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A REPORT TO
PARADISE DEVELOPMENTS HERON'S HILL INC.

HYDROGEOLOGICAL ASSESSMENT

PROPOSED MIXED USE DEVELOPMENT

1 HERON'S HILL WAY

CITY OF TORONTO

REFERENCE NO. 1908-W037

APRIL 2020
(REVISION OF REPORT DATED DECEMBER 2019)

DISTRIBUTION

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1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. conducted a preliminary hydrogeological assessment for a proposed residential development site, located at 1 Heron's Hill Way, in the City of Toronto. Surrounding land use includes; Yorkland Road and commercial building to the west, Heron's Hill Way and residential properties to the north, along with commercial properties to the south and east of the subject site. The site is currently occupied by a by an office building within its western portion, and an above grade parking area is located within the mid portion of the subject site. It is proposed to construct a thirty-nine (39), storey mixed use building, with a one (1) - level underground parking structure within the eastern portion of the property.

The subject site lies within the physiographic region of Southern Ontario known as the Peel Plain which is underlain by the Halton Till unit native soil deposits, consisting predominantly of silt to silty clay matrix, high in matrix calcium carbonate content, considered as being clast-poor.

The subject site is located within Lower East Don River subwatershed of the Don River Watershed.

A review of the local topography shows that the site is relatively flat, having a minor decline in elevation relief towards its eastern limits.

The study has disclosed that beneath the existing layer of pavers, granular fill, and earth fill, the native soils underlying the subject site consist of silt, silty sand till, sandy silt till, silty clay, sand, silty clay till, and sand and gravel.

The study confirms that the groundwater level elevations beneath the site, ranges from 165.60 to 157.80 masl (i.e. 9.60 to 18.0 m below ground surface).

A review of the average of the groundwater elevations suggests that shallow groundwater flows in southerly, easterly, and south-easterly directions.

The single well response test results provided an estimated hydraulic conductivity (K) estimate of 1.1×10^{-8} m/sec for the silty clay unit, a K estimate for the silty sand till and silty clay till units is 9.7×10^{-9} m/sec, a K estimate for the sandy silt till, and silty clay unit, is at 1.2×10^{-7} m/sec., and a K estimate for the sandy silt till unit is 7.8×10^{-7} m/sec., at the depths of the well screens. This result suggests that low shallow groundwater seepage rates can be anticipated into open excavations below the water table.

The Hazen Equation calculated permeability results indicates that the hydraulic conductivity (K) estimates for the silty sand till, ranges from 6.4 x 10^{-6} to 7.29 x 10^{-8} m/sec; the K estimate for the sandy silty till, is about 1.94 x 10^{-7} m/sec., and for the sand and gravel unit, it is about 1.69 x 10^{-5} m/sec. The K estimates determined from the Hazen method suggests low to moderate hydraulic conductivities for the shallow subsoil units beneath the site.

The groundwater beneath the site is approximately 5.0 m below the proposed elevation for the base of the proposed underground parking foundation footings, and is 4.08 m below the proposed elevator pit structure. It is therefore not anticipated that construction dewatering will be required for groundwater control earthworks and for construction of the proposed development, including installation of any associated underground services.

Accumulated stormwater runoff within earthworks excavation following storm event precipitation associated with this development is estimated to be approximately 412,760 L/day. The runoff from the proposed development area could be directed for discharge into the adjacent building's foundation drainage/sump network, which, in turn could be directed for disposal discharge building the municipal storm sewer. However, given that the existing site is included as part of the proposed development application, the city may require a discharge permit for the existing structure even for short-term stormwater related drainage.

There is no anticipated long-term permanent foundation drainage from groundwater seepage for the proposed underground parking structure, or to elevator pit structures. However, potential drainage associated with shallow runoff related seepage from storm event precipitation runoff associated with this development is estimated to be approximately 2,036 litres/day; by applying a safety factor of three, the runoff could reach a maximum of 6,108 litres/day. The runoff from the proposed development area can be directed for discharge into the existing building foundation drainage/sump network, for disposal discharge into the municipal storm sewer.

Dewatering effluent from any short-term construction dewatering or from any long-term foundation drainage is acceptable for disposal to the City of Toronto sanitary sewer. For disposal to the storm sewer, the effluent will require pre-treatment to lower levels of total suspended solids and chloroform to meet the City's disposal standards. Any short-term dewatering may be associated with seepage of any perched groundwater encountered within excavations, or from the removal of the accumulated runoff from within the excavation following storm events. It is anticipated that there may be limited construction dewatering following storm events during excavation works. However, any groundwater seepage within excavations will likely dissipate relatively quickly after the earthworks commence.

The option exists to pump any accumulated runoff from excavations to a temporary building tank, for later removal off site, using licensed carriers and not direct any of the runoff effluent to the city sewer system.

2.0 INTRODUCTION

2.1 Project Description

In accordance with authorization from the Paradise Developments Heron's Hill Inc., Soil Engineers Ltd., (SEL) has conducted a hydrogeological assessment for a proposed mixed-use building development site located at 1 Heron's Hill Way, in the City of Toronto. The location of the site is shown on Drawing No. 1.

The subject site is located within an existing urban developed area; where the surrounding land use includes; Yorkland Road and commercial building to the west, Heron's Hill Way and residential properties to the north, along with commercial properties to the south and to the east of the site. The site is currently occupied by a paved, above-grade parking lot within its mid portion, and an existing office building within its western portion. It is anticipated that this existing building will remain after the proposed development is completed. The remainder of the development site will be comprised of the construction of a 39-storey mixed use development building having a 1-level underground parking structure. It is anticipated that the first 4 storeys will be used for above ground parking facility and for office purposes, and the upper floors will be used for residential occupancy purposes.

This report summarizes findings of the field study and associated groundwater monitoring and hydraulic testing. The current study provides preliminary recommendations for any construction dewatering needs, including any long-term foundation drainage needs prior to detailed design. In addition, comments are provided regarding the groundwater quality for any proposed discharge for disposal to the City of Toronto Sewer Systems. A description and characterization of the hydrogeostratigraphy for the site and surrounding area, is provided, together with an assessment of the site's groundwater function relative to the maintenance for any on-site or nearby groundwater receptors.

2.2 Project Objectives

The major objectives of this Hydrogeological Assessment Report are as follows:

1. Establish the hydrogeological setting for the subject site and surrounding local area;
2. Interpret shallow groundwater flow and runoff patterns;

3. Identify zones of higher groundwater yield as potential sources for ongoing shallow groundwater seepage;
4. Characterize the hydraulic conductivity (K) for the groundwater-bearing sub-soil soil strata;
5. Prepare an interpreted hydrostratigraphic cross-section across the subject site and the proposed development footprint;
6. Estimate the anticipated dewatering flows that may be required to lower the groundwater table to facilitate construction, or for any permanent, long-term foundation drainage needs, following construction;
7. Evaluate potential impacts to any nearby groundwater receptors within the anticipated zone of influence for construction dewatering; and to develop preliminary estimates for any temporary dewatering flow rates that may be required to facilitate excavations for construction, or from any long-term foundation drainage needs, following construction.

2.3 **Scope of Work**

The scope of work for the hydrogeological assessment is summarized below:

1. Clearance of underground services, drilling of six (6) boreholes, and installation of monitoring wells, one within each of the boreholes advance beneath the site within the site's development footprint;
2. Monitoring well development and performance of Single Well Response Tests (SWRTs) at six (6) monitoring wells to estimate the hydraulic conductivity (K) for groundwater-bearing subsoil at the depths of the well screens;
3. Describing the geological and hydrogeological setting for the subject site and local surrounding areas;
4. Estimating the hydraulic conductivity (K) for the groundwater bearing subsoil strata, based on the SWRT results and from a review of soils grain size analyses.
5. Review of the findings of the previous geotechnical study; review of available engineering development plans and profiles for the proposed multi-storey mixed-use development; assessing the preliminary construction dewatering needs and estimation of any anticipated dewatering flows to lower the groundwater levels for construction, or for any anticipated long-term foundation drainage needs following construction.
6. Groundwater sampling and analysis from one (1) monitoring well to assess shallow groundwater quality for comparison and evaluation against the City of Toronto Sanitary and Storm Sewer Use By-Law limits to assess any disposal management options for any dewatering or drainage effluent generated during construction or for any long-term foundation drainage.

3.0 METHODOLOGY

3.1 Borehole Advancement and Monitoring Well Installation

Borehole drilling and monitoring well construction were performed on August 14, 15, 16, 19, 20 and 21, 2019. The program consisted of the drilling of six (6) boreholes (BH) and the installation of six (6) monitoring wells (MW), one in each of the six (6) boreholes advance beneath the site. The locations of the boreholes/monitoring wells are shown on Drawing No. 2.

The borehole drilling and monitoring well construction were completed by a licensed water well contractor, DBW Drilling Ltd., under the full-time supervision of a geotechnical technician from SEL, who also logged the soil sub-strata encountered during borehole advancement, and collected representative subsoil samples for textural classification. The boreholes were drilled using continuous flight power augers. Detailed descriptions of the encountered subsoil and groundwater conditions are presented on the borehole and monitoring well logs, on the enclosed Figures 1 to 6, inclusive.

The monitoring wells were constructed, using 50-mm diameter PVC riser pipes and screens, which were installed in each of the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were provided with flush mount protective steel casings at the ground surface. The details of the monitoring well construction are provided on the enclosed Borehole Logs (Figures 1 to 6).

The UTM coordinates and ground surface elevations at the borehole/monitoring well locations, together with the monitoring well construction details, are provided on Table 3-1.

Table 3-1 - Monitoring Well Installation Details

Well ID	Installation Date	UTM Coordinates		Ground El. (masl)	Borehole Depth (mbgs)	Screen Interval (mbgs)	Casing Dia. (mm)
		East	North				
BH/MW 1	14 - Aug-19	633927	4848153	175.2	24.5	21.4-24.4	50
BH/MW 2	20-2 1- Aug-19	633945	4848184	175.2	21.8	17.9-20.9	50
BH/MW 3	20-21 - Aug-19	633966	4848190	175.2	21.8	18.3-21.3	50
BH/MW 4	14-16 - Aug-19	633974	4848167	175.3	30.6	27.5-30.5	50
BH/MW 5	20 -Aug-19	634001	4848200	175.2	21.6	18.3-21.3	50
BH/MW 6	16, 19 - Aug-19	634006	4848177	175.8	21.4	18.3-21.3	50

Notes: mbgs - metres below ground surface masl - metres above sea level

3.2 Groundwater Monitoring

The groundwater levels in the monitoring wells were measured, manually on August 28, September 12, 25, October 9, 24, and November 4, 2019.

3.3 Mapping of Ontario Water Well Records

SEL received the Ministry of the Environment, Conservation and Park (MECP) Water Well Records (WWRs) for the registered wells located on the subject site and within 500 m of the site boundaries (study area). The well records indicate that sixty-four (64) registered well records are located within the 500 m zone of influence study area relative to the subject site boundaries. The WWR well locations are shown on Drawing No. 3, and a summary of the WWRs reviewed for this study are listed in Appendix 'A', with a discussion of the findings provided in Section 6.2.

3.4 Monitoring Well Development and Single Well Response Tests

All of the monitoring wells, except BH/MWs 2 and 4, underwent development in preparation for single well response testing (SWRT) to estimate the hydraulic conductivity (K) for saturated subsoil strata at the depths of the monitoring well screens. Well development involved the purging and removal of several casing volumes of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring wells during construction, and to induce the flow of formation groundwater through the well screens, thereby improving the transmissivity of the subsoil strata formation at the monitoring well screen depths.

The K values derived from the SWRT's provide an indication of the yield capacity for the groundwater-bearing subsoil strata, at the well screen depths, and can be used to estimate the flow of groundwater through the groundwater-bearing subsoil strata.

The SWRT involves the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The rate at which the groundwater level recovers to static conditions (falling head) is tracked using a data logger/pressure transducer, and/or manually using a water level tape. The rate at which the groundwater table recovers to static conditions is used to estimate the K value for the groundwater-bearing substrata formation at the well screen depth interval.

The SWRT could not be performed on BH/MWs 2 and 4, due to the fact that these wells were heavily laden with silt, throughout the monitoring period. The K test estimate results are provided in Appendix 'B', with a summary of the results provided in Table 6-2.

3.5 Groundwater Quality Assessment

The monitoring well at BH/MW 4 underwent sampling for groundwater quality analysis to characterize its quality for evaluation against the City of Toronto Storm and Sanitary Sewer Use By-Law parameters. This was performed to assess whether any anticipated dewatering effluent from construction can be disposed of into the City of Toronto sewer systems, or following site development, from any anticipated long-term foundation drainage. Based on the results, recommendations for any pre-treatment of any dewatering or drainage effluent can be developed, if required.

BH/MW 4 was developed and purged of at least 3 well casing volumes of groundwater prior to sample collection. In accordance with City of Toronto Storm and Sanitary Sewer use by-law sampling protocols, one entire set of groundwater samples was not field filtered prior to placement in the laboratory sample bottles, while a second set of samples that were collected underwent filtration in the laboratory for metals and phosphorus parameter analysis. This was performed to provide a basis of comparison between the unfiltered and filtered groundwater sample for metals and total phosphorous (TP) analysis to assess potential sources for any elevated metals and phosphorous from the analysis of unfiltered groundwater. Upon sampling, all of the bottles were placed in ice and packed in a cooler at about 4^0 C for shipment to the analytical laboratory. Sample analysis was performed by SGS Environmental Services, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).

Results of the water quality analysis are provided in Appendix 'C', with a discussion of the findings and evaluation provided in Section 7.5.

3.6 Review Summary of Concurrent Report

The following reports prepared by SEL were reviewed in preparation of this hydrogeological study:

"A Report to Paradise Developments Heron's Hill Inc., a Geotechnical Investigation for Proposed Mixed Use Building, 1 Heron's Hill Way City of Toronto" Reference No., 1908-S037, dated November 2019.

4.0 REGIONAL AND LOCAL SETTING

4.1 Regional Geology

The subject site lies within the physiographic region of Southern Ontario known as the Peel Plain where bevelled till is the dominant shallow physiographic feature. The Peel Plain is a level-to-undulating tract of silt and clay rich native soil covering an area of about 780 km^2 across the central portions of the Regional Municipalities of York, Peel, and Halton. In general, the ground surface elevation ranges from 150 to 230 masl. The area exhibits a gradual and fairly uniform downward slope towards Lake Ontario. The underlying native geological material for the Peel Plain is a till unit, containing significant amounts of shale and limestone. For most parts of the Peel Plain, the native mineral soil has been modified by a veneer of clay. The deeper clay deposits are clearly seen to be varved on occasion. There are widespread beds of stone less clay, overlying the till, while in some areas, the clay beds are deep and thick enough to preserve some of the un-weathered stratified clay (Chapman and Putnam, 1984).

The surface geological map of Ontario shows that the subject site is located on Halton Till, consisting predominantly of silt to silty clay matrix, high in calcium carbonate content being clast-poor. Drawing No. 4, reproduced from Ontario Geological Survey (OGS) mapping, illustrates the quaternary surface soil geology for the site and surrounding area.

The bedrock underlying the site is comprised mainly of Upper Ordovician aged shale, limestone, dolostone and siltstone of the Georgian Bay Formation, the Blue Mountain Formation, the Billings Formation, the Collingwood Member and the Eastview Member (Ontario Ministry of Northern Department and Mines, 1991). The approximate elevation for the top of the bedrock is at approximately 106.38 masl, which is about 68.82 to 69.42 m below the existing grades on site.

4.2 Physical Topography

A review of the topography shows that the subject site is relatively flat exhibiting a minor decline in elevation relief towards to the east perimeter of the site. Runoff from the site is expected to drain towards the east. Based on the topographic map, and from the review of the ground surface elevations at borehole and monitoring well locations, the elevation relief across the subject site is about 2.80 m. Drawing No. 5 shows the mapped topographical contours for the site and surrounding area.

4.3 **Watershed Setting**

The subject site is located within the Lower East Don sub-watershed portion of the Don River watershed. The Don River watershed occupies an area of approximately 358 square kilometers, which is large compare to the other watersheds within the Greater Toronto Area. The headwaters of the Don River watershed begin within the areas defined as Oak Ridges Moraine and South Slope. The Don River watershed flows through the municipalities of Toronto, York, Markham, Richmond Hill and Vaughan. It consists of three principal tributaries which are known as the Main Don, West Don and East Don.

Urban development has changed the watershed drastically, with approximately 96% of the watershed area having been urbanized. These changes have caused serious degradation to the watershed. While development within the watershed continues, regulations enforced by the Toronto Region Conservation Authority (TRCA) have been put in place to ensure a more sustainable approach to watershed development with considerations for improving the water quality and natural habitat conditions within the watershed.

Drawing No. 6 shows the location of the subject site within the Watershed.

4.4 **Local Surface Water and Natural Features**

There are no records for any natural heritage features, or Areas of Natural and Scientific Interest (ANSI) on site or within close proximity of the subject site. Two wooded areas are located approximately 165 m to the north of, and 275 m west of the subject site. The locations of the site and the noted natural features are shown on Drawing No. 7.

5.0 **SOIL LITHOLOGY**

This study has disclosed that beneath a layer of pavers, granular fill, and earth fill, in places the native soils underlying the subject site consist of silt, silty sand till, sandy silt till, silty clay, sand, silty clay till, and sand and gravel. A Key Plan and the interpreted geological cross-sections along the delineated north to south, and east to west transects are presented on Drawing Nos. 8-1 and 8-2.

5.1 **Pavement** (BH/MWs 1 and 2)

The existing parking lot consists of pavement material comprised of interlocking stone pavers. The thickness of the pavement materials ranges from 0.2 to 1.0 m.

5.2 **Topsoil** (BH/MWs 3, 4, 5 and 6)

Topsoil, approximately 10 cm and 20 cm thick, was observed at the ground surface at all of the BH/MWs, except at BH/MWs 1 and 2.

5.3 **Earth Fill** (All BH/MWs)

Earth fill, approximately 0.9 to 3.1 m thick, was encountered at all of the borehole locations. It consists of sandy silt with occasional sand and gravel layers. Asphalt and brick construction debris were encountered in some boreholes at depths of 1.5 to 1.8 m.

5.4 **Silt** (BH/MWs 1 and 4)

Silt was encountered beneath the earth fill, at depths of 2.0 mbgs and 2.9 mbgs at BH/MWs 1 and 4, respectively. The silt is brown in colour, and loose to compact in consistency, having traces of clay, and occasional sand seams. The thickness of the silt at the BH/MW 1, location is about 2.0 m, and it is 2.6 m at the BH/MW ,4 location. The moisture content for the unit ranges from 14% to 24%, indicating moist conditions.

5.5 **Silty Clay** (BH/MWs 2, 3, 5 and 6)

Silty clay was encountered below the earth fill horizon, at depths ranging between 2.1 mbgs and 3.2 mbgs. The unit is brown in colour, being stiff to very stiff in consistency, and having occasional silt and sand seams and layers. The thickness of this unit ranges from 1.5 to 2.5 m.

The soil moisture content for this unit ranges from 12% to 25%, indicating moist conditions.

5.6 **Silty Sand Till** (All BH/MWs)

Silty sand till, was encountered at depths, ranging from 4.0 to 5.6 mbgs at all of the BH/MW locations. It is brown to grey in colour, is loose to very dense in consistency, having traces of clay and gravel, with occasional silt seams, and layers, and cobbles and boulders. The silty sand till changes from brown to grey at about 7.2 mbgs at BH/MW 1, and at 6.0 mbgs at the BH/MW 2, location. The thickness of the unit ranges from 5.0 to 14.0 m. Its soil moisture content ranged from 8-18%, indicating damp to moist conditions.

The estimated permeability for the silty sand till layer encountered at BH/MW 2, at a depth of 9.4 mbgs is about 10^{-6} m/sec, the estimated permeability for the silty sand till layer

encountered at BH/MW 4, at a depth of 9.4 mbgs is about 10^{-7} m/sec, estimated permeability for the silty sand till layer at BH/MW 5, at a depth of 15.5 mbgs is about 10^{-6} m/sec. Grain size analyses were performed on three (3) soil samples, and the soil gradation curves are plotted on Figure Nos. 7, 8 and 9.

5.7 **Sandy Silt Till** (BH/MWs 4, 5 and 6)

Sandy silt till, was encountered at depths, ranging from 16.2 to 29.1 mbgs at the BH/MWs 4, 5 and 6, locations. It is grey in colour, is compact to very dense in consistency, having traces of clay and gravel, with occasional sand seams, cobbles and boulders. The thickness of the unit ranges from 1.5 to 4.2 m, at the BH/MWs 4 and 5, locations, where it extends from a depth of 17.1 m to the maximum investigated depth of 21.4 m at the BH/MW 6 location. Its soil moisture contents ranged from 9-14%, indicating damp to moist conditions.

The estimated permeability for the sandy silt till layer at BH/MW 1, at a depth of 12.4 mbgs is about 10^{-7} m/sec. Grain size analysis was performed on one (1) soil sample, and the gradation curve is plotted on Figure No. 10.

5.8 **Silty Clay Till** (BH/MWs 1, 2, 3, 4 and 5)

Silty clay till, was encountered at depths ranging from between 12.8 to 20.4 mbgs at the BH/MWs 1, 2, 3, 4 and 5, locations. It is grey in colour, hard in consistency, having traces of gravel and occasional sand layers cobbles and boulders. It is approximately 15.1 m thick at the BH/MW 4 location, where it extends from depths ranging from 12.8 to 20.4 mbgs to the maximum investigated depths of 21.6 to 24.5 m at the BH/MWs 1, 2, 3 and 5, locations.

Its moisture content ranges from 8-23%, indicating damp to moist conditions.

5.9 **Sand** (BH/MWs 2 and 6)

Sand, approximately 3.6 to 13.1 m thick, was encountered at the BH/MWs 2 and 6, locations. The sand was encountered beneath the silty sand unit, at depths of 11.0 mbgs and 14.0 mbgs, at BH/MWs 2 and 5, respectively. The sand is grey in colour, being compact to very dense in consistency, with fine sand and some silt, clay, and gravel. The moisture content for the sand ranges from 9% to 18%, indicating damp to moist conditions.

The estimated permeability for the sand layer, encountered at BH/MW 6, at a depth of 14.0 mbgs is about 10^{-5} m/sec. A grain size analysis was performed on one (1) soil sample, and the gradation curve is plotted on Figure No. 11.

5.10 **Sand and Gravel** (BH/MW 4)

Sand and gravel, were encountered at the BH/MW 4, location, at a depth of 10 mbgs. It is grey, being dense to very dense in consistency, with some silt, and having a trace of clay. This unit is approximately 4 m thick.

The moisture content for the sand and gravel unit ranges from 12% to 14%, indicating damp conditions.

The estimated permeability for the sand and gravel layer encountered at BH/MW 4, at a depth of 12.4 mbgs is about 10^{-6} m/sec. A grain size analysis was performed on one (1) soil sample, and the gradation curve is plotted on Figure No. 12.

6.0 **GROUNDWATER STUDY**

6.1 **Review Summary of Concurrent Report**

A review of the findings from the previous geotechnical soil investigation report (SEL, Reference No. 1908-S037) has disclosed that beneath a topsoil veneer or pavement structure with granular fill and a layer of earth fill in places, the site is predominantly underlain by loose to dense sandy silt till and silty sand till, overlying hard silty clay till, with compact sand and silt layers extending to 30.6 m below existing grade.

6.2 **Review of Ontario Water Well Records**

The Ministry of Environment, Conservation, and Parks (MECP) water well records for the subject site and for the properties within a 500 m radius of the boundaries of the subject site (study area) were reviewed.

The records indicate that sixty-four (64) wells are located within the study area. The locations of these wells, based on the UTM coordinates provided by the records, are shown on Drawing No. 3. Details of the MECP water well records that were reviewed are provided in Appendix ‘A’.

A review of the final status of the well records within the study area reveals that eight (8) are registered as observation wells, twenty-seven (27) are registered as monitoring and test hole wells, six (6) are registered as dewatering wells, two (2) are registered as water supply wells, eight (8) are registered as abandoned-other wells, and thirteen (13) wells are registered as having unknown statuses.

A review of the first use of the well records within the study area reveals that thirty-four (34) are registered as monitoring and test hole wells, twenty-one (21) are registered as having unknown statuses, five (5) were registered as dewatering wells, one (1) is registered as a domestic well, one (1) is registered as a commercial well, and two (2) wells are registered as not being used.

6.3 **Groundwater Monitoring**

The groundwater levels in the monitoring wells were measured on six occasions over the study period, on the following dates; August 28, September 12, 25, October 9, 24, and

November 4, 2019, to record the fluctuation of the shallow groundwater table beneath the site. The groundwater levels and their corresponding elevations are given in Table 6-1.

Table 6-1 - Groundwater Level Measurements

Well ID		Aug-28-19	Sept-12-19	Sept-25-19	Oct-9-19	Oct-24-19	Nov- 4-19	Average Elevation	Fluctuation (m)
	mbgs	9.95	14.17	13.47	14.05	14.05	15.64	13.56	
BH/MW 1	masl	165.25	161.03	161.73	161.15	161.15	159.56	161.65	5.69
	mbgs	11.73	15.74	15.67	15.64	15.67	13.94	14.73	
BH/MW 2	masl	163.47	159.46	159.53	159.56	159.53	161.26	160.47	4.01
	mbgs	9.60	14.09	14.05	13.90	13.75	13.37	13.13	
BH/MW 3	masl	165.60	161.11	161.15	161.30	161.45	161.83	162.07	4.49
	mbgs	17.50	17.67	17.65	17.65	17.70	17.65	17.64	
BH/MW 4	masl	157.80	157.63	157.65	157.65	157.60	157.65	157.66	0.20
	mbgs	15.38	15.94	15.88	15.88	15.88	15.78	15.79	
BH/MW 5	masl	159.82	159.26	159.32	159.32	159.32	159.42	159.41	0.56
	mbgs	16.47	17.87	17.87	17.96	17.99	18.00	17.69	
BH/MW 6	masl	159.33	157.93	157.93	157.84	157.81	157.80	158.11	1.53

Notes: mbgs -- metres below ground surface masl -- metres above sea level

As shown above, in Table 6-1, the groundwater levels at BH/MW 1 fluctuated, where they decreased between August 28, and September 12, 2019, they increased again between September 12, and 25, 2019, they decreased between September 25, and October 9, 2019, it stabilized between October 9, to October 24, 2019, and again decreased between October 24, and November 4, 2019.

The groundwater levels at BH/MW 2 fluctuated, where they decreased between August 28, and September 12, 2019, increased again between September 12, and October 9, 2019, decreased again between October 9, and October 24, 2019, and again increased between October 24, and November 4, 2019.

The groundwater levels at BH/MW 3 fluctuated, where they decreased between August 28, and September 12, 2019, and exhibiting an increasing trend throughout the remainder of the monitoring period.

The groundwater levels at BH/MW 4 fluctuated, where they decreased between August 28, and September 12, 2019, it increased between September 12, and 25, 2019, and stabilized between September 12, and October 24, 2019, it again increased between October 24, and November 4, 2019.

The groundwater levels at BH/MW 5 fluctuated, where they decreased between August 28, and September 12, 2019, increased again between September 12, and 25, 2019, stabilized between September 25, and October 24, 2019, and again increased between October 24, and November 4, 2019.

The groundwater levels at BH/MW 6 fluctuated, where they decreased between August 28, and September 12, 2019, stabilized, between September 12, and September 25, 2019, and afterwards, exhibited a decreasing trend throughout the remainder of the monitoring period.

The greatest fluctuation was observed at BH/MW 1, where the groundwater level increased by 5.69 m during the monitoring period.

6.4 **Shallow Groundwater Flow Pattern**

The shallow groundwater flow pattern beneath the site was interpreted from the average of groundwater level measurements recorded at all of the BH/MWs locations. The recorded measured groundwater levels indicate that shallow groundwater flows in southerly, southeasterly, and easterly directions from an interpreted localized groundwater high area within the northeastern portion of the site. The interpreted shallow groundwater flow pattern for the subject site is illustrated on Drawing No. 9.

6.5 **Single Well Response Test Analysis**

All of the BH/MWs except BH/MWs 1 and 4, underwent single well response testing (SWRT), to estimate the hydraulic conductivity (K) for saturated shallow aquifer sub-soils at

the depths of the well screens. BH/MWs 2 and 4, were unable to undergo the SWRT K testing due to the high levels of silt encountered within the well screen intervals within these monitoring wells. The results of the SWRTs are presented in Appendix 'B', with a summary of the findings shown in Table 6-2.

Table 6-2 - Summary of SWRTs Results

Well ID	Ground El. (masl)	Monitoring Well Depth (mbgs)	Borehole Depth (mbgs)	Well Screen Interval (mbgs)	Screened Subsoil Strata	Hydraulic Conductivity (K) (m/sec)
BH/MW 1	175.2	24.4	24.5	21.4 – 24.4	Silty Clay Till	1.1×10^{-8}
BH/MW 3	175.2	21.8	21.8	18.3 – 21.3	Silty Sand Till, Silty Clay Till	9.7×10^{-9}
BH/MW 5	175.2	21.6	21.6	18.3 – 21.3	Sandy Silt Till, Silty Clay Till	1.2×10^{-7}
BH/MW 6	175.8	21.4	21.4	18.3 – 21.3	Sandy Silt Till	7.8×10^{-7}

Notes: mbgs -- metres below ground surface masl -- metres above sea level

As shown in Table 6-2, the K estimate for the silty clay unit is at 1.1×10^{-8} m/sec, the K estimates for the silty sand till and silty clay till units is 9.7×10^{-9} m/sec, the K estimate for the sandy silt till, and silty clay unit, is 1.2×10^{-7} m/sec., and the K estimates for the sandy silt till unit is 7.8×10^{-7} m/sec. The above results suggest that a low hydraulic conductivity for the groundwater-bearing subsoils at the depths of the well screen is low, with corresponding low anticipated groundwater seepage rates into open excavations, below the water table.

6.6 Assessment of Hydraulic Conductivity Based on the Hazen Equation

The Hazen Equation method was also adopted to estimate the hydraulic conductivity (K) for different subsoil layers which may contain groundwater during the high-water table spring season. These layers are primarily above the well screen depths.

The Hazen equation relies on the interrelationship between hydraulic conductivity and effective grain size, d_{10}, in the soil media. This empirical relation predicts a power-law relation with K, as follows:

$$K = Ad_{10}^2$$

where;

- d_{10}: Value of the soil grain size gradation curve as determined by sieve analysis whereby 10% by weight of the soil particles are finer and 90% by weight of the soil particles are coarser.
- A: Coefficient; it is equal to 1 when K in cm/sec and d_{10} is in mm

The Hazen Equation estimation method provides an indication of the yield capacity for groundwater-bearing sub-soil strata at the depths where the soil samples that underwent grain size analyses were collected. The calculated results indicate that the K estimate for the silty sand till, ranges from 6.4 x 10^{-6} to 7.29 x 10^{-8} m/sec; the K estimate for the sandy silty till, retrieved from a depth of 12.4 mbgs at BH/MW 1 is 1.94 x 10^{-7} m/sec., and for the sand and gravel unit, retrieved from a depth of 12.4 mbgs at BH/MW 4 it is 1.69 x 10^{-5} m/sec. The K estimate determined from the Hazen method suggests low to moderate hydraulic conductivities (K) for the shallow sub-soil and for any encountered shallow perched groundwater found beneath the subject site.

Table 6-3 - Summary of Hazen Equation Estimated K Results

Well ID	Sample Depth (mbgs)	Sample El. (masl)	Description of Soil Strata	$D_{10\ (mm)}$	Hydraulic Conductivity (K) Estimates (m/sec)
BH/MW 1	12.4	162.8	Sandy Silt Till, some gravel, a trace of clay	0.0044	1.94×10^{-7}
BH/MW 2	9.4	165.8	Silty Sand Till, traces of clay and gravel	0.014	1.96×10^{-6}
BH/MW 4	9.4	165.9	Silty Sand Till, traces of clay and gravel	0.0027	7.29×10^{-8}
BH/MW 4	12.4	162.9	Sand and Gravel, some silt, a trace of clay	0.013	1.69×10^{-6}
BH/MW 5	15.5	159.7	Silty Sand Till, some gravel, a trace of clay	0.008	6.4×10^{-7}

Notes: mbgs -- metres below ground surface masl -- metres above sea level

7.0 GROUNDWATER CONTROL

The hydraulic conductivity (K) estimates for the sand, silty clay, sandy silt, silty clay, silty clay till, and shale bedrock, suggest that groundwater seepage rates into open excavations below the groundwater table will low. To provide safe, dry and stable conditions for earthworks excavations for construction of the proposed 1-level underground parking structures, the groundwater table should be lowered in advance of, or, during construction. The preliminary estimates for construction dewatering flows required to locally lower the water table, based on the K test estimates, are discussed in the following sections.

7.1 Groundwater Construction Dewatering Rates

The proposed development plans, provided by Graziani and Corazza Architects Inc., dated March 17, 2020, indicate that it is planned to construct a thirty-nine (39) storey, mixed-use building, having 4-levels of above ground parking facilities, and a 1-level underground parking structure. The proposed development footprint encompasses an area of approximately 3,318 square meters.

Thirty-Nine (39) Storey Mixed Use Building Construction – 1-Level Underground Parking Structure (95.51 m x 34.74 m) with an Estimated Finished Floor Elevation of approximately 171.2 masl:

For the proposed thirty-nine (39) storey mixed-use building, for the preliminary construction dewatering flow calculations, the estimated area of excavation for the 1-level underground parking structure is approximately 3,318 square meters which is approximately 95.51 m long by 34.74 m wide, having a perimeter of approximately 260.50 m, with a site grade elevation of approximately 175.2 masl.

An excavation depth of approximately 4.0 m beneath the finished floor elevation, was indicated for the proposed depth of the underground parking structure. The approximate underground structure floor elevation was therefore considered at 171.2 masl. An additional excavation depth of 0.6 m (El. 170.6 masl) was considered to accommodate the proposed underground parking level structure and footings which were considered for this dewatering need assessment.

To facilitate excavation and construction in dry and stable subsoil conditions, it is proposed that the shallow groundwater table be lowered to an elevation of 169.6 masl, which is about 1 m below the lowest considered excavation depth. The subsoil comprises topsoil, earth fill, silty and silty clay, extending to the maximum proposed depths for excavation. Comparison of the lowest proposed excavation depths with the highest measured shallow groundwater level indicates that the lowest proposed excavation depth is about 5.0 m below the highest measured shallow groundwater level elevation of 165.60 masl, as recorded at the BH/MW 3 location. As such, it is not anticipated that construction dewatering will be required for groundwater control to lower the groundwater table to facilitate earthworks and construction of the proposed underground parking structures at the proposed development, including installation of associated underground services, other than the need for potential removal of any accumulated runoff within the excavation, footprint following heavy rainfall events.

Installation of Elevator Pit:

An excavation depth of approximately 1.525 m (El. 169.68 masl) beneath the proposed elevation of the underground parking structure was considered for the proposed elevator pit construction. The lowest proposed excavation depth elevation of 169.68 masl was considered for the dewatering assessment estimation to accommodate the elevator pit structure. The subsoil at this depth is comprised of granular fill, earth fill, silty sand till, silty clay, and silt extending to the proposed excavation depths. Comparison of the lowest proposed excavation depth with the anticipated highest measured water level of 165.60 masl, as measured at the BH/MW 3 location, indicates that the proposed elevation for the elevator pit footing is about 4.08 m above the highest shallow groundwater level. As such, it is not anticipated that construction dewatering will be required for groundwater control for the installation of the proposed elevator pit footings, other than the potential need to remove any accumulated runoff within the excavation footprints for the elevator pit following heavy rainfall events.

7.2 Management of Runoff Accumulation During Construction

The anticipated runoff volume that could accumulate in the excavation (s) was calculated by using the Intensity-Duration-Frequency (IDF) curve for the year 2010 with a 100-yr return period for Station ID 43.770833-79.337500 which is adjacent to the site. The data was taken from the Ministry of Transportation (MTO) website. A maximum rainfall depth of 124.4 mm was used for a rainfall storm event having a duration of 24 hours. The accumulated runoff within the excavation for the proposed underground parking structure, having an estimated area of 3,318 square meters, was calculated using the maximum storm event rainfall depth from above, multiplied by the estimated area for the construction excavation i.e.

Maximum rainfall depth; 124.4 mm (0.1244 m)
Surface area for proposed excavation; 3,318 m^2
Accumulated rainfall runoff for a 100-year return period = (0.1244 m *3,318 square meters) = 412.76 m^3/day (412,760 litres/day).

The anticipated runoff volume was calculated at 412,760 liters per day. Any temporary dewatering system should be designed for the removal of the maximum expected runoff accumulation rate.

During construction, the runoff from this proposed development area could be discharged into the municipal storm sewer, or alternatively managed on site at an infiltration gallery or

holding tank. It is recommended that any retained runoff undergo filtration such that it meets the City of Toronto Storm Sewer Use By-law disposal standards for Total Suspended Solids (TSS) prior to its disposal discharge to the same.

7.3 Permanent Drainage for Proposed Underground Structures

Based on review of the proposed development plans for the construction of the proposed building, the shallow groundwater level is approximately 5.0 m below the proposed elevation for the underground parking level foundation footings and 4.08 m below the proposed elevator pit structure. As such there will be no anticipated permanent foundation drainage from groundwater seepage to the proposed underground parking and elevator pit structures.

7.4 Management of Potential Foundation Drainage Runoff

The anticipated runoff volume that could accumulate in the excavation (s) was calculated by using the Intensity-Duration-Frequency (IDF) curve for the year 2010 with a 100-yr return period for Station ID 43.770833 -79.337500 which is adjacent to the site. The data was taken from the Ministry of Transportation (MTO) website. A maximum rainfall depth of 124.4 mm was used for a rainfall storm event having a duration of 24 hours. The accumulated runoff within the drainage network for the proposed underground parking structure foundation drainage weeper network, having an estimated area of 81.84 square meters, was calculated using the maximum storm event rainfall depth multiplied by the estimated drainage weeper area, multiplied by the porosity of the soil i.e.

Maximum rainfall depth; 124.4 mm (0.1244 m)
Surface area for footing drainage weeper tiles; 81.84 m^2
Porosity of Soil (Silty clay /Silt)-0.20
Accumulated rainfall runoff for a 100-year return period = (0.1244 m *81.84 square meters * 0.20) = 2.036 m^3/day (2,036 litres/day).

The anticipated drainage volume was calculated at 2,036 liters per day for a standard perimeter foundation weeper drainage system. With a safety factor of three (3) applied to the estimate, it could reach to a maximum of 6,108 litres per day. The pumping facility and sump systems connected to the foundation drainage system should be designed for the maximum expected drainage flow rate. The drainage piping should be properly constructed, using weepers surrounded by filter cloth, in turn surrounded by bedding stone or concrete sand to minimize loss of fines and to prevent silt clogging of weeper tiles.

The runoff from this proposed development area can be discharged into the municipal storm sewer, or alternatively managed on site at an infiltration gallery or holding tank. It should be noted that should any foundation drainage system be connected to the municipal sewer system, a city issued permit will be required in accordance with City of Toronto By-Laws. It is recommended that any retained runoff undergo filtration such that it meets the City of Toronto Storm Sewer Use By-law disposal standards for Total Suspended Solids (TSS) prior to its disposal discharge to the same.

7.5 **Groundwater Quality**

One (1) groundwater sample was collected for analysis from the monitoring well at BH/MW 4, on November 4, 2019, using a dedicated sampling bailer. The monitoring well was purged of three well casing volumes of groundwater prior to sample collection. Upon sampling, all of the sample bottles were placed in ice and packed in a cooler, at about 4^{o} C for shipment to the analytical laboratory. The groundwater sample was submitted for analysis and evaluation against the City of Toronto storm and sanitary sewer use by-law parameters. Sample analysis was performed by SGS Environmental Services, which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Results of the analysis are provided in Appendix 'C', with a discussion of the findings provided below.

As per the protocol for City of Toronto storm and sanitary sewer use, a full set of collected samples consisted of unfiltered groundwater which were submitted for analysis, with results presented as totals for various parameters analyzed. A second set of select samples underwent field filtration during collection, prior to analyses for Metals and Total Phosphorous. This was performed in order to evaluate the sources of any potentially elevated Metals and Phosphorous in a dissolved form, indicated from the results of the total analysis (unfiltered samples). The chain of custody number for the submitted samples that underwent analysis is 011792 (SGS Group). The analytical results for the unfiltered groundwater, show several exceedances of the City of Toronto Storm and Sanitary Sewer Use By-Law parameters.

The exceedances, together with the storm and sanitary sewer use standards, are presented in Table 7-2.

Table 7-2 - Groundwater Quality Exceedances Results (Unfiltered-Groundwater)

Parameter	Groundwater Quality Results (Unfiltered Groundwater) (mg/L) BH/MW 4	City of Toronto Storm Sewer Use Limits (mg/L)	City of Toronto Sanitary Sewer Use Limits (mg/L)	Comments
Total Suspended Solids (TSS)	57	15	350	Exceeds Storm; meets Sanitary Sewer Use
Chloroform	0.0041	0.002	0.04	Exceeds Storm; meets Sanitary Sewer Use

As shown above, the results of analysis for the unfiltered groundwater obtained from BH/MW 4 indicates that the concentrations for all of the measured parameters are within the City of Toronto sanitary sewer use limits, and the concentrations for Total Suspended Solids and Chloroform, exceed the City of Toronto storm sewer use limits. The results suggest that short-term construction dewatering effluent and effluent from any long-term foundation drainage should be acceptable for disposal to the City of Toronto Storm Sewer with minimal pre-treatment being implemented to lower TSS and Chloroform to acceptable disposal standards. The results suggest that short-term construction dewatering effluent and any long-term foundation drainage effluent should be acceptable for disposal to the City of Toronto Sanitary Sewer use limits, with no anticipated pretreatment being required.

A review of the results for the filtered groundwater sample indicates that all of the tested parameters for dissolved metals and phosphorus, also meet the Storm Sewer Use limits.

The results suggest that if there is any short-term construction dewatering effluent and/or any long-term foundation drainage effluent, the effluent should be acceptable for disposal to the City of Toronto sanitary sewer. The anticipated drainage effluent from both sources would not be acceptable for disposal to the City of Toronto Storm Sewer System; however, implementing minor pre-treatment to lower TSS and Chloroform to meet City of Toronto Storm Sewer Use limits should permit disposal of the effluent to the City's Storm Sewer.

A foundation drainage system designed to minimize TSS and Chloroform should result in the effluent being acceptable for disposal to the City's storm sewer system.

The final design for any construction dewatering effluent pre-treatment system will be the responsibility of the contractors responsible for construction. The final design for any long-term foundation drainage system effluent pre-treatment, will be the responsibility of the mechanical engineer, or the associated water treatment specialists responsible for the design for the long-term foundation drainage pretreatment system.

It should be noted that the above groundwater quality from above would not be representative of runoff quality generated onsite following a storm event, as groundwater control during construction and for any long-term foundation drainage is not anticipated.

7.6 Groundwater Function of the Subject Site

The subject site is located within an existing developed residential and commercial area. Two wooded areas are located approximately 165 m to the north and 275 m west of the subject site. There are no natural features, such as watercourses, bodies of water, wetlands or any other groundwater receptors, including water supply wells on site or within close proximity of the subject site.

Since the shallow groundwater elevation is lower than the proposed 1-level underground parking foundation structures, there will be no anticipated construction dewatering need, and no associated potential impacts on shallow groundwater or associated nearby groundwater receptors from the proposed development.

7.7 Low Impact Development

The subsoil beneath the site consists, predominantly of earth fill, underlain by silt, silty sand till, silty clay, silty clay till, silt, sand, and sand and gravel. Opportunities may exist to infiltrate collected runoff to the subsurface at the developed site, using appropriate Low Impact Development Infrastructure, such as infiltration galleries or underground storage/exfiltration tanks.

The groundwater lies at depths, ranging between 9.60 to 18.0 m below the ground surface. Potential LID infrastructure could be implemented in areas where the shallow groundwater is deeper than 1 m below the ground surface, and where it is possible to maintain a minimum of a 1 m separation between the base of any proposed LID stormwater management infiltration infrastructure and the high groundwater table. Any proposed LID infrastructure should be designed by the stormwater engineer for the project.

8.0 CONCLUSIONS

1. The subject site lies within the physiographic region of Southern Ontario known as the Peel Plain which is underlain by the Halton Till native soil deposits, consisting predominantly of silt to silty clay, high in matrix calcium carbonate content, considered as being clast-poor.

2. The subject site is located within Lower East Don River subwatershed of the Don River Watershed.
3. A review of the local topography shows that the site is relatively flat, exhibiting a minor decline in elevation relief towards its eastern limits.
4. The study has disclosed that beneath the existing layer of pavers, granular fill, and earth fill, the native soils underlying the subject site consists of silt, silty sand till, sandy silt till, silty clay, sand, silty clay till, and sand and gravel.
5. The findings of this study confirm that the groundwater level elevations beneath the site, ranges from 165.60 to 157.80 masl (i.e. 9.60 to 18.0 m below ground surface).
6. A review of the average of the groundwater elevations suggests that shallow groundwater flows in southerly, easterly, and south-easterly directions.
7. The single well response test results provided an estimated hydraulic conductivity (K) estimate of 1.1×10^{-8} m/sec for the silty clay unit, the K estimate for the silty sand till and silty clay till units is 9.7×10^{-9} m/sec, the K estimate for the sandy silt till, and silty clay unit, is at 1.2×10^{-7} m/sec, and the K estimate for the sandy silt till unit is 7.8×10^{-7} m/sec., at the depths of the well screens. This result suggests that low shallow groundwater seepage rates can be anticipated into open excavations below the water table.
8. The Hazen Equation calculated permeability results indicates that the hydraulic conductivity (K) estimates for the silty sand till, ranges from 6.4×10^{-6} to 7.29×10^{-8} m/sec; the K estimate for the sandy silty till, is at about 1.94×10^{-7} m/sec., and for the sand and gravel unit, it is about 1.69×10^{-5} m/sec. The K estimates determined from the Hazen method suggests low to moderate hydraulic conductivities for the shallow subsoil units beneath the site.
9. The groundwater at the site is approximately 5.0 m below the proposed elevation for the base of the underground parking foundation footings, and is 4.08 m below the proposed elevator pit structure. It is therefore not anticipated that construction dewatering will be required for groundwater control for earthworks and construction of the proposed development, including installation of any associated underground services.
10. Accumulated storm runoff within earthworks excavation from storm event precipitation associated with this development is estimated to be approximately 412,760 L/day. The runoff from the proposed development area can be directed for discharge into the adjacent building's foundation drainage/sump network, which, in turn could be directed for disposal discharge building the municipal storm sewer. However, given that the existing site is included as part of the development application, the city may require a discharge permit for the existing structure even for short-term storm related drainage.

11. There is no anticipated long-term permanent foundation drainage from groundwater seepage for the proposed underground parking structure or elevator pit structures. However, potential drainage associated with shallow runoff related seepage from storm event precipitation associated with this development is estimated to be approximately 2,036 litres/day; by applying a safety factor of three, the runoff could reach a maximum of 6,108 litres/day. The runoff from the proposed development area can be directed for discharge into the building foundation drainage/sump network, for disposal discharge into the municipal storm sewer.
12. Dewatering effluent from any short-term construction dewatering or from any long-term foundation drainage is acceptable for disposal to the City of Toronto sanitary sewer. For disposal to the storm sewer, the effluent will require pre-treatment to lower levels of total suspended solids and chloroform. Any short-term dewatering may be associated with seepage of any perched groundwater encountered within excavations, or from the removal of the accumulated runoff from within the excavation following storm events. It is anticipated that there may be limited construction dewatering needs following storm events during excavation works. However, any groundwater seepage within excavations will likely dissipate relatively quickly after the earthworks commence. The option also exists to pump any accumulated runoff from excavations to a temporary holding tank, for later removal off site using licensed carriers and to not direct any of the runoff effluent to the city sewer system.

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March 25, 2020

9.0 REFERENCES

1. The Physiography of Southern Ontario (Third Edition), L. J. Chapman and D. F. Putnam, 1984.

2. Bedrock Geology of Ontario, 1993, Data set 6, Ministry of Northern Development

3. D.P. Rogers, R.C. Ostry and P.F. Karrow, 1961, Metropolitan Toronto Bedrock Contours, Ontario Department of Mines, Preliminary Map 102.

4. Don River, 2018, Toronto Region Conservation Authority.

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FIGURES 1 to 6

MONITORING WELL LOGS

REFERENCE NO. 1908-W037

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

□ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 14, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) / Shear Strength (kN/m²) / Penetration Resistance (blows/30 cm)	Atterberg Limits PL LL / Moisture Content (%)	WATER LEVEL
175.2	Ground Surface							
0.0	**INTERLOCKING STONE OVER GRANULAR FILL**	1	DO	-	0			
0.1 / 0.3	**EARTH FILL** grey sandy silt with occ. sand and gravel layers	2	DO	27	1		12	
		3	DO	50/8			8	
173.2	asphalt debris at 1.5 m				2			
2.0	Brown, compact	4	DO	10			22	
	SILT				3		19	
	a trace of clay occ. sand seams	5	DO	17				
171.2					4			
4.0	Comapct to dense						14	
	SILTY SAND TILL	6	DO	12	5			
	traces of clay and gravel occ. silt seams and layers				6		12	
		7	DO	31				
	brown / grey				7			
		8	DO	16	8		11	
					9		10	
		9	DO	23				
					10			
		10	DO	33	11		8	
					12			
		11	DO	31			8	
162.4								
12.8	Grey, hard				13			
	SILTY CLAY TILL	12	DO	44	14		11	
	low plasticity a trace of gravel occ. sand layers below 18 m				15			
		13	DO	38			12	
					16			
		14	DO	44	17		15	
157.2					18			

Soil Engineers Ltd.

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 1

FIGURE NO.: 1

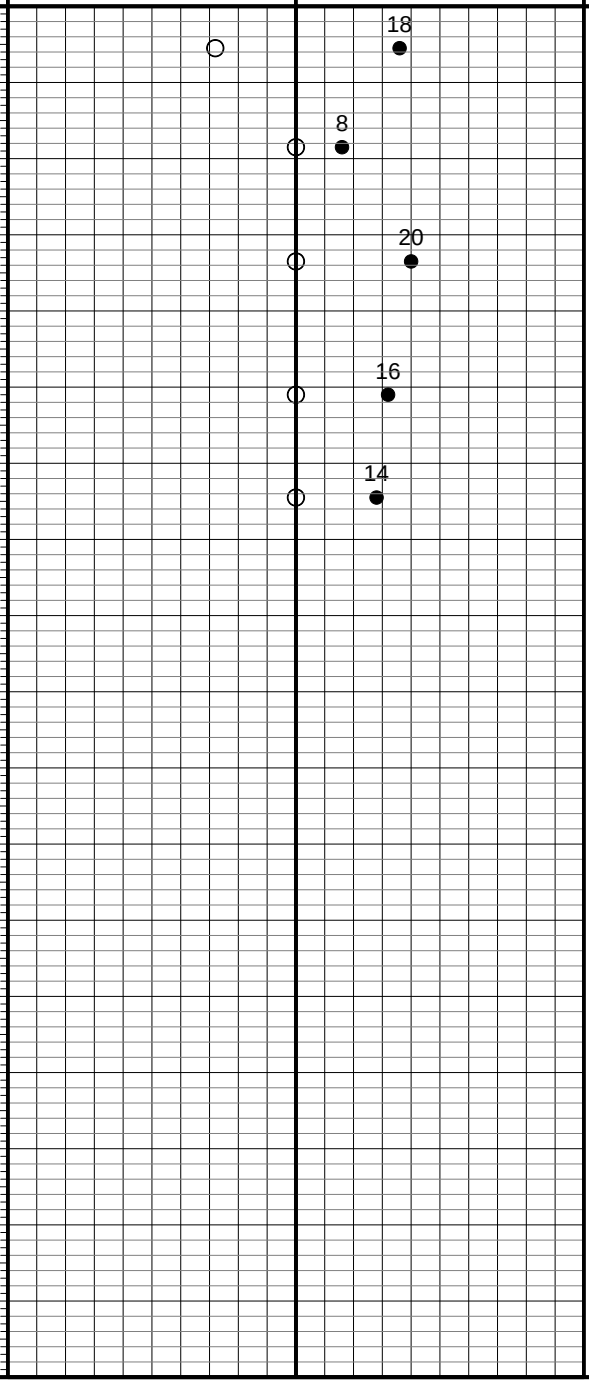
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 14, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
18.0	Grey, hard				18
	SILTY CLAY TILL	15	DO	72	19
	low plasticity a trace of gravel occ. sand layers below 18 m	~~16~~	~~DO~~	~~50/8~~	20
		~~17~~	~~DO~~	~~50/3~~	21
		18	DO	86/23	22
150.7		~~19~~	~~DO~~	~~50/10~~	23
24.5	**END OF BOREHOLE**				24
	Installed 50 mm Ø monitoring well to 24.4 m completed with 3.1 m screen Sand backfill from 20.7 to 24.4 m Bentonite seal from 0.0 to 20.7 m Provided with a monument steel casing				25
					26
					27
					28
					29
					30
					31
					32
					33
					34
					35
					36



WATER LEVEL

Ground Water Elevations:
W.L. @ El. 165.25 m on August 28, 2019
W.L. @ El. 161.03 m on September 12, 2019
W.L. @ El. 161.73 m on September 25, 2019
W.L. @ El. 161.15 m on October 9, 2019
W.L. @ El. 161.15 m on October 24, 2019
W.L. @ El. 159.56 m on November 4, 2019

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20-21, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
175.2	Ground Surface				
0.0 / 0.1	**INTERLOCKING STONE OVER GRANULAR FILL**	1	DO	36	0
		2	DO	23	1
1.2	**EARTH FILL** brown sandy silt occ. sand and gravel pockets	3	DO	50/5	
173.1 / 2.1	Brown, stiff	4	DO	9	2
	SILTY CLAY occ. silt and sand seams and layers	5	DO	9	3
		6	DO	11	4
170.6 / 4.6	Compact to dense	7	DO	13	5
	SILTY SAND TILL traces of clay and gravel — — brown / grey occ. silt seams, cobbles and boulders	8	DO	23	6
		9	DO	34	8
		10	DO	25	9
164.2 / 11.0	Grey, compact to very dense	11	DO	63/25	11
	SAND fine grained silty a trace of clay occ. silt seams and layers	12	DO	26	12
		13	DO	81/25	14
160.6 / 14.6	Grey, hard				
	SILTY CLAY TILL some sand and gravel occ. cobbles and boulders	14	DO	60	15
		15	DO	48	17
157.2					18

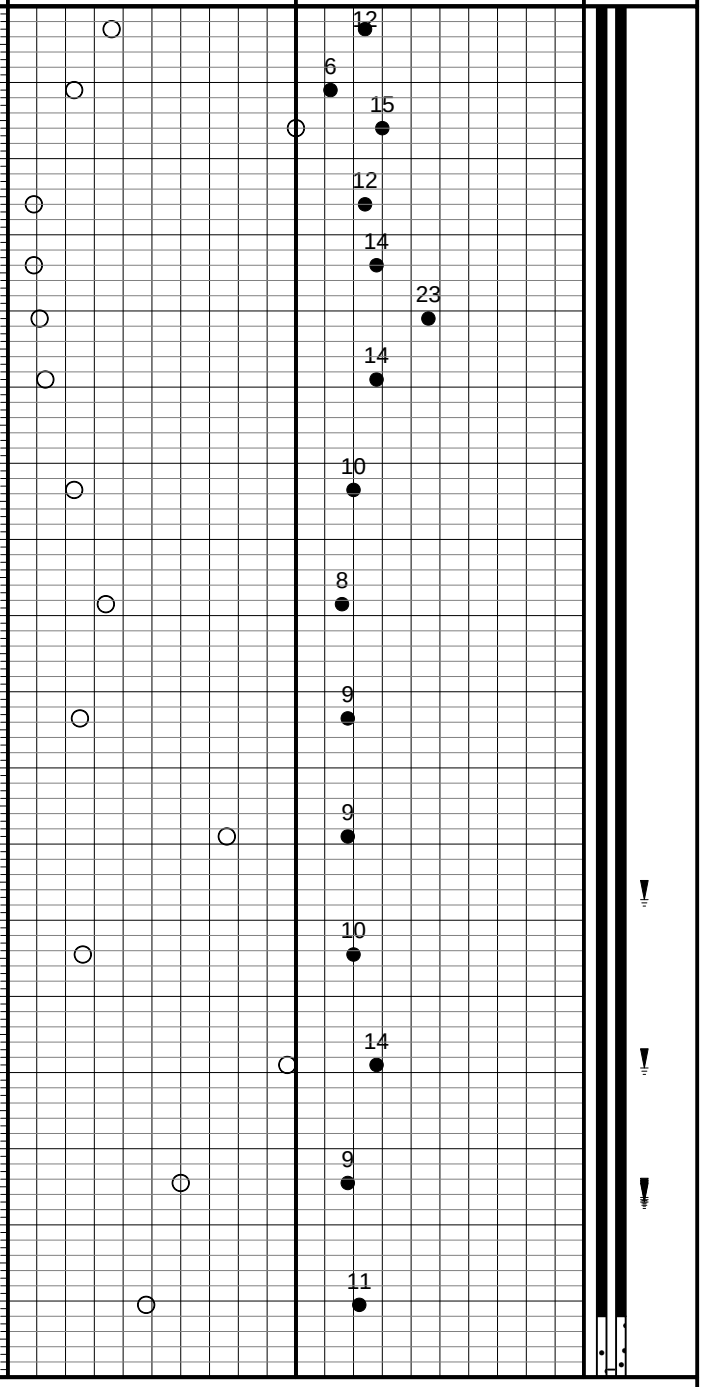
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20-21, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
18.0	Grey, hard				18			
	SILTY CLAY TILL	16	DO	77	19		15	
	some sand and gravel occ. cobbles and boulders							
		17	DO	50/13	20		9	
					21			
153.4		18	DO	58			16	
21.8	**END OF BOREHOLE**				22			
	Installed 50 mm Ø monitoring well to 20.9 m completed with 3.1 m screen Sand backfill from 17.2 to 20.9 m Bentonite seal from 0.0 to 17.2 m Provided with a monument steel casing				23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
	Ground Water Elevations: W.L. @ El. 163.47 m on August 28, 2019 W.L. @ El. 159.46 m on September 12, 2019 W.L. @ El. 159.53 m on September 25, 2019 W.L. @ El. 159.56 m on October 9, 2019 W.L. @ El. 159.53 m on October 24, 2019 W.L. @ El. 161.26 m on November 4, 2019				34			
					35			
					36			

Soil Engineers Ltd.

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20-21, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
175.2	Ground Surface							
0.0	**10 cm TOPSOIL**				0			
0.1	**EARTH FILL** dark brown to grey sandy silt with some clay occ. topsoil and rootlet inclusions	1	DO	15			8	
		2	DO	9	1		11	
		3	DO	7	2		11	
172.5		4	DO	9			21	
2.7	Brown, stiff to very stiff **SILTY CLAY** occ. silt seams and layers	5	DO	13	3		19	
					4			
170.0		6	DO	20	5		17	
5.2	Grey, compact to very dense **SILTY SAND TILL** traces of clay and gravel occ. silt seams, cobbles and boulders	7	DO	27	6		11	
					7			
		8	DO	29	8		11	
		9	DO	17	9		10	
		10	DO	10	10		13	
		11	DO	18	11		11	
		12	DO	11	12		8	
		13	DO	32	13		8	
		14	DO	50/15	14		11	
157.2					15			
					16			
					17			
					18			

Soil Engineers Ltd.

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20-21, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
18.0	Grey, very dense				18			
	SILTY SAND TILL	15	DO	50/15			12	
	traces of clay and gravel				19			
156.0	occ. silt seams, cobbles and boulders							
19.2	Grey, hard							
	SILTY CLAY TILL	16	DO	76	20		14	
	a trace of gravel							
	occ. sand seams, cobbles and boulders				21			
153.4		17	DO	61			16	
21.8	**END OF BOREHOLE**				22			
	Installed 50 mm Ø monitoring well to 21.3 m completed with 3.1 m screen Sand backfill from 17.7 to 21.3 m Bentonite seal from 0.0 to 17.7 m Provided with a monument steel casing				23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
	Ground Water Elevations: W.L. @ El. 170.24 m on August 28, 2019 W.L. @ El. 161.11 m on September 12, 2019 W.L. @ El. 161.15 m on September 25, 2019 W.L. @ El. 161.30 m on October 9, 2019 W.L. @ El. 161.45 m on October 24, 2019 W.L. @ El. 161.83 m on November 4, 2019.				34			
					35			
					36			

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 4

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 14-16, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
175.3	Ground Surface				
0.0	~~20 cm TOPSOIL~~	1	DO	20	0
0.2	**GRANULAR FILL**				
0.9	**EARTH FILL** brown sandy silt silty clay layers occ. topsoil inclusion and asphalt debris at 1.8 m	2	DO	11	1
		3	DO	43	2
172.4		4	DO	8	
2.9	Brown, loose to dense **SILT** a trace of clay occ. fine sand seams	5	DO	7	3
		6	DO	31	4
169.8					5
5.5	Grey, compact to dense **SILTY SAND TILL** a trace of gravel occ. sand seams, cobbles and boulders	7	DO	38	6
		8	DO	20	7
		9	DO	40	8
165.3					9
10.0	Grey, dense to very dense **SAND AND GRAVEL** some silt a trace of clay	10	DO	64	10
		11	DO	32	11
161.3					12
14.0	Grey, hard **SILTY CLAY TILL** low plasticity a trace to some gravel occ. sand seams and layers	12	DO	66	13
		13	DO	66	14
		14	DO	51	15
157.3					16
					17
					18

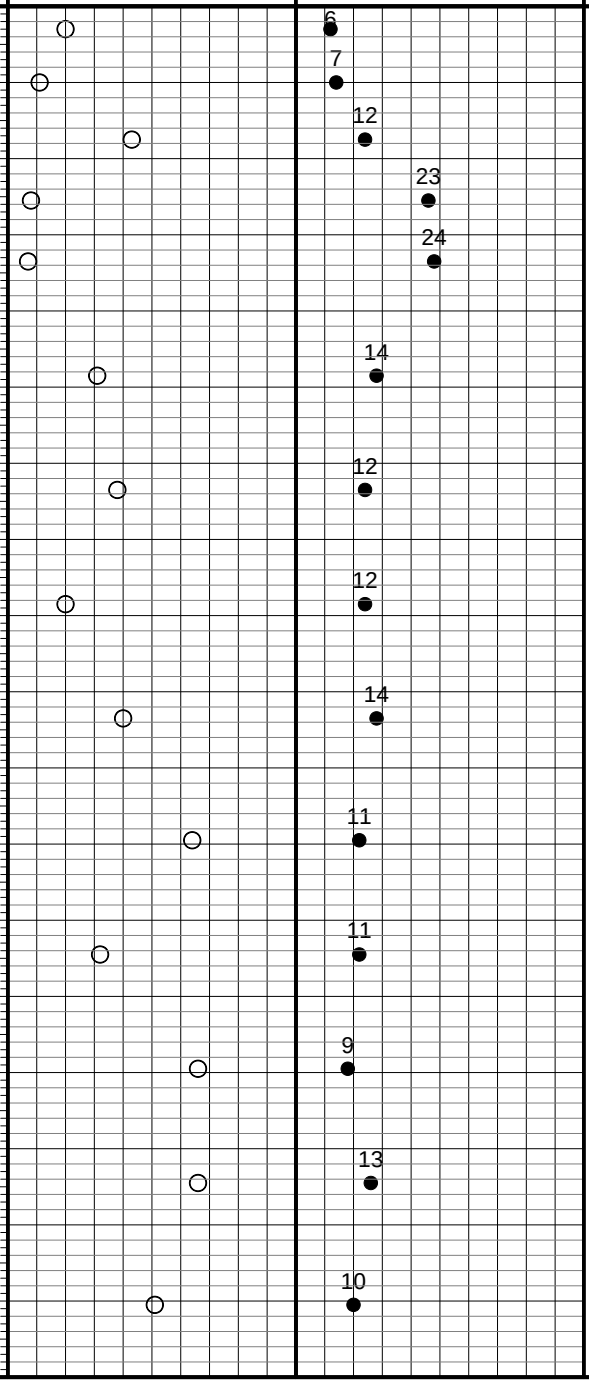
Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40



WATER LEVEL

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 4

FIGURE NO.: 4

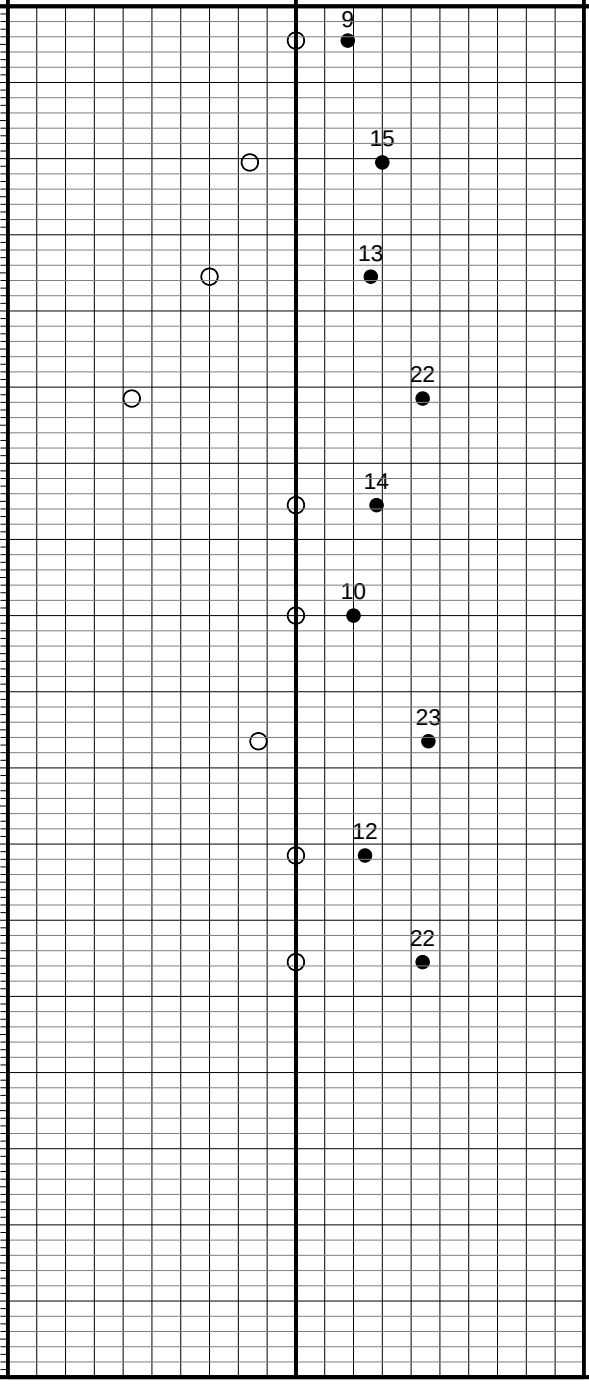
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 14-16, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
18.0	Grey, hard				18
		15	DO	50/15	
	SILTY CLAY TILL				19
	low plasticity a trace to some gravel occ. sand seams and layers	16	DO	84	20
		17	DO	70	21
		18	DO	43	22
		19	DO	78/18	23
		20	DO	54/15	24
		21	DO	87	25
146.2					26
29.1	Grey, very dense **SANDY SILT TILL** traces of clay and gravel occ. sand seams, cobbles and boulders	22	DO	50/13	27
144.7		23	DO	50/10	28
30.6	**END OF BOREHOLE**				29
	Installed 50 mm Ø monitoring well to 30.5 m completed with 3.1 m screen Sand backfill from 26.8 to 30.5 m Bentonite seal from 0.0 to 26.8 m Provided with a monument steel casing				30
	Ground Water Elevations: W.L. @ El. 157.80 m on August 28, 2019 W.L. @ El. 157.63 m on September 12, 2019 W.L. @ El. 157.65 m on September 25, 2019 W.L. @ El. 157.65 m on October 9, 2019 W.L. @ El. 157.60 m on October 24, 2019 W.L. @ El. 157.65 m on November 4, 2019				31
					32
					33
					34
					35
					36



WATER LEVEL

Soil Engineers Ltd.

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
175.2	Ground Surface				
0.0	**10 cm TOPSOIL**	1	DO	9	0
0.1	**EARTH FILL**				
	brown sandy silt with sand and gravel occ. topsoil and rootlet inclusions	2	DO	6	1
		3	DO	50/8	
					2
172.6		4	DO	6	
2.6	Brown, firm to stiff **SILTY CLAY** varved occ. silt layers	5	DO	11	3
171.1		6	DO		4
4.1	Grey, loose to compact				
	SILTY SAND TILL	7	DO	7	5
	traces of clay and gravel occ. silt layers and cobbles	8	DO		
					6
		9	DO	6	
					7
		10	DO	8	8
					9
		11	DO	6	
					10
		12	DO	15	11
	clay layer				12
		13	DO	14	
					13
		14	DO	22	14
					15
		15	DO	13	
159.0					16
16.2	Grey, very dense **SANDY SILT TILL** some gravel, a trace of clay occ. sand seams and layers, cobbles and boulders	16	DO	75	17
157.2					18

Dynamic Cone (blows/30 cm) 10 30 50 70 90

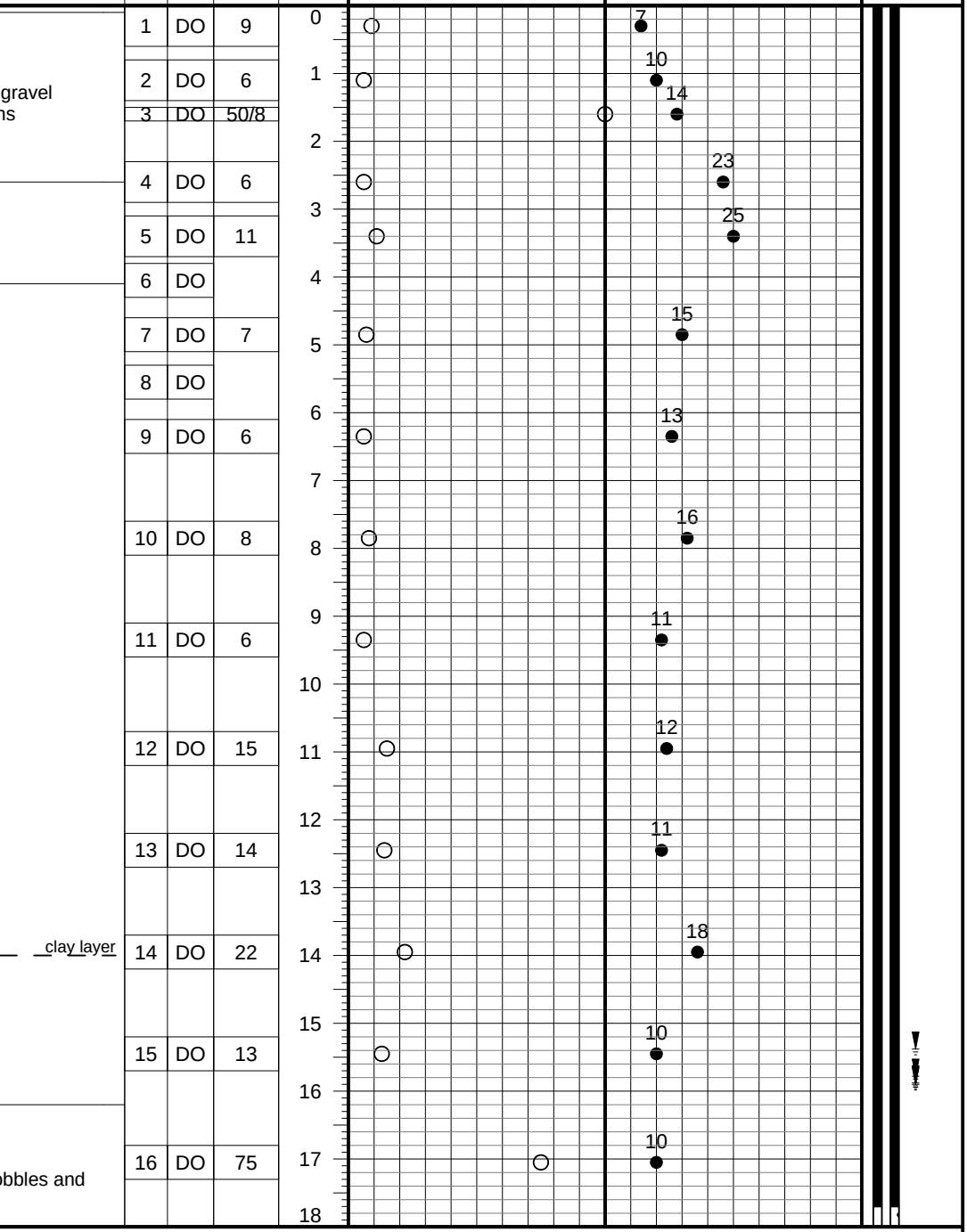
Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

WATER LEVEL



JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 5

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 20, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
18.0	Grey, very dense **SANDY SILT TILL** some gravel, a trace of clay occ. sand seams and layers, cobbles and boulders	~~17~~	~~DO~~	~~50/13~~	18		14	
		~~18~~	~~DO~~	~~50/13~~	19			
154.8					20		14	
20.4	Grey, hard **SILTY CLAY TILL** occ. sand seams, cobbles and boulders				21			
153.6		19	DO	50/13			15	
21.6	**END OF BOREHOLE**				22			
	Installed 50 mm Ø monitoring well to 21.3 m completed with 3.1 m screen Sand backfill from 17.7 to 21.3 m Bentonite seal from 0.0 to 17.7 m Provided with a monument steel casing				23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
	Ground Water Elevations: W.L. @ El. 159.82 m on August 28, 2019 W.L. @ El. 159.26 m on September 12, 2019 W.L. @ El. 159.32 m on September 25, 2019 W.L. @ El. 159.32 m on October 9, 2019 W.L. @ El. 159.32 m on October 24, 2019 W.L. @ El. 159.42 m on November 4, 2019				34			
					35			
					36			

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 6

FIGURE NO.: 6

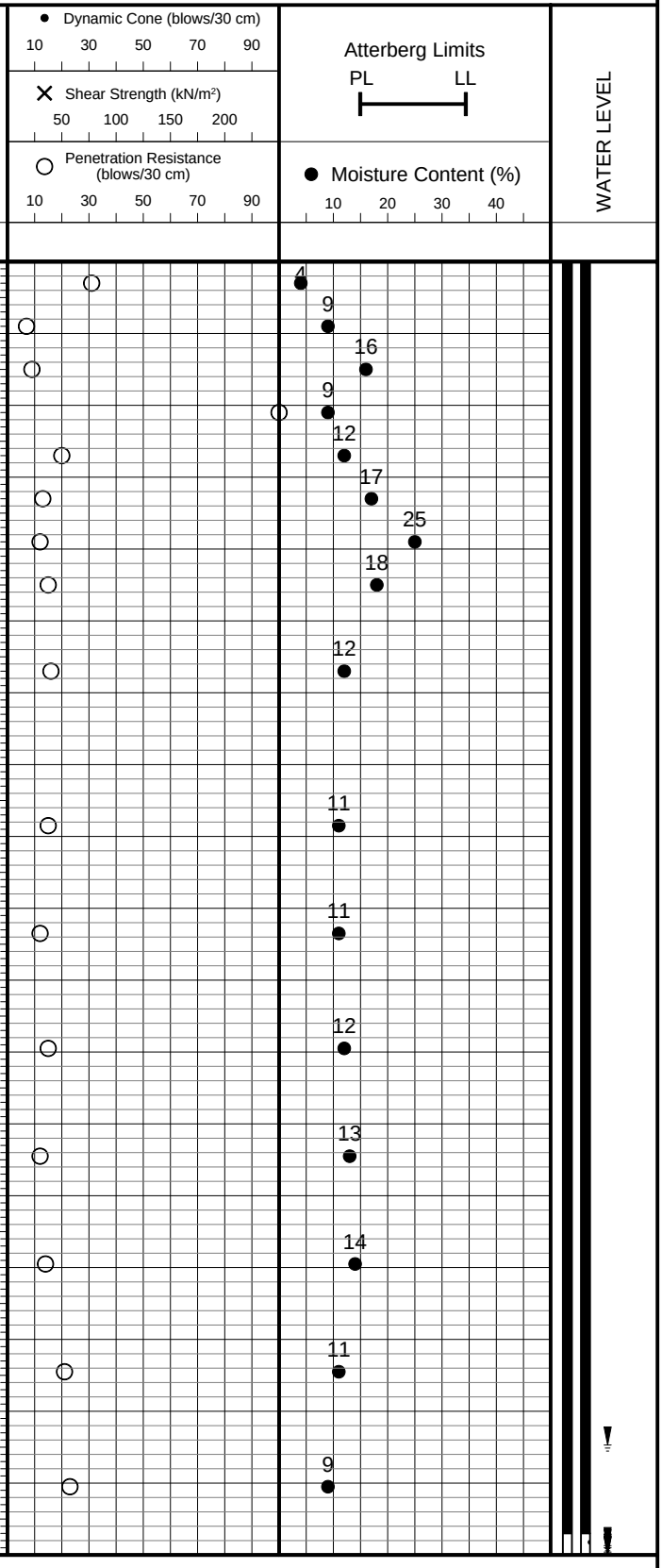
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 16 & 19, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
175.8	Ground Surface				
0.0	**10 cm TOPSOIL**	1	DO	31	0
0.1	**EARTH FILL** brown sandy silt with sand and gravel asphalt and brick debris below 1.8 m	2	DO	7	1
		3	DO	9	
		4	DO	50/8	2
		5	DO	20	
172.6					3
3.2	Brown, stiff **SILTY CLAY** occ. sand seams and layers	6	DO	13	
		7	DO	12	4
		8	DO	15	
					5
170.2					
5.6	Grey, compact **SILTY SAND TILL** some clay a trace of gravel occ. silt layers, cobbles and boulders	9	DO	16	6
					7
		10	DO	15	8
		11	DO	12	9
					10
		12	DO	15	11
					12
		13	DO	12	
					13
161.8					
14.0	Grey, compact **SAND** well graded some silt and gravel	14	DO	14	14
					15
		15	DO	21	
					16
158.7					
17.1	Grey, compact to very dense **SANDY SILT TILL**	16	DO	23	17
157.8					18



Soil Engineers Ltd.

JOB NO.: 1908-W037

LOG OF BOREHOLE NO.: BH/MW 6

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Auger with Wash Boring

PROJECT LOCATION: 1 Herons Hill Way, City of Toronto

DRILLING DATE: August 16 & 19, 2019

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
18.0	Grey, compact to very dense				18			
	SANDY SILT TILL	17	DO	10	19	○	12 ●	
	some clay a trace of gravel occ. sand seams and layers, cobbles and boulders	18	DO	46	20	○	9 ●	
154.4		19	DO	50/10	21	○	14 ●	
21.4	**END OF BOREHOLE**				22			
	Installed 50 mm Ø monitoring well to 21.3 m completed with 3.1 m screen Sand backfill from 17.7 to 21.3 m Bentonite seal from 0.0 to 17.7 m Provided with a monument steel casing				23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
	Ground Water Elevations: W.L. @ El. 159.33 m on August 28, 2019 W.L. @ El. 157.93 m on September 12, 2019 W.L. @ El. 157.93 m on September 25, 2019 W.L. @ El. 157.84 m on October 9, 2019 W.L. @ El. 157.81 m on October 24, 2019 W.L. @ El. 157.80 m on November 4, 2019				34			
					35			
					36			

Soil Engineers Ltd.
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

FIGURES 7 to 12

GRAIN SIZE DISTRIBUTION GRAPHS

REFERENCE NO. 1908-W037

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

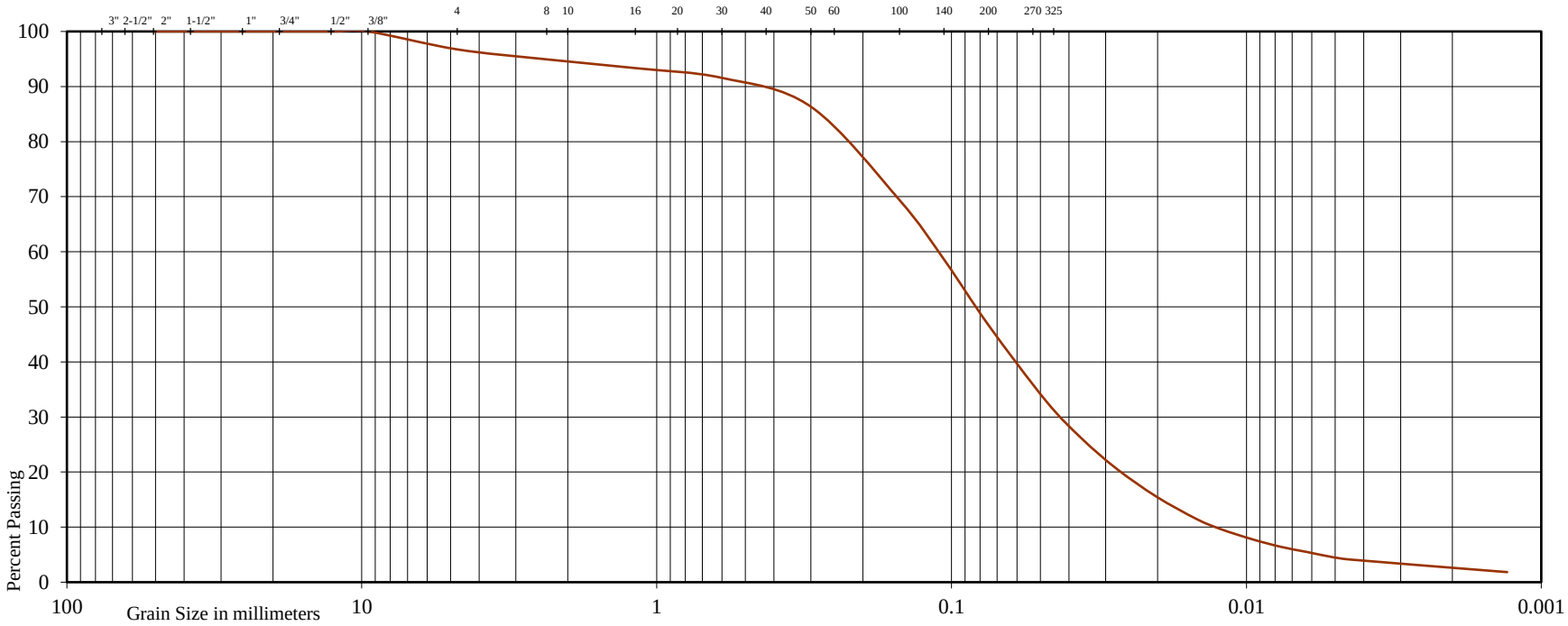
Reference No: 1908-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 2

Sample No: 10

Depth (m): 9.4

Elevation (m): 165.8

Estimated Permeability (m./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SILTY SAND, TILL

traces of clay and gravel

Figure: 7

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

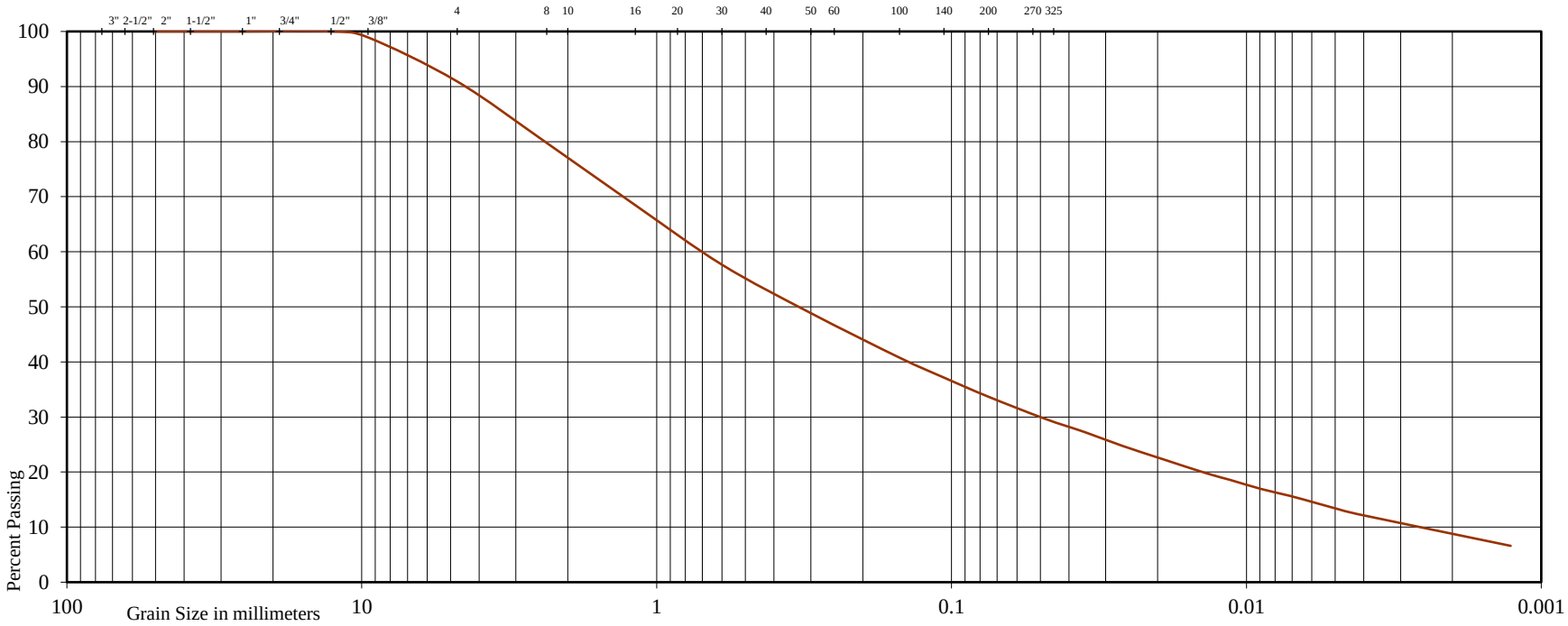
Reference No: 1908-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 4

Sample No: 9

Depth (m): 9.4

Elevation (m): 165.9

Estimated Permeability (m./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY SAND, TILL
traces of clay and gravel

Figure: 8

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

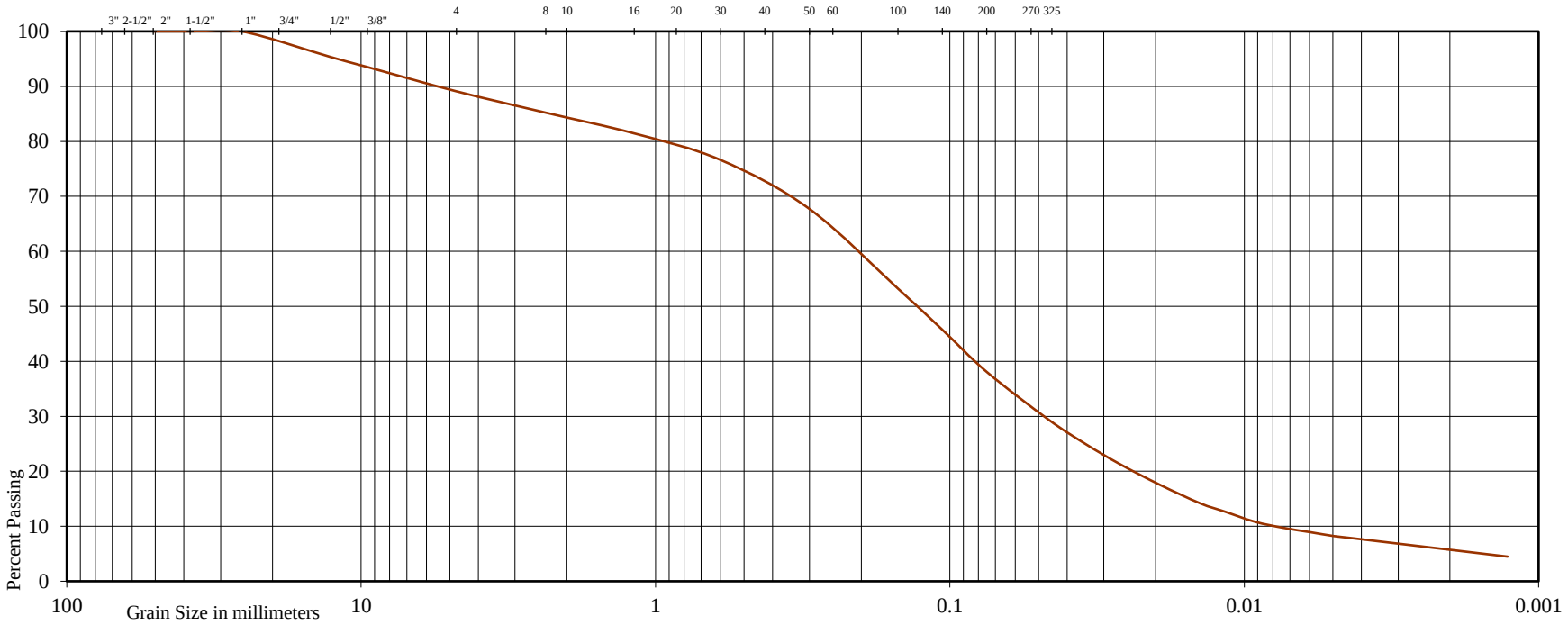
Reference No: 1908-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 5

Sample No: 15

Depth (m): 15.5

Elevation (m): 159.7

Estimated Permeability (m./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SILTY SAND, TILL
some gravel, a trace of clay

Figure: 9

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

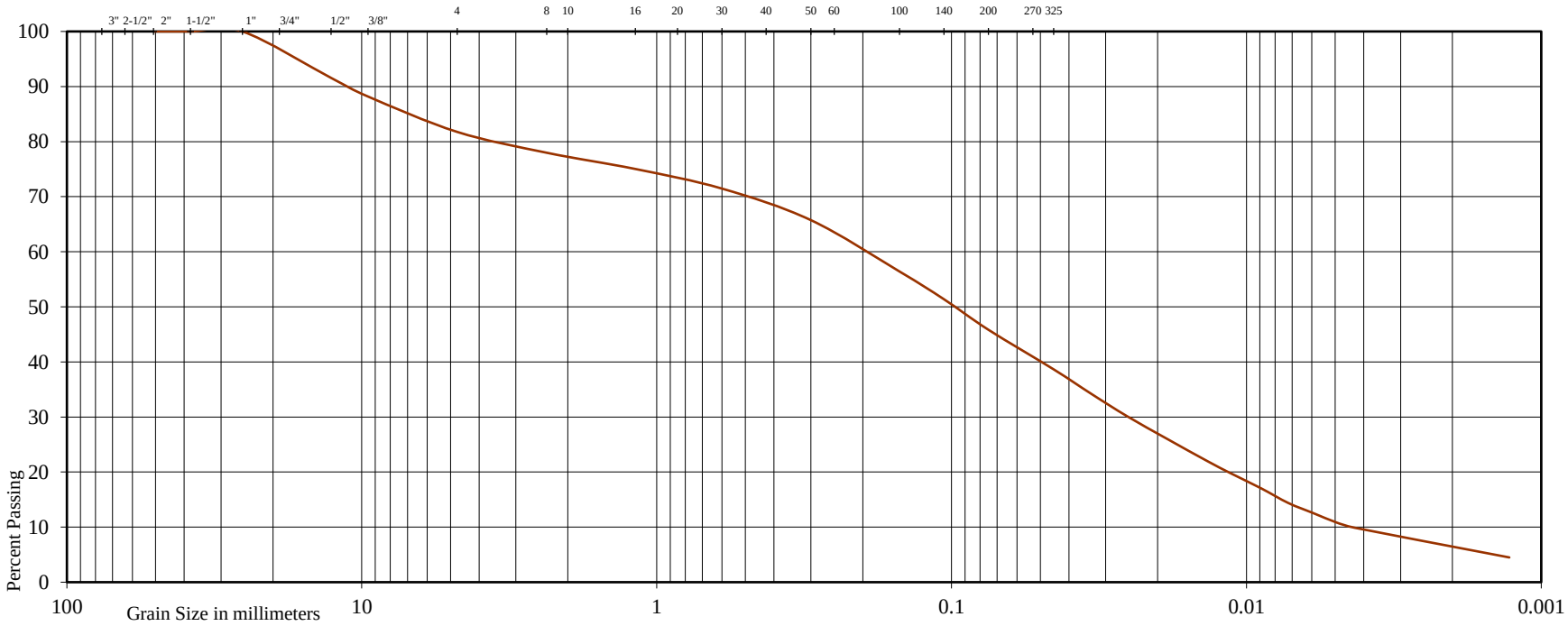
Reference No: 1908-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 1

Sample No: 11

Depth (m): 12.4

Elevation (m): 162.8

Estimated Permeability (m./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SANDY SILT, TILL
some gravel, a trace of clay

Figure: 10

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

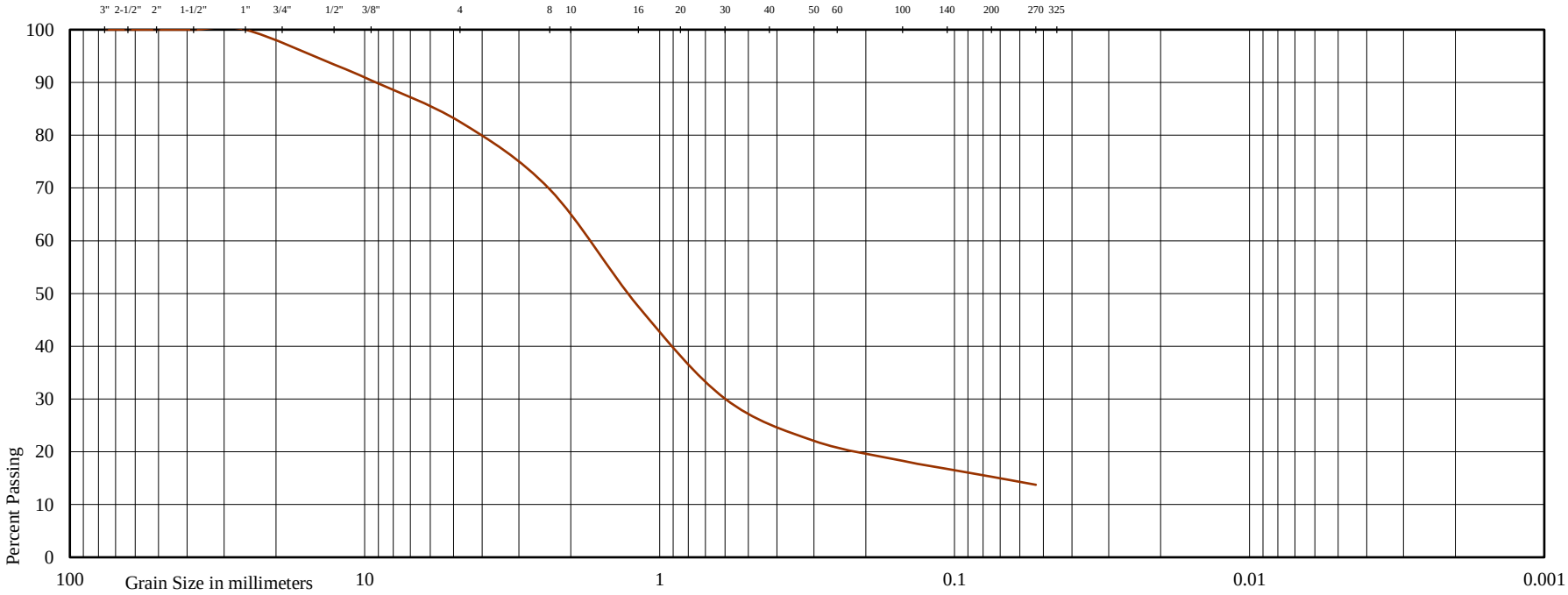
Reference No: 1908-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 6

Sample No: 14

Depth (m): 14

Elevation (m): 161.8

Estimated Permeability (m./sec.) = 10^{-5}

Classification of Sample [& Group Symbol]:	MEDIUM TO COARSE SAND some silt and gravel, a trace of fine sand

Figure: 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

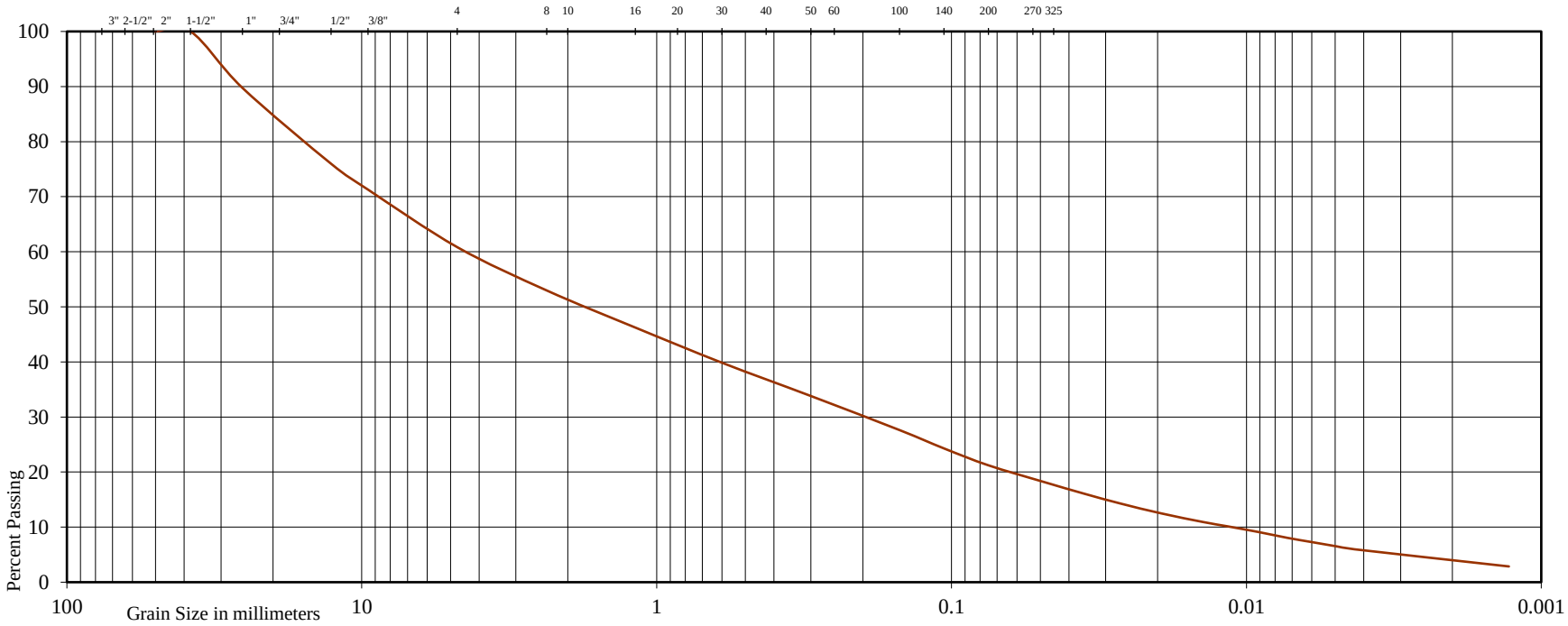
Reference No: 1903-W037

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Mixed-Use Development

Location: 1 Herons Hill Way, City of Toronto

Borehole No: 4

Sample No: 11 & 12

Depth (m): 12.4

Elevation (m): 162.9

Estimated Permeability (m./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SAND AND GRAVEL
some silt, a trace of clay

Figure: 12

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

DRAWINGS 1 to 9

REFERENCE NO. 1908-W037

Source: Ministry of Natural Resources and Forestry
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N

Approximate Boundary of Subject Site

Expressway/Freeway

Major Road

Local Road

Soil Engineers Ltd.

Title: Site Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

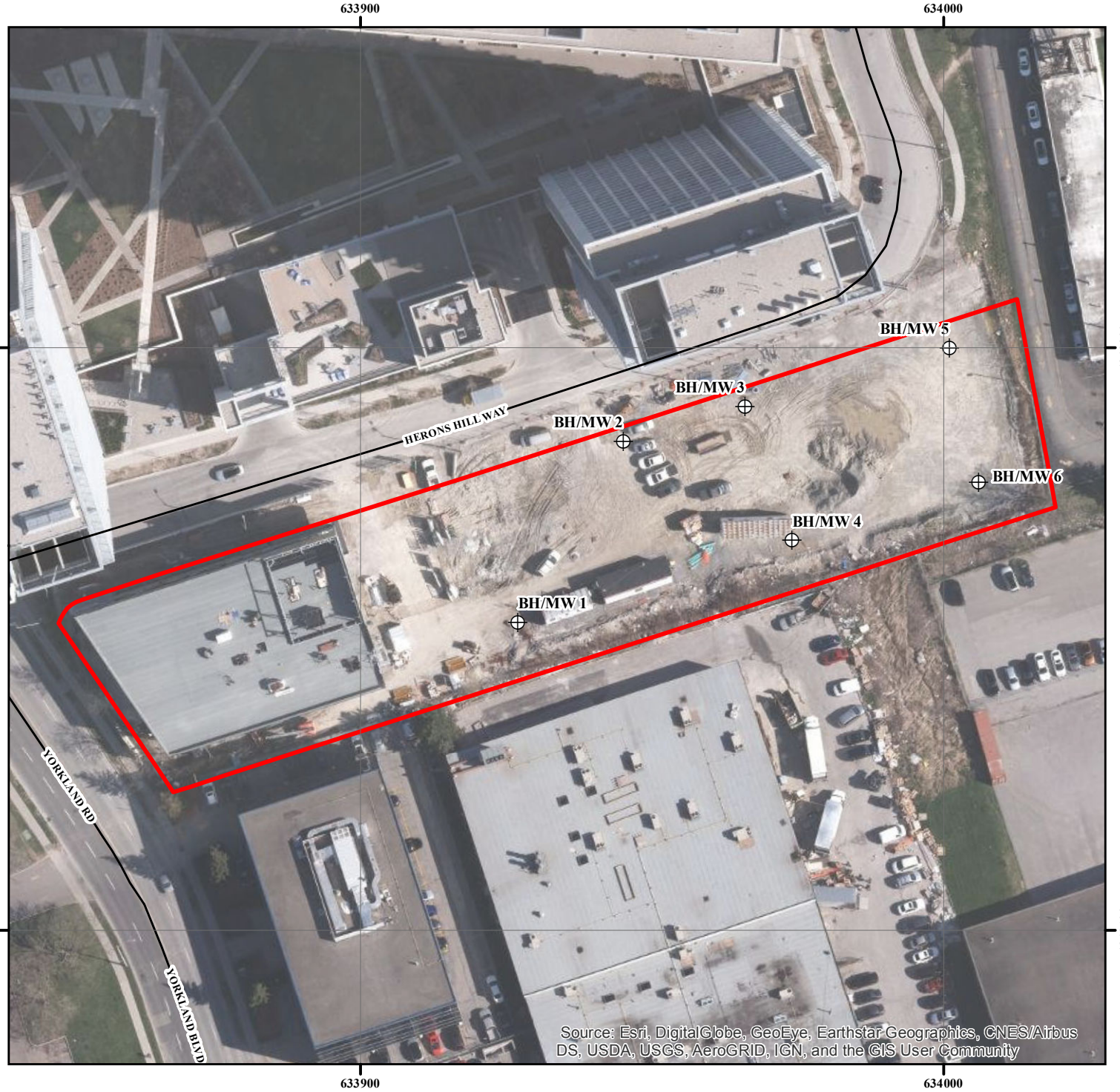
Reference No. 1908-W037

Date: September 20, 2019

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 1



Source: Ministry of Natural Resources and Forestry
©Queen's Printer for Ontario, 2019

N

Approximate Boundary of Subject Site

Borehole with Monitoring Well

Local Road

Soil Engineers Ltd.

Title: Borehole and Monitoring Well Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

Reference No. 1908-W037

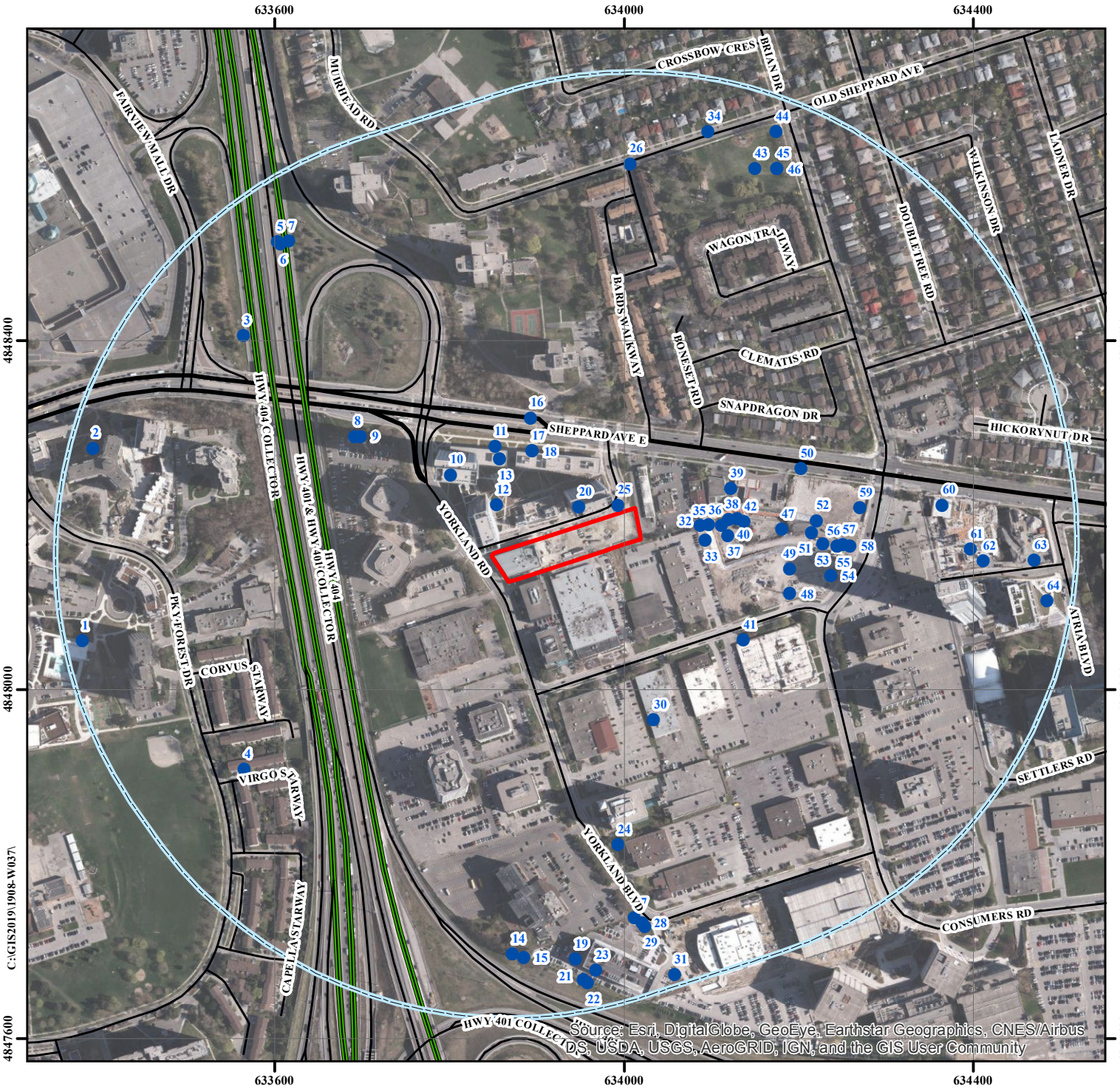
Date: September 20, 2019

Scale:

0 5 10 20 30 40 50
Metres

Drawing No. 2

C:\GIS\2019\1908-W037\



Source: Ministry of Natural Resources and Forestry
©Queen's Printer for Ontario, 2019

N

Approximate Boundary of Subject Site

500 metres from Subject Site Boundary

1 Well Location from MECP Well Records (see Appendix 'A')

Expressway/Freeway

Major Road

Local Road

Soil Engineers Ltd.

Title: MECP Well Location Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

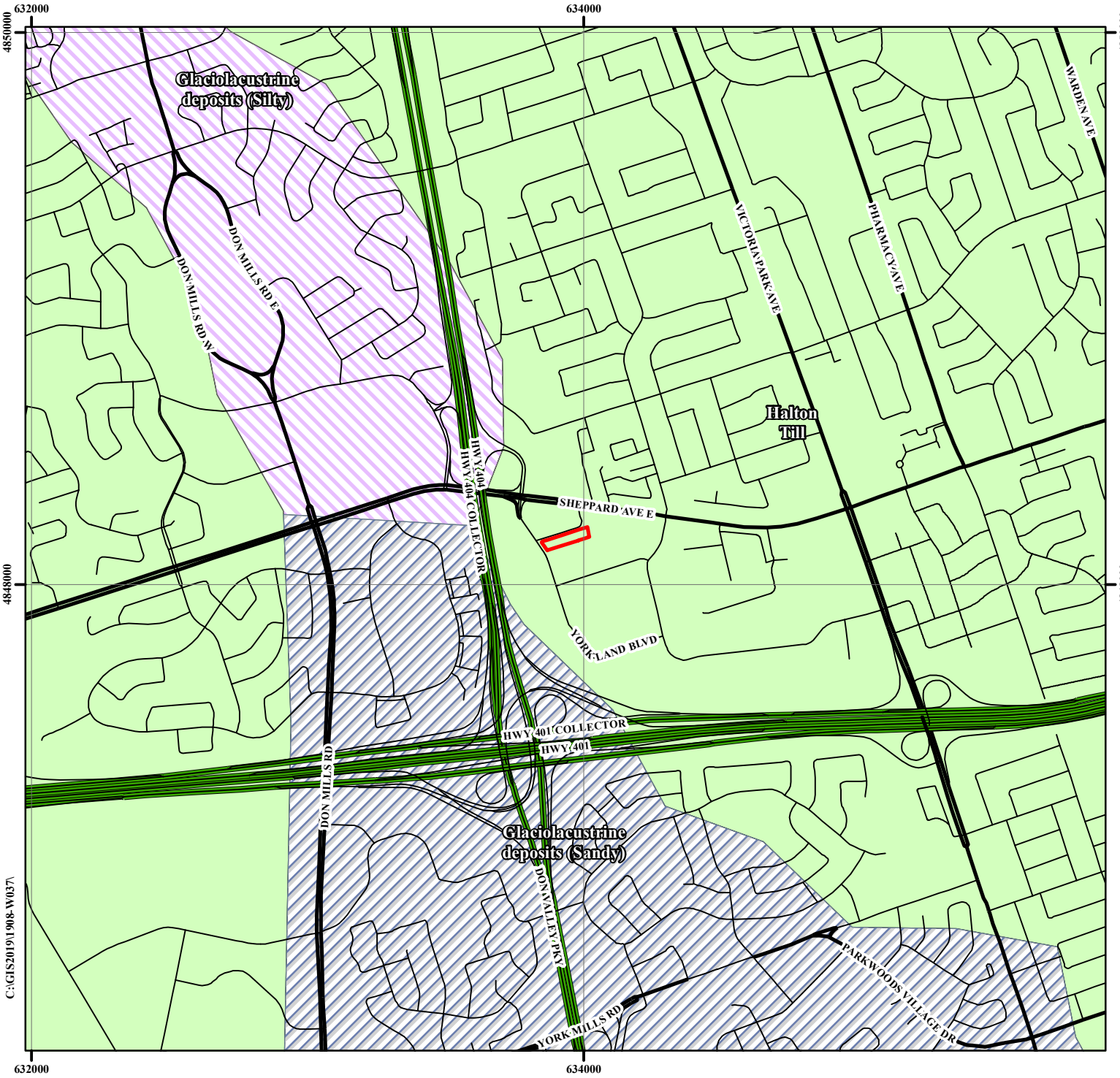
Reference No. 1908-W037

Date: September 20, 2019

Scale:

0 30 60 120 180 240 300
Metres

Drawing No. 3



Source:Ontario Geological Survey, 1997, Surface Geology of Ontario; Ontario Geological Survey, Miscellaneous Released-Data 0014

N

Approximate Boundary of Subject Site

Glaciolacustrine deposits (Sandy)
Material: sand, gravelly sand and gravel, nearshore and beach deposits

Glaciolacustrine deposits (Silty)
Material: silt and clay, minor sand, basin and quiet water deposits

Halton Till
Material: predominantly silt to silty clay matrix, high in matrix carbonate content and clast poor

Expressway/Freeway

Major Road

Local Road

Soil Engineers Ltd.

Title: Quarternary and Surface Geology Map

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

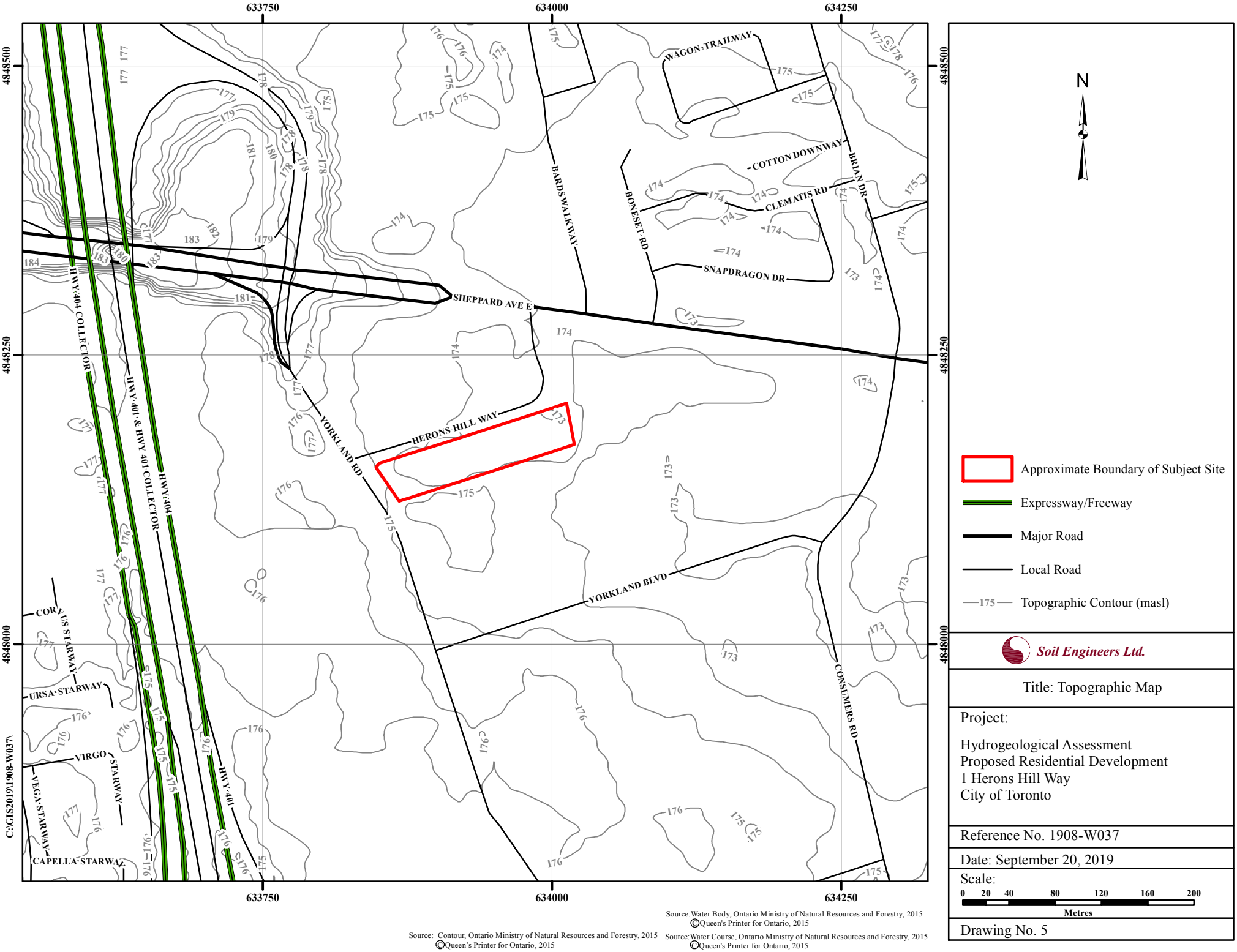
Reference No. 1908-W037

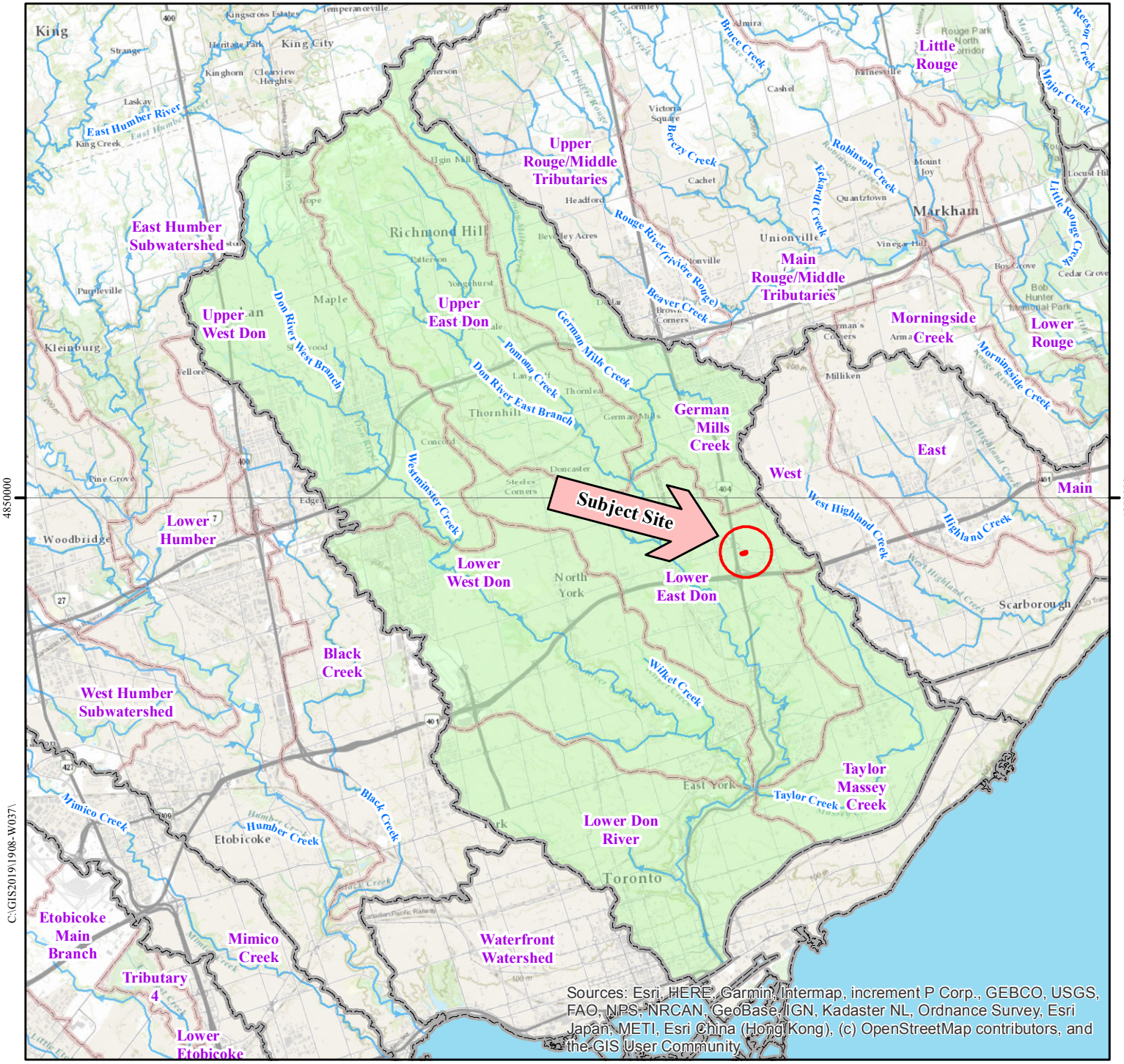
Date: September 20, 2019

Scale:

0 100 200 400 600 800 1,000
Metres

Drawing No. 4


633750
634000
634250
4848500
4848250
4848000
N
WAGON TRAILWAY
COTTON DOWNWAY
BRIAN DR
CLEMATIS RD
BONESET RD
BARDSWALK WAY
SNAPDRAGON DR
SHEPPARD AVE E
HWY 404 COLLECTOR
HWY 401 & HWY 401 COLLECTOR
HWY 404
YORKLAND RD
HERONS HILL WAY
YORKLAND BLVD
CONSUMERS RD
CORVUS STARWAY
URSA STARWAY
VIRGO STARWAY
VEGA STARWAY
CAPELLA STARWAY
HWY 401
Approximate Boundary of Subject Site
Expressway/Freeway
Major Road
Local Road
175 Topographic Contour (masl)
Soil Engineers Ltd.
Title: Topographic Map
Project:
Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto
Reference No. 1908-W037
Date: September 20, 2019
Scale:
0 20 40 80 120 160 200
Metres
Drawing No. 5
C:\GIS2019\1908-W037\
Source: Contour, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015
Source: Water Body, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015
Source: Water Course, Ontario Ministry of Natural Resources and Forestry, 2015
©Queen's Printer for Ontario, 2015



N

Watershed:

Approximate Boundary of the Subject Site

Watershed Boundaries

Waterbody

Watercourse

Expressway/Major Road

Soil Engineers Ltd.

Title: Watershed and Subwatershed Map

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

Reference No. 1908-W037

Date: September 20, 2019

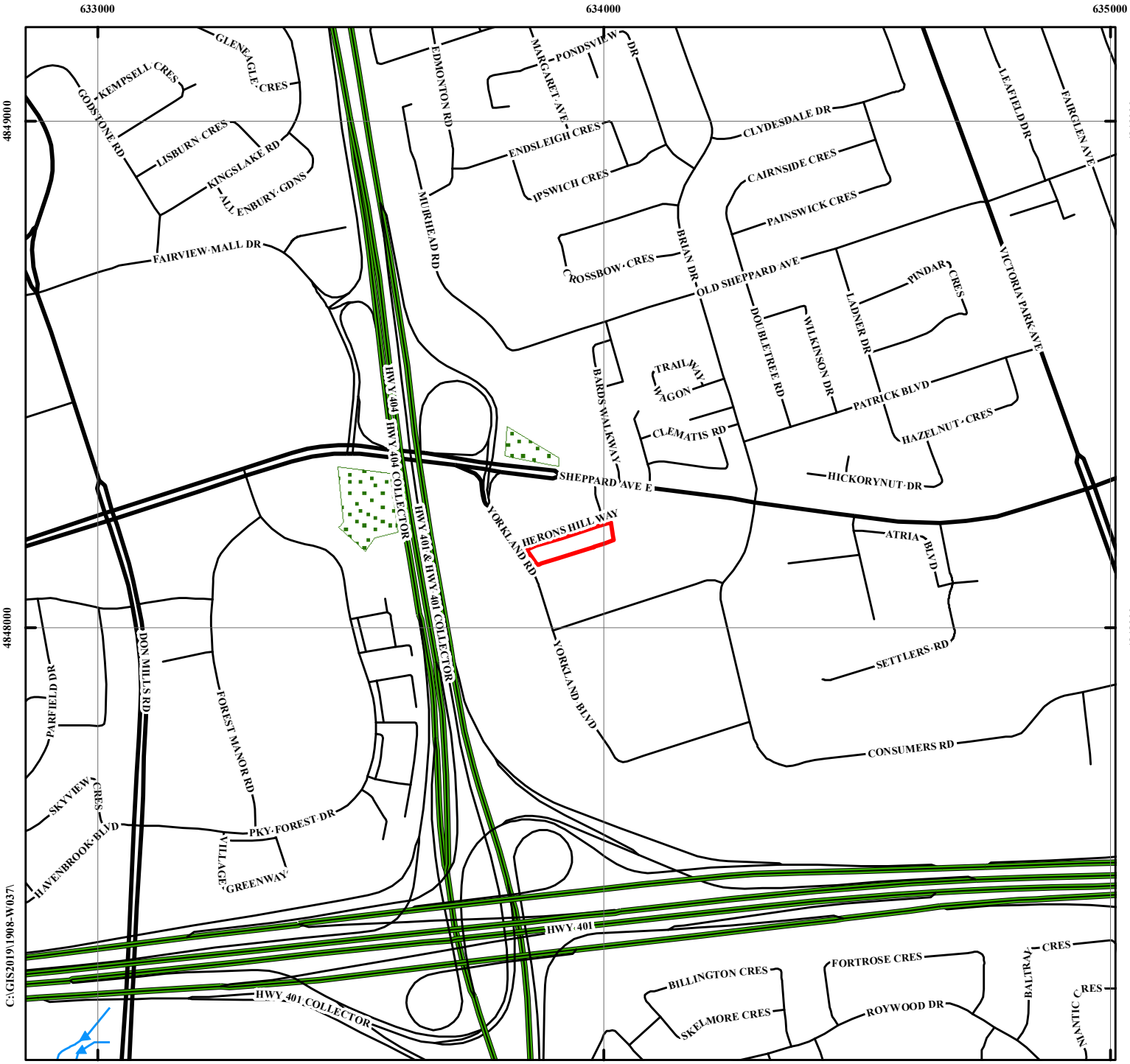
Scale:

0 4,650 9,300 18,600 27,900 37,200 46,500

Metres

Drawing No. 6

this mapping was produced by SEL and should be used for information purposes only.
Data sources used in its production are of varying quality and accuracy and all boundaries should be considered approximate.



Contains information licensed under the Open Government Licence – Ontario, 2019
Includes information: Provincial Park, Conservation Reserve, Area of Natural and Scientific Interest, Wetland, Niagara Escarpment Protection Area, Oak Ridges Moraine Conservation and Wilderness Areas

Source: Ministry of Natural Resources and Forestry
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N

- Approximate Boundary of Subject Site
- Wooded Area
- Watercourse
- Expressway/Freeway
- Major Road
- Local Road

Soil Engineers Ltd.

Title: Natural Features and Protection Area Plan

Project:

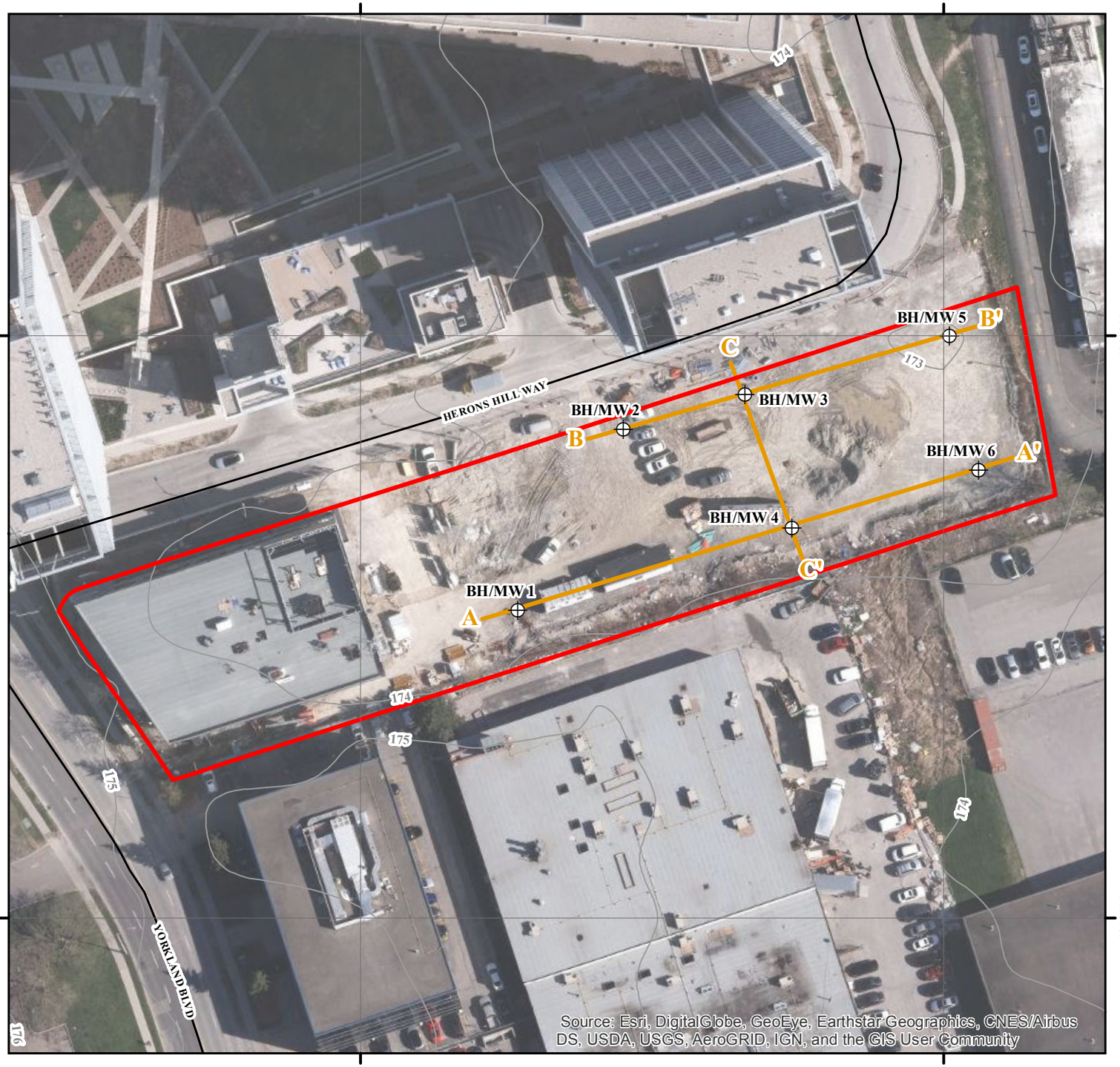
Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

Reference No. 1908-W037

Date: September 20, 2019

Scale:
0 55 110 220 330 440 550
Metres

Drawing No. 7



Source: Ministry of Natural Resources and Forestry
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N

Approximate Boundary of Subject Site

Borehole with Monitoring Well

Local Road

A A' Cross-Section Direction

175 Topographic Contour (masl)

Soil Engineers Ltd.

Title: Cross-Section Key Plan

Project:

Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto

Reference No. 1908-W037

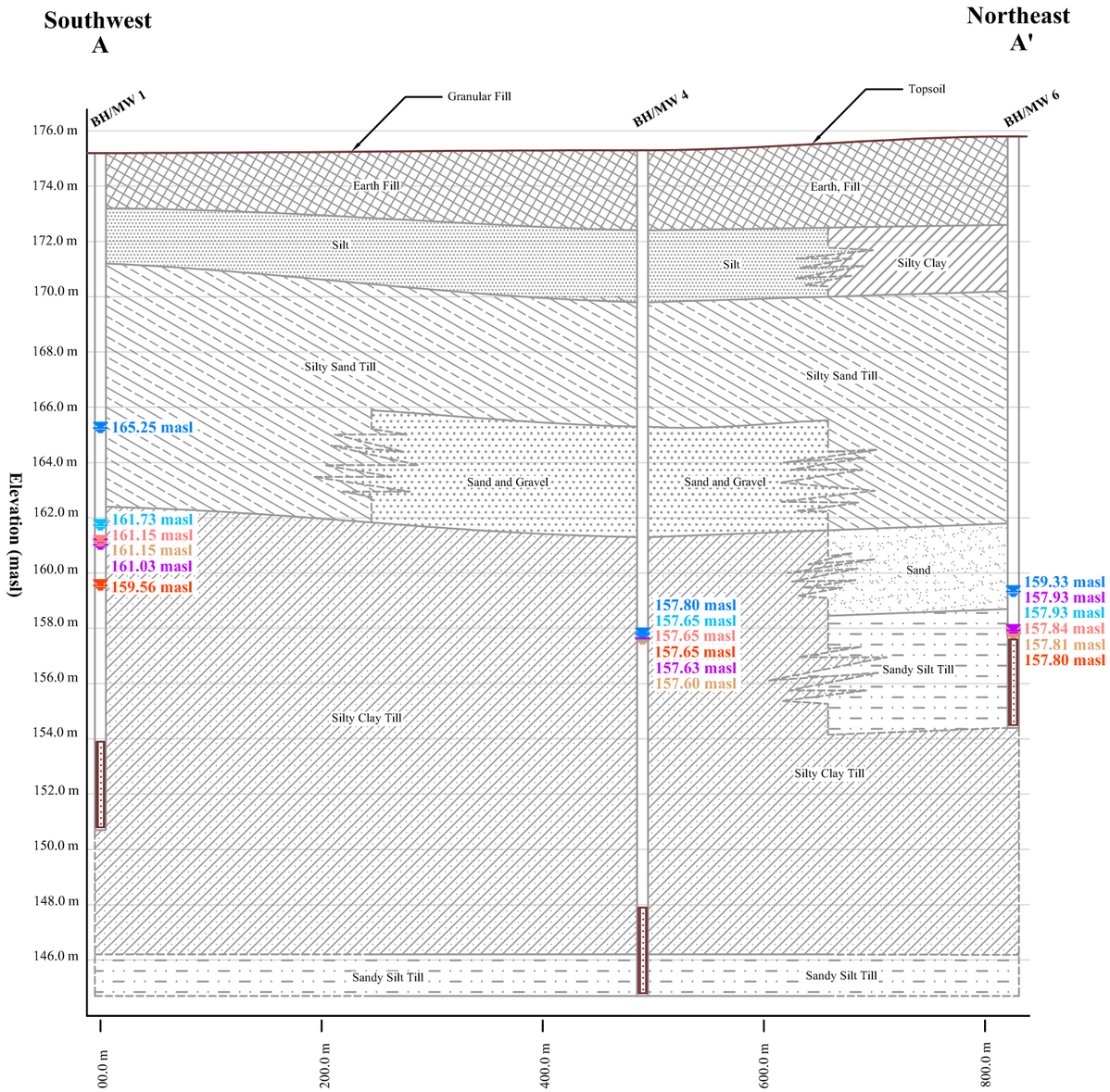
Date: November 21, 2019

Scale:

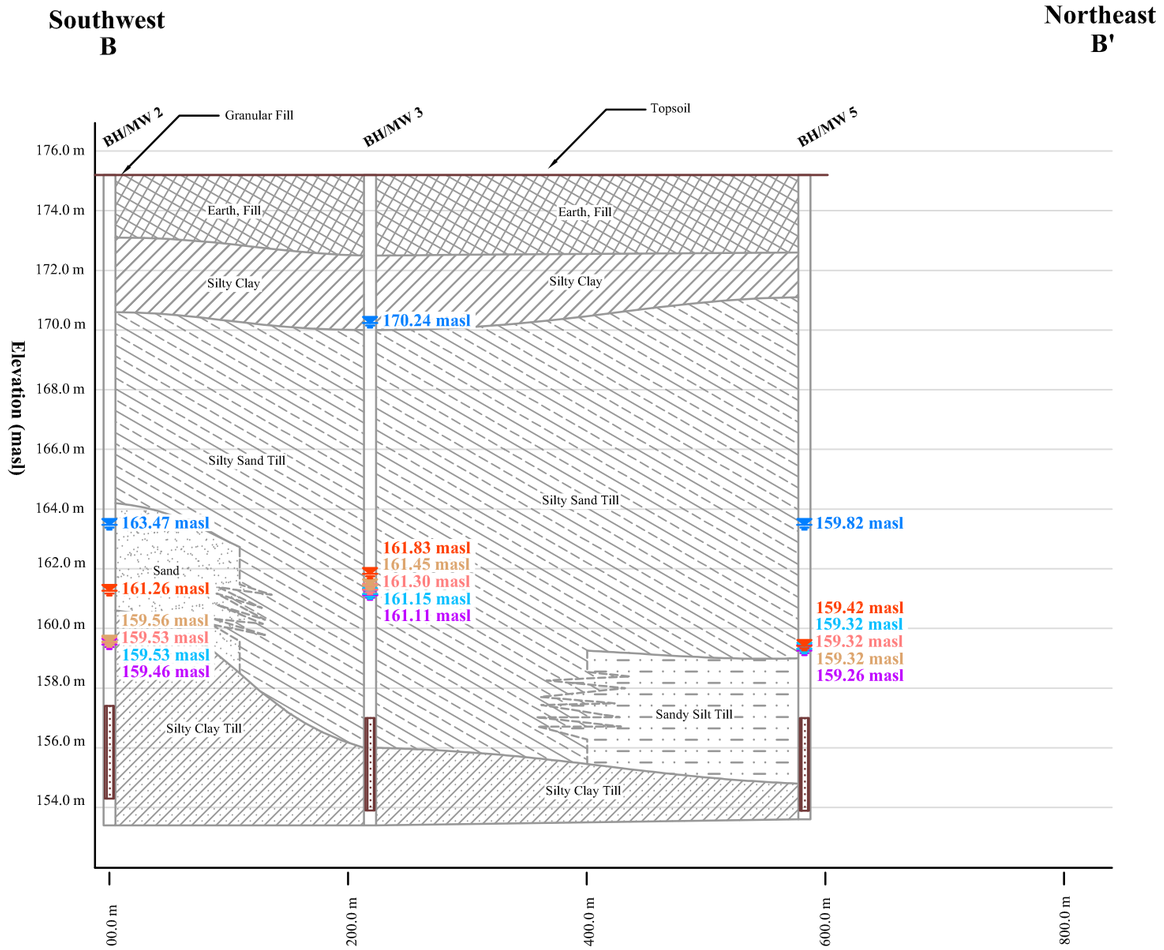
0 5 10 20 30 40 50
Metres

Drawing No. 8-1

C:\GIS\2019\1908-W037\



Section A-A'



Section B-B'

C:Projects/2019 Jobs/1908-W037

- Earth, Fill
- Sand and Gravel
- Silt
- Silty Clay
- Silty Clay, Till
- Silty Sand, Till
- Sandy Silt, Till
- Sand
- 3.1 m Screen

- Water Table on August 28, 2018
- Water Table on September 12, 2019
- Water Table on September 25, 2019
- Water Table on October 9, 2019
- Water Table on October 24, 2019
- Water Table on November 4, 2019

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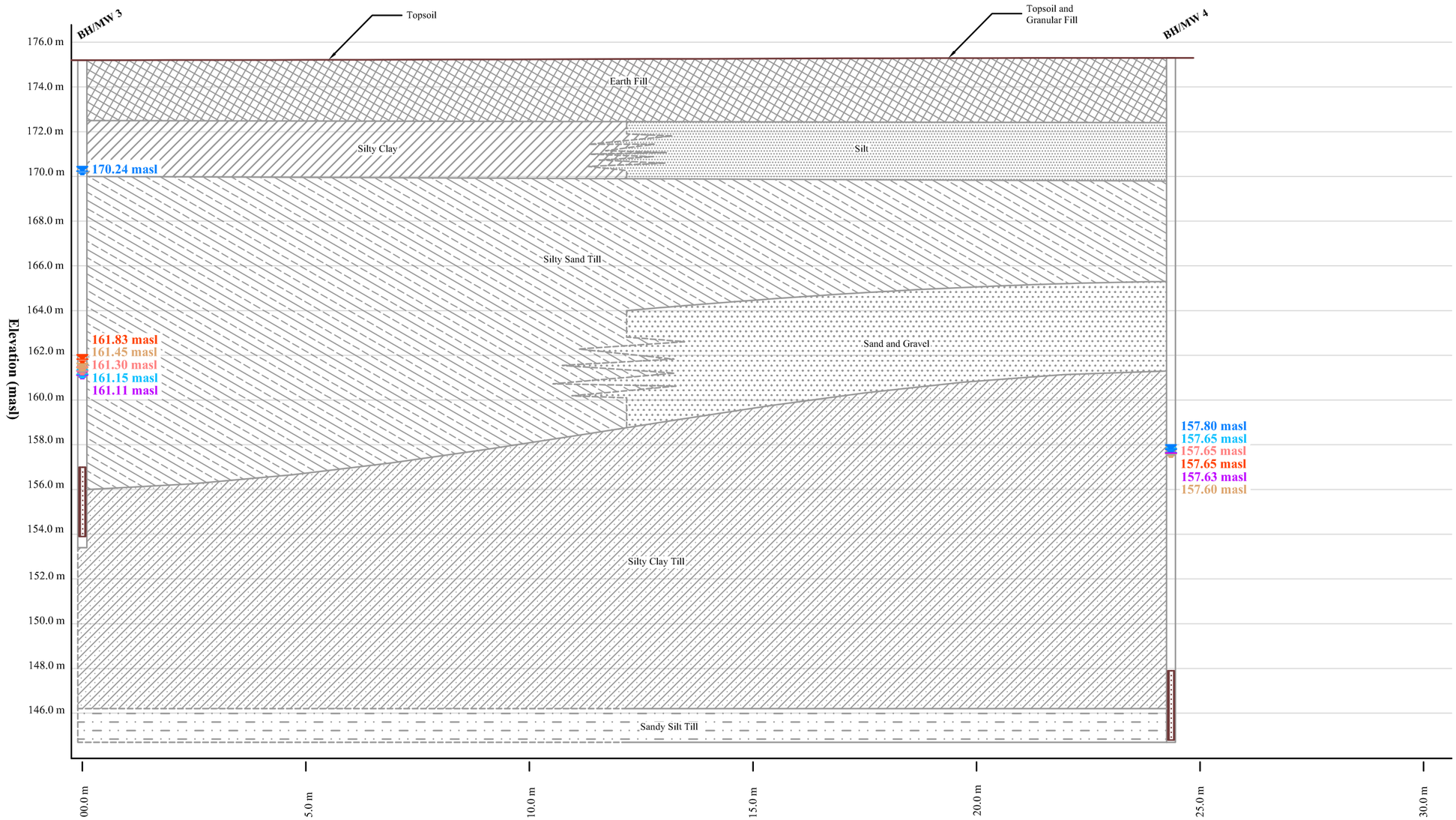
Title: Geological Cross-Section (A-A' and B-B')

Project: Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way, City of Toronto

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1908-W037	November, 2019	1:200	1:500	8-2A

Northwest
C

Southeast
C'



Section C-C'

Earth, Fill
Sand and Gravel
Silt
Silty Clay
Silty Clay, Till
Silty Sand, Till
Sandy Silt, Till
3.1 m Screen

Water Table on August 28, 2018
Water Table on September 12, 2019
Water Table on September 25, 2019
Water Table on October 9, 2019
Water Table on October 24, 2019
Water Table on November 4, 2019

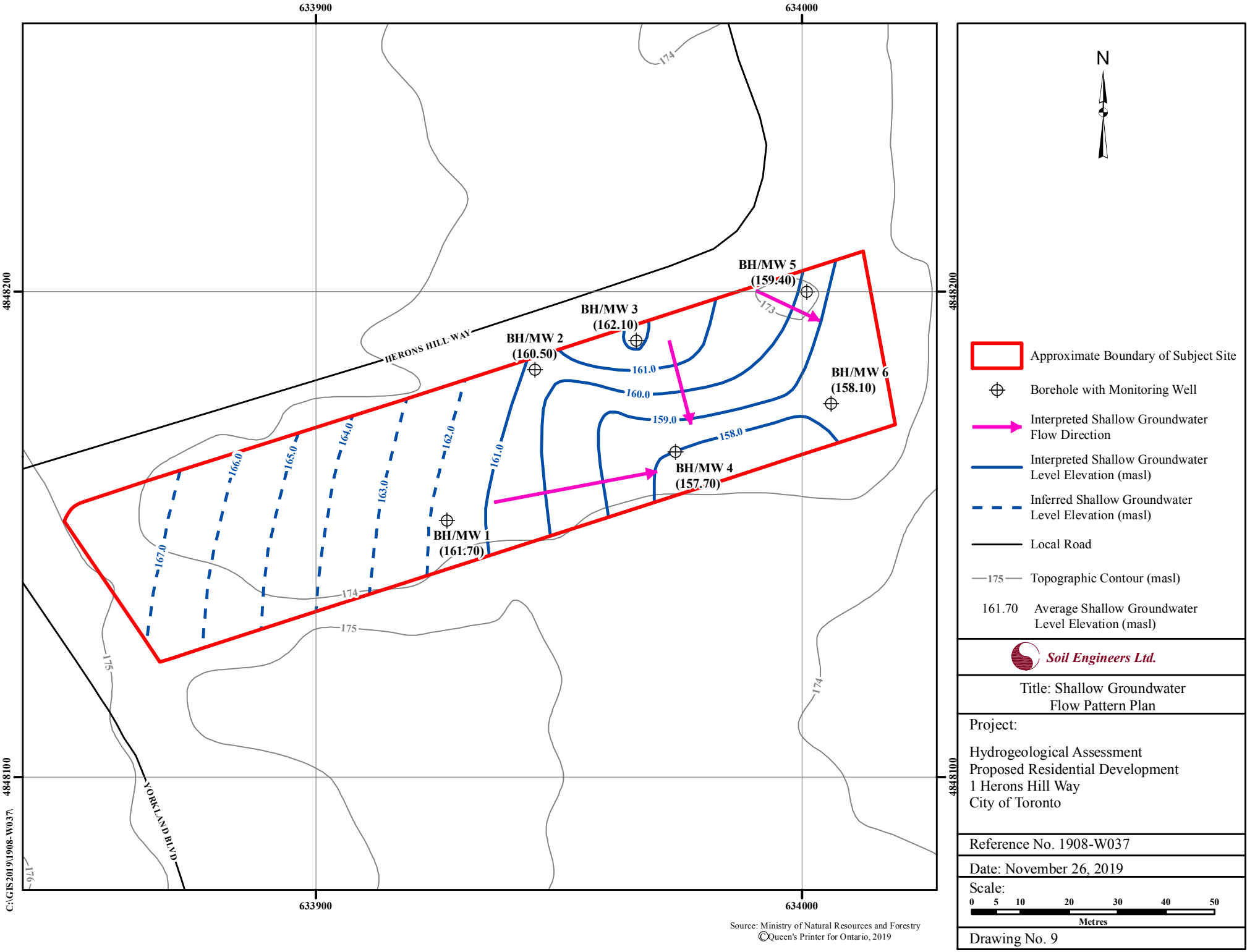
C:Projects/2019 Jobs/1908-W037

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (C-C')

Project: Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way, City of Toronto

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
1908-W037	November, 2019	1:200	1:100	8-2B


633900
634000
4848200
4848100
HERONS HILL WAY
YORKLAND BLVD
BH/MW 1
(161.70)
BH/MW 2
(160.50)
BH/MW 3
(162.10)
BH/MW 4
(157.70)
BH/MW 5
(159.40)
BH/MW 6
(158.10)
167.0
166.0
165.0
164.0
163.0
162.0
161.0
160.0
159.0
158.0
174
175
176
173
N
Approximate Boundary of Subject Site
Borehole with Monitoring Well
Interpreted Shallow Groundwater Flow Direction
Interpreted Shallow Groundwater Level Elevation (masl)
Inferred Shallow Groundwater Level Elevation (masl)
Local Road
175 Topographic Contour (masl)
161.70 Average Shallow Groundwater Level Elevation (masl)
Soil Engineers Ltd.
Title: Shallow Groundwater Flow Pattern Plan
Project:
Hydrogeological Assessment
Proposed Residential Development
1 Herons Hill Way
City of Toronto
Reference No. 1908-W037
Date: November 26, 2019
Scale:
0 5 10 20 30 40 50
Metres
Drawing No. 9
C:\GIS\2019\1908-W037\
Source: Ministry of Natural Resources and Forestry
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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'A'

MECP WATER WELL RECORDS SUMMARY

REFERENCE NO. 1903-W049

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)**	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
				Final Status	First Use				
1	7183889	Boring	4.58	-	Test Hole	-	-	1.22	4.27
2	7244493	Boring	15.25	Observation Wells	Monitoring	-	-	12.20	15.25
3	7116440	Boring	-	Observation Wells	Monitoring	-	-	-	-
4	6905047	Cable Tool	-	Water Supply	Domestic	43.62	19.83	-	-
5	6905069	Cable Tool	-	Water Supply	Commerical	20.74	7.02	19.82	21.96
6	6905068	Cable Tool	-	Abandoned-Supply	-	-	-	-	-
7	6905070	Rotary (Convent.)	-	Test Hole	Not Used	8.85	8.85	-	-
8	7148392	Direct Push	2.14	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.19	2.14
9	7148393	Direct Push	2.14	Monitoring and Test Hole	Monitoring and Test Hole	-	-	1.19	2.14
10	7140484	Rotary (Convent.)	19.52	Monitoring and Test Hole	Test Hole	-	11.13	17.39	18.91
11	7113783	Other Method	14.64	Dewatering	Dewatering	13.73	7.81	10.68	13.73
12	7113782	Other Method	14.34	Dewatering	Dewatering	13.42	9.24	10.37	13.42
13	7109181	Rotary (Air)	16.47	-	-	18.00	-	17.08	18.00
14	7177031	Direct Push	7.63	Monitoring and Test Hole	Monitoring and Test Hole	-	-	4.27	7.63
15	7219783	-	-	Abandoned-Other	-	-	-	-	-
16	7160218	Boring	25.00	Observation Wells	Monitoring and Test Hole	14.00		-	-
17	7113781	Other Method	20.74	Dewatering	Dewatering	18.91	7.56	16.16	18.00
18	7113780	Other Method	19.82	Dewatering	Monitoring	18.91	7.14	15.86	18.91
19	7219782	-	0.00	Abandoned-Other	-	-	-	-	-
20	7050330	Rotary (Reverse)	13.12	-	-	13.12	-	-	-
21	7177029	Direct Push	7.63	Monitoring and Test Hole	Monitoring and Test Hole	-	-	4.58	7.63
22	7219784	-	-	Abandoned-Other	-	-	-	-	-
23	7219780	-	-	Abandoned-Other	-	-	-	-	-
24	7229413	-	-	-	-	-	-	-	-
25	7050331	Rotary (Air)	15.86	Test Hole	-	15.86	-	-	-
26	7176567	-	-	-	-	-	-	-	-
27	7233536	-	-	-	-	-	-	-	-
28	7233537	-	-	-	-	-	-	-	-
29	7233538	-	-	-	-	-	-	-	-
30	6930091	Other Method	5.49	Observation Wells	-	-	-	2.44	5.49
31	7219786		0.00	Abandoned-Other	-	-	-	-	-
32	7258710	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
33	7258712	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
34	7171218	-	-	Abandoned-Other	-	-	-	-	-
35	7269593	Boring	21.96	Observation Wells	Monitoring	-	-	18.91	21.96
36	7258708	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10

Ontario Water Well Records

WELL ID	MECP WWR ID	Construction Method	Well Depth (m)**	Well Usage		Water Found (m)**	Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**
				Final Status	First Use				
37	7258722	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
38	7258719	Direct Push	3.66	Monitoring and Test Hole	Monitoring and Test Hole	-	-	0.61	3.66
39	7181850	Direct Push	6.10	Test Hole	Monitoring and Test Hole	-	-	3.10	6.10
40	7258709	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
41	7052311	Other Method	4.60	Observation Wells	Not Used	2.70	-	-	-
42	7258720	Direct Push	9.15	Monitoring and Test Hole	Monitoring and Test Hole	-	-	7.63	9.15
43	7168425	-	-	doned Monitoring and Test	Monitoring	-	-	-	-
44	7168424	Other Method	-	doned Monitoring and Test	Monitoring	-	-	-	-
45	7165045	-	-	-	-	-	-	-	-
46	7188566	-	-	-	-	-	-	-	-
47	7258723	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
48	7258725	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	6.10	6.10
49	7258724	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
50	7185156	Boring	9.15	Abandoned-Other	Monitoring	-	-	6.10	9.15
51	7258717	Direct Push	7.63	Monitoring and Test Hole	Monitoring and Test Hole	-		6.10	7.63
52	7258713	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
53	7258718	Direct Push	3.97	Monitoring and Test Hole	Monitoring and Test Hole	-	-	0.92	3.97
54	7258711	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
55	7258716	Direct Push	3.97	Monitoring and Test Hole	Monitoring and Test Hole	-	-	0.92	3.97
56	7258715	Direct Push	7.63	Monitoring and Test Hole	Monitoring and Test Hole	-	-	6.10	7.63
57	7135809	-	5.60	Observation Wells	Monitoring	1.40	-	2.60	5.60
58	7258714	Direct Push	6.10	Monitoring and Test Hole	Monitoring and Test Hole	-	-	3.05	6.10
59	7167857	Boring	12.90	Observation Wells	Monitoring	3.10	-	9.10	12.20
60	7269540	-	-	-	-	-	-	-	-
61	7274223	Sonic	15.00	-	-	2.11	-	12.00	15.00
62	7219260	Jetting	19.00	Dewatering	Dewatering	4.00	-	16.00	19.00
63	7219261	Jetting	19.00	Dewatering	Dewatering	4.00	-	16.00	19.00
64	7164640	-	-	-	-	-	-	-	-

Notes:

*MECP WWID: Ministry of Environment, Conservation, and Parks - Water Well Records Identification

**metres below ground surface

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

APPENDIX 'B'

RESULT OF SINGLE WELL RESPONSE TESTS

REFERENCE NO. 1908-W037

Falling Head Test (Slug Test)

Test Date:		12-Sep-19	
Piezometer/Well No.:		BH/MW 1	
Ground level:		175.20	m
Screen top level:		156.96	m
Screen bottom level:		153.86	m
Test El. (at midpoint of screen):		155.41	m
Test depth (at midpoint of screen):		19.79	m
Screen length	L=	3.1	m
Diameter of undisturbed portion	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.937	m
Initial water depth		1.77	m
Aquifer material:		**SILTY CLAY TILL**	

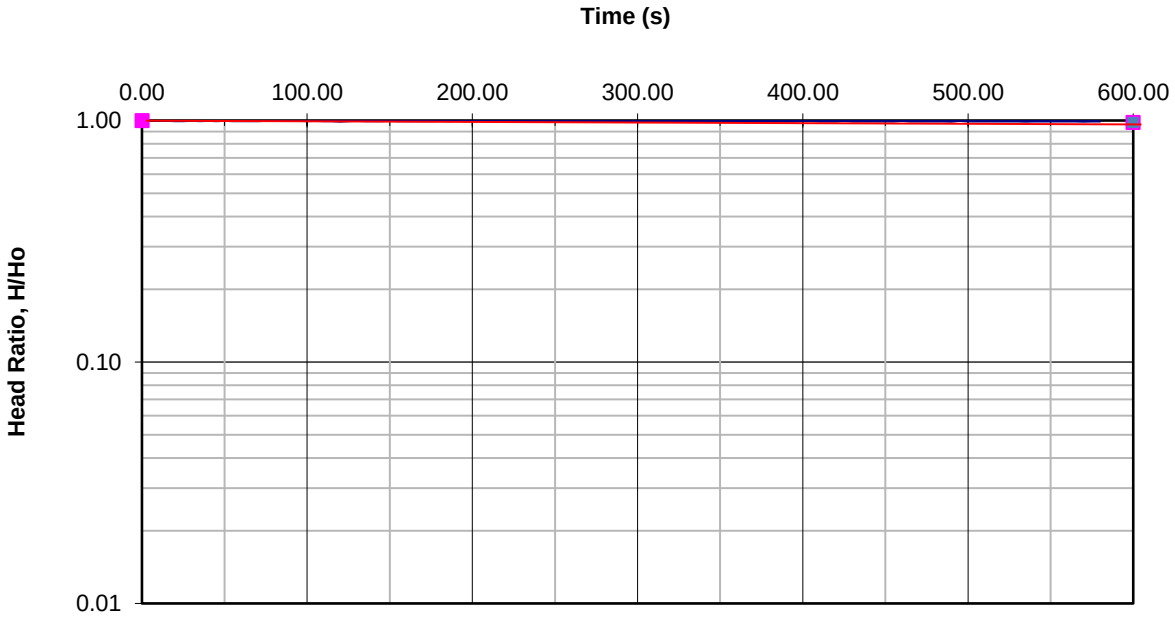
Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$$\frac{\ln(H1/H2)}{(t2 - t1)} = 3.3671E\text{-}05$$

K= **1.1E-06** cm/s

1.1E-08 m/s



Falling Head Test (Slug Test)

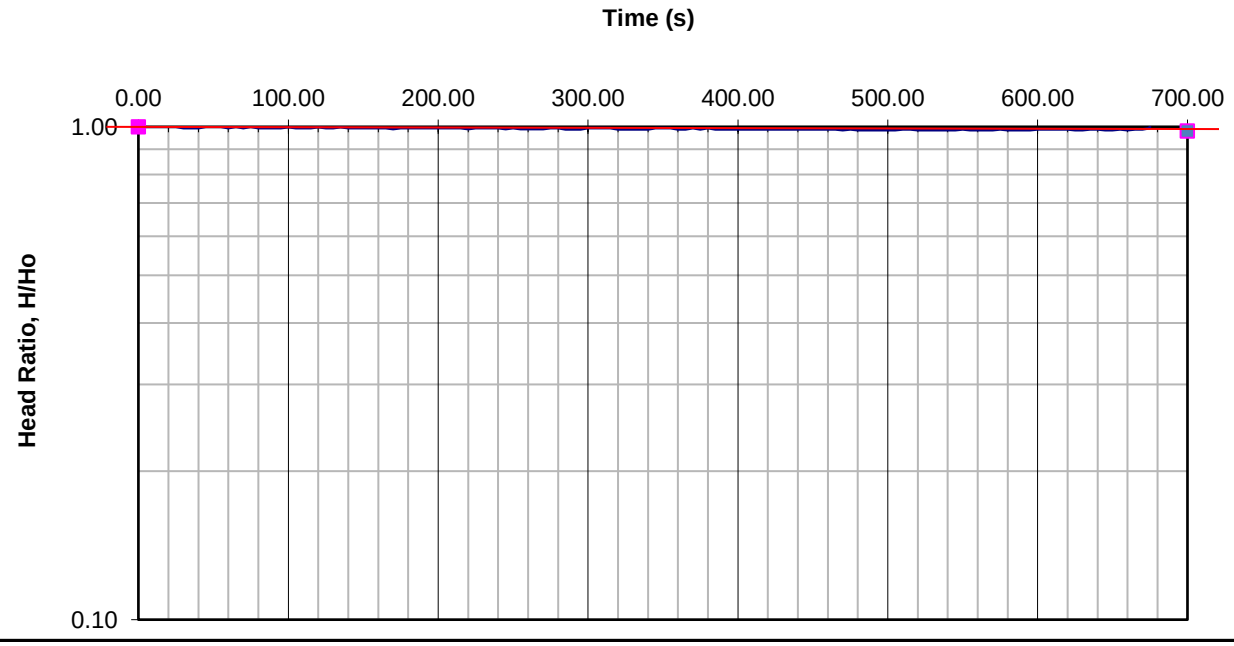
Test Date:		12-Sep-19	
Piezometer/Well No.:		BH/MW 3	
Ground level:		175.20	m
Screen top level:		156.96	m
Screen bottom level:		153.86	m
Test El. (at midpoint of screen):		155.41	m
Test depth (at midpoint of screen):		19.79	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.704	m
Initial water depth		3.66	m
Aquifer material:		**SILTY SAND TILL/SILTY CLAY TILL**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 2.8861E\text{-}05$

K= **9.7E-07** cm/s
9.7E-09 m/s



Falling Head Test (Slug Test)

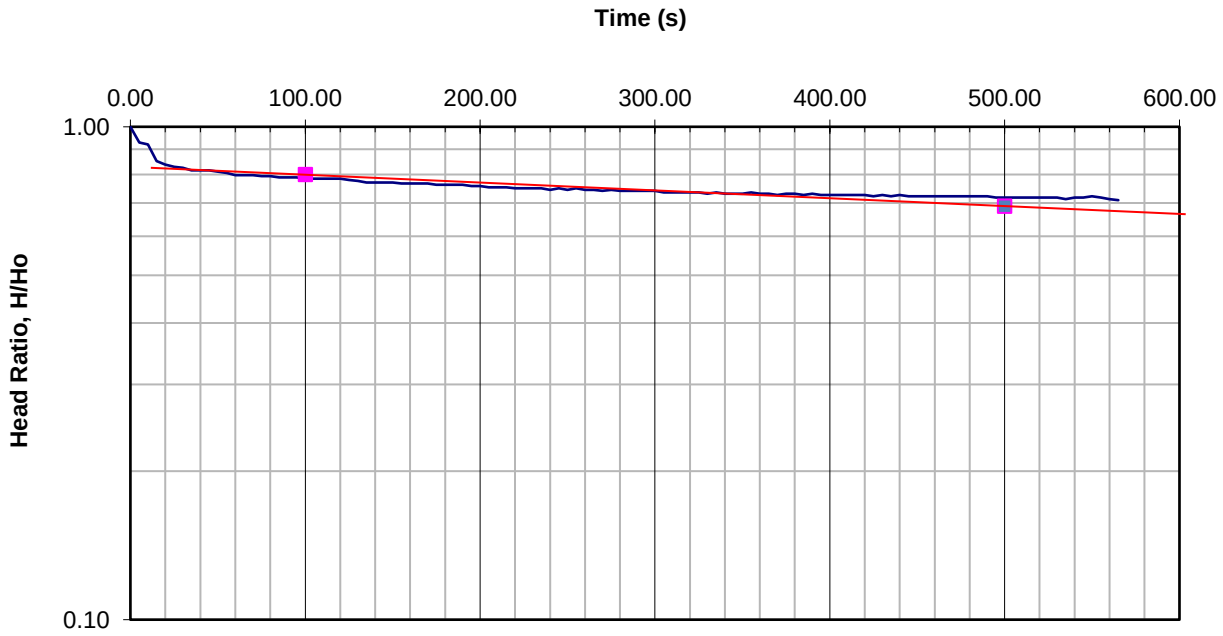
Test Date:		12-Sep-19	
Piezometer/Well No.:		BH/MW 5	
Ground level:		175.20	m
Screen top level:		156.96	m
Screen bottom level:		153.86	m
Test El. (at midpoint of screen):		155.41	m
Test depth (at midpoint of screen):		19.79	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.796	m
Initial water depth		3.66	m
Aquifer material:		**SANDY SILT TILL/SILTY CLAY TILL**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.0003698$

K= **1.2E-05** cm/s
1.2E-07 m/s



Falling Head Test (Slug Test)

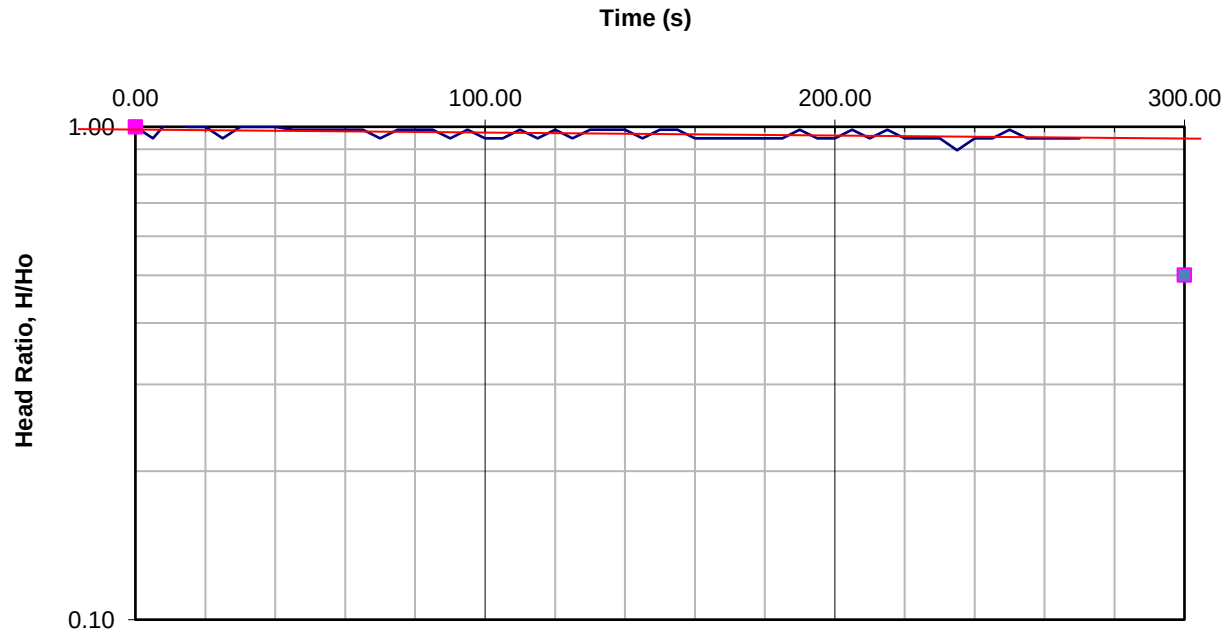
Test Date:		12-Sep-19	
Piezometer/Well No.:		BH/MW 6	
Ground level:		175.80	m
Screen top level:		157.56	m
Screen bottom level:		154.46	m
Test El. (at midpoint of screen):		156.01	m
Test depth (at midpoint of screen):		19.79	m
Screen length	L=	3.1	m
Diameter of undisturbed portion c	2R=	0.22	m
Standpipe diameter	2r=	0.05	m
Initial unbalanced head	Ho=	-0.077	m
Initial water depth		3.66	m
Aquifer material:		**SILTY SAND TILL/SANDY SILT TILL**	

Shape factor $F = \frac{2 \times 3.14 \times L}{\ln(L/R)} = 5.83401$ m

Permeability $K = \frac{3.14 \times r2}{F \times (t2 - t1)} \times \ln(H1/H2)$ (Bouwer and Rice Method)

$\frac{\ln(H1/H2)}{(t2 - t1)} = 0.00231049$

K= **7.8E-05** cm/s
7.8E-07 m/s



Soil Engineers Ltd.
CONSULTING ENGINEERS
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TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
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APPENDIX 'C'

WATER QUALITY CERTIFICATE OF ANALYSIS

REFERENCE NO. 1908-W037

FINAL REPORT

CA14137-NOV19 R1

1908-W037 1 Heron's Hill Way Toronto

Prepared for

Soil Engineers Ltd.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Soil Engineers Ltd.	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	90 West Beaver Creek Rd Richmond Hill, ON M1S 3A7. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Yogiraj Rana	Telephone	705-652-2143
Telephone	705-341-1987	Facsimile	705-652-6365
Facsimile	416-754-8516	Email	brad.moore@sgs.com
Email	yogiraj.rana@soilengineersltd.com	SGS Reference	CA14137-NOV19
Project	1908-W037 1 Heron's Hill Way Toronto	Received	11/05/2019
Order Number		Approved	11/12/2019
Samples	Ground Water (2)	Report Number	CA14137-NOV19 R1
		Date Reported	11/27/2019

COMMENTS

RL - SGS Reporting Limit

Nonylphenol Ethoxylates is the sum of nonylphenol monoethoxylate and nonylphenol diethoxylate.

Total PAH is the sum of anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(e)pyrene, benzo(b,j)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzo(a,i)pyrene, dibenzo(a,j)acridine, 7H-dibenzo(c,g)carbazole, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, phenanthrene and pyrene..

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:011792

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - General Chemistry** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

				Sample Number	8	
				Sample Name	BH/MW 4	
				Sample Matrix	Ground Water	
				Sample Date	04/11/2019	
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	
General Chemistry						
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	5	
Total Kjeldahl Nitrogen	as N mg/L	0.5	100		< 0.5	
Total Suspended Solids	mg/L	2	350	15	57	

PACKAGE: **SANSEW - Metals and Inorganics** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

					Sample Number	8	9
					Sample Name	BH/MW 4	BH/MW 4 Dissolved
					Sample Matrix	Ground Water	Ground Water
					Sample Date	04/11/2019	04/11/2019
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
Metals and Inorganics						
Fluoride	mg/L	0.06	10		0.71	
Cyanide (total)	mg/L	0.01	2	0.02	< 0.01	
Phosphorus (total)	mg/L	0.03				< 0.03
Aluminum (total)	mg/L	0.001	50		1.22	0.002
Antimony (total)	mg/L	0.0009	5		0.0012	0.0011
Arsenic (total)	mg/L	0.0002	1	0.02	0.0010	0.0008
Cadmium (total)	mg/L	0.000003	0.7	0.008	0.000012	0.000007
Chromium (total)	mg/L	0.00008	4	0.08	0.00206	< 0.00008

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - Metals and Inorganics**
(WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number					8	9
Sample Name					BH/MW 4	BH/MW 4 Dissolved
Sample Matrix					Ground Water	Ground Water
Sample Date					04/11/2019	04/11/2019
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**
Metals and Inorganics (continued)						
Cobalt (total)	mg/L	0.000004	5		0.000627	0.000030
Copper (total)	mg/L	0.0002	2	0.04	0.0036	0.0008
Lead (total)	mg/L	0.00001	1	0.12	0.00085	0.00002
Manganese (total)	mg/L	0.00001	5	0.05	0.0392	0.00302
Molybdenum (total)	mg/L	0.00004	5		0.0122	0.0118
Nickel (total)	mg/L	0.0001	2	0.08	0.0028	0.0011
Phosphorus (total)	mg/L	0.003	10	0.4	0.082	0.034
Selenium (total)	mg/L	0.00004	1	0.02	0.00022	0.00022
Silver (total)	mg/L	0.00005	5	0.12	< 0.00005	< 0.00005
Tin (total)	mg/L	0.00006	5		0.00644	0.00130
Titanium (total)	mg/L	0.00005	5		0.0430	0.00008
Zinc (total)	mg/L	0.002	2	0.04	0.010	< 0.002

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - Microbiology** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
Microbiology					
E. Coli	cfu/100mL	-		200	< 2↑

PACKAGE: **SANSEW - Nonylphenol and Ethoxylates** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
Nonylphenol and Ethoxylates					
Nonylphenol	mg/L	0.001	0.02	0.001	< 0.001
Nonylphenol Ethoxylates	mg/L	0.01	0.2	0.01	< 0.01
Nonylphenol diethoxylate	mg/L	0.01			< 0.01
Nonylphenol monoethoxylate	mg/L	0.01			< 0.01

PACKAGE: **SANSEW - Oil and Grease** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - Oil and Grease** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
Oil and Grease					
Oil & Grease (total)	mg/L	2			< 2
Oil & Grease (animal/vegetable)	mg/L	4	150		< 4
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4

PACKAGE: **SANSEW - Other (ORP)** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
Other (ORP)					
pH	no unit	0.05	11.5	9.5	7.91
Chromium VI	mg/L	0.0002	2	0.04	0.0002
Mercury (total)	mg/L	0.00001	0.01	0.0004	< 0.00001

PACKAGE: **SANSEW - PAHs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result

PACKAGE: **SANSEW - PAHs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
PAHs					
Benzo(b+j)fluoranthene	mg/L	0.0001			< 0.0001

PACKAGE: **SANSEW - PCBs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
PCBs					
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001	0.001	0.0004	< 0.0001

PACKAGE: **SANSEW - Phenols** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
Phenols					
4AAP-Phenolics	mg/L	0.002	1	0.008	< 0.002

PACKAGE: **SANSEW - SVOCs** (WATER)

Sample Number	8
Sample Name	BH/MW 4

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - SVOCs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
SVOCs					
di-n-Butyl Phthalate	mg/L	0.002	0.08	0.015	< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.002	0.012	0.0088	< 0.002
3,3-Dichlorobenzidine	mg/L	0.0005	0.002	0.0008	< 0.0005
Pentachlorophenol	mg/L	0.0005	0.005	0.002	< 0.0005
PAHs (Total)	mg/L	-	0.005	0.002	< 0.001
Perylene	mg/L	0.0005			< 0.0005

PACKAGE: **SANSEW - SVOCs - PAHs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
SVOCs - PAHs					
7Hdibenzo(c,g)carbazole	mg/L	0.0001			< 0.0001
Anthracene	mg/L	0.0001			< 0.0001
Benzo(a)anthracene	mg/L	0.0001			< 0.0001
Benzo(a)pyrene	mg/L	0.0001			< 0.0001
Benzo[e]pyrene	mg/L	0.0001			< 0.0001
Benzo(ghi)perylene	mg/L	0.0002			< 0.0002
Benzo(k)fluoranthene	mg/L	0.0001			< 0.0001
Chrysene	mg/L	0.0001			< 0.0001

Client: Soil Engineers Ltd.
Project: 1908-W037 1 Heron's Hill Way Toronto
Project Manager: Yogiraj Rana
Samplers: N/A

PACKAGE: **SANSEW - SVOCs - PAHs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
SVOCs - PAHs (continued)					
Dibenzo(a,h)anthracene	mg/L	0.0001			< 0.0001
Dibenzo(a,i)pyrene	mg/L	0.0001			< 0.0001
Dibenzo(a,j)acridine	mg/L	0.0001			< 0.0001
Fluoranthene	mg/L	0.0001			< 0.0001
Indeno(1,2,3-cd)pyrene	mg/L	0.0002			< 0.0002
Phenanthrene	mg/L	0.0001			< 0.0001
Pyrene	mg/L	0.0001			< 0.0001

PACKAGE: **SANSEW - VOCs** (WATER)

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

Parameter	Units	RL	L1	L2	Result
VOCs					
Chloroform	mg/L	0.0005	0.04	0.002	0.0041
1,2-Dichlorobenzene	mg/L	0.0005	0.05	0.0056	< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005	0.08	0.0068	< 0.0005
cis-1,2-Dichloroethene	mg/L	0.0005	4	0.0056	< 0.0005
trans-1,3-Dichloropropene	mg/L	0.0005	0.14	0.0056	< 0.0005
Methylene Chloride	mg/L	0.0005	2	0.0052	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	1.4	0.017	< 0.0005

PACKAGE: **SANSEW - VOCs** (WATER)

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Parameter	Units	RL	L1	L2	Result
VOCs (continued)					
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	1	0.0044	< 0.0005
Trichloroethylene	mg/L	0.0005	0.4	0.0076	< 0.0005

PACKAGE: **SANSEW - VOCs - BTEX** (WATER)

Sample Number	8
Sample Name	BH/MW 4
Sample Matrix	Ground Water
Sample Date	04/11/2019

L1 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016

L2 = SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016

Parameter	Units	RL	L1	L2	Result
VOCs - BTEX					
Benzene	mg/L	0.0005	0.01	0.002	< 0.0005
Ethylbenzene	mg/L	0.0005	0.16	0.002	< 0.0005
Toluene	mg/L	0.0005	0.016	0.002	< 0.0005
Xylene (total)	mg/L	0.0005	1.4	0.0044	< 0.0005
m-p-xylene	mg/L	0.0005			< 0.0005
o-xylene	mg/L	0.0005			< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	SANSEW / WATER / - - Toronto Sewer Use By Law Table 1 - Sanitary and Combined Sewer Discharge - BL_100_2016 L1	SANSEW / WATER / - - Toronto Sewer Use By Law Table 2 - Storm Sewer Discharge - BL_100_2016 L2
BH/MW 4					
Chloroform	EPA 5030B/8260C	mg/L	0.0041		0.002
Total Suspended Solids	SM 2540D	mg/L	57		15

QC SUMMARY

Biochemical Oxygen Demand

Method: SM 5210 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0012-NOV19	mg/L	2	< 2	5	30	88	70	130	121	70	130

Cyanide by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0063-NOV19	mg/L	0.01	<0.01	ND	10	96	90	110	84	75	125

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0106-NOV19	mg/L	0.06	<0.06	0	10	101	90	110	104	75	125

QC SUMMARY

Hexavalent Chromium by SFA

Method: EPA218.6/EPA3060A | Internal ref.: ME-CA-[ENVISKA-LAK-AN-012

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	SKA0060-NOV19	mg/L	0.0002	<0.0002	ND	20	102	80	120	NV	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0007-NOV19	mg/L	0.00001	< 0.00001	ND	20	114	80	120	114	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0025-NOV19	mg/L	0.00005	<0.00005	ND	20	100	90	110	95	70	130
Aluminum (total)	EMS0025-NOV19	mg/L	0.001	<0.001	5	20	107	90	110	105	70	130
Arsenic (total)	EMS0025-NOV19	mg/L	0.0002	<0.0002	ND	20	100	90	110	104	70	130
Cadmium (total)	EMS0025-NOV19	mg/L	0.000003	<0.000003	ND	20	98	90	110	97	70	130
Cobalt (total)	EMS0025-NOV19	mg/L	0.000004	<0.000004	0	20	101	90	110	101	70	130
Chromium (total)	EMS0025-NOV19	mg/L	0.00008	<0.00008	ND	20	103	90	110	106	70	130
Copper (total)	EMS0025-NOV19	mg/L	0.0002	<0.0002	0	20	102	90	110	NV	70	130
Manganese (total)	EMS0025-NOV19	mg/L	0.00001	<0.00001	1	20	102	90	110	89	70	130
Molybdenum (total)	EMS0025-NOV19	mg/L	0.00004	<0.00004	13	20	102	90	110	109	70	130
Nickel (total)	EMS0025-NOV19	mg/L	0.0001	<0.0001	3	20	102	90	110	100	70	130
Lead (total)	EMS0025-NOV19	mg/L	0.00001	<0.00001	7	20	94	90	110	91	70	130
Phosphorus (total)	EMS0025-NOV19	mg/L	0.003	<0.003	ND	20	97	90	110	NV	70	130
Antimony (total)	EMS0025-NOV19	mg/L	0.0009	<0.0009	ND	20	93	90	110	NV	70	130
Selenium (total)	EMS0025-NOV19	mg/L	0.00004	<0.00004	ND	20	98	90	110	113	70	130
Tin (total)	EMS0025-NOV19	mg/L	0.00006	<0.00006	ND	20	101	90	110	NV	70	130
Titanium (total)	EMS0025-NOV19	mg/L	0.00005	<0.00005	ND	20	100	90	110	NV	70	130
Zinc (total)	EMS0025-NOV19	mg/L	0.002	<0.002	1	20	100	90	110	106	70	130

QC SUMMARY

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
E. Coli	BAC9070-NOV19	cfu/100mL	-	ACCEPTED	ACCEPTED							

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0110-NOV19	mg/L	0.01	< 0.01			86	55	120			
Nonylphenol Ethoxylates	GCM0110-NOV19	mg/L	0.01	< 0.01								
Nonylphenol monoethoxylate	GCM0110-NOV19	mg/L	0.01	< 0.01			92	55	120			
Nonylphenol	GCM0110-NOV19	mg/L	0.001	< 0.001			84	55	120			

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0088-NOV19	mg/L	2	<2	NSS	20	91	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-[ENV]GC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0088-NOV19	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0088-NOV19	mg/L	4	< 4	NSS	20	NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0099-NOV19	no unit	0.05	NA	0		101			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0052-NOV19	mg/L	0.002	<0.002	7	10	101	90	110	89	75	125

Phosphorus by SFA

Method: SM 4500-P J | Internal ref.: ME-CA-[ENVISFA-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	SKA0057-NOV19	mg/L	0.03	<0.03	5	10	101	90	110	97	75	125

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENVIGC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0119-NOV19	mg/L	0.0001	<0.0001	ND	30	96	60	140	86	60	140

QC SUMMARY

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
3,3-Dichlorobenzidine	GCM0116-NOV19	mg/L	0.0005	< 0.0005	NSS	30	96	30	130	NSS	30	130
7Hdibenzo(c,g)carbazole	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	94	50	140	NSS	50	140
Anthracene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	84	50	140	NSS	50	140
Benzo(a)anthracene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	93	50	140	NSS	50	140
Benzo(a)pyrene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	83	50	140	NSS	50	140
Benzo(b+j)fluoranthene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	92	50	140	NSS	50	140
Benzo[e]pyrene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	78	50	140	NSS	50	140
Benzo(ghi)perylene	GCM0122-NOV19	mg/L	0.0002	< 0.0002	NSS	30	91	50	140	NSS	50	140
Benzo(k)fluoranthene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	92	50	140	NSS	50	140
Bis(2-ethylhexyl)phthalate	GCM0122-NOV19	mg/L	0.002	< 0.002	NSS	30	96	50	140	NSS	50	140
Chrysene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	92	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0122-NOV19	mg/L	0.002	< 0.002	NSS	30	97	50	140	NSS	50	140
Dibenzo(a,h)anthracene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140
Dibenzo(a,i)pyrene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	89	50	140	NSS	50	140
Dibenzo(a,j)acridine	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	93	50	140	NSS	50	140
Fluoranthene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140
Indeno(1,2,3-cd)pyrene	GCM0122-NOV19	mg/L	0.0002	< 0.0002	NSS	30	91	50	140	NSS	50	140
Pentachlorophenol	GCM0122-NOV19	mg/L	0.0005	< 0.0005	NSS	30	94	50	140	NSS	50	140
Perylene	GCM0122-NOV19	mg/L	0.0005	< 0.0005	NSS	30	92	50	140	NSS	50	140
Phenanthrene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	83	50	140	NSS	50	140

QC SUMMARY

Semi-Volatile Organics (continued)

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENVIGC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Pyrene	GCM0122-NOV19	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0095-NOV19	mg/L	2	< 2	1	10	NV	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENVISFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0054-NOV19	as N mg/L	0.5	<0.5	10	10	102	90	110	107	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	102	60	130	102	50	140
1,2-Dichlorobenzene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	101	60	130	99	50	140
1,4-Dichlorobenzene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	102	60	130	99	50	140
Benzene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	98	60	130	99	50	140
Chloroform	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	99	60	130	93	50	140
cis-1,2-Dichloroethene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	97	60	130	98	50	140
Ethylbenzene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	101	60	130	99	50	140
m-p-xylene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	103	60	130	101	50	140
Methylene Chloride	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	104	60	130	103	50	140
o-xylene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	102	60	130	99	50	140
Tetrachloroethylene (perchloroethylene)	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	101	60	130	98	50	140
Toluene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	100	60	130	99	50	140
trans-1,3-Dichloropropene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	99	60	130	97	50	140
Trichloroethylene	GCM0104-NOV19	mg/L	0.0005	<0.0005	ND	30	99	60	130	93	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

-- End of Analytical Report --

SGS Request for Laboratory Services and CHAIN OF CUSTODY

No: 011792

Page _____ of _____

Environment, Health & Safety - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Laboratory Information Section - Lab use only

Received By: Kim Sheard
Received Date: 11 05 19 (mm/dd/yy)
Received Time: 16 : 45 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☐ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice
Temperature Upon Receipt (°C) 8 , 8 , 8
LAB LIMS #: OA 14137 - Nov19

REPORT INFORMATION

Company: Soil Engineers ltd
Contact: Yogiraj Rana
Address: 90 West Beaver Creek Road, Richmond Hill
Phone: 647-223-1743
Fax:
Email: yogiraj.rana@soilengineersltd.com

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 1908-C0037
Site Location/ID: See comments

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

Regulation 153/04:
☐ Table 1 ☐ Res/Park Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium
☐ Table 3 ☐ Agri/Other ☐ Fine
☐ Table _____

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA

Sewer By-Law:
☑ Sanitary
☑ Storm
Municipality: Toronto

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics (incl CrVI, CN,Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na–water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only (Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni, Se,Ag,Ti,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs (all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only (no BTEX	VOC: VOCs (all incl BTEX	VOC: BTEX only	Pest: Pesticides (Organochlorine or specify other	Other (please specify)	TCLP (Specify TCLP tests ☐M&I ☐VOC ☐PCB ☐B(a)P ☐ABN ☐Ignit.)	COMMENTS:
1	BH/MW 4	Nov-4-19	3:50PM	#19	GW	√												Sewer Use: Toronto Specify pkg: storm sanitary; Water Characterization Pkg ☐ General ☐ Extended		1 Hesdons Hill way, Toronto.
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

Observations/Comments/Special Instructions

Sampled By (NAME): **Signature:** Date: _____/_____/_____ (mm/dd/yy)

Relinquished by (NAME): **Signature:** Date: _____/_____/_____ (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.2
Date of Issue: 09 Sept, 2019