


APPENDIX A
TEST HOLE LOGS

LEGEND

TEST HOLE
 TH1

No.	DATE	ISSUE /REVISION
0	Dec 9/14	report

ENG-TECH
 CONSULTANTS LIMITED
 6 - 854 Marion Street
 Winnipeg, MB R2J 0K4
 Phone: (204) 233-1694
 Fax: (204) 235-1579

ENG. STAMP:



CLIENT:
 CITY OF WINNIPEG

PROJECT:
 SOILS INVESTIGATION -
 SEWER PROJECT, WARDE AVE.,
 WINNIPEG, MANITOBA

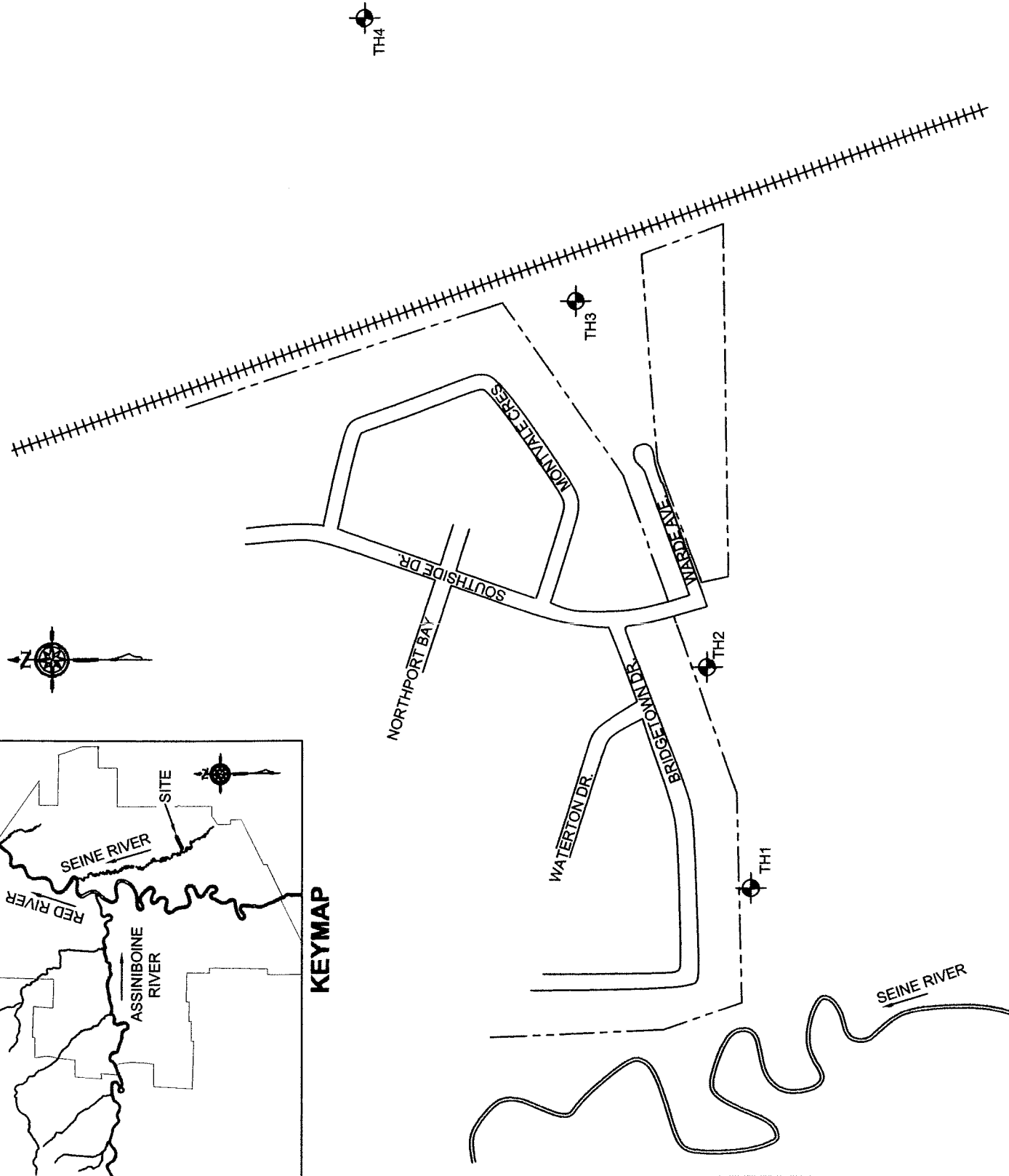
DWG DESCRIPTION:
 SITE AND TEST HOLE LOCATION
 PLAN

SCALE:
 NTS

DRAWN BY:
 ERM

DATE:
 DECEMBER 2014

FILE No.:
 14-217-04





**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH1

Client: City of Winnipeg

Site: Warde Avenue

Location: 14U 0638449 UTM 5520332

Project: Soils Investigation - Sewer Project, Warde Avenue, Winnipeg, Manitoba

File No.: 14-217-04

Date Drilled: November 7, 2014

Grade Elevation: 100.0 m (local)

Water Elevation: 91.5 m

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			
								PL	X	LL	P. Pen
0.0		Ground Surface	100.0								
0.0 - 0.25		Topsoil (25 mm) - grass covered.		S1	Split Barrel	32.7				72	
0.25 - 1.0		Clay (CH) - dark brown, moist, stiff, highly plastic.	99.0	S2	Split Barrel	26.2					
1.0 - 2.0		Silt (ML) - light brown, moist, soft, low plastic, with clay. - at 1.2 m, clay pocket, medium brown, firm.	98.0	S3 S4	Split Barrel	26.0 38.7				48	
2.0 - 3.0		Clay (CH) - dark brown, moist, firm to stiff, highly plastic, silt inclusions. - below 3.0 m, firm to soft, occa. gypsum inclusions.	97.0	S5 S6	Split Barrel	50.1 51.4				24 24	
3.0 - 4.0			96.0	S7	Split Barrel	54.4				36	
4.0 - 5.0			95.0	S8	Split Barrel	54.6				29	
5.0 - 6.0			94.0	S9	Split Barrel	54.2				17	
6.0 - 7.0			93.0	S10	Split Barrel	51.3				5	
7.0 - 8.0			92.0								
8.0 - 9.0			91.0	S11	Split Barrel	55.6				5	
9.0 - 10.0		End of Test Hole - end of test hole at 9.1 m below existing grade. - squeezing of test hole from clay layer during drilling.	90.0								
10.0 - 11.0		- test hole remained open to 8.7 m after drilling. - trace seepage observed from clay layer during drilling.	89.0								
11.0 - 12.0		- water accumulated in test hole to 8.5 m below grade after drilling. - backfilled test hole with auger cuttings and bentonite.	88.0								
12.0 - 13.0			87.0								

ENG-TECH Consulting Limited

Logged by: erm

Reviewed by:

Drilled By: Maple Leaf Drilling Ltd.

Drill Rig: DR150

Auger Size: 125 mm solid stem

Completion Depth: 9.1 m

Completion Elevation: 90.9 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH2
Client: City of Winnipeg
Site: Warde Avenue
Location: 14U 0638699 UTM 5520382
Project: Soils Investigation - Sewer Project, Warde Avenue, Winnipeg, Manitoba

File No.: 14-217-04
Date Drilled: November 7, 2014
Grade Elevation: 100.0 m (local)
Water Elevation: 91.8 m

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			
								PL	X	LL	P. Pen
0.0		Ground Surface	100.0								
0.0 - 0.25		Topsoil (25 mm) - grass covered.		S1	Split Barrel	36.7				29	
0.25 - 0.3				S2	Split Barrel	35.9				39	
0.3 - 2.0		Clay (CH) - blackish dark brown, moist, firm, highly plastic. - below 0.3 m, medium to dark brown, stiff. - below 1.5 m, transition to silt.	99.0	S3	Split Barrel	34.7				60	
2.0 - 3.0		Silt (ML) - light brown, moist, soft, low plastic, with clay. - at 2.7 m, firm, medium brown, 100 mm clay pocket.	98.0	S4	Split Barrel	27.2				25	
3.0 - 3.2			97.0	S5	Split Barrel	25.0				19	24
3.2 - 3.4				S6	Split Barrel	47.4					
3.4 - 4.0		Clay (CH) - dark brown, moist, firm, highly plastic.	96.0	S7	Split Barrel	52.6				24	
4.0 - 4.6		- below 4.6 m, silt inclusions.	95.0	S8	Shelby Tube	55.7				48	
4.6 - 6.1		- below 6.1 m, firm to soft.	94.0	S9	Split Barrel	51.0				14	
6.1 - 7.6		- below 7.6 m, grey.	93.0								
7.6 - 8.2			92.0	S10	Split Barrel	50.9					
8.2 - 9.1			91.0	S11	Split Barrel	48.6				10	
9.1 - 13.0		End of Test Hole - end of test hole at 9.1 m below existing grade. - squeezing of test hole from clay layer during drilling. - test hole remained open to 8.5 m after drilling. - trace seepage observed from clay layer during drilling. - water accumulated in test hole to 8.2 m below grade, after drilling. - backfilled test hole with auger cuttings and bentonite.	87.0								

ENG-TECH Consulting Limited

Logged by: erm

Reviewed by: *CT*

Drilled By: Maple Leaf Drilling Ltd.

Drill Rig: DR150

Auger Size: 125 mm solid stem

Completion Depth: 9.1 m

Completion Elevation: 90.9 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH3

Client: City of Winnipeg

Site: Warde Avenue

Location: 14U 0639031 UTM 5520485

Project: Soils Investigation - Sewer Project, Warde Avenue, Winnipeg, Manitoba

File No.: 14-217-04

Date Drilled: November 7, 2014

Grade Elevation: 100.0 m (local)

Water Elevation: 91.5 m

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)		
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)		
								PL	X	ILL
								P. Pen	Torvane	UC
0.0		Ground Surface Topsoil (25 mm) - grass covered.	100.0							
0.0 - 0.45		Clay (CH) - dark brown, moist, stiff to very stiff, highly plastic. - below 0.45 m, dark brown, transition to silt.	99.0	S1	Split Barrel	33.2			108	
0.45 - 2.0		Silt (ML) - light brown, moist, soft, low plastic, with clay.	98.0	S2	Split Barrel	29.3			94	
2.0 - 2.7		Clay (CH) - dark brown, moist, stiff, highly plastic. - below 2.7 m, stiff to firm.	97.0	S3	Split Barrel	26.2			21	
2.7 - 4.0		Silt (ML) - light brown, moist, soft, low plastic, with clay.	96.0	S4	Split Barrel	47.4			36	
4.0 - 5.3		Clay (CH) - dark brown, moist, stiff, highly plastic. - below 4.0 m, soft.	95.0	S5	Split Barrel	53.2			12	
5.3 - 9.1		Clay (CH) - dark brown, moist, stiff, highly plastic. - below 5.3 m, occa. gypsum inclusion.	94.0	S6	Split Barrel	52.1			12	
9.1 - 9.9		End of Test Hole - end of test hole at 9.1 m below existing grade. - squeezing of test hole from clay layer during drilling. - test hole remained open to 8.8 m after drilling. - trace seepage observed from clay layer during drilling. - water accumulated in test hole to 8.5 m below grade after drilling. - backfilled test hole with auger cuttings and bentonite.	93.0	S7	Split Barrel	47.9			12	
9.9 - 10.0			92.0	S8	Split Barrel	46.1			10	
10.0 - 13.0			87.0							

ENG-TECH Consulting Limited

Logged by: erm

Reviewed by: *CH*

Drilled By: Maple Leaf Drilling Ltd.

Drill Rig: DR150

Auger Size: 125 mm solid stem

Completion Depth: 9.1 m

Completion Elevation: 90.9 m

Sheet: 1 of 1

SAMPLE TYPE



SPLIT BARREL



SHELBY TUBE



AUGER CUTTINGS



SPLIT SPOON



**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH4

Client: City of Winnipeg

Site: Warde Avenue

Location: 14U 0639383 UTM 5520681

Project: Soils Investigation - Sewer Project, Warde Avenue, Winnipeg, Manitoba

File No.: 14-217-04

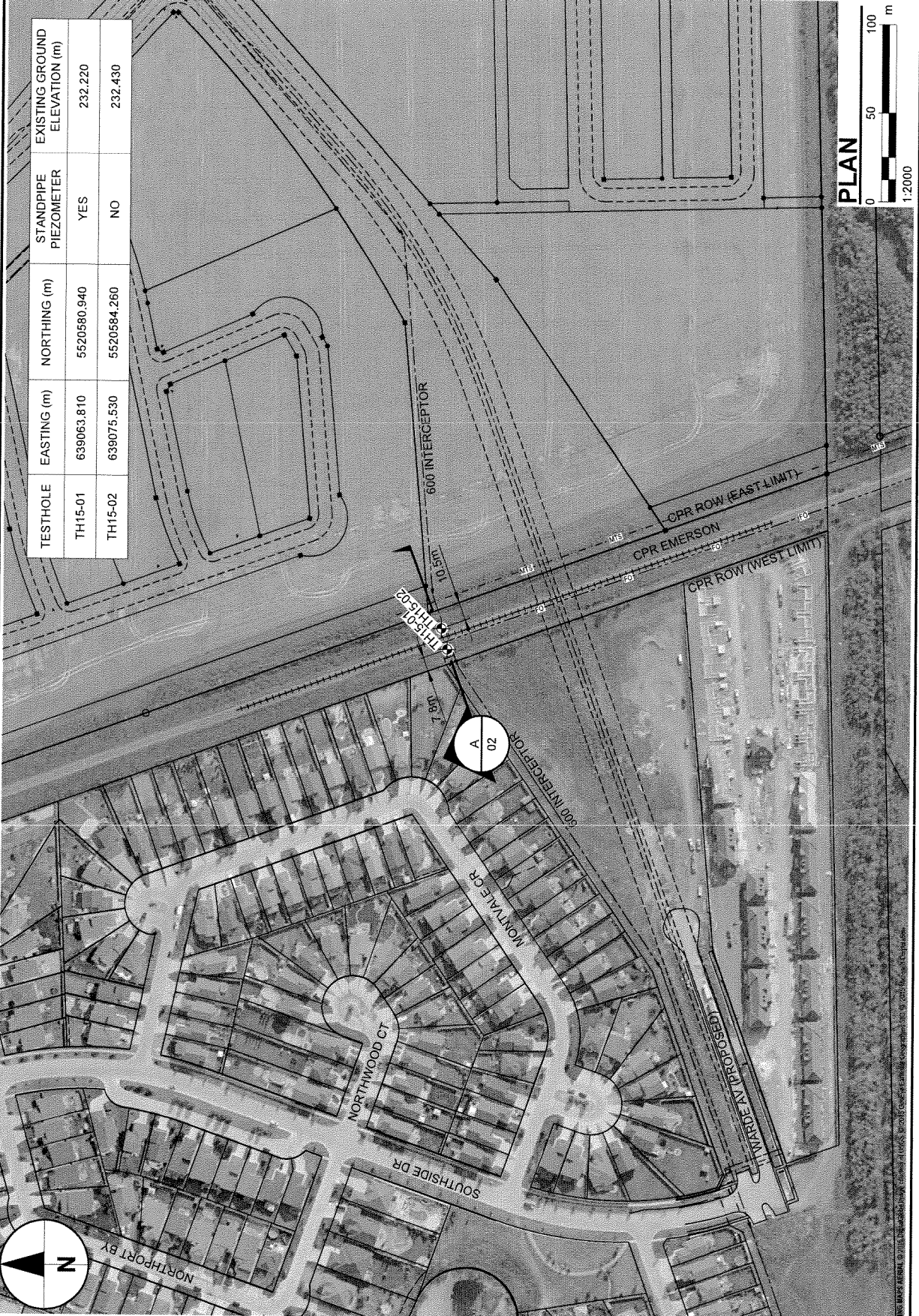
Date Drilled: November 7, 2014

Grade Elevation: 100.0 m (local)

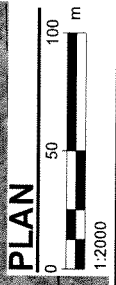
Water Elevation: - -

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			
								PL	X	ILL	P. Pen
0.0		Ground Surface	100.0								
0.0 - 0.8		Clay (CH) - blackish/dark brown, moist, stiff, highly plastic.		S1	▲	19.3				96	
0.8 - 1.8		Silt (ML) - light brown, moist, soft, low plastic.		S2	▲	36.6				91	
1.8 - 2.0		Clay (CH) - dark brown, moist, stiff, highly plastic.								96	
2.0 - 6.8		- between 1.2 to 1.5 m, varved silty clay.		S3	▲	50.8				38	
6.8 - 9.1		- below 6.8 m, grey, soft, occa. silt inclusions.		S4	▲	53.7				29	
9.1 - 9.9		End of Test Hole - end of test hole at 9.1 m below existing grade. - squeezing of test hole from clay layer during drilling. - test hole remained open to 8.5 m after drilling. - no seepage observed in test hole before or after drilling. - backfilled test hole with auger cuttings and bentonite.		S5	▲	45.9				24	
9.9 - 10.0				S6	▲	47.8				24	
10.0 - 13.0				S7	▲	56.9				12	

ENG-TECH Consulting Limited	Drilled By: Maple Leaf Drilling Ltd.	Completion Depth: 9.1 m
Logged by: erm	Drill Rig: DR150	Completion Elevation: 90.9 m
Reviewed by:	Auger Size: 125 mm soil stem	Sheet: 1 of 1
SAMPLE TYPE	SPLIT BARREL	SHELBY TUBE
	AUGER CUTTINGS	SPLIT SPOON



TESTHOLE	EASTING (m)	NORTHING (m)	STANDPIPE PIEZOMETER	EXISTING GROUND ELEVATION (m)
TH15-01	639063.810	5520580.940	YES	232.220
TH15-02	639075.530	5520584.260	NO	232.430



Issue Status: DRAFT

WARDE AVENUE INTERCEPTOR - PROPOSED PIPE / TRACK CROSSING
 GEOTECHNICAL REPORT
 CITY OF WINNIPEG
 Project No.: 60341931 Date: 2015-04-23

TEST HOLE LOCATION PLAN



PROJECT: Warde Avenue Interceptor CLIENT: City of Winnipeg TESTHOLE NO: TH15-01
 LOCATION: ~7.5 m West of CPR Centerline; UTM 14 U N 5520580.94, E 639063.81 PROJECT NO.: 60341931
 CONTRACTOR: Paddock Drilling Ltd. METHOD: RM-30 Track Mounted/125 mm SSA ELEVATION (m): 232.22

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION (m)
							* Beaker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m ³)	+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ◆ Field Vane ◆	(kPa)			
0			TOPSOIL/ORGANICS									232
0-1			CLAY (FILL) - some silt, trace to some gravel, trace sand, trace organics - dark grey and black, moist, firm - high plasticity	GRAB	G1	●						
1-2			CLAY - silty, trace sand, trace silt inclusions - dark brown, moist, stiff - intermediate plasticity	GRAB	G2	●						231
2-3			CLAY - some silt - dark brown, moist, stiff to firm - high plasticity	GRAB	G3	●						230
3-4			- G4: Gravel: 0%, Sand: 0.4%, Silt: 16.3%, Clay: 83.3%	GRAB	G4	●						229
4-5			- trace silt inclusions (<6 mm dia.) below 3.7 m	GRAB	G5	●						228
5-6				GRAB	G6	●						227
6-7			- some silt to silty, trace silt inclusions (<6 mm dia.) below 6.1 m - dark grey, moist, firm below 6.1 m	SHELBY TUBE	T8	■ ●			×		Tube Recovery: 90%	226
7-8				GRAB	G9	●						225
8-9				SHELBY TUBE	T10	■ ●			×		Tube Recovery: 100%	224
9				GRAB	G11	●						224

LOG OF TEST HOLE 60341931 - WARDE AVE TEST HOLE LOGS - UPDATED.GPJ UMA.VINN.GDT 4/26/15



LOGGED BY: Ryan Harras COMPLETION DEPTH: 12.19 m
 REVIEWED BY: Mustafa Alkiki COMPLETION DATE: 3/17/15
 PROJECT ENGINEER: Faris Khalil Page 1 of 2

PROJECT: Warde Avenue Interceptor	CLIENT: City of Winnipeg	TESTHOLE NO: TH15-01
LOCATION: ~7.5 m West of CPR Centerline; UTM 14 U N 5520580.94, E 639063.81		PROJECT NO.: 60341931
CONTRACTOR: Paddock Drilling Ltd.	METHOD: RM-30 Track Mounted/125 mm SSA	ELEVATION (m): 232.22
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> CUTTINGS <input type="checkbox"/> SAND	

DEPTH (m)	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION (m)
							* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m ³)	+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●				
9												223
10					G13						Tube Recovery: 90%	222
11					G14							221
12					G15							220
12.19			END OF TEST HOLE AT 12.19 m IN CLAY		G16							220
13			Notes: 1. No seepage or sloughing observed during drilling. 2. Standpipe piezometer (SP15-01) equipped with Casagrande tip installed at 11.9 m below ground surface. Backfilled with silica sand from 12.19 m to 11.28 m and bentonite chips from 11.28 m to ground surface. Flush mounted cover installed at ground surface. 3. Ground water level measurements in SP15-01 are as following: - On April 08, 2015 at 11.14 m below ground (Elev. 221.08 m) - On April 23, 2015 at 9.90 m below ground (Elev. 222.32 m)									219
14												218
15												217
16												216
17												215
18												215

LOG OF TEST HOLE 60341931 - WARDE AVE TEST HOLE LOGS - UPDATED.GPJ UMA WINN.GDT 4/26/15



LOGGED BY: Ryan Harras	COMPLETION DEPTH: 12.19 m
REVIEWED BY: Mustafa Alkiki	COMPLETION DATE: 3/17/15
PROJECT ENGINEER: Faris Khalil	

PROJECT: Warde Avenue Interceptor CLIENT: City of Winnipeg TESTHOLE NO: TH15-02
 LOCATION: ~5.5 m East of CPR Centerline; UTM 14 U N 5520584.26, E 639075.53 PROJECT NO.: 60341931
 CONTRACTOR: Paddock Drilling Ltd. METHOD: RM-30 Track Mounted/125 mm SSA ELEVATION (m): 232.43
 SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION (m)	
						Becker Cone	Dynamic Cone	Torvane	QU			
0		TOPSOIL/ORGANICS									232	
0-1		CLAY (FILL) - some gravel to gravelly, some silt, trace sand, trace organics - dark grey and black, moist, firm - high plasticity - G17: Gravel: 29.6%, Sand: 3.2%, Silt: 15.1%, Clay: 52.1%		G17	~45							
1-2		CLAY - silty, trace sand, trace gravel - dark grey and black, moist, firm to stiff - intermediate plasticity		G18	~45							231
2-3		CLAY - some silt to silty - dark brown, moist, stiff to firm - high plasticity		G19	~55							230
3-5		- some silt, trace silt inclusions (<6 mm dia.) below 3 m		G20	~55							229
4-5				G21	~55							228
5-6				T22	~55			×		Tube Recovery: 85%		227
5-6		- dark grey, moist, firm below 5.8 m - silty below 6.1 m		G23	~55							
6-7				T24	~55			×		Tube Recovery: 85%		226
7-8				G25	~55							225
8-9		- T26: Gravel: 0%, Sand: 2.6%, Silt: 27.9%, Clay: 69.5%		T26	~55			×		Tube Recovery: 85%		224
9				G27	~55							224

LOG OF TEST HOLE 60341931 - WARDE AVE TEST HOLE LOGS - UPDATED.GPJ UMA WINN.GDT 4/26/15



LOGGED BY: Ryan Harras COMPLETION DEPTH: 12.19 m
 REVIEWED BY: Mustafa Alkiki COMPLETION DATE: 3/17/15
 PROJECT ENGINEER: Faris Khalil Page 1 of 2

PROJECT: Warde Avenue Interceptor CLIENT: City of Winnipeg TESTHOLE NO: TH15-02
 LOCATION: ~5.5 m East of CPR Centerline; UTM 14 U N 5520584.26, E 639075.53 PROJECT NO.: 60341931
 CONTRACTOR: Paddock Drilling Ltd. METHOD: RM-30 Track Mounted/125 mm SSA ELEVATION (m): 232.43
 SAMPLE TYPE GRAB SHELBY TUBE SPLIT SPOON BULK NO RECOVERY CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	ELEVATION (m)
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt ■ (kN/m ³)	+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ◆ Field Vane ◆ (kPa)				
9				G28							223
10				G29							222
11				G30							221
12				G31							220
12.19		END OF TEST HOLE AT 12.19 m IN CLAY		G32							219
13		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with bentonite chips upon completion.									218
14											217
15											216
16											215
17											214
18											213

LOG OF TEST HOLE 60341931 - WARDE AVE TEST HOLE LOGS - UPDATED.GPJ UMA WINN.GDT 4/26/15



LOGGED BY: Ryan Harras COMPLETION DEPTH: 12.19 m
 REVIEWED BY: Mustafa Alkiki COMPLETION DATE: 3/17/15
 PROJECT ENGINEER: Faris Khalil Page 2 of 2