APPENDIX E

Laboratory Testing

Prairies and North Laboratories

ATTN: Fernando Junqueira
Senior Geotechnical Engineer
Golder Associates Ltd.

Received: 16-Oct-17
Report Date: 10-Nov-17
Version: Final

Calgary Geotechnical Laboratory Testing Report

Client: Agnico Eagle Mines
Client PO No.: OL-627166
Golder Billing: 1784383.5000

Matthew Becker
Geotechnical Laboratory Manager
Golder Associates Ltd.

Our liability is limited to the cost of the test requested. The test results only relate to the sample as received. No liability in whole or in part is assumed for the collection, handling or transport of the sample, application or interpretation of the test data or results.

Golder Associates Ltd., Bay 7, 820 28th Street NE, Calgary Alberta, Canada T2K 6K1
Tel. (403) 248-6386 Fax. (403) 248-6387

General Lab Testing Summary

Project No.: 1784383
Short Title: AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING
Tested By: FC/ MB

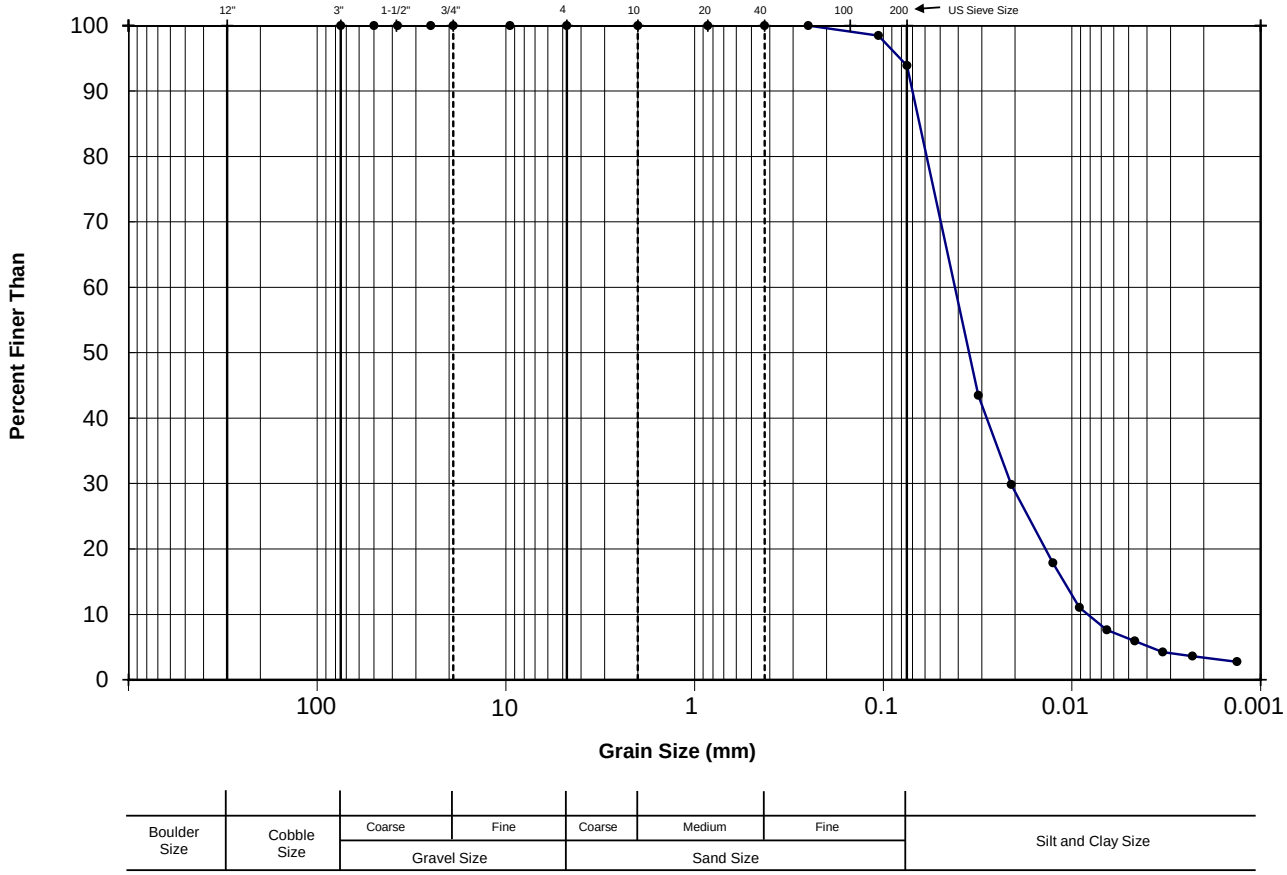
Phase: 5000
Sched: C499
Date: 10-Nov-17

Sample Identification					Laboratory Test Results													
		Depth (m)					Thermal Conductivity, K (W/m*K)		Volumetric Specific Heat Capacity, C (mJ/ (m^3*K)					Strain Rate of Frozen Compressive Creep at -3 °C (%/ day)				
Borehole No.	Sample No.	from	to	Lab No.	Water Content (%)	Percentage Passing 75 µm	At -5 °C	At +10 °C	At -5 °C	At +10 °C	Salinity	Peak Frozen Unconfined Compressive Strength at -3 °C (kPa)	Peak Frozen Confined Compressive Strength at -3 °C (kPa)	50 kPa	150 kPa	350 kPa	Asbestos (%)	Cyanide (mg/kg)
SDW-01-16	RC1	0.00	0.58	C499-01	34.9	93.9	-	-	-	-	see ALS Report	414	-	-	-	-	< 1	2.51
	RC5	5.75	7.25	C499-02	31.7	79.8	3.336	1.983	3.673	2.759	-	-	-	-	-	-	-	-
	RC7	8.75	10.25	C499-03	50.4	77.2	-	-	-	-	-	-	-	0.10	2.65	40.65	-	-
	RC8	10.25	11.75	C499-04	30.1	86.8	-	-	-	-	see ALS Report	-	-	-	-	-	-	-
	RC9	11.75	13.25	C499-05	-	-	-	-	-	-	-	-	-	-	-	-	< 1	66.7
	RC10	13.25	14.75	C499-06	23.0	76.6	-	2.453	2.524	-	see ALS Report	-	812	-	-	-	-	-

Project No.:	1784383.5000	Lab No.:	C499-01
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Borehole:	SDW-01-16	Sample No.:	RC1
Depth:	0.0-0.6 m		
Date Tested:	20-Oct-17	By:	FC

Particle Size Analysis of Soil

(ASTM D422)



Diameter of Sieve (mm)	Percent Passing (%)
75.0	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
9.5	100.0
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.106	98.5
0.075	93.9
0.031	43.5
0.021	29.8
0.013	17.9
0.009	11.0
0.007	7.6
0.005	5.9
0.003	4.2
0.002	3.6
0.001	2.8

Comments:

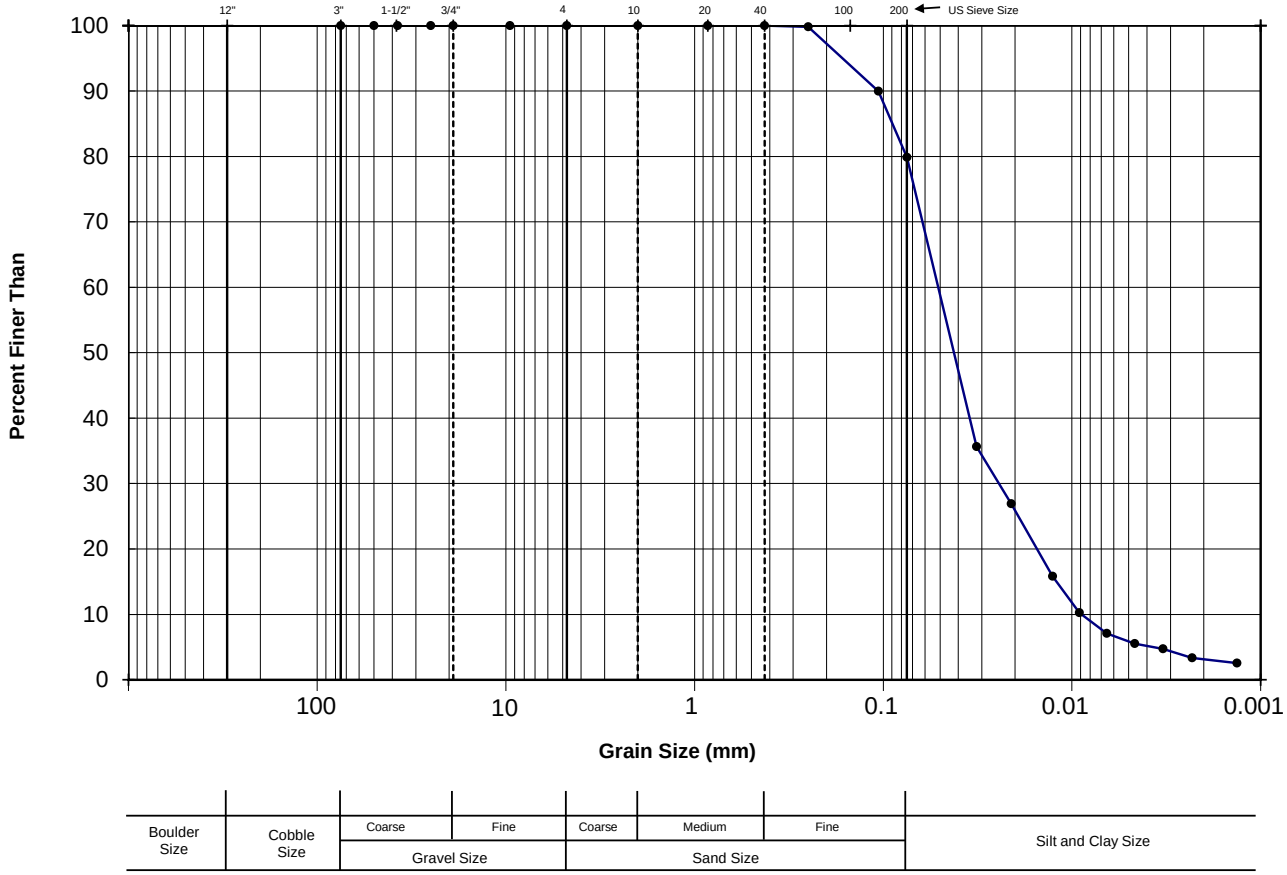
PERCENT GRAVEL, SAND, SILT AND CLAY OF SAMPLE

GRAVEL		SAND			SILT / CLAY
Coarse	Fine	Coarse	Medium	Fine	
0.0%	0.0%	0.0%	0.0%	6.1%	93.9%

Project No.:	1784383.5000	Lab No.:	C499-02
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Borehole:	SDW-01-16	Sample No.:	RC5
Depth:	5.8-7.3 m		
Date Tested:	20-Oct-17	By:	FC

Particle Size Analysis of Soil

(ASTM D422)



Diameter of Sieve (mm)	Percent Passing (%)
75.0	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
9.5	100.0
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	99.8
0.106	90.0
0.075	79.8
0.032	35.6
0.021	26.9
0.013	15.8
0.009	10.3
0.007	7.1
0.005	5.5
0.003	4.7
0.002	3.3
0.001	2.6

Comments:

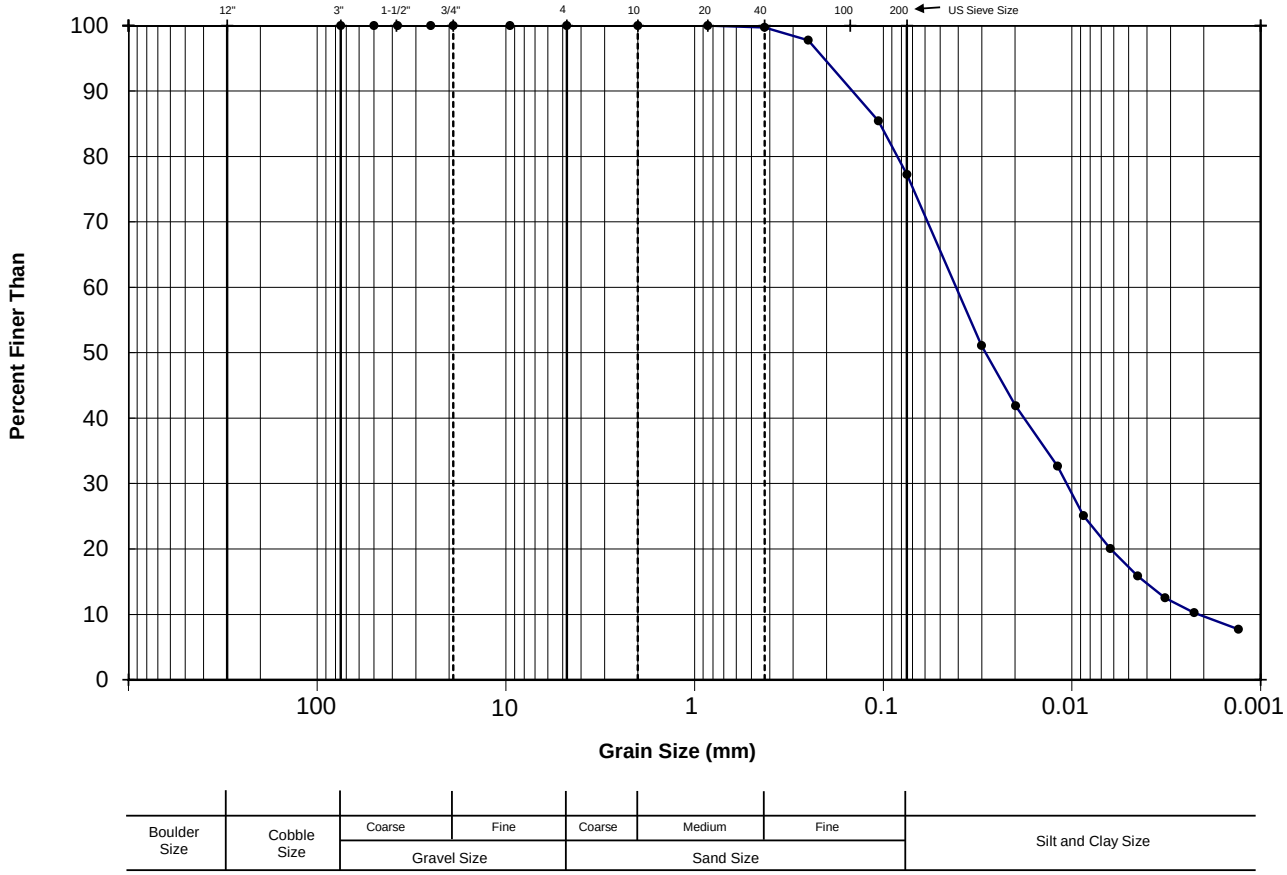
PERCENT GRAVEL, SAND, SILT AND CLAY OF SAMPLE

GRAVEL		SAND			SILT / CLAY
Coarse	Fine	Coarse	Medium	Fine	
0.0%	0.0%	0.0%	0.0%	20.2%	79.8%

Project No.:	1784383.5000	Lab No.:	C499-03
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Borehole:	SDW-01-16	Sample No.:	RC7
Depth:	8.8-10.0 m		
Date Tested:	20-Oct-17	By:	FC

Particle Size Analysis of Soil

(ASTM D422)



Diameter of Sieve (mm)	Percent Passing (%)
75.0	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
9.5	100.0
4.75	100.0
2.0	100.0
0.850	100.0
0.425	99.7
0.250	97.7
0.106	85.4
0.075	77.2
0.030	51.1
0.020	41.9
0.012	32.6
0.009	25.1
0.006	20.1
0.004	15.9
0.003	12.5
0.002	10.2
0.001	7.7

Comments:

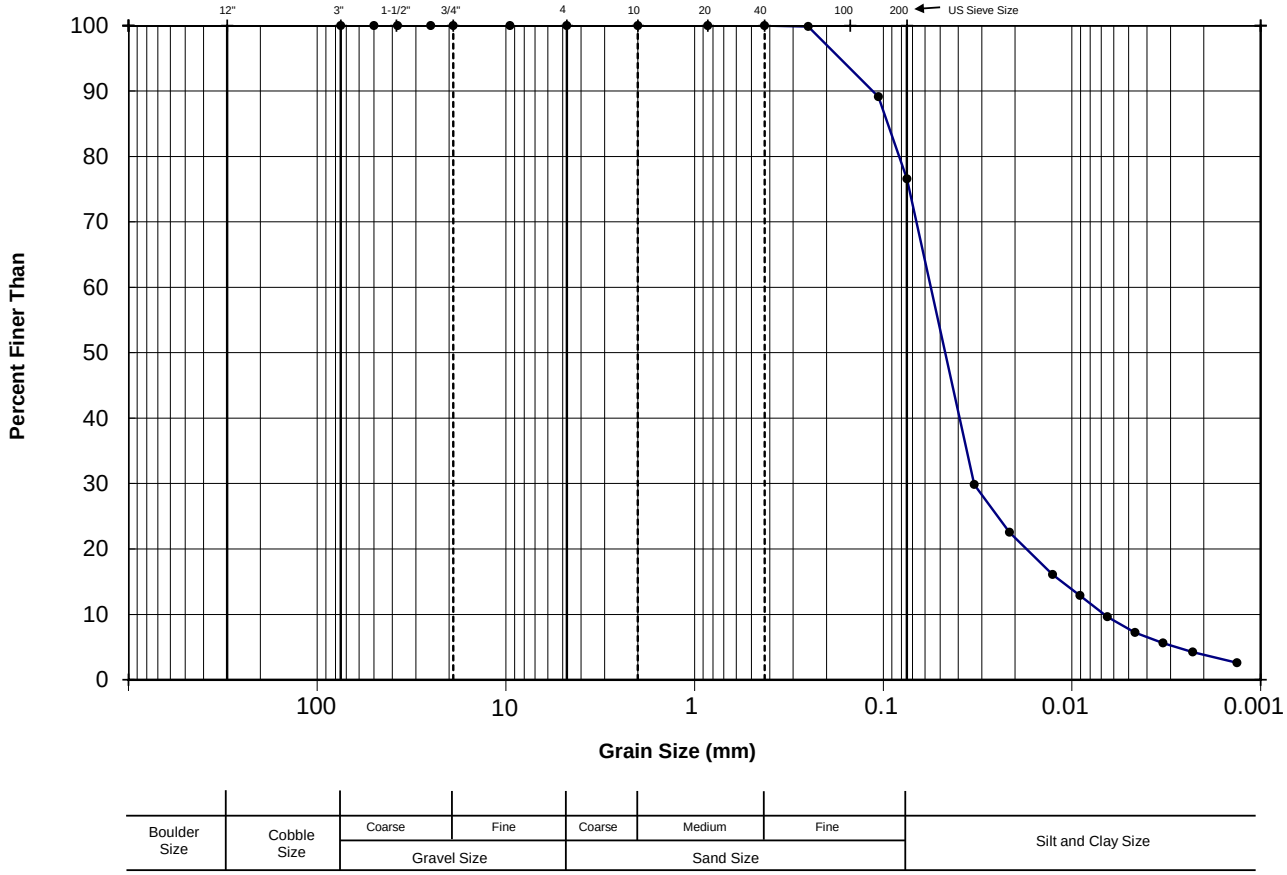
PERCENT GRAVEL, SAND, SILT AND CLAY OF SAMPLE

GRAVEL		SAND			SILT / CLAY
Coarse	Fine	Coarse	Medium	Fine	
0.0%	0.0%	0.0%	0.3%	22.5%	77.2%

Project No.:	1784383.5000	Lab No.:	C499-06
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Borehole:	SDW-01-16	Sample No.:	RC10
Depth:	13.0-15.0 m		
Date Tested:	20-Oct-17	By:	FC

Particle Size Analysis of Soil

(ASTM D422)



Diameter of Sieve (mm)	Percent Passing (%)
75.0	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
9.5	100.0
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	99.8
0.106	89.1
0.075	76.6
0.033	29.8
0.021	22.6
0.013	16.1
0.009	12.9
0.006	9.6
0.005	7.2
0.003	5.6
0.002	4.2
0.001	2.6

Comments:

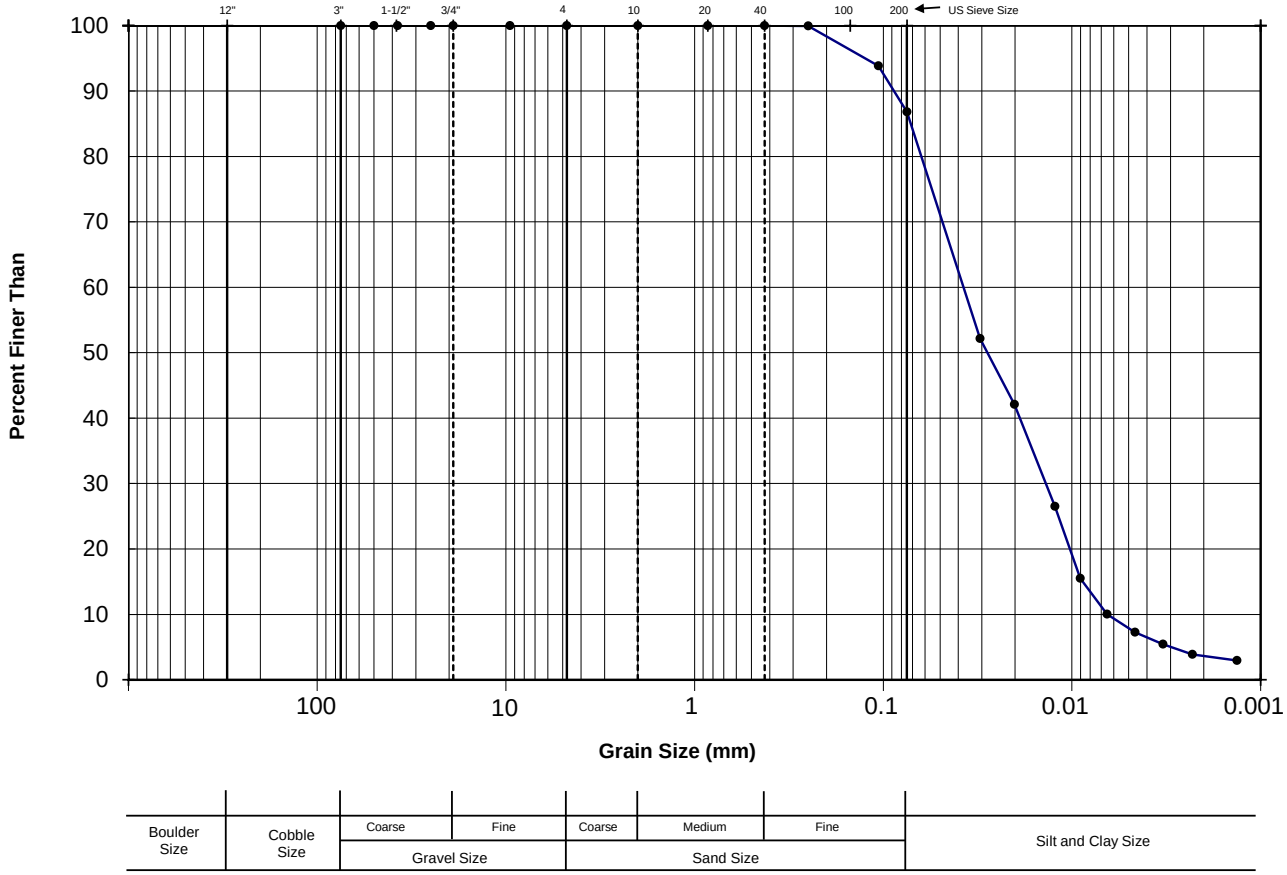
PERCENT GRAVEL, SAND, SILT AND CLAY OF SAMPLE

GRAVEL		SAND			SILT / CLAY
Coarse	Fine	Coarse	Medium	Fine	
0.0%	0.0%	0.0%	0.0%	23.4%	76.6%

Project No.:	1784383.5000	Lab No.:	C499-04
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Borehole:	SDW-01-16	Sample No.:	RC8
Depth:	10.0-12.0 m		
Date Tested:	20-Oct-17	By:	FC

Particle Size Analysis of Soil

(ASTM D422)



Diameter of Sieve (mm)	Percent Passing (%)
75.0	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
9.5	100.0
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	99.9
0.106	93.8
0.075	86.8
0.031	52.1
0.020	42.1
0.012	26.5
0.009	15.5
0.007	10.0
0.005	7.3
0.003	5.4
0.002	3.9
0.001	3.0

Comments:

PERCENT GRAVEL, SAND, SILT AND CLAY OF SAMPLE

GRAVEL		SAND			SILT / CLAY
Coarse	Fine	Coarse	Medium	Fine	
0.0%	0.0%	0.0%	0.0%	13.2%	86.8%

Thermal Conductivity of Soil by Thermal Needle Probe

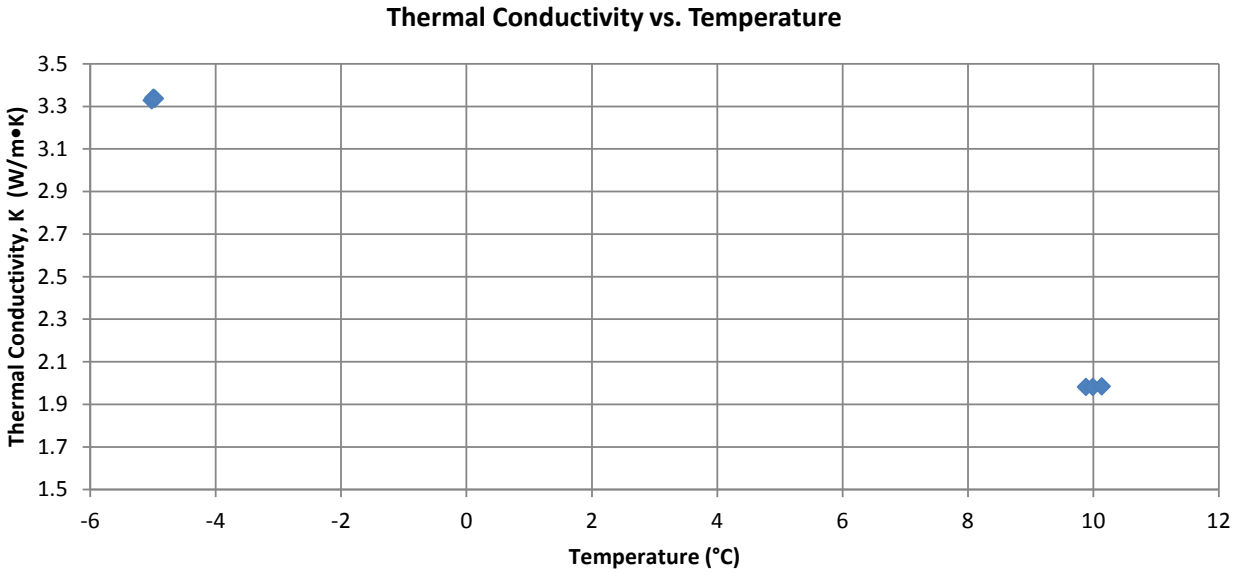
(ASTM D5334-08)

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Lab No.:	C499-02
Tested By:	MB	Date:	10-Nov-17

Borehole No.:	SDW-01-16	**Undisturbed or Remolded:**	Undisturbed/ trimmed
Sample No.:	RC5	**Wet Density (kg/m^3):**	1918
Height (mm):	118.40	**Water Content (%):**	31.7
Diameter (mm):	62.20	**Dry Density (kg/m^3):**	1457
Mass (g):	690.15	**Void Ratio:**	0.922
Thermal Probe No.:	SH-1	**Saturation (%):**	96.2
Probe Length (mm):	50.0	**G_s (assumed):**	2.8

Test Results:

Trial No.	Temp. (°C)	Avg. Temp. (°C)	Thermal Conductivity, K (W/m•K)	Avg. Thermal Conductivity, K (W/m•K)	Thermal Resistivity, R (m•K/W)	Avg. Thermal Resistivity, R (m•K/W)
1	-5.02	-5.0	3.330	3.336	0.300	0.300
2	-4.99		3.341		0.299	
3	-4.97		3.337		0.300	
4	9.88	10.0	1.982	1.983	0.505	0.504
5	9.99		1.983		0.504	
6	10.13		1.985		0.504	



Remarks:
Thermal conductivity value has a precision of +/- 10%
1. Intact sample - trimmed to regularly-shaped cylinder
2. Sample allowed to reach equilibrium for 60 min before testing.
3. Test Conducted using KD2-Pro Thermal Properties Analyzer

Volumetric Specific Heat Capacity of Soil by Thermal Needle Probe

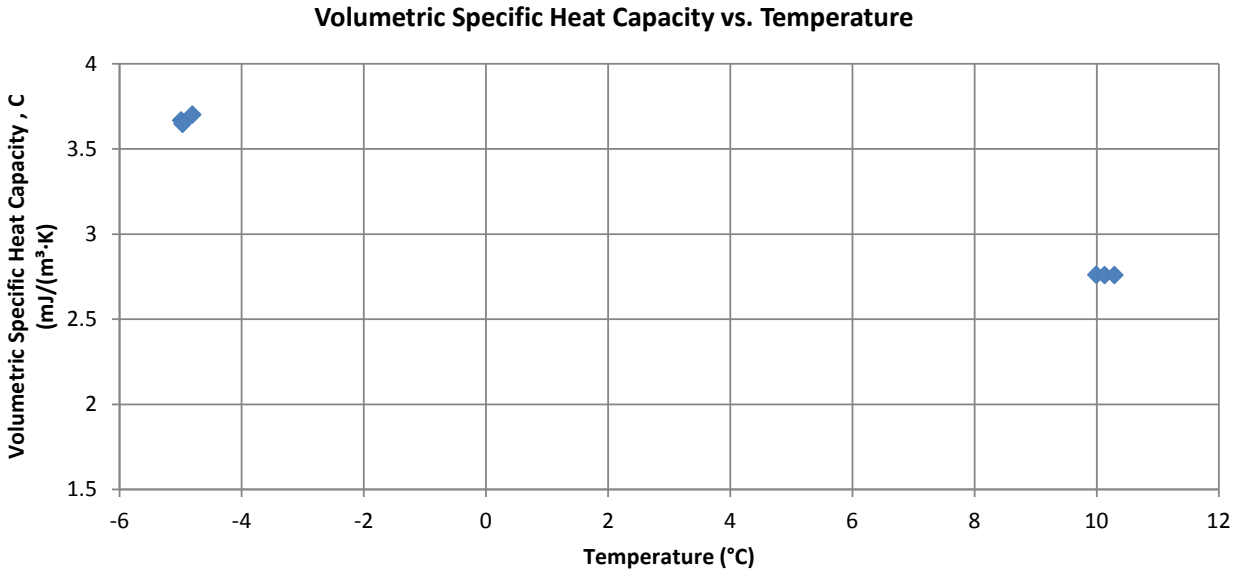
(ASTM D5334-08)

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Lab No.:	C499-02
Tested By:	MB	Date:	10-Nov-17

Borehole No.:	SDW-01-16	**Undisturbed or Remolded:**	Undisturbed/ trimmed
Sample No.:	RC5	**Wet Density (kg/m^3):**	1919
Height (mm):	118.35	**Water Content (%):**	31.7
Diameter (mm):	62.20	**Dry Density (kg/m^3):**	1457
Mass (g):	690.15	**Void Ratio:**	0.921
Thermal Probe No.:	SH-1	**Saturation (%):**	96.3
Probe Length (mm):	50.0	**G_s (assumed):**	2.8

Test Results:

Trial No.	Temp. (°C)	Avg. Temp. (°C)	Volumetric Specific Heat Capacity, C mJ/(m³·K)	Avg. Volumetric Specific Heat Capacity, C mJ/(m³·K)	Thermal Diffusivity, D (mm^2/s)	Avg. Thermal Diffusivity, D (mm^2/s)
1	-4.99	-4.9	3.668	3.673	0.911	0.910
2	-4.97		3.648		0.915	
3	-4.81		3.702		0.904	
1	9.99	10.1	2.760	2.759	0.718	0.719
2	10.13		2.759		0.719	
3	10.29		2.759		0.720	



Remarks:
Volumetric Heat Capacity value has a precision of +/- 10%
1. Intact sample - trimmed to regularly-shaped cylinder
2. Sample allowed to reach equilibrium for 60 min before testing.
3. Test Conducted using KD2-Pro Thermal Properties Analyzer

Thaw Consolidation of Frozen Soil

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Tested By:	MB	Date:	05-Nov-17

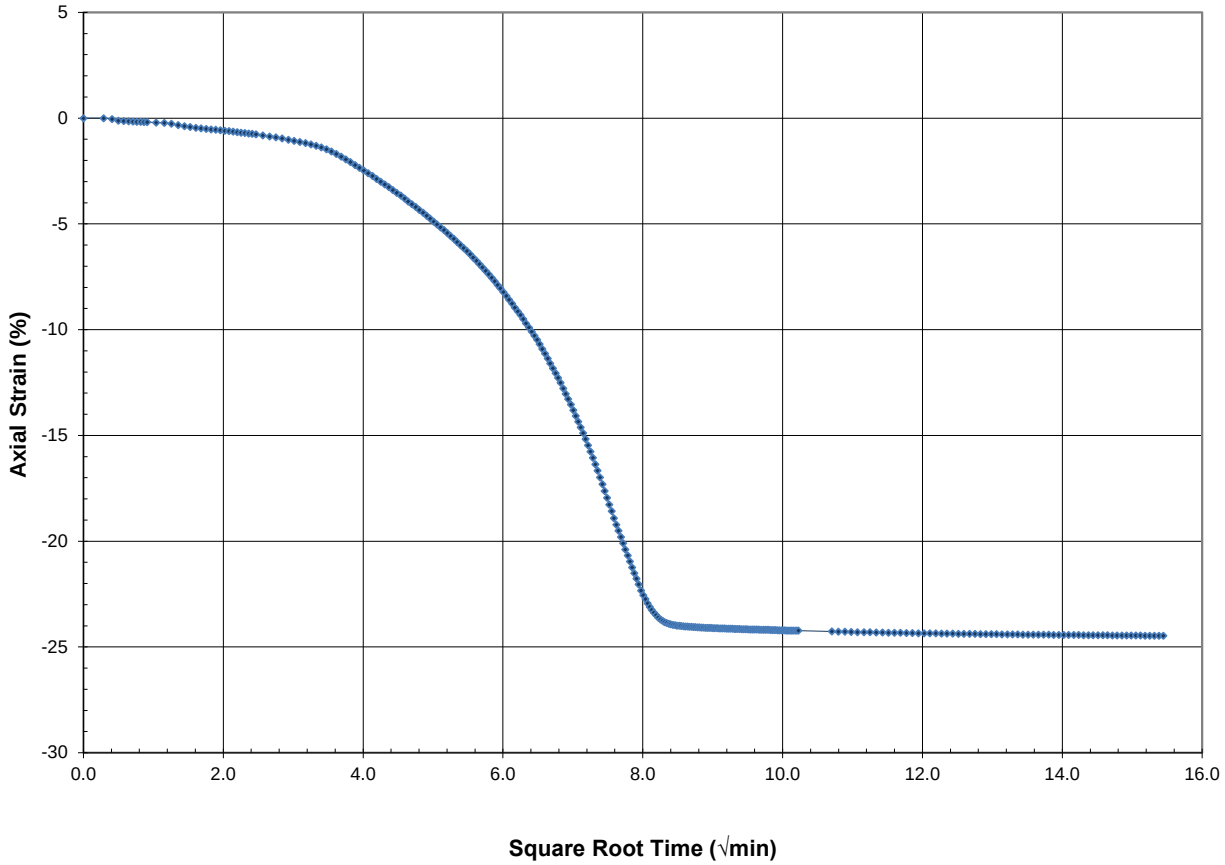
Borehole No.:	SDW-01-16	Sample No.: RC7	Depth: 8.75 - 10.25	m	Lab No.: C499-03
Location:	Agnico Eagle Mines				
Sample Description:	(ML) sandy SILT; grey; non-cohesive, wet				

	Initial (frozen)	Final (thawed)	
Diameter:	6.30	6.20	cm
Height:	4.21	3.19	cm
Wet Mass:	238.21	213.20	g
Volume:	131.17	96.27	cm^3
w:	55.90	28.06	%
ρd:	1165	1729	kg/m^3
e:	1.33	0.72	

Applied Axial Load: **40** **kPa**

% Thaw Consolidation: **26.61%**

Axial Strain vs. Root Time



Remarks: Water drained from the mold once the cell was dismantled - this could not be included when determining the final water content.

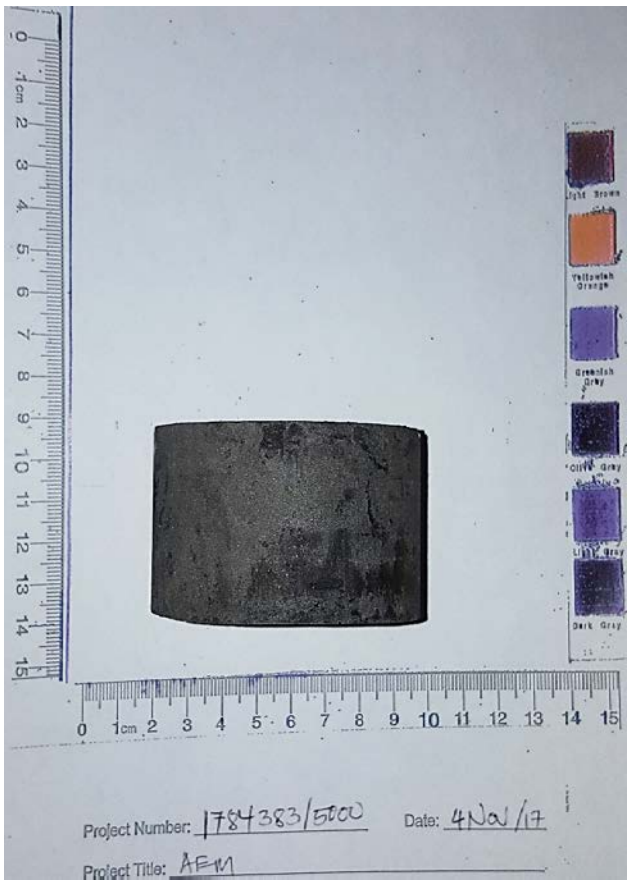
The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

Bay 8, 820 - 28 St. NE
Calgary, AB T2A 6K1

Thaw Consolidation of Frozen Soil

Project No.:	1784383		Phase: 5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Tested By:	MB		Date: 05-Nov-17

Borehole No.:	SDW-01-16	Sample No.:	RC7	Depth:	8.75 - 10.25	m	Lab No.: C499-03
Location:	Agnico Eagle Mines						
Sample Description:	(ML) sandy SILT; grey; non-cohesive, wet						

PRE-TEST PHOTO	POST-TEST PHOTO
	Note: Mislabelled in photo sheet below - sample is RC7 and Depth is 8.75 - 10.25 m 

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Bay 8, 820 - 28 St. NE
Calgary, AB T2A 6K1

Thaw Consolidation of Frozen Soil

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Tested By:	MB	Date:	03-Nov-17

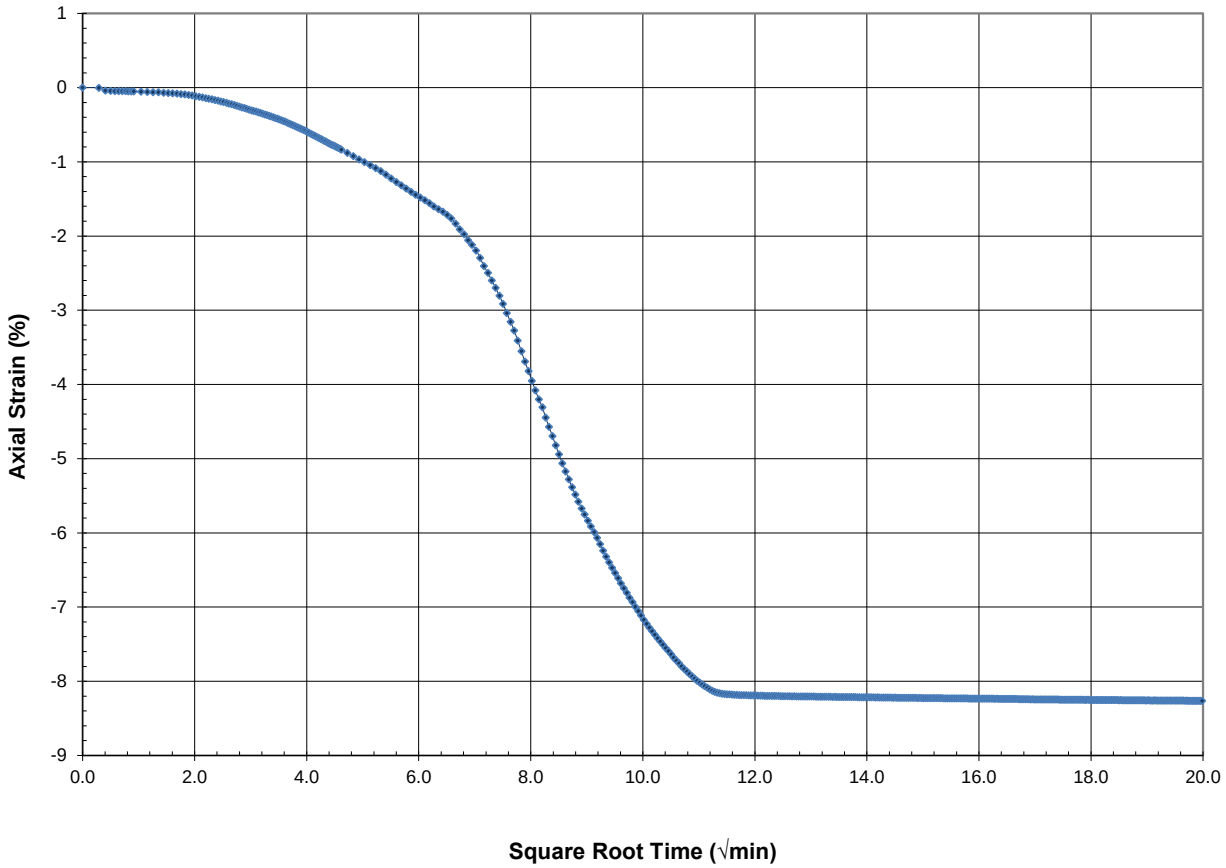
Borehole No.:	SDW-01-16	Sample No.: RC9	Depth: 11.75 - 13.25	m	Lab No.: C499-05
Location:	Agnico Eagle Mines				
Sample Description:	(ML) sandy SILT; grey; non-cohesive, wet				

	Initial (frozen)	Final (thawed)	
Diameter:	6.29	6.20	cm
Height:	10.51	9.65	cm
Wet Mass:	638.64	632.86	g
Volume:	326.58	291.27	cm^3
w:	30.90	29.71	%
ρd:	1494	1675	kg/m^3
e:	0.83	0.64	

Applied Axial Load: **40** **kPa**

% Thaw Consolidation: **10.81%**

Axial Strain vs. Root Time



Remarks:

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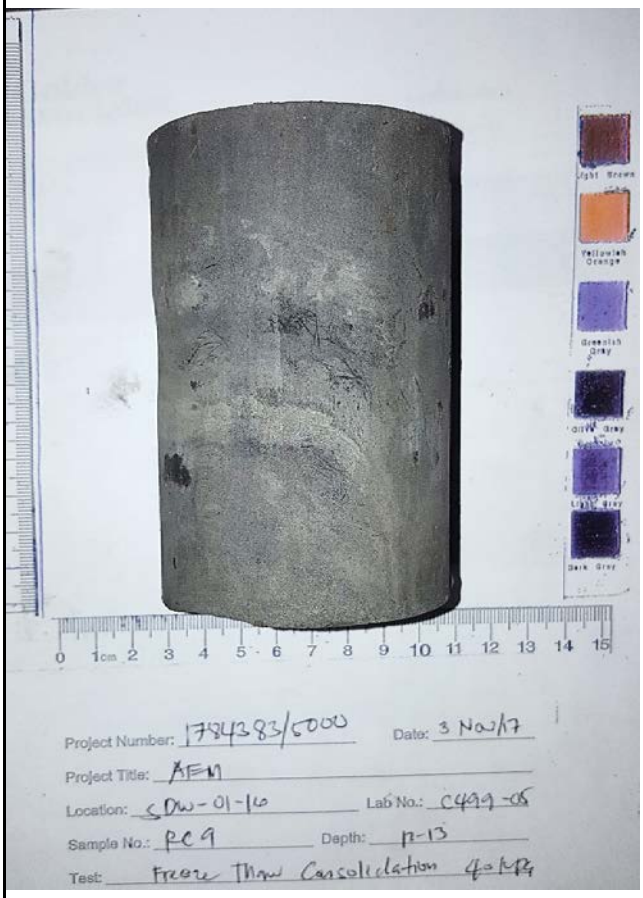
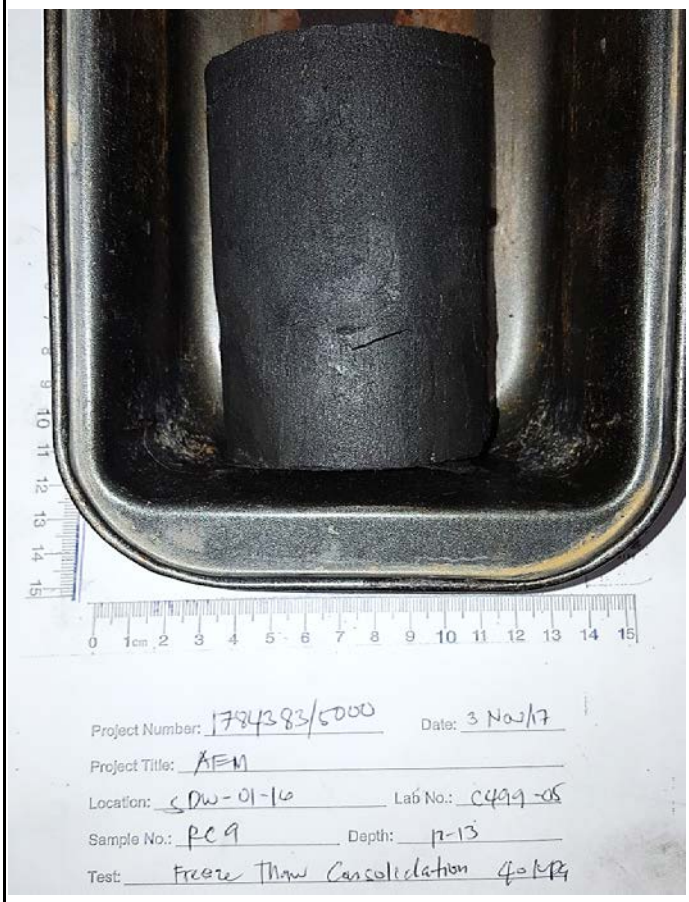
Calgary, AB T2A 6K1

Thaw Consolidation of Frozen Soil

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING		
Tested By:	MB	Date:	03-Nov-17

Borehole No.:	SDW-01-16	Sample No.:	RC9	Depth:	11.75 - 13.25 m	Lab No.:	C499-05
Location:	Agnico Eagle Mines						
Sample Description:	(ML) sandy SILT; grey; non-cohesive, wet						

PRE-TEST PHOTO	POST-TEST PHOTO
	

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Bay 8, 820 - 28 St. NE
Calgary, AB T2A 6K1

Thermal Conductivity of Soil by Thermal Needle Probe

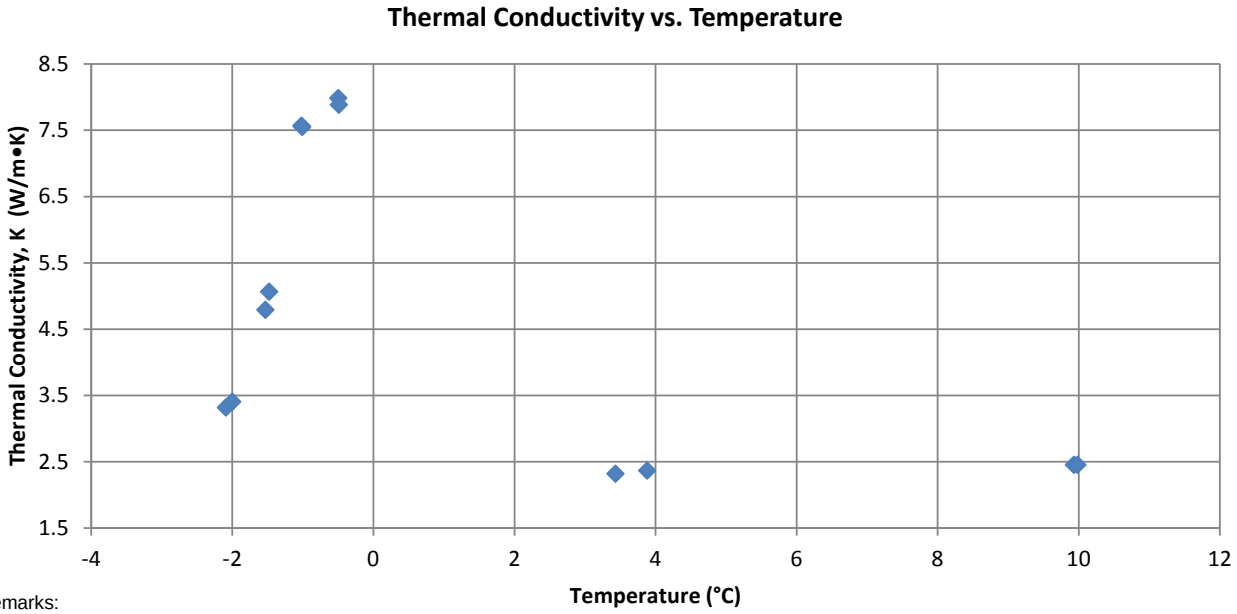
(ASTM D5334-08)

Project No.: 1784383 — Phase: 5000
Short Title: AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING — Lab No.: C499-06
Tested By: MB — Date: 10-Nov-17

Borehole No.:	SDW-01-16	**Undisturbed or Remolded:**	Undisturbed/ trimmed
Sample No.:	RC10	**Wet Density (kg/m^3):**	1965
Height (mm):	115.00	**Water Content (%):**	31.7
Diameter (mm):	62.85	**Dry Density (kg/m^3):**	1492
Mass (g):	700.91	**Void Ratio:**	0.877
Thermal Probe No.:	SH-1	**Saturation (%):**	101.2
Probe Length (mm):	50.0	**G_s (assumed):**	2.8

Test Results:

Trial No.	Temp. (°C)	Avg. Temp. (°C)	Thermal Conductivity, K (W/m•K)	Avg. Thermal Conductivity, K (W/m•K)	Thermal Resistivity, R (m•K/W)	Avg. Thermal Resistivity, R (m•K/W)
1	-2.09	-2.0	3.317	3.362	0.301	0.298
2	-2.00		3.406		0.294	
1	-1.53	-1.5	4.791	4.929	0.209	0.203
2	-1.48		5.066		0.197	
1	-1.02	-1.0	7.568	7.559	0.132	0.132
2	-1.01		7.550		0.132	
1	-0.50	-0.5	7.983	7.934	0.125	0.126
2	-0.49		7.885		0.127	
1	9.93	10.0	2.452	2.453	0.408	0.408
2	9.98		2.454		0.407	
1	3.43	3.7	2.320	2.343	0.431	0.427
2	3.88		2.365		0.423	



Remarks:

Thermal conductivity value has a precision of +/- 10%

1. Intact sample - trimmed to regularly-shaped cylinder
2. Sample allowed to reach equilibrium for 60 min before testing.
3. Test Conducted using KD2-Pro Thermal Properties Analyzer
4. The average of two trials were used to determine the Thermal Conductivity at each temperature stage

Volumetric Specific Heat Capacity of Soil by Thermal Needle Probe

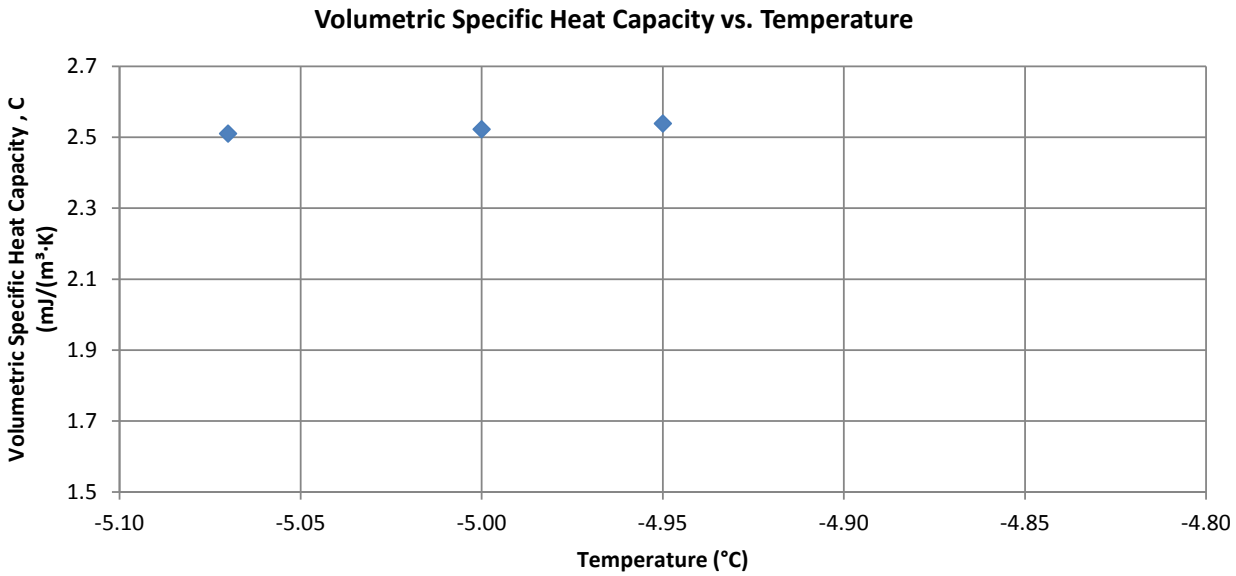
(ASTM D5334-08)

Project No.:	1784383	Phase:	5000
Short Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Lab No.:	C499-06
Tested By:	MB	Date:	10-Nov-17

Borehole No.:	SDW-01-16	**Undisturbed or Remolded:**	Undisturbed/ trimmed
Sample No.:	RC10	**Wet Density (kg/m^3):**	1965
Height (mm):	115.00	**Water Content (%):**	31.7
Diameter (mm):	62.85	**Dry Density (kg/m^3):**	1492
Mass (g):	700.91	**Void Ratio:**	0.877
Thermal Probe No.:	SH-1	**Saturation (%):**	101.2
Probe Length (mm):	50.0	**G_s (assumed):**	2.8

Test Results:

Trial No.	Temp. (°C)	Avg. Temp. (°C)	Volumetric Specific Heat Capacity, C mJ/(m³·K)	Avg. Volumetric Specific Heat Capacity, C mJ/(m³·K)	Thermal Diffusivity, D (mm^2/s)	Avg. Thermal Diffusivity, D (mm^2/s)
1	-5.07	-5.0	2.511	2.524	1.548	1.628
2	-4.95		2.539		1.524	
3	-5.00		2.523		1.813	



Remarks:
Volumetric Heat Capacity value has a precision of +/- 10%
1. Intact sample - trimmed to regularly-shaped cylinder
2. Sample allowed to reach equilibrium for 60 min before testing.
3. Test Conducted using KD2-Pro Thermal Properties Analyzer

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Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Unconfined Compressive Strength of Frozen Soil

Sample Identification

Project No.:	1784383.5000	Borehole No.:	SDW-01-16
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Sample No.:	RC1
Start Date:	26-Oct-17	Test Temp:	-3 °C
End Date:	30-Oct-17	Loading Rate:	0.005 %/min
Date Cast:	-	Lab Number:	C499-01

INITIAL - Sample Dimensions

Length/Height, (cm)	10.91
Diameter, (cm)	5.12
Volume, (cm^3)	225
Initial Water Content, (%)	34.9
Final Water Content, (%)	25.9
Initial $\rho_{dry,}$ (kg/m^3)	1521
Specific Gravity (assumed)	2.80
Initial Void Ratio, (e)	0.63
Initial Saturation, (%)	116

INITIAL - Sample Preparation

The sample was trimmed from the as received diameter to the reported test specimen diameter

The sample has been kept frozen throughout the trimming process

The test specimen was cut at both ends using a saw and the trimmings were used as the initial water content

Equipment Description

Load Frame:		50 kN test frame
LVDT:	Serial #	BBD04862
Load Cell:	Serial #	406213
Computer data file name:		C499-01_RC1-3C_UCS.csv

Summary

Test Duration:	**3.95**	days
Average Temperature:	**-3.0**	°C
Peak Stress :	**414**	kPa
Average Displacement Rate :	**0.0050**	mm/ min
Average Strain Rate:	**0.0053**	%/ min

Sample Description:

(ML) SILT, some fine sand; grey; non-cohesive, wet

Tested By: F. Cabrera Date Completed: 30-Oct-17

Checked By: M. Becker

GOLDER ASSOCIATES - Calgary Lab

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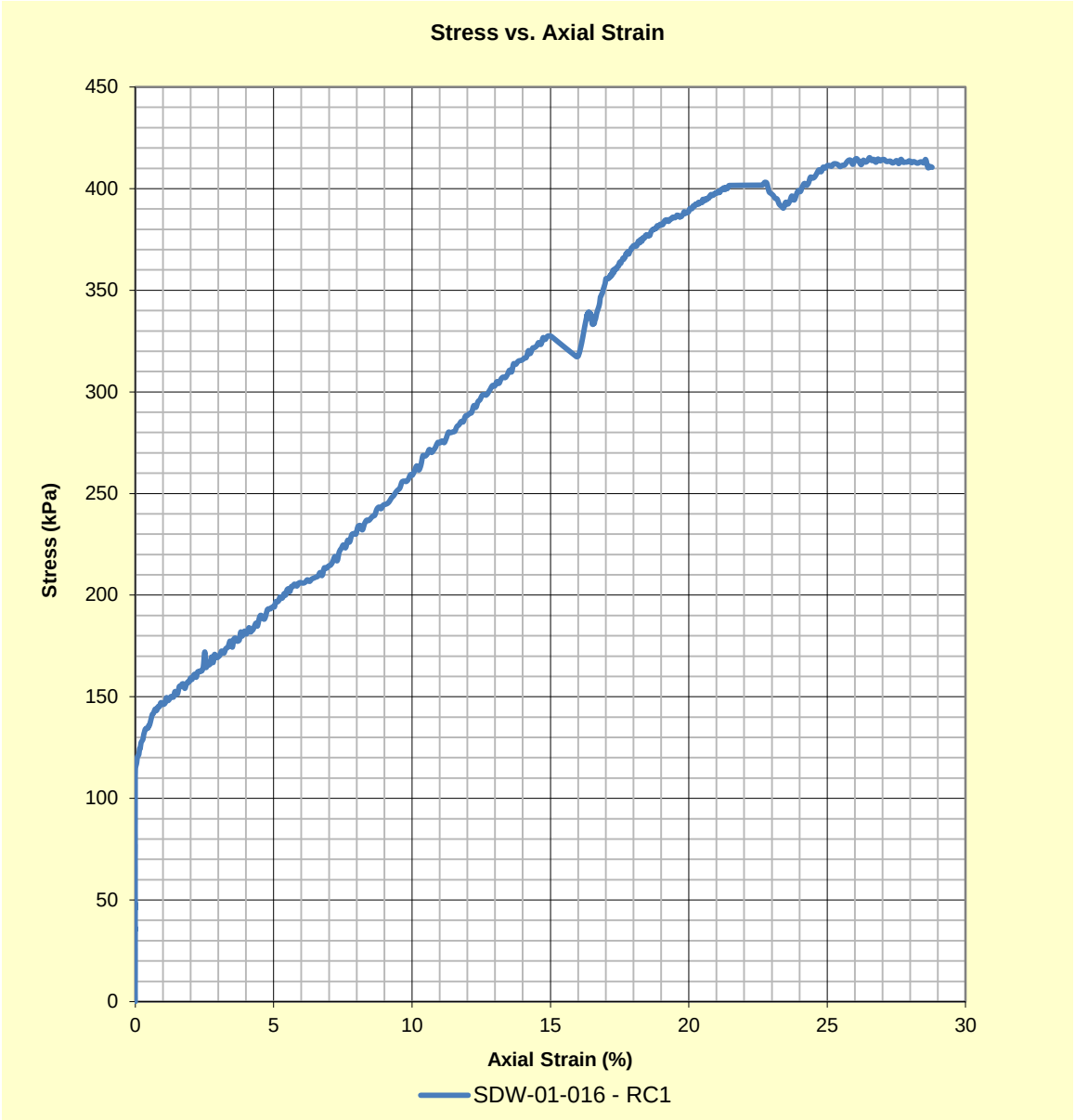
Unconfined Compressive Strength of Frozen Soil

Sample Identification

Project No.:	1784383.5	Borehole No.:	RC1
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Sample No.:	SDW-01-16
Start Date:	26-Oct-17	Test Temp:	-3 °C
End Date:	30-Oct-17	Loading Rate:	0.005 %/min
Date Cast:	-	Lab Number:	C499-01



Tested By: F. Cabrera Date Completed: 30-Oct-17

Checked By: M. Becker

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Unconfined Compressive Strength of Frozen Soil

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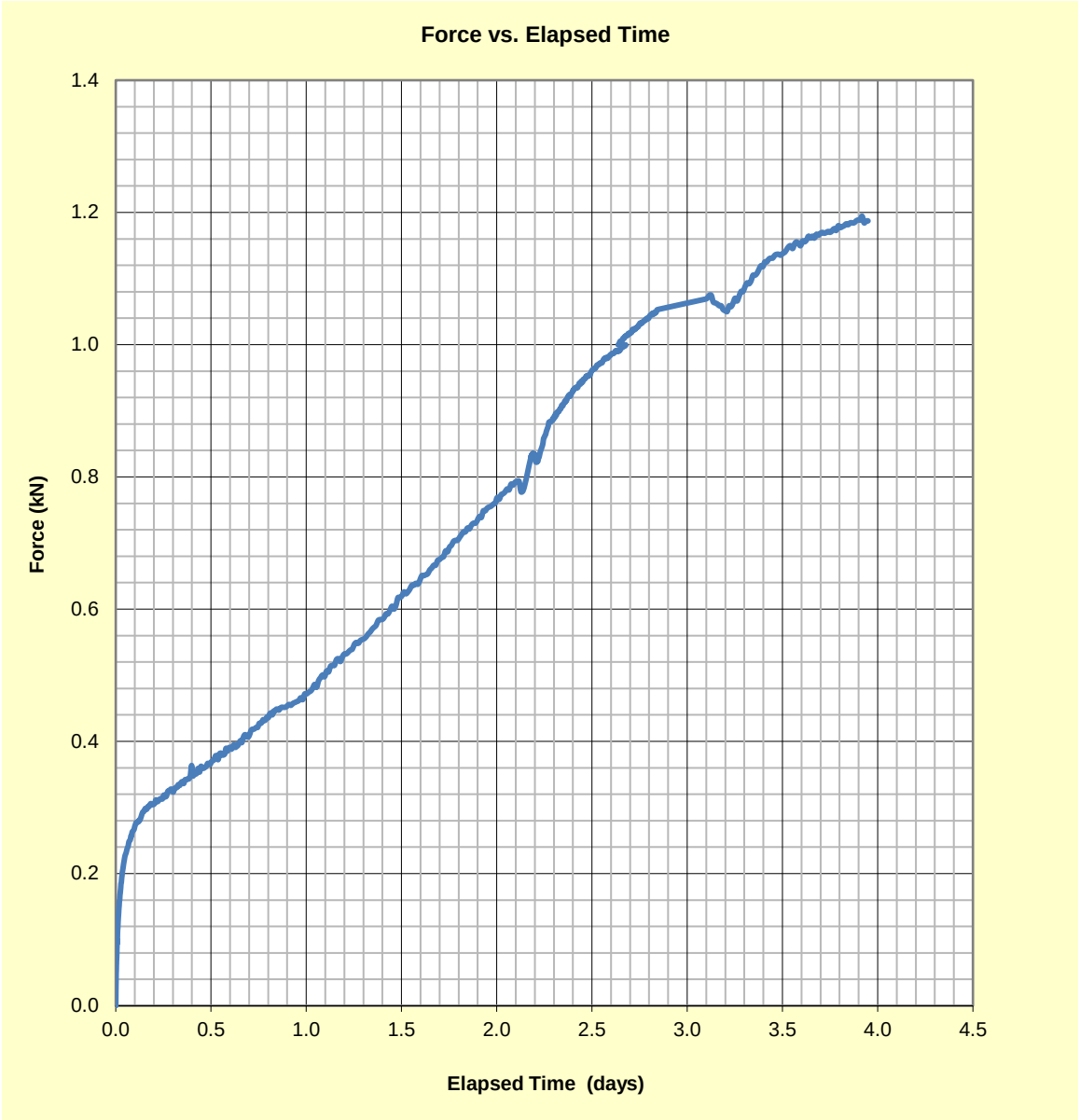
Start Date:	26-Oct-17	Test Temp:	-3 °C
End Date:	30-Oct-17	Loading Rate:	0.005 %/min
Date Cast:	-	Lab Number:	C499-01



Tested By: F. Cabrera Date Completed: 30-Oct-17

Checked By: M. Becker

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Unconfined Compressive Strength of Frozen Soil

Sample Identification

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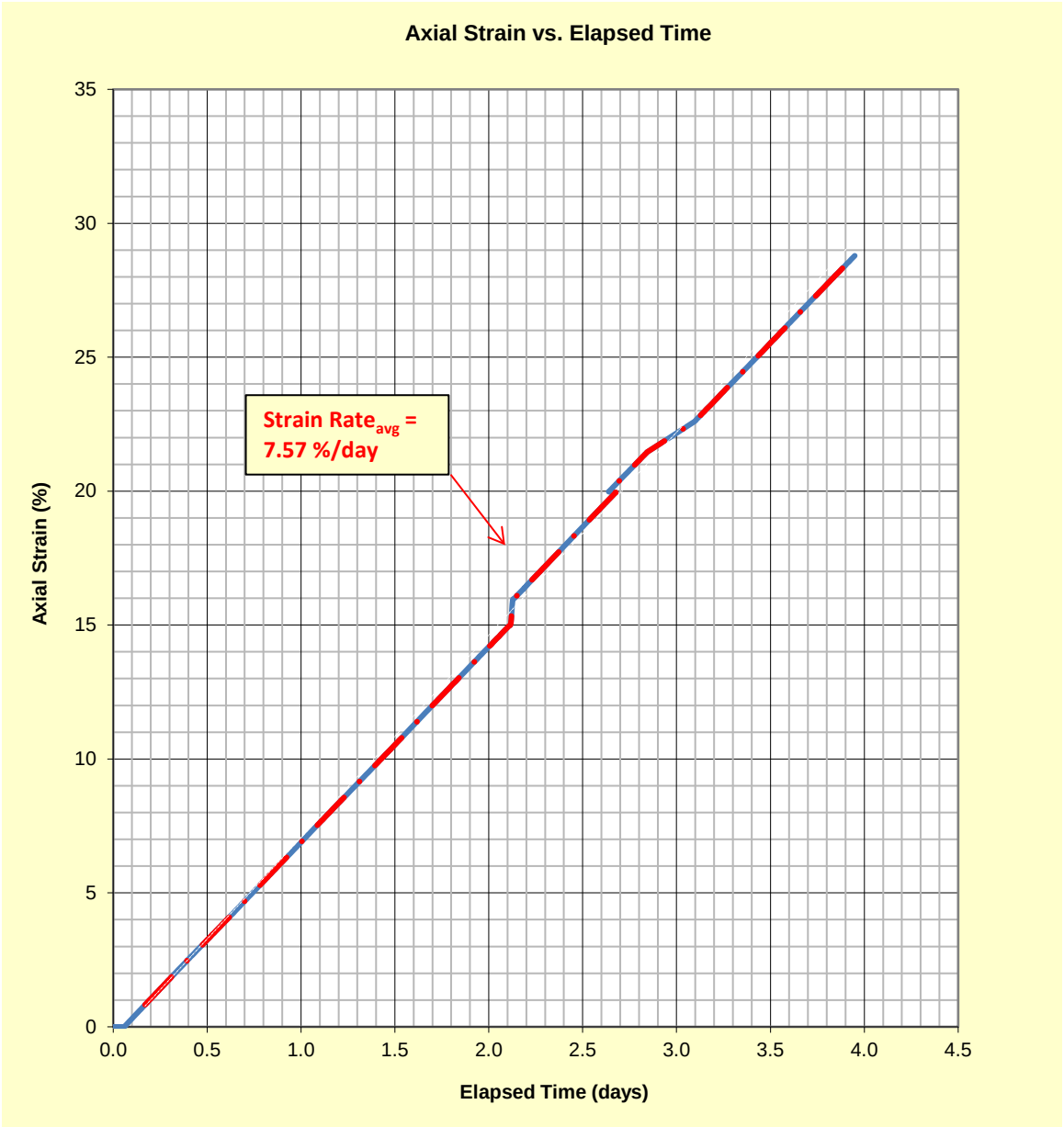
Start Date:	26-Oct-17	Test Temp:	-3 °C
End Date:	30-Oct-17	Loading Rate:	0.005 %/min
Date Cast:	-	Lab Number:	C499-01



Tested By: F. Cabrera Date Completed: 30-Oct-17

Checked By: M. Becker

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Unconfined Compressive Strength of Frozen Soil

Sample Identification

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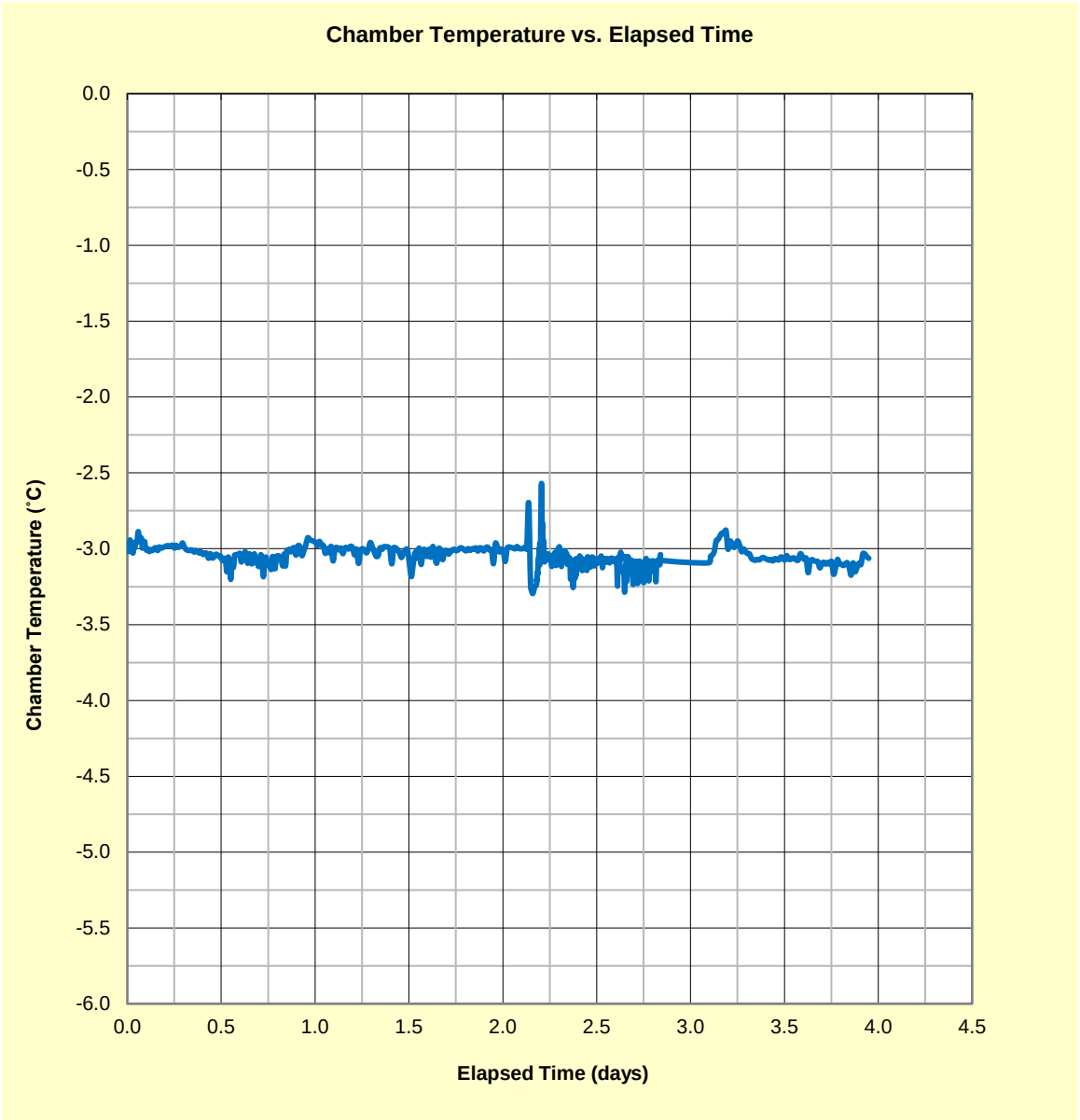
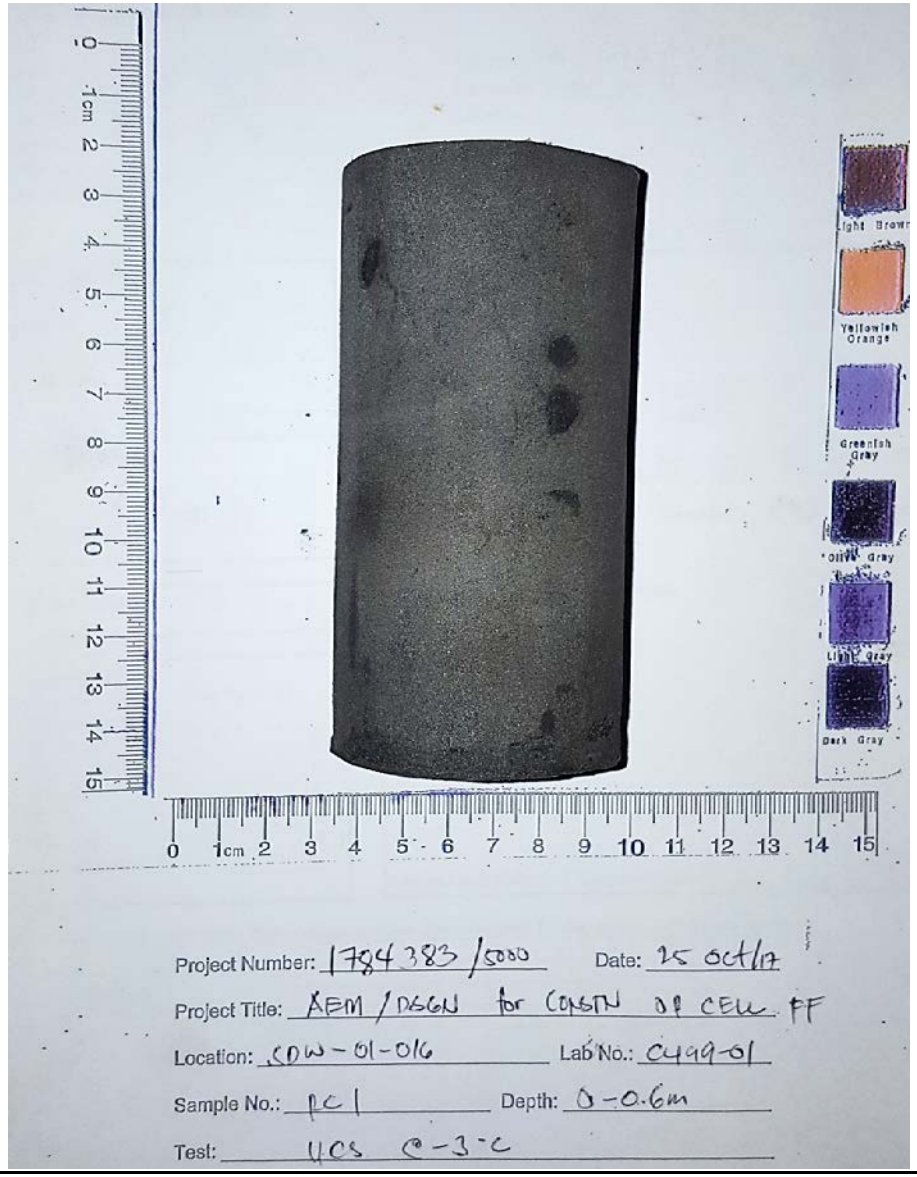
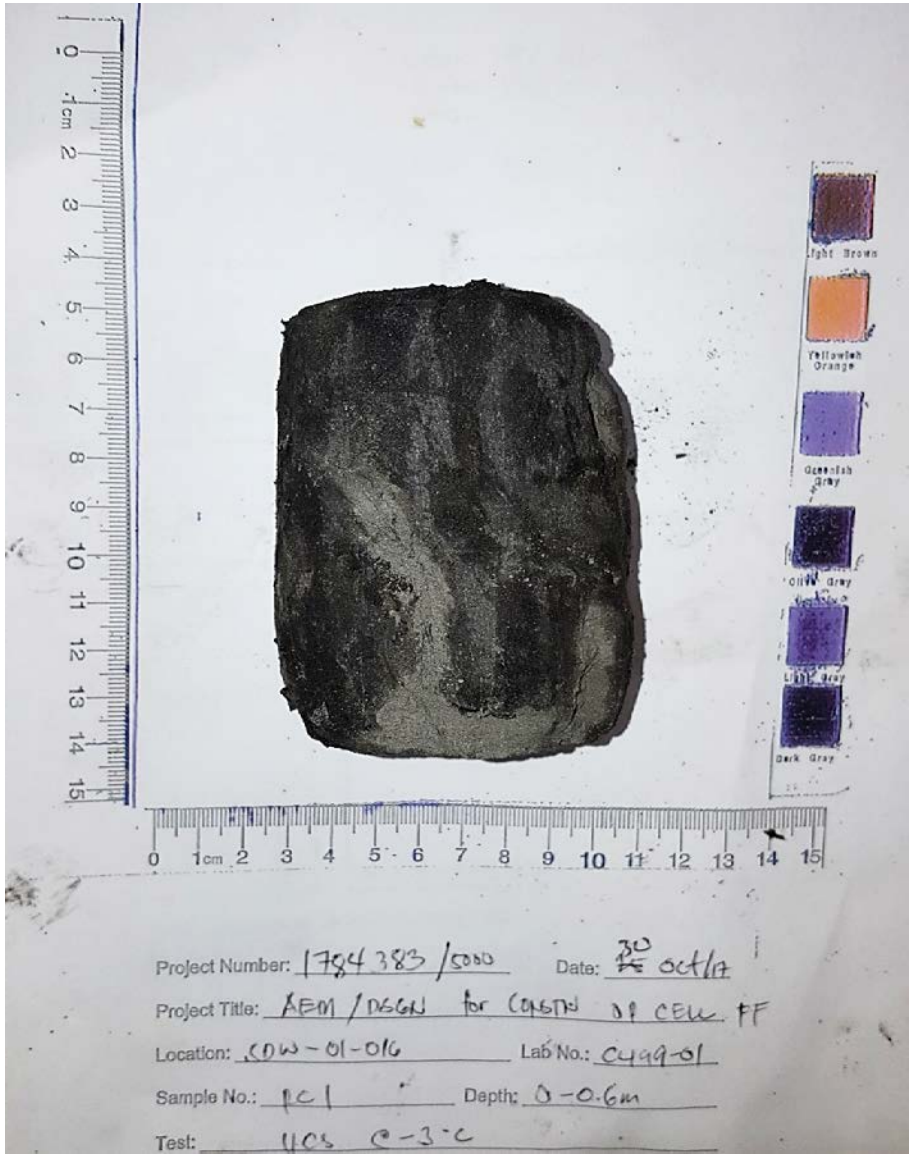
Start Date:	26-Oct-17	Test Temp:	-3 °C
End Date:	30-Oct-17	Loading Rate:	0.005 %/min
Date Cast:	-	Lab Number:	C499-01



Tested By: F. Cabrera Date Completed: 30-Oct-17

Checked By: M. Becker

PRE-TEST PHOTO	POST-TEST PHOTO
	

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Calgary, AB, T2A 6K1

Confined Compressive Strength of Frozen Soil

Sample Identification

Project No.:	1784383.5000	Borehole No.:	SDW-01-16
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Sample No.:	RC10
Start Date:	30-Oct-17	Test Temp:	-3 °C
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa

INITIAL - Sample Dimensions

Length/Height, (cm)	8.23
Diameter, (cm)	5.22
Volume, (cm^3)	176
Initial Water Content, (%)	21.2
Final Water Content, (%)	19.6
Initial $\rho_{dry,}$ (kg/m^3)	1606
Specific Gravity (assumed)	2.80
Initial Void Ratio, (e)	0.74
Initial Saturation, (%)	80

INITIAL - Sample Preparation

The sample was trimmed from the as received diameter to the reported test specimen diameter

The sample has been kept frozen throughout the trimming process

The test specimen was cut at both ends using a saw and the trimmings were used as the initial water content

Equipment Description

Load Frame:		50 kN test frame
LVDT:	Serial #	BBD 04838
Load Cell:	Serial #	618236
Pressure Transducer:	Serial #	60617
Computer data file name:		C499-06_RC10_-3C_UU.csv

Summary

Test Duration:	**3.74**	days
Average Temperature:	**-3.0**	°C
Peak Stress :	**812**	kPa
Average Displacement Rate :	**0.0040**	mm/ min
Average Strain Rate:	**0.0050**	%/min
Average Cell Pressure:	**350**	kPa

Sample Description:

(ML) sandy SILT, fine sand; grey; non-cohesive, wet

Tested By: F.Cabrera Date Completed: 03-Nov-17

Checked By: M.Becker

GOLDER ASSOCIATES - Calgary Lab

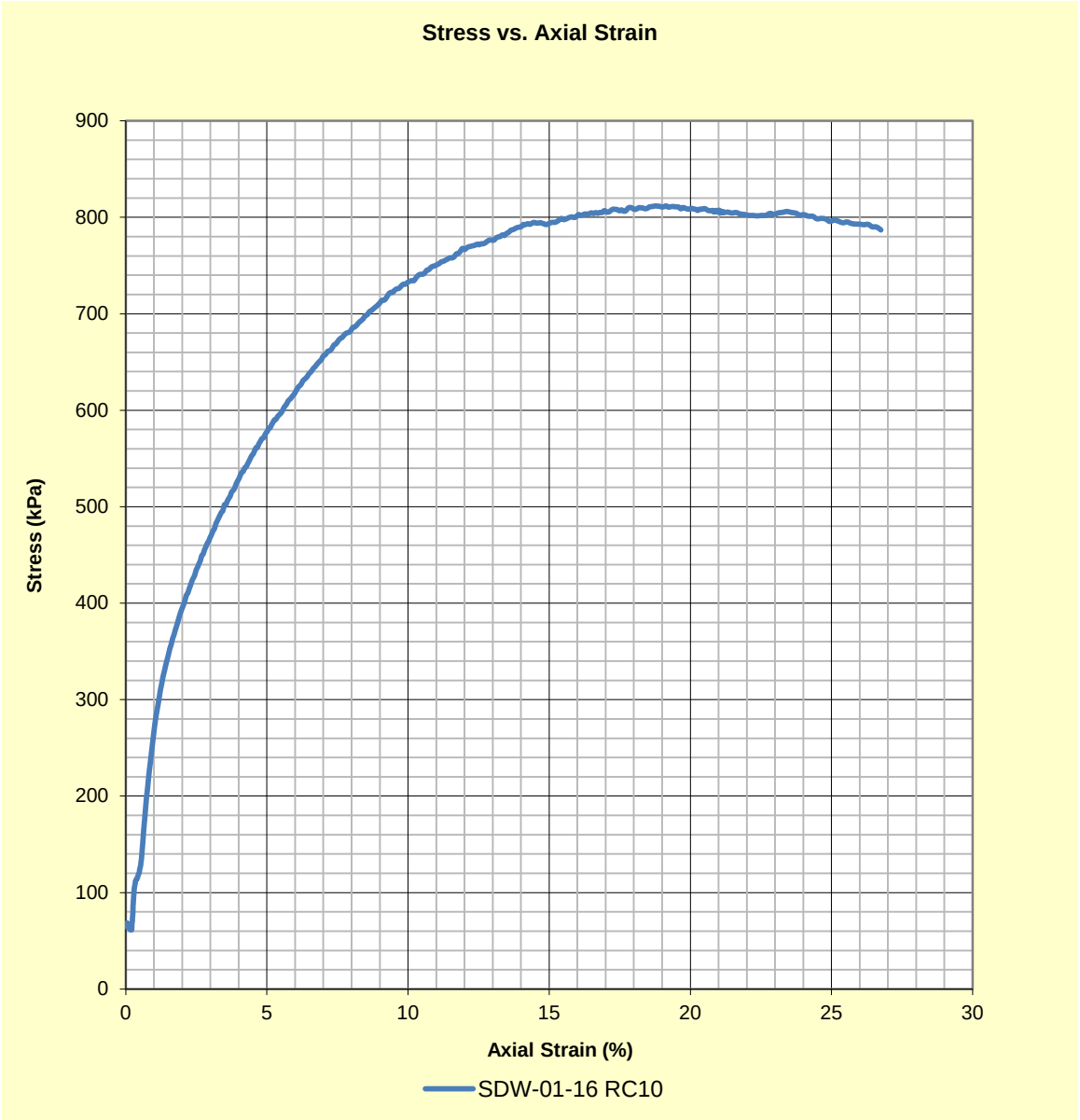
Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Confined Compressive Strength of Frozen Soil

Sample Identification

Project No.:	1784383.5	Borehole No.:	RC10
Project Title:	AEM/Dsgn for Constrn of Cell TF - FROZEN TESTING	Sample No.:	SDW-01-16
Start Date:	30-Oct-17	Test Temp:	-3 °C
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa



Tested By: F.Cabrera Date Completed: 03-Nov-17

Checked By: M.Becker

GOLDER ASSOCIATES - Calgary Lab

Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Confined Compressive Strength of Frozen Soil

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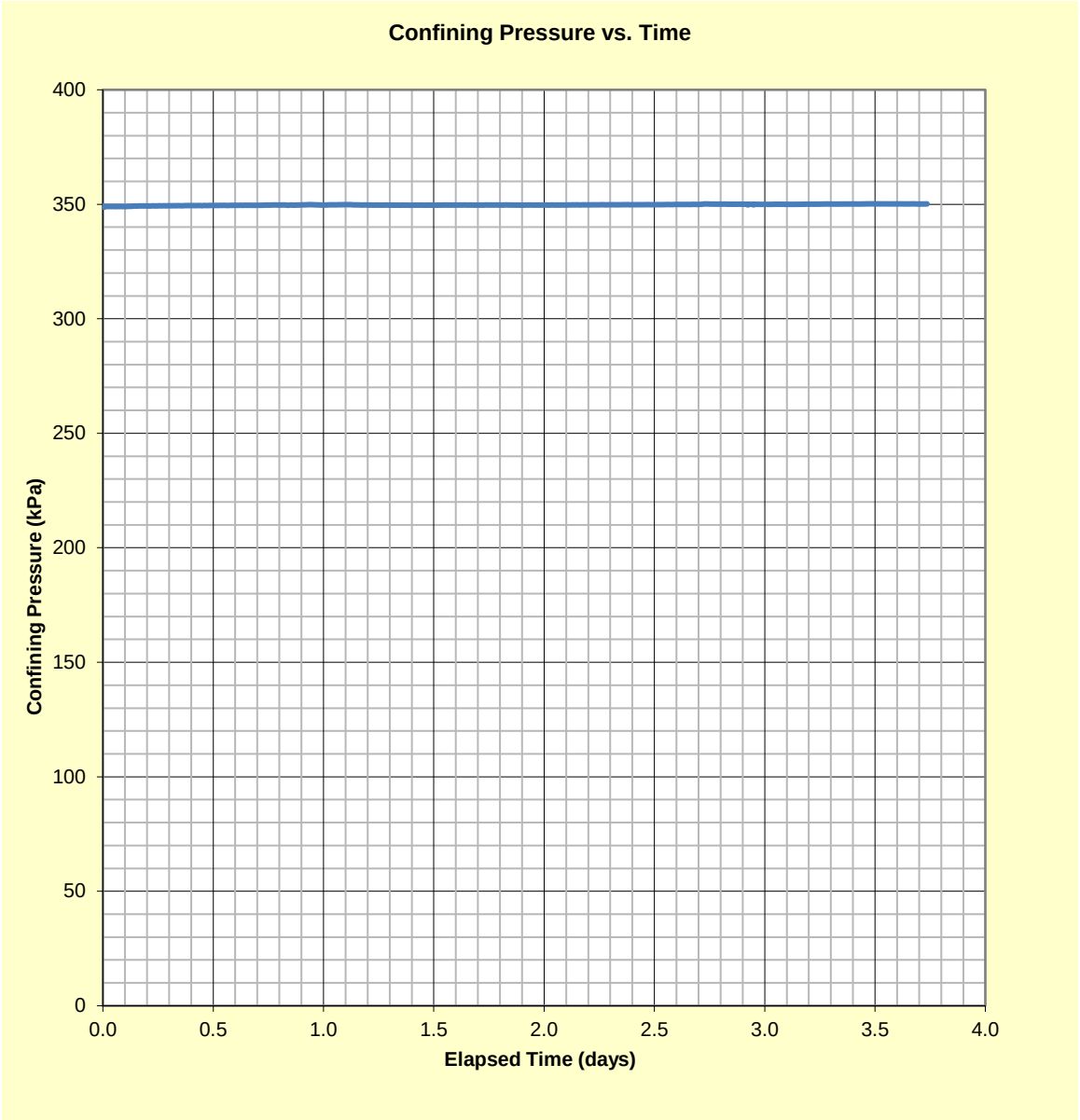
Start Date:	30-Oct-17	Test Temp:	-3 °C
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa



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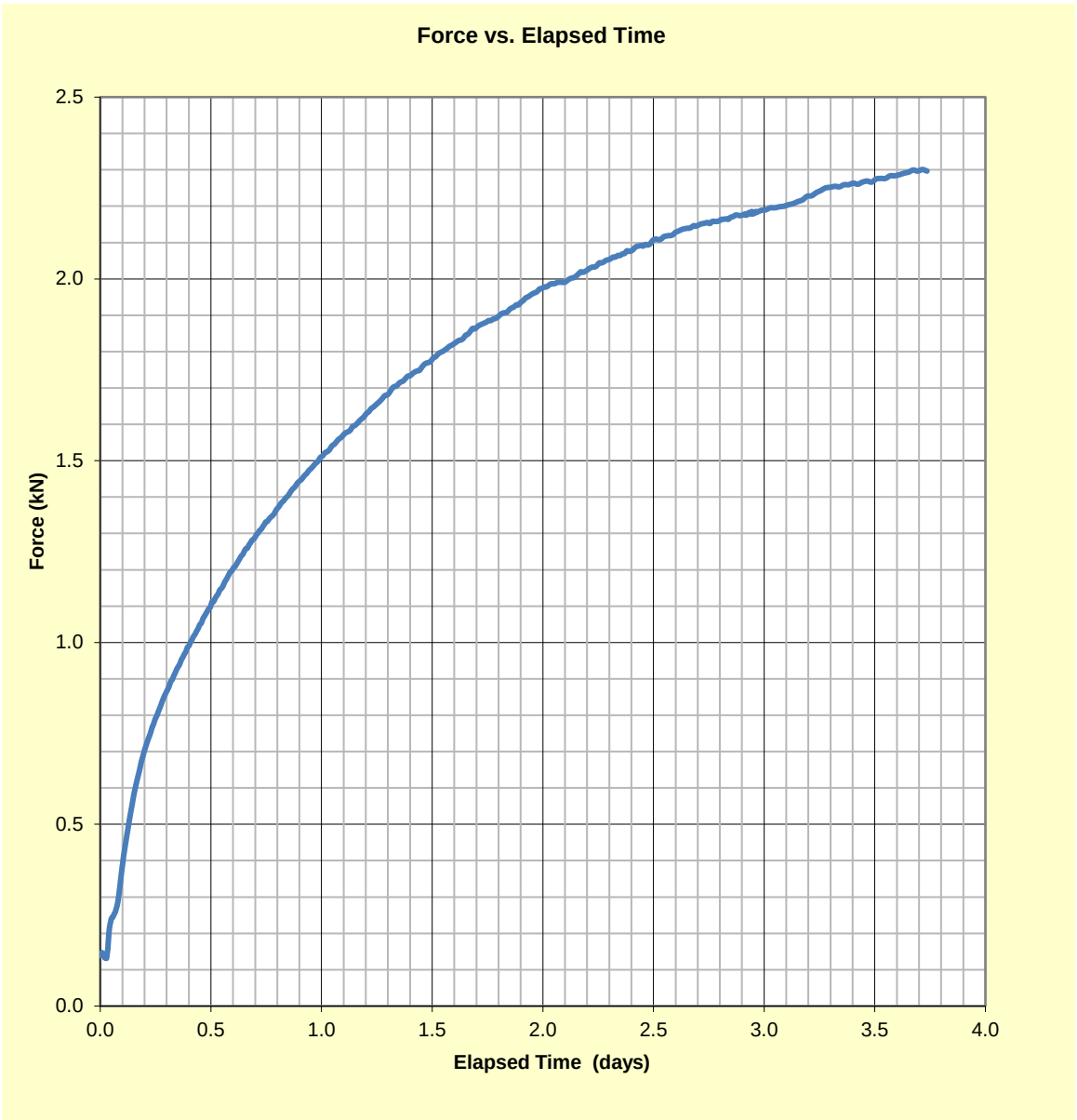
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa



Tested By: F.Cabrera Date Completed: 03-Nov-17

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Confined Compressive Strength of Frozen Soil

Sample Identification

Project No.:	1784383.5	Borehole No.:	RC10
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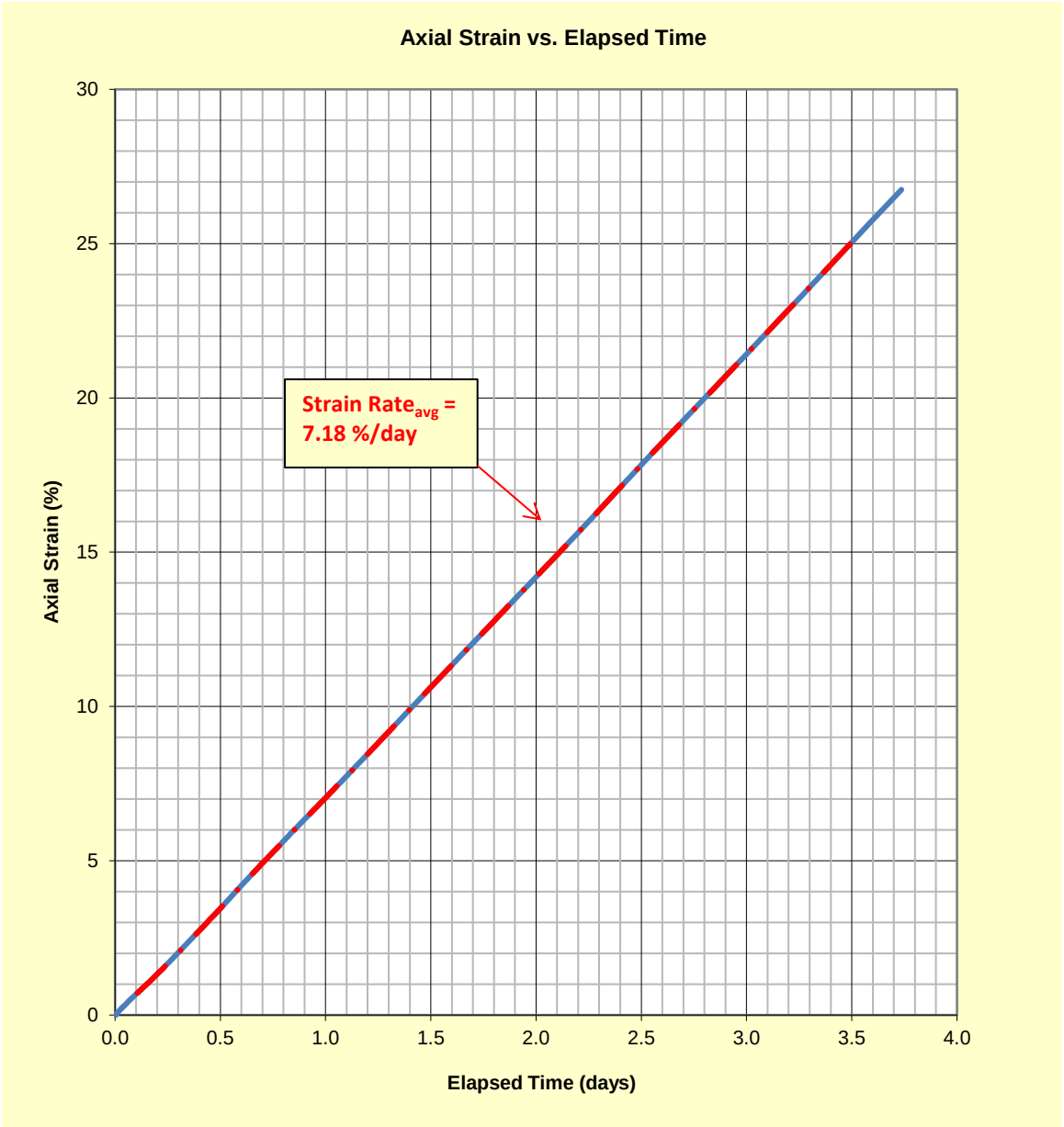
Start Date:	30-Oct-17	Test Temp:	-3 °C
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa



Tested By: F.Cabrera Date Completed: 03-Nov-17

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Confined Compressive Strength of Frozen Soil

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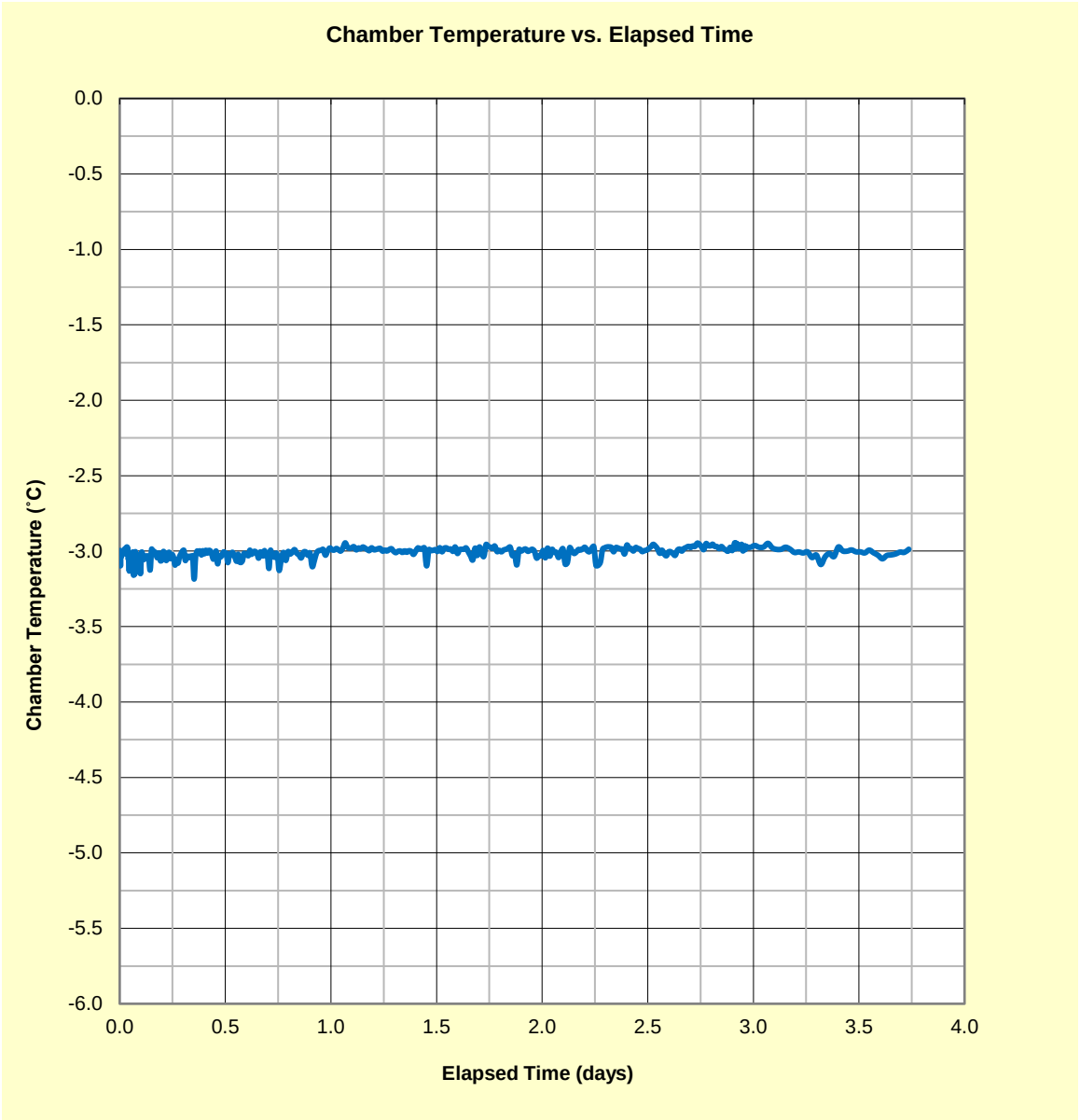
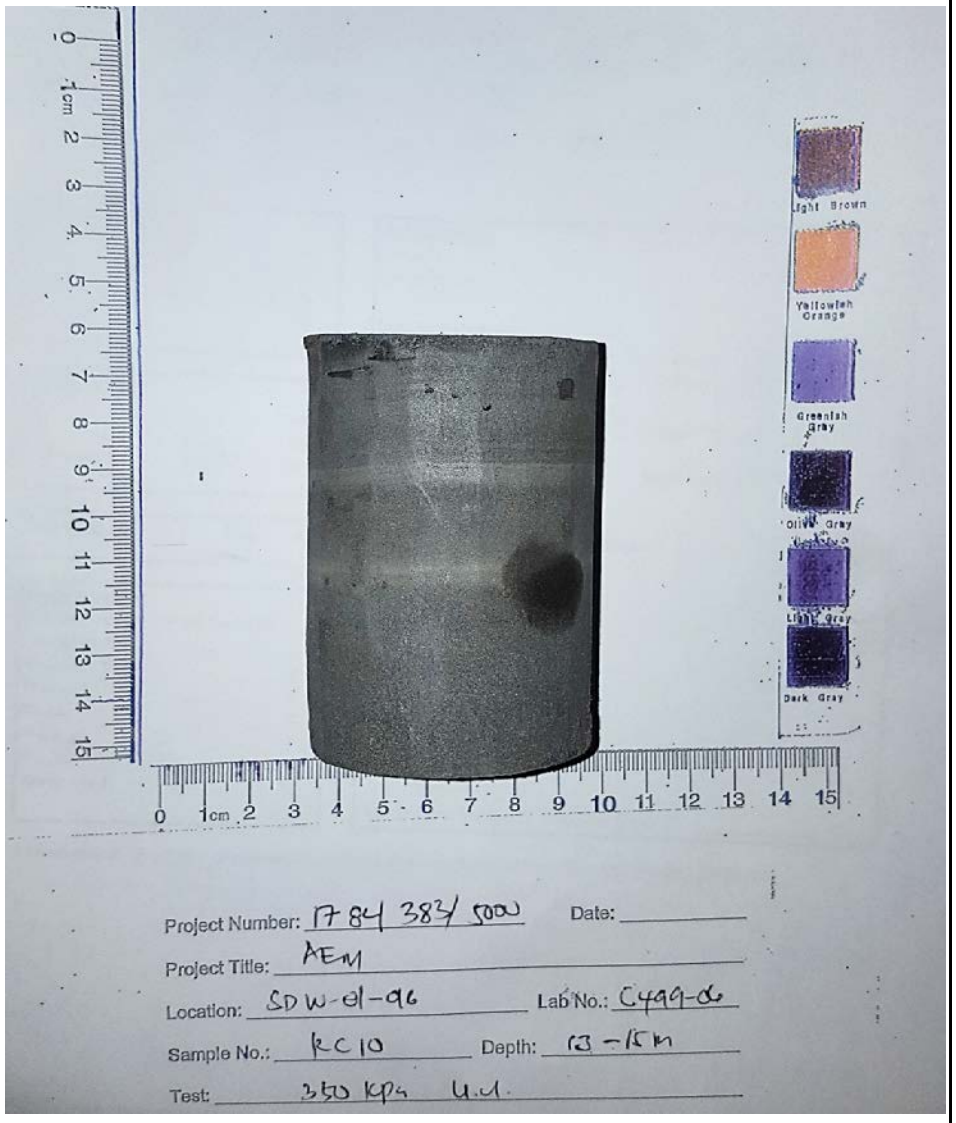
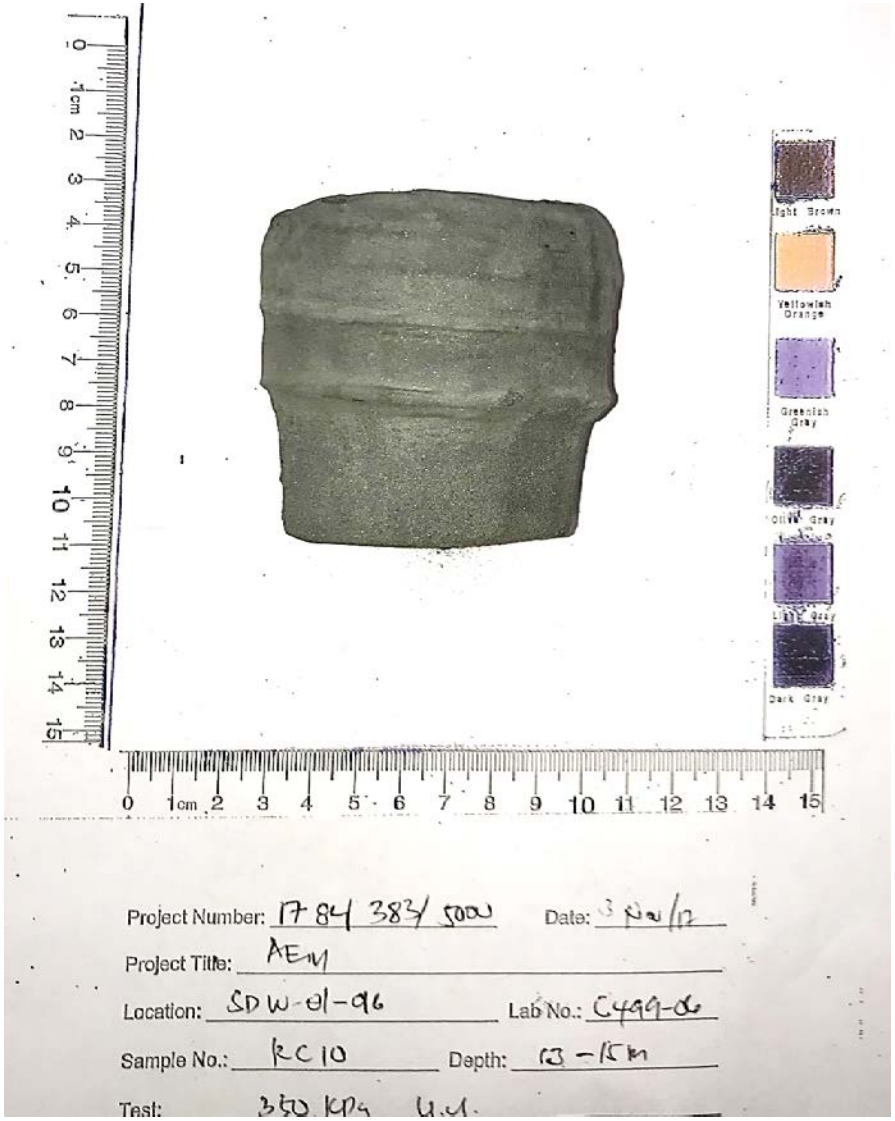
Start Date:	30-Oct-17	Test Temp:	-3 °C
End Date:	3-Nov-17	Loading Rate:	0.005 %/min
Date Cast:	-	Confining Cell Pressure:	350 kPa



Tested By: F.Cabrera Date Completed: 03-Nov-17

Checked By: M.Becker

PRE-TEST PHOTO	POST-TEST PHOTO
	

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Calgary, AB, T2A 6K1

Compressive Creep Test on Frozen Soil

Sample Identification

Project No.:	1784383	Borehole No.:	SDW-01-16
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa

INITIAL - Sample Dimensions

Length/Height, (cm)	6.29
Diameter, (cm)	5.06
Volume, (cm^3)	127
Initial Water Content, (%)	78.7
Final Water Content, (%)	59.8
Initial $\rho_{dry,}$ (kg/m^3)	888
Specific Gravity (assumed)	2.80
Initial Void Ratio, (e)	2.04
Initial Saturation, (%)	102

Note: The initial water content was taken from the trimmings of the upper and lower cuts of the core. It was noticed that the one trimming end was of a greater water content then the other. This was observed when looking at the dried initial water content trimmings - the one end "dissolved" while the other maintained its shape after drying.

INITIAL - Sample Preparation

The sample was trimmed from the as received diameter to the reported test specimen diameter

The sample has been kept frozen throughout the trimming process

The test specimen was cut at both ends using a saw and the trimmings were used as the initial water content

Equipment Description

Load Frame:		kwsoil 10:1 Frame
LVDT:	Serial #	BBD04862
Thermistor ID:	TM #	3
Chamber & Test Cell ID:		1-3
Computer data file name:		C449-03_RC7_CC.csv

Summary

Applied Stress (kPa)	Strain Rate (%/day)
50	0.10
150	2.65
350	40.65

Sample Description:

(ML) sandy SILT, some fine sand; grey; non-cohesive, wet

Note: Sample began to fail after applying the 3rd load to the load arm.
Vertical ice lenses were observed during sample trimming (see test photos).

Tested By: F.Cabrera Date Completed: 08-Nov-17

Checked By: M. Becker

GOLDER ASSOCIATES - Calgary Lab

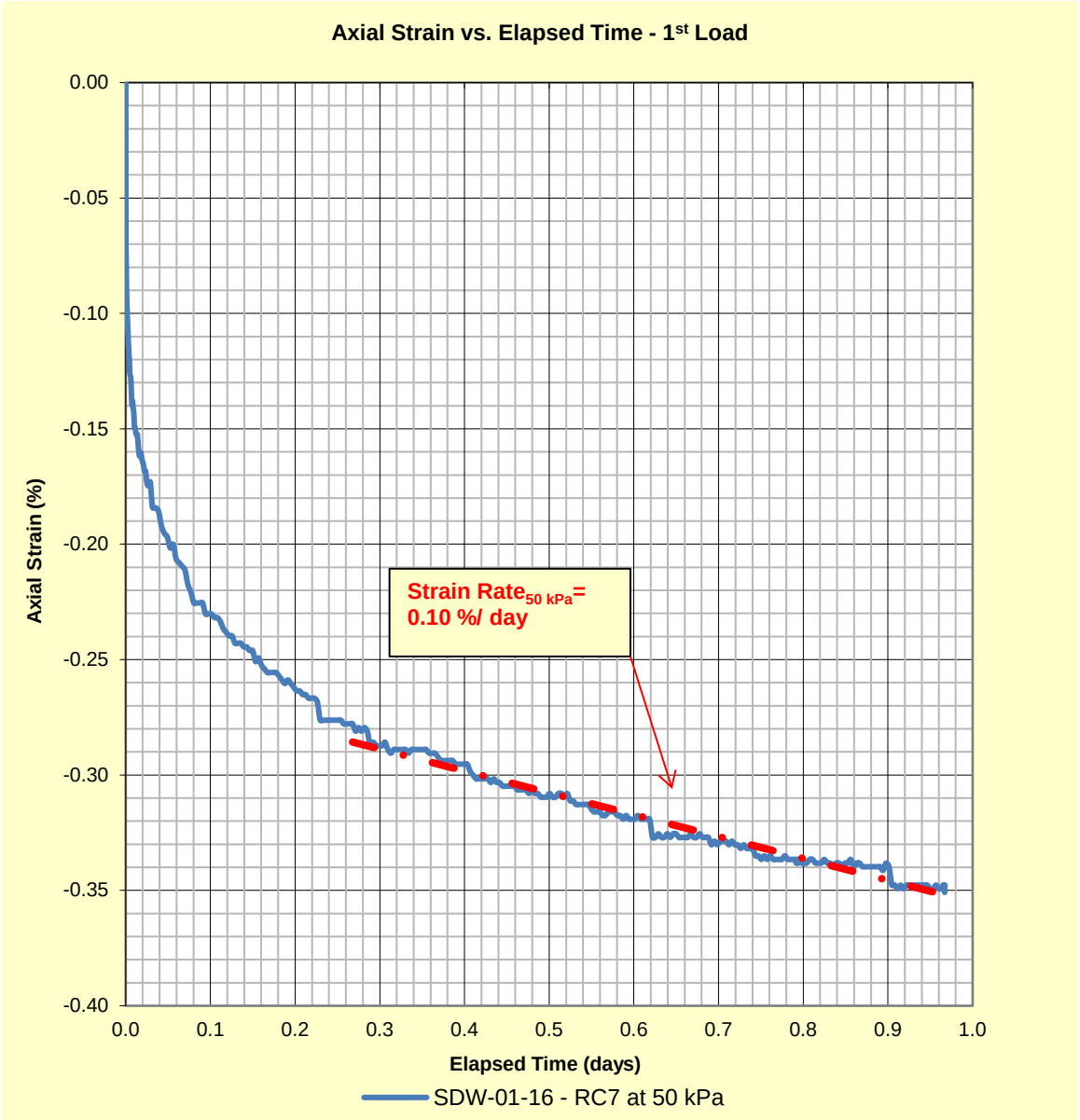
Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Compressive Creep Test on Frozen Soil

Sample Identification

Project No.:	1784383	Borehole No.:	SDW-01-16
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa



Tested By: F.Cabrera Date Completed: 08-Nov-17

Checked By: M. Becker

GOLDER ASSOCIATES - Calgary Lab

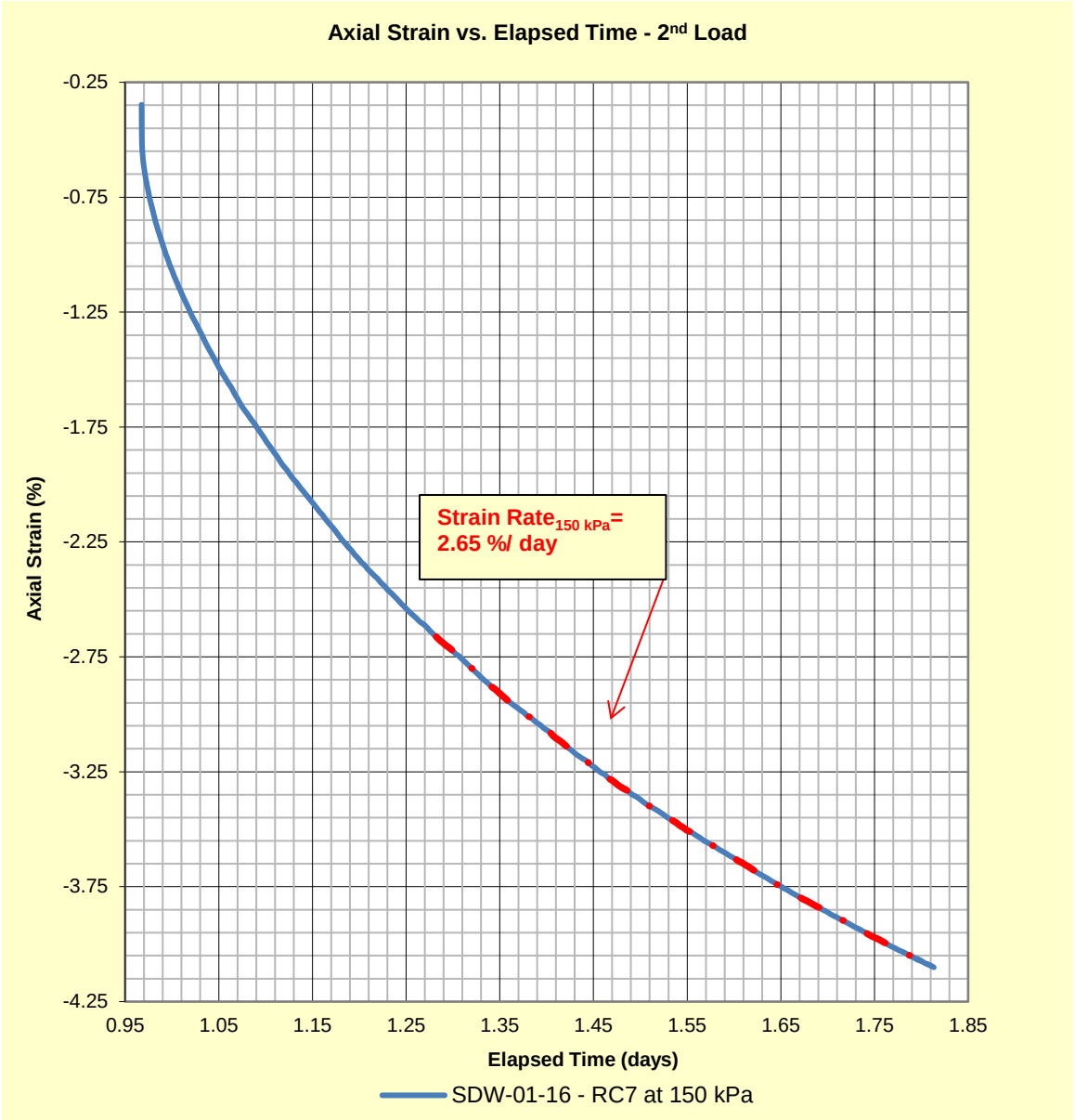
Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Compressive Creep Test on Frozen Soil

Sample Identification

Project No.:	1784383	Borehole No.:	SDW-01-16
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa



Tested By: F.Cabrera Date Completed: 08-Nov-17

Checked By: M. Becker

GOLDER ASSOCIATES - Calgary Lab

Bay 7, 820 28th St NE

Calgary, AB, T2A 6K1

Compressive Creep Test on Frozen Soil

Sample Identification

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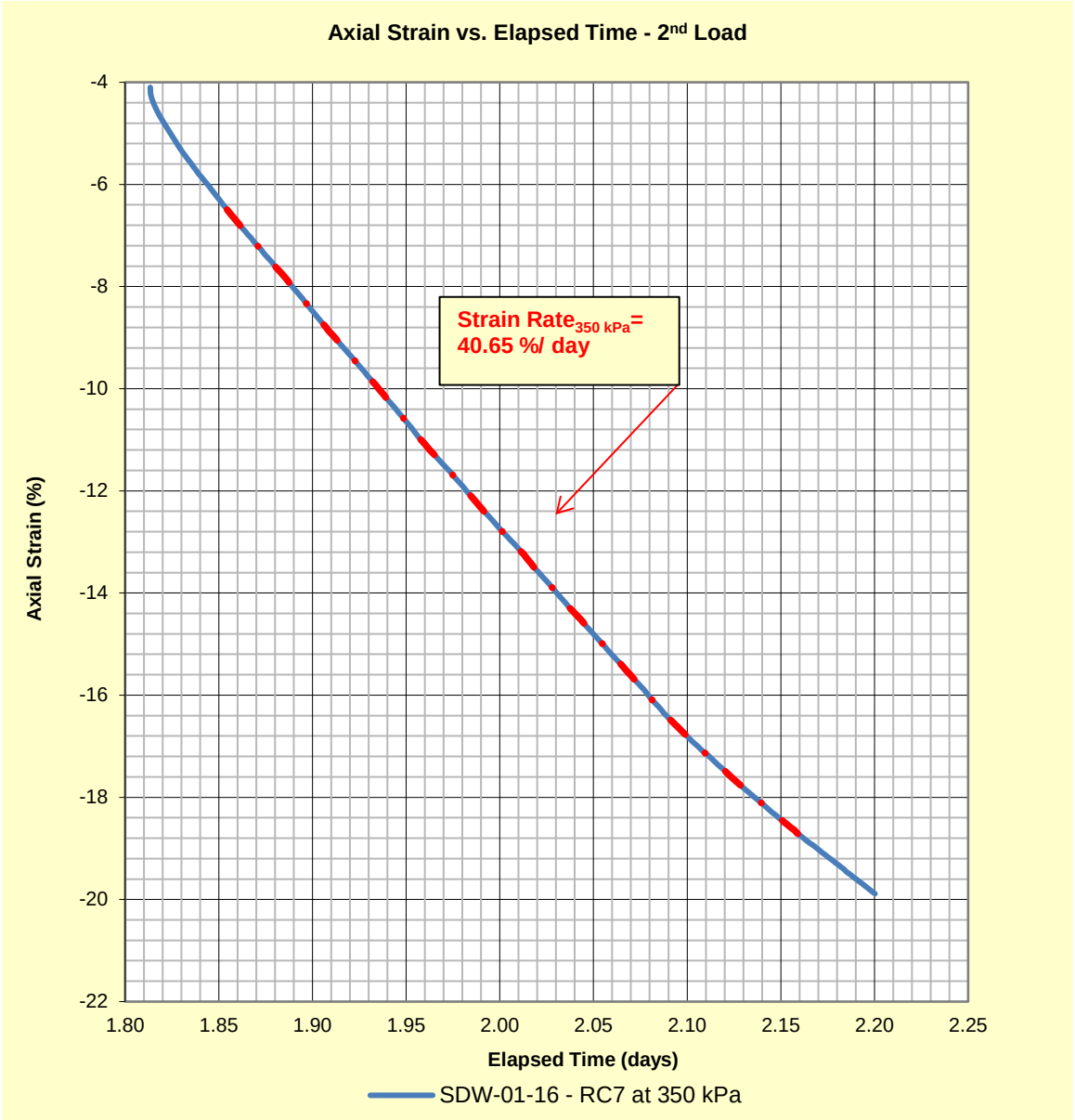
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa



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Checked By: M. Becker

GOLDER ASSOCIATES - Calgary Lab

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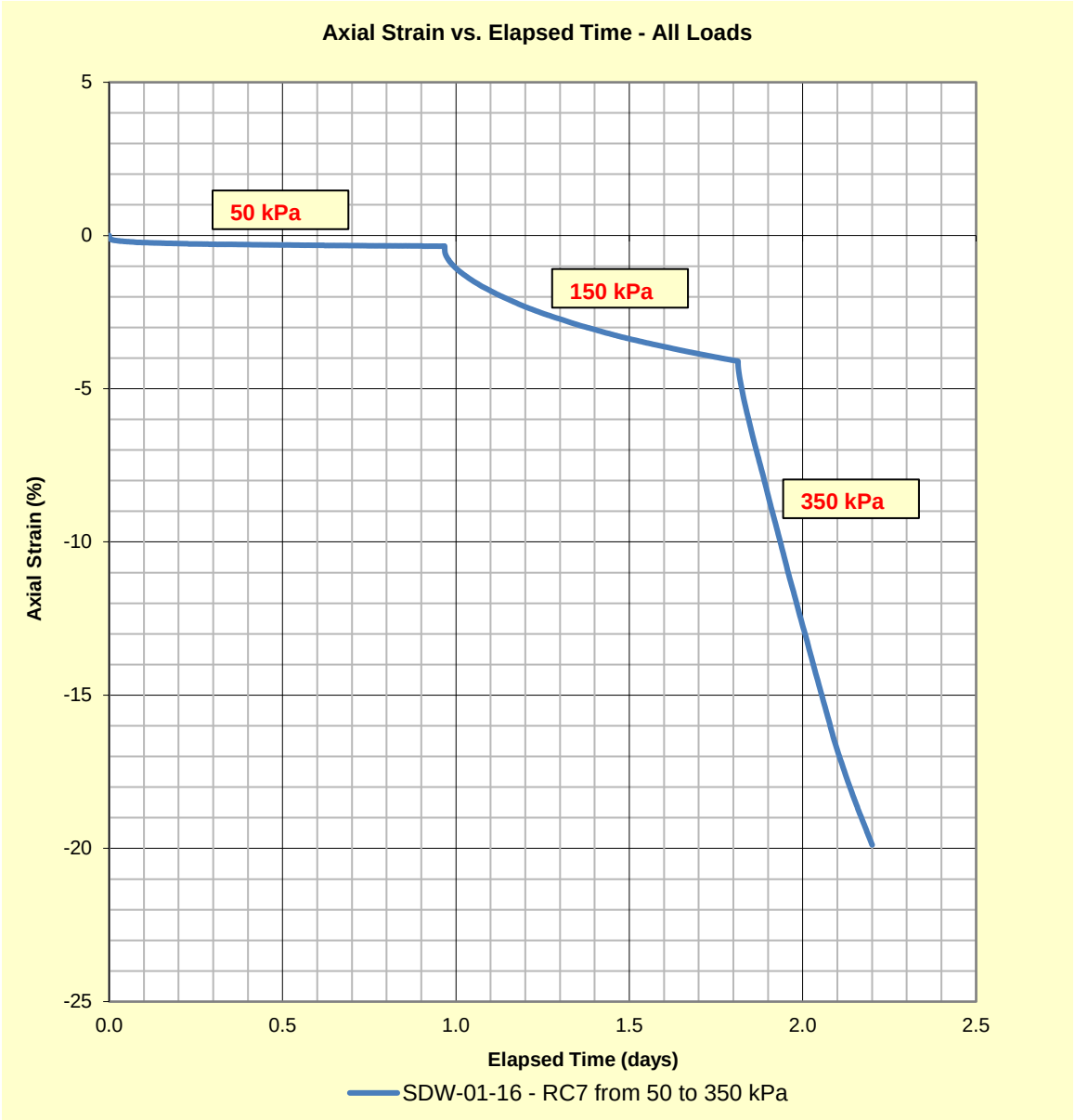
Compressive Creep Test on Frozen Soil

Sample Identification

Project No.:	1784383	Borehole No.:	SDW-01-16
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa



Tested By: F.Cabrera Date Completed: 08-Nov-17

Checked By: M. Becker

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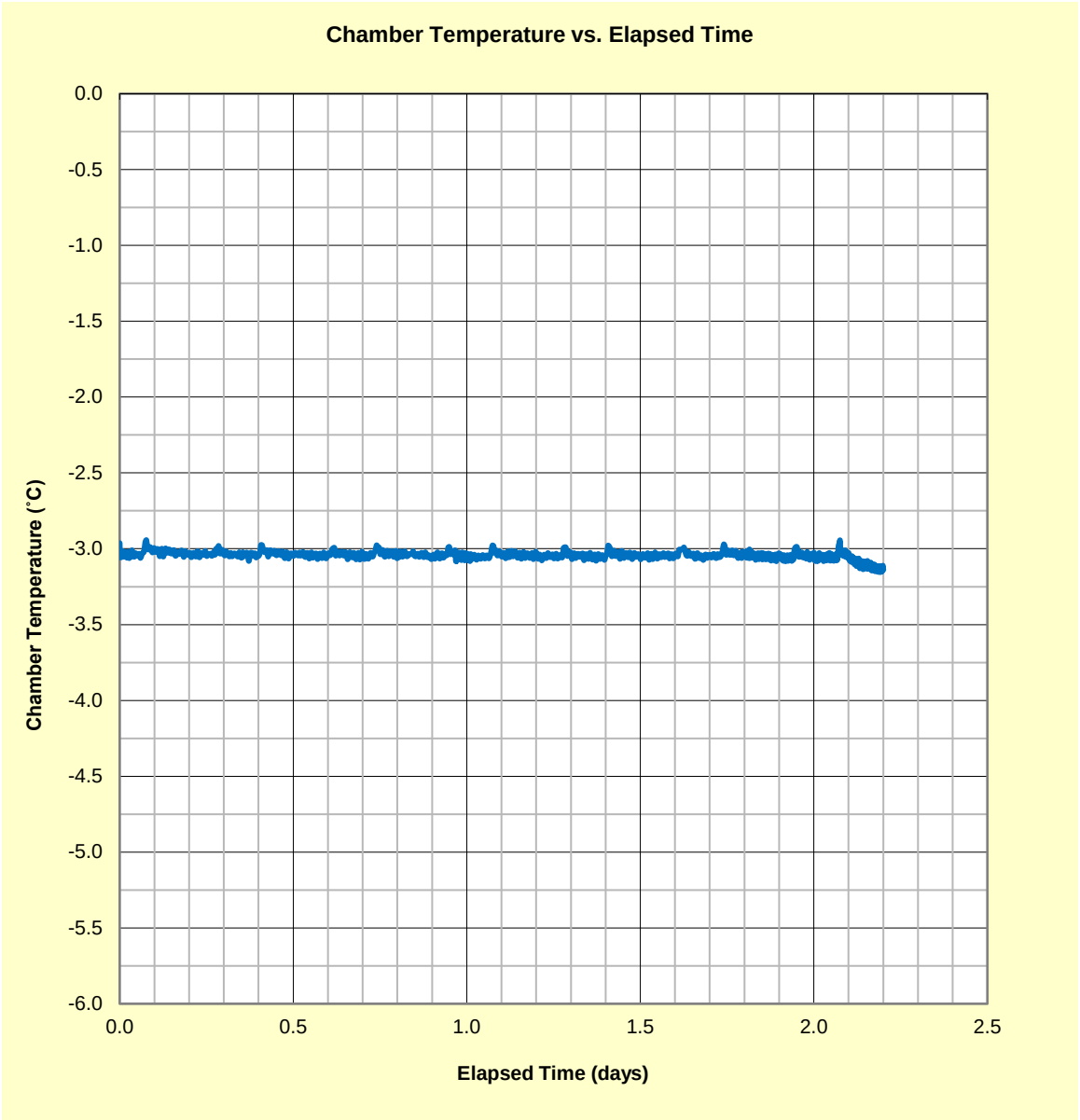
Compressive Creep Test on Frozen Soil

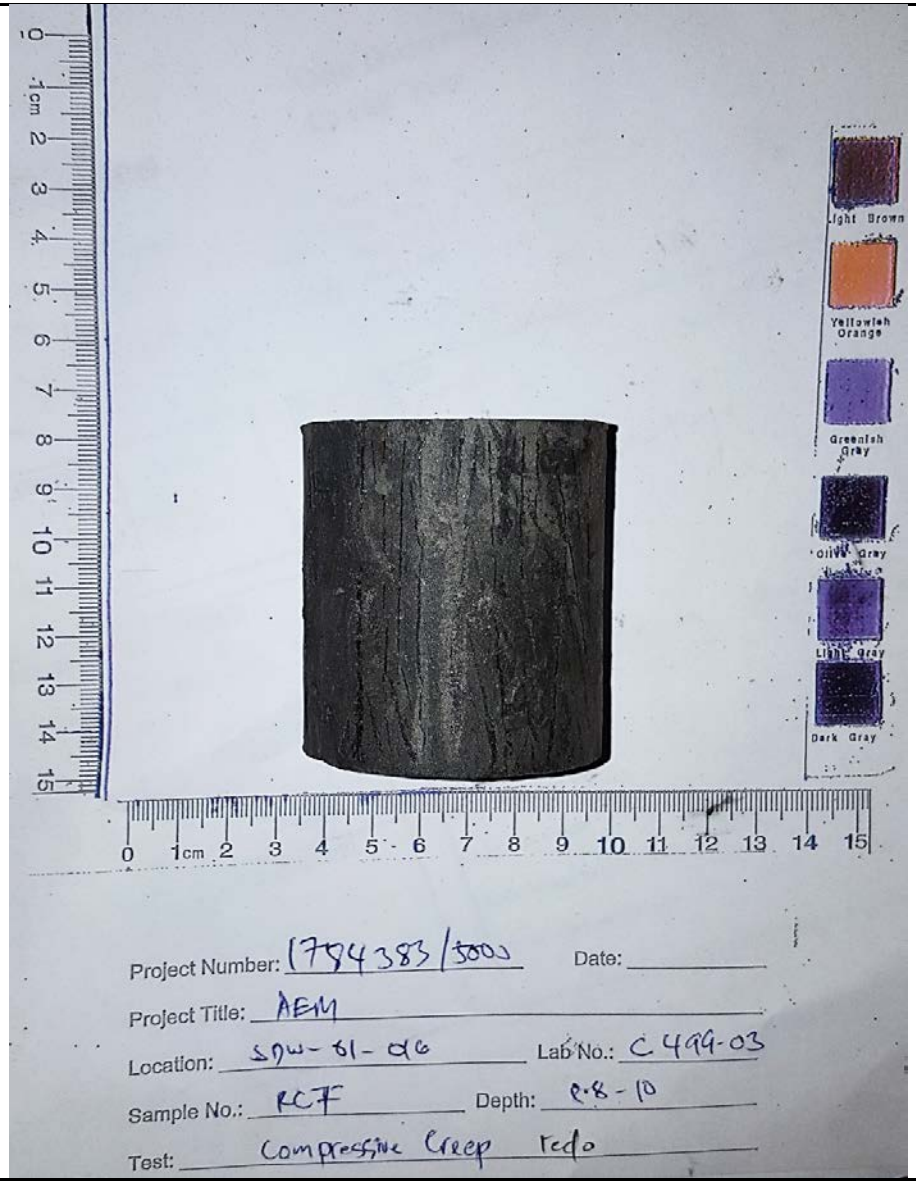
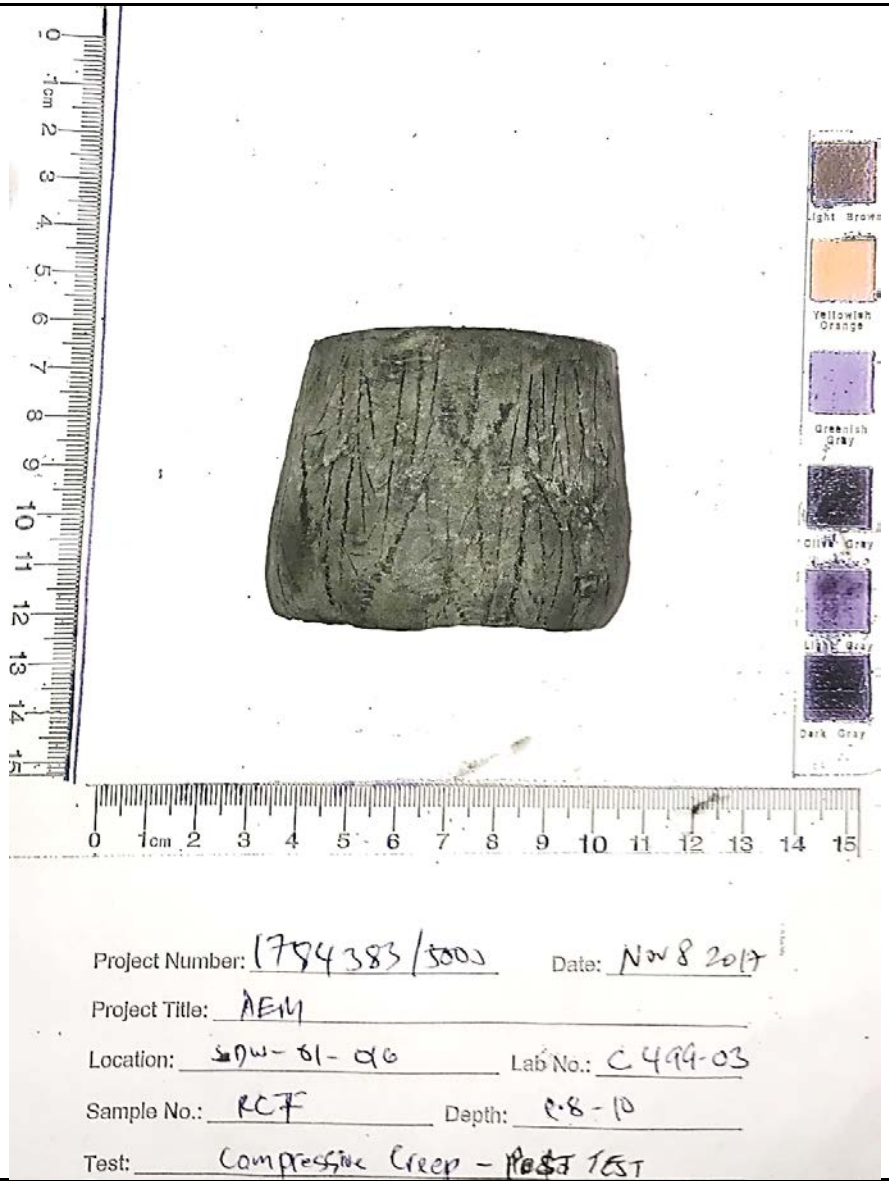
Sample Identification

Project No.:	1784383	Borehole No.:	SDW-01-16
Project Title:	AEM	Sample No.:	RC7
Start Date:	05-Nov-17	Test Temp:	-3 °C
End Date:	08-Nov-17	Load Frame:	10:1
Date Cast:	-	Applied Axial Stress:	50-350 kPa



Tested By: F.Cabrera Date Completed: 08-Nov-17

Checked By: M. Becker

PRE-TEST PHOTO	POST-TEST PHOTO
	

GRAIN SIZE ANALYSIS

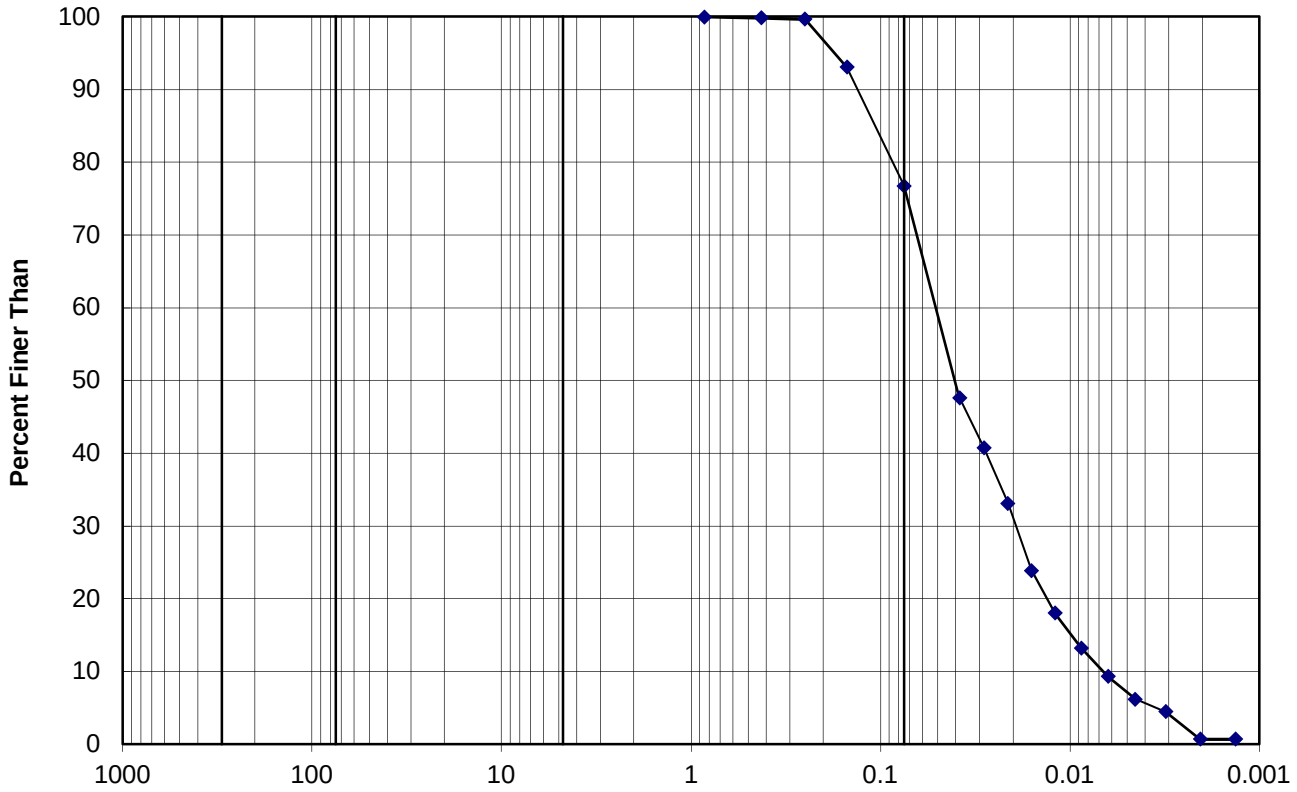
(Mechanical & Hydrometer)

Project #: 1784383
Short Title: AEM / Dsgn for Constrn of Cell TF
Tested by: M.W. / S.H.

Phase: 5000
Date: October 20, 2017

Borehole #: Whale Tail Tailings
Source:
Date Sample Received: N/A

Graphical Analysis



BOULDERS	COBBLES	GRAVEL		SAND			SILT / CLAY
		Coarse	Fine	Coarse	Medium	Fine	

Grain Size Analysis Results:

Opening (mm)	Percent Passing (%)
51	100
38	100
25	100
19	100
9.5	100
4.75	100
2.0	100
0.850	100
0.425	100
0.250	100
0.150	93
0.075	77
0.038	48
0.028	41
0.021	33
0.016	24
0.012	18
0.009	13
0.006	9.3
0.005	6.2
0.003	4.5
0.002	0.7
0.001	0.7

Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.,
Saskatoon, Saskatchewan S7N 0T4

Reviewed by:_____

Golder Associates

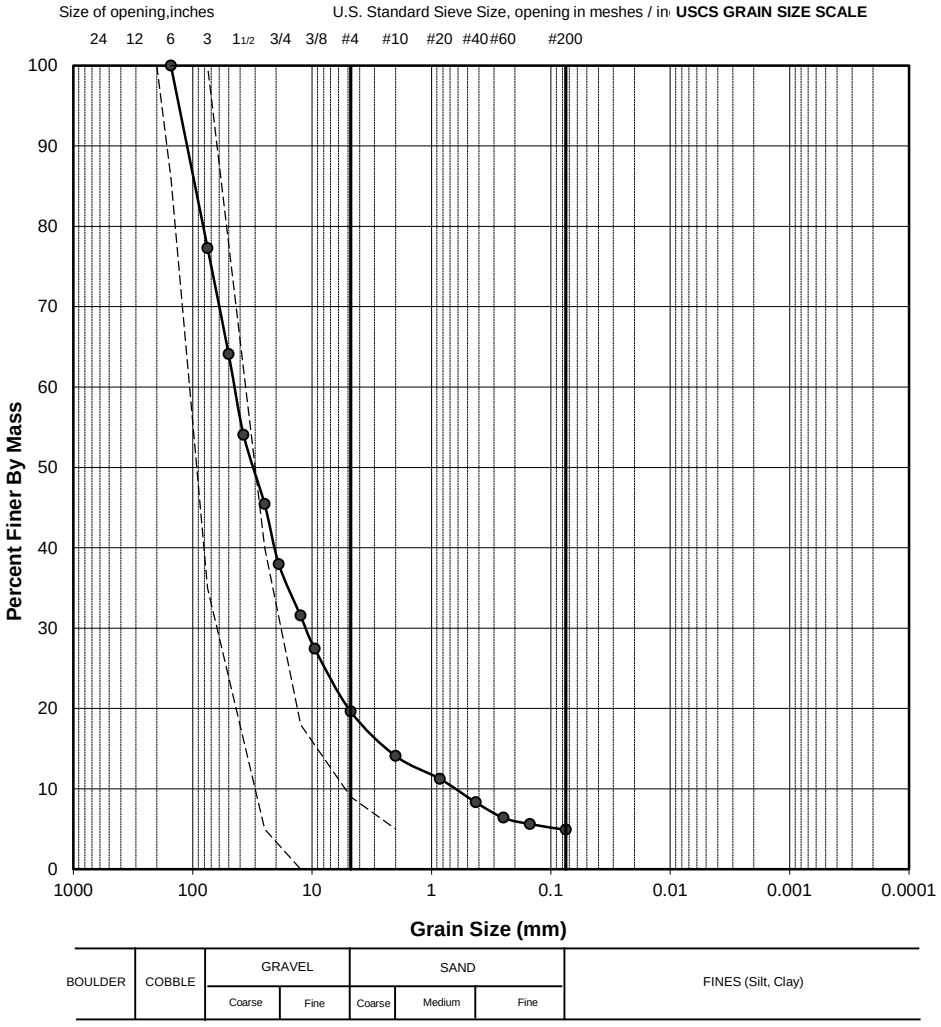
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**SD3-05**
Client:	AEM	**Field Label:**	SD3-05
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD3-05
Remarks:	EL:140,5	**Date Sampled:**	August 01, 2016
Sa. Location:	As place Sta.20+700/o.s. -18	**Material Specification**	Coarse Filter
Water content: 3%		**Method:**	SPLIT, WASHED
		Date Tested:	August 19, 2016

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	77.3
2"	50.0	64.1
1.5"	37.5	54.1
1"	25.0	45.4
3/4"	19.0	38.0
1/2"	12.5	31.5
3/8"	9.5	27.4
#4	4.8	19.6
#10	2.0	14.1
#20	0.9	11.2
#40	0.4	8.3
#60	0.3	6.4
#100	0.2	5.6
#200	0.1	4.9



** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

M.Nadon	August 19, 2016	M.D.Bonin	August 20, 2016
TESTED BY	DATE	CHECKED BY	DATE

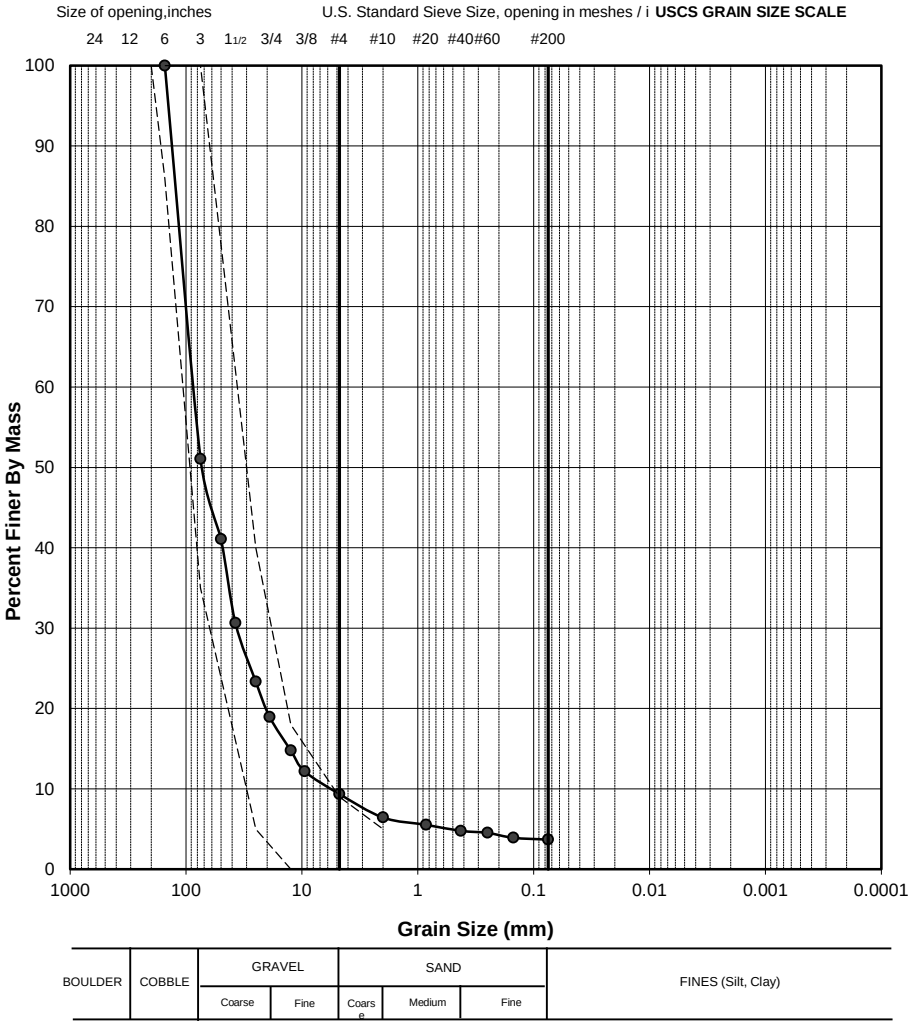
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1777687	**Sample No.:**	**SD3-09**
Client:	AEM	**Field Label:**	SD3-09
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD3-09
Remarks:	(in place) 20+770/-	**Date Sampled:**	August 29, 2017
Sta. Location:	SD3-09	**Material Specification**	Coarse Filter
Water content:	0,5%	**Method:**	SPLIT, WASHED
		Date Tested:	September 1, 2017

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	51.1
2"	50.0	41.1
1.5"	37.5	30.6
1"	25.0	23.3
3/4"	19.0	18.9
1/2"	12.5	14.8
3/8"	9.5	12.2
#4	4.8	9.4
#10	2.0	6.4
#20	0.9	5.5
#40	0.4	4.8
#60	0.3	4.5
#100	0.2	3.9
#200	0.1	3.7



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M.Nadon	September 1, 2017	M.Nadon	
TESTED BY	DATE	CHECKED BY	DATE

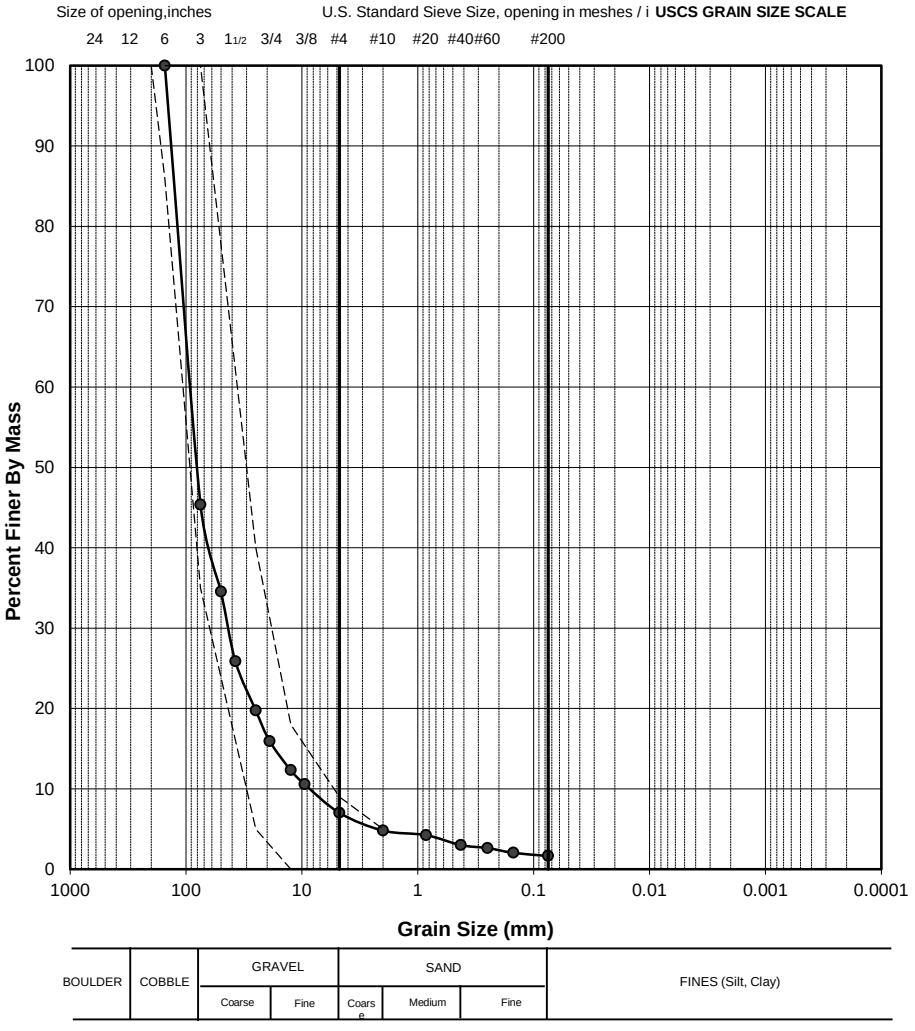
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1777687	**Sample No.:**	**SD4-09**
Client:	AEM	**Field Label:**	SD4-09
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD4-09
Remarks:	(in place) 40+350/-	**Date Sampled:**	August 24, 2017
Sta. Location:	SD4-09	**Material Specification**	Coarse Filter
Water content:	1,1%	**Method:**	SPLIT, WASHED
		Date Tested:	August 31, 2017

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	45.3
2"	50.0	34.5
1.5"	37.5	25.9
1"	25.0	19.7
3/4"	19.0	15.9
1/2"	12.5	12.3
3/8"	9.5	10.6
#4	4.8	7.0
#10	2.0	4.8
#20	0.9	4.2
#40	0.4	3.0
#60	0.3	2.6
#100	0.2	2.0
#200	0.1	1.6



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M.Nadon	August 31, 2017	M.Nadon	
TESTED BY	DATE	CHECKED BY	DATE

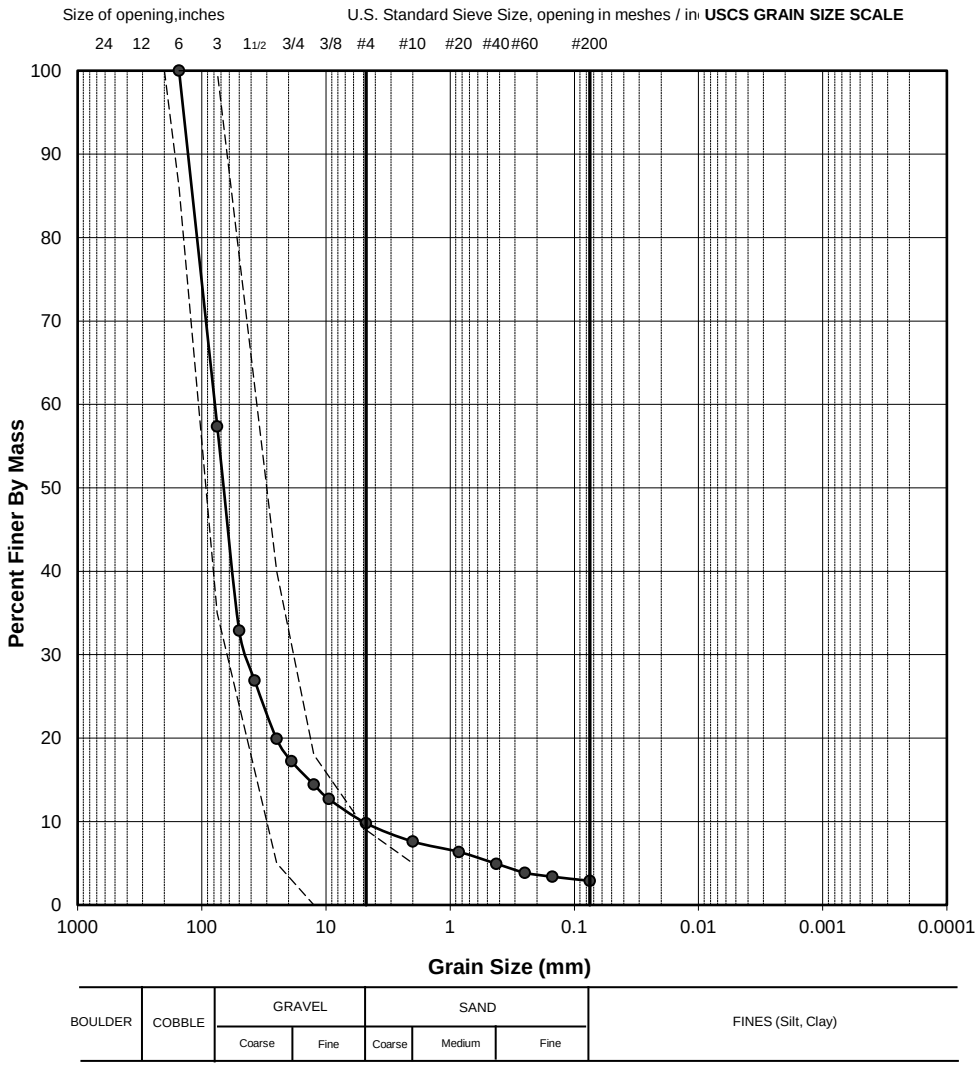
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**SD5-02**
Client:	AEM	**Field Label:**	SD5-02
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD5-02
Remarks:	EL:141,5	**Date Sampled:**	August 8, 2016
Sa. Location:	As placed Sta.40+732/o.s. -35,3	**Material Specification**	Coarse Filter
Water content: 1,8%		**Method:**	SPLIT, WASHED
		Date Tested:	August 22, 2016

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	57.3
2"	50.0	32.9
1.5"	37.5	26.9
1"	25.0	19.9
3/4"	19.0	17.2
1/2"	12.5	14.4
3/8"	9.5	12.7
#4	4.8	9.8
#10	2.0	7.6
#20	0.9	6.4
#40	0.4	4.9
#60	0.3	3.9
#100	0.2	3.4
#200	0.1	2.9



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M.Nadon	August 22, 2016		
TESTED BY	DATE	CHECKED BY	DATE

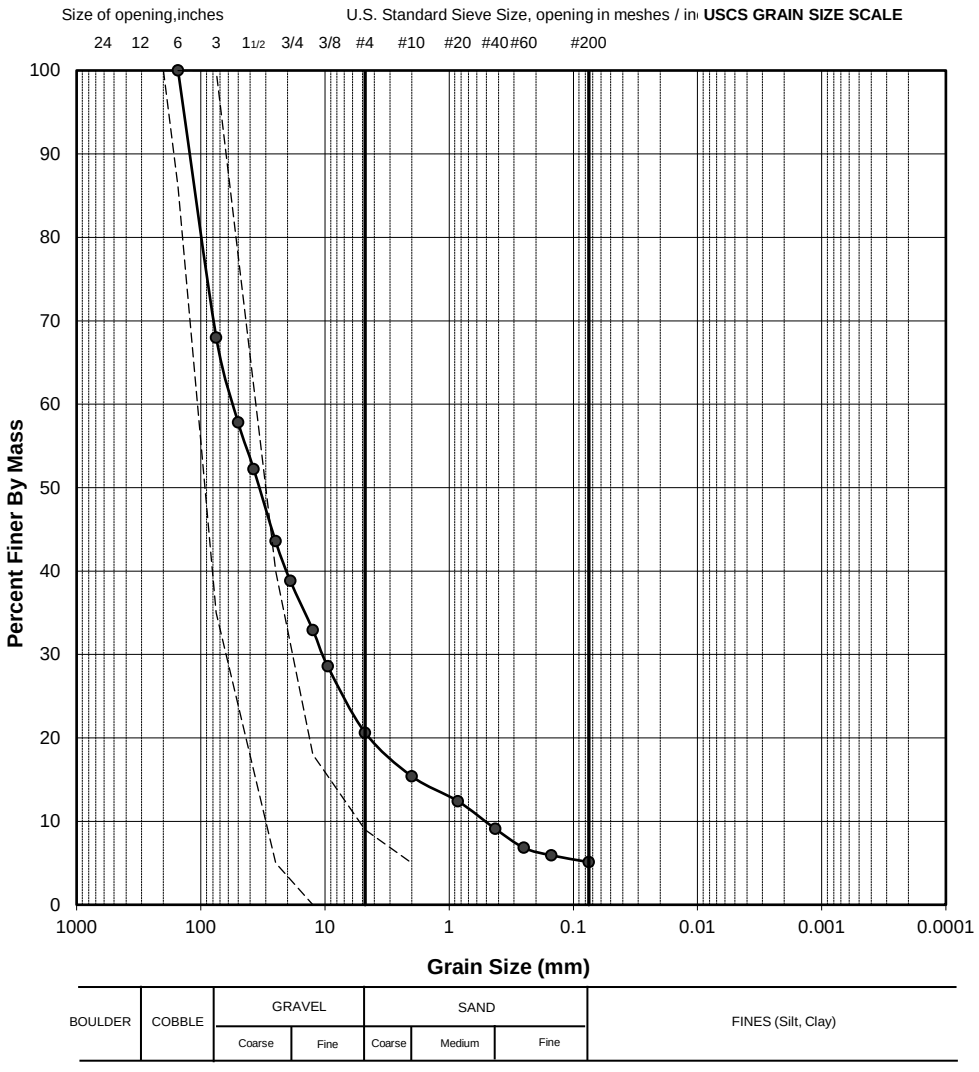
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**STCK-05**
Client:	AEM	**Field Label:**	STCK-05
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	STCK-05
Remarks:	SANA crusher	**Date Sampled:**	July 09, 2015
Sa. Location:	Stock pile 1	**Material Specification**	Coarse Filter
Water content: 1,44%		**Method:**	SPLIT, WASHED
		Date Tested:	July 21, 2016

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	68.0
2"	50.0	57.8
1.5"	37.5	52.2
1"	25.0	43.6
3/4"	19.0	38.8
1/2"	12.5	32.9
3/8"	9.5	28.6
#4	4.8	20.6
#10	2.0	15.4
#20	0.9	12.4
#40	0.4	9.1
#60	0.3	6.8
#100	0.2	5.9
#200	0.1	5.1



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M.Nadon	July 21, 2016		
TESTED BY	DATE	CHECKED BY	DATE

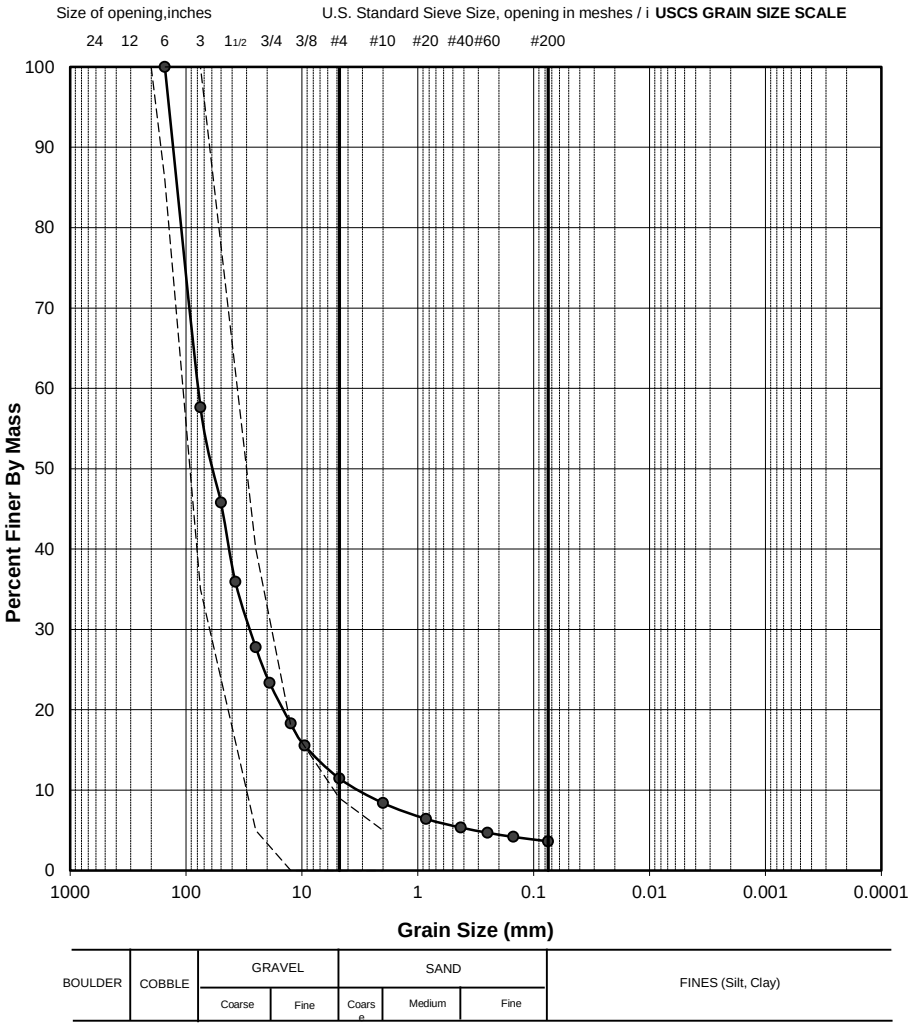
Golder Associates Ltd. Meadowbank Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1777687	**Sample No.:**	**STCK-23**
Client:	AEM	**Field Label:**	STCK-23
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	STCK-23
Remarks:	0.0	**Date Sampled:**	August 4, 2017
Sa. Location:	Stock Pile Sana Crusher	**Material Specification**	Coarse Filter
Water content:	1,1%	**Method:**	SPLIT, WASHED
		Date Tested:	August 28, 2017

Sieve Size (USS)	(mm)	Passing %
8"	200.0	100.0
6"	152.4	100.0
3"	75.0	57.6
2"	50.0	45.8
1.5"	37.5	35.9
1"	25.0	27.8
3/4"	19.0	23.4
1/2"	12.5	18.3
3/8"	9.5	15.5
#4	4.8	11.5
#10	2.0	8.4
#20	0.9	6.4
#40	0.4	5.3
#60	0.3	4.7
#100	0.2	4.2
#200	0.1	3.6



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M.Nadon	August 28, 2017	M.Nadon	
TESTED BY	DATE	CHECKED BY	DATE

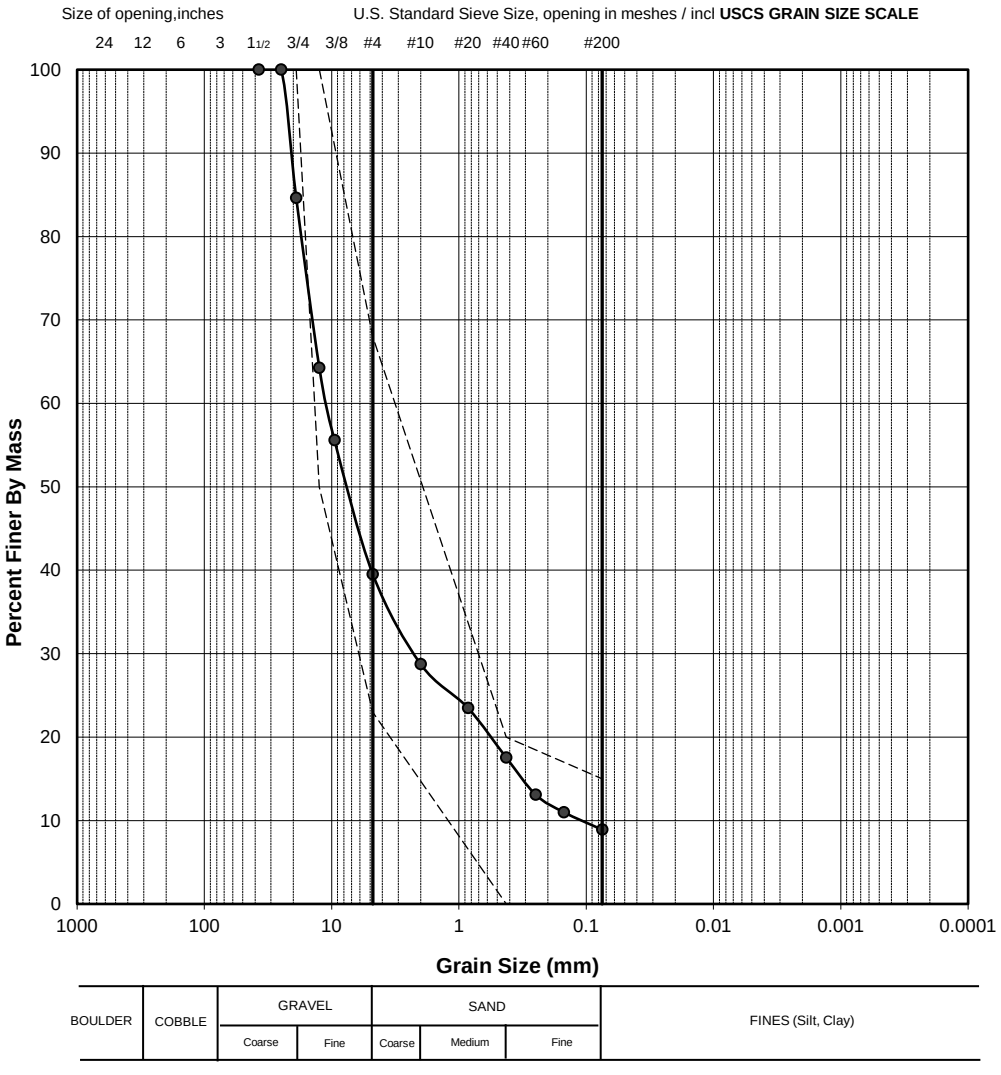
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**SD3-06**
Client:	AEM	**Field Label:**	SD3-06
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD3-06
Remarks:	EL: 140,5	**Date Sampled:**	August 1, 2016
Sa. Location:	As placed Sta. 20+700/o.s. -19	**Material Specification**	Fine Filter
Moisture Content: 1,4%		**Method:**	SPLIT, WASHED
		Date Tested:	August 23, 2016

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	84.6
1/2"	12.5	64.3
3/8"	9.5	55.6
#4	4.8	39.5
#10	2.0	28.7
#20	0.9	23.5
#40	0.4	17.5
#60	0.3	13.1
#100	0.2	11.0
#200	0.1	8.9



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M.Nadon	August 23, 2016		
TESTED BY	DATE	CHECKED BY	DATE

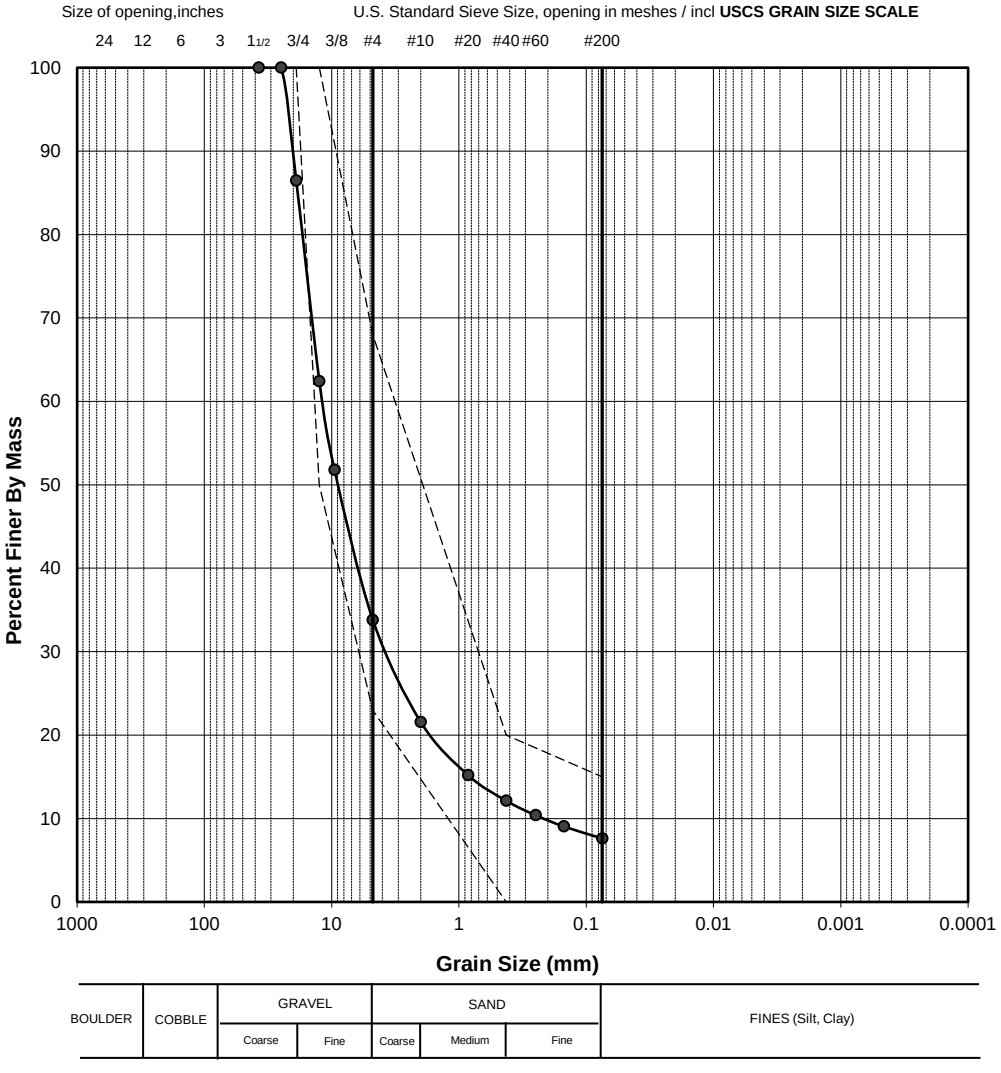
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1777687	**Sample No.:**	**SD3-08**
Client:	AEM	**Field Label:**	SD3-08
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD3-08
Remarks:	El. 144.5 m	**Date Sampled:**	August 17, 2017
Sa. Location:	As placed Sta. 20+580 m/o.s. -30 m	**Material Specification**	Fine Filter
Moisture Content : 2,3%		**Method:**	SPLIT, WASHED
		Date Tested:	August 20, 2017

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	86.5
1/2"	12.5	62.4
3/8"	9.5	51.8
#4	4.8	33.8
#10	2.0	21.6
#20	0.9	15.2
#40	0.4	12.1
#60	0.3	10.4
#100	0.2	9.0
#200	0.1	7.6



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M.Nadon	August 20, 2017	M.Nadon	
TESTED BY	DATE	CHECKED BY	DATE

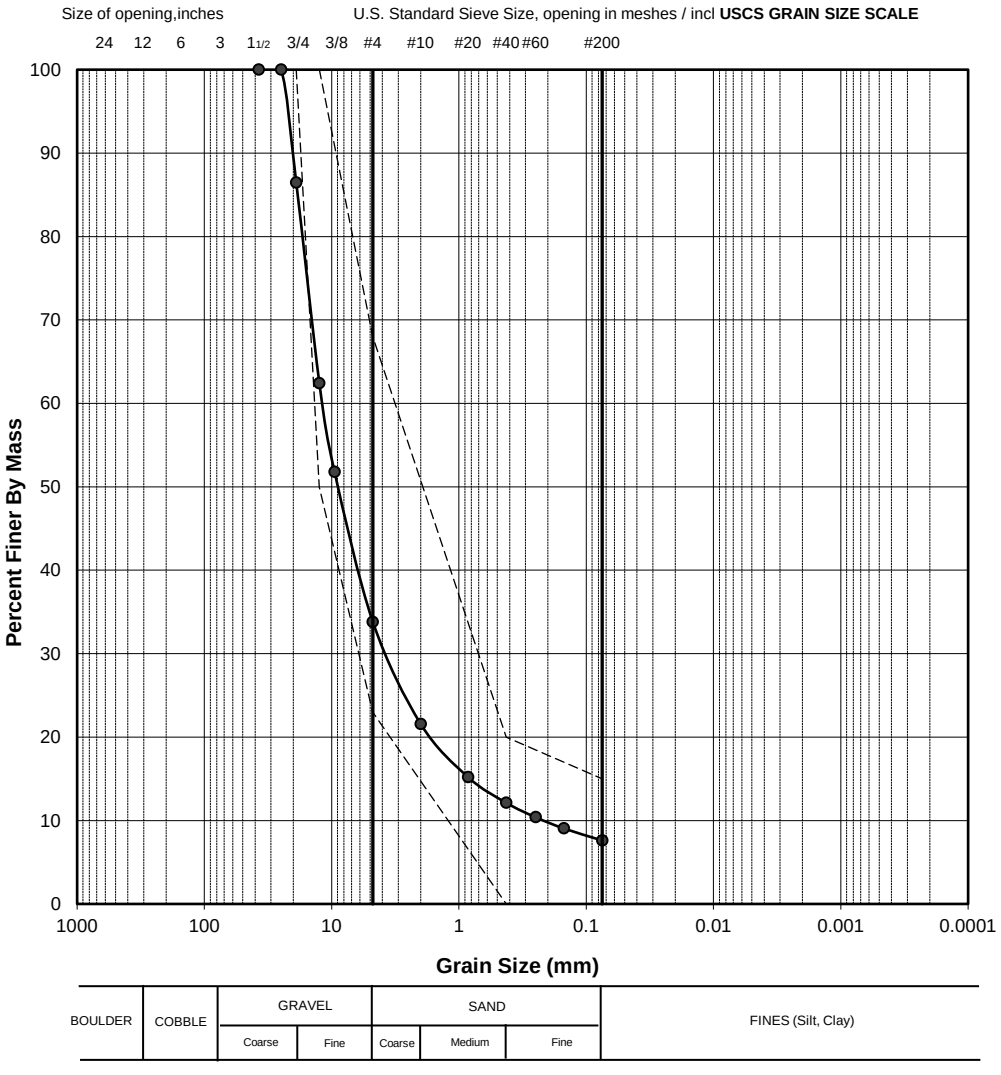
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1777687	**Sample No.:**	**SD3-08**
Client:	AEM	**Field Label:**	SD3-08
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD3-08
Remarks:	El. 144.5 m	**Date Sampled:**	August 17, 2017
Sa. Location:	As placed Sta. 20+580 m/o.s. -30 m	**Material Specification**	Fine Filter
Moisture Content : 2,3%		**Method:**	SPLIT, WASHED
		Date Tested:	August 20, 2017

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	86.5
1/2"	12.5	62.4
3/8"	9.5	51.8
#4	4.8	33.8
#10	2.0	21.6
#20	0.9	15.2
#40	0.4	12.1
#60	0.3	10.4
#100	0.2	9.0
#200	0.1	7.6



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M.Nadon	August 20, 2017	M.Nadon	
TESTED BY	DATE	CHECKED BY	DATE

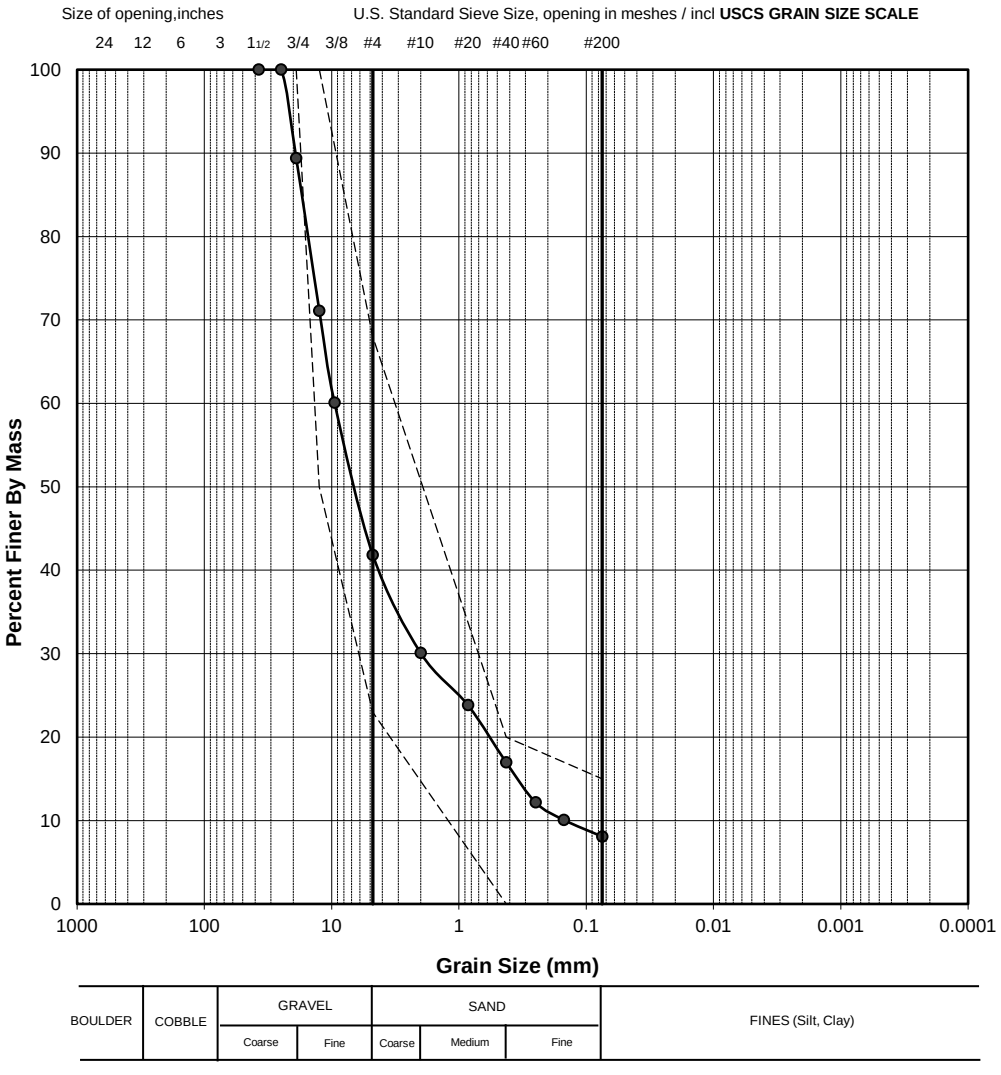
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**SD4-05**
Client:	AEM	**Field Label:**	SD4-05
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD4-05
Remarks:	EL: 140,5	**Date Sampled:**	July 31, 2016
Sa. Location:	As placed Sta. 40 + 420/o.s. -34	**Material Specification**	Fine Filter
Moisture Content: 1,6%		**Method:**	SPLIT, WASHED
		Date Tested:	August 22, 2016

Sieve Size (USS)	Sieve Size (mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	89.4
1/2"	12.5	71.1
3/8"	9.5	60.1
#4	4.8	41.8
#10	2.0	30.1
#20	0.9	23.8
#40	0.4	16.9
#60	0.3	12.2
#100	0.2	10.1
#200	0.1	8.1



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M.Nadon	August 22, 2016		
TESTED BY	DATE	CHECKED BY	DATE

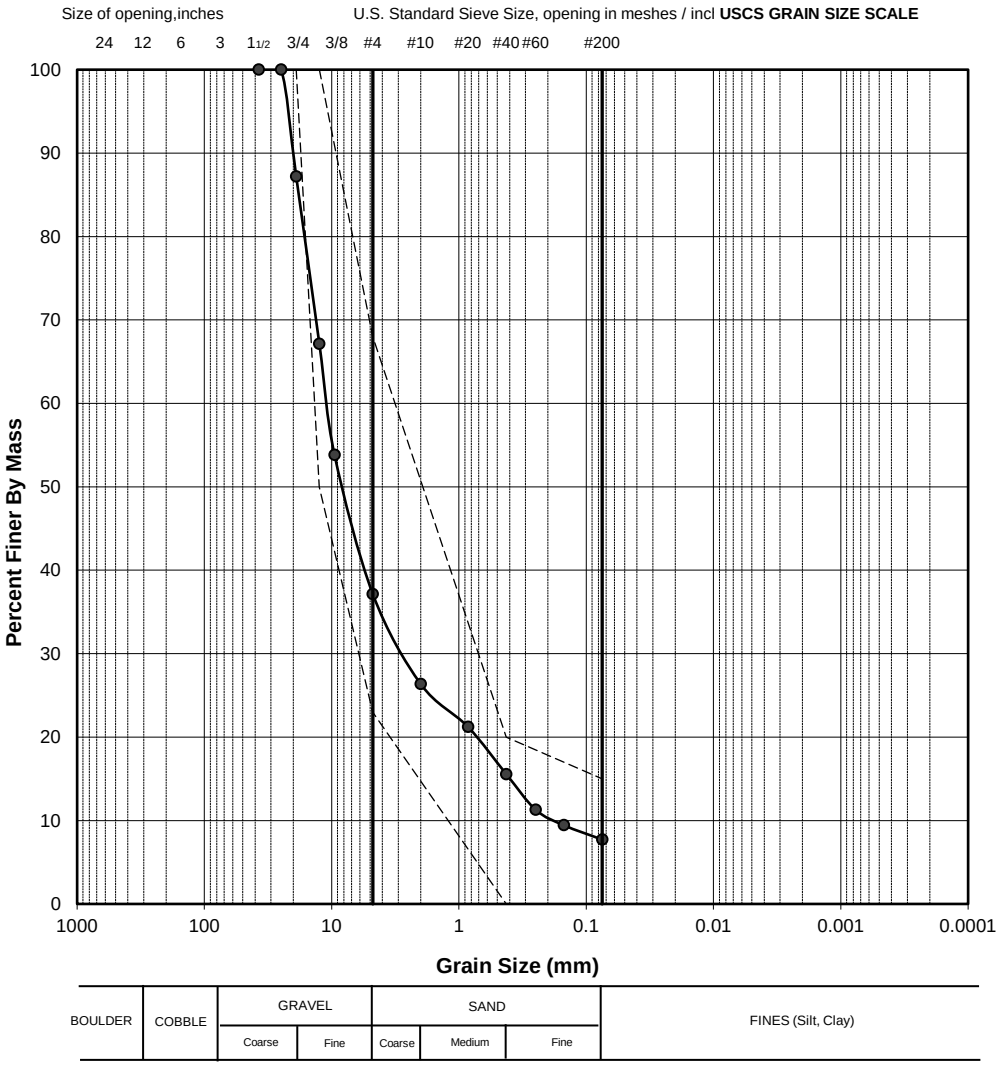
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**SD5-01**
Client:	AEM	**Field Label:**	SD5-01
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	SD5-01
Remarks:	EL: 141	**Date Sampled:**	July 29, 2016
Sa. Location:	As placed Sta. 40+760/o.s. -36	**Material Specification**	Fine Filter
Moisture Content: 2,8%		**Method:**	SPLIT, WASHED
		Date Tested:	August 23, 2016

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	87.2
1/2"	12.5	67.1
3/8"	9.5	53.8
#4	4.8	37.1
#10	2.0	26.4
#20	0.9	21.2
#40	0.4	15.6
#60	0.3	11.3
#100	0.2	9.4
#200	0.1	7.7



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M.Nadon	August 23, 2016		
TESTED BY	DATE	CHECKED BY	DATE

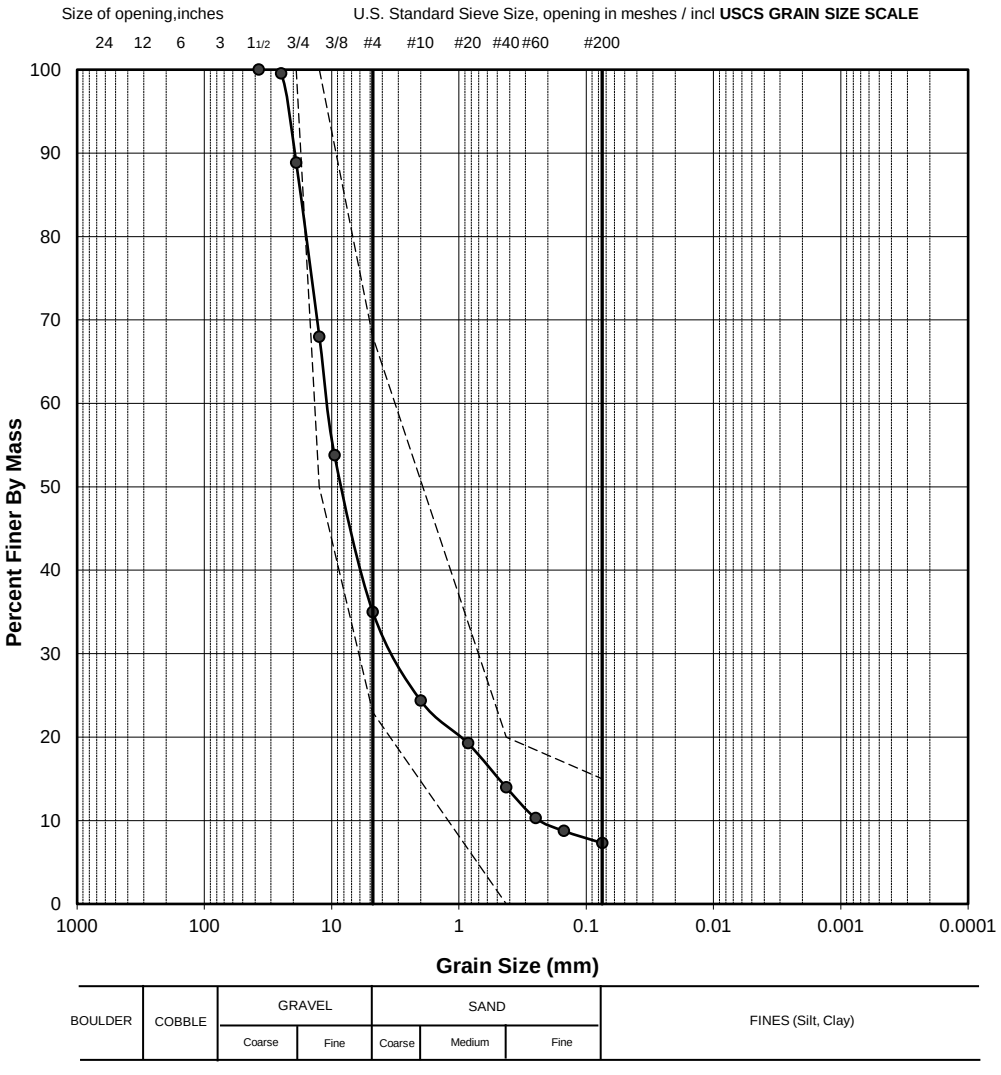
Laboratory
Nunavut, Canada

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	1656047	**Sample No.:**	**STCK-15**
Client:	AEM	**Field Label:**	STCK-15
Project:	Meadowbank Gold Project	**Depth (m):**	NA
Location:	Nunavut	**Lab ID No:**	STCK-15
Remarks:	SANA crusher	**Date Sampled:**	June 30, 2016
Sa. Location:	Stock pile 2	**Material Specification**	Fine Filter
Moisture Content : 2,6%		**Method:**	SPLIT, WASHED
		Date Tested:	July 17, 2016

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	99.5
3/4"	19.0	88.9
1/2"	12.5	68.0
3/8"	9.5	53.8
#4	4.8	35.0
#10	2.0	24.4
#20	0.9	19.3
#40	0.4	14.0
#60	0.3	10.3
#100	0.2	8.7
#200	0.1	7.3



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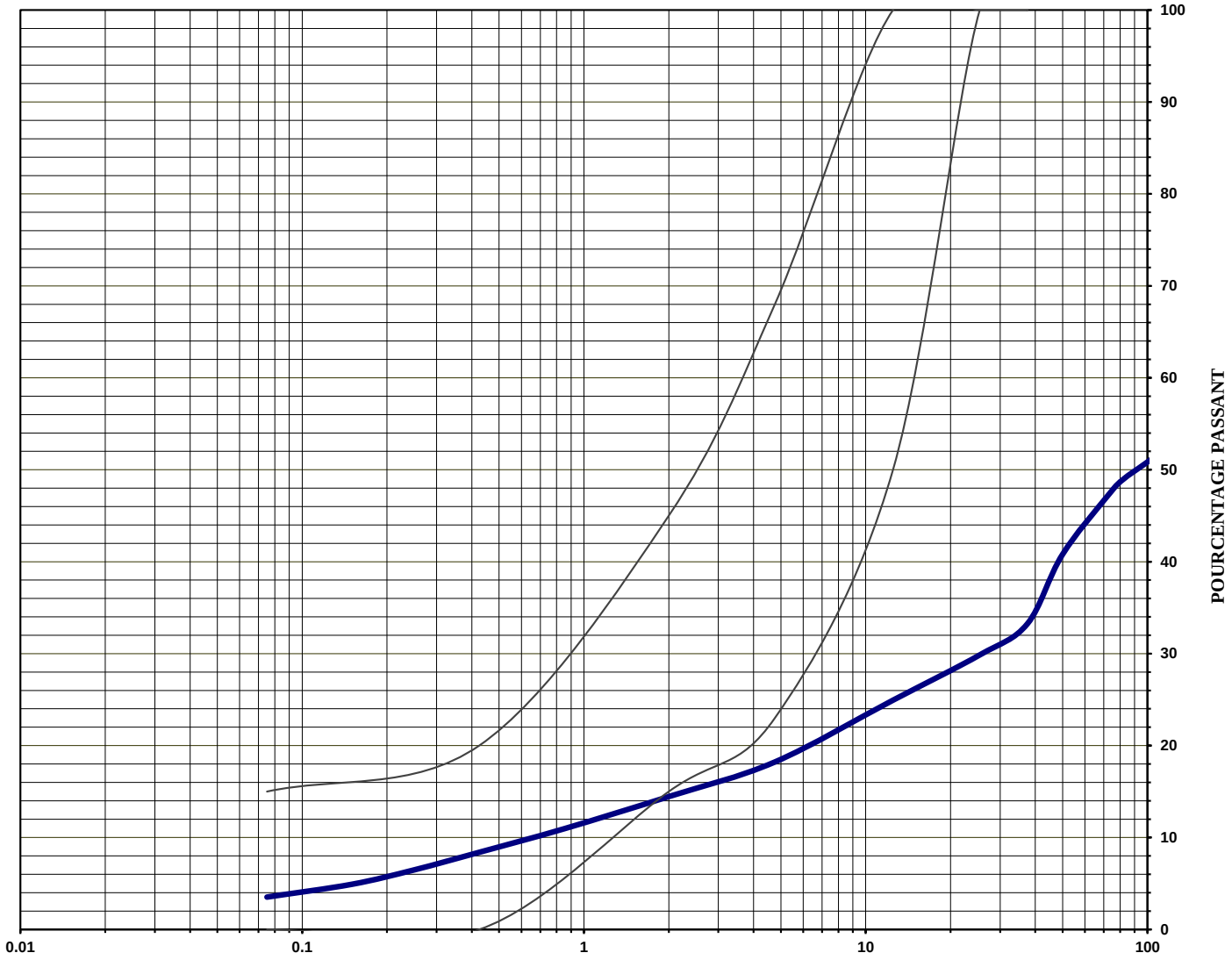
M.Nadon	July 17, 2016		
TESTED BY	DATE	CHECKED BY	DATE

AGNICO EAGLE

CLIENT: AEM

PROJET No.: _____ **ÉCHANTILLON No.:** _____

COURBE GRANULOMÉTRIQUE



SILT ET ARGILE	FIN	MOYEN	GROSSIER	FIN	GROSSIER
	SABLE			GRAVIER	

Préparé par: J-R-V

Vérifié par: #REF!

AGNICO EAGLE

ANALYSE GRANULOMÉTRIQUE

LC 21-040 [X]

CSA A23.2-2A [ ]

CLIENT: AEM

PROJET No.: _____ **ÉCHANTILLON No.:** _____

APPAREILS DE MESURE UTILISÉS:

Tamis No. EE 13767 Séparateur No. Gilson model # SP-1

Étuve No. B23 3546 Agitateur mécanique No. 25824

Balance No. 1,127,170,847

MASSE TOTALE DE L'ÉCHANTILLON avant:	**27311.0**	g		
MASSE DU RETENU AU TAMIS 5 mm:	22336.0	g	**% MC:** **4.35**	%
MASSE DU PASSANT AU TAMIS 5 mm:	4975.0	g		
MASSE TOTALE DE L'ÉCHANTILLON après:	27311.0	g	**% PERTE:** **0.00**	%
MASSE UTILISÉE 5 mm avant lavage :	**245.0**	g		
MASSE UTILISÉE 5 mm après lavage :	201.5	g	**% PERTE:** **0.10**	%

ANALYSE GRANULOMÉTRIQUE & DIMENSION DES GRAINS

TAMIS	MASSE RETENUE (IND.)	MASSE RETENUE (CUM.)	% RETENU (IND.)	% RETENU (CUM.)	% PASSANT (IND.)	% PASSANT (CUM.)
150 mm		0.0		0.0		100
76.2 mm		11188.0		41.0		59
50 mm		14195.0		52.0		48
37.5 mm		16166.0		59.2		41
25 mm		18229.0		66.7		33
19 mm		19156.0		70.1		30
12.5 mm		20500.0		75.1		25
4.76 mm		22336.0		81.8		18
2.00 mm		50.6		85.5		14
0.85 mm		97.7		89.0		11
0.425 mm		132.1		91.6		8
0.25 mm		157.8		93.5		6
0.15 mm		178.9		95.1		5
0.075 mm		197.6		96.5		3.5
PLATEAU		201.3		96.8		3.2

REMARQUES: _____

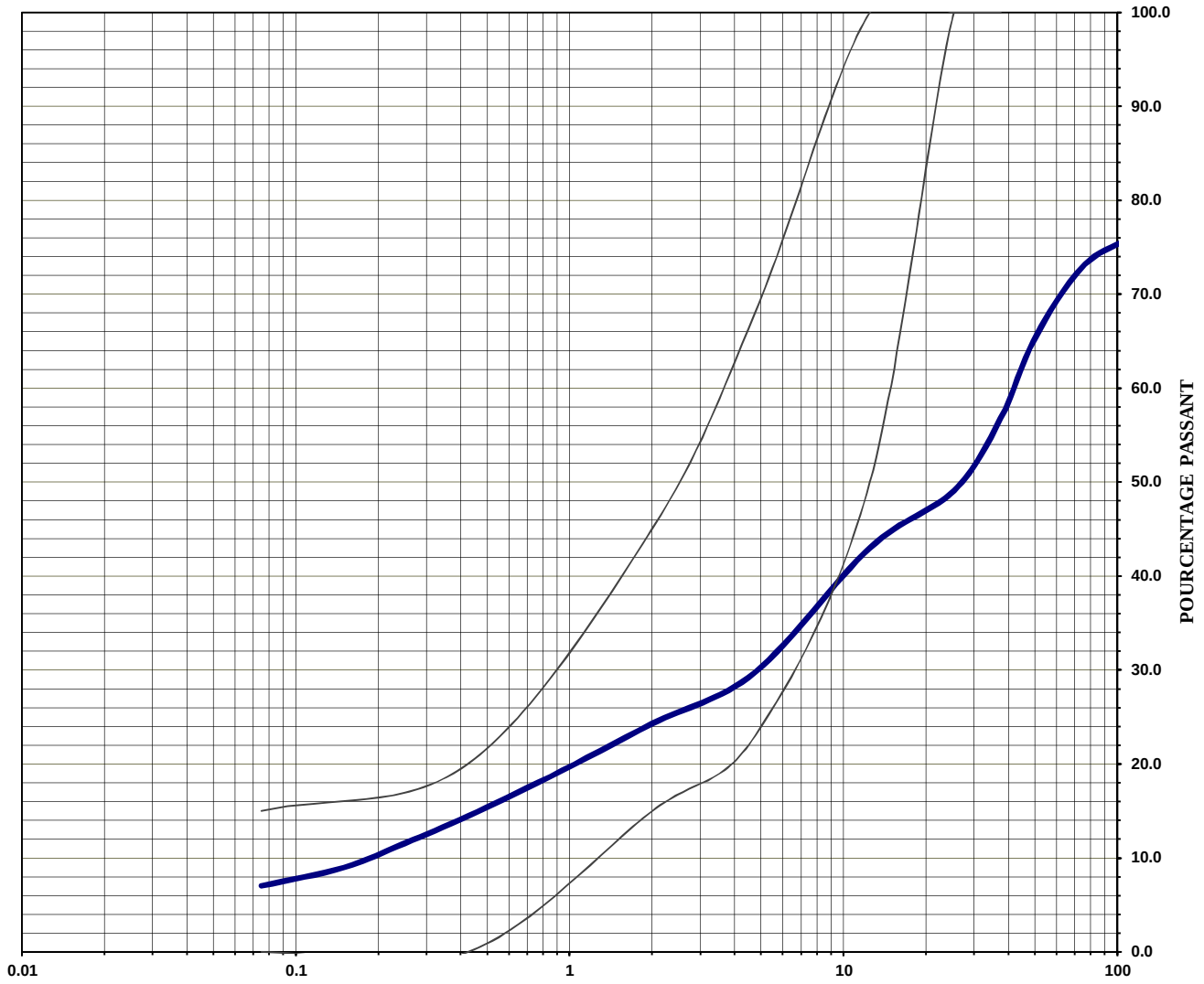
EFFECTUÉ PAR: _____ **DATE:** _____

VÉRIFIÉ PAR : _____ **DATE:** _____

CLIENT: AEM

PROJET No.: Internal Structure Trench 1 sample 1 **ÉCHANTILLON No.:**

COURBE GRANULOMÉTRIQUE



SILT ET ARGILE	FIN	MOYEN	GROSSIER	FIN	GROSSIER
	SABLE			GRAVIER	

Préparé par: TD

Vérifié par: PG

AGNICO EAGLE

ANALYSE GRANULOMÉTRIQUE

LC 21-040 [X]
CSA A23.2-2A [ ]

CLIENT: AEM

PROJET No.: South Cell Internal Structure **ÉCHANTILLON No.:** Trench #1 South Sample #1

APPAREILS DE MESURE UTILISÉS:
Tamis No. EE 13767 Séparateur No. Gilson model # SP-1
Étuve No. B23 3546 Agitateur mécanique No. 25824
Balance No. 1,127,170,847

MASSE TOTALE DE L'ÉCHANTILLON avant:	**11536.0**	g			
MASSE DU RETENU AU TAMIS 5 mm:	8102.0	g	Dépassem	**% MC:** **1.59**	%
MASSE DU PASSANT AU TAMIS 5 mm:	3999.0	g			
MASSE TOTALE DE L'ÉCHANTILLON après:	12101.0	g		**% PERTE:** -4.90	%
MASSE UTILISÉE 5 mm avant lavage :	**239.4**	g			
MASSE UTILISÉE 5 mm après lavage :	183.6	g		**% PERTE:** **0.11**	%

ANALYSE GRANULOMÉTRIQUE & DIMENSION DES GRAINS

TAMIS	MASSE RETENUE (IND.)	MASSE RETENUE (CUM.)	% RETENU (IND.)	% RETENU (CUM.)	% PASSANT (IND.)	% PASSANT (CUM.)
150 mm		0.0		0		100
76.2 mm		2295.0		20		80
50 mm		3093.0		27		73
37.5 mm		4005.0		35		65
25 mm		4987.0		43		57
19 mm		5870.0		51		49
12.5 mm		6574.0		57		43
4.76 mm		8102.0		70		30
2.00 mm		44.1		76		24
0.85 mm		89.3		81		19
0.425 mm		123.1		86		14
0.25 mm		146.4		88		12
0.15 mm		167.1		91		9
0.075 mm		182.8		93.0		7.0
PLATEAU		183.4		93.0		7.0

REMARQUES:

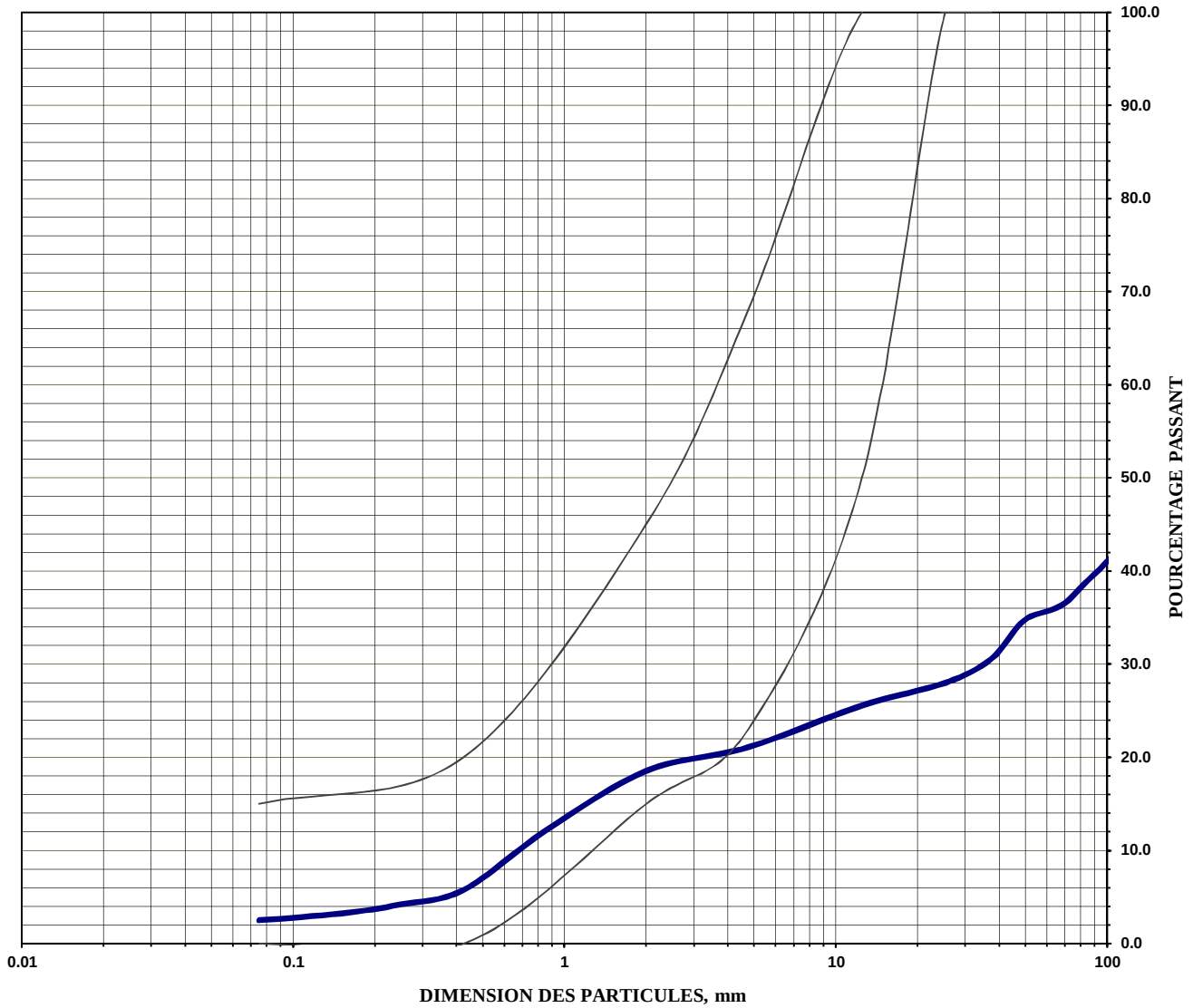
EFFECTUÉ PAR: **DATE:**

VÉRIFIÉ PAR : **DATE:**

CLIENT: AEM

PROJET No.: Internal Structure, Trench #3 sample #1 **ÉCHANTILLON No.:**

COURBE GRANULOMÉTRIQUE



SILT ET ARGILE	FIN	MOYEN	GROSSIER	FIN	GROSSIER
	SABLE			GRAVIER	

Préparé par: TD

Vérifié par: PG

AGNICO EAGLE

ANALYSE GRANULOMÉTRIQUE

LC 21-040 [X]

CSA A23.2-2A [ ]

CLIENT: AEM

PROJET No.: South Cell Internal structure **ÉCHANTILLON No.:** Trench #3 Sample #1

APPAREILS DE MESURE UTILISÉS:

Tamis No. EE 13767 Séparateur No. Gilson model # SP-1

Étuve No. B23 3546 Agitateur mécanique No. 25824

Balance No. 1,127,170,847

MASSE TOTALE DE L'ÉCHANTILLON avant:	**12970.0**	g			
MASSE DU RETENU AU TAMIS 5 mm:	10235.0	g	Dépassem	**% MC:** **0.06**	%
MASSE DU PASSANT AU TAMIS 5 mm:	2911.0	g			
MASSE TOTALE DE L'ÉCHANTILLON après:	13146.0	g		**% PERTE:** -1.36	%
MASSE UTILISÉE 5 mm avant lavage :	**280.0**	g			
MASSE UTILISÉE 5 mm après lavage :	247.3	g		**% PERTE:** **0.04**	%

ANALYSE GRANULOMÉTRIQUE & DIMENSION DES GRAINS

TAMIS	MASSE RETENUE (IND.)	MASSE RETENUE (CUM.)	% RETENU (IND.)	% RETENU (CUM.)	% PASSANT (IND.)	% PASSANT (CUM.)
150 mm		0.0		0		100
76.2 mm		6270.0		48		52
50 mm		8096.0		62		38
37.5 mm		8455.0		65		35
25 mm		9004.0		69		31
19 mm		9337.0		72		28
12.5 mm		9655.0		74		26
4.76 mm		10235.0		79		21
2.00 mm		34.0		81		19
0.85 mm		119.3		88		12
0.425 mm		203.6		94		6
0.25 mm		224.0		96		4
0.15 mm		237.1		97		3
0.075 mm		246.8		97.5		2.5
PLATEAU		247.2		97.5		2.5

REMARQUES:

EFFECTUÉ PAR: **DATE:**

VÉRIFIÉ PAR : **DATE:**

SUMMARY OF WATER CONTENT [1] / ATTERBERG LIMITS[2] DETERMINATIONS

[1]ASTM D2216 / [2]ASTM D4318

PROJECT NUMBER	1775467 (3000)
PROJECT NAME	AEM/Amaruq/Lab Testing
DATE	June, 2017

Borehole No.	Sample No.	Depth (ft)	Depth (m)	Water Content (%)	Atterberg Limits LL=, PL=, PI=,
	Whale Tails			63.7%	NP

CONSOLIDATED UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENTS ASTM D4767 SHEET 1 OF 4			FIGURE
TEST STAGE	A	B	C
BOREHOLE NUMBER		-	
SAMPLE		Whale Tails	
DEPTH, m		-	
SPECIMEN DIAMETER, cm	5.00	5.00	5.00
SPECIMEN HEIGHT, cm	10.00	10.00	10.00
NATURAL WATER CONTENT, %	28.4	27.6	28.0
DRY DENSITY, Mg/m^3	1.60	1.64	1.64
WATER CONTENT AFTER SATURATION, %	23.5	23.1	23.2
CELL PRESSURE, σ_3, kPa	520.0	700.0	830.0
BACK PRESSURE, kPa	270.0	200.0	130.0
PORE PRESSURE PARAMETER "B"	0.96	0.96	0.96
EFFECTIVE CONSOLIDATION STRESS, σc, kPa	250.0	500.0	700.0
VOLUMETRIC STRAIN DURING CONSOLIDATION, %	4.3	5.9	7.4
WATER CONTENT AFTER CONSOLIDATION, %	20.8	19.6	18.7
AVERAGE RATE OF STRAIN, %/hr	0.5	0.5	0.5
TIME TO FAILURE, HOURS	29.9	30.0	29.9
WATER CONTENT AFTER TEST, %	19.4	19.0	18.3
MAX. DEVIATOR STRESS, $(\sigma_1-\sigma_3)$, kPa	436.4	733.7	1221.8
AXIAL STRAIN AT $(\sigma_1-\sigma_3)$ maximum, %	14.9	15.0	15.0
MAX EFFECTIVE PRINCIPAL STRESS RATIO, (σ'_1/σ'_3) maximum	3.9	3.9	4.0
DEVIATOR STRESS AT (σ'_1/σ'_3) maximum, kPa	308.4	606.5	1079.6
AXIAL STRAIN AT (σ'_1/σ'_3) maximum, %	9.3	11.4	12.3
PORE PRESSURE PARAMETER, Af, AT $(\sigma_1-\sigma_3)$ maximum	0.22	0.33	0.24
PORE PRESSURE PARAMETER, Af, AT (σ'_1/σ'_3) maximum	0.47	0.48	0.32
FILTER DRAINS USED, y/n	y	y	y
TEST NOTES:			
Effective consolidation stresses are assigned by the client.			
FAILURE PLANE NUMBER	-	-	-
ANGLE OF FAILURE PLANE, DEGREES	Bulged	Bulged	Bulged

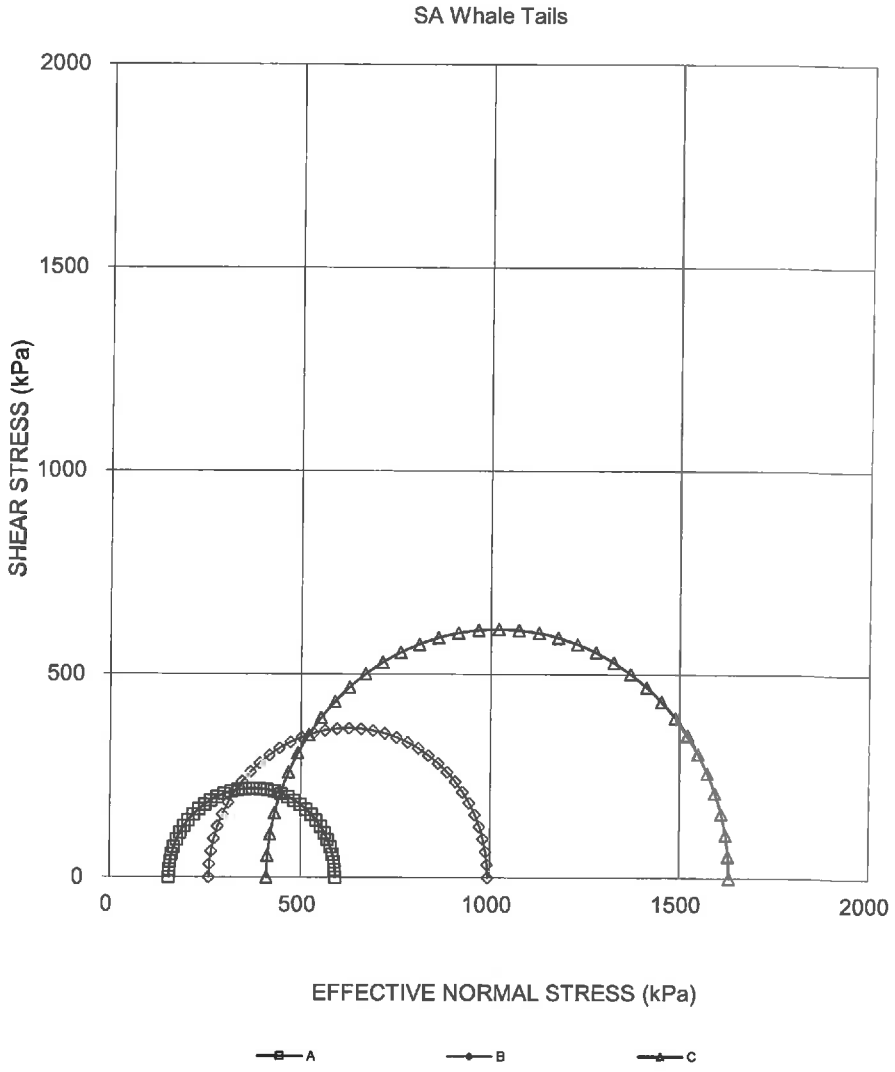
Date: 7/21/2017
Project No. 1775467

Golder Associates

Prepared By LH
Checked By:

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
ASTM D4767
SHEET 2 OF 4

FIGURE

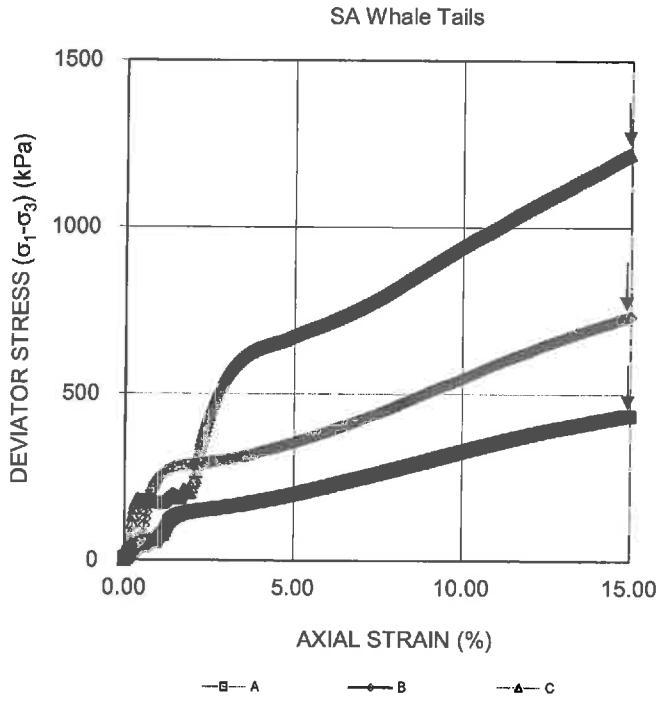


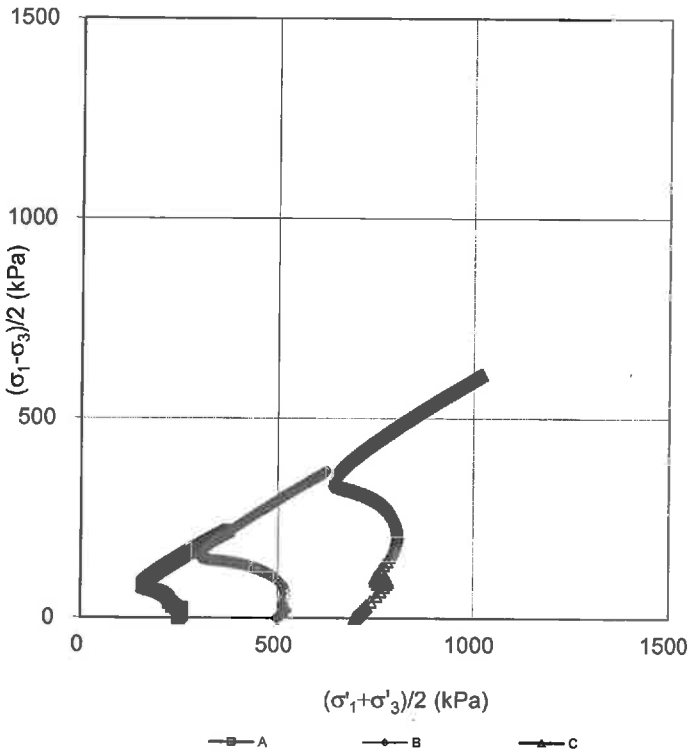
Date: 7/21/2017
Project No. 1775467

Golder Associates

Prepared By LH
Checked By:

CONSOLIDATED UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENTS ASTM D4767 SHEET 3 OF 4	FIGURE





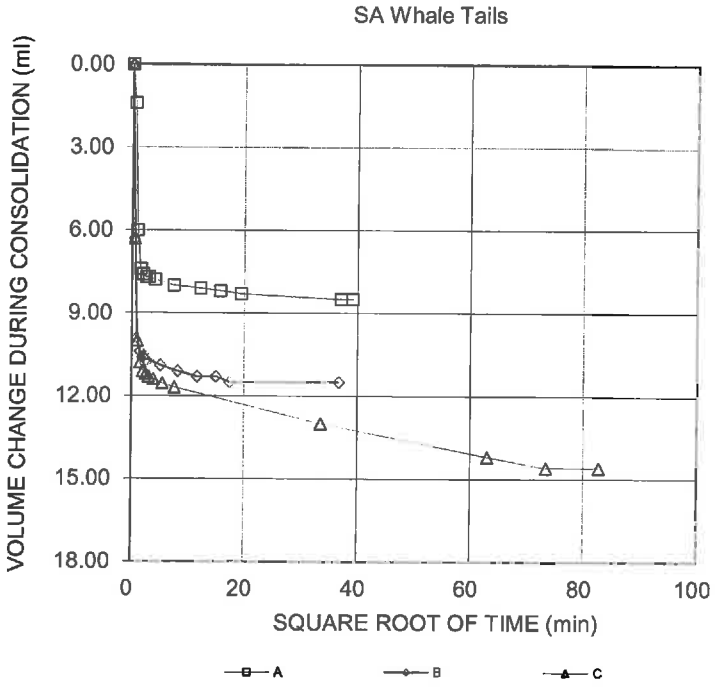
Date: 7/21/2017
Project No. 1775467

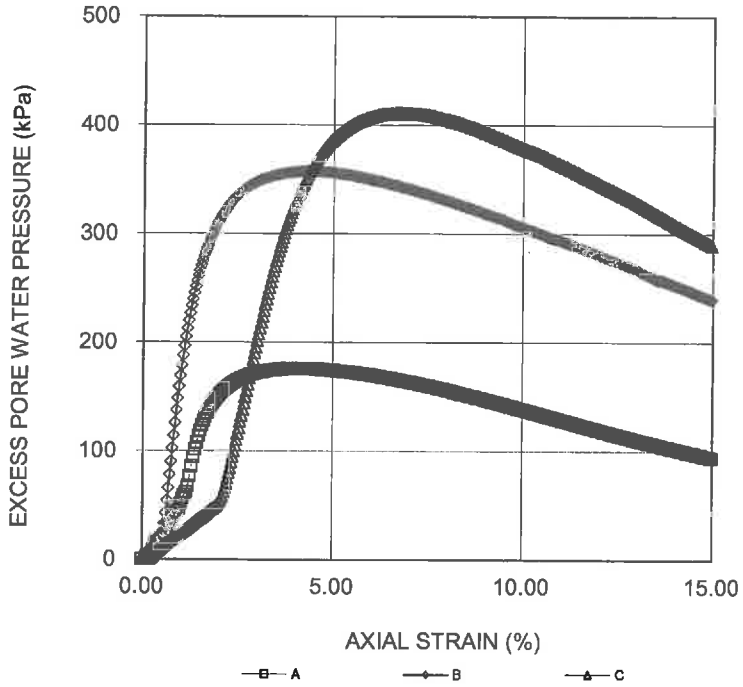
Golder Associates

Prepared By LH
Checked By:

CONSOLIDATED UNDRAINED TRIAXIAL
WITH PORE PRESSURE MEASUREMENTS
ASTM D4767
SHEET 4 OF 4

FIGURE





Date: 7/21/2017
Project No. 1775467

Golder Associates

Prepared By LH
Checked By:

CONSOLIDATION TEST SUMMARY

ASTM D2435/D2435M

FIGURE

SAMPLE IDENTIFICATION

Project Number	1775467	Sample Number	Whale Tails
Borehole Number	-	Sample Depth, m	-

TEST CONDITIONS

Test Type	Laboratory Standard	Load Duration, hr	24
Oedometer Number	10		
Date Started	6/23/2017		
Date Completed	7/10/2017		

SAMPLE DIMENSIONS AND PROPERTIES - INITIAL

Sample Height, cm	2.54	Unit Weight, kN/m^3	20.00
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	15.41
Area, cm^2	31.52	Specific Gravity, measured	2.96
Volume, cm^3	80.19	Solids Height, cm	1.350
Water Content, %	29.80	Volume of Solids, cm^3	42.56
Wet Mass, g	163.52	Volume of Voids, cm^3	37.63
Dry Mass, g	125.98	Degree of Saturation, %	99.8

Stress kPa	Corr. Height cm	Void Ratio	Average Height cm	t_{90} sec	cv. cm^2/s	mv m^2/kN	k cm/s
0.00	2.544	0.884	2.544				
5.84	2.512	0.860	2.512	38	3.52E-02	2.17E-03	7.50E-06
10.70	2.494	0.847	2.494	29	4.55E-02	1.42E-03	6.31E-06
20.50	2.475	0.833	2.475	101	1.29E-02	7.66E-04	9.65E-07
40.19	2.454	0.818	2.454	34	3.76E-02	4.13E-04	1.52E-06
78.88	2.423	0.794	2.423	154	8.08E-03	3.21E-04	2.54E-07
156.44	2.393	0.772	2.393	126	9.63E-03	1.52E-04	1.43E-07
312.56	2.357	0.746	2.357	653	1.80E-03	8.96E-05	1.58E-08
622.13	2.321	0.719	2.321	162	7.05E-03	4.63E-05	3.20E-08
1242.20	2.276	0.686	2.276	86	1.28E-02	2.83E-05	3.54E-08
2483.41	2.225	0.648	2.225	73	1.44E-02	1.62E-05	2.28E-08
621.19	2.237	0.657	2.237				
156.44	2.252	0.667	2.252				
40.19	2.263	0.676	2.263				
10.70	2.274	0.684	2.274				

Note:
Consolidation loading and unloading schedule assigned by the client.
cv and k are approximate only based on t90 estimated from Square Root of Time Method (ASTMD2435/2435M)

SAMPLE DIMENSIONS AND PROPERTIES - FINAL

Sample Height, cm	2.27	Unit Weight, kN/m^3	20.47
Sample Diameter, cm	6.34	Dry Unit Weight, kN/m^3	17.23
Area, cm^2	31.52	Specific Gravity, measured	2.96
Volume, cm^3	71.69	Solids Height, cm	1.350
Water Content, %	18.76	Volume of Solids, cm^3	42.56
Wet Mass, g	149.61	Volume of Voids, cm^3	29.13
Dry Mass, g	125.98		

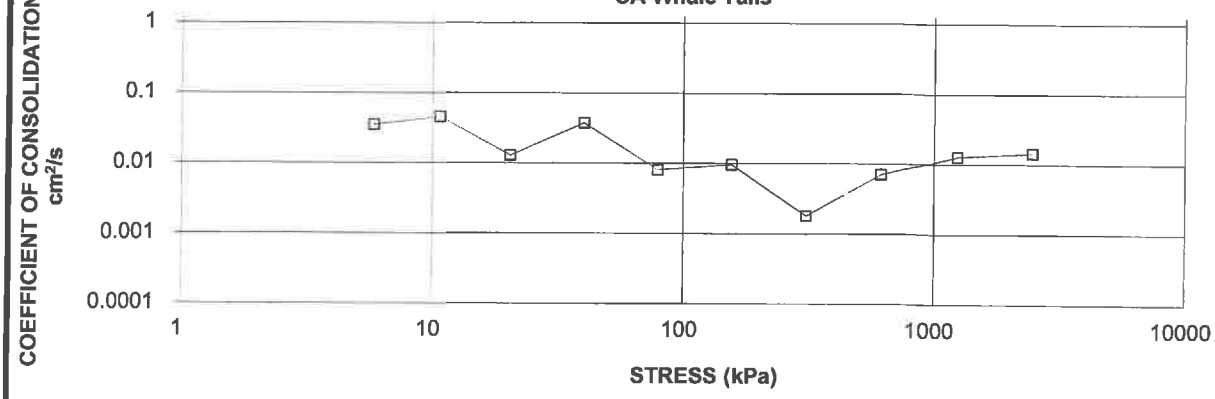
Prepared By: LH

Golder Associates

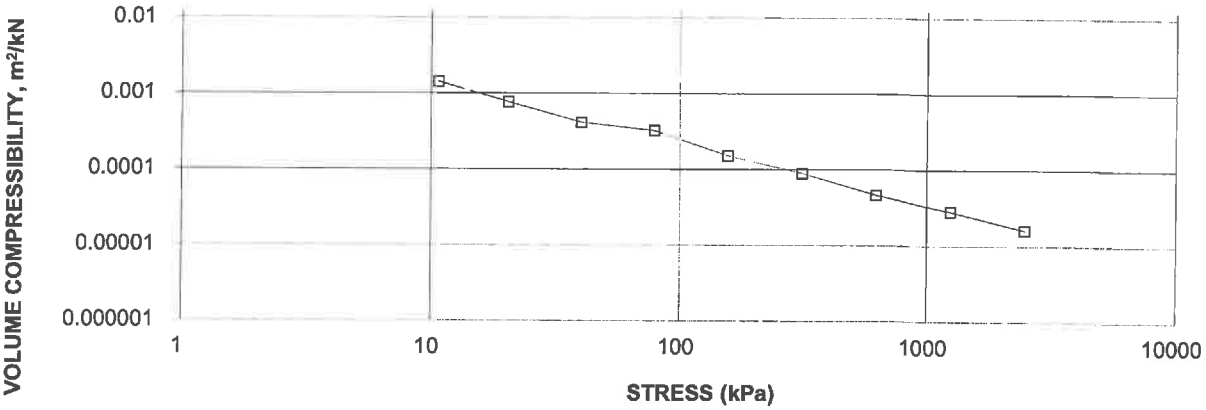
Checked By:

CONSOLIDATION TEST SUMMARY	FIGURE

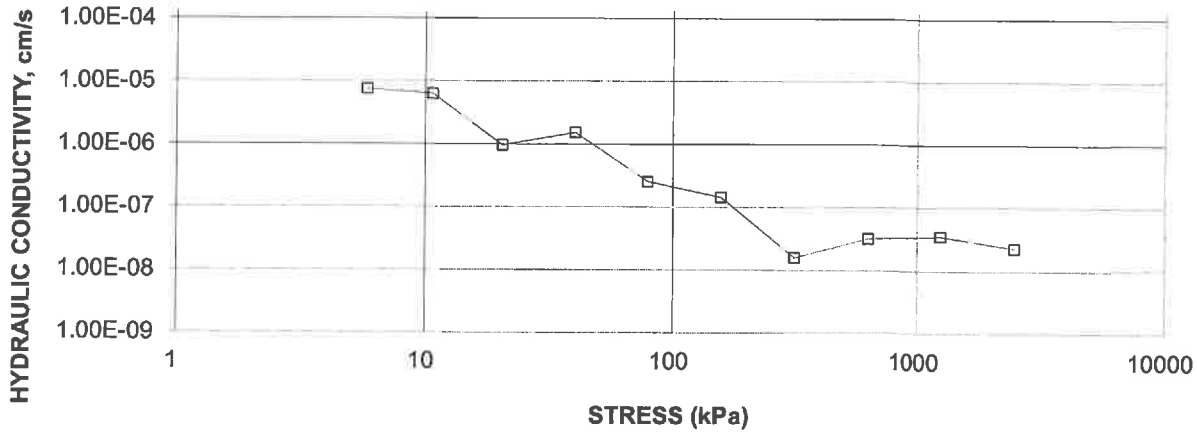
CONSOLIDATION TEST
CV cm^2/s VS STRESS (kPa)
SA Whale Tails



CONSOLIDATION TEST
MV m^2/kN vs STRESS (kPa)
SA Whale Tails



CONSOLIDATION TEST
HYDRAULIC CONDUCTIVITY vs STRESS
SA Whale Tails

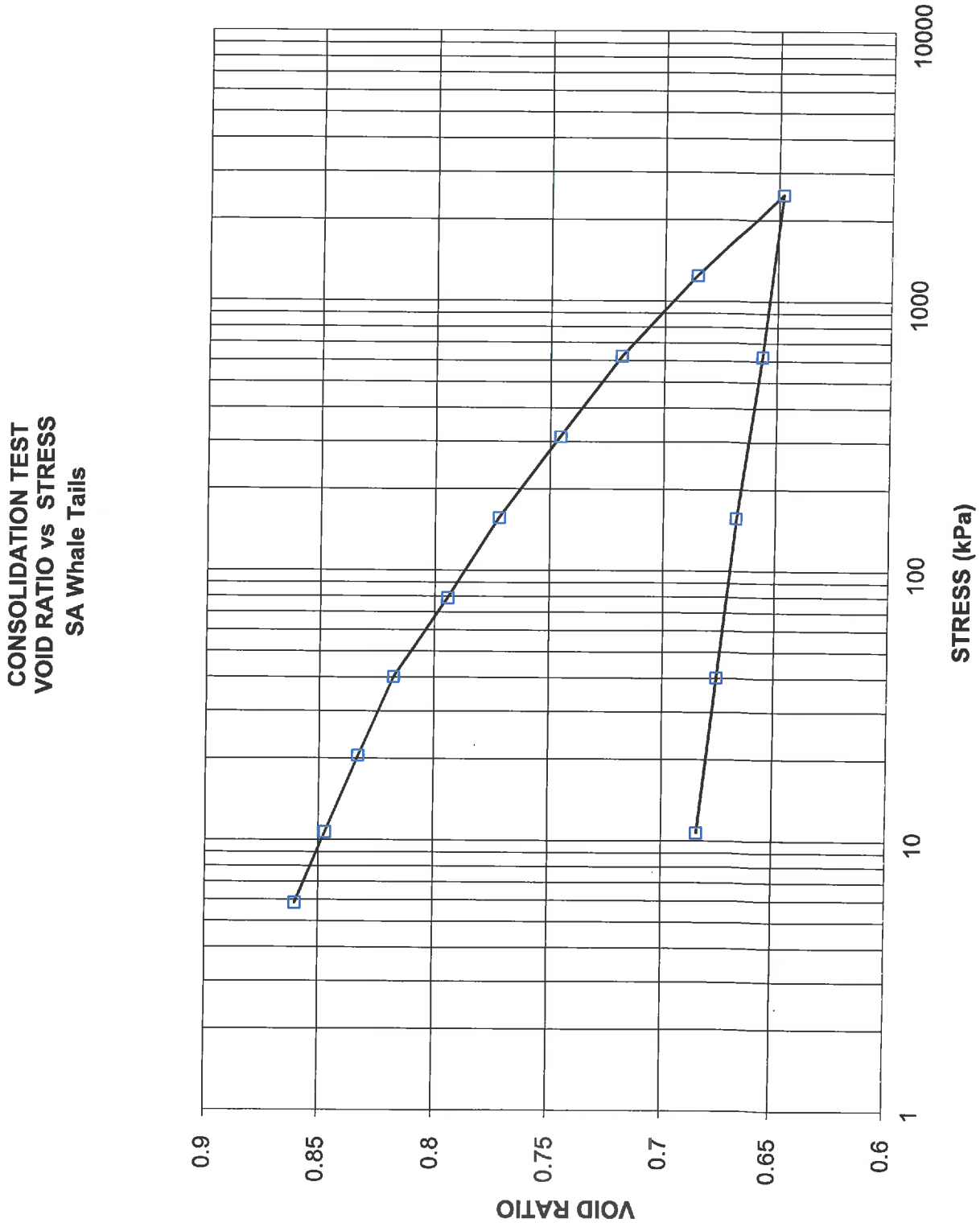


Project No. 1775467
Prepared By: LH

Golder Associates

Checked By:

CONSOLIDATION TEST VOID RATIO VS LOG STRESS	FIGURE



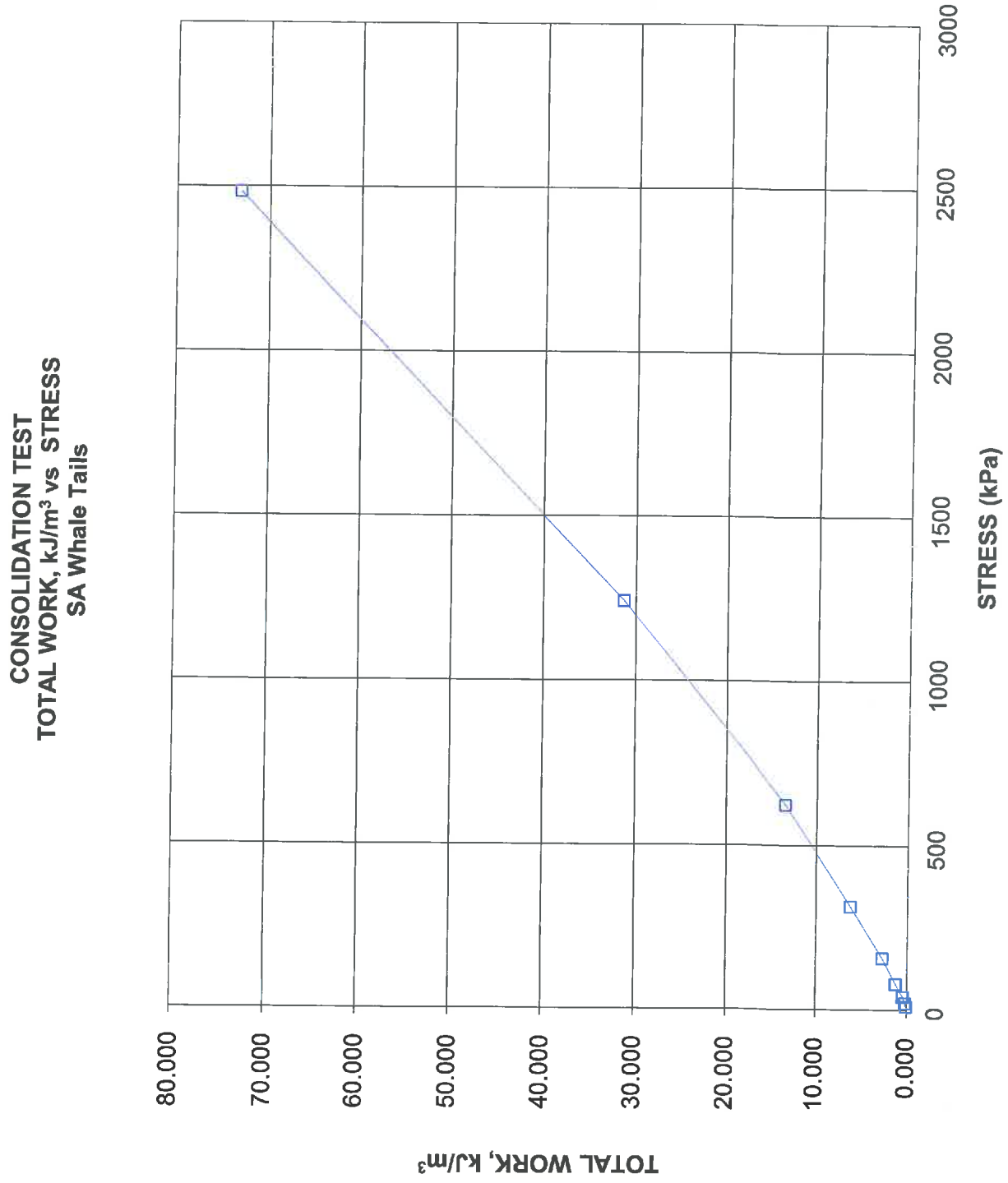
Project No. 1775467

Prepared By: LH

Golder Associates

Checked By:

CONSOLIDATION TEST TOTAL WORK VS STRESS	FIGURE



Project No. 1775467

Prepared By: LH

Golder Associates

Checked By:

HYDRAULIC CONDUCTIVITY TEST

ASTM D 5084 (CONSTANT HEAD)

SAMPLE IDENTIFICATION

PROJECT NUMBER	1775467	SAMPLE	Whale Tails
PROJECT TITLE	AEM/Amaruq/Lab Testing	SAMPLE DEPTH, m	-
BOREHOLE NUMBER	-	DATE	July 19 2017

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)

SAMPLE HEIGHT, cm	9.91	UNIT WEIGHT, kN/m^3	21.08
SAMPLE DIAMETER, cm	4.96	DRY UNIT WEIGHT, kN/m^3	16.30
SAMPLE AREA, cm^2	19.30	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	191.36	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	411.30	VOLUME OF VOIDS, cm^3	73.54
DRY MASS, g	318.12	VOID RATIO	0.62
WATER CONTENT, %	29.3		

SATURATION STAGE

CELL PRESSURE, kPa	140.00	EFFECTIVE CONSOLIDATION STRESS,	10
HEAD PRESSURE, kPa	130.00	DURATION, min	5,371
BACK PRESSURE, kPa	130.00	B COEFFICIENT	0.96

CONSOLIDATION STAGE

CELL PRESSURE, kPa	753.00	EFFECTIVE CONSOLIDATION STRESS,	600
HEAD PRESSURE, kPa	153.00	DURATION, min	1,157
BACK PRESSURE, kPa	153.00	VOLUME CHANGE, cm^3	2.90
		DRAINAGE	Top and Bottom

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)

SAMPLE HEIGHT, cm	9.86	SAMPLE AREA, cm^2	19.11
SAMPLE DIAMETER, cm	4.93	SAMPLE VOLUME, cm^3	188.47

HYDRAULIC CONDUCTIVITY STAGE

CELL PRESSURE, kPa	771	EFFECTIVE CONSOLIDATION STRESS,	600
HEAD PRESSURE, kPa	171	DURATION, min	818
BACK PRESSURE, kPa	153	HYDRAULIC GRADIENT, i	19

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)

SAMPLE HEIGHT, cm	9.86	UNIT WEIGHT, kN/m^3	19.52
SAMPLE DIAMETER, cm	4.93	DRY UNIT WEIGHT, kN/m^3	16.55
SAMPLE AREA, cm^2	19.11	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	188.47	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	375.06	VOLUME OF VOIDS, cm^3	70.65
DRY MASS, g	318.12	VOID RATIO	0.60
WATER CONTENT, %	17.9		

TEST RESULTS

ELAPSED TIME TO STEADY STATE FLOW (min)	0.0
DURATION OF STEADY STATE FLOW (min)	818
INFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	117.8
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	118.3
INFLOW TO OUTFLOW RATIO	1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)	6.75E-06
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)	6.78E-06
HYDRAULIC CONDUCTIVITY, K, cm/s	6.77E-06
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K_{20}, cm/s	**6.30E-06**

NOTES:

Effective consolidation stress assigned, by the client.

PERMEANT FLUID	Deaired tap water
AVERAGE TEST TEMPERATURE	23.0 °C

Prepared By: LH

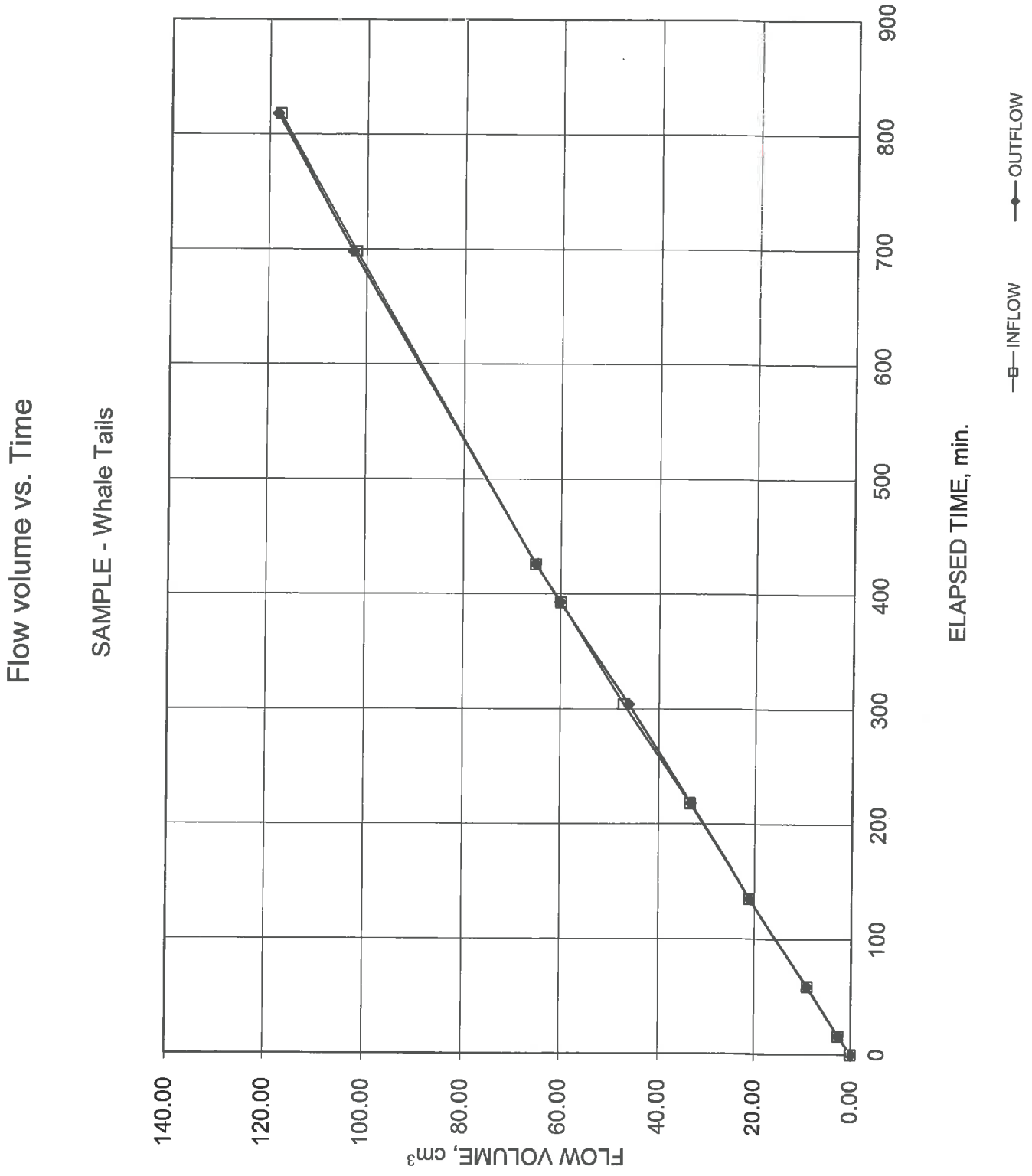
Golder Associates

Checked By:

HYDRAULIC CONDUCTIVITY TEST

July 19 2017

Project title: AEM/Amaruq/Lab Testing
Borehole number: -
Sample depth: -



Project number : 1775467
Prepared by : LH

Golder Associates

Checked by : MM

HYDRAULIC CONDUCTIVITY TEST

ASTM D 5084 (CONSTANT HEAD)

SAMPLE IDENTIFICATION

PROJECT NUMBER	1775467	SAMPLE	Whale Tails
PROJECT TITLE	AEM/Amaruq/Lab Testing	SAMPLE DEPTH, m	-
BOREHOLE NUMBER	-	DATE	July 12 2017

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)

SAMPLE HEIGHT, cm	9.96	UNIT WEIGHT, kN/m^3	20.77
SAMPLE DIAMETER, cm	4.98	DRY UNIT WEIGHT, kN/m^3	16.07
SAMPLE AREA, cm^2	19.49	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	194.16	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	411.30	VOLUME OF VOIDS, cm^3	76.33
DRY MASS, g	318.12	VOID RATIO	0.65
WATER CONTENT, %	29.3		

SATURATION STAGE

CELL PRESSURE, kPa	140.00	EFFECTIVE CONSOLIDATION STRESS,	10
HEAD PRESSURE, kPa	130.00	DURATION, min	5,371
BACK PRESSURE, kPa	130.00	B COEFFICIENT	0.96

CONSOLIDATION STAGE

CELL PRESSURE, kPa	443.00	EFFECTIVE CONSOLIDATION STRESS,	300
HEAD PRESSURE, kPa	143.00	DURATION, min	1,157
BACK PRESSURE, kPa	143.00	VOLUME CHANGE, cm^3	2.80
		DRAINAGE	Top and Bottom

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)

SAMPLE HEIGHT, cm	9.91	SAMPLE AREA, cm^2	19.30
SAMPLE DIAMETER, cm	4.96	SAMPLE VOLUME, cm^3	191.36

HYDRAULIC CONDUCTIVITY STAGE

CELL PRESSURE, kPa	453	EFFECTIVE CONSOLIDATION STRESS,	300
HEAD PRESSURE, kPa	153	DURATION, min	687
BACK PRESSURE, kPa	143	HYDRAULIC GRADIENT, i	10

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)

SAMPLE HEIGHT, cm	9.91	UNIT WEIGHT, kN/m^3	19.22
SAMPLE DIAMETER, cm	4.96	DRY UNIT WEIGHT, kN/m^3	16.30
SAMPLE AREA, cm^2	19.30	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	191.36	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	375.06	VOLUME OF VOIDS, cm^3	73.54
DRY MASS, g	318.12	VOID RATIO	0.62
WATER CONTENT, %	17.9		

TEST RESULTS

ELAPSED TIME TO STEADY STATE FLOW (min)	0.0
DURATION OF STEADY STATE FLOW (min)	687
INFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	70.5
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	70.4
INFLOW TO OUTFLOW RATIO	1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)	8.60E-06
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)	8.60E-06
HYDRAULIC CONDUCTIVITY, K, cm/s	8.60E-06
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K_{20}, cm/s	**8.01E-06**

NOTES:

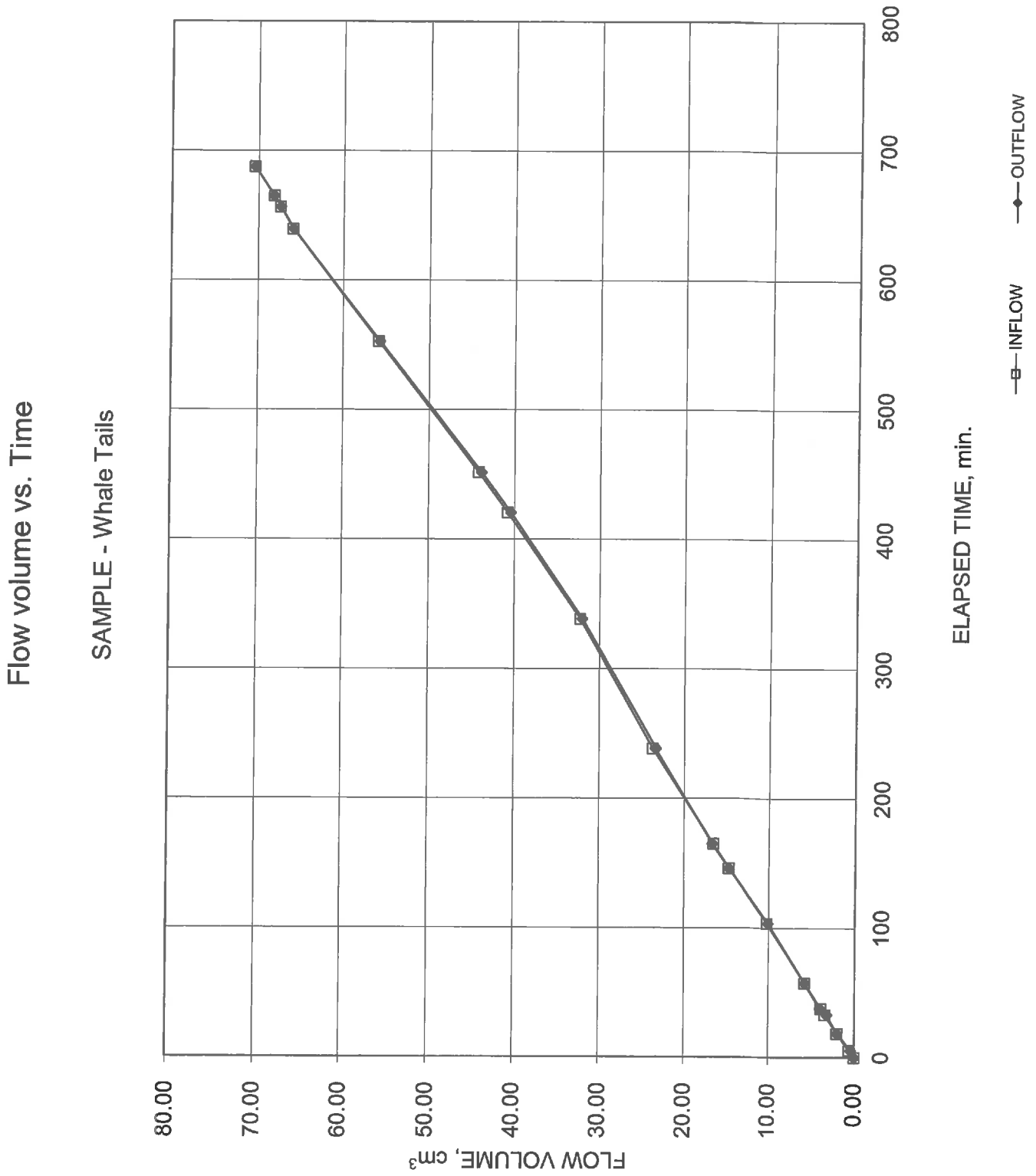
Effective consolidation stress assigned, by the client.

PERMEANT FLUID	Deaired tap water
AVERAGE TEST TEMPERATURE	23.0 °C

HYDRAULIC CONDUCTIVITY TEST

July 12 2017

Project title: AEM/Amaruq/Lab Testing
Borehole number: -
Sample depth: -



Project number : 1775467
Prepared by : LH

Golder Associates

Checked by : MM

HYDRAULIC CONDUCTIVITY TEST

ASTM D 5084 (CONSTANT HEAD)

SAMPLE IDENTIFICATION

PROJECT NUMBER	1775467	SAMPLE	Whale Tails
PROJECT TITLE	AEM/Amaruq/Lab Testing	SAMPLE DEPTH, m	-
BOREHOLE NUMBER	-	DATE	July 5 2017

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)

SAMPLE HEIGHT, cm	10.00	UNIT WEIGHT, kN/m^3	20.54
SAMPLE DIAMETER, cm	5.00	DRY UNIT WEIGHT, kN/m^3	15.89
SAMPLE AREA, cm^2	19.63	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	196.35	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	411.30	VOLUME OF VOIDS, cm^3	78.53
DRY MASS, g	318.12	VOID RATIO	0.67
WATER CONTENT, %	29.3		

SATURATION STAGE

CELL PRESSURE, kPa	140.00	EFFECTIVE CONSOLIDATION STRESS,	10
HEAD PRESSURE, kPa	130.00	DURATION, min	5,371
BACK PRESSURE, kPa	130.00	B COEFFICIENT	0.96

CONSOLIDATION STAGE

CELL PRESSURE, kPa	230.00	EFFECTIVE CONSOLIDATION STRESS,	100
HEAD PRESSURE, kPa	130.00	DURATION, min	1,403
BACK PRESSURE, kPa	130.00	VOLUME CHANGE, cm^3	2.20
		DRAINAGE	Top and Bottom

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)

SAMPLE HEIGHT, cm	9.96	SAMPLE AREA, cm^2	19.49
SAMPLE DIAMETER, cm	4.98	SAMPLE VOLUME, cm^3	194.16

HYDRAULIC CONDUCTIVITY STAGE

CELL PRESSURE, kPa	243	EFFECTIVE CONSOLIDATION STRESS,	100
HEAD PRESSURE, kPa	143	DURATION, min	721
BACK PRESSURE, kPa	130	HYDRAULIC GRADIENT, i	13

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)

SAMPLE HEIGHT, cm	9.96	UNIT WEIGHT, kN/m^3	18.94
SAMPLE DIAMETER, cm	4.98	DRY UNIT WEIGHT, kN/m^3	16.07
SAMPLE AREA, cm^2	19.49	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm^3	194.16	VOLUME OF SOLIDS, cm^3	117.82
TOTAL MASS, g	375.06	VOLUME OF VOIDS, cm^3	76.33
DRY MASS, g	318.12	VOID RATIO	0.65
WATER CONTENT, %	17.9		

TEST RESULTS

ELAPSED TIME TO STEADY STATE FLOW (min)	0.0
DURATION OF STEADY STATE FLOW (min)	721
INFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	148.0
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm^3)	148.5
INFLOW TO OUTFLOW RATIO	1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)	1.32E-05
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)	1.32E-05
HYDRAULIC CONDUCTIVITY, K, cm/s	1.32E-05
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K_{20}, cm/s	**1.23E-05**

NOTES:

Effective consolidation stress assigned, by the client.

PERMEANT FLUID	Deaired tap water
AVERAGE TEST TEMPERATURE	23.0 °C

Prepared By: LH

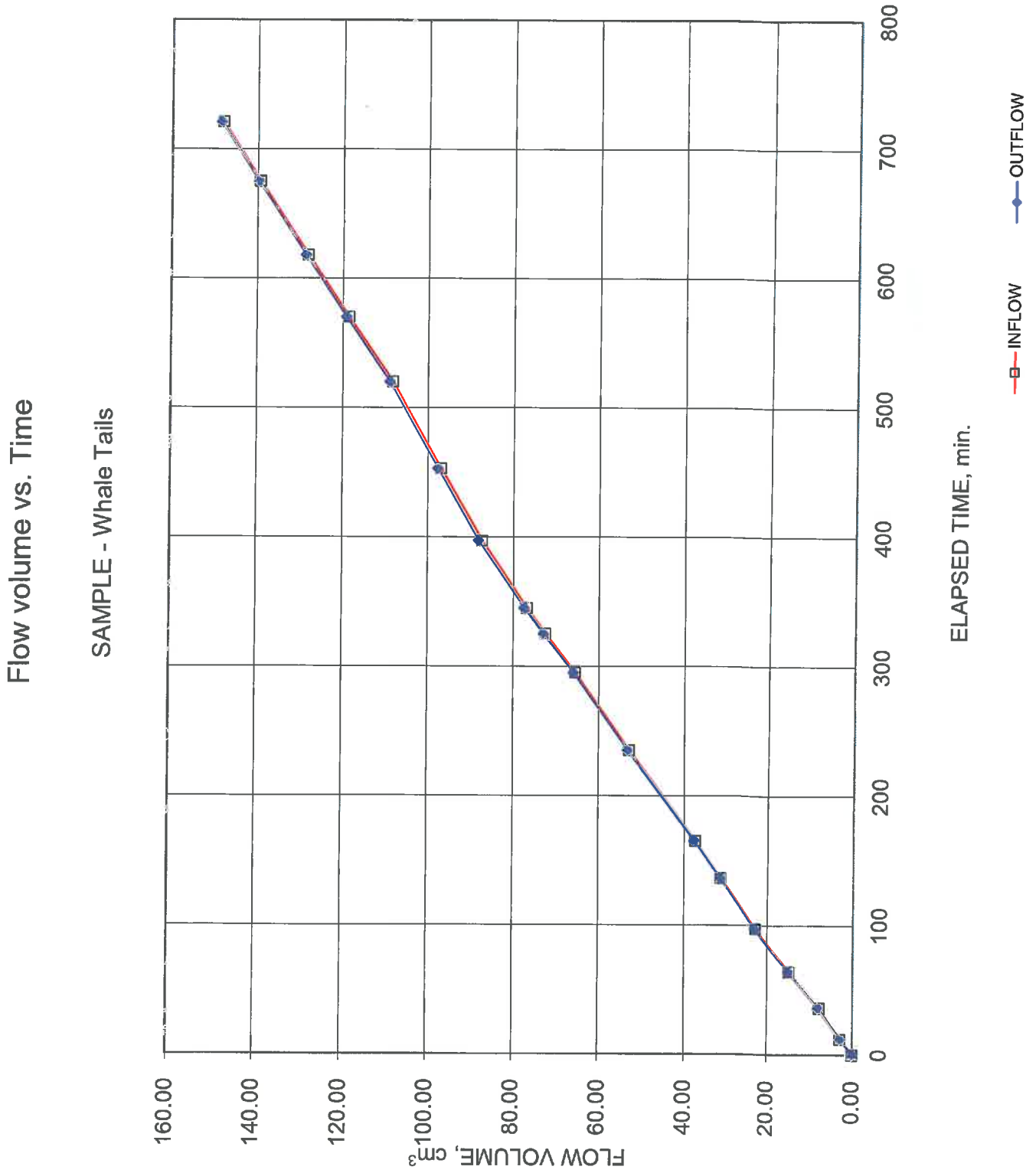
Golder Associates

Checked By: lab

HYDRAULIC CONDUCTIVITY TEST

July 5 2017

Project title: AEM/Amaruq/Lab Testing
Borehole number: -
Sample depth: -



Project number : 1775467
Prepared by : LH

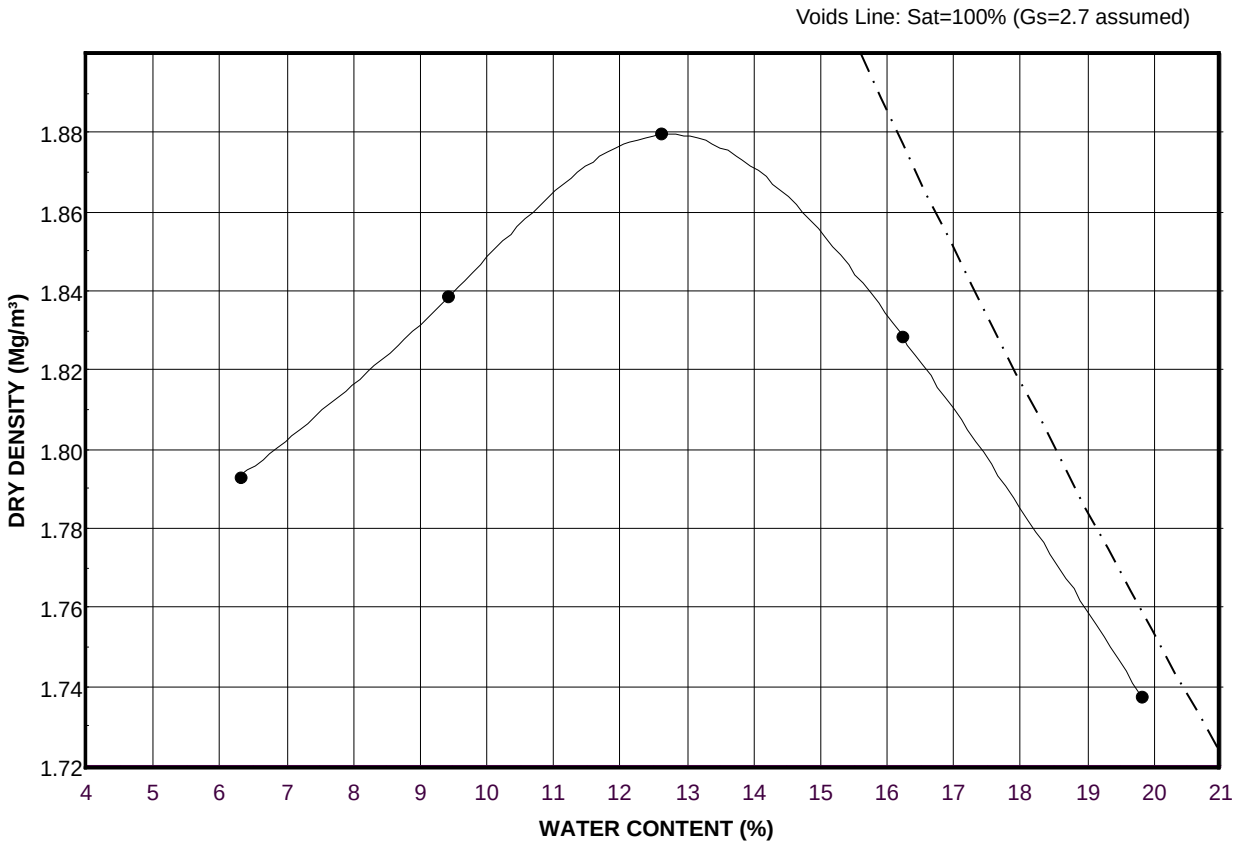
Golder Associates

Checked by : MM

LABORATORY COMPACTION TEST

MTO LS-706 Method A

FIGURE



Standard
Proctor Test Results

Sample ID:
Whale Tails

Max Dry Density:
1.880 Mg/m³

Optimum Water
Content: 12.6%

Natural Water
Content: 63.7%

Project Number: 1775467
Checked By: _____

Golder Associates

LABID: 17-481
Date: 13-Jul-17

THERMAL CONDUCTIVITY TEST

Project #: 1775467 Phase: 4000
Short Title: AEM Amaruq Lab Testing
Tested By: D.B. Date: August 3, 2017

Measurements obtained using a KD2 Pro Thermal Properties Analyzer (Decagon Devices)

Sample: Whale Tail Tailings (SL5580) (room temperature)

	Thermal Conductivity $W\ m^{-1}\ K^{-1}$	Temperature ^oC
1)	1.740	22.22
2)	1.821	22.02
3)	1.854	21.97

Measurements made on material prepared at water content = 30.5% and dry density = 1559 kg/m^3.

Sample: Whale Tail Tailings (SL5580) (frozen)

	Thermal Conductivity $W\ m^{-1}\ K^{-1}$	Temperature ^oC
1)	3.017	-13.56
2)		
3)		

Measurements made on specimen from above, after freezing at -13^{o}C for 24hrs.

Comments:

The testing services reported herein have been performed in accordance with the indicated recognized standard, or in accordance with local industry practice. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability. Engineering interpretation can be provided by Golder Associates Ltd. upon request.

1721 8th Street E.,
Saskatoon, Saskatchewan, S7H 0T4

Reviewed by:

SOIL-WATER CHARACTERISTIC CURVE

Project #:	1775467	Phase:	4000
Short Title:	AEM Amaruq Lab Testing		
Tested By:	D.B.	Date:	August 2, 2017
Sample:	Whale Tail Tailings (SL5580)		

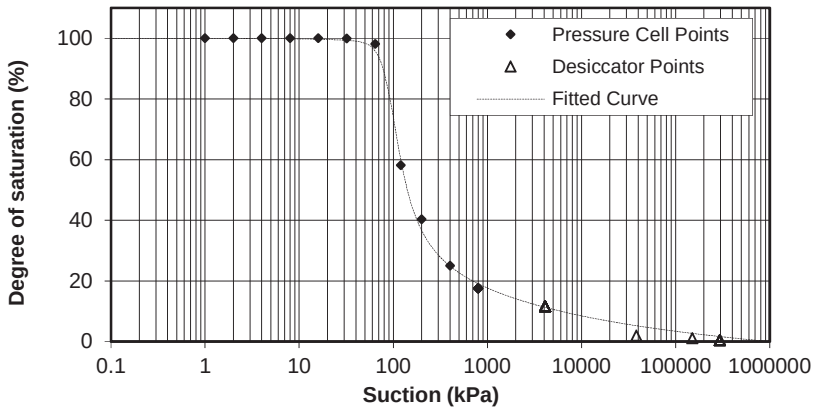
Test Results:

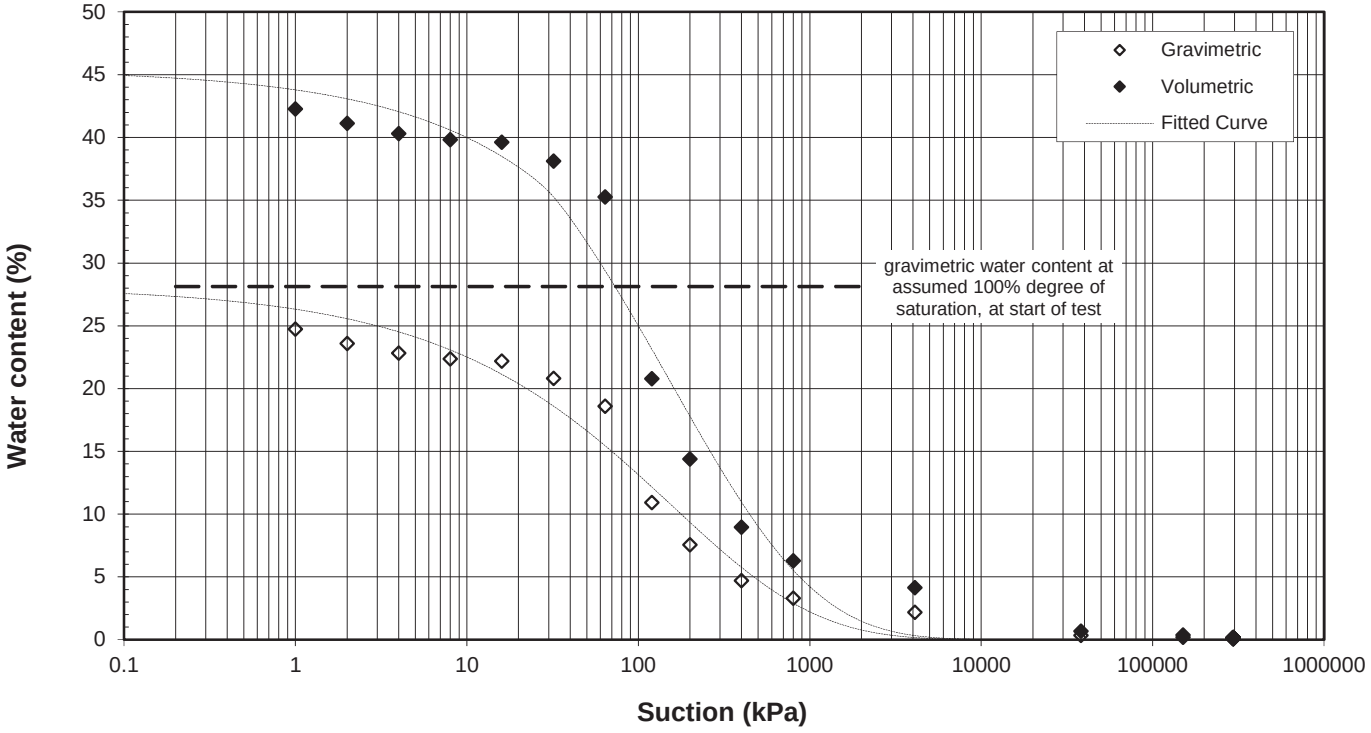
Suction	Water Content (%)	
(kPa)	Gravimetric	Volumetric
1.0	24.7	42.3
2.0	23.6	41.1
4.0	22.8	40.3
8.0	22.4	39.8
16	22.2	39.6
32	20.8	38.1
64	18.6	35.3
120	10.9	20.8
200	7.6	14.4
400	4.7	9.0
800	3.3	6.3
4100	2.2	4.1
38200	0.4	0.7
150300	0.2	0.4
295000	0.1	0.2

Sample Data:

Diameter:	63.8	mm (initial)
Height:	31.1	mm (initial)
Initial Water Content:	29.5	% (gravimetric)
Dry Density:	1615	kg/m^3 (initial)
Specific Gravity:	2.96	(provided)
Material used passing:	4.75	mm sieve

Comments: specimen was set up as initially saturated. Some shrinkage occurred during drying.





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Saskatoon, Saskatchewan, S7H 0T4

Reviewed by:

SHRINKAGE CURVE TEST

Project #: 1775467 Phase: 4000
Short Title: AEM Amaruq Lab Testing
Tested By: D.B. Date: August 2, 2017
Sample: Whale Tail Tailings (SL5580)

Test Results: Specific Gravity: 2.96 (provided)

Specimen: 1

Reading:	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Elapsed time (days):	0.0	0.0	0.1	0.8	0.8	1.0	1.1	1.8	1.9	2.1	2.7	2.9	3.1	3.8
Mass (g):	29.7	29.4	29.0	28.9	28.5	27.9	27.4	24.8	24.1	23.6	22.9	22.9	22.9	22.9
Volume (cm^3):	14.8	14.4	13.6	13.6	13.3	12.8	12.4	12.2	12.3	12.3	12.2	12.2	12.1	12.3
Water content (%):	30.0	28.4	26.6	26.4	24.6	22.1	19.8	8.2	5.3	3.1	0.3	0.2	0.2	0.0
Dry density (kg/m^3):	1550	1592	1679	1681	1720	1782	1851	1877	1856	1868	1878	1872	1889	1864
Void ratio:	0.91	0.86	0.76	0.76	0.72	0.66	0.60	0.58	0.59	0.58	0.58	0.58	0.57	0.59

Specimen: 2

Reading:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Elapsed time (days):	0.0	0.0	0.1	0.8	1.0	1.1	1.9	2.1	2.7	2.9	3.1	3.7	4.1	4.7	5.1	6.1
Mass (g):	29.5	29.2	28.8	28.3	27.8	27.3	26.7	26.1	26.0	25.5	24.6	23.1	22.8	22.7	22.7	22.7
Volume (cm^3):	14.8	14.3	13.7	13.4	13.0	12.4	12.0	12.1	12.0	12.0	12.0	12.1	12.1	12.0	12.0	12.1
Water content (%):	30.3	28.9	27.1	24.9	22.6	20.4	17.7	15.1	14.9	12.5	8.5	1.8	0.4	0.3	0.3	0.0
Dry density (kg/m^3):	1531	1589	1658	1687	1745	1822	1893	1871	1885	1887	1884	1865	1872	1887	1888	1871
Void ratio:	0.93	0.86	0.78	0.76	0.70	0.62	0.56	0.58	0.57	0.57	0.57	0.59	0.58	0.57	0.57	0.58

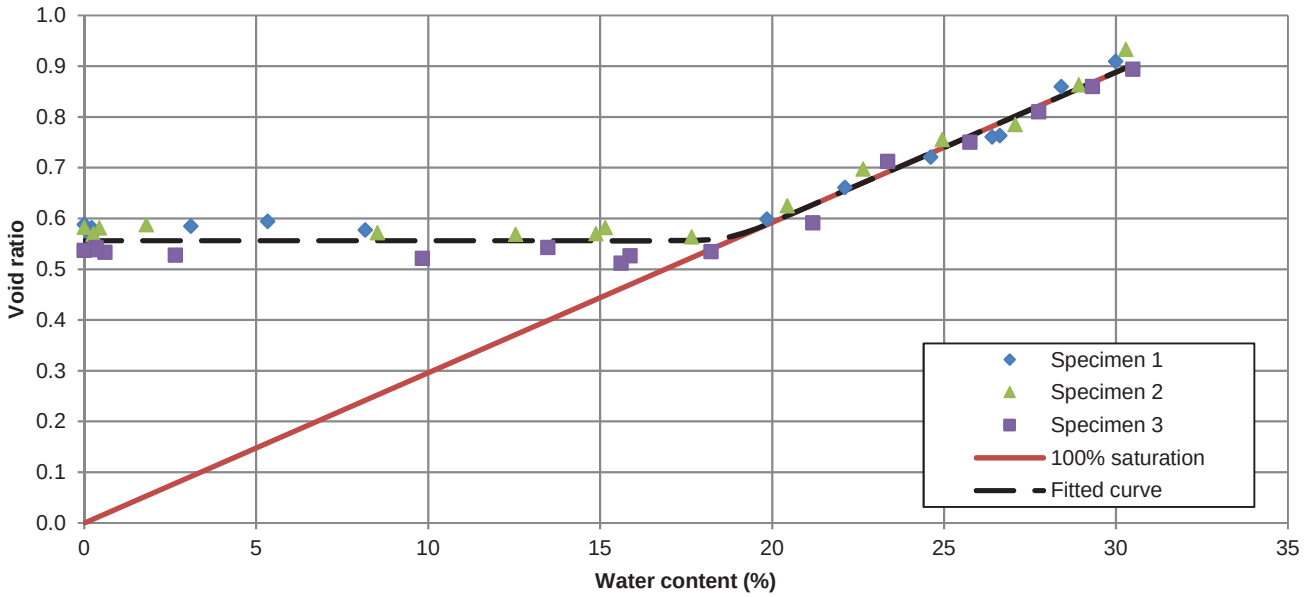
Specimen: 3

Reading:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Elapsed time (days):	0.0	0.0	0.1	0.8	1.0	1.1	1.9	2.0	2.7	2.9	3.1	3.7	4.1	4.7	5.1	6.1
Mass (g):	30.0	29.7	29.4	28.9	28.4	27.9	27.2	26.6	26.6	26.1	25.3	23.6	23.1	23.1	23.1	23.0
Volume (cm^3):	14.7	14.4	14.1	13.6	13.3	12.4	11.9	11.9	11.7	12.0	11.8	11.9	11.9	12.0	11.9	11.9
Water content (%):	30.5	29.3	27.8	25.8	23.4	21.2	18.2	15.9	15.6	13.5	9.8	2.7	0.6	0.3	0.3	0.0
Dry density (kg/m^3):	1563	1592	1635	1691	1729	1861	1930	1939	1958	1919	1946	1938	1931	1919	1925	1926
Void ratio:	0.89	0.86	0.81	0.75	0.71	0.59	0.53	0.53	0.51	0.54	0.52	0.53	0.53	0.54	0.54	0.54

Comments:

Shrinkage Limit: 19
Minimum Void Ratio: 0.56

Summary Shrinkage Curve Graph



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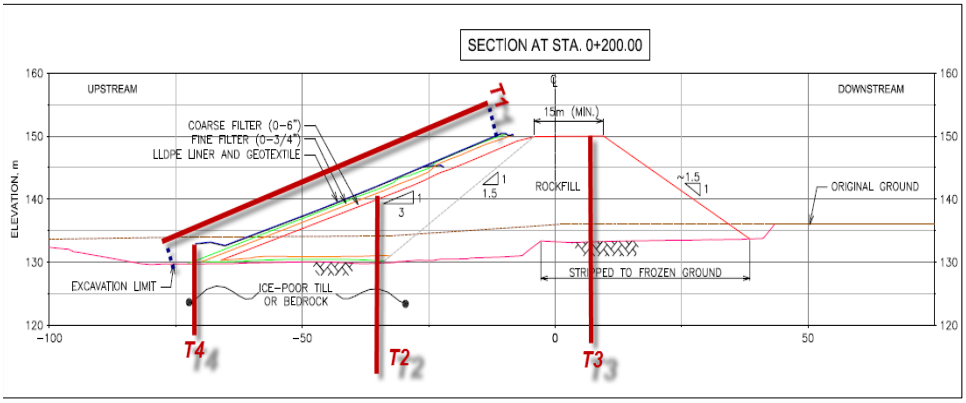
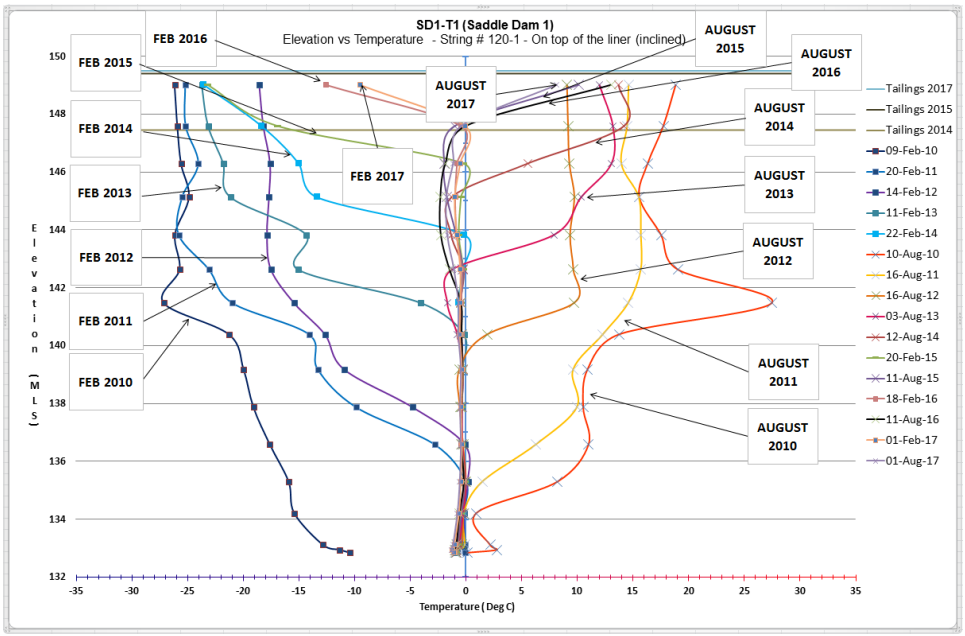
Reviewed by:

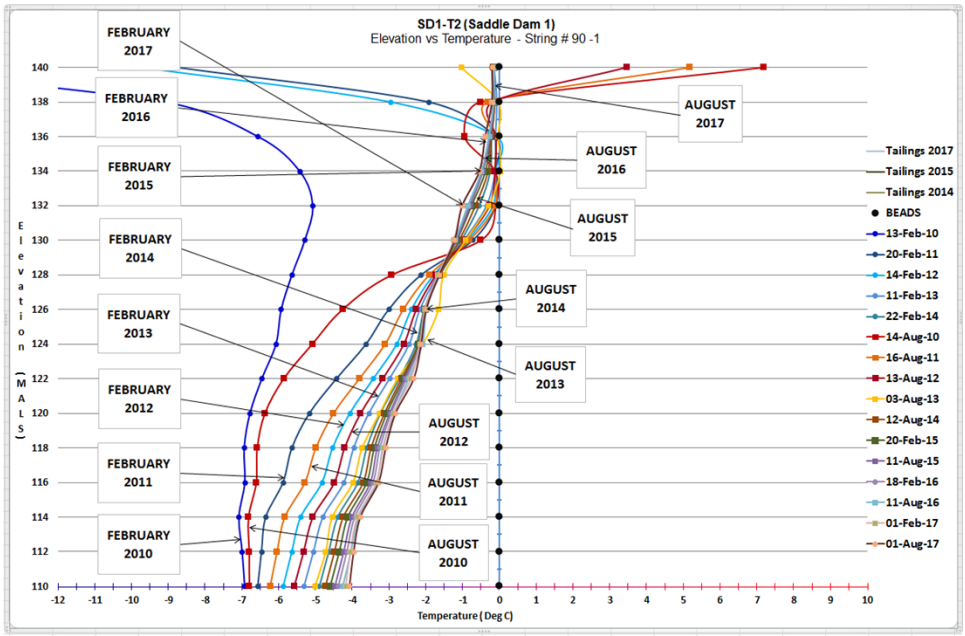
APPENDIX F

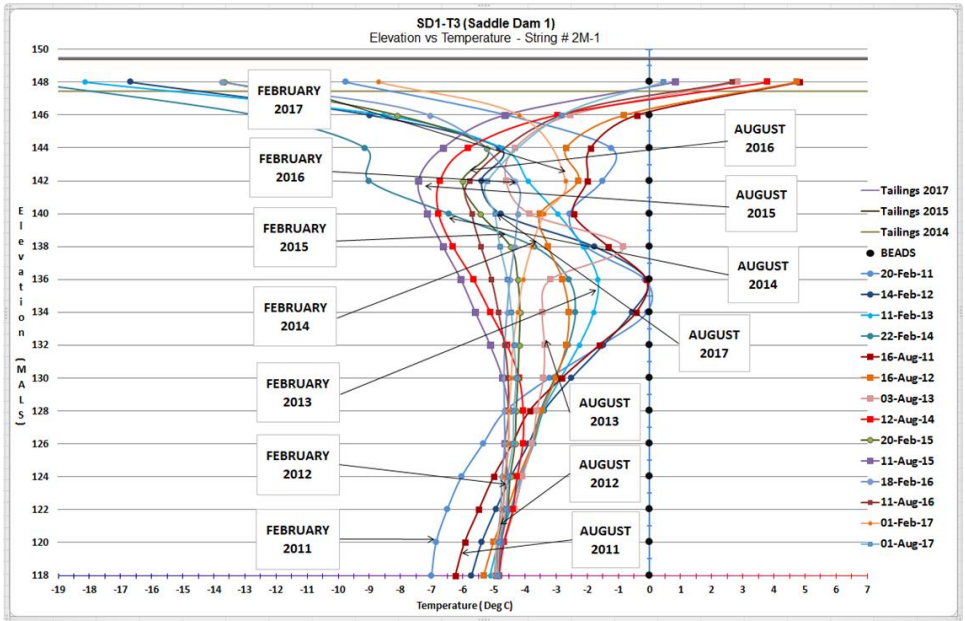
Thermistor Data

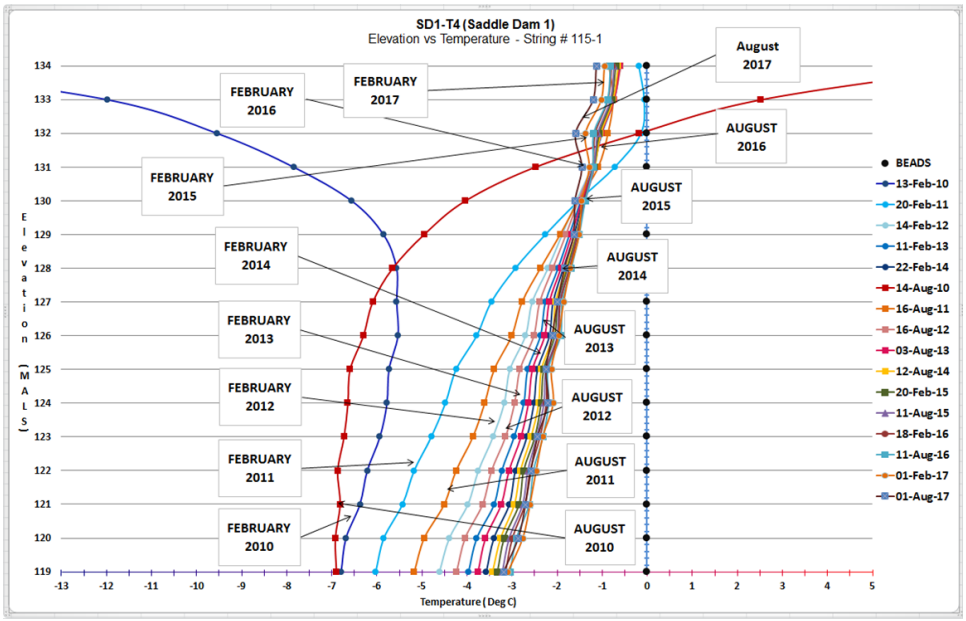
Saddle Dam 1 Thermistors



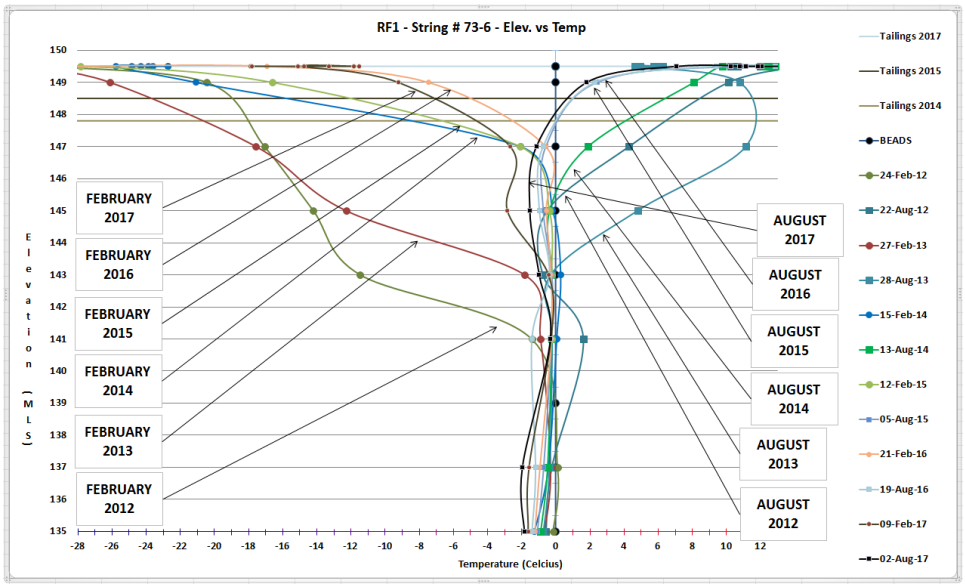



SD1-T2 (Saddle Dam 1)
Elevation vs Temperature - String # 90 -1
FEBRUARY 2017
FEBRUARY 2016
FEBRUARY 2015
FEBRUARY 2014
FEBRUARY 2013
FEBRUARY 2012
FEBRUARY 2011
FEBRUARY 2010
AUGUST 2017
AUGUST 2016
AUGUST 2015
AUGUST 2014
AUGUST 2013
AUGUST 2012
AUGUST 2011
AUGUST 2010
Elevation (MALS)
Temperature (Deg C)
Tailings 2017
Tailings 2015
Tailings 2014
BEADS
13-Feb-10
20-Feb-11
14-Feb-12
11-Feb-13
22-Feb-14
14-Aug-10
16-Aug-11
13-Aug-12
03-Aug-13
12-Aug-14
20-Feb-15
11-Aug-15
18-Feb-16
11-Aug-16
01-Feb-17
01-Aug-17

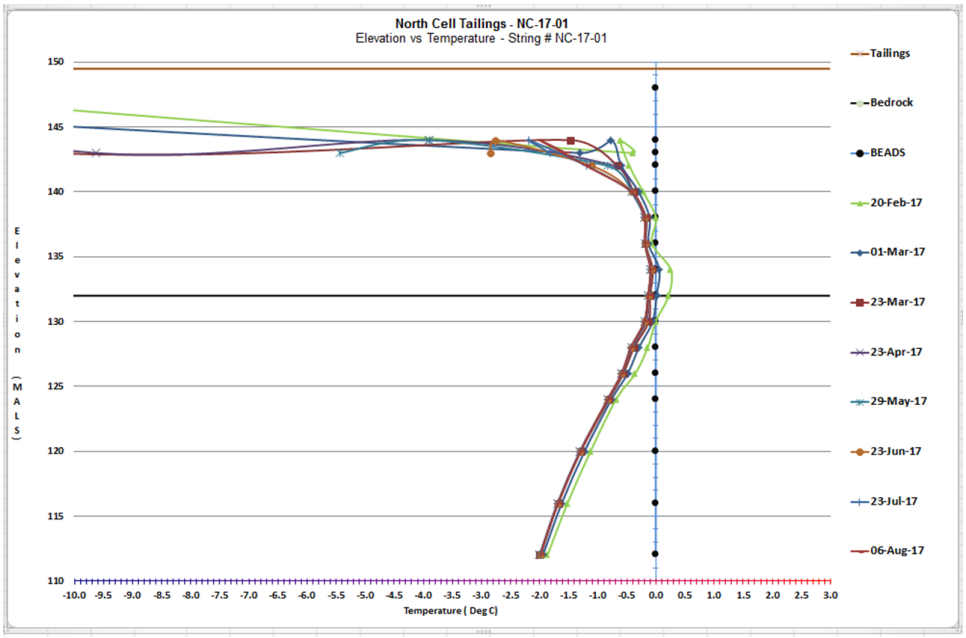

SD1-T3 (Saddle Dam 1)
Elevation vs Temperature - String # 2M-1
FEBRUARY 2017
FEBRUARY 2016
FEBRUARY 2015
FEBRUARY 2014
FEBRUARY 2013
FEBRUARY 2012
FEBRUARY 2011
AUGUST 2016
AUGUST 2015
AUGUST 2014
AUGUST 2017
AUGUST 2013
AUGUST 2012
AUGUST 2011
Elevation (MALS)
Temperature (Deg C)
Tailings 2017
Tailings 2015
Tailings 2014
BEADS
20-Feb-11
14-Feb-12
11-Feb-13
22-Feb-14
16-Aug-11
16-Aug-12
03-Aug-13
12-Aug-14
20-Feb-15
11-Aug-15
18-Feb-16
11-Aug-16
01-Feb-17
01-Aug-17

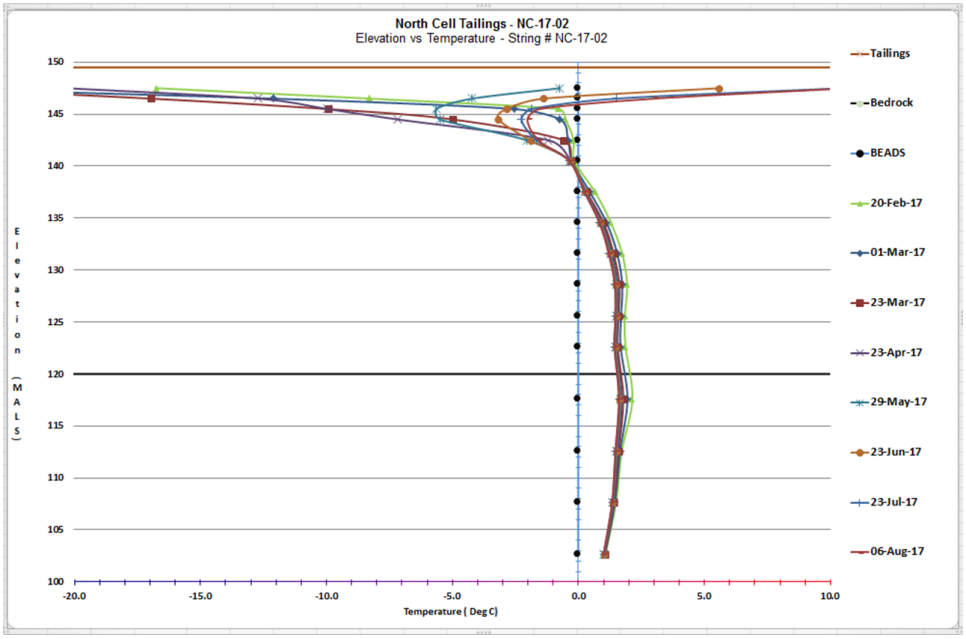


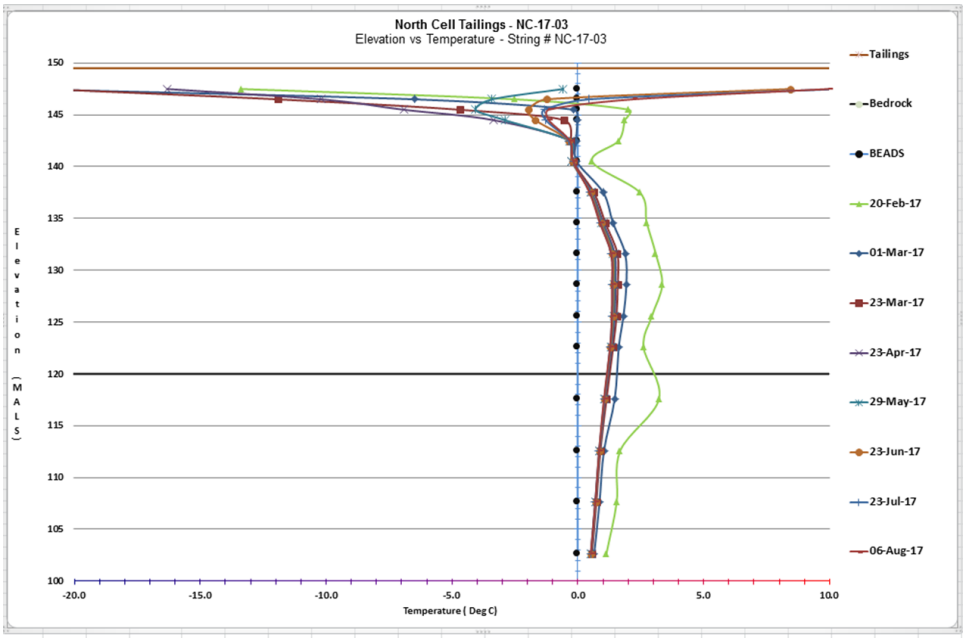
RF1 Thermistors

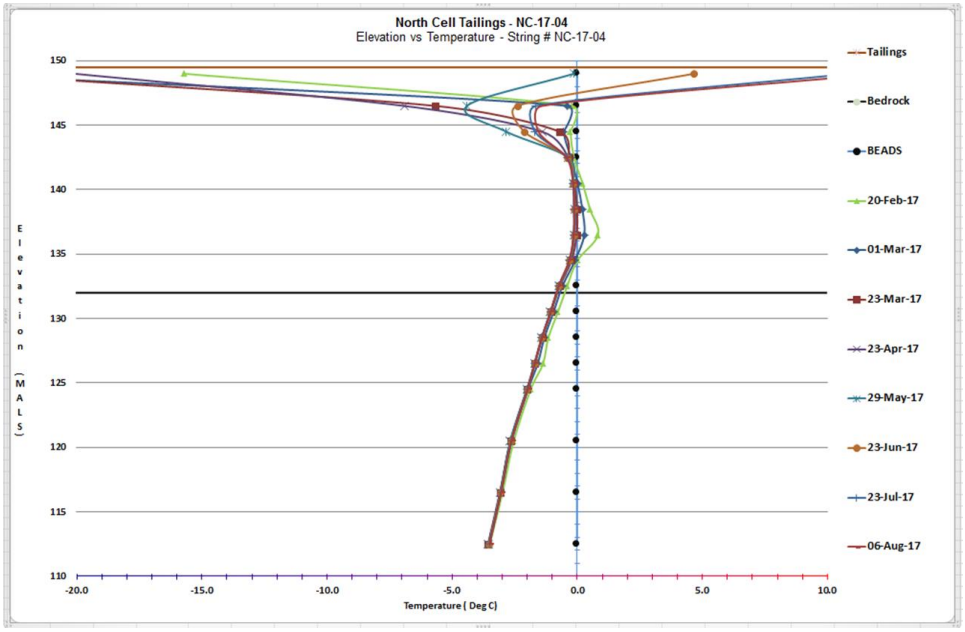


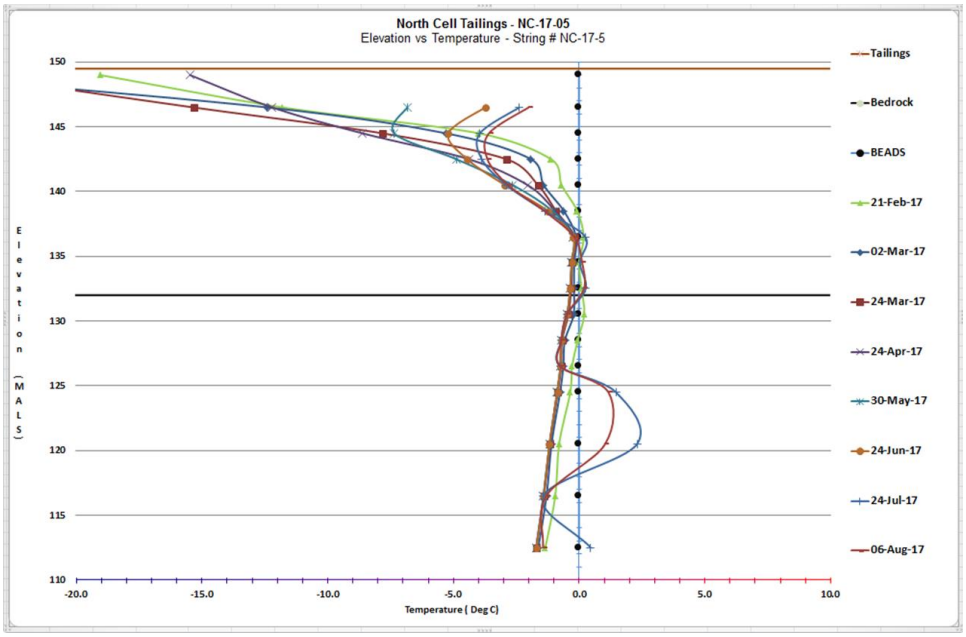
Early 2017 Thermistors

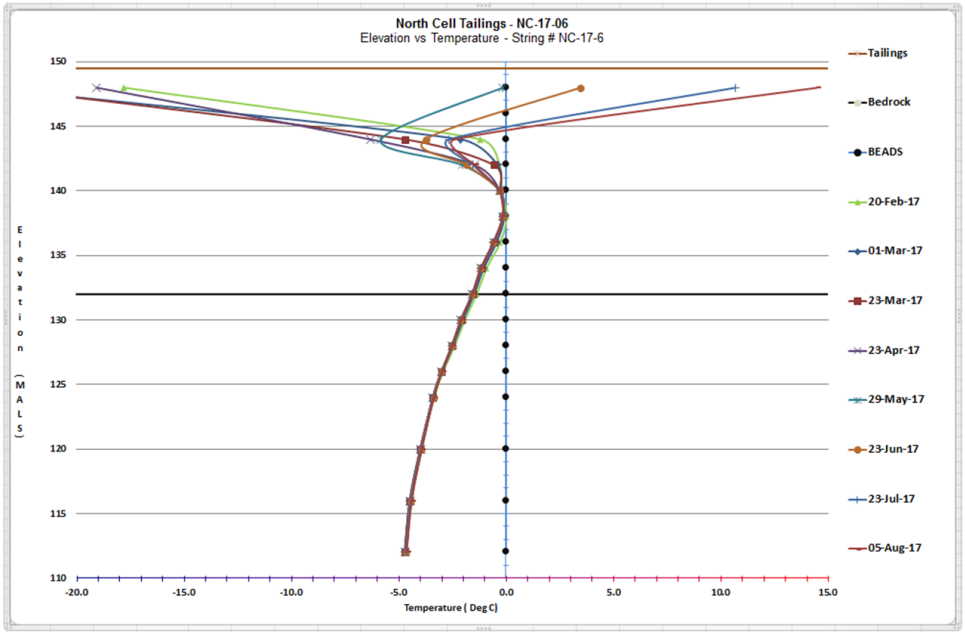

North Cell Tailings - NC-17-01
Elevation vs Temperature - String # NC-17-01
Elevation (m) MALS
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
06-Aug-17

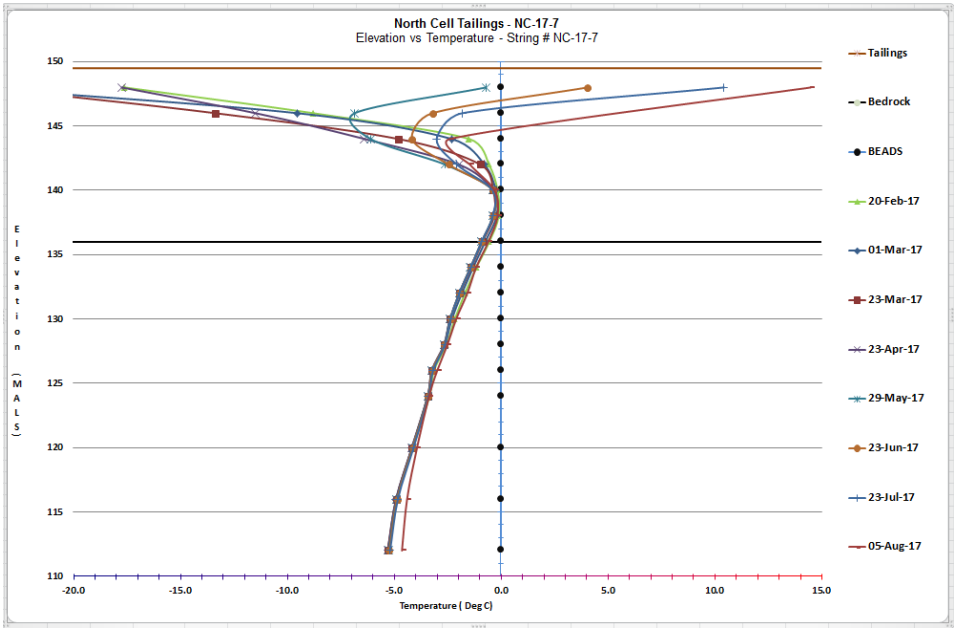

North Cell Tailings - NC-17-02
Elevation vs Temperature - String # NC-17-02
Elevation (m) MALS
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
06-Aug-17

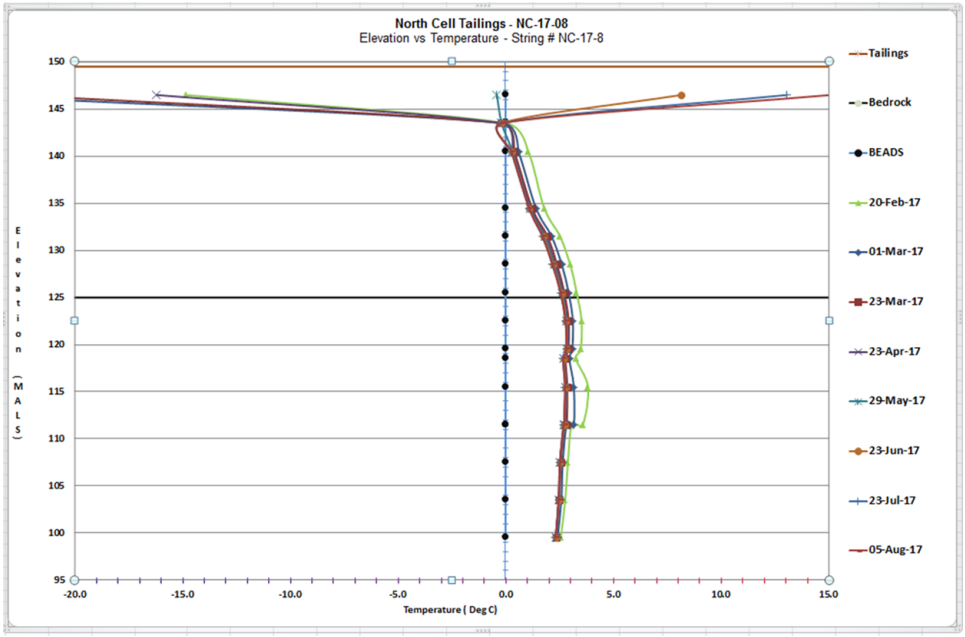

North Cell Tailings - NC-17-03
Elevation vs Temperature - String # NC-17-03
Elevation (m MALS)
150
145
140
135
130
125
120
115
110
105
100
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
06-Aug-17


North Cell Tailings - NC-17-04
Elevation vs Temperature - String # NC-17-04
Elevation (m MALS)
150
145
140
135
130
125
120
115
110
-20.0
-15.0
-10.0
-5.0
0.0
5.0
10.0
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
06-Aug-17


North Cell Tailings - NC-17-05
Elevation vs Temperature - String # NC-17-5
Elevation (m MALS)
Temperature (Deg C)
Tailings
Bedrock
BEADS
21-Feb-17
02-Mar-17
24-Mar-17
24-Apr-17
30-May-17
24-Jun-17
24-Jul-17
06-Aug-17


North Cell Tailings - NC-17-06
Elevation vs Temperature - String # NC-17-6
Elevation (m MALS)
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
05-Aug-17


North Cell Tailings - NC-17-7
Elevation vs Temperature - String # NC-17-7
Elevation (MALS)
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
05-Aug-17


North Cell Tailings - NC-17-08
Elevation vs Temperature - String # NC-17-8
Elevation (MALS)
Temperature (Deg C)
Tailings
Bedrock
BEADS
20-Feb-17
01-Mar-17
23-Mar-17
23-Apr-17
29-May-17
23-Jun-17
23-Jul-17
05-Aug-17