

AECOM 99 Commerce Drive Winnipeg, MB, Canada R3P 0Y7 www.aecom.com

204 477 5381 tel 204 284 2040 fax

#### Memorandum

То	Keith Fitchett		Page 1
CC	Ray Bilevicious		
Subject	Miller Environmental Corporation Cell #2 and #3 Rehabilitation Geotechnical Assessment		
From	Faris Khalil		
Date	August 18, 2011	Project Number	60216914 (402.19)

### 1. Introduction

Miller Environmental is planning to rehabilitate the existing clay liner for Cell #2 and #3 at the Hazardous Waste Site near Letellier, Manitoba. The existing cells are now overgrown with vegetation.

This memorandum summarizes the results of the geotechnical investigation performed at the above referenced site and provides a geotechnical assessment related to the design and construction of the proposed Cell #2 and #3 rehabilitation works.

## 2. Geotechnical Investigation

Fourteen test holes (TH11-01 to TH 11-14) were drilled on June 7, 2011 at the locations shown on Figure 01. Seven test holes (TH11-01 to TH11-07) were drilled within the boundaries of Cell #2 and TH11-08 to TH11-14 were drilled within the boundaries of Cell #3. TH11-06 and TH11-07 were drilled at the dyke of Cell #2 and TH11-13 and TH11-14 were drilled at the dyke of Cell #3. The drilling was completed by Paddock Drilling Ltd. using a track mounted Acker RM 30 drill rig equipped with 125 mm solid stem augers. The test holes were advanced up to 3.0 m below the existing cell floor or the top of the existing dyke. Disturbed and relatively undisturbed soil samples (Shelby Tubes) were collected at regular intervals from these test holes. A total of eight Shelby Tube samples were collected from Cell #2 and #3. One Shelby Tube sample was collected from the dyke of each cell. All soils observed during drilling were logged and visually classified on site by AECOM personnel. Soil samples recovered were transported to AECOM's Materials Testing Laboratory in Winnipeg for further visual examination and testing.

Laboratory testing included the determination of moisture contents, Atterberg Limits, grain size hydrometer analysis and flexible wall permeability. A detailed test hole log has been prepared for each test hole to record the description and the relative position of the various soil strata, location of samples obtained, field and laboratory test results and other pertinent information. Test hole logs are attached.



### 3. Subsurface Conditions

#### 3.1 Soil Profile

The general soil profile in descending order is:

- Topsoil
- Clay/Clay and Silt

These soil units are described separately as follows:

#### Topsoil

Topsoil was encountered at the ground surface at some test holes and extended to depths up to 0.2 m. The topsoil consists of black, moist and soft organic matters. Ponding water approximately 0.2 m deep was observed at some test hole locations within the cell. The source of the water is most likely from surface runoff.

#### Clay/Clay and Silt

Clay/Clay and Silt deposit was encountered at the ground surface or below the topsoil in all test holes and extended to the maximum depth explored. The clay contains variable amounts of silt, trace organics, and silt inclusions. The deposit is moist to wet, firm to stiff and of intermediate to high plasticity.

#### 4. Geotechnical Assessment

Based on the site investigation completed within Cell #2 and #3, cohesive soil was encountered within the perimeter dykes and underneath the cells floor for depths ranging from 1.5 to 3.0 m. Moisture content has been determined for all disturbed and undisturbed samples and varies between 17 and 44 percent. Results from two Atterberg Limit tests indicate that the clay is of intermediate to high plasticity based on average liquid limit and plastic limit of 46 and 19 percent, respectively. Grain size distribution has been completed; the percent passing sieve No. 200 is more than 97 percent. A total of four hydraulic conductivity tests have been completed on undisturbed soil samples collected from test holes TH11-04, TH11-06, TH11-12 and TH11-14 at different depths. Table 01 summarizes the test results. The hydraulic conductivity values k vary between 1.03 X 10<sup>-7</sup> to 4.5 X 10<sup>-9</sup> cm/sec which fall within the anticipated range of hydraulic conductivity properties of clay. It is our opinion that the existing clay liner would provide satisfactory performance under the intended use subject to the following conditions:

- 1. Remove and strip the existing vegetation and topsoil;
- Re-work and compact the top 300 mm to a minimum of 95 percent of standard proctor maximum dry density.



**AECOM** 

Table: Summary of Hydraulic Conductivity Test Results

Location	Test Hole	Depth (m)	Hydraulic Conductivity k cm/sec	Soil Type (Lab Test)	
Cell#2 Floor	TH11-04	1.21	4.5 X 10-9	Silt and Clay, some sand	
Cell#2 Floor	TH11-06	1.52	4.5 X 10-9	Clay	
Cell#3 Floor/ Dyke Toe	TH11-12	0.9	1.03 X 10-7	Clay and Silt, some sand	
Cell#3 Floor	TH11-14	2.13	1.7 X 10-9	Clay	

Please contact the undersigned if you have any questions regarding the subsurface investigation or recommendations found herein.

Sincerely, AECOM Canada Ltd.

Prepared By:

Reviewed By:

Faris Khalil, P.Eng., PMP, M.Sc.

Manager, Geotechnical Engineering

Md. for Auhlan Mohammad Akhtar, P.Eng. Geotechnical Engineer

MA:dh



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## Memorandum

То	Mohammad Akhtar		Page 1
СС			
Subject	Miller Environmental – Cell 2	and 3 Rehabilitation	
From	Stephen Petsche		
Date	June 23, 2011	60216914	

Attached are testing results for the above noted project. The testing included thirty-five (35) Moisture Content tests, two (2) Atterberg Limits tests and two (2) Grain Size Distribution (hydrometer method) tests on samples submitted to the lab.

If you have any questions, please call.

Sincerely,

Stephen Petsche, C.E.T.

Coordinator, Lab and Technical Services

Attach.

## **MOISTURE CONTENT**

JOB No.: 60216914

**CLIENT: Miller Environmental** 

PROJECT: Cell 2 and 3 Rehabilitation

DATE: June 20, 2011

HOLE NO.	11-01		11-02	11-03		11-04
SAMPLE NO.	G1	G2	G3	G4	G5	G6
DEPTH (FT)	3.0	6.0	3.0	3.0	6.0	1.5
MOISTURE CONTENT OF	05.0					
MOISTURE CONTENT %	25.6	23.3	26.7	26.4	23.9	35.8
HOLE NO.	11-04	11-05	·	11-06		11-07
SAMPLE NO.	G7	G8	G9	G10	G11	G12
DEPTH (FT)	6.5	3.0	5.0	3.0	6.0	3.0
MOISTURE CONTENT %	29.7	29.2	36.8	36.3	23.8	24.5
HOLE NO.						
SAMPLE NO.	11-07	11-08	-	11-09	11-10	11-10
DEPTH (FT)	G13 6.0	G14 3.0	G15	G16	G17	G18
	0.0	3.0	6.0	3.0	3.0	6.0
MOISTURE CONTENT %	40.3	28.5	30.3	29.6	33.7	30.7
HOLE NO.	11-10	11-11	11-12	11-13		
SAMPLE NO.	G19	G20	G21	G22	G23	G24
DEPTH (FT)	9.0	5.0	5.0	3.0	6.0	9.0
MOISTURE CONTENT %	30.9	34.6	22.3	16.9	28.8	24.0

NOTES:



MATERIALS LABORATORY AECOM

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## **MOISTURE CONTENT**

JOB No.: 60216914

**CLIENT: Miller Environmental** 

PROJECT: Cell 2 and 3 Rehabilitation

DATE: June 20, 2011

HOLE NO. SAMPLE NO. DEPTH (FT) MOISTURE CONTENT %	11-14 G25 3.0 37.5	- G26 5.0	- G27 9.0 21.1	11-03 T1 5.0 28.3	11-04 T2 4 24.5	11-05 T3 4 43.4
HOLE NO. SAMPLE NO. DEPTH (FT) MOISTURE CONTENT %	11-06 T4 5	11-09 T5 5	11-11 T6 4 34.7	11-12 T7 3 24.9	11-14 T8 7	
HOLE NO. SAMPLE NO. DEPTH (FT) MOISTURE CONTENT %						
HOLE NO. SAMPLE NO. DEPTH (FT) MOISTURE CONTENT %						

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NOTES:

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## ATTERBERG (ASTM D4318-98)

## **A**ECOM

MATERIALS LABORATORY

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99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada tel (204) 477-5381 fax (204) 284-2040

JOB No.:	60216914
CLIENT:	Miller Environmental
PROJECT:	Cell 2 and 3 Rehabilitation
LOCATION:	

DATE:	22-Jun-11	
TEST HOLE:	TH11-04	
SAMPLE:	T2	
DEPTH:	4'	_
TECH.:	TN	

## Liquid Limit

WATER CONTENT

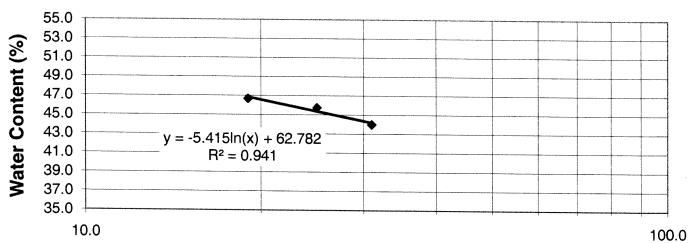
Blows	31	25	19	
WT. SAMPLE WET + TARE (gr)	145.941	144.052	145.850	
WT. SAMPLE DRY + TARE (gr)	135.354	133.385	135,071	
WT. TARE (gr)	111.278	110.062	111,975	
WT. WATER (gr)	10.587	10.667	10.779	
WT. DRY SOIL (gr)	24.076	23.323	23.096	
MOISTURE CONTENT (%)	43.973	45.736	46.670	

## Plastic Limit

WATER CONTENT

WT. SAMPLE WET + TARE (gr)	119.545	121.050	
WT. SAMPLE DRY + TARE (gr)	118.625	119.895	
WT. TARE (gr)	113.789	113.865	
WT. WATER (gr)	0.920	1.155	
WT. DRY SOIL (gr)	4.836	6.030	
MOISTURE CONTENT (%)	19.024	19.154	





## Blows (N)

Liquid Limit =	45.4	Plastic Limit =	19.1	Plasticity Index =	26.3

## ATTERBERG (ASTM D4318-98)

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JOB No.:	60216914
CLIENT:	Miller Environmental
PROJECT:	Cell 2 and 3 Rehabilitation
LOCATION:	

DATE:	22-Jun-11
TEST HOLE:	TH11-12
SAMPLE:	T7
DEPTH:	3'
TECH.:	TN

## Liquid Limit

WATER CONTENT

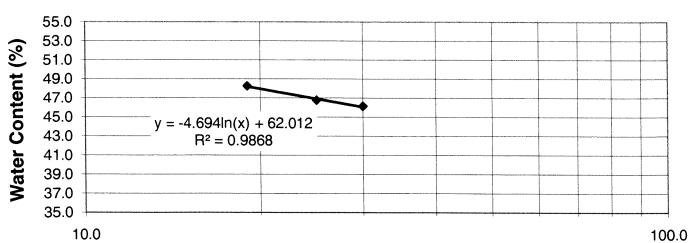
Blows	30	25	19	
WT. SAMPLE WET + TARE (gr)	139.925	146.959	144.405	
WT. SAMPLE DRY + TARE (gr)	130.772	136.290	135.256	
WT. TARE (gr)	110.932	113.474	116.294	
WT. WATER (gr)	9.153	10.669	9.149	
WT. DRY SOIL (gr)	19.840	22.816	18.962	
MOISTURE CONTENT (%)	46.134	46.761	48.249	

## Plastic Limit

WATER CONTENT

WT. SAMPLE WET + TARE (gr)	119.771	122.344	
WT. SAMPLE DRY + TARE (gr)	118.810	121.023	
WT. TARE (gr)	113,751	114.157	
WT. WATER (gr)	0.961	1.321	
WT. DRY SOIL (gr)	5.059	6.866	
MOISTURE CONTENT (%)	18.996	19.240	





## Blows (N)

Liquid Limit =	46.9	Plastic Limit =	19.1	Plasticity Index =	27.8
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#### **GRAIN SIZE DISTRIBUTION**

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MATERIALS LABORATORY

99 Commerce Dr., Winnipeg, MB R3P 0Y7 Canada tel (204) 477-5381 fax (204) 284-2040

Job No.:

60216914

Client:

MacKay OpCo

Project:

Cell 2 and 3 Rehabilitation

Date Tested: Tested By:

22-Jun-11

Hole No.:

TH11-04

Sample No.:

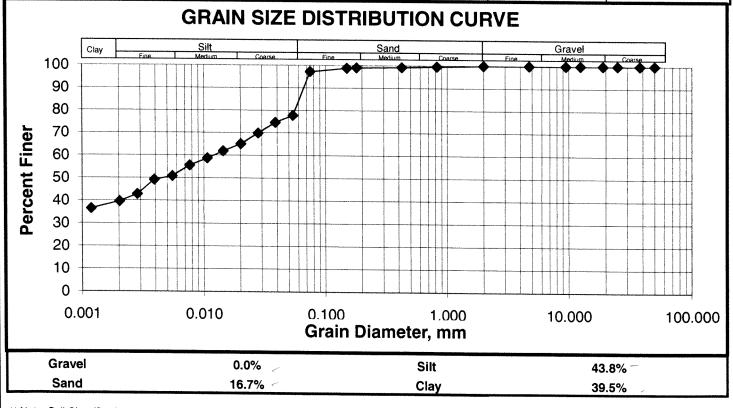
Depth:

4.0'

Date Sampled:

Sampled By:

GRAVE	L SIZES	SAND	SIZES	FINES		
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	
50.0	100.0	2.00	100.0	0.0750	97.2	
38.0	100.0	0.83	99.6	0.0540	77.8	
25.0	100.0	0.43	99.2	0.0387	74.6	
19.0	100.0	0.18	99.0	0.0280	69.8	
12.5	100.0	0.15	98.8	0.0202	65.1	
9.5	100.0	0.075	97.2	0.0145	61.9	
4.75	100.0			0.0107	58.7	
2.00	100.0			0.0077	55.5	
				0.0055	50.8	
				0.0039	49.2	
				0.0028	42.8	
				0.0020	39.6	
				0.0012	36.5	
	l					



<sup>\*\*</sup> Note: Soil Classification based on Grain Size from Canadian Foundation Engineering Manual, 3rd edition (1992).

#### **GRAIN SIZE DISTRIBUTION**

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MATERIALS LABORATORY

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Job No.:

60216914

Client:

MacKay OpCo

Project: Date Tested:

Cell 2 and 3 Rehabilitation 22-Jun-11

Tested By:

Hole No.:

TH11-12

Sample No.:

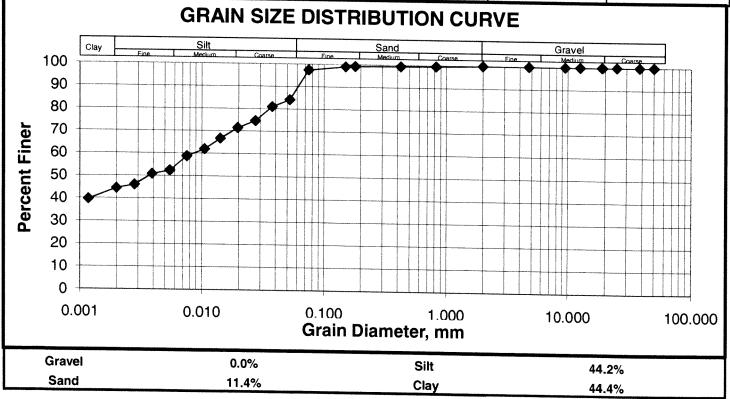
**T7** 

Depth:

3.0' Date Sampled:

Sampled By:

GRAVE	L SIZES	SAND S	SIZES	FINES		
Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	Grain Size (mm.)	Total Percent Passing	
50.0 38.0	100.0 100.0	2.00	100.0 99.6	0.0750 0.0523	97.4	
25.0 19.0	100.0 100.0	0.43	99.4	0.0376	84.1 80.9	
12.5	100.0	0.18 0.15	99.2 99.0	0.0274 0.0196	74.6 71.4	
9.5 4.75	100.0 100.0	0.075	97.4	0.0142	66.6	
2.00	100.0			0.0106 0.0076	61.9 58.7	
				0.0055	52.3	
				0.0039 0.0028	50.8	
				0.0028	46.0 44.4	
				0.0012	39.6	



<sup>\*\*</sup> Note: Soil Classification based on Grain Size from Canadian Foundation Engineering Manual, 3rd edition (1992).



#6 - 854 Marion Street, Winnipeg, Manitoba, R2J 0K4
Phone: (204) 233-1694 Fax: (204) 235-1579
E-mail: eng\_tech@mts.net
www.eng-tech.ca

July 4, 2011

File No. 11-027-01

AECOM Canada Ltd. 99 Commerce Drive Winnipeg, Manitoba R3P 0Y7

**ATTENTION:** 

Stephen Petsche, C.E.T.

RE:

Hydraulic Conductivity Test - Miller Environmental Cell 2 & Cell 3 Rehabilitation

Dear Mr. Petsche,

ENG-TECH Consulting Limited (ENG-TECH) received a total four (4) soil samples on June 17, 2011. ENG-TECH prepared and tested the samples for hydraulic conductivity in accordance with ASTM D5084-03, Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter. Testing on three (3) samples is complete and the remaining sample is being tested and the results will be presented in a following letter. The final hydraulic conductivity values ( $k_{20}$ ) of  $4.5 \times 10^{-9}$ ,  $4.5 \times 10^{-9}$  and  $1.03 \times 10^{-7}$  cm/sec were obtained for the samples identified as TH11-04 T2, TH11-06 T2, and TH11-12 T7, respectively. The hydraulic conductivity test data is outlined in Table 1, while graphical representations of the hydraulic conductivity versus elapsed time are shown on Figures 1, 2, and 3 attached.

ENG-TECH trusts this is all the information you require. If you have any questions or require additional information, please contact the undersigned.

Sincerely,

**ENG-TECH Consulting Limited** 

Clark Hryhoruk, M.Sc., P.Eng. Principal, Geotechnical Engineer

CDH/erm

Attachments:

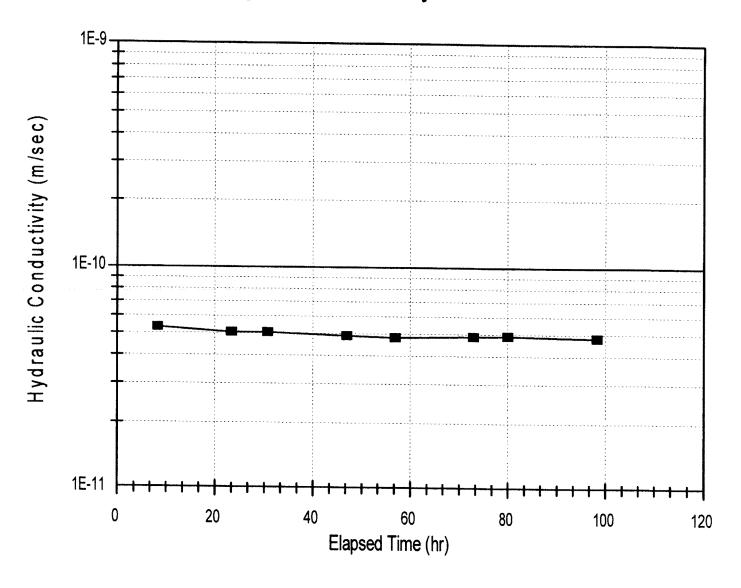
Table 1 - Hydraulic Conductivity Test Data

Figure 1 - Hydraulic Conductivity Versus elapsed Time (TH11-04 T2) Figure 2 - Hydraulic Conductivity Versus elapsed Time (TH11-06 T2)

Figure 3 - Hydraulic Conductivity Versus elapsed Time (TH11-12 T7)

# TABLE 1 HYDRAULIC CONDUCTIVITY TEST DATA MILLER ENVIRONMENTAL CELL 2 & CELL 3 REHABILITATION

SAMPLE IDENTIFICATION	TH11-04 T2	TH11-06 T2	TH11-12 T7
INITIAL VALUES			
ENG-TECH Reference No.	11-27-1-6	11-27-1-7	11-27-1-8
Length of Sample in Tube (cm)			
Length (cm)	6.19	6.21	6.18
Diameter (cm)	7.26	7.14	7.26
Area (cm²)	41.4	40.1	41.4
Volume (cm <sup>3</sup> )	256.4	248.8	255.8
Water Content (%)	25.1	25.6	21.8
Bulk Dry Density (kg/m³)	1597	1553	1692
Specific Gravity (G <sub>s</sub> ) (assumed)	2.70	2.70	2.70
Void Ratio	0.691	0.739	0.596
Degree of Saturation (%)	98.1	93.5	98.8
FINAL VALUES		•	
Length (cm)	6.22	6.30	6.18
Diameter (cm)	7.26	7.17	7.27
Area (cm²)	41.3	40.3	41.5
Volume (cm³)	257.0	254.1	256.0
Water Content (%)	25.5	29.3	21.2
Bulk Dry Density (kg/m³)	1606	1509	1715
Specific Gravity (G <sub>s</sub> ) (assumed)	2.70	2.70	2.70
Void Ratio	0.681	0.790	0.574
Degree of Saturation (%)	~100	~100	99.7
CONSOLIDATION PHASE			1
Confining Pressure (kPa)	172.4	172.4	172.4
Pore Water Pressure (kPa)	137.9	137.9	137.9
Effective Stress (kPa)	34.5	34.5	34.5
PERMEATION PHASE		.1	J
Confining Pressure (kPa)	172.4	172.4	172.4
Pore Water Pressure (kPa)	137.9	137.9	137.9
Effective Stress (kPa)	34.5	34.5	34.5
Hydraulic Gradient	45.2	44.6	45.5
Permeant Fluid	Distilled	Distilled	Distilled
HYDRAULIC CONDUCTIVITY at TEST TEMPERATURE OF 24 °C (cm/sec)	Water 4.9 x 10 <sup>-9</sup>	Water 4.9 x 10 <sup>-9</sup>	1.13 x 10
HYDRAULIC CONDUCTIVITY at TEMPERATURE OF 20 °C (K <sub>20</sub> ) (cm/sec)	4.5 x 10 <sup>-9</sup>	4.5 x 10 <sup>-9</sup>	1.03 x 10





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ENG. STAMP

Certificate of Authorization ENG-TECH Consulting Limited No. 2475 Expiry: April 30, 2012

MILLER ENVIRONMENTAL **CELL 2 & CELL 3 REHABILITATION** 

1

JUNE 2011

DRAWN BY:

**ERM** 

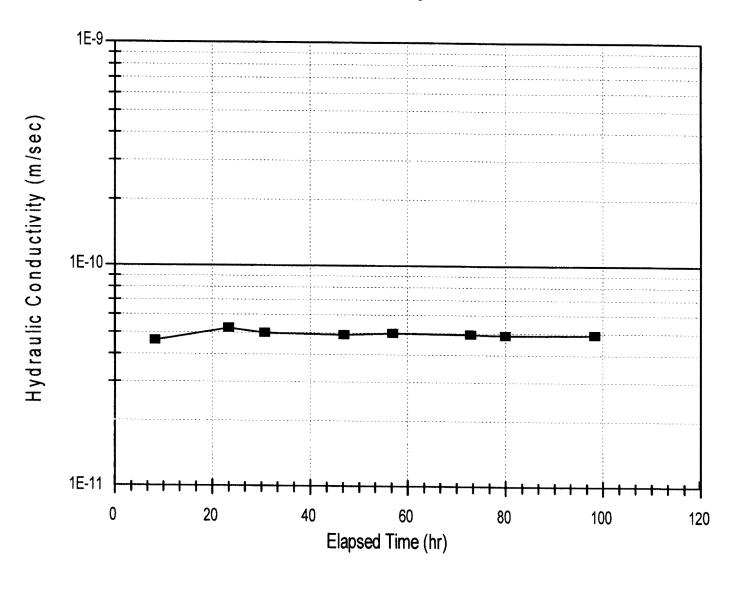
FIGURE No.: REV. PROJECT: AECOM CANADA LTD.

FILE No.: 11-027-01

SCALE:

N/A

HYDRAULIC CONDUCTIVITY **VERSUS ELAPSED TIME** (TH11-04 T2)





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Certificate of Authorization ENG-TECH Consulting Limited No. 2475 Expiry: April 30, 2012

MILLER ENVIRONMENTAL						
CELL 2 & CELL 3 REHABILITATION						

JUNE 2011

11-027-01 SCALE:

N/A

AECOM CANADA LTD.

PROJECT:

HYDRAULIC CONDUCTIVITY VERSUS ELAPSED TIME (TH11-06 T4)

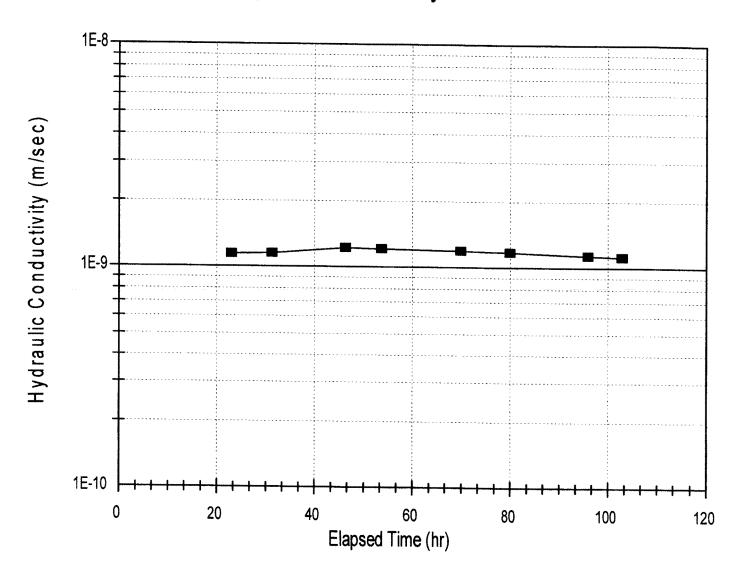
FIGURE No.:

2

CLIENT:

**ERM** 

REV.:





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CLIENT:		
MILLER	ENVIRONMENTAL	
CELL 2	R CELL 3 REHABILITATION	
DATE		

DATE:
JUNE 2011

FIGURE No.:

3

DRAWN BY:

**ERM** 

FILE No.: 11-027-01 REV.: SCALE:

N/A

AECOM CANADA LTD.

HYDRAULIC CONDUCTIVITY VERSUS ELAPSED TIME (TH11-12 T7)



#6 - 854 Marion Street, Winnipeg, Manitoba, R2J 0K4
Phone: (204) 233-1694 Fax: (204) 235-1579
E-mail: eng\_tech@mts.net
www.eng-tech.ca

July 6, 2011

File No. 11-027-01

AECOM Canada Ltd. 99 Commerce Drive Winnipeg, Manitoba R3P 0Y7

**ATTENTION:** 

Stephen Petsche, C.E.T.

RE:

Hydraulic Conductivity Test - Miller Environmental Cell 2 & Cell 3 Rehabilitation

Dear Mr. Petsche,

ENG-TECH Consulting Limited (ENG-TECH) completed the requested testing on the remaining sample from the above project. ENG-TECH prepared and tested the sample for hydraulic conductivity in accordance with ASTM D5084-03, Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter. The final hydraulic conductivity value ( $k_{20}$ ) of 1.7 x 10<sup>-9</sup> cm/sec was obtained for the sample identified as TH11-14 T8. The hydraulic conductivity test data is outlined in Table 1, while a graphical representation of the hydraulic conductivity versus elapsed time is shown on Figure 1, attached.

ENG-TECH trusts this is all the information you require. If you have any questions or require additional information, please contact the undersigned.

Sincerely,

**ENG-TECH Consulting Limited** 

Lank Hypour.

Clark Hryhoruk, M.Sc., P.Eng. Principal, Geotechnical Engineer

CDH/erm

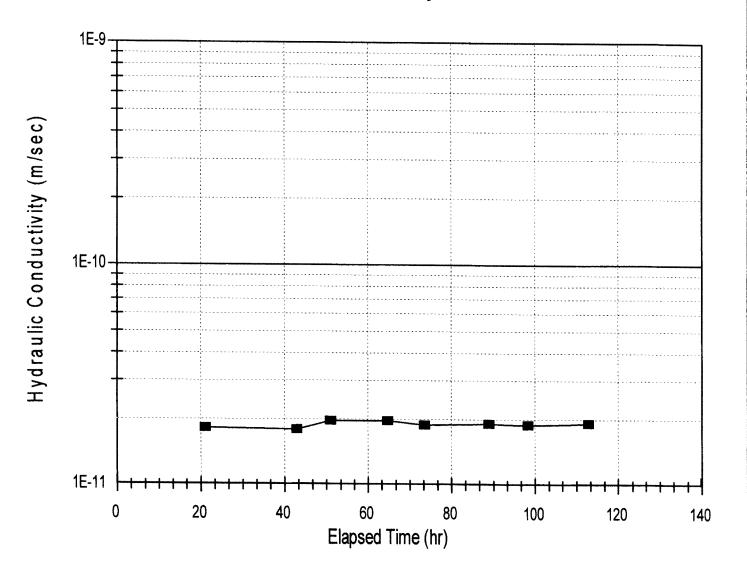
Attachments:

Table 1 - Hydraulic Conductivity Test Data

Figure 1 - Hydraulic Conductivity Versus elapsed Time (TH11-14 T8)

# TABLE 1 HYDRAULIC CONDUCTIVITY TEST DATA MILLER ENVIRONMENTAL CELL 2 & CELL 3 REHABILITATION

SAMPLE IDENTIFICATION	TH11-14 T7
INITIAL VALUES	
ENG-TECH Reference No.	11-27-1-9
Length of Sample in Tube (cm)	
Length (cm)	6.36
Diameter (cm)	7.20
Area (cm²)	40.7
Volume (cm³)	258.9
Water Content (%)	28.3
Bulk Dry Density (kg/m <sup>3</sup> )	1520
Specific Gravity (G <sub>s</sub> ) (assumed)	2.70
Void Ratio	0.776
Degree of Saturation (%)	98.5
FINAL VALUES	<u> </u>
Length (cm)	6.40
Diameter (cm)	7.25
Area (cm <sup>2</sup> )	41.3
Volume (cm <sup>3</sup> )	264.2
Water Content (%)	30.5
Bulk Dry Density (kg/m³)	1483
Specific Gravity (G <sub>s</sub> ) (assumed)	2.70
Void Ratio	0.820
Degree of Saturation (%)	~100
CONSOLIDATION PHASE	L.
Confining Pressure (kPa)	172.4
Pore Water Pressure (kPa)	137.9
Effective Stress (kPa)	34.5
PERMEATION PHASE	<u> </u>
Confining Pressure (kPa)	172.4
Pore Water Pressure (kPa)	137.9
Effective Stress (kPa)	34.5
Hydraulic Gradient	43.9
Permeant Fluid	Distilled
HYDRAULIC CONDUCTIVITY at TEST TEMPERATURE OF 26 °C (cm/sec)	Water 1.9 x 10 <sup>-9</sup>
HYDRAULIC CONDUCTIVITY at TEMPERATURE OF 20 °C (K <sub>20</sub> ) (cm/sec)	1.9 x 10 <sup>-9</sup>





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	AECOM CANADA LT	D.
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CLIENT:

**ERM** 

 DATE:
 FILE NO.:

 JULY 2011
 11-027 

 DRAWN BY:
 FIGURE No.:
 REV.:
 SCALE:

PROJECT:
MILLER ENVIRONMENTAL
CELL 2 & CELL 3 REHABILITATION

FILE No.:

11-027-01

N/A

HYDRAULIC CONDUCTIVITY VERSUS ELAPSED TIME (TH11-14 T8)

#### AECOM Canada Ltd.

#### **GENERAL STATEMENT**

#### NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

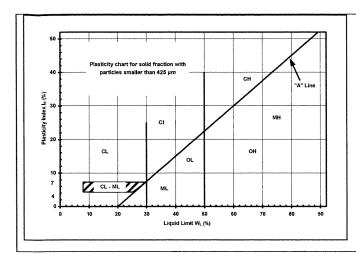
Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

## **EXPLANATION OF FIELD & LABORATORY TEST DATA**

Description			UMA	UMA USCS			Classification Criteria			
	Description				Log Symbols	Classification	Fines (%)	Grading	Plasticity	Notes
		CLEAN GRAVELS	Well graded sandy gravels, or no fir	with little	242	GW	0-5	C <sub>U</sub> > 4 1 < C <sub>C</sub> < 3		March 17 17 17 17 17 17 17 17 17 17 17 17 17
	GRAVELS (More than 50% of	(Little or no fines)	Poorly graded sandy gravels or no fir	with little	33	GP	0-5	Not satisfying GW requirements		Dual symbols if 5-
STICS	coarse fraction of gravel size)	DIRTY GRAVELS	Silty gravels, s grave			GM	> 12		Atterberg limits below "A" line or W <sub>P</sub> <4	12% fines. Dual symbols if above "A" line and
AINED SC		(With some fines)	Clayey gravel sandy gra			GC	> 12		Atterberg limits above "A" line or W <sub>P</sub> <7	4 <w<sub>P&lt;7</w<sub>
COARSE GRAINED SOILS		CLEAN SANDS	Well graded gravelly sands or no fit	, with little		sw	0-5	C <sub>U</sub> > 6 1 < C <sub>C</sub> < 3		$C_{U} = \frac{D_{60}}{D_{10}}$
COA	SANDS (More than 50% of	(Little or no fines)	Poorly grade gravelly sands or no fil	, with little	000	SP	0-5	Not satisfying SW requirements		$C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
	coarse fraction of sand size)	on of DIPTY	Silty sar sand-silt m		BB	SM	> 12		Atterberg limits below "A" line or W <sub>P</sub> <4	
			Clayey sa sand-clay n			SC 4	> 12		Atterberg limits above "A" line or W <sub>P</sub> <7	
	SILTS (Below 'A' line	W <sub>L</sub> <50	Inorganic silt clayey fine sa slight pla	ands, with		ML				
	negligible organic content)	W <sub>L</sub> >50	Inorganic sili plastic	-		МН				
SOILS	CLAYS	W <sub>L</sub> <30	Inorganic cla clays, sandy low plasticity,	clays of		CL				
FINE GRAINED SOILS	(Above 'A' line negligible organic	30 <w<sub>L&lt;50</w<sub>	Inorganic clay clays of m plastic	edium		СІ			Classification is Based upon Plasticity Chart	
FINE	content)	W <sub>L</sub> >50	Inorganic cla plasticity, f			СН				
	ORGANIC SILTS & CLAYS	W <sub>L</sub> <50	Organic si organic silty c plastic	lays of low	A CONTRACTOR OF THE CONTRACTOR	OL				
	(Below 'A' line)	W <sub>L</sub> >50	Organic clay plastic			ОН				
ŀ	HIGHLY ORGAINIC SOILS  Peat and other highly organic soils			Pt	<b>I</b>	Von Post sification Limit		or odour, and often us texture		
		Asphalt	BG.		Till					
		Concrete			Bedrock lifferentiated)	)			AE	COM
X		Fill		(L	Bedrock .imestone)				signated fracti	

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.



FRACTION		SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS		
		Passing	Retained	Percent	Identifier	
Gravel	Coarse	76	19	35-50	and	
Graver	Fine	19	4.75	35-50		
	Coarse	4.75	2.00	20-35	"v" or "ev" *	
Sand	Medium	2.00	0.425	20-33	y Or ey	
	Fine	0.425	0.075	10-20	como	
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		10-20	some	
				1-10	trace	

<sup>\*</sup> for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter BOULDERS: >300mm diameter

#### **LEGEND OF SYMBOLS**

Laboratory and field tests are identified as follows:

qu - undrained shear strength (kPa) derived from unconfined compression testing.

T<sub>v</sub> - undrained shear strength (kPa) measured using a torvane

pp - undrained shear strength (kPa) measured using a pocket penetrometer.

 $L_{\nu}$  - undrained shear strength (kPa) measured using a lab vane.

F<sub>v</sub> - undrained shear strength (kPa) measured using a field vane.

 $\gamma$  - bulk unit weight (kN/m<sup>3</sup>).

SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.

DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.

w - moisture content (W<sub>L</sub>, W<sub>P</sub>)

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N - BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

TY	PE	Paddock Drilling Ltd		ACTL						ECT NO.: 60216914	
		GRAB SHELBY TUBE			HOD:	RM 30, 125 m	nm SSA		ELEVA	ATION (m):	***************************************
SC	7				IT SPC			☑ NO R	ECOVERY		
	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE#	SPT (N)	(KIN/III	er ★ Cone ♦ Pen Test) ♦ 0mm) 60 80 100 it Wt ■ 3 9 20 21 Liquid	NDRAINED SHEAR S  + Torvane +  × QU ×  □ Lab Vane I  △ Pocket Pen.  ♣ Field Vane  (kPa)  50 100	) 	COMMENTS	- Hand
DR }		TOPSOIL - trace organics - black, moist, soft	A				00 100		150 200		
		CLAY - silty - brown to grey, moist, stiff - high plasticity		SANCARONA DA LA RESTRUCTURA DE LA CALVANDA DEL CALVANDA DEL CALVANDA DE LA CALVAN			-				
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CH /		- brown to grey - stiff to very stiff		MA CALLED THE STATE OF THE STAT			-		THE PERSONNEL PROPERTY AND ADDRESS OF THE PERSONNEL PROPERTY ADDRESS OF		many man mental mental mental and a special state of the
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	H		- brown to grey - stiff to very stiff	- brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed Hole is submerged under water - Backfilled with bentonite chips to surface.	- trace rootlets  - brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed Hole is submerged under water - Backfilled with bentonite chips to surface.	- trace rootlets  - brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed Hole is submerged under water - Backfilled with bentonite chips to surface.	- trace rootlets  - brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed: - Hole is submerged under water - Backfilled with bentonite chips to surface.  LOGGED BY: REVIEWED B	- brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed: - Hole is submerged under water - Backfilled with bentonite chips to surface.  LOGGED BY: M.Akhtar  REVIEWED BY: Farls Kha	- trace rooflets  - brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed Hole is submerged under water - Backfilled with bentonite chips to surface.	- trace rootlets  - brown to grey - stiff to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY  NOTES: - No sloughing observed - Indie is submerged under water - Backfilled with bentonite chips to surface.  LOGGED BY: M.Akhitar COMPLET  REVIEWED BY: Faris Khalil COMPLET	- brown to grey - solf to very stiff  - grey to black  END OF TEST HOLE AT 2.3m IN CLAY NOTES - No sloughing observed - Hole is submerged under water - Backfilled with bentonite chips to surface.  LOGGED BY: M.Akhitar COMPLETION DEPTH: 2.29 m REVIEWED BY: Fans Khalil COMPLETION DATE: 6/11/11/1

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SOIL DESCRIPTION  SOIL DESCRIPTION  SOIL TOPSOL Trace organics  CAY 1987 And 1987 An					N	1ETH	IOD:	RM 30, 125 mm SSA			
SOIL DESCRIPTION   SOIL DESCRI	SAMP	LET	YPE	GRAB SHELBY TUBE		SPL	IT SPO	OON BULK	∠ NO RE		
TOPSOIL -trace organics block, moist, solid CLAY-silly -grey in brown -sill inclusions (<10 mm)  BND OF TEST HOLE AT 1.5 m IN CLAY NOTES: - No Sloughing observed at 1.5 m No Sloughing observed at 1.5 m No Sloughing observed at 1.5 m Back/filled with bentonite chips to surface.	DEPTH (m)	OSO	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)		+ Torvane +  × QU ×  □ Lab Vane □  △ Pocket Pen. 2  ♣ Field Vane ♀  (kPa)	COMMENTS	TECLE
Silt inclusions (<10 mm)  END OF TEST HOLE AT 1.5 m in CLAY  NOTES:  Note:  Note:  Backfilled with bentonite chips to surface.	0	OR .		- black, moist, soft  CLAY - silty - grey, moist, stiff - high plasticity				20 10 00 00 100		30 200	The state of the s
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DEPTH (m)	nsc	SOIL SYMBOL	SOIL DES		SAMPLE TYPE	# ::	The second secon	◆ SF	BULK  PENETRATION TESTS  ** Becker ** <pre></pre>	t) •	+ Torvane  × QU × □ Lab Vane △ Pocket Per	+ 	RY Toore  COMMENTS	DEDTH
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	UR		- black, moist, soft SILT and CLAY - some sand - brown to black, moist, stiff	i organico						CONTROL OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON ADDRESS OF THE PERSON ADDRESS				
			- intermediate plasticity - trace rootlets - dark brown		\	G6								
1						T2	MA AND DESCRIPTION		<b>●</b> I		Δ			
	CLSI				-								Gravel: 0%, Sand: 16.7%, Silt: 43.8%, Clay: 39.5%	
			- silt inclusions (<5 mm) - homogenous brown colour		PROPERTY AND ADMINISTRATION OF THE PROPERTY OF	ma yo maa aa ahaa aa			_ :					
2			END OF TEST HOLE AT 2.1	m IN CLAY		G7		THE RESERVE OF THE PARTY OF THE	•					
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		<b>Y</b>	AECON	A					GED BY: M.Akh IEWED BY: Faris				ETION DEPTH: 2.13 m ETION DATE: 6/11/11	

			#2 & 3 Rehabilitation # 2 (Northing 5449695.0000, Easting 620237.0		CLIEN	IT: M	iller Environment	al Corpora	tion	TESTHOLE NO: TH 11 PROJECT NO.: 602169	*************
			Paddock Drilling Ltd		1ETH	IOD:	RM 30, 125 mm	SSA		ELEVATION (m):	/ I T
SAMPI	LE T	YPE	GRAB SHELBY TUBE			IT SPC			NO R	RECOVERY CORE	
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0	OR		TOPSOIL - black, moist, soft CLAY - silty - brown to grey, moist, firm - high plasticity - grey to black - trace rootlets		G8		201 40 60	80 100	50 100	150 200	
2			- trace rootlets - firm to stiff END OF TEST HOLE AT 1.5 m IN CLAY  NOTES: - No Sloughing observed at 1.5 m Backfilled with bentonite chips to surface.		9						
3					A CONTRACTOR OF THE PROPERTY O						
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6		9	A=COM				LOGGED BY: M. REVIEWED BY:			COMPLETION DEPTH: 1.52 COMPLETION DATE: 6/11/1	

			# 2 (Northing 5449697.0000, Easting 6202	46.0000)			liller Environmental Corpo		TESTHOLE NO: TH 11-0 PROJECT NO.: 6021691	
			Paddock Drilling Ltd				RM 30, 125 mm SSA		ELEVATION (m):	
SAMP	LET	YPE	GRAB SHELBY TU	BE >	SPI	_IT SPC	OON BULK	∠ NO RI	ECOVERY CORE	
DEPTH (m)	nsc	SOILSYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	NDRAINED SHEAR ST + Torvane +  × QU × □ Lab Vane □  △ Pocket Pen.  ⑤ Field Vane ⑥  (kPa)	COMMENTS	i H
0	OR		TOPSOIL - trace organics - black, moist, soft							
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1			- trace rootlets - light grey to grey		G10	)	. •			
	CH		- silt inclusions (<5 mm)		T4					
2			- grey to brown		G1 <sup>2</sup>		•	· Δ		
			- dark brown							
3	AND THE PROPERTY OF THE PROPER		END OF TEST HOLE AT 3.0 m IN CLAY NOTES:							MATERIAL APPLICATION AND A AND AND AND A AND AND AND AND AN
			<ul> <li>No Sloughing observed at 3.0 m.</li> <li>Backfilled with bentonite chips to surface.</li> </ul>							
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	,	Y	AECOM				LOGGED BY: M.Akhtar REVIEWED BY: Faris Kha		COMPLETION DEPTH: 3.05 m COMPLETION DATE: 6/11/11	

			#2 & 3 Rehabilitation		LIEN	T: Mi	iller Environmental Corpo	ration		E NO: <b>TH 11-0</b>	·
			I # 2 (Northing 5449724.0000, Easting 620223.0			0.5	<b></b>			NO.: 60216914	4
			Paddock Drilling Ltd				RM 30, 125 mm SSA		ELEVATION		
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DEPTH (m)	OSO	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	R.	PENETRATION TESTS	DRAINED SHEAR ST  + Torvane +  × QU ×  □ Lab Vane □  △ Pocket Pen.  ♣ Field Vane ♣  (kPa)  50 100 1	<sub>2</sub> (	COMMENTS	DEPTH
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	CI		- silt inclusions (<10 mm)		G13		•				
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			#2 & 3 Rehabilitation I # 3 (Northing 5449682.	0000, Easting 620208.00	000)	<u>/LILI</u>	N I . IV	ancı	LITVITOTII	nental C	orpore	IIIOH		STHOLE NO: <b>TH 11-0</b> OJECT NO.: 6021691	
			Paddock Drilling Ltd						30, 125 r		4			EVATION (m):	•
SAMP	LET	YPE	GRAB	SHELBY TUBE	$\boxtimes$	SPL	IT SPO	OON		BULK			NO RECOVE		
DEPTH (m)	OSC	SOIL SYMBOL	SOIL DES	SCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ S 0	PENETRATII   ** Becl  Dynamic  PT (Standar  (Blows/3  20 40  Total U  (kN/r)  17 18  Plastic MC  20 40	ker # c Cone � rd Pen Test 00mm) 60 80 nit Wt  m³) 19 20 C Liquid	100 21	+ Tor	HEAR STRENGTH vane + QU × Vane □ et Pen. △ I Vane ♥ Pa)	COMMENTS	
0	OR		TOPSOIL - trace organics						20 40		100	30 1	00 150 20	9	-
			CLAY - silty - brown, moist, stiff - intermediate plasticity			G14			•						100 A
1	CI		- brown to grey - silt inclusions (<5 mm)												TOTAL DESIGNATION OF THE PROPERTY OF THE PROPE
2			dad brown			G15		C. T. C.				∑ 			
3			- dark brown - silt inclusions (<10 mm) - intermediate plasticity  END OF TEST HOLE AT 3.0	m IN CLAY											
4			NOTES:  - No Sloughing observed at  - Hole is submerged under v  - Backfilled with bentonite ch	vater	TO A CANADA THE		NAME OF THE PARTY				A STATE OF THE STA				A THE RESERVE OF STREET OF THE PROPERTY OF THE
					MINISTRA DE LA CALLA DEL CALLA DE LA CALLA DE LA CALLA DEL CALLA DE LA CALLA D						THE PROPERTY OF THE PROPERTY O				
5							Populario (Antalanda) de la composiçõe d				The state of the s				
6			RAFT					10	OOF D	· ha all-					
			A ECON	A					GGED BY	: M.Akhi BY: Faris				ETION DEPTH: 3.05 m ETION DATE: 6/11/11	

			#2 & 3 Rehabilitation	C	LIEN	IT: M	liller	Environmental Corp	oration		OLE NO: TH 11-0	
		N: Cell # 3 (Northing 5449687.0000, Easting 6201 CTOR: Paddock Drilling Ltd  TYPE GRAB SHELBY TO  ONE OF COLUMN TO THE CONTROL OF THE COLUMN TO THE COLUMN T		i —			<b>-</b> -	00 405			ECT NO.: 6021691	4
								30, 125 mm SSA			TION (m):	
OMIVIE		16	ALMD METRA INRE		SPL	IT SPO	NOV		☑ NO RE	·····	CORE	1
DEPTH (m)	OSO	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE#	SPT (N)	0	# Becker #  Dynamic Cone   SPT (Standard Pen Test) ◆  (Blows/300mm)  40 60 80 100  Total Unit Wt ■  (kN/m³)	❤ Field Vane ❤	۷	COMMENTS	UEGEG
0	OR		TOPSOIL - trace organics CLAY - silty						30 100 1	200		
			- brown, moist, stiff - intermediate plasticity									
-1	CI		<ul><li>trace rootlets</li><li>brown to grey</li><li>silt inclusions (&lt;7 mm)</li></ul>		G16	The same of the sa		•	, , , ,			
			END OF TEST HOLE AT 1.5 m IN CLAY NOTES:							MARKINGANIANIAN BAARANAA		
-2		A CONTRACTOR OF THE PROPERTY O	<ul> <li>No Sloughing observed at 3.0 m.</li> <li>Hole is submerged under water</li> <li>Backfilled with bentonite chips to surface.</li> </ul>									
		PER SERVICE COMPANY OF SERVICE										
- 3	The statement of the st	THE CASE OF THE CA					PROPORTING TO THE PROPORTION OF THE PROPORTION O					
4												
		AND THE PARTY OF T					TO COME AND ADDRESS OF THE PARTY OF T					
5		WAS CHARLES AND THE STATE OF TH					Program A REV agrand AREV (1) to the material American					
		YMA AYYOMANNY W mm NA AXYON NI A AYYON NI AYYON										
6			RAFT			en e						
	1	닏	AECOM				<u></u>	GGED BY: M.Akhtar			ON DEPTH: 1.52 m	
		Aller .	ALCOM					EVIEWED BY: Faris Kh ROJECT ENGINEER: F		UMPLETI	ON DATE: 6/11/11 Page	

			#2 & 3 Rehabilitation # 3 (Northing 5449701.0000,Easting 620196.0		LIEN	IT: M	filler	Environmental Corpo	oration		HOLE NO: TH 11-10	
			Paddock Drilling Ltd	<del></del>	/FTH	IOD.	ВM	30, 125 mm SSA			ECT NO.: 60216914 ATION (m):	+
SAMP			GRAB SHELBY TUBE			IT SPC		BULK	NO RE			
DEPTH (m)	OSU	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE		SPT (N)	◆ S 0	PENETRATION TESTS	NDRAINED SHEAR STI + Torvane + × QU × □ Lab Vane □ △ Pocket Pen. 2 ❖ Field Vane ❖ (kPa)	RENGTH	COMMENTS	
0	OR		TOPSOIL - trace organics - black, moist, soft CLAY - silty - brown, moist, stiff - high plasticity		The state of the s			20 40 60 80 100	50 100 1	50 200		
-1	CH		- brown to black		G17		THE RESIDENCE OF THE PROPERTY	•	Δ·			A CONTRACTOR OF THE PROPERTY O
-2	CI		- trace rootlets  CLAY - silty - brown, moist, stiff - intermediate plasticity - trace rootlets - silt inclusions (<5 mm)		G18			•				Western Commission of the Comm
3			END OF TEST HOLE AT 3 m IN CLAY NOTES:		G19			•	    			
4			<ul> <li>No Sloughing observed at 3.0 m.</li> <li>Hole is submerged under water</li> <li>Backfilled with bentonite chips to surface.</li> </ul>			AND THE REAL PROPERTY OF THE P						
5	A DO A DO AND A DO AN									The second secon		
6			RAFT									
		Y	AECOM				RE	GGED BY: M.Akhtar VIEWED BY: Faris Kha OJECT ENGINEER: KI	dil C		ION DEPTH: 3.05 m ION DATE: 6/11/11 Page	1 4

			#2 & 3 Rehabilitation I # 3 (Northing 5449710.0000, Easting 6202	אטא אטעע	CLIE	ENT: N	/liller l	Environmental C		TESTHOLE NO: TH 11-11				
CONTRACTOR: Paddock Drilling Ltd						LIOD	D* * *	00 405 - 00		PROJECT NO.: 60216914				
SAMPLE TYPE GRAB SHELBY TUBE						HOD: PLIT SPO		30, 125 mm SSA ⊟BULK		RECOVERY	TION (m):			
DEPTH (m)	OSO	SOIL SYMBOL	SOIL DESCRIPTION	MANDI AVE	Ī		◆ SF	PENETRATION TESTS  ** Becker ** <pre>     Dynamic Cone </pre> ** (Standard Pen Test     (Blows/300mm)  0 40 60 80  ** Total Unit Wt **  (kN/m*)  7 18 19 20  Plastic MC Liquid	UNDRAINED SHEAR + Torvane  X QU X □ Lab Van  100 △ Pocket Pe Prield Var  (kPa)	STRENGTH + e □	COMMENTS			
0	OR		TOPSOIL - trace organics - black, moist, soft CLAY - silty - brown, moist, stiff - high plasticity					40 60 80	100 50 100	150 200				
- <b>1</b>	СН		- brown to grey - trace rootlets		To G2			•	Δ	AL A CAMADA CAMA				
2			- intermediate plasticity - silt inclusions (<5 mm) - stiff to firm  END OF TEST HOLE AT 1.8 m IN CLAY  NOTES: - No Sloughing observed at 3.0 m Hole is submerged under water - Backfilled with bentonite chips to surface.				AMPRICATION CONTRACTOR IN THE BEAUTY OF THE		Δ.					
3	THE STATE OF THE S													
4					THE									
5						The state of the s						THE RESIDENCE OF THE PROPERTY		
6			RAFT			PLOTE CONTROL OF THE PARTY OF T	100	GED BY: M.Akht	tor.	COMPLET	ON DEDTIL 4 CO			
			AECOM				RE\	IEWED BY: Faris	s Khalil		ON DEPTH: 1.83 m ON DATE: 6/11/11 Page			

PROJECT: Cell #2 & 3 Rehabilitation  LOCATION: Cell # 3 (Northing 5449728.0000, Easting 620193.000  CONTRACTOR: Paddock Drilling Ltd						IT: M	liller	Environmental Corp	TESTHOLE NO: TH 11-12			
										PROJECT NO.: 60216914		
								30, 125 mm SSA			VATION (m):	
SAMP	LE 1)	r PE	GRAB SHELBY TUBE		SPL	IT SPC	T	BULK	∠ NO F			
DEPTH (m)	OSO	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ S 0		♣ Field Vane (kPa)	D A	COMMENTS	
-1	OR SICL		TOPSOIL - trace organics - grey to dark grey, moist, soft CLAY and SILT - some sand - brown to light grey, moist, firm - intermediate plasticity - dark grey - trace rootlets  - brown to grey - trace rootlets  - silt inclusions (<10 mm) - firm to stiff		T7				+	190 200	Gravel: 0%, Sand: 11.4%, Silt: 44.2%, Clay: 44.4%	
-2			END OF TEST HOLE AT 1.5 m IN CLAY  NOTES: - No Sloughing observed at 1.5 m Hole is submerged under water - Backfilled with bentonite chips to surface.				THE PARTY AND TH		+			
-3												
- <b>4</b>				The control of the co						-		
-5							ALL COLOR TO THE C					
6			RAFT					GGED BY: M.Akhtar		COMPLE	ETION DEPTH: 1.52 m	
		Apple Contraction of the Contrac	AECOM				RE	VIEWED BY: Faris Kh	alil (	COMPLE	ETION DATE: 6/11/11	

PROJECT: Cell #2 & 3 Rehabilitation  LOCATION: Cell #3 (Northing 5449721.0000, Easting 620177.000						IT: N	liller	Environmental Cor	poration	1	HOLE NO: <b>TH 11-1</b>	
			II # 3 (Northing 5449721.0000, Easting 620177.000 Paddock Drilling Ltd	<del></del>							ECT NO.: 6021691	4
								30, 125 mm SSA			ATION (m):	
SAMP		175	GRAB SHELBY TUBE	$+$ $\succeq$	SPL	IT SPO	ON	BULK	T	COVERY	CORE	
DEPTH (m)	OSC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ S 0	PENETRATION TESTS	□ Lab Vane □  △ Pocket Pen.  ♣ Field Vane €  (kPa)		COMMENTS	
0	OR		TOPSOIL - trace organics - grey, moist, soft									1
			CLAY - silty - light grey to dark grey, moist, stiff - high plasticity		THE PROPERTY OF THE PROPERTY O	AND THE RESERVE OF THE PERSON						
-1			- black		G22							
~2	СН		- trace rootlets - silt inclusions (<10 mm)		G23			•	· Δ			The second secon
			- grey to brown	100 to 10	G24		NAME OF TAXABLE PARTY O	•	Δ			
-3		A STATE OF THE STA	- silt inclusions (<10 mm) - low plasticity  END OF TEST HOLE AT 3.0 m IN CLAY  NOTES: - No Sloughing observed at 3.0 m Backfilled with bentonite chips to surface.									
4												
-5	And the second s	ARRIAN ARRAM ARRAMAN A										
		Alta a Maria de Carta		ESPECIALISM AN AUTHALISM AN ALLA LA L		The state of the s						Commonwealth (1)
6	•		AECOM			Transplant in the minimum and		OGGED BY: M.Akhtar			ION DEPTH: 3.05 m	
		-	ALCOM					EVIEWED BY: Faris K ROJECT ENGINEER:		OMPLET	ION DATE: 6/11/11 Page	

PROJ	PROJECT: Cell #2 & 3 Rehabilitation						/liller	Environ	ment		TESTHOLE NO: TH 11-14				
			ll # 3 (Northing 5449703.0000, Easting 620216.0	0000)									PROJECT NO.: 60216914		
	-		Paddock Drilling Ltd	N	/ETH	IOD:	RM	30, 125	mm S	SSA			ELEVATION (m):		
SAMP	LE T	YPE	GRAB SHELBY TUBE			IT SPO			BUL			NO RE			~
DEРТН (m)	nsc	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	◆ S 0	Opynam PT (Stand (Blows, 20 40 Total (kh 17 18	cker × nic Cone ard Pen /300mm 60 Unit Wt I/m³) 19		UNDRAINED + > □ L △ Po	SHEAR STI Forvane + × QU × ab Vane □ cket Pen. ∠ eld Vane <b>2</b> (kPa)	RENGTH	COMMENTS	DEPTH
0	OR	3333	TOPSOIL - trace organics				+	20 40	60	<b>1</b> 80 100	50	100 1	50 200		
			\- dark grey, moist, soft CLAY - silty - dark grey, moist, stiff - high plasticity		THE RESIDENCE OF THE PARTY OF T		_								
- 1 1			- trace rootlets		G25		TOTAL CONTRACTOR OF THE PROPERTY OF THE PROPER	•			· Δ				1 -
	B. B		- grey to brown												
-	СН		- intermediate plasticity		G26										
-2	PRINTED THE PRINTE		- trace rootlets		T8		OMANA MANAGEMENT OF THE PROPERTY OF THE PROPER	•			Δ				2
			- silt inclusions (<10 mm)		G27	The state of the s									
3			- grey to black		GZI		William Colonia and Colonia an								
			NOTES:  No Sloughing observed at 3.0 m.  Backfilled with bentonite chips to surface.		OF BETT AND										3 -
- 4		778.000													
106 OF 1591 HOLE DRAFT MILLER ENV. LACION GFJ UMA WINN GDJ (1971)		Control of the Contro													4
5										And the state of t			The state of the s		5 -
ן אוורריי ריי		PROPERTY AND PROPERTY WHEN A SHEET OF STREET AND A SHEET AS A SHEE											Ampropolation and the state of		
- 6			RAFT												
100 OU 150		y	AECOM	1 1			RE\	GED BY IEWED DJECT E	BY: F	aris Kh	alil (halil Faris			TION DEPTH: 3.05 m TION DATE: 6/11/11 Page	1 of 1

m SCALE 1:750
0 7.5 15 22.6
IMAGE SOURCE: GOOGLE EARTH PRO 2011
IMAGE DATE: APRIL 14, 2007 **SCALE 1:750** 

