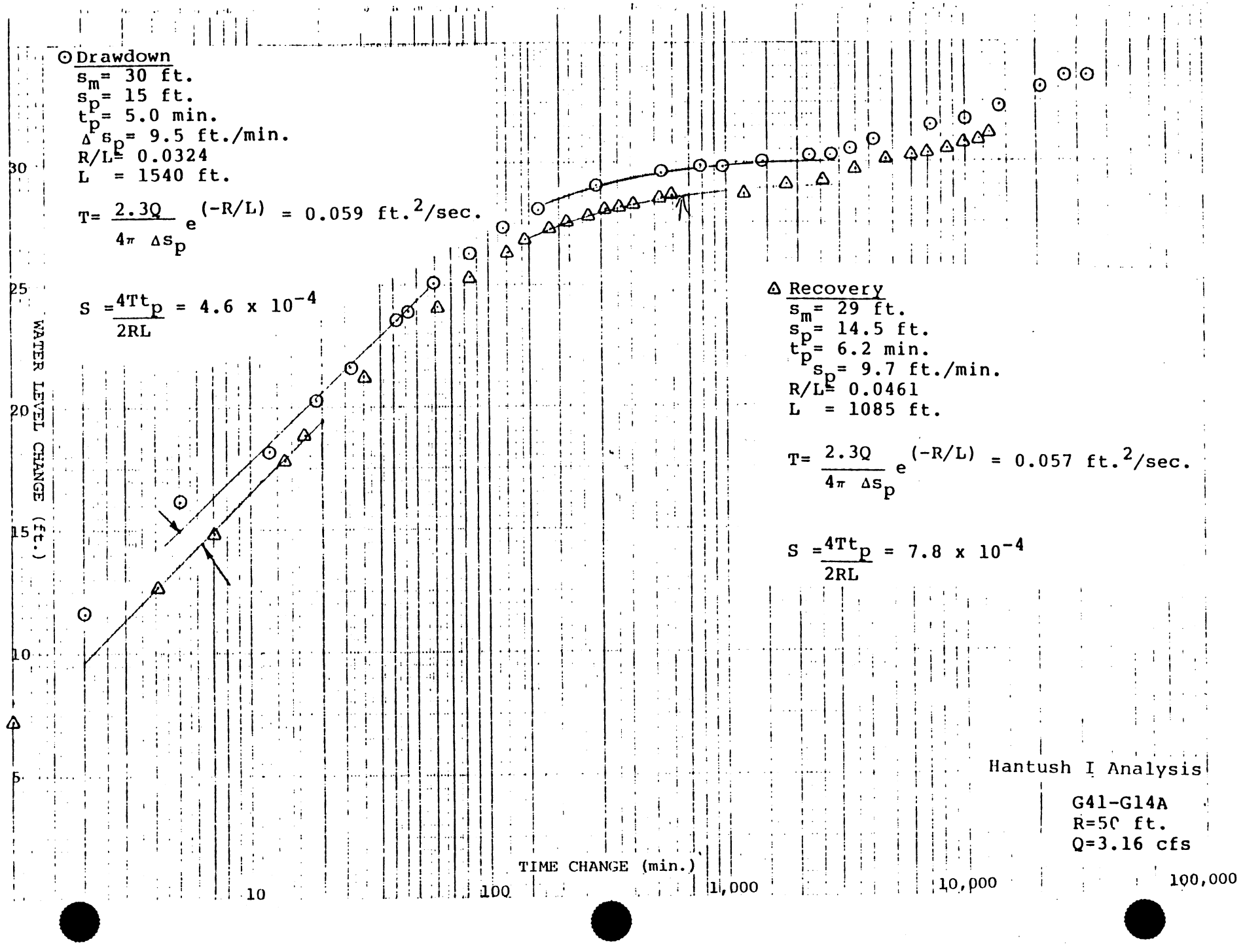
DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1709.71 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
22JUL80	942.00	119.78	.69	1	39	35977.00	1589.24	13 TOP 12 INCH PIPE
22JUL80	952.00	119.64	.69	1	39	35987.00	1589.38	13
23JUL80	10.00	119.55	.69	1	39	36845.00	1589.47	13
23JUL80	327.00	119.56	.69	1	39	37042.00	1589.46	13
23JUL80	1105.00	119.34	.69	1	39	37500.00	1589.68	13
23JUL80	1920.00	119.16	.69	1	39	37995.00	1589.86	13
24JUL80	852.00	118.98	.69	1	39	38787.00	1590.04	13
25JUL80	1000.00	118.55	.98	1	21	40315.00	1590.31	1 TOP FINISHED WELL
25JUL80	1521.00	118.23	.98	1	67	40636.00	1590.35	14
26JUL80	747.00	118.16	.98	1	67	41622.00	1590.42	14
26JUL80	748.00	120.57	.98	1	95	41623.00	1590.34	15
27JUL80	1015.00	120.32	.98	1	95	43210.00	1590.59	15
28JUL80	935.00	120.13	.98	1	95	44606.00	1590.78	15
29JUL80	930.00	120.14	.98	1	95	46045.00	1590.77	15
30JUL80	1055.00	120.00	.98	1	95	47570.00	1590.91	15
31JUL80	1420.00	119.58	.98	1	94	49215.00	1591.03	15
01AUG80	1210.00	119.60	.98	1	94	50525.00	1591.01	15
03AUG80	845.00	119.33	.98	1	94	53200.00	1591.28	15
05AUG80	1444.00	119.22	.98	1	94	56439.00	1591.39	15
07AUG80	1446.00	119.15	.98	1	94	59321.00	1591.46	15
09AUG80	1010.00	119.07	.98	1	94	61925.00	1591.54	15
12AUG80	1400.00	119.04	.98	1	94	66475.00	1591.57	15
14AUG80	1145.00	118.87	.98	1	94	69220.00	1591.74	15
16AUG80	1133.00	118.87	.98	1	94	72088.00	1591.74	15
20AUG80	1450.00	118.60	.98	1	94	78045.00	1592.01	15
22AUG80	1324.00	118.87	.98	1	94	80839.00	1591.74	15
02SEP80	958.00	118.53	.98	1	94	96473.00	1592.08	15

NOTE: Flow measurements indicated are at approximate time of measurement, more detailed data in Table B-2

APPENDIX B

B-2
G41-G14A
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details
Boring Log G41-G14


⊙ Drawdown
T = QW/4πs = 0.05 ft.²/sec.
S_e = 4Ttu/R² = 5.8 x 10⁻⁴
S_L = 4Ttu/R² = 0.097
k_v = Tm¹/B² = (0.050)80/(1000)²
= 4.0x10⁻⁶ ft./sec.
= 1.2x10⁻⁴ cm./sec.
△ Recovery
T = QW/4πs = 0.059 ft.²/sec.
S_e = 4Ttu/R² = 4.9 x 10⁻⁴
S_L = 4Ttu/R² = 0.056
R/B = 0.05
Early
W = 1.0
u = 10⁻³
s = 4.3 ft.
t = 87 min.
Late
W = 1.0
u = 1.0
s = 4.3 ft.
t = 10 min.
Early
W = 1.0
u = 0.1
s = 5.0 ft.
t = 1.2 min.
Late
W = 1.0
u = 1.0
s = 5.0 ft.
t = 20 min.
Boulton Analysis
G41-G14A
Q=3.16 cfs
R=50 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
1
10
100
1,000
10,000


⊙ Drawdown
s_m = 30 ft.
s_p = 15 ft.
t_p = 5.0 min.
Δs_p = 9.5 ft./min.
R/L = 0.0324
L = 1540 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.059 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 4.6 x 10^{-4}
△ Recovery
s_m = 29 ft.
s_p = 14.5 ft.
t_p = 6.2 min.
s_p = 9.7 ft./min.
R/L = 0.0461
L = 1085 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.057 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 7.8 x 10^{-4}
WATER LEVEL CHANGE (ft.)
30
25
20
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
Hantush I Analysis
G41-G14A
R=50 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
04DEC79	1200.00	115.80	0.00	1	20	-296525.00	1594.82	GROUND SURFACE-CORR. TO
12FEB80	1410.00	114.07	0.00	1	20	-195595.00	1594.55	RT D&M
25APR80	1200.00	114.60	.14	1	14	-90605.00	1593.88	14 - TIME NOT RECORD
15MAY80	950.00	114.87	0.00	1	20	-61915.00	1593.75	20 D&M
20MAY80	600.00	114.54	0.00	1	66	-54965.00	1593.94	4 14
21MAY80	1200.00	114.56	0.00	1	1	-53165.00	1594.17	1 - NO TIME
29MAY80	930.00	114.53	0.00	1	21	-41795.00	1594.22	4 1 -REV. CIR.
30MAY80	1730.00	114.41	0.00	1	1	-39875.00	1594.32	4 1 -REV. CIR.
31MAY80	20.00	113.74	0.00	1	1	-39465.00	1594.99	4 1 -REV. CIR.
31MAY80	945.00	114.36	0.00	1	1	-38900.00	1594.37	4 1 SET CASE
01JUN80	600.00	114.36	0.00	1	1	-37685.00	1594.37	4 1 SET CASE
01JUN80	1525.00	114.34	0.00	1	1	-37120.00	1594.39	4 1 GRAVEL
02JUN80	830.00	114.22	0.00	1	1	-36095.00	1594.51	4 1
03JUN80	915.00	114.55	0.00	1	1	-34610.00	1594.18	4 1
04JUN80	135.00	115.23	0.00	1	1	-33630.00	1593.50	4 1 AIR DEV.
06JUN80	922.00	116.44	0.00	1	21	-30283.00	1592.31	4 1
06JUN80	1010.00	119.00	0.00	1	21	-30235.00	1589.75	1 PUMP SED. FROM WELL
06JUN80	1012.00	119.06	0.00	1	21	-30233.00	1589.69	1 PUMP SED. FROM WELL
06JUN80	1015.00	119.14	0.00	1	21	-30230.00	1589.61	1 "
06JUN80	1020.00	119.20	0.00	1	21	-30225.00	1589.55	1 "
06JUN80	1025.00	119.28	0.00	1	21	-30220.00	1589.47	1 "
06JUN80	1030.00	119.34	0.00	1	21	-30215.00	1589.41	1 PUMP SED. FROM WELL
06JUN80	1033.00	118.26	0.00	1	21	-30212.00	1590.49	4 1
06JUN80	1034.00	117.64	0.00	1	21	-30211.00	1591.11	4 1
06JUN80	1036.00	117.24	0.00	1	21	-30209.00	1591.51	4 1
06JUN80	1037.00	117.17	0.00	1	21	-30208.00	1591.58	4 1
06JUN80	1038.00	116.80	0.00	1	21	-30207.00	1591.95	4 1
06JUN80	1039.00	116.61	0.00	1	21	-30206.00	1592.14	4 1
06JUN80	1040.00	116.47	0.00	1	21	-30205.00	1592.28	4 1
06JUN80	1041.00	116.38	0.00	1	21	-30204.00	1592.37	4 1
06JUN80	1042.00	116.27	0.00	1	21	-30203.00	1592.48	4 1
06JUN80	1043.00	116.21	0.00	1	21	-30202.00	1592.54	4 1
06JUN80	1044.00	116.12	0.00	1	21	-30201.00	1592.63	4 1
06JUN80	1045.00	116.08	0.00	1	21	-30200.00	1592.67	4 1
06JUN80	1046.00	116.01	0.00	1	21	-30199.00	1592.74	4 1
06JUN80	1047.00	115.91	0.00	1	21	-30198.00	1592.84	4 1
06JUN80	1048.00	116.01	0.00	1	21	-30197.00	1592.74	4 1
06JUN80	1049.00	115.91	0.00	1	21	-30196.00	1592.84	4 1
06JUN80	1050.00	115.88	0.00	1	21	-30195.00	1592.87	4 1
06JUN80	1056.00	115.56	0.00	1	21	-30189.00	1593.19	4 1
06JUN80	1100.00	115.47	0.00	1	21	-30185.00	1593.28	4 1

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION		** COMMENTS **
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET		
									COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL-
									TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1737.00	144.32	0.00	1	24	452.00	1564.45	1 1	
27JUN80	1856.00	144.46	0.00	1	24	531.00	1564.31	1 1	
27JUN80	1927.00	144.42	0.00	1	24	562.00	1564.35	1 1	
27JUN80	2039.00	144.59	0.00	1	24	634.00	1564.18	1 1	
27JUN80	2135.00	144.60	0.00	1	24	690.00	1564.17	1 1	
27JUN80	2302.00	144.64	0.00	1	24	777.00	1564.13	1 1	
28JUN80	30.00	144.75	0.00	1	24	865.00	1564.02	1 1	
28JUN80	220.00	144.67	0.00	1	24	975.00	1564.10	1 1	
28JUN80	532.00	144.78	0.00	1	24	1167.00	1563.99	1 1	
28JUN80	736.00	144.98	0.00	1	24	1291.00	1563.79	1 1	
28JUN80	1007.00	144.91	0.00	1	24	1442.00	1563.86	1 1	
28JUN80	1215.00	144.98	0.00	1	24	1570.00	1563.79	1 1	
28JUN80	1505.00	145.00	0.00	1	21	1740.00	1563.75	1 1	
28JUN80	1805.00	145.05	0.00	1	21	1920.00	1563.70	1 1	
28JUN80	2327.00	145.12	0.00	1	21	2242.00	1563.63	1 1	
29JUN80	216.00	145.23	0.00	1	21	2771.00	1563.52	1 1	
29JUN80	1557.00	145.44	0.00	1	24	3232.00	1563.33	4 1	
30JUN80	37.00	145.68	0.00	1	24	3752.00	1563.09	1 1	
30JUN80	826.00	145.48	0.00	1	21	4221.00	1563.27	1 1	
30JUN80	1527.00	145.79	0.00	1	21	4642.00	1562.96	1 1	
01JUL80	759.00	145.82	0.00	1	21	5634.00	1562.93	1 1	
01JUL80	1015.00	145.88	0.00	1	21	5770.00	1562.87	1 1	
01JUL80	1020.00	144.20	0.00	1	21	5775.00	1564.55	1 1	STOP PUMP-OIL
01JUL80	1025.00	131.63	0.00	1	23	5780.00	1577.13	1 1	STOP PUMP-OIL
01JUL80	1030.00	129.48	0.00	1	23	5785.00	1579.28	1 1	RESTART PUMP
01JUL80	1033.00	140.31	0.00	1	24	5788.00	1568.46	1 1	
01JUL80	1039.00	142.75	0.00	1	24	5794.00	1566.02	1 1	
01JUL80	1042.00	143.38	0.00	1	24	5797.00	1565.39	1 1	
01JUL80	1046.00	143.90	0.00	1	24	5801.00	1564.87	1 1	
01JUL80	1100.00	144.80	0.00	1	24	5815.00	1563.97	1 1	
01JUL80	1105.00	144.96	0.00	1	24	5820.00	1563.81	1 1	
01JUL80	1111.00	145.11	0.00	1	21	5826.00	1563.64	1 1	
01JUL80	1120.00	145.31	0.00	1	21	5835.00	1563.44	1 1	
01JUL80	1151.00	145.67	0.00	1	21	5866.00	1563.08	1 1	
01JUL80	1302.00	145.91	0.00	1	21	5937.00	1562.84	1 1	
01JUL80	1438.00	146.03	0.00	1	21	6033.00	1562.72	1 1	
01JUL80	1505.00	146.14	0.00	1	21	6060.00	1562.61	1 1	
01JUL80	1708.00	146.10	0.00	1	21	6183.00	1562.65	1 1	
02JUL80	158.00	146.58	0.00	1	21	6713.00	1562.17	1 1	
02JUL80	837.00	146.38	0.00	1	21	7112.00	1562.37	1 1	

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
06JUN80	1141.00	114.90	0.00	1	1	-30144.00	1593.83	4 1
06JUN80	1257.00	114.81	0.00	1	1	-30068.00	1593.92	4 1
06JUN80	1624.00	122.00	0.00	1	22	-29861.00	1586.78	4 1 VEL TEST START AT 16
06JUN80	1630.00	122.21	0.00	1	22	-29855.00	1586.57	4 1 VEL TEST
06JUN80	1644.00	122.45	0.00	1	22	-29841.00	1586.33	4 1 VEL TEST
06JUN80	1700.00	116.54	0.00	1	21	-29825.00	1592.21	4 1 VEL TEST
06JUN80	1840.00	117.71	0.00	1	21	-29725.00	1591.04	4 1 VEL TEST
07JUN80	930.00	114.58	0.00	1	1	-28835.00	1594.15	4 1
08JUN80	830.00	114.88	0.00	1	1	-27455.00	1593.85	4 1
09JUN80	800.00	114.50	0.00	1	1	-26045.00	1594.23	4 1
10JUN80	635.00	114.75	0.00	1	1	-24570.00	1593.98	4 1
11JUN80	845.00	114.83	0.00	1	1	-23120.00	1593.90	4 1
12JUN80	840.00	114.71	0.00	1	1	-21685.00	1594.02	4 1
13JUN80	815.00	114.50	0.00	1	1	-20270.00	1594.23	4 1
13JUN80	2115.00	114.46	0.00	1	21	-19490.00	1594.29	4 1 DIFF. RULE
14JUN80	815.00	114.53	0.00	1	1	-18830.00	1594.20	4 1
14JUN80	1745.00	114.51	0.00	1	1	-18260.00	1594.22	4 1
15JUN80	820.00	114.65	0.00	1	1	-17385.00	1594.08	4 1
16JUN80	805.00	114.81	0.00	1	1	-15960.00	1593.92	4 1
24JUN80	820.00	114.72	0.00	1	1	-4425.00	1594.01	4 1
25JUN80	815.00	114.69	0.00	1	1	-2990.00	1594.04	4 1
26JUN80	840.00	114.63	0.00	1	1	-1525.00	1594.10	4 1
27JUN80	800.00	114.82	0.00	1	1	-125.00	1593.91	1 1 BEFORE TEST
27JUN80	1007.00	126.47	0.00	1	23	2.00	1582.29	1 1
27JUN80	1012.00	131.05	0.00	1	23	7.00	1577.71	1 1
27JUN80	1017.00	133.10	0.00	1	23	12.00	1575.66	1 1
27JUN80	1024.00	135.13	0.00	1	22	19.00	1573.65	1 1
27JUN80	1031.00	136.49	0.00	1	22	26.00	1572.29	1 1 START @ 10
27JUN80	1046.00	138.40	0.00	1	22	41.00	1570.38	1 1
27JUN80	1051.00	138.84	0.00	1	22	46.00	1569.94	1 1
27JUN80	1057.00	139.45	0.00	1	22	52.00	1569.33	1 1
27JUN80	1103.00	139.98	0.00	1	22	58.00	1568.80	1 1
27JUN80	1113.00	140.58	0.00	1	24	68.00	1568.19	1 1
27JUN80	1128.00	141.24	0.00	1	24	83.00	1567.53	1 1
27JUN80	1145.00	141.86	0.00	1	24	100.00	1566.91	1 1
27JUN80	1200.00	142.29	0.00	1	24	115.00	1566.48	1 1
27JUN80	1218.00	142.68	0.00	1	24	133.00	1566.19	1 1
27JUN80	1247.00	143.05	0.00	1	24	162.00	1565.72	1 1
27JUN80	1316.00	143.39	0.00	1	24	191.00	1565.38	1 1
27JUN80	1354.00	143.75	0.00	1	24	229.00	1565.02	1 1
27JUN80	1453.00	143.98	0.00	1	24	288.00	1564.79	1 1
27JUN80	1527.00	144.19	0.00	1	24	322.00	1564.58	1 1 TIME CORRECTED
27JUN80	1652.00	144.28	0.00	1	24	407.00	1564.49	1 1

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G19A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
02JUL80	1506.00	146.12	.14	1	14	7381.00	1562.36	16 14 COMPARE PIEZ.
02JUL80	1307.00	146.38	0.00	1	21	7382.00	1562.37	1 1 COMPARE PIEZ.
02JUL80	2113.00	146.36	0.00	1	21	7868.00	1562.39	1 1
03JUL80	901.00	146.38	0.00	1	21	8576.00	1562.37	1 1
03JUL80	2050.00	146.41	0.00	1	21	9285.00	1562.34	1 1
04JUL80	843.00	146.55	0.00	1	21	9998.00	1562.20	1 1
04JUL80	2049.00	146.46	0.00	1	21	10724.00	1562.29	1 1
05JUL80	818.00	146.62	0.00	1	21	11413.00	1562.13	1 1
05JUL80	2041.00	146.92	0.00	1	21	12156.00	1561.83	1 1
06JUL80	910.00	147.05	0.00	1	21	12905.00	1561.70	1 1
06JUL80	1746.00	146.94	0.00	1	21	13421.00	1561.81	1 1
07JUL80	747.00	146.88	0.00	1	21	14262.00	1561.87	1 1
07JUL80	1633.00	146.83	0.00	1	21	14788.00	1561.92	1 1
08JUL80	833.00	147.23	0.00	1	21	15748.00	1561.52	1 1
08JUL80	2058.00	147.25	0.00	1	21	16493.00	1561.50	1 1
09JUL80	850.00	147.33	0.00	1	21	17205.00	1561.42	1 1
09JUL80	1601.00	147.28	0.00	1	21	17636.00	1561.47	1 1
10JUL80	841.00	147.43	0.00	1	21	18636.00	1561.32	1 1
10JUL80	1740.00	147.41	0.00	1	21	19175.00	1561.34	1 1
11JUL80	913.00	147.60	0.00	1	21	20108.00	1561.15	1 1
11JUL80	1908.00	147.61	0.00	1	21	20703.00	1561.14	1 1
12JUL80	850.00	147.69	0.00	1	21	21525.00	1561.06	1 1
13JUL80	818.00	147.86	0.00	1	21	22933.00	1560.89	1 1
14JUL80	756.00	147.95	0.00	1	21	24351.00	1560.80	1 1
14JUL80	824.00	133.57	0.00	1	23	24379.00	1575.19	1 1 PUMP OFF-OIL
14JUL80	829.00	131.00	0.00	1	23	24384.00	1577.76	1 1
14JUL80	849.00	126.45	0.00	1	23	24404.00	1582.31	1 1
14JUL80	900.00	138.08	0.00	1	22	24415.00	1570.70	1 1 PUMP ON
14JUL80	907.00	141.71	0.00	1	20	24422.00	1567.06	1 1
14JUL80	915.00	143.42	0.00	1	20	24430.00	1565.35	1 1
14JUL80	934.00	145.47	0.00	1	21	24449.00	1563.28	1 1
14JUL80	1052.00	147.48	0.00	1	21	24527.00	1561.27	1 1
15JUL80	824.00	148.16	0.00	1	21	25819.00	1560.59	1 1
16JUL80	903.00	148.30	0.00	1	21	27298.00	1560.45	1 1
17JUL80	808.00	148.50	0.00	1	21	28683.00	1560.25	1 1
18JUL80	756.00	148.38	0.00	1	21	30111.00	1560.37	1 1
20JUL80	801.00	148.38	0.00	1	21	32996.00	1560.37	1 1
21JUL80	824.00	148.62	0.00	1	21	34459.00	1560.13	1 1

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
-- PIEZOMETER/WELL IDENTIFIER ***G19A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1006.00	140.92	0.00	1	24	34561.00	1567.85	1 1 RECOVERY @ 10
21JUL80	1009.00	135.90	0.00	1	22	34564.00	1572.88	1 1
21JUL80	1012.00	133.76	0.00	1	23	34567.00	1575.00	1 1
21JUL80	1019.00	130.85	0.00	1	23	34574.00	1577.91	1 1
21JUL80	1022.00	129.79	0.00	1	23	34577.00	1578.97	1 1
21JUL80	1025.00	129.14	0.00	1	23	34580.00	1579.62	1 1
21JUL80	1032.00	127.88	0.00	1	23	34587.00	1580.88	1 1
21JUL80	1035.00	127.35	0.00	1	23	34590.00	1581.41	1 1
21JUL80	1038.00	127.03	0.00	1	23	34593.00	1581.73	1 1
21JUL80	1041.00	126.66	0.00	1	23	34596.00	1582.10	1 1
21JUL80	1047.00	125.97	0.00	1	23	34602.00	1582.79	1 1
21JUL80	1051.00	125.61	0.00	1	23	34606.00	1583.15	1 1
21JUL80	1059.00	125.00	0.00	1	23	34614.00	1583.76	1 1
21JUL80	1106.00	124.55	0.00	1	22	34621.00	1584.23	1 1
21JUL80	1112.00	124.10	0.00	1	22	34627.00	1584.68	1 1
21JUL80	1119.00	123.79	0.00	1	22	34634.00	1584.99	1 1
21JUL80	1123.00	123.63	0.00	1	22	34638.00	1585.15	1 1
21JUL80	1129.00	123.36	0.00	1	22	34644.00	1585.42	1 1
21JUL80	1135.00	123.24	0.00	1	22	34648.00	1585.54	1 1
21JUL80	1137.00	123.05	0.00	1	22	34652.00	1585.73	1 1
21JUL80	1144.00	122.91	0.00	1	22	34658.00	1585.87	1 1
21JUL80	1147.00	122.80	0.00	1	22	34662.00	1585.98	1 1
21JUL80	1151.00	122.64	0.00	1	22	34666.00	1586.14	1 1
21JUL80	1154.00	122.51	0.00	1	22	34669.00	1586.27	1 1
21JUL80	1201.00	122.43	0.00	1	22	34676.00	1586.35	1 1
21JUL80	1206.00	122.31	0.00	1	22	34681.00	1586.47	1 1
21JUL80	1212.00	122.19	0.00	1	22	34687.00	1586.59	1 1
21JUL80	1234.00	121.80	0.00	1	22	34709.00	1586.98	1 1
21JUL80	1255.00	121.62	0.00	1	22	34728.00	1587.26	1 1
21JUL80	1309.00	121.37	0.00	1	22	34744.00	1587.41	1 1
21JUL80	1324.00	121.24	0.00	1	22	34759.00	1587.54	1 1
21JUL80	1342.00	121.10	0.00	1	22	34777.00	1587.68	1 1
21JUL80	1358.00	121.02	0.00	1	22	34793.00	1587.76	1 1
21JUL80	1431.00	120.79	0.00	1	22	34826.00	1587.99	1 1
21JUL80	1459.00	120.65	0.00	1	22	34854.00	1588.13	1 1
21JUL80	1533.00	120.55	0.00	1	22	34888.00	1588.23	1 1
21JUL80	1605.00	120.47	0.00	1	22	34920.00	1588.31	1 1
21JUL80	1700.00	120.33	0.00	1	22	34975.00	1588.45	1 1
21JUL80	1812.00	120.16	0.00	1	22	35047.00	1588.62	1 1
21JUL80	1907.00	120.07	0.00	1	22	35102.00	1588.71	1 1
21JUL80	2000.00	120.02	0.00	1	22	35155.00	1588.76	1 1

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786095 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	2118.00	119.91	0.00	1	21	35233.00	1588.84	1 1
21JUL80	2226.00	119.85	0.00	1	21	35301.00	1588.90	1 1
22JUL80	103.00	119.76	0.00	1	21	35458.00	1588.99	1 1
22JUL80	225.00	119.69	0.00	1	21	35540.00	1589.06	1 1
22JUL80	410.00	119.63	0.00	1	21	35645.00	1589.12	1 1
22JUL80	837.00	119.46	0.00	1	21	35912.00	1589.29	1 1
22JUL80	1130.00	119.36	0.00	1	21	36085.00	1589.39	1 1
22JUL80	1514.00	119.25	0.00	1	21	36309.00	1589.50	1 1
22JUL80	1856.00	119.20	0.00	1	21	36531.00	1589.55	1 1
23JUL80	14.00	119.14	0.00	1	21	36849.00	1589.61	1 1
23JUL80	329.00	119.08	0.00	1	21	37044.00	1589.67	1 1
23JUL80	1107.00	115.00	3.97	1	21	37502.00	1589.78	1 1
23JUL80	1921.00	115.00	3.75	1	21	37996.00	1590.00	1 1
24JUL80	833.00	115.00	3.61	1	21	38788.00	1590.14	1 1
24JUL80	1654.00	115.00	3.42	1	21	39289.00	1590.33	1 1
25JUL80	1010.00	115.00	3.42	1	21	40325.00	1590.33	1 1
25JUL80	1524.00	115.00	3.36	1	21	40639.00	1590.39	1 1
26JUL80	753.00	115.00	3.06	1	67	41628.00	1590.41	14 14
27JUL80	1010.00	120.00	.29	1	95	43205.00	1590.56	15 BY D. K. TO 9/2/80
28JUL80	927.00	120.00	.05	1	95	44602.00	1590.75	15 BY D. K. TO 9/2/80
29JUL80	525.00	120.00	.03	1	95	46040.00	1590.77	15 BY D. K. TO 9/2/80
30JUL80	1100.00	115.00	4.60	1	94	47575.00	1590.90	15 BY D. K. TO 9/2/80
31JUL80	1918.00	115.00	4.48	1	94	49213.00	1591.02	15 BY D. K. TO 9/2/80
01AUG80	1213.00	115.00	4.44	1	94	50528.00	1591.06	15 BY D. K. TO 9/2/80
01AUG80	1840.00	115.00	4.22	1	94	53195.00	1591.28	4 15
05AUG80	1441.00	115.00	4.17	1	94	56436.00	1591.33	4 15
07AUG80	1443.00	115.00	4.04	1	94	59318.00	1591.46	4 15
09AUG80	1005.00	115.00	4.00	1	94	61920.00	1591.50	4 15
12AUG80	1338.00	115.00	3.90	1	94	66453.00	1591.60	4 15
14AUG80	1140.00	115.00	3.71	1	94	69215.00	1591.79	4 15
16AUG80	1130.00	115.00	3.71	1	94	72085.00	1591.79	4 15
19AUG80	740.00	116.81	0.00	1	20	76175.00	1591.81	20 D&M
20AUG80	1447.00	118.49	0.00	1	94	78042.00	1592.01	15
22AUG80	1322.00	118.78	0.00	1	94	80837.00	1591.72	15
025EP80	956.00	118.90	0.00	1	94	96471.00	1592.10	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
10SEP80	900.00	116.55	0.00	1	15	107935.00	1592.07	COLLAR ELEV 1708.62 FEET PIEZO ELEV 0.00 -NULL TIME PUMP TEST BEGAN = 27JUN80-1005.00 15 FOR G.W. MAP

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 1 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILING DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.0		See boring G41-G14 for soil stratigraphy							
30.48				-	1	DO	Air Hammer	6.5/6.5	
100.0		Very dense, brown, fine to coarse gravelly, fine to coarse SAND, trace silt	SP-SM						
32.77									
107.5		Very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt; frequent cobbles	GP-GM	-	2	DO	Air Hammer	6/12	▼ 12/4/79 34.17 / 112.1
35.05									
115.0		Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles	SM	-	3	DO	Air Hammer	18/18	
38.10									
125.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-138

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 2 OF 6

SURFACE ELEV 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL - DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER/FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
38.10		CONTINUED							
125.0							Air Hammer		
				-	4	DO		12/12	
		Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles	SM				Air Hammer		
				-	5	DO		12/12	
							Air Hammer		
				-	6	DO		2/4	
47.24									
155.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates
3.6-4-139

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 3 OF 6

SURFACE ELEV. 1706.9 ft (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
47.24		CONTINUED							
155.0		Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay to fine to coarse SAND, some silt, trace to some fine to coarse gravel, occasional to frequent cobbles	SM	-	7	DO	Air Hammer	6/11	
50.29									
165.0		Very dense, red-brown to brown, fine to coarse SAND, some silt, trace to some fine gravel, trace clay, frequent cobbles	SM	-	8	DO	Air Hammer	3/12	Grout (to surface)
				-	9	DO	Air Hammer	4/12	2" Solid PVC Pipe to Surface
									55.78
									183.0 Bentonite Clay Seal
56.69									
186.0		CONTINUED							CONTINUED

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-140

Drawn jls
Checked

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

BORING LOG G41-G14

SHEET 1 OF 4

SURFACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN (Note 1)	SAMPLES REC/ATT (ins.)	REMARKS
0.0		Loose, brown, silty, fine to medium SAND, trace organics	SM	5	1	DO	3-2-3	15/18	
0.76									
2.5				53	2	DO	8-27-26	10/18	
				15	3	DO	5-5-10	15/18	
		Compact to very dense, red-brown to brown, fine to coarse SAND, some fine to coarse gravel, some silt	SM	66	4	DO	9-12-54	18/18	
		Cobbles noted at 19.0'-19.5'		135	5	DO	42-35-100	6/18	
				80	6	DO	13-39-41	6/8	
				115/5"	7	DO	115/5"	4/5	
9.75									
32.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-141

Drawn jls
Checked

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

BORING LOG G41-G14

SURFACE ELEV 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

DEPTH METER	DEPTH FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	REMARKS
			CONTINUED							
9.75	32.0		Compact to very dense, red-brown to brown, fine to coarse SAND, some fine to coarse gravel, some silt Cobbles and boulders noted at 41.0'-51.0' and 62.5'-64.0'	SM	150/4"	8	DO	150/4"	3/4	
					130/3"	9	DO	130/3"	3/3	
					140/4"	11	DO	140/4"	1/4	
					150/8"	12	DO	100-50/2"	6/8	
					170/5"	13	DO	170/5"	5/5	
19.51					150/6"	14	DO	150/6"	5/6	
	64.0		See next page							
20.42										
	67.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-142

Drawn jls
Checked

COOR. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

BORING LOG G41-G14

SURFACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

DRILL RIG Joy R-15 DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6"IN (Note 1)	SAMPLES REC/ATT (ins.)	REMARKS
20.42		CONTINUED							
67.0		Very dense, brown, fine gravelly, fine to medium SAND, trace silt to brown-gray, fine to coarse GRAVEL and fine to coarse SAND, trace silt, occasional cobbles from 65'-70'	SP-SM	150/9"	15	DO	75-75/3"	8/9	
				150/5"	16	DO	150/5"	5/5	
				150/2"	17	DO	150/2"	0/2	
25.15									
82.5		Very dense, gray-brown, medium to coarse SAND, some fine to medium gravel, trace silt	SP-SM	100/8"	13	DO	50-50/2"	8/8	
27.13									
89.0		Very dense, green-black to dark brown, organic SILT, some clay, trace fine gravel	OL	102/11"	19	DO	16-41-60/5"	17/17	
29.41				102	20	DO	18-27-75	18/18	
96.5		END OF BORING HOLE GROUTED AT COMPLETION							

(See sheet 4 for notes)

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-143

Drawn jls
Checked

R. N113930 ft. (N34726m)
E2284315 ft. (E696260m)

BORING LOG G41-G14

SHEET 4 OF 4

FACE ELEV. 1705.1 ft. (519.73m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

UM USGS MSL DATE STARTED 3/13/79 DATE COMPLETED 3/16/79

L RIG Joy R-15 DRILLING METHOD Mud Rotary

NOTES

1. Standard Penetration Test - Driving 2" O.D. sampler with 140 lb. hammer freely falling 30". (Samples 5-7, 9, 11)

   Penetration Test - Driving 3" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 1-4, 8)

   Penetration Test - Driving 2" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 12 - 20)

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-144

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 4 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES: REC / ATT. (ins.)	GROUNDWATER OBSERVATION WELL
56.69		CONTINUED							CONTINUED
186.0		Very dense, red-brown to brown, fine to coarse SAND, some silt, trace to some fine gravel, trace clay, frequent cobbles	SM		10	DO	Air Hammer	6/12	Bentonite Clay Seal
58.67									57.92
192.5		Gravel and cobbles. Unable to retain samples	GP		11	DO	Air Hammer	0/12	190.0 Caved material (Note 2)
					12	DO	Air Hammer	0/12	
61.57									
202.0		Very dense, brown, fine to coarse SAND to fine SAND, trace silt (fineness increasing with depth)	SP to SP-SM		13	DO	Air Hammer	18/18	
					14	DO	Air Hammer	4/18	
					15	DO	Air Hammer	12/18	
66.45									
218.0		CONTINUED							CONTINUED

2" Solid PVC Pipe

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-145

Drawn jls
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 5 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
66.45		CONTINUED							CONTINUED
218.0		Very dense, brown, fine to coarse SAND to fine SAND, trace silt (fineness increasing with depth	SP to SP SM	-	16	DO	Air Hammer	3/16	Caved Material (Note 2) 67.36 221.0
				-	17	DO	Air Hammer	6/12	2" Slotted PVC Pipe
72.39									Caved Material (Note 2)
237.5		Very dense, fine sandy SILT	ML	-	18	DO	Air Hammer	12/12	
73.46									
241.0		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Borehole caved to 190.0 ft. after placement of the PVC well pipe. Pumped 1000 gallons of water down the well pipe to wash caved material. No water return.
3. Elevation of top of protector pipe, 1708.6 ft. (520.79m).

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-146

Drawn jlg
Checked

COOR. N114080 ft. (N34772m)
E2284315 ft. (E696261m)

BORING LOG G41-G14A

SHEET 6 OF 6

SURFACE ELEV. 1706.9 ft. (520.27m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/13/79 DATE COMPLETED 11/16/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	12/4/79	2/12/80	4/25/80	5/15/80	5/20/80	6/26/80*	9/10/80*
DEPTH (m)	34.17	34.26	34.41	34.50	34.38	34.38	34.99
DEPTH (ft.)	112.1	112.4	112.9	113.2	112.8	112.8	114.8

DATE	6/10/81						
DEPTH (m)	35.02						
DEPTH (ft.)	114.9						

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

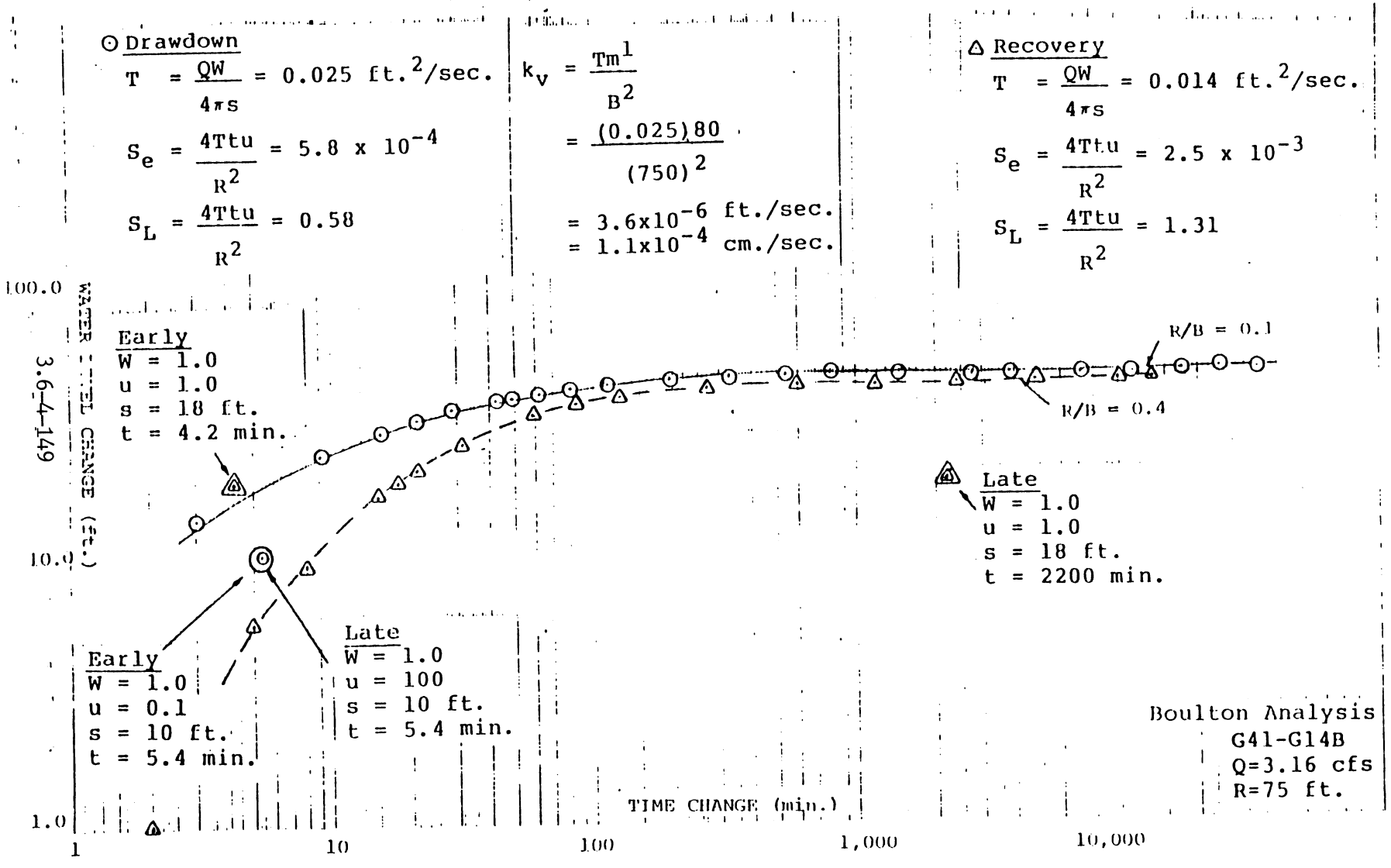
Job No. 786085
Scale 1" = 5'

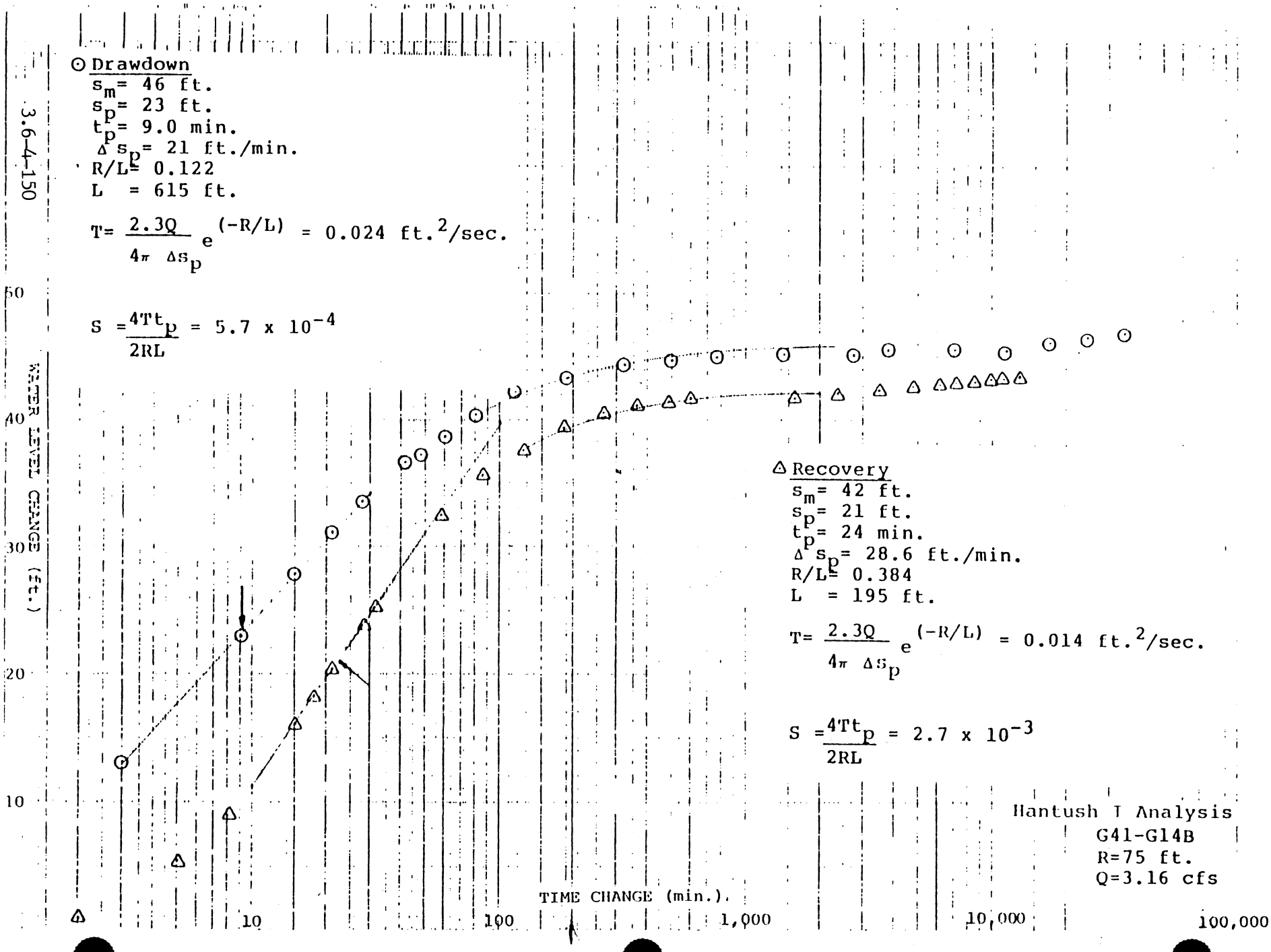
Golder Associates 3.6-4-147

Drawn JEF
Checked

APPENDIX B

B-3
G41-G14B
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


⊙ Drawdown
T = QW/4πs = 0.025 ft.²/sec.
S_e = 4Ttu/R² = 5.8 x 10⁻⁴
S_L = 4Ttu/R² = 0.58
k_v = Tm¹/B²
= (0.025)80/(750)²
= 3.6x10⁻⁶ ft./sec.
= 1.1x10⁻⁴ cm./sec.
△ Recovery
T = QW/4πs = 0.014 ft.²/sec.
S_e = 4Ttu/R² = 2.5 x 10⁻³
S_L = 4Ttu/R² = 1.31
100.0
10.0
1.0
WATER-LEVEL CHANGE (ft.)
3.6-4-149
Early
W = 1.0
u = 1.0
s = 18 ft.
t = 4.2 min.
R/B = 0.1
R/B = 0.4
Late
W = 1.0
u = 1.0
s = 18 ft.
t = 2200 min.
Early
W = 1.0
u = 0.1
s = 10 ft.
t = 5.4 min.
Late
W = 1.0
u = 100
s = 10 ft.
t = 5.4 min.
Boulton Analysis
G41-G14B
Q=3.16 cfs
R=75 ft.
TIME CHANGE (min.)
1
10
100
1,000
10,000


⊙ Drawdown
s_m= 46 ft.
s_p= 23 ft.
t_p= 9.0 min.
Δs_p= 21 ft./min.
R/L= 0.122
L = 615 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.024 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 5.7 x 10⁻⁴
△ Recovery
s_m= 42 ft.
s_p= 21 ft.
t_p= 24 min.
Δs_p= 28.6 ft./min.
R/L= 0.384
L = 195 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.014 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.7 x 10⁻³
Hantush I Analysis
G41-G14B
R=75 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
50
40
30
20
10
TIME CHANGE (min.)
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14M ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
04DEC79	1200.00	112.80	0.00	1	20	-296525.00	1596.07	GROUND SURFACE-CORR. TO
12FEB80	1525.00	114.12	0.00	1	20	-195520.00	1594.75	BY D&M
25APR80	1200.00	114.90	.14	1	14	-90605.00	1593.83	14 - TIME NOT RECORD
15MAY80	900.00	115.23	0.00	1	20	-61985.00	1593.64	20 D&M
20MAY80	600.00	114.83	0.00	1	66	-54965.00	1593.90	* 14
21MAY80	1200.00	114.83	0.00	1	2	-53165.00	1594.11	2 - NO TIME
28MAY80	930.00	115.98	0.00	1	2	-41795.00	1594.16	* 2 -REV. CIR.
30MAY80	1730.00	115.96	0.00	1	2	-39875.00	1594.18	* 2 -REV. CIR.
31MAY80	20.00	112.16	0.00	1	2	-39465.00	1595.98	* 2 -REV. CIR.
31MAY80	945.00	115.60	0.00	1	2	-38900.00	1594.54	* 2 SLT CASE
01JUN80	600.00	115.51	0.00	1	2	-37685.00	1594.83	* 2 SLT CASE
01JUN80	1525.00	115.70	0.00	1	2	-37120.00	1594.49	* 2 GRAVEL
02JUN80	830.00	115.65	0.00	1	2	-36095.00	1594.69	* 2
03JUN80	915.00	115.92	0.00	1	2	-34610.00	1594.22	* 2
04JUN80	135.00	114.95	0.00	1	2	-33630.00	1595.19	* 2 AIR DEV.
06JUN80	925.00	116.93	0.00	1	25	-30280.00	1591.22	* 2
06JUN80	1103.00	115.29	0.00	1	25	-30182.00	1592.86	* 2
06JUN80	1258.00	114.35	0.00	1	2	-30067.00	1593.79	* 2
06JUN80	1702.00	117.92	0.00	1	25	-29823.00	1590.23	* 2 VEL TEST
06JUN80	1842.00	118.42	0.00	1	25	-29723.00	1589.73	* 2 VEL TEST
07JUN80	930.00	114.04	0.00	1	2	-28835.00	1594.10	* 2
08JUN80	830.00	114.36	0.00	1	2	-27455.00	1593.78	* 2
09JUN80	800.00	114.06	0.00	1	2	-26645.00	1594.08	* 2
10JUN80	835.00	114.19	0.00	1	2	-24570.00	1593.95	* 2
11JUN80	845.00	114.38	0.00	1	2	-23120.00	1593.76	* 2
12JUN80	840.00	114.26	0.00	1	2	-21685.00	1593.88	* 2
13JUN80	815.00	114.07	0.00	1	2	-20270.00	1594.07	* 2
13JUN80	2115.00	113.99	0.00	1	25	-19490.00	1594.16	* 2 DIFF. RULE
14JUN80	815.00	114.05	0.00	1	2	-18830.00	1594.09	* 2
14JUN80	1745.00	114.10	0.00	1	2	-18260.00	1594.04	* 2
15JUN80	820.00	114.18	0.00	1	2	-17240.00	1593.96	* 2
16JUN80	805.00	114.35	0.00	1	2	-15900.00	1593.79	* 2
24JUN80	820.00	114.22	0.00	1	2	-4425.00	1593.92	* 2
25JUN80	815.00	114.23	0.00	1	2	-2990.00	1593.91	* 2
26JUN80	740.00	114.20	0.00	1	2	-1525.00	1593.94	* 2
27JUN80	800.00	114.39	0.00	1	2	-125.00	1593.75	2 2 BEFORE TEST

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 796085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14R ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1008.00	127.70	0.00	1	27	3.00	1580.48	2 2
27JUN80	1014.00	137.45	0.00	1	28	9.00	1570.74	2 2
27JUN80	1020.00	142.55	0.00	1	28	15.00	1565.64	2 2
27JUN80	1026.00	145.80	0.00	1	29	21.00	1562.41	2 2
27JUN80	1033.00	148.16	0.00	1	29	28.00	1560.05	2 2
27JUN80	1047.00	151.08	0.00	1	29	42.00	1557.13	2 2
27JUN80	1053.00	151.75	0.00	1	29	48.00	1556.46	2 2
27JUN80	1058.00	152.56	0.00	1	29	53.00	1555.65	2 2
27JUN80	1108.00	153.34	0.00	1	29	63.00	1554.87	2 2
27JUN80	1116.00	154.20	0.00	1	29	71.00	1554.01	2 2
27JUN80	1128.00	155.02	0.00	1	30	83.00	1553.21	2 2
27JUN80	1147.00	156.98	0.00	1	30	102.00	1552.25	2 2
27JUN80	1203.00	156.60	0.00	1	30	118.00	1551.63	2 2
27JUN80	1220.00	156.98	0.00	1	30	135.00	1551.25	2 2
27JUN80	1248.00	157.56	0.00	1	30	163.00	1550.67	2 2
27JUN80	1318.00	158.00	0.00	1	30	193.00	1550.23	2 2
27JUN80	1357.00	158.45	0.00	1	30	232.00	1549.78	2 2
27JUN80	1454.00	158.80	0.00	1	30	289.00	1549.43	2 2
27JUN80	1531.00	159.00	0.00	1	30	326.00	1549.23	2 2 TIME CORRECTED
27JUN80	1654.00	159.17	0.00	1	30	409.00	1549.06	2 2
27JUN80	1739.00	159.24	0.00	1	30	454.00	1548.99	2 2
27JUN80	1755.00	159.30	0.00	1	30	530.00	1548.85	2 2
27JUN80	1928.00	159.38	0.00	1	30	563.00	1548.85	2 2
27JUN80	2042.00	159.45	0.00	1	30	637.00	1548.79	2 2
27JUN80	2137.00	159.46	0.00	1	30	692.00	1548.77	2 2
27JUN80	2204.00	159.56	0.00	1	30	775.00	1548.67	2 2
28JUN80	35.00	159.51	0.00	1	30	870.00	1548.72	2 2
28JUN80	221.00	159.50	0.00	1	30	977.00	1548.73	2 2
28JUN80	539.00	159.61	0.00	1	30	1169.00	1548.62	2 2
28JUN80	736.00	159.65	0.00	1	30	1293.00	1548.58	2 2
28JUN80	1009.00	159.69	0.00	1	30	1444.00	1548.54	2 2
28JUN80	1213.00	159.69	0.00	1	30	1568.00	1548.55	2 2
28JUN80	1508.00	159.61	0.00	1	30	1743.00	1548.62	2 2
28JUN80	1706.00	159.62	0.00	1	30	1921.00	1548.61	2 2
28JUN80	2331.00	159.66	0.00	1	30	2246.00	1548.57	2 2
29JUN80	818.00	159.65	0.00	1	30	2773.00	1548.58	2 2
29JUN80	1555.00	159.62	0.00	1	30	3234.00	1548.61	2 2
30JUN80	40.00	160.13	0.00	1	30	3755.00	1548.10	2 2
30JUN80	830.00	159.62	0.00	1	30	4225.00	1548.61	2 2
30JUN80	1728.00	160.10	0.00	1	30	4643.00	1548.13	2 2
01JUL80	400.00	160.12	0.00	1	30	5115.00	1548.11	2 2
01JUL80	1014.00	160.13	0.00	1	30	5769.00	1548.10	2 2
01JUL80	1020.00	158.85	0.00	1	30	5775.00	1549.38	2 2 STOP PUMP-OIL

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G16B ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
01JUL80	1026.00	143.90	0.00	1	28	5781.00	1564.29	2 2 STOP PUMP-OIL
01JUL80	1031.00	140.25	0.00	1	28	5786.00	1567.99	2 2 RESTART PUMP
01JUL80	1035.00	144.11	0.00	1	28	5790.00	1564.08	2 2
01JUL80	1040.00	148.84	0.00	1	29	5795.00	1559.37	2 2
01JUL80	1045.00	150.75	0.00	1	29	5798.00	1557.46	2 2
01JUL80	1047.00	152.82	0.00	1	30	5802.00	1555.41	2 2
01JUL80	1101.00	156.54	0.00	1	30	5816.00	1551.69	2 2
01JUL80	1106.00	157.23	0.00	1	30	5821.00	1551.00	2 2
01JUL80	1112.00	157.85	0.00	1	30	5827.00	1550.38	2 2
01JUL80	1121.00	158.57	0.00	1	30	5836.00	1549.66	2 2
01JUL80	1152.00	159.98	0.00	1	30	5867.00	1548.75	2 2
01JUL80	1303.00	159.89	0.00	1	30	5938.00	1548.34	2 2
01JUL80	1442.00	159.94	0.00	1	30	6037.00	1548.29	2 2
01JUL80	1707.00	159.97	0.00	1	30	6182.00	1548.26	2 2
02JUL80	200.00	160.14	0.00	1	30	6715.00	1548.09	2 2
02JUL80	838.00	160.18	0.00	1	30	7113.00	1548.05	2 2
02JUL80	1311.00	160.66	.14	1	14	7586.00	1548.07	16 14 COMPARE PIEZ.
02JUL80	1312.00	160.17	0.00	1	30	7587.00	1548.06	2 2 COMPARE PIEZ.
02JUL80	2132.00	160.15	0.00	1	30	8087.00	1548.08	2 2
02JUL80	2302.00	160.20	0.00	1	30	8577.00	1548.03	2 2
03JUL80	2049.00	160.17	0.00	1	30	9284.00	1548.06	2 2
04JUL80	849.00	160.25	0.00	1	30	9999.00	1547.98	2 2
04JUL80	2044.00	160.15	0.00	1	30	10723.00	1548.08	2 2
05JUL80	820.00	160.21	0.00	1	30	11415.00	1548.02	2 2
05JUL80	2043.00	160.52	0.00	1	30	12156.00	1547.71	2 2
06JUL80	912.00	160.61	0.00	1	30	12967.00	1547.62	2 2
06JUL80	1744.00	160.48	0.00	1	30	13819.00	1547.75	2 2
07JUL80	748.00	160.40	0.00	1	30	14263.00	1547.83	2 2
07JUL80	1655.00	160.32	0.00	1	30	14790.00	1547.91	2 2
08JUL80	834.00	160.69	0.00	1	30	15749.00	1547.54	2 2
08JUL80	2059.00	160.72	0.00	1	30	16494.00	1547.51	2 2
09JUL80	851.00	160.77	0.00	1	30	17206.00	1547.46	2 2
09JUL80	1603.00	160.70	0.00	1	30	17638.00	1547.53	2 2
10JUL80	842.00	160.84	0.00	1	30	18637.00	1547.39	2 2
10JUL80	1739.00	160.77	0.00	1	30	19174.00	1547.46	2 2

3.6-4-153

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANCON PUMP TEST JOB NO. 7H60M5 DATE- 9/10/80
PIEZOMETER/CELL IDENTIFIER ***G14B ***

DATE DDMONYY	TIME HUMP.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
11JUL80	914.06	160.96	0.00	1	36	20169.00	1547.97	2 2
11JUL80	1912.00	160.97	0.00	1	30	20707.00	1547.26	2 2
12JUL80	853.00	160.98	0.00	1	30	21528.00	1547.25	2 2
13JUL80	820.00	161.00	0.00	1	30	22935.00	1547.23	2 2
14JUL80	757.00	161.21	0.00	1	30	24352.00	1547.02	2 2
14JUL80	826.00	139.72	0.00	1	28	24381.00	1568.47	2 2 PUMP OFF-OIL
14JUL80	852.00	159.23	0.00	1	27	24407.00	1573.95	2 2 PUMP ON
14JUL80	855.00	127.98	0.00	1	27	24410.00	1580.20	2 2
14JUL80	902.00	135.24	0.00	1	28	24417.00	1572.95	2 2
14JUL80	910.00	141.87	0.00	1	28	24425.00	1566.32	2 2
14JUL80	917.00	146.78	0.00	1	29	24432.00	1561.51	2 2
14JUL80	937.00	154.39	0.00	1	29	24452.00	1553.82	2 2
14JUL80	1054.00	160.64	0.00	1	30	24529.00	1547.59	2 2
15JUL80	826.00	161.32	0.00	1	30	25821.00	1546.91	2 2
16JUL80	915.00	161.98	0.00	1	30	27308.00	1546.75	2 2
17JUL80	810.00	161.69	0.00	1	30	28885.00	1546.59	2 2
18JUL80	757.00	161.57	0.00	1	30	30112.00	1546.86	2 2
20JUL80	802.00	161.23	0.00	1	30	32997.00	1547.00	2 2
21JUL80	825.00	161.38	0.00	1	30	34460.00	1546.85	2 2
21JUL80	1007.00	160.42	0.00	1	30	34562.00	1547.81	2 RECOVERY @ 10
21JUL80	1010.00	155.96	0.00	1	30	34565.00	1552.27	2 2
21JUL80	1013.00	152.35	0.00	1	29	34568.00	1555.86	2 2
21JUL80	1020.00	145.35	0.00	1	29	34575.00	1562.86	2 2
21JUL80	1023.00	143.14	0.00	1	28	34578.00	1565.05	2 2
21JUL80	1026.00	141.03	0.00	1	28	34581.00	1567.16	2 2
21JUL80	1033.00	137.36	0.00	1	28	34588.00	1570.83	2 2
21JUL80	1036.00	136.07	0.00	1	28	34591.00	1572.12	2 2
21JUL80	1039.00	134.82	0.00	1	27	34594.00	1573.36	2 2
21JUL80	1043.00	133.57	0.00	1	27	34598.00	1574.61	2 2
21JUL80	1048.00	132.10	0.00	1	27	34603.00	1576.08	2 2
21JUL80	1052.00	131.05	0.00	1	27	34607.00	1577.13	2 2
21JUL80	1103.00	128.90	0.00	1	27	34618.00	1579.28	2 2
21JUL80	1108.00	128.08	0.00	1	27	34623.00	1580.10	2 2
21JUL80	1113.00	127.36	0.00	1	27	34628.00	1580.82	2 2
21JUL80	1120.00	126.59	0.00	1	27	34635.00	1581.59	2 2
21JUL80	1125.00	126.05	0.00	1	27	34640.00	1582.13	2 2
21JUL80	1130.00	125.66	0.00	1	27	34645.00	1582.52	2 2
21JUL80	1134.00	125.33	0.00	1	27	34649.00	1582.85	2 2
21JUL80	1138.00	125.02	0.00	1	27	34653.00	1583.16	2 2

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 91/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/90
PIEZOMETER/WELL IDENTIFIER ***G19B ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
21JUL90	1149.00	129.68	0.00	1	26	34659.00	1583.49	COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL
21JUL90	1150.00	129.43	0.00	1	26	34663.00	1583.74	TIME PUMP TEST BEGAN = 27JUN90-1005.00
21JUL90	1152.00	129.20	0.00	1	26	34667.00	1583.97	
21JUL90	1155.30	128.95	0.00	1	26	34670.00	1584.22	
21JUL90	1202.00	128.68	0.00	1	26	34677.00	1584.49	
21JUL90	1207.00	128.53	0.00	1	26	34682.00	1584.64	
21JUL90	1213.00	128.29	0.00	1	26	34688.00	1584.92	
21JUL90	1235.00	128.55	0.00	1	26	34710.00	1585.62	
21JUL90	1254.00	122.10	0.00	1	26	34729.00	[illegible] 6.07	
21JUL90	1310.00	121.80	0.00	1	26	34745.00	[illegible]6.37	
21JUL90	1325.00	121.52	0.00	1	26	34760.00	1586.65	
21JUL90	1343.00	121.27	0.00	1	26	34778.00	1586.90	
21JUL90	1359.00	121.08	0.00	1	26	34794.00	1587.09	
21JUL90	1432.00	120.77	0.00	1	26	34827.00	1587.40	
21JUL90	1500.00	120.55	0.00	1	26	34855.00	1587.62	
21JUL90	1534.00	120.35	0.00	1	26	34889.00	1587.82	
21JUL90	1606.00	120.19	0.00	1	26	34921.00	1587.98	
21JUL90	1701.00	119.96	0.00	1	25	34976.00	1588.17	
21JUL90	1813.00	119.74	0.00	1	25	35048.00	1588.41	
21JUL90	1909.00	119.62	0.00	1	25	35104.00	1588.53	
21JUL90	2001.00	119.53	0.00	1	25	35156.00	1588.62	
21JUL90	2120.00	119.40	0.00	1	25	35235.00	1588.75	
21JUL90	2228.00	119.32	0.00	1	25	35303.00	1588.83	
22JUL90	105.00	119.18	0.00	1	25	35360.00	1588.97	
22JUL90	220.00	119.10	0.00	1	25	35441.00	1589.05	
22JUL90	412.00	119.01	0.00	1	25	35567.00	1589.14	
22JUL90	538.00	118.86	0.00	1	25	35613.00	1589.29	
22JUL90	1124.00	118.81	0.00	1	25	36001.00	1589.34	
22JUL90	1515.00	118.65	0.00	1	25	36310.00	1589.50	
22JUL90	1657.00	118.59	0.00	1	25	36532.00	1589.61	
23JUL90	15.00	118.49	0.00	1	25	36850.00	1589.66	
23JUL90	531.00	118.42	0.00	1	25	37046.00	1589.73	
23JUL90	1109.00	115.00	3.33	1	25	37504.00	1589.82	
23JUL90	1922.00	115.00	3.16	1	25	37997.00	1589.99	
24JUL90	834.00	115.00	3.01	1	25	38789.00	1590.14	
24JUL90	1655.00	115.00	2.89	1	25	39290.00	1590.31	
25JUL90	1011.00	115.00	2.82	1	25	40036.00	1590.33	
25JUL90	1525.00	115.00	2.79	1	25	40640.00	1590.41	

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G19B ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.87 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
26JUL80	755.00	115.00	3.23	1	87	91630.00	1590.49	14 14
27JUL80	1005.00	120.00	.93	1	95	93200.00	1590.62	15 BY D. K. TO 9/2/80
28JUL80	923.00	120.00	.23	1	95	94598.00	1590.82	15 BY D. K. TO 9/2/80
29JUL80	920.00	120.00	.23	1	95	96035.00	1590.82	15 BY D. K. TO 9/2/80
30JUL80	1105.00	120.00	.08	1	95	97580.00	1590.97	15 BY D. K. TO 9/2/80
31JUL80	1424.00	120.00	0.00	1	95	99219.00	1591.05	15 BY D. K. TO 9/2/80
01AUG80	1216.00	115.00	4.63	1	94	50531.00	1591.12	15 BY D. K. TO 9/2/80
03AUG80	836.00	115.00	4.50	1	94	53191.00	1591.25	4 15
05AUG80	1438.00	115.00	4.42	1	94	56433.00	1591.33	4 15
07AUG80	1442.00	115.00	4.30	1	94	59317.00	1591.45	4 15
09AUG80	1000.00	115.00	4.21	1	94	61915.00	1591.54	4 15
12AUG80	1336.00	115.00	4.18	1	94	66451.00	1591.57	4 15
14AUG80	1133.00	115.00	4.03	1	94	69208.00	1591.72	4 15
16AUG80	1128.00	115.00	4.01	1	94	72083.00	1591.74	4 15
19AUG80	745.00	117.10	0.00	1	20	76160.00	1591.77	20 DRM
20AUG80	1445.00	118.72	0.00	1	94	78040.00	1592.03	15
22AUG80	1320.00	119.00	0.00	1	94	80835.00	1591.79	15
02SEP80	950.00	118.68	0.00	1	94	96965.00	1592.07	15
10SEP80	905.00	116.87	0.00	1	15	107940.00	1592.00	15 FOR G.W. MAP
12SEP80	1800.00	116.64	0.00	1	15	111355.00	1592.23	15 FOR G.W. MAP

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

BORING LOG G41-G14B

SHEET 1 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.0		See borings G41-G14 and G41-G41A for stratigraphy							12/4/79 33.7 / 110.
73.46									
241.0		Very dense, brown, silty, fine SAND, trace clay	SM	-	1	DO	Air Hammer	18/18	Grout (to surface)
75.44									
247.3		Very dense, brown, fine sandy SILT	ML	-	2	DO	Air Hammer	18/18	
76.96									
252.3		Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay to fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders	SP-SM to SM	-	3	DO	Air Hammer	12/12	2" Solid PVC Pipe; 77.7 / 255.0 Bentonite Clay Seal
81.23				-	4	DO	Air Hammer	12/12	80.1 / 263.0 Pea Gravel
266.3		CONTINUED							CONTINUED

Job No. 786085 Golder Associates 3.6-4-157 Drawn jls

COOR. N114055 ft. (N34764m)
E2284315 ft. (E69626im)

BORING LOG G41-G14B

SHEET 2 OF 5

SURFACE ELEV. 1706.5 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
81.25		CONTINUED							CONTINUED
266.5									2" Solid PVC Pipe; Pea Gravel
									82.91 / 272.0
				-	5	DO	Air Hammer	3/6	
		Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay ± fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders	SP-SM to SM						2" Slotted PVC Pipe; Pea Gravel
				-	6	DO	Air Hammer	7/14	
				-	7	DO	Air Hammer	5/5	
									89.00 / 292.0
									Pea Gravel (to bottom of boring)
91.44 / 300.0		CONTINUED							

Job No. 786085 Scale 1"=5'

Golder Associates 3.6-4-158

Drawn jls

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

BORING LOG G41-G14B

SHEET 3 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILING DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
91.44		CONTINUED							
300.0		Very dense, brown to red-brown, silty fine to coarse SAND, trace fine gravel, trace clay to fine to coarse gravelly fine to coarse SAND, some silt, occasional to frequent cobbles and boulders	SP SM to SM	-	8	DO	Air Hammer	2/8	
93.73									
307.5		Very dense, brown SILT, some fine sand to fine to coarse SAND and SILT, trace fine gravel	SM to ML	-	9	DO	Air Hammer	4/4	
96.01									
315.0		Red-brown and green, highly weathered to weathered metavolcanic TUFF		-	10	DO	Air Hammer	6/6	
				-	11	DO	Air Hammer	3/3	
101.80									
334.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-159

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

BORING LOG G41-G14B

SHEET 4 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CARNDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
101.80		CONTINUED							
334.0				-	12	DO	Air Hammer	2/2	
		Red-brown and green, highly weathered to weathered metavolcanic TUFF							
109.76				-	13	DO	Air Hammer	1.5 / 1.5	
360.1		END OF BORING HOLE GROUTED AT COMPLETION							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1708.9 ft. (520.86m).

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-160

Drawn jls
Checked

COOR. N114055 ft. (N34764m)
E2284315 ft. (E696261m)

BORING LOG G41-G14B

SHEET 5 OF 5

SURFACE ELEV. 1706.8 ft. (520.23m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/27/79 DATE COMPLETED 11/30/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

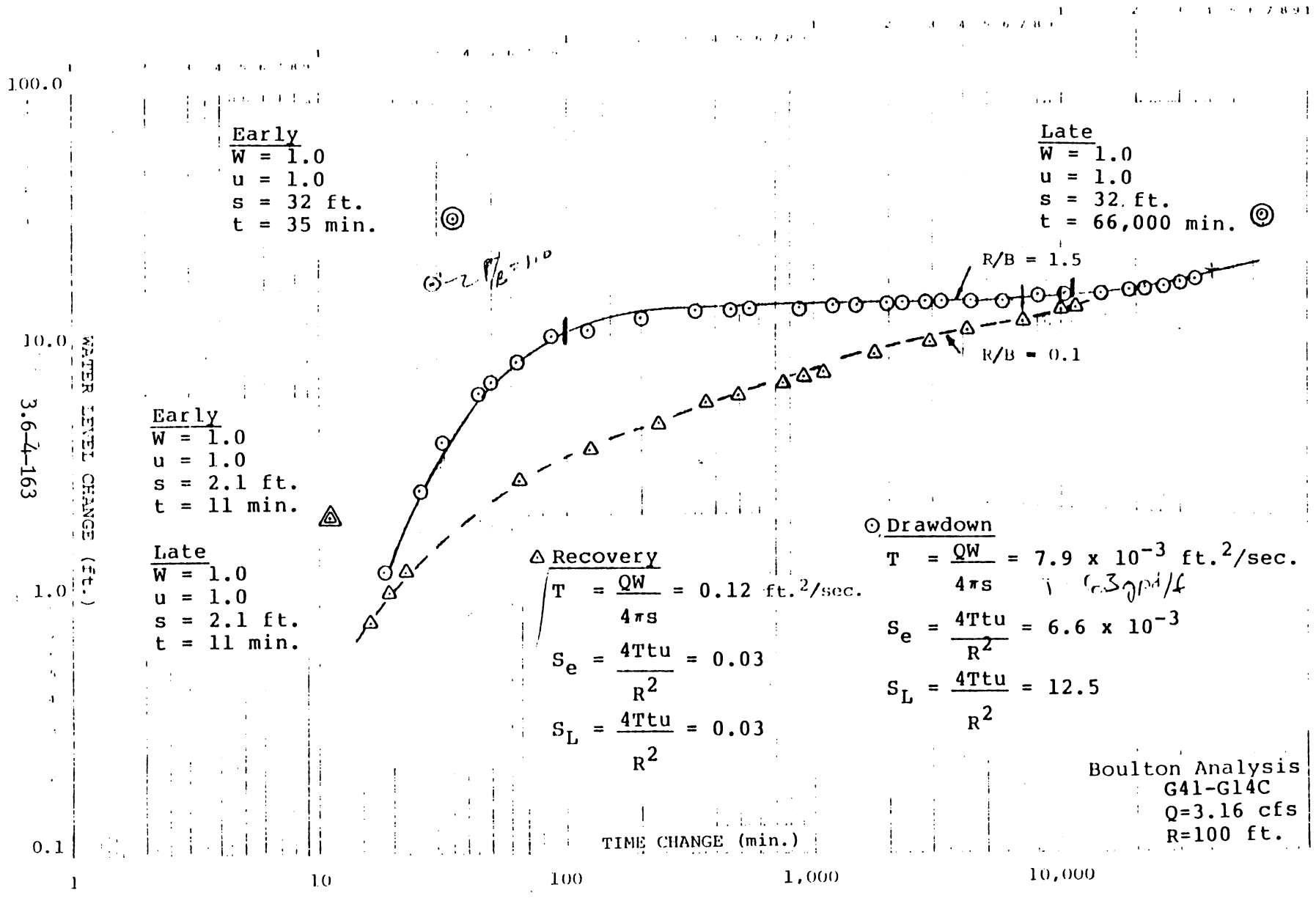
DATE	12/4/79	2/12/80	4/25/80	5/15/80	5/20/80	6/26/80*	9/10/80*
DEPTH (m)	33.74	34.17	34.38	34.50	34.38	34.41	34.99
DEPTH (ft.)	110.7	112.1	112.8	113.2	112.8	112.9	114.8

DATE	6/10/80						
DEPTH (m)	35.02						
DEPTH (ft.)	114.9						

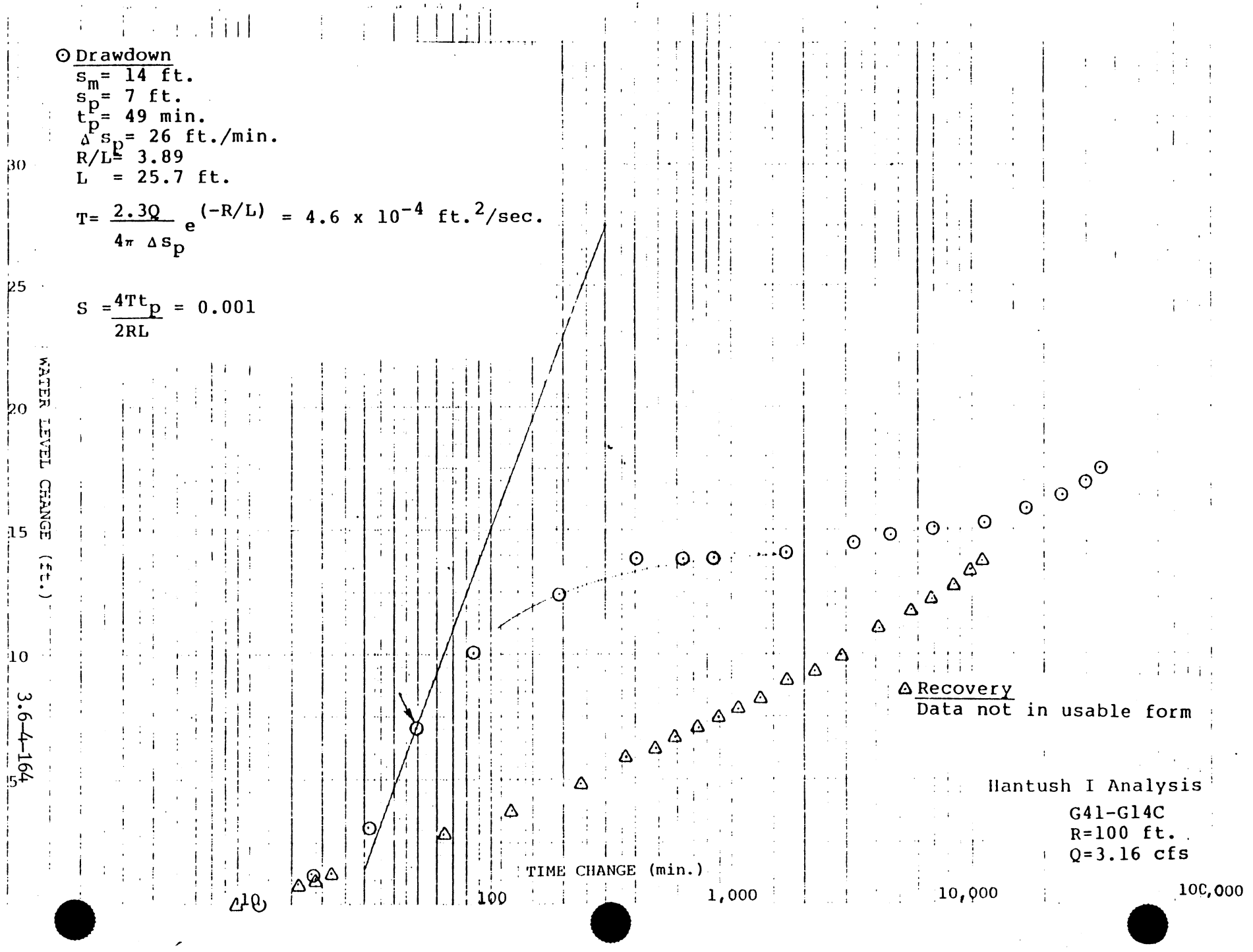
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

APPENDIX B

B-4
G41-G14C
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


100.0
10.0
1.0
0.1
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
1
10
100
1,000
10,000
Early
W = 1.0
u = 1.0
s = 32 ft.
t = 35 min.
Late
W = 1.0
u = 1.0
s = 32 ft.
t = 66,000 min.
R/B = 1.5
R/B = 0.1
Early
W = 1.0
u = 1.0
s = 2.1 ft.
t = 11 min.
Late
W = 1.0
u = 1.0
s = 2.1 ft.
t = 11 min.
Recovery
T = QW/4πs = 0.12 ft.²/sec.
Se = 4Ttu/R² = 0.03
SL = 4Ttu/R² = 0.03
Drawdown
T = QW/4πs = 7.9 x 10⁻³ ft.²/sec.
Se = 4Ttu/R² = 6.6 x 10⁻³
SL = 4Ttu/R² = 12.5
Boulton Analysis
G41-G14C
Q=3.16 cfs
R=100 ft.

3.6-4-163


⊙ Drawdown
s_m= 14 ft.
s_p= 7 ft.
t_p= 49 min.
Δs_p= 26 ft./min.
R/L= 3.89
L = 25.7 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 4.6 \times 10^{-4}$ ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL} = 0.001$
△ Recovery
Data not in usable form
Hantush I Analysis
G41-G14C
R=100 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
30
25
20
15
10
5
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 8/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

DATE DD-MMM-YY	TIME HH.MM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.08 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
11DEC79	1200.00	113.10	0.00	1	20	-286445.00	1595.58	GROUND SURFACE-CORR. TO
12DEC80	1600.00	113.40	0.00	1	20	-195485.00	1595.28	BY D&M
25APR80	1200.00	113.95	.14	1	14	-90605.00	1594.59	14 - TIME NOT RECORD
15MAY80	1020.00	114.27	0.00	1	20	-61965.00	1594.41	20 D&M
20MAY80	600.00	113.67	0.00	1	66	-54965.00	1594.67	4 14
21MAY80	1200.00	113.75	0.00	1	3	-53165.00	1594.79	3 - NO TIME
24MAY80	930.00	113.49	0.00	1	3	-41795.00	1595.05	4 3 -REV. CIR.
30MAY80	1730.00	113.53	0.00	1	3	-39875.00	1595.01	4 3 -REV. CIR.
31MAY80	20.00	111.65	0.00	1	3	-39965.00	1596.89	4 3 -REV. CIR.
31MAY80	945.00	112.54	0.00	1	3	-38900.00	1596.00	4 3 SET CASE
01JUN80	600.00	112.75	0.00	1	3	-37685.00	1595.81	4 3 SET CASE
01JUN80	1525.00	113.15	0.00	1	3	-37120.00	1595.39	4 3 GRAVEL
02JUN80	930.00	113.44	0.00	1	3	-36095.00	1595.10	4 3
03JUN80	915.00	113.75	0.00	1	3	-34610.00	1594.79	4 3
04JUN80	135.00	114.41	0.00	1	3	-33630.00	1594.13	4 3 AIR DEV.
05JUN80	927.00	114.13	0.00	1	3	-30270.00	1594.41	4 3
06JUN80	1105.00	114.79	0.00	1	3	-30190.00	1593.75	4 3
06JUN80	1500.00	113.84	0.00	1	3	-30065.00	1594.70	4 3
09JUN80	1703.00	117.04	0.00	1	31	-29822.00	1591.45	4 3 VEL TEST
09JUN80	1844.00	117.04	0.00	1	31	-29721.00	1591.45	4 3 VEL TEST
07JUN80	930.00	113.65	0.00	1	3	-28835.00	1594.89	4 3
08JUN80	930.00	113.86	0.00	1	3	-27455.00	1594.68	4 3
09JUN80	800.00	113.72	0.00	1	3	-26095.00	1594.82	4 3
10JUN80	835.00	113.93	0.00	1	3	-24570.00	1594.61	4 3
11JUN80	745.00	114.11	0.00	1	3	-23120.00	1594.43	4 3
12JUN80	840.00	113.95	0.00	1	3	-21685.00	1594.59	4 3
13JUN80	815.00	113.75	0.00	1	3	-20270.00	1594.79	4 3
15JUN80	2115.00	113.61	0.00	1	31	-19470.00	1594.86	4 3 LIFE. RULE
14JUN80	815.00	113.72	0.00	1	3	-18630.00	1594.82	4 3
14JUN80	1745.00	113.72	0.00	1	3	-18260.00	1594.82	4 3
15JUN80	920.00	113.69	0.00	1	3	-17385.00	1594.85	4 3
16JUN80	905.00	114.01	0.00	1	3	-15960.00	1594.49	4 3
20JUN80	920.00	113.98	0.00	1	3	-9825.00	1594.56	4 3
25JUN80	815.00	113.94	0.00	1	3	-2990.00	1594.60	4 3
26JUN80	840.00	113.90	0.00	1	3	-1575.00	1594.64	4 3
27JUN80	830.00	114.09	0.00	1	3	-125.00	1594.45	3 3 BEFORE TEST
27JUN80	1011.00	113.10	0.00	1	3	0.00	1595.08	3 3 START @ 10
27JUN80	1016.00	113.97	0.00	1	3	11.00	1594.57	3 3

GEEER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 01/01/80.- 20.23.37.

CRANDON PUMP TEST JOB NO. 780085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***GIN(***

DATE	TIME	FIRST READING FEET	SECOND READING FEET	ALARM	CONTROL	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
DDMONYY	HHMM.SS							COLLAR ELEV 1708.66 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1025.00	115.30	0.00	1	31	18.00	1593.17	
27JUN80	1028.00	116.67	0.00	1	31	23.00	1591.80	
27JUN80	1036.00	118.13	0.00	1	31	31.00	1590.34	
27JUN80	1049.00	120.47	0.00	1	31	44.00	1588.00	
27JUN80	1054.00	121.11	0.00	1	31	49.00	1587.36	
27JUN80	1100.00	121.78	0.00	1	31	55.00	1586.69	
27JUN80	1107.00	122.48	0.00	1	31	62.00	1585.99	
27JUN80	1118.00	123.50	0.00	1	31	73.00	1585.17	
27JUN80	1131.00	124.10	0.00	1	31	86.00	1584.57	
27JUN80	1148.00	124.94	0.00	1	31	103.00	1583.53	
27JUN80	1206.00	125.31	0.00	1	31	121.00	1583.16	
27JUN80	1221.00	125.66	0.00	1	31	136.00	1582.81	
27JUN80	1239.00	126.10	0.00	1	31	154.00	1582.37	
27JUN80	1320.00	126.50	0.00	1	31	195.00	1581.97	
27JUN80	1359.00	126.86	0.00	1	31	234.00	1581.61	
27JUN80	1435.00	127.16	0.00	1	31	290.00	1581.31	
27JUN80	1534.00	127.35	0.00	1	31	329.00	1581.12	TIME CORRECTED
27JUN80	1655.00	127.52	0.00	1	31	410.00	1580.95	
27JUN80	1740.00	127.59	0.00	1	31	455.00	1580.88	
27JUN80	1854.00	127.74	0.00	1	31	529.00	1580.73	
27JUN80	1929.00	127.72	0.00	1	31	564.00	1580.75	
27JUN80	2043.00	127.85	0.00	1	31	636.00	1580.62	
27JUN80	2139.00	127.89	0.00	1	31	694.00	1580.58	
27JUN80	2305.00	127.98	0.00	1	31	790.00	1580.49	
28JUN80	36.00	127.90	0.00	1	31	871.00	0.57	
28JUN80	222.00	127.96	0.00	1	31	977.00	1580.51	
28JUN80	537.00	128.06	0.00	1	31	1172.00	1580.41	
28JUN80	742.00	128.06	0.00	1	31	1297.00	1580.41	
28JUN80	1010.00	128.11	0.00	1	31	1445.00	1580.36	
28JUN80	1212.00	128.30	0.00	1	31	1567.00	1580.17	
28JUN80	1509.00	128.25	0.00	1	31	1744.00	1580.24	
28JUN80	1809.00	128.26	0.00	1	31	1924.00	1580.21	
28JUN80	2332.00	128.29	0.00	1	31	2247.00	1580.18	
29JUN80	819.00	128.40	0.00	1	31	2774.00	1580.07	
29JUN80	1602.00	128.54	0.00	1	31	3237.00	1579.93	
30JUN80	43.00	128.79	0.00	1	31	3758.00	1579.68	
30JUN80	832.00	128.89	0.00	1	31	4227.00	1579.78	
30JUN80	1530.00	128.79	0.00	1	31	4645.00	1579.68	
01JUL80	801.00	128.77	0.00	1	31	5636.00	1579.70	
01JUL80	1012.00	128.80	0.00	1	31	5767.00	1579.67	
01JUL80	1022.00	129.10	0.00	1	31	5777.00	1579.37	STOP PUMP-OIL
01JUL80	1027.00	129.20	0.00	1	31	5782.00	1579.27	STOP PUMP-OIL
01JUL80	1032.00	128.35	0.00	1	31	5787.00	1580.12	RESTART PUMP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
01JUL80	1036.00	127.32	0.00	1	31	5791.00	1581.15	3 3
01JUL80	1042.00	126.69	0.00	1	31	5797.00	1581.78	3 3
01JUL80	1044.00	126.66	0.00	1	31	5799.00	1581.81	3 3
01JUL80	1048.00	126.82	0.00	1	31	5803.00	1581.65	3 3
01JUL80	1102.00	127.42	0.00	1	31	5817.00	1581.05	3 3
01JUL80	1107.00	127.63	0.00	1	31	5822.00	1580.84	3 3
01JUL80	1113.00	127.80	0.00	1	31	5828.00	1580.67	3 3
01JUL80	1123.00	128.06	0.00	1	31	5838.00	1580.41	3 3
01JUL80	1153.00	128.46	0.00	1	31	5868.00	1580.01	3 3
01JUL80	1305.00	128.76	0.00	1	31	5940.00	1579.71	3 3
01JUL80	1440.00	128.85	0.00	1	31	6035.00	1579.62	3 3
01JUL80	1705.00	128.95	0.00	1	31	6180.00	1579.52	3 3
02JUL80	203.00	129.12	0.00	1	31	6718.00	1579.35	3 3
02JUL80	840.00	129.23	0.00	1	31	7115.00	1579.24	3 3
02JUL80	1315.00	129.25	.16	1	14	7390.00	1579.27	1E 14 COMPARE PIEZ.
02JUL80	1316.00	129.25	0.00	1	31	7391.00	1579.24	3 3 COMPARE PIEZ.
02JUL80	2130.00	129.11	0.00	1	31	7885.00	1579.36	3 3
03JUL80	903.00	129.12	0.00	1	31	8578.00	1579.35	3 3
03JUL80	2046.00	129.16	0.00	1	31	9283.00	1579.31	3 3
04JUL80	845.00	129.26	0.00	1	31	10000.00	1579.21	3 3
04JUL80	2047.00	129.19	0.00	1	31	10722.00	1579.28	3 3
05JUL80	821.00	129.38	0.00	1	31	11416.00	1579.09	3 3
05JUL80	2044.00	129.70	0.00	1	31	12159.00	1578.77	3 3
06JUL80	813.00	129.82	0.00	1	31	12908.00	1578.65	3 3
06JUL80	1743.00	129.69	0.00	1	31	13418.00	1578.78	3 3
07JUL80	749.00	129.58	0.00	1	31	14264.00	1578.89	3 3
07JUL80	1638.00	129.53	0.00	1	31	14791.00	1578.94	3 3
08JUL80	835.00	129.90	0.00	1	31	15750.00	1578.57	3 3
08JUL80	2100.00	129.90	0.00	1	31	16495.00	1578.57	3 3
09JUL80	853.00	129.94	0.00	1	31	17206.00	1578.53	3 3
09JUL80	1605.00	129.91	0.00	1	31	17640.00	1578.56	3 3
10JUL80	844.00	130.02	0.00	1	32	18639.00	1578.44	3 3
10JUL80	1738.00	130.00	0.00	1	32	19173.00	1578.46	3 3
11JUL80	916.00	130.17	0.00	1	32	20111.00	1578.29	3 3
11JUL80	1919.00	130.18	0.00	1	32	20714.00	1578.28	3 3
12JUL80	855.00	130.26	0.00	1	32	21550.00	1578.20	3 3
13JUL80	822.00	130.49	0.00	1	32	22937.00	1577.97	3 3
14JUL80	758.00	130.43	0.00	1	32	24353.00	1578.03	3 3

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CHANCON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.68 FEET PIEZC ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
14JUL80	832.00	129.79	0.00	1	31	24387.00	1578.68	3 3 PUMP OFF-OIL
14JUL80	904.00	127.38	0.00	1	31	24419.00	1581.09	3 3
14JUL80	912.00	128.05	0.00	1	31	24427.00	1580.44	3 3 3 PUMP ON
14JUL80	920.00	128.63	0.00	1	31	24435.00	1579.84	3 3
14JUL80	939.00	129.31	0.00	1	31	24454.00	1579.16	3 3
14JUL80	1056.00	130.00	0.00	1	32	24551.00	1578.46	3 3
15JUL80	827.00	130.58	0.00	1	32	25822.00	1577.88	3 3
16JUL80	914.00	130.76	0.00	1	32	27309.00	1577.70	3 3
17JUL80	811.00	131.04	0.00	1	32	28686.00	1577.42	3 3
18JUL80	758.00	131.09	0.00	1	32	30113.00	1577.37	3 3
20JUL80	804.00	131.19	0.00	1	32	32999.00	1577.28	3 3
21JUL80	826.00	131.55	0.00	1	32	34461.00	1576.91	3 3
21JUL80	1008.00	131.66	0.00	1	32	34563.00	1576.80	3 3 RECOVERY @ 10
21JUL80	1011.00	131.71	0.00	1	32	34566.00	1576.75	3 3
21JUL80	1014.00	131.47	0.00	1	32	34569.00	1576.99	3 3
21JUL80	1021.00	130.75	0.00	1	32	34576.00	1577.71	3 3
21JUL80	1024.00	130.51	0.00	1	32	34579.00	1577.95	3 3
21JUL80	1027.00	130.28	0.00	1	32	34582.00	1578.18	3 3
21JUL80	1034.00	129.84	0.00	1	31	34589.00	1578.63	3 3
21JUL80	1037.00	129.66	0.00	1	31	34592.00	1578.81	3 3
21JUL80	1040.00	129.59	0.00	1	31	34595.00	1578.88	3 3
21JUL80	1044.00	129.41	0.00	1	31	34599.00	1579.06	3 3
21JUL80	1049.00	129.21	0.00	1	31	34604.00	1579.26	3 3
21JUL80	1053.00	129.08	0.00	1	31	34608.00	1579.39	3 3
21JUL80	1104.00	128.93	0.00	1	31	34619.00	1579.54	3 3
21JUL80	1109.00	128.67	0.00	1	31	34624.00	1579.80	3 3
21JUL80	1114.00	128.60	0.00	1	31	34629.00	1579.87	3 3
21JUL80	1121.00	128.44	0.00	1	31	34636.00	1580.03	3 3
21JUL80	1126.00	128.33	0.00	1	31	34641.00	1580.14	3 3
21JUL80	1131.00	128.29	0.00	1	31	34646.00	1580.18	3 3
21JUL80	1135.00	128.21	0.00	1	31	34650.00	1580.26	3 3
21JUL80	1139.00	128.16	0.00	1	31	34654.00	1580.31	3 3
21JUL80	1145.00	128.05	0.00	1	31	34660.00	1580.42	3 3
21JUL80	1149.00	127.99	0.00	1	31	34664.00	1580.48	3 3
21JUL80	1155.00	127.93	0.00	1	31	34668.00	1580.54	3 3
21JUL80	1157.00	127.88	0.00	1	31	34672.00	1580.59	3 3
21JUL80	1203.00	127.79	0.00	1	31	34678.00	1580.68	3 3
21JUL80	1208.00	127.76	0.00	1	31	34683.00	1580.71	3 3
21JUL80	1214.00	127.68	0.00	1	31	34689.00	1580.79	3 3
21JUL80	1237.00	127.43	0.00	1	31	34711.00	1581.04	3 3
21JUL80	1255.00	127.24	0.00	1	31	34730.00	1581.23	3 3
21JUL80	1311.00	127.09	0.00	1	31	34746.00	1581.38	3 3
21JUL80	1326.00	126.97	0.00	1	31	34761.00	1581.50	3 3

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

DATE DDMMYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.68 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1344.00	126.80	0.00	1	31	34779.00	1581.67	3 3
21JUL80	1400.00	126.68	0.00	1	31	34795.00	1581.79	3 3
21JUL80	1433.00	126.45	0.00	1	31	34828.00	1582.02	3 3
21JUL80	1501.00	126.25	0.00	1	31	34856.00	1582.22	3 3
21JUL80	1535.00	126.07	0.00	1	31	34890.00	1582.40	3 3
21JUL80	1607.00	125.88	0.00	1	31	34922.00	1582.59	3 3
21JUL80	1702.00	125.63	0.00	1	31	34977.00	1582.84	3 3
21JUL80	1814.00	125.28	0.00	1	31	35049.00	1583.19	3 3
21JUL80	1910.00	125.05	0.00	1	31	35105.00	1583.42	3 3
21JUL80	2002.00	124.86	0.00	1	31	35157.00	1583.61	3 3
21JUL80	2122.00	124.60	0.00	1	31	35237.00	1583.87	3 3
21JUL80	2230.00	124.39	0.00	1	31	35305.00	1584.08	3 3
22JUL80	106.00	124.02	0.00	1	31	35361.00	1584.45	3 3
22JUL80	228.00	123.83	0.00	1	31	35443.00	1584.64	3 3
22JUL80	413.00	123.64	0.00	1	31	35648.00	1584.83	3 3
22JUL80	539.00	123.18	0.00	1	31	35914.00	1585.29	3 3
22JUL80	1127.00	122.95	0.00	1	31	36082.00	1585.52	3 3
22JUL80	1516.00	122.61	0.00	1	31	36311.00	1585.86	3 3
22JUL80	1658.00	122.42	0.00	1	31	36533.00	1586.05	3 3
23JUL80	17.00	122.19	0.00	1	31	36652.00	1586.28	3 3
23JUL80	532.00	121.99	0.00	1	31	37047.00	1586.48	3 3
23JUL80	1110.00	120.00	1.66	1	31	37505.00	1586.81	3 3
23JUL80	1923.00	120.00	1.26	1	31	37998.00	1587.21	3 3
24JUL80	835.00	120.00	.75	1	31	38790.00	1587.72	3 3
24JUL80	1657.00	120.00	.44	1	31	39292.00	1588.03	3 3
25JUL80	1012.00	120.00	.13	1	31	40327.00	1588.34	3 3
25JUL80	1528.00	120.00	.02	1	31	40641.00	1588.45	3 3
26JUL80	757.00	115.00	4.92	1	67	41632.00	1588.61	14 14
27JUL80	1000.00	120.00	1.79	1	95	43195.00	1589.07	15 97 O. K. TO 9/22/80
28JUL80	930.00	120.00	1.40	1	95	44595.00	1589.46	15 97 O. K. TO 9/22/80
29JUL80	915.00	120.00	1.22	1	95	46028.00	1589.64	15 97 O. K. TO 9/22/80
30JUL80	1110.00	120.00	.90	1	95	47585.00	1589.96	15 97 O. K. TO 9/22/80
31JUL80	1428.00	120.00	.64	1	95	49223.00	1590.22	15 97 O. K. TO 9/22/80
01AUG80	1220.00	120.00	.45	1	95	50535.00	1590.41	15 97 O. K. TO 9/22/80
03AUG80	830.00	120.00	.01	1	95	53185.00	1590.85	4 15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14C ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1709.18 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
05AUG80	1433.00	115.00	4.55	1	94	56428.00	1591.01	4 15
07AUG80	1440.00	115.00	4.29	1	94	59315.00	1591.27	4 15
09AUG80	948.00	115.00	4.19	1	94	61903.00	1591.37	4 15
12AUG80	1331.00	115.00	3.94	1	94	66446.00	1591.62	4 15
14AUG80	1130.00	115.00	3.72	1	94	69205.00	1591.84	4 15
16AUG80	1125.00	115.00	3.72	1	94	72080.00	1591.84	4 15
19AUG80	750.00	116.69	0.00	1	20	76185.00	1591.99	20 O&M
20AUG80	1438.00	118.31	0.00	1	94	78033.00	1592.25	15
22AUG80	1314.00	118.65	0.00	1	94	80829.00	1591.91	15
02SEP80	948.00	118.17	0.00	1	94	96463.00	1592.39	15
10SEP80	915.00	116.31	0.00	1	15	107950.00	1592.37	15 FOR G.W. MAP

COOR. N114030 ft. (N34757m)
E2284315 ft. (E696261m)

BORING LOG G41-G14C

SHEET 1 OF 2

SURFACE ELEV. 1706.3 ft. (520.09m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/2/79 DATE COMPLETED 12/4/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN.	SAMPLES: REC / ATT.	GROUNDWATER OBSERVATION WELL
0.0		See borings G41-G14 and G41-G14A for soil stratigraphy							Grout (to surface)
									▼ 12/11/79 33.56 / 110.1
									2" Solid PVC Pipe
									35.97 / 118.0 Bentonite Clay Seal
									37.80 / 124.0 Pea Gravel
									39.93 / 131.0 2" Slot pipe Pea Gravel
41.45 / 136.0		CONTINUED							CONTINUED

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-171

Drawn jls
Checked

COOR. N1i4030 ft. (N34757m)
E2284315 ft. (E696261m)

BORING LOG G41-G14C

SHEET 2 OF 2

SURFACE ELEV 1706.3 ft. (520.09m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/2/79 DATE COMPLETED 12/4/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN.	SAMPLES: REC/ATT.	GROUNDWATER OBSERVATION WELL
41.45		CONTINUED							CONTINUED
136.0		See borings G41-G14 and G41-G14A for soil stratigraphy							12" Slotted PVC Pipe; Pea Gravel; 45.72; 150.0; 151.0; Caved Material
48.77									
160.0		END OF BORING							

NOTES

Elevation of top of protector pipe, 1708.7 ft. (520.81m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	10/11/79	2/12/80	4/25/80	5/15/80	5/20/80	6/26/81*	9/10/80*
DEPTH (m)	33.56	33.66	34.02	34.11	33.99	34.05	34.75
DEPTH (ft.)	110.1	111.1	111.6	111.9	111.5	111.7	114.0

DATE	6/10/81						
DEPTH (m)	34.75						
DEPTH (ft.)	114.0						

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

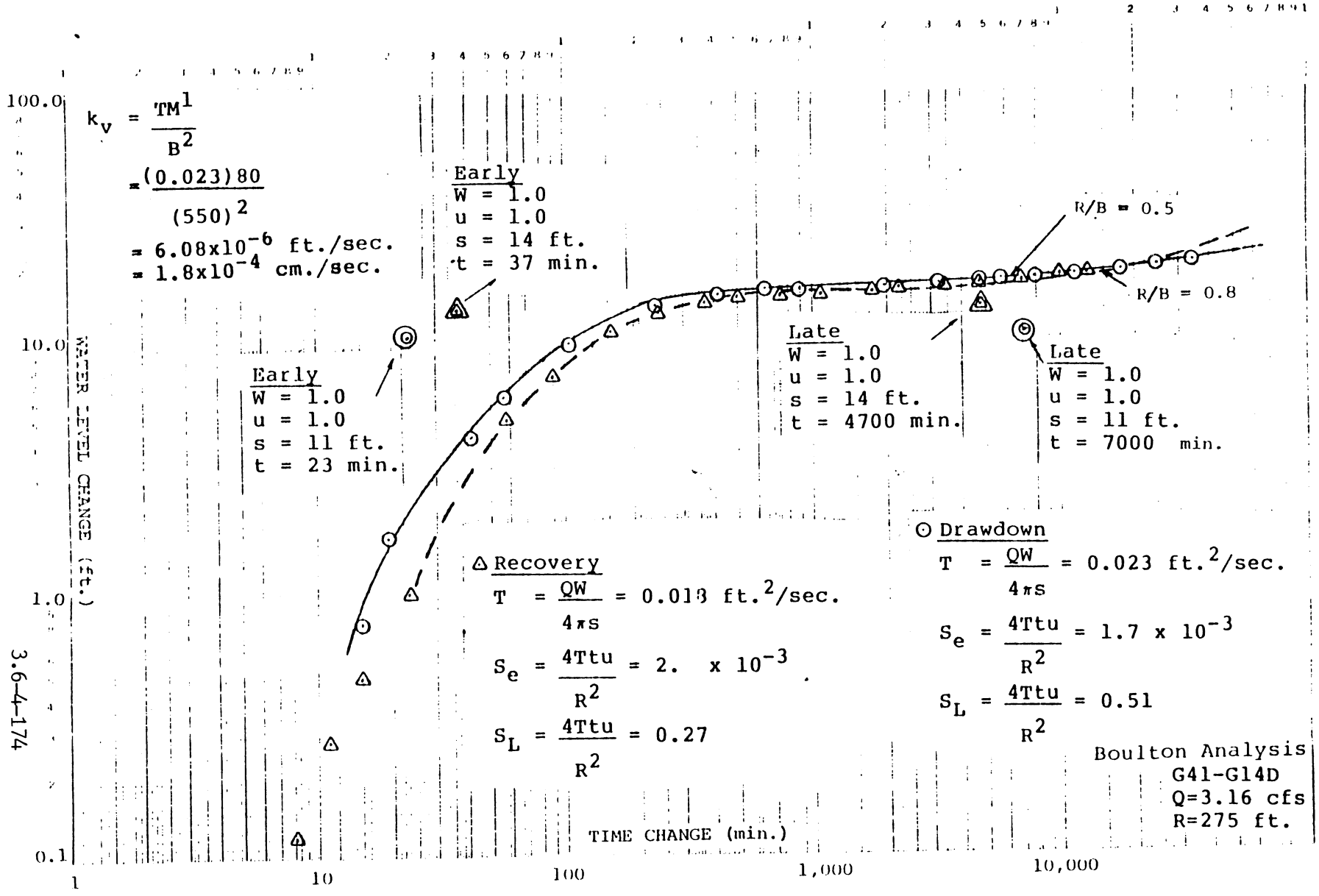
Job No 786035

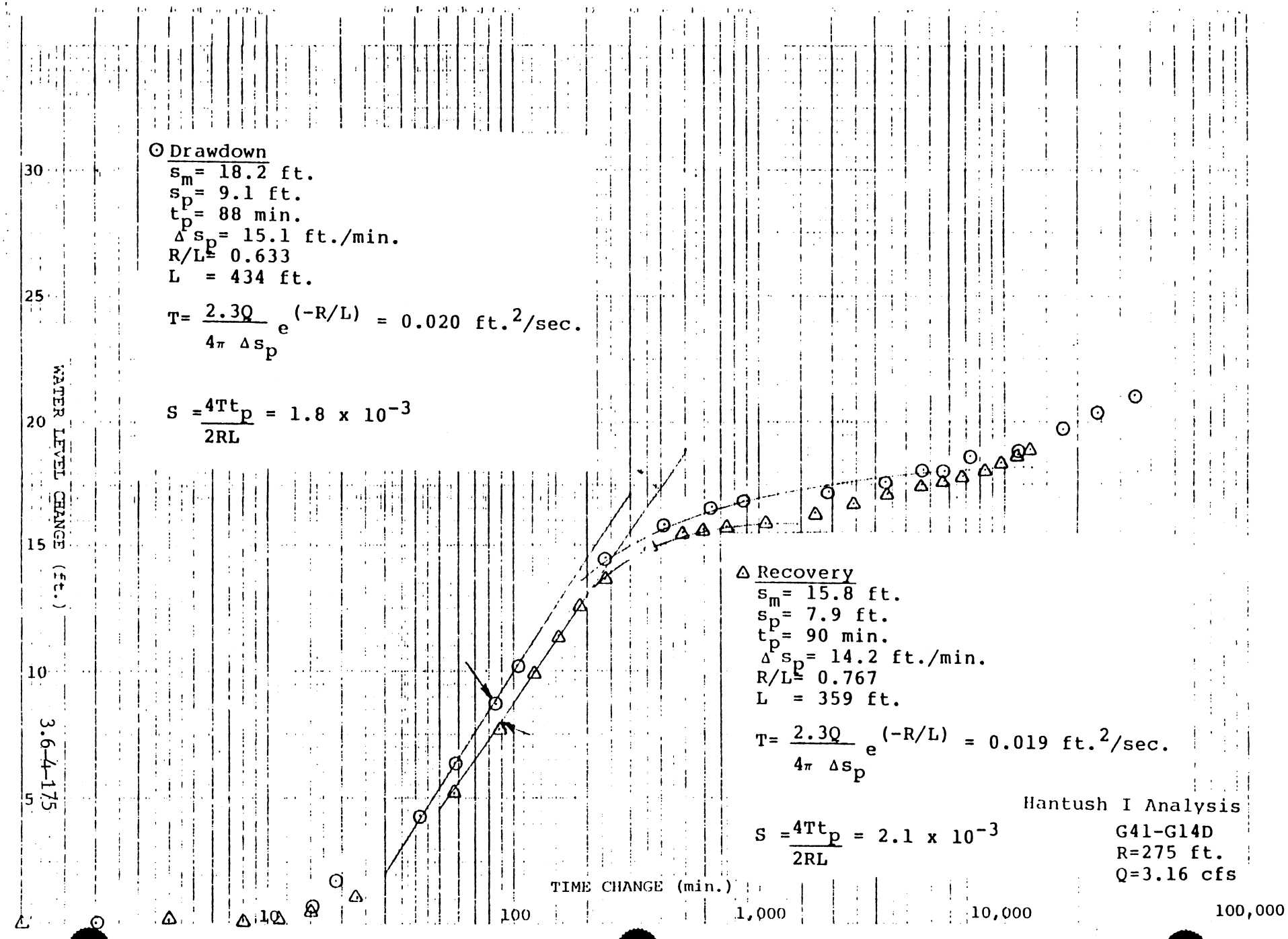
Golder Associates 3.6-4-172

Drawn jls

APPENDIX B

B-5
G41-G14D
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


$k_v = \frac{TM^1}{B^2}$
$= \frac{(0.023)80}{(550)^2}$
$= 6.08 \times 10^{-6}$ ft./sec.
$= 1.8 \times 10^{-4}$ cm./sec.
Early
W = 1.0
u = 1.0
s = 14 ft.
t = 37 min.
Early
W = 1.0
u = 1.0
s = 11 ft.
t = 23 min.
Late
W = 1.0
u = 1.0
s = 14 ft.
t = 4700 min.
Late
W = 1.0
u = 1.0
s = 11 ft.
t = 7000 min.
R/B = 0.5
R/B = 0.8
△ Recovery
$T = \frac{QW}{4\pi s} = 0.013$ ft.^{2}/sec.
$S_e = \frac{4Ttu}{R^2} = 2. \times 10^{-3}$
$S_L = \frac{4Ttu}{R^2} = 0.27$
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.023$ ft.^{2}/sec.
$S_e = \frac{4Ttu}{R^2} = 1.7 \times 10^{-3}$
$S_L = \frac{4Ttu}{R^2} = 0.51$
Boulton Analysis
G41-G14D
Q=3.16 cfs
R=275 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000


⊙ Drawdown
s_m= 18.2 ft.
s_p= 9.1 ft.
t_p= 88 min.
Δs_p= 15.1 ft./min.
R/L= 0.633
L = 434 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.020 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 1.8 x 10^{-3}
△ Recovery
s_m= 15.8 ft.
s_p= 7.9 ft.
t_p= 90 min.
Δs_p= 14.2 ft./min.
R/L= 0.767
L = 359 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.019 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.1 x 10^{-3}
Hantush I Analysis
G41-G14D
R=275 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
30
25
20
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
3.6-4-175

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14D ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
19DEC79	1200.00	112.80	0.00	1	20	-274925.00	1594.80	CORRECT TO COLLAR TOP
25APR80	1200.00	113.65	.14	1	14	-90605.00	1593.81	14 - TIME NOT RECORD
20MAY80	600.00	113.59	0.00	1	66	-54965.00	1593.87	4 14
21MAY80	1200.00	113.78	0.00	1	4	-53165.00	1594.04	4 - NO TIME
29MAY80	930.00	113.61	0.00	1	4	-41795.00	1594.21	4 4 -REV. DIR.
30MAY80	1730.00	113.60	0.00	1	4	-39875.00	1594.22	4 4 -REV. DIR.
31MAY80	20.00	113.09	0.00	1	4	-39465.00	1594.73	4 4 -REV. DIR.
31MAY80	945.00	113.58	0.00	1	4	-38900.00	1594.44	4 4 SET CASE
01JUN80	600.00	113.65	0.00	1	4	-37685.00	1594.17	4 4 SET CASE
01JUN80	1525.00	113.56	0.00	1	4	-37120.00	1594.26	4 4 GRAVEL
02JUN80	830.00	113.44	0.00	1	4	-36095.00	1594.38	4 4
03JUN80	915.00	113.72	0.00	1	4	-34610.00	1594.10	4 4
04JUN80	135.00	115.34	0.00	1	4	-33630.00	1592.48	4 4 AIR DEV.
06JUN80	930.00	113.71	0.00	1	4	-30275.00	1594.11	4 4
06JUN80	1107.00	114.30	0.00	1	4	-30178.00	1593.52	4 4
06JUN80	1304.00	114.18	0.00	1	4	-30061.00	1593.64	4 4
06JUN80	1703.00	115.29	0.00	1	36	-29822.00	1592.37	4 4 VEL TEST
06JUN80	1846.00	116.25	0.00	1	36	-29719.00	1591.41	4 4 VEL TEST
07JUN80	930.00	113.70	0.00	1	4	-28835.00	1594.12	4 4
08JUN80	830.00	114.03	0.00	1	4	-27455.00	1593.79	4 4
09JUN80	800.00	113.67	0.00	1	4	-26045.00	1594.15	4 4
10JUN80	835.00	113.82	0.00	1	4	-24570.00	1594.00	4 4
11JUN80	845.00	113.98	0.00	1	4	-23120.00	1593.84	4 4
12JUN80	840.00	113.90	0.00	1	4	-21685.00	1593.92	4 4
13JUN80	815.00	113.68	0.00	1	4	-20270.00	1594.14	4 4
13JUN80	2115.00	113.67	0.00	1	36	-19490.00	1593.99	4 4 DIFF. RULE
14JUN80	815.00	113.67	0.00	1	4	-18830.00	1594.15	4 4
14JUN80	1745.00	113.65	0.00	1	4	-18260.00	1594.17	4 4
15JUN80	820.00	113.83	0.00	1	4	-17385.00	1593.99	4 4
16JUN80	805.00	113.97	0.00	1	4	-15960.00	1593.85	4 4
24JUN80	820.00	113.87	0.00	1	4	-4425.00	1593.95	4 4
25JUN80	815.00	113.84	0.00	1	4	-2990.00	1593.98	4 4
26JUN80	840.00	113.78	0.00	1	4	-1525.00	1594.04	4 4
27JUN80	900.00	113.98	0.00	1	4	-125.00	1593.84	4 BEFORE TEST
27JUN80	1007.00	114.05	0.00	1	4	2.00	1593.77	4 4 START @ 10

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 01/01/80.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***GIAC ***

DATE DD/MON/YY	TIME HRMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 +GULF
								TIME PUMP TEST BEGAN = 27JUN80-1055.00
27JUN80	1017.00	111.14	0.00	1	12	12.00	1593.01	12 12 START @ 10
								NEW PIEZOMETER
27JUN80	1024.00	112.09	0.00	1	12	19.00	1592.06	12 12
27JUN80	1031.00	112.99	0.00	1	12	26.00	1591.16	12 REPLACE INST.
27JUN80	1045.00	114.75	0.00	1	12	40.00	1589.40	12 12
27JUN80	1101.00	116.72	0.00	1	12	56.00	1587.43	12 12
27JUN80	1123.00	118.95	0.00	1	12	78.00	1585.22	12 12
27JUN80	1148.00	120.51	0.00	1	76	103.00	1583.59	9 12
27JUN80	1203.00	121.96	0.00	1	76	118.00	1582.64	12 12
27JUN80	1233.00	122.80	0.00	1	76	148.00	1581.30	5 5
27JUN80	1323.00	124.08	0.00	1	76	178.00	1580.02	12 12
27JUN80	1401.00	124.68	0.00	1	76	236.00	1579.22	12 12
27JUN80	1457.00	125.48	0.00	1	76	292.00	1578.62	12 12
27JUN80	1538.00	125.93	0.00	1	76	351.00	1578.17	12 12 TIME CORRECTED
27JUN80	1654.00	126.20	0.00	1	76	411.00	1577.90	12 12
27JUN80	1752.00	126.42	0.00	1	76	467.00	1577.68	12 12
27JUN80	1853.00	126.60	0.00	1	76	528.00	1577.50	12 12
27JUN80	1951.00	126.65	0.00	1	76	586.00	1577.45	12 12
27JUN80	2047.00	126.89	0.00	1	76	641.00	1577.21	12 12
27JUN80	2141.00	126.91	0.00	1	76	696.00	1577.19	12 12
27JUN80	2306.00	127.05	0.00	1	76	791.00	1577.05	12 12
28JUN80	40.00	127.08	0.00	1	76	875.00	1577.12	12 12
28JUN80	226.00	127.08	0.00	1	76	981.00	1577.02	12 12
28JUN80	535.00	127.22	0.00	1	76	1174.00	1576.88	12 12
28JUN80	746.00	127.25	0.00	1	76	1301.00	1576.85	12 12
28JUN80	1011.00	127.36	0.00	1	76	1496.00	1576.74	12 12
28JUN80	1210.00	127.41	0.00	1	76	1565.00	1576.69	12 12
28JUN80	1411.00	127.47	0.00	1	76	1796.00	1576.63	12 12
28JUN80	1611.00	127.54	0.00	1	76	1926.00	1576.56	12 12
28JUN80	2334.00	127.69	0.00	1	76	2249.00	1576.41	12 12
29JUN80	000.00	127.74	0.00	1	76	2777.00	1576.36	12 12
29JUN80	1004.00	127.93	0.00	1	76	3239.00	1576.17	12 12
30JUN80	40.00	128.00	0.00	1	76	3761.00	1576.90	12 12
30JUN80	234.00	128.21	0.00	1	76	4229.00	1575.69	12 12
30JUN80	1322.00	128.28	0.00	1	76	4647.00	1575.62	12 12
01JUL80	409.00	128.40	0.00	1	76	5639.00	1575.50	12 12
01JUL80	1350.00	127.23	0.00	1	76	5705.00	1576.67	12 12
01JUL80	1114.00	127.25	0.00	1	76	5855.00	1576.65	12 12
01JUL80	1156.00	127.47	0.00	1	76	5871.00	1576.63	12 12
01JUL80	1701.00	127.82	0.00	1	76	5941.00	1576.28	12 12
01JUL80	1951.00	128.18	0.00	1	76	6040.00	1575.92	12 12
01JUL80	1655.00	128.41	0.00	1	76	6170.00	1575.69	12 12
02JUL80	206.00	128.83	0.00	1	76	6721.00	1575.27	12 12
02JUL80	40.00	128.95	0.00	1	76	7117.00	1575.15	12 12

GEOLOGIC ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G19C ***

DATE DD MONTH	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
02JUL80	1529.00	132.30	.10	1	14	7599.00	1575.14	16 14 COMPARE PIEZ.
02JUL80	1526.00	129.00	0.00	1	76	7461.00	1575.10	1. 1. COMPARE PIEZ.
02JUL80	2127.60	128.96	0.00	1	76	7682.00	1575.14	12 12
03JUL80	905.00	129.01	0.00	1	76	7800.00	1575.09	12 12
03JUL80	2041.00	129.02	0.00	1	76	8281.00	1575.08	12 12
04JUL80	854.00	129.04	0.00	1	76	10009.00	1575.06	12 12
04JUL80	2045.00	129.16	0.00	1	76	10720.00	1574.94	12 12
05JUL80	824.00	129.22	0.00	1	76	11419.00	1574.88	12 12
05JUL80	2046.00	129.55	0.00	1	76	12101.00	1574.55	12 12
06JUL80	914.00	129.71	0.00	1	76	12805.00	1574.39	12 12
06JUL80	1741.00	129.69	0.00	1	76	13416.00	1574.41	12 12
07JUL80	754.00	129.57	0.00	1	76	14067.00	1574.53	12 12
07JUL80	1658.00	129.53	0.00	1	76	14713.00	1574.57	12 12
08JUL80	837.00	129.43	0.00	1	76	15412.00	1574.27	12 12
08JUL80	2101.00	129.34	0.00	1	76	16096.00	1574.16	12 12
09JUL80	654.00	129.28	0.00	1	76	17209.00	1574.12	1. 12
09JUL80	1601.00	129.27	0.00	1	76	17643.00	1574.13	12 12
10JUL80	847.00	130.05	0.00	1	77	18642.00	1573.99	12 12
10JUL80	1737.00	130.09	0.00	1	77	19172.00	1573.95	12 12
11JUL80	919.00	130.18	0.00	1	77	20114.00	1573.86	12 12
11JUL80	1921.00	130.27	0.00	1	77	20716.00	1573.77	12 12
12JUL80	958.00	130.33	0.00	1	77	21553.00	1573.71	1. 12
13JUL80	925.00	130.58	0.00	1	77	23058.00	1573.50	12 12
14JUL80	200.00	130.60	0.00	1	77	24355.00	1573.48	12 12
14JUL80	1657.00	127.92	0.00	1	77	24922.00	1576.12	12 12
15JUL80	850.00	130.67	0.00	1	77	25835.00	1573.37	12 12
16JUL80	915.00	130.80	0.00	1	77	27310.00	1573.18	12 12
17JUL80	912.00	131.00	0.00	1	77	28687.00	1572.98	12 12
18JUL80	900.00	131.07	0.00	1	77	30115.00	1572.97	9 12
20JUL80	905.00	131.19	0.00	1	77	33000.00	1572.91	12 12
21JUL80	920.00	131.39	0.00	1	77	34461.00	1572.69	12 12
21JUL80	1004.00	131.39	0.00	1	77	34561.00	1572.65	12 12 RECOVERY = 10
21JUL80	1005.00	131.56	0.00	1	77	34568.00	1572.68	12 12
21JUL80	1015.00	131. 7	0.00	1	77	34668.00	1572.77	1. 12
21JUL80	1016.00	131.11	0.00	1	77	34671.00	1572.97	12 12
21JUL80	1020.00	130.89	0.00	1	77	34875.00	1573.19	12 12
21JUL80	1028.00	130.52	0.00	1	77	34975.00	1573.72	12 12

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 87/01/28.- 20.23.57.

CRAIGTON PUMP TEST JOB NO. 786085 DATE= 9/10/86
PIEZOMETER/WELL IDENTIFIER ***G19D ***

DD/MO/YY	HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1707.60 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN86-1065.00
21JUL80	1033.00	129.75	0.00	1	76	5958.00	1574.35	12 12
21JUL80	1045.00	126.52	0.00	1	76	5960.00	1575.58	12 12
21JUL80	1055.00	127.40	0.00	1	76	5961.00	1576.70	12 12
21JUL80	1103.00	126.33	0.00	1	76	5961.00	1577.77	12 12
21JUL80	1114.00	125.83	0.00	1	76	5962.00	1578.67	12 12
21JUL80	1123.00	124.55	0.00	1	76	5963.00	1579.55	12 12
21JUL80	1132.00	123.84	0.00	1	76	5964.00	1580.26	12 12
21JUL80	1140.00	123.20	0.00	1	76	5965.00	1580.90	12 12
21JUL80	1150.00	122.52	0.00	1	76	5966.00	1581.58	12 12
21JUL80	1157.00	121.99	0.00	1	76	5967.00	1582.11	12 12
21JUL80	1206.00	121.47	0.00	1	76	5968.00	1582.63	12 12
21JUL80	1216.00	120.92	0.00	1	76	5969.00	1583.16	12 12
21JUL80	1257.00	1.0.00	0.00	1	76	5972.00	1584.10	12 12
21JUL80	1258.00	119.46	0.00	1	12	5973.00	1584.69	12 12
21JUL80	1313.00	118.92	0.00	1	12	5974.00	1585.23	12 12
21JUL80	1327.00	118.27	0.00	1	12	5975.00	1585.88	12 12
21JUL80	1401.00	117.81	0.00	1	12	5979.00	1586.34	12 12
21JUL80	1438.00	117.35	0.00	1	12	5983.00	1586.80	12 12
21JUL80	1502.00	117.01	0.00	1	12	5986.00	1587.14	12 12
21JUL80	1527.00	116.70	0.00	1	12	5987.00	1587.45	12 12
21JUL80	1608.00	116.55	0.00	1	12	5992.00	1587.60	12 12
21JUL80	1703.00	116.28	0.00	1	12	5998.00	1587.87	12 12
21JUL80	1818.00	116.06	0.00	1	12	6005.00	1588.09	12 12
21JUL80	1911.00	115.92	0.00	1	12	6010.00	1588.23	12 12
21JUL80	2001.00	115.81	0.00	1	12	6016.00	1588.29	12 12
21JUL80	2129.00	115.70	0.00	1	12	6023.00	1588.45	12 12
21JUL80	2252.00	115.64	0.00	1	12	6030.00	1588.51	12 12
22JUL80	107.00	115.49	0.00	1	12	6038.00	1588.66	12 12
22JUL80	226.00	115.44	0.00	1	12	6045.00	1588.71	12 12
22JUL80	418.00	115.33	0.00	1	12	6056.00	1588.82	12 12
22JUL80	640.00	115.20	0.00	1	12	6069.00	1588.95	12 12
22JUL80	1151.00	115.14	0.00	1	12	6098.00	1589.01	12 12
22JUL80	1517.00	115.06	0.00	1	12	6119.00	1589.09	12 12
22JUL80	1659.00	114.90	0.00	1	12	6128.00	1589.25	12 12
23JUL80	19.00	114.80	0.00	1	12	6154.00	1589.35	12 12
23JUL80	338.00	114.75	0.00	1	12	6176.00	1589.40	12 12
23JUL80	1111.00	110.00	0.00	1	12	6250.00	1594.51	12 12
23JUL80	1925.00	110.00	0.00	1	12	6300.00	1589.68	12 12
24JUL80	837.00	110.00	0.00	1	12	6347.00	1589.86	12 12
24JUL80	1518.00	110.00	0.00	1	12	6387.00	1590.01	12 12
25JUL80	1019.00	110.00	0.00	1	12	6435.00	1590.07	12 12
25JUL80	1927.00	110.00	0.00	1	12	6484.00	1590.10	12 12

GEETER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 01/01/80.- 20:23:37.

CRAWSON PUMP TEST JOB NO. 7H6085 DATE= 9/10/80
FILE/OMPETER/WELL IDENTIFIER ***GING ***

DATE	TIME	FIRST READING	SECOND READING	A L C	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1707.60 FEET PIEZ ELEV 0.00 =NOLL
								TIME PUMP TEST BEGAN = 17JUN70-1105.00
26JUL80	800.00	115.00	2.25	1 ET		41635.00	1590.20	IN IN
27JUL80	955.00	115.00	4.15	1 94		53190.00	1590.35	IN ET O. K. TO 9/27/80
28JUL80	915.00	115.00	3.92	1 94		49590.00	1590.56	IN BY O. K. TO 9/27/80
29JUL80	910.00	115.00	3.81	1 94		47025.00	1590.67	IN BY O. K. TO 9/27/80
30JUL80	1115.00	115.00	5.75	1 94		67590.00	1590.75	IN BY O. K. TO 9/27/80
31JUL80	1440.00	115.00	5.68	1 94		49245.00	1590.80	IN BY O. K. TO 9/27/80
01AUG80	1220.00	115.00	5.55	1 94		53541.00	1590.93	IN BY O. K. TO 9/27/80
02AUG80	820.00	115.00	3.52	1 94		53101.00	1591.16	N IN
03AUG80	1020.00	115.00	4.29	1 94		56425.00	1591.19	N IN
07AUG80	1010.00	115.00	3.16	1 94		59311.00	1591.32	N IN
10AUG80	945.00	115.00	2.84	1 94		61098.00	1591.44	N IN
12AUG80	1520.00	115.00	5.03	1 94		66483.00	1591.45	N IN
14AUG80	1120.00	115.00	2.83	1 94		69203.00	1591.65	N IN
16AUG80	1105.00	115.00	2.84	1 94		72010.00	1591.69	N IN
20AUG80	1435.00	117.61	0.90	1 94		78050.00	1591.67	IN
22AUG80	1112.00	117.83	0.00	1 94		80827.00	1591.65	IN
25AUG80	940.00	117.98	0.00	1 94		86461.30	1592.00	IN
10SEP80	915.00	115.63	0.00	1 15		107950.00	1591.97	IN FOR G.W. MAP

COOR. N113855 ft. (N34705m)
E2284315 ft. (E696261m)

BORING LOG G41-G14D

SHEET 1 OF 2

SURFACE ELEV. 1705.6 ft. (519.86m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/10/79 DATE COMPLETED 12/11/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN.	SAMPLES: REC / ATT.	GROUNDWATER OBSERVATION WELL
0.0		See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy							▼ 12/19/79 33.59
									110.2 Grout (to surface)
									64.01
									210.0 Bentonite Clay Seal
									65.53
									215.0 Pea Gravel
									67.67
									222.0 Pea Gravel
71.32									
234.0		CONTINUED							CONTINUED

2" Solid PVC Pipe to Surface

2" Slotted PVC Pipe

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-181

Drawn jls
Checked

COOR. N113855 ft. (N34705m)
E2284315 ft. (E696261m)

BORING LOG G41-G14D

SHEET 2 OF 2

SURFACE ELEV. 1705.9 ft. (519.86m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/10/79 DATE COMPLETED 12/11/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FOOT	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN.	SAMPLES REC / ATT.	GROUNDWATER OBSERVATION WELL
71.32		CONTINUED							CONTINUED
234.0		See boring G41-G14, G41-G14A and G41-G14B for soil stratigraphy							2" Slotted PVC Pipe; Pea Gravel 73.76; 242.0; Pea Gravel 74.68; 245.0; Caved Material
78.33									
257.0		END OF BORING							

NOTES

1. Elevation of top of protector pipe, 1707.6 ft. (520.48m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	12/19/79	4/25/80	5/20/80	6/26/80*	9/10/80*		
DEPTH (m)	33.59	34.02	34.02	34.02	34.63		
DEPTH (ft.)	110.2	111.6	111.6	111.6	113.6		

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

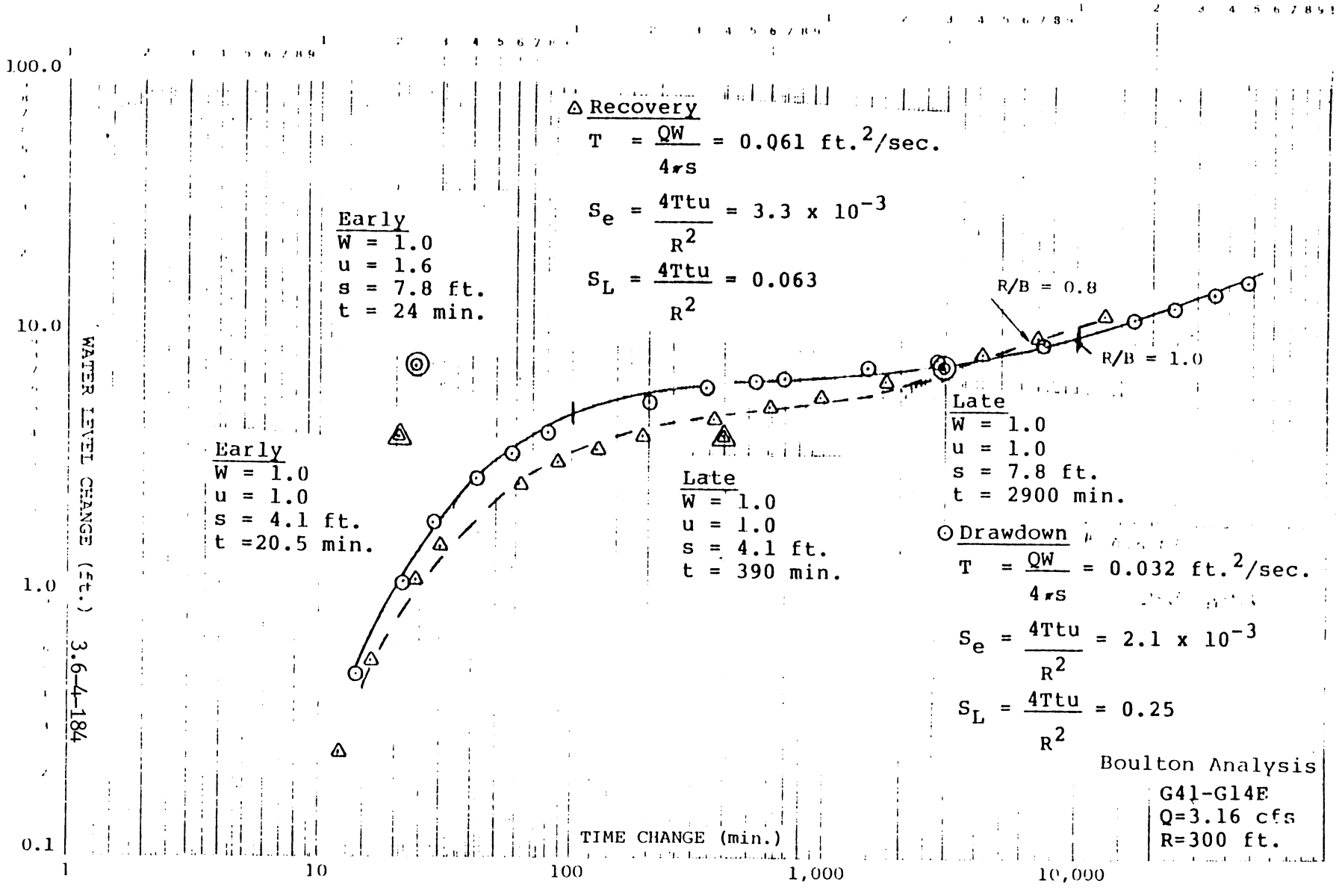
Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-182

Drawn jls
Checked

APPENDIX B

B-6
G41-G14E
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


100.0
10.0
1.0
0.1
WATER LEVEL CHANGE (ft.)
1
10
100
1,000
10,000
TIME CHANGE (min.)
Recovery
T = QW/4πs = 0.061 ft.²/sec.
Se = 4Ttu/R² = 3.3 x 10⁻³
SL = 4Ttu/R² = 0.063
Early
W = 1.0
u = 1.6
s = 7.8 ft.
t = 24 min.
Early
W = 1.0
u = 1.0
s = 4.1 ft.
t =20.5 min.
Late
W = 1.0
u = 1.0
s = 4.1 ft.
t = 390 min.
R/B = 0.8
R/B = 1.0
Late
W = 1.0
u = 1.0
s = 7.8 ft.
t = 2900 min.
Drawdown
T = QW/4πs = 0.032 ft.²/sec.
Se = 4Ttu/R² = 2.1 x 10⁻³
SL = 4Ttu/R² = 0.25
Boulton Analysis
G41-G14E
Q=3.16 cfs
R=300 ft.

⊙ Drawdown

s_m = 7.74 ft.
s_p = 3.87 ft.
t_p = 66 min.
Δs_p = 5.2 ft./min.
R/L = 0.370
L = 811 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.077 \text{ ft.}^2/\text{sec.}$$

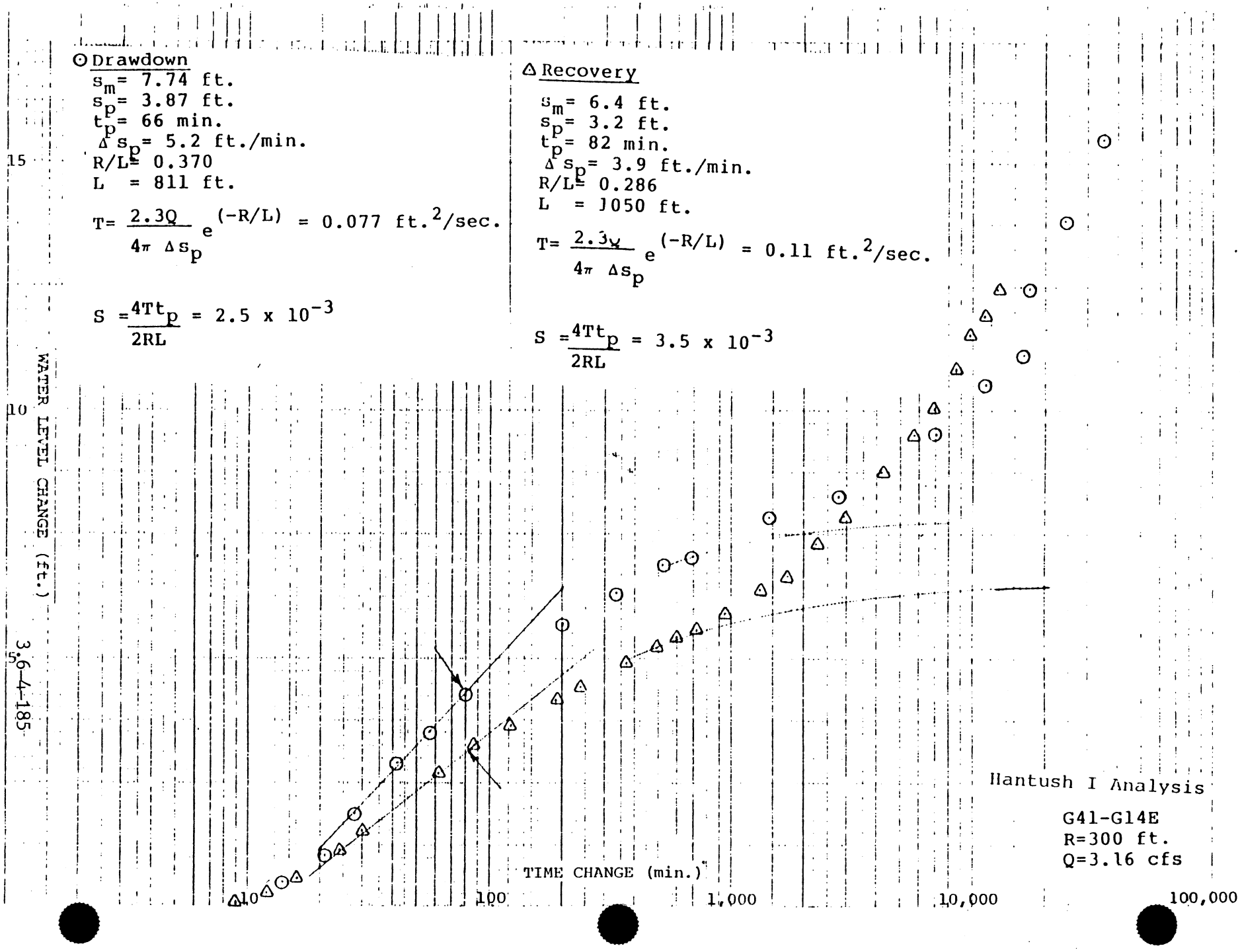
$$S = \frac{4Tt_p}{2RL} = 2.5 \times 10^{-3}$$

△ Recovery

s_m = 6.4 ft.
s_p = 3.2 ft.
t_p = 82 min.
Δs_p = 3.9 ft./min.
R/L = 0.286
L = 1050 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.11 \text{ ft.}^2/\text{sec.}$$

$$S = \frac{4Tt_p}{2RL} = 3.5 \times 10^{-3}$$



GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATE LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
11DEC79	1200.00	112.80	0.00	1	20	-286445.00	1595.20	CORRECT TO COLLAR TOP
25APR80	1200.00	113.70	.14	1	14	-90605.00	1594.16	14 - TIME NOT RECORD
20MAY80	600.00	113.62	0.00	1	66	-54965.00	1594.24	4 14
21MAY80	1200.00	112.63	0.00	1	5	-53165.00	1594.37	5 - NO TIME
29MAY80	930.00	112.49	0.00	1	5	-41795.00	1594.51	4 5 -REV. CIR.
30MAY80	1730.00	112.44	0.00	1	5	-39875.00	1594.56	4 5 -REV. CIR.
31MAY80	20.00	112.19	0.00	1	5	-39465.00	1594.81	4 5 -REV. CIR.
31MAY80	945.00	112.55	0.00	1	5	-38900.00	1594.45	4 5 SET CASE
01JUN80	600.00	112.59	0.00	1	5	-37685.00	1594.41	4 5 SET CASE
01JUN80	1525.00	112.42	0.00	1	5	-37120.00	1594.58	4 5 GRAVEL
02JUN80	830.00	112.50	0.00	1	5	-36095.00	1594.50	4 5
03JUN80	915.00	112.78	0.00	1	5	-34610.00	1594.22	4 5
04JUN80	135.00	113.29	0.00	1	5	-33630.00	1593.71	4 5 AIR DEV.
06JUN80	931.00	112.95	0.00	1	5	-30274.00	1594.05	4 5
06JUN80	1108.00	113.10	0.00	1	5	-30177.00	1593.90	4 5
06JUN80	1306.00	112.78	0.00	1	5	-30059.00	1594.22	4 5
06JUN80	1704.00	114.04	0.00	1	5	-29621.00	1592.96	4 5 VEL TEST
06JUN80	1847.00	114.04	0.00	1	5	-29718.00	1592.96	4 5 VEL TEST
07JUN80	930.00	112.65	0.00	1	5	-28835.00	1594.35	4 5
08JUN80	630.00	113.00	0.00	1	5	-27455.00	1594.00	4 5
09JUN80	800.00	112.63	0.00	1	5	-26045.00	1594.37	4 5
10JUN80	835.00	112.82	0.00	1	5	-24570.00	1594.18	4 5
11JUN80	845.00	113.02	0.00	1	5	-23120.00	1593.98	4 5
12JUN80	840.00	112.88	0.00	1	5	-21685.00	1594.12	4 5
13JUN80	815.00	112.63	0.00	1	5	-20270.00	1594.37	4 5
13JUN80	2115.00	112.59	0.00	1	5	-19490.00	1594.41	4 5 DIFF. RULE
14JUN80	815.00	112.61	0.00	1	5	-18830.00	1594.39	4 5
14JUN80	1745.00	112.64	0.00	1	5	-18260.00	1594.36	4 5
15JUN80	820.00	112.80	0.00	1	5	-17385.00	1594.20	4 5
16JUN80	805.00	112.97	0.00	1	5	-15960.00	1594.03	4 5
24JUN80	820.00	112.88	0.00	1	5	-4425.00	1594.12	4 5
25JUN80	815.00	112.80	0.00	1	5	-2990.00	1594.20	4 5
26JUN80	840.00	112.77	0.00	1	5	-1525.00	1594.23	4 5
27JUN80	800.00	113.05	0.00	1	5	-125.00	1593.95	5 5 BEFORE TEST
27JUN80	1011.00	112.60	0.00	1	5	6.00	1594.40	5 5 START @ 10
27JUN80	1015.00	113.00	0.00	1	5	10.00	1594.00	5 5
27JUN80	1019.00	113.56	0.00	1	5	14.00	1593.44	5 5 START @ 10
27JUN80	1025.00	114.20	0.00	1	5	20.00	1592.80	5 5
27JUN80	1033.00	115.00	0.00	1	5	28.00	1592.00	5 5
27JUN80	1046.00	115.93	0.00	1	5	41.00	1591.07	5 5
27JUN80	1102.00	116.63	0.00	1	5	57.00	1590.37	5 5
27JUN80	1125.00	117.37	0.00	1	5	80.00	1589.63	5 5
27JUN80	1149.00	117.80	0.00	1	5	104.00	1589.20	5 5

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G1WE ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1204.00	118.05	0.00	1	5	119.00	1588.95	5 5
27JUN80	1240.00	118.40	0.00	1	5	155.00	1588.60	5 5
27JUN80	1326.00	118.78	0.00	1	5	201.00	1588.22	5 5
27JUN80	1404.00	119.05	0.00	1	5	239.00	1587.95	5 5
27JUN80	1458.00	119.29	0.00	1	5	293.00	1587.71	5 5
27JUN80	1539.00	119.49	0.00	1	5	334.00	1587.51	5 5 TIME CORRECTED
27JUN80	1707.00	119.69	0.00	1	5	422.00	1587.31	5 5
27JUN80	1753.00	119.80	0.00	1	5	468.00	1587.20	5 5
27JUN80	1851.00	119.96	0.00	1	5	526.00	1587.04	5 5
27JUN80	1932.00	119.96	0.00	1	5	567.00	1587.04	5 5
27JUN80	2048.00	120.09	0.00	1	41	643.00	1586.89	5 5
27JUN80	2143.00	120.21	0.00	1	41	698.00	1586.77	5 5
27JUN80	2307.00	120.35	0.00	1	41	782.00	1586.63	5 5
28JUN80	42.00	120.30	0.00	1	41	877.00	1586.68	5 5
28JUN80	227.00	120.46	0.00	1	41	982.00	1586.52	5 5
28JUN80	542.00	120.70	0.00	1	41	1177.00	1586.28	5 5
28JUN80	748.00	120.77	0.00	1	41	1303.00	1586.21	5 5
28JUN80	1012.00	120.87	0.00	1	41	1447.00	1586.11	5 5
28JUN80	1208.00	120.93	0.00	1	41	1563.00	1585.05	5 5
28JUN80	1512.00	121.04	0.00	1	41	1747.00	1585.94	5 5
28JUN80	1812.00	121.15	0.00	1	41	1927.00	1585.83	5 5
28JUN80	2336.00	121.19	0.00	1	41	2253.00	1585.79	5 5
29JUN80	824.00	121.32	0.00	1	41	2779.00	1585.66	5 5
29JUN80	1606.00	121.54	0.00	1	41	3241.00	1585.44	5 5
30JUN80	48.00	121.82	0.00	1	41	3763.00	1585.16	5 5
30JUN80	838.00	121.85	0.00	1	41	4233.00	1585.13	5 5
30JUN80	1558.00	121.91	0.00	1	41	4673.00	1585.07	5 5
01JUL80	805.00	121.98	0.00	1	41	5640.00	1585.00	5 5
01JUL80	1051.00	121.17	0.00	1	41	5806.00	1585.81	5 5
01JUL80	1115.00	121.63	0.00	1	41	5830.00	1585.35	5 5
01JUL80	1157.00	121.86	0.00	1	41	5872.00	1585.12	5 5
01JUL80	1308.00	122.04	0.00	1	41	5943.00	1584.94	5 5
01JUL80	1452.00	122.13	0.00	1	41	6047.00	1584.85	5 5
01JUL80	1654.00	122.19	0.00	1	41	6169.00	1584.79	5 5
02JUL80	208.00	122.53	0.00	1	41	6723.00	1584.45	5 5
02JUL80	844.00	122.67	0.00	1	41	7119.00	1584.31	5 5

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
02JUL80	1328.00	123.55	.16	1	14	7403.00	1584.29	16 14 COMPARE PIEZ.
02JUL80	1329.00	122.72	0.00	1	41	7404.00	1584.26	5 5 COMPARE PIEZ.
02JUL80	2126.00	122.74	0.00	1	41	7881.00	1584.24	5 5
03JUL80	906.00	122.90	0.00	1	41	8581.00	1584.08	5 5
03JUL80	2045.00	123.05	0.00	1	41	9280.00	1583.93	5 5
04JUL80	855.00	123.31	0.00	1	41	10010.00	1583.67	5 5
04JUL80	2044.00	123.36	0.00	1	41	10719.00	1583.62	5 5
05JUL80	825.00	123.66	0.00	1	41	11420.00	1583.32	5 5
05JUL80	2047.00	124.18	0.00	1	41	12162.00	1582.80	5 5
06JUL80	917.00	124.49	0.00	1	41	12912.00	1582.49	5 5
06JUL80	1739.00	124.52	0.00	1	41	13414.00	1582.46	5 5
07JUL80	753.00	124.61	0.00	1	41	14268.00	1582.37	5 5
07JUL80	1640.00	124.70	0.00	1	41	14795.00	1582.28	5 5
08JUL80	840.00	125.25	0.00	1	41	15755.00	1581.73	5 5
08JUL80	2102.00	125.40	0.00	1	41	16497.00	1581.58	5 5
09JUL80	856.00	125.58	0.00	1	41	17211.00	1581.40	5 5
09JUL80	1610.00	-125.58	0.00	1	41	17645.00	1581.40	5 5
10JUL80	848.00	125.83	0.00	1	41	18643.00	1581.15	5 5
10JUL80	1736.00	125.89	0.00	1	41	19171.00	1581.09	5 5
11JUL80	921.00	126.14	0.00	1	41	20116.00	1580.84	5 5
11JUL80	1925.00	126.27	0.00	1	41	20720.00	1580.71	5 5
12JUL80	900.00	126.40	0.00	1	41	21535.00	1580.58	5 5
13JUL80	826.00	126.81	0.00	1	41	22941.00	1580.17	5 5
14JUL80	802.00	126.87	0.00	1	41	24357.00	1580.11	5 5
14JUL80	1059.00	126.88	0.00	1	41	24534.00	1580.10	5 5
15JUL80	832.00	127.15	0.00	1	41	25827.00	1579.83	5 5
16JUL80	916.00	127.40	0.00	1	41	27311.00	1579.58	5 5
17JUL80	814.00	127.77	0.00	1	41	28689.00	1579.21	5 5
18JUL80	801.00	127.94	0.00	1	41	30116.00	1579.04	5 5
20JUL80	806.00	128.16	0.00	1	41	33001.00	1578.82	5 5
21JUL80	830.00	128.57	0.00	1	41	34465.00	1578.41	5 5
21JUL80	1007.00	128.60	0.00	1	41	34562.00	1578.38	5 5 RECOVERY # 10
21JUL80	1010.00	128.59	0.00	1	41	34565.00	1578.39	5 5
21JUL80	1014.00	128.55	0.00	1	41	34569.00	1578.43	5 5
21JUL80	1017.00	128.32	0.00	1	41	34572.00	1578.66	5 5
21JUL80	1021.00	128.00	0.00	1	41	34576.00	1578.98	5 5
21JUL80	1029.00	127.41	0.00	1	41	34584.00	1579.57	5 5
21JUL80	1035.00	127.04	0.00	1	41	34590.00	1579.94	5 5
21JUL80	1046.00	126.49	0.00	1	41	34601.00	1580.49	5 5
21JUL80	1056.00	126.13	0.00	1	41	34611.00	1580.85	5 5
21JUL80	1106.00	125.87	0.00	1	41	34621.00	1581.11	5 5
21JUL80	1115.00	125.65	0.00	1	41	34630.00	1581.33	5 5
21JUL80	1124.00	125.46	0.00	1	41	34639.00	1581.52	5 5

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.00 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1133.00	125.32	0.00	1	41	34648.00	1581.66	5 5
21JUL80	1141.00	125.21	0.00	1	41	34656.00	1581.77	5 5
21JUL80	1151.00	125.05	0.00	1	41	34666.00	1581.93	5 5
21JUL80	1158.00	125.00	0.00	1	41	34673.00	1581.98	5 5
21JUL80	1208.00	124.90	0.00	1	41	34683.00	1582.08	5 5
21JUL80	1218.00	124.79	0.00	1	41	34693.00	1582.19	5 5
21JUL80	1228.00	124.64	0.00	1	41	34713.00	1582.34	5 5
21JUL80	1257.00	124.50	0.00	1	41	34732.00	1582.48	5 5
21JUL80	1314.00	124.41	0.00	1	41	34749.00	1582.57	5 5
21JUL80	1342.00	124.23	0.00	1	41	34777.00	1582.75	5 5
21JUL80	1403.00	124.14	0.00	1	41	34798.00	1582.84	5 5
21JUL80	1436.00	123.99	0.00	1	41	34831.00	1582.99	5 5
21JUL80	1503.00	123.91	0.00	1	41	34858.00	1583.07	5 5
21JUL80	1538.00	123.77	0.00	1	41	34893.00	1583.21	5 5
21JUL80	1609.00	123.67	0.00	1	41	34929.00	1583.31	5 5
21JUL80	1705.00	123.58	0.00	1	41	34980.00	1583.40	5 5
21JUL80	1817.00	123.36	0.00	1	41	35052.00	1583.62	5 5
21JUL80	1912.00	123.27	0.00	1	41	35107.00	1583.71	5 5
21JUL80	2007.00	123.16	0.00	1	41	35162.00	1583.82	5 5
21JUL80	2125.00	123.03	0.00	1	41	35240.00	1583.95	5 5
21JUL80	2234.00	122.94	0.00	1	41	35309.00	1584.04	5 5
22JUL80	109.00	122.74	0.00	1	41	35464.00	1584.24	5 5
22JUL80	231.00	122.64	0.00	1	41	35546.00	1584.34	5 5
22JUL80	418.00	122.53	0.00	1	41	35653.00	1584.45	5 5
22JUL80	841.00	122.25	0.00	1	41	35916.00	1584.75	5 5
22JUL80	1132.00	122.06	0.00	1	41	36087.00	1584.92	5 5
22JUL80	1518.00	121.82	0.00	1	41	36313.00	1585.16	5 5
22JUL80	1901.00	121.66	0.00	1	41	36536.00	1585.32	5 5
23JUL80	20.00	121.46	0.00	1	41	36855.00	1585.52	5 5
23JUL80	336.00	121.33	0.00	1	41	37051.00	1585.65	5 5
23JUL80	1112.00	120.00	1.04	1	41	37507.00	1585.94	5 5
23JUL80	1926.00	120.00	.74	1	41	38001.00	1586.24	5 5
24JUL80	836.00	120.00	.33	1	41	38793.00	1586.65	5 5
24JUL80	1700.00	120.00	0.00	1	41	39295.00	1586.98	5 5
25JUL80	1015.00	115.00	4.74	1	41	40330.00	1587.24	5 5
25JUL80	1529.00	115.00	4.66	1	41	40644.00	1587.32	5 5

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14E ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1708.00 FEET PIEZC ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
26JUL80	803.00	120.00	.17	1	69	41638.00	1587.67	14 14
27JUL80	950.00	120.00	2.05	1	95	43185.00	1588.13	15 BY D. K. TO 9/2/80
28JUL80	910.00	120.00	1.61	1	95	44585.00	1588.57	15 BY D. K. TO 9/2/80
29JUL80	905.00	120.00	1.40	1	95	46020.00	1588.78	15 BY D. K. TO 9/2/80
30JUL80	1120.00	120.00	1.10	1	95	47595.00	1589.08	15 BY D. K. TO 9/2/80
31JUL80	1443.00	120.00	.81	1	95	49238.00	1589.37	15 BY D. K. TO 9/2/80
01AUG80	1228.00	120.00	.69	1	95	50543.00	1589.49	15 BY D. K. TO 9/2/80
03AUG80	821.00	120.00	.23	1	95	53176.00	1589.95	15 BY D. K. TO 9/2/80
05AUG80	1425.00	120.00	0.00	1	95	56420.00	1590.18	4 15
07AUG80	1433.00	115.00	4.46	1	94	59308.00	1590.42	4 15
09AUG80	940.00	115.00	4.30	1	94	61895.00	1590.58	4 15
12AUG80	1326.00	115.00	4.09	1	94	66441.00	1590.79	4 15
14AUG80	1126.00	115.00	3.83	1	94	69201.00	1591.05	4 15
16AUG80	1108.00	115.00	3.86	1	94	72063.00	1591.02	4 15
20AUG80	1432.00	118.39	0.00	1	94	76027.00	1591.49	15
22AUG80	1310.00	118.72	0.00	1	94	80825.00	1591.16	15
02SEP80	944.00	118.16	0.00	1	94	96459.00	1591.72	15
10SEP80	925.00	116.29	0.00	1	15	107960.00	1591.71	15 FOR G.W. MAP

COOR. N113830 ft. (N34696m)
E2284315 ft. (E696261m)

BORING LOG G41-G14E

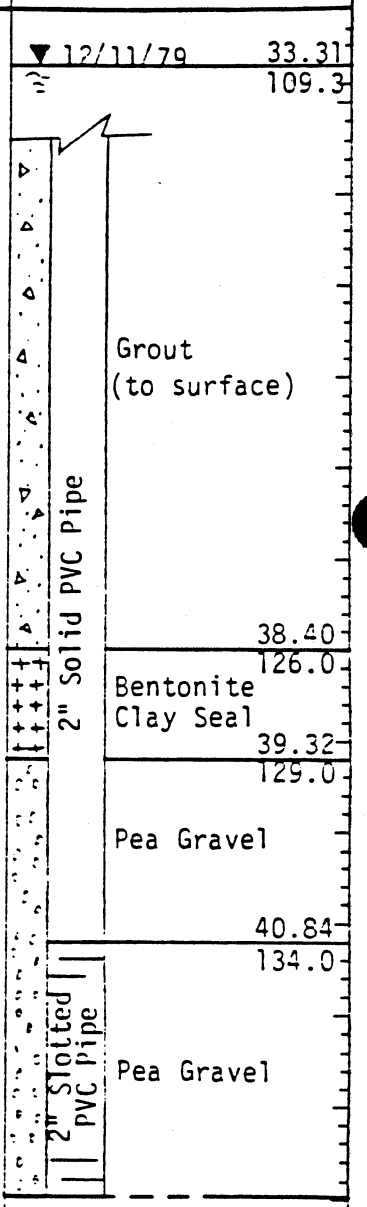
SHEET 1 OF 2

SURFACE ELEV. 1705.6 ft. (519.87m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/7/79 DATE COMPLETED 12/7/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER/FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6IN.	SAMPLES: REC./ATT.	GROUNDWATER OBSERVATION WELL
0.0		See borings G41-G14 and G41-G14A for soil stratigraphy							▼ 12/11/79 33.31 / 109.3
42.97 / 141.0		CONTINUED							CONTINUED



Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-191

Drawn jls
Checked

COOR. N113830 ft. (N34696m)
E2284315 ft. (E696261m)

BORING LOG G41-G14E

SHEET 2 OF 2

SURFACE ELEV. 1705.6 ft. (519.87m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 12/7/79 DATE COMPLETED 12/7/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN.	SAMPLES REC./ATT.	GROUNDWATER OBSERVATION WELL
		CONTINUED							CONTINUED
		See borings G41-G14 and G41-G14A for soil stratigraphy							2" Slotted PVC Pipe; Pea Gravel; 46.94; 154.0; Caved Material
50.29 165.0		END OF BORING							

NOTES

1. Elevation of top of protector pipe, 1708.0 ft. (520.60m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	12/11/79	4/25/80	5/20/80	6/26,80*	9/10/80*		
DEPTH (m)	33.31	33.92	33.89	33.95	34.72		
DEPTH (ft.)	109.3	111.3	111.2	111.4	113.9		

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

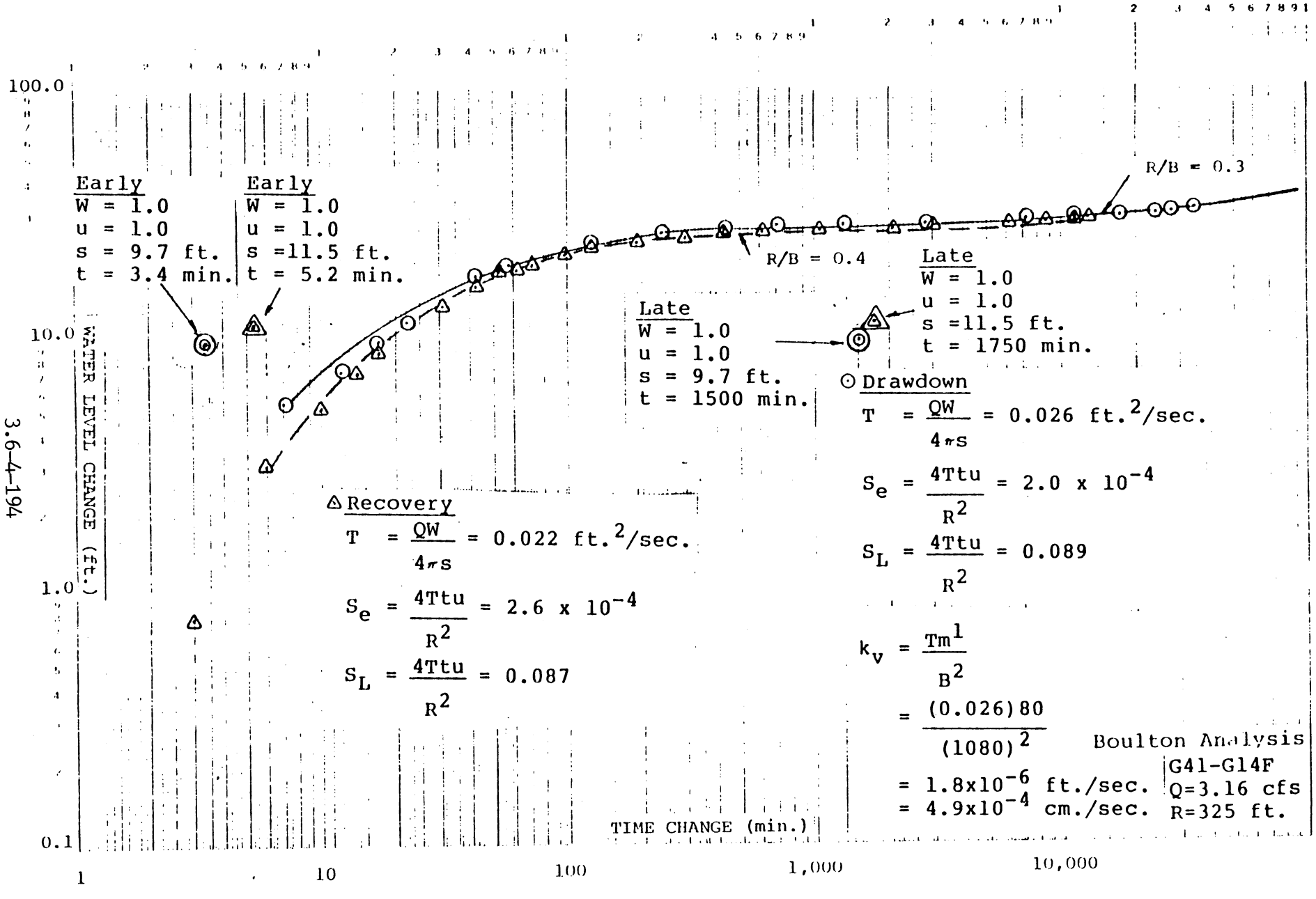
Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-192

Drawn JLS
Checked

APPENDIX B

B-7
G41-G14F
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details



△ Recovery

$$T = \frac{QW}{4\pi s} = 0.022 \text{ ft.}^2/\text{sec.}$$

$$S_e = \frac{4Ttu}{R^2} = 2.6 \times 10^{-4}$$

$$S_L = \frac{4Ttu}{R^2} = 0.087$$

⊙ Drawdown

$$T = \frac{QW}{4\pi s} = 0.026 \text{ ft.}^2/\text{sec.}$$

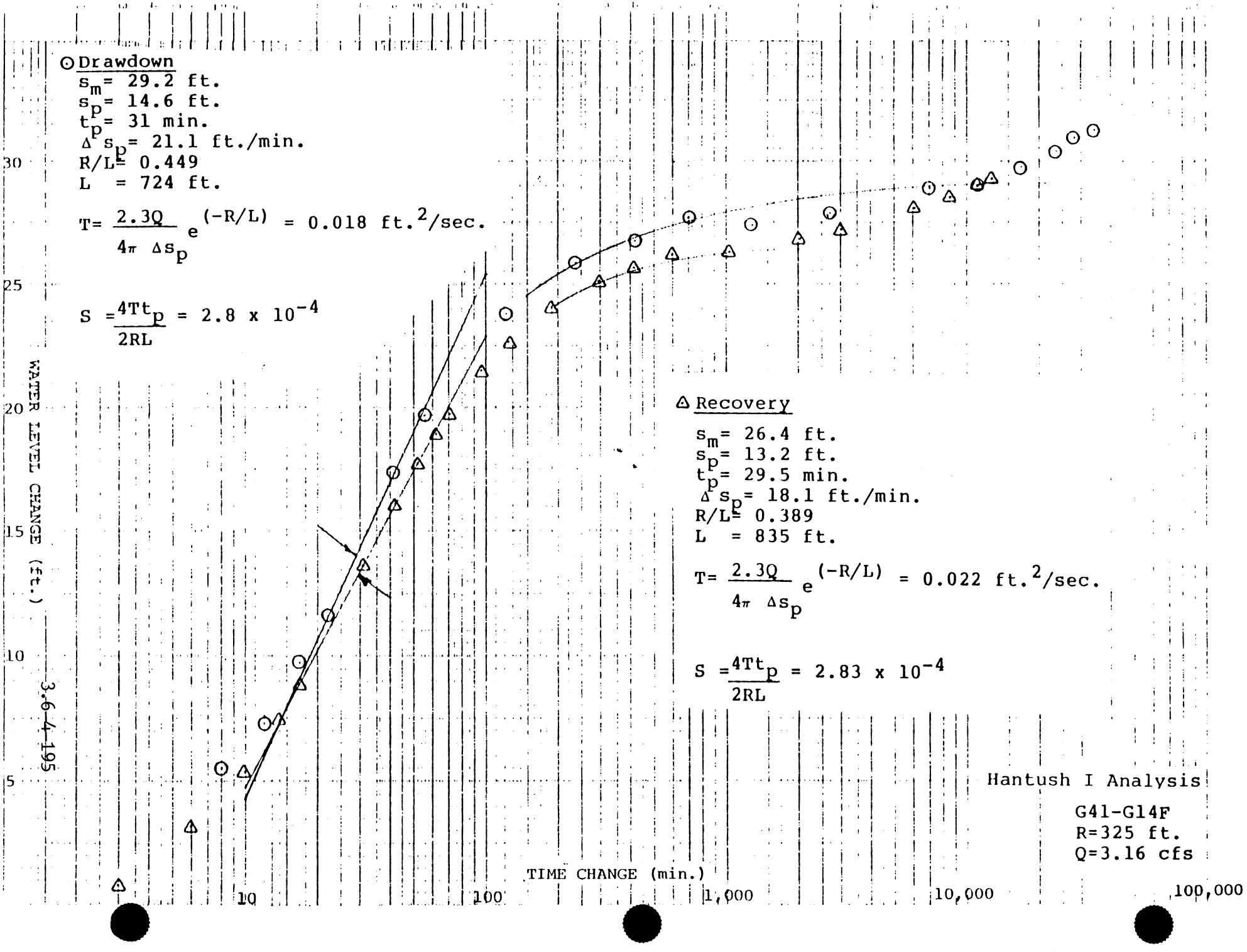
$$S_e = \frac{4Ttu}{R^2} = 2.0 \times 10^{-4}$$

$$S_L = \frac{4Ttu}{R^2} = 0.089$$

$$k_v = \frac{Tm^1}{B^2} = \frac{(0.026)80}{(1080)^2}$$

$= 1.8 \times 10^{-6}$ ft./sec.
$= 4.9 \times 10^{-4}$ cm./sec.

Boulton Analysis
G41-G14F
Q=3.16 cfs
R=325 ft.


⊙ Drawdown
s_m = 29.2 ft.
s_p = 14.6 ft.
t_p = 31 min.
Δs_p = 21.1 ft./min.
R/L = 0.449
L = 724 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.018 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.8 x 10^{-4}
△ Recovery
s_m = 26.4 ft.
s_p = 13.2 ft.
t_p = 29.5 min.
Δs_p = 18.1 ft./min.
R/L = 0.389
L = 835 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.022 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.83 x 10^{-4}
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
5
10
15
20
25
30
3-6-4-195
Hantush I Analysis
G41-G14F
R=325 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
11DEC79	1200.00	112.10	0.00	1	20	-286995.00	1594.82	CORRECT TO COLLAR TOP
25APR80	1200.00	112.95	.14	1	14	-90605.00	1593.83	14 - TIME NOT RECORD
20MAY80	600.00	110.88	0.00	1	66	-54965.00	1595.90	& 14
21MAY80	1200.00	112.84	0.00	1	6	-53165.00	1594.04	6 - NO TIME
29MAY80	930.00	112.72	0.00	1	6	-41795.00	1594.16	& 6 -REV. CIR.
30MAY80	1736.00	112.69	0.00	1	6	-39875.00	1594.19	& 6 -REV. CIR.
31MAY80	20.00	111.75	0.00	1	6	-[illegible]965.00	1595.13	& 6 -REV. CIR.
31MAY80	945.00	112.56	0.00	1	6	-38900.00	1594.32	& 6 SET CASE
01JUN80	600.00	112.42	0.00	1	6	-37685.00	1594.46	& 6 SET CASE
01JUN80	1525.00	112.58	0.00	1	6	-37120.00	1594.30	& 6 GRAVEL
02JUN80	830.00	112.49	0.00	1	6	-36095.00	1594.39	& 6
03JUN80	915.00	112.79	0.00	1	6	-34610.00	1594.09	& 6
04JUN80	135.00	113.72	0.00	1	6	-33630.00	1593.16	& 6 AIR DEV.
06JUN80	933.00	114.45	0.00	1	6	-30272.00	1592.43	& 6
06JUN80	1110.00	114.01	0.00	1	6	-30175.00	1592.87	& 6
06JUN80	1307.00	113.87	0.00	1	6	-30058.00	1593.81	& 6
06JUN80	1705.00	116.96	0.00	1	46	-29820.00	1589.98	& 6 VEL TEST
06JUN80	1900.00	116.63	0.00	1	46	-29717.00	1590.07	& 6 VEL TEST
07JUN80	930.00	112.91	0.00	1	6	-28835.00	1593.97	& 6
08JUN80	830.00	113.12	0.00	1	6	-27455.00	1593.76	& 6
09JUN80	800.00	112.82	0.00	1	6	-26095.00	1594.06	& 6
10JUN80	835.00	112.98	0.00	1	6	-24570.00	1593.90	& 6
11JUN80	845.00	113.12	0.00	1	6	-23120.00	1593.76	& 6
12JUN80	840.00	112.97	0.00	1	6	-21685.00	1593.91	& 6
13JUN80	815.00	112.78	0.00	1	6	-20270.00	1594.10	& 6
13JUN80	2115.00	112.72	0.00	1	46	-19490.00	1594.18	& 6 DIFF. RULE
14JUN80	815.00	112.77	0.00	1	6	-19030.00	1594.11	& 6
14JUN80	1745.00	112.78	0.00	1	6	-18260.00	1594.10	& 6
15JUN80	820.00	112.91	0.00	1	6	-17385.00	1593.97	& 6
16JUN80	805.00	113.09	0.00	1	6	-15960.00	1593.79	& 6
24JUN80	820.00	112.98	0.00	1	6	-4425.00	1593.90	& 6
25JUN80	815.00	112.95	0.00	1	6	-2990.00	1593.93	& 6
26JUN80	840.00	112.91	0.00	1	6	-1525.00	1593.97	& 6
27JUN80	800.00	113.09	0.00	1	6	-125.00	1593.79	& 6 -BEFORE TEST

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN: 81/01/28.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G1SF ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1706.42 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1013.00	118.61	0.00	1	46	8.00	1588.29	6 6 START @ 10
27JUN80	1017.00	120.45	0.00	1	47	12.00	1586.44	6 6
27JUN80	1022.00	122.84	0.00	1	47	17.00	1584.05	6 6 START @ 10
27JUN80	1027.00	124.61	0.00	1	47	22.00	1582.28	6 6
27JUN80	1034.00	127.64	0.00	1	47	29.00	1579.25	6 6
27JUN80	1047.00	130.52	0.00	1	47	42.00	1576.37	6 6
27JUN80	1103.00	132.78	0.00	1	47	58.00	1574.11	6 6
27JUN80	1208.00	136.91	0.00	1	48	123.00	1569.97	6 6
27JUN80	1258.00	137.90	0.00	1	48	173.00	1568.98	6 6
27JUN80	1329.00	138.49	0.00	1	48	204.00	1568.39	6 6
27JUN80	1405.00	138.94	0.00	1	48	240.00	1567.94	6 6
27JUN80	1456.00	139.32	0.00	1	48	294.00	1567.56	6 6
27JUN80	1541.00	139.57	0.00	1	48	336.00	1567.31	6 6 TIME CORRECTED
27JUN80	1708.00	139.79	0.00	1	48	423.00	1567.09	6 6
27JUN80	1754.00	139.93	0.00	1	48	469.00	1566.95	6 6
27JUN80	1850.00	140.00	0.00	1	49	525.00	1566.86	6 6
27JUN80	1933.00	140.05	0.00	1	49	568.00	1566.81	6 6
27JUN80	2049.00	140.11	0.00	1	49	644.00	1566.75	6 6
27JUN80	2144.00	140.18	0.00	1	49	699.00	1566.68	6 6
27JUN80	2308.00	140.31	0.00	1	49	783.00	1566.55	6 6
28JUN80	93.00	140.27	0.00	1	49	878.00	1566.59	6 6
28JUN80	229.00	140.33	0.00	1	49	984.00	1566.53	6 6
28JUN80	343.00	140.36	0.00	1	49	1178.00	1566.50	6 6
28JUN80	749.00	140.51	0.00	1	49	1304.00	1566.35	6 6
28JUN80	1013.00	140.60	0.00	1	49	1498.00	1566.26	6 6
28JUN80	1206.00	140.67	0.00	1	49	1561.00	1566.19	6 6
28JUN80	1513.00	140.71	0.00	1	49	1748.00	1566.15	6 6
28JUN80	1615.00	140.80	0.00	1	49	1928.00	1566.06	6 6
28JUN80	2340.00	140.89	0.00	1	49	2255.00	1566.02	6 6
29JUN80	825.00	140.95	0.00	1	49	2780.00	1565.91	6 6
29JUN80	1608.00	141.14	0.00	1	49	3243.00	1565.72	6 6
30JUN80	51.00	141.43	0.00	1	49	3766.00	1565.43	6 6
30JUN80	841.00	141.21	0.00	1	49	4236.00	1565.65	6 6
30JUN80	1600.00	141.52	0.00	1	49	4675.00	1565.34	6 6
01JUL80	806.00	141.55	0.00	1	49	5641.00	1565.31	6 6

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
01JUL80	1052.00	138.56	0.00	1	48	5807.00	1568.52	6 6
01JUL80	1117.00	140.11	0.00	1	49	5832.00	1566.75	6 6
01JUL80	1158.00	141.01	0.00	1	49	5873.00	1565.85	6 6
01JUL80	1309.00	141.59	0.00	1	49	5944.00	1565.47	6 6
01JUL80	1454.00	141.55	0.00	1	49	6049.00	1565.31	6 6
01JUL80	1652.00	141.69	0.00	1	49	6167.00	1565.22	6 6
02JUL80	211.00	141.88	0.00	1	49	6726.00	1564.98	6 6
02JUL80	845.00	141.94	0.00	1	49	7120.00	1564.92	6 6
02JUL80	1337.00	141.87	.15	1	14	7408.00	1564.90	16 14 COMPARE PIEZ.
02JUL80	1335.00	141.93	0.00	1	49	7410.00	1564.93	6 6 COMPARE PIEZ.
02JUL80	2125.00	141.92	0.00	1	49	7880.00	1564.94	6 6
03JUL80	907.00	141.94	0.00	1	49	8582.00	1564.92	6 6
03JUL80	2044.00	141.87	0.00	1	49	9279.00	1565.39	6 6
04JUL80	857.00	142.05	0.00	1	49	10012.00	1564.81	6 6
04JUL80	2043.00	142.02	0.00	1	49	10718.00	1564.84	6 6
05JUL80	826.00	142.16	0.00	1	49	11421.00	1564.70	6 6
05JUL80	2048.00	142.46	0.00	1	49	12163.00	1564.40	6 6
06JUL80	918.00	142.58	0.00	1	49	12913.00	1564.28	6 6
06JUL80	1737.00	142.45	0.00	1	49	13412.00	1564.41	6 6
07JUL80	754.00	142.39	0.00	1	49	14269.00	1564.47	6 6
07JUL80	1641.00	142.34	0.00	1	49	14796.00	1564.52	6 6
08JUL80	842.00	142.73	0.00	1	49	15757.00	1564.13	6 6
08JUL80	2103.00	142.73	0.00	1	49	16498.00	1564.13	6 6
09JUL80	857.00	142.79	0.00	1	49	17212.00	1564.07	6 6
09JUL80	1611.00	142.78	0.00	1	49	17646.00	1564.08	6 6
10JUL80	850.00	142.94	0.00	1	49	18645.00	1563.92	6 6
10JUL80	1734.00	142.91	0.00	1	49	19169.00	1563.95	6 6
11JUL80	923.00	143.09	0.00	1	49	20118.00	1563.77	6 6
11JUL80	1928.00	143.10	0.00	1	49	20723.00	1563.76	6 6
12JUL80	902.00	143.20	0.00	1	49	21537.00	1563.66	6 6
13JUL80	828.00	143.36	0.00	1	49	22943.00	1563.50	6 6
14JUL80	803.00	143.47	0.00	1	49	24358.00	1563.39	6 6
14JUL80	1100.00	142.70	0.00	1	49	24535.00	1564.16	6 6
15JUL80	834.00	143.70	0.00	1	49	25829.00	1563.16	6 6
16JUL80	917.00	143.91	0.00	1	49	27512.00	1562.95	6 6
17JUL80	815.00	144.13	0.00	1	49	28690.00	1562.73	6 6
18JUL80	802.00	144.03	0.00	1	49	30117.00	1562.83	6 6
20JUL80	807.00	144.06	0.00	1	49	33002.00	1562.80	6 6
21JUL80	831.00	144.31	0.00	1	49	34466.00	1562.55	6 6
21JUL80	1008.00	143.52	0.00	1	49	34563.00	1563.34	6 6 RECOVERY @ 10
21JUL80	1011.00	141.17	0.00	1	49	34566.00	1565.69	6 6

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
01JUL80	1052.00	158.36	0.00	1	88	5807.00	1548.52	6 6
01JUL80	1117.00	140.11	0.00	1	99	5832.00	1566.75	6 6
01JUL80	1158.00	141.01	0.00	1	99	5873.00	1565.85	6 6
01JUL80	1309.00	141.39	0.00	1	99	5944.00	1565.47	6 6
01JUL80	1454.00	141.55	0.00	1	99	6049.00	1565.31	6 6
01JUL80	1652.00	141.69	0.00	1	99	6167.00	1565.22	6 6
02JUL80	211.00	141.88	0.00	1	99	6726.00	1564.98	6 6
02JUL80	845.00	141.94	0.00	1	99	7120.00	1564.92	6 6
02JUL80	1337.00	141.87	.15	1	14	7408.00	1564.90	16 14 COMPARE PIEZ.
02JUL80	1335.00	141.93	0.00	1	99	7410.00	1564.93	6 6 COMPARE PIEZ.
02JUL80	2125.00	141.92	0.00	1	99	7880.00	1564.94	6 6
03JUL80	907.00	141.94	0.00	1	99	8582.00	1564.92	6 6
03JUL80	2044.00	141.87	0.00	1	99	9279.00	1565.39	6 6
04JUL80	857.00	142.05	0.00	1	99	10012.00	1564.81	6 6
04JUL80	2043.00	142.02	0.00	1	99	10718.00	1564.84	6 6
05JUL80	826.00	142.16	0.00	1	99	11421.00	1564.70	6 6
05JUL80	2648.00	142.46	0.00	1	99	12163.00	1564.40	6 6
06JUL80	918.00	142.58	0.00	1	99	12913.00	1564.28	6 6
06JUL80	1737.00	142.45	0.00	1	99	13412.00	1564.41	6 6
07JUL80	754.00	142.39	0.00	1	99	14269.00	1564.47	6 6
07JUL80	1641.00	142.34	0.00	1	99	14796.00	1564.52	6 6
08JUL80	942.00	142.73	0.00	1	99	15757.00	1564.13	6 6
08JUL80	2103.00	142.73	0.00	1	99	16498.00	1564.13	6 6
09JUL80	857.00	142.79	0.00	1	99	17212.00	1564.07	6 6
09JUL80	1611.00	142.78	0.00	1	99	17646.00	1564.08	6 6
10JUL80	850.00	142.94	0.00	1	99	18645.00	1563.92	6 6
10JUL80	1734.00	142.91	0.00	1	99	19169.00	1563.95	6 6
11JUL80	923.00	143.09	0.00	1	99	20118.00	1563.77	6 6
11JUL80	1528.00	143.10	0.00	1	99	20723.00	1563.76	6 6
12JUL80	902.00	143.20	0.00	1	99	21537.00	1563.66	6 6
13JUL80	828.00	143.36	0.00	1	99	22943.00	1563.50	6 6
14JUL80	805.00	143.47	0.00	1	99	24358.00	1563.39	6 6
14JUL80	1100.00	142.70	0.00	1	99	24535.00	1564.16	6 6
15JUL80	834.00	143.70	0.00	1	99	25829.00	1563.16	6 6
16JUL80	917.00	143.91	0.00	1	99	27312.00	1562.95	6 6
17JUL80	815.00	144.13	0.00	1	99	28690.00	1562.73	6 6
18JUL80	802.00	144.03	0.00	1	99	30117.00	1562.83	6 6
20JUL80	807.00	144.06	0.00	1	99	33002.00	1562.80	6 6
21JUL80	831.00	144.31	0.00	1	99	34466.00	1562.55	6 6
21JUL80	1008.00	143.52	0.00	1	99	34563.00	1563.34	6 6 RECOVERY @ 10
21JUL80	1011.00	141.17	0.00	1	99	34566.00	1565.69	6 6

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 796085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	
21JUL80	1015.00	139.04	0.00	1	48	34570.00	1567.84	6 6
21JUL80	1019.00	136.93	0.00	1	48	34574.00	1569.95	6 6
21JUL80	1022.00	135.49	0.00	1	48	34577.00	1571.39	6 6
21JUL80	1036.00	130.71	0.00	1	47	34591.00	1576.18	6 6
21JUL80	1047.00	128.27	0.00	1	47	34602.00	1578.62	6 6
21JUL80	1057.00	126.68	0.00	1	47	34612.00	1580.21	6 6
21JUL80	1107.00	125.52	0.00	1	47	34622.00	1581.37	6 6
21JUL80	1116.00	124.63	0.00	1	47	34631.00	1582.26	6 6
21JUL80	1125.00	123.87	0.00	1	47	34640.00	1583.02	6 6
21JUL80	1134.00	123.32	0.00	1	47	34649.00	1583.57	6 6
21JUL80	1142.00	122.85	0.00	1	47	34657.00	1584.04	6 6
21JUL80	1152.00	122.40	0.00	1	47	34667.00	1584.49	6 6
21JUL80	1159.00	122.05	0.00	1	47	34674.00	1584.84	6 6
21JUL80	1209.00	121.72	0.00	1	47	34684.00	1585.17	6 6
21JUL80	1219.00	121.39	0.00	1	47	34694.00	1585.50	6 6
21JUL80	1238.00	120.90	0.00	1	47	34713.00	1585.99	6 6
21JUL80	1258.00	120.48	0.00	1	47	34733.00	1586.41	6 6
21JUL80	1315.00	120.19	0.00	1	47	34750.00	1586.70	6 6
21JUL80	1341.00	119.88	0.00	1	46	34776.00	1587.02	6 6
21JUL80	1404.00	119.65	0.00	1	46	34799.00	1587.25	6 6
21JUL80	1435.00	119.37	0.00	1	46	34830.00	1587.53	6 6
21JUL80	1504.00	119.21	0.00	1	46	34859.00	1587.69	6 6
21JUL80	1539.00	119.00	0.00	1	46	34894.00	1587.90	6 6
21JUL80	1610.00	118.87	0.00	1	46	34925.00	1588.03	6 6
21JUL80	1706.00	118.67	0.00	1	46	34981.00	1588.23	6 6
21JUL80	1810.00	118.46	0.00	1	46	35053.00	1588.44	6 6
21JUL80	1913.00	118.40	0.00	1	46	35108.00	1588.50	6 6
21JUL80	2008.00	118.26	0.00	1	46	35163.00	1588.64	6 6
21JUL80	2127.00	118.16	0.00	1	46	35242.00	1588.74	6 6
21JUL80	2235.00	118.07	0.00	1	46	35310.00	1588.83	6 6
22JUL80	110.00	117.97	0.00	1	46	35465.00	1588.93	6 6
22JUL80	232.00	117.91	0.00	1	46	35547.00	1588.99	6 6
22JUL80	420.00	117.85	0.00	1	46	35655.00	1589.05	6 6
22JUL80	842.00	117.68	0.00	1	46	35917.00	1589.22	6 6
22JUL80	1133.00	117.58	0.00	1	46	36088.00	1589.32	6 6
22JUL80	1515.00	117.42	0.00	1	46	36314.00	1589.48	6 6
22JUL80	1902.00	117.38	0.00	1	46	36537.00	1589.52	6 6
23JUL80	23.00	117.30	0.00	1	46	36856.00	1589.60	6 6
23JUL80	338.00	117.23	0.00	1	46	37053.00	1589.67	6 6
23JUL80	1113.00	115.00	2.13	1	46	37504.00	1589.77	6 6
23JUL80	1927.00	115.00	1.97	1	46	38002.00	1589.93	6 6
24JUL80	840.00	115.00	1.79	1	46	38795.00	1590.11	6 6
24JUL80	1701.00	115.00	1.65	1	46	39296.00	1590.25	6 6

COMMENTS
COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 796085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14F ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
21JUL80	1015.00	139.04	0.00	1	48	34570.00	1567.84	COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL-
21JUL80	1019.00	136.93	0.00	1	48	34574.00	1569.95	TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1022.00	135.49	0.00	1	48	34577.00	1571.39	
21JUL80	1036.00	130.71	0.00	1	47	34591.00	1576.18	
21JUL80	1047.00	128.27	0.00	1	47	34602.00	1578.62	
21JUL80	1057.00	126.68	0.00	1	47	34612.00	1580.21	
21JUL80	1107.00	125.52	0.00	1	47	34622.00	1581.37	
21JUL80	1116.00	124.63	0.00	1	47	34631.00	1582.26	
21JUL80	1125.00	123.87	0.00	1	47	34640.00	1583.02	
21JUL80	1134.00	123.32	0.00	1	47	34649.00	1583.57	
21JUL80	1142.00	122.85	0.00	1	47	34657.00	1584.04	
21JUL80	1152.00	122.40	0.00	1	47	34667.00	1584.49	
21JUL80	1159.00	122.05	0.00	1	47	34674.00	1584.84	
21JUL80	1209.00	121.72	0.00	1	47	34684.00	1585.17	
21JUL80	1219.00	121.39	0.00	1	47	34694.00	1585.50	
21JUL80	1238.00	120.90	0.00	1	47	34713.00	1585.99	
21JUL80	1258.00	120.48	0.00	1	47	34733.00	1586.41	
21JUL80	1315.00	120.19	0.00	1	47	34750.00	1586.70	
21JUL80	1341.00	119.88	0.00	1	46	34776.00	1587.02	
21JUL80	1404.00	119.65	0.00	1	46	34799.00	1587.25	
21JUL80	1435.00	119.37	0.00	1	46	34830.00	1587.53	
21JUL80	1504.00	119.21	0.00	1	46	34859.00	1587.69	
21JUL80	1539.00	119.00	0.00	1	46	34894.00	1587.90	
21JUL80	1610.00	118.87	0.00	1	46	34925.00	1588.03	
21JUL80	1706.00	118.67	0.00	1	46	34981.00	1588.23	
21JUL80	1810.00	118.46	0.00	1	46	35053.00	1588.44	
21JUL80	1913.00	118.40	0.00	1	46	35108.00	1588.50	
21JUL80	2008.30	118.26	0.00	1	46	35163.00	1588.64	
21JUL80	2127.00	118.16	0.00	1	46	35242.00	1588.74	
21JUL80	2235.00	118.07	0.00	1	46	35310.00	1588.83	
22JUL80	110.00	117.97	0.00	1	46	35465.00	1588.93	
22JUL80	232.00	117.91	0.00	1	46	35547.00	1588.99	
22JUL80	420.00	117.85	0.00	1	46	35655.00	1589.05	
22JUL80	842.00	117.68	0.00	1	46	35917.00	1589.22	
22JUL80	1133.00	117.58	0.00	1	46	36088.00	1589.32	
22JUL80	1515.00	117.42	0.00	1	46	36314.00	1589.48	
22JUL80	1902.00	117.38	0.00	1	46	36537.00	1589.52	
23JUL80	23.00	117.30	0.00	1	46	36858.00	1589.60	
23JUL80	538.00	117.23	0.00	1	46	37053.00	1589.67	
23JUL80	1113.00	115.00	2.13	1	46	37508.00	1589.77	
23JUL80	1927.00	115.00	1.97	1	46	38002.00	1589.93	
24JUL80	840.00	115.00	1.79	1	46	38795.00	1590.11	
24JUL80	1701.00	115.00	1.65	1	46	39296.00	1590.25	

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G14P ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1706.92 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
25JUL80	1016.00	115.00	1.58	1	96	40331.00	1590.32	6 6
25JUL80	1530.00	115.00	1.53	1	96	40695.00	1590.37	6 6
26JUL80	806.00	115.00	1.32	1	67	41641.00	1590.45	14 14
27JUL80	945.00	115.00	3.26	1	99	43180.00	1590.59	15 BY O. K. TO 9/2/80
28JUL80	905.00	115.00	3.03	1	99	44580.00	1590.77	15 BY O. K. TO 9/2/80
29JUL80	900.00	115.00	2.99	1	99	46015.00	1590.81	15 BY O. K. TO 9/2/80
30JUL80	1125.00	115.00	2.88	1	99	47600.00	1590.92	15 BY O. K. TO 9/2/80
31JUL80	1446.00	115.00	2.77	1	99	49241.00	1591.03	15 BY O. K. TO 9/2/80
01AUG80	1235.00	115.00	2.70	1	99	50550.00	1591.10	15 BY O. K. TO 9/2/80
03AUG80	816.00	115.00	2.55	1	99	53171.00	1591.21	4 15
05AUG80	1421.00	115.00	2.48	1	99	56416.00	1591.32	4 15
07AUG80	1430.00	115.00	2.36	1	99	59305.00	1591.44	4 15
09AUG80	936.00	115.00	2.32	1	99	61891.00	1591.48	4 15
12AUG80	1329.00	115.00	2.25	1	99	66439.00	1591.55	4 15
14AUG80	1123.00	115.00	2.08	1	99	69198.00	1591.72	4 15
16AUG80	1110.00	115.00	2.10	1	99	72065.00	1591.70	4 15
20AUG80	1930.00	116.42	0.00	1	99	78029.00	1591.98	15
22AUG80	1308.00	117.07	0.00	1	93	80823.00	1592.06	15
02SEP80	941.00	116.71	0.00	1	99	96456.00	1592.09	15
10SEP80	930.00	114.89	0.00	1	15	107965.00	1592.03	15 FOR G.W. MAP

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

BORING LOG G41-G14F

SHEET 1 OF 3

SURFACE ELEV. 1703.5 ft. (519.22m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN.	SAMPLES: REC./ATT.	GROUNDWATER OBSERVATION WELL
0.0		See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy							▼12/11/79 33.07 108.5 Grout (to surface) 84.12 276.0 Bentonite Clay Seal 85.65 281.0 Pea Gravel 88.39 290.0 Pea Gravel 2" Solid PVC Pipe to Surface 2" Slotted PVC Pipe
91.44									
300.0		CONTINUED							CONTINUED

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-203

Drawn jls
Checked

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

BORING LOG G41-G14F

SHEET 2 OF 3

SURFACE ELEV. 17035 ft. (519.22m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN.	SAMPLES: REC./ATT.	GROUNDWATER OBSERVATION WELL
91.44		CONTINUED							CONTINUED
300.0		See borings G41-G14, G41-G14A and G41-G14B for soil stratigraphy							2" Slotted PVC Pipe; Caved Material (Note 1)
94.49									
310.0									Caved Material (Note 1)
101.19									
332.0		END OF BORING							

NOTES

1. Groundwater observation well was placed at 310.0 ft. on caved material. After placement of the PVC well pipe, the borehole caved to 3000 ft.

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-204

Drawn jls
Checked

COOR. N113805 ft. (N34688m)
E2284315 ft. (E696261m)

BORING LOG G41-G14F

SHEET 3 OF 3

SURFACE ELEV. 1703.5 ft. (519.22) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 11/4/79 DATE COMPLETED 11/6/79

DRILL RIG Drilltech D40K DRILLING METHOD Mud Rotary

NOTES (continued)

2. Elevation of top of protector pipe, 1706.9 ft. (520.27).

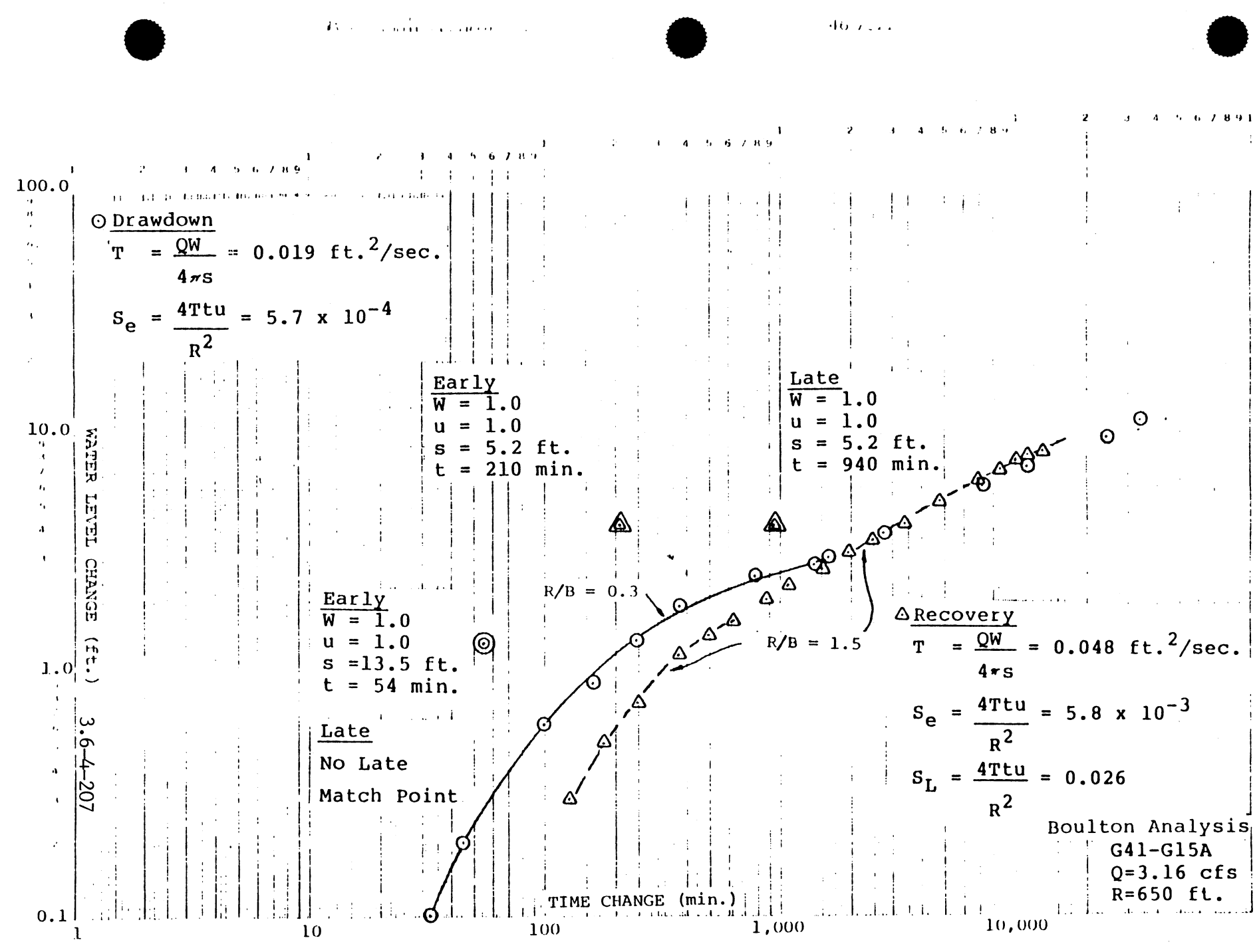
Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

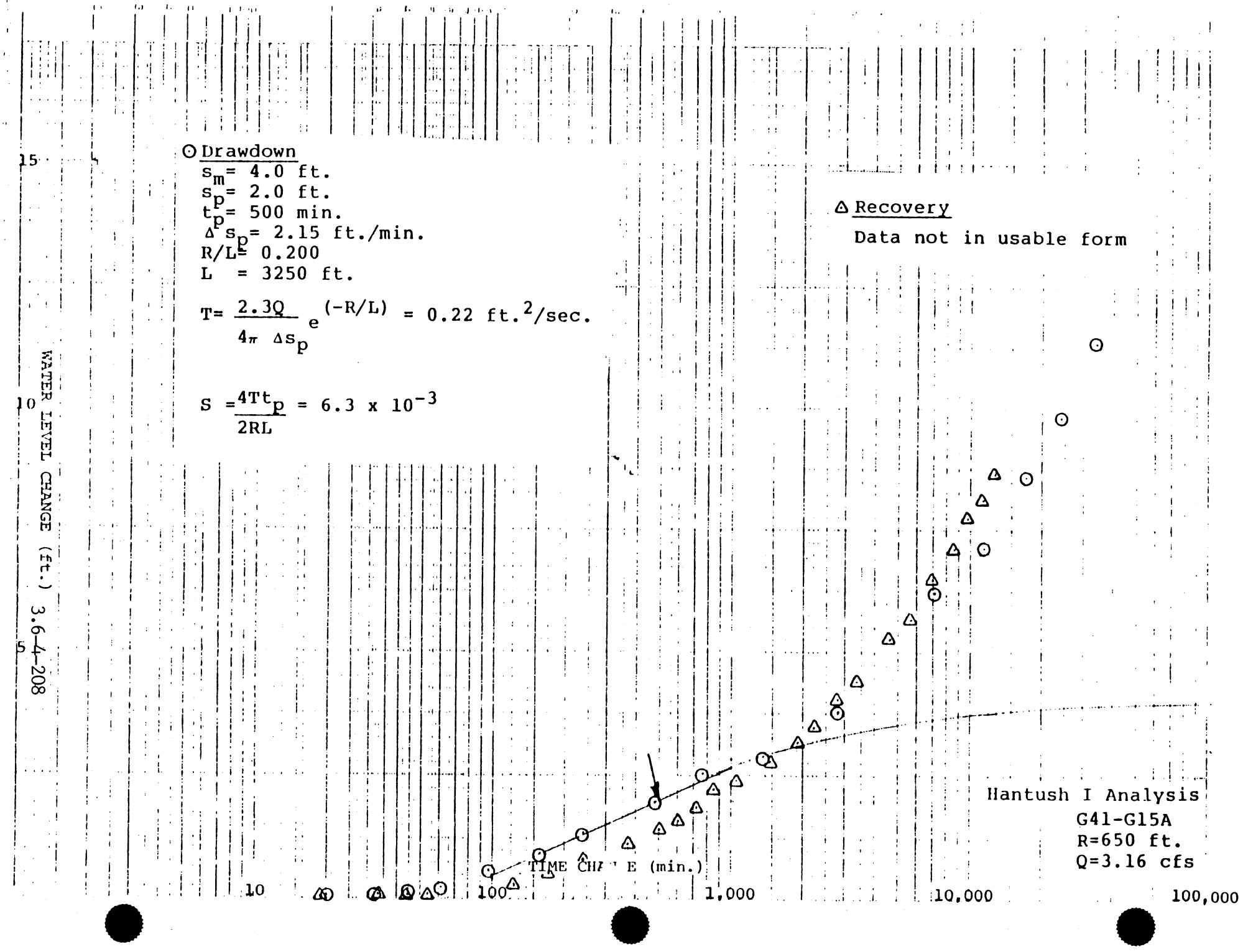
DATE	12/11/79	4/25/80	5/20/80	6/26/80*	9/10/80*		
DEPTH (m)	33.07	33.38	32.74	33.38	33.95		
DEPTH (ft.)	108.5	109.5	107.4	109.5	111.4		

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

APPENDIX B

B-8
G41-G15A
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


⊙ Drawdown
T = QW / 4πs = 0.019 ft.²/sec.
S_e = 4Ttu / R² = 5.7 x 10⁻⁴
Early
W = 1.0
u = 1.0
s = 5.2 ft.
t = 210 min.
Late
W = 1.0
u = 1.0
s = 5.2 ft.
t = 940 min.
Early
W = 1.0
u = 1.0
s =13.5 ft.
t = 54 min.
Late
No Late
Match Point
R/B = 0.3
R/B = 1.5
△ Recovery
T = QW / 4πs = 0.048 ft.²/sec.
S_e = 4Ttu / R² = 5.8 x 10⁻³
S_L = 4Ttu / R² = 0.026
Boulton Analysis
G41-G15A
Q=3.16 cfs
R=650 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000
3.6-4-207


⊙ Drawdown
s_m= 4.0 ft.
s_p= 2.0 ft.
t_p= 500 min.
Δs_p= 2.15 ft./min.
R/L= 0.200
L = 3250 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.22$ ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL} = 6.3 \times 10^{-3}$
△ Recovery
Data not in usable form
Hantush I Analysis
G41-G15A
R=650 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
3.6-4-208

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1530.00	105.60	0.00	1	20	-627515.00	1590.11	
18APR79	1530.00	105.60	0.00	1	20	-627515.00	1590.11	CORRECT TO COLLAR TOP
								GROUND SURFACE-CORR. TO
09NOV79	1200.00	100.80	0.00	1	20	-332525.00	1594.91	
09NOV79	1200.00	100.80	0.00	1	20	-332525.00	1594.91	BY D&M
								BY D&M
12NOV79	1200.00	101.20	0.00	1	20	-328205.00	1594.51	GROUND SURFACE-CORR. TO
03DEC79	1200.00	100.00	0.00	1	20	-297965.00	1595.71	CORRECT TO COLLAR TOP
25APR80	1200.00	101.75	.21	1	14	-90605.00	1593.75	14 - TIME NOT RECORD
20MAY80	600.00	100.85	0.00	1	70	-54965.00	1594.65	14 - NO TIME
21MAY80	1200.00	259.58	0.00	1	7	-53165.00	1594.13	7 - NO TIME
29MAY80	930.00	259.41	0.00	1	7	-41795.00	1594.30	4 7 -REV. CIR.
29MAY80	2250.00	259.37	0.00	1	7	-40995.00	1594.34	4 7 -REV. CIR.
30MAY80	1730.00	259.19	0.00	1	7	-39875.00	1594.52	4 7 -REV. CIR.
31MAY80	945.00	259.51	0.00	1	7	-38900.00	1594.20	4 7 SET CASE
01JUN80	600.00	259.52	0.00	1	7	-37685.00	1594.19	4 7 SET CASE
01JUN80	1525.00	259.30	0.00	1	7	-37120.00	1594.41	4 7 GRAVEL
02JUN80	830.00	259.33	0.00	1	7	-36095.00	1594.38	4 7
03JUN80	1000.00	259.72	0.00	1	7	-34565.00	1593.99	4 7
04JUN80	135.00	260.05	0.00	1	7	-33630.00	1593.66	4 7 AIR DEV.
06JUN80	936.00	259.65	0.00	1	7	-30269.00	1594.06	4 7
06JUN80	1313.00	259.57	0.00	1	7	-30052.00	1594.14	4 7
06JUN80	1708.00	259.83	0.00	1	7	-29817.00	1593.88	4 7 YEL TEST
06JUN80	1849.00	259.92	0.00	1	7	-29716.00	1593.79	4 7 YEL TEST
07JUN80	930.00	259.50	0.00	1	7	-28835.00	1594.21	4 7
08JUN80	900.00	259.93	0.00	1	7	-27425.00	1593.78	4 7
09JUN80	800.00	259.62	0.00	1	7	-26045.00	1594.09	4 7
10JUN80	935.00	278.19	0.00	1	51	-24510.00	1593.57	4 7 NEW CORRECTION
11JUN80	910.00	278.42	0.00	1	51	-23095.00	1593.34	4 7
12JUN80	900.00	278.25	0.00	1	51	-21665.00	1593.51	4 7
13JUN80	815.00	277.99	0.00	1	51	-20270.00	1593.77	4 7
13JUN80	2115.00	277.93	0.00	1	51	-19490.00	1593.83	4 7 DIFF. RULE
14JUN80	835.00	277.92	0.00	1	51	-18810.00	1593.84	4 7
14JUN80	1745.00	277.96	0.00	1	51	-18260.00	1593.80	4 7
15JUN80	820.00	278.16	0.00	1	51	-17385.00	1593.60	4 7
16JUN80	805.00	278.37	0.00	1	51	-15960.00	1593.39	4 7
24JUN80	820.00	278.21	0.00	1	51	-4425.00	1593.55	4 7
25JUN80	815.00	278.14	0.00	1	51	-2990.00	1593.62	4 7
26JUN80	840.00	278.11	0.00	1	51	-1525.00	1593.65	4 7
27JUN80	800.00	278.38	0.00	1	51	-125.00	1593.38	7 7 BEFORE TEST
27JUN80	1020.00	278.25	0.00	1	51	15.00	1593.51	7 7 START @ 10
27JUN80	1025.30	278.42	0.00	1	51	20.00	1593.34	7 7
27JUN80	1037.00	278.48	0.00	1	51	32.00	1593.28	7 7
27JUN80	1050.00	278.58	0.00	1	51	45.00	1593.18	7 7
27JUN80	1106.00	278.62	0.00	1	51	61.00	1593.14	7 7

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	••COMMENTS••
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1142.00	279.00	0.00	1	51	97.00	1592.76	7 7
27JUN80	1212.00	279.19	0.00	1	51	127.00	1592.57	7 7
27JUN80	1245.00	279.30	0.00	1	51	160.00	1592.46	7 7
27JUN80	1407.00	279.76	0.00	1	51	242.00	1592.00	7 7
27JUN80	1500.00	279.90	0.00	1	51	295.00	1591.86	7 7
27JUN80	1544.00	280.04	0.00	1	52	339.00	1591.70	7 7 TIME CORRECTED
27JUN80	1710.00	280.17	0.00	1	52	425.00	1591.57	7 7
27JUN80	1757.00	280.27	0.00	1	52	472.00	1591.47	7 7
27JUN80	1848.00	280.28	0.00	1	52	523.00	1591.46	7 7
27JUN80	1936.00	280.41	0.00	1	52	571.00	1591.33	7 7
27JUN80	2051.00	280.49	0.00	1	52	646.00	1591.25	7 7
27JUN80	2150.00	280.64	0.00	1	52	705.00	1591.10	7 7
28JUN80	45.00	280.64	0.00	1	52	880.00	1591.10	7 7
28JUN80	232.00	280.83	0.00	1	52	987.00	1590.91	7 7
28JUN80	857.00	281.21	0.00	1	52	1372.00	1590.53	9 7
28JUN80	1015.00	281.26	0.00	1	52	1450.60	1590.48	7 7
28JUN80	1204.00	281.38	0.00	1	52	1559.00	1590.36	7 7
28JUN80	1516.00	281.53	0.00	1	52	1751.00	1590.21	7 7
28JUN80	1815.00	281.68	0.00	1	52	1930.00	1590.06	7 7
28JUN80	2342.00	281.83	0.00	1	52	2257.00	1589.91	7 7
29JUN80	827.00	282.24	0.00	1	52	2782.00	1589.50	7 7
29JUN80	1610.00	282.61	0.00	1	52	3245.00	1589.13	7 7
30JUN80	55.00	283.07	0.00	1	52	3770.00	88.67	7 7
30JUN80	844.00	283.35	0.00	1	52	4239.00	1588.39	7 7
30JUN80	1604.00	283.55	0.00	1	52	4679.00	1588.19	7 7
01JUL80	808.00	283.72	0.00	1	52	5643.00	1588.02	7 7
01JUL80	1055.00	283.80	0.00	1	52	5810.00	1587.94	7 7
01JUL80	1200.00	283.76	0.00	1	52	5875.00	1587.98	7 7
01JUL80	1313.00	283.83	0.00	1	52	5948.00	1587.91	7 7
01JUL80	1456.00	283.92	0.00	1	52	6051.00	1587.82	7 7
01JUL80	1646.00	284.02	0.00	1	52	6161.00	1587.72	7 7
02JUL80	214.00	284.37	0.00	1	52	6729.00	1587.37	7 7
02JUL80	847.00	284.63	0.00	1	52	7122.00	1587.11	7 7
02JUL80	1341.00	284.69	0.00	1	52	7416.00	1587.05	7 7 COMPARE PIEZ.
02JUL80	2122.00	284.73	0.00	1	52	7877.00	1587.01	7 7
03JUL80	910.00	284.86	0.00	1	52	8585.00	1586.88	7 7
03JUL80	2042.00	284.96	0.00	1	52	9277.00	1586.78	7 7

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
04JUL80	858.00	285.18	0.00	1	53	10013.00	1586.54	7 7
04JUL80	2040.00	285.23	0.00	1	53	10715.00	1586.49	7 7
05JUL80	829.00	285.51	0.00	1	53	11424.00	1586.21	7 7
05JUL80	2051.00	285.99	0.00	1	53	12166.00	1585.73	7 7
06JUL80	920.00	286.31	0.00	1	53	12915.00	1585.41	7 7
06JUL80	1735.00	286.30	0.00	1	53	13410.00	1585.42	7 7
07JUL80	756.00	286.29	0.00	1	53	14271.00	1585.43	7 7
07JUL80	1643.00	286.29	0.00	1	53	14798.00	1585.43	7 7
08JUL80	845.00	286.67	0.00	1	53	15760.00	1585.05	7 7
08JUL80	2106.00	286.90	0.00	1	53	16501.00	1584.82	7 7
09JUL80	859.00	287.01	0.00	1	53	17214.00	1584.71	7 7
09JUL80	1613.00	287.08	0.00	1	53	17648.00	1584.64	7 7
10JUL80	853.00	287.27	0.00	1	53	18648.00	1584.45	7 7
10JUL80	1731.00	287.33	0.00	1	53	19166.00	1584.39	7 7
11JUL80	925.00	287.49	0.00	1	53	20120.00	1584.23	7 7
11JUL80	1930.00	287.68	0.00	1	53	20725.00	1584.04	7 7
12JUL80	907.00	287.79	0.00	1	53	21542.00	1583.93	7 7
13JUL80	831.00	288.14	0.00	1	53	22946.00	1583.58	7 7
14JUL80	805.00	288.16	0.00	1	53	24360.00	583.56	7 7
14JUL80	1104.00	288.08	0.00	1	53	24539.00	583.64	7 7
15JUL80	837.00	288.34	0.00	1	53	25832.00	583.38	7 7
16JUL80	920.00	288.54	0.00	1	53	27315.00	1583.18	7 7
17JUL80	819.00	288.86	0.00	1	53	28694.00	1582.86	7 7
18JUL80	804.00	289.09	0.00	1	53	30119.00	1582.63	7 7
20JUL80	810.00	289.35	0.00	1	53	33005.00	1582.37	7 7
21JUL80	834.00	289.73	0.00	1	53	34469.00	1581.99	7 7
21JUL80	1024.00	289.72	0.00	1	53	34579.00	1582.00	7 7 RECOVERY @ 10
21JUL80	1038.00	289.66	0.00	1	53	34593.00	1582.06	7 7
21JUL80	1049.00	289.66	0.00	1	53	34604.00	1582.06	7 7
21JUL80	1059.00	289.64	0.00	1	53	34614.00	1582.08	7 7
21JUL80	1109.00	289.62	0.00	1	53	34624.00	1582.10	7 7
21JUL80	1118.00	289.59	0.00	1	53	34633.00	1582.13	7 7
21JUL80	1128.00	289.55	0.00	1	53	34643.00	1582.17	7 7
21JUL80	1136.00	289.51	0.00	1	53	34651.00	1582.21	7 7
21JUL80	1144.00	289.48	0.00	1	53	34659.00	1582.24	7 7
21JUL80	1153.00	289.45	0.00	1	53	34668.00	1582.27	7 7
21JUL80	1201.00	289.45	0.00	1	53	34676.00	1582.27	7 7
21JUL80	1211.00	289.42	0.00	1	53	34686.00	1582.30	7 7
21JUL80	1221.00	289.35	0.00	1	53	34696.00	1582.37	7 7
21JUL80	1240.00	289.29	0.00	1	53	34715.00	1582.43	7 7
21JUL80	1300.00	289.21	0.00	1	53	34735.00	1582.51	7 7
21JUL80	1316.00	289.12	0.00	1	53	34751.00	1582.60	7 7
21JUL80	1344.00	289.04	0.00	1	53	34779.00	1582.68	7 7

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1407.00	288.96	0.00	1	53	34802.00	1582.76	7 7
21JUL80	1439.00	288.89	0.00	1	53	34834.00	1582.88	7 7
21JUL80	1506.00	288.77	0.00	1	53	34861.00	1582.95	7 7
21JUL80	1541.00	288.62	0.00	1	53	34896.00	1583.10	7 7
21JUL80	1612.00	288.53	0.00	1	53	34927.00	1583.19	7 7
21JUL80	1708.00	288.42	0.00	1	53	34983.00	1583.30	7 7
21JUL80	1819.00	288.26	0.00	1	53	35054.00	1583.46	7 7
21JUL80	1915.00	288.20	0.00	1	53	35110.00	1583.52	7 7
21JUL80	2009.00	288.09	0.00	1	53	35164.00	1583.63	7 7
21JUL80	2129.00	287.98	0.00	1	53	35244.00	1583.74	7 7
21JUL80	2240.00	287.90	0.00	1	53	35315.00	1583.82	7 7
22JUL80	111.00	287.76	0.00	1	53	35466.00	1583.96	7 7
22JUL80	235.00	287.65	0.00	1	53	35550.00	1584.07	7 7
22JUL80	425.00	287.54	0.00	1	53	35660.00	1584.18	7 7
22JUL80	844.00	287.22	0.00	1	53	35919.00	1584.50	7 7
22JUL80	1135.00	287.13	0.00	1	53	36090.00	1584.59	7 7
22JUL80	1522.00	286.92	0.00	1	53	36317.00	1584.80	7 7
22JUL80	1903.00	286.75	0.00	1	53	36538.00	1584.97	7 7
23JUL80	25.00	286.49	0.00	1	53	36860.00	1585.23	7 7
23JUL80	340.00	286.42	0.00	1	53	37055.00	1585.30	7 7
23JUL80	1114.00	285.00	1.07	1	53	37509.00	1585.65	7 7
23JUL80	1928.00	285.00	.83	1	53	38003.00	1585.89	7 7
24JUL80	842.00	285.00	.96	1	53	38797.00	1586.26	7 7
24JUL80	1703.00	285.00	.18	1	53	39298.00	1586.54	7 7
25JUL80	1018.00	280.00	4.93	1	52	40333.00	1586.81	7 7
25JUL80	1532.00	280.00	4.82	1	52	40647.00	1586.92	7 7
26JUL80	810.00	105.00	3.20	1	65	41645.00	1587.41	14 14
27JUL80	939.00	110.00	.15	1	93	43174.00	1587.77	15 BY D. K. TO 9/22/80
28JUL80	753.00	105.00	4.72	1	92	44568.00	1588.19	15 BY D. K. TO 9/22/80
29JUL80	853.00	105.00	4.58	1	92	46008.00	1588.33	15 BY D. K. TO 9/22/80
30JUL80	1136.00	105.00	4.33	1	92	47611.00	1588.58	15 BY D. K. TO 9/22/80
31JUL80	1454.00	105.00	4.05	1	92	49249.00	1588.86	15 BY D. K. TO 9/22/80
01AUG80	1744.00	105.00	3.85	1	92	50559.00	1589.06	15 BY D. K. TO 9/22/80
03AUG80	804.00	105.00	3.53	1	92	53159.00	1589.38	4 15
05AUG80	1415.00	105.00	3.24	1	92	56410.00	1589.67	4 15
07AUG80	1423.00	105.00	3.08	1	92	59298.00	1589.83	4 15
09AUG80	925.00	105.00	3.00	1	92	61880.00	1589.91	4 15
12AUG80	1318.00	105.00	2.69	1	92	66433.00	1590.27	4 15
14AUG80	1118.00	105.00	2.52	1	92	69193.00	1590.59	4 15
16AUG80	1055.00	105.00	2.35	1	92	72050.00	1590.56	4 15
20AUG80	1427.00	106.78	0.00	1	92	78022.00	1591.13	15
22AUG80	1303.00	107.18	0.00	1	92	80818.00	1590.73	15
02SEP80	936.00	106.45	0.00	1	92	96451.00	1591.46	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
10SEP80	935.00	104.18	0.00	1	15	107970.00	1591.53	COLLAR ELEV 1695.71 FEET PIEZO ELEV 0.00 -NULL- TIME PUMP TEST BEGAN = 27JUN80-1005.00 15 FOR G.W. MAP

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

BORING LOG G41-G15A

SHEET 1 OF 5

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.0		Brown, SAND and GRAVEL, some cobbles and boulders	SP to GP						
1.22									
4.0		Brown, fine to coarse SAND, some fine gravel, some silt, trace clay	SM	-	1	DO	Push	18/13	
				-	2	DO	Push	12/12	
4.[illegible]									
15.0		Brown, fine to coarse gravelly, silty, fine to coarse SAND	SM	-	3	DO	Push	12/17	
6.10									
20.0		Brown, fine to coarse SAND, some fine gravel, some silt, trace clay	SM	-	4	DO	Push	12/12	
				-	5	DO	Push	5/6	
9.45									
31.0		CONTINUED							

Job No 786035
Scale 1"=5'

Golder Associates 3.6-4-214

Drawn jls
Checked DCB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

BORING LOG G41-G15A

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
9.45		CONTINUED							
31.0		Brown, fine to coarse SAND, some fine gravel, some silt, trace clay	SM	-	6	DO	Push	3/3	
11.58				-	7	DO	Push	2/2	
38.0		Brown, fine to coarse sandy, fine to coarse GRAVEL, some silt, some clay	GM						
13.11									
43.0		Brown to red-brown, fine to coarse SAND, some silt, some to trace fine to coarse gravel, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt	SM to GM						
20.12									
66.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-215

Drawn jls
Checked JCB

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

BORING LOG G41-G15A

SHEET 3 OF 5

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES: REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
20.12		CONTINUED							
66.0		Brown to red-brown, fine to coarse SAND, some silt, some to trace fine to coarse gravel, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt	SM to GM						Grout (to surface)
29.26									27.13 / 89.0 Bentonite Clay Seal
96.0		Red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay	SM						28.04 / 92.0 Pea Gravel
30.79									2" Solid PVC Pipe to Surface
101.0		CONTINUED							CONTINUED

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-216

Drawn jls
Checked

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

BORING LOG G41-G15A

SHEET 4 OF 5

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS.	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
30.79		CONTINUED							CONTINUED
101.0		Red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay	SM	-	8	DO	Air Hammer	18/18	30.94 101.5 ▼ 31.27 ≈ 102.6 4/18/79 2" Slotted PVC pipe Pea Gravel
33.22				-	9	DO	Air Hammer	18/18	
109.0		Red-brown, silty fine to coarse SAND, trace fine to coarse gravel, trace clay	SM	-	10	DO	Air Hammer	18/18	33.00 111.5 Note 2
34.44									
113.0		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler pushed with drilling rig. (Samples 1 - 7)

   Penetration Test - 3" O.D. sampler driven with air hammer. (Samples 8 - 10)

2. PERMEABILITY TEST NUMBER 1
   Drove 6" casing from 96.0' to 111.5' leaving 2.0' above ground.
   Cleaned hole to 111.5' with water.
   Blew water out of hole to conduct rising head permeability test.
   After 40 minutes, water had risen 1.0' in the hole to 110.5'.
   Drove 3" O.D. split tube sampler from 111.5' to 113.0'.
   Filled 6" casing with water (2.0' above ground) to conduct falling head test.
   After 15 minutes, water level in casing dropped 0.02'. Test terminated.

3. Elevation of top of protector pipe, 1695.7 ft. (516.85m).

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-217

Drawn jls
Checked

COOR. N113480 ft. (N34588m)
E2284390 ft. (E696283m)

BORING LOG G41-G15A

SHEET 5 OF 5

SURFACE ELEV. 1692.8 ft. (515.95m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/6/79 DATE COMPLETED 3/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	4/18/79	11/9/79	11/12/79	12/3/79	4/25/80	5/20/80	6/26/80*
DEPTH (m)	31.27	29.81	29.93	29.57	30.11	30.08	30.21
DEPTH (ft.)	102.6	97.8	98.2	97.0	98.8	98.7	99.1

DATE	9/10/80*						
DEPTH (m)	30.85						
DEPTH (ft.)	101.2						

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

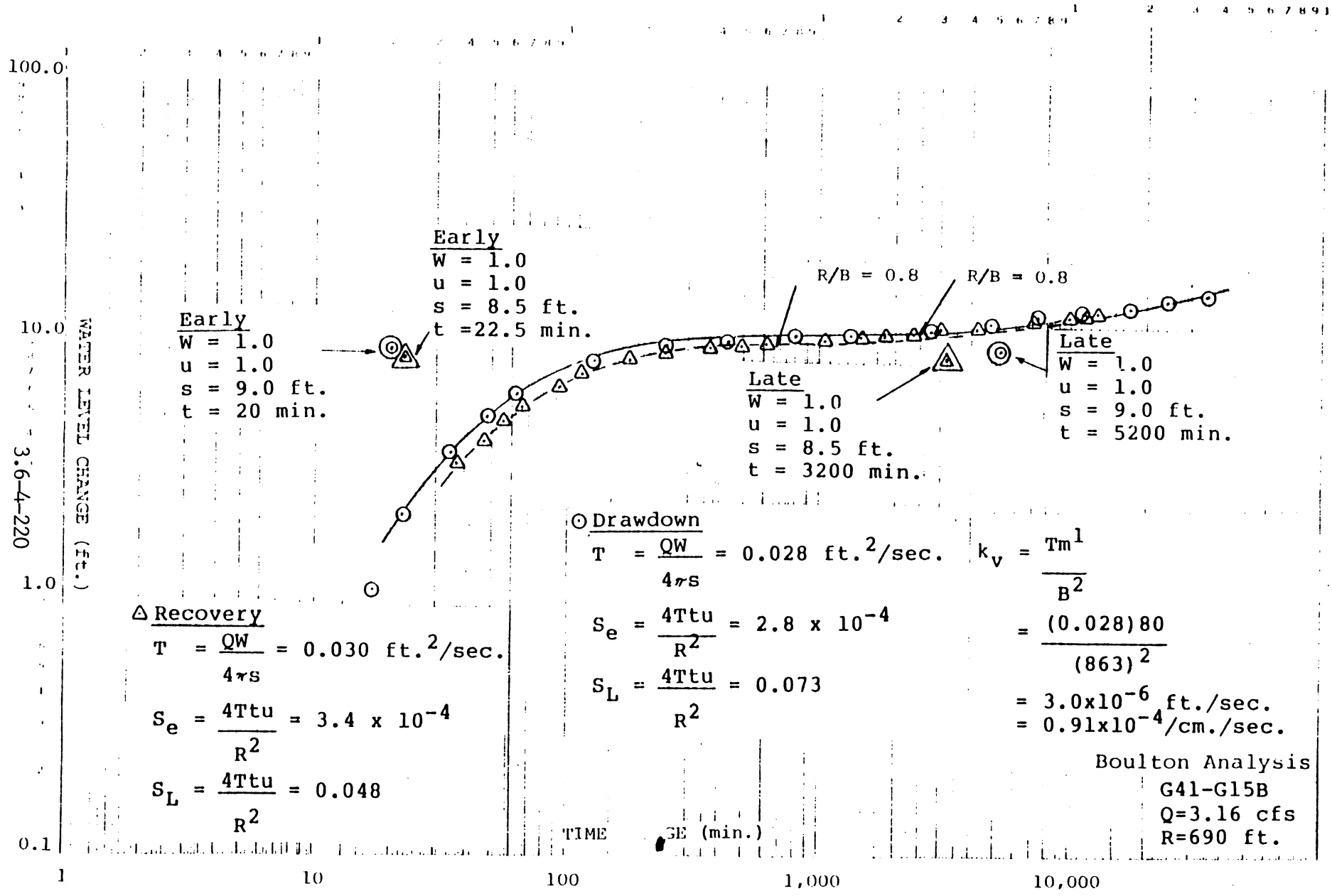
Job No. 786085
Scale 1"=5'

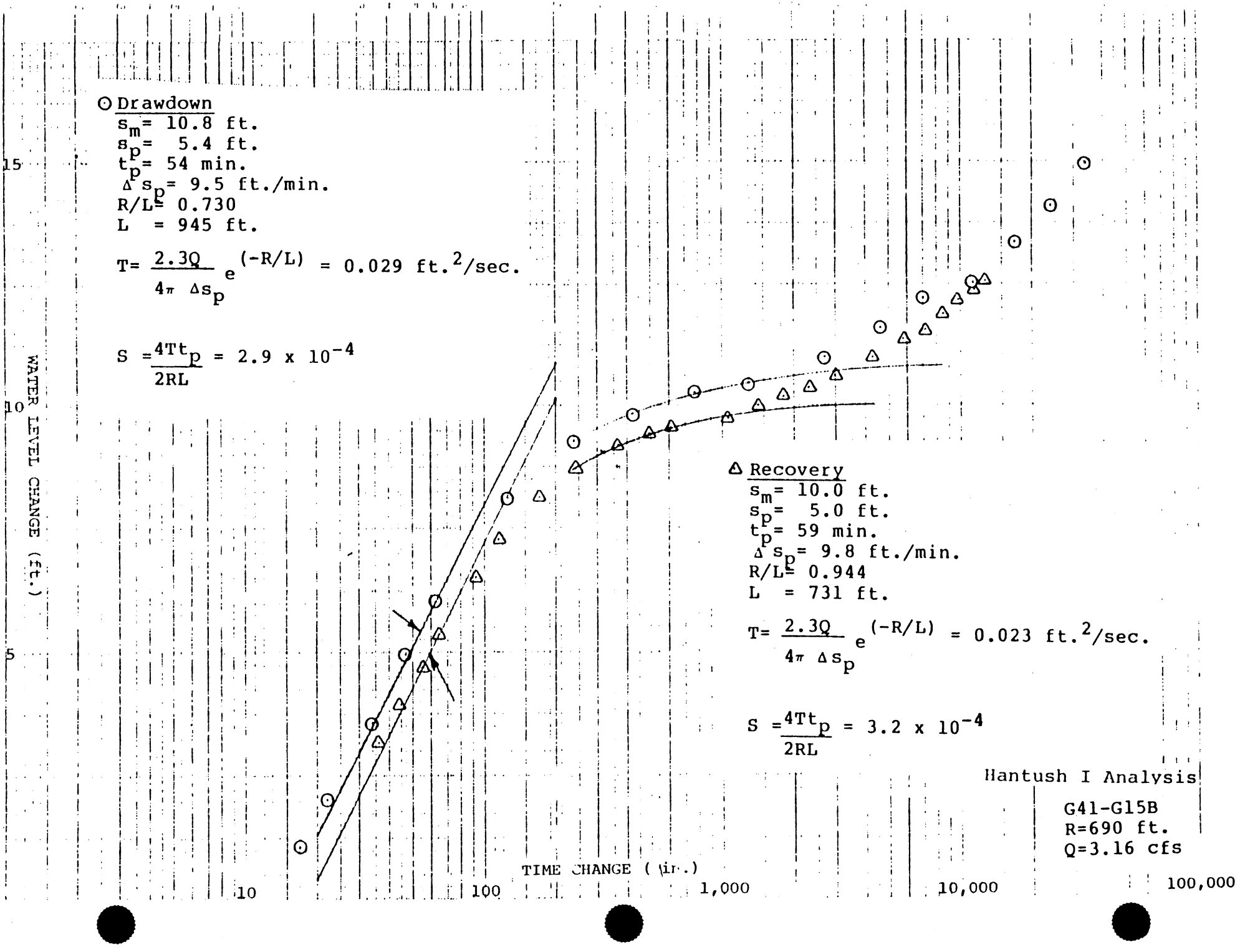
Golder Associates 3.6-4-218

Drawn JEF
Checked DAB

APPENDIX B

B-9
G41-G15B
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


100.0
10.0
1.0
0.1
WATER LEVEL CHANGE (ft.)
3.6-4-220
1
10
100
1,000
10,000
TIME (min.)
Early
W = 1.0
u = 1.0
s = 9.0 ft.
t = 20 min.
Early
W = 1.0
u = 1.0
s = 8.5 ft.
t =22.5 min.
R/B = 0.8
R/B = 0.8
Late
W = 1.0
u = 1.0
s = 8.5 ft.
t = 3200 min.
Late
W = 1.0
u = 1.0
s = 9.0 ft.
t = 5200 min.
△ Recovery
T = QW/4πs = 0.030 ft.²/sec.
Se = 4Ttu/R² = 3.4 x 10⁻⁴
SL = 4Ttu/R² = 0.048
⊙ Drawdown
T = QW/4πs = 0.028 ft.²/sec.
Se = 4Ttu/R² = 2.8 x 10⁻⁴
SL = 4Ttu/R² = 0.073
kv = Tm¹/B²
= (0.028)80/(863)²
= 3.0x10⁻⁶ ft./sec.
= 0.91x10⁻⁴/cm./sec.
Boulton Analysis
G41-G15B
Q=3.16 cfs
R=690 ft.


⊙ Drawdown
s_m= 10.8 ft.
s_p= 5.4 ft.
t_p= 54 min.
Δs_p= 9.5 ft./min.
R/L= 0.730
L = 945 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.029 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.9 x 10^{-4}
△ Recovery
s_m= 10.0 ft.
s_p= 5.0 ft.
t_p= 59 min.
Δs_p= 9.8 ft./min.
R/L= 0.944
L = 731 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.023 ft.²/sec.
$S = \frac{4Tt_p}{2RL}$ = 3.2 x 10^{-4}
Hantush I Analysis
G41-G15B
R=690 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G150 ***

DATE	TIME	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
DDMONYY	HHMM.SS							
								COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
17APR79	1230.00	105.20	0.00	1	20	-629135.00	1589.52	
17APR79	1230.00	105.20	0.00	1	20	-629135.00	1589.52	
								CORRECT TO COLLAR TOP
09NOV79	1030.00	100.00	0.00	1	20	-332615.00	1594.72	GROUND SURFACE-CORR. TO
09NOV79	1030.00	100.00	0.00	1	20	-332615.00	1594.72	
								BY D&M
12NOV79	1200.00	101.10	0.00	1	20	-328205.00	1593.62	BY D&M
03DEC79	1200.00	99.70	0.00	1	20	-297965.00	1595.02	GROUND SURFACE-CORR. TO
25APR80	1200.00	100.90	.21	1	14	-90605.00	1593.61	CORRECT TO COLLAR TOP
20MAY80	600.00	101.69	0.00	1	70	-54965.00	1592.87	14 - TIME NOT RECORD
21MAY80	1200.00	335.59	0.00	1	8	-53165.00	1593.87	14 - NO TIME
29MAY80	930.00	335.44	0.00	1	8	-41795.00	1594.02	8 - NO TIME
29MAY80	2250.00	335.50	0.00	1	8	-40995.00	1593.96	4 8 -REV. CIR.
30MAY80	1730.00	335.35	0.00	1	8	-39875.00	1594.11	4 8 -REV. CIR.
31MAY80	945.00	335.56	0.00	1	8	-38900.00	1593.90	4 8 -REV. CIR.
01JUN80	600.00	335.54	0.00	1	8	-37685.00	1593.92	4 8 SET CASE
01JUN80	1525.00	335.38	0.00	1	8	-37120.00	1594.08	4 8 SET CASE
02JUN80	830.00	335.38	0.00	1	8	-36095.00	1594.08	4 8
03JUN80	915.00	335.61	0.00	1	8	-34610.00	1593.85	4 8
04JUN80	135.00	336.16	0.00	1	8	-33630.00	1593.30	4 8
06JUN80	938.00	336.00	0.00	1	8	-30267.00	1593.46	4 8 AIR DEV.
06JUN80	1118.00	336.21	0.00	1	8	-30167.00	1593.25	4 8
06JUN80	1315.00	335.72	0.00	1	8	-30050.00	1593.74	4 8
06JUN80	1710.00	337.42	0.00	1	8	-29815.00	1592.04	4 8
06JUN80	1851.00	337.58	0.00	1	8	-29719.00	1591.88	4 8 VEL TEST
07JUN80	930.00	335.52	0.00	1	8	-28835.00	1593.94	4 8 VEL TEST
08JUN80	900.00	335.87	0.00	1	8	-27425.00	1593.59	4 8
09JUN80	800.00	335.54	0.00	1	8	-26045.00	1593.92	4 8
10JUN80	935.00	335.73	0.00	1	8	-24518.00	1593.73	4 8
11JUN80	910.00	335.90	0.00	1	8	-23095.00	1593.56	4 8
12JUN80	900.00	335.78	0.00	1	8	-21665.00	1593.68	4 8
13JUN80	815.00	335.57	0.00	1	8	-20270.00	1593.89	4 8
13JUN80	2115.00	335.50	0.00	1	8	-19490.00	1593.96	4 8
14JUN80	835.00	335.54	0.00	1	8	-18810.00	1593.92	4 8 DIFF. RULE
14JUN80	1745.00	335.61	0.00	1	8	-18260.00	1593.85	4 8
15JUN80	820.00	335.71	0.00	1	8	-17385.00	1593.75	4 8
16JUN80	805.00	335.87	0.00	1	8	-15960.00	1593.59	4 8
24JUN80	820.00	335.78	0.00	1	8	-9425.00	1593.68	4 8
25JUN80	815.00	335.72	0.00	1	8	-29	1593.74	4 8
26JUN80	840.00	335.61	0.00	1	8	-15	1593.85	4 8
27JUN80	815.00	335.87	0.00	1	8	-1 0	1593.59	16 8 BEFORE TEST
27JUN80	1022.60	337.21	0.00	1	8	.0	1592.25	8 8 START @ 10
27JUN80	1027.00	337.90	0.00	1	8	22.0	1591.56	1 8
27JUN80	1039.00	339.43	0.00	1	8	34.0	1590.03	8 8
27JUN80	1052.00	340.80	0.00	1	8	47.0	1588.6	8 8

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15B ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1694.72 FEET PIEZC ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	1108.00	341.95	0.00	1	8	63.00	1587.53	A B
27JUN80	1143.00	343.33	0.00	1	8	98.00	1586.13	B B
27JUN80	1213.00	343.99	0.00	1	8	128.00	1585.47	A B
27JUN80	1248.00	344.48	0.00	1	8	163.00	1584.98	A B
27JUN80	1337.00	344.93	0.00	1	8	212.00	1584.53	B B
27JUN80	1409.00	345.19	0.00	1	56	244.00	1584.30	A B
27JUN80	1501.00	345.44	0.00	1	56	296.00	1584.05	A B
27JUN80	1545.00	345.61	0.00	1	56	340.00	1583.88	A B TIME CORRECTED
27JUN80	1711.00	345.77	0.00	1	56	426.00	1583.72	B B
27JUN80	1758.00	345.90	0.00	1	56	473.00	1583.59	B B
27JUN80	1847.00	345.90	0.00	1	56	522.00	1583.59	A B
27JUN80	1939.00	345.94	0.00	1	56	574.00	1583.55	A B
27JUN80	2052.00	346.00	0.00	1	56	647.00	1583.49	B B
27JUN80	2152.00	346.13	0.00	1	56	707.00	1583.36	B B
27JUN80	2311.00	346.15	0.00	1	56	786.00	1583.34	A B
28JUN80	47.00	346.11	0.00	1	56	882.00	1583.38	A B
28JUN80	234.00	346.17	0.00	1	56	989.00	1583.32	B B
28JUN80	549.00	346.26	0.00	1	56	1184.00	1583.23	B B
28JUN80	753.00	346.37	0.00	1	56	1308.00	1583.12	B B
28JUN80	1016.00	346.37	0.00	1	56	1451.00	1583.12	B B
28JUN80	1202.00	346.51	0.00	1	56	1557.00	1582.98	B B
28JUN80	1517.00	346.58	0.00	1	56	1752.00	1582.91	A B
28JUN80	1816.00	346.63	0.00	1	56	1931.00	1582.86	B B
28JUN80	2344.00	346.73	0.00	1	56	2259.00	1582.76	A B
29JUN80	828.00	346.89	0.00	1	56	2783.00	1582.60	B B
29JUN80	1612.00	347.11	0.00	1	56	3247.00	1582.38	B B
30JUN80	58.00	347.38	0.00	1	56	3773.00	1582.11	B B
30JUN80	846.00	347.42	0.00	1	56	4241.00	1582.07	B B
30JUN80	1606.00	347.53	0.00	1	56	4681.00	1581.96	B B
01JUL80	810.00	347.55	0.00	1	56	5645.00	1581.9	B B
01JUL80	1056.00	346.40	0.00	1	56	5811.00	1583.0	A B
01JUL80	1202.00	347.35	0.00	1	56	5877.00	1582.1	B B
01JUL80	1314.00	347.56	0.00	1	56	5949.00	1581.9	A B
01JUL80	1457.00	347.67	0.00	1	56	6052.0	1581.82	B B
01JUL80	1642.00	347.71	0.00	1	56	6157.	1581.78	A B
02JUL80	217.00	348.00	0.00	1	56	6732	1581.49	B B
02JUL80	850.00	348.10	0.00	1	56	7125.	1581.39	B B

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TYPE OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G158 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
02JUL80	1345.00	113.19	0.00	1	66	7420.00	1581.39	16 16 COMPARE PIEZ.
02JUL80	1346.00	348.04	0.00	1	56	7421.00	1581.45	8 8 COMPARE PIEZ.
02JUL80	2118.00	348.06	0.00	1	56	7873.00	1581.43	8 8
03JUL80	912.00	348.13	0.00	1	56	8587.00	1581.36	8 8
03JUL80	2041.00	348.14	0.00	1	56	9276.00	1581.35	8 8
04JUL80	859.00	348.30	0.00	1	56	10014.00	1581.19	8 8
04JUL80	2039.00	348.27	0.00	1	56	10714.00	1581.22	8 8
05JUL80	830.00	348.44	0.00	1	56	11425.00	1581.05	8 8
05JUL80	2053.00	348.78	0.00	1	56	12168.00	1580.71	8 8
06JUL80	922.00	348.91	0.00	1	56	12917.00	1580.58	8 8
06JUL80	1733.00	348.86	0.00	1	56	13408.00	1580.63	8 8
07JUL80	758.00	348.78	0.00	1	56	14273.00	1580.71	8 8
07JUL80	1645.00	348.78	0.00	1	56	14800.00	1580.71	8 8
08JUL80	846.00	349.14	0.00	1	56	15761.00	1580.35	8 8
08JUL80	2107.00	349.19	0.00	1	56	16502.00	1580.30	8 8
09JUL80	900.00	349.26	0.00	1	56	17215.00	1580.23	8 8
09JUL80	1615.00	349.22	0.00	1	56	17650.00	1580.27	8 8
10JUL80	855.00	349.38	0.00	1	56	18650.00	1580.11	8 8
10JUL80	1728.00	349.37	0.00	1	56	19163.00	1580.12	8 8
11JUL80	927.00	349.59	0.00	1	56	20122.00	1579.90	8 8
11JUL80	1932.00	349.61	0.00	1	56	20727.00	1579.88	8 8
12JUL80	910.00	349.70	0.00	1	56	21545.00	1579.79	8 8
13JUL80	833.00	349.94	0.00	1	56	22948.00	1579.55	8 8
14JUL80	806.00	350.00	0.00	1	56	24361.00	1579.49	8 8
14JUL80	1105.00	349.96	0.00	1	56	24540.00	1580.03	8 8
15JUL80	838.00	350.10	0.00	1	56	25833.00	1579.39	8 8
16JUL80	922.00	350.28	0.00	1	56	27317.00	1579.21	8 8
17JUL80	818.00	350.48	0.00	1	56	28693.00	1579.01	8 8
18JUL80	806.00	350.48	0.00	1	56	30121.00	1579.01	8 8
20JUL80	811.00	350.57	0.00	1	56	33006.00	1578.92	8 8
21JUL80	835.00	350.85	0.00	1	56	34470.00	1578.64	8 8
21JUL80	1041.00	114.71	0.00	1	81	34596.00	1581.8.	16 16 RECOVERY # 10
								REPLACED INSTRUMENT
21JUL80	1051.00	113.94	0.00	1	81	34606.00	1582.6	16 16
21JUL80	1100.00	113.20	0.00	1	81	34615.00	1583.34	16 16
21JUL80	1110.00	112.53	0.00	1	81	34625.00	1584.01	16 16
21JUL80	1120.00	112.02	0.00	1	81	34635.	1584.52	16 16
21JUL80	1129.00	111.68	0.00	1	81	34644.	1584.86	16 16
21JUL80	1137.00	111.37	0.00	1	81	34652.00	1585.17	16 16
21JUL80	1145.00	111.06	0.00	1	81	34660.00	1585.48	16 16
21JUL80	1154.00	110.83	0.00	1	81	34669.00	1585.71	16 16
21JUL80	1202.00	110.62	0.00	1	81	34677.00	1585.92	16 16
21JUL80	1212.00	110.43	0.00	1	81	34687.00	1586.11	16 16
21JUL80	1222.00	110.29	0.00	1	81	34697.00	1586.25	16 16

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G150 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DD*ONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NULL- TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1241.00	110.00	0.00	1	81	34716.00	1586.54	16 16
21JUL80	1301.00	109.75	0.00	1	81	34736.00	1586.79	16 16
21JUL80	1318.00	109.53	0.00	1	81	34753.00	1587.01	16 16
21JUL80	1345.00	109.39	0.00	1	81	34780.00	1587.15	16 16
21JUL80	1408.00	109.17	0.00	1	81	34803.00	1587.37	16 16
21JUL80	1438.00	109.07	0.00	1	81	34833.00	1587.47	16 16
21JUL80	1507.00	108.89	0.00	1	81	34862.00	1587.65	16 16
21JUL80	1543.00	108.79	0.00	1	81	34898.00	1587.75	16 16
21JUL80	1613.00	108.70	0.00	1	81	34928.00	1587.84	16 16
21JUL80	1709.00	108.60	0.00	1	81	34984.00	1587.94	16 16
21JUL80	1820.00	108.46	0.00	1	81	35055.00	1588.08	16 16
21JUL80	1916.00	108.42	0.00	1	81	35111.00	1588.12	16 16
21JUL80	2011.00	108.32	0.00	1	81	35166.00	1588.22	16 16
21JUL80	2131.00	108.26	0.00	1	81	35246.00	1588.28	16 16
21JUL80	2241.00	108.21	0.00	1	81	35316.00	1588.33	16 16
22JUL80	113.00	108.07	0.00	1	81	35968.00	1588.47	16 16
22JUL80	237.00	108.00	0.00	1	81	35552.00	1588.54	16 16
22JUL80	428.00	107.94	0.00	1	81	35663.00	1588.60	16 16
22JUL80	845.00	107.77	0.00	1	81	35920.00	1588.77	16 16
22JUL80	1137.00	107.76	0.00	1	81	36092.00	1588.78	16 16
22JUL80	1523.00	107.60	0.00	1	81	36318.00	1588.94	16 16
22JUL80	1905.00	107.53	0.00	1	81	36540.00	1589.[illegible]	16 16
23JUL80	26.00	107.46	0.00	1	81	36661.00	1589.	16 16
23JUL80	341.00	107.41	0.00	1	81	37056.00	1589.	16 16
23JUL80	1115.00	105.00	2.24	1	81	37510.00	1589.	16 16
23JUL80	1928.00	105.00	2.08	1	81	38003.00	1589.46	16 16
24JUL80	843.00	105.00	1.91	1	81	38798 [illegible]	1589.63	16 16
24JUL80	1704.00	105.00	1.74	1	81	39299 [illegible]	1589.80	16 16
25JUL80	1019.00	105.00	1.71	1	81	40334 [illegible]	1589.83	16 16
25JUL80	1533.00	105.00	1.68	1	81	40648.00	1589.86	16 16
26JUL80	812.00	100.00	4.52	1	70	41647.00	1589.99	14 14
27JUL80	930.00	105.00	1.77	1	92	43165.00	1590.15	15 BY D. K. TO 9/2/80
28JUL80	856.00	105.00	1.58	1	92	44571.00	1590.34	15 BY D. K. TO 9/2/80
29JUL80	856.00	105.00	1.52	1	92	46011.00	1590.40	15 BY D. K. TO 9/2/80
30JUL80	1140.00	105.00	1.40	1	92	47615.00	1590.52	15 BY D. K. TO 9/2/80
31JUL80	1458.00	105.00	1.26	1	92	49253.00	1590.66	15 BY D. K. TO 9/2/80
01AUG80	1248.00	105.00	1.20	1	92	50563.00	1590.72	15 BY D. K. TO 9/2/80
03AUG80	809.00	105.00	1.05	1	92	53164.00	1590.87	4 15
05AUG80	1418.00	105.00	.92	1	92	56413.00	1591.00	4 15
07AUG80	1426.00	105.00	.81	1	92	59301.00	1591.11	4 15
09AUG80	930.00	105.00	.78	1	92	61685.00	1691.14	4 15
12AUG80	1321.00	105.00	.62	1	92	66436.00	1591.30	4 15
14AUG80	1115.00	105.00	.48	1	92	69190.00	1591.44	4 15

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN- 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 7860B5 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15R ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1694.72 FEET PIEZO ELEV 0.00 -NOLL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
16AUG80	1058.00	105.00	.50	1	92	72052.00	1591.42	9 15
20AUG80	1425.00	105.24	0.00	1	92	78020.00	1591.68	15
22AUG80	1306.00	105.43	0.00	1	92	80821.00	1591.49	15
02SEP80	935.00	105.14	0.00	1	92	96450.00	1591.78	15
10SEP80	940.00	102.81	0.00	1	15	107975.00	1591.91	15 FOR G.W. MAP

COOR. N113440 ft. (N34577m)
E2284385 ft. (E696282m)

BORING LOG G41-G15B

SHEET 1 OF 2

SURFACE ELEV 1692.1 ft. (515.75m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/9/79 DATE COMPLETED 3/13/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Casing and Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
		See borings G41-G15 and G41-G15A for soil stratigraphy Boulder encountered in this hole at 147'							4/17/79 31.22 102.6 Grout (to surface) 43.59 143.0 Bentonite Clay Seal 44.50 146.0 2" Solid PVC Pipe to Surface Pea Gravel 48.16 158.0 Pea Gravel 2" Slotted PVC Pipe 51.21 168.0
48.77									
160.0		Brown, fine to coarse GRAVEL and fine to coarse SAND, trace silt	GP GM	-	1	DO	Air Hammer	18/18	
				-	2	DO	Air Hammer	18/18	
51.82									51.82 170.0
170.0		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Mud Rotary to 141.0'. Advanced 6" casing to 147.0' and encountered boulder. Drilled past boulder but could not advance casing.

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-227

Drawn jls
Checked DB

COOR. N113440 ft. (N34577m)
E2284385 ft. (E696282m)

BORING LOG G41-G15B

SURFACE ELEV. 1692.1 ft. (515.75m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/9/79 DATE COMPLETED 3/13/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Casing and Mud Rotary

NOTES (continued)

3. Elevation of top of protector pipe, 1694.7 ft. (516.55m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

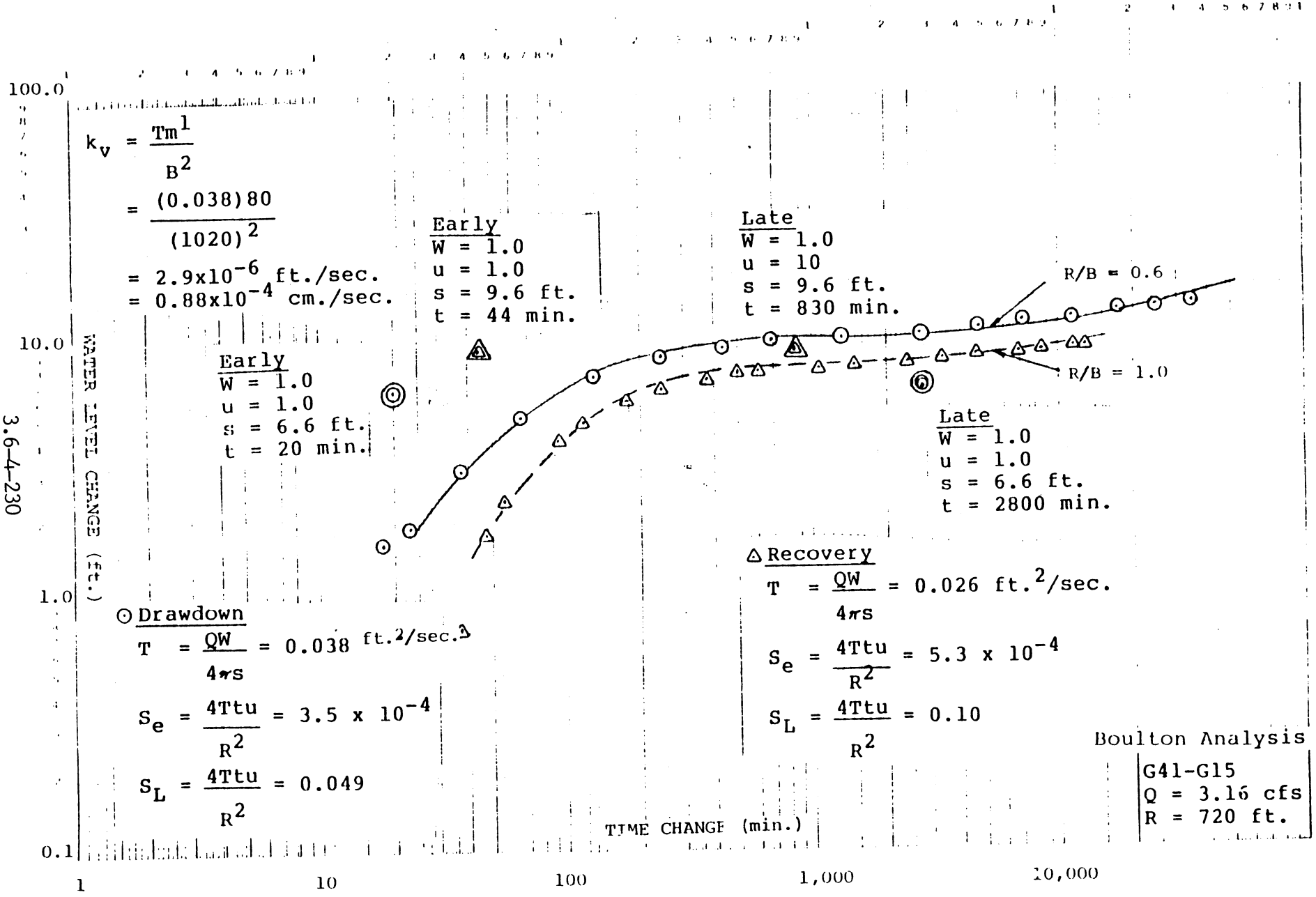
DATE	4/17/79	11/9/79	11/12/79	12/3/79	4/25/80	5/20/80	6/26/80*
DEPTH (m)	31.27	29.69	30.02	29.60	29.96	29.93	29.93
DEPTH (ft.)	102.6	97.4	98.5	97.1	98.3	98.2	98.2

DATE	9/10/80*					
DEPTH (m)	30.54					
DEPTH (ft.)	100.2					

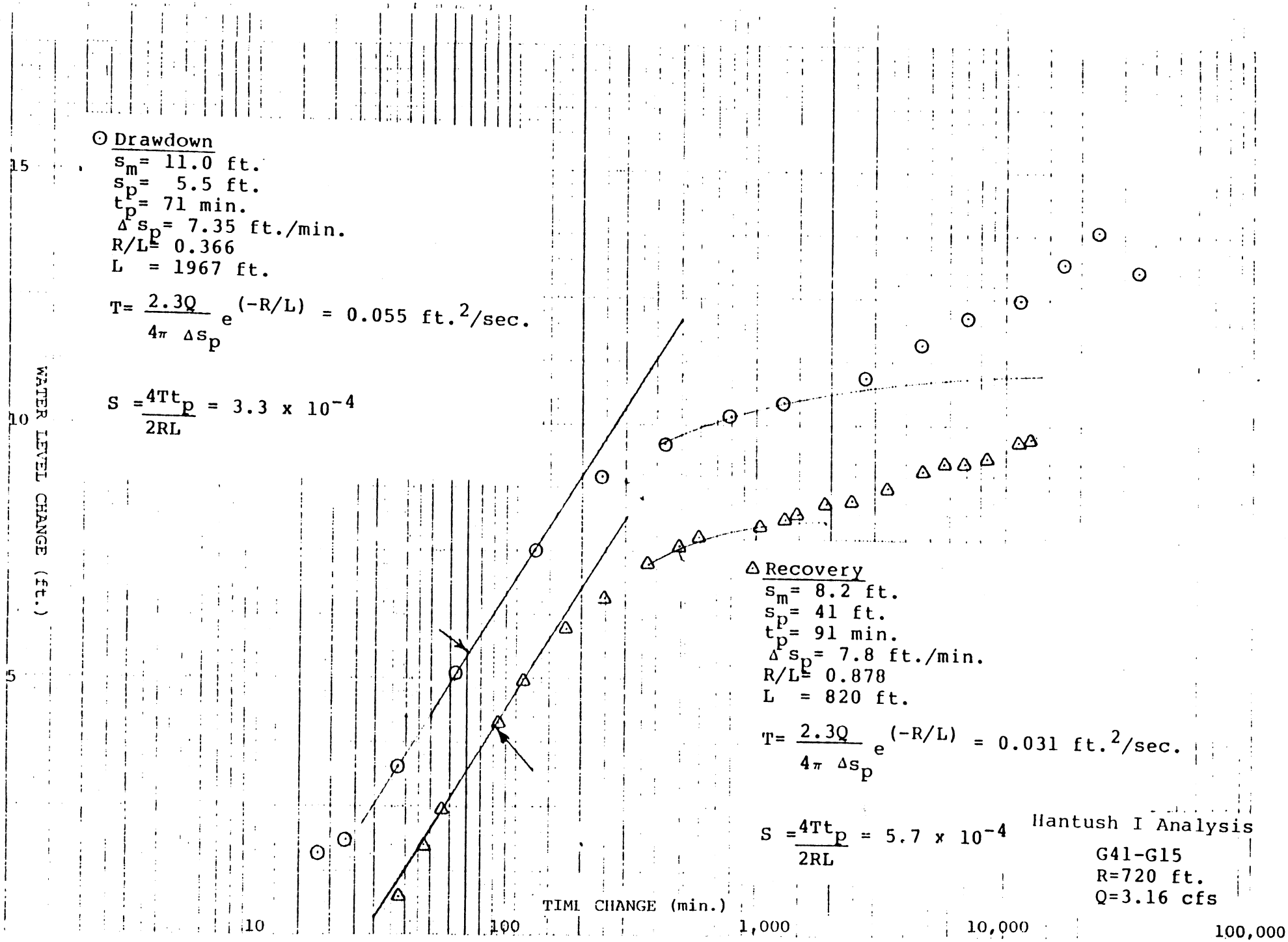
*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

APPENDIX B

B-10
G41-G15
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


100.0
10.0
1.0
0.1
1
10
100
1,000
10,000
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
$k_v = \frac{Tm^1}{B^2}$
$= \frac{(0.038)80}{(1020)^2}$
$= 2.9 \times 10^{-6}$ ft./sec.
$= 0.88 \times 10^{-4}$ cm./sec.
Early
W = 1.0
u = 1.0
s = 6.6 ft.
t = 20 min.
Early
W = 1.0
u = 1.0
s = 9.6 ft.
t = 44 min.
Late
W = 1.0
u = 10
s = 9.6 ft.
t = 830 min.
R/B = 0.6
R/B = 1.0
Late
W = 1.0
u = 1.0
s = 6.6 ft.
t = 2800 min.
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.038$ ft.²/sec.
$S_e = \frac{4Ttu}{R^2} = 3.5 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.049$
△ Recovery
$T = \frac{QW}{4\pi s} = 0.026$ ft.²/sec.
$S_e = \frac{4Ttu}{R^2} = 5.3 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.10$
Boulton Analysis
G41-G15
Q = 3.16 cfs
R = 720 ft.

3.6-4-230


⊙ Drawdown
s_m= 11.0 ft.
s_p= 5.5 ft.
t_p= 71 min.
Δs_p= 7.35 ft./min.
R/L= 0.366
L = 1967 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.055 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 3.3 x 10^{-4}
△ Recovery
s_m= 8.2 ft.
s_p= 41 ft.
t_p= 91 min.
Δs_p= 7.8 ft./min.
R/L= 0.878
L = 820 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.031 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 5.7 x 10^{-4}
Hantush I Analysis
G41-G15
R=720 ft.
Q=3.16 cfs
WATER LEVEL CHANGE (ft.)
15
10
5
TIME CHANGE (min.)
10
100
1,000
10,000
100,000

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDC PUMP TEST JOB NO. 7860H5 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1530.00	102.50	0.00	1	20	-627515.00	1591.74	
18APR79	1530.00	102.50	0.00	1	20	-627515.00	1591.74	CORRECT TO COLLAR TOP
								GROUND SURFACE-CORR. TO
12NOV79	1200.00	99.90	0.00	1	20	-328205.00	1594.34	GROUND SURFACE-CORR. TO
05DEC79	1200.00	99.20	0.00	1	20	-297965.00	1595.04	CORRECT TO COLLAR TOP
25APR80	1200.00	99.80	.06	1	14	-90605.00	1594.38	14 - TIME NOT RECORD
20MAY80	600.00	99.82	0.00	1	9	-54965.00	1594.50	9
21MAY80	1200.00	99.83	0.00	1	9	-53165.00	1594.49	9 - NO TIME
29MAY80	930.00	99.90	0.00	1	9	-41795.00	1594.42	9 -REV. CIR.
29MAY80	2250.00	99.93	0.00	1	9	-40995.00	1594.39	9 -REV. CIR.
30MAY80	1730.00	99.85	0.00	1	9	-39875.00	1594.47	9 -REV. CIR.
31MAY80	945.00	99.84	0.00	1	9	-38900.00	1594.48	9 SET CASE
01JUN80	600.00	99.82	0.00	1	9	-37685.00	1594.50	9 SET CASE
01JUN80	1525.00	99.81	0.00	1	9	-37120.00	1594.51	9 GRAVEL
02JUN80	830.00	99.80	0.00	1	9	-36095.00	1594.52	9
03JUN80	915.00	99.77	0.00	1	9	-34610.00	1594.55	9
04JUN80	135.00	99.90	0.00	1	9	-33630.00	1594.42	9 AIR DEV.
06JUN80	939.00	99.84	0.00	1	9	-30266.00	1594.48	9
06JUN80	1116.00	99.81	0.00	1	9	-30169.00	1594.51	9
06JUN80	1314.00	99.81	0.00	1	9	-30051.00	1594.51	9
06JUN80	1712.00	99.88	0.00	1	9	-29813.00	1594.44	9 VEL TEST
06JUN80	1852.00	99.83	0.00	1	9	-29713.00	1594.49	9 VEL TEST
07JUN80	930.00	99.79	0.00	1	9	-28835.00	1594.53	9
08JUN80	900.00	99.78	0.00	1	9	-27425.00	1594.54	9
09JUN80	800.00	99.79	0.00	1	9	-26045.00	1594.53	9
10JUN80	935.00	99.80	0.00	1	9	-24510.00	1594.52	9
11JUN80	910.00	99.79	0.00	1	9	-23095.00	1594.53	9
12JUN80	900.00	99.79	0.00	1	9	-21665.00	1594.53	9
13JUN80	815.00	99.79	0.00	1	9	-20270.00	1594.53	9
13JUN80	2115.00	99.79	0.00	1	61	-19490.00	1594.53	9 DIFF. RULE
14JUN80	835.00	99.79	0.00	1	9	-18810.00	1594.53	9
14JUN80	1745.00	99.79	0.00	1	9	-18260.00	1594.53	9
15JUN80	820.00	99.80	0.00	1	9	-17385.00	1594.52	9
16JUN80	805.00	99.78	0.00	1	9	-15960.00	1594.54	9
24JUN80	820.00	100.71	0.00	1	9	-4425.00	1593.61	9
25JUN80	815.00	100.67	0.00	1	9	-2990.00	1593.65	9

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
26JUN80	840.00	100.65	0.00	1	61	-1525.00	1593.67	9 9
27JUN80	815.00	100.79	0.00	1	61	-110.00	1593.53	9 9 BEFORE TEST
27JUN80	1023.00	102.41	0.00	1	61	18.00	1591.91	9 9 START @ 10
27JUN80	1028.00	102.66	0.00	1	61	23.00	1591.66	9 9
27JUN80	1042.00	104.08	0.00	1	61	37.00	1590.24	9 9
27JUN80	1054.00	105.11	0.00	1	61	49.00	1589.21	9 9
27JUN80	1110.00	105.98	0.00	1	61	65.00	1588.34	9 9
27JUN80	1145.00	107.51	0.00	1	61	100.00	1586.81	9 9
27JUN80	1215.00	108.31	0.00	1	61	130.00	1586.01	9 9
27JUN80	1249.00	108.87	0.00	1	61	164.00	1585.45	9 9
27JUN80	1340.00	109.52	0.00	1	61	215.00	1584.80	9 9
27JUN80	1410.00	109.77	0.00	1	61	245.00	1584.55	9 9
27JUN80	1502.00	110.07	0.00	1	62	297.00	1584.24	9 9
27JUN80	1548.00	110.27	0.00	1	62	343.00	1584.04	9 9 TIME CORRECTED
27JUN80	1711.00	110.47	0.00	1	62	426.00	1583.84	9 9
27JUN80	1800.00	110.59	0.00	1	62	475.00	1583.72	9 9
27JUN80	1846.00	110.67	0.00	1	62	521.00	1583.64	9 9
27JUN80	1938.00	110.73	0.00	1	62	573.00	1583.58	9 9
27JUN80	2054.00	110.81	0.00	1	62	649.00	1583.50	9 9
27JUN80	2154.00	110.91	0.00	1	62	709.00	1583.40	9 9
27JUN80	2312.00	111.02	0.00	1	62	787.00	1583.29	9 9
28JUN80	49.00	110.96	0.00	1	62	884.00	1583.35	9 9
28JUN80	238.00	111.04	0.00	1	62	993.00	1583.27	9 9
28JUN80	552.00	111.17	0.00	1	62	1187.00	1583.14	9 9
28JUN80	755.00	111.25	0.00	1	62	1310.00	1583. 6	9
28JUN80	1017.00	111.34	0.00	1	62	1452.00	1582. 7	9 9
28JUN80	1200.00	111.42	0.00	1	62	1555 00	1582. 9	9 9
28JUN80	1520.00	111.47	0.00	1	62	1755 00	1582.84	9 9
28JUN80	1818.00	111.53	0.00	1	62	1935 00	1582.78	9 9
28JUN80	2346.00	111.59	0.00	1	62	2261 00	1582.72	9 9
29JUN80	829.00	111.75	0.00	1	62	2784 00	1582.56	9 9
29JUN80	1613.00	112.00	0.00	1	61	3248 00	1582.32	9 9
30JUN80	101.00	112.26	0.00	1	61	3776.00	1582.06	9 9
30JUN80	847.00	112.29	0.00	1	61	4242.00	1582.03	9 9
30JUN80	1607.00	112.41	0.00	1	61	4682.00	1581.91	9 9

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
01JUL80	813.00	112.45	0.00	1	62	5648.00	1581.86	9 9
01JUL80	1057.00	111.50	0.00	1	62	5812.00	1582.81	9 9
01JUL80	1203.00	112.17	0.00	1	62	5878.00	1582.14	9 9
01JUL80	1316.00	112.40	0.00	1	62	5951.00	1581.91	9 9
01JUL80	1459.00	112.54	0.00	1	62	6054.00	1581.77	9 9
01JUL80	1640.00	112.61	0.00	1	62	6155.00	1581.70	9 9
02JUL80	220.00	112.85	0.00	1	62	6735.00	1581.46	9 9
02JUL80	852.00	112.94	0.00	1	62	7127.00	1581.37	9 9
02JUL80	1350.00	112.77	0.00	1	66	7425.00	1581.33	16 14 COMPARE PIEZ.
02JUL80	1351.00	112.91	0.00	1	62	7426.00	1581.40	9 9 COMPARE PIEZ.
02JUL80	2117.00	112.92	0.00	1	62	7872.00	1581.39	9 9
03JUL80	913.00	112.96	0.00	1	62	8588.00	1581.35	9 9
03JUL80	2040.00	113.00	0.00	1	62	9275.00	1581.31	9 9
04JUL80	901.00	113.13	0.00	1	62	10016.00	1581.18	9 9
05JUL80	836.00	113.26	0.00	1	62	11431.00	1581.05	9 9
05JUL80	2052.00	113.59	0.00	1	62	12167.00	1580.72	9 9
06JUL80	923.00	113.72	0.00	1	62	12918.00	1580.59	9 9
06JUL80	1728.00	113.65	0.00	1	62	13403.00	1580.66	9 9
07JUL80	759.00	113.58	0.00	1	62	14274.00	1580.73	9 9
07JUL80	1647.00	113.57	0.00	1	62	14802.00	1580.74	9 9
08JUL80	848.00	113.92	0.00	1	62	15763.00	1580.39	9 9
08JUL80	2108.00	113.96	0.00	1	62	16503.00	1580.35	9 9
09JUL80	901.00	114.01	0.00	1	62	17216.00	1580.30	9 9
09JUL80	1617.00	113.99	0.00	1	62	17652.00	1580.32	9 9
10JUL80	857.00	114.14	0.00	1	62	18652.00	1580.17	9 9
10JUL80	1727.00	114.14	0.00	1	62	19162.00	1580.17	9 9
11JUL80	929.00	114.30	0.00	1	62	20124.00	1580.01	9 9
11JUL80	1933.00	114.36	0.00	1	62	20728.00	1579.95	9 9
12JUL80	913.00	114.42	0.00	1	62	21548.00	1579.89	9 9
13JUL80	835.00	114.64	0.00	1	62	22950.00	1579.67	9 9
14JUL80	807.00	114.62	0.00	1	62	24362.00	1579.69	9 9
14JUL80	1107.00	113.83	0.00	1	62	24542.00	1580.48	9 9
15JUL80	840.00	113.87	0.00	1	62	25835.00	1580.44	9 9
16JUL80	923.00	113.87	0.00	1	62	27318.00	1580.44	9 9
17JUL80	820.00	113.87	0.00	1	62	28695.00	1580.44	9 9
18JUL80	807.00	113.89	0.00	1	62	30122.00	1580.42	9 9
20JUL80	813.00	113.81	0.00	1	62	33008.00	1580.50	9 9
21JUL80	836.00	113.81	0.00	1	62	34471.00	1580.50	9 9
21JUL80	1027.00	113.82	0.00	1	62	34582.00	1580.49	9 9 RECOVERY @ 10
21JUL80	1042.00	113.06	0.00	1	62	34597.00	1581.25	9 9
21JUL80	1052.00	112.04	0.00	1	62	34607.00	1582.27	9 9
21JUL80	1101.00	111.40	0.00	1	62	34616.00	1582.91	9 9
21JUL80	1111.00	110.76	0.00	1	62	34626.00	1583.55	9 9

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	
21JUL80	1121.00	110.29	0.00	1	62	34636.00	1584.02	9 9
21JUL80	1129.00	109.92	0.00	1	61	34644.00	1584.40	9 9
21JUL80	1138.00	109.64	0.00	1	61	34653.00	[illegible]4.68	9 9
21JUL80	1147.00	109.26	0.00	1	61	34662.00	[illegible]85.06	9 9
21JUL80	1155.00	109.04	0.00	1	61	34670.00	1585.28	9 9
21JUL80	1203.00	108.83	0.00	1	61	34678.00	1585.49	9 9
21JUL80	1213.00	108.60	0.00	1	61	34688.00	1585.72	9 9
21JUL80	1223.00	108.42	0.00	1	61	34698.00	1585.90	9 9
21JUL80	1242.00	108.07	0.00	1	61	34717.00	1586.25	9 9
21JUL80	1302.00	107.84	0.00	1	61	34737.00	1586.48	9 9
21JUL80	1320.00	107.58	0.00	1	61	34755.00	1586.74	9 9
21JUL80	1346.00	107.36	0.00	1	61	34781.00	1586.96	9 9
21JUL80	1409.00	107.17	0.00	1	61	34804.00	1587.15	9 9
21JUL80	1441.00	106.98	0.00	1	61	34836.00	1587.34	9 9
21JUL80	1508.00	106.84	0.00	1	61	34863.00	1587.48	9 9
21JUL80	1544.00	106.62	0.00	1	61	34899.00	1587.70	9 9
21JUL80	1615.00	106.56	0.00	1	61	34930.00	1587.76	9 9
21JUL80	1710.00	106.38	0.00	1	61	34985.00	1587.94	9 9
21JUL80	1822.00	106.21	0.00	1	61	35057.00	1588.11	9 9
21JUL80	1917.00	106.15	0.00	1	61	35112.00	1588.17	9 9
21JUL80	2012.00	106.04	0.00	1	61	35167.00	1588.28	9 9
21JUL80	2133.00	105.98	0.00	1	61	35248.00	1588.34	9 9
21JUL80	2242.00	105.88	0.00	1	61	35317.00	1588.44	9 9
22JUL80	115.00	105.78	0.00	1	61	35470.00	1588.54	9 9
22JUL80	240.00	105.72	0.00	1	61	35555.00	1588.60	9 9
22JUL80	430.00	105.66	0.00	1	61	35665.00	1588.66	9 9
22JUL80	846.00	105.47	0.00	1	61	35921.00	1588.85	9 9
22JUL80	1138.00	105.42	0.00	1	61	36093.00	1588.90	9 9
22JUL80	1532.00	105.28	0.00	1	61	36327.00	1589.04	9 9
22JUL80	1906.00	105.20	0.00	1	61	36541.00	1589.12	9 9
23JUL80	28.00	105.13	0.00	1	61	36863.00	1589.19	9 9
23JUL80	342.00	105.07	0.00	1	61	37057.00	1589.25	9 9
23JUL80	1115.00	100.00	4.97	1	61	37510.00	1589.35	9 9
23JUL80	1929.00	100.00	4.88	1	61	38004.00	1589.52	9 9
24JUL80	849.00	100.00	4.58	1	61	38799.00	1589.74	9 9
24JUL80	1705.00	100.00	4.44	1	61	39300.00	1589.88	9 9
25JUL80	1020.00	100.00	4.34	1	61	40335.00	1589.98	9 9
25JUL80	1536.00	100.00	4.34	1	61	40651.00	1589.98	9 9

COMMENTS
COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G15 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	COM	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1694.24 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
26JUL80	815.00	100.00	4.01	1	70	41650.00	1590.02	14 14
27JUL80	928.00	105.00	1.27	1	92	43163.00	1590.17	15 BY D. K. TO 9/2/80
28JUL80	850.00	105.00	.05	1	92	44565.00	1591.39	15 BY D. K. TO 9/2/80
29JUL80	850.00	105.00	.95	1	92	46005.00	1590.49	15 BY D. K. TO 9/2/80
30JUL80	1132.00	105.00	.93	1	92	47607.00	1590.51	15 BY D. K. TO 9/2/80
31JUL80	1450.00	105.00	.79	1	92	49245.00	1590.65	15 BY D. K. TO 9/2/80
01AUG80	1240.00	105.00	.73	1	92	50555.00	1590.71	15 BY D. K. TO 9/2/80
03AUG80	800.00	105.00	.52	1	92	53155.00	1590.92	4 15
05AUG80	1410.00	105.00	.35	1	92	56405.00	1591.09	4 15
07AUG80	1420.00	105.00	.33	1	92	59295.00	1591.11	4 15
09AUG80	920.00	105.00	.22	1	92	61875.00	1591.22	4 15
12AUG80	1315.00	100.00	4.62	1	91	66430.00	1591.48	4 15
14AUG80	1120.00	100.00	4.72	1	91	69195.00	1591.58	4 15
16AUG80	1100.00	100.00	4.75	1	91	72055.00	1591.55	4 15
20AUG80	1428.00	104.54	0.00	1	91	78023.00	1591.76	15
22AUG80	1300.00	104.43	0.00	1	91	80815.00	1591.87	15
02SEP80	938.00	104.32	0.00	1	91	96453.00	1591.98	15
10SEP80	945.00	102.35	0.00	1	15	107980.00	1591.89	15 FOR G.W. MAP

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SHEET 1 OF 10

SURFACE ELE. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.0		See Boring G41-G15A for detailed descriptions.							
				-	1	DO	Air Hammer	12/12	
13.72 / 45.0									
				-	2	DO	Air Hammer	6/6	
		Very dense, brown, fine to coarse gravelly, fine to coarse SAND, some silt, trace clay to brown, fine to coarse GRAVEL and fine to coarse SAND, some silt	SM to GM						
				-	3	DO	Air Hammer	6/6	
				-	4	DO	Air Hammer	3/3	
18.90 / 62.0									
		Very dense, red-brown, silty, fine to coarse SAND, some fine gravel, trace clay to fine to coarse SAND, some fine gravel, some silt, trace clay	SM	-	5	DO	Air Hammer	12/12	
				-	6	DO	Air Hammer	10/12	
23.47				-	7	DO	Air Hammer	10/12	
77.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-237

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SHEET 2 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
23.47 / 77.0		CONTINUED							
		Very dense, red-brown, silty, fine to coarse SAND, some fine gravel, trace clay to fine to coarse SAND, some fine gravel, some silt, trace clay	SM	-	8	DO	Air-hammer	3/12	
				-	9	DO	Air-hammer	10/12	
27.43 / 90.0						DO	Air-hammer	12/12	
		Very dense, red-brown, fine to coarse SAND, some silt, trace fine to coarse gravel, trace clay	SM	-	11	DO	Air-hammer	12/12	▼ 4/18/79 30.39
				-	12	DO	Air-hammer	6/6	99.7
32.31 / 106.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-238

Drawn jls
Checked DCB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
32.31		CONTINUED							
106.0		Very dense, red-brown, fine to coarse SAND, some silt, trace fine to coarse gravel, trace clay	SM	-	13	DO	Hammer	12/12	
35.97									
118.0		Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay	SM	-	14	DO	Hammer	12/12	
				-	15	DO	Air Hammer	6/6	
41.76									
137.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates

3.6-4-239

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
41.76		CONTINUED							
137.0									
		Very dense, red-brown, silty, fine to coarse SAND, some fine to coarse gravel, trace clay	SM		16	DO	Air hammer	2/2	
					17	DO	Air hammer	12/12	
48.77									
160.0		Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel	SP to SP-SM		18	DO	Air hammer	5/12	
51.21									
168.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-240

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
51.21		CONTINUED							
168.0				-	19	DD	Air hammer	2/2	
		Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel	SP to SP-SM	-	20	DD	Air hammer	6/6	
				-	21	DD	Air hammer	6/6	
60.05									
197.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-241

Drawn jls
Checked JDB

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
		CONTINUED							
60.05									
197.0		Very dense, brown, fine to coarse SAND and fine to coarse GRAVEL, trace silt to fine to coarse SAND, some fine to coarse gravel	SP to SP-SM	-	22	DO	Air Hammer	0/6	
64.01									
210.0		Very dense, brown, fine to coarse SAND, some silt	SP-SM	-	23	DO	Air Hammer	8/12	
65.53				-	24	DO	Air Hammer	12/12	
215.0		Very dense, brown, fine to coarse SAND, trace silt	SP	-	25	DO	Air Hammer	6/6	
68.58									
225.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-242

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SHEET 7 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
63.58		CONTINUED							
225.0		Very dense, brown, fine to coarse SAND, trace silt	SP						
70.10									
230.0		Very dense, brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay to silty, fine to coarse SAND, some fine to coarse gravel, trace clay	SM	-	26	DO	Air Hammer	6/6	
				-	27	DO	Air Hammer	4/4	
77.72				-	28	DO	Air Hammer	0/4	
255.0		Stiff to hard, brown, SILT, some clay	ML						
79.25									
260.0		CONTINUED							

Grout (to surface) 70.10

2" Solid PVC Pipe to Surface 230.0

Bentonite Clay Seal 71.32 234.0

Pea Gravel 73.15 240.0

2" Slotted PVC Pipe

Pea Gravel 76.25 250.0

(to bottom of boring)

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-243

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft. (E696292m)

BORING LOG G41-G15

SHEET 8 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
79.25		CONTINUED							
260.0		Stiff to hard, brown, SILT, some clay	ML	-	29	DO	Air Hammer	4/4	
82.30									
270.0				-	30	DO	Air Hammer	3/3	
		Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown, SILT with some fine to coarse sand, weathered green gravel throughout	SM to ML	-	31	DO	Air Hammer	4/4	
88.39									
290.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-244

Drawn jls
Checked JCB

COOR. N113415 ft. (N34569m)
E2284420 ft (E690292m)

BORING LOG G41-G15

SHEET 9 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
88.39		CONTINUED							
290.0				-	32	DO	Air Hammer	0/3	
		Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown, SILT with some fine to coarse sand, weathered green gravel throughout	SM to ML	-	33	DO	Air Hammer	2/2	
				-	34	DO	Air Hammer	2/2	
97.54									
320.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-245

Drawn jls
Checked

COOR. N113415 ft. (N34569m)
E2284420 ft (E696292m)

BORING LOG G41-G15

SHEET 10 OF 10

SURFACE ELEV. 1691.5 ft. (515.56m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/2/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
97.54		CONTINUED							
320.0		Very dense, brown, silty, fine to coarse SAND to stiff to hard, brown. SILT with some fine to coarse sand, weathered green gravel throughout	SM to ML						
99.06									
325.0		Green, residual CLAY and weathered metavolcanic TUFF		-	-	-	Drill Cuttings	-	
103.02									
338.0		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1694.2 ft. (516.40m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	4/18/79	11/12/79	12/3/79	4/25/80	5/20/80	5/26/80*	9/10/80*
DEPTH (m)	30.39	29.60	29.36	29.44	29.44	29.66	30.21
DEPTH (ft.)	99.7	97.1	96.4	96.6	96.6	97.3	99.1

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-246

Drawn jls
Checked JCB

APPENDIX B

B-11
G41-E13
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details

△ Recovery

s_m = 1.7 ft.
s_p = 0.85 ft.
t_p = 115 min.
Δs_p = 1.34 ft./min.
R/L = 0.558
L = 2599 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.25 \text{ ft.}^2/\text{sec.}$$

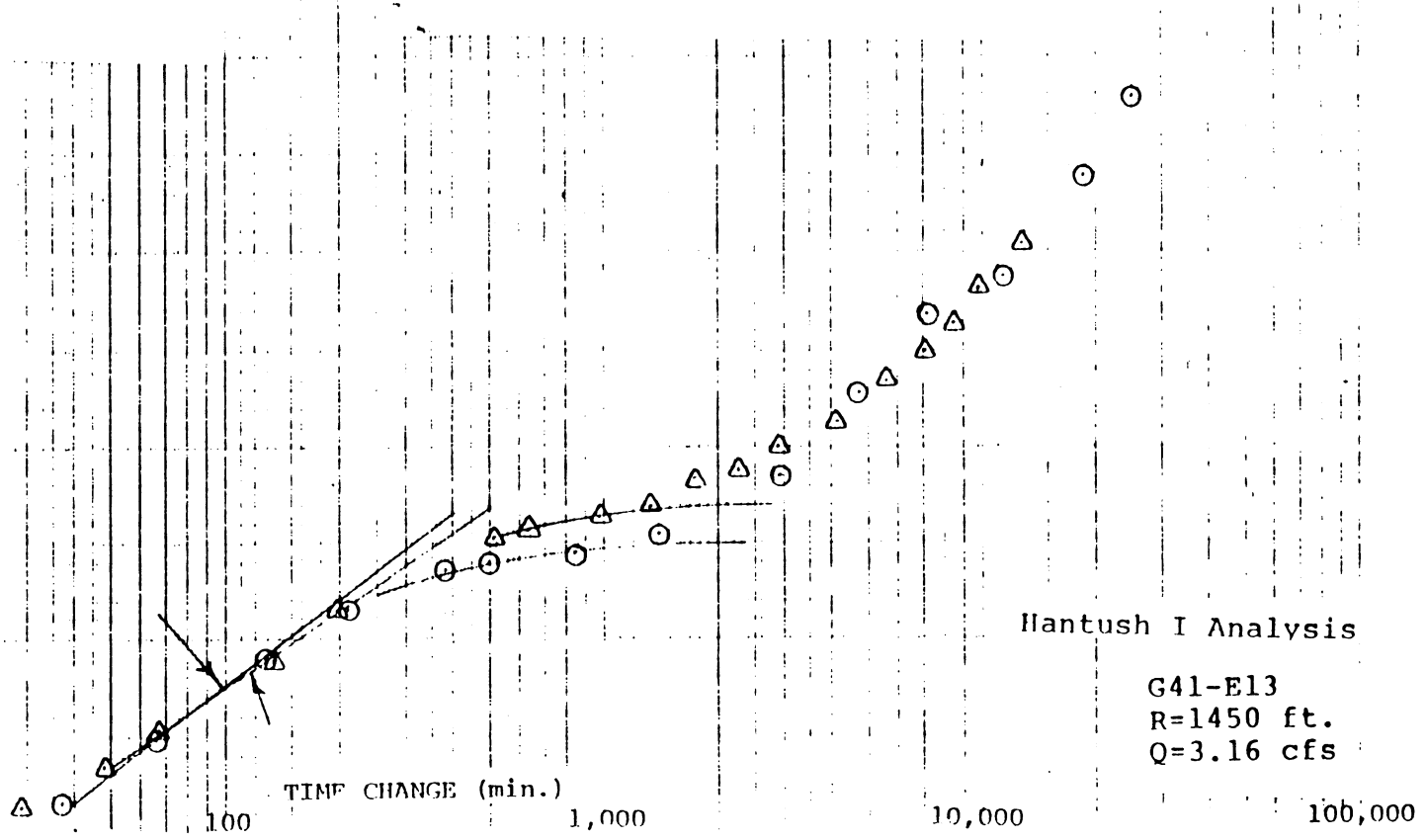
$$S = \frac{4Tt_p}{2RL} = 9.1 \times 10^{-4}$$

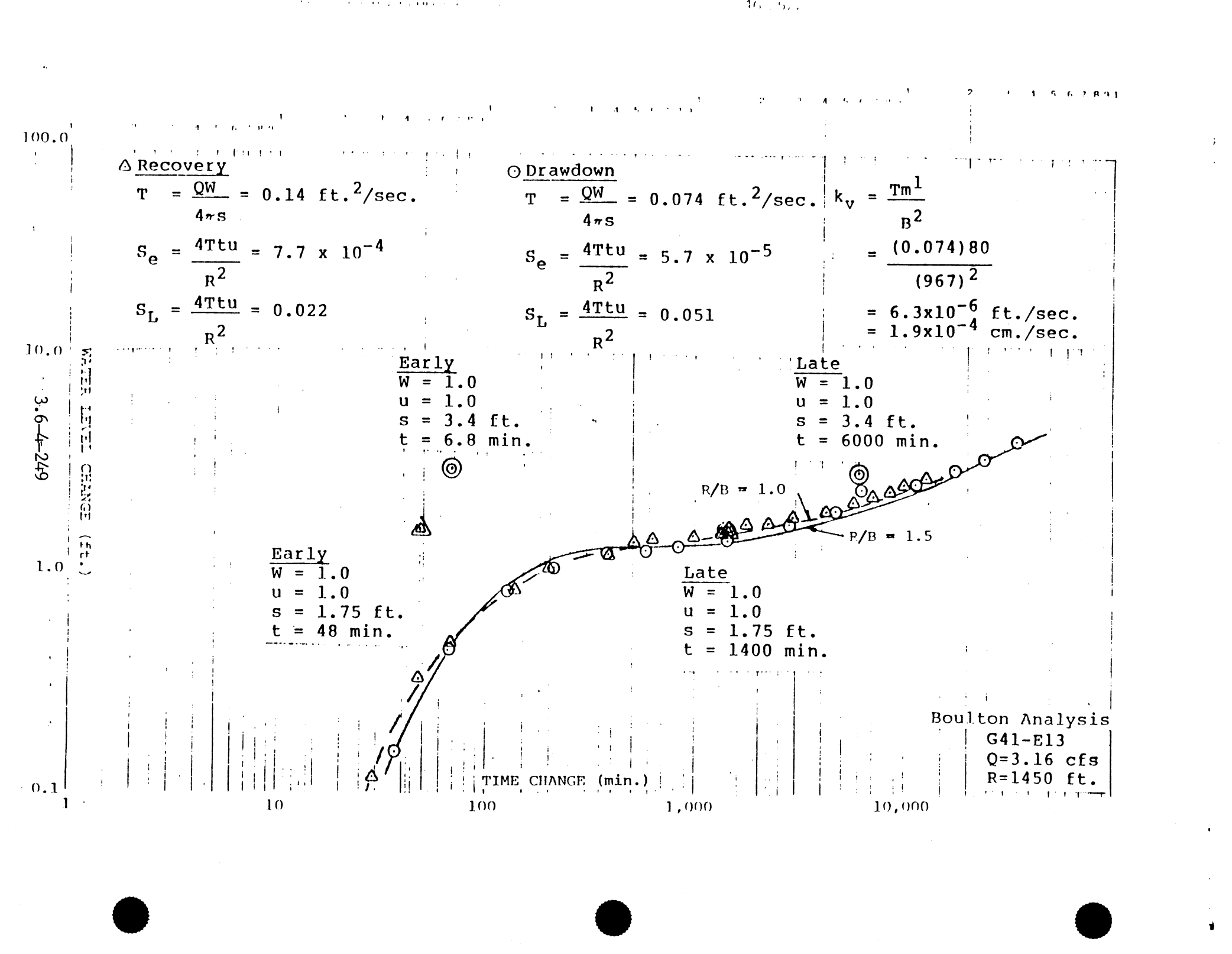
⊙ Drawdown

s_m = 1.5 ft.
s_p = 0.75 ft.
t_p = 98 min.
Δs_p = 1.5 ft./min.
R/L = 0.988
L = 1468 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.14 \text{ ft.}^2/\text{sec.}$$

$$S = \frac{4Tt_p}{2RL} = 7.7 \times 10^{-4}$$




△ Recovery
T = QW/4πs = 0.14 ft.²/sec.
Se = 4Ttu/R² = 7.7 x 10⁻⁴
SL = 4Ttu/R² = 0.022
⊙ Drawdown
T = QW/4πs = 0.074 ft.²/sec.
Se = 4Ttu/R² = 5.7 x 10⁻⁵
SL = 4Ttu/R² = 0.051
kv = Tm¹/B²
= (0.074)80/(967)²
= 6.3x10⁻⁶ ft./sec.
= 1.9x10⁻⁴ cm./sec.
Early
W = 1.0
u = 1.0
s = 3.4 ft.
t = 6.8 min.
Late
W = 1.0
u = 1.0
s = 3.4 ft.
t = 6000 min.
R/B = 1.0
R/B = 1.5
Early
W = 1.0
u = 1.0
s = 1.75 ft.
t = 48 min.
Late
W = 1.0
u = 1.0
s = 1.75 ft.
t = 1400 min.
Boulton Analysis
G41-E13
Q=3.16 cfs
R=1450 ft.
3.6-4-249
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
100.0
10.0
1.0
0.1
1
10
100
1,000
10,000

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
17APR79	1425.00	37.40	0.00	1	20	-629020.00	1592.05	
17APR79	1425.00	37.40	0.00	1	20	-629020.00	1592.05	CORRECT TO COLLAR TOP
								GROUND SURFACE-CORR. TO
07NOV79	1210.00	33.55	0.00	1	20	-335395.00	1595.90	BY D&M
02JAN80	1200.00	34.00	0.00	1	20	-254765.00	1595.45	CORRECT TO COLLAR TOP
25APR80	1200.00	34.95	-.09	1	14	-90665.00	1594.59	14 - TIME NOT RECORD
22MAY80	1200.00	34.95	-.04	1	14	-51725.00	1594.54	14 - NO TIME
08JUN80	915.00	35.29	0.00	1	64	-27410.00	1594.25	4 14
09JUN80	945.00	34.93	0.00	1	64	-25940.00	1594.61	4 14
10JUN80	1025.00	35.10	0.00	1	64	-24460.00	1594.44	4 14
11JUN80	1000.00	35.25	0.00	1	64	-23045.00	1594.29	14 14
12JUN80	950.00	35.10	0.00	1	64	-21615.00	1594.44	14 14
13JUN80	850.00	34.94	0.00	1	64	-20235.00	1594.60	14 14
14JUN80	1015.00	34.50	0.00	1	64	-18710.00	1595.04	4 14
15JUN80	920.00	35.08	0.00	1	64	-17325.00	1594.46	4 14
16JUN80	805.00	35.18	0.00	1	64	-15960.00	1594.36	4 14
24JUN80	820.00	35.11	0.00	1	64	-4425.00	1594.43	4 14
25JUN80	915.00	35.07	0.00	1	64	-2930.00	1594.47	4 14
26JUN80	930.00	35.07	0.00	1	64	-1475.00	1594.47	4 14
27JUN80	850.00	34.92	0.00	1	10	-75.00	1594.33	10 10
27JUN80	1042.00	35.08	0.00	1	10	37.00	1594.17	10 10 START,@ 10
27JUN80	1111.00	35.40	0.00	1	10	66.00	1593.85	10 10
27JUN80	1213.00	35.83	0.00	1	10	128.00	1593.42	10 10
27JUN80	1335.00	36.08	0.00	1	10	210.00	1593.17	10 10
27JUN80	1513.00	36.25	0.00	1	10	308.00	1593.00	10 10
27JUN80	1623.00	36.29	0.00	1	10	378.00	1592.96	10 10
27JUN80	1813.00	36.32	0.00	1	10	488.00	1592.93	10 10
27JUN80	2004.00	36.35	0.00	1	10	599.00	1592.90	10 10
27JUN80	2207.00	36.37	0.00	1	10	722.00	1592.88	10 10
27JUN80	2349.00	36.38	0.00	1	10	829.00	1592.87	10 10
28JUN80	206.00	36.42	0.00	1	10	961.00	1592.83	4 10
28JUN80	611.00	36.50	0.00	1	10	1206.00	1592.75	10 10
28JUN80	932.00	36.49	0.00	1	10	1407.00	1592.76	10 10
28JUN80	1314.00	36.61	0.00	1	10	1629.00	1592.64	10 10
28JUN80	1608.00	36.65	0.00	1	10	1803.00	1592.60	10 10
28JUN80	1906.00	36.67	0.00	1	10	1981.00	1592.58	10 10
28JUN80	2141.00	36.74	0.00	1	10	2256.00	1592.51	10 10
29JUN80	857.00	36.78	0.00	1	10	2812.00	1592.47	10 10
29JUN80	1707.00	36.98	0.00	1	10	3302.00	1592.27	10 10
30JUN80	124.00	37.13	0.00	1	10	3799.00	1592.12	10 10

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1629.95 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
30JUN80	757.00	37.18	0.00	1	64	4192.00	1592.36	14 14
30JUN80	1623.00	37.51	0.00	1	64	4698.00	1592.03	14 14
01JUL80	724.00	37.21	0.00	1	10	5599.00	1592.04	10 10
01JUL80	1723.00	37.66	0.00	1	64	6198.00	1591.88	16 14
02JUL80	138.00	37.52	0.00	1	10	6693.00	1591.73	10 10
02JUL80	2059.00	37.89	0.00	1	64	7854.00	1591.65	16 14
03JUL80	945.00	37.89	0.00	1	64	8820.00	1591.65	16 14
03JUL80	2026.00	37.93	0.00	1	64	9261.00	1591.61	16 14
04JUL80	824.00	38.03	0.00	1	64	9979.00	1591.51	16 14
04JUL80	2017.00	34.84	0.00	1	11	10692.00	1591.57	11 11
05JUL80	755.00	34.95	0.00	1	11	11390.00	1591.46	11 11
05JUL80	2117.00	38.34	0.00	1	64	12192.00	1591.20	14 14 SINCO 1
06JUL80	1212.30	38.37	0.00	1	64	13087.00	1591.17	14 14
06JUL80	1812.00	38.30	0.00	1	64	13997.00	1591.24	14 14
07JUL80	857.00	38.29	0.00	1	64	14332.00	1591.25	14 14
07JUL80	1708.00	38.29	0.00	1	64	14823.00	1591.25	14 14
08JUL80	612.00	38.58	0.00	1	64	15727.00	1590.96	14 14
08JUL80	2022.00	38.58	0.00	1	64	16457.00	1590.96	14 14
09JUL80	1031.00	38.61	0.00	1	64	17306.00	1590.93	14 14
09JUL80	1641.00	38.57	0.00	1	64	17676.00	1590.97	14 14
10JUL80	1009.00	38.71	0.00	1	64	18724.00	1590.83	14 14
10JUL80	1804.00	38.71	0.00	1	64	19199.00	1590.83	14 14
11JUL80	1040.00	38.83	0.00	1	64	20195.00	1590.71	14 14
11JUL80	2001.00	38.88	0.00	1	64	20756.00	1590.66	14 14
12JUL80	1100.00	38.96	0.00	1	64	21655.00	1590.58	14 14
13JUL80	953.00	39.08	0.00	1	64	23028.00	1590.46	14 14
14JUL80	1230.00	39.01	0.00	1	64	24625.00	1590.53	14 14
15JUL80	1050.00	39.26	0.00	1	64	25965.00	1590.28	14 14
16JUL80	1051.00	39.27	0.00	1	64	27406.00	1590.27	14 14
17JUL80	944.00	39.49	0.00	1	64	28779.00	1590.05	14 14
18JUL80	905.00	39.50	0.00	1	64	30178.00	1590.04	14 14
20JUL80	911.00	39.60	0.00	1	64	33066.00	1589.94	14 14
21JUL80	801.00	39.78	0.00	1	64	34436.00	1589.76	14 14
21JUL80	802.00	41.72	-1.91	1	15	34437.00	1869.69	15 15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE - 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E15 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL- TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1010.00	39.79	0.00	1	64	34565.00	1589.75	14 14 START @ 10
21JUL80	1034.00	39.66	0.00	1	64	34589.00	1589.88	14 14
21JUL80	1053.00	39.43	0.00	1	64	34608.00	1590.11	14 14
21JUL80	1113.00	39.27	0.00	1	64	34628.00	1590.27	14 14
21JUL80	1133.00	39.19	0.00	1	64	34648.00	1590.35	14 14
21JUL80	1159.00	39.02	0.00	1	64	34674.00	1590.52	14 14
21JUL80	1220.00	38.87	0.00	1	64	34695.00	1590.67	14 14
21JUL80	1243.00	38.74	0.00	1	64	34718.00	1590.80	14 14
21JUL80	1303.00	38.69	0.00	1	64	34738.00	1590.85	14 14
21JUL80	1325.00	38.63	0.00	1	64	34760.00	1590.91	14 14
21JUL80	1351.00	38.55	0.00	1	64	34786.00	1590.99	14 14
21JUL80	1412.00	38.49	0.00	1	64	34807.00	1591.05	14 14
21JUL80	1438.00	38.43	0.00	1	64	34833.00	1591.11	14 14
21JUL80	1627.00	38.43	0.00	1	64	34942.00	1591.11	14 14
21JUL80	1737.00	38.40	0.00	1	64	35012.00	1591.14	14 14
21JUL80	1837.00	38.26	0.00	1	64	35072.00	1591.28	14 14
21JUL80	1935.00	38.24	0.00	1	64	35130.00	1591.30	14 14
21JUL80	2027.00	38.20	0.00	1	64	35182.00	1591.34	14 14
21JUL80	2145.00	38.18	0.00	1	64	35260.00	1591.36	14 14
21JUL80	2302.00	38.17	0.00	1	64	35337.00	1591.37	14 14
22JUL80	50.00	38.11	0.00	1	64	35445.00	1591.43	14 14
22JUL80	254.00	38.09	0.00	1	64	35569.00	1591.45	14 14
22JUL80	442.00	38.07	0.00	1	64	35677.00	1591.47	14 14
22JUL80	818.00	38.05	0.00	1	64	35893.00	1591.49	14 14
22JUL80	1154.00	37.99	0.00	1	64	36109.00	1591.55	14 14
22JUL80	1612.00	37.93	0.00	1	64	36367.00	1591.61	14 14
22JUL80	1916.00	37.88	0.00	1	64	36551.00	1591. 6	14 14
23JUL80	41.00	37.88	0.00	1	64	36876.00	1591.66	14 14
23JUL80	354.00	37.85	0.00	1	64	37069.00	1591.69	14 14
23JUL80	1143.00	35.00	2.81	1	64	37538.00	1591.73	14 14
23JUL80	1937.00	35.00	2.72	1	64	38017.00	1591.82	14 14
24JUL80	920.00	35.00	2.73	1	64	38835	1591.81	14 14
24JUL80	1732.00	35.00	2.58	1	64	39327.	1591.96	14 14
25JUL80	1030.00	35.00	2.61	1	64	40345.00	1591.93	14 14
25JUL80	1736.00	35.00	2.60	1	64	40751.00	1591.94	14 14
26JUL80	1030.00	35.00	2.52	1	64	41785.00	1592.02	14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/29.- 21.24.33.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1629.45 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUL80	1030.00	30.00	9.69	1	83	43225.00	1592.10	15 BY D. K. TO 9/2/80
28JUL80	950.00	30.00	9.55	1	83	44625.00	1592.19	15 BY D. K. TO 9/2/80
29JUL80	830.00	30.00	9.56	1	83	45985.00	1592.18	15 BY D. K. TO 9/2/80
30JUL80	1035.00	30.00	9.47	1	83	47550.00	1592.27	15 BY D. K. TO 9/2/80
31JUL80	1400.00	30.00	9.45	1	83	49195.00	1592.29	15 BY D. K. TO 9/2/80
01AUG80	1310.00	30.00	9.40	1	83	50585.00	1592.34	15 BY D. K. TO 9/2/80
03AUG80	725.00	30.00	9.37	1	83	53120.00	1592.37	4 15
05AUG80	1400.00	30.00	9.34	1	83	56395.00	1592.40	4 15
07AUG80	1400.00	30.00	9.26	1	83	59275.00	1592.48	4 15
09AUG80	905.00	30.00	9.23	1	83	61861.	1592.51	4 15
12AUG80	1420.00	30.00	9.17	1	83	66495.	1592.57	4 15
14AUG80	1055.00	30.00	9.15	1	83	69170.	1592.59	4 15
16AUG80	1205.00	30.00	9.17	1	83	72120.0	1592.57	4 15
20AUG80	1400.00	39.02	0.00	1	83	77995.00	1592.72	15
22AUG80	1230.00	39.23	0.00	1	83	80785.00	1592.51	15
02SEP80	815.00	38.99	0.00	1	83	96370.00	1592.7	15
11SEP80	1700.00	36.58	0.00	1	15	109855.00	1592.8	15 FOR G.W. MAP

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 1 OF 8

SURFACE ELEV 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 125 DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.30		Topsoil and rootmat		-	1	AS	-	-	
1.0									
				27	2	DO	4-14-13	18/18	
				35	3	DO	12-11-24	18/18	
		Compact to very dense, brown to light brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles	SM	148	4	DO	48-100	12/12	
				169	5	DO	24-57-112	16/18	
				156	6	DO	27-60-96	16/18	
				165	7	DO	50-65-100	16/18	
									▼ 4/17/79 10.73
11.28				115	8	DO	30-55-60	13/18	≈ 35.2
37.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-254

Drawn jls
Checked RB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-F13

SHEET 2 OF 8

SURFACE ELEV. 1627.3 ft (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
11.28 / 37.0		CONTINUED							
				145	9	DO	62-62-83	10/18	
				87	10	DO	30-37-50	12/18	
		Very dense, red-brown, fine to coarse SAND and fine GRAVEL, trace silt, trace clay to fine to coarse gravelly, fine to coarse SAND, some silt, trace clay, occasional boulders	SP-SM to SM	200/5"	11	DO	200/5"	5/6	
				210/10"	12	DO	110-100/4"	9/10	
				200/9"	13	DO	100-100/3"	8/9	
				125/6"	14	DO	125/6"	6/6	
				80/9"	15	DO	80-100/3"	9/9	
21.95 / 72.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-255

Drawn jls
Checked DCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 3 OF 8

SURFACE ELEV 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
21.95 / 72.0		CONTINUED							
		Very dense, red-brown, fine to coarse SAND and fine GRAVEL, trace silt, trace clay to fine to coarse gravelly, fine to coarse SAND, some silt, trace clay, occasional boulders	SP-SM to SM	190/8"	16	DO	90-100/2"	8/8	
				180/11"	17	DO	80-100/5"	8/11	
				200/10"	18	DO	100-100/4"	8/10	
				165/6"	19	DO	165/6"	6/6	
28.19 / 92.5		Very dense, red-brown to light brown, fine to coarse SAND, some silt, trace fine gravel, trace clay, occasional silty sand layers	SM	167	20	DO	73-75-92	16/18	
				170/8"	21	DO	70-100/2"	8/8	
31.70 / 104.0		CONTINUED							

Job No 786025
Scale 1"=5'

Golder Associates 3.6-4-256

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
31.70		CONTINUED							
104.0		Very dense, red-brown to light brown, fine to coarse SAND, some silt, trace fine gravel, trace clay, occasional silty sand layers	SM	175	22	DO	75-100	12/12	
					23	DO	85-100/2"	7/8	
38.10									
125.0		Very dense, red-brown to light brown, fine to coarse SAND, trace silt	SP to SP-SM	105	24	DO	27-35-70	12/18	
41.15									
135.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-257

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 5 OF 8

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Jov 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
41.15 / 135.0		CONTINUED							
				190	25	DO	40-150	10/12	
		Very dense, red-brown to light brown, fine to medium SAND, trace silt	SP to SP-SM	270	26	DO	70-200	12/12	
				190	27	DO	50-140	0/12	
51.21 / 168.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-258

Drawn jls
Checked JCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 6 OF 8

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
51.21		CONTINUED							
168.0				215 9"	28	DO	115-100/3	9/9	
		Very dense, red-brown to light brown, fine to medium SAND, trace silt	SP to SP-SM	251	29	DO	85-166	12/12	
				185	30	DO	45-140	12/12	
60.35									
198.0		CONTINUED							

Job No 786035
Scale 1"=5'

Golder Associates 3.6-4-259

Drawn jls
Checked DCB

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 7 OF 8

SURFACE ELEV. 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12S DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
60.35		CONTINUED							
198.0				210	31	DO	80-130	12/12	
		Very dense, red-brown to light brown, fine to medium SAND, trace silt	SP to SP-SM	275	32	DO	75-200	12/12	
67.06									
220.0		Very dense, red-brown to light brown, fine to coarse SAND, some fine to coarse gravel, trace silt, occasional cobbles	SP-SM to SM	180	33	DO	60-120	12/12	
68.85									
226.0		Very dense, red-brown to light brown, fine to coarse SAND, trace fine gravel, trace silt	SP-SM	220	34	DO	50-170	12/12	
71.02									
233.0		CONTINUED							

Grout (to surface)

67.97

Bentonite Clay Seal 223.2

68.59

Pea Gravel 225.0

69.19

227.0

2" Solid PVC Pipe to Surface

2" Slotted PVC Pipe

Pea Gravel

CONTINUED

Job No 786085

Scale 1"=5'

Golder Associates 3.6-4-260

Drawn jls

Checked

COOR. N114395 ft. (N34868m)
E2282890 ft. (E695826m)

BORING LOG G41-E13

SHEET 8 OF 8

SURFACE ELEV 1627.3 ft. (496.00m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 2/25/79 DATE COMPLETED 3/6/79

DRILL RIG Joy 12B DRILLING METHOD Mud Rotary

DEPTH METER	DEPTH FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
			CONTINUED							CONTINUED
71.02	233.0									2" Slotted PVC Pipe / Pea Gravel
			Very dense, red-brown to light brown, fine to coarse SAND, trace fine gravel, trace silt	SP-SM	170/6"	35	DO	170/6"	2/6	72.2 / 237.0
73.30										
240.5			Green-gray, slight to nighly weathered metavolcanic TUFF		-	36	NX RC	-	10/24	Pea Gravel
					-	37	NX RC	-	34/36	
					-	38	RC	-	4/6	
					-	39	RC	-	54/54	
76.35										
250.5			END OF BORING							

NOTES

1. Standard Penetration Test - Driving 2" O.D. sampler with 140 lb. hammer freely falling 30". (Samples 2 - 23)

   Penetration Test - Driving 2" O.D. sampler with 300 lb. hammer freely falling 20". (Sample 24)

   Penetration Test - Driving 3" O.D. sampler with 300 lb. hammer freely falling 20". (Samples 25 - 35)

2. Elevation of top of protector pipe, 1629.45 ft. (496.66m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	4/17/79	11/7/79	1/2/80	4/25/80	5/22/80	6/25/80*	9/10/80*
DEPTH (m)	10.73	9.57	9.69	10.00	10.00	10.00	10.49
DEPTH (ft.)	35.2	31.4	31.8	32.8	32.8	32.8	34.4

DATE	6/10/81						
DEPTH (m)	10.64						
DEPTH (ft.)	34.9						

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

Job No 786085
Scale 1"=5'

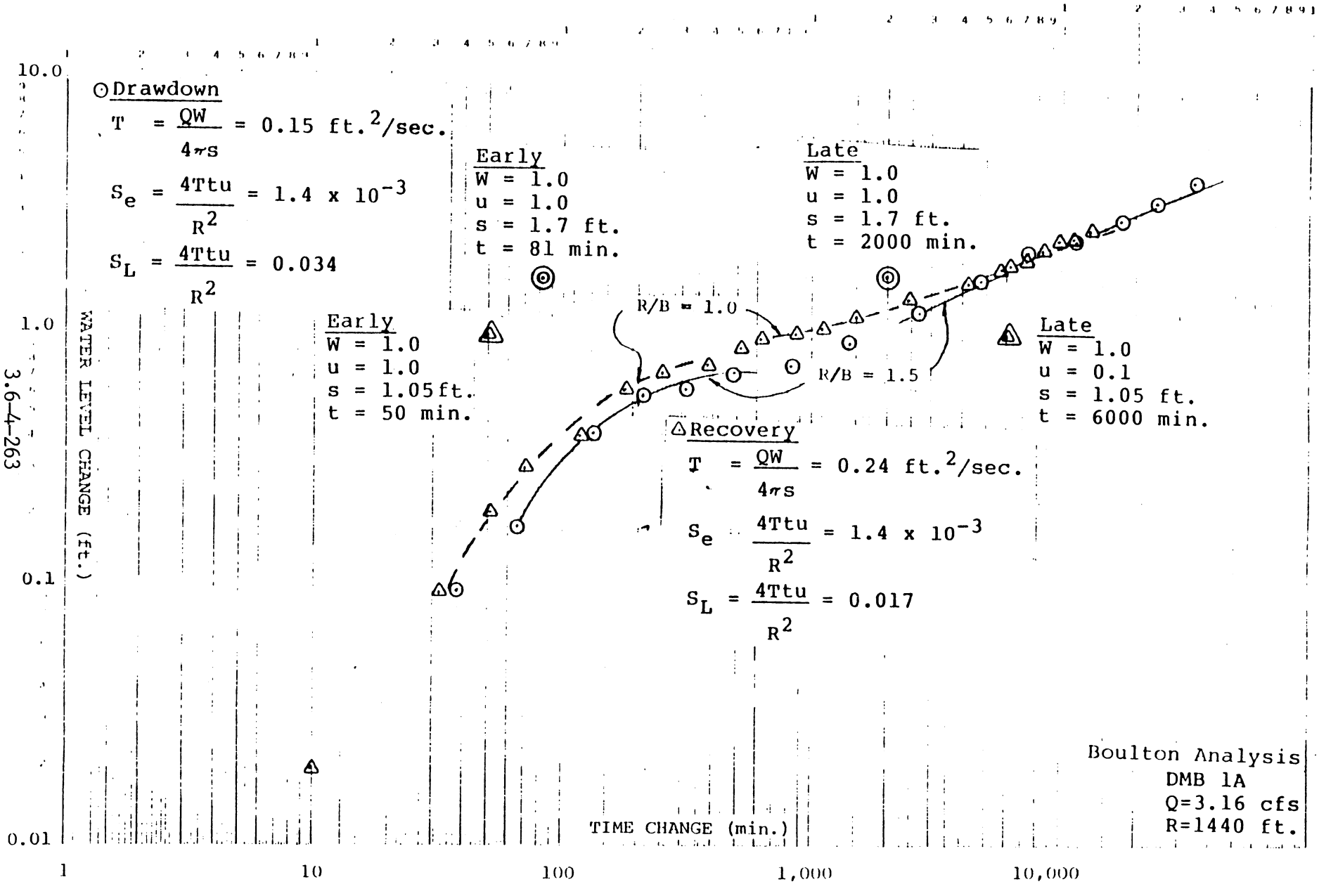
Golder Associates

3.6-4-261

Drawn jls
Checked JCB

APPENDIX B

B-12
DMB-1A
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


⊙Drawdown
T = QW / 4πs = 0.15 ft.²/sec.
Se = 4Ttu / R² = 1.4 x 10⁻³
SL = 4Ttu / R² = 0.034
Early
W = 1.0
u = 1.0
s = 1.7 ft.
t = 81 min.
Late
W = 1.0
u = 1.0
s = 1.7 ft.
t = 2000 min.
R/B = 1.0
R/B = 1.5
Early
W = 1.0
u = 1.0
s = 1.05ft.
t = 50 min.
Late
W = 1.0
u = 0.1
s = 1.05 ft.
t = 6000 min.
△Recovery
T = QW / 4πs = 0.24 ft.²/sec.
Se = 4Ttu / R² = 1.4 x 10⁻³
SL = 4Ttu / R² = 0.017
Boulton Analysis
DMB 1A
Q=3.16 cfs
R=1440 ft.
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10.0
1.0
0.1
0.01
1
10
100
1,000
10,000

3.6-4-263

⊙ Drawdown

s_m = 0.8 ft.
s_p = 0.4 ft.
t_p = 140 min.
Δs_p = 0.93 ft./min.
R/L = 1.40
L = 1028 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.15 \text{ ft.}^2/\text{sec.}$$

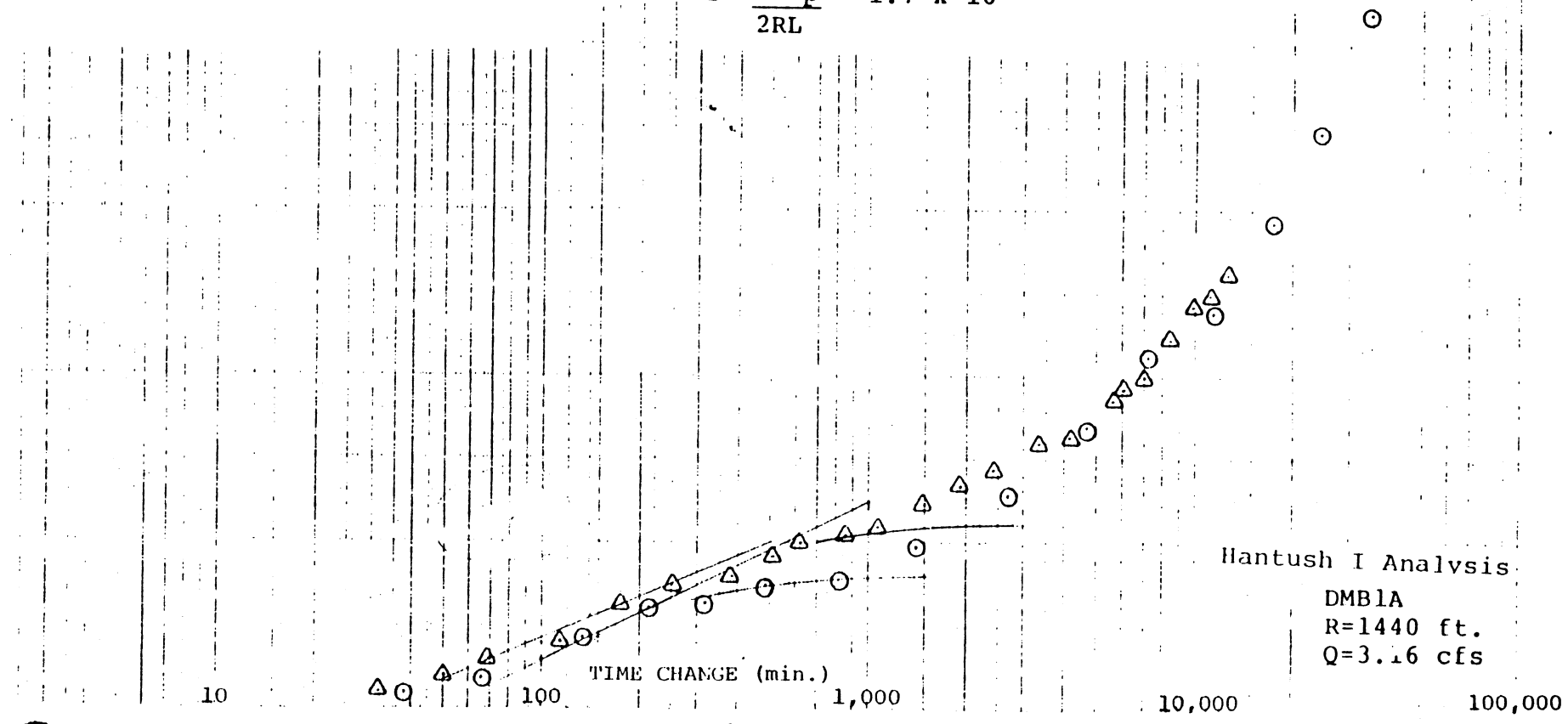
$$S = \frac{4Tt_p}{2RL} = 1.7 \times 10^{-3}$$

△ Recovery

s_m = 1.1 ft.
s_p = 0.55 ft.
t_p = 140 min.
Δs_p = 0.81 ft./min.
R/L = 0.470
L = 3064 ft.

$$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)} = 0.45 \text{ ft.}^2/\text{sec.}$$

$$S = \frac{4Tt_p}{2RL} = 1.7 \times 10^{-3}$$



GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANCON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMB1A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
25APR80	1200.00	35.16	-.09	1	14	-90605.00	1594.63	14 - TIME NOT RECORD
22MAY80	1200.00	35.21	-.04	1	14	-51725.00	1594.53	14 - NO TIME
08JUN80	915.00	35.42	0.00	1	64	-27410.00	1594.37	4 14
09JUN80	945.00	35.22	0.00	1	64	-25940.00	1594.57	4 14
10JUN80	1025.00	35.33	0.00	1	64	-24960.00	1594.46	4 14
11JUN80	1000.00	35.52	0.00	1	64	-23045.00	1594.27	14 14
12JUN80	950.00	35.35	0.00	1	64	-21615.00	1594.44	14 14
13JUN80	950.00	35.23	0.00	1	64	-20235.00	1594.56	14 14
14JUN80	1015.00	35.23	0.00	1	64	-18710.00	1594.56	4 14
15JUN80	920.00	35.35	0.00	1	64	-17325.00	1594.44	4 14
16JUN80	805.00	35.47	0.00	1	64	-15960.00	1594.32	4 14
24JUN80	820.00	35.39	0.00	1	64	-4425.00	1594.40	4 14
25JUN80	915.00	35.34	0.00	1	64	-2930.00	1594.45	4 14
26JUN80	930.00	35.36	0.00	1	64	-1475.00	1594.43	4 14
27JUN80	845.00	32.40	0.00	1	11	-80.00	1594.26	11 11
27JUN80	1043.00	32.50	0.00	1	11	38.00	1594.16	11 11
27JUN80	1113.00	32.58	0.00	1	11	68.00	1594.08	11 11
27JUN80	1217.00	32.83	0.00	1	11	132.00	1593.83	11 11
27JUN80	1337.00	33.00	0.00	1	11	212.00	1593.66	11 11
27JUN80	1515.00	33.03	0.00	1	11	310.00	1593.63	14 11
27JUN80	1624.00	33.13	0.00	1	11	379.00	1593.53	11 11
27JUN80	1817.00	33.13	0.00	1	11	492.00	1593.53	11 11
27JUN80	2005.00	33.12	0.00	1	11	600.00	1593.54	11 11
27JUN80	2210.00	33.17	0.00	1	11	725.00	1593.49	11 11
27JUN80	2351.00	33.18	0.00	1	11	826.00	1593.48	11 11
28JUN80	207.00	33.25	0.00	1	11	962.00	1593.41	11 11
28JUN80	613.00	33.33	0.00	1	11	1208.00	1593.33	11 11
28JUN80	934.00	33.36	0.00	1	11	1409.00	1593.30	11 11
28JUN80	1312.00	33.41	0.00	1	11	1627.00	1593.25	11 11
28JUN80	1606.00	33.52	0.00	1	11	1801.00	1593.14	11 11
28JUN80	1904.00	33.51	0.00	1	11	1979.00	1593.15	11 11
28JUN80	2344.00	33.57	0.00	1	11	2259.00	1593.09	11 11
29JUN80	459.00	33.68	0.00	1	11	2814.00	1592.98	11 11
29JUN80	1709.00	33.87	0.00	1	11	3304.00	1592.79	11 11
30JUN80	126.00	34.03	0.00	1	11	3801.00	1592.63	11 11
30JUN80	758.00	34.06	0.00	1	11	4193.00	1592.60	11 11 SINCO 1
30JUN80	1622.00	34.10	0.00	1	11	4697.00	1592.56	11 11
01JUL80	726.00	34.14	0.00	1	11	5601.00	1592.52	11 11
01JUL80	1721.00	34.31	0.00	1	11	6196.00	1592.35	11 11
02JUL80	140.00	34.43	0.00	1	11	6695.00	1592.23	11 11
02JUL80	1006.00	34.52	0.00	1	11	7201.00	1592.14	11 11
02JUL80	1408.00	34.48	0.00	1	11	7493. 0	1592.18	11 11 COMPARE PIEZ.
02JUL80	2103.00	34.51	0.00	1	11	7858. 0	1592.15	11 11

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

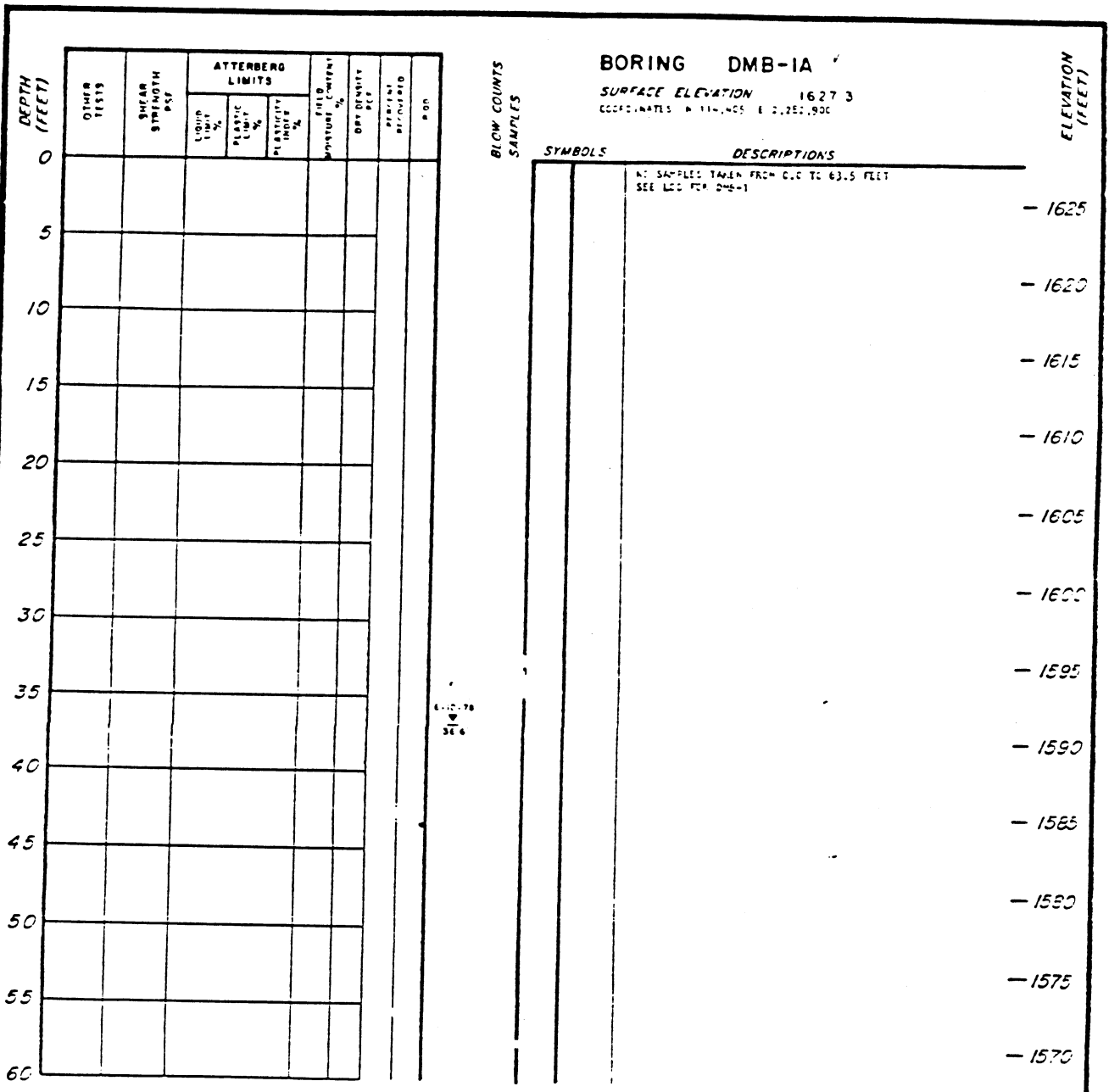
CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***OMBIA ***

DATE	TIME	FIRST READING	SECOND READING	ALG	CON	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FT	
								COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
03JUL80	947.00	38.54	0.00	1	11	8622.00	1592.12	11 11
03JUL80	2028.00	38.57	0.00	1	11	9263.00	1592.09	11 11
04JUL80	826.00	38.69	0.00	1	11	9901.00	1591.97	11 11
04JUL80	2015.00	38.63	0.00	1	11	10690.00	1592.03	11 11
05JUL80	757.00	38.78	0.00	1	11	11392.00	1591.88	11 11
05JUL80	2118.00	35.00	0.00	1	11	12193.00	1591.66	11 11
06JUL80	1216.00	38.17	0.00	1	64	13091.00	1591.62	14 14
06JUL80	1813.00	38.09	0.00	1	64	13448.00	1591.70	14 14
07JUL80	858.00	38.14	0.00	1	64	14333.00	1591.65	14 14
07JUL80	1710.00	38.14	0.00	1	64	14825.00	1591.65	14 14
08JUL80	814.00	38.40	0.00	1	64	15729.00	1591.39	14 14
08JUL80	2024.00	38.42	0.00	1	64	16459.00	1591.37	14 14
09JUL80	1033.00	38.46	0.00	1	64	17308.00	1591.33	14 14
09JUL80	1642.00	38.44	0.00	1	64	17677.00	1591.35	14 14
10JUL80	1011.00	38.55	0.00	1	64	18726.00	1591.24	14 14
10JUL80	1805.00	38.54	0.00	1	64	19200.00	1591.25	14 14
11JUL80	1040.00	38.68	0.00	1	64	20195.00	1591.11	14 14
11JUL80	2003.00	38.73	0.00	1	64	20758.00	1591.06	14 14
12JUL80	1102.00	38.82	0.00	1	64	21657.00	1590.97	14 14
13JUL80	955.00	38.94	0.00	1	64	23030.00	1590.85	14 14
14JUL80	1732.00	39.01	0.00	1	64	24627.00	1590.78	14 14
15JUL80	1053.00	39.13	0.00	1	64	25968.00	1590.66	14 14
16JUL80	1052.00	39.16	0.00	1	64	27407.00	1590.63	14 14
17JUL80	946.00	39.30	0.00	1	64	28781.00	1590.45	14 14
18JUL80	905.00	39.38	0.00	1	64	30180.00	1590.41	14 14
20JUL80	912.00	39.49	0.00	1	64	33067.00	1590.30	14 14
21JUL80	801.00	39.68	0.00	1	64	34436.00	1590.11	14 14
21JUL80	809.00	41.59	-1.91	1	15	34438.00	1590.07	15 15
21JUL80	1015.00	39.70	0.00	1	64	34570.00	1590.09	14 14 START # 10
21JUL80	1037.00	39.62	0.00	1	64	34592.00	1590.17	14 14
21JUL80	1056.00	39.51	0.00	1	64	34611.00	1590.28	14 14
21JUL80	1115.00	39.41	0.00	1	64	34630.00	1590.38	14 14
21JUL80	1136.00	39.40	0.00	1	64	34651.00	1590.39	14 14
21JUL80	1201.00	39.30	0.00	1	64	34676.00	1590.49	14 14
21JUL80	1225.00	39.20	0.00	1	64	34698.00	1590.59	14 14
21JUL80	1244.00	39.14	0.00	1	64	34719.00	1590.65	14 14
21JUL80	1304.00	39.08	0.00	1	64	34739.00	1590.71	14 14
21JUL80	1327.00	39.04	0.00	1	64	34762.00	1590.75	14 14
21JUL80	1353.00	39.00	0.00	1	64	34788.00	1590.79	14 14
21JUL80	1417.00	38.97	0.00	1	64	34812.00	1590.82	14 14
21JUL80	1500.00	38.92	0.00	1	64	34855.00	1590.87	14 14
21JUL80	1629.00	38.92	0.00	1	64	34944.00	1590.87	14 14
21JUL80	1738.00	38.84	0.00	1	64	35013.00	1590.95	14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***OMBIA ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1629.70 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1839.00	38.79	0.00	1	64	35079.00	1591.00	14 14
21JUL80	1937.00	38.77	0.00	1	64	35132.00	1591.02	14 14
21JUL80	2029.00	38.71	0.00	1	64	35184.00	1591.08	14 14
21JUL80	2148.00	38.70	0.00	1	64	35263.00	1591.09	14 14
21JUL80	2259.00	38.67	0.00	1	64	35334.00	1591.12	14 14
22JUL80	51.00	38.61	0.00	1	64	35446.00	1591.18	14 14
22JUL80	255.00	38.57	0.00	1	64	35570.00	1591.22	14 14
22JUL80	444.00	38.55	0.00	1	64	35679.)	1591.24	14 14
22JUL80	819.00	38.53	0.00	1	64	35894.00	1591.26	14 14
22JUL80	1155.00	38.46	0.00	1	64	36110.00	1591.33	14 14
22JUL80	1614.00	38.40	0.00	1	64	36365.00	1591.39	14 14
22JUL80	1917.00	38.34	0.00	1	64	3655.	1591.45	14 14
23JUL80	43.00	38.32	0.00	1	64	36878.	1591.47	14 14
23JUL80	356.00	38.29	0.00	1	64	37071.(	1591.50	14 14
23JUL80	1144.00	35.00	3.23	1	64	37539.0	1591.56	14 14
23JUL80	1538.00	35.00	3.15	1	64	38013.00	1591.64	14 14
24JUL80	922.00	35.00	3.14	1	64	38837.00	1591.65	14 14
24JUL80	1733.00	35.00	2.97	1	64	39328.00	1591.8	14 14
25JUL80	1032.00	35.00	3.00	1	64	40347.00	1591.7	14 14
25JUL80	1720.00	35.00	2.97	1	64	40755.00	1591.82	14 14
26JUL80	1031.00	35.00	2.91	1	64	41786.00	1591.88	14 14
27JUL80	1035.00	30.00	9.99	1	83	45230.00	1592.00	15 BY D. K. TO 9/2/80
28JUL80	955.00	30.00	9.85	1	83	44628.00	1592.14	15 BY D. K. TO 9/2/80
29JUL80	833.00	30.00	9.88	1	83	45988.00	1592.11	15 BY D. K. TO 9/2/80
30JUL80	1038.00	30.00	9.81	1	83	47553.00	1592.18	15 BY D. K. TO 9/2/80
31JUL80	1405.00	30.00	9.78	1	83	49200.00	1592.21	15 BY D. K. TO 9/2/80
01AUG80	1314.00	30.00	9.75	1	83	50589.00	1592.24	15 BY D. K. TO 9/2/80
03AUG80	728.00	30.00	9.70	1	83	53123.00	1592.29	4 15
05AUG80	1405.00	30.00	9.67	1	83	56400.00	1592.32	4 15
07AUG80	1403.00	30.00	9.59	1	83	59278.00	1592.40	4 15
09AUG80	900.00	30.00	9.54	1	83	61855.00	1592.45	4 15
12AUG80	1422.00	30.00	9.54	1	83	66497.00	1592.45	4 15
14AUG80	1058.00	30.00	9.44	1	83	69173.00	1592.55	4 15
16AUG80	1210.00	30.00	9.47	1	83	72125.00	1592.52	4 15
20AUG80	1405.00	39.31	0.00	1	83	78000.00	1592.68	15
22AUG80	1232.00	39.44	0.00	1	83	80787.00	1592.55	15
02SEP80	818.00	39.28	0.00	1	83	96373.00	1592.71	15



PRELIMINARY

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Preliminary Report

3.6-4-268

EXXON MINERALS COMPANY, U.S.A. DRANDON PROJECT
LOG OF BORING DMB-1A SHEET 1 OF 2
DAMES & MOORE | FIGURE B-67

BORING DMB-1A (CONT'D)

DEPTH (FEET)	OTHER TESTS	SHEAR STRENGTH PSF	ATTERBERG LIMITS: LIQUID LIMIT %	ATTERBERG LIMITS: PLASTIC LIMIT %	ATTERBERG LIMITS: PLASTICITY INDEX %	FIELD MOISTURE CONTENT %	DRY DENSITY PCF	PERCENT RECOVERED	R QD	BLOW COUNTS SAMPLES	SYMBOLS	DESCRIPTIONS	ELEVATION (FEET)
60													
65										112/9" ■	SP	REDDISH-BROWN FINE GRAINED, SUBROUNDED QUARTZ SAND, TRACE SILT, TRACE OF GRAVEL AND COBBLES TO 1" IN DIAMETER, VERY DENSE, CALCAREOUS	— 1565
70										120/9" ■	SP	REDDISH-BROWN, MEDIUM GRAINED, SUBROUNDED QUARTZ SAND, TRACE FINE GRAVEL, VERY DENSE, CALCAREOUS MOIST-WET	— 1560
75										122/11" ■	SP SM	REDDISH-BROWN FINE GRAINED, SUBROUNDED QUARTZ SAND, TRACE SILT, VERY DENSE, CALCALCAREOUS	— 1555
80										147/11" ■			— 1550

BORING COMPLETED AT 79.4 FEET ON 5-16-78.
4 INCH CASING USED TO A DEPTH OF 10 FEET.
PIEZOMETER INSTALLED ON 5-16-78.
2 INCH PVC SLOTTED FROM 65.0 TO 79.0 FEET.
GRAVEL PACK: 30.0 TO 79.0 FEET.
SAND: 24.0 TO 30.0 FEET.
GROUT: 0 TO 24.0 FEET.
GROUND WATER LEVEL RECORDED AT 36.6 FEET ON 6-10-78.

PRELIMINARY

Copy from Dames & Moore
Preliminary Report

EXXON MINERALS COMPANY, U.S.A.
CRANDON PROJECT

LOG OF BORING DMB-1A
SHEET 2 OF 2

1/79

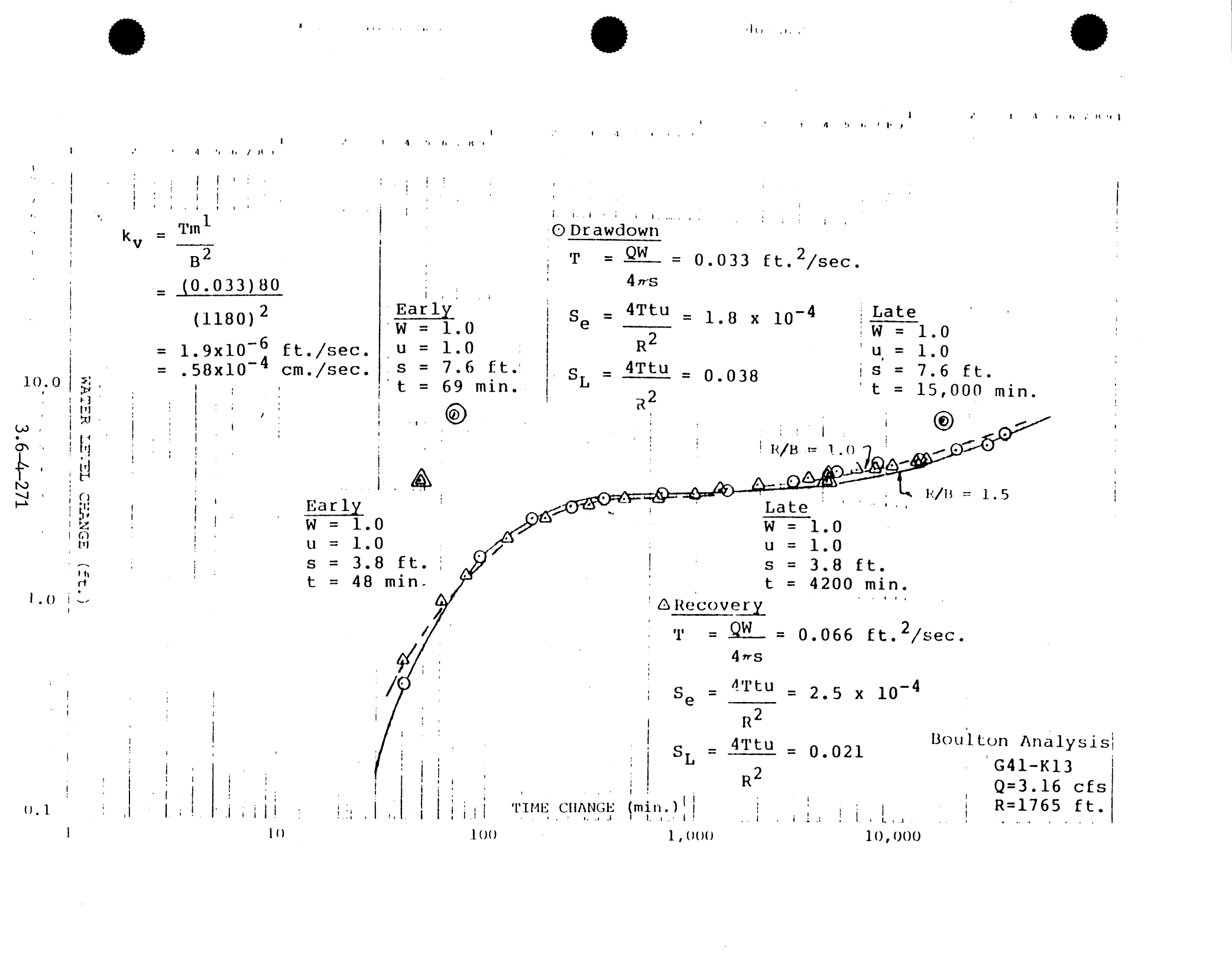
3.6-4-269

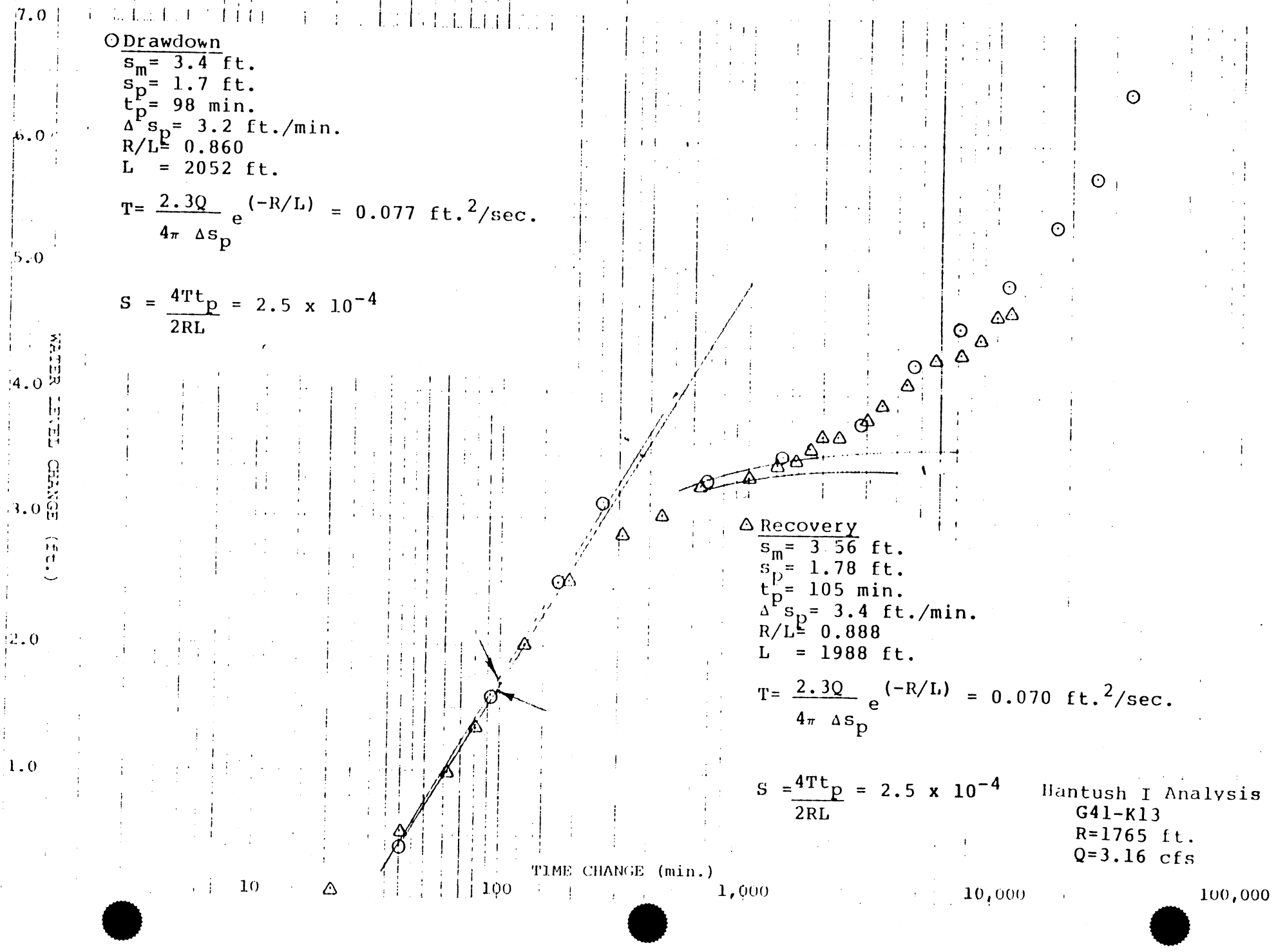
DAMES & MOORE

FIGURE B-402

APPENDIX B

B-13
G41-K13
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


$k_v = \frac{Tm^1}{B^2}$
$= \frac{(0.033)80}{(1180)^2}$
$= 1.9 \times 10^{-6}$ ft./sec.
$= .58 \times 10^{-4}$ cm./sec.
⊙ Drawdown
$T = \frac{QW}{4\pi s} = 0.033$ ft.^{2}/sec.
$S_e = \frac{4Ttu}{R^2} = 1.8 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.038$
Early
W = 1.0
u = 1.0
s = 7.6 ft.
t = 69 min.
Late
W = 1.0
u = 1.0
s = 7.6 ft.
t = 15,000 min.
R/B = 1.0
R/B = 1.5
Early
W = 1.0
u = 1.0
s = 3.8 ft.
t = 48 min.
Late
W = 1.0
u = 1.0
s = 3.8 ft.
t = 4200 min.
△ Recovery
$T = \frac{QW}{4\pi s} = 0.066$ ft.^{2}/sec.
$S_e = \frac{4Ttu}{R^2} = 2.5 \times 10^{-4}$
$S_L = \frac{4Ttu}{R^2} = 0.021$
Boulton Analysis
G41-K13
Q=3.16 cfs
R=1765 ft.
10.0
1.0
0.1
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000


7.0
6.0
5.0
4.0
3.0
2.0
1.0
WATER LEVEL CHANGE (ft.)
TIME CHANGE (min.)
10
100
1,000
10,000
100,000
⊙Drawdown
s_m= 3.4 ft.
s_p= 1.7 ft.
t_p= 98 min.
Δs_p= 3.2 ft./min.
R/L= 0.860
L = 2052 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.077 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.5 x 10^{-4}
△Recovery
s_m= 3 56 ft.
s_p= 1.78 ft.
t_p= 105 min.
Δs_p= 3.4 ft./min.
R/L= 0.888
L = 1988 ft.
$T = \frac{2.3Q}{4\pi \Delta s_p} e^{(-R/L)}$ = 0.070 ft.^{2}/sec.
$S = \frac{4Tt_p}{2RL}$ = 2.5 x 10^{-4}
Hantush I Analysis
G41-K13
R=1765 ft.
Q=3.16 cfs

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1005.00	100.70	0.00	1	20	-627840.00	1602.22	
18APR79	1005.00	100.70	0.00	1	20	-627840.00	1602.22	
								CORRECT TO COLLAR TOP
12NOV79	1200.00	108.50	0.00	1	20	-328205.00	1594.42	GROUND SURFACE-CORR. TO
05DEC79	1200.00	108.30	0.00	1	20	-297965.00	1594.62	GROUND SURFACE-CORR. TO
25APR80	1200.00	109.15	.10	1	14	-90605.00	1593.67	CORRECT TO COLLAR TOP
21MAY80	1200.00	111.16	-1.88	1	15	-53165.00	1593.69	14 - TIME NOT RECORD
31MAY80	1240.00	109.25	0.00	1	65	-38725.00	1593.57	15 - NO TIME
02JUN80	930.00	109.07	0.00	1	65	-36035.00	1593.75	4 14 SET CASE
03JUN80	1030.00	111.53	0.00	1	93	-34535.00	1593.60	4 14
08JUN80	915.00	109.43	0.00	1	65	-27410.00	1593.59	4 15
09JUN80	930.00	109.08	0.00	1	65	-25955.00	1593.74	4 14
10JUN80	1025.00	109.30	0.00	1	65	-24460.00	1593.52	4 14
11JUN80	945.00	111.54	0.00	1	93	-23060.00	1593.59	4 14
12JUN80	935.00	111.44	0.00	1	93	-21610.00	1593.69	15 15
13JUN80	935.00	109.12	0.00	1	92	-20190.00	1596.00	15 15
14JUN80	1035.00	109.11	0.00	1	65	-18690.00	1593.71	15 15
15JUN80	935.00	109.03	0.00	1	65	-17310.00	1593.79	4 14
16JUN80	805.00	109.19	0.00	1	65	-15960.00	1593.63	4 14
24JUN80	820.00	109.08	0.00	1	65	-4425.00	1593.74	4 14
25JUN80	930.00	109.03	0.00	1	65	-2915.00	1593.79	4 14
26JUN80	945.00	109.05	0.00	1	65	-1460.00	1593.77	4 14
27JUN80	853.00	109.29	0.00	1	65	-72.00	1593.53	4 14
27JUN80	1045.00	109.71	0.00	1	65	40.00	1593.11	14 14 BEFORE TEST
27JUN80	1137.00	110.88	0.00	1	66	92.00	1591.90	14 14
27JUN80	1238.00	111.75	0.00	1	66	173.00	591.03	14 14
27JUN80	1415.00	112.12	0.00	1	66	250.00	590.66	14 14
27JUN80	1602.00	112.37	0.00	1	66	357.00	590.41	14 14
27JUN80	1747.00	112.50	0.00	1	66	462.00	590.28	14 14
27JUN80	1944.00	112.52	0.00	1	66	579.00	1590.26	14 14
27JUN80	2138.00	112.56	0.00	1	66	693.00	1590.22	14 14
28JUN80	551.00	112.83	0.00	1	66	1186.00	1589.95	14 14
28JUN80	917.00	112.75	0.00	1	66	1392.00	1590.03	14 14
28JUN80	1231.00	113.20	0.00	1	4	1586.00	1589.94	
28JUN80	1231.00	113.20	0.00	1	4	1586.00	1589.94	4
								4
28JUN80	1539.00	113.18	0.00	1	4	1774.00	1589.96	
28JUN80	1539.00	113.18	0.00	1	4	1774.00	1589.96	4 4
								4 4
28JUN80	1842.00	113.24	0.00	1	4	1957.00	1589.90	4 4

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
28JUN80	2329.00	112.96	0.00	1	66	2244.00	1589.82	12 14
29JUN80	908.00	113.03	0.00	1	66	2823.00	1589.75	14 14
29JUN80	1717.00	113.23	0.00	1	66	3312.00	1589.55	14 14
30JUN80	137.00	113.42	0.00	1	66	3812.00	1589.36	14 14
30JUN80	746.00	113.45	0.00	1	66	4181.00	1589.33	14 14
30JUN80	1633.00	113.50	0.00	1	66	4708.00	1589.28	14 14
01JUL80	710.00	113.68	0.00	1	66	5585.00	1589.30	14 14
01JUL80	1734.00	113.64	0.00	1	66	6209.00	1589.14	16 14
02JUL80	126.00	113.79	0.00	1	66	6681.00	1588.99	16 14
02JUL80	1017.00	113.88	0.00	1	66	7212.00	1588.90	16 14
02JUL80	2051.00	113.85	0.00	1	66	7846.00	1588.93	16 14
03JUL80	958.00	113.88	0.00	1	66	8633.00	1588.90	16 14
03JUL80	2017.00	113.89	0.00	1	66	9252.00	1588.89	16 14
04JUL80	811.00	113.98	0.00	1	66	9966.00	1588.80	16 14
05JUL80	2110.00	114.33	0.00	1	66	12185.00	1588.45	14 14
06JUL80	1205.00	114.40	0.00	1	66	13080.00	1588.38	14 14
06JUL80	1803.00	114.31	0.00	1	66	13638.00	1588.47	14 14
07JUL80	735.00	114.25	0.00	1	66	14250.00	1588.53	14 14
07JUL80	1700.00	114.20	0.00	1	66	14815.00	1588.58	14 14
08JUL80	1130.00	114.59	0.00	1	66	15925.00	1588.19	14 14
08JUL80	2042.00	114.56	0.00	1	66	16477.00	1588.22	14 14
09JUL80	1001.00	114.61	0.00	1	66	17276.00	1588.17	14 14
09JUL80	1632.00	114.56	0.00	1	66	17667.00	1588.22	14 14
10JUL80	948.00	114.68	0.00	1	66	18703.00	1588.10	14 14
10JUL80	1757.00	114.65	0.00	1	66	19192.00	1588.13	14 14
11JUL80	1028.00	114.79	0.00	1	66	20183.00	1587.99	14 14
11JUL80	1952.00	114.87	0.00	1	66	20747.00	1587.91	14 14
12JUL80	1049.00	114.94	0.00	1	66	21644.00	1587.84	14 14
13JUL80	947.00	115.11	0.00	1	66	23022.00	1587.67	14 14
14JUL80	1158.00	115.00	0.00	1	66	24593.00	1587.78	14 14
15JUL80	1039.00	115.25	0.00	1	66	25954.00	1587.53	14 14
16JUL80	1040.00	115.22	0.00	1	66	27395.00	1587.56	14 14
17JUL80	932.00	115.38	0.00	1	66	28767.00	1587.40	14 14
18JUL80	857.00	115.42	0.00	1	66	30172.00	1587.36	14 14
20JUL80	902.00	115.42	0.00	1	66	33057.00	1587.36	14 14
21JUL80	747.00	115.69	0.00	1	66	34422.00	1587.09	14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALOG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1702.92 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1026.00	115.62	0.00	1	67	34581.00	1587.15	14 14 START @ 10
21JUL80	1045.00	115.15	0.00	1	67	34600.00	1587.62	14 14
21JUL80	1106.00	114.69	0.00	1	66	34621.00	1588.09	14 14
21JUL80	1125.00	114.35	0.00	1	66	34640.00	1588.43	66
21JUL80	1150.00	113.91	0.00	1	66	34665.00	1588.87	14 14
21JUL80	1211.00	113.67	0.00	1	66	34686.00	1589.11	14 14
21JUL80	1233.00	113.46	0.00	1	66	34708.00	1589.32	14 14
21JUL80	1253.00	113.31	0.00	1	66	34728.00	1589.47	14 14
21JUL80	1314.00	113.17	0.00	1	66	34749.00	1589.61	14 14
21JUL80	1337.00	113.06	0.00	1	66	34772.00	1589.72	14 14
21JUL80	1404.00	112.96	0.00	1	66	34799.00	1589.82	14 14
21JUL80	1427.00	112.89	0.00	1	66	34822.00	1589.89	14 14
21JUL80	1510.00	112.80	0.00	1	66	34865.00	1589.98	14 14
21JUL80	1635.00	112.69	0.00	1	66	34954.00	1590.09	14 14
21JUL80	1731.00	112.65	0.00	1	66	35006.00	1590.13	14 14
21JUL80	1945.00	112.46	0.00	1	66	35140.00	1590.32	14 14
21JUL80	2037.00	112.41	0.00	1	66	35192.00	1590.37	14 14
21JUL80	2200.00	112.38	0.00	1	66	35275.00	1590.40	14 14
22JUL80	37.00	112.34	0.00	1	66	35432.00	1590.44	14 14
22JUL80	308.00	112.28	0.00	1	66	35583.00	1590.50	14 14
22JUL80	826.00	112.19	0.00	1	66	35901.00	1590.59	14 14
22JUL80	1215.00	112.15	0.00	1	66	36128.00	1590.63	14 14
22JUL80	1549.00	112.08	0.00	1	66	36344.00	1590.70	14 14
22JUL80	1929.00	112.00	0.00	1	66	36564.00	1590.78	14 14
23JUL80	55.00	112.00	0.00	1	66	36890.00	1590.78	14 14
23JUL80	408.00	111.99	0.00	1	66	37083.00	1590.79	14 14
23JUL80	1202.00	110.00	1.90	1	66	37557.00	1590.88	14 14
23JUL80	1947.00	110.00	1.81	1	66	38022.00	1590.97	14 14
24JUL80	945.00	110.00	1.69	1	66	38860.00	1591.09	14 14
24JUL80	1741.00	110.00	1.58	1	66	39336.00	1591.20	14 14
25JUL80	1041.00	110.00	1.57	1	66	40356.00	1591.21	14 14
25JUL80	1710.00	110.00	1.64	1	66	40745.00	1591.14	14 14
26JUL80	955.00	110.00	1.61	1	66	41750.00	1591.17	14 14
27JUL80	905.00	110.00	3.90	1	93	43140.00	1591.[illegible]3	15 BY O. K. TO 9/2/80
28JUL80	840.00	110.00	3.77	1	93	44555.00	1591.[illegible]6	15 BY O. K. TO 9/2/80
29JUL80	940.00	110.00	3.84	1	93	46055.00	1591.29	15 BY O. K. TO 9/2/80
30JUL80	1151.00	110.00	3.75	1	93	47626.00	1591.38	15 BY O. K. TO 9/2/80
31JUL80	1508.00	110.00	3.70	1	93	49263.00	1591.43	15 BY O. K. TO 9/2/80
01AUG80	1155.00	110.00	3.64	1	93	50510.00	1591.49	15 BY O. K. TO 9/2/80
03AUG80	911.00	110.00	3.59	1	93	53226.00	1591.54	4 15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1707.92 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
05AUG80	1705.00	100.00	3.51	1	91	56580.00	1601.47	4 15
07AUG80	1453.00	110.00	3.49	1	93	59328.00	1591.64	4 15
09AUG80	1020.00	110.00	3.48	1	93	61935.00	1591.65	4 15
12AUG80	1303.00	110.00	3.52	1	93	66418.00	1591.61	4 15
14AUG80	1156.00	110.00	3.41	1	93	69231.00	1591.72	4 15
16AUG80	1040.00	110.00	3.43	1	93	72035.00	1591.70	4 15
20AUG80	1502.00	113.23	0.00	1	93	78057.00	1591.90	15
22AUG80	1350.00	113.17	0.00	1	93	80865.00	1591.96	15
02SEP80	838.00	113.22	0.00	1	93	96393.00	1591.91	15
10SEP80	1010.00	114.14	0.00	1	15	108005.00	1588.78	15 FOR G.W. MAP

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-K13

SHEET 1 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/?/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.0		For soil stratigraphy, see boring G41-K13A							4/18/79 29.69 97.4
36.58									
120.0		Very dense, yellow-brown, fine to coarse SAND, trace silt, trace fine gravel, trace clay Boulder noted at 125.0'-129.5'	SM	-	1	DD	Air Hammer	9/9	
39.47									
129.5				-	2	DD	Air Hammer	6/6	
		Very dense, red-brown, fine to coarse SAND, some silt, trace fine gravel, trace clay	SM						
				-	3	DD	Air Hammer	12/12	
44.50									
146.0		CONTINUED							

Job No 786035
Scale 1"=5'

Golder Associates 3.6-4-277

Drawn jls
Checked

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-K13

SHEET 2 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
44.50 / 146.0		CONTINUED							
					4	DO	Air Hammer	6/6	
		Very dense, red-brown, fine to coarse SAND, some silt, trace fine gravel, trace clay	SM						
				-	5	DO	Air Hammer	12/12	
51.05 / 167.5									
		Very dense, brown, fine gravelly, fine to coarse SAND, some silt, occasional cobbles	GP-GM	-	6	DO	Air Hammer	10/12	
				-	7	DO	Air Hammer	0/0	
55.17 / 181.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates

3.6-4-278

Drawn jls
Checked JDS

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-M13

SURFACE ELEV 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
55.17		CONTINUED							
181.0		Very dense, brown, fine gravelly, fine to coarse SAND, some silt, occasional cobbles	GP-GM						
57.91									
190.0		Very dense, yellow-brown, fine to coarse SAND, some silt	SM	-	8	DO	Air Hammer	12/12	
59.44									
195.0		Very dense, brown, fine to coarse SAND, some fine gravel, trace silt	SW-SM	-	9	DO	Air Hammer	18/18	
64.01									
210.0		Very dense, brown, fine to medium SAND and SILT	SM	-	10	DO	Air Hammer	6/6	
65.53									
215.0		CONTINUED							

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-279

Drawn jls
Checked

COOR. N1114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-K13

SHEET 4 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT (ins.)	GROUNDWATER OBSERVATION WELL
65.53		CONTINUED							
215.0		Very dense, brown fine to medium SAND and SILT	SM						
66.45									
218.0		Very dense, brown, fine to medium SAND, trace silt	SP-SM						
				-	11	DO	Air Hammer	6/12	
69.50									
228.0		Very dense, red-brown, silty fine to coarse SAND, trace to some fine gravel	SM	-	12	DO	Air Hammer	6/6	
									Grout (to surface)
									2" Solid PVC Pipe to Surface
									72.39 / 237.0 Bentonite Clay Seal
									73.15 / 240.0 Pea Gravel
74.07									
243.0		CONTINUED							CONTINUED

Job No 786085
Scale 1"=5'

Golder Associates 3.6-4-280

Drawn jls
Checked

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-K13

SHEET 5 OF 6

SURFACE ELEV 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
74.07		CONTINUED							CONTINUED
243.0		Very dense, red-brown, silty fine to coarse SAND, trace to some fine gravel	SM	-	13	DD	Air Hammer	12/12	
75.44									
247.5		Very dense, brown, fine to coarse SAND, some fine gravel, trace silt, trace clay	SM	-	14	DD	Air Hammer	18/18	Pea Gravel; 2" Solid PVC Pipe
78.86									
262.0		Very dense, brown, fine to coarse SAND, trace silt, trace clay	SM	-	15	DD	Air Hammer	18/18	79.25 / 260.0 Pea Gravel; 2" Slotted PVC Pipe
82.91									
272.0		Greenish-gray, highly weathered metavolcanic TUFF		-	16	DD	Air Hammer	6/6	82.30 / 270.0 Pea Gravel (to bottom of boring)
84.43									
277.0		CONTINUED							

Job No. 786085
Scale 1"=5'

Golder Associates 3.6-4-281

Drawn jls
Checked

COOR. N114755 ft. (N34977m)
E2285965 ft. (E696764m)

BORING LOG G41-K13

SHEET 6 OF 6

SURFACE ELEV. 1699.7 ft. (518.06m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 4/3/79 DATE COMPLETED 4/9/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES: REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
84.43		CONTINUED							
277.0		Greenish-gray, highly weathered metavolcanic TUFF		-	-	-	Drill Cuttings	-	
86.87									
285.0		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Elevation of top of protector pipe, 1702.9 ft. (519.05m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	4/16/79	11/12/79	12/3/79	4/25/80	5/21/80	6/26/80*	9/10/80*
DEPTH (m)	29.69	32.06	32.00	32.28	32.89	32.28	32.89
DEPTH (ft.)	97.4	105.2	105.0	105.9	107.9	105.9	107.9

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

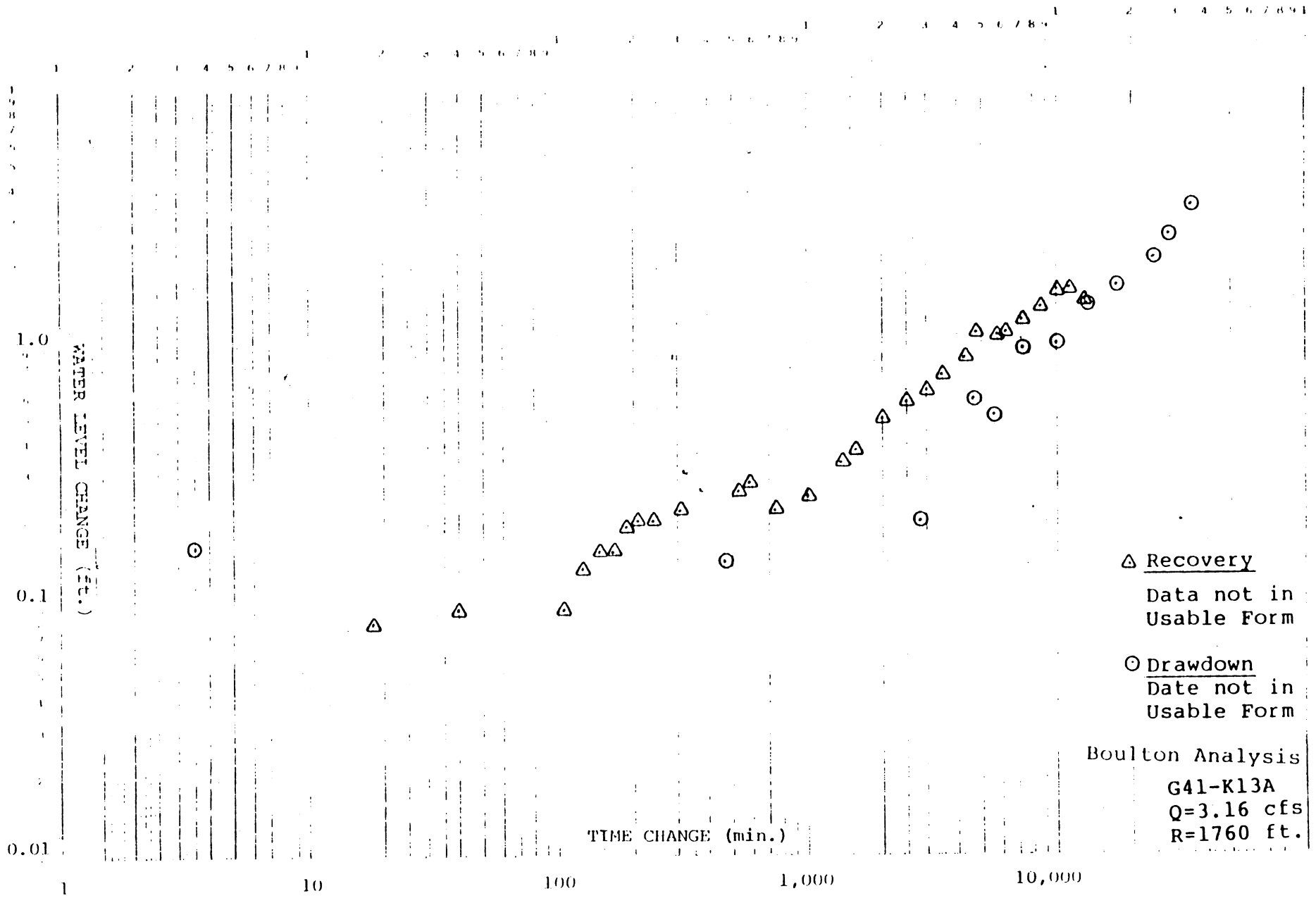
Job No. 786085
Scale 1"=5'

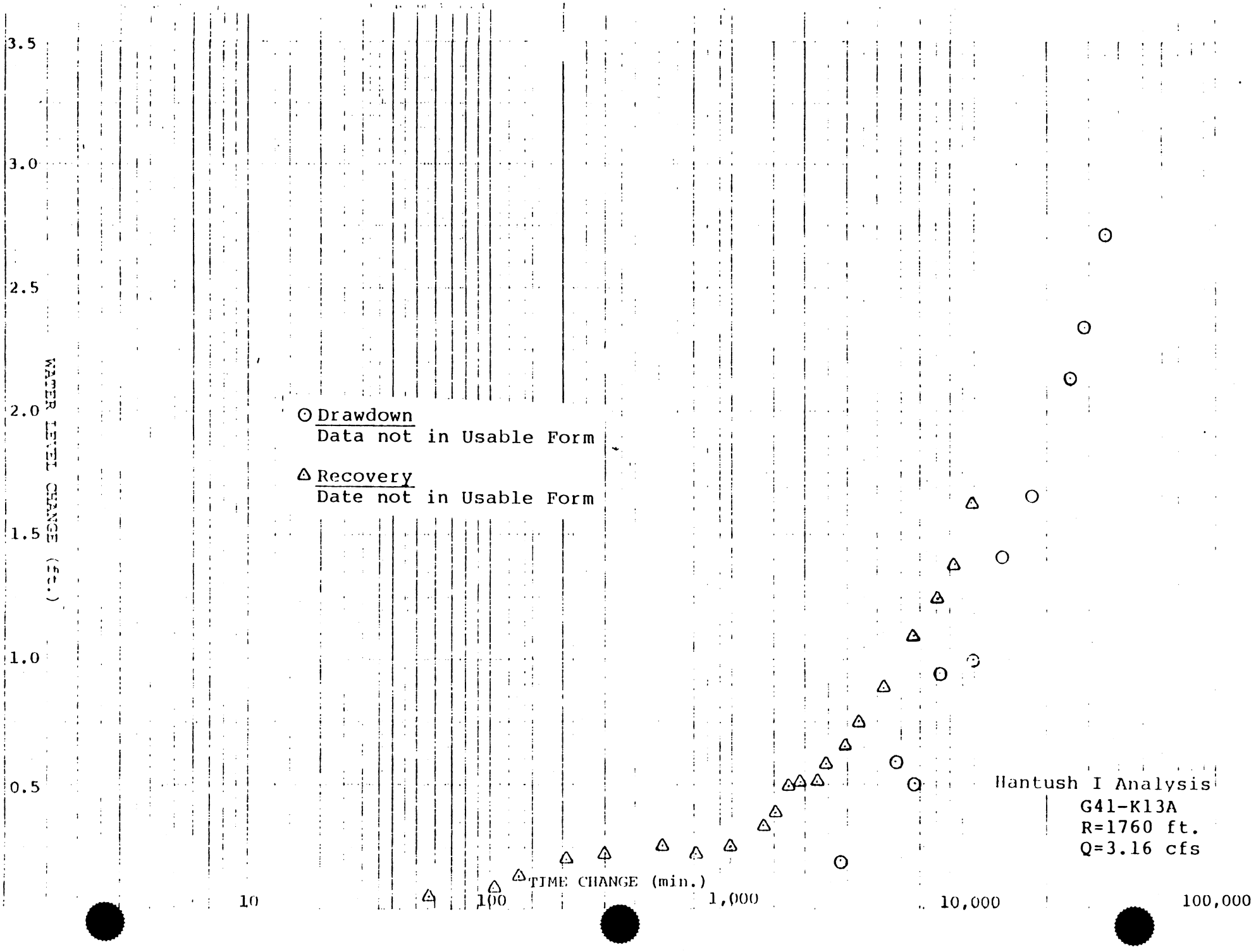
Golder Associates 3.6-4-282

Drawn jls
Checked

APPENDIX B

B-14
G41-K13A
Boulton Analysis Curves
Hantush I Analysis Curves
Water Level Measurements
Boring Log with Observation Well Details


WATER LEVEL CHANGE (ft.)
1.0
0.1
0.01
TIME CHANGE (min.)
1
10
100
1,000
10,000
Recovery
Data not in Usable Form
Drawdown
Date not in Usable Form
Boulton Analysis
G41-K13A
Q=3.16 cfs
R=1760 ft.


3.5
3.0
2.5
2.0
1.5
1.0
0.5
WATER LEVEL CHANGE (ft.)
⊙ Drawdown
Data not in Usable Form
△ Recovery
Date not in Usable Form
Hantush I Analysis
G41-K13A
R=1760 ft.
Q=3.16 cfs
10
100
1,000
10,000
100,000
TIME CHANGE (min.)

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 796085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
								COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1005.00	111.70	0.00	1	20	-627840.00	1591.29	
18APR79	1005.00	111.70	0.00	1	20	-627840.00	1591.29	CORRECT TO COLLAR TOP
								GROUND SURFACE-CORR. TO
12NOV79	1200.00	108.20	0.00	1	20	-328205.00	1594.79	GROUND SURFACE-CORR. TO
03DEC79	1200.00	107.60	0.00	1	20	-297965.00	1595.39	CORRECT TO COLLAR TOP
25APR80	1200.00	108.75	.10	1	14	-90605.00	1594.14	14 - TIME NOT RECORD
21MAY80	1200.00	100.71	-7.86	1	15	-53165.00	1604.34	15 - NO TIME
31MAY80	1240.00	108.87	0.00	1	65	-38725.00	1594.02	4 14 SET CASE
02JUN80	930.00	108.68	0.00	1	65	-36035.00	1594.21	4 14
03JUN80	1030.00	111.05	0.00	1	93	-34535.00	1594.15	4 15
06JUN80	915.00	108.90	0.00	1	65	-27410.00	1593.99	4 14
09JUN80	930.00	108.60	0.00	1	65	-25955.00	1594.29	4 14
10JUN80	1025.00	108.79	0.00	1	65	-24460.00	1594.10	4 14
11JUN80	945.00	111.10	0.00	1	93	-23060.00	1594.10	15 15
12JUN80	935.00	110.92	0.00	1	93	-21630.00	1594.28	15 15
13JUN80	935.00	108.64	0.00	1	92	-20190.00	1596.55	15 15
14JUN80	1035.00	108.63	0.00	1	65	-18690.00	1594.26	4 14
15JUN80	935.00	108.79	0.00	1	65	-17310.00	1594.10	4 14
16JUN80	805.00	108.70	0.00	1	65	-15960.00	1594.19	4 14
24JUN80	820.00	108.64	0.00	1	65	-4425.00	1594.25	4 14
25JUN80	930.00	108.52	0.00	1	65	-2915.00	1594.37	4 14
26JUN80	945.00	108.52	0.00	1	65	-1460.00	1594.37	4 14
27JUN80	850.00	108.79	0.00	1	65	-75.00	1594.10	14 14 BEFORE TEST
27JUN80	1040.00	108.68	0.00	1	65	35.00	1594.21	14 14 START # 10
27JUN80	1140.00	108.77	0.00	1	65	95.00	1594.12	14 14
27JUN80	1255.00	108.68	0.00	1	65	170.00	1594.21	14 14
27JUN80	1419.00	108.75	0.00	1	65	259.00	1594.14	14 14
27JUN80	1600.00	108.70	0.00	1	65	355.00	1594.19	14 14
27JUN80	1749.00	108.66	0.00	1	65	464.00	1594.23	14 14
27JUN80	1942.00	108.60	0.00	1	65	577.00	1594.29	14 14
27JUN80	2141.00	108.58	0.00	1	65	696.00	1594.31	14 14
28JUN80	547.00	108.58	0.00	1	65	1182.00	1594.31	14 14
28JUN80	919.00	108.53	0.00	1	65	1394.00	1594.36	14 14
28JUN80	1247.00	108.91	0.00	1	4	1602.00	1594.30	
28JUN80	1247.00	108.91	0.00	1	4	1602.00	1594.30	14
								14
28JUN80	1547.00	108.92	0.00	1	4	1782.00	1594.29	4 14
28JUN80	1838.00	108.92	0.00	1	4	1953.00	1594.29	4 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	ALG	CON	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1702.09 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
28JUN80	2325.00	108.66	0.00	1	65	2240.00	1594.23	12 14
29JUN80	910.00	108.72	0.00	1	65	2825.00	1594.17	14 14
29JUN80	1714.00	108.94	0.00	1	65	3309.00	1593.95	14 14
30JUN80	133.00	109.11	0.00	1	65	3808.00	1593.78	14 14
30JUN80	743.00	109.10	0.00	1	65	4178.00	1593.79	14 14
30JUN80	1631.00	109.11	0.00	1	65	4706.00	1593.78	14 14
01JUL80	706.00	109.03	0.00	1	65	5581.00	1593.86	14 14
01JUL80	1731.00	109.22	0.00	1	65	6206.00	1593.67	16 14
02JUL80	122.00	109.37	0.00	1	65	6677.00	1593.52	16 14
02JUL80	1015.00	109.47	0.00	1	65	7210.00	1593.42	16 14
02JUL80	2048.00	109.41	0.00	1	65	7843.00	1593.48	16 14
03JUL80	955.00	109.40	0.00	1	65	8630.00	1593.49	16 14
03JUL80	2013.00	109.40	0.00	1	65	9248.00	1593.49	16 14
04JUL80	808.00	109.52	0.00	1	65	9963.00	1593.37	16 14
04JUL80	2003.00	109.51	0.00	1	62	10678.00	1593.55	15 15 SINCO 1
05JUL80	743.00	109.63	0.00	1	65	11378.00	1593.26	14 14
05JUL80	2108.00	109.92	0.00	1	65	12183.00	1592.97	14 14
06JUL80	1203.00	109.94	0.00	1	65	13078.00	1592.95	14 14
06JUL80	1801.00	109.79	0.00	1	65	13436.00	1593.10	14 14
07JUL80	730.00	109.75	0.00	1	65	14245.00	1593.14	14 14
07JUL80	1658.00	109.71	0.00	1	65	14813.00	1593.18	14 14
08JUL80	1126.00	110.14	0.00	1	66	15921.00	15 .71	14 14
08JUL80	2040.00	110.13	0.00	1	66	16475.00	15 .72	14 14
09JUL80	959.00	110.14	0.00	1	66	17274.00	1592.71	14 14
09JUL80	1629.00	110.09	0.00	1	66	17669.00	1592.76	14 14
10JUL80	946.00	110.24	0.00	1	66	18701.00	1592.61	14 14
10JUL80	1755.00	110.20	0.00	1	66	19190.00	1592.65	14 14
11JUL80	1028.00	110.37	0.00	1	66	20183.00	1592.48	14 14
11JUL80	1950.00	110.49	0.00	1	66	20745.00	1592.36	14 14
12JUL80	1045.00	110.51	0.00	1	66	21640.00	1592.34	14 14
13JUL80	945.00	110.80	0.00	1	66	23020.00	1592.05	14 14
14JUL80	1155.00	110.66	0.00	1	66	24590.00	1592.19	14 14
15JUL80	1057.00	110.87	0.00	1	66	25952.00	1591.98	14 14
16JUL80	1037.00	110.99	0.00	1	66	27392.00	1591.86	14 14
17JUL80	930.00	111.16	0.00	1	66	28765.00	1591.69	14 14
18JUL80	855.00	111.31	0.00	1	66	30170.00	1591.54	14 14
20JUL80	901.00	111.53	0.00	1	66	33056.00	1591.32	14 14
21JUL80	745.00	111.92	0.00	1	66	34420.00	1590.93	14 14
21JUL80	1023.00	111.89	0.00	1	66	34578.00	1591.01	14 14 START @ 10
21JUL80	1044.00	111.83	0.00	1	66	34599.00	1591.02	14 14
21JUL80	1102.00	111.87	0.00	1	66	34617.00	1590.98	14 14
21JUL80	1122.00	111.97	0.00	1	66	34637.00	1590.88	66
21JUL80	1148.00	111.83	0.00	1	66	34663.00	1591.02	14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K15A ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1702.99 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
21JUL80	1208.00	111.79	0.00	1	66	34683.00	1591.26	14 14
21JUL80	1231.00	111.77	0.00	1	66	34706.00	1591.08	14 14
21JUL80	1251.00	111.77	0.00	1	66	34726.00	1591.08	14 14
21JUL80	1312.00	111.73	0.00	1	66	34747.00	1591.12	14 14
21JUL80	1334.00	111.73	0.00	1	66	34769.00	1591.12	14 14
21JUL80	1402.00	111.73	0.00	1	66	34797.00	1591.12	14 14
21JUL80	1425.00	111.73	0.00	1	66	34820.00	1591.12	14 14
21JUL80	1508.00	111.70	0.00	1	66	34863.00	1591.15	14 14
21JUL80	1637.00	111.73	0.00	1	66	34952.00	1591.12	14 14
21JUL80	1729.00	111.71	0.00	1	66	35009.00	1591.14	14 14
21JUL80	1845.00	111.66	0.00	1	66	35080.00	1591.19	14 14
21JUL80	1943.00	111.64	0.00	1	66	35138.00	1591.21	14 14
21JUL80	2039.00	111.71	0.00	1	66	35194.00	1591.14	14 14
21JUL80	2203.00	111.70	0.00	1	66	35278.00	1591.15	14 14
21JUL80	2314.00	111.96	0.00	1	66	35349.00	1590.89	14 14
22JUL80	35.00	111.82	0.00	1	66	35430.00	1591.03	14 14
22JUL80	305.00	111.66	0.00	1	66	35580.00	1591.19	14 14
22JUL80	828.00	111.62	0.00	1	66	35903.00	1591.23	14 14
22JUL80	1215.00	111.62	0.00	1	66	36130.00	1591.23	14 14
22JUL80	1552.00	111.52	0.00	1	66	36347.00	1591.33	14 14
22JUL80	1927.00	111.51	0.00	1	66	36562.00	1591.34	14 14
23JUL80	53.00	111.52	0.00	1	66	36888.00	1591.33	14 14
23JUL80	406.00	111.50	0.00	1	66	37081.00	1591.35	14 14
23JUL80	1201.00	110.00	1.45	1	66	37556.00	1591.40	14 14
23JUL80	1946.00	110.00	1.38	1	66	38021.00	1591.47	14 14
24JUL80	943.00	110.00	1.32	1	66	38858.00	1591.53	14 14
24JUL80	1740.00	110.00	1.17	1	66	39335.00	1591.68	14 14
25JUL80	1039.00	110.00	1.26	1	66	40354.00	1591.59	14 14
25JUL80	1705.00	110.00	1.28	1	66	40740.00	1591.57	14 14
26JUL80	953.00	110.00	1.23	1	66	41748.00	1591.62	14 14
27JUL80	902.00	110.00	3.54	1	93	43137.00	1591.66	15 BY O. K. TO 9/2/80
28JUL80	838.00	110.00	3.41	1	93	44553.00	1591.79	15 BY O. K. TO 9/2/80
29JUL80	945.00	110.00	3.52	1	93	46060.00	1591.68	15 BY O. K. TO 9/2/80
30JUL80	1156.00	110.00	3.88	1	93	47631.00	1591.32	15 BY O. K. TO 9/2/80
31JUL80	1510.00	110.00	3.33	1	93	49265.00	1591.87	15 BY O. K. TO 9/2/80
01AUG80	1158.00	110.00	3.34	1	93	50513.00	1591.86	15 BY O. K. TO 9/2/80
03AUG80	916.00	110.00	3.31	1	93	53231.00	1591.89	4 15
05AUG80	1700.00	110.00	3.32	1	93	56575.00	1591.88	4 15
07AUG80	1450.00	110.00	3.18	1	93	59325.00	1592.02	4 15
09AUG80	1023.00	110.00	3.15	1	93	61938.00	1592.05	4 15
12AUG80	1306.00	110.00	3.12	1	93	66921.00	1592.08	4 15
14AUG80	1159.00	110.00	3.10	1	93	69234.00	1592.10	4 15
16AUG80	1043.00	110.00	3.11	1	93	72038.00	1592.09	4 15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***K13A ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	**COMMENTS**
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1702.59 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
20AUG80	1505.00	112.87	0.00	1	93	78060.00	1592.33	15
22AUG80	1352.00	112.80	0.00	1	93	80867.00	1592.40	15
02SEP80	835.00	112.98	0.00	1	93	96390.00	1592.22	15
10SEP80	1005.00	110.81	0.00	1	15	108000.00	1592.18	15 FOR G.W. MAP

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

BORING LOG G41-N13A

SHEET 1 OF 5

SURFACE ELEV 1699.9 ft. (518.12m) PROJECT EXXON GRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN.	SAMPLES REC / ATT. (ins.)	GROUNDWATER OBSERVATION WELL
0.15		topsoil and rootmat							
0.5		Dense to very dense, red-brown, fine to coarse SAND, some fine to coarse gravel, some silt, trace clay Boulders noted at: 22.5'-25.0' 25.0'-26.0'	SM	-	1	DO	Air Hammer	18/18	
				-	2	DO	Air Hammer	18/18	
				-	3	DO	Air Hammer	12/12	
				-	4	DO	Air Hammer	6/18	
				-	5	DO	Air Hammer	2/6	
7.92 / 26.0				-	6	DO	Air Hammer	6/9	
		Very dense, brown, fine to coarse SAND, some fine gravel, some silt, trace clay, occasional cobbles and boulders	SM	-	7	DO	Air Hammer	3/3	
				-	8	DO	Air Hammer	4/4	
11.13 / 36.5		CONTINUED							

Job No 796085
Scale 1"=5'

Golder Associates 3.6-4-290

Drawn jls
Checked

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

BORING LOG G41-K13A

SHEET 2 OF 5

SURFACE ELEV 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
11.13 / 36.5		CONTINUED							
					9	DO	Air Hammer	0/3	
		Very dense, brown, fine to coarse SAND, some fine gravel, some silt, trace clay, occasional cobbles and boulders Boulder noted at 42.5'-44.5'	SM		10	DO	Air Hammer	3/3	
					11	DO	Air Hammer	3/3	
16.76 / 55.0					12	DO	Air Hammer	7/7	
17.52 / 57.5		Hard, red-brown SILT, trace clay and fine gravel	ML						
		Very dense, brown, fine to coarse SAND, some fine gravel, some clay, trace silt	SM		13	DO	Air Hammer	6/6	
					14	DO	Air Hammer	2/2	
20.12 / 66.0		CONTINUED							

Job No 786065
Scale 1"=5'

Golder Associates 3.6-4-291

Drawn jls
Checked

COOR. N114770 ft. (N34982m)
E2235955 ft. (E696760m)

BORING LOG G41-K13A

SHEET 3 OF 5

SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS/FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6IN. (Note 1)	SAMPLES REC/ATT. (ins.)	GROUNDWATER OBSERVATION WELL
20.12		CONTINUED							
66.0		Very dense, brown, fine to coarse SAND, some fine gravel, some clay, trace silt, occasional cobbles	SM						
21.34				-	15	DO	Air Hammer	4/4	
70.0		Very dense, brown, fine GRAVEL and fine to coarse SAND, some silt	GM						
22.86				-	16	DO	Air Hammer	6/6	
75.0		Very dense, green-gray, fine to coarse gravelly, fine to coarse SAND, trace silt, trace clay, occasional cobbles	SP SM		17	DO	Air Hammer	0/2	
				-	18	DO	Air Hammer	7/7	
26.67									
87.5		Very dense, red-brown to brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles	SM	-	19	DO	Air Hammer	6/6	
				-	20	DO	Air Hammer	12/12	
29.87									
98.0		CONTINUED							

Job No. T36085
Scale 1"=5'

Golder Associates 3.6-4-292

Drawn jls
Checked

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

BORING LOG G41-K13A

SHEET 4 OF 5

SURFACE ELEV. 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

DEPTH METER / FEET	STRAT. PLOT	DESCRIPTION	UNIFIED CLASS	BLOWS / FOOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES HAMMER BLOWS PER 6 IN. (Note 1)	SAMPLES REC./ATT. (ins.)	GROUNDWATER OBSERVATION WELL
29.87		CONTINUED							
98.0		Very dense, red-brown to brown, fine to coarse SAND, some silt, some fine gravel, occasional cobbles	SM	-	21	DO	Air Hammer	18/18	Grout (to surface) 31.55
									Bentonite Clay Seal 103.5 32.16
									Pea Gravel 105.5
									▼ 33.10 4/18/79
									2" Solid PVC Pipe to Surface ≈108.6 33.32
33.99				-	22	DO	Air Hammer	6/6	109.3
111.5		Very dense, brown, fine to coarse SAND, trace fine gravel, trace silt Boulder noted at 120.0'-121.5'	SP-SM	-	23	DO	Air Hammer	18/18	Pea Gravel 2" Slotted PVC Pipe 36.36 119.3
37.24									Note 2
122.2		END OF BORING							

NOTES

1. Penetration Test - 3" O.D. sampler driven with air hammer. (All samples)
2. Permeability test was falling head test with water level at top of casing at beginning of test. See page 5 for permeability test number 1.

Job No. 736085 Scale 1"=5'

Golder Associates 3.6-4-293

Drawn jls Checked

COOR. N114770 ft. (N34982m)
E2285955 ft. (E696760m)

BORING LOG G41-K13A

SURFACE ELEV 1699.9 ft. (518.12m) PROJECT EXXON CRANDON TAILINGS DISPOSAL SYSTEM

DATUM USGS MSL DATE STARTED 3/28/79 DATE COMPLETED 3/31/79

DRILL RIG Schramm Rotadrill DRILLING METHOD Mud Rotary

NOTES (continued)

PERMEABILITY TEST NUMBER 1

Drove 4" casing from 116.0' to 120.0', leaving top of casing 2.67' above ground.
Cleaned hole to 120.0' with water and encountered boulder.
Advanced hole from 120.0' to 121.5' with 4" bit through boulder.
Cleaned hole to 122.17' (0.67' past boulder) with water. Performed falling head permeability test.

Time (min.)	Drop (ft.)	Time (min.)	Drop (ft.)
0.5	0.04	20.0	1.46
1.0	0.13	25.0	1.67
2.0	0.21	30.0	1.83
5.0	0.46	35.0	1.96
10.0	0.79	40.0	2.08
15.0	1.17		

3. Elevation of top of protector pipe, 1703.0 ft. (519.07m).

Table of Water Level Readings by Date. Readings Indicate Depth Below Ground Surface.

DATE	4/18/79	11/12/79	12/3/79	4/25/80	5/21/80	6/26/80*	9/10/80*
DEPTH (m)	33.10	32.06	31.85	32.19	32.80	32.16	32.83
DEPTH (ft.)	108.6	105.1	104.5	105.6	107.6	105.5	107.7

*Pump Test and Recovery Period Between these Dates. For Pump Test Data, Refer to PUMP TEST AND ANALYSIS, Project Report No. 4.

APPENDIX B

B-15

Water Level Measurements from Other Observation Wells

G41-C15
G41-E17
G41-F24
G41-G21
G41-N21
G41-P18
G41-P18B
G41-P24
DMB-3
DMB-5
DMB-6
DMB-7
DMB-8
DMB-26
DMB-28
DMB-29

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***C15 ***

DATE DD*MONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1617.30 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1615.00	22.60	0.00	1	20	-627470.00	1594.70	
18APR79	1615.00	22.60	0.00	1	20	-627470.00	1594.70	CORRECT TO COLLAR TOP
								GROUND SURFACE-CORR. TO
07NOV79	800.00	23.15	0.00	1	20	-335645.00	1594.15	
07NOV79	800.00	23.15	0.00	1	20	-335645.00	1594.15	BY D&M
								BY D&M
12DEC79	1200.00	23.60	0.00	1	20	-328205.00	1593.70	GROUND SURFACE-CORR. TO
14FEB80	1145.00	23.50	0.00	1	20	-192860.00	1593.80	BY D&M
25APR80	1200.00	24.30	-.08	1	14	-90605.00	1593.08	14 - TIME NOT RECORD
22MAY80	1200.00	24.26	-.03	1	14	-51725.00	1593.07	14 - NO TIME
28JUN80	1855.00	27.76	-.08	1	14	1970.00	1592.62	14 14
07JUL80	919.00	29.49	-.08	1	14	14354.00	15 ? 89	14 14
09JUL80	1057.00	29.83	-.08	1	14	17332.00	15[illegible].55	14 14
17JUL80	2430.00	30.78	0.00	1	64	29665.00	1586.61	14 14
24JUL80	1032.00	25.00	2.41	1	64	38907.00	1589.98	14 14
02AUG80	850.00	25.00	1.50	1	82	51765.00	1590.83	15 BY D. K. TO 9/2/80
09AUG80	1650.00	25.00	1.55	1	82	61965.00	1590.98	4 15
16AUG80	1000.00	25.00	1.22	1	82	71995.00	1591.11	4 15
20AUG80	715.00	26.06	0.00	1	20	77590.00	1591.24	20 D&M
22AUG80	1428.00	26.20	0.00	1	82	80903.00	1591.13	15
02SEP80	915.00	24.97	0.00	1	82	96430.00	1592.36	15
10SEP80	1115.00	25.92	0.00	1	15	108070.00	1591.38	15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 7860H5 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***E17 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET
18APR79	1630.00	78.80	0.00	1	20	-627455.00	1589.69
12NOV79	1200.00	79.80	0.00	1	20	-328205.00	1593.69
25APR80	1200.00	75.75	-.03	1	14	-90605.00	1592.77
22MAY80	1200.00	75.72	-.06	1	14	-51725.00	1592.83
09JUL80	1112.00	78.11	-.03	1	14	17547.00	1590.41
17JUL80	2417.00	81.61	-.02	1	14	29652.00	1586.90
24JUL80	1017.00	75.00	5.62	1	68	38892.00	1589.90
02AUG80	840.00	75.00	2.82	1	89	51755.00	1590.65
09AUG80	1045.00	75.00	2.65	1	89	61960.00	1590.84
16AUG80	1017.00	75.00	2.48	1	89	72012.00	1590.99
22AUG80	1415.00	77.44	0.00	1	89	80690.00	1591.03
02SEP80	905.00	77.22	0.00	1	89	96420.00	1591.25
10SEP80	1050.00	77.23	0.00	1	15	108045.00	1591.26

COMMENTS
COLLAR ELEV 1668.49 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

GROUND SURFACE-CORR. TO
CORRECT TO COLLAR TOP
14 - TIME NOT RECORD
14 - NO TIME
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15
15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***G21 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1666.91 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
1NOEC79	1200.00	75.50	0.00	1	20	-276365.00	1591.61	CORRECT TO COLLAR TOP
25APR80	1200.00	74.00	-.09	1	14	-90605.00	1593.00	14 - TIME NOT RECORD
28JUN80	1240.00	75.75	-.03	1	14	1595.00	1591.19	14 14
09JUL80	1335.00	76.06	-.03	1	14	17490.00	1590.88	14 14
17JUL80	1525.00	76.34	-.03	1	14	29118.00	1590.60	14 14
02AUG80	949.00	75.00	1.30	1	89	51824.00	1590.59	15 BY D. K. TO 9/2/80
09AUG80	1430.00	75.00	1.43	1	89	62185.00	1590.46	4 15
16AUG80	941.00	75.00	1.52	1	89	71976.00	1590.37	4 15
23AUG80	730.00	76.60	0.00	1	89	81925.00	1590.29	15
02SEP80	1030.00	76.60	0.00	1	89	96505.00	1590.29	15
10SEP80	1310.00	76.62	0.00	1	15	108185.00	1590.29	15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P24 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1656.61 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
10JAN80	1200.00	68.50	0.00	1	20	-243245.00	1588.11	CORRECT TO COLLAR TOP
25APR80	1200.00	69.20	-.09	1	14	-90605.00	1587.50	14 - TIME NOT RECORD
28JUN80	1545.00	68.95	-.06	1	14	1780.00	1587.72	14 14
09JUL80	1226.00	69.06	-.06	1	14	17421.00	1587.61	14 14
17JUL80	1443.00	69.13	-.06	1	14	29078.00	1587.54	14 14
25JUL80	1523.00	65.00	4.06	1	14	40518.00	1587.55	14 14
02AUG80	1010.00	60.00	8.99	1	88	51845.00	1587.59	15 BY D. K. TO 9/2/80
09AUG80	1515.00	60.00	8.94	1	88	62230.00	1587.64	4 15
16AUG80	905.00	60.00	8.90	1	88	71940.00	1587.68	4 15
23AUG80	745.00	68.92	0.00	1	88	81940.00	1587.66	15
02SEP80	1105.00	68.93	0.00	1	88	96540.00	1587.65	15
10SEP80	1400.00	69.36	0.00	1	15	108235.00	1587.25	15 FOR G.W. MAP

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.57.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***J17 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET
27JUN80	900.00	98.50	.06	1	14	-65.00	1590.68
02JUL80	1200.00	100.09	.21	1	14	7323.00	1588.94
07JUL80	847.00	100.63	.21	1	14	14322.00	1588.40
17JUL80	1153.00	101.91	.21	1	14	28908.00	1587.12
29JUL80	1012.00	100.00	1.10	1	70	38887.00	1587.93
02AUG80	830.00	100.00	2.50	1	91	51745.00	1588.80
09AUG80	1033.00	100.00	2.32	1	91	61948.00	1588.98
16AUG80	1030.00	100.00	2.13	1	91	72025.00	1589.17
22AUG80	1410.00	102.11	0.00	1	91	80885.00	1589.19
02SEP80	855.00	101.92	0.00	1	91	96410.00	1589.38

COMMENTS
COLLAR ELEV 1689.29 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 14 BEFORE TEST
16 14
14 14
14 14
14 14
15 BY D. K. TO 9/2/80
4 15
4 15
15
15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***N21 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1729.50 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
18APR79	1200.00	158.50	0.00	1	20	-627725.00	1591.20	CORRECT TO COLLAR TOP
25APR80	1200.00	159.90	.15	1	14	-90605.00	1589.45	14 - TIME NOT RECORD
28JUN80	1650.00	158.71	.16	1	14	1895.00	1590.63	14 14
09JUL80	1249.00	158.84	.16	1	14	17444.00	1590.50	14 14
17JUL80	1537.00	158.80	.16	1	14	29012.00	1590.54	14 14
25JUL80	1414.00	155.00	3.97	1	14	40569.00	1590.53	14 14
02AUG80	1040.00	140.00	1.13	1	97	51875.00	1590.87	15 BY D. K. TO 9/2/80
09AUG80	1555.00	140.00	1.18	1	97	62270.00	1590.82	4 15
16AUG80	850.00	140.00	1.30	1	97	71905.00	1590.70	4 15
23AUG80	858.00	141.34	0.00	1	97	82013.00	1590.66	15
02SEP80	1150.00	141.33	0.00	1	97	96565.00	1590.67	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P18 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	COMMENTS
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	
19APR79	930.00	9.90	0.00	1	20	-626435.00	1587.11	COLLAR ELEV 1591.51 FEET PIEZO ELEV 0.00 -NULL
19APR79	930.00	9.90	0.00	1	20	-626435.00	1587.11	TIME PUMP TEST BEGAN = 27JUNA0-1005.00
02JANA0	1200.00	9.00	0.00	1	20	-254765.00	1587.51	CORRECT TO COLLAR TOP
11FEBA0	1030.00	9.25	0.00	1	20	-197255.00	1587.26	GROUND SURFACE-CORR. TO
25APRA0	1200.00	9.20	0.00	1	19	-90605.00	1587.31	GROUND SURFACE-CORR. TO
29JUNA0	1030.00	9.11	0.00	1	19	2905.00	1587.40	BY D&M
07JULA0	1030.00	9.15	0.00	1	19	14425.00	1587.36	19 - TIME NOT RECORD
09JULP0	1345.00	9.17	0.00	1	19	17500.00	1587.34	9 19
17JULA0	1315.00	9.30	0.00	1	19	28988.00	1587.21	19 19
25JULA0	1425.00	0.00	9.35	1	19	40580.00	1587.16	19 19
02AUGA0	923.00	0.00	9.40	1	15	51798.00	1587.11	19 19
09AUGA0	1105.00	0.00	9.44	1	15	61980.00	1587.07	15 BY D. K. TO 9/2/80
16AUGP0	950.00	0.00	9.49	1	15	71985.00	1587.02	9 15
22AUGA0	1450.00	9.50	0.00	1	15	80925.00	1587.01	9 15
02SEPA0	1015.00	9.50	0.00	1	15	96990.00	1587.01	15
10SEPA0	1200.00	9.65	0.00	1	20	108115.00	1586.86	15
								20 FOR G.W. MAP, DEM, N

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P18B ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1591.27 FEET PIEZO ELEV 0.00 -NULL-
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
19APR79	935.00	2.70	0.00	1	20	-626430.00	1588.57	CORRECT TO COLLAR TOP
02JAN80	1200.00	0.00	0.00	1	20	-254765.00	1591.27	ICE IN COLLAR
13FEB80	1200.00	0.00	0.00	1	20	-194285.00	1591.27	ICE IN COLLAR
17MAY80	1240.00	1.67	0.00	1	20	-58885.00	1589.60	20 D&M
29JUN80	1034.00	1.83	0.00	1	14	2909.00	1589.44	4 14
09JUL80	1348.00	2.05	0.00	1	14	17503.00	1589.22	14 14
17JUL80	1315.00	2.20	0.00	1	14	28990.00	1589.07	14 14
25JUL80	1427.00	0.00	2.23	1	14	40582.00	1589.04	14 14
02AUG80	930.00	0.00	2.23	1	15	51805.00	1589.04	15 BY D. K. TO 9/2/80
09AUG80	1100.00	0.00	2.28	1	15	61975.00	1588.99	4 15
16AUG80	954.00	0.00	2.32	1	15	71989.00	1588.95	4 15
20AUG80	845.00	2.54	0.00	1	20	77680.00	1588.73	20 D&M
22AUG80	1455.00	2.32	0.00	1	15	80930.00	1589.95	15
02SEP80	1018.00	2.32	0.00	1	15	96493.00	1588.95	15
10SEP80	1200.00	2.52	0.00	1	20	108115.00	1588.75	20 FOR G.W. MAP, D&M, N

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***P24 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1684.37 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUNH0-1005.00
10JANH0	1200.00	93.10	0.00	1	20	-243245.00	1591.27	GROUND SURFACE-CORR. TO
14FEB80	1200.00	93.67	0.00	1	20	-192885.00	1590.70	BY D&M
25APR80	1200.00	93.80	-.07	1	19	-90605.00	1590.64	19 - TIME NOT RECORD
19MAY80	930.00	93.67	0.00	1	20	-56195.00	1590.70	20 D&M
28JUN80	1710.00	93.48	.09	1	19	1865.00	1590.85	19 19
09JUL80	1305.00	93.59	.09	1	19	17460.00	1590.74	19 19
17JUL80	1355.00	93.61	.09	1	19	29030.00	1590.72	19 19
25JUL80	1400.00	90.00	3.74	1	19	40555.00	1590.63	19 19
02AUG80	1056.00	95.00	.67	1	90	51891.00	1590.63	15 BY D. K. TO 9/2/80
05AUG80	1610.00	95.00	.73	1	90	62285.00	1590.57	4 15
16AUG80	845.00	95.00	.80	1	90	71920.00	1590.50	4 15
19AUG80	820.00	94.00	0.00	1	20	74775.00	1590.37	20 D&M
23AUG80	920.00	95.86	0.00	1	90	82035.00	1590.44	15
02SEP80	1145.00	95.82	0.00	1	90	96580.00	1590.48	15
10SEP80	1200.00	94.15	0.00	1	20	108115.00	1590.22	20 FOR G.W. MAP, D&M, N

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM03 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET
02JUL80	1438.00	9.51	-.02	1	19	7473.00	1579.99
07JUL80	1020.00	9.53	-.02	1	19	14415.00	1579.97
09JUL80	1407.00	9.56	-.02	1	19	17522.00	1579.94

COMMENTS
COLLAR ELEV 1589.48 FEET PIEZO ELEV 0.00 -NULL-
TIME PUMP TEST BEGAN = 27JUN80-1005.00

16 19
19 19
19 19

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/09/02.- 07.55.16.

CRANDON PUMP TEST JOB NO. 786685 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM05 ***

DATE DDMMMYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1690.37 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
27JUN80	900.00	98.50	.06	1	19	-65.00	1591.81	19 19 BEFORE TEST
02JUL80	1200.00	100.09	.21	1	19	7525.00	1590.07	16 19
07JUL80	847.00	100.43	.21	1	19	14522.00	1589.53	19 19
17JUL80	1153.00	101.91	.21	1	19	28508.00	1588.25	19 19
29JUL80	1612.00	100.00	1.10	1	70	39887.00	1589.06	19 19
02AUG80	930.00	100.00	2.19	1	91	51745.60	1589.93	15 OY O. K. TO 9/2/80
09AUG80	1533.00	100.00	2.52	1	91	61348.00	1590.11	9 15
16AUG80	1530.00	100.90	2.15	1	91	72025.00	1590.30	9 15
22AUG80	1410.00	102.11	0.00	1	91	80885.00	1590.52	15
02SEP80	855.00	101.92	0.00	1	91	96410.00	1590.51	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM86 ***

DATE	TIME	FIRST READING	SECOND READING	ALG	CON	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION	••COMMENTS••
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET	COLLAR ELEV 1668.26 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
25APR80	1200.00	73.00	-.09	1	14	-90605.00	1595.35	14 - TIME NOT RECORD
22MAY80	1200.00	74.60	-.08	1	14	-51725.00	1593.74	14 - NO TIME
09JUL80	1108.00	80.75	-.02	1	14	17343.00	1587.53	14 14
17JUL80	2419.00	79.24	-.03	1	14	29654.00	1589.05	14 14
24JUL80	1019.00	75.00	3.10	1	68	38894.00	1590.19	14 14
02AUG80	843.00	75.00	2.23	1	89	51758.00	1591.01	15 PY D. K. TO 9/2/80
09AUG80	1043.00	75.00	2.04	1	89	61958.00	1591.20	4 15
16AUG80	1015.00	75.00	1.80	1	89	72010.00	1591.44	4 15
22AUG80	1417.00	76.73	0.00	1	89	80892.00	1591.51	15
02SEP80	907.00	77.05	0.00	1	89	96922.00	1591.19	15

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/2H.- 20.23.37.

BRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM67 ***

DATE	TIME	FIRST READING	SECOND READING	A L G	C O N	TIME SINCE TEST BEGAN	WATER LEVEL ELEVATION
DDMONYY	HHMM.SS	FEET	FEET			MINUTES	FEET
25APR80	1200.00	65.40	-.07	1	14	-90605.00	1591.75
28JUN80	1615.00	64.53	-.07	1	14	1810.00	1590.62
09JUL80	1235.00	64.70	-.07	1	14	17430.00	1590.45

COMMENTS
COLLAR ELEV 1655.08 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 - TIME NOT RECORD
14 14
14 14

GOLLER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANCON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM08 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET
25APR80	1200.00	32.55	-.09	1	14	-90605.00	1592.11
02JUL80	1451.00	34.91	0.00	1	64	7486.00	1589.75
09JUL80	1358.00	35.13	0.00	1	64	17513.00	1589.53

COMMENTS
COLLAR ELEV 1624.57 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00

14 - TIME NOT RECORD
16 14
14 14

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM8.6 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1714.49 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUN80-1005.00
28JUN80	1910.00	126.05	.16	1	14	1985.00	1588.28	14 14
09JUL80	1212.00	129.15	.16	1	14	17407.00	1585.18	14 14
17JUL80	1458.00	129.19	.16	1	14	29093.00	1585.14	14 14
25JUL80	1307.00	125.00	4.27	1	14	40502.00	1585.22	14 14
02AUG80	958.00	130.00	1.48	1	96	51633.00	1585.14	15 BY D. K. TO 9/2/80
09AUG80	1455.00	130.00	1.46	1	96	62210.00	1585.16	4 15
16AUG80	924.00	130.00	1.43	1	96	71959.00	1585.19	4 15
23AUG80	805.00	131.45	0.00	1	96	81960.00	1585.17	15
02SEP80	1050.00	131.45	0.00	1	96	96525.00	1585.17	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.25.37.

CRANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DM628 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET	**COMMENTS**
								COLLAR ELEV 1643.88 FEET PIEZO ELEV 0.00 -NULL
								TIME PUMP TEST BEGAN = 27JUL80-1005.00
25APR80	1200.00	53.25	-.10	1	14	-90605.00	1590.73	14 - TIME NOT RECORD
17JUL80	1437.00	55.16	-.10	1	14	29072.00	1588.82	14 14
25JUL80	1528.00	55.00	.06	1	14	40523.00	1588.82	14 14
02AUG80	1016.00	50.00	5.22	1	86	51851.00	1588.75	15 BY D. K. TO 9/2/80
09AUG80	1525.00	50.00	5.31	1	86	62240.00	1588.66	4 15
16AUG80	858.00	50.00	5.38	1	86	71933.00	1588.59	4 15
23AUG80	825.00	55.40	0.00	1	87	81980.00	1590.52	15
02SEP80	1110.00	55.47	0.00	1	87	96545.00	1590.45	15

GOLDER ASSOCIATES -- PUMP TEST DATA PROGRAM
TIME OF PROGRAM RUN= 81/01/28.- 20.23.57.

CHANDON PUMP TEST JOB NO. 786085 DATE- 9/10/80
PIEZOMETER/WELL IDENTIFIER ***DMW29 ***

DATE DDMONYY	TIME HHMM.SS	FIRST READING FEET	SECOND READING FEET	A L G	C O N	TIME SINCE TEST BEGAN MINUTES	WATER LEVEL ELEVATION FEET
28JUN80	1725.00	41.05	-.01	1	14	1680.00	1569.54
09JUL80	1321.00	42.04	-.10	1	14	17476.00	1569.54
17JUL80	1429.00	42.14	-.10	1	14	29064.00	1569.44
25JUL80	1546.00	40.00	2.09	1	14	40541.0	1569.39
02AUG80	1022.00	40.00	3.98	1	85	51857.00	1569.41
09AUG80	1538.00	40.00	3.97	1	85	62453.00	1569.42
16AUG80	850.00	40.00	4.10	1	85	71925.00	1569.29
23AUG80	833.00	44.13	0.00	1	85	81988.00	1569.26
02SEP80	1115.00	44.16	0.00	1	85	96550.00	1569.23

COMMENTS
COLLAR ELEV 1631.48 FEET PIEZO ELEV 0.00 -NULL
TIME PUMP TEST BEGAN = 27JUN80-1005.00
14 14
14 14
14 14
14 14
15 BY D. K. TO 9/22/80
4 15
4 15
15
15