



**GeoPro Consulting Limited**

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

## **Preliminary Hydrogeological Investigation**

**Proposed Improvements of Regional Road 25 Transportation Corridor  
From Steeles Avenue (Regional Road 8) to 5 Side Road**

**Town of Milton, Ontario**

**Prepared For:**

**Stantec Consulting Limited**



**GeoPro Project No.: 17-1758H**

**Report Date: January 7, 2018**

*Professional, Proficient, Proactive*

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**Limitations to the Report**

## **1.0 INTRODUCTION**

GeoPro Consulting Limited ("GeoPro") was retained by Stantec Consulting Limited (the "Client") to conduct a hydrogeological investigation to support the proposed improvements of Regional Road 25 Transportation Corridor from Steeles Avenue (Regional Road 8) to 5 Side Road (the "Project"), Town of Milton (the "Town"), Ontario (the "Site"). The approximate site location is shown on Drawing No. 1.

It is understood that the proposed development consists of replacement of the existing storm sewer and a culvert.

It should be noted that no design drawing was provided when preparing this hydrogeological report. In this regard, this hydrogeological investigation is considered to be preliminary.

### **1.1 Purposes**

The purposes of this preliminary hydrogeological investigation are to characterize the subsurface soil and groundwater conditions in the limited number of boreholes at the Site and to assess temporary dewatering and groundwater control needs (if any) in order to facilitate the design of the Project.

It should be noted that the preliminary hydrogeological investigation was completed concurrently with a preliminary geotechnical investigation carried out by GeoPro at the Site. The results of the preliminary geotechnical investigation were summarized in a separate report.

### **1.2 Scope of Work**

In conjunction with the preliminary geotechnical investigation, the preliminary hydrogeological investigation comprised the following tasks:

- 1) Conducting a search and review of the available geology and hydrogeology data resources, including Ministry of the Environment, Conservation and Parks ("MECP") Water Well Records ("WWR"), Ontario Geological Survey ("OGS") and Ontario source water protection agency;
- 2) Conducting a site visit to observe the site features and potential source(s) of contamination;
- 3) Conducting groundwater sampling and testing;
- 4) Completing a borehole elevation survey, groundwater level monitoring and in-situ hydraulic conductivity tests (slug tests); and
- 5) Completing data processing, interpretation and report preparation.

This report has been prepared for the Client. Third party use of this report without GeoPro's consent is prohibited. The limitation conditions presented in this report form an integral part of the report and they must be considered in conjunction with this report.

### **1.3 Previous Investigations and Reports**

#### **1.3.1 Geotechnical Investigation by GeoPro**

A geotechnical report entitled “*Preliminary Geotechnical Investigation, Regional Road 25 Transportation Corridor Improvement, From Steeles Avenue (Regional Road 8) to 5 Sideroad, Town of Milton, Halton Region, Ontario*” dated December 10, 2018 was prepared by GeoPro. The preliminary geotechnical investigation consisted of advancement of twenty-nine (29) boreholes (BH1 to BH11, BH101 to BH115, BH201, BH202 and BH301) drilled to depths ranging from 2.0 to 17.2 meters below the existing ground surface (“mBGS”), and installation of six (6) monitoring wells in the advanced boreholes (BH106, BH110, BH115, BH201, BH202 and BH301).

The information or data obtained from GeoPro’s geotechnical investigation has been incorporated in this hydrogeological investigation report. The approximate borehole and monitoring well locations are shown on Drawing No. 2, and the Borehole Logs are included in Appendix A.

### **2.0 SITE CONDITIONS**

#### **2.1 Site Feature Observations**

A site visit was conducted on August 24, 2018 to observe the general site features and sources of potential contamination and/or environmental concern.

The Site was noted to be the roadway along Regional Road 25 between Steeles Avenue East (Regional Road 8) and Side Road 5. The Site was noted to be bounded by commercial/industrial properties.

During the site visit, a box culvert was observed to cross Regional Road 25 near the Westbound London Entrance of Highway 401, where a tributary of Sixteen Mile Creek was noted to flow in an easterly direction. One (1) box culvert was observed to cross Chisholm Drive near the intersection of Chisholm Drive and Regional Road 25, where a tributary of Sixteen Mile Creek was observed to flow in an easterly direction; the tributary was then observed to flow through a box culvert crossing Regional Road 25 at about 140 m east of the intersection of Chisholm Drive and Regional Road 25.

Catch basins and manholes were observed along Regional Road 25.

Gas stations and auto garages (auto service shops) were noticed in the area within a 500 m radius from the Site and summarized as below:

- True Tech Auto Repair Ltd. (at 310 Steeles Avenue East) about 355 m northeast of the Site
- Petro Canada Gas Station (at 235 Steeles Avenue East) 85 m north of the Site
- Canadian Tire Gas Station (at 20 Market Drive #1) about 25 m south of the Site
- Esso Gas Station (at 640 Martin Street) about 45 m south of the Site
- Pioneer Gas Station (at 2755 High Point Drive) about 20 m north of the Site

In addition, the Canadian National Railway ("CNR") tracks were noted to cross the Regional Road 25 at about 300 m west of the intersection of Regional Road 25 and Steeles Avenue East. And the Site was noted to be bounded by commercial/industrial properties which may have potential contamination and/or environmental concerns.

## **2.2 Physiography and Drainage**

The Site is located within the boundary area of South Slope and Peel Plain physiographical region in an area comprised of Drumlinized Till Plains and Bevelled Till Plains according to the "Physiography Map of South Central Portion of Southern Ontario" (Map 2226, Scale 1:253,440) prepared by the Ontario Department of Mines and Northern Affairs, and based on database maintained by Ontario Geological Survey ("OGS").

The Site is located within the Sixteen Mile Creek Watershed area, under the jurisdiction of the Conservation Halton ("CH"). Three (3) tributaries of the Sixteen Mile Creek crossing the east portion of the Site flows southeasterly towards the Sixteen Mile Creek. The tributaries join the Sixteen Mile Creek approximately 1.2 km southeast of the Site.

## **2.3 Geology**

### *2.3.1 Bedrock Geology*

The bedrock at the Site consists of Upper Ordovician deposits of shale, limestone, dolostone, and siltstone, and the bedrock depth ranges from 12 to 24 mBGS, according to the "Bedrock Geology of Southern Ontario" (Map 2544, Scale 1: 1,000,000) prepared by the Ontario Department of Mines and Northern Affairs and based on database maintained by OGS.

### *2.3.2 Surficial Geology*

As shown on Drawing No. 3, the Site and its surrounding area are located in an area covered with clay to silt-textured till deposits, fine-textured glaciolacustrine and older alluvial deposits according to the database of "Surficial Geology of Southern Ontario" maintained by the OGS.

### *2.3.3 Site Stratigraphy*

As shown in the borehole logs, the soil stratigraphy at the Site generally consists of fill materials below asphalt, topsoil and granular base/subbase, underlain by till deposits with zones of cohesionless soils textured from silt to sand or cohesive clayey soils. Probable Weathered Shale was encountered at the depth of approximately 4.9 mBGS.

Detailed description of soil strata encountered in the boreholes drilled at the Site is provided on the Borehole Logs in Appendix A.



## 2.4 Hydrogeology

The hydrogeological conditions at the Site were evaluated based on the information obtained from the Ministry of Natural Resources and Forestry and the Ontario Source Protection Information Atlas, the water well data collected from the MECP database, the information obtained in the geotechnical investigation, and the data collected from the additional work conducted at the Site.

### 2.4.1 Highly Vulnerable Aquifer (“HVA”)

Based on the Ontario Source Protection Information Atlas, the Site is not located in an area with a Highly Vulnerable Aquifer (“HVA”). HVA was delineated according to Technical Rules under the Clean Water Act. In general, an HVA will consist of source granular aquifer materials or fractured rock that have a high permeability and are exposed near the ground surface with a relatively shallow water table.

An aquifer is indicated as vulnerable if possible contaminants could quickly flow into it and impact water quality. In addition, the plume of the possible contaminants would migrate quickly in an HVA.

### 2.4.2 MECP WWR

A search of the MECP WWR database was conducted focusing on a 500 m radius from the Site. The locations of the MECP water wells are shown on Drawing No. 5. A summary of water well records is included in Appendix B and presented in the following table.

Type of Well Record	Number of Record
Industrial	7
Commercial	3
Public	4
Livestock	2
Domestic	24
Monitoring	14
Test Hole	9
Monitoring and Test Hole	31
Not Used	13
Unknown	38
<b>Total</b>	<b>145</b>

Based on review of the WWR database, forty (40) water wells are used for water supply. The recorded depths of the water wells ranged from approximately 3.7 to 37.5 mBGS. Shale bedrock was encountered at recorded depths ranging from 0.9 to 30.2 mBGS, and water was reported at recorded depths ranging from 0.9 to 31.4 mBGS in overburden or bedrock.

### 2.4.3 Wellhead Protection Area (“WHPA”)

Based on the Ontario Source Protection Information Atlas, the Site and its neighboring properties are not located within a municipal Wellhead Protection Area (“WHPA”).

#### 2.4.4 Intake Protection Zone ("IPZ")

Based on the information obtained from the Conservation Halton, the Site and its neighboring properties are not located within the municipal surface water intake protection zone ("IPZ").

#### 2.4.5 Groundwater Levels

Groundwater conditions were observed in the advanced boreholes during and immediately upon completion of drilling. The observations are included on the Borehole Logs in Appendix A.

Groundwater levels were measured on August 24, November 8, 2018 and Jan 4, 2019 in all the monitoring wells.

The monitoring well construction details and the measured groundwater levels are recorded on the appended Borehole Logs and summarized in the following table.

Monitoring Well ID	Well Ground Elevation (mASL)	Screen Interval (mBGS)	August 24, 2018		November 8, 2018		January 4, 2019	
			Ground water Level (mBGS)	Groundwater Elevation (mASL)	Ground water Level (mBGS)	Groundwater Elevation (mASL)	Ground water Level (mBGS)	Groundwater Elevation (mASL)
BH106	216.92	3.0 ~ 4.5	-	-	3.93	212.99	1.55	204.55
BH110	213.20	1.2 ~ 2.7	-	-	0.13	213.07	0.20	213.00
BH115	206.10	3.0 ~ 4.5	-	-	2.88	203.22	2.05	204.04
BH201	205.01	8.2 ~ 11.2	-0.27	205.28	-0.75	205.76	-0.29	205.30
BH202	205.51	9.6 ~ 12.6	0.66	204.85	0.90	204.61	0.59	204.92
BH301	206.46	13.7 ~ 16.7	2.74	203.72	2.65	203.81	2.55	203.91

As shown in the above table, groundwater levels ranged from -0.75 to 3.93 mBGS during the monitoring period, corresponding to elevations ranging from 203.22 to 213.07 meters above sea level ("mASL").

Shallow groundwater is expected to flow southeast towards the Sixteen Mile Creek.; however, the extensive underground infrastructure in this urban setting may influence local groundwater flow patterns.

It should be noted that the groundwater levels can be expected to vary over time and are subject to seasonal fluctuations.

#### 2.4.6 Groundwater Quality

Groundwater sampling was conducted on January 4, 2019 by GeoPro from Monitoring Wells BH106 and BH201. The collected groundwater samples were submitted to Eurofins Scientific Testing Laboratories ("Eurofins") in Ottawa for chemical analysis. The samples from BH106 were analyzed for physical, chemical and bacteriological parameters as specified in the Halton Region Combined Sewer Use By-Law (the "Local Sewer Use By-Law"). The samples from BH201 were analyzed for metals set out in the Provincial Water Quality Objectives ("PWQO") of the Environmental Protection Act. In addition, analyses

of dissolved metals were conducted with a filtered water sample from BH106. The analytical results are included in Appendix C.

The results were compared with the respective criteria specified in the Local Sewer Use By-Law and PWQO. Based on the comparison, no exceedances were measured for the Local Sewer Use By-Law. However, exceedances of the PWQO standards were measured for some metals in the unfiltered water samples collect from both BH201 and BH106. It should be noted that fewer exceedances were measured in the filtered water sample inferred to be the result of reduced sediment in the sample corresponding to a reduction in the presence of metals adsorbed onto the sediment.

Sample ID	Parameter	Unfiltered Concentration (mg/L)	Filtered Concentration (mg/L)	Sanitary Standard (mg/L)	PWQO Standard (mg/L)
BH201	Boron	(0.66)	N/A	N/A	0.200
	Iron	(0.43)	N/A	50	0.30
BH106	Beryllium	(<0.01)	<0.0005	5	0.011
	Cadmium	(<0.008)	<0.0001	1	0.0002
	Cobalt	(<0.01)	<0.0002	5	0.0009
	Copper	(<0.01)	<0.001	3	0.005
	Iron	(3.8)	<0.03	N/A	0.30
	Lead	(<0.01)	<0.001	3	0.005
	Zinc	(<0.04)	<0.01	3	0.030

Note: (0.66) = sample concentration exceeds PWQO standard value

### 3.0 ESTIMATED HYDRAULIC CONDUCTIVITY

Hydraulic conductivity (K-value) of the soils was estimated based on the results obtained from grain size analyses of selected soil samples and from single well response tests (slug tests).

#### 3.1 Grain Size Distribution Method

Grain size analysis (sieve and hydrometer) of nine (9) soil samples collected from the borehole BH004, BH005, BH101, BH104, BH108, BH201, BH202 and BH301 were conducted, and the result of grain size analyses are presented in Figure No. 1-3.

The hydraulic conductivity of the selected soil sample was estimated using applicable empirical equations based on the particle size gradation details. As shown in the table below, the estimated K value for the tested soil ranged from  $4.6 \times 10^{-7}$  cm/s to  $3.3 \times 10^{-6}$  cm/s

Borehole ID	Sample #	Soil sample Depth (mBGS)	Soil Type	K Value (cm/s)
BH004	SS3B	1.7 – 2.0	Clayey Silt	$8.8 \times 10^{-7}$
BH005	SS3	1.5 – 2.0	Clayey Silt	$1.5 \times 10^{-6}$
BH101	SS5	3.1 – 3.5	Silt	$4.6 \times 10^{-7}$
BH104	SS3	1.5 – 2.0	Clayey Silt	$9.6 \times 10^{-7}$
BH108	SS5	3.1 – 3.5	Clayey Silt	$3.3 \times 10^{-6}$
BH201	SS3A	1.5 – 1.8	Silt	$8.3 \times 10^{-7}$
BH202	SS3	1.5 – 2.0	Clayey Silt	$6.9 \times 10^{-7}$
BH301	SS6	4.6 – 5.0	Clayey Silt	$2.4 \times 10^{-6}$
BH301	SS8B	7.8 – 8.1	Sandy Silt	$3.3 \times 10^{-6}$

### 3.2 Single Well Response Test (Slug Test) Method

Single well response tests (slug tests) were conducted in six (6) monitoring wells BH106, BH110, BH115, BH201, BH202 and BH301. Prior to the slug testing, initial water levels were measured manually using a water level tape, and the monitoring wells were purged using Waterra pumps (tubing and footvalves) to remove the sediments settled in the wells and in the sand pack around the well screens.

The field slug test was completed either using a rising head method in which a certain amount of groundwater was removed from the tested monitoring well or using a falling head method in which a certain volume of potable water was added into the tested monitoring well, and the recovery of water level was measured and recorded. Before purging or introducing the water, a datalogger was placed in the monitoring well to record the change in water head versus time throughout the test. The retrieved water level data was plotted on a semi-logarithmic scale using Hvorslev's method to estimate the hydraulic conductivity values.

Slug Test analysis graphs and calculations are included in Appendix D. A summary of K values estimated from the slug tests is shown in the following table.

Monitoring Well No.	Screen Depth (mBGS)	Soil Type	Estimated K-Value (cm/s)
BH106	3.0 ~ 4.5	Clayey Silt Till	$2.6 \times 10^{-6}$
BH110	1.2 ~ 2.7	Clayey Silt Till	$1.4 \times 10^{-4}$
BH115	3.0 ~ 4.5	Fill; Clayey Silt Till	$3.2 \times 10^{-6}$
BH201	8.2 ~ 11.2	Silt; Clayey Silt	$5.7 \times 10^{-7}$
BH202	9.6 ~ 12.6	Sandy Silt Till; Silt	$7.9 \times 10^{-7}$
BH301	13.7 ~ 16.7	Silt; Sandy Silt Till/Shale Complex; Sand and Silt/Shale Complex	$5.0 \times 10^{-7}$

Based on the slug test results, the estimated hydraulic conductivity value of the screened soils ranged from  $5.0 \times 10^{-7}$  cm/s to  $1.4 \times 10^{-4}$  cm/s.

### 4.0 TEMPORARY DEWATERING REQUIREMENTS

Temporary dewatering is intended to lower the groundwater table within the excavation area in order to provide a "dry" working condition during excavation and installation operations.

The temporary dewatering flow rate generally depends on the design specifications of the proposed structures (such as invert elevation, length, depth, and/or size, etc.), the site hydrogeological conditions (such as existing groundwater levels and flow regime), and the drawdown levels required for maintaining dry working conditions and stable excavation bottom and slopes.

#### 4.1 The Project Concept

No design drawing was available when preparing this preliminary hydrogeological investigation report. However, based on the preliminary design information, replacements of the existing storm sewer system, the culvert crossing Regional Road 25 south of Chisholm Drive ("C2") and the culvert crossing Chisholm Drive ("C3") are proposed at the Site. According to the preliminary design information, the location and size of each section of the proposed replacement are provided in the table below.

Excavation Section (Name)	Location	Anticipated Excavation Depth (mBGS)	Anticipated Size
Culvert (C2)	crossing Regional Road 25 south of Chisholm Drive	2.4	6.0 m x 2.0 m
Culvert (C3)	crossing Chisholm Drive	3.3	3.0 m x 2.4 m
Storm Sewer (WSTM)	Highway 401 to Peddie Road (Sta. 11+444.08 to Sta.12+676.26)	5.5	600 mm diameter; 1233 m long
Storm Sewer (ESTM)	Highway 401 to Steeles Avenue (Station Numbers are unavailable)	5.5	600 mm diameter; 900 m long

#### 4.2 Excavation and Temporary Dewatering Requirements

Groundwater levels measured in the on-site monitoring wells ranged from -0.75 to 3.93 mBGS during the monitoring period, corresponding to elevations ranging from 203.22 to 213.07 mASL. Considering seasonal fluctuations, the initial water level for dewatering is assumed to be 1.0 m higher than the highest measured water levels or at the ground surface. Therefore, the excavations for the proposed replacement are anticipated to occur below the groundwater table, and temporary dewatering or groundwater control is anticipated to lower the water level to at least 1 m below the excavation base to achieve dry work conditions for the excavation and installation.

The details of excavation and temporary dewatering requirements of each excavation Section are provided in the following table.



Name of Excavation Section	Proposed Excavation Depth (mBGS)	Anticipated Target Water Level (mBGS)	Adjacent Borehole/ Monitoring Well	Highest Measured Groundwater Level or Depth of Wet Sample (mBGS)	Anticipated Initial Water Level (mBGS)	Dewatering Requirement (Yes/No)
C2	2.4	3.4	BH202, BH201	-0.75	0.0	Yes
C3	3.3	4.3	BH202, BH201	-0.75	0.0	Yes
WSTM	5.5	6.5	BH104 to BH111	0.13	0.0	Yes
ESTM	5.5	6.5	BH112 to BH115; BH201, BH202 and BH301	-0.75	0.0	Yes

Dewatering involves controlling groundwater by pumping, to locally lower groundwater levels in the vicinity of the excavation. Sump pumping is the simplest form of dewatering, by which groundwater is allowed to enter the excavation, and is then collected in a sump and pumped away by robust solids-handling pumps. Sump pumping can be effective in many circumstances, but continual seepage into the excavation may create the risk of instability and other problems.

To prevent significant groundwater seepage into the excavation and ensure stability of the excavation base and side slopes, it may be necessary to lower groundwater levels prior to excavation, which is known as 'pre-drainage'. The pre-drainage methods may include deep wells, wellpoints, eductors (ejectors), vacuum wells, horizontal wells, etc.

As shown in the borehole logs, the excavations are expected to cut through fill materials and take place within till deposits with zones of cohesionless soils textured from silt to sand or cohesive clayey soils. Considering the artesian condition observed in a confined zone of cohesionless soils near culverts C2 and C3, pre-drainage groundwater control measures using wells and/or well points installed in the confined zones of cohesionless soils should be considered in conjunction with conventional sump pumping. The groundwater tables within the confined zones of cohesionless soils should be drawn down to at least 1.0 m below the excavation base to maintain the stability of the base. Considering the heterogeneous nature of the soils at the Site, variation of the anticipated groundwater seepage should be considered in the dewatering system design and construction.

#### 4.3 Preliminary Temporary Dewatering Estimation

The assumptions provided in the table below were used in the preliminary calculations for temporary dewatering requirements.

Name of Excavation Section	Proposed Excavation Depth (mBGS)	Anticipated Target Water Level (mBGS)	Anticipated Initial Water Level (mBGS)	Anticipated Excavation Bottom Area	Anticipated Hydraulic Conductivity (m/s)
C2	2.4	3.4	0.0	6.0 m x 2.0 m	$1.4 \times 10^{-6}$
C3	3.3	4.3	0.0	3.0 m x 2.4 m	$1.4 \times 10^{-6}$
WSTM	5.5	6.5	0.0	1.6 m x 1233 m	$1.4 \times 10^{-6}$
ESTM	5.5	6.5	0.0	1.6 m x 900 m	$1.4 \times 10^{-6}$

### Culvert C2 and C3

The following Dupuit-Thiem equation was used to calculate radial flow to an open excavation from an unconfined aquifer under steady-state condition:

$$Q = [\pi \times K \times (H^2 - h_w^2)] / \ln(R_o/r_e)$$

Where:

Q = Flow Rate [m<sup>3</sup>/s]

H = Initial Water Level [m]

h<sub>w</sub> = Target water Level [m]

K = Hydraulic Conductivity [m/s]

r<sub>e</sub> = effective radius [m], r<sub>e</sub> = (excavation area/ π)<sup>0.5</sup> [m]

R<sub>o</sub> = 3000\*(H-h<sub>w</sub>)\*K<sup>1/2</sup> [m]

### Strom Sewer (WSTM and ESTM)

The following Dupuit-Thiem equation was used to estimate the dewatering flow rate needed to drain the excavation trench, in an unconfined aquifer under steady-state conditions:

$$Q = [\pi \times K \times (H^2 - h_w^2)] / \ln(R_o/r_e) + 2[x \times K \times (H^2 - h_w^2) / 2L]$$

Where:

Q = Flow Rate [m<sup>3</sup>/s]

x = Trench length [m]

H = Initial Water Level [m]

h<sub>w</sub> = Target water Level [m]

$K$  = Hydraulic Conductivity [m/s]

$r_e$  = effective radius [m],  $r_e$  = width of the excavation/2

$R_o = 3000 * (H - h_w) * K^{1/2}$  [m]

$L = R_o/2$  [m]

Based on the calculation described above, the estimated radius of influence and the estimated steady-state groundwater inflow rate for the excavation sections are summarized in the following table:

Section Name	Estimated Excavation Length	Estimated Excavation Bottom Width	Estimated Excavation Depth	Estimated Radius of Influence	Steady-State Dewatering Rate
	(m)	(m)	(mBGS)	(m)	(L/day)
C2	6.0	2.0	2.4	12	8,258
C3	3.0	2.4	3.3	15	7,945
WSTM	1233	1.6	5.5	23	843,944
ESTM	900	1.6	5.5	23	628,341
100 m/day Storm Sewer	100	1.6	5.5	23	110,377

It should be noted that the dewatering requirement is expected to be highest at the beginning of the dewatering process, when the volume of groundwater stored within the pore space of the soil matrix must be removed. The additional pumping rates to be considered to allow removal of the overburden storage within a 30-day period for the excavation sections are summarized in the following table:

Section Name	Overburden Storage Removal Rate
	(L/day)
C2	11,624
C3	15,020
WSTM	652,623
ESTM	486,154
100 m/day Storm Sewer	86,277

During and after storm events, significantly higher dewatering flow rates are anticipated to account for direct precipitation and runoff into the excavation. The highest recorded daily rainfall at a nearby Environmental Canada station (GEORGETOWN WWTP) is 110.5 mm (based on data from Environmental Canada). Assuming removal of a 110.5 mm storm event within 24 hours, the additional pumping capacities for the excavation sections were summarized in the following table:

Section Name	Removal of Direct Precipitation
	(L/day)
C2	1,326
C3	796
WSTM	1,989,199

ESTM	1,451,970
100 m/day Storm Sewer	161,330

Based on the conservative assumptions described above, a total maximum daily dewatering flow rates for the excavation sections were summarized in the following table:

Scenario	Estimated Excavation Length	Estimated Excavation Bottom Width	Estimated Excavation Depth	Estimated Radius of Influence	Estimated Total Dewatering Rate
	(m)	(m)	(mBGS)	(m)	(L/day)
C2	6.0	2.0	2.4	12	21,208
C3	3.0	2.4	3.3	15	23,760
WSTM	1233	1.6	5.5	23	3,485,766
ESTM	900	1.6	5.5	23	2,566,465
100 m/day Storm Sewer	100	1.6	5.5	23	357,933

Based on the conservative assumptions described above, the total maximum daily dewatering flow rate for an excavation section would be up to approximately 3,485,766 L/day, with consideration of removal of the aquifer storage within a 30-day period and storm events. The maximum estimated zone of influence would be 15 m from the edge of the excavation for the replacement of the culverts, and 23 m from the centre of the excavation for the replacement of storm sewer.

It should be noted that the assumed excavation depths and areas for the dewatering volume estimation are based on our understanding of the proposed development and the information provided by the Client. Should there be any modifications of the design or the assumed depths and areas, this office should be further consulted and the dewatering estimation may need to be revised accordingly.

It is known that the subsurface soil conditions may change significantly between and beyond the on-site boreholes. As the information obtained and assumptions made in this investigation report are based on the results obtained from a limited number of investigated locations, unexpected water bearing zones with a hydraulic conductivity higher than that used in these calculations may be present. In addition, the above estimated dewatering volumes are based on the estimated hydraulic conductivities (K-value) from grain size analysis from limited soil samples and in-situ slug tests.

Please note that it is the responsibility of the contractor to ensure dry conditions are maintained within the excavation at all time and at all costs.

#### 4.4 Permit-to-Take-Water/Regulatory Registration

According to O. Reg. 387/04, any water taking over 50,000 litres per day requires a Permit to Take Water ("PTTW"), which shall be obtained in accordance with the MECP's PTTW Manual, dated April 2005.

According to O. Reg. 63/16, a PTTW will not be required for temporary dewatering at a construction site in an amount less than 400,000 L/day. However, the dewatering at a construction site in an amount

between 50,000 L/day and 400,000 L/day shall be registered through the Environmental Activity and Sector Registry ("EASR").

According to the preliminary dewatering rate estimations, should the replacements could be conducted by stages and sections, and the dewatering rates could be controlled within 400,000 L/day, an EASR posting per O.Reg. 63/16 is recommended. However, if all excavations take place concurrently, the total concurrent pumping rate would exceed the 400,000 L/day threshold and a Category 3 PTTW would be required.

## **5.0 POTENTIAL TEMPORARY DEWATERING IMPACTS**

### **5.1 Potential Sources of Contamination**

Based on the observation made during the site visit, the Site was noted to be bounded by commercial/industrial properties which may have potential contamination and/or environmental concerns. In addition, the CNR tracks were noted to cross the Site at about 300 m west of the intersection of Regional Road 25 and Steeles Avenue East. Therefore, environmental concerns due to the temporary dewatering activities should be considered when designing a dewatering system.

Please note that the level of environmental issues observation outlined herein is meant to provide a broad indication of environmental concerns based on the visual observation during the site visit. The observation results contained in this report should not be considered a warranty with respect to environmental evaluation or assessment of the subject site for any specific purpose. Furthermore, it must be noted that our scope of work was limited to the preliminary observation of potential environmental concerns. The scope of work did not include any environmental evaluation or assessment of the subject site (such as a Phase One or Phase Two Environmental Site Assessment).

### **5.2 Intake Protection Zone**

As discussed previously, the Site is not located within a surface water IPZ. Therefore, impact on the surface water intake source due to the temporary dewatering activities should not be anticipated.

### **5.3 Water Supply Wells near the Site Area**

Based on the MECP water well records, no water supply wells are present within the preliminarily estimated zone of influence of temporary dewatering. In addition, the Site and its neighboring properties are anticipated to be serviced by municipal water sourced from Lake Ontario. Therefore, no impacts to water supply wells are anticipated.

### **5.4 Wellhead Protection Sensitivity Area**

As discussed, the Site and its neighboring properties are not located within a WHPA. Considering the preliminarily estimated zone of influence, no WHPA impacts due to the proposed temporary dewatering are anticipated.



## **5.5 Surface Water**

Based on the site observation, tributaries of Sixteen Mile Creek cross the roadways of Regional Road 25 and Chisholm Drive through culverts. Diversion of the surface water may be considered for the replacements of the culverts. Therefore, impact on the Sixteen Mile Creek due to the road widening and improvements, as well as temporary dewatering should be anticipated.

## **5.6 Ground Subsidence in Adjacent Structures**

Under certain conditions, dewatering activities can cause ground settlement or subsidence. When groundwater levels are lowered in the soil deposits, effective stresses will be increased and consolidation and subsequent settlement may occur.

During the site visit, catch basins and manholes were noted along the roadways on and around the Site, as well as commercial/industrial buildings and structures adjacent to the Site. In addition, the CNR tracks were noted to cross the Site at about 300 m west of the intersection of Regional Road 25 and Steeles Avenue East. Therefore, potential impact associated with the temporary dewatering should be considered for the buildings, structures, roadways, CNR tracks and underground utilities which are located within the estimated zone of influence.

## **6.0 RECOMMENDATIONS**

### **6.1 Registration on EASR**

- Based on the preliminary dewatering calculations provided should the replacements be conducted by stages and sections, and the dewatering rates could be controlled within 400,000 L/day, an EASR posting per O.Reg. 63/16 is recommended. However, if all excavations take place concurrently, the total concurrent pumping rate would exceed the 400,000 L/day threshold and a Category 3 PTTW would be required.
- The process of EASR posting typically takes a few days, requiring coordination with the Client and the availability of the owner's MECP Account.

### **6.2 Point of Discharge**

As mentioned previously, catch basins and manholes were noted along the roadway on and near the Site. In addition, no exceedances were measured for the Local Sewer Use By-Law in the analyzed water samples. Prior to startup of dewatering operations, samples of groundwater should be obtained from the dewatering system and submitted for analysis of the appropriate Sewer Use By-Law parameters.

Installation of an appropriate water filtration/treatment system designed to address any measured exceedances would be necessary prior to start-up of dewatering. Should the treated water meet the Local Sewer Use By-Law criteria, the water generated could be discharged into the local municipal sewer system

provided a Municipal Sewer Use Permit is in place. In addition, during discharge, the water quality must be in compliance with the requirements set up in the Local Sewer Use by-law.

### **6.3 Diversion of Surface Water**

Based on the site observation, the Banks Creek crosses the roadway of Regional Road 25 at three (3) locations, and Chisholm Drive at one (1) location within the proposed alignment area. During the replacement of culverts, diversion of the creek water may be considered during the replacement to maintain the creek flow.

It should be noted that in accordance with Ontario Regulation 387/04 as amended by O. Reg. 64/16, a PTTW may not be required for the activity of diverting the waters of a water body for the construction purposes, if water levels upstream and downstream of the work area are not affected by the diversion, and no pumping is applied in the creek water diversion.

### **6.4 Temporary Dewatering Plan**

Prior to the dewatering activities, a temporary dewatering plan shall be prepared by the selected contractor for GeoPro's review.

It should be noted that the design and installation of a temporary dewatering system is the responsibility of the construction contractor, including selection of a sump pump, wellpoint system or well system. The extent and details of the dewatering scheme (well size, spacing, pump level, screen size, wick gradation, etc.) are left solely to the contractor's discretion to achieve the performance objectives for stable slopes and dry conditions and will be based on their own interpretation and analysis of the site conditions, equipment, experience and system efficiency.

Once the pumping system, header pipes and a decanter tank/holding tank are installed, a trial dewatering for a short period of time should be conducted to obtain a representative groundwater sample from the decanting tank for chemical analysis to confirm the water quality.

### **6.5 Building/Structure Settlement Monitoring**

As discussed above, structures located within the zone of influence may be susceptible to potential settlement or subsidence due to the temporary dewatering. Therefore, the following monitoring and mitigative measures are recommended to be carried out before and during the temporary dewatering:

- Complete a pre-excavation condition survey, and install settlement monitoring monuments for the existing buildings and roadways within the estimated zone of influence.
- The above settlement monitoring monuments should be surveyed prior to the dewatering to establish a baseline, and surveyed on a daily basis during the dewatering. The survey results will be provided to the geotechnical engineer of GeoPro for evaluation. The estimated potential and

actual settlements should also be reviewed by a structural engineer to assess the potential damage to the existing structures.

- If the settlement monitoring indicates an undesirable deformation, the dewatering will have to be reduced to a lower rate or ceased temporarily, and alternative measures may be considered for the excavation, which should be approved by the geotechnical engineer and project team.

## **6.6 Surface Water Monitoring and Contingency/Mitigation Measures**

As discussed above, the Sixteen Mile Creek would be impacted due to the temporary dewatering activities because of its proximity from the Site and/or the replacement of the culverts. A surface water baseline study and monitoring program should be conducted prior to and during the Project, and the local conservation authority would be contacted and consulted for advice to design the study and monitoring program.

### **6.6.1 Baseline Study**

A baseline study of the tributary would be conducted to establish the conditions prior to the Project on the water level, baseflow and water quality, which may include chemical testing of surface water samples for general metals and inorganics or as per the advice from the local conservation authority.

### **6.6.2 Surface Water Level and Baseflow Monitoring**

Visual observation of the creek water levels may be conducted daily at a selected location during the construction. Should adverse impact be observed during the temporary dewatering, the dewatering volume may be reviewed and modified appropriately. If required, water with acceptable water quality may be introduced to the creek to maintain the baseflow in the creek.

### **6.6.3 Surface Water Quality Monitoring**

If significant water level changes are found, a sampling and chemical testing may have to be considered to assess any change in surface water quality. Should adverse impact be observed during the temporary dewatering, the dewatering volume may be modified. If required, water with acceptable water quality may be introduced to the creek to maintain the baseflow in the creek.

## **6.7 Erosion Control/Sedimentation Mitigation Plan**

During the replacement of the culverts, erosion control may have to be considered, which is discussed in the following table.

Period	Monitoring Location	Monitoring Frequency	Method	Triggers for Mitigation	Mitigation/ Contingency
<b>Pre-construction</b>	Water discharge points (swale, ditch, creek or overland locations)	Prior to discharge	Visual observation	None	All erosion and sediment controls should be in place prior to commencing discharge activities. The water should be dispersed through straw bales or Filtrexx Silt Soxx, when necessary combined with rock check dam.
<b>In - construction</b>	Water discharge points (swale, ditch or overland locations)	Daily	Visual observation	Noted erosion	To reduce the discharge to watercourse using overland flow.  To control the flow/runoff velocity to a minimum. To select and apply optimal alternatives of erosion control methods.

## 6.8 Groundwater Monitoring and Contingency/Mitigation Measures

Prior to commencement of the temporary dewatering, water level measurements shall be obtained from all on-site monitoring wells to verify the assumed water levels used in the calculations. If significant variation occurs, the dewatering volume calculations may be reviewed and updated.

### 6.8.1 Total Dewatering Volume

- The pumping rate and discharged volume shall be measured daily using a flow measuring device to ensure that the dewatering rate/volume does not exceed the approved or accepted limits.
- If the measured daily volume exceeds the approved limit, either the dewatering methodology or the construction methodology will need to be altered to ensure the maximum permitted rate is not exceeded.
- The contractor on behalf of the Client should maintain a record of all water takings, which should include the dates and durations of water takings, and the rates and total measured volumes of water pumped per day for each day that water is taken under the EASR/permit.

### 6.8.2 Water Quality

Depending on the selected point of discharge, water quality should be regularly monitored during the temporary dewatering to ensure that discharge meets the relevant Local Sewer Use By-Law quality criteria.

As TSS is an important parameter which may directly reflect the water quality, a treatment facility should be considered to reduce the concentration of suspended solids in the pumped water.

Prior to discharge of the treated water, a representative water sample should be collected and analyzed for the parameters specified in the applicable standards or criteria. During the temporary dewatering, daily field monitoring of the TSS/turbidity in the water to be discharged is recommended.

In addition, groundwater quality shall be monitored via chemical testing for parameters as specified in the local Sewer Use By-law weekly for the first month. If the results demonstrate that groundwater quality consistently meets the applicable standards, the monitoring frequency can be reduced to once each month afterwards.

## **6.9 Monitoring Well Decommissioning**

According to Ontario Regulation 903 ("O. Reg. 903"), when the monitoring wells are no longer used, they should be decommissioned by a licensed water well contractor.



## **7.0 CLOSURE**

We trust that the information contained in this report is complete within our terms of reference. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely,

### **GeoPro Consulting Limited**

Geotechnical - Hydrogeology - Environmental - Materials Testing – Inspection

**Draft**

**Kaiying Qiu, B.Sc, M.Sc.**

**Assistant Project Manager**

**Draft**

**Frank C. Liu, P. Geo. P.Eng.**

**Senior Hydrogeologist**

**Draft**

**David B. Liu, P.Eng., Principal**

## **8.0 REFERENCES**

Chapman, L.J. and D.F. Putnam. 1984. The Physiography of Southern Ontario. 3rd ed. Ontario Geological Survey Special Volume 2, Ontario Ministry of Natural Resources, Ontario, Canada.

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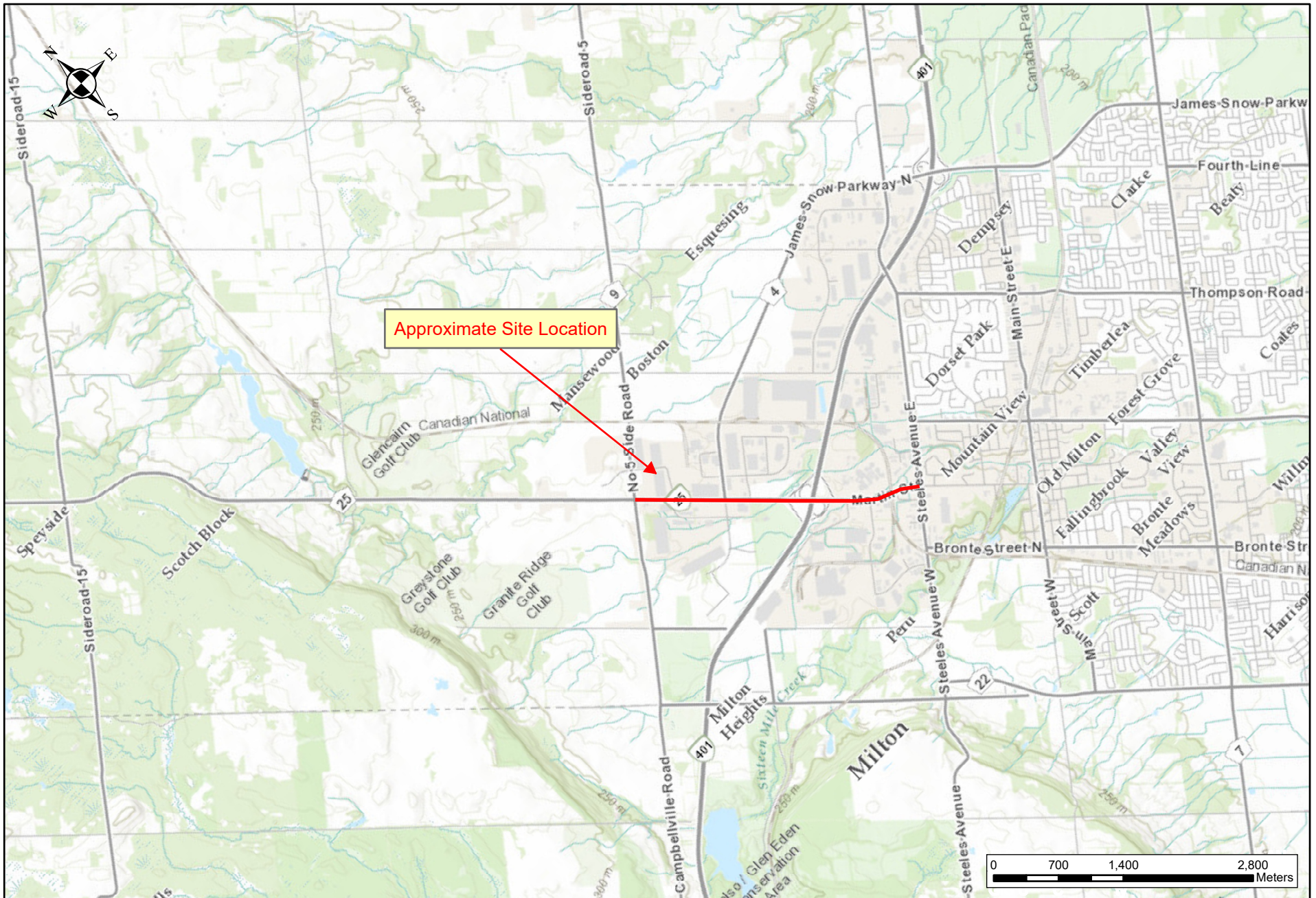


GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

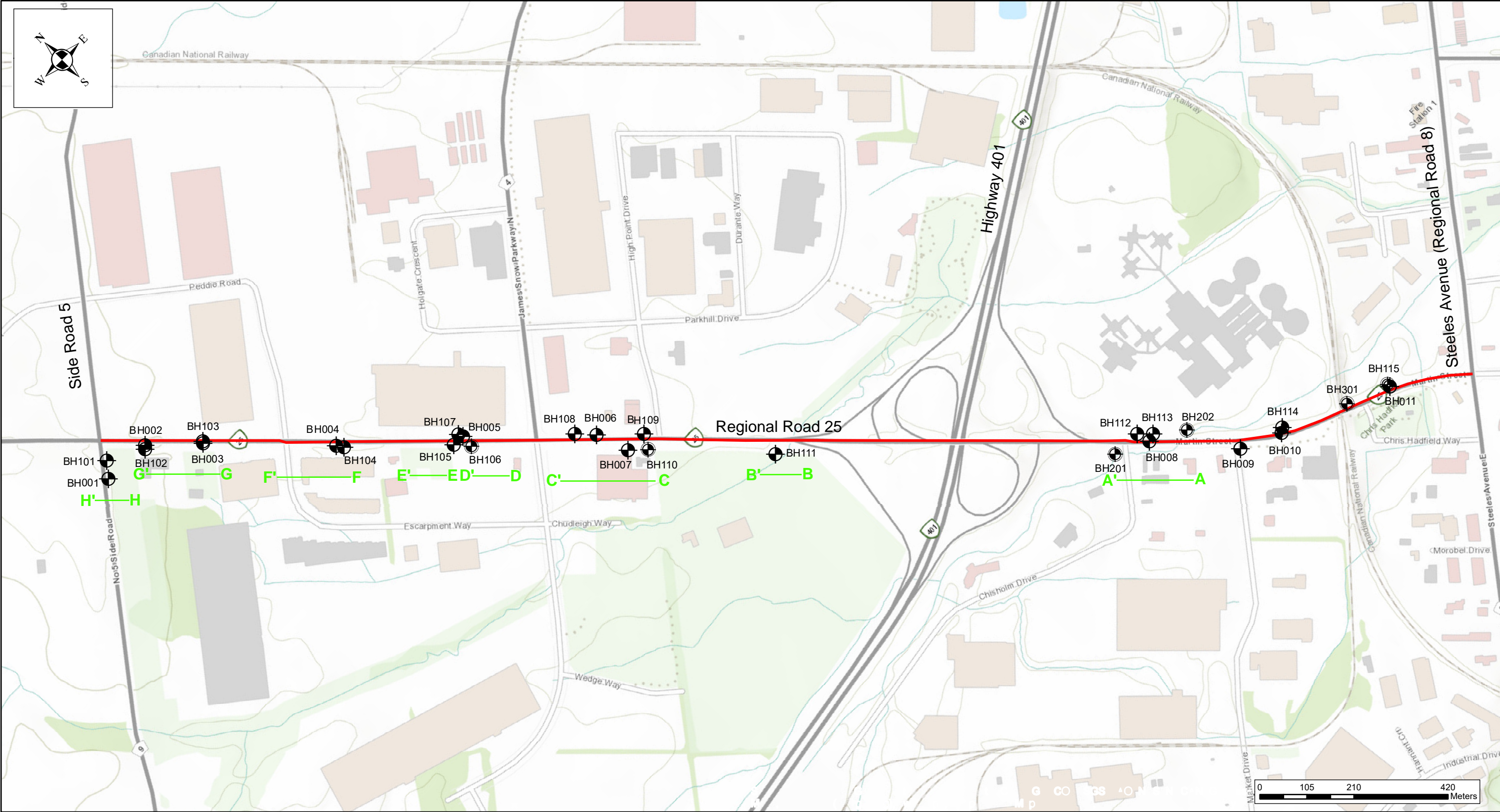
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## **DRAWINGS**

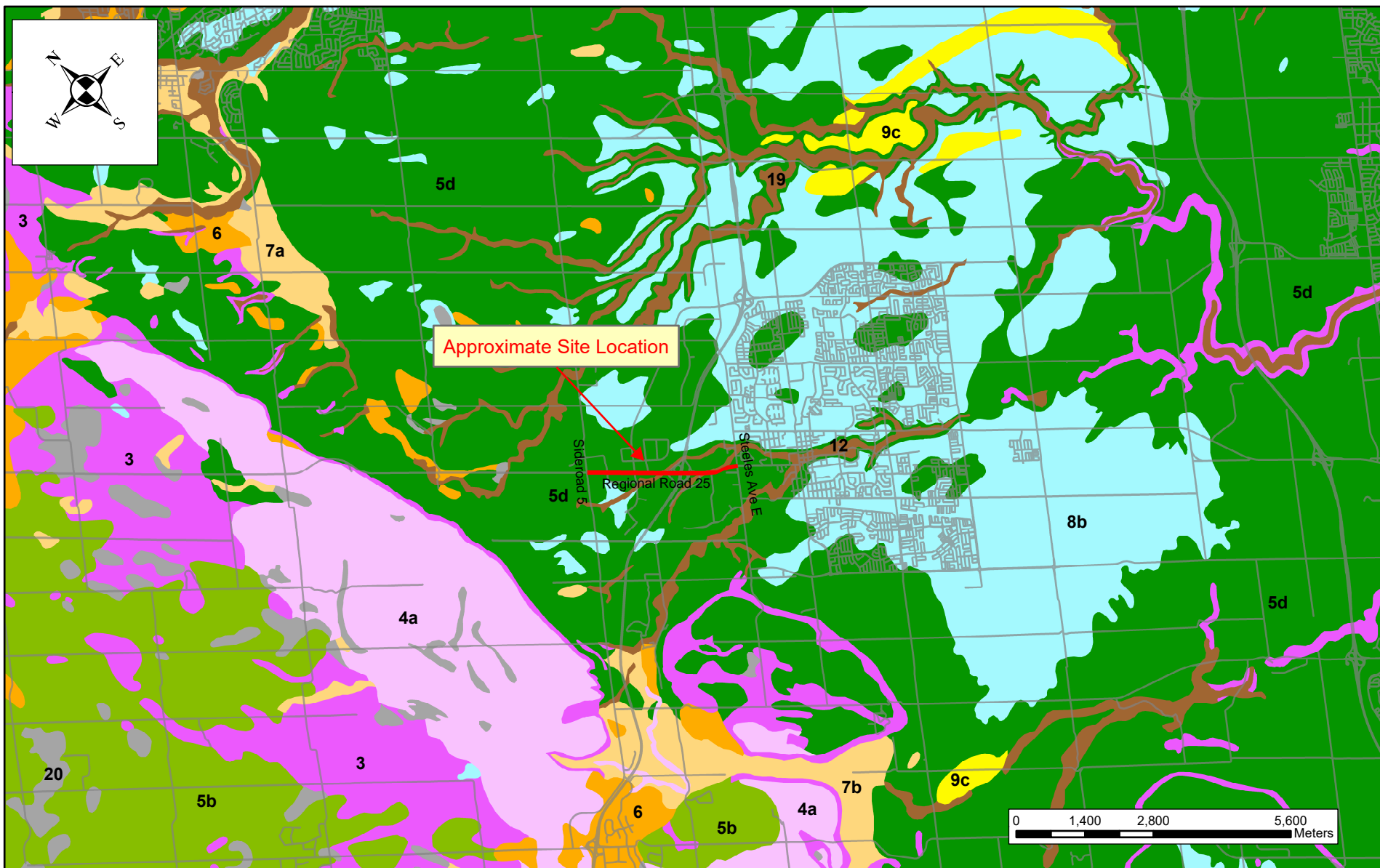


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Client: Stantec Consulting Limited		Title: Site Location Plan		Project: Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor from Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario		GeoPro Consulting Limited	



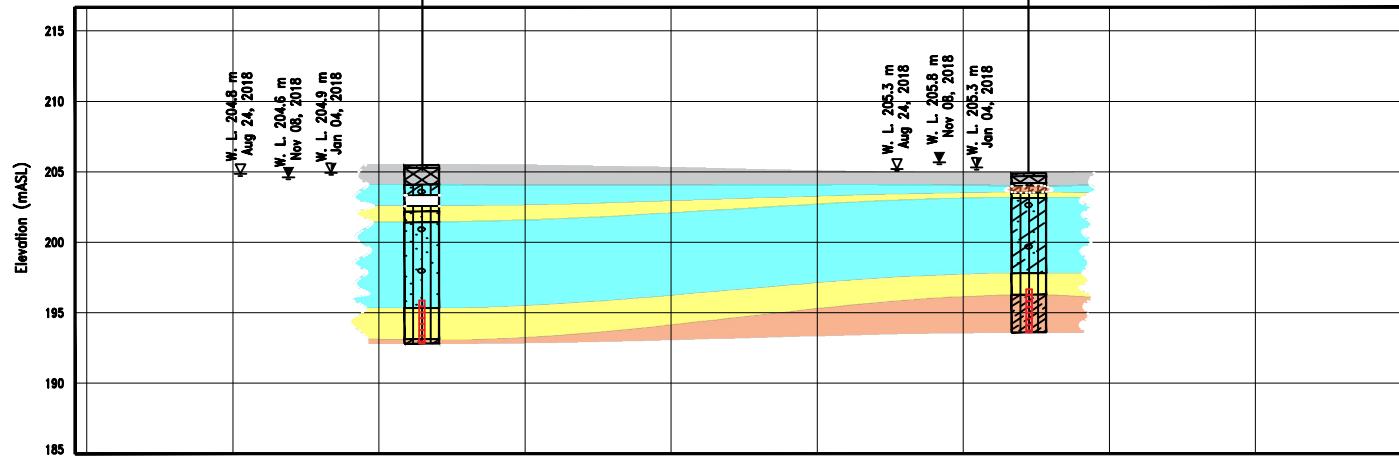
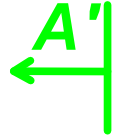
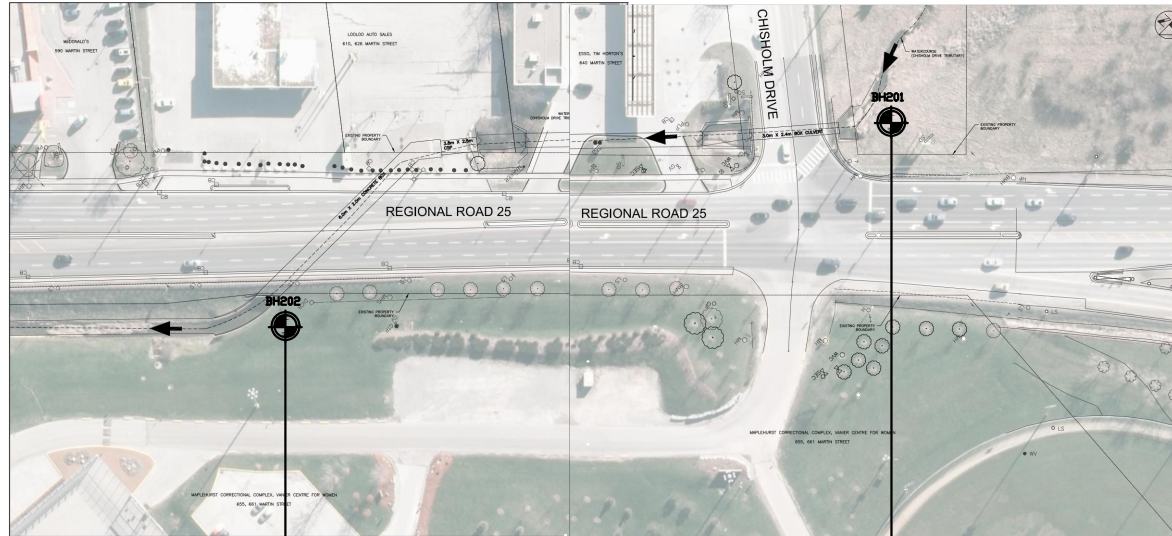
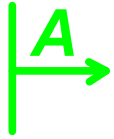


<b>Legend</b> <div><div></div> Site Location</div> <div><div></div> Borehole Location</div> <div><div></div> Monitoring Well Location</div> <div><div>A — A'</div> Subsurface Projection Diagram Baseline</div>
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<b>Legend</b>							
<ul style="list-style-type: none"> <li>3 Paleozoic Bedrock</li> <li>4a Bedrock-drift complex in Paleozoic terrain; primarily till cover</li> </ul>	<ul style="list-style-type: none"> <li>5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain</li> <li>5d Clay to silt-textured till (derived from glaciolacustrine deposits or shale)</li> <li>6 Ice-contact stratified deposits: sand and gravel, minor silt, clay and till</li> </ul>	<ul style="list-style-type: none"> <li>7 Glaciofluvial deposits: river deposits and delta topset facies</li> <li>7a Sandy deposits 7b Gravely deposits</li> <li>8b Fine-textured glaciolacustrine deposits: silt and clay, minor sand and gravel</li> <li>9 Coarse-textured glaciolacustrine deposits: sand, gravel, minor silt and clay</li> <li>9c Foreshoreshore and basinal deposits</li> <li>12 Older alluvial deposits: clay, silt, sand, gravel, may contain organic remains</li> <li>19 Modern alluvial deposits: clay, silt, sand, gravel, may contain organic remains</li> <li>20 Organic deposits: peat, muck, marl</li> </ul>					<b>Data Source:</b> 1. Surficial Geology of Southern Ontario 2. Natural Resources Canada
Date: January 2019	Scale: As Shown	Prepared by: MB	Approved by: KY	Rev: KY	Project No.: 17-1758H	Drawing No.:3	Original Size: Letter
Client: Stantec Consulting Limited		Title: Surficial Geology		Project: Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor from Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario			GeoPro Consulting Limited



**LEGEND**

Asphalt, Topsoil, Fill

Till Deposits

Silt to Fine Sand



Borehole



Monitoring Well

Groundwater level  
and Date Recorded

Monitoring Well Screen

Clay to Clayey Silt

Sand to Gravel

BedRock

**Note:**

1. Please note that the hydrogeological profiles are prepared according to the inferred site stratigraphy based on the information obtained from the limited number of boreholes. The subsurface soil between and beyond the boreholes may differ significantly from those encountered at the borehole locations. The inferred boundary between the different soil strata should be considered as approximate and for reference only.

2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.

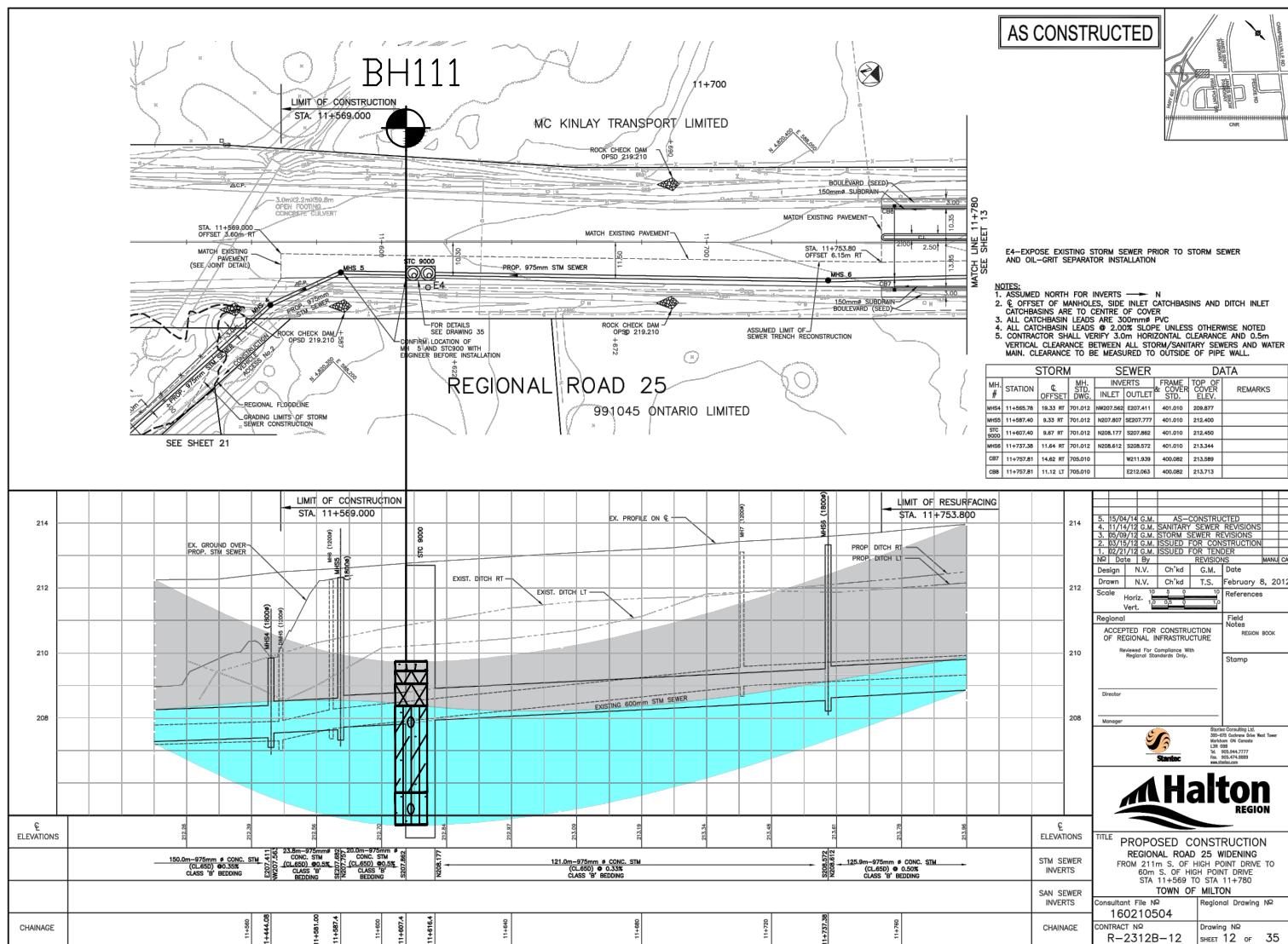
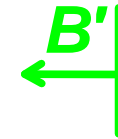
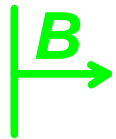
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Size:**Letter**

Client:

**Stantec Consulting Limited**Title: **Subsurface Projection Diagram A-A'**

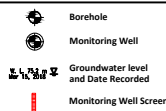
Project: **Preliminary Hydrogeological Investigation  
Proposed Improvements of Regional Road 25 Transportation Corridor  
From Steeles Avenue (Regional Road 8) to 5 Side Road  
Town of Milton, Ontario**

**GeoPro Consulting Limited**



**LEGEND**

Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock



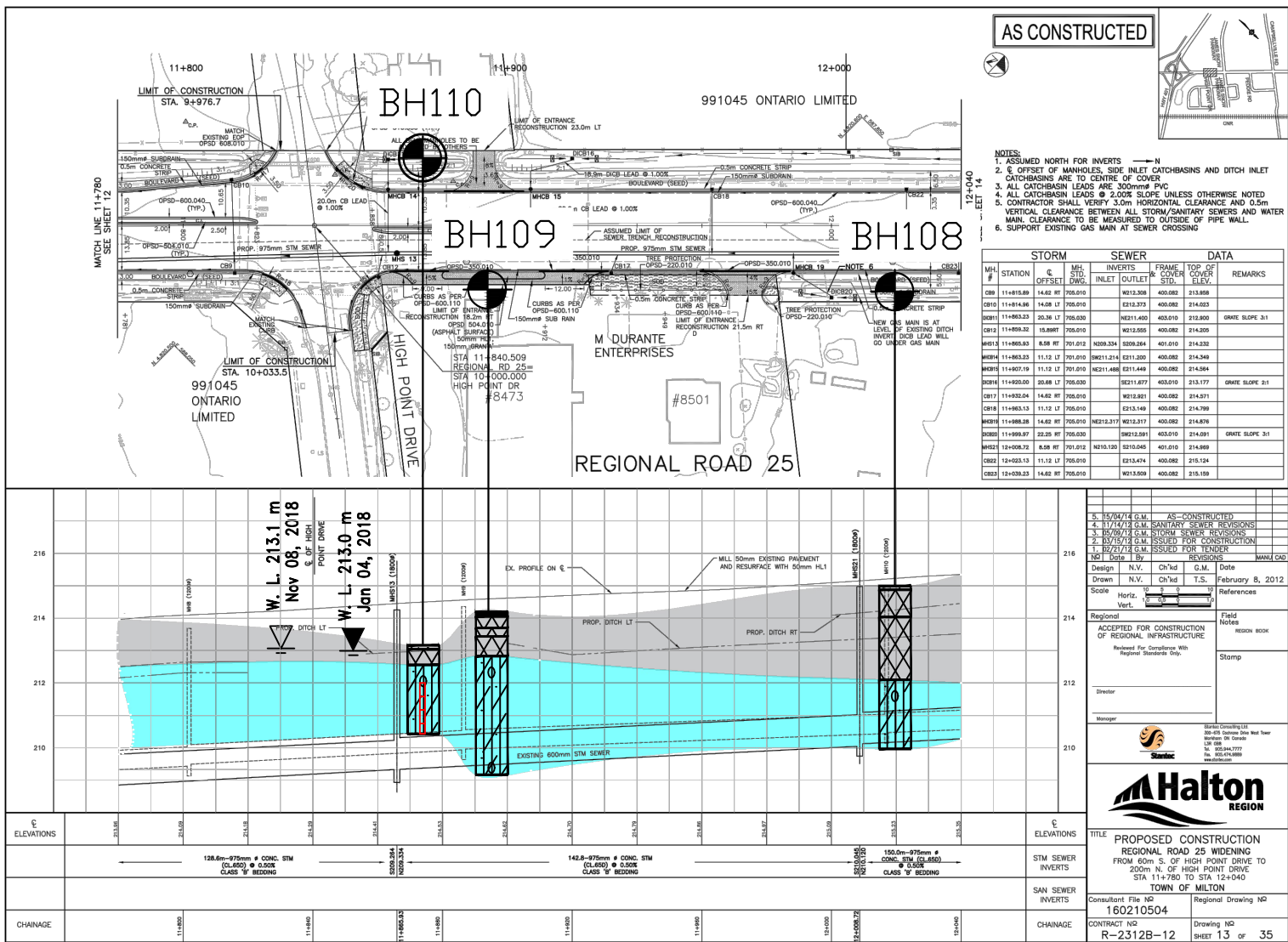
**Note:**

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2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.

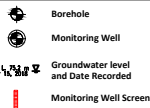
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Client: <b>Stantec Consulting Limited</b>	Title: <b>Subsurface Projection Diagram B-B'</b>			Project: <b>Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor From Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario</b>			



Drawn: MB, 10/08/2018  
 Checked: KY, 10/08/2018  
 Date: 10/08/2018

**LEGEND**

Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock

**Note:**

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Date: **January 2019**Scale: **As Shown**Drawn: **MB**Approved: **KY**Rev: **KY**Project No.: **17-1758H**Drawing No.: **4C**Original Size: **Letter**

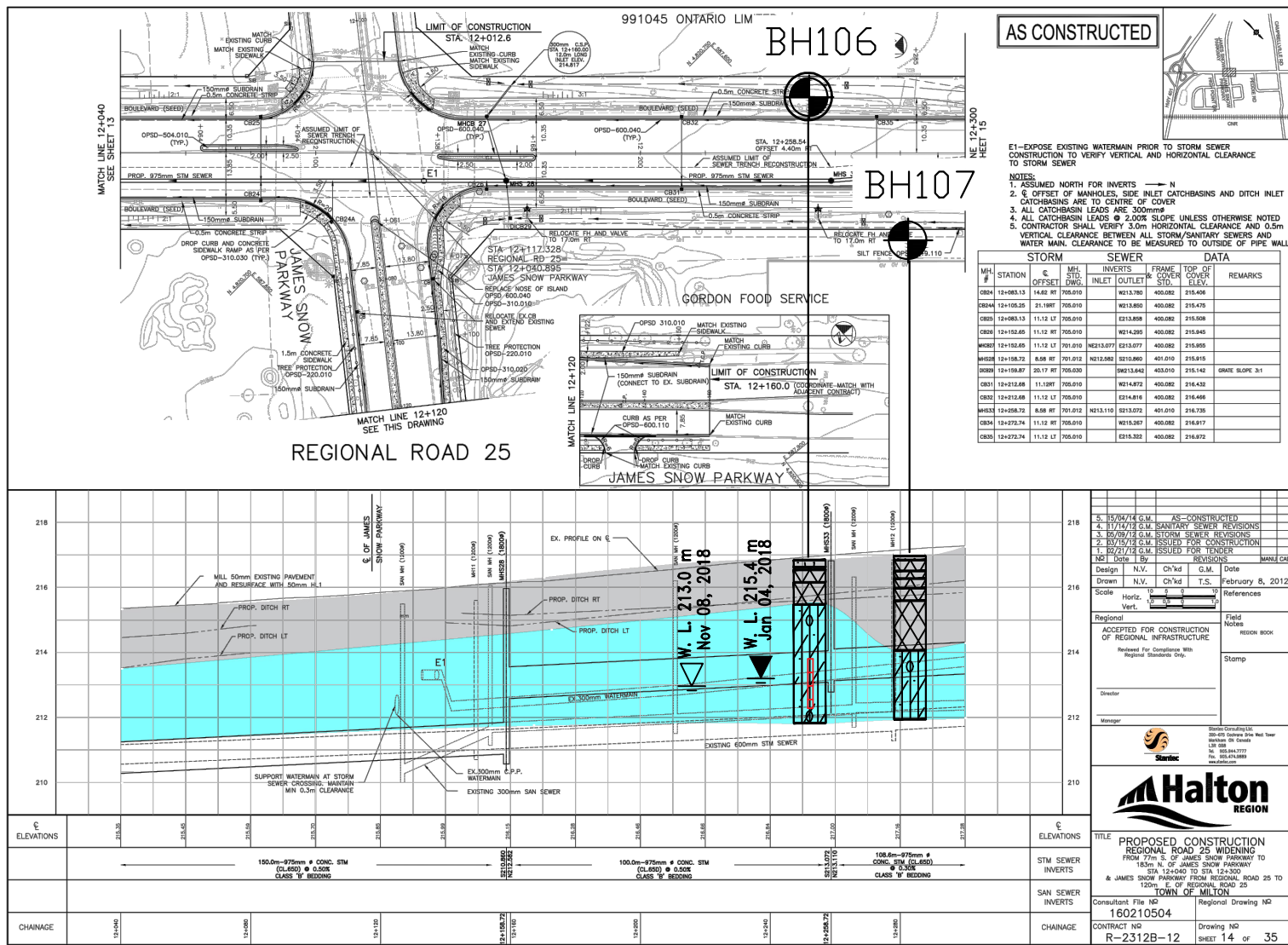
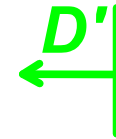
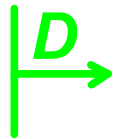
Client:

**Stantec Consulting Limited**Title: **Subsurface Projection Diagram C-C'**

Project:

**Preliminary Hydrogeological Investigation**  
**Proposed Improvements of Regional Road 25 Transportation Corridor**  
**From Steeles Avenue (Regional Road 8) to 5 Side Road**  
**Town of Milton, Ontario**

**GeoPro Consulting Limited**

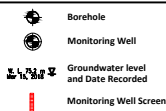


R-2312B-12 14 of 35

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#### LEGEND

Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock

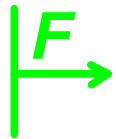


#### Note:

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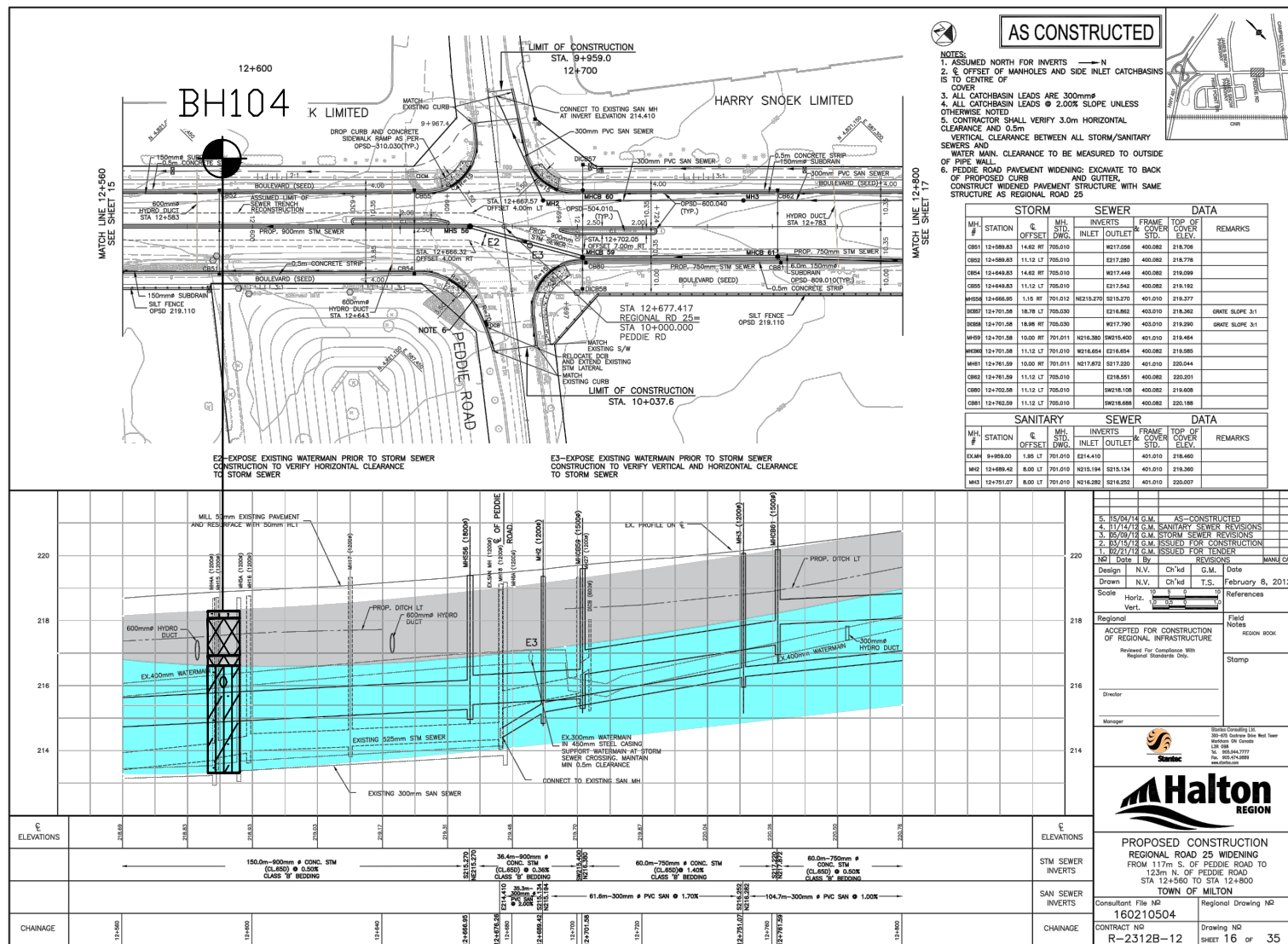
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R-2312B-12 16 of 35

Client: STANTEC CONSULTING LTD. - REGIONAL ROAD 25 (MILTON) TRANSPORTATION CORRIDOR  
Project: PRELIMINARY HYDROGEOLOGICAL INVESTIGATION  
Date: 04/27/2019  
Time: 10:20:20 AM



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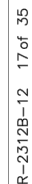
Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock






Borehole
Monitoring Well
Groundwater level and Date Recorded
Monitoring Well Screen

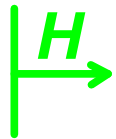
Note:  
1. Please note that the hydrogeological profiles are prepared according to the inferred site stratigraphy based on the information obtained from the limited number of boreholes. The subsurface soil between and beyond the boreholes may differ significantly from those encountered at the borehole locations. The inferred boundary between the different soil strata should be considered as approximate and for reference only.  
2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.

Date: January 2019	Scale: As Shown	Drawn: MB	Approved: KY	Rev: KY	Project No.: 17-1758H	Drawing No.: 4F	Original Size: Letter
Client: Stantec Consulting Limited	Title: Subsurface Projection Diagram F-F'	Project: Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor From Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario	GeoPro Consulting Limited				



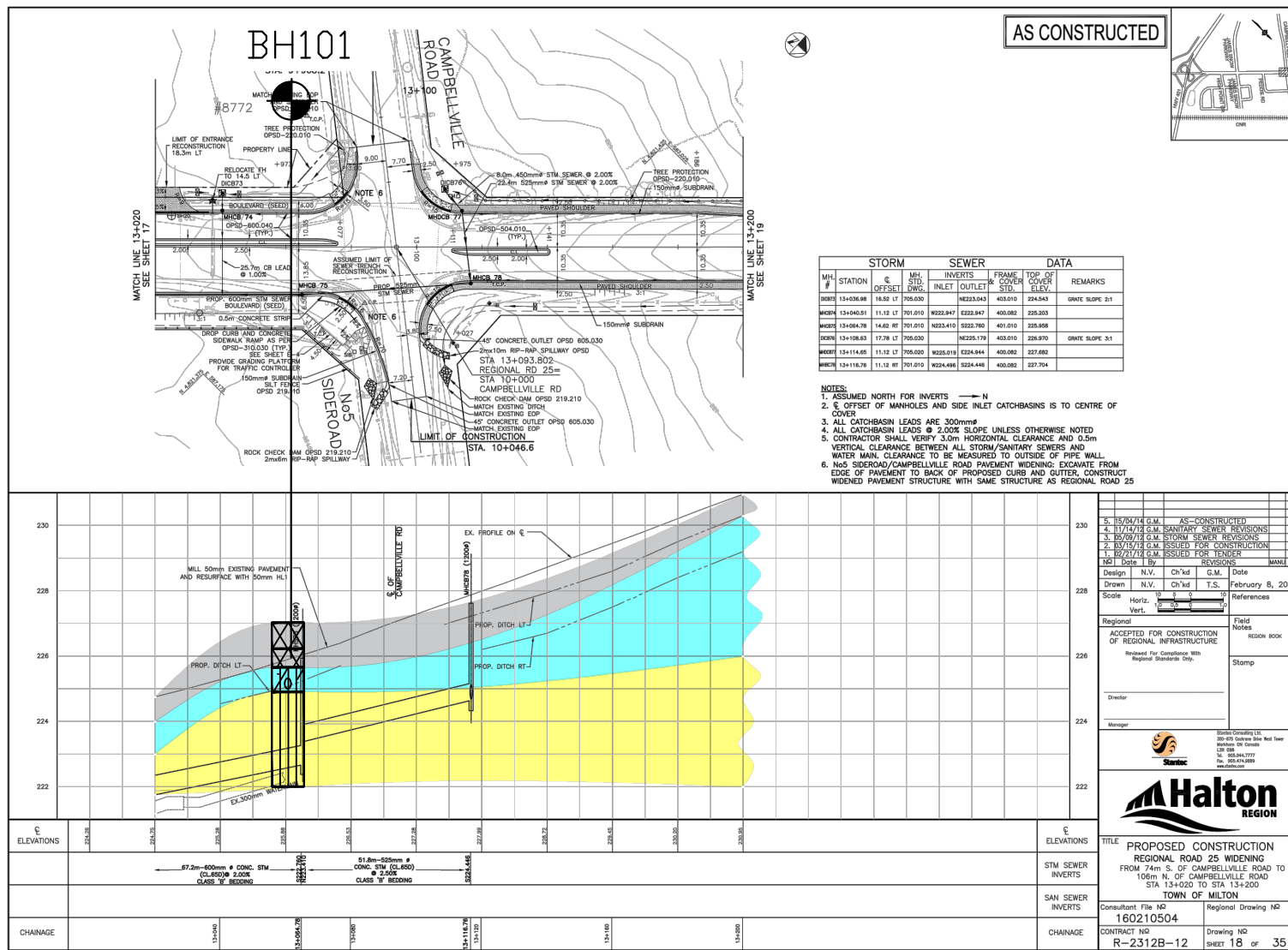


<b>LEGEND</b>		<div>Asphalt, Topsoil, Fill</div> <div>Till Deposits</div> <div>Silt to Fine Sand</div> <div>Clay to Clayey Silt</div> <div>Sand to Gravel</div> <div>BedRock</div>		<div> Borehole</div> <div> Monitoring Well</div> <div> Groundwater level and Date Recorded</div> <div> Monitoring Well Screen</div>		<div>Note:</div> <div>1. Please note that the hydrogeological profiles are prepared according to the inferred site stratigraphy based on the information obtained from the limited number of boreholes. The subsurface soil between and beyond the boreholes may differ significantly from those encountered at the borehole locations. The inferred boundary between the different soil strata should be considered as approximate and for reference only.</div> <div>2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.</div>									
Date: <b>January 2019</b>		Scale: <b>As Shown</b>		Drawn: <b>MB</b>		Approved: <b>KY</b>		Rev: <b>KY</b>		Project No.: <b>17-1758H</b>		Drawing No.: <b>4G</b>		Original Size: <b>Letter</b>	
Client: <b>Stantec Consulting Limited</b>				Title: <b>Subsurface Projection Diagram G-G'</b>				Project: <b>Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor From Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario</b>					 <b>GeoPro Consulting Limited</b>		



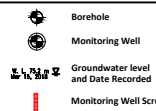
R-2312B-12 18 of 35

Drawn: N. V. (N.V. CONSULTING LTD.)  
Checked: M.B. (MB)  
Reviewed: K.Y. (KY)  
Date: 04/12/2019  
Scale: 1:2000



## LEGEND

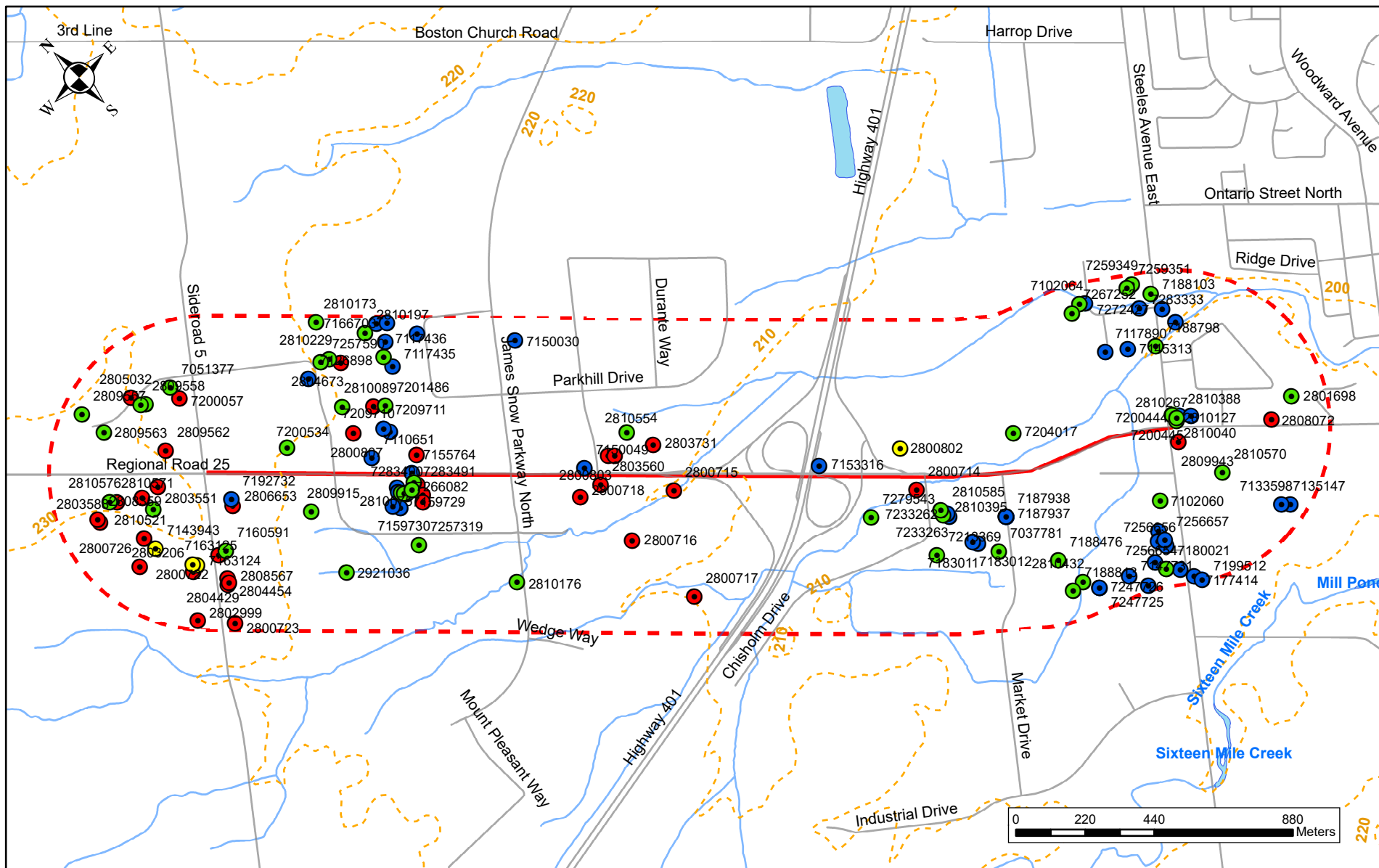
Asphalt, Topsoil, Fill	Till Deposits	Silt to Fine Sand
Clay to Clayey Silt	Sand to Gravel	BedRock




## Note:

1. Please note that the hydrogeological profiles are prepared according to the inferred site stratigraphy based on the information obtained from the limited number of boreholes. The subsurface soil between and beyond the boreholes may differ significantly from those encountered at the borehole locations. The inferred boundary between the different soil strata should be considered as approximate and for reference only.
2. Please also note that the groundwater levels shown on the hydrogeological profiles were measured in limited number of monitoring wells at different screen depths. The groundwater levels between and beyond the monitoring wells may differ significantly from those encountered at the monitoring well locations and screen depths. Groundwater levels were measured on a specific date and may change due to the seasonal fluctuation.

Date: <b>January 2019</b>	Scale: <b>As Shown</b>	Drawn: <b>MB</b>	Approved: <b>KY</b>	Rev: <b>KY</b>	Project No.: <b>17-1758H</b>	Drawing No.: <b>4H</b>	Original Size: <b>Letter</b>
Client: <b>Stantec Consulting Limited</b>	Title: <b>Subsurface Projection Diagram H-H'</b>		Project: <b>Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor From Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario</b>				



<b>Legend</b> <div><div><div><div></div><div>Site Location</div></div><div><div></div><div>Domestic/Commercial/Livestock/Industrial</div></div><div><div></div><div>Not Used/Unknown</div></div><div><div></div><div>Watercourse</div></div><div><div></div><div>Road</div></div></div><div><div><div></div><div>500m Radius From The Site</div></div><div><div></div><div>Monitoring/Test Hole/Monitoring and Test Hole</div></div><div><div></div><div>Public</div></div><div><div></div><div>Elevation Contour</div></div><div><div></div><div>Waterbody</div></div></div></div>							<b>Data Source:</b> 1. Atlas Canada - Toporama 2. MECP Water Well Data Base 3.Natural Resources Canada	
Date: January 2019	Scale: As Shown	Prepared by: MB	Approved by: BG	Rev: BG	Project No.: 17-1758GH	Drawing No. : 5	Original Size: Letter	
Client: Stantec Consulting Limited		Title: MECP Water Well Location Plan		Project: Preliminary Hydrogeological Investigation Proposed Improvements of Regional Road 25 Transportation Corridor from Steeles Avenue (Regional Road 8) to 5 Side Road Town of Milton, Ontario				



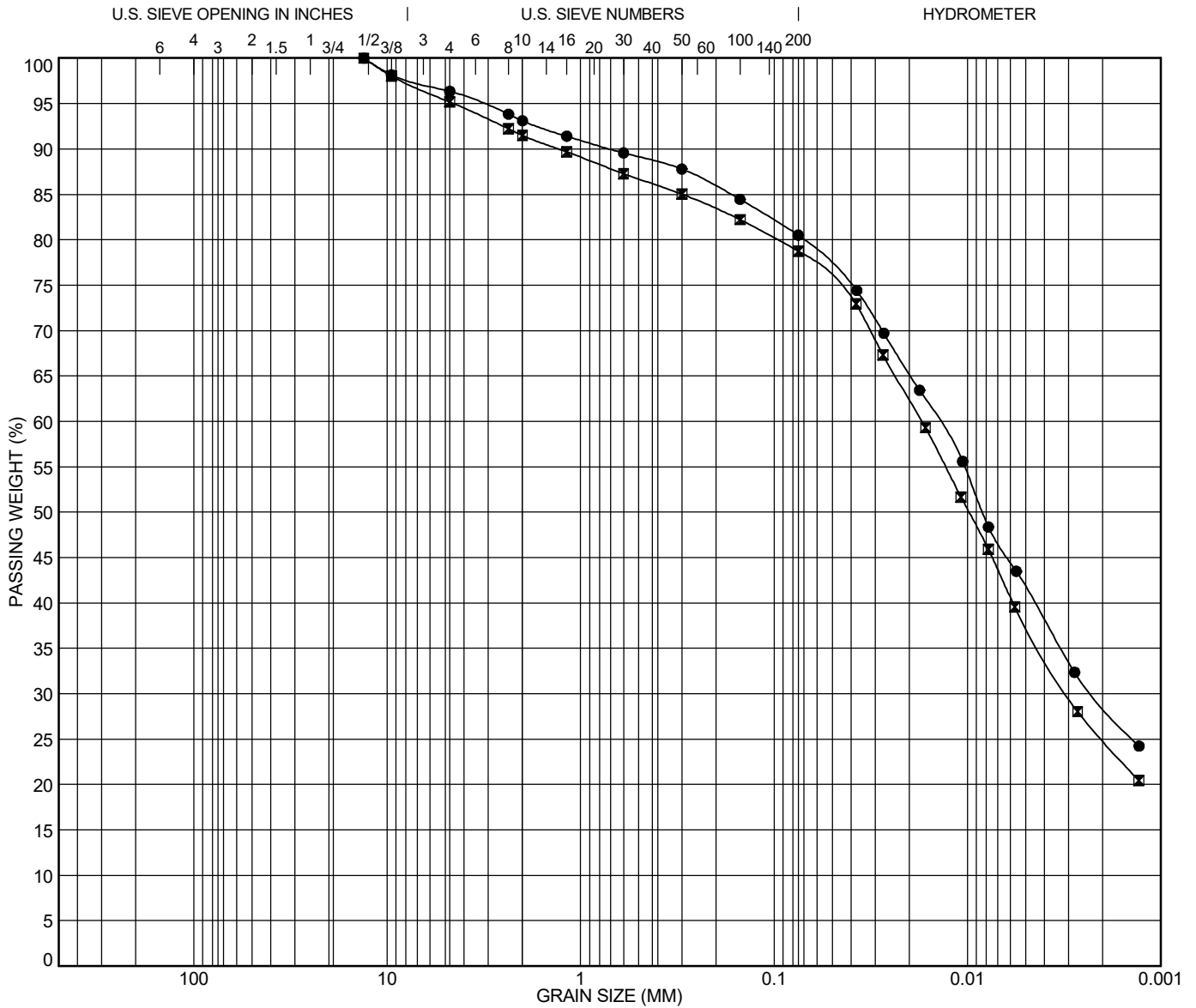
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## FIGURES





COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification			Classification				LL	PL	PI	Cc	Cu
●	BH004	SS3B 1.68									
■	BH005	SS3 1.52									
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	BH004	SS3B 1.68	13.2	0.014	0.002		3.7	15.8	51.7	28.8	
■	BH005	SS3 1.52	13.2	0.017	0.003		4.8	16.4	53.8	24.9	



Unit 57, 40 Vogell Road, Richmond Hill, Ontario L4B 3N6  
Tel: 905-237-8336 Fax: 905-248-3699  
office@geoproconsulting.ca www.geoproconsulting.ca

### GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements

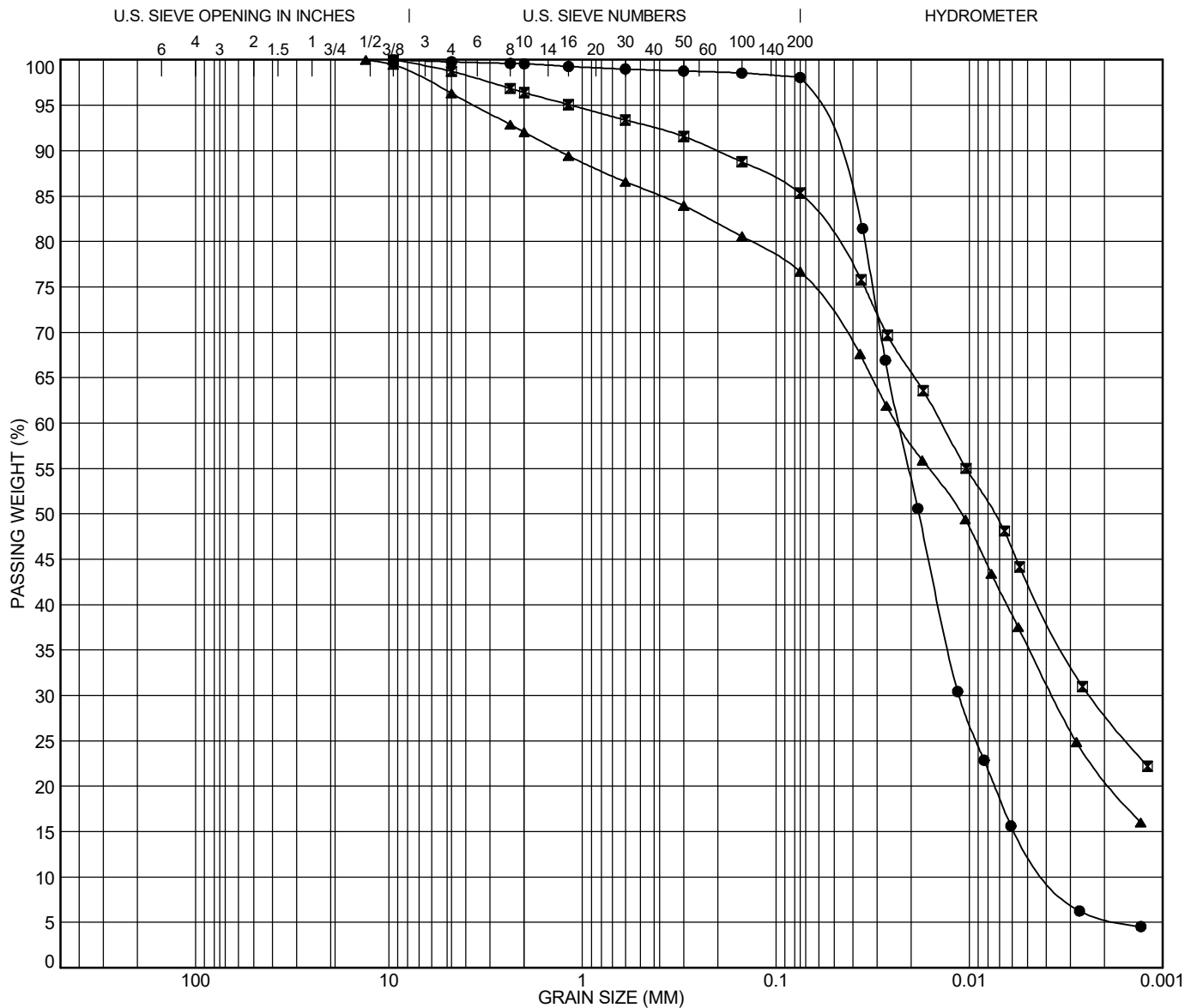
LOCATION: Regional Road 25, Milton, Ontario

PROJECT NO.: 17-1758GH

SAMPLED ON: 2018-07-03

FIGURE NO.: 1

TESTED ON: 2018-08-01



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification				Classification				LL	PL	PI	Cc	Cu
●	BH101	SS5	3.05								1.48	6.17
■	BH104	SS3	1.52									
▲	BH108	SS5	3.05									
Specimen Identification				D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	BH101	SS5	3.05	9.5	0.023	0.011	0.004	0.2	1.7	92.5	5.5	
■	BH104	SS3	1.52	9.5	0.014	0.002		1.3	13.4	57.3	28.0	
▲	BH108	SS5	3.05	13.2	0.023	0.004		3.7	19.6	55.7	21.0	



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### GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements

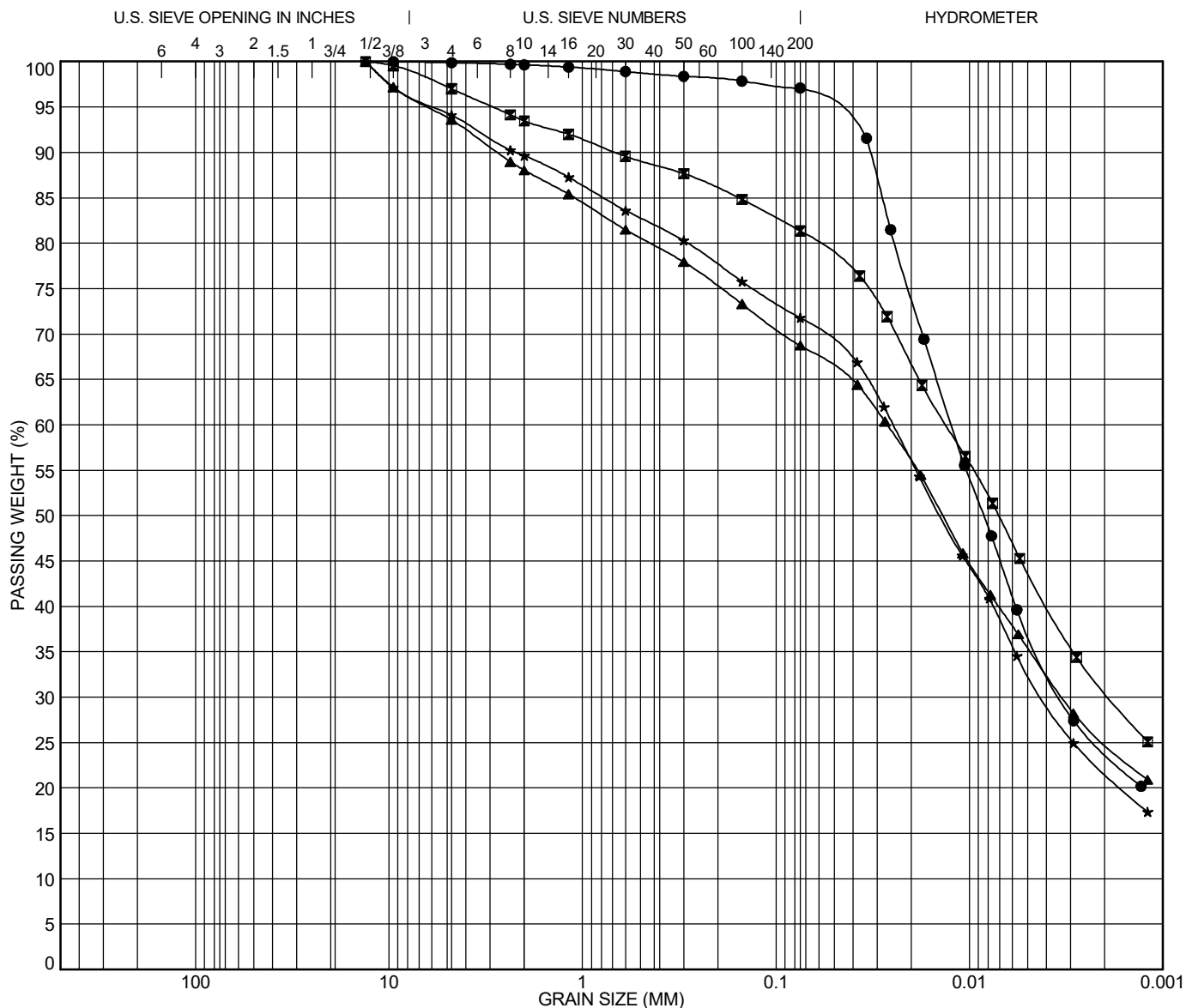
LOCATION: Regional Road 25, Milton, Ontario

PROJECT NO.: 17-1758GH

SAMPLED ON: 2018-06-11

FIGURE NO.: 2

TESTED ON: 2018-08-24



COBBLES	GRAVEL		SAND			SILT	CLAY
	coarse	fine	coarse	medium	fine		

Specimen Identification		Classification					LL	PL	PI	Cc	Cu
●	BH201 SS3A 1.52										
■	BH202 SS3 1.52										
▲	BH301 SS6 4.57										
★	BH301 SS8B 7.77										
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	BH201 SS3A 1.52	9.5	0.012	0.003		0.1	2.8	73.0	24.1		
■	BH202 SS3 1.52	13.2	0.013	0.002		3.0	15.6	50.7	30.7		
▲	BH301 SS6 4.57	13.2	0.027	0.003		6.4	24.9	43.6	25.1		
★	BH301 SS8B 7.77	13.2	0.025	0.004		5.9	22.3	50.0	21.7		



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### GRAIN SIZE DISTRIBUTION

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements

LOCATION: Regional Road 25, Milton, Ontario

PROJECT NO.: 17-1758GH

SAMPLED ON: 2018-06-14

FIGURE NO.: 3

TESTED ON: 2018-07-20



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## **APPENDIX A**



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**ENCLOSURES**



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## Enclosure 1A: Notes on Sample Descriptions

1. Each soil stratum is described according to the *Modified Unified Soil Classification System*. The compactness condition of cohesionless soils (SPT) and the consistency of cohesive soils (undrained shear strength) are defined according to Canadian Foundation Engineering Manual, 4<sup>th</sup> Edition. Different soil classification systems may be used by others. Please note that a description of the soil strata is based on visual and tactile examination of the samples augmented with field and laboratory test results, such as a grain size analysis and/or Atterberg Limits testing. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.
2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.
3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



## Enclosure 1B: Explanation of Terms Used in the Record of Boreholes

### Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube Sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

### Penetration Resistance

#### Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

PM – Samples advanced by manual pressure

WR – Samples advanced by weight of sampler and rod

WH – Samples advanced by static weight of hammer

#### Dynamic Cone Penetration Resistance, $N_d$ :

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in).

#### Piezo-Cone Penetration Test (CPT):

An electronic cone penetrometer with a 60 degree conical tip and a projected end area of 10 cm<sup>2</sup> pushed through ground at a penetration rate of 2 cm/s. Measurement of tip resistance ( $Q_t$ ), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

### Textural Classification of Soils (ASTM D2487)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm – 4.75 mm
Silt	0.002 mm-0.075 mm
Clay	<0.002 mm(*)

(\*) Canadian Foundation Engineering Manual (4<sup>th</sup> Edition)

### Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

### Soil Description

#### a) Cohesive Soils(\*)

Consistency Value	Undrained Shear Strength (kPa)	SPT “N”
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(\*) Hierarchy of Shear Strength prediction






1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT “N” value
5. Pocket penetrometer

#### b) Cohesionless Soils

Density Index (Relative Density)	SPT “N” Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

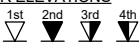
### Soil Tests

w	Water content
w <sub>p</sub>	Plastic limit
w <sub>l</sub>	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D <sub>R</sub>	Relative density (specific gravity, G <sub>s</sub> )
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements CLIENT: Stantec Consulting Limited PROJECT LOCATION: Regional Road 25, Milton, Ontario DATUM: N/A BH LOCATION: See Borehole Location Plan						<b>DRILLING DATA</b> METHOD: Continuous Flight Auger - Auto Hammer FIELD ENGINEER: HR SAMPLE REVIEW: DX CHECKED: DL DIAMETER: 155 mm DATE: 2018-06-20 REF. NO.: 17-1758GH ENCL. NO.: 2							
SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	ELEVATION	SPT 20 40 60 80	Cone 40 60 80	blows/0.3m 20 40 60 80	Plastic Limit W <sub>p</sub> 10 20 30 40	Natural Moisture Content W 10 20 30 40	
0.0	ASPHALT: (200 mm)												
0.2	GRANULAR BASE/SUBBASE: (450 mm)		1A	AS									
0.7	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, layers of sandy silt, brown, moist, very stiff		1B	AS									
0.9	PROBABLE FILL: sandy silt, some clay to clayey, trace gravel, layers of clayey silt, containing shale fragments, brown, moist, compact		2A	SS									
			2B	SS	17								
1.4	SANDY SILT TO SILT: trace to some clay, trace gravel, layers/zones of clayey silt, brown, moist, compact		3	SS	29								
2.0	END OF BOREHOLE												
Note: 1) Borehole was open and dry upon completion of drilling.													

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM.GPJ 2019-01-10 09:48

**GROUNDWATER ELEVATIONS**

 Measurement 1st 2nd 3rd 4th  

**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure



PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA									
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: HR					DATE: 2018-06-20									
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 3									
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Plastic Moisture Liquid Limit Content Limit			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			20	40	60	80	W <sub>p</sub>	W	W <sub>L</sub>					
0.0	ASPHALT: (210 mm)																		
0.2	GRANULAR BASE/SUBBASE: (590 mm)		1	AS												31 47 22			
0.8	FILL: clayey silt, trace to some sand, trace gravel, trace organics, rootlet inclusions, layers of sandy silt, dark brown, moist, stiff		2A	SS															
			2B	SS	9														
1.4	FILL: sandy silt to sand and silt, trace to some clay, trace to some gravel, brown, moist, dense		3	SS	32														
2.0	END OF BOREHOLE  Note: 1) Borehole was open and dry upon completion of drilling.																		

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>					
CLIENT: Stantec Consulting Limited			METHOD: Continuous Flight Auger - Auto Hammer			DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario			FIELD ENGINEER: HR			DATE: 2118-06-20					
DATUM: N/A			SAMPLE REVIEW: DX			REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan			CHECKED: DL			ENCL. NO.: 4					

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				SHEAR STRENGTH (kPa)			WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	Unconfined	Field Vane & Sensitivity	Quick Triaxial	Penetrometer	Lab Vane	W <sub>p</sub>	W	W <sub>L</sub>			
0.0	<b>ASPHALT:</b> (160 mm)																
0.2	<b>GRANULAR BASE/SUBBASE:</b> (470 mm)		1A	AS													
0.6	<b>FILL:</b> clayey silt, trace to some sand, trace gravel, trace organics, layers of sandy silt, zones of silt, dark brown, moist, stiff		1B	AS													
1.4	<b>FILL:</b> clayey silt, some sand to sandy, trace gravel, organic inclusions, brown, moist, very stiff		2	SS	13												
1.8	<b>CLAYEY SILT TILL:</b> some sand to sandy, trace gravel, containing shale fragments, cobbles and boulders, brown, moist, very stiff		3A	SS	26												
2.0	<b>END OF BOREHOLE</b>  Note: 1) Borehole was open and dry upon completion of drilling.		3B	SS													

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM.GPJ 2019-01-10 09:48

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST								Natural Moisture Content				UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m		SPT				Cone				Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

 GRAPH  
NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer  
to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA																			
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm																			
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: KL					DATE: 2018-07-03																			
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH																			
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 6																			
SOIL PROFILE			SAMPLES			GROUND WATER		DYNAMIC PENETRATION TEST								Plastic Limit				Natural Moisture Content				Liquid Limit				REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			ELEVATION	○ SPT 20	≥ Cone 40	blows/0.3m 60	80	W <sub>p</sub>	W	W <sub>L</sub>	UNIT WT (kN/m <sup>3</sup> )													
								SHEAR STRENGTH (kPa)								WATER CONTENT (%)													
								● Unconfined    X Field Vane & Sensitivity ▲ Quick Triaxial    ▣ Penetrometer + Lab Vane																					
								20    40    60    80								10    20    30    40				GR    SA    SI    CL									
0.0	ASPHALT: (220 mm)																												
0.2	GRANULAR BASE/SUBBASE: (520 mm)		1A	AS																					43    45    12				
0.7	FILL: clayey silt, some sand to sandy, trace gravel, layers of sandy silt, containing shale fragments, brown, moist, firm		1B	AS																									
			2A	SS	7																								
1.2	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of clayey silt, layers of silt, layers/zones of sandy silt, containing shale fragments, cobbles and boulders, brown, moist, very stiff		2B	SS																									
			3	SS	19																				5    16    54    25				
2.0	END OF BOREHOLE																												
	Note: 1) Borehole was open and dry upon completion of drilling.																												

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

 GRAPH  
NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer  
to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>							
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm	
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: KL						DATE: 2018-07-03	
DATUM: N/A						SAMPLE REVIEW: DX						REF. NO.: 17-1758GH	
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 7	

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	ELEVATION	SPT 20 40 60 80	Cone 20 40 60 80	Plastic Limit W <sub>p</sub>	Natural Moisture Content W	Liquid Limit W <sub>L</sub>	
0.0	ASPHALT: (180 mm)												
0.2	GRANULAR BASE/SUBBASE: (680 mm)		1	AS									
0.9	FILL: gravelly sand, some silt to silty, layers of sandy silt, brown, moist, compact		2A	SS									
			2B	SS	20								
1.4	FILL: clayey silt, trace to some sand, trace gravel, organic inclusions, rootlet inclusions, layers of sand and silt, organic odour, dark brown, moist, firm		3	SS	6								
2.0	END OF BOREHOLE												
Note: 1) Borehole was open and dry upon completion of drilling.													

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LABJV - MYB-MB - VM.GPJ 2019-01-10 09:48


**GROUNDWATER ELEVATIONS**

Measurement 1st 2nd 3rd 4th

**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: NS					DATE: 2018-11-01																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST								Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>	UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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0.0	<b>TOPSOIL:</b> (50 mm) <b>FILL:</b> sandy silt, some clay to clayey, trace gravel, organic inclusions, rootlet inclusions, layers of clayey silt, pockets of sand, brown, moist to wet, loose		1	SS	4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

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PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements								DRILLING DATA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>							
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm	
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: KL						DATE: 2018-07-03	
DATUM: N/A						SAMPLE REVIEW: DX						REF. NO.: 17-1758GH	
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 10	

SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT 20 40 60 80	Cone 40 60 80	blows/0.3m 20 40 60 80	Plastic Limit W <sub>p</sub>	Natural Moisture Content W	Liquid Limit W <sub>L</sub>			
0.0	ASPHALT: (170 mm)															
0.2	GRANULAR BASE/SUBBASE: (530 mm)		1A	AS												
0.7	FILL: gravelly sand, trace silt, brown, moist, loose to compact		1B	AS												
			2	SS	15											
			3	SS	6											
2.0	<b>END OF BOREHOLE</b>  Note: 1) Borehole was open and dry upon completion of drilling.															

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM.GPJ 2019-01-10 09:48

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure



PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA											
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm											
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: KL					DATE: 2018-07-03											
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH											
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 11											
SOIL PROFILE			SAMPLES			GROUND WATER		DYNAMIC PENETRATION TEST								Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			ELEVATION	SHEAR STRENGTH (kPa)				WATER CONTENT (%)								
								○ SPT    ≥ Cone    blows/0.3m 20    40    60    80				Plastic Limit    Natural Moisture Content    Liquid Limit w <sub>p</sub> w    w <sub>L</sub>				UNIT WT (kN/m <sup>3</sup> ) GR   SA   SI   CL					
								● Unconfined    X Field Vane & Sensitivity ▲ Quick Triaxial    ⊠ Penetrometer + Lab Vane													
0.0	ASPHALT: (390 mm)																				
0.4	GRANULAR BASE/SUBBASE: (520 mm)		1	AS																	
0.9	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, seams of organic silt, layers of sandy silt, containing shale fragments, dark brown to brown, moist, stiff		2A	SS	9																
1.4	FILL: clayey silt, trace to some sand, trace gravel, trace organics, rootlet inclusions, layers of sandy silt, layers of sand and silt, layers of organic silt, dark brown, moist, firm		2B	SS																	
2.0	END OF BOREHOLE		3	SS	6																
Note: 1) Borehole was open and dry upon completion of drilling.																					

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, x 3: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>					
CLIENT: Stantec Consulting Limited			METHOD: Continuous Flight Auger - Auto Hammer			DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario			FIELD ENGINEER: HR			DATE: 2118-06-20					
DATUM: N/A			SAMPLE REVIEW: DX			REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan			CHECKED: DL			ENCL. NO.: 12					

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				SHEAR STRENGTH (kPa)			WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)		
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	ELEVATION	SPT				FIELD VANE & SENSITIVITY			WATER CONTENT (%)				
								20	40	60	80	Unconfined	Quick Triaxial	Penetrometer	Lab Vane			W <sub>p</sub>	W
0.0	ASPHALT: (290 mm)																		
0.3	GRANULAR BASE/SUBBASE: (380 mm)		1A	AS													26 50 25		
0.7	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, rootlet inclusions, layers of sand and silt, dark brown to brown, moist, soft to firm		1B	AS															
			2	SS	4														
1.4	FILL: clayey silt, trace to some sand, trace gravel, trace to some organics, dark grey, moist, firm		3	SS	5														
2.0	END OF BOREHOLE  Note: 1) Borehole was open and dry upon completion of drilling.																		





01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM.GPJ 2019-01-10 09:48

**GROUNDWATER ELEVATIONS**

 Measurement 1st 2nd 3rd 4th
**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA										
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm			
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: KL							DATE: 2018-06-11			
DATUM: N/A							SAMPLE REVIEW: DX							REF. NO.: 17-1758GH			
BH LOCATION: See Borehole Location Plan							CHECKED: DL							ENCL. NO.: 13			
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Plastic Limit					
								Cone				Natural Moisture Content					
								blows/0.3m				Liquid Limit					
							SHEAR STRENGTH (kPa)				WATER CONTENT (%)						
							○ SPT				w <sub>p</sub>						
							20 40 60 80				w						
							● Unconfined				w <sub>L</sub>						
							▲ Quick Triaxial										
							✕ Field Vane & Sensitivity										
							✠ Penetrometer + Lab Vane										
							20 40 60 80				10 20 30 40						
0.0	GRANULAR BASE/SUBBASE: (800 mm)		1	SS	20												
0.8	FILL: gravelly sand, trace to some silt, zones of clayey silt, containing asphalt fragments, brown, moist, loose		2A	SS													
			2B	SS	8												
1.4	CLAYEY SILT TILL: sandy, trace gravel, rootlet inclusions, layers of sandy silt, containing shale fragments, cobbles and boulders, brown, moist, stiff		3	SS	10												
2.1	SILT: trace to some clay, trace sand, seams/layers of clayey silt, brown to grey, moist to wet, compact		4	SS	11												
			5	SS	21												
	--- grey		6	SS	22												
5.0	END OF BOREHOLE																
	Notes: 1) Water encountered at a depth of 3.0 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 4.6 mBGS upon completion of drilling. 3) Borehole was open upon completion of drilling.																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA													
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm						
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: KL							DATE: 2018-06-11						
DATUM: N/A							SAMPLE REVIEW: DX							REF. NO.: 17-1758GH						
BH LOCATION: See Borehole Location Plan							CHECKED: DL							ENCL. NO.: 14						
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)				WATER CONTENT (%)								
								SPT      Cone      blows/0.3m				Plastic Limit      Natural Moisture Content      Liquid Limit								
								20      40      60      80				w <sub>p</sub> w      w <sub>L</sub>								
							● Unconfined      X Field Vane & Sensitivity													
							▲ Quick Triaxial      □ Penetrometer + Lab Vane													
							20      40      60      80				10      20      30      40				GR   SA   SI   CL					
0.0	TOPSOIL: (100 mm)																			
0.1	FILL: gravelly sand, some silt, brown, moist, compact		1	SS	28															
0.7	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, rootlet inclusions, dark brown, moist, stiff		2	SS	9															
1.4	SANDY SILT TILL: some clay, trace gravel, layers/zones of sandy silt, containing shale fragments, brown, moist, compact		3	SS	17															
2.1	SILT: some clay, trace to some sand, layers of clayey silt, layers of sandy silt, brown to grey, moist to wet, compact		4	SS	17															
			5	SS	25															
	--- grey		6	SS	29															
5.0	END OF BOREHOLE																			
Notes: 1) Water encountered at a depth of 4.6 m below ground surface (mBGS) during drilling. 2) Borehole caved at a depth of 4.3 mBGS upon completion of drilling.																				

GROUNDWATER ELEVATIONS

Measurement    1st    2nd    3rd    4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG    GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ    2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: HR							DATE: 2018-08-29																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
DATUM: N/A							SAMPLE REVIEW: DC							REF. NO.: 17-1758GH																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST								UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Cone						Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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0.0	ASPHALT: (300 mm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ 2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA											
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm											
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: HR					DATE: 2018-06-20											
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH											
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 16											
SOIL PROFILE			SAMPLES			GROUND WATER		DYNAMIC PENETRATION TEST								Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)				WATER CONTENT (%)									
0.0	TOPSOIL: (220 mm)																				
0.2	FILL: gravelly sand, some silt, organic inclusions, layers/zones of clayey silt, brown, moist, compact		1	SS	11																
1			2	SS	23																
1.4	PROBABLE FILL: clayey silt, some sand, organic inclusions, rootlet inclusions, brown, moist, stiff		3A	SS	12																
1.7	CLAYEY SILT TILL: sandy, zones/layers of sandy silt, seams of sand, containing shale fragments, cobbles and boulders, brown to grey, moist, stiff to hard		3B	SS																	
			4	SS	24																
			5	SS	35																
	--- grey		6	SS	70 / 255 mm																
5.0	END OF BOREHOLE																				
	Note: 1) Borehole was open and dry upon completion of drilling.																				

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA									
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: HR					DATE: 2018-08-29									
DATUM: N/A					SAMPLE REVIEW: DC					REF. NO.: 17-1758GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 17									
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)				WATER CONTENT (%)							
								○ SPT 20	≥ Cone 40	blows/0.3m 60	80	Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>					
							● Unconfined    ✕ Field Vane & Sensitivity ▲ Quick Triaxial    ✕ Penetrometer + Lab Vane								GR   SA   SI   CL				
0.0	ASPHALT: (250 mm)																		
0.3	GRANULAR BASE/SUBBASE: (510 mm)		1	AS													38	61   1	
0.8	FILL: clayey silt, some sand to sandy, trace gravel, layers of organic clayey silt, containing shale fragments, brown, moist, firm		2	SS	7														
1.4	CLAYEY SILT: sandy, trace gravel, rootlet inclusions, layers of silt, containing shale fragments, brown, moist, stiff		3	SS	14														
2.1	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of sandy silt till, seams of sand, containing shale fragments, cobbles and boulders, brown to grey, moist, stiff to hard		4	SS	21														
			5	SS	31														
	--- grey		6	SS	14														
5.0	END OF BOREHOLE																		
Note: 1) Borehole was open and dry upon completion of drilling.																			

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:48

[illegible]



PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						DRILLING DATA											
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: KL						DATE: 2018-06-11					
DATUM: N/A						SAMPLE REVIEW: DX						REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 19					
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				WATER CONTENT (%)					
								SHEAR STRENGTH (kPa)									
0.0	TOPSOIL: (120 mm)																
0.1	FILL: gravelly sand, some silt to silty, rootlet inclusions, layers of sandy silt, containing rock		1A	SS	19												
0.5	fragments, organic odour, brown, moist, compact		1B	SS													
0.7	FILL: clayey silt, some sand to sandy, trace gravel, brown, moist, very stiff		2A	SS	7												
1.0	FILL: gravelly sand, some silt, layers of clayey silt, containing rock fragments, brown, moist, loose		2B	SS													
1.4	FILL: sandy silt to sand and silt, some clay, trace gravel, organic inclusions, zones of clayey silt, brown, moist, loose		3	SS	7												
2.9	FILL: clayey silt, trace to some sand, trace gravel, organic inclusions, brown, moist, firm to stiff		4	SS	12												
2.9	CLAYEY SILT TILL: some sand to sandy, trace gravel, containing shale fragments, cobbles and boulders, brown to grey, moist, very stiff		5	SS	23												
5.0	END OF BOREHOLE																
	Note: 1) Borehole was open and dry upon completion of drilling.																















GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						DRILLING DATA															
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm									
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: KL						DATE: 2018-06-11									
DATUM: N/A						SAMPLE REVIEW: DX						REF. NO.: 17-1758GH									
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 20									
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Plastic Limit									
								blows/0.3m				w <sub>p</sub>									
								20 40 60 80				w									
								SHEAR STRENGTH (kPa)				w <sub>L</sub>									
● Unconfined    ✕ Field Vane & Sensitivity				▲ Quick Triaxial    ⊠ Penetrometer + Lab Vane				WATER CONTENT (%)													
0.0	TOPSOIL: (120 mm)																				
0.1	FILL: gravelly sand to sand and gravel, some silt, layers of sandy silt, brown, moist, loose to dense		1	SS	42																
			2A	SS																	
1.0	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, rootlet inclusions, layers of sandy silt, brown, moist, firm to stiff		2B	SS	12																
																					
			3	SS	6																
																					
	--- zones of sandy silt, containing shale fragments		4	SS	11																
																					
2.9	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of sandy silt, containing shale fragments, cobbles and boulders, brown, moist, very stiff to hard		5	SS	21													4	20	56	20
																					
																					
	--- layers/zones of sandy silt till		6	SS	32																
																					
5.0	END OF BOREHOLE																				
	Note: 1) Borehole was open and dry upon completion of drilling.																				

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>							
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm	
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: HR						DATE: 2018-08-29	
DATUM: N/A						SAMPLE REVIEW: DC						REF. NO.: 17-1758GH	
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 21	

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)	
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	SHEAR STRENGTH (kPa)				W <sub>p</sub>	W			W <sub>L</sub>
							● Unconfined	✕ Field Vane & Sensitivity	▲ Quick Triaxial	✕ Penetrometer + Lab Vane					
0.0	<b>ASPHALT:</b> (140 mm)														
0.1	<b>GRANULAR BASE/SUBBASE:</b> (360 mm)		1A	AS											
0.5	<b>FILL:</b> sandy silt, clayey, trace gravel, organic inclusions, brown, moist		1B	AS											
0.8	<b>FILL:</b> clayey silt, sandy, trace gravel, layers of sandy silt, containing shale fragments, brown, moist, loose		2	SS	4										
1.4	<b>CLAYEY SILT TILL:</b> some sand to sandy, trace gravel, layers of sandy silt, seams of sand, containing shale fragments, cobbles and boulders, brown, moist, firm to very stiff		3	SS	6										
			4	SS	18										
			5	SS	17										
			6	SS	27										
5.0	<b>END OF BOREHOLE</b>  Note: 1) Borehole was open and dry upon completion of drilling.														

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

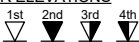
▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements								DRILLING DATA															
CLIENT: Stantec Consulting Limited								METHOD: Continuous Flight Auger - Auto Hammer								DIAMETER: 155 mm							
PROJECT LOCATION: Regional Road 25, Milton, Ontario								FIELD ENGINEER: HR								DATE: 2018-10-30							
DATUM: N/A								SAMPLE REVIEW: DC								REF. NO.: 17-1758GH							
BH LOCATION: See Borehole Location Plan								CHECKED: DL								ENCL. NO.: 22							
SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST								Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m		SHEAR STRENGTH (kPa)								WATER CONTENT (%)								
							SPT				Cone				Plastic Limit					Liquid Limit			
							20	40	60	80	blows/0.3m	20	40	60	80	W <sub>p</sub>	W	W <sub>L</sub>		GR	SA	SI	CL
0.0	TOPSOIL: (130 mm)																						
0.1	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, pockets of sandy silt, brown, moist, soft to firm		1	SS	4	0.1 mBGS Nov 08 0.2 mBGS Jan 04 Bentonite																	
0.6	CLAYEY SILT TILL: some sand, trace gravel, layers of silt, containing cobbles and boulders, reddish brown, moist, stiff to hard		2	SS	15																		
			3	SS	25	Sand																	
			4	SS	33	Screen																	
2.7	END OF BOREHOLE																						
<div>Notes:</div> <div>1) Borehole was open and dry upon completion of drilling.</div> <div>2) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.</div> <div>Water Level Readings</div> <div>DateW. L. Depth (mBGS)</div> <div>Nov. 8, 20180.13</div> <div>Jan. 4, 20180.20</div>																							









01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ 2019-01-10 09:48

**GROUNDWATER ELEVATIONS**

 Measurement      1st      2nd      3rd      4th  

**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements										DRILLING DATA									
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: HR					DATE: 2018-06-19									
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 23									
SOIL PROFILE			SAMPLES			GROUND WATER		DYNAMIC PENETRATION TEST								REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			ELEVATION	SHEAR STRENGTH (kPa)				WATER CONTENT (%)						
								○ SPT    ≥ Cone    blows/0.3m 20    40    60    80				Plastic Limit    Natural Moisture Content    Liquid Limit w <sub>p</sub> w                      w <sub>L</sub>							
								● Unconfined    × Field Vane & Sensitivity ▲ Quick Triaxial    ▣ Penetrometer + Lab Vane											
								20    40    60    80				10    20    30    40							
0.0	TOPSOIL: (290 mm)																		
0.3	FILL: sandy silt, trace clay, organic inclusions, rootlet inclusions, dark brown to brown, moist, loose		1	SS	7														
0.7	FILL: clayey silt, some sand, trace gravel, organic inclusions, layers of sandy silt, containing shale fragments, brown, moist, stiff		2	SS	9														
1.4	CLAYEY SILT TILL: some sand to sandy, trace gravel, containing shale fragments, brown, moist, very stiff to hard		3	SS	16														
			4	SS	38														
			5	SS	28														
4.0	SANDY SILT TILL: trace gravel, some clay, layers of clayey silt till, layers of sandy silt, containing cobbles and boulders, grey, moist, very dense		6	SS	56														
5.0	END OF BOREHOLE																		
	Note: 1) Borehole was open and dry upon completion of drilling.																		

GROUNDWATER ELEVATIONS

Measurement    1st    2nd    3rd    4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG    GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ    2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA													
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm						
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: KL							DATE: 2018-06-11						
DATUM: N/A							SAMPLE REVIEW: DX							REF. NO.: 17-1758GH						
BH LOCATION: See Borehole Location Plan							CHECKED: DL							ENCL. NO.: 24						
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Plastic Limit								
								Cone				Moisture Content								
								blows/0.3m				Liquid Limit								
							SHEAR STRENGTH (kPa)				WATER CONTENT (%)									
							○ SPT    ≥ Cone    blows/0.3m				w <sub>p</sub> w    w <sub>L</sub>									
							● Unconfined    X Field Vane & Sensitivity													
							▲ Quick Triaxial    ⊠ Penetrometer + Lab Vane													
							20    40    60    80				10    20    30    40									
0.0	TOPSOIL: (170 mm)																			
0.2	FILL: sandy silt to sand and silt, trace clay, organic inclusions, rootlet inclusions, brown, moist, compact		1	SS	29															
0.7	FILL: asphalt fragments/pieces, trace sand, trace gravel, black, moist, compact		2A	SS	11															
1.1	FILL: sandy silt, trace to some clay, trace gravel, rootlet inclusions, containing rock fragments, brown, moist, loose to compact		2B	SS																
	--- seams of organic silt, zones of clayey silt, containing shale fragments/pieces		3	SS	10															
2.1	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of sandy silt, containing shale fragments, cobbles and boulders, brown, moist, hard		4	SS	32															
2.9	SANDY SILT TILL: some clay, trace gravel, layers of sand and silt, containing shale fragments/pieces, cobbles and boulders, brown, moist, dense		5	SS	41															
4.0	CLAYEY SILT TILL: sandy, trace gravel, layers of sandy silt, containing cobbles and boulders, grey, moist to wet, stiff		6	SS	13															
5.0	END OF BOREHOLE																			
	Notes: 1) Borehole caved at a depth of 3.6 m below ground surface (mBGS) upon completion of drilling.																			

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						DRILLING DATA											
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: HR						DATE: 2018-08-29					
DATUM: N/A						SAMPLE REVIEW: DC						REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 25					
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Liquid Limit					
								20	40	60	80	W <sub>p</sub>	W	W <sub>L</sub>			
							SHEAR STRENGTH (kPa)				WATER CONTENT (%)						
							● Unconfined    ✕ Field Vane & Sensitivity										
							▲ Quick Triaxial    ⊠ Penetrometer + Lab Vane										
0.0	TOPSOIL: (280 mm)																
0.3	FILL: sandy silt, trace clay, trace gravel, organic inclusions, rootlet inclusions, brown, moist, compact		1A	SS	11		○						○				
0.6	FILL: asphalt fragments, compact		1B	SS									○				
0.8	FILL: sandy silt, some clay to clayey, trace gravel, layers of clayey silt, layers/seams of sand, containing shale fragments, brown, moist, compact		2A	SS									○				
1.4	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of sandy silt till, seams of sand, containing shale fragments, cobbles and boulders, brown, moist, very stiff to hard		2B	SS	11		○						○				
			3	SS	17		○						○				
			4	SS	20		○						○				
			5	SS	36			○									
			6A	SS	21		○						○				
4.9	PROBABLE WEATHERED SHALE:		6B	SS													
5.0	reddish brown END OF BOREHOLE																
	Note: 1) Borehole was open and dry upon completion of drilling.																

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:48

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA												
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: HR							DATE: 2018-06-20					
DATUM: N/A							SAMPLE REVIEW: DX							REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan							CHECKED: DL							ENCL. NO.: 26					
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content				UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SPT				Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>					
								○	≥	Cone	blows/0.3m								
								20	40	60	80								
							SHEAR STRENGTH (kPa)				WATER CONTENT (%)								
							● Unconfined    ✕ Field Vane & Sensitivity												
							▲ Quick Triaxial    ⊠ Penetrometer + Lab Vane												
							20	40	60	80	10	20	30	40		GR	SA	SI	CL
0.0	TOPSOIL: (220 mm)																		
0.2	FILL: gravelly sand, silty, organic inclusions, rootlet inclusions, brown, moist, dense		1	SS	32				○			○							
0.7	FILL: silty sand, some gravel, layers of sand and silt, brown, moist, dense		2	SS	46							○							
1.4	FILL: organic silt, some clay, some sand, rootlet inclusions, dark brown, moist, loose		3	SS	7			○						○					
2.1	FILL: sandy silt, some clay, trace gravel, organic inclusions, layers of clayey silt, pockets of organic silt, containing shale fragments, brown, moist, compact		4A	SS	14			○						○					
2.7	CLAYEY SILT TILL: some sand to sandy, trace gravel, seams of sand, layers of sandy silt, containing cobbles and boulders, brown, moist, hard		4B	SS										○					
			5	SS	32				○					○					
			6	SS	48							○							
5.0	END OF BOREHOLE																		
	Note: 1) Borehole was open and dry upon completion of drilling.																		

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure



PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements

**DRILLING DATA**

CLIENT: Stantec Consulting Limited

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: Regional Road 25, Milton, Ontario

FIELD ENGINEER: HR

DATE: 2018-06-20

DATUM: N/A

SAMPLE REVIEW: DX

REF. NO.: 17-1758GH

BH LOCATION: See Borehole Location Plan

CHECKED: DL

ENCL. NO.: 27

SOIL PROFILE			SAMPLES		GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE			"N" BLOWS/0.3m	SHEAR STRENGTH (kPa)				Plastic Limit w <sub>p</sub>	Natural Moisture Content w						Liquid Limit w <sub>L</sub>
								SPT Cone blows/0.3m											
								● Unconfined    ✕ Field Vane & Sensitivity											
								▲ Quick Triaxial    ✕ Penetrometer + Lab Vane											
20    40    60    80				20    40    60    80				10    20    30    40											
0.0	TOPSOIL: (120 mm)																		
0.1	FILL: silty sand, trace to some gravel, containing metal pieces, brown, moist, dense		1	SS	33														
0.7	FILL: gravelly sand, some silt to silty, brown, moist, loose		2	SS	9														
1.4	FILL: sand and silt, some clay to clayey, organic inclusions, rootlet inclusions, layers of clayey silt, dark brown to brown, moist to wet, loose		3	SS	9														
2.1	FILL: clayey silt, some sand to sandy, trace gravel, organic inclusions, rootlet inclusions, layers of silt, zones of sandy silt, dark brown to brown, moist, stiff		4	SS	12														
2.9	FILL: sandy silt, some clay to clayey, trace gravel, containing shale fragments, brown, moist, compact		5A	SS	18														
3.4	PROBABLE FILL: clayey silt, sandy, trace gravel, containing shale fragments, reddish brown, moist, very stiff		5B	SS															
3.8	CLAYEY SILT TILL: some sand to sandy, trace gravel, layers of sandy silt, containing shale fragments, cobbles and boulders, brown, moist, hard																		
5.0	END OF BOREHOLE		6	SS	50														
<div>Notes:</div> <div>1) Water encountered at a depth of 1.5 m below ground surface (mBGS) during drilling.</div> <div>2) Water was at a depth of 4.5 mBGS upon completion of drilling.</div> <div>3) Borehole was open upon completion of drilling.</div> <div>4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.</div> <div>Water Level Readings</div> <div>Date                      W. L. Depth (mBGS)</div> <div>Nov. 8, 2018                      2.88</div> <div>Jan. 4, 2018                      2.05</div>																			

**GROUNDWATER ELEVATIONS**

Measurement 1st 2nd 3rd 4th

**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements					DRILLING DATA															
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm										
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: HR					DATE: 2018-06-19										
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH										
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 28										
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION TEST								REMARKS AND GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
							Unconfined	Field Vane & Sensitivity	Quick Triaxial	Penetrometer + Lab Vane	Plastic Limit	Natural Moisture Content	Liquid Limit	GR		SA	SI	CL		
0.0	TOPSOIL: (200 mm)																			
0.2	FILL: sandy silt, some clay, trace gravel, trace organics, trace rootlets, dark brown to brown, moist, compact		1	SS	11															
0.7	FILL: clayey silt, some sand to sandy, trace gravel, trace rootlets, brown, moist, very stiff		2A	SS																
0.9	CLAYEY SILT: some sand to sandy, trace gravel, trace rootlets, layers/zones of silt, brown, moist, very stiff		2B	SS	17															
1.4	SILT: trace to some clay, trace sand, layers of clayey silt, brown, moist, compact		3A	SS																
1.8	CLAYEY SILT TILL: some sand to sandy, trace gravel, containing cobbles and boulders, brown, moist, very stiff to hard --- auger grinding		3B	SS	25															
			4	SS	18															
			5	SS	30															
			6	SS	59															
			7	SS	46															
7.1	SILT: trace sand, layers/zones of clayey silt, containing cobbles and boulders, reddish brown to grey, moist, dense		8	SS	36															

01 - GEOPRO SOIL LOG - GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:49

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, X 3: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements							DRILLING DATA												
CLIENT: Stantec Consulting Limited							METHOD: Continuous Flight Auger - Auto Hammer							DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario							FIELD ENGINEER: HR							DATE: 2018-06-19					
DATUM: N/A							SAMPLE REVIEW: DX							REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan							CHECKED: DL							ENCL. NO.: 28					
SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Natural Moisture Content			UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			SHEAR STRENGTH (kPa)				Plastic Limit	Natural Moisture Content	Liquid Limit					
								○ SPT	≧ Cone	blows/0.3m		w <sub>p</sub>	w	w <sub>L</sub>					
							● Unconfined    ✕ Field Vane & Sensitivity ▲ Quick Triaxial    ☒ Penetrometer + Lab Vane				WATER CONTENT (%)								
							20    40    60    80				10    20    30    40								
	SILT: trace sand, layers/zones of clayey silt, containing cobbles and boulders, reddish brown to grey, moist, dense(Continued)																		
8.6	CLAYEY SILT: trace to some sand, trace gravel, layers of silt, grey, moist, hard																		
			9	SS	35														

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements					DRILLING DATA														
CLIENT: Stantec Consulting Limited					METHOD: Continuous Flight Auger - Auto Hammer					DIAMETER: 155 mm									
PROJECT LOCATION: Regional Road 25, Milton, Ontario					FIELD ENGINEER: RR					DATE: 2018-06-15									
DATUM: N/A					SAMPLE REVIEW: DX					REF. NO.: 17-1758GH									
BH LOCATION: See Borehole Location Plan					CHECKED: DL					ENCL. NO.: 29									
SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC PENETRATION TEST				Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m		SHEAR STRENGTH (kPa)				Plastic Limit w <sub>p</sub>	Natural Moisture Content w	Liquid Limit w <sub>L</sub>						
							SPT      Cone      blows/0.3m												
							20      40      60      80												
							● Unconfined      X Field Vane & Sensitivity ▲ Quick Triaxial      ▣ Penetrometer + Lab Vane												
WATER CONTENT (%)																			
UNIT WT (kN/m <sup>3</sup> )																			
0.0	TOPSOIL: (200 mm)																		
0.2	FILL: sandy silt, some clay, trace gravel, trace rootlets, brown, moist, loose to compact		1	SS	23														
	--- layers of clayey silt		2	SS	10														
1.4	CLAYEY SILT TILL: sandy, trace gravel, containing shale fragments, cobbles and boulders, reddish brown, moist, very stiff		3	SS	19														
2.1	NO SAMPLE RECOVERY DUE TO SHALE PIECES: likely clayey silt till, very stiff		4	SS	25														
2.9	SILT: trace clay, trace sand, brown, wet, compact		5A	SS	18														
3.3	SANDY SILT TO SAND AND SILT: trace to some gravel, zones of sand, zones of gravelly sand, brown, wet, compact		5B	SS															
4.0	SANDY SILT TILL: some clay, trace gravel, containing cobbles and boulders, brown, moist to wet, dense to very dense		6	SS	39														
													</						

01 - GEOPRO SOIL LOG - GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:49

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement    1st    2nd    3rd    4th

GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements								DRILLING DATA																								
CLIENT: Stantec Consulting Limited								METHOD: Continuous Flight Auger - Auto Hammer								DIAMETER: 155 mm																
PROJECT LOCATION: Regional Road 25, Milton, Ontario								FIELD ENGINEER: RR								DATE: 2018-06-15																
DATUM: N/A								SAMPLE REVIEW: DX								REF. NO.: 17-1758GH																
BH LOCATION: See Borehole Location Plan								CHECKED: DL								ENCL. NO.: 29																
SOIL PROFILE			SAMPLES			GROUND WATER			DYNAMIC PENETRATION TEST								Natural Moisture Content				REMARKS AND GRAIN SIZE DISTRIBUTION (%)											
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m				SPT				Cone				Plastic Limit	Natural Moisture Content	Liquid Limit													
						SHEAR STRENGTH (kPa)								WATER CONTENT (%)																		
									○ SPT				≧ Cone				blows/0.3m				w <sub>p</sub>				w				w <sub>L</sub>			
									20				40				60				80											
									● Unconfined				✕ Field Vane & Sensitivity																			
									▲ Quick Triaxial				⊠ Penetrometer + Lab Vane																			
									20				40				60				80											

**GROUNDWATER ELEVATIONS**

Measurement 1st 2nd 3rd 4th

**GRAPH NOTES**

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements

**DRILLING DATA**

CLIENT: Stantec Consulting Limited

METHOD: Continuous Flight Auger - Auto Hammer

DIAMETER: 155 mm

PROJECT LOCATION: Regional Road 25, Milton, Ontario

FIELD ENGINEER: RR

DATE: 2018-06-14

DATUM: N/A

SAMPLE REVIEW: DX

REF. NO.: 17-1758GH

BH LOCATION: See Borehole Location Plan

CHECKED: DL

ENCL. NO.: 30

SOIL PROFILE			SAMPLES			GROUND WATER	ELEVATION	DYNAMIC PENETRATION TEST				Plastic Limit Natural Moisture Content Liquid Limit			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m			○ SPT 20	≥ Cone 40	blows/0.3m 60	80	W <sub>p</sub>	W	W <sub>L</sub>		
0.0	<b>TOPSOIL:</b> (120 mm)															
0.1	<b>FILL:</b> sandy silt, some clay, trace gravel, trace organics, trace rootlets, brown, moist, loose to compact		1	SS	13	Concrete		○				○				
1			2	SS	8			○				○				
1.4	<b>FILL:</b> clayey silt, some sand to sandy, trace gravel, trace organics, trace rootlets, layers of sandy silt, dark brown to brown, moist, soft to firm		3	SS	4			○					○			
2			4	SS	4	2.6 mBGS Jan 04 2.7 mBGS Nov 08 2.7 mBGS Aug 24							○			
2.9	<b>SILT:</b> some sand, trace gravel, layers/zones of clayey silt, containing shale fragments, cobbles and boulders, brown to reddish brown, moist to wet, compact		5	SS	15			○					○			
4.0	<b>CLAYEY SILT TILL:</b> sandy, trace gravel, seams of sand, containing shale fragments, cobbles and boulders, reddish brown, moist, hard --- auger grinding		6	SS	32			○				○				6 25 44 25
5.6	<b>SANDY SILT TILL:</b> some clay, zones of sandy silt, containing cobbles and boulders, brown, moist, dense		7	SS	43				○			○				
7.1	<b>SANDY SILT:</b> some clay, trace gravel, containing shale fragments, brown, wet, compact		8A	SS		Bentonite							○			
7.8			8B	SS	23			○				○				6 22 50 22

01 - GEOPRO SOIL LOG - GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:49

Continued Next Page

**GROUNDWATER ELEVATIONS**

Measurement 1st 2nd 3rd 4th

**GRAPH NOTES**

+ 3, × 3: Numbers refer to Sensitivity

▲ s=3% Strain at Failure

PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						DRILLING DATA																										
CLIENT: Stantec Consulting Limited						METHOD: Continuous Flight Auger - Auto Hammer						DIAMETER: 155 mm																				
PROJECT LOCATION: Regional Road 25, Milton, Ontario						FIELD ENGINEER: RR						DATE: 2018-06-14																				
DATUM: N/A						SAMPLE REVIEW: DX						REF. NO.: 17-1758GH																				
BH LOCATION: See Borehole Location Plan						CHECKED: DL						ENCL. NO.: 30																				
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION TEST												REMARKS AND GRAIN SIZE DISTRIBUTION (%)														
ELEV DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS/0.3m	GROUND WATER	ELEVATION	SPT				Cone				blows/0.3m				Plastic Limit		Natural Moisture Content		Liquid Limit		UNIT WT (kN/m³)	GR	SA	SI	CL		
								20	40	60	80	20	40	60	80	W <sub>p</sub>	W	W <sub>L</sub>	WATER CONTENT (%)													
								SHEAR STRENGTH (kPa)																								
								● Unconfined    ✕ Field Vane & Sensitivity																								
								▲ Quick Triaxial    ☒ Penetrometer    + Lab Vane																								
								20	40	60	80								10	20	30	40										
9	CLAYEY SILT TILL: some sandy to sandy, trace gravel, layers of sandy silt, containing shale fragments, cobbles and boulders, brown, moist to wet, compact to very dense(Continued)		9	SS	58																											
10																																
10.1		SILT: some clay, trace to some sand, trace gravel, layers/zones of clayey silt, grey, moist, very dense																														
11			10	SS	56																											
11.7	CLAYEY SILT TILL: trace to some sand, trace gravel, layers of silt, grey, moist, hard																															
12			11	SS	37																											
13	SILT: trace to some clay, trace sand, zones/layers of clayey silt, reddish brown to grey, moist, very dense  --- auger grinding																															
14			12	SS	65																											
14.7	SANDY SILT TILL/SHALE COMPLEX: trace to some clay, trace gravel, layers of sand and silt, containing shale fragments, cobbles and boulders, reddish brown, moist to wet, very dense																															
15			13	SS	50 / 100 mm																											
16																																

01 - GEOPRO SOIL LOG - GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM-GPJ - 2019-01-10 09:49

Continued Next Page

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th


GRAPH NOTES

+ 3 , ✕ 3 : Numbers refer to Sensitivity

▲ s=3% Strain at Failure

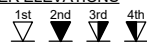
PROJECT: Geotechnical and Hydrogeological Investigations for Proposed Road Improvements						<b>DRILLING DATA</b>					
CLIENT: Stantec Consulting Limited			METHOD: Continuous Flight Auger - Auto Hammer			DIAMETER: 155 mm					
PROJECT LOCATION: Regional Road 25, Milton, Ontario			FIELD ENGINEER: RR			DATE: 2018-06-14					
DATUM: N/A			SAMPLE REVIEW: DX			REF. NO.: 17-1758GH					
BH LOCATION: See Borehole Location Plan			CHECKED: DL			ENCL. NO.: 30					

SOIL PROFILE			SAMPLES		GROUND WATER	DYNAMIC PENETRATION TEST				WATER CONTENT (%)			UNIT WT (kN/m <sup>3</sup> )	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE		"N" BLOWS/0.3m	SPT 20 40 60 80 Cone blows/0.3m 20 40 60 80	Plastic Limit W <sub>p</sub> Natural Moisture Content W Liquid Limit W <sub>L</sub>						
16.1	<b>SAND AND SILT/SHALE COMPLEX:</b> trace to some clay, trace gravel, containing shale fragments, reddish brown, wet, very dense --- auger grinding													
17			14	SS	72 / 405 mm									
17.2	<b>END OF BOREHOLE</b>  Notes: 1) Water encountered at a depth of 7.6 m below ground surface (mBGS) during drilling. 2) Water was at a depth of 1.5 mBGS upon completion of drilling. 3) Borehole caved at a depth of 6.1 mBGS upon completion of drilling. 4) 51 mm dia. monitoring well was installed in borehole upon completion of drilling.  Water Level Readings Date      W. L. Depth (mBGS) Aug. 24, 2018      2.74 Nov. 8, 2018      2.65 Jan. 4, 2018      2.55													

01 - GEOPRO SOIL LOG GEOPRO BH LOG DATA 17-1758GH 20190110-MYB-LAB(MYB) - MBS-LAB(JV - MYB-MB - VM.GPJ 2019-01-10 09:49

GROUNDWATER ELEVATIONS

 Measurement    1st    2nd    3rd    4th  


GRAPH NOTES

 +<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity

▲ s=3% Strain at Failure





GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

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## APPENDIX B

WELL_ID	EAST83	NORTH83	Use Type
2800714	588672.4	4819751	Industrial
2800716	587919.4	4820276	Industrial
2800717	587933.4	4820011	Industrial
2804673	587665.4	4821331	Industrial
2805032	587114.4	4821723	Industrial
2809562	587074	4821527	Industrial
7200057	587222	4821613	Industrial
<b>Total: 7</b>			
2800720	587562.4	4820884	Commerical
2800804	588056.4	4820521	Commerical
2806653	587100.8	4821252	Commerical
<b>Total: 3</b>			
2800807	587534.4	4821144	Livestock
2800808	587639.4	4821159	Livestock
<b>Total: 2</b>			
2800802	588728.4	4819881	Public
7143943	586830	4821329	Public
7163124	586887	4821199	Public
7163125	586879	4821210	Public
<b>Total: 4</b>			
2800715	588125.4	4820295	Domestic
2800718	587901.4	4820491	Domestic
2800722	586958.4	4821173	Domestic
2800723	586842.4	4820983	Domestic
2800726	586754.4	4821324	Domestic
2800803	588071.4	4820506	Domestic
2800806	587628.4	4820954	Domestic
2802999	586764.4	4821073	Domestic
2803206	586864.4	4821193	Domestic
2803560	587974.4	4820473	Domestic
2803588	586764.4	4821513	Domestic
2803731	588182.4	4820445	Domestic
2804319	586914.4	4821473	Domestic
2804429	586925.4	4821100	Domestic
2804454	586912.4	4821086	Domestic
2805316	586974.4	4821463	Domestic
2806588	587551.8	4820849	Domestic
2808072	589628.9	4819112	Domestic
2808359	586765.8	4821525	Domestic
2808567	586919.8	4821088	Domestic
2809943	589369.4	4819271	Domestic
2810521	586828	4821378	Domestic
2810576	586849	4821521	Domestic
7160583	587536	4820833	Domestic
<b>Total: 24</b>			

7117505	587832	4821338	Monitoring
7133598	589480	4818879	Monitoring
7135147	589460	4818899	Monitoring
7150030	588106	4820989	Monitoring
7150049	587975	4820546	Monitoring
7153316	588507	4820024	Monitoring
7155764	587577	4820924	Monitoring
7155765	587511	4820924	Monitoring
7159727	587472	4820870	Monitoring
7159728	587503	4820911	Monitoring
7159730	587458	4820890	Monitoring
7177413	589087	4818980	Monitoring
7177417	589046	4819052	Monitoring
7177414	589103	4818934	Monitoring
<b>Total: 14</b>			
7117890	589407	4819637	Test Hole
7126898	587555	4821367	Test Hole
7147731	588956	4819079	Test Hole
7183011	588690	4819492	Test Hole
7183012	588682	4819508	Test Hole
7199512	589113	4818908	Test Hole
7247725	588864	4819120	Test Hole
7247726	588863	4819120	Test Hole
7283333	589582	4819659	Test Hole
<b>Total: 9</b>			
7110651	587520	4821047	Monitoring and Test Hole
7117435	587773	4821207	Monitoring and Test Hole
7145312	589632	4819547	Monitoring and Test Hole
7145313	589464	4819593	Monitoring and Test Hole
7145314	589631	4819606	Monitoring and Test Hole
7150315	588978	4819015	Monitoring and Test Hole
7166701	587858	4821317	Monitoring and Test Hole
7166702	587902	4821225	Monitoring and Test Hole
7166703	587812	4821278	Monitoring and Test Hole
7187933	588813	4819489	Monitoring and Test Hole
7187934	588813	4819489	Monitoring and Test Hole
7187935	588813	4819489	Monitoring and Test Hole
7187936	588813	4819489	Monitoring and Test Hole
7187937	588813	4819489	Monitoring and Test Hole
7187938	588813	4819489	Monitoring and Test Hole
7192732	587112	4821270	Monitoring and Test Hole
7200443	589418	4819343	Monitoring and Test Hole
7200444	589430	4819328	Monitoring and Test Hole
7200445	589456	4819301	Monitoring and Test Hole
7209710	587620	4821065	Monitoring and Test Hole
7209711	587613	4821087	Monitoring and Test Hole

7233261	588679	4819650	Monitoring and Test Hole
7233262	588685	4819617	Monitoring and Test Hole
7233263	588689	4819629	Monitoring and Test Hole
7256654	589124	4819115	Monitoring and Test Hole
7256655	589100	4819093	Monitoring and Test Hole
7256656	589109	4819065	Monitoring and Test Hole
7256657	589118	4819081	Monitoring and Test Hole
7272091	587515	4820893	Monitoring and Test Hole
7272092	587517	4820889	Monitoring and Test Hole
7272427	589470	4819791	Monitoring and Test Hole
<b>Total: 31</b>			
2801698	589725.4	4819119	Not Used
2803551	586914.4	4821423	Not Used
2809555	587133	4821676	Not Used
2809557	586967	4821797	Not Used
2809558	587121	4821686	Not Used
2809563	586975	4821706	Not Used
2809915	587264	4821063	Not Used
2810075	587560	4820898	Not Used
7037781	588719	4819428	Not Used
7102060	589196	4819179	Not Used
7102064	589457	4819803	Not Used
7105081	611367	4845351	Not Used
7259349	589619	4819730	Not Used
<b>Total: 13</b>			
2810229	587647	4821365	Unknown Use
2810571	586833	4821537	Unknown Use
2810040	589416	4819346	Unknown Use
2810089	587568.8	4821229	Unknown Use
2810127	589416	4819346	Unknown Use
2810173	587700	4821477	Unknown Use
2810176	587568	4820442	Unknown Use
2810197	587785.5	4821343	Unknown Use
2810267	589411	4819322	Unknown Use
2810388	589419	4819329	Unknown Use
2810395	588675	4819634	Unknown Use
2810432	588840	4819170	Unknown Use
2921036	587206.9	4820847	Unknown Use
2810554	588151.6	4820532	Unknown Use
2810570	589399	4819103	Unknown Use
2810585	588681	4819651	Unknown Use
7051377	587225	4821658	Unknown Use
7110514	587800	4821678	Unknown Use
7117436	587774	4821247	Unknown Use
7159729	587508	4820903	Unknown Use
7160591	586983	4821166	Unknown Use

7180021	589056	4819013	Unknown Use
7188103	589639	4819665	Unknown Use
7188476	588833	4819274	Unknown Use
7188798	589533	4819537	Unknown Use
7188813	588798	4819173	Unknown Use
7200534	587354	4821261	Unknown Use
7201486	587668	4821134	Unknown Use
7204017	589017	4819661	Unknown Use
7213369	588572	4819559	Unknown Use
7257319	587430	4820745	Unknown Use
7257590	587621	4821377	Unknown Use
7259351	589599	4819733	Unknown Use
7266082	587513	4820894	Unknown Use
7267252	589419	4819799	Unknown Use
7279543	588508	4819791	Unknown Use
7283490	587538	4820885	Unknown Use
7283491	587538	4820885	Unknown Use
<b>Total: 38</b>			

Summary of Well Type in 500m Radius from the Site			
Well Type	Number of Records		Sum
Industrial	7	40	145
Commerical	3		
Public	4		
Livestock	2		
Domestic	24		
Monitoring	14	54	
Test Hole	9		
Monitoring and Test Hole	31		
Not Used	13	51	
Unknown Use	38		

# Water Well Records

Wednesday, August 22, 2018

9:40:11 AM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
HALTON HILLS TOWN (E	17 587222 4821613 W	2012/05 7268	6.25 6.25	FR 0088	7/70/2/1:0	IN		7200057 (Z141945) A125334	BRWN CLAY 0004 GREY CLAY SNDY 0025 GREY SAND 0027 BRWN CLAY SNDY 0029 GREY SNDY 0046 RED SHLE HARD 0092
HALTON HILLS TOWN (E	17 586828 4821378 W	2006/02 2663			18///:	DO		2810521 (Z41583) A	
HALTON HILLS TOWN (E 03 006	17 587225 4821658 W	2007/09 6607		FR 0009	///:			7051377 (Z60494) A	
HALTON HILLS TOWN (E CON 02 003	17 588125 4820295 W	1963/06 4602			0/28/10/:	DO		2800715 ()	PRDG 0040 CLAY 0055 QSND SILT 0080 MSND GRVL 0087 GRVL 0093
HALTON HILLS TOWN (E CON 02 006	17 586879 4821210 W	2011/05 7389	6.09	FR 0070	15/30/8/1:0	PS	0072 3	7163125 (Z128660) A113348	BRWN CLAY STNS DNSE 0018 BRWN SAND GRVL HARD 0053 BRWN CLAY SAND GRVL 0070 BRWN SAND GRVL PCKD 0076 RED SHLE SAND GRVL 0080
HALTON HILLS TOWN (E CON 02 006	17 586887 4821199 W	2011/05 7389				PS		7163124 (Z128661) A	
HALTON HILLS TOWN (E CON 02 006	17 586830 4821329 W	2010/03 7389	6.09			PS		7143943 (Z108054) A093417	
HALTON HILLS TOWN (E CON 02 006	17 586974 4821463 W	1978/09 4602	6	FR 0045 FR 0085	24/94/6/2:0	DO		2805316 ()	BRWN SAND SLTY 0021 BRWN SAND GRVL STNS 0045 GREY GRVL CLAY 0055 GREY SAND 0067 RED SAND 0085 RED GRVL SAND CLAY 0099 RED SHLE 0100
HALTON HILLS TOWN (E CON 02 006	17 586754 4821324 W	1960/03 1307	30	FR 0020	5//10/:	DO		2800726 ()	BRWN LOAM CLAY 0018 CSND 0020
HALTON HILLS TOWN (E CON 02 006	17 586764 4821073 W	1968/12 4602	6	FR 0005 FR 0065	8/123/2/4:0	DO		2802999 ()	BRWN CLAY 0005 BRWN MSND CLAY 0016 GREY CLAY MSND 0035 GREY CLAY 0054 RED CLAY 0062 BLUE CLAY GRVL 0065 GREY QSND 0071 RED CLAY GRVL 0090 BLUE CLAY 0123
HALTON HILLS TOWN (E CON 02 006	17 586914 4821423 W	1971/04 4602	6	FR 0012	10///:	NU		2803551 () A	BRWN MSND SILT 0062 GREY CLAY MSND 0081
HALTON HILLS TOWN (E CON 02 006	17 586849 4821521 W	2006/04 2663	6.21	FR 0103	32//25/1:0	DO		2810576 (Z43919) A039499	BLCK LOAM 0002 RED CLAY SAND 0060 SAND 0100 GRVL 0103
HALTON HILLS TOWN (E CON 02 006	17 586833 4821537 W	2006/04 2663						2810571 (Z43918) A	
HALTON HILLS TOWN (E CON 02 006	17 586764 4821513 W	1971/07 4602	6	FR 0022	8/14/20/1:0	DO		2803588 ()	BRWN SILT 0020 GREY MSND SILT 0042 GREY MSND 0080 GREY CLAY GRVL 0090
HALTON HILLS TOWN (E CON 02 006	17 586920 4821088 W	1997/07 4868				DO		2808567 (172096)	PRDG 0018
HALTON HILLS TOWN (E CON 02 006	17 586864 4821193 W	1969/08 3637	30 32	FR 0008	8/22//1:0	DO		2803206 ()	BRWN LOAM 0001 BRWN MSND CLAY 0008 GREY MSND 0022

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
HALTON HILLS TOWN (E CON 02 006	17 586914 4821473 W	1973/02 4602	6	FR 0088	26/88/10/1:0	DO		2804319 ( )	BRWN CLAY 0018 GREY CLAY 0088 GREY SAND GRVL CLAY 0097 BLUE CLAY GRVL 0098
HALTON HILLS TOWN (E CON 02 006	17 586766 4821525 W	1994/07 1660	6	FR 0060	38/50/8/1:30	DO		2808359 (74897)	BRWN CLAY 0007 BRWN SAND 0016 BRWN CLAY GRVL 0038 RED SAND 0056 BRWN GRVL 0060
HALTON HILLS TOWN (E CON 03 005	17 587569 4821229 W	2004/09 4868	48.0		17///:			2810089 (Z05835) A	
HALTON HILLS TOWN (E CON 03 006	17 587114 4821723 W	1977/02 2336	6	FR 0062	27/55/8/4:0	IN	0051 3	2805032 ( )	LOAM 0001 CLAY SAND 0055 BRWN CLAY SAND GRVL 0059 BRWN CLAY SAND GRVL 0062 GRVL 0064
HALTON HILLS TOWN (E CON 03 006	17 587121 4821686 W	2001/06 3406	2	UK 0028		NU	0028 5	2809558 (224312)	BRWN CLAY 0015 BRWN SAND CLAY 0028 BRWN GRVL SAND 0034
HALTON HILLS TOWN (E CON 03 006	17 586975 4821706 W	2001/06 3406	6 6	UK 0045 UK 0073 UK 0081 UK 0093	34//2/1:0	NU		2809563 (224310)	BRWN CLAY 0032 BRWN CLAY SNDS 0039 GREY CLAY 0045 GREY SAND SILT 0070 BRWN CLAY STNS 0073 GREY SAND SILT GRVL 0075 UNKN 0095
HALTON HILLS TOWN (E CON 03 006	17 587133 4821676 W	2001/05 3406	6	UK 0038 UK 0066	10/14/10/6:0	NU	0067 3	2809555 (224308)	BRWN CLAY SNDY 0022 BRWN CLAY GRVL 0028 BRWN SAND 0038 GREY SAND SILT 0046 GREY CLAY 0051 GREY SAND GRVL 0052 BRWN CLAY STNS 0055 BRWN SILT STNS 0059 RED CLAY GRVL 0062 GREY SILT 0066 GREY GRVL SAND FCRD 0069 RED SHLE 0070
HALTON HILLS TOWN (E CON 03 006	17 587074 4821527 W	2001/06 3406	6	UK 0026 UK 0054	5/7/27/6:0	IN	0057 3	2809562 (224316)	BRWN CLAY 0016 BRWN CLAY SAND 0025 BRWN SAND 0029 BRWN SILT SAND 0034 GREY SILT 0038 GREY CSND SILT 0039 GREY CLAY GRVL 0054 BRWN MSND 0059 RED SHLE 0062
HALTON HILLS TOWN (E CON 03 006	17 586967 4821797 W	2001/06 3406	6	UK 0079 UK 0088	22//4/1:0	NU		2809557 (224311)	BRWN CLAY GRVL 0025 BRWN SAND SILT CLAY 0030 GREY SILT SAND 0036 RED CLAY GRVL 0052 GREY CLAY STNS 0057 GREY GRVL CLAY 0060 GREY CLAY GRVL 0071 GREY SILT 0075 RED SHLE LYRD 0091
MILTON TOWN (ESQUESI	17 587858 4821317 W	2011/06 7241	2.04			MT	0011 10	7166701 (Z128867) A114446	BRWN LOAM LOOS SOFT 0002 BRWN SILT SAND HARD 0018 BRWN SILT GRVL HARD 0021
MILTON TOWN (ESQUESI	17 587536 4820833 W	2010/12 7268	6.25 6.25	FR 0090	19//3/1:	DO PS		7160583 (Z126542) A093216	BRWN CLAY 0017 GREY CLAY 0029 GREY SAND CLAY 0040 GREY SAND GRVL 0061 RED CLAY 0063 RED SHLE HARD 0100
MILTON TOWN (ESQUESI	17 587902 4821225 W	2011/06 7241	7.86			MT	0011 10	7166702 (Z128868) A114445	BRWN LOAM LOOS SOFT 0001 BRWN SILT SAND HARD 0018 GREY SILT GRVL HARD 0021
MILTON TOWN (ESQUESI	17 588106 4820989 W	2009/06 6607	2.00 2.00			MO		7150030 (M05179) A085371	BRWN SAND GRVL PCKD 0004 BRWN SILT CLAY DNSE 0006 BRWN SAND SILT 0025
MILTON TOWN (ESQUESI	17 587503 4820911 W	2011/02 7241	1.5			MO	0010 15	7159728 (Z128747) A112709	BLCK CMTD 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND DNSE 0018 GREY SILT CLAY DNSE 0025

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (ESQUESI)	17 588507 4820024 W	2010/06 6607	2.00			MO		7153316 (M07245) A094863	BRWN SILT LOAM 0002 BRWN SILT CLAY TILL 0005 GREY CLAY SILT TILL 0020 BRWN SAND GRVL 0030
MILTON TOWN (ESQUESI)	17 587812 4821278 W	2011/06 7241	2.04			MT	0011 10	7166703 (Z128869) A114444	BRWN LOAM SOFT LOOS 0003 RED SILT SAND HARD 0018 BRWN SILT GRVL HARD 0021
MILTON TOWN (ESQUESI)	17 587458 4820890 W	2011/02 7241	1.5			MO	0010 15	7159730 (Z128748) A112707	BLCK CMTD 0001 BRWN SAND GRVL LOOS 0001 BRWN SAND SILT DNSE 0018 GREY SILT CLAY DNSE 0025
MILTON TOWN (ESQUESI)	17 589464 4819593 W	2010/04 7241	2.04			MT	0013 10	7145313 (Z113235) A097160	BRWN SAND GRVL LOOS 0003 BRWN SILT FSND HARD 0023
MILTON TOWN (ESQUESI)	17 587832 4821338 W	2008/12 7241	2.04			MO		7117505 (M04232) A081918	BRWN SAND SOFT 0010 RED SILT SAND HARD 0018
MILTON TOWN (ESQUESI)	17 587647 4821365 W	2005/03 6607	2.00				0002 10	2810229 (Z26533) A019277	BRWN SAND GRVL FILL 0004 BRWN SILT CLAY SAND 0012
MILTON TOWN (ESQUESI)	17 587773 4821207 W	7241	5.19			MT	0004 10	7117435 (Z91359) A081128	BRWN CLAY SILT DNSE 0014
MILTON TOWN (ESQUESI)	17 587800 4821678 W	2008/08 7241						7110514 (M02540) A063645 A	
MILTON TOWN (ESQUESI)	17 589087 4818980 W	2012/01 6607	2.00			MO	0015 10	7177413 (Z130560) A126123	0001 BRWN SAND GRVL DNSE 0007 BRWN SILT SAND HARD 0013 GREY SILT SAND HARD 0021 GREY CLAY SILT DNSE 0025
MILTON TOWN (ESQUESI)	17 587508 4820903 W	2011/02 7241	1.5				0010 15	7159729 (Z128749) A112708	BLCK CMTD 0000 BRWN SAND GRVL LOOS 0001 BRWN SAND SILT DNSE 0018 GREY SILT CLAY DNSE 0025
MILTON TOWN (ESQUESI)	17 588681 4819651 W	2006/05 6607	2.00	FR 0015			0010 10	2810585 (Z49024) A043875	BRWN SAND GRVL 0005 BRWN CLAY TILL 0015 GREY SAND 0017 GREY CLAY 0020
MILTON TOWN (ESQUESI)	17 587700 4821477 W	2005/02 6607	2.00	0003			0002 10	2810173 (Z24224) A021359	BRWN SAND FILL 0005 BRWN SAND SILT HARD 0010 BRWN CLAY SILT 0012
MILTON TOWN (ESQUESI)	17 588152 4820532 W	2006/05 7241	1.5				0009 10	2810554 (Z45957) A039332 A	BRWN LOAM GRVL 0004 BRWN CLAY SILT 0016 GREY CLAY SILT 0019
MILTON TOWN (ESQUESI)	17 587786 4821343 W	2005/02 7241	1.5				0002 10	2810197 (Z25286) A021523	BRWN GRVL SAND SILT 0004 BRWN SILT SAND GRVL 0012



TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (ESQUESI	17 588840 4819170 W	2005/07 6607	2.00	0015			0012 10	2810432 (Z32303) A027625	BRWN SAND GRVL 0003 GREY SILT CLAY 0011 GREY SILT SAND 0020 RED SHLE 0022
MILTON TOWN (ESQUESI	17 588675 4819634 W	2005/10 6809	2				0010 15	2810395 (Z34012) A011207	BLCK 0000 BRWN FILL GRVL SAND 0010 BRWN TILL 0017 GREY CLAY 0025
MILTON TOWN (ESQUESI	17 587555 4821367 W	2009/06 7215	2			TH	0010 10	7126898 (Z099616) A083686	BRWN SAND SILT LOOS 0007 BRWN SILT TILL 0020
MILTON TOWN (ESQUESI	17 589109 4819065 W	2015/12 7241	2			MT	0017 10	7256656 (Z224906) A188386	BRWN CLAY 0016 GREY CLAY DNSE 0027
MILTON TOWN (ESQUESI	17 589046 4819052 W	2012/01 6607	2.00			MO	0012 10	7177417 (Z130562) A126292	0001 BRWN SAND GRVL LOOS 0015 GREY SILT SAND DNSE 0020 GREY CLAY SILT DNSE 0022
MILTON TOWN (ESQUESI	17 587472 4820870 W	2011/02 7241	1.5			MO	0010 15	7159727 (Z128750) A112710	BLCK CMTD 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND DNSE 0018 GREY SILT CLAY DNSE 0025
MILTON TOWN (ESQUESI	17 587620 4821065 W	2013/09 7241	2			MT	0025 5	7209710 (Z176441) A152792	BRWN GRVL FSND SOFT 0010 BRWN SAND SILT SOFT 0015 BRWN SILT SAND HARD 0030
MILTON TOWN (ESQUESI	17 587613 4821087 W	2013/09 7241	2.04			MT	0013 5	7209711 (Z176440) A152761 A	BRWN GRVL SAND SOFT 0010 BRWN SILT SAND HARD 0013 BRWN SILT TILL HARD 0018
MILTON TOWN (ESQUESI	17 588679 4819650 W	2014/11 7320	2.00			MT	0015 10	7233261 (Z201862) A174431	BLCK GRVL 0001 GREY GRVL FILL 0003 BRWN SILT CLAY 0014 GREY SILT CLAY 0025
MILTON TOWN (ESQUESI	17 588685 4819617 W	2014/11 7320	2.00			MT	0015 10	7233262 (Z201860) A174418	BLCK GRVL 0001 GREY GRVL FILL 0003 BRWN SILT CLAY 0014 GREY SILT CLAY SAND 0025
MILTON TOWN (ESQUESI	17 588689 4819629 W	2014/11 7320	2.00			MT	0015 10	7233263 (Z201861) A174419	BLCK GRVL 0001 GREY GRVL FILL 0003 BRWN SILT CLAY 0014 GREY SILT CLAY SAND 0025
MILTON TOWN (ESQUESI	17 588864 4819120 W	2015/05 7215				TH		7247725 (Z203491) A	GREY 0015
MILTON TOWN (ESQUESI	17 588863 4819120 W	2015/05 7215	2			TH	0025 10	7247726 (Z203512) A178741	BRWN SAND DRY 0010 GREY SILT SAND WBRG 0025
MILTON TOWN (ESQUESI	17 589017 4819661 W	2013/06 7215						7204017 (C22793) A144914 P	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (ESQUESI	17 589100 4819093 W	2015/12 7241	2			MT	0015 10	7256655 (Z224905) A183513	BRWN CLAY 0014 BRWN CLAY 0025
MILTON TOWN (ESQUESI	17 587668 4821134 W	2013/01 7215						7201486 (C21108) A142404 P	
MILTON TOWN (ESQUESI	17 589118 4819081 W	2015/12 7241	1.25			MT	0019 10	7256657 (Z224907) A183387	BRWN CLAY 0019 GREY CLAY 0029
MILTON TOWN (ESQUESI	17 587430 4820745 W	2015/10 7230						7257319 (C31504) A194767 P	
MILTON TOWN (ESQUESI	17 587621 4821377 W	2016/01 7148						7257590 (Z218631) A	
MILTON TOWN (ESQUESI	17 589619 4819730 W	2016/02 6607		UT		NU		7259349 (Z223790) A	
MILTON TOWN (ESQUESI	17 589599 4819733 W	2016/01 6607						7259351 (Z220089) A	
MILTON TOWN (ESQUESI	17 589582 4819659 W	2016/10 7230	1.97	UT 0013		TH MO	0022 3	7283333 (Z230835) A217087	BLCK ---- HARD 0000 BRWN SILT CLYY SAND 0007 BRWN SILT CLYY SAND 0025
MILTON TOWN (ESQUESI	17 589419 4819799 W	2015/05 6607						7267252 (C25938) A179922 P	
MILTON TOWN (ESQUESI	17 587515 4820893 W	2016/08 7241	2			MT	0000 12	7272091 (Z241085) A	
MILTON TOWN (ESQUESI	17 587517 4820889 W	2016/08 7241	1.5			MT	0010 5	7272092 (Z241086) A205827	GREY CLAY SLTY DNSE 0015
MILTON TOWN (ESQUESI	17 589470 4819791 W	2016/05 7247	0.75			MT	0010 5	7272427 (Z228859) A199713	BRWN SAND GRVL FILL 0002 BRWN SILT CLYY FILL 0007 BRWN SILT CLYY SAND 0015
MILTON TOWN (ESQUESI	17 589124 4819115 W	2015/12 7241	2			MT	0015 10	7256654 (Z224904) A162977	BRWN CLAY 0017 GREY CLAY DNSE 0025
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0010 10	7187933 (Z156825) A137030	BRWN SILT TILL 0014 GREY CLAY 0020
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0010 10	7187936 (Z156824) A137031	BRWN SILT TILL 0014 GREY CLAY 0020

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION	
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0010 10	7187937 (Z156822) A135079	BRWN SILT TILL 0014 GREY CLAY SILT 0020	
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0007 10	7187935 (Z156823) A137029	BRWN SILT TILL 0014 GREY CLAY SAND 0017	
MILTON TOWN (ESQUESI	17 589056 4819013 W	2012/04 6607						7180021 (Z147803) A		
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0010 10	7187938 (Z156821) A135086	BRWN SILT TILL 0014 GREY CLAY SAND 0020	
MILTON TOWN (ESQUESI	17 588690 4819492 W	2012/06 7320	2.40	UT 0012		TH	0010 10	7183011 (Z145990) A133361	BRWN SAND GRVL 0002 BRWN CLAY TILL STNS 0012 BRWN CLAY 0015 GREY SILT CLAY WBRG 0020	
MILTON TOWN (ESQUESI	17 589639 4819665 W	2012/08 7484	0.75					7188103 (Z141652) A		
MILTON TOWN (ESQUESI	17 588682 4819508 W	2012/06 7320	2.00	UT 0015		TH	0010 10	7183012 (Z145989) A133362	BRWN SAND GRVL 0002 BRWN CLAY STNS TILL 0013 BRWN CLAY 0015 GREY CLAY SILT WBRG 0017 BRWN CLAY FGVL WBRG 0020	
MILTON TOWN (ESQUESI	17 588813 4819489 W	2012/08 7241	1.5			MT	0007 10	7187934 (Z156826) A137028	BRWN SILT TILL 0014 GREY CLAY SAND 0017	
MILTON TOWN (ESQUESI	17 589533 4819537 W	2012/05 6607						7188798 (C18001) A115277 P		
MILTON TOWN (ESQUESI	17 588833 4819274 W	2012/08 7215						7188476 (C19383) A136173 P		
MILTON TOWN (ESQUESI CON 02 001	17 588798 4819173 W	2012/07 7147						7188813 (C16643) A132947 P		
MILTON TOWN (ESQUESI CON 02 002	17 588572 4819559 W	2013/12 7147						7213369 (C22719) A036875 P		
MILTON TOWN (ESQUESI CON 02 002	17 588508 4819791 W	2016/11 6946						7279543 (C36004) A203384 P		
MILTON TOWN (ESQUESI CON 02 002	17 588672 4819751 W	1960/11 1307	30	FR 0050	20//1/2:0	IN		2800714 ()	BRWN LOAM CLAY 0012 RED CLAY 0049 MSND 0050	
MILTON TOWN (ESQUESI CON 02 003	17 587974 4820473 W	1971/05 4813	7	FR 0032	10/52/2/1:45	DO		2803560 ()	BRWN CLAY 0019 RED SHLE 0056	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (ESQUESI CON 02 003	17 587919 4820276 W	1967/03 4813	5	FR 0070	-1/30/30/4:0	IN		2800716 ( )	LOAM MSND 0002 BRWN CLAY 0014 GRVL 0058 HPAN 0069 GRVL 0071
MILTON TOWN (ESQUESI CON 02 003	17 587933 4820011 W	1967/06 4813	7	FR 0088	-1/77/20/4:0	IN		2800717 ( )	LOAM MSND 0004 CLAY STNS 0056 GRVL 0088
MILTON TOWN (ESQUESI CON 02 004	17 587513 4820894 W	7147						7266082 (C33974) A198576 P	
MILTON TOWN (ESQUESI CON 02 004	17 587568 4820442 W	2005/01 6607	0.75				0020 6	2810176 (Z24178) A019248	BRWN TILL GRVL 0002 BRWN SILT CLYY GRVL 0011 BRWN SILT CLYY SAND 0019 BRWN SILT CLYY SAND 0026
MILTON TOWN (ESQUESI CON 02 004	17 587538 4820885 W	2017/02 7268						7283490 (Z236244) A	
MILTON TOWN (ESQUESI CON 02 004	17 587538 4820885 W	2017/02 7268						7283491 (Z236243) A093216 A	
MILTON TOWN (ESQUESI CON 02 004	17 587560 4820898 W	2004/09 6607	1.97	0013		NU	0008 12	2810075 (Z17127) A014532	BRWN SAND GRVL 0003 BRWN SHLE WTHD 0010 RED SHLE 0020
MILTON TOWN (ESQUESI CON 02 004	17 587901 4820491 W	1960/08 4602	6	FR 0037	2/55/1/2:0	DO		2800718 ( )	BRWN CLAY 0021 GREY CLAY 0041 RED CLAY 0055
MILTON TOWN (ESQUESI CON 02 004	17 587552 4820849 W	1987/03 4005	6	FR 0062	30/72/3/1:0	DO		2806588 (10199)	BRWN CLAY SNDY LOOS 0011 BRWN CLAY SNDY LOOS 0021 BRWN GRVL SAND LOOS 0033 BRWN SAND FGVL LOOS 0041 BRWN GRVL PCKD 0042 BRWN CLAY SNDY LOOS 0051 BRWN GRVL PCKD 0052 BRWN CLAY SNDY LOOS 0055 RED SHLE HARD 0075
MILTON TOWN (ESQUESI CON 02 004	17 587562 4820884 W	1967/08 4101	5	FR 0050	8/10/21/4:0	CO		2800720 ( )	BRWN CLAY MSND 0020 HPAN 0046 SHLE GRVL 0051
MILTON TOWN (ESQUESI CON 02 005	17 586925 4821100 W	1973/04 3637	30 32	FR 0011	8/26/1/10:0	DO		2804429 ( )	BRWN FILL 0003 BRWN LOAM 0004 BRWN CLAY 0011 BRWN SAND 0020 GREY SAND MUCK 0024 BLCK CSND FSND GRVL 0026
MILTON TOWN (ESQUESI CON 02 005	17 586912 4821086 W	1973/09 3637	30 18	FR 0027	10/27//:	DO		2804454 ( )	BLCK LOAM 0001 BRWN CLAY 0010 BRWN MSND CSND 0027
MILTON TOWN (ESQUESI CON 02 005	17 586983 4821166 W	2010/12 7268						7160591 (Z126539) A	
MILTON TOWN (ESQUESI CON 02 005	17 587101 4821252 W	1987/06 4005	6	FR 0056	4/51/3/2:0	CO		2806653 (10139)	BRWN SAND CLAY GRVL 0008 BRWN CLAY SAND LOOS 0017 BRWN SAND LOOS 0028 BRWN CLAY SAND LOOS 0054 BRWN GRVL SAND LOOS 0056
MILTON TOWN (ESQUESI CON 02 005	17 586842 4820983 W	1964/10 4602	6	FR 0021	10/34/4/3:0	DO		2800723 ( )	GREY CLAY 0017 GREY CLAY BLDR 0021 GREY QSND 0027 GRVL 0031 GREY CLAY GRVL 0033 RED CLAY GRVL 0036
MILTON TOWN (ESQUESI CON 02 005	17 587112 4821270 W	2012/11 7241	1.25			MT	0010 10	7192732 (Z160483) A140100	BRWN FILL 0003 BRWN SAND SILT 0008 GREY SILT 0020

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (ESQUESI CON 02 005	17 586958 4821173 W	1963/05 3711	30	FR 0015	6/15/3/24:0	DO		2800722 ( )	LOAM 0002 CLAY 0015 CSND 0021
MILTON TOWN (ESQUESI CON 03 001	17 589407 4819637 W	2008/12 7215				TH	0020 10	7117890 (Z93459) A075233	BRWN GRVL FILL LOOS 0008 BRWN SILT TILL 0025 GREY SILT CLAY 0029
MILTON TOWN (ESQUESI CON 03 002	17 588728 4819881 W	1962/05 2415	7 7	FR 0079 FR 0081	-15/25/15/2:0	PS		2800802 ( )	LOAM 0002 BLUE CLAY 0050 RED CLAY 0078 GRVL 0079 SHLE 0083
MILTON TOWN (ESQUESI CON 03 003	17 588182 4820445 W	1972/01 5459	30	FR 0010	6///:	DO		2803731 ( )	LOAM 0002 BRWN SAND CLAY 0010 BRWN CLAY 0022 RED SHLE 0023
MILTON TOWN (ESQUESI CON 03 003	17 588071 4820506 W	1964/06 1613	6 6	FR 0085	3/14/14/3:0	DO		2800803 ( )	BRWN CLAY 0058 RED CLAY 0071 RED SHLE 0087
MILTON TOWN (ESQUESI CON 03 003	17 588056 4820521 W	1965/08 4602	6 6	FR 0042	10/66/6/1:0	CO		2800804 ( )	PRDG 0052 QSND 0056 GRVL CLAY 0064 RED SHLE 0066
MILTON TOWN (ESQUESI CON 03 004	17 587975 4820546 W	2010/04 6607	2.00	0026		MO	0020 20	7150049 (M06559) A094787	BRWN SAND GRVL FILL 0004 BRWN SAND SILT DNSE 0026 GREY SAND SILT DNSE 0040
MILTON TOWN (ESQUESI CON 03 004	17 587774 4821247 W	7241						7117436 (Z91358) A081127	
MILTON TOWN (ESQUESI CON 03 004	17 587628 4820954 W	1963/07 3711	30	FR 0035	10/35/2/24:0	DO		2800806 ( )	LOAM 0002 CLAY 0035 CLAY SHLE 0050
MILTON TOWN (ESQUESI CON 03 005	17 587665 4821331 W	1974/03 3349	7 7	FR 0083	18/78/10/1:0	IN		2804673 ( )	BRWN CLAY STNS 0019 GREY CLAY 0036 GREY SAND 0071 RED SHLE 0088
MILTON TOWN (ESQUESI CON 03 005	17 587639 4821159 W	1961/03 4602	6 6	FR 0058	16/63/2/2:0	ST		2800808 ( )	PRDG 0021 GREY GRVL CLAY 0063
MILTON TOWN (ESQUESI CON 03 005	17 587534 4821144 W	1959/09 4602	6 6	SA 0092	15/92/0/2:0	ST		2800807 ( )	BRWN CLAY 0020 GREY CLAY 0058 RED CLAY 0063 RED SHLE 0094
MILTON TOWN (ESQUESI CON 03 005	17 587354 4821261 W	2013/04 7147						7200534 (C19686) P	
MILTON TOWN (MILTON)	17 589725 4819119 W	1961/04 2801	2 2	FR 0039	1///:	NU	0044 10	2801698 ( )	LOAM 0001 BRWN CLAY GRVL 0016 BLUE CLAY GRVL 0039 BLUE SHLE GRVL 0054 RED SHLE 0064
MILTON TOWN (MILTON)	17 589457 4819803 W	2007/12 6607	2.00	0008		NU		7102064 (M00761) A054760	BRWN SAND GRVL 0005 RED TILL GRVL 0007 GREY SAND SILT 0020
MILTON TOWN (MILTON)	17 588978 4819015 W	2010/08 7241	1.5			MT	0008 10	7150315 (Z113284) A099946	BRWN SAND GRVL FILL 0001 BRWN SILT CLAY GRVL 0012 GREY SILT CLAY GRVL 0018
MILTON TOWN (MILTON)	17 588956 4819079 W	2010/05 7215				TH	0018 5	7147731 (Z112567) A100088	BRWN FILL DRY 0006 BRWN SILT TILL ---- 0017 GREY SILT TILL ---- 0023

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION	
MILTON TOWN (MILTON)	17 589631 4819606 W	2010/04 7241	2.04			MT	0015 10	7145314 (Z113233) A097157	BRWN SAND GRVL LOOS 0003 BRWN SILT FSND HARD 0025	
MILTON TOWN (MILTON)	17 589632 4819547 W	2010/04 7241	2.04			MT	0010 5	7145312 (Z113234) A097158	BRWN SAND GRVL LOOS 0003 BRWN SAND SOFT 0015	
MILTON TOWN (MILTON)	17 589629 4819112 W	1992/12 4868	60			DO		2808072 (103933)	UNKN 0012 CMTD 0016 UNKN 0018 STNS 0025	
MILTON TOWN (MILTON)	17 589460 4818899 W	2009/10 7295	1.79			MO	0025 10	7135147 (Z108034) A090343	BRWN TILL SOFT 0035	
MILTON TOWN (MILTON)	17 589196 4819179 W	2007/12 6607	2.00	UK 0009		NU		7102060 (M00769) A059238	BRWN SAND 0007 GREY TILL 0010 GREY SHLE 0020	
MILTON TOWN (MILTON)	17 588719 4819428 W	2006/10 6607	2.00	0000		NU	0005 10	7037781 (Z54989) A036875	BRWN SILT SAND GRVL 0015	
MILTON TOWN (MILTON)	17 589399 4819103 W	2006/06 6607		FR 0007				2810570 (Z49075) A		
MILTON TOWN (MILTON)	17 589419 4819329 W	2005/09 6607	2.00	0011			0006 10	2810388 (Z35424) A031692	BRWN SILT SAND GRVL 0015 GREY SILT SAND 0016	
MILTON TOWN (MILTON)	17 589411 4819322 W	2005/05 6607	2.00	FR 0007			0005 15	2810267 (Z27797) A026529	BRWN SAND FILL 0013 BLCK GRVL SAND 0017 GREY SILT FSND 0020	
MILTON TOWN (MILTON) 001	17 589369 4819271 W	2004/05 4868				DO		2809943 (Z03986) A		
MILTON TOWN (MILTON) 02 005	17 587207 4820847 W	2005/08 7295	1.48				0015 11	2921036 (Z32380) A031557	BRWN SILT CLAY 0026	
MILTON TOWN (NASSAGA)	17 587577 4820924 W	2010/11 7241	1.25			MO	0020 10	7155764 (Z126436) A111522	BRWN ROCK SAND FILL 0005 BRWN CLAY ROCK DNSE 0014 BRWN CLAY ROCK 0025 BRWN CLAY WBRG 0030	
MILTON TOWN (NASSAGA)	17 587511 4820924 W	2010/11 7241	1.25			MO	0020 10	7155765 (Z126435) A111521	BRWN ROCK SAND FILL 0005 BRWN CLAY ROCK DNSE 0015 BRWN CLAY ROCK 0025 BRWN CLAY WBRG 0030	
MILTON TOWN (TRAFALG)	17 589430 4819328 W	2013/03 7241	1.25			MT	0010 10	7200444 (Z167578) A145253	BRWN SILT SAND 0011 GREY SAND SILT WBRG 0020	
MILTON TOWN (TRAFALG)	17 589480 4818879 W	2009/09 6607	1.25			MO		7133598 (M05678) A088155	BRWN TILL 0020 GREY CLAY SAND 0033	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
MILTON TOWN (TRAFALG	17 589418 4819343 W	2013/03 7241	2			MT	0010 10	7200443 (Z167608) A145248	BRWN FILL GRVL WBRG 0012 BRWN SILT SAND WBRG 0020
MILTON TOWN (TRAFALG	17 589113 4818908 W	2013/02 7215	2			TH	0020 10	7199512 (Z163841) A142366	
MILTON TOWN (TRAFALG	17 589456 4819301 W	2013/03 7241	1.25			MT	0010 10	7200445 (Z167579) A145872	BRWN SILT 0011 GREY SILT 0020
MILTON TOWN (TRAFALG	17 589103 4818934 W	2012/02 6607	2.00			MO	0017 10	7177414 (Z130561) A126311	BRWN GRVL SAND LOOS 0001 BRWN SAND GRVL DNSE 0003 BRWN SILT SAND HARD 0015 GREY SILT SAND HARD 0023 GREY CLAY SILT SAND 0027
MILTON TOWN (TRAFALG NS 02 015	17 589416 4819346 W	2004/07 6607	1.97	FR 0025			0005 15	2810040 (Z17041) A015762	BLCK 0000 BRWN GRVL 0001 BRWN CLAY SILT 0012 GREY SILT CLAY 0020
MILTON TOWN (TRAFALG NS 02 015	17 589416 4819346 W	2004/11 6607	1.97	FR 0007			0005 15	2810127 (Z21571) A015762 A	BLCK 0000 BRWN GRVL 0001 BRWN CLAY SILT 0012 GREY SILT CLAY 0020
MILTON TOWN (TRAFALG NS 03 005	17 587264 4821063 W	2004/02 7190	1.97	FR 0008		NU	0005 44	2809915 (Z06444) A006326	BRWN SILT CLAY GRVL 0007 BRWN SILT SAND GRVL 0008 BRWN SILT VERY 0016
TORONTO CITY	17 611367 4845351 W	2007/12 6607	2.00	FR 0016		NU		7105081 (M00775) A054773	GREY GRVL 0007 BRWN FILL 0016 TILL CLAY 0025
TORONTO CITY	17 587520 4821047 W	2008/08 7241	2.04			MT		7110651 (M02564) A072941	BLCK FILL LOOS 0006 BRWN SILT CLAY DNSE 0015 GREY CLAY SILT DNSE 0022

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
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Notes:

UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid

DATE CNTR: Date Work Completedand Well Contractor Licence Number

CASING DIA: Casing diameter in inches

WATER: Unit of Depth in Fee. See Table 4 for Meaning of Code

PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes

WELL USE: See Table 3 for Meaning of Code

SCREEN: Screen Depth and Length in feet

WELL: WEL ( AUDIT # ) Well Tag . A: Abandonment; P: Partial Data Entry Only

FORMATION: See Table 1 and 2 for Meaning of Code

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLV	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPG	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

3. Well Use

Code	Description	Code	Description
DO	Domestic	OT	Other
ST	Livestock	TH	Test Hole
IR	Irrigation	DE	Dewatering
IN	Industrial	MO	Monitoring
CO	Commercial	MT	Monitoring TestHole
MN	Municipal		
PS	Public		
AC	Cooling And A/C		
NU	Not Used		

4. Water Detail

Code	Description	Code	Description
FR	Fresh	GS	Gas
SA	Salty	IR	Iron
SU	Sulphur		
MN	Mineral		
UK	Unknown		





GeoPro Consulting Limited

Geotechnical-Hydrogeology-Environmental-Materials-Inspection

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## APPENDIX C

**Certificate of Analysis**

Client: Geo Pro Consulting  
40 Vogell Rd, Unit 57  
Richmond Hill, Ontario  
L4B 3K6

Attention: Ms. Sarena Medina

PO#:

Invoice to: Geo Pro Consulting

Report Number: 1900234  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-11  
Project: 17-1758H  
COC #: 839417

Page 1 of 4

---

**Dear Sarena Medina:**

**Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).**

Report Comments:

APPROVAL:

\_\_\_\_\_  
Sarah Horner, Inorganics Technician

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <http://www.cala.ca/scopes/2602.pdf>.

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Client: Geo Pro Consulting  
 40 Vogell Rd, Unit 57  
 Richmond Hill, Ontario  
 L4B 3K6  
 Attention: Ms. Sarena Medina  
 PO#:  
 Invoice to: Geo Pro Consulting

Report Number: 1900234  
 Date Submitted: 2019-01-05  
 Date Reported: 2019-01-11  
 Project: 17-1758H  
 COC #: 839417

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1406378 SURF W  2019-01-04 BH201 - PWQO Metals
Group	Analyte	MRL	Units	Guideline	
Metals	Ag	0.0001	mg/L	PWQO 0.0001	<0.0001
	Al (dissolved)	0.01	mg/L	IPWQO 0.075	0.02
	As	0.001	mg/L	PWQO 0.100	0.005
	B	0.01	mg/L	IPWQO 0.200	0.66*
	Be	0.0005	mg/L	PWQO 0.011	<0.0005
	Cd	0.0001	mg/L	PWQO 0.0002	<0.0001
	Co	0.0002	mg/L	PWQO 0.0009	0.0004
	Cr	0.001	mg/L		<0.001
	Cu	0.001	mg/L	PWQO 0.005	0.002
	Fe	0.03	mg/L	PWQO 0.30	0.43*
	Filtration				Y
	Hg Dissolved		mg/L		<0.0001
	Mo	0.005	mg/L	IPWQO 0.040	0.022
	Ni	0.005	mg/L	PWQO 0.025	<0.005
	Pb	0.001	mg/L	PWQO 0.005	0.001
	Sb	0.0005	mg/L	IPWQO 0.020	<0.0005
	Se	0.001	mg/L	PWQO 0.100	<0.001
	Tl	0.0001	mg/L	IPWQO 0.0003	<0.0001
	U	0.001	mg/L	IPWQO 0.005	0.002
	V	0.001	mg/L	IPWQO 0.006	<0.001
	W	0.002	mg/L	IPWQO 0.030	<0.002
	Zn	0.01	mg/L	PWQO 0.030	<0.01
	Zr	0.002	mg/L	IPWQO 0.004	<0.002

**Guideline = PWQO - Ontario**

**\* = Guideline Exceedence**

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 Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

## Certificate of Analysis

Client: Geo Pro Consulting  
40 Vogell Rd, Unit 57  
Richmond Hill, Ontario  
L4B 3K6  
Attention: Ms. Sarena Medina  
PO#:  
Invoice to: Geo Pro Consulting

Report Number: 1900234  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-11  
Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
<b>Run No</b> 359363 <b>Analysis/Extraction Date</b> 2019-01-11 <b>Analyst</b> H_D <b>Method</b> EPA 200.8			
Al (dissolved)	<0.01 mg/L	110	91.5-108.4
Filtration			
Hg Dissolved	0 mg/L	108	
W	<0.002 mg/L	108	90.9-109.1
Zr	<0.002 mg/L	86	74.7-125.3
<b>Run No</b> 359421 <b>Analysis/Extraction Date</b> 2019-01-11 <b>Analyst</b> H_D <b>Method</b> EPA 200.8			
Silver	<0.0001 mg/L	107	89-111
Arsenic	<0.001 mg/L	101	91.7-108.2
Boron (total)	<0.01 mg/L	98	84.9-115
Beryllium	<0.0005 mg/L	105	89.5-110.4
Cadmium	<0.0001 mg/L	104	93.5-106.4
Cobalt	<0.0002 mg/L	102	92.7-107.2
Chromium Total	<0.001 mg/L	102	94-106
Copper	<0.001 mg/L	102	92.4-107.6
Iron	<0.03 mg/L	104	91-109

Guideline = PWQO - Ontario

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Richmond Hill, Ontario  
L4B 3K6  
Attention: Ms. Sarena Medina  
PO#:  
Invoice to: Geo Pro Consulting

Report Number: 1900234  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-11  
Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Molybdenum	<0.005 mg/L	100	92.8-107.2
Nickel	<0.005 mg/L	103	93-106.9
Lead	<0.001 mg/L	105	90-110
Antimony	<0.0005 mg/L	109	89.6-110.3
Selenium	<0.001 mg/L	96	87.4-112.6
Thallium	<0.0001 mg/L	106	90.4-109.5
Uranium	<0.001 mg/L	100	92.7-107.2
Vanadium	<0.001 mg/L	103	93-106.9
Zinc	<0.01 mg/L	100	91.5-108.4

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Client: Geo Pro Consulting  
40 Vogell Rd, Unit 57  
Richmond Hill, Ontario  
L4B 3K6

Attention: Ms. Sarena Medina

PO#:

Invoice to: Geo Pro Consulting

Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

Page 1 of 11

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**Dear Sarena Medina:**

**Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).**

Report Comments:

APPROVAL:

\_\_\_\_\_  
Rebecca Koshy, Project Manager

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# Certificate of Analysis

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40 Vogell Rd, Unit 57  
Richmond Hill, Ontario  
L4B 3K6  
Attention: Ms. Sarena Medina  
PO#:   
Invoice to: Geo Pro Consulting

Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

					1406376 WW	1406377 Water
					2019-01-04 BH106 - Combine	2019-01-04 BH106 - Dissolved Metals.
Group	Analyte	MRL	Units	Guideline		
Anions	F	0.10	mg/L	MAC 10	0.21	
	SO4	1	mg/L	MAC 1500	145	
General Chemistry	BOD5	1	mg/L	MAC 300	<1	
	Cyanide (total)	0.005	mg/L	MAC 2	<0.005	
	pH	1.00		6.0-10.0	7.54	
	Total Suspended Solids	2	mg/L	MAC 350	79	
Mercury	Hg	0.0001	mg/L	MAC 0.05	<0.0001	
Metals	Ag	0.0001	mg/L	MAC 5		<0.0001
		0.01	mg/L	MAC 5	<0.01	
	Al	0.01	mg/L	MAC 50		<0.01
		0.1	mg/L	MAC 50	2.4	
	Aqua-Regia Digest				Y	
	As	0.001	mg/L	MAC 1		<0.001
		0.02	mg/L	MAC 1	<0.02	
	Be	0.0005	mg/L	MAC 5		<0.0005
		0.01	mg/L	MAC 5	<0.01	
	Cd	0.0001	mg/L	MAC 1.0		<0.0001
		0.008	mg/L	MAC 1.0	<0.008	
	Co	0.0002	mg/L	MAC 5		<0.0002
		0.01	mg/L	MAC 5	<0.01	
	Cr	0.001	mg/L	MAC 3		<0.001
		0.05	mg/L	MAC 3	<0.05	
	Cu	0.001	mg/L	MAC 3		<0.001
		0.01	mg/L	MAC 3	<0.01	
	Fe	0.03	mg/L			<0.03

Guideline = Sanitary Sewer - Halton

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Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1406376 WW  2019-01-04 BH106 - Combine	1406377 Water  2019-01-04 BH106 - Dissolved Metals.
Group	Analyte	MRL	Units	Guideline			
Metals	Fe	0.1	mg/L			3.8	
	Hg	0.0001	mg/L	MAC 0.05			<0.0001
	Mn	0.01	mg/L	MAC 5		1.78	<0.01
	Mo	0.005	mg/L	MAC 5			<0.005
		0.01	mg/L	MAC 5		<0.01	
	Ni	0.005	mg/L	MAC 3			<0.005
		0.01	mg/L	MAC 3		<0.01	
	Pb	0.001	mg/L	MAC 3			<0.001
		0.01	mg/L	MAC 3		<0.01	
	Sb	0.0005	mg/L	MAC 5			<0.0005
		0.01	mg/L	MAC 5		<0.01	
	Se	0.001	mg/L	MAC 5			<0.001
		0.02	mg/L	MAC 5		<0.02	
	Sn	0.01	mg/L	MAC 5			<0.01
		0.1	mg/L	MAC 5		<0.1	
	Ti	0.01	mg/L	MAC 5			<0.01
		0.1	mg/L	MAC 5		<0.1	
	Zn	0.01	mg/L	MAC 3			<0.01
		0.04	mg/L	MAC 3		<0.04	
Microbiology	Escherichia Coli	0	ct/100mL			<10	
Oil and Grease	Oil & Grease - Mineral	1	mg/L	MAC 15		<1	
	Oil & Grease - Non-mineral	1	mg/L	MAC 150		<1	
	Oil & Grease - Total	1	mg/L			<1	
PAH	Naphthalene	0.1	ug/L	MAC 140		<0.1	
Subcontract-Inorg	Phenols	0.001	mg/L	MAC 1.0		<0.001	

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COC #: 839417

					Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1406376 WW  2019-01-04 BH106 - Combine	1406377 Water  2019-01-04 BH106 - Dissolved Metals.
Group	Analyte	MRL	Units	Guideline			
Subcontract-Inorg	Total Kjeldahl Nitrogen	0.8	mg/L	MAC 100		<0.8	
	Total P	0.01	mg/L	MAC 10		0.10	
VOCs Surrogates	1,2-dichloroethane-d4	0	%			107	
	4-bromofluorobenzene	0	%			95	
	Toluene-d8	0	%			116	
Volatiles	1,4-dichlorobenzene	0.4	ug/L	MAC 80		<0.4	
	Benzene	0.5	ug/L	MAC 10		<0.5	
	Chloroform	0.5	ug/L	MAC 40		<0.5	
	Dichloromethane	4.0	ug/L	MAC 2000		<4.0	
	Ethylbenzene	0.5	ug/L	MAC 160		<0.5	
	Tetrachloroethylene	0.3	ug/L	MAC 1000		<0.3	
	Toluene	0.5	ug/L	MAC 16		<0.5	
	Trichloroethylene	0.3	ug/L	MAC 400		<0.3	

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Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
<b>Run No</b> 359120 <b>Analysis/Extraction Date</b> 2019-01-07 <b>Analyst</b> C_M <b>Method</b> P 8270			
Naphthalene	<0.1 ug/L	66	50-140
<b>Run No</b> 359172 <b>Analysis/Extraction Date</b> 2019-01-06 <b>Analyst</b> L_V <b>Method</b> AMBCOLM1			
Escherichia Coli			
<b>Run No</b> 359208 <b>Analysis/Extraction Date</b> 2019-01-07 <b>Analyst</b> H_D <b>Method</b> EPA 200.8			
Titanium	<0.1 mg/L	102	80-120
<b>Run No</b> 359211 <b>Analysis/Extraction Date</b> 2019-01-07 <b>Analyst</b> AA <b>Method</b> C SM4500-CNC			
Cyanide (total)	<0.005 mg/L	97	61-139
<b>Run No</b> 359243 <b>Analysis/Extraction Date</b> 2019-01-07 <b>Analyst</b> AET <b>Method</b> SM2320,2510,4500H/F			
F	<0.10 mg/L	97	90-110
pH		99	90-110
<b>Run No</b> 359251 <b>Analysis/Extraction Date</b> 2019-01-08 <b>Analyst</b> SKH <b>Method</b> M SM3112B-3500B			
Mercury	<0.0001 mg/L	100	76-123

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MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

## Certificate of Analysis

Client: Geo Pro Consulting  
40 Vogell Rd, Unit 57  
Richmond Hill, Ontario  
L4B 3K6  
Attention: Ms. Sarena Medina  
PO#:   
Invoice to: Geo Pro Consulting

Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
<b>Run No</b> 359257 <b>Analysis/Extraction Date</b> 2019-01-08 <b>Analyst</b> TJB <b>Method</b> C SM5520B			
Oil & Grease - Mineral	<1 mg/L	89	60-120
Oil & Grease - Non-mineral	<1 mg/L		60-120
Oil & Grease - Total	<1 mg/L	95	60-120
<b>Run No</b> 359270 <b>Analysis/Extraction Date</b> 2019-01-08 <b>Analyst</b> SKH <b>Method</b> EPA 200.8			
Aluminum	<0.1 mg/L	97	70-130
Arsenic	<0.02 mg/L	92	70-130
Beryllium	<0.01 mg/L	88	70-130
Cadmium	<0.008 mg/L	99	70-130
Cobalt	<0.01 mg/L	90	70-130
Chromium Total	<0.05 mg/L	91	70-130
Copper	<0.01 mg/L	95	70-130
Iron	<0.1 mg/L	81	70-130
Manganese	<0.01 mg/L	93	70-130
Molybdenum	<0.01 mg/L	87	70-130
Nickel	<0.01 mg/L	93	70-130

Guideline = Sanitary Sewer - Halton

\* = Guideline Exceedence

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Report Number: 1900233  
Date Submitted: 2019-01-05  
Date Reported: 2019-01-14  
Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Lead	<0.01 mg/L	94	70-130
Antimony	<0.01 mg/L	104	70-130
Selenium	<0.02 mg/L	97	70-130
Zinc	<0.04 mg/L	102	70-130
<b>Run No</b> 359277 <b>Analysis/Extraction Date</b> 2019-01-09 <b>Analyst</b> H_F <b>Method</b> SM 4110			
SO4	<1 mg/L	100	90-110
<b>Run No</b> 359285 <b>Analysis/Extraction Date</b> 2019-01-08 <b>Analyst</b> TJB <b>Method</b> EPA 8260			
Dichlorobenzene, 1,4-	<0.4 ug/L	111	60-130
Benzene	<0.5 ug/L	112	60-130
Chloroform	<0.5 ug/L	107	60-130
Methylene Chloride	<4.0 ug/L	81	60-130
Ethylbenzene	<0.5 ug/L	94	60-130
Tetrachloroethylene	<0.3 ug/L	112	60-130
Toluene	<0.5 ug/L	110	60-130
Trichloroethylene	<0.3 ug/L	114	60-130
<b>Run No</b> 359289 <b>Analysis/Extraction Date</b> 2019-01-14 <b>Analyst</b> Z_S <b>Method</b> SM 5210B			

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Richmond Hill, Ontario  
L4B 3K6  
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Report Number: 1900233  
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Project: 17-1758H  
COC #: 839417

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
BOD5	<1 mg/L	94	75-125
<b>Run No</b> 359336 <b>Analysis/Extraction Date</b> 2019-01-09 <b>Analyst</b> AET <b>Method</b> C SM2540			
Total Suspended Solids	<2 mg/L	100	90-110
<b>Run No</b> 359363 <b>Analysis/Extraction Date</b> 2019-01-10 <b>Analyst</b> H_D <b>Method</b> EPA 200.8			
Silver	<0.0001 mg/L	109	89-111
Aluminum	<0.01 mg/L	110	91.5-108.4
Arsenic	<0.001 mg/L	99	91.7-108.2
Beryllium	<0.0005 mg/L	101	89.5-110.4
Cadmium	<0.0001 mg/L	104	93.5-106.4
Cobalt	<0.0002 mg/L	99	92.7-107.2
Chromium Total	<0.001 mg/L	100	94-106
Copper	<0.001 mg/L	98	92.4-107.6
Iron	<0.03 mg/L	95	91-109
Mercury	<0.0001 mg/L	110	80-120
Manganese	<0.01 mg/L	99	92.9-107
Molybdenum	<0.005 mg/L	101	92.8-107.2

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### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Nickel	<0.005 mg/L	99	93-106.9
Lead	<0.001 mg/L	104	90-110
Antimony	<0.0005 mg/L	111	89.6-110.3
Selenium	<0.001 mg/L	95	87.4-112.6
Sn	<0.01 mg/L	80	80-120
Titanium	<0.01 mg/L	93	80-120
Zinc	<0.01 mg/L	99	91.5-108.4
<b>Run No</b> 359427 <b>Analysis/Extraction Date</b> 2019-01-11 <b>Analyst</b> SKH <b>Method</b> EPA 200.8			
Silver	<0.01 mg/L	120	70-130
Aqua-Regia Digest			
Sn	<0.1 mg/L	130	70-130
<b>Run No</b> 359434 <b>Analysis/Extraction Date</b> 2019-01-11 <b>Analyst</b> SDC <b>Method</b> SUBCONTRACT P-INORG			
Phenols	<0.001 mg/L	84	69-132
<b>Run No</b> 359449 <b>Analysis/Extraction Date</b> 2019-01-10 <b>Analyst</b> REE <b>Method</b> POINTECLAIRE			
Total Kjeldahl Nitrogen	<0.8 mg/L	94	
Total P			

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COC #: 839417

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***Sample Comment Summary***

Sample ID: 1406376 BH106 - Combine Metals analysis performed on aqua-regia digest of sample material, except for Titanium.
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**Guideline = Sanitary Sewer - Halton****\* = Guideline Exceedence**

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Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range



CLIENT INFORMATION					INVOICE INFORMATION (SAME AS CLIENT INFORMATION: YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> )												
Company: GeoPro Consulting					Company:												
Contact: Sarena Medina sarenam@geoproconsulting.ca ✓					Contact:												
Address: 40 Vogell Road, Unit 23, Richmond Hill, ON					Address:												
Telephone: 905-237-8336 Fax:					Telephone:					Fax:							
Email: #1: kai@geoproconsulting.ca ✓					Email: #1: office@geoproconsulting.ca												
Email: #2: vesslan@geoproconsulting.ca; mariab@geoproconsulting.ca ✓					Email: #2: junrong.li@geoproconsulting.ca ✓												
Project: 17-1758H					PO #:					Quote #:							
REGULATION/GUIDELINE REQUIRED					TURN-AROUND TIME												
<input checked="" type="checkbox"/> Sanitary Sewer, City: _____ <input checked="" type="checkbox"/> Storm Sewer, City: _____ <input type="checkbox"/> O. Reg 153, Table: _____, Type: _____ <input type="checkbox"/> Excess Soil, Table: _____, Type: _____					<input type="checkbox"/> ODWSOG <input checked="" type="checkbox"/> PWQO <input type="checkbox"/> O. Reg 347/558 <input type="checkbox"/> Other: _____					<input type="checkbox"/> 1 Day* (100%) <input type="checkbox"/> 2 Day** (50%) <input type="checkbox"/> 3-5 Days (25%) <input checked="" type="checkbox"/> 5-7 Days (Standard) Please contact the laboratory in advance to determine rush availability. Surcharges may apply to rush service. *If the results are reported the day after the rush due date, the following surcharges will apply: before 12:00 - 100%, after 12:00 - 50%. **If the results are reported the day after the rush due date, the following surcharges will apply: before 12:00 - 50%, after 12:00 - 25%.							
The optimal temperature conditions during transport should be less than 10°C. Sample(s) cannot be frozen, unless otherwise indicated or agreed upon with the Laboratory. Note that this COC is not to be used for drinking water samples. The COC must be complete upon submission of the samples, there will be a \$25 surcharge if required information is missing (required fields are shaded in grey).					Sample Analysis Required										Field Parameters		RN# (Lab Use Only)
					Sample Details												
Sample ID		Date/Time Collected		Sample Matrix	Field Filtered →	Resample? Y = Yes N = No	# of Containers	Metals and Inorganics	Metals (ex. Hg, B, CrVI)	BTEX	VOC	PHC FL-F4	Halton SAN+STM	Dissolve metals	PWQO Metals		
BH106		Jan 4, 2019		GW									✓				
BH106		Jan 4, 2019		GW										✓			
BH201		Jan 4, 2019		GW											✓		
PRINT				SIGN				DATE/TIME				TEMP (°C)		COMMENTS:			
Sampled By: BL														• Halton Sewer bylaw (Comb SAN + STM) • Dissolve Metals: All metals as per the by-law after lab filtered • PWQO metals			
Relinquished By:														CUSTODY SEAL: YES <input type="checkbox"/> NO <input type="checkbox"/>			
Received By: Mackenzie				MR				2019-01-05 10:20				70°					



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## **APPENDIX D**

**Slug Test: BH106****(Based on data from Datalogger - Falling Head Method - November 8, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VY

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH106

Screen Depth (mBGS): 3.0 ~ 4.5

Well Elevation (mASL): 216.92

L = 150 cm

Well Diameter: 2.0" ID

R = 7.75 cm

Static Water Level (mBGS): 3.93

r = 2.55 cm

Finish Reading (H) 10.9913 m

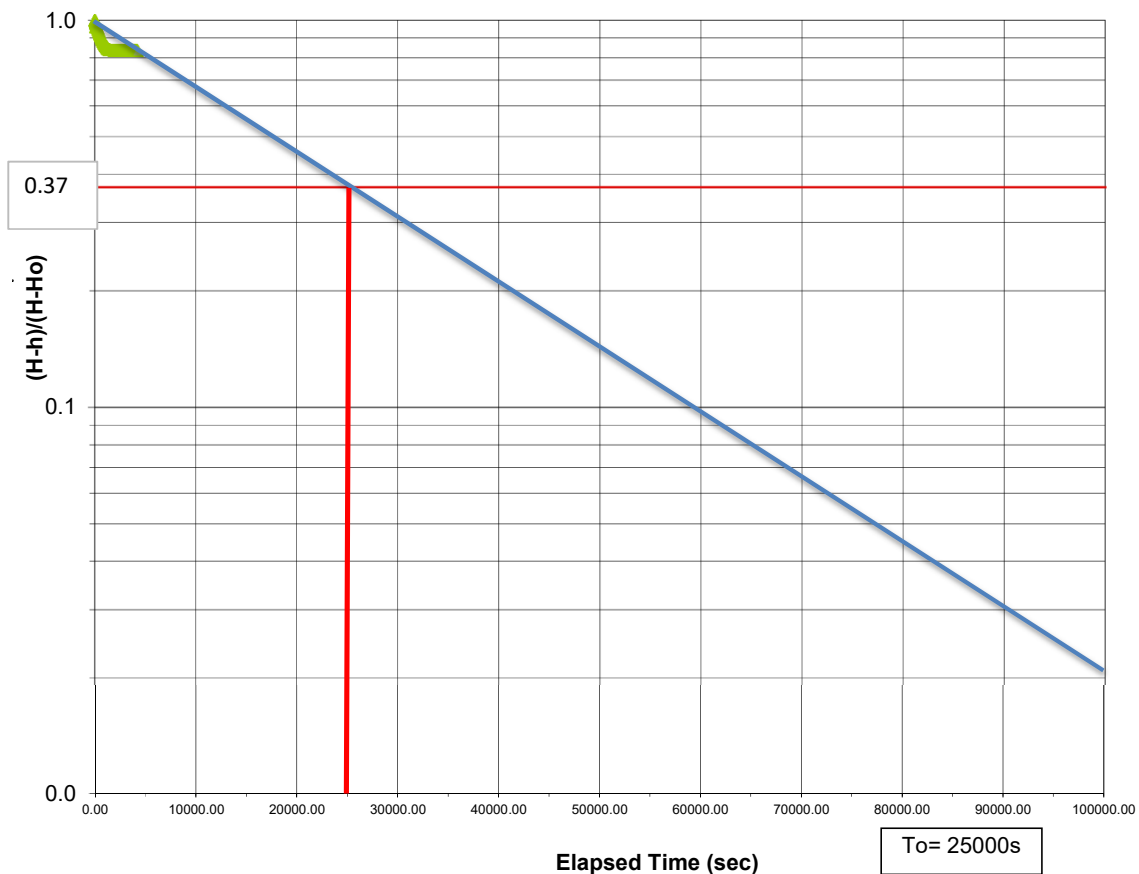
To = 25000 sec

Start Reading (h<sub>0</sub>) 13.3128 m $K = r^2 \ln(L/R)/(2LTo) = 2.6E-06$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



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**Slug Test: BH201****(Based on data from Datalogger - Rising Head Method - August 24, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VM

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH201

Screen Depth (mBGS): 8.2 ~ 11.2

Well Elevation (mASL): 205.01

L = 300 cm

Well Diameter: 2.0" ID

R = 7.75 cm

Static Water Level (mBGS): -0.27

r = 2.55 cm

Finish Reading (H): 20.5491 m

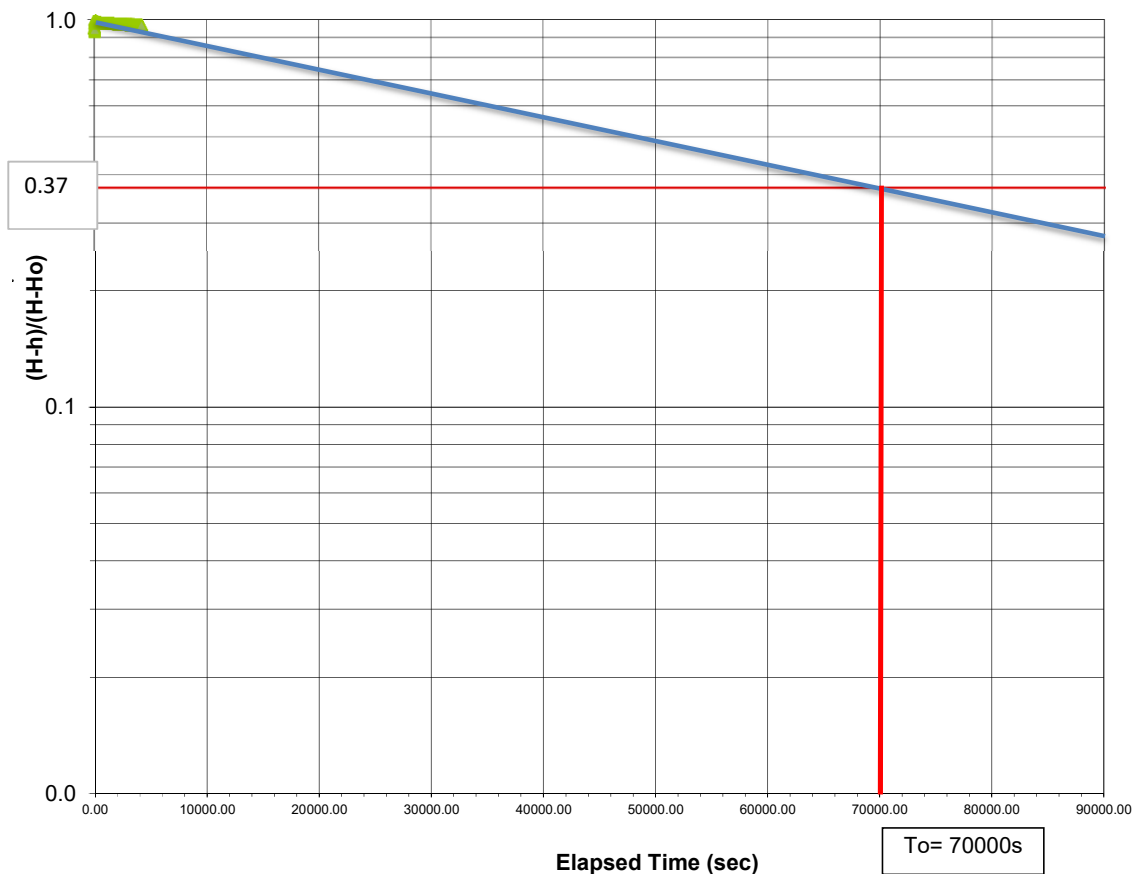
To = 70000 sec

Start Reading (h<sub>0</sub>): 17.478 m $K = r^2 \ln(L/R)/(2LT_o) = 5.7E-07$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



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**Slug Test: BH202****(Based on data from Datalogger - Rising Head Method - August 24, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VM

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH202

Screen Depth (mBGS): 9.6 ~ 12.6

Well Elevation (mASL): 205.51

L = 300 cm

Well Diameter: 2.0" ID

R = 7.75 cm

Static Water Level (mBGS): 0.66

r = 2.55 cm

Finish Reading (H) 21.4301 m

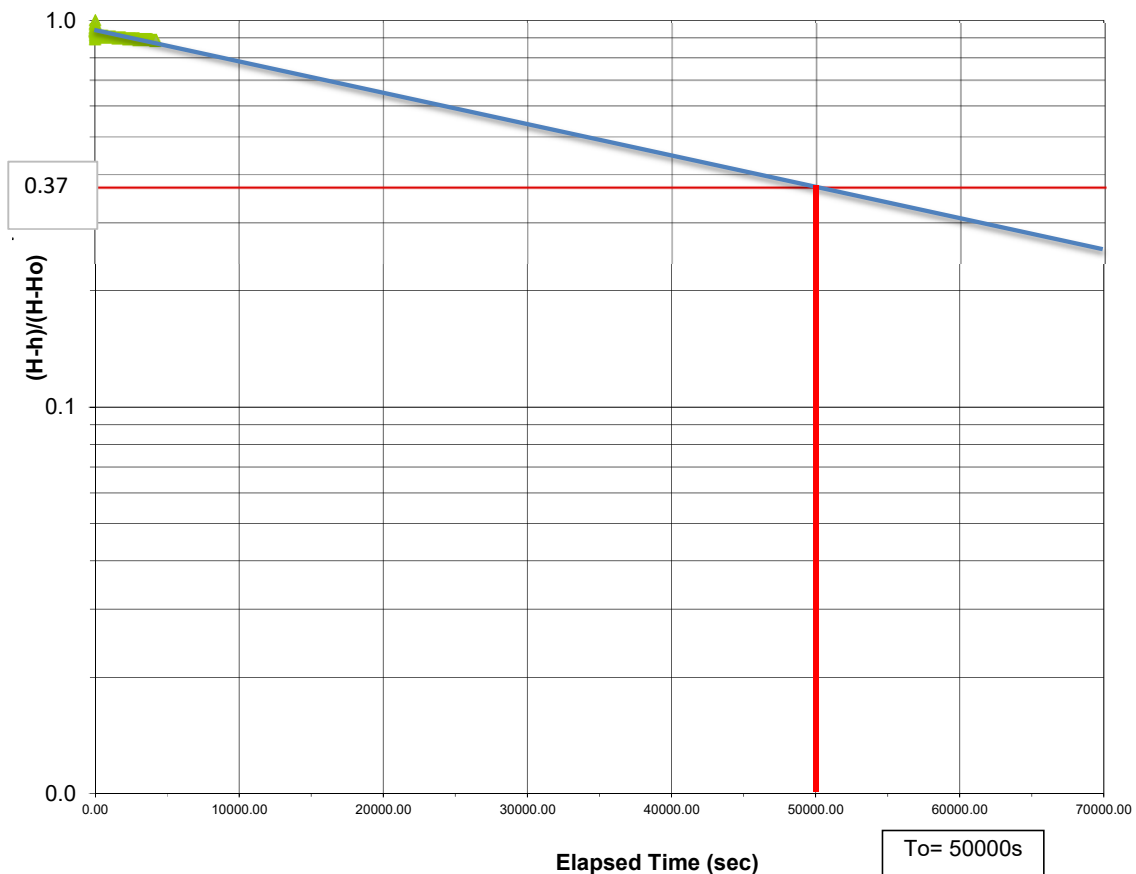
To = 50000 sec

Start Reading (h<sub>0</sub>) 19.2436 m $K = r^2 \ln(L/R) / (2LTo) = 7.9E-07$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



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**Slug Test: BH301****(Based on data from Datalogger - Rising Head Method - August 24, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VM

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH301

Screen Depth (mBGS): 13.7 ~ 16.7

Well Elevation (mASL): 206.46

L = 300 cm

Well Diameter: 2.0" ID

R = 7.75 cm

Static Water Level (mBGS): 2.74

r = 2.55 cm

Finish Reading (H) 24.4283 m

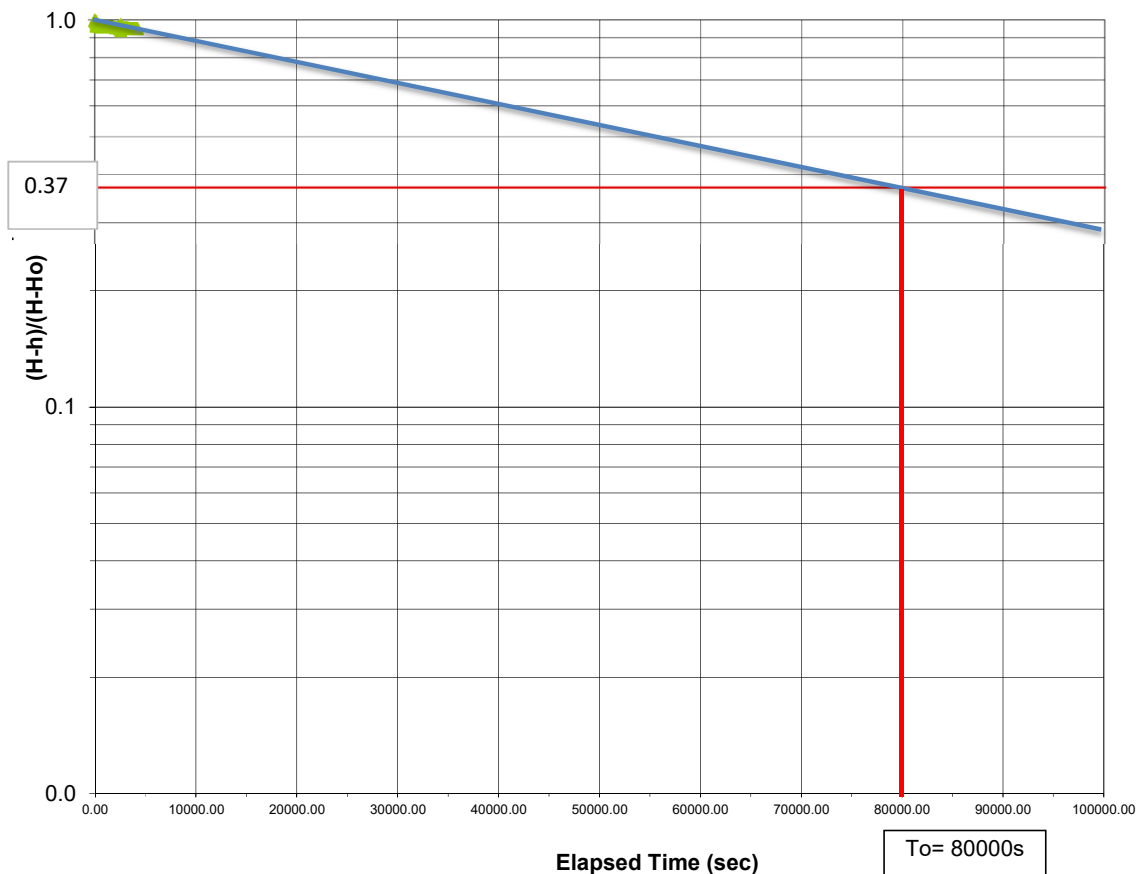
To = 80000 sec

Start Reading (h<sub>0</sub>) 21.6653 m $K = r^2 \ln(L/R) / (2LTo) = 5.0E-07$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



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**Slug Test: BH110****(Based on data from Datalogger - Falling Head Method - November 8, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VY

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH110

Screen Depth (mBGS): 1.2 ~ 2.7

Well Elevation (mASL): 206.46

Well Diameter: 2.0" ID

Static Water Level (mBGS): 0.13

Finish Reading (H) 12.745 m

Start Reading (h<sub>0</sub>) 13.7029 m

L = 150 cm

R = 7.75 cm

r = 2.55 cm

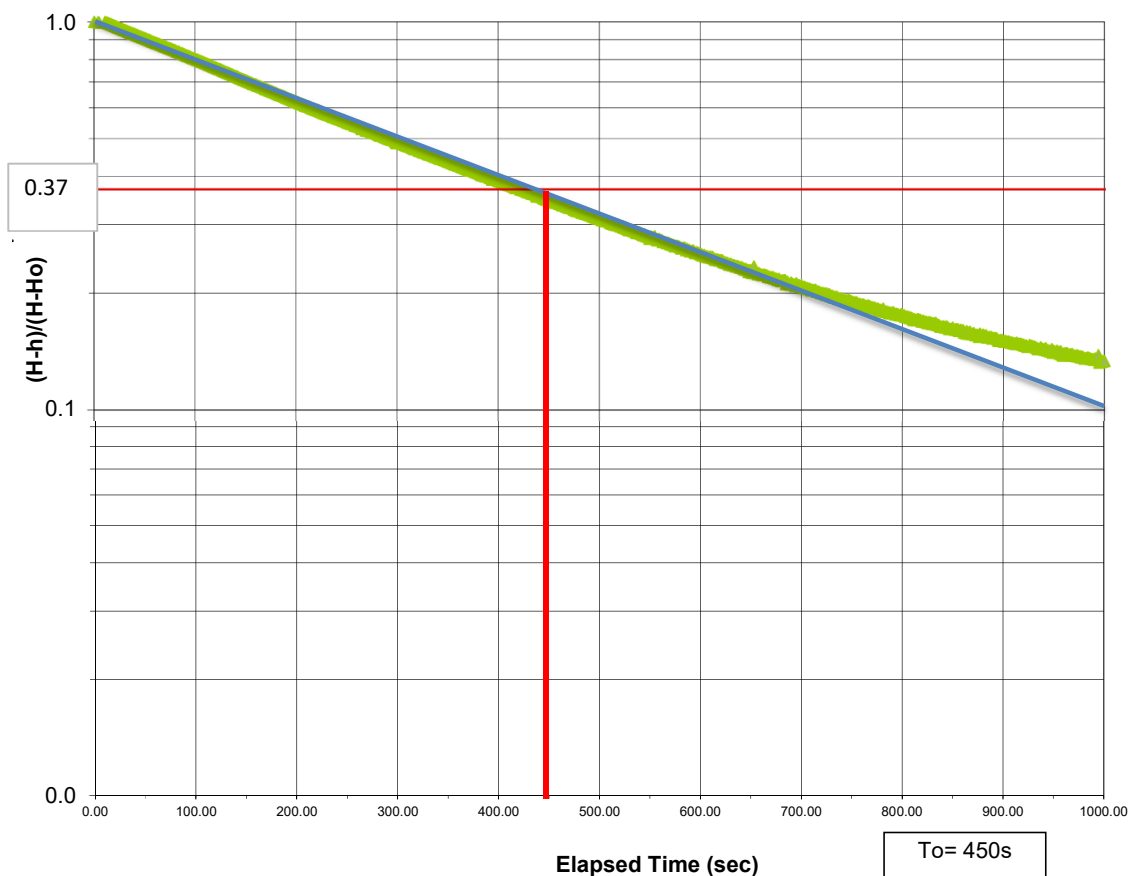
To = 450 sec

 $K = r^2 \ln(L/R) / (2LTo) = 1.4E-04$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



GeoPro Consulting Limited  
Geotechnical Hydrogeology-Environmental Materials-Inspection



**Slug Test: BH115****(Based on data from Datalogger - Falling Head Method - November 8, 2018)**

Regional Road 25, Town of Milton, ON

Project No. : 17-1758H

H = Assumed Initial Water Head

Conducted by: VY/PJ

Ho = Water Head at time = 0

Interpreted by: MB

h = Water Head/Level at time t

Well Number: BH115

Screen Depth (mBGS): 3.0 ~ 4.5

Well Elevation (mASL): 206.1

L = 150 cm

Well Diameter: 2.0" ID

R = 7.75 cm

Static Water Level (mBGS): 2.88

r = 2.55 cm

Finish Reading (H) 10.5715 m

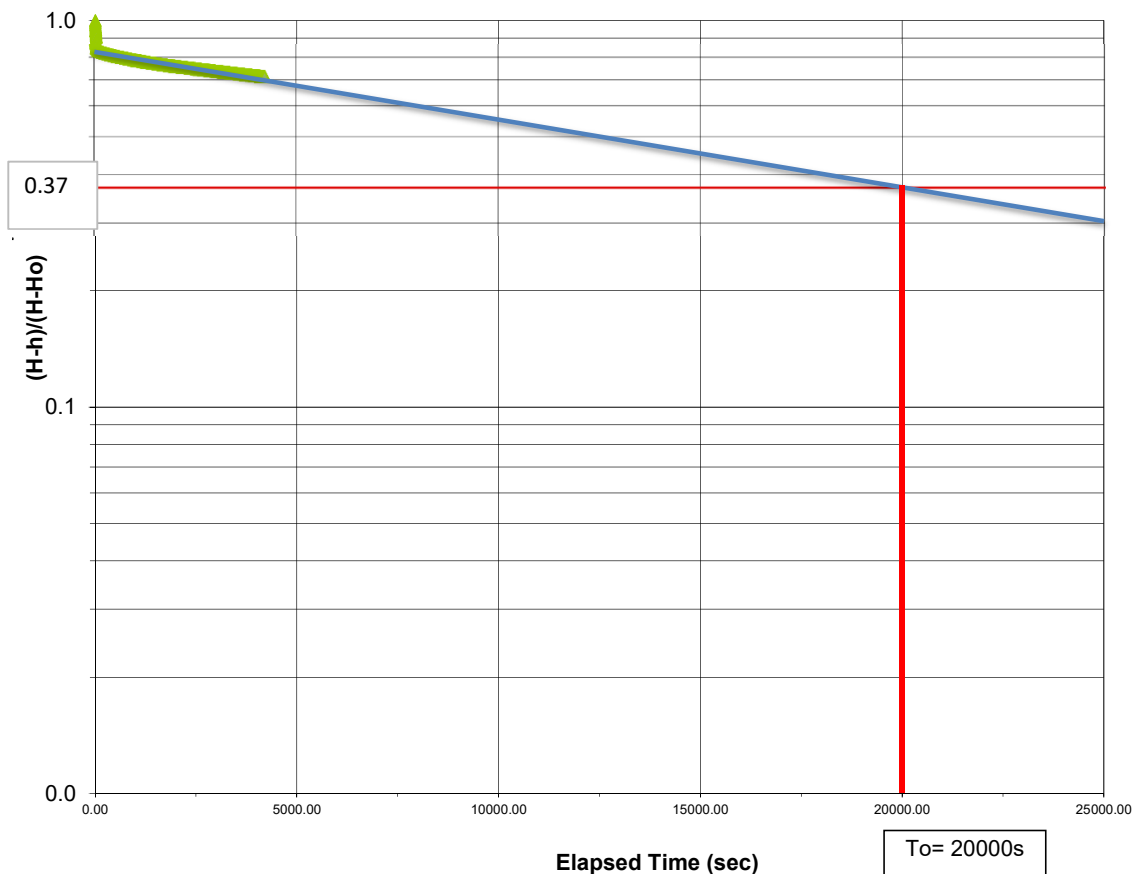
To = 20000 sec

Start Reading (h<sub>0</sub>) 12.6054 m $K = r^2 \ln(L/R)/(2LT_o) = 3.2E-06$  cm/s

Slug Test Result (Hvorslev Method)  
Based on Datalogger Readings



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## **LIMITATIONS TO THE REPORT**

This report is intended solely for the Client named. The report is prepared based on the work has been undertaken in accordance with normally accepted geotechnical engineering practices in Ontario.

The comments and recommendations given in this report are based on information determined at the limited number of the test hole and test pit locations. Subsurface and groundwater conditions between and beyond the test holes and test pit may differ significantly from those encountered at the test hole and test pit locations. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole and test pit locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The report reflects our best judgment based on the information available to GeoPro Consulting Limited at the time of preparation. Unless otherwise agreed in writing by GeoPro Consulting Limited, it shall not be used to express or imply warranty as to any other purposes. No portion of this report shall be used as a separate entity, it is written to be read in its entirety. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated.

The design recommendations given in this report are applicable only to the project designed and constructed completely in accordance with the details stated in this report.

Should any comments and recommendations provided in this report be made on any construction related issues, they are intended only for the guidance of the designers. The number of test holes and test pits may not be sufficient to determine all the factors that may affect construction activities, methods and costs. Such as, the thickness of surficial topsoil or fill layers may vary significantly and unpredictably; the amount of the cobbles and boulders may vary significantly than what described in the report; unexpected water bearing zones/layers with various thickness and extent may be encountered in the fill and native soils. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and make their own conclusions as to how the subsurface conditions may affect their work and determine the proper construction methods.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GeoPro Consulting Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.