APPENDIX 'A'

Geotechnical Report

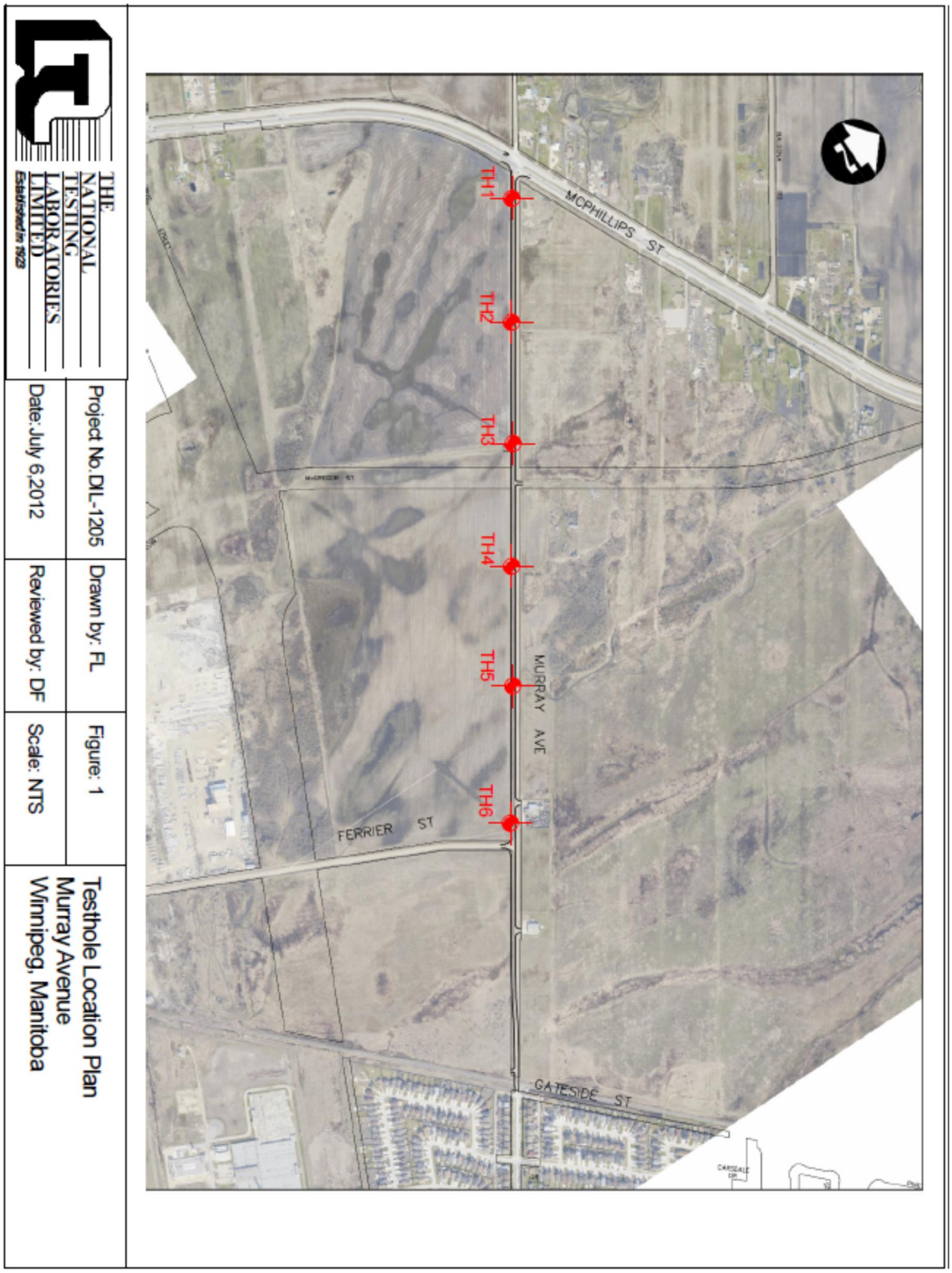
APPENDIX 'A' - GEOTECHNICAL REPORT

TABLE OF CONTENTS

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.

Geotechnical Report for Murray Avenue

Test Hole Locations



Summary of Core Samples

MURRAY AVENUE
GEOTECHNICAL INVESTIGATION

Testhole ID	Testhole Location (GPS Coordinates)	Pavement Surface		Soil Description	Sample Depth (m)	Moisture Content (%)	Particle Size Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
TH1	634041 m E, 5536764 m N	50 mm Crushed Limestone	300	-	-	-	-	-	-	-	-	-	-
TH2	634273 m E, 5536617 m N	50 mm Crushed Limestone	250	-	-	-	-	-	-	-	-	-	-
TH3	634493 m E, 5536482 m N	50 mm Crushed Limestone	200	Clay	0.9	39.6	0.3	2.0	11.0	86.7	83	25	58
				Clayey Silt	1.5	23.6	0.0	1.8	67.3	30.9	28	17	11
TH4	634718 m E, 5536332 m N	50 mm Crushed Limestone	200	-	-	-	-	-	-	-	-	-	-
TH5	634938 m E, 5536199 m N	50 mm Crushed Limestone	500	-	-	-	-	-	-	-	-	-	-
TH6	635187 m E, 5536031 m N	25 mm Crushed Limestone	300	Clay	1.2	36.5	0.0	0.9	8.8	90.3	85	23	62

Test Hole Log for Test Hole #1

TESTHOLE TH1

THE NATIONAL TESTING LABORATORIES LIMITED

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 634041 m E, 5536764 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	● Water Content (%) 25 50 75 100
		Crushed Limestone - 50 mm maximum aggregate size	BS	●3
0.5		**Clay Fill** - black, stiff, moist, high plasticity - with trace fine to medium gravel - trace organic material	BS	●35
1.0		**Clay** - brown, firm, moist, high plasticity	BS	●31
			BS	●34
1.5		**Clayey Silt** - tan, soft, moist, low plasticity	BS	●23
			BS	●22
2.0		**Clay** - brown, firm, moist, high plasticity	BS	●37
2.5		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.		
3.0				

Page 1 of 1

Test Hole Log for Test Hole #2

TESTHOLE TH2

THE NATIONAL TESTING LABORATORIES LIMITED

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 634273 m E, 5536617 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	● Water Content (%) 25 50 75 100
		Crushed Limestone - 50 mm maximum aggregate size	BS	●2
0.5		**Clay Fill** - black, stiff, moist, high plasticity - trace organic material - brown below 1.8 m	BS	●35
1.0			BS	●36
			BS	●34
1.5			BS	●35
			BS	●31
2.0		**Clayey Silt** - tan, soft, moist, low plasticity	BS	●22
		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.		
2.5				
3.0				

Page 1 of 1

Test Hole Log for Test Hole #3

TESTHOLE TH3

THE NATIONAL TESTING LABORATORIES LIMITED
Established in 1923

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 634493 m E, 5536482 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	Particle Size Distribution: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Water Content (%) PL LL
0.0		**Crushed Limestone** - 50 mm maximum aggregate size	BS					3
		Clay Fill - black, stiff, moist, high plasticity - with trace fine to medium gravel - trace organic material	BS					39
0.5			BS	0.3	2.0	11.0	86.7	40
1.0			BS					35
		Clayey Silt - tan, soft, moist, low plasticity	BS	0.0	1.6	67.3	30.9	24
1.5		**Clay** - brown, firm, moist, high plasticity	BS					37
2.0			BS					41
		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.						
2.5								
3.0								

Page 1 of 1

Test Hole Log for Test Hole #4

TESTHOLE TH4

THE NATIONAL TESTING LABORATORIES LIMITED

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 634718 m E, 5536332 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	● Water Content (%) 25 50 75 100
		Crushed Limestone - 50 mm maximum aggregate size	BS	●4
		Clay Fill - black, stiff, moist, high plasticity - with trace fine to medium gravel - trace organic material	BS	●32
0.5			BS	●33
1.0			BS	●42
1.5		**Clay** - brown, firm, moist, high plasticity	BS	●33
			BS	●33
2.0			BS	●36
		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.		
2.5				
3.0				

Page 1 of 1

Test Hole Log for Test Hole #5

TESTHOLE TH5

THE NATIONAL TESTING LABORATORIES LIMITED

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 634938 m E, 5536199 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	Water Content (%)
		Crushed Limestone - 50 mm maximum aggregate size	BS	4
			BS	3
0.5		**Clay Fill** - black, stiff, moist, high plasticity - with trace fine to medium gravel - trace organic material	BS	34
1.0			BS	35
1.5		**Clay** - brown, firm, moist, high plasticity	BS	34
			BS	33
2.0			BS	35
		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.		
2.5				
3.0				

Water Content (%): 25 50 75 100

Page 1 of 1

Test Hole Log for Test Hole #6

TESTHOLE TH6

THE NATIONAL TESTING LABORATORIES LIMITED

Project Name: Murray Avenue Geotechnical Investigation
Project Location: Winnipeg, Manitoba
Client: Dillon Consulting Limited.
Drilling Contractor: Kletke Enviro Drilling Ltd.
Drilling Method: 125 mm Auger
GPS Coordinates: 14U 635187 m E, 5536031 m N

Date Drilled: June 26, 2012
Depth of Testhole: 2.1 m
Logged by: Farouk Fourar-Laidi
Reviewed by: Don Flatt

Depth (m)	Symbol	Description	Sample Type	Particle Size Distribution: Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Water Content (%) PL LL 25 50 75 100
		Crushed Limestone - 25 mm maximum aggregate size	BS					4
0.5		**Clay Fill** - black, stiff, moist, high plasticity - trace organic material - brown below 1.8 m	BS					43
1.0			BS					36
		Clay - brown, firm, moist, high plasticity	BS	0.0	0.9	8.8	90.3	36
1.5			BS					34
		Clayey Silt - tan, soft, moist, low plasticity	BS					23
2.0			BS					23
		• No groundwater seepage or soil sloughing was observed during or upon completion of drilling. • Testhole terminated at a depth of 2.1 m.						
2.5								
3.0								

Page 1 of 1

Particle Size Analysis for Test Hole #3

THE NATIONAL TESTING LABORATORIES LIMITED
Established in 1973

PARTICLE SIZE ANALYSIS
ASTM D422

Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba
R3T 0Y4

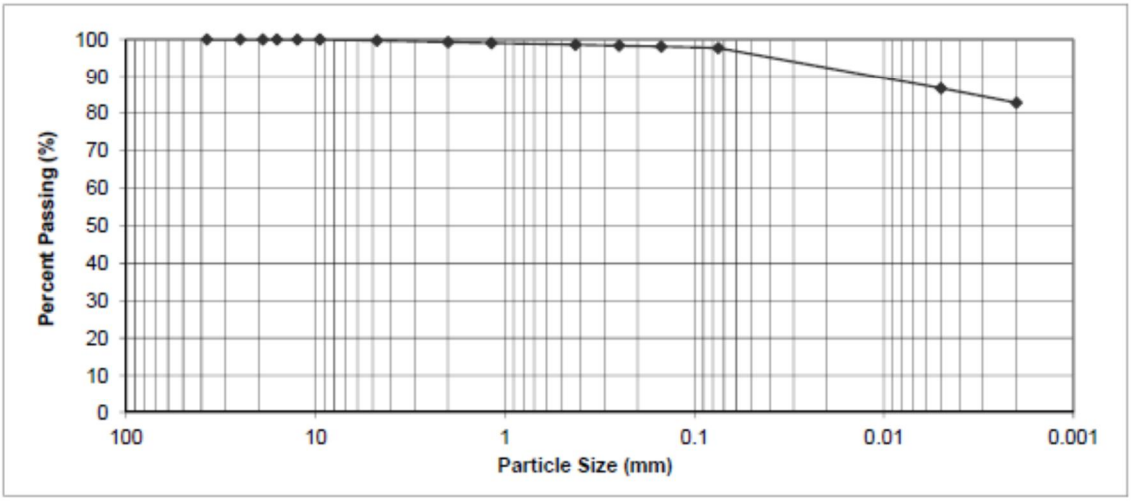
PROJECT: Murray Avenue Geotechnical Investigation

Attention: Jeff Short

PROJECT NO.: DIL-1205

SAMPLED BY: Farouk Fourar-Laidi
SAMPLE ID: TH3 at 0.9 m

DATE RECEIVED: June 26, 2012
TESTED BY: Sothea Bun



PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	100.0
9.50 mm	100.0
4.75 mm	99.7
2.00 mm	99.3

PARTICLE SIZE	PERCENT PASSING
1.18 mm	99.0
0.425 mm	98.6
0.250 mm	98.3
0.150 mm	98.1
0.075 mm	97.7
0.005 mm	86.7
0.002 mm	82.9
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.3	0.4	0.7	0.9	11.0	86.7	NT*

NT* Sample not tested for colloids

July 7, 2012

REVIEWED BY: Farouk Fourar-Laidi, B.Sc., EIT

199 Henlow Bay, Winnipeg, Manitoba R3Y 1G4 Phone (204) 488-6999 Fax (204) 488-6947 Email info@nationaltestlabs.com

Particle Size Analysis for Test Hole #3

THE NATIONAL TESTING LABORATORIES LIMITED
Established in 1923

PARTICLE SIZE ANALYSIS
ASTM D422

Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba
R3T 0Y4

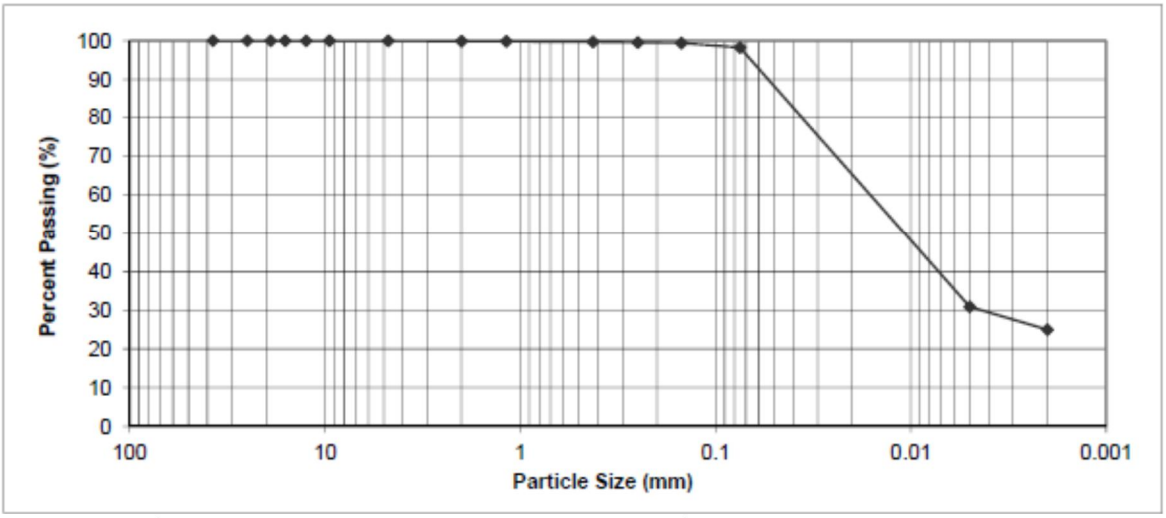
PROJECT: Murray Avenue Geotechnical Investigation

Attention: Jeff Short

PROJECT NO.: DIL-1205

SAMPLED BY: Farouk Fourar-Laidi
SAMPLE ID: TH3 at 1.5 m

DATE RECEIVED: June 26, 2012
TESTED BY: Sothea Bun



PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	100.0
9.50 mm	100.0
4.75 mm	100.0
2.00 mm	99.9

PARTICLE SIZE	PERCENT PASSING
1.18 mm	99.8
0.425 mm	99.7
0.250 mm	99.6
0.150 mm	99.4
0.075 mm	98.2
0.005 mm	30.9
0.002 mm	25.0
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.0	0.1	0.2	1.5	67.3	30.9	NT*

NT* Sample not tested for colloids

July 7, 2012

REVIEWED BY: Farouk Fourar-Laidi, B.Sc., EIT

199 Henlow Bay, Winnipeg, Manitoba R3Y 1G4 Phone (204) 488-6999 Fax (204) 488-6947 Email info@nationaltestlabs.com

Particle Size Analysis for Test Hole #6

THE NATIONAL TESTING LABORATORIES LIMITED
Established in 1973

PARTICLE SIZE ANALYSIS
ASTM D422

Dillon Consulting Limited
1558 Willson Place
Winnipeg, Manitoba
R3T 0Y4

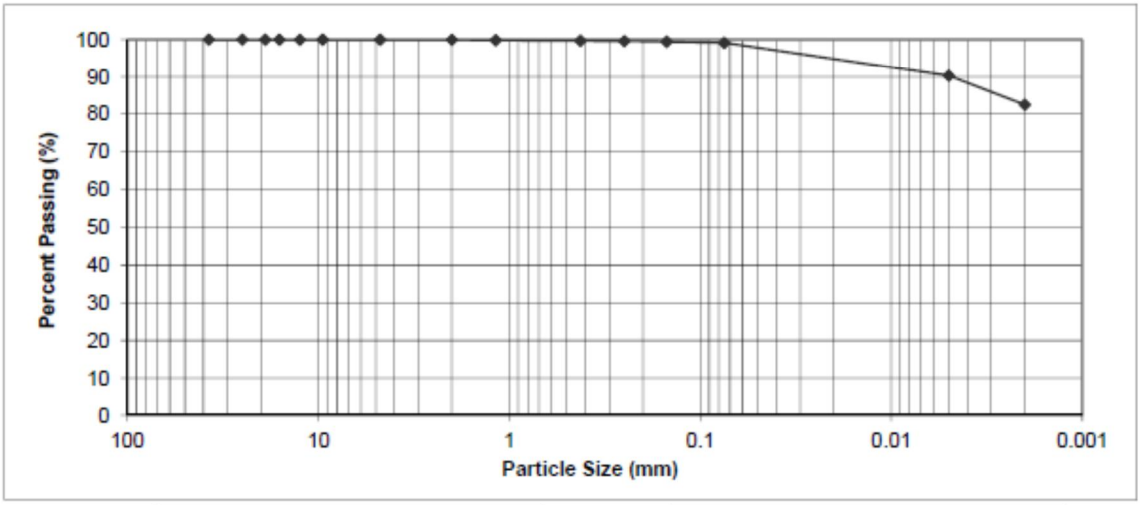
PROJECT: Murray Avenue Geotechnical Investigation

Attention: Jeff Short

PROJECT NO.: DIL-1205

SAMPLED BY: Farouk Fourar-Laidi
SAMPLE ID: TH6 at 1.2 m

DATE RECEIVED: June 26, 2012
TESTED BY: Sothea Bun



PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	100.0
9.50 mm	100.0
4.75 mm	100.0
2.00 mm	100.0

PARTICLE SIZE	PERCENT PASSING
1.18 mm	99.8
0.425 mm	99.7
0.250 mm	99.6
0.150 mm	99.4
0.075 mm	99.1
0.005 mm	90.3
0.002 mm	82.5
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.0	0.0	0.3	0.6	8.8	90.3	NT*

NT* Sample not tested for colloids

July 7, 2012

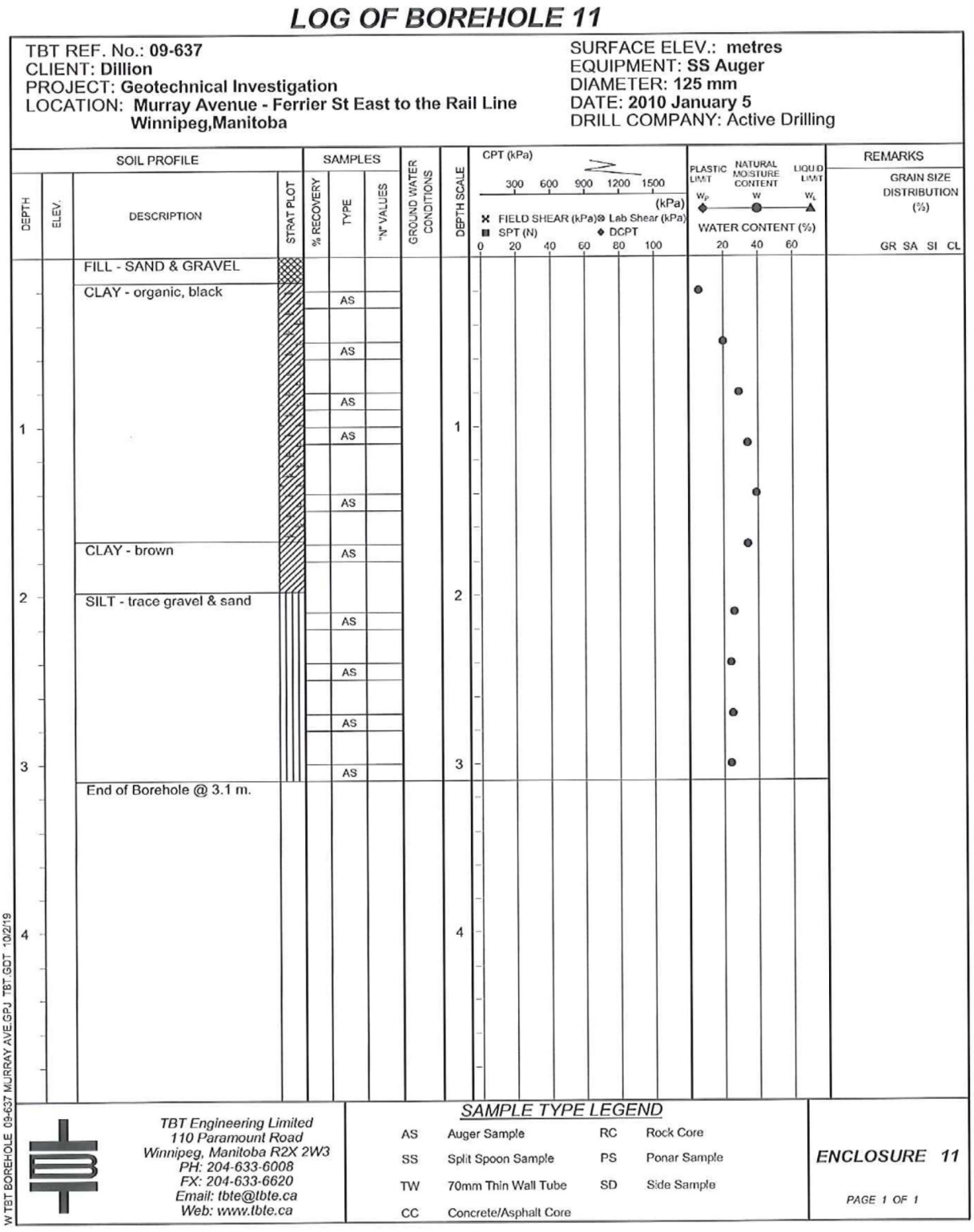
REVIEWED BY: Farouk Fourar-Laidi, B.Sc., EIT

199 Henlow Bay, Winnipeg, Manitoba R3Y 1G4 Phone (204) 488-6999 Fax (204) 488-6947 Email info@nationaltestlabs.com

Geotechnical Report for Murray – Ferrier to CN Tracks

Test Hole Locations

Test Hole Log for Test Hole #11



LOG OF BOREHOLE 11

TBT REF. No.: **09-637**
CLIENT: **Dillion**
PROJECT: **Geotechnical Investigation**
LOCATION: **Murray Avenue - Ferrier St East to the Rail Line Winnipeg,Manitoba**

SURFACE ELEV.: **metres**
EQUIPMENT: **SS Auger**
DIAMETER: **125 mm**
DATE: **2010 January 5**
DRILL COMPANY: Active Drilling

DEPTH	ELEV.	DESCRIPTION	STRAT PLOT	SAMPLES % RECOVERY	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH SCALE
0		FILL - SAND & GRAVEL						0
		CLAY - organic, black			AS			
					AS			
					AS			
1					AS			1
					AS			
		CLAY - brown			AS			
2		SILT - trace gravel & sand			AS			2
					AS			
					AS			
3					AS			3
		End of Borehole @ 3.1 m.						
4								4

CPT (kPa) 300 600 900 1200 1500 (kPa)
FIELD SHEAR (kPa) ⊗ Lab Shear (kPa)
SPT (N) ◆ DCPT
0 20 40 60 80 100

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L
WATER CONTENT (%)
20 40 60

REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

W TBT BOREHOLE 09-637 MURRAY AVE.GPJ TBT.GDT 10/2/19

TBT Engineering Limited
110 Paramount Road
Winnipeg, Manitoba R2X 2W3
PH: 204-633-6008
FX: 204-633-6620
Email: tbte@tbte.ca
Web: www.tbte.ca

SAMPLE TYPE LEGEND

AS	Auger Sample	RC	Rock Core
SS	Split Spoon Sample	PS	Ponar Sample
TW	70mm Thin Wall Tube	SD	Side Sample
CC	Concrete/Asphalt Core		

ENCLOSURE 11

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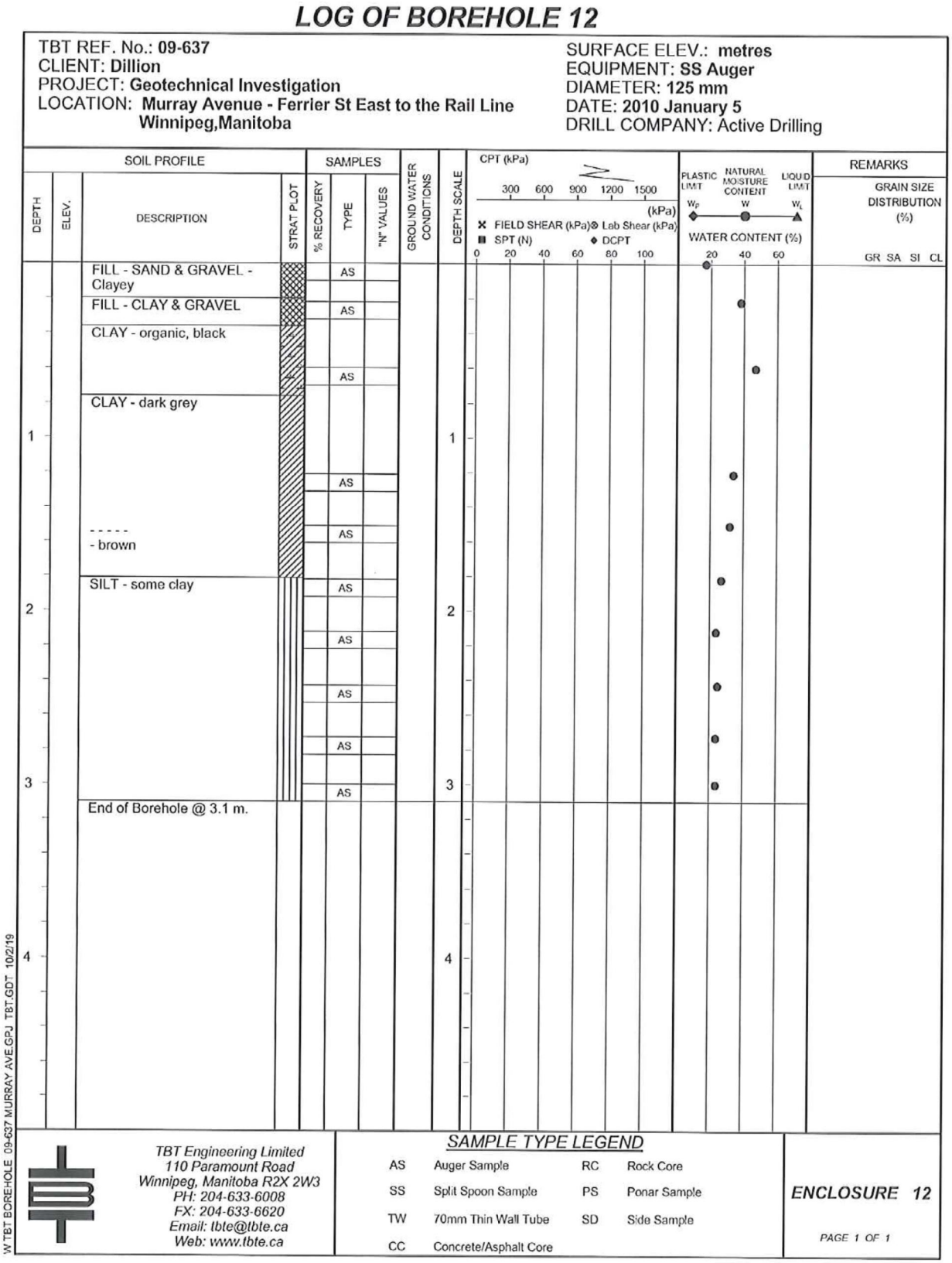
Test Hole Log for Test Hole #12



Test Hole Log for Test Hole #13

LOG OF BOREHOLE 13

TBT REF. No.: **09-637**
CLIENT: **Dillion**
PROJECT: **Geotechnical Investigation**
LOCATION: **Murray Avenue - Ferrier St East to the Rail Line Winnipeg,Manitoba**

SURFACE ELEV.: **metres**
EQUIPMENT: **SS Auger**
DIAMETER: **125 mm**
DATE: **2010 January 5**
DRILL COMPANY: Active Drilling

DEPTH	ELEV.	DESCRIPTION	STRAT PLOT	SAMPLES % RECOVERY	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	DEPTH SCALE
		FILL - GRAVEL & SAND - some clay			AS			
		CLAY - organic, black			AS			
		CLAY - Silty, grey			AS			
1		- trace silt			AS			1
					AS			
		- Silty			AS			
2					AS			2
					AS			
					AS			
3		End of Borehole @ 3.1 m.			AS			3
4								4

CPT (kPa) 300 600 900 1200 1500 (kPa)
× FIELD SHEAR (kPa) ⊗ Lab Shear (kPa)
■ SPT (N) ◆ DCPT
0 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
20 40 60

REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL
0 2 36 62

TBT Engineering Limited
110 Paramount Road
Winnipeg, Manitoba R2X 2W3
PH: 204-633-6008
FX: 204-633-6620
Email: tbte@tbte.ca
Web: www.tbte.ca

SAMPLE TYPE LEGEND

AS	Auger Sample	RC	Rock Core
SS	Split Spoon Sample	PS	Ponar Sample
TW	70mm Thin Wall Tube	SD	Side Sample
CC	Concrete/Asphalt Core		

ENCLOSURE 13

PAGE 1 OF 1

W TBT BOREHOLE 09-637 MURRAY AVE.GPJ TBT.GDT 10/2/19

Template Version: C420120419 - RW

Test Hole Log for Test Hole #14

LOG OF BOREHOLE 14

TBT REF. No.: **09-637**
CLIENT: **Dillion**
PROJECT: **Geotechnical Investigation**
LOCATION: **Murray Avenue - Ferrier St East to the Rail Line Winnipeg,Manitoba**

SURFACE ELEV.: **metres**
EQUIPMENT: **SS Auger**
DIAMETER: **125 mm**
DATE: **2010 January 5**
DRILL COMPANY: Active Drilling

DEPTH	ELEV.	DESCRIPTION	STRAT PLOT	SAMPLES % RECOVERY	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS
		FILL - GRAVEL & SAND			AS		
		- - - - - - some clay			AS		
1		CLAY - dark grey			AS		
					AS		
		- - - - - - very Silty			AS		
2					AS		
		- - - - - - mottled			AS		
					AS		
3					AS		
		End of Borehole @ 3.1 m.					
4							

CPT (kPa) 300 600 900 1200 1500 (kPa)
FIELD SHEAR (kPa) ⊗ Lab Shear (kPa)
SPT (N) ◆ DCPT
0 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
20 40 60

REMARKS
GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

TBT Engineering Limited
110 Paramount Road
Winnipeg, Manitoba R2X 2W3
PH: 204-633-6008
FX: 204-633-6620
Email: tbte@tbte.ca
Web: www.tbte.ca

SAMPLE TYPE LEGEND

AS	Auger Sample	RC	Rock Core
SS	Split Spoon Sample	PS	Ponar Sample
TW	70mm Thin Wall Tube	SD	Side Sample
CC	Concrete/Asphalt Core		

ENCLOSURE 14

PAGE 1 OF 1

W:\TBT BOREHOLE 09-637 MURRAY AVE.GPJ TBT.GDT 10/2/19

Particle Size Analysis for Test Hole #13

TBT ENGINEERING
CONSULTING GROUP

TBT Engineering Limited
110 Paramount Road, Winnipeg, MB R2X 2W3
PH: (204) 633-6008 FAX: (204) 633-6620
E-Mail: hmanalo@tbte.ca

Particle Size Analysis of Soils Test Report

To: Dillon Consulting Limited
895 Waverly Street, Suite 200
Winnipeg, Manitoba R3T 5P4
Attention: Jeff Short, EIT
Project: Geotechnical Investigation - Street Reconstruction
Ferrier Street, Winnipeg, Manitoba

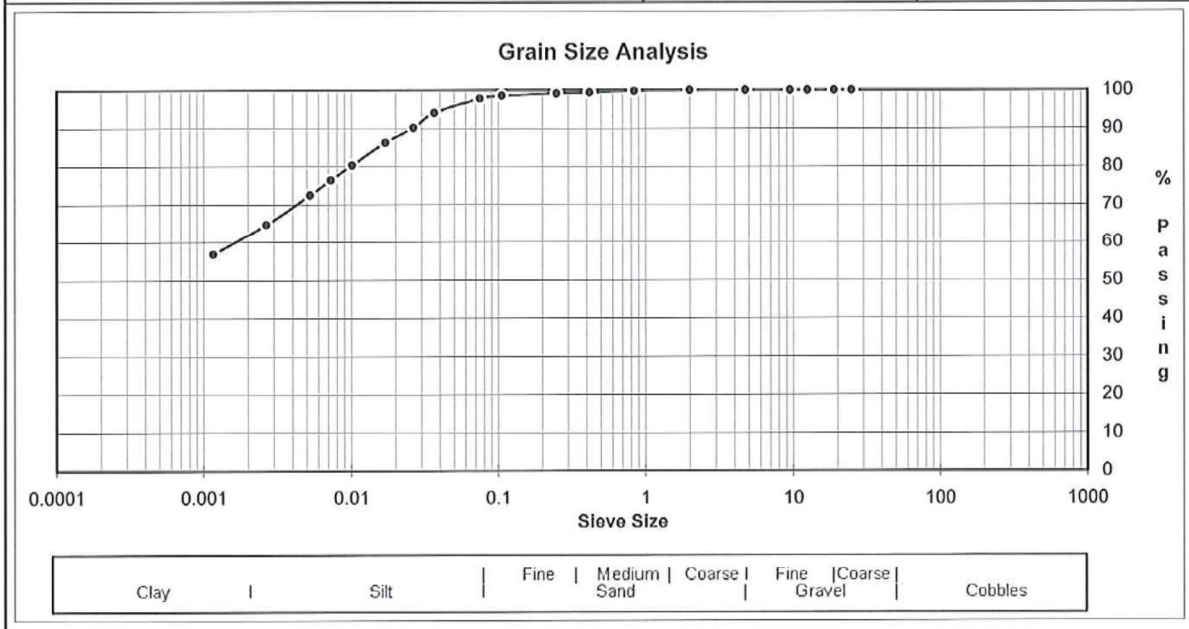
TBTE Project No.: 09-637
Lab Sample No. 10-03

Date Sampled: - Date Received: 06-Jan-10
Sampled By: EO-TBTE Date Tested: 15-Feb-10

Material Identification

B.H./T.H. No. TH 13
Sample No. 8
Depth 2.5 m
Specific Gravity of Material: 2.65

Sieve Analysis		Hydrometer Analysis	
Sieve(mm)	% Passing	Diameter	% Finer
37.5	100.0	0.106	98.5
25	100.0	0.075	97.8
19	100.0	0.0367629	94.1
12.5	100.0	0.026509	90.2
9.5	100.0	0.0170844	86.3
4.75	100.0	0.0101334	80.4
2	100.0	0.0072898	76.5
0.841	99.8	0.0052708	72.5
0.42	99.4	0.0026653	64.7
0.25	99.2	0.001164	56.9



Soil Classification	% Composition		D10	-
		Gravel	D30	-
Clay	2.2	Sand	D60	0.0017
	35.8	Silt	Cu	-
	62.0	Clay	Cc	-

Test Method: ASTM D422, D2216, D4318, D2487
TBT Technician: Elena Oberez

REVIEWED BY: Hermie Manalo