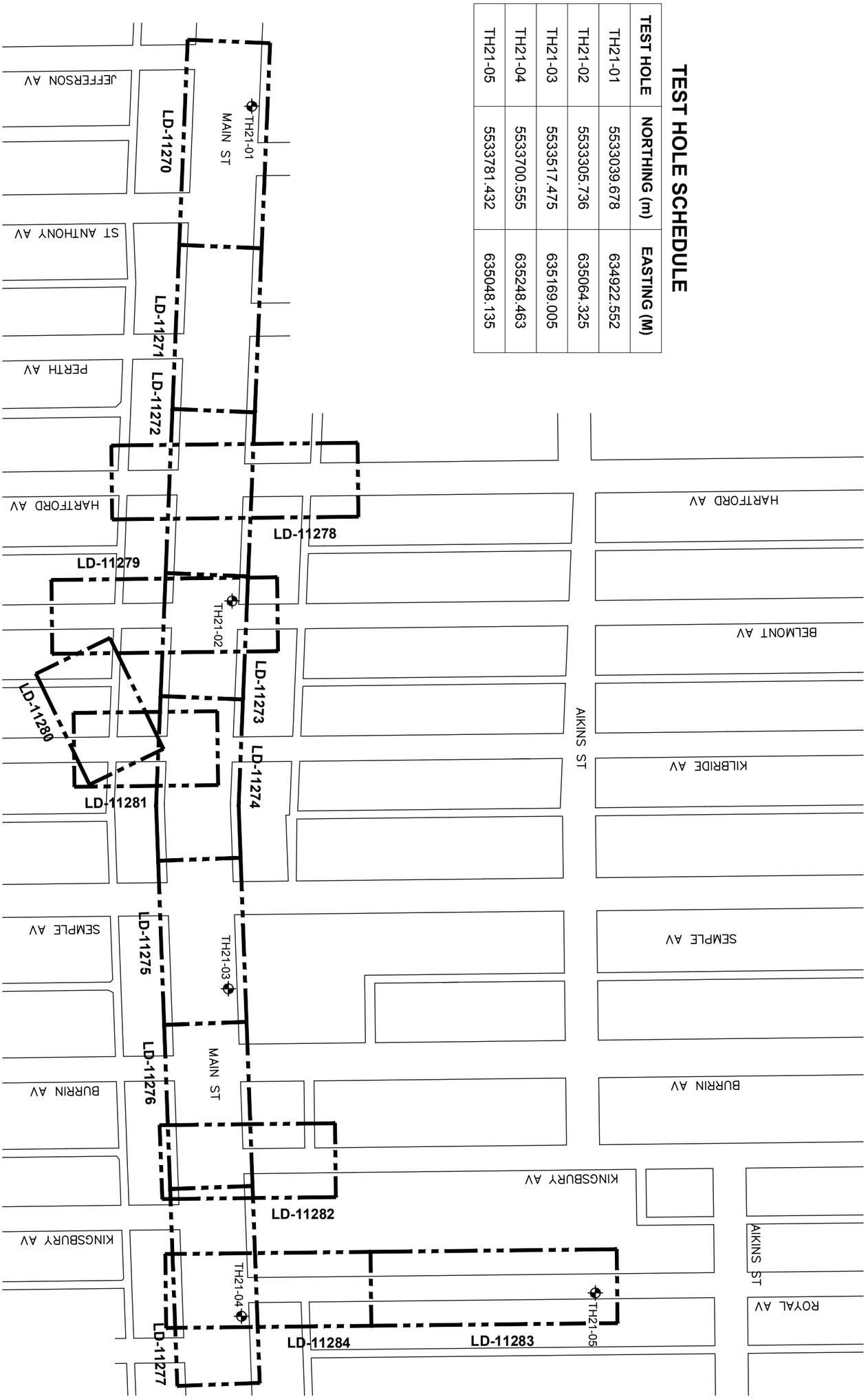
Appendix A

Test Hole Logs

Last saved by: LEIPPIA(2021-12-23) Last Plotted: 2021-12-23
Filename: C:\USERS\LEIPPIA\DOCUMENTS\WORK FROM HOME\60599385\900-CAD_GIS\910-CAD\20-SHEETS\60599385-SKE-30 CON6A-B-1000.DWG
Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI B 279.4mm x 431.8mm

TEST HOLE SCHEDULE

TEST HOLE	NORTHING (m)	EASTING (M)
TH21-01	5533039.678	634922.552
TH21-02	5533305.736	635064.325
TH21-03	5533517.475	635169.005
TH21-04	5533700.555	635248.463
TH21-05	5533781.432	635048.135



THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT
ENGINEERING DIVISION
Bid Opportunity 862-2021 Date: 2021/12/23

JEFFERSON EAST COMBINED SEWER RELIEF
CONTRACT 6A
TEST HOLE LOCATION PLAN & SCHEDULE

AECOM

AECOM Canada Ltd.

GENERAL STATEMENT

NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

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

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

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

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

EXPLANATION OF FIELD & LABORATORY TEST DATA

The field and laboratory test results, as shown for each hole, are described below.

1. NATURAL MOISTURE CONTENT

The relationship between the natural moisture content and depth is significant in determining the subsurface moisture conditions. The Atterberg Limits for a sample should be compared to its natural moisture content and plotted on the Plasticity Chart in order to determine the soil classification.

2. SOIL PROFILE AND DESCRIPTION

Each soil stratum is classified and described noting any special conditions. The Modified Unified Classification System (MUCS) is used. The soil profile refers to the existing ground level at the time the hole was done. Where available, the ground elevation is shown. The soil symbols used are shown in detail on the soil classification chart.

3. TESTS ON SOIL SAMPLES

Laboratory and field tests are identified by the following and are on the logs:

N - Standard Penetration Test (SPT) Blow Count. The SPT is conducted in the field to assess the in-situ consistency of cohesive soils and the relative density of non-cohesive soils. The N value recorded is the number of blows from a 63.5 kg hammer dropped 760 mm which is required to drive a 51 mm split spoon sampler 300 mm into the soil.

SO_4 - Water Soluble Sulphate Content. Expressed in percent. Conducted primarily to determine requirements for the use of sulphate resistant cement. Further details on the water-soluble sulphate content are given in Section 6.

γ_D - Dry Unit Weight. Usually expressed in kN/m^3.

γ_T - Total Unit Weight. Usually expressed in kN/m^3.

Q_U - Unconfined Compressive Strength. Usually expressed in kPa and may be used in determining allowable bearing capacity of the soil.

C_U - Undrained Shear Strength. Usually expressed in kPa. This value is determined by either a direct shear test or by an unconfined compression test and may also be used in determining the allowable bearing capacity of the soil.

C_{PEN} - Pocket Penetrometer Reading. Usually expressed in kPa. Estimate of the undrained shear strength as determined by a pocket penetrometer.

The following tests may also be performed on selected soil samples and the results are given on separate sheets enclosed with the logs:

- Grain Size Analysis
- Standard or Modified Proctor Compaction Test
- California Bearing Ratio Test
- Direct Shear Test
- Permeability Test
- Consolidation Test
- Triaxial Test

4. SOIL DENSITY AND CONSISTENCY

The SPT test described above may be used to estimate the consistency of cohesive soils and the density of cohesionless soils. These approximate relationships are summarized in the following tables:

Table 1 Cohesive Soils

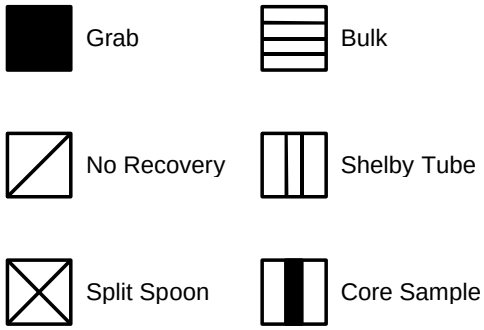
N	Consistency	C_u (kPa) approx.
0 - 1	Very Soft	<10
1 - 4	Soft	10 - 25
4 - 8	Firm	25 - 50
8 - 15	Stiff	50 - 100
15 - 30	Very Stiff	100 - 200
30 - 60	Hard	200 - 300
>60	Very Hard	>300

Table 2 Cohesionless Soils

N	Density
0 - 5	Very Loose
5 - 10	Loose
10 - 30	Compact
30 - 50	Dense
>50	Very Dense

5. SAMPLE CONDITION AND TYPE

The depth, type, and condition of samples are indicated on the logs by the following symbols:



6. WATER SOLUBLE SULPHATE CONCENTRATION

The following table, from CSA Standard A23.1-14, indicates the requirements for concrete subjected to sulphate attack based upon the percentage of water-soluble sulphate as presented on the logs. CSA Standard A23.1-14 should be read in conjunction with the table.

Table 3 Requirements for Concrete Subjected to Sulphate Attack*

Class of exposure	Degree of exposure	Water-soluble sulphate (SO_4)† in soil sample, %	Sulphate (SO_4) in groundwater samples, mg/L‡	Water soluble sulphate (SO_4) in recycled aggregate sample, %	Cementing materials to be used§††	Performance requirements§,§§		
						Maximum expansion when tested using CSA A3004-C8 Procedure A at 23 °C, %		Maximum expansion when tested using CSA A3004-C8 Procedure B at 5 °C, % †††
						At 6 months	At 12 months††	At 18 months‡‡
S-1	Very severe	> 2.0	> 10 000	> 2.0	HS** ,HSb, HSLb*** or HSe	0.05	0.10	0.10
S-2	Severe	0.20–2.0	1500–10 000	0.60–2.0	HS**, HSb, HSLb*** or HSe	0.05	0.10	0.10
S-3	Moderate (including seawater exposure*)	0.10–0.20	150–1500	0.20–0.60	MS, MSb, MSe, MSLb***, LH, LHb, HS**, HSb, HSLb*** or HSe	0.10		0.10

*For sea water exposure, also see Clause 4.1.1.5.
†In accordance with CSA A23.2-3B.
‡In accordance with CSA A23.2-2B.
§Where combinations of supplementary cementing materials and portland or blended hydraulic cements are to be used in the concrete mix design instead of the cementing materials listed, and provided they meet the performance requirements demonstrating equivalent performance against sulphate exposure, they shall be designated as MS equivalent (MSe) or HS equivalent (HSe) in the relevant sulphate exposures (see Clauses 4.1.1.6.2, 4.2.1.1, and 4.2.1.3, and 4.2.1.4).
**Type HS cement shall not be used in reinforced concrete exposed to both chlorides and sulphates, including seawater. See Clause 4.1.1.6.3.

††The requirement for testing at 5 °C does not apply to MS, HS, MSb, HSb, and MSe and HSe combinations made without portland limestone cement.
‡‡ If the increase in expansion between 12 and 18 months exceeds 0.03%, the sulphate expansion at 24 months shall not exceed 0.10% in order for the cement to be deemed to have passed the sulphate resistance requirement.
§§For demonstrating equivalent performance, use the testing frequency in Table 1 of CSA A3004-A1 and see the applicable notes to Table A3 in A3001 with regard to re-establishing compliance if the composition of the cementing materials used to establish compliance changes.
***Where MSLb or HSLb cements are proposed for use, or where MSe or HSe combinations include Portland-limestone cement, they must also contain a minimum of 25% Type F fly ash or 40% slag or 15% metakaolin (meeting Type N pozzolan requirements) or a combination of 5% Type SF silica fume with 25% slag or a combination of 5% Type SF silica fume with 20% Type F fly ash. For some proposed MSLb, HSLb, and MSe or HSe combinations that include Portland-limestone cement, higher SCM replacement levels may be required to meet the A3004-C8 Procedure B expansion limits. Due to the 18-month test period, SCM replacements higher than the identified minimum levels should also be tested. In addition, sulphate resistance testing shall be run on MSLb and HSLb cement and MSe or HSe combinations that include Portland-limestone cement at both 23 °C and 5 °C as specified in the table.
†††If the expansion is greater than 0.05% at 6 months but less than 0.10% at 1 year, the cementing materials combination under test shall be considered to have passed.

7. SOIL CORROSIVITY

The following table, from the Handbook of Corrosion Engineering (Roberge, 1999) indicates the corrosivity rating can be obtained from the soil resistivity, presented on the logs.

Table 4 Corrosivity Ratings Based on Soil Resistivity

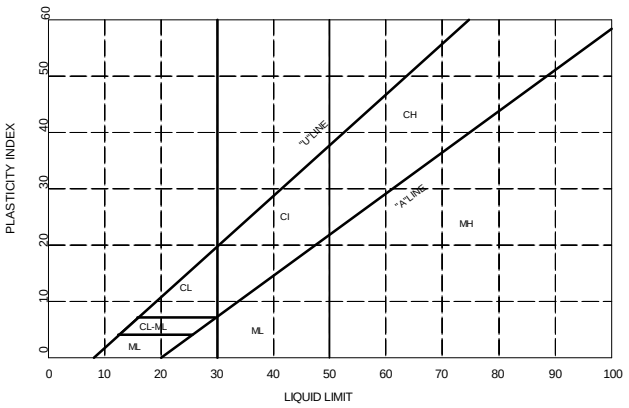
Soil Resistivity (ohm-cm)	Corrosivity Rating
>20,000	Essentially non-corrosive
10,000 – 20,000	Mildly corrosive
5,000 – 10,000	Moderately corrosive
3,000 – 5,000	Corrosive
1,000 – 3,000	Highly corrosive
<1,000	Extremely corrosive

8. GROUNDWATER TABLE

The groundwater table is indicated by the equilibrium level of water in a standpipe installed in a testhole or test pit. This level is generally taken at least 24 hours after installation of the standpipe. The groundwater level is subject to seasonal variations and is usually highest in the spring. The symbol on the logs indicating the groundwater level is an inverted solid triangle (▼).

AECOM

MAJOR DIVISION			LOG SYMBOLS	UCS	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
COARSE GRAINED SOILS	GRAVELS (MORE THAN HALF COARSE GRAINS LARGER THAN 4.75 mm)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL GRADED GRAVELS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
				GP	POORLY GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW 'A' LINE W_p LESS THAN 4
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE 'A' LINE W_p MORE THAN 7
	SANDS (MORE THAN HALF COARSE GRAINS SMALLER THAN 4.75 mm)	CLEAN SANDS (LITTLE R NO FINES)		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
				SP	POORLY GRADED SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS	
		SANDS WITH FINES		SM	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW 'A' LINE W_p LESS THAN 4
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE 'A' LINE W_p MORE THAN 7
FINE GRAINED SOILS	SILTS (BELOW 'A' LINE NEGLIGIBLE ORGANIC CONTENT)	$W_L < 50$		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)	
		$W_L > 50$		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS		
	CLAYS (ABOVE 'A' LINE NEGLIGIBLE ORGANIC CONTENT)	$W_L < 30$		CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	WHENEVER THE NATURE OF THE FINE CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER 'F'. E.G. SF IS A MIXTURE OF SAND WITH SILT OR CLAY	
		$30 < W_L < 50$		CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS		
		$W_L > 50$		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
	ORGANIC SILTS & CLAYS (BELOW 'A' LINE)	$W_L < 50$		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		
		$W_L > 50$		OH	ORGANIC CLAYS OF HIGH PLASTICITY		
HIGHLY ORGANIC SOILS				Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE	
BEDROCK				BR	SEE REPORT DESCRIPTION		
FILL				FILL	SEE REPORT DESCRIPTION		



NOTE:
1. BOUNDARY CLASSIFICATION POSSESSING CHARACTERISTICS OF TWO GROUPS ARE GIVEN GROUP SYMBOLS, E.G. GW-GC IS A WELL GRADED GRAVEL MIXTURE WITH CLAY BINDER BETWEEN 5% AND 12%

SOIL COMPONENTS

FRACTION		SIEVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		PASSING	RETAINED	PERCENT	IDENTIFIER
GRAVEL	COARSE	75	19	50 - 35	AND
	FINE	19	4.75		
SAND	COARSE	4.75	2.00	35 – 20	_____Y
	MEDIUM	2.00	0.425		
	FINE	0.425	0.080	20 – 10	SOME
SILT (non-plastic) or CLAY (plastic)		0.080		10 - 1	TRACE
OVERSIZE MATERIALS					
ROUNDED OR SUB-ROUNDED COBBLES 75 mm TO 200 mm BOULDERS >200 mm		ANGULAR ROCK FRAGMENTS ROCKS > 0.75 m3 IN VOLUME			

MODIFIED UNIFIED SOIL CLASSIFICATION SYSTEM

August 2015

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-01
LOCATION: UTM 14 - 5533040 m N, 634923 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 231.02

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
0	OR	TOPSOIL (75 mm) - black, frozen					
		SILT and CLAY - trace sand - dark grey, stiff, moist - intermediate plasticity - dark brownish-grey below 0.5 m		G1			
1	MI-CI						230
				S2	11	SPT Blows: [3/5/6], Spoon Recovery: 28%	
2				G3			229
		SILT - some clay, trace sand - light brown, firm to stiff, moist - low plasticity					
3	ML			S4	9	SPT Blows: [3/4/5], Spoon Recovery: 78%	228
		CLAY and SILT (Lacustrine) - trace sand - brown mottled grey, firm to stiff, moist - high plasticity - trace silt inclusions (<15 mm diam.)					
4							227
				S5	6	SPT Blows: [2/3/3], Spoon Recovery: 100%	
5							226
6		- grey below 6.1 m		G6			225
7							224
8				T7		Tube Recovery: 92%, (T7): Gravel 0.0%, Sand 3.0%, Silt 35.5%, Clay 61.5%	223
9	CH-MH			G8			222
10							221
11		- soft to firm below 10.7 m		S9	2	SPT Blows: [1/1/1], Spoon Recovery: 100%	220
12				G10			219
13							218
14				T11		Tube Recovery: 100%	217
15							

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 20.27 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/3/21
PROJECT ENGINEER: Jordan T.	Page 1 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-01
LOCATION: UTM 14 - 5533040 m N, 634923 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 231.02

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
15					G12				216
16									215
17	CH-MH				G13				214
18					G14				213
19	TILL		SILT (Till) - some clay, some gravel, trace sand - light brown, very stiff, moist - low plasticity						212
20					S15	29		SPT Blows: [9/13/16], Spoon Recovery: 100%	211
21			END OF TEST HOLE AT 20.27 m IN SILT (Till) Notes: 1. Seepage observed below 18.3 m during augering. 2. Sloughing observed below 3.7 m during augering. 3. Test hole backfilled with auger cuttings and bentonite upon completion.						210
22									209
23									208
24									207
25									206
26									205
27									204
28									203
29									202
30									

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100; Total Unit Wt (kN/m³) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 20.27 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/3/21
PROJECT ENGINEER: Jordan T.	Page 2 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-02
LOCATION: UTM 14 - 5533306 m N, 635064 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 230.95

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
0	OR		TOPSOIL (100 mm) - black, frozen						
			SILT and CLAY - trace sand - dark grey, firm, moist - intermediate plasticity		G1				
1	MI-CI		- dark brownish-grey below 1.2 m						230
					S2	6		SPT Blows: [3/2/4], Spoon Recovery: 33%	
2					G3			(G3): Gravel 0.0%, Sand 3.4%, Silt 56.8%, Clay 39.8%	229
			CLAY and SILT (Lacustrine) - trace sand - brown mottled grey, firm, moist - high plasticity						
3			- trace silt inclusions (<15 mm diam.) - soft below 3.1 m		S4	2		SPT Blows: [1/1/1], Spoon Recovery: 67%	228
4									227
					G5				
5									226
6			- grey below 6.1 m						225
					T6			Tube Recovery: 83%	
7									224
	CH-MH				G7				
8			- soft below 7.6 m						223
9									222
					S8	2		SPT Blows: [0/1/1], Spoon Recovery: 100%, (S8): Gravel 0.0%, Sand 4.4%, Silt 47.8%, Clay 47.8%	
10									221
					G9				
11									220
12									219
					S10	2		SPT Blows: [0/1/1], Spoon Recovery: 78%	
13			END OF TEST HOLE AT 12.65 m IN CLAY and SILT						218
14			Notes: 1. Seepage not observed during augering. 2. Sloughing not observed during augering. 3. Test hole backfilled with auger cuttings and bentonite upon completion.						217
15									

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 12.65 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/1/21
PROJECT ENGINEER: Jordan T.	Page 1 of 1

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-03
LOCATION: UTM 14 - 5533517 m N, 635169 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 230.89

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
0	OR	TOPSOIL (125 mm) - black, frozen					
	MI-CI	SILT and CLAY - trace sand - dark grey, firm to stiff, moist - intermediate plasticity		G1			
1		- dark brownish-grey below 1.1 m					230
	ML	SILT - some clay, trace sand - light brown, firm, moist - low plasticity		S2	5	SPT Blows: [3/2/3], Spoon Recovery: 67%	
2				G3		(G3): Gravel 0.0%, Sand 5.0%, Silt 83.5%, Clay 11.5%	229
		CLAY and SILT (Lacustrine) - trace sand - grey, firm, moist - high plasticity					
3		- trace silt inclusions (<15 mm diam.)		S4	6	SPT Blows: [3/3/3], Spoon Recovery: 100%	228
4							227
				S5	4	SPT Blows: [2/2/2], Spoon Recovery: 100%	
5							226
6				T6		Tube Recovery: 92%	225
7							224
		- soft to very soft from 4.6 m to 10.7 m		S7	1	SPT Blows: [0/0/1], Spoon Recovery: 100%	
8	CH-MH						223
9				G8			222
10							221
		- firm below 10.7 m		S9	2	SPT Blows: [0/1/1], Spoon Recovery: 67%	220
11							
12				G10		(G10): Gravel 0.0%, Sand 6.2%, Silt 46.5%, Clay 47.3%	219
13							218
14				T11		Tube Recovery: 92%	217
15							216

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 20.27 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/1/21
PROJECT ENGINEER: Jordan T.	Page 1 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-03
LOCATION: UTM 14 - 5533517 m N, 635169 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 230.89

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
15						G12			215
16									
17	CH-MH			- trace to some silt till inclusions (<10 mm diam.) below 16.8 m		G13			214
18									213
19	TILL			SILT (Till) - some clay, some gravel, trace sand - light brown, very stiff, moist - low plasticity		G14			212
20				- hard below 19.8 m		S15	34	SPT Blows: [12/16/18], Spoon Recovery: 67%, (S15): Gravel 14.0%, Sand 4.6%, Silt 65.0%, Clay 16.4%	211
21				END OF TEST HOLE AT 20.27 m IN SILT (Till) Notes: 1. Seepage not observed during augering. 2. Sloughing not observed during augering. 3. Standpipe piezometer SP21-03 installed upon completion. Test hole backfilled with sand from 18.6 m to 19.1 m, bentonite from 19.1 m to 0.3 m, and sand from 0.3 m to 0.2 m. Flush-mount cover installed. 4. Groundwater monitoring: - December 17, 2021 at elev. 224.71 m (6.18 m bgs)					210
22									209
23									208
24									207
25									206
26									205
27									204
28									203
29									202
30									201

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 20.27 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/1/21
PROJECT ENGINEER: Jordan T.	Page 2 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-04
LOCATION: UTM 14 - 5533701 m N, 635249 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Geoprobe 7822DT - 125 mm SSA	ELEVATION (m): 231.06

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	ELEVATION
0	OR		TOPSOIL (100 mm) - black, frozen						
			SILT and CLAY - trace sand - dark grey, firm to stiff, moist - intermediate plasticity - brown below 0.6 m		G1				
1	MI-CI				G2				230
2			SILT - some clay, trace sand - light brown, soft to firm, moist - low plasticity		G3				229
3	ML				G4				228
4			CLAY (Lacustrine) - silty, trace sand - grey, firm, moist - high plasticity - trace silt inclusions (<15 mm diam.) - brown from 4.6 m to 6.1 m						227
5					T5			Tube Recovery: 100%	226
6			- grey, soft to firm below 6.1 m		G6			(G6): Gravel 0.0%, Sand 1.2%, Silt 32.9%, Clay 65.9%	225
7									224
8	CH				S7	1		SPT Blows: [0/0/1], Spoon Recovery: 100%	223
9					T8			Tube Recovery: 100%	222
10									221
11					G9				220
12					S10	1		SPT Blows: [0/0/1], Spoon Recovery: 100%	219
13			END OF TEST HOLE AT 12.65 m IN CLAY Notes: 1. Seepage not observed during augering. 2. Sloughing not observed during augering. 3. Test hole backfilled with auger cuttings and bentonite upon completion.						218
14									217
15									

PENETRATION TESTS: Becker | Dynamic Cone | SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100 | Total Unit Wt (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: Torvane | QU/2 | Lab Vane | Pocket Pen. | Field Vane (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 12.65 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 11/30/21
PROJECT ENGINEER: Jordan T.	Page 1 of 1

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-05
LOCATION: UTM 14 - 5533781 m N, 635048 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Mobile B-40LX - 125 mm SSA	ELEVATION (m): 230.88

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	USC	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
0	OR	TOPSOIL (75 mm) - black, frozen					230
	MI-CI	SILT and CLAY - trace sand - dark grey, firm to stiff, moist - intermediate plasticity - dark brownish-grey below 0.9 m		G1			
1							
	ML	SILT - some clay, trace sand - light brown, soft, moist - low plasticity		S2	2	SPT Blows: [2/1/1], Spoon Recovery: 100%	229
2		CLAY (Lacustrine) - silty, trace sand - brown mottled grey, firm, moist - high plasticity - trace silt inclusions (<15 mm diam.)		G3			
							228
3				T4		Tube Recovery: 67%, (T4): Gravel 0.0%, Sand 5.4%, Silt 25.8%, Clay 68.8%	
4							227
				S5	6	SPT Blows: [3/3/3], Spoon Recovery: 0%	
5							226
6		- grey below 6.1 m		G6			225
7							224
				G7			
8							223
	CH						
9		- soft below 9.1 m		S8	2	SPT Blows: [1/1/1], Spoon Recovery: 100%	222
10							221
				G9			
11							220
12							219
				S10	2	SPT Blows: [1/1/1], Spoon Recovery: 33%	
13							218
				G11			
14		- trace to some silt till inclusions (<10 mm diam.) below 13.7 m					217
15							216

PENETRATION TESTS: ✳ Becker ✳ | ◇ Dynamic Cone ◇ | ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | ☐ Lab Vane ☐ | △ Pocket Pen. △ | ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM	LOGGED BY: Ryan Harras	COMPLETION DEPTH: 18.59 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/6/21
	PROJECT ENGINEER: Jordan T.	Page 1 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21

PROJECT: Jefferson East CSR Works (Contract 6A)	CLIENT: City of Winnipeg	TESTHOLE NO: TH21-05
LOCATION: UTM 14 - 5533781 m N, 635048 m E		PROJECT NO.: 60599385
CONTRACTOR: Maple Leaf Drilling	METHOD: Mobile B-40LX - 125 mm SSA	ELEVATION (m): 230.88

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	USC	SOIL SYMBOL	SLOTTED PIEZOMETER	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	ELEVATION
15									215
16	CH					S12	3	SPT Blows: [1/2/1], Spoon Recovery: 100%	214
17									213
18	TILL			SILT (Till) - some clay, some gravel, trace sand - light brown, moist - low plasticity		G14			212
19				END OF TEST HOLE AT 18.59 m ON AUGER REFUSAL Notes: 1. Seepage observed below 3.1 m during augering. 2. Water to 2.1 m below ground surface upon completion of augering. 3. Sloughing observed below 3.1 m during augering. 4. Test hole open to 18.6 m upon completion of augering. 5. Auger refusal at 18.6 m in silt (till). 6. Standpipe piezometer SP21-05 installed upon completion. Test hole backfilled with sand from 18.6 m to 17.8 m, bentonite from 17.8 m to 0.3 m, and sand from 0.3 m to 0.2 m. Flush-mount cover installed. 7. Groundwater monitoring: - December 17, 2021 at elev. 221.10 m (9.79 m bgs)				211
20									210
21									209
22									208
23									207
24									206
25									205
26									204
27									203
28									202
29									201
30									

PENETRATION TESTS: ✳ Becker ✳ | ◇ Dynamic Cone ◇ | ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | ■ Total Unit Wt ■ (kN/m³) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | ☐ Lab Vane ☐ | △ Pocket Pen. △ | ⬘ Field Vane ⬘ (kPa) 50 100 150 200

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 18.59 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 12/6/21
PROJECT ENGINEER: Jordan T.	Page 2 of 2

LOG OF TEST HOLE 60599385 - TEST HOLE LOGS - CONTRACT 6A.GPJ UMA WINN.GDT 12/22/21