



THURBER ENGINEERING LTD.

**FOUNDATION INVESTIGATION REPORT
MTO PATROL YARD IN GRAFTON, ONTARIO
AGREEMENT NO. 4017-E-0021, ASSIGNMENT NO. 6**

Geocres No.: 31C-287

Report to:

McIntosh Perry Consulting Engineers

Latitude: 44.003101°
Longitude: -78.024064°

February 2020
Thurber File No.: 25964



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PART 1. FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual data obtained from a foundation investigation conducted by Thurber Engineering Ltd. (Thurber) for the MTO Patrol Yard located south east of the Lyle Street / County Road 23 / Highway 401 Interchange in Grafton, Ontario. Thurber carried out the investigation as a subconsultant to McIntosh Perry Consulting Engineers (MPCE), under MTO Retainer Agreement Number 4017-E-0021, Assignment #06.

A preliminary general arrangement (GA) drawing and base plan mapping were provided by MPCE for the preparation of this report.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on this data, provide a borehole location plan, record of boreholes, a stratigraphic profile, laboratory test results and a written description of the subsurface conditions.

2 SITE DESCRIPTION

The existing Grafton Patrol Yard configuration consists of a garage, salt shed and storage building. Paved access roads and parking areas are present as are grassed landscape areas and gravel surfaced outside storage areas. The land adjacent to the site is relatively flat and typically consists of forests and agricultural fields. The site is bordered to the north by Highway 401 and by Lyle Street / County Road 23 to the west. Drainage is generally overland leading to ditches on the north and east sides of this relatively flat site.

Based on published geological information in *The Physiography of Southern Ontario* by Chapman and Putnam (1984), the site lies within the physiographic region known as the Iroquois Plain. The Iroquois Plain is characterized primarily by a band of beach deposits formed at the shoreline of an ancestral lake and a lacustrine plain extending to Lake Ontario that represent lake bottom deposits smoothed by wave action.

Photographs showing the existing conditions at the time of the field investigation are included in Appendix D for reference.



3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field-testing program was carried out between December 10th and 13th, 2019. The field investigation consisted of advancing eight boreholes identified as Boreholes 19-1 through 19-8. Prior to commencement of drilling, utility clearances were obtained in the vicinity of the borehole locations.

The northing, easting and elevation of the boreholes are shown on the Borehole Location and Soil Strata Drawing No. 1 in Appendix A, the individual Record of Borehole sheets in Appendix B, and in Table 3-1 below. The site is located within MTM Zone 10.

Table 3-1: Borehole Summary

Borehole No.	Drilled Location	Northing (Latitude)	Easting (Longitude)	Ground Surface Elevation (m)	Termination Depth (m)
19-1	Proposed Garage	4 874 728.8 (44.003018)	423 126.5 (-78.024505)	166.9	9.4
19-2	Proposed Garage	4 874 699.5 (44.002752)	423 136.7 (-78.024384)	166.4	13.2
19-3	Proposed Garage	4 874 725.5 (44.002983)	423 159.7 (-78.024092)	166.8	10.9
19-4	Proposed Garage	4 874 750.8 (44.003206)	423 183.0 (-78.023795)	167.3	10.7
19-5	Proposed Garage	4 874 719.9 (44.002927)	423 194.7 (-78.023656)	166.3	8.2
19-6	Proposed Garage	4 874 740.0 (44.003106)	423 203.2 (-78.023546)	167.3	11.2
19-7	Proposed Cold Storage	4 874 774.2 (44.003406)	423 249.6 (-78.02296)	167.3	8.0
19-8	Proposed Cold Storage	4 874 786.9 (44.003519)	423 259.6 (-78.022832)	167.6	9.3

The investigation was carried out using a truck-mounted CME 75 drill rig equipped with hollow-stem augers.

The subsurface stratigraphy encountered in the boreholes was recorded in the field by Thurber personnel. Split spoon samples were collected at regular depth intervals in the boreholes during the completion of Standard Penetration Tests (SPT) following the methods described in ASTM Standard D1586-11. All soil samples recovered from the boreholes were placed in moisture-proof



containers and the samples were transported to Thurber's Ottawa geotechnical laboratory for further examination and testing.

A 50 mm diameter monitoring well was installed in Borehole 19-2 on completion of drilling to allow for pump testing and measurements of the groundwater level. The well installation details are illustrated on the Record of Borehole sheets for Borehole 19-2 provided in Appendix B. The well was decommissioned in accordance with Ontario MOE Regulation 903 on December 13th, 2019.

The boreholes without well installations were backfilled with a low-permeability combination of auger cuttings and bentonite pellets in accordance with Ontario MOE Regulation 903.

The as-drilled locations of the boreholes and ground surface elevations at the borehole locations were surveyed by Thurber on December 13th, 2019 using a Trimble Catalyst DA1 antenna with centimeter accuracy. The benchmarks used were site benchmarks provided by MPCE labeled 300 and 301 with geodetic elevations of 167.848 m and 168.024 m, respectively.

4 LABORATORY TESTING

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all soil samples in accordance with the current MTO standards. Grain size distribution analyses, Atterberg Limits testing and organic content testing were carried out on selected samples to MTO and ASTM standards.

The results of the geotechnical tests are summarized on the Record of Borehole sheets included in Appendix B and all laboratory results are presented on the figures included in Appendix C.

Chemical analysis for determination of pH, resistivity, conductivity, soluble sulphate, sulfide and chloride concentrations was carried out on three soil samples. A copy of the chemical analysis results is provided in Appendix C.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

5.1 Overview / General

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix B. Stratigraphic profiles for the site are presented on the drawing in Appendix A for illustrative purposes. An overall description of the stratigraphy is given in the following paragraphs; however, the factual data presented in the Record of Boreholes governs any interpretation of the site conditions. It must be recognized that the soil and groundwater conditions may vary between and beyond borehole locations. Soil classification is in accordance with ASTM D2487.

For reference, the stratigraphy encountered in the boreholes at this site is characterized by fill, overlying a native sand to silt deposit over glacial till. Bedrock was not confirmed during the course of this investigation.



More detailed descriptions of the individual strata are presented below.

5.2 Fill

A fill layer ranging in composition from silty sand with gravel to gravel with silt and sand was encountered from surface in all boreholes. Trace to some organics was observed in the fill from a depth of 0.8 to 3.0 m in Borehole 19-1. The fill extended to depths ranging from 1.5 m to 3.0 m (Elevation 163.3 m to 166.1 m) below ground surface.

SPT tests conducted in this layer gave N-values ranging from 3 to greater than 100 blows, indicating a very loose to very dense relative density.

The moisture content of the fill samples tested ranged from 3 to 35%. An organic content test performed on a sample of fill material from Borehole 19-1 indicated an organic content of 13.7%. The results of grain size analysis tests conducted on seven samples of the fill material are summarized below in Table 5-1 and are illustrated on Figures C1 and C2 in Appendix C.

Table 5-1: Summary of Grain Size Distribution Testing – Fill

Soil Particle	Percentage (%)
Gravel	1 – 46
Sand	46 – 82
Silt & Clay	6 – 22

5.3 Silty Sand to Sand (SP-SM)

A native deposit ranging in composition from silty sand to sand with silt some gravel, trace organics was encountered below the fill in Boreholes 19-1, 19-2, 19-5 and 19-6. This layer ranged in thickness from 0.9 m to 3.8 m with an underside depth ranging from 3.0 to 6.1 m below ground surface (base elevation 160.2 m to 163.4 m).

SPT tests conducted within this layer gave N-values ranging from 3 to greater than 100 blows, indicating a very loose to very dense relative density; but typically, compact to dense.

The moisture content of the samples tested ranged from 8 to 19%. An organic content test performed on a sample near the surface of this deposit in Borehole 19-6 indicated an organic content of 1.3%. The results of three grain size analysis tests conducted on samples of this material are summarized below in Table 5-2 and are illustrated on Figure C3 in Appendix C.



Table 5-2: Summary of Grain Size Distribution Testing – Silty Sand to Sand

Soil Particle	Percentage (%)	
Gravel	10 – 18	
Sand	46 – 80	
Silt	33	10 – 42
Clay	9	

Atterberg Limits testing was completed on the fines fraction (minus the gravel and coarse sand fraction) of one sample of this deposit. The sample was found to be non-plastic.

5.4 Sandy Silt to Silt (ML)

A native deposit ranging in composition from sandy silt to silt some sand was encountered below the silty sand layer in Borehole 19-2 and beneath the fill material in Boreholes 19-3, 19-4, 19-7 and 19-8. This layer ranged in thickness from 1.5 m to 4.6 m with an underside depth ranging from 3.0 m to 7.6 m below ground surface (base elevation ranging from 159.2 m to 164.6 m).

SPT tests conducted within this layer gave N-values ranging from 8 to 99 blows indicating a loose to very dense state; but typically, compact to dense.

The moisture content of the samples tested ranged from 8 to 24%. The results of four gradation tests on samples of this material are summarized below in Table 5-3 and are illustrated on Figure C4 in Appendix C.

Table 5-3: Summary of Grain Size Distribution Testing – Sandy Silt to Silt

Soil Particle	Percentage (%)	
Gravel	0 – 3	
Sand	10 – 46	
Silt	57 – 85	51 – 90
Clay	4 – 7	

Atterberg Limits testing on three samples of the sandy silt to silt indicated the samples to be non-plastic.

5.5 Glacial Till

A glacial till deposit consisting of a heterogeneous mixture of gravel, sand, silt and clay was encountered beneath the native silty sand to sand in Boreholes 19-1, 19-5 and 19-6 and below the native sandy silt to silt deposit in all other boreholes. The till is generally classified as silty



sand with to some gravel. It is noted that, although not observed in the boreholes, glacial till typically contains cobbles and boulders.

Sampling in all of the boreholes was terminated within this deposit at depths ranging from 8.0 to 11.3 m (Elevation 155.1 m to 159.3 m). Borehole 19-2 was continued with a dynamic cone penetration test to a refusal depth of 13.2 m (elevation 153.2 m). The SPT 'N' values ranged from 14 to greater than 100 indicating a compact to very dense condition; but typically, dense. The higher blow counts could also be due to the presence of cobbles or a boulder within the deposit rather than the relative density of the soil matrix.

The moisture content of the glacial till ranged from 6 to 15%. The results of grain size distribution testing carried out on nine samples of the glacial till are summarized in Table 5-4 below and are illustrated on Figures C5 and C6 in Appendix C.

Table 5-4: Summary of Grain Size Distribution Testing – Glacial Till

Soil Particle	Percentage (%)	
Gravel	11 – 24	
Sand	40 – 66	
Silt	27 – 33	17 – 33
Clay	5 – 12	

Atterberg Limits testing was completed on the fines fraction (minus the gravel and coarse sand fraction) of seven samples of the glacial till. Six of the fines portion samples were found to be non-plastic; the remaining sample had a liquid limit of 11, a plastic limit of 10 and a plasticity index of 1, indicating a silt of low plasticity (ML). The results of this Atterberg Limits analysis are illustrated on Figure C7 in Appendix C.

5.6 Groundwater

The groundwater level was measured in the monitoring well installed in Borehole 19-2. The measurements are presented on the Record Borehole sheets in Appendix B and in Table 5-5 below:

Table 5-5: Summary of Groundwater Levels

Borehole No.	Bottom of Screen Elevation (m)	Depth (mbgs)	Groundwater Elevation (m)	Date of Measurement
19-2	158.8	4.1	162.3	2019.12.10
		3.4	163.0	2019.12.11
		3.4	163.0	2019.12.12
		3.4	163.0	2019.12.13



These observations are considered short term and it should be noted that the groundwater level at the time of construction may be different and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after periods of significant and/or prolonged precipitation.

A pump test was performed within the monitoring well installed in Borehole 19-2; this test indicates an estimated hydraulic conductivity using Hvorslev of 1.9×10^{-6} m/s at the well screen level.

5.7 Analytical Testing

Three samples of the native soils were submitted to Paracel Laboratories in Ottawa, Ontario for analysis of pH, water soluble sulphate, sulphide and chloride concentrations, resistivity and conductivity. The analysis results are summarized in Table 5-6. Copies of the test results are provided in Appendix C.

Table 5-6: Results of Chemical Analysis

Borehole	19-2	19-4	19-7
Sample	SS5	SS4	SS4
Depth (m)	3.0 – 3.6	2.3 – 2.9	2.3 – 2.9
Chloride ($\mu\text{g/g}$)	222	257	82
Sulphate ($\mu\text{g/g}$)	15	12	8
Sulphide (%)	< 0.02	< 0.02	< 0.02
pH (-)	7.7	7.8	7.8
Resistivity (Ohm-cm)	2,330	1,640	4,590
Conductivity ($\mu\text{S/cm}$)	429	611	218



6 MISCELLANEOUS

Thurber staked and/or marked the borehole locations in the field and obtained utility clearances prior to drilling. The as-drilled locations and ground surface elevation were measured by Thurber following completion of the field program.

Downing Drilling of Hawkesbury, Ontario supplied and operated the drilling equipment and carried out the drilling, soil sampling, in-situ testing, well installation and borehole decommissioning. The field investigation was supervised on a full-time basis by Mr. Jamil Pirani of Thurber. Overall supervision of the investigation program was provided by Mr. Christopher Murray, P.Eng.

Routine geotechnical laboratory testing was completed by Thurber's laboratory in Ottawa, Ontario. Analytical testing was completed by Paracel Laboratories in Ottawa, Ontario. Organic content testing was carried out by Stantec Consulting Ltd. in its MTO-approved laboratory in Ottawa.

Overall project management was provided by Mr. Stephen Peters, P.Eng. Interpretation of the factual data and preparation of this report were carried out by Mr. Christopher Murray, P.Eng.. The report was reviewed by Dr. Fred Griffiths, P.Eng., a Designated Principal Contact for MTO Foundations Projects.



Christopher Murray, M.A.Sc., P.Eng.
Geotechnical Engineer

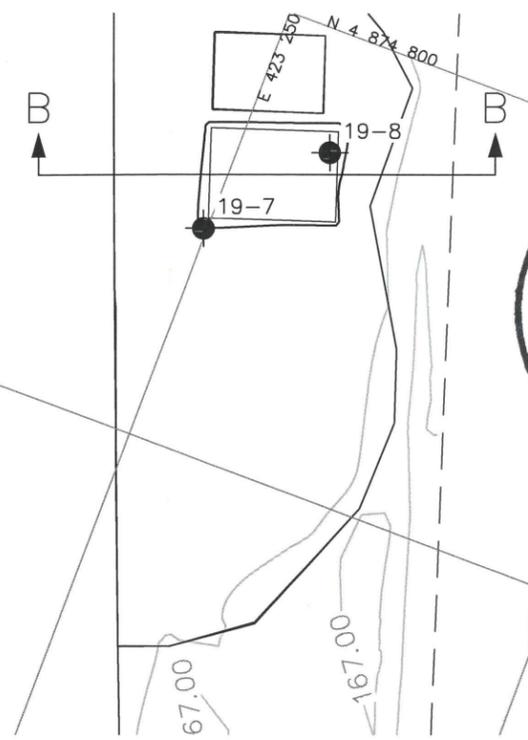
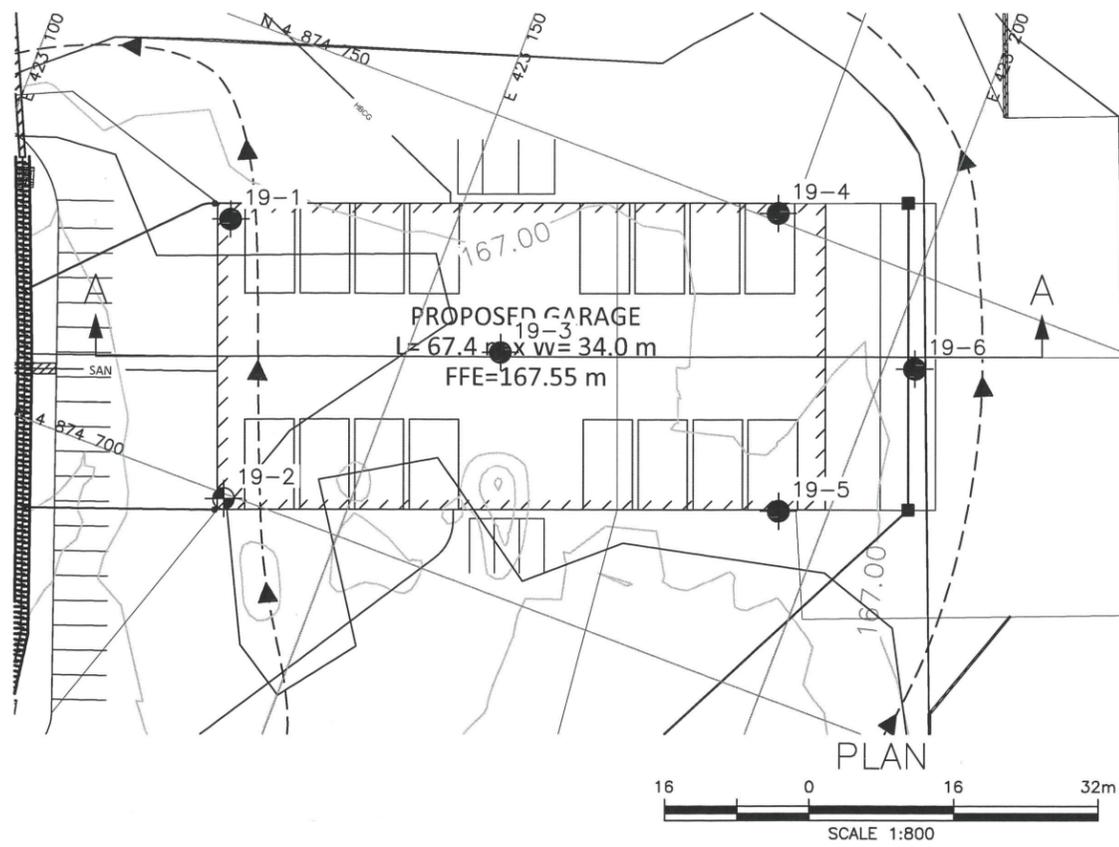


Dr. Fred Griffiths, P.Eng.
MTO Review Principal,
Senior Geotechnical Engineer



Appendix A.

Borehole Location Plan and Stratigraphic Drawings

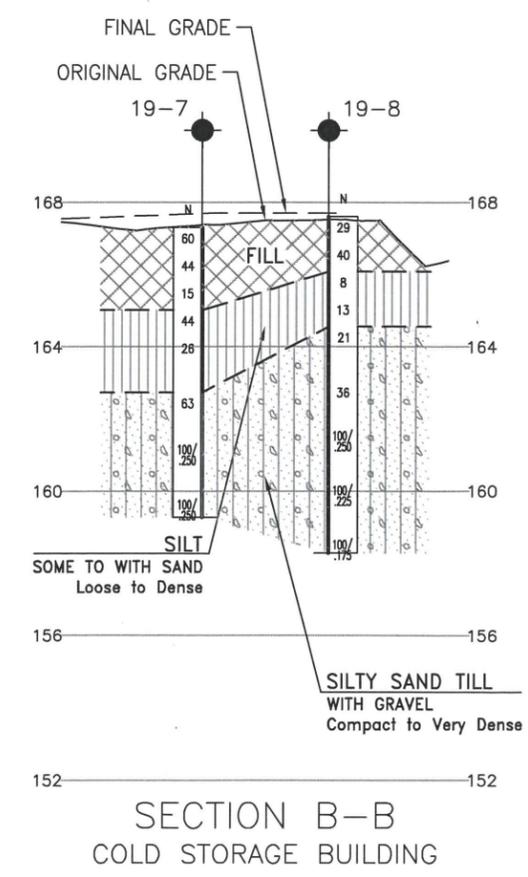
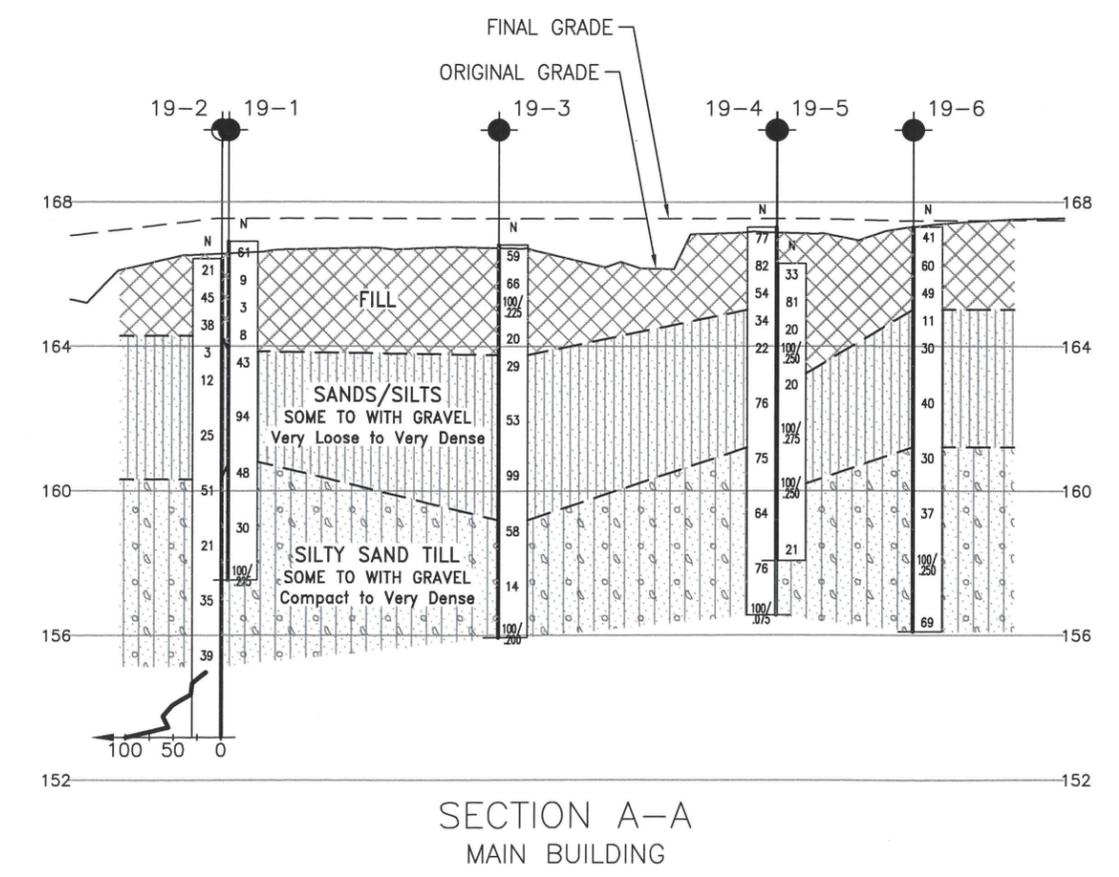
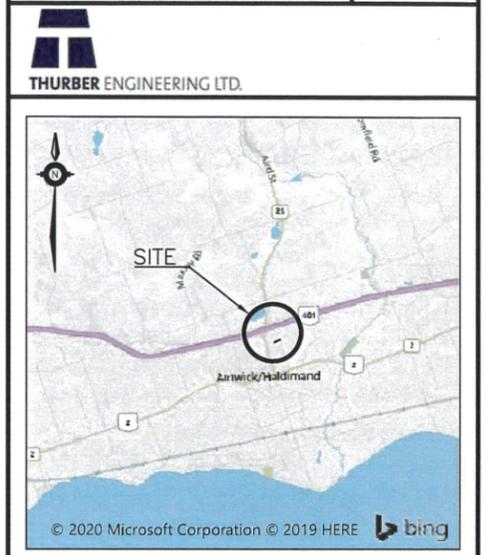


METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

LICENSED PROFESSIONAL ENGINEER
C. A. Murray
C. A. MURRAY
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F. J. GRIFFITHS
90360280
Feb 21/20
PROVINCE OF ONTARIO

CONT No	HIGHWAY 401 GRAFTON PATROL YARD	SHEET
WP No		
BOREHOLE LOCATIONS AND SOIL STRATA		



LEGEND

- ◆ Borehole
- ◆ Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- ▽ Water Level
- ▽ Head Artesian Water
- ⊥ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
19-1	166.9	4 874 728.8	423 126.5
19-2	166.4	4 874 699.5	423 136.7
19-3	166.8	4 874 725.5	423 159.7
19-4	167.3	4 874 750.8	423 183.0
19-5	166.3	4 874 719.9	423 194.7
19-6	167.3	4 874 740.0	423 203.2
19-7	167.3	4 874 774.2	423 249.6
19-8	167.6	4 874 786.9	423 259.6

- NOTES-
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
 - This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
 - Coordinate system is MTM NAD 83 Zone 10.

GEOCRES No. 31C-287

DATE	BY	DESCRIPTION
DESIGN	CM	CHK - CODE
DRAWN	MFA	CHK CM SITE

LOAD DATE FEB 2020
STRUCT DWG 1



Appendix B.
Field Investigation and Testing



SYMBOLS, ABBREVIATIONS AND TERMS USED ON TEST HOLE RECORDS

TERMINOLOGY DESCRIBING COMMON SOIL GENESIS

Topsoil	mixture of soil and humus capable of supporting vegetative growth
Peat	mixture of fragments of decayed organic matter
Till	unstratified glacial deposit which may include particles ranging in sizes from clay to boulder
Fill	material below the surface identified as placed by humans (excluding buried services)

TERMINOLOGY DESCRIBING SOIL STRUCTURE:

Desiccated	having visible signs of weathering by oxidization of clay materials, shrinkage cracks, etc.
Fissured	having cracks, and hence a blocky structure
Varved	composed of alternating layers of silt and clay
Stratified	composed of alternating successions of different soil types, e.g. silt and sand
Layer	> 75 mm in thickness
Seam	2 mm to 75 mm in thickness
Parting	< 2 mm in thickness

RECOVERY:

For soil samples, the recovery is recorded as the length of the soil sample recovered.

N-VALUE:

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 63.5 kg hammer falling 0.76 m, required to drive a 50 mm O.D. split spoon sampler 0.3 m into undisturbed soil. For samples where insufficient penetration was achieved and N-value cannot be presented, the number of blows are reported over the sampler penetration in millimetres (e.g. 50/75).

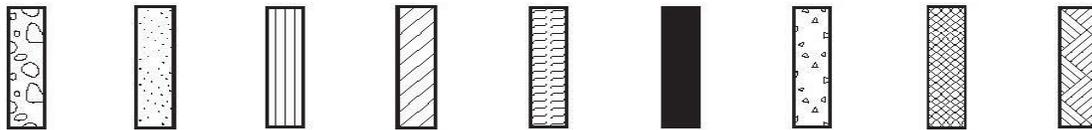
DYNAMIC CONE PENETRATION TEST (DCPT):

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to an "A" size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone 0.3 m into the soil. The DCPT is used as a probe to assess soil variability.



STRATA PLOT:

Strata plots symbolize the soil and bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



Boulders
Cobbles
Gravel Sand Silt Clay Organics Asphalt Concrete Fill Bedrock

TEXTURING CLASSIFICATION OF SOILS

Classification	Particle Size
Boulders	Greater than 200 mm
Cobbles	75 – 200 mm
Gravel	4.75 – 75 mm
Sand	0.075 – 4.75 mm
Silt	0.002 – 0.075 mm
Clay	Less than 0.002 mm

TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

Descriptive Term	Undrained Shear Strength (kPa)
Very Soft	12 or less
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	100 – 200
Hard	Greater than 200

NOTE: Clay sensitivity is defined as the ratio of the undisturbed strength over the remolded strength.

SAMPLE TYPES

SS	Split spoon samples
ST	Shelby tube or thin wall tube
DP	Direct push sample
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ etc.	Rock core sample obtained with the use of standard size diamond coring equipment

TERMS DESCRIBING CONSISTENCY (COHESIONLESS SOILS ONLY)

Descriptive Term	SPT "N" Value
Very Loose	Less than 4
Loose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	Greater than 50



MODIFIED UNIFIED SOIL CLASSIFICATION

Major Divisions		Group Symbol	Typical Description
COARSE GRAINED SOIL	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILT AND CLAY SOILS $W_L < 35\%$	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty-clays of low plasticity.
	SILT AND CLAY SOILS $35\% < W_L < 50\%$	MI	Inorganic compressible fine sandy silt with clay of medium plasticity, clayey silts.
		CI	Inorganic clays of medium plasticity, silty clays.
		OI	Organic silty clays of medium plasticity.
	SILT AND CLAY SOILS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other organic soils.

Note - W_L = Liquid Limit



EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock materials.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structures are preserved.

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1 m in length or larger, as a percentage of total core length
Unconfined Compressive Strength: (UCS)	Axial stress required to break the specimen.
Fracture Index: (FI)	Frequency of natural fractures per 0.3 m of core run.

DISCONTINUITY SPACING

Bedding	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 to 2 m
Medium bedded	0.2 to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 to 60 mm
Laminated	6 to 20 mm
Thinly laminated	Less than 6 mm

STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength (MPa)
Extremely Strong	Greater than 250
Very Strong	100 – 250
Strong	50 – 100
Medium Strong	25 – 50
Weak	5 – 25
Very Weak	1 – 5
Extremely Weak	0.25 – 1

RECORD OF BOREHOLE No 19-1

1 OF 1

METRIC

Lat: 44.003018°, Long: -78.024505°
Grafton Patrol Yard, MTM z10: N 4 874 728.8 E 423 126.5

WP# _____	LOCATION _____	ORIGINATED BY <u>JP</u>
HWY <u>401</u>	BOREHOLE TYPE <u>CME 75 Truckmount, HSA</u>	COMPILED BY <u>JP</u>
DATUM <u>Geodetic</u>	DATE <u>2019.12.12 - 2019.12.12</u>	CHECKED BY <u>CM</u>

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W		
166.9	Ground Surface											
0.0	SILTY SAND, with gravel Very Dense Brown FILL		1	SS	61							
166.1												
0.8	SILTY SAND, trace to some organics Very Loose to Loose Dark Brown to Brown FILL		2	SS	9							
			3	SS	3							
			4	SS	8							
163.9												
3.0	SILTY SAND (SP-SM), with gravel Dense to Very Dense Grey-Brown to Brown		5	SS	43							
			6	SS	94							
160.8												
6.1	SILTY SAND (SM) some gravel Dense to Very Dense Grey-Brown TILL		7	SS	48							
			8	SS	30							
157.5			9	SS	100/							
9.4	End of Borehole					225mm						

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO) GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-2

1 OF 2

METRIC

WP# _____ LOCATION Lat: 44.002752°, Long: -78.024384°
Grafton Patrol Yard, MTM z10: N 4 874 699.5 E 423 136.7 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.10 - 2019.12.10 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80			100
166.4	Ground Surface													
0.0	SILTY SAND, with gravel Compact to Dense Brown to Grey-Brown FILL		1	SS	21									
			2	SS	45									27 55 18 (SI+CL)
			3	SS	38									
164.3	SILTY SAND (SM) some gravel Very Loose Grey		4	SS	3									12 46 33 9 non-plastic
163.4	SANDY SILT (ML) Compact Grey to Brown		5	SS	12									
			6	SS	25									
160.3	SILTY SAND (SM) some gravel Compact to Very Dense Grey to Grey-Brown TILL		7	SS	51									11 56 33 (SI+CL)
			8	SS	21									
			9	SS	35									

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-2

2 OF 2

METRIC

WP# _____ LOCATION Lat: 44.002752°, Long: -78.024384°
Grafton Patrol Yard, MTM z10: N 4 874 699.5 E 423 136.7 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.10 - 2019.12.10 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60					
155.1	Continued From Previous Page SILTY SAND (SM) some gravel Compact to Very Dense Grey to Grey-Brown TILL		10	SS	39										
11.3	End of Borehole - Continue with DCPT														
153.2	End of DCPT 50 mm diameter monitoring well installed on completion of DCPT WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2019.12.10 4.1 162.3 2019.12.11 3.4 163.0 2019.12.12 3.4 163.0 2019.12.13 3.4 163.0														

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

RECORD OF BOREHOLE No 19-3

2 OF 2

METRIC

WP# _____ LOCATION Lat: 44.002983°, Long: -78.024092°
Grafton Patrol Yard, MTM z10: N 4 874 725.5 E 423 159.7 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.11 - 2019.12.11 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
						20 40 60 80 100	20 40 60	20 40 60	20 40 60	20 40 60	W _p	W	W _L			
	Continued From Previous Page															
155.9	SILTY SAND (SM) with gravel Compact to Very Dense Grey TILL		10	SS	100/											
10.9	End of Borehole				200mm											

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-4

1 OF 2

METRIC

WP# _____ LOCATION Lat: 44.003206°, Long: -78.023795°
Grafton Patrol Yard, MTM z10: N 4 874 750.8 E 423 183.0 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.12 - 2019.12.12 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							
167.3	Ground Surface														
0.0	SAND with silt and gravel Very Dense Brown FILL		1	SS	77		167								33 61 6 (SI+CL)
			2	SS	82		166								
			3	SS	54										
165.0	SANDY SILT (ML) Compact to Very Dense Brown to Grey-Brown		4	SS	34		165								
2.3			5	SS	22		164								
			6	SS	76		163								1 38 57 4 non-plastic
							162								
161.2	SILTY SAND (SM) with gravel Very Dense Grey to Grey-Brown TILL		7	SS	75		161								
6.1			8	SS	64		160								
							159								
			9	SS	76		158								16 66 18 (SI+CL)

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-4

2 OF 2

METRIC

WP# _____ LOCATION Lat: 44.003206°, Long: -78.023795°
Grafton Patrol Yard, MTM z10: N 4 874 750.8 E 423 183.0 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.12 - 2019.12.12 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
						20	40	60	80	100	W _p	W	W _L			
	Continued From Previous Page															
156.6	SILTY SAND (SM) with gravel Very Dense Grey to Grey-Brown TILL		10	SS	100/											
10.7	End of Borehole				75mm											

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

RECORD OF BOREHOLE No 19-5

1 OF 1

METRIC

WP# _____ LOCATION Lat: 44.002927°, Long: -78.023656°
Grafton Patrol Yard, MTM z10: N 4 874 719.9 E 423 194.7 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.11 - 2019.12.11 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60					
166.3	Ground Surface														
0.0	SILTY SAND with gravel Compact to Very Dense Brown to Grey-Brown FILL		1	SS	33										
			2	SS	81										
			3	SS	20										
			4	SS	100/ 250mm										
163.3	SAND (SP-SM) with silt, some gravel Compact to Very Dense Brown		5	SS	20										10 80 10 (SI+CL)
			6	SS	100/ 275mm										
160.2	SILTY SAND (SM) some gravel Compact to Very Dense Grey-Brown TILL		7	SS	100/ 250mm										
			8	SS	21										12 49 32 7 non-plastic
158.1	End of Borehole														
8.2	End of Borehole														

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-6

1 OF 2

METRIC

WP# _____ LOCATION Lat: 44.003106°, Long: -78.023546°
Grafton Patrol Yard, MTM z10: N 4 874 740.0 E 423 203.2 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.11 - 2019.12.11 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)			
						20 40 60 80 100		20 40 60					
						○ UNCONFINED + FIELD VANE		W P W W L					
						● QUICK TRIAXIAL × LAB VANE							
167.3	Ground Surface												
0.0	SAND with silt and gravel to GRAVEL with silt and sand Dense to Very Dense Brown FILL		1	SS	41								
			2	SS	60								
			3	SS	49							46 46 8 (SI+CL)	
165.0													
2.3	SAND (SP-SM) with silt, some gravel - trace organics in SS4 Compact to Dense Brown-Black to Brown		4	SS	11							Org Content = 1.3%	
			5	SS	30								
			6	SS	40								
161.2													
6.1	SILTY SAND (SM) some to with gravel Compact to Very Dense Grey to Grey-Brown TILL		7	SS	30							14 44 33 9 non-plastic	
			8	SS	37								
			9	SS	100/250mm								

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-6

2 OF 2

METRIC

WP# _____ LOCATION Lat: 44.003106°, Long: -78.023546°
Grafton Patrol Yard, MTM z10: N 4 874 740.0 E 423 203.2 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.11 - 2019.12.11 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)
							20	40	60	80	100	W _p	W	W _L			
	Continued From Previous Page																
156.1	SILTY SAND (SM) some to with gravel Compact to Very Dense Grey to Grey-Brown TILL		10	SS	69												16 40 32 12
11.2	End of Borehole																

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-7

1 OF 1

METRIC

WP# _____ LOCATION Lat: 44.003406°, Long: -78.02296°
Grafton Patrol Yard, MTM z10: N 4 874 774.2 E 423 249.6 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.12 - 2019.12.13 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60					
167.3	Ground Surface														
0.0	SAND with silt and gravel Compact to Very Dense Brown to Grey-Brown FILL		1	SS	60										32 59 9 (SI+CL)
			2	SS	44										
			3	SS	15										
165.0															
2.3	SILT (ML) with sand Compact to Dense Brown		4	SS	44										2 27 64 7 non-plastic
			5	SS	26										
162.7															
4.6	SILTY SAND (SM) with gravel Very Dense Brown TILL		6	SS	63										
			7	SS	100/ 250mm										
159.3															
8.0	End of Borehole		8	SS	100/ 250mm										17 40 32 11 non-plastic

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 19-8

1 OF 1

METRIC

WP# _____ LOCATION Lat: 44.003519°, Long: -78.022832°
Grafton Patrol Yard, MTM z10: N 4 874 786.9 E 423 259.6 ORIGINATED BY JP
 HWY 401 BOREHOLE TYPE CME 75 Truckmount, HSA COMPILED BY JP
 DATUM Geodetic DATE 2019.12.13 - 2019.12.13 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80			100
167.6	Ground Surface													
0.0	SAND with silt and gravel Compact to Dense Brown FILL		1	SS	29						o			
			2	SS	40						o			25 67 8 (SI+CL)
166.1	SILT (ML) some sand trace organics Loose to Compact Brown to Brown-Black		3	SS	8						o			
1.5			4	SS	13						o			0 10 85 5 non-plastic
164.6	SILTY SAND (SM) with gravel Compact to Very Dense Brown TILL		5	SS	21						o			
3.0			6	SS	36						o			24 44 27 5 non-plastic
			7	SS	100/ 250mm						o			
			8	SS	100/ 225mm						o			
			9	SS	100/ 175mm						o			
158.3	End of Borehole													
9.3														

DOUBLE LINE 25964 GRAFTON PATROL YARD.GPJ 2012TEMPLATE(MTO).GDT 20/2/20

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE



Slug Test Analysis Report

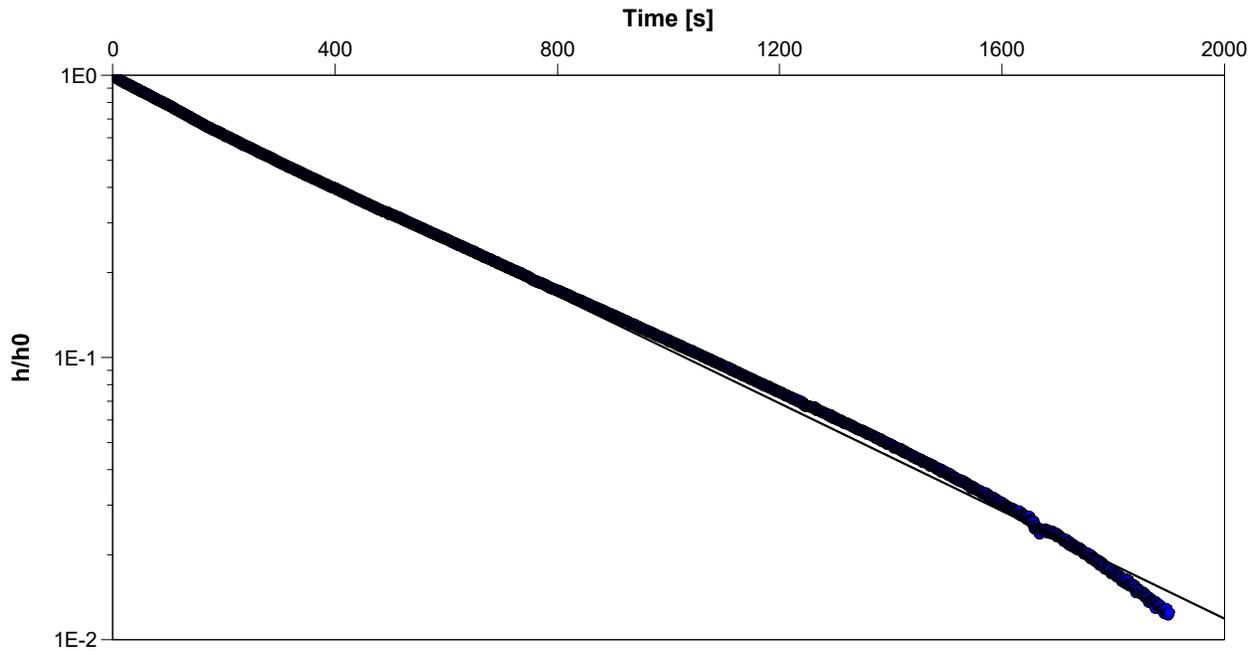
Project: Hwy 401 - Grafton Patrol Yard

Number: 25964

Client: McIntosh Perry

Location: Grafton Patrol Yard	Slug Test: BH19-2	Test Well: BH19-02
Test Conducted by: J.P.		Test Date: 2019-12-12
Analysis Performed by: Y.C.	Checked by: D.H.	Analysis Date: 2019-12-17

Aquifer Thickness:



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]
BH19-02	1.9×10^{-6}



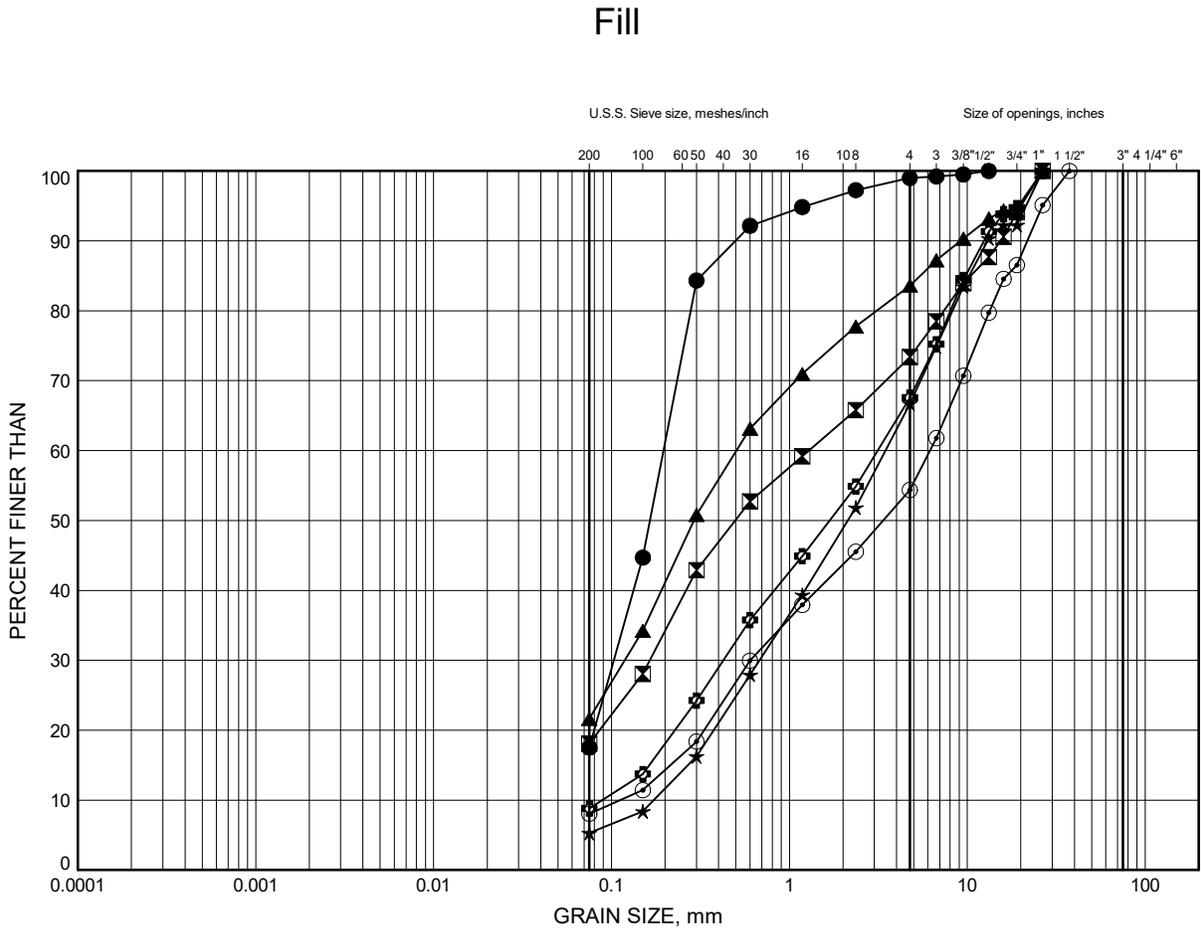
Appendix C.
Laboratory Testing



Appendix C.1
Particle Size Analysis Figures
Atterberg Limit Test Results

Hwy 401 Grafton Patrol Yard GRAIN SIZE DISTRIBUTION

FIGURE C1



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-1	2.6	164.3
⊠	19-2	1.1	165.4
▲	19-3	1.1	165.8
★	19-4	0.3	167.0
⊙	19-6	1.8	165.5
⊕	19-7	0.3	167.0

Date January 2020
WP#

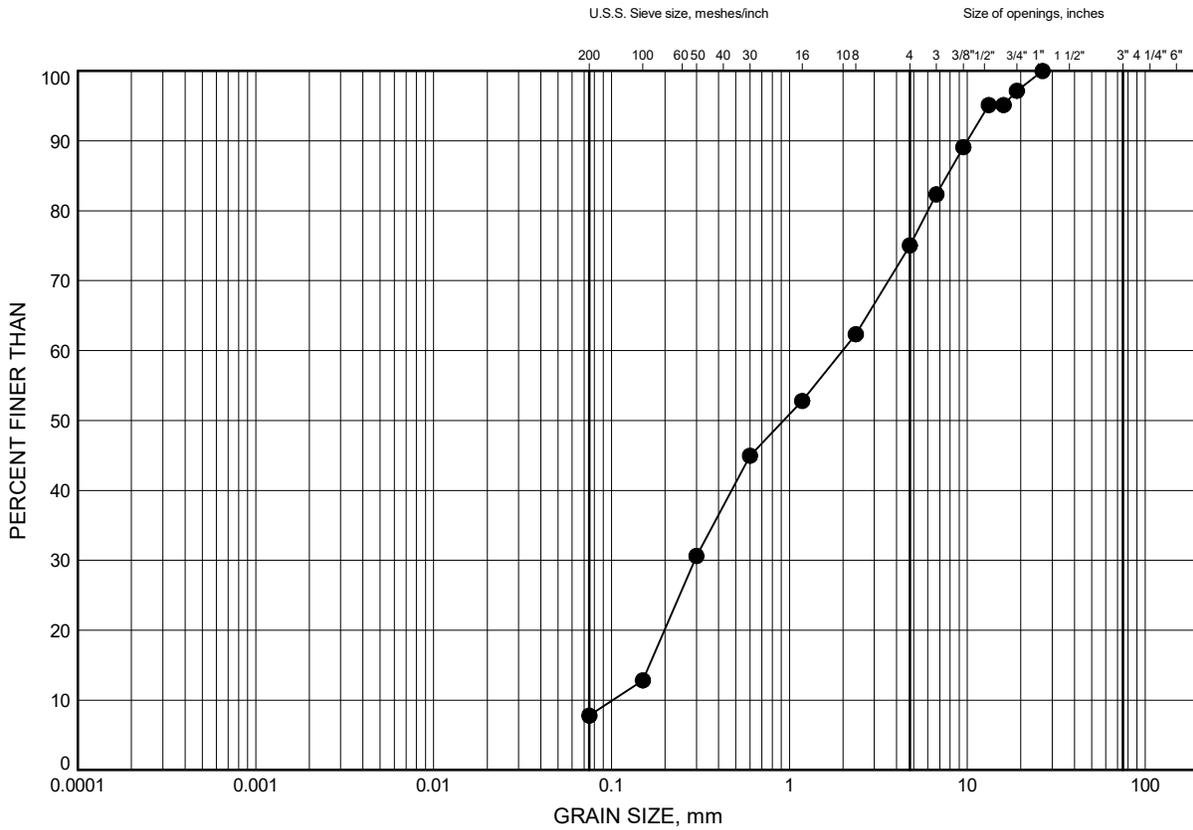


Prep'd CM
Chkd. FJG

Hwy 401 Grafton Patrol Yard
GRAIN SIZE DISTRIBUTION

FIGURE C2

Fill



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-8	1.1	166.5

Date January 2020
 WP#



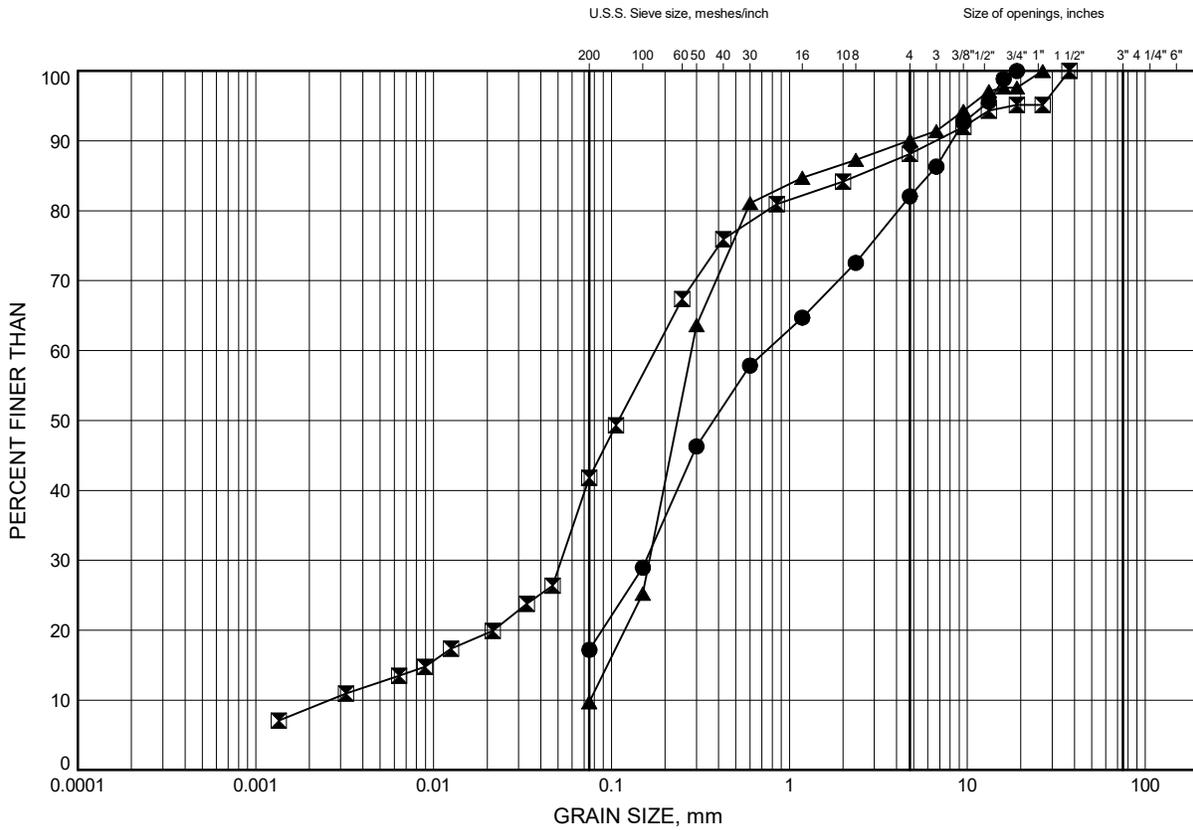
Prep'd CM
 Chkd. FJG

GRAIN SIZE DISTRIBUTION - THURBER 25964 GRAFTON PATROL YARD.GPJ 22/1/20

Hwy 401 Grafton Patrol Yard
GRAIN SIZE DISTRIBUTION

FIGURE C3

Silty Sand to Sand



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-1	3.4	163.6
⊠	19-2	2.6	163.8
▲	19-5	3.4	162.9

Date January 2020
 WP#



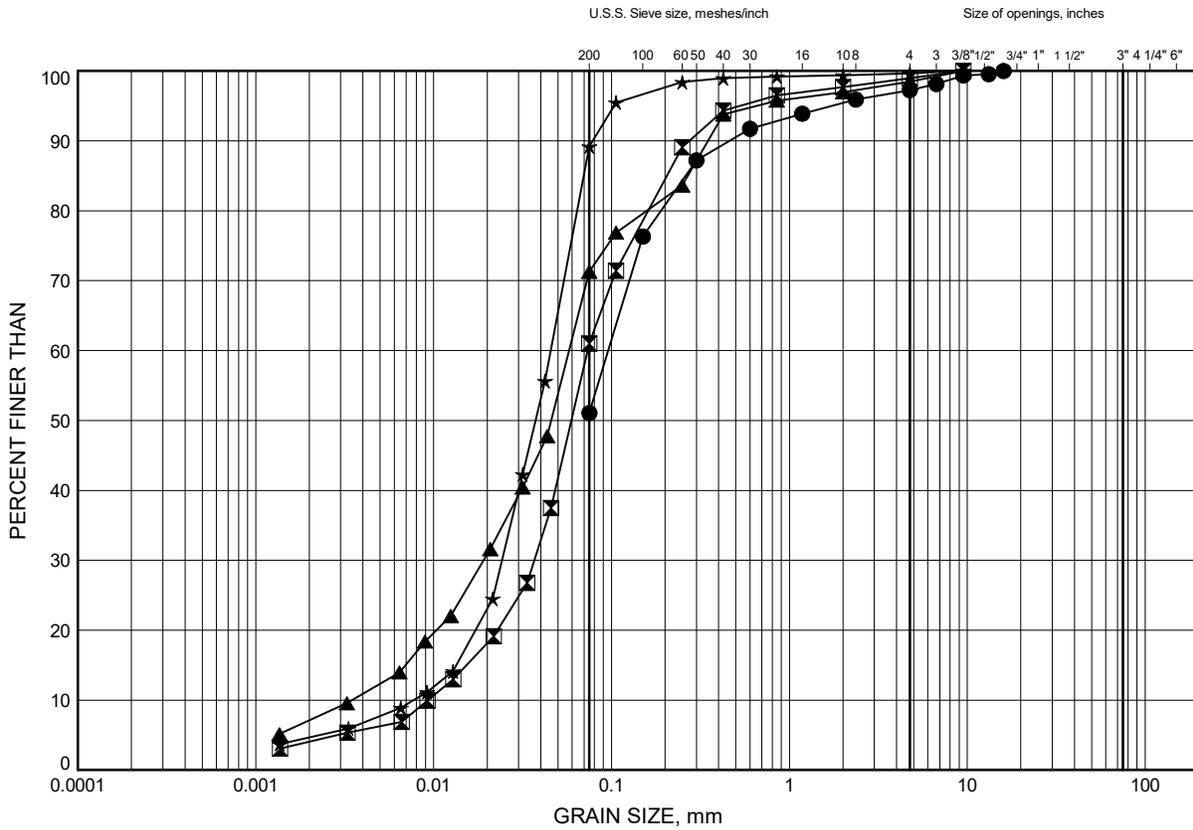
Prep'd CM
 Chkd. FJG

GRAIN SIZE DISTRIBUTION - THURBER 25964 GRAFTON PATROL YARD.GPJ 24/1/20

Hwy 401 Grafton Patrol Yard
GRAIN SIZE DISTRIBUTION

FIGURE C4

Sandy Silt to Silt



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-3	4.9	162.0
⊠	19-4	4.9	162.4
▲	19-7	3.4	164.0
★	19-8	2.6	165.0

Date January 2020
 WP#



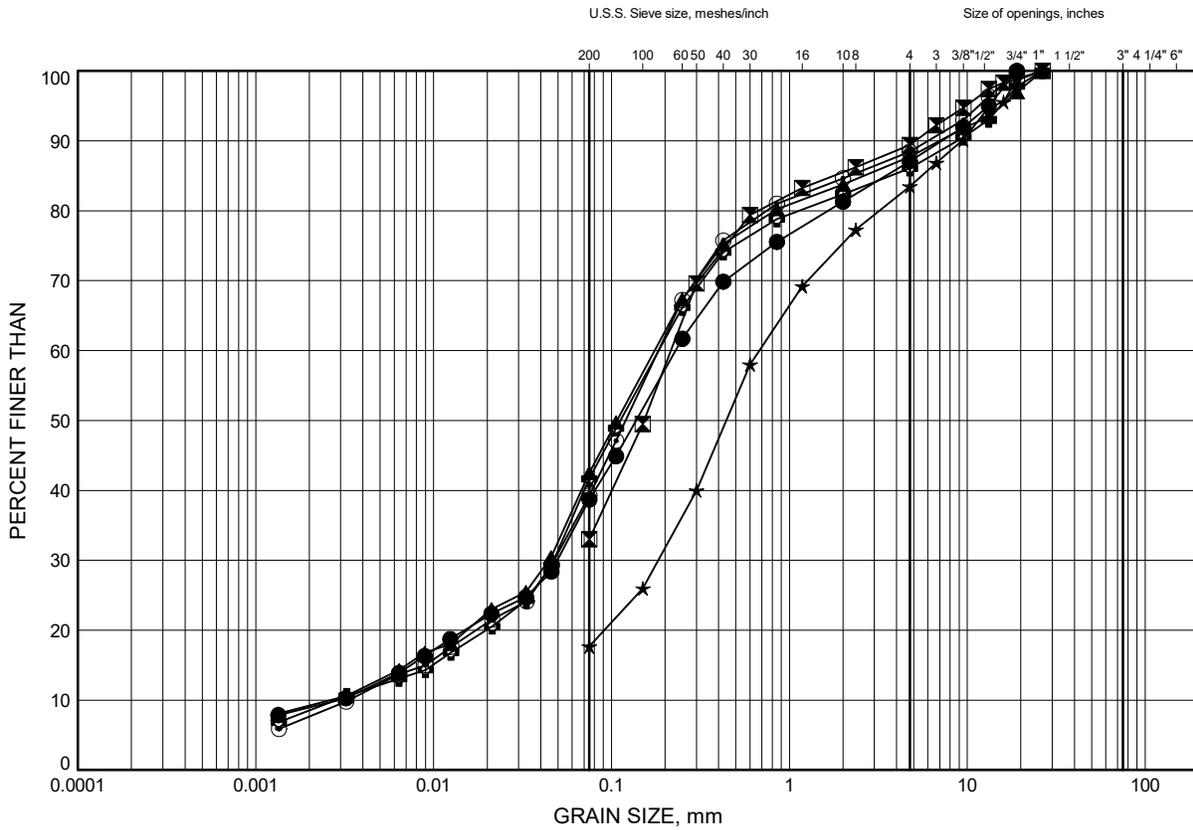
Prep'd CM
 Chkd. FJG

GRAIN SIZE DISTRIBUTION - THURBER 25964 GRAFTON PATROL YARD.GPJ 24/1/20

Hwy 401 Grafton Patrol Yard
GRAIN SIZE DISTRIBUTION

FIGURE C5

Glacial Till



SILT and CLAY		FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED		SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-1	6.4	160.5
⊠	19-2	6.4	160.0
▲	19-3	9.4	157.4
★	19-4	9.4	157.9
⊙	19-5	7.9	158.4
⊕	19-6	6.4	160.9

Date January 2020
 WP#

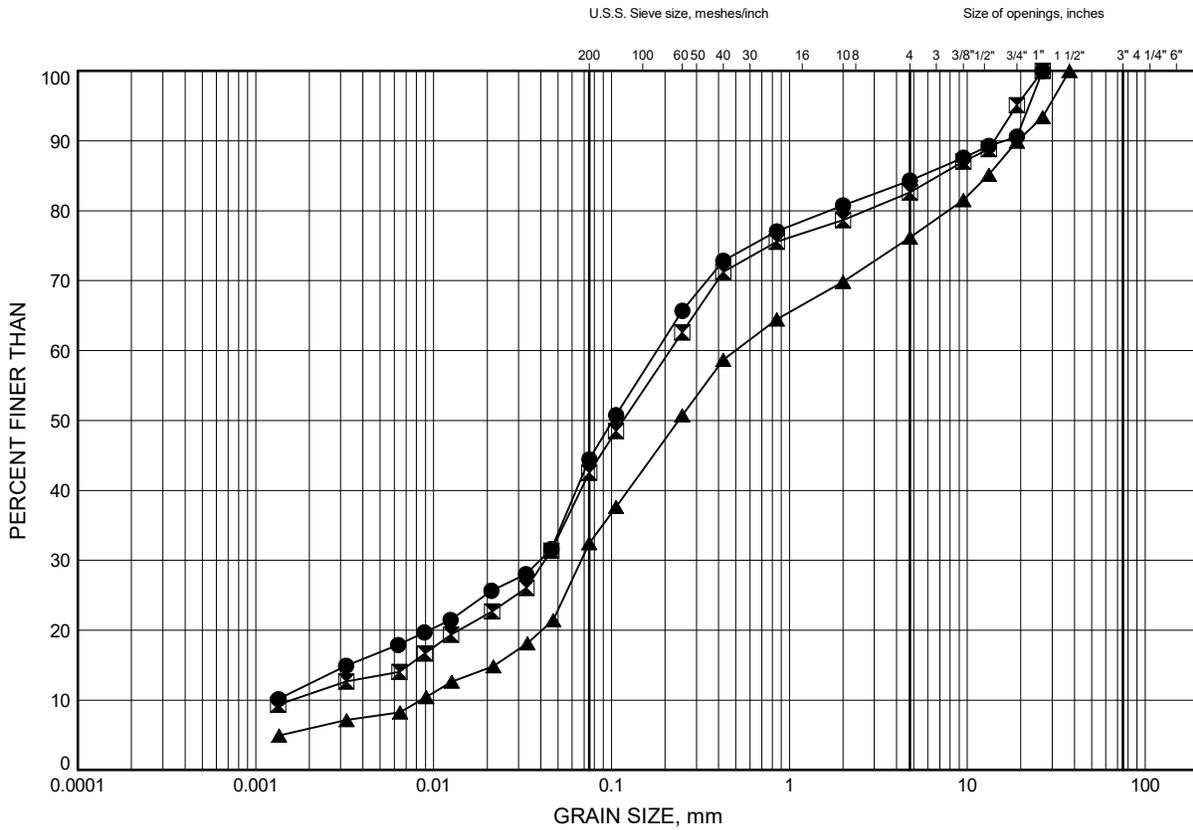


Prep'd CM
 Chkd. FJG

Hwy 401 Grafton Patrol Yard
GRAIN SIZE DISTRIBUTION

FIGURE C6

Glacial Till



SILT and CLAY		FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED		SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-6	10.9	156.4
⊠	19-7	7.8	159.5
▲	19-8	4.9	162.7

Date January 2020
 WP#



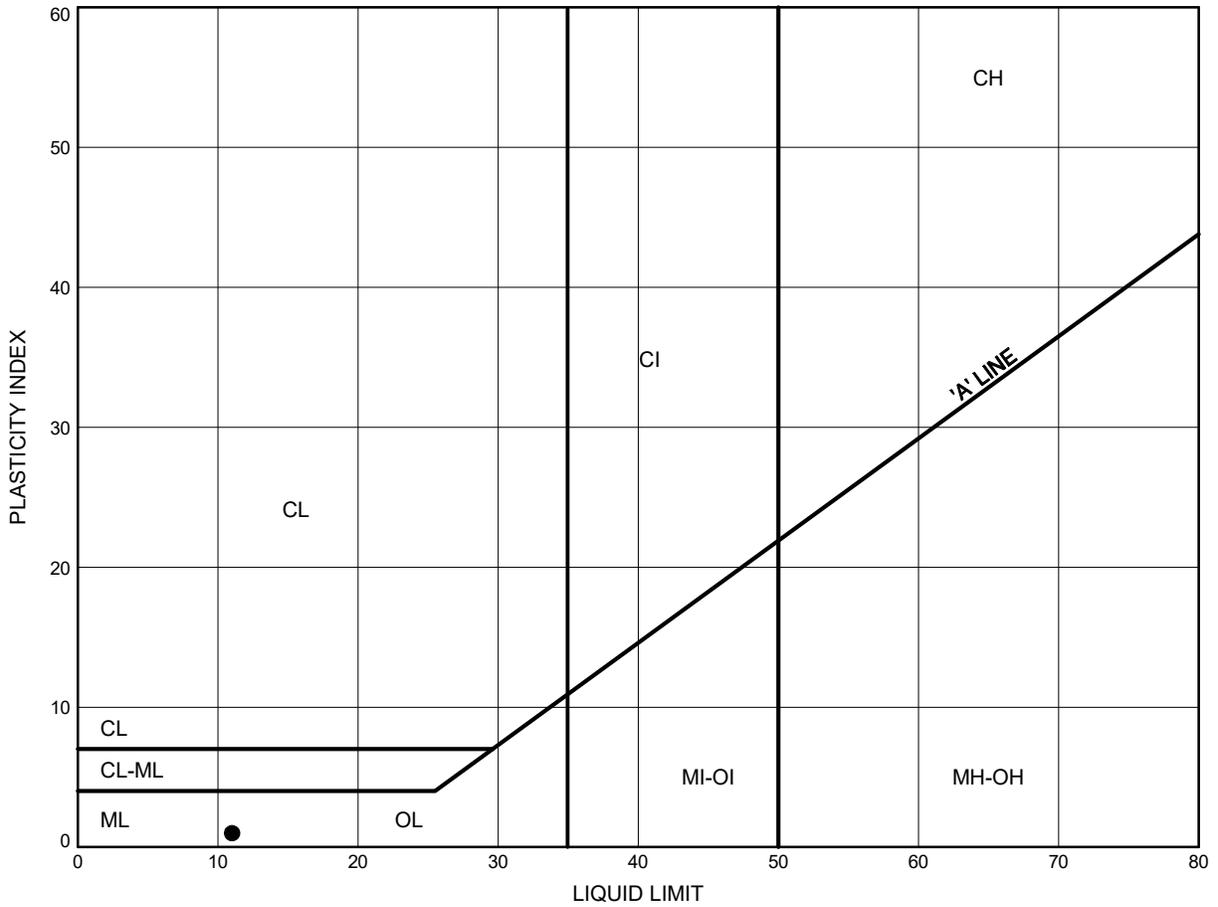
Prep'd CM
 Chkd. FJG

GRAIN SIZE DISTRIBUTION - THURBER 25964 GRAFTON PATROL YARD.GPJ 24/1/20

Hwy 401 Grafton Patrol Yard
ATTERBERG LIMITS TEST RESULTS

FIGURE C7

Glacial Till



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	19-6	10.9	156.4

Date .. January 2020

WP#



Prep'd CM

Chkd. FJG

THURBALT_25964_GRAFTON PATROL YARD.GPJ 24/1/20



Appendix C.2

Analytical Testing Results

Certificate of Analysis
 Client: Thurber Engineering Ltd.
 Client PO:

Report Date: 20-Dec-2019

Order Date: 17-Dec-2019

Project Description: 25964

Client ID:	19-7, SS4 (7'6"-9'6")	19-2, SS5 (10'-12')	19-4, SS4 (7'6"-9'6")	-
Sample Date:	12-Dec-19 09:00	10-Dec-19 09:00	12-Dec-19 09:00	-
Sample ID:	1951218-01	1951218-02	1951218-03	-
MDL/Units	Soil	Soil	Soil	-

Physical Characteristics

% Solids	0.1 % by Wt.	84.7	87.5	93.0	-
----------	--------------	------	------	------	---

General Inorganics

Conductivity	5 uS/cm	218	429	611	-
pH	0.05 pH Units	7.75	7.72	7.79	-
Resistivity	0.10 Ohm.m	45.9	23.3	16.4	-

Anions

Chloride	5 ug/g dry	82	222	257	-
Sulphate	5 ug/g dry	8	15	12	-



SGS Canada Inc.

P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

02-January-2020

Paracel Laboratories

Attn : Dale Robertson

300-2319 St.Laurent Blvd.
Ottawa, ON
K1G 4K6, Canada

Phone: 613-731-9577
Fax:613-731-9064

Date Rec. : 19 December 2019
LR Report: CA12694-DEC19
Reference: Project#: 1951218

Copy: #1

CERTIFICATE OF ANALYSIS

Final Report

Sample ID	Sample Date & Time	Sulphide %
1: Analysis Start Date		31-Dec-19
2: Analysis Start Time		14:43
3: Analysis Completed Date		31-Dec-19
4: Analysis Completed Time		14:47
5: QC - Blank		< 0.02
6: QC - STD % Recovery		117%
7: QC - DUP % RPD		0%
8: RL		0.02
9: 19-7, SS4 (7'6"-9'6")	12-Dec-19	< 0.02
10: 19-2, SS5 (10'-12')	10-Dec-19	< 0.02
11: 19-4, SS4 (7'6"-9'6")	12-Dec-19	< 0.02

RL - SGS Reporting Limit

Kimberley Didsbury
Project Specialist,
Environment, Health & Safety



Appendix C.3
Organic Content Testing Results



Stantec

Stantec Consulting Ltd
100 A&B – 2781 Lancaster Rd
Ottawa, ON K1B 1A7
Tel: (613) 738-6075
Fax: (613) 738-6067

December 30, 2019
File: 122410864

Attention: Thurber Engineering, File #25964

Reference: ASTM D2974 Organic Matter of Peat & Other Soils

The following table summarizes two test results for Organic Matter of Peat and Other Soils.

Location	Source	Organic Content (%)
19-01 SS3	5'-7'	13.7
19-06 SS4	7'6"-9'6"	1.3

Sincerely,

Stantec Consulting Ltd.

Brian Prevost
Laboratory Supervisor
Tel: 613-738-6075
Fax: 613-738-6067
brian.prevost@stantec.com



Appendix D.
Site Photographs



Photo 1. Looking west from BH 19-6 towards proposed garage building



Photo 2. Looking north from BH 19-7 towards proposed cold storage building