GEI Consultants
Consulting Engineers and Scientists

Hydrogeological Investigation

South Simpson (Headwaters of West Rainbow Creek), Block Plan and Master Environmental Servicing Plan Update

Northern corner of Coleraine Drive and Mayfield Road, Caledon, Ontario

Submitted to:
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1. Introduction

GEI Consultants Ltd. (GEI) was retained by Simpson Road Landowners Group Inc. (the Client) to complete a hydrogeological investigation to support a Block Plan and Master Environmental Servicing Plan update at South Simpson (Headwaters of West Rainbow Creek). These works are required as part of the submission for a proposed extension of Simpson Road and provide an update to the Master Environmental Servicing Plan 2000 (MESP) and incorporate the revisions made through the Municipal Class EA for Simpson Road (2013). All are intended to support future development of the study area identified in Schedule "C" of the Terms of Reference (TOR). Simpson Road is generally located north of the intersection of Coleraine Drive and Mayfield Road in Caledon, Ontario. A summarized site location plan as described by Schedule "C" is enclosed as Figure 1.

The subject lands are designated Prestige Industrial and General Industrial in the Official Plan. The subject lands are a part of the Town of Caledon's South Simpson Secondary Plan Area and are subdivided into eleven (11) distinct properties, separated by different landowners. The Landowner Group consists of landowners of parcels 2, 3, 4, 5 and 11 on the map by Weston Consulting (Weston). As requested, non-participating landowners within the secondary plan area have not been included in this study. This exclusion is to be confirmed by the Town of Caledon.

The subject lands have an approximate total area of 36.75 ha (90.70 acres) and are currently occupied by open lands, various truck and transportation uses, and a former garden supply store. The subject lands are bounded by Mayfield Road to the south, Coleraine Drive to the west, and mixed residential, commercial, and undeveloped lands to the east and north. Undeveloped lands exist within a southern parcel located on three sides by subject lands and Mayfield Road to the south.

Local elevations in the northeastern portion of the subject lands are near Elev. 236.0 m, sloping to the south-southeast with elevations near 230.5 m. The maximum difference in elevation across the site is approximately 5.5 m as inferred from Topographic information provided by First Base Solutions and shown in Pre-Development Drainage Plan Drawing DAP-2. An aerial image of the site from 2022 is provided on Figure 2.

Historical study and contemporary documents related to this development file were available for review. GEI was provided the following information in preparation of this report:

- "*Block Planning for the South Simpson Secondary Plan, North-East Corner of Coleraine Drive and Mayfield Road, Ward 5*." Staff-Report 2022-0374, dated July 12, 2022, prepared by Planning Department, Town of Caledon
- *"South Simpson Secondary Plan Area Ownership"* Map, from Schedule "C" to Staff Report 2022-0374 dated May 25, 2022.
- *"Terms of Reference: South Simpson (Headwaters of West Rainbow Creek) Master Environmental Servicing Plan Update"*. Town of Caledon

- *"Hydrogeological Appraisal Simpson Road Completion from North of George Bolton Parkway to Mayfield Road Town of Caledon, Ontario"* prepared by AMEC Earth & Environmental Limited dated March 8, 2011.
- *"Simpson Road Extension Phase 3, from 282m South of Parr Boulevard to Mayfield Road, Contract 14-09"* prepared by Wood and commissioned by Region of Peel, dated November 2020.

The proposed development involves the construction of an approximate 600 m length of road that will be oriented in a north-northwest/south-southeast direction and connects Simpson Road as it currently exists in the north to Mayfield Road in the south. It includes site servicing and associated bedding as much as 4.5 mbgs along Simpson Road.

The hydrogeological investigation consisted of 1) borehole drilling and monitoring well installations to characterize existing soils and groundwater subsurface and 2) staff gauge installations at surface to monitor baseflow conditions in the Rainbow Creek Tributary that run approximately parallel to the proposed road extension.

This report includes monthly groundwater and surface water monitoring, and infiltration testing. GEI is completing a geotechnical report concurrently under separate cover.

1.1 Purpose and Scope of Work

The main objectives of the Hydrogeological Investigation were to:

a) Establish the local hydrogeological settings of the Site;
b) Provide an assessment of anticipated construction dewatering flow rates based on the site servicing plan provided from the Client;
c) Assess use of Low Impact Development (LID) measures;
d) Assess groundwater quality and compare the results to the applicable Provincial Water Quality Objective (PWQO), Ontario Drinking Water Objective (ODWO), and O.Reg.153/04, as amended, Site Condition Standards (SCSs);
e) Qualitatively assess the potential impact to the nearby structures, water bodies and water users, if any, and comment on future regulatory agency involvement;
f) Assess private servicing feasibility; and
g) Prepare a hydrogeological investigation report.

To achieve the investigation objectives, GEI carried out the following scope of work:

a) Conduct a background desktop review of pertinent geological and hydrogeological resources, Ministry of Environment, Conservation and Parks (MECP) Water Well Records, previous reports, and proposed Site plan drawings.
b) Visit the site and note existing site conditions, site setting, topography, drainage, water features, and potential water wells within 500 m of the site, if any.
c) Utilization of eight (8) advanced boreholes with five (5) monitoring wells installed during the field investigation and two (2) nested piezometers, each including one (1) shallow well and one (1) deep piezometer.

d) Install and utilize two (2) staff gauges and two (2) level loggers to monitor surface water elevations, to be included in a later subsequent letter report.
e) Revisit the site and measure groundwater levels, perform hydraulic conductivity testing at three (3) monitoring wells, and retrieve representative groundwater samples.
f) Submit one (1) representative unfiltered groundwater sample for laboratory testing to compare against the chemical parameters as defined in the Peel Storm and Sanitary Sewer Use Bylaw; one (1) representative unfiltered groundwater samples compared to PWQO standards for metals; O.Reg. 153/04, as amended, for PHCs and VOCs; and for general Total Suspended Solids (TSS).
g) Submit one (1) representative filtered groundwater sample for laboratory testing to compare against the PWQO standards for metals and TSS.
h) Evaluate the background information, and field and laboratory data to assess construction dewatering requirements.
i) Prepare a hydrogeological investigation report.

1.2 Regulatory Requirements for Water Taking

1.2.1 Water Taking – Temporary

The volume of water entering the excavation during construction will be based on both groundwater infiltration and precipitation events. Based on O.Reg. 63/16, the following dewatering limits and requirements are as follows:

- Construction Dewatering less than 50,000 L/day: The takings of both groundwater and stormwater does not require a hydrogeological report, does not require registration on the Environmental Activity and Sector Registry (EASR), and does not require a Permit to Take Water (PTTW) from the MECP.
- Construction Dewatering greater than 50,000 L/day and less than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and registration on the EASR but does not require a PTTW from the MECP.
- Construction Dewatering greater than 400,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and requires a PTTW from the MECP.

1.2.2 Source Water Protection

The site is in the Toronto Source Protection Area, the CTC Source Protection Region, and is in the jurisdiction of the Toronto and Region Conservation Authority (TRCA). The following documents should be used in determination of the regulatory requirements when it comes to maintaining hydrogeological function at this site:

- "*Approved CTC Source Protection Plan*", dated February 23, 2022, by the CTC Source Protection Committee.
- *"Approved Assessment Report: Toronto and Region Source Protection Area,"* dated February 23, 2022, by the CTC Source Protection Committee.

Based on Source Water Protection online mapping, the following is noted:

- Wellhead Protection Area (WHPA): The site is not located within a WHPA Zone, Q1 or Q2 (Figure 3).
- Intake Protection Zone (IPZ): The study area is not located within IPZ (Figure 4).
- Highly Vulnerable Aquifer (HVA): The site is not located within an HVA (Figure 5).
- Significant Groundwater Recharge Area (SGRA): The site is not located within an SGRA (Figure 6).
- The site is not located within the Oak Ridges Moraine or Niagara Escarpment planning areas.

2. Background Review

The subject lands are irregular in shape and have an approximate total area of 36.75 ha (90.70 acres). They are currently occupied by open lands, various truck and transportation uses, and a former garden supply store. The subject lands are bounded by Mayfield Road to the south, Coleraine Drive to the west, and mixed residential, commercial, and undeveloped lands to the east and north. Undeveloped lands exist within a southern parcel located on three sides by subject lands and Mayfield Road to the south.

The site does not lie within any Well Head Protection Area (WHPA) as shown on Figure 3. The site is not within an Intake Protection Zone (IPZ) as shown on Figure 4. A Highly Vulnerable Aquifer (HVA) does not underly the site as shown on Figure 5. The site is not within a Significant Groundwater Recharge Area (SGRA), as shown on Figure 6. The site is not located within the designated areas of the Oak Ridges Moraine Conservation Act or Niagara Escarpment Planning and Development Act.

2.1 Topography and Drainage

Local elevations in the northeastern portion of the subject lands are near Elev. 236.0 m, sloping to the south-east with elevations near 230.5 m. The maximum difference in elevation across the site is approximately 5.5 m as inferred from Topographic information provided by First Base Solutions and shown in Pre-Development Drainage Plan Drawing DAP-2.

As shown in the Ontario Watershed Information Tool and Ontario Watershed Boundaries mapping, the subject lands are located in a headwater drainage area associated with the larger Black Creek – Humber River Outlet Watershed (02HC-02) and Humber River – Don River Watershed (02HC). Two sub-catchment areas are located in the southern half of the subject area. Both serve as headwater areas to the larger Black Creek – Humber River Outlet Watershed.

It is expected that surficial runoff from the site is captured primarily within the storm water pond where it travels through the linked headwater tributary then travels south-south east approximately 6 km before migrating south east toward Woodbridge where it connects with the main Humber River channel, which is defined southeast of the Site, some 13 km away.

The level of water use is classified as “Low” under the summer low flow and “Low” under the average annual flow conditions for purposes of Ontario Regulation 387/04 (Water Taking and Transfer) under the Ontario Water Resources Act. Storm water management ponds appear to capture surficial runoff from the adjacent commercial / industrial lands. An unevaluated wetland exists south of Mayfield Road and was observed to be hydraulically connected at the surface to West Rainbow Creek Tributary through a culvert running under Mayfield Road. The Rainbow Creek tributary runs approximately parallel to the prevailing direction of surface water flow in the primary watershed and the proposed Simpson Road extension. This tributary was instrumented with two (2) staff gauges and two (2) water level loggers to evaluate surface water elevations. Based on field observations, it appears this tributary is hydraulically connected to surface water features southeast of Mayfield Road through a culvert that runs under Mayfield Road.

2.2 Site Physiographic, Geologic and Hydrogeological Settings

The site is in the physiographic region denoted as bevelled till plains of the Peel Plain Physiographic Region per Chapman and Putnam, 1984. Quaternary geology mapping from the Ontario Geological Society indicates cohesive clay to silt textured glacial till deposits across the site.

Historic aerial imagery shows earthworks and industrial development across large portions of the site to accommodate the current industrial land use which suggests that some surficial zones of earth fill should be expected. Water well records from the site and surrounding area indicate that clays, clay gravels and hard tills extend deeper than 15 m below grade.

The bedrock in the general area corresponds to the Georgian Bay Formation, consisting of shale and limestone lithology. Based on the MECP Water Well Records in the area bedrock was anticipated at a depth of approximately 20 to 52 m below existing grade. Drift thickness mapping (C. Gao, et al., 2006. Bedrock topography and overburden thickness mapping, southern Ontario; Ontario Geological Survey, Miscellaneous Release – Data 207.) shows approximately 35 m of drift material overlying bedrock.

2.3 MECP Water Well Records and Existing Water Wells

MECP water well records were obtained within 500 m of the site area to assess the general nature of the groundwater resource in near vicinity of the site, and historical/current uses of wells in the area. Forty-nine (49) well records were found. The approximate MECP well locations are shown on Figure 7 and a well records summary table is included in Appendix A.

The wells were installed for the following uses:

- Sixteen (16) of the records indicate domestic use.
- Seventeen (17) of the records indicate monitoring use/test hole.
- One (1) of the records indicate not used.
- Fourteen (14) of the records did not specify the use and are of unknown use.

The stratigraphic descriptions within the MECP water well records may show discrepancies due to the methodology in which they are determined (observations of cuttings and lacking consistency of soil descriptions between different drillers). Though this is the case, an overall sense of the deep stratigraphy can be determined by looking at commonalities between most stratigraphic descriptions and where the wells were terminated in an aquifer.

As much as approximately 30 mbgs, the well records typically indicate brown clays and loams near surface (< 4 mbgs) underlain by grey clays and clay silts to gravel (potentially glacial till in some locations (5 – 30 mbgs). Shale bedrock was encountered in multiple wells at depths ranging from 36 to 48 mbgs. The domestic supply well records do not show screen installation depths, though fresh water was noted at 12 to 44 mbgs.

2.4 Site Condition Standards

The MECP has developed a set of Soil, Ground water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) and O. Reg. 153/04, as amended. The standards consist of nine tables (Table 1 through Table 9) that provide criteria for maximum concentrations of various contaminants. In general, the applicable O. Reg. 153/04, as amended, SCSs depend on the site location, land use, soil texture, bedrock depth and the applicable potable or non-potable ground water condition at the investigation site.

In order to determine the Site Sensitivity, Sections 41 and 43.1 of O. Reg. 153/04, as amended, were evaluated by GEI as shown in the following table:

CRITERIA	RESULT
Current Property Use	Vacant/Undeveloped
Potable vs. Non-Potable Ground Water	Potable
Proximity of Areas of Natural Significance	>30 m
Proximity to a Water Body	<30 m
Shallow Soil Condition	No
Land Use	Residential/Parkland/Institutional (RPI)
Applicable Site Condition Standard	Table 8: Generic Site Condition Standards For Use within 30 m of a Water Body in a Potable Ground Water Condition for RPI / Industrial/Commercial/Community (ICC) land use (Table 8 RPI/ICC)

2.5 Visual Inspection of the Site

The site is irregular in shape have an approximate total area of 36.75 ha (90.70 acres). The subject lands are bounded by Mayfield Road to the south, Coleraine Drive to the west, and mixed residential, commercial, and undeveloped lands to the east and north. Undeveloped lands exist in a southern parcel located on three sides by subject lands and Mayfield Road to the south. Agricultural lands exist primarily to the south and west of Coleraine Drive and Mayfield Rd. The site currently contains a mix of various truck and transportation uses, open and residential lands, and a former garden supply store which is consistent with other land uses in the area.

The topography within the study region (within 500 m of the site) is consistent with surficial geological mapping and the developmental history of the site as evidenced in the aerial photo record. Local to the site, the northwestern portion of the site is near Elev. 236.0 m, sloping to the southeast at an elevation near 230.5 m, with a maximum difference in elevation across the site of about 5.5 m shown in Pre-Development Drainage Plan Drawing DAP-2.

3. Procedures and Methodology

All elevations in this report are geodetic/metric and expressed in metres (m). All measurements are also in metric and expressed in millimetres (mm), metres (m) or kilometers (km). Boreholes appear in short form as BH and those in which wells were installed are presented as BH/MW.

The borehole locations were laid out in the field by GEI staff prior to commencement of drilling operations. The locations of underground utilities were coordinated with private and public locating companies.

Borehole ground surface elevations and coordinates (referencing NAD 83 geodetic datum) were surveyed by GEI with a Topcon HiPer SR GPS Survey unit. The elevations are provided on the borehole logs in Appendix B. Borehole locations are shown on Figure 2.

The fieldwork for the drilling program was carried out between May 17 and May 19, 2023. A total of eight (8) boreholes were drilled to a maximum depth of 6 m (Elev. 223.8). At select borehole locations a deep well and a shallow well were installed to allow for nested wells to be installed as described below. Borehole logs are provided in Appendix B.

The boreholes were advanced by a drilling subcontractor retained and supervised by GEI using a track-mounted drill rig, solid and hollow stem augers, and standard soil sampling equipment. Sampling was conducted using a 51 mm O.D. Split Spoon (SS) sampler. Standard Penetration Test (SPT) “N” Values (N values) were recorded for the sampled intervals as the number of blows required to drive an SS sampler 305 mm into the soil using a 63.5 kg drop hammer falling 750 mm, in accordance with ASTM D1586. In each borehole soil sampling was conducted at 0.75 m intervals for the upper 3.0 m and at 1.5 m intervals thereafter.

Five (5) monitoring wells were installed within select boreholes on site. Though included in the Borehole Log, one monitoring well became inaccessible during re-grading, and thus only four (4) wells are operational. Nested monitoring wells / piezometers were installed in two (2) boreholes. The “D” signifies the deep well and the “S” signifies the shallow piezometer such that both deep and shallow conditions can be monitored. The wells/piezometers were installed on site to facilitate long-term groundwater monitoring, sampling, and in-situ testing. Monitoring well construction is shown on the borehole logs in Appendix B.

GEI field staff examined and classified characteristics of the soils encountered in the boreholes, including the presence of fill materials, groundwater observations during and upon completion of the drilling, recorded observations of borehole construction, and processed the recovered samples. All recovered soil samples were logged in the field, carefully packaged, and transported to GEI’s laboratory for more detailed examination and classification.

In GEI’s laboratory, the samples were classified as to their visual and textural characteristics. Six (6) representative samples of the major soil units were selected and submitted to our laboratory for grain size analysis. Grain size results are provided in Appendix C. Four of the samples were submitted for Atterberg Limits tests and the results area also provided in Appendix C.

3.1 Groundwater Monitoring

Groundwater levels will be measured in four (4) monitoring wells and two (2) nested monitoring wells / piezometers each month for one (1) year to determine the seasonally high groundwater levels.

Measures conducted up to the point of this reporting, are included in Section 4.2, Supplemental Groundwater Level Monitoring Report, will be issued following the completion of the 12-month groundwater level monitoring program.

3.2 Surface Water Monitoring

A baseflow monitoring program is being carried out. Nested piezometers (at Boreholes 4 and 6), staff gauges and level loggers. Staff gauges and level loggers were installed in West Rainbow Creek at locations near Borehole 4 and Borehole 6 (SG4 and SG6, respectively) to evaluate groundwater elevations and baseflow conditions. A supplemental report under separate cover will be provided upon completion of the monitoring program that incorporates measures captured through spring, summer, and fall seasons.

3.3 Hydraulic Conductivity Testing

Rising head tests were completed in the BH/MW 3 and BH/MW 8 on June 8th, and in BH/MW 6S on July 3, 2023. Water was manually purged from monitoring wells using LDPE piping and a foot valve. The static water level was measured prior to the start of testing, and the change in water level was monitored using an electronic level logger. The level loggers were left in the monitoring wells for several hours to allow for adequate recovery of the groundwater. The test data were used to estimate the horizontal hydraulic conductivity (K) of the soils at the well screen depths.

The semi-log plot for drawdown versus time for the tests are provided in Appendix D and results are discussed in Section 4.3.

3.4 Groundwater Chemical Sampling

To establish baseline conditions and assess the suitability for discharge of pumped groundwater to surface during potential dewatering activities, the following groundwater samples were collected from nested BH/MW 4D on June 8, 2023 and tested relative to the Peel Region storm and sanitary sewer use by-laws PWQO, and/or O.Reg.153/04, as amended, Table 1 SCSs (the most stringent SCSs):

- One (1) unfiltered groundwater sample was collected from Nested BH/MW 4d analyzed against Peel Region storm and sanitary sewer use by-laws; PWQO metals; O.Reg.153/04, as amended, PHCs and VOCs; and general Total Suspended Solids (TSS).
- One (1) filtered groundwater samples were collected from Nested BH/MW 4d and analyzed against PWQO metals and TSS only.

Prior to collection of the samples, approximately three (3) standing well volumes of groundwater were purged from the well. The samples were collected and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The field filtered samples were run through a 75 µm filter. The samples were submitted to CALA- accredited Eurofins Environmental Laboratory for analysis. The results of the groundwater chemistry are presented in the Laboratory Certificates of Analysis provided in Appendix E.

4. Subsurface Conditions

The borehole locations are shown on Figure 2 and detailed subsurface conditions are presented on the borehole logs in Appendix B. The soil conditions encountered at the borehole locations are summarized below. A stratigraphic cross-section across the property as aligned on Figure 2 is included as Figure 8. The stratigraphy discussed in Sections 4.1.1 and 4.1.2 below pertain only to Boreholes 1 to 8 advanced by GEI in 2023.

It should be noted that the conditions indicated on the borehole logs are for specific locations only and can vary between and beyond the locations. It should be noted that the soil boundaries indicated on the borehole logs and subsurface profile are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones and should not be interpreted as exact planes of geological change.

In addition, the descriptions provided in the borehole logs are inferred from a variety of factors that include visual observations of the soil samples retrieved, laboratory testing, measurements prior to and after drilling, and the drilling process itself (speed of drilling, shaking/grinding of the augers, etc.). The passage of time also may result in changes in conditions interpreted to exist at locations where sampling was conducted.

4.1 Stratigraphy and Hydrostratigraphy

The site is predominantly underlain by deposits of clayey silt and silt glacial till with coarse grained lenses at depth. Surface materials are mainly comprised of an asphalt / granular driving surface and are underlain by a variable fill layer associated with grading/leveling of the properties to approximately 1 mbgs. Topsoil was encountered locally at the surface. These near-surface materials capped layers of clayey silt and variably textured silt glacial tills which interbed with sands at depth. Materials are described below and visualized in Borehole Logs (Appendix B) and the Site Cross Section (Figure 8) in greater vertical dimension. Textural qualities of key materials are shown in Geotechnical Laboratory Results (Appendix C).

Moisture contents across the site vary uniformly through the soil column, ranging between 9 and 18% vertically, with median and average values of 14%. Slightly elevated moisture contents (22 to 24%) occur in near surface materials where less compaction (lower SPT-N values) can increase localized infiltration.

4.1.1 Surface Structure and Earth Fill

Non-native surface materials include 700 mm of asphalt (BH2), 250 mm of recycled asphalt (BH1), 25 to 760 mm of combination asphalt granular (BH6, BH7), and 720 mm granular (BH8).

A surficial topsoil layer was at the ground surface in BH3, NP's 4S and 4D and BH5 ranging in thickness from 25 to 180 mm.

Earth fill was encountered in all BH's / NP's with the exception of BH 7 where Asphalt/Granular combination materials extended to native materials. Earth fill of brown clayey silt to sand with trace gravel was stiff and encountered in remaining boreholes, 40 to 80 mm in thickness, as deep as 1.5 mbgs.

Previous reporting has indicated that this layer may participate in water perching. Evidence of this was not observed during the current field investigation. NP's 4 and 6, located near to West Rainbow Creek tributary exhibited elevated moisture contents (near surface) relative to subsurface layer moisture contents.

4.1.2 Clayey Silt

Upper cohesive clayey silt deposits were encountered beneath non-native materials in Boreholes 1, 3, 4, 5, 6, 7, and 8, and were found at approximately 0.8 mbgs to approximately 2.3 mbgs. The deposits were 0.78 to 1.5 m in thickness. Materials were variable in consistency (firm to very stiff), moisture content (moist to wet), and colour (brown to grey). Some sand was observed across Boreholes 1, 3, 4, 5, 7, 8 with minor incidence of trace organics, and trace gravel. N-values measured in these deposits ranged from 4 to 29.

These materials are suspected to actively participate as an actively diffusive recharging layer when compaction permits infiltration from overlying fill and granular materials. These materials are also found at depth below silt glacial till materials (described in Section 4.1.3), occurring with some sand, grey, moist to wet (nearer to West Rainbow Creek tributary) and being very stiff. It is suspected they act similarly as when found shallower. Most wells were installed in these materials.

4.1.3 Silt Glacial Till

Silt Glacial Till deposits were 0.8 to 4.6 m thick and encountered in all boreholes 1.5 to 2.3 mbgs. These deposits were typically encountered below and between clayey silt layers, and exhibited similar textural properties, albeit with an increased presence of gravel. Trace to some sand and inferred cobbles and boulders were also observed. In BH 8 this layer is underlain by sand and silt at 6.1 mbgs. N values ranged from 15 to 54. These soils were more consistently grey than overlying clayey silts and were moist to wet.

These materials are suspected to actively participate as a slow diffusing recharging layer, acting in functional concert with clayey silt materials above which share much of the same textural quality (as shown in Appendix C) and presumable bedding characteristics. Materials closer to West Rainbow Creek tributary and farther downstream exhibit greater wetness than farther upstream.

4.2 Groundwater Level Monitoring

Unstabilized groundwater level measurements and cave measurements were taken upon completion of drilling of each borehole as shown on the borehole logs in Appendix B. These measurements provide a rough estimate of the possible excavation and temporary groundwater control constructability considerations that may arise.

Monitoring wells were operational in four (4) GEI boreholes and two (2) nested piezometers/ monitoring wells to facilitate the measurements of stabilized groundwater levels. A 50 mm diameter PVC monitoring well was installed in all monitoring wells and 25 mm diameter PVC monitoring well was installed in all nested piezometers with a 1.5 m long screen. Monitoring well and nested piezometer construction and groundwater measurements are shown on the borehole logs in Appendix B, and the results are summarized in the table below. Please note, the well in Borehole 2 was covered during grading activities, becoming inaccessible following installation. The number of wells remaining is sufficient to carry out the required analysis.

Borehole / Monitoring Well	Well Screen Location (From - To)				Unit Screened	Unstabilized Groundwater Level	
	Depth (m bgs)		Elev. (m)			Depth (m)	Elev. (m)
BH/MW 1	4.6	6.1	229.2	227.7	Clayey Silt	Dry	--
BH/MW 2	4.6	6.1	--	--	Clayey Silt	Dry	--
BH/MW 3	4.6	6.1	228.8	227.3	Sandy Clayey Silt	Dry	--
BH/MW 4S	0.8	2.3	229.6	228.1	Clayey Silt	Dry	--
BH/MW 4D	4.6	6.1	225.8	224.3	Clayey Silt	Dry	--
BH/MW5	4.6	6.1	226.6	225.1	Clayey Silt	Dry	--
BH/MW6S	0.8	2.3	230.6	229.1	Clayey Silt	5.4	226.0
BH/MW6D	4.6	6.1	226.8	225.3	Clayey Silt Glacial Till	5.4	226.0
BH /MW 8	4.6	6.1	227.1	225.6	Clayey Silt Glacial Till	5.4	226.3

The stabilized groundwater levels in the installed monitoring wells were measured to range between approximately Elev. 228.7 and Elev. 232.1 or between 0.5 and 4.7 mbgs. Groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions.

A groundwater contour plan is provided as Figure 9, based on the late spring groundwater level measurements from June 2023. Based on this plan, local groundwater flow trends approximately south-east towards the West Humber River.

The groundwater monitoring data to date is provided below.

Borehole / Monitoring Well	Stabilized Groundwater Levels							
	June 7, 2023		July 10, 2023		Aug 22, 2023		Sept 20, 2023	
	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)
BH/MW 1	4.6	229.1	2.7	231.1	2.8	231.0	2.9	230.9
BH/MW 2	--	--	-	-	-	-	-	-
BH/MW 3	1.3	232.0	1.6	231.7	1.4	232.0	1.6	231.7
BH/MW 4S	1.2	229.2	2.3	228.1	2.5	228.0	2.8	227.7

Borehole / Monitoring Well	Stabilized Groundwater Levels							
	June 7, 2023		July 10, 2023		Aug 22, 2023		Sept 20, 2023	
	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)
BH/MW 4D	1.7	228.7	0.9	229.5	1.0	229.3	1.4	229.0
BH/MW5	1.3	229.9	0.3	230.9	0.5	230.7	0.9	230.3
BH/MW6S	0.5	230.9	2.2	229.2	1.8	229.6	1.5	229.9
BH/MW6D	1.3	230.1	0.4	231.0	0.4	231.0	0.7	230.8
BH /MW 8	2	229.7	2.0	229.8	2.0	229.8	2.0	229.8

4.3 Hydraulic Conductivity Testing

Hydraulic conductivity values were calculated from the rising head test data using Hvorslev's solution (1951). The semi-log plots for the results are provided in Appendix D and are summarized in the table below.

Borehole / Monitoring Well	Well Screen Location (From - To)				Unit Screened	Hydraulic Conductivity (K) (m/s)
	Depth (m bgs)		Elev. (m)			
BH/MW 3	4.6	6.1	228.8	227.3	Sandy Clayey Silt	1.3×10^{-8}
BH/MW 6S	0.8	2.3	230.6	229.1	Clayey Silt	1.9×10^{-5}
BH/MW 8	4.6	6.1	227.1	225.6	Clayey Silt Glacial Till	5.8×10^{-6}

Commonly reported ranges of hydraulic conductivity for material textures observed in BH/MW's are as follows from Freeze and Cherry (1979):

- Clay: 10^{-9} m/s to 10^{-12} m/s
- Silt: 10^{-5} m/s to 10^{-9} m/s

The reported textural properties and in-situ hydraulic conductivities fall within the reported ranges common for deposits consisting of clay and silt to clayey silt.

The site is predominantly underlain by lower-permeability deposits of clayey silt to silt and clay, or cohesive glacial till. A conservative hydraulic conductivity reflective of more permeable materials is considered applicable given the potential for hydrostratigraphic variability between boreholes. Based on the above observations and the stratigraphy that is expected to be encountered predominantly during excavation, the recommended hydraulic conductivity to use for dewatering calculations is 1.9×10^{-5} m/s.

4.4 Groundwater Quality

To assess the suitability for discharge of pumped groundwater to the surface or the existing storm/sanitary sewer system during dewatering activities, one (1) unfiltered and one (1) filtered groundwater sample was collected from Nested BH/MW 4D on June 8, 2023.

For the assessment purposes, the analytical results were compared to Peel Region Storm and Sanitary Sewer Use Bylaw 53-2010; PWQO; and/or the applicable O.Reg. 153/04, as amended, Table 1 SCSs. The results of the groundwater chemistry are presented in the laboratory Certificates of Analysis provided in Appendix E and are summarized below.

Exceedances						
Monitoring Well Sample Location	**Parameters Tested**	**O.Reg. 153/04, as amended, Table 1 All Types of Property Uses SCSs**	**Peel Region Sewer Use By-Law Criteria**		**PWQO**	
			Storm	**Sanitary**	**Interim**	
BH4D (Unfiltered)	Metals, TSS, PHCs, VOCs	No Exceedances	TSS, Manganese	TSS	Uranium, Cobalt, Aluminum	Iron
BH4D (Filtered)	Metals, TSS	--	Manganese	--	Uranium, Cobalt	No Exceedances

The unfiltered groundwater sample collected from BH/MWs 4D met Peel Region Storm and Sanitary Sewer Use Bylaw, PWQO and O.Reg. 153/04, as amended, Table 1 SCSs for all parameters tested except for:

- BH/MW 4D
  - Peel Region Storm Sewer Use Bylaw - TSS, Manganese
  - Peel Region Sanitary Sewer Use Bylaw - TSS
  - Interim PWQO – Uranium, Cobalt, Aluminum
  - PWQO – Iron

The filtered groundwater samples met PWQO for all parameters tested except for:

- BH/MW 4D
  - Interim PWQO – Uranium, Cobalt

If pumped groundwater will be discharged to surface, it must be suitably treated to remove the parameter exceedances prior to discharge (treatment methods to be determined by the dewatering contractor or civil engineer).

The above chemical results suggest treatment of the dewatering discharge water by filtration may reduce the concentration of metals sufficiently to meet the applicable Peel Region Storm and Sanitary Sewer Use By Law and PWQO for most parameters. However, some dissolved metals may naturally occur within the groundwater; concentrations of Manganese, Uranium, and Cobalt

were not reduced to acceptable concentrations by field filtering in 4D. Treatment of the dewatering discharge water by filtration or sedimentation to reduce the concentration of suspended solids, and thus reduce the concentrations of non-dissolved metals, is necessary and may be effective in achieving compliance with the Peel Region Storm and Sanitary Sewer Use By Law and PWQO. Other treatment methods may be necessary to reduce the concentration of dissolved analytes.

It is expected that during construction dewatering, the pumped water is to be first discharged to a silt bag or sedimentation tank at a minimum before being discharged to surface.

4.5 Preliminary Infiltration Rates

Determination of percolation rates are based on the "*Ministry of Municipal Affairs and Housing (MMAH) Supplementary Guidelines SB-6, Percolation Time and Soil Descriptions, September 14, 2012*". The boreholes indicate that the site is predominantly underlain by clayey silt to silt and clay, or cohesive glacial till (C.L.). Cohesionless deposits of sand, silt to silty sand were encountered near grade locally in the northeastern part of the site (generally S.M.). The Unified Soil Classification System classifications for the predominant soils encountered on-site are summarized below with the interpreted unfactored percolation rates (T-Time) and unfactored infiltration rates:

Unified Soil Classification System Classification	Unfactored Percolation Rate (T-Time) (mins/cm)	Unfactored Infiltration Rate (mm/hr)
S.M. Silty sand, sand-silt mixtures	8 to 20	30 to 75
C.L. Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Over 50	Lower than 12

The infiltration rate is not applicable below the groundwater table, and infiltration into earth fill or weathered / disturbed soil is not recommended. Appendix C of *"Low Impact Development Stormwater Management and Planning Design Guide"* (Version 1.0, 2010, by CVC and TRCA) suggests safety factors to be applied to infiltration rates. The safety factor applicable to the site is expected to be 2.5 but could be higher due to the underlying cohesive deposits and must be confirmed once the final location and elevation of LID measures are known.

It should be noted that these rates are based on published values and not on site-specific data. Once designs for LID features are further along or potential locations and types of LID features are decided, in-situ infiltration testing (typically Guelph Permeameter testing) should be conducted at the specific locations and elevations of the LID features being considered to ensure that the designed features are appropriate for the site.

5. Discussion and Analysis

5.1 Construction Dewatering Calculations

5.1.1 Excavations and Temporary Groundwater Control

New construction plan and profile drawings for the Simpson Road extension were available for review in exaction and dewatering estimates. The limits of construction for Simpson Road extend between Station 10+860 and Station 11+458 at Mayfield Rd, or approximately 600 m. It includes site servicing and associated bedding as much as 4.5 mbgs along Simpson Road.

The stabilized groundwater levels in the installed monitoring wells were measured to range between approximately Elev. 228.7 and Elev. 232.0, or 0.5 and 4.7 mbgs. Groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions.

For conservative estimates, the construction dewatering calculation is based on an open cut excavation at the present time. To excavate under dry conditions, the water level is anticipated to be lowered at least to a minimum of approximately 1.0 m below the proposed excavation depth. Based on the soil encountered during the borehole drilling program (predominantly clayey silt to silt and clay, or cohesive glacial till) a hydraulic conductivity of 1.9×10^{-5} m/s has been applied to the site.

Additional dewatering capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. It should be noted that the dewatering estimates provided in this report are based on the assumed site servicing depths. GEI must be provided with final site servicing and grading plans to verify the design assumptions or update the water taking estimates as needed. The exact scenario where these groundwater control techniques will work are estimates only and are directly correlated to how coarse/fine the native soils are in an excavation, and both the lateral and vertical extent of the cohesionless deposits encountered. If the groundwater table is not controlled during construction, the base of the excavations will probably be unstable, leading to difficulties in excavating and placement of pipes or footings. A dewatering contractor must review and assess the subsurface conditions to verify which dewatering techniques will work for the site and proposed utility installations, based on their experience and interpretation of the data. A test dig could be carried out to assist prospective contractors determine the most appropriate dewatering methods based on their own means and methods.

5.1.2 Construction Dewatering Calculation Assumptions

The assumptions used for the calculation of the dewatering rates for the proposed development are presented below:

- Existing grades are at an elevation of 230.4 to 233.8 based on the survey of the boreholes on site.
- The lowest ground surface elevation measured on-site is 230.4 at BH/MW 4.
- The highest water elevation measured on-site is 232.0 at BH/MW 3.

- A hydraulic conductivity of 1.9 x 10^{-5} m/s has been applied to the site and is based on the soils encountered during the borehole drilling program.
- The assumed storm and sanitary sewers and water main servicing will require open cut excavations as deep as 4.5 mbgs based on drawings along Simpson Road
- Groundwater levels should be lowered a minimum of 0.5 m below the excavation base.
- The highest groundwater level measured on-site to date is 0.5 mbgs at BH/MW 6.
- The total water table drawdown (including the 0.5 m below the excavation base) would be as much as 4.5 m for the typical scenario.
- It has been assumed that surface water will be managed sufficiently such that all surface water is diverted around the proposed excavations and surface water entering the proposed excavation would be minimal.
- The dewatering contractor may use smaller dewatering zones for general site servicing construction, thus limiting the dewatering discharge rates.

5.1.3 Radius of Influence

The Radius of Influence (ROI) for the construction dewatering is based on the empirical Sichardt equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. This equation is empirical and was developed to provide representative flow rates using the steady state flow dewatering equations, as discussed below.

It is noted that in steady state conditions, the radius of influence of pumping will extend until boundary flow conditions are reached and provide sufficient water inputs to the aquifer, such as recharge and surface water bodies. As a result, the distance of influence calculated using Sichardt equation is used to provide a representative flow rate calculation, but it is not precise in determining the actual radius influenced by pumping.

The ROI of pumping (dewatering) for radial flow is calculated based on the Sichardt equation, which is described as follows:

$$R_0 = 3000\ (\mathrm{H} - \mathrm{h})\sqrt{\mathrm{K}}$$

Where:

K	= Hydraulic conductivity (m/s)
H	= Static Saturated Head (m)
h	= Dynamic Saturated Head (m)
R_0	= Radius of influence (m)

Based on the Sichardt equation, the typical 4.5 m of drawdown and a hydraulic conductivity of 1.9 x 10^{-5} m/s recommended for calculations at this site, the ROI is approximately 86 m from the centre of the excavation. Calculation details are provided in Appendix F, and are summarized below:

Dewatering Scenario	ROI (m)
Assumed Site Servicing Trench in Clayey Silts	86

The ROI calculation is a conservative methodology and is calculated based on the assumption of active pumping during the construction dewatering. It should be noted that most of the water will be pumped during the first stage of the construction period or when a rain event occurs.

5.1.4 Temporary Dewatering Flow Rate Equation

The Dupuit-Forcheimer and equivalent well method for radial and linear flow from an unconfined aquifer for a fully penetrating excavation was used to obtain a flow rate estimate for the proposed linear infrastructure on Parcel A, and is expressed as follows:

$$Q = \frac{\pi K(H^2 - h^2)}{In\,{}^{R_0}/_{r_s}} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right]$$

Where:

Q	= Rate of pumping (m³/s)
x	= Length of excavation (m)
L	= Length of Influence (m)
K	= Hydraulic conductivity (m/s)
H	= Head beyond the influence of pumping (static groundwater elevation) (m)
h	= Head above base of aquifer at the excavation (m)
R_0	= Radius of Influence (m)
r_s	= Equivalent well radius (m)

It is expected that the initial dewatering rate will be higher in order to remove groundwater from within the overburden formation. The dewatering rates are expected to decrease once the target water level is achieved in the excavation footprint as groundwater will have been removed locally from storage resulting in lower seepage rates into the excavation.

Based on the assumptions provided in this report, the results of the dewatering rate estimates are summarized below, and calculation details are provided in Appendix F:

Dewatering Scenario (per 100 m of Trench Length)	**Construction Dewatering Flow Rate Without Safety Factor**	**Construction Dewatering Flow Rate Including Safety Factor of 2.0**	**Construction Dewatering Flow Rate Including Safety Factor of 2.0 and a 10 mm Rainfall Event**
	L/day	**L/day**	**L/day**
Assumed Site Servicing Trench in Clayey Silts	182,050	364,100	367,100

The total construction dewatering flow rate includes a factor of safety of 2.0 to account for seasonal fluctuations in the groundwater table and variation in hydrogeological properties beyond those encountered during the course of this study. This total dewatering flow rate also provides additional capacity for the dewatering contractors. A 10 mm rain event was also included. This rate should be considered contingency volume subject to the timing and season of the construction.

Given that the predicted construction dewatering volume is more than 50,000 L/day and less than 400,000 L/day, registry on the EASR system at the MECP is expected to be required at the time of construction.

The above dewatering rate estimates can be verified and updated should road servicing details or other development details change; at that point a recommendation with respect to the total volume of water takings to be requested for the site can be determined. Should the development of the proposed site extend further, additional boreholes and monitoring wells may be required to further investigate the extent of local permeable deposits that could yield higher flow rates than encountered during the current investigation. Given that a posting on the EASR / PTTW from the MECP is already required, an update may be advisable depending on the future development scheme or future subsurface investigation results.

It is the responsibility of the contractor to ensure dry conditions are maintained in the excavation at all times. Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. Additionally, the presence of near-surface fill material could hold significant groundwater.

The contractor is responsible for selecting the dewatering method based on their preferred means and methods after reviewing the information provided in this report.

5.2 Impact Assessment

5.2.1 Impacts to Nearby Groundwater Users

Based on the MECP Water Well Record database, active private well use associated with farm and residential use may be present in the vicinity of the site. It is not anticipated that private water wells will be within the estimated dewatering zone of influence which will extend only an estimated 86 m from trench locations. Dewatering activities will be limited to the upper 5.0 m of soils, and private and domestic water wells in the area are reportedly screened between 12 to 41.5 m below grade.

A private well survey for the houses within a 500 m radius surrounding the site should be conducted prior to activity to confirm the current use and condition of these wells by talking to the landowner and by visual well inspection.

As a precautionary measure even if impacts to the wells are not anticipated, if private well owners issue complaints regarding shortages or other interference with their water well, the complaints will be investigated, and if the problem is deemed to be related to the construction dewatering, a temporary supply of water may be required to be provided to the well owner until construction dewatering has been completed.

5.2.2 Natural Environment

Within this analysis there are two distinct regions of importance: the larger subject area and the development zone / dewatering area. Within the larger subject area, there are two storm water facilities and a third centrally mapped feature which display as waterbodies in Figures 3 to 7. These are excluded from discussion of the natural environment, following from the definition of “waterbody” within O.Reg 153/04 governing Records of Site Condition, which is a river or similar

watercourse or a pond or lake, but does not include a pond constructed on the property for the purpose of controlling surface water drainage. Most relevant to the discussion of local impacts to the natural environment as a consequence of the South Simpson Road Extension are those that pertain to the development zone / dewatering area along South Simpson Road and an unevaluated wetland which exists south of Mayfield Road which was observed to be hydraulically connected at the surface to West Rainbow Creek Tributary through a culvert.

West Rainbow Creek tributary, which runs parallel to the proposed development area is located 15 to 25 m from the proposed road extension road. It is understood that this Tributary, as part of the development plan, will undergo a post development channel redesign which includes connections between existing storm water management ponds and ties into shallow floodplain pools to the northwest near Parr Boulevard and to the southeast, on north and south sides of Mayfield Road at the proposed Simpson Road and Mayfield Road intersection. The southeastern outlet of the West Rainbow Creek Tributary is currently designed to flow into two unevaluated wetlands south of Mayfield Road, one close to the region of include, and one further afield, within 500 m of the study area boundary.

GEI is completing an additional scope of work through 2023 that includes installing and monitoring staff gauges within West Rainbow Creek Tributary and monitoring the nested piezometers installed near these locations to quantify seepage into features on site. This future data will be used to determine the amount of potential baseflow into the surface water features and will help evaluate any potential impacts related to the local hydrologic regime.

While the amount of baseflow entering the tributaries (if any) is expected to be minimal due to the low-permeability soils encountered near surface across most of the site, the distance from south Simpson Road to the watercourse (15 to 25 m) is within the radius of influence (of approximately 127 m). West Rainbow Creek tributary may be temporarily impacted by dewatering depending on the duration of dewatering, but effects are not expected to be permanent as each excavation will require dewatering for short periods of duration. Saturated Hydraulic Conductivities in materials that underlie the tributary are low and would already restrict groundwater inputs into the headwater feature, notwithstanding surface water inputs (i.e. precipitation).

No other impacts to local surface water features are expected at this time. The dewatering will be of short duration and any pumped water can be discharged into the surface water features after treatment to offset drawdown effects.

5.2.3 Land Stability

When drawing down the water table by 4.5 m, settlement of the soil within the radius of influence must be calculated based on the increase in effective stress (10 kPa per m of drawdown) from reducing the pore water pressures. Settlement has the potential to damage buried utilities, building foundations, or cause subsidence in adjacent lands. The maximum amount of settlement will occur adjacent to the dewatering system where the maximum drawdown occurs, and the amount of settlement will decrease exponentially to zero towards the radius of influence limit.

The estimated total settlement of the soil is assessed to be as much as 5 to 10 mm at the dewatering location. Due to the cohesive nature of some of the soils on site, settlement may not occur immediately and could be time dependent.

A review of aerial mapping shows that there is only one building in near proximity to the site, about 60 m to the east. Due to the exponential decrease in drawdown with distance, the estimated settlement for the off-site buildings east of the site is 5 mm or less. It is assumed that the residential dwellings in the west will be removed before any dewatering activities begin, however should this not be the case, the estimated settlement for the on-site buildings may be as much as 5 to 10 mm or less.

Based on the above, settlement related impacts to nearby buildings are not expected.

Another cause of significant dewatering related settlement is due to pumping of fines through the system. It is imperative that any dewatering systems shall be designed and installed adequately to ensure no soil is conveyed through the system. Sufficient filtering techniques will need to be incorporated at the entry point to avoid migration of fines in the pumping/dewatering system.

6. Limitations and Closure

6.1 Limitations

The recommendations and comments provided are necessarily on-going as new information of underground conditions becomes available. More specific information with respect to the conditions between samples, or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, conditions not observed during this investigation may become apparent. Should this occur, GEI should be contacted to assess the situation and additional testing and reporting may be required.

GEI should be retained for a general review of the final design drawings and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, GEI will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of the design engineers. The number of boreholes and monitoring wells required to determine the localized underground conditions between boreholes and wells affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report was authorized by, and prepared by GEI for, the account of Simpson Road Landowners Group Inc. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GEI accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

6.2 Closure

We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact our office.

Yours truly,

GEI Consultants

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Hydrogeologic Project Manager

Reviewed By:

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Senior Hydrogeologist

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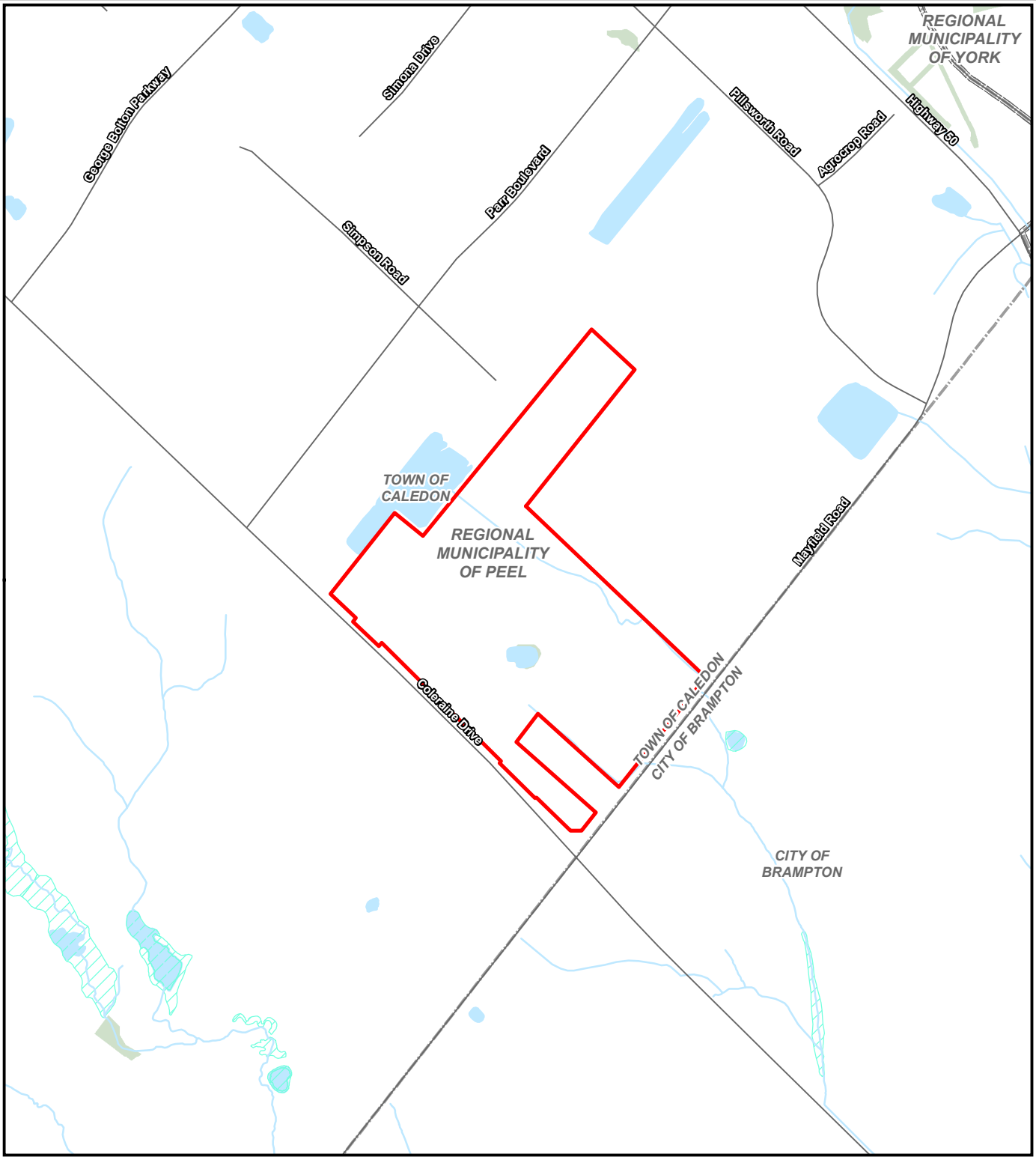
Geotechnical Practice Lead

Figures



NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023.

Legend

- Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES

N

0 100 200 m

1:10,000

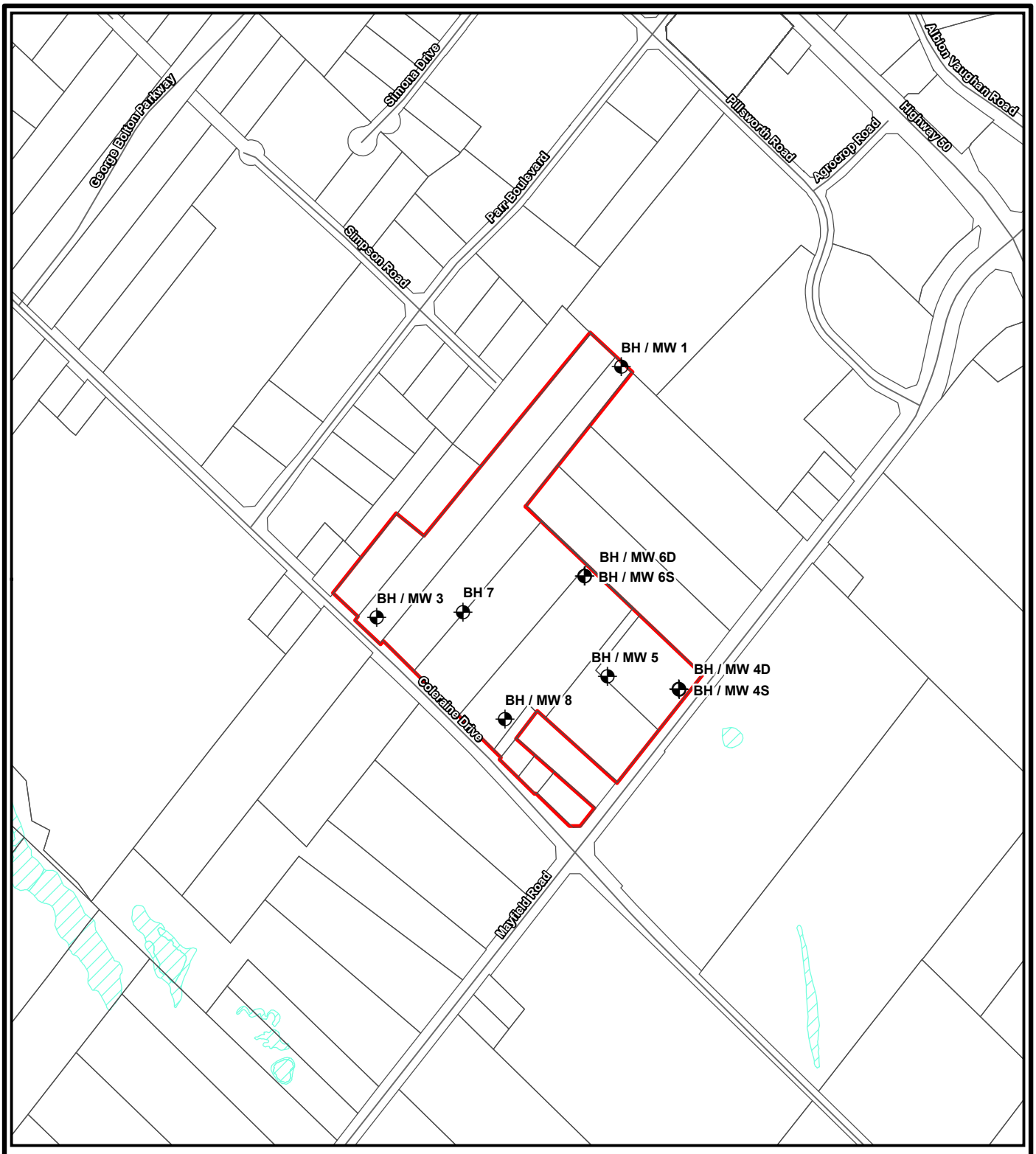
Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

GEI Consultants

SITE LOCATION PLAN

Project 2301130 | July 2023 | Fig. 1



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3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2022.

Legend

- Subject Area
- Road
- Wetland - Not evaluated per OWES
- Borehole/Monitoring Well Location
- Lot Fabric (Town of Caledon, 2023)

N

0 100 200 m

1:10,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

GEI Consultants

BOREHOLE LOCATION PLAN (AERIAL)

Project 2301130

September 2023

Fig. 2a

NOTES:

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3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2022.

Legend

- Subject Area
- Borehole/Monitoring Well Location

N

0 100 200 m

1:10,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

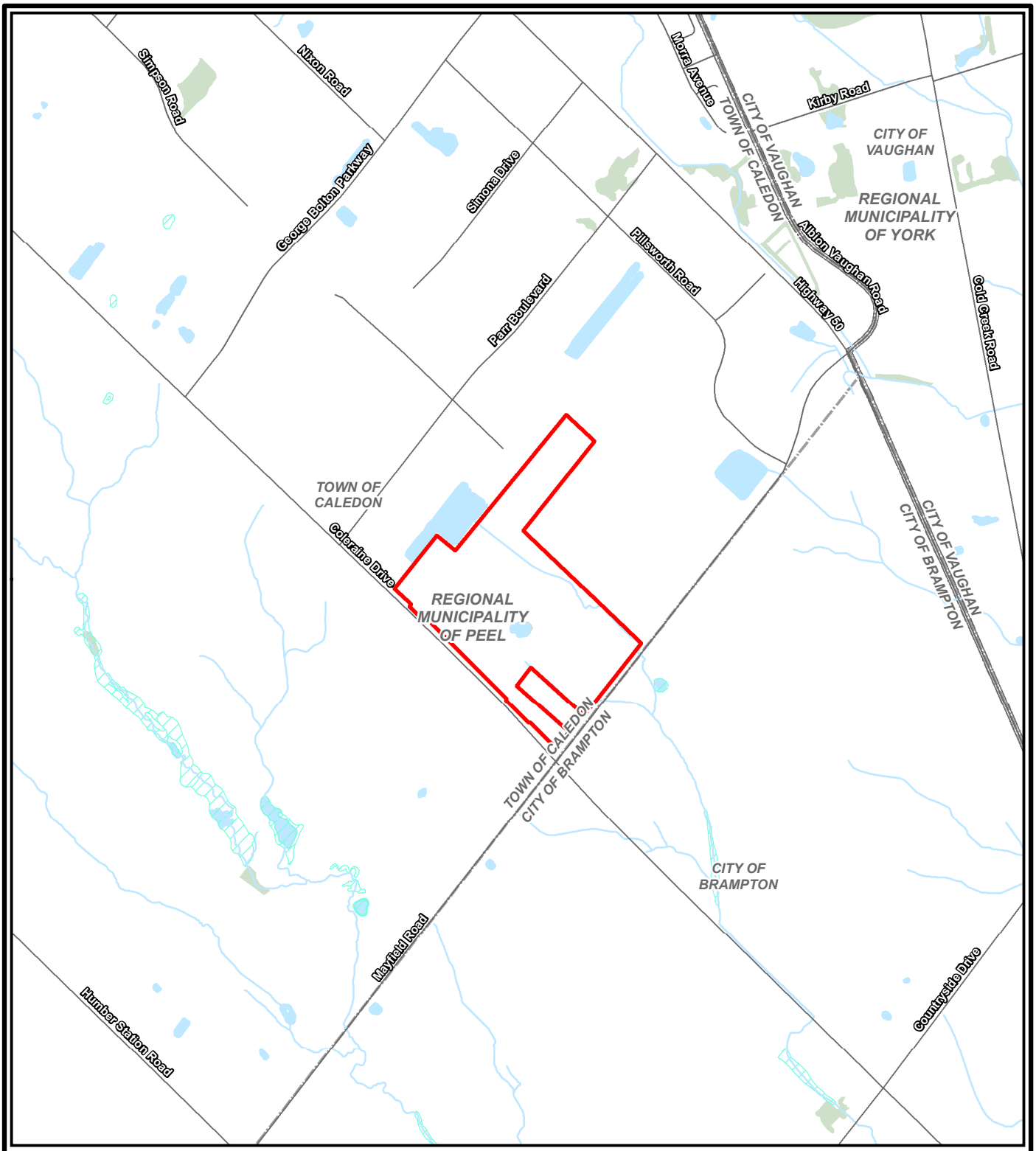
GEI Consultants

Project 2301130

BOREHOLE LOCATION PLAN (AERIAL)

July 2023

Fig. 2b



NOTES:
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Legend

- Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES

- Site in not within a Wellhead Protection Zone -

Wellhead Protection Area (MECP)

Zone
- A
- B
- C
- C1
- D
- Q1
- Q2

N

0 150 300 m

1:15,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

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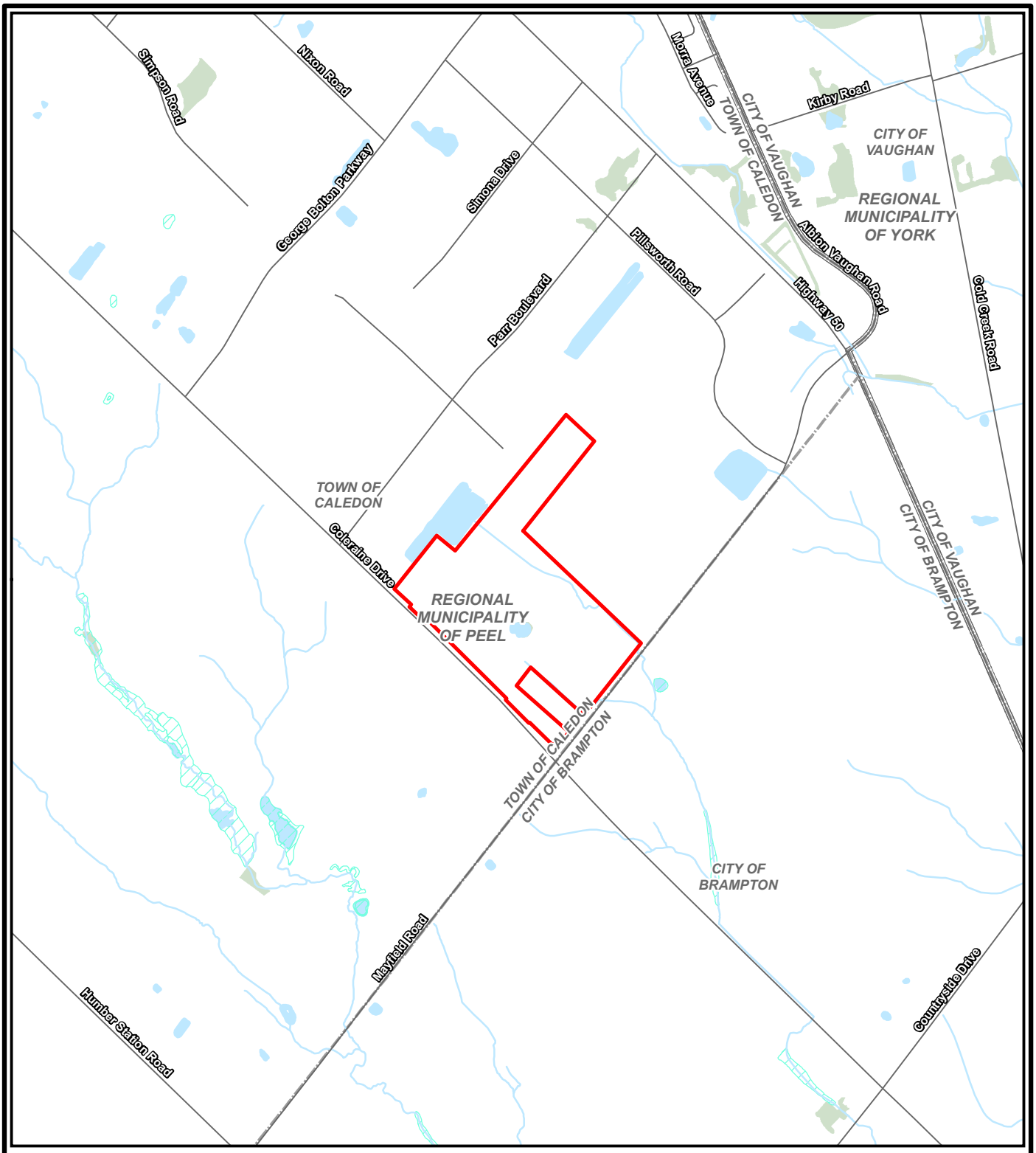
WELLHEAD PROTECTION AREA

Project 2301130 | July 2023 | Fig. 3



NOTES:

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Legend

- Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES

- Site in not within an Intake Protection Zone -

Intake Protection Zone (MECP)

- Intake Protection Zone 1
- Intake Protection Zone 2
- Intake Protection Zone 3

N

0 150 300 m

1:15,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

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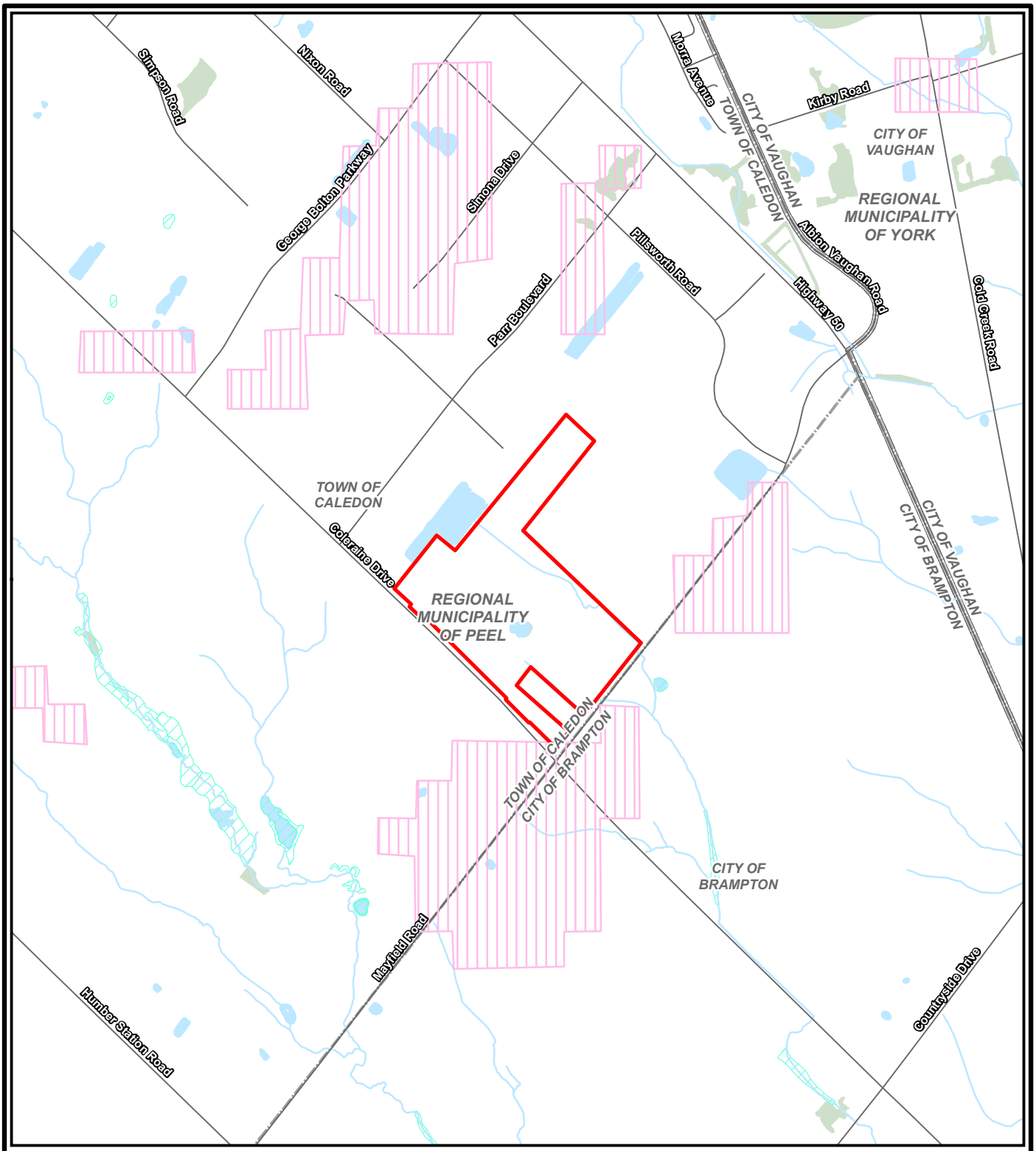
INTAKE PROTECTION ZONE

Project 2301130 | July 2023 | Fig. 4



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Legend

- Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES
- Highly Vulnerable Aquifer (MECP)

N

0 150 300 m

1:15,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

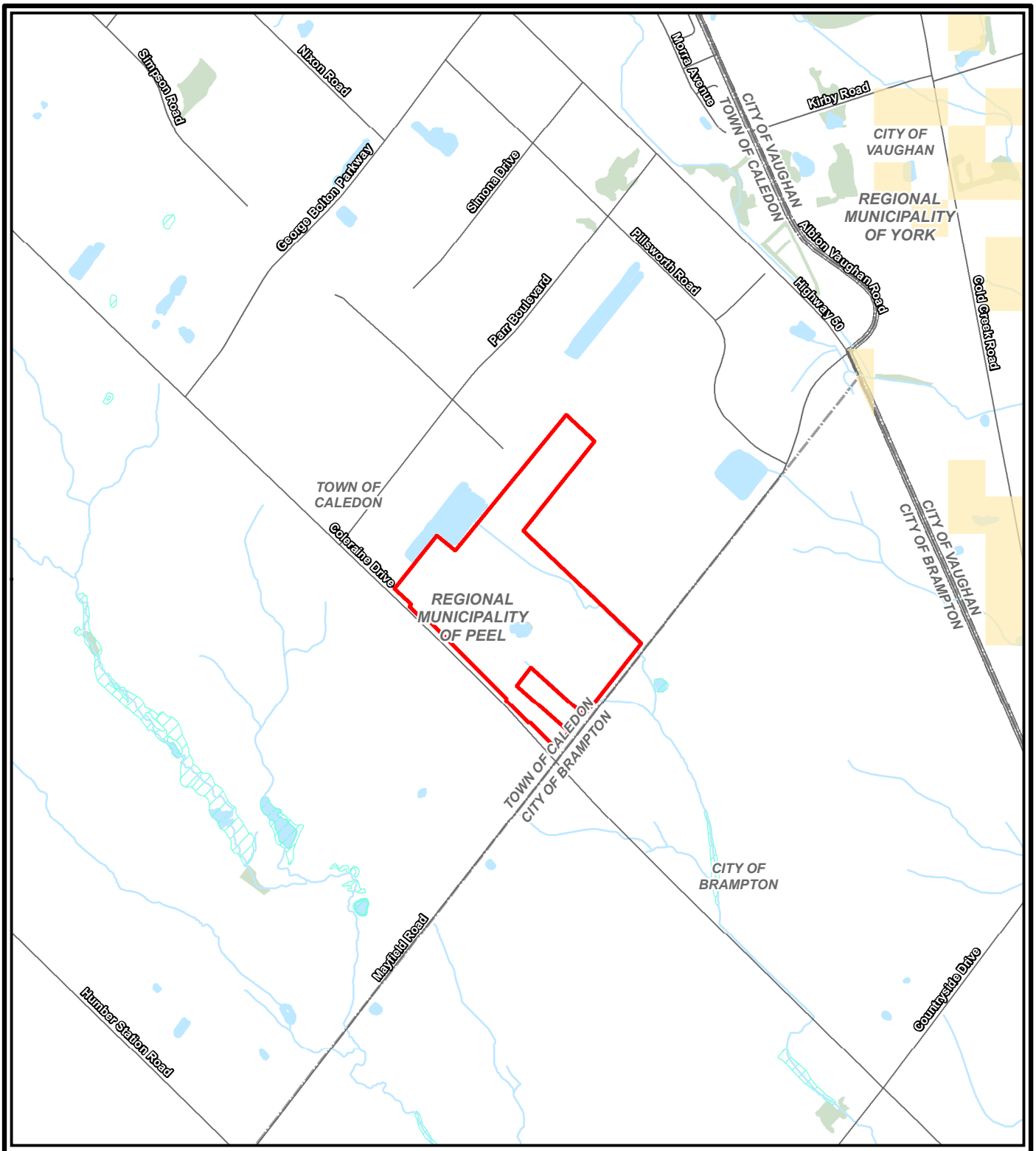
GEI Consultants

Project 2301130

HIGHLY VULNERABLE AQUIFER

July 2023

Fig. 5



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Legend

- Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES
- Significant Groundwater Recharge Area (TRCA)
- Vulnerability Score
- N/A
- 0
- 2, 4
- 6

N

0 150 300 m

1:15,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

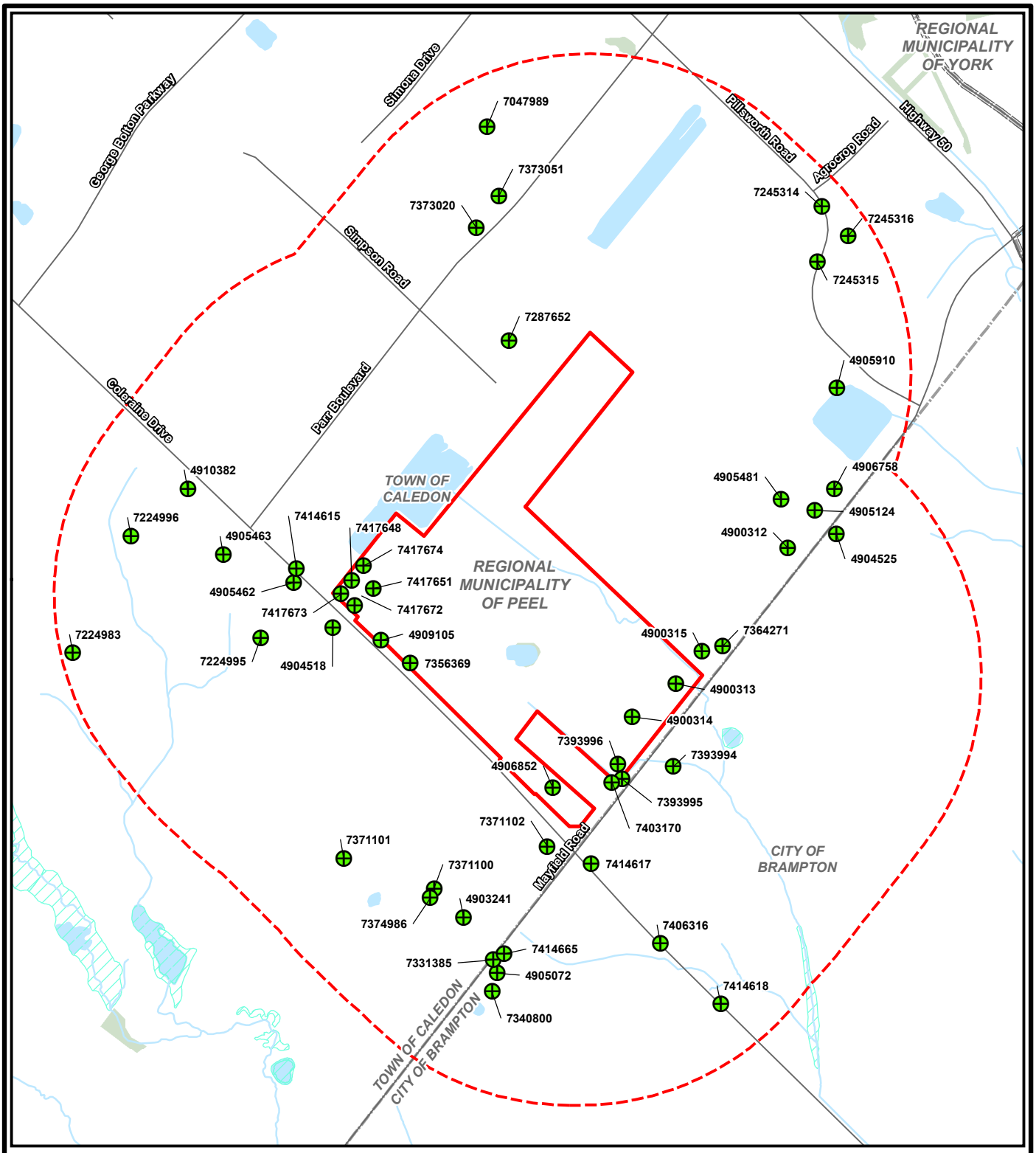
GEI Consultants

SIGNIFICANT GROUNDWATER RECHARGE AREA

Project 2301130

July 2023

Fig. 6



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Legend

- Subject Area
- Subject Area +500m
- MECP Well Records within 500m of Subject Area
- Road
- Watercourse
- Waterbody
- Wooded Area
- Wetland - Not evaluated per OWES

N

0 150 300 m

1:10,000

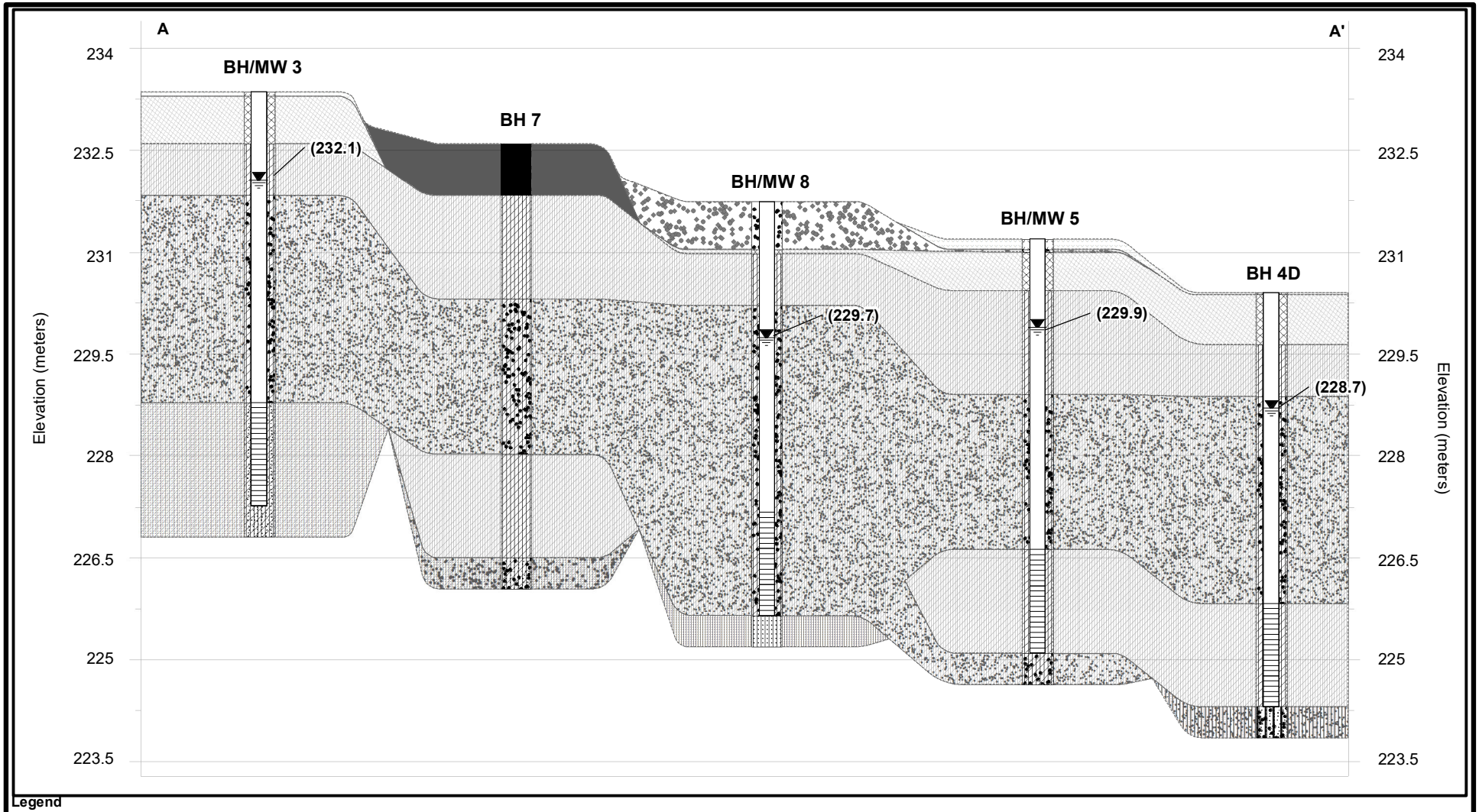
Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

GEI Consultants

MECP WELL RECORD LOCATIONS

Project 2301130 | July 2023 | Fig. 7



Legend

Water Level In Monitoring Well

Strata

- Asphalt/Granular
- Granular
- Fill
- Topsoil
- Clayey Silt
- Clayey Silt Glacial Till
- Sandy Clayey Silt
- Sandy Clayey Silt Glacial Till
- Sand and Silt
- Sandy Silty Glacial Till

[xx.xx] Water Level (masl)

NOTES:

1. Subsurface conditions known only at borehole locations.
2. Horizontal distances are not to scale

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

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GEOLOGICAL CROSS SECTION A-A'

Project 2301130

September 2023

Fig. 8

NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2023, © Caledon Open Data, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2022.

Legend

- Subject Area
- Borehole/Monitoring Well Location
- Groundwater Contour (metres ASL)
- (xx.xx) Groundwater Level (metres ASL)
- Interpreted Direction of Groundwater Flow

N

0 100 200 m

1:10,000

Natural Heritage, Geotechnical, Hydrogeological and Civil Services - South Simpson (Headwaters of West Rainbow Creek), Caledon, Master Environmental Servicing Plan

Simpson Road Landowners Group Inc.

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GROUNDWATER CONTOUR MAP

Project 2301130

September 2023

Fig. 9

Appendix A

MECP Water Well Records

GEI Consultants

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 001	17 604427 4855336 W	1958/12 1325	30	FR 0058	48///:	DO		4900312 ()	BRWN CLAY 0015 HPAN 0058 PEAT 0068
CALEDON TOWN (ALBION CON 06 001	17 604226 4855092 W	1962/10 1325	30	FR 0062	50//1/ 1:0	DO		4900313 ()	BRWN CLAY 0012 BLUE CLAY 0062 BLUE FSND 0071
CALEDON TOWN (ALBION CON 06 001	17 604147 4855033 W	1963/07 4823	4 4	FR 0119	40/12 0/1/12 :0	DO		4900314 ()	LOAM 0001 YLLW CLAY 0005 YLLW CLAY MSND STNS 0012 BLUE CLAY STNS 0040 BLUE CLAY SILT 0107 GREY CLAY MSND GRVL 0116 SHLE 0120
CALEDON TOWN (ALBION CON 06 001	17 604273 4855150 W	1966/02 3108	4 4	FR 0145	84/13 5/3/2: 0	DO		4900315 ()	BLUE CLAY 0003 YLLW CLAY 0016 BLUE CLAY 0115 CSND 0123 BLUE SHLE 0147
CALEDON TOWN (ALBION CON 05 001	17 603845 4854673 W	1969/06 1307	30	FR 0057	20///:	DO		4903241 ()	BRWN LOAM 0010 GREY CLAY 0056 GREY MSND 0057
CALEDON TOWN (ALBION CON 06 002	17 603611 4855193 W	1974/08 1307	30	FR 0040	12/38/ 2/1:0	DO		4904518 ()	BRWN LOAM 0010 GREY CLAY 0038 CSND 0040
CALEDON TOWN (ALBION CON 06 001	17 604514 4855361 W	1974/11 1307	30	FR 0080	40/78/ 0/1:0	DO		4904525 ()	BRWN LOAM 0012 GREY CLAY 0078 GREY FSND 0080
BRAMPTON CITY (TORON CON 11 017	17 603905 4854573 W	1977/03 3814	30	FR 0065	53/63/ 1/1:0	DO		4905072 ()	BRWN LOAM 0012 GREY CLAY 0062 GREY SHLE WBRG 0065

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 001	17 604475 4855403 W	1977/05 3108	6	UK 0136	84/13 8/4/4: 0	DO		4905124 ()	BLCK LOAM 0002 YLLW CLAY 0012 BLUE CLAY 0110 CSND SHLE DRTY 0133 BLUE SHLE 0139
CALEDON TOWN (ALBION CON 05 002	17 603540 4855273 W	1978/05 3814	30	FR 0070	45//3/ 1:0	DO		4905462 ()	UNKN 0070
CALEDON TOWN (ALBION CON 05 002	17 603414 4855323 W	1978/05 3814	30	FR 0052	35//2/ 1:0	DO		4905463 ()	UNKN 0052
CALEDON TOWN (ALBION CON 06 001	17 604415 4855423 W	1978/11 1663	5	FR	60/10 5/2/2: 0	DO		4905481 ()	BLCK LOAM 0001 BRWN CLAY GRVL 0014 BLUE CLAY GRVL 0048 BLUE CLAY 0101 GREY CSND GRVL 0106 BLUE CLAY GRVL 0112 BLUE CLAY 0120 GREY FSND 0127 BLUE CLAY 0130
CALEDON TOWN (ALBION CON 06 001	17 604515 4855623 W	1981/03 1663	5	FR 0101	//1/2: 0	DO	0103 3	4905910 ()	BRWN LOAM 0001 YLLW CLAY GRVL 0016 BLUE CLAY GRVL 0048 GREY CLAY SILT 0101 GREY SAND GRVL SILT 0107 BLUE CLAY GRVL SAND 0136 GREY SHLE 0170
CALEDON TOWN (ALBION CON 06 001	17 604510 4855442 W	1987/09 1663	6	FR 0122	90/12 5/2/2: 0	DO	0124 3	4906758 (09130)	BRWN CLAY SAND 0002 BRWN CLAY GRVL 0016 BLUE CLAY GRVL 0051 BLUE CLAY 0072 BLUE CLAY SILT 0102 GREY GRVL LOOS 0110 0115 0119 0122 0127 0140
CALEDON TOWN (ALBION CON 06 001	17 604005 4854905 W	1988/03 4919	30 30	FR 0065	10/70/ /1:0	DO		4906852 (25634)	BRWN LOAM HARD 0001 BRWN CLAY HARD 0020 GREY CLAY HARD 0075

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 006	17 603697 4855170 W	2003/02 7088	6 6	SA 0133	30///:	DO		4909105 (252315)	GREY GRVL FILL 0001 BRWN CLAY SAND 0012 GREY CLAY SAND 0076 BLUE CLAY 0102 GREY GRVL SLTY 0112 GREN GRVL CLAY 0113 BLUE SHLE 0147
CALEDON TOWN (ALBION	17 603350 4855442 W	2006/11 6809	2				0015 5	4910382 (Z51263) A052542	BRWN LOAM 0001 BRWN SILT TILL 0010 GREY CLAY SILT 0020
CALEDON TOWN (ALBION	17 603144 4855147 W	2014/06 7472	2.04			MO	0015 10	7224983 (Z189603) A165999	BRWN CLAY SILT LOOS 0015 GREY SILT CLAY PCKD 0025
CALEDON TOWN (ALBION	17 603481 4855174 W	2014/06 7472	2.04			MO	0010 10	7224995 (Z189602) A165998	BRWN CLAY SILT LOOS 0015 GREY SILT CLAY PCKD 0020
CALEDON TOWN (ALBION	17 603248 4855357 W	2014/06 7472						7224996 (Z189601) A165997	
CALEDON TOWN (ALBION CON 06 001	17 604487 4855947 W	2015/07 7360	2	UT 0005		MO	0005 10	7245314 (Z208147) A182032	CLAY SILT 0005 SAND WBRG 0010 CLAY SILT 0015
CALEDON TOWN (ALBION CON 06 001	17 604480 4855849 W	2015/07 7360	2			MO	0020 10	7245315 (Z208148) A182063	CLAY SILT 0005 CLAY SILT 0020
CALEDON TOWN (ALBION CON 06 001	17 604535 4855896 W	2015/07 7360	2			MO	0010 10	7245316 (Z208149) A182090	CLAY SILT 0005 CLAY SILT 0020
CALEDON TOWN (ALBION	17 603926 4855708 W	2017/04 7215						7287652 (C37477) A218567 P	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
BRAMPTON CITY (TORON CON 11 017	17 603898 4854597 W	2019/03 7360	2			MO	0010 10	7331385 (Z309301) A266676	GRVL SNDY 0004 SAND 0010 CLAY TILL 0020
BRAMPTON CITY (TORON CON 11 017	17 603896 4854540 W	2019/09 7147	35.4	UT 0003				7340800 (QRV7WFD9) _NO_TAG A	
CALEDON TOWN (ALBION	17 603749 4855129 W	2020/03 7523	6.21 6.21			NU		7356369 (Z333748) A207322 A	BLCK LOAM 0001 BRWN CLAY SAND 0015 GREY SILT 0035 GREY SAND GRVL 0135 RED SHLE 0164
CALEDON TOWN (ALBION	17 604310 4855160 W	6946						7364271 (Z340885) A301730 P	
CALEDON TOWN (ALBION CON 05 001	17 603792 4854725 W	2020/10 7732	1.97	UT 0013			0008 10	7371100 (JDHP8SJJ) _NO_TAG A	
CALEDON TOWN (ALBION CON 05 001	17 603630 4854779 W	2020/10 7732	1.97	UT 0017			0015 10	7371101 (U465GQJ2) _NO_TAG A	
CALEDON TOWN (ALBION CON 05 001	17 603995 4854800 W	2020/10 7732	1.97	UT 0004			0016 10	7371102 (AKYKFSA6) _NO_TAG A	
CALEDON TOWN (ALBION CON 06 002	17 603868 4855910 W	2020/11 6607	2.00			MO	0010 10	7373020 (9BUBW7QL) A293647	BRWN SILT CLAY HARD 0015 GREY SILT CLAY HARD 0020

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
CALEDON TOWN (ALBION CON 06 002	17 603908 4855966 W	2020/11 6607	2.00			MO	0010 10	7373051 (LJER9BFV) A293279	BRWN SILT CLAY HARD 0020
CALEDON TOWN (ALBION	17 603785 4854709 W	2020/11 7241						7374986 (Z351107) A308998 P	
BRAMPTON CITY (TORON	17 604221 4854943 W	2021/05 7215						7393994 (Z346498) A317280 P	
CALEDON TOWN (ALBION CON 06 001	17 604129 4854921 W	2021/05 7215						7393995 (Z346510) A317278 P	
CALEDON TOWN (ALBION CON 06 001	17 604122 4854947 W	2021/05 7215						7393996 (Z346497) A317281 P	
CALEDON TOWN (ALBION	17 604111 4854915 W	2021/07 6988						7403170 (Z356021) A314334 P	
BRAMPTON CITY (TORON CON 12 017	17 604198 4854626 W	2021/10 7360	2	UT 0035		MO	0050 10	7406316 (4AOHDINP) A319821	---- 0000 FILL GRVL 0007 TILL CLAY 0050 SHLE 0060
CALEDON TOWN (ALBION CON 06 002	17 603545 4855298 W	2022/02 7360	2			MO	0010 5	7414615 (LSZYI96U) A330866	BRWN TILL HARD 0005 GREY TILL HARD 0015
BRAMPTON CITY (TORON CON 12 017	17 604073 4854770 W	2022/02 7360	2			MO	0010 5	7414617 (X6GMGUJT) A344018	BRWN TILL HARD 0005 GREY TILL HARD 0015

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
BRAMPTON CITY (TORON CON 11 017	17 604306 4854517 W	2022/02 7360	2			MO	0010 5	7414618 (6FSF8AGS) A344030	BRWN TILL HARD 0005 GREY TILL HARD 0015
BRAMPTON CITY (TORON CON 11 017	17 603918 4854608 W	2022/03 7732	1.97	UT 0003			0010 10	7414665 (5CJ4VKQ9) _NO_TAG A	
CALEDON TOWN (ALBION CON 06 001	17 603644 4855277 W	2022/03 7360	2			MO	0010 10	7417648 (CMBUCOM Y) A306595	BRWN CLAY 0010 GREY TILL 0020
CALEDON TOWN (ALBION CON 06 001	17 603683 4855263 W	2022/03 7360	2			MO	0010 10	7417651 (CAM3SEOK) A343289	BRWN CLAY 0010 GREY TILL 0020
CALEDON TOWN (ALBION CON 06 001	17 603649 4855232 W	2022/03 7360	2			MO	0010 10	7417672 (895IRXSP) A345738	BRWN CLAY 0010 GREY TILL 0020
CALEDON TOWN (ALBION CON 06 001	17 603625 4855253 W	2022/03 7360	2			MO	0010 10	7417673 (QCDOOCFD) A345745	BRWN CLAY 0010 GREY TILL 0020
CALEDON TOWN (ALBION CON 06 001	17 603665 4855303 W	2022/03 7360	2			MO	0010 10	7417674 (DOR88VVJ) A345746	BRWN CLAY 0010 GREY TILL 0020
MINTO CON 4 LOT 40	17 603887 4856091	2007	6	FR 0142	142/2 5/2	DO	0010 10	7047989 AO49962	GRAVEL & STONES 025 CLAY & STONES 0059 LIMESTONE 147

Appendix B

Borehole Logs

RECORD OF BOREHOLE No. 1

Project Number:	2301130						
Project Client:	Simpson Road Landowners Group Inc.						
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers		
Project Location:	Caledon, ON	Logged By:	TA	Northing:	4855660.1	Date Started:	May 17/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting:	604127.8	Date Completed:	May 17/23
Local Benchmark:							

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	Instrumentation Installation	COMMENTS & GRAIN SIZE DISTRIBUTION (%)
	0.0 233.9										GR SA SI CL
	0.2 RECYCLED ASPHALT: 250 mm 233.6					0					
	FILL: Sandy silt, trace gravel, very stiff, brown, moist 0.6 233.3	AS	1								
	CLAYEY SILT: Some sand, very stiff, brown, moist	SS	2	95	16			16	14		
	1.5 232.3					1.5	232.5				
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, hard, brown, moist	SS	3	90	26			26	16		
		SS	4	100	34			34	16		
						3	231				
		SS	5	100	54			54	11		
	4.6 229.3					4.5	229.5				
	CLAYEY SILT: Trace sand, very stiff, grey, moist	SS	6	100	21			21	16		First Water Strike SS5
						6	228				
	6.6 227.3	SS	7	100	22			22	15		
	Borehole Terminated at 6.6 m										

FIELD TESTING: Shear Strength Testing (kPa) — Other Test; Pocket Penetrometer; Field Vane (Intact); Field Vane (Remolded); 40 80 120 160. Penetration Testing: SPT, DCPT; 10 20 30 40.

LAB TESTING: Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm); 100 200 300 400. Atterberg Limits: PL, LL. Water Content (%); 10 20 30 40.

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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7/23 at depth of: 4.69 m.

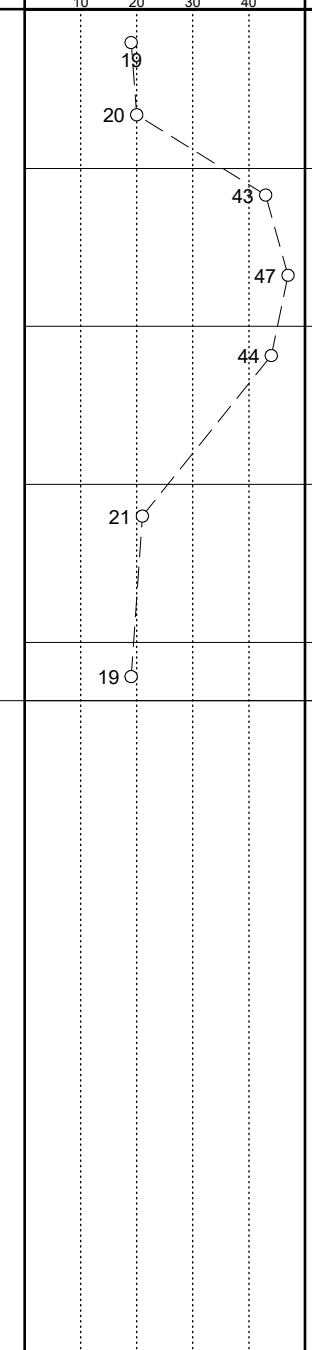
Groundwater Elevation: 229.2 m

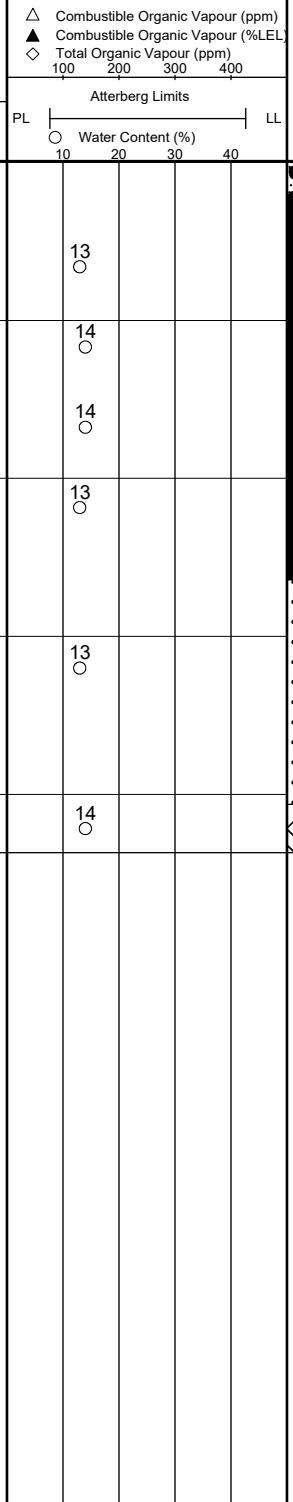
RECORD OF BOREHOLE No. 2

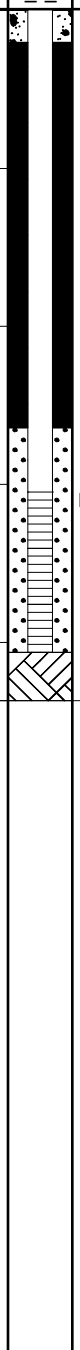
Project Number: **2301130**
Project Client: **Simpson Road Landowners Group Inc.**
Project Name: **South Simpson (Headwaters of West**
Project Location: **Caledon, ON**
Drilling Location: **See Borehole Location Plan**
Local Benchmark:

Drilling Method: **Track Mount** Drilling Machine: **Solid Stem Augers**
Logged By: **TA** Northing: Date Started: **May 18/23**
Reviewed By: **GW** Easting: Date Completed: **May 18/23**

Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	Elevation (m)
0.0						0.0
	ASPHALT: 700 mm	SS	1	40	19	
0.7						-0.7
	FILL: CLAYEY SILT: Trace gravel, very stiff, brown, moist	SS	2	80	20	
1.5						-1.5
	CLAYEY SILT GLACIAL TILL: Trace sand, inferred cobbles and boulders, stiff to hard, grey spotting, moist	SS	3	45	43	
2.3						-2.3
	SANDY CLAYEY SILT: Trace gravel, hard, moist	SS	4	100	47	
		SS	5	100	44	
4.6						-4.6
	CLAYEY SILT: Trace sand, stiff, grey, very moist	SS	6	100	21	
		SS	7	100	19	
6.6						-6.6
	Borehole Terminated at 6.6 m					







Depth (m)	GR	SA	SI	CL	Comments
3	5	21	42	32	
4.5					First Water Strike SS6

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Groundwater depth encountered on completion of drilling: Dry
Groundwater depth observed on:
Cave depth after auger removal: Open
Groundwater Elevation:

Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretative assistance from a qualified geotechnical engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Boring Log'.

Scale: **1 :75**
Page: **1 of 1**

RECORD OF BOREHOLE No. 3

Project Number:	2301130						
Project Client:	Simpson Road Landowners Group Inc.						
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers		
Project Location:	Caledon, ON	Logged By:	TA	Northing:	4855211.7	Date Started:	May 17/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting:	603689.4	Date Completed:	May 17/23
Local Benchmark:							

Depth (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	Elevation (m)	Field Testing: SPT / DCPT	Lab Testing: Water Content (%)	Comments & Grain Size Distribution (%) GR	SA	SI	CL
0.0 / 0.1	TOPSOIL: 75 mm					233.4 / 233.3						
0.8	FILL: Clayey silt, trace sand, firm, brown, moist	SS	1	20	6	232.6	6	17				
		SS	2	65	20	232.5	20	15				
1.5	CLAYEY SILT: Some sand, firm to very stiff, grey, moist					231.8						
	CLAYEY SILT GLACIAL TILL: Some sand, trace gravel, inferred cobbles and boulders, hard, grey to brown, moist	SS	3	100	31	231.5	31	16				
		SS	4	100	47	231	47	13	8	18	42	32
3		SS	5	80	38	229.5	38	18				
4.6	SANDY CLAYEY SILT: Trace gravel, firm to very stiff, grey, moist					228.8						
		SS	6	100	29	228	29	13	4	20	45	31
6.6		SS	7	100	21	226.8	21	14				
	Borehole Terminated at 6.6 m											

Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); 40 80 120 160

Penetration Testing: ○ SPT ● DCPT; 10 20 30 40

△ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); 100 200 300 400

Atterberg Limits: PL ○ Water Content (%) LL; 10 20 30 40

Instrumentation Installation

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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7/23 at depth of: 1.3 m.

Groundwater Elevation: 232.1 m

RECORD OF BOREHOLE No. 4-D

Project Number:	2301130						
Project Client:	Simpson Road Landowners Group Inc.						
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers		
Project Location:	Caledon, ON	Logged By:	TA	Northing:	4855082.3	Date Started:	May 18/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting:	604231.5	Date Completed:	May 18/23
Local Benchmark:							

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING (Shear Strength Testing (kPa); Penetration Testing SPT/DCPT)	LAB TESTING (Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm); Atterberg Limits; Water Content (%))	Instrumentation Installation	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	0.0 230.4										
	TOPSOIL: 25 mm										
	FILL: Clayey silt, trace sand, firm, brown, moist	SS	1	75	11	0		11	23		
	0.8 229.6										
	CLAYEY SILT: Some sand, stiff, brown with grey spotting, moist	SS	2	100	12		229.5	12	24		
	1.5 228.9					1.5					
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff to hard, brown, moist	SS	3	90	26			26	13		
		SS	4	90	26		228	26	10		
		SS	5	90	41	3		41	13		
	4.6 225.8						226.5				
	CLAYEY SILT: Some sand, firm to very stiff, grey, moist	SS	6	100	24	4.5		24	12		First Water Strike SS6
	6.1 224.3						225				
	SANDY SILTY GLACIAL TILL: Trace clay, inferred cobbles and boulders, hard, grey, moist	SS	7	95	50+	6		50+	9		
	6.6 223.8										
	Borehole Terminated at 6.6 m										

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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7/23 at depth of: 1.7 m.

Groundwater Elevation: 228.7 m

RECORD OF BOREHOLE No. 4-S

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Project Number:	2301130				
Project Client:	Simpson Road Landowners Group Inc.				
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers
Project Location:	Caledon, ON	Logged By:	TA	Northing: 4855081.4	Date Started: May 18/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting: 604231.5	Date Completed: May 18/23
Local Benchmark:					

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	Shear Strength Testing (kPa): Other Test, Pocket Penetrometer, Field Vane (Intact), Field Vane (Remolded); 40 80 120 160; Penetration Testing: SPT, DCPT; 10 20 30 40	Combustible Organic Vapour (ppm), Combustible Organic Vapour (%LEL), Total Organic Vapour (ppm); 100 200 300 400; Atterberg Limits: PL, LL; Water Content (%); 10 20 30 40	Instrumentation Installation	GR SA SI CL
	0.0 230.4					0					
	TOPSOIL: 25 mm										
	FILL: Clayey silt, trace sand, firm, brown, moist										Descriptions copied from BH 4-D
	0.8 229.6						229.5				
	CLAYEY SILT: Some sand, stiff, brown with grey spotting, moist										
	1.5 228.8					1.5					
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff to hard, brown, moist										
	2.3 228.1										
	Borehole Terminated at 2.3 m										

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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7/23 at depth of: 1.2 m.

Groundwater Elevation: 229.2 m

RECORD OF BOREHOLE No. 5

Project Number:	2301130						
Project Client:	Simpson Road Landowners Group Inc.						
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers		
Project Location:	Caledon, ON	Logged By:	TA	Northing:	4855105.3	Date Started:	May 18/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting:	604103.3	Date Completed:	May 18/23
Local Benchmark:							

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LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)				
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	Shear Strength Testing (kPa): Other Test, Pocket Penetrometer, Field Vane (Intact), Field Vane (Remolded); Penetration Testing: SPT, DCPT	Combustible Organic Vapour (ppm), Combustible Organic Vapour (%LEL), Total Organic Vapour (ppm); Atterberg Limits: PL, LL; Water Content (%)	Instrumentation Installation		GR	SA	SI	CL
	0.0 231.2														
	0.2 TOPSOIL: 180 mm 231.0 GRAVEL: 25 mm FILL: 555 mm 0.8 230.4	SS	1	85	6	0	231	6	22						
	CLAYEY SILT: Some sand, firm to stiff, brown to grey, moist	SS	2	100	19			19	14						
	2.3 228.9	SS	3	100	29	1.5	229.5	29	13						
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff to hard, grey, moist	SS	4	100	21			21	14						
		SS	5	100	43	3	228	43	13		First Water Strike SS5				
	4.6 226.6														
	CLAYEY SILT: Some sand, trace gravel, firm to very stiff, grey, moist	SS	6	100	21	4.5	226.5	21	13			2	17	48	33
	6.1 225.1														
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff to hard, grey, moist 6.6 224.6	SS	7	100	19	6	225	19	15						
	Borehole Terminated at 6.6 m														

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Barrie, Ontario L4N 0B7
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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7/23 at depth of: 1.3 m.

Groundwater Elevation: 229.9 m

RECORD OF BOREHOLE No. 6-D

GEI Consultants

Project Number:	2301130				
Project Client:	Simpson Road Landowners Group Inc.				
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers
Project Location:	Caledon, ON	Logged By:	TA	Northing: 4855285.3	Date Started: May 19/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting: 604062.3	Date Completed: May 19/23
Local Benchmark:					

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)
	0.0 231.4						
	ASPHALT: 25 mm GRANULAR: Sand FILL: Sand, trace silt	AS	1			0	231
	0.8 230.7						
	CLAYEY SILT: Trace organics, firm, brown, wet	SS	2	55	4		
	- - - Some sand, brown to grey - - -	SS	3	100	6	1.5	229.5
	2.3 229.1						
	CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff to hard, grey, wet to moist	SS	4	100	24		
		SS	5	100	44	3	228
		SS	6	100	36	4.5	226.5
	6.1 225.3						
	CLAYEY SILT: Some sand, very stiff, grey, wet	SS	7	100	30	6	225
	6.6 224.9						
	Borehole Terminated at 6.6 m						

FIELD TESTING

Shear Strength Testing (kPa)

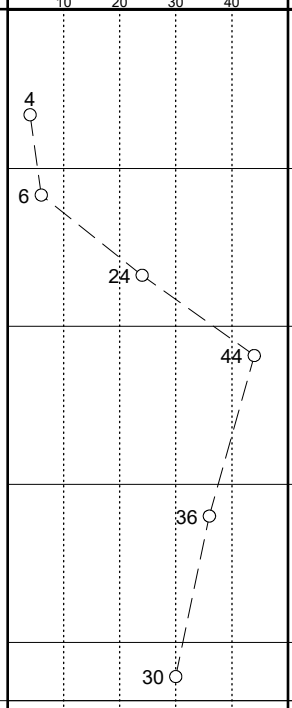
× Other Test
+ Pocket Penetrometer
▲ Field Vane (Intact)
△ Field Vane (Remolded)

40 80 120 160

Penetration Testing

○ SPT ● DCPT

10 20 30 40



LAB TESTING

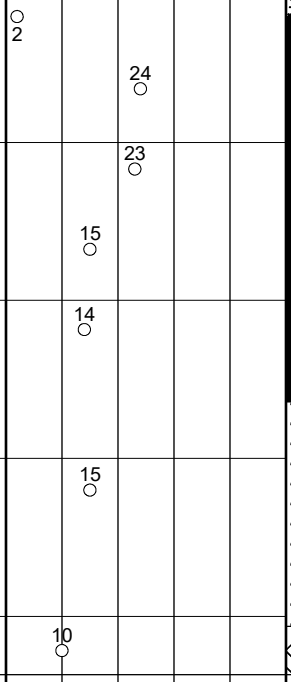
△ Combustible Organic Vapour (ppm)
▲ Combustible Organic Vapour (%LEL)
◇ Total Organic Vapour (ppm)

100 200 300 400

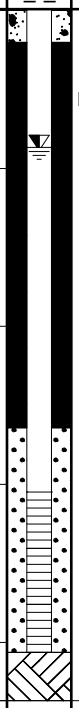
Atterberg Limits

PL ○ Water Content (%) LL

10 20 30 40



Instrumentation Installation



COMMENTS & GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL

First Water Strike SS2

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▽ Groundwater depth encountered on completion of drilling: 5.4 m. (Cave depth after auger removal: Open

▽ Groundwater depth observed on: Jun 7/23 at depth of: 1.3 m. Groundwater Elevation: 230.1 m

Scale: **1 :75**

RECORD OF BOREHOLE No. 6-S

GEI Consultants

Project Number:	**2301130**						
Project Client:	**Simpson Road Landowners Group Inc.**						
Project Name:	**South Simpson (Headwaters of West**	Drilling Method:	**Track Mount**	Drilling Machine:	**Solid Stem Augers**		
Project Location:	**Caledon, ON**	Logged By:	**TA**	Northing:	**4855284.8**	Date Started:	**May 19/23**
Drilling Location:	**See Borehole Location Plan**	Reviewed By:	**GW**	Easting:	**604061.4**	Date Completed:	**May 19/23**
Local Benchmark:							

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	Shear Strength Testing (kPa): Other Test, Pocket Penetrometer, Field Vane (Intact), Field Vane (Remolded); 40 80 120 160; Penetration Testing: SPT, DCPT; 10 20 30 40	Combustible Organic Vapour (ppm), Combustible Organic Vapour (%LEL), Total Organic Vapour (ppm); 100 200 300 400; Atterberg Limits: PL, LL; Water Content (%); 10 20 30 40	Instrumentation Installation	GR SA SI CL
	0.0 231.4					0	231				
	ASPHALT: 25 mm GRANULAR: Sand FILL: Sand, trace silt 0.8 230.7										Descriptions copied from BH 6-D
	CLAYEY SILT: Trace organics, firm, brown, wet - - - Some sand, brown to grey - - - 2.3 229.1					1.5	229.5				First Water Strike SS2
	Borehole Terminated at 2.3 m										

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Groundwater depth encountered on completion of drilling: 5.4 m. Cave depth after auger removal: Open

Groundwater depth observed on: Jun 7.23 at depth of: 0.5 m. Groundwater Elevation: 230.9 m

RECORD OF BOREHOLE No. 7

GEI Consultants

Project Number:	2301130				
Project Client:	Simpson Road Landowners Group Inc.				
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers
Project Location:	Caledon, ON	Logged By:	TA	Northing: 4855220.4	Date Started: May 19/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting: 603844.3	Date Completed: May 19/23
Local Benchmark:					

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING (Shear Strength Testing (kPa); Penetration Testing SPT/DCPT)	LAB TESTING (Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm); Atterberg Limits PL–LL; Water Content (%))	Instrumentation Installation	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	0.0 232.6 ASPHALT/GRANULAR: 760 mm	SS	1	80	37	0	232.5	37	5					
	0.8 231.8 CLAYEY SILT: Some sand, firm to very stiff, brown and grey, moist	SS	2	100	9			9	15					
		SS	3	90	21	1.5	231	21	15					
	2.3 230.3 CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, very stiff, grey, moist	SS	4	100	25			25	14		First Water Strike SS4			
		SS	5	100	25	3	229.5	25	14					
	4.6 228.0 CLAYEY SILT: Trace sand, stiff, grey, moist	SS	6	100	14	4.5	228	14	15					
	6.1 226.5 SANDY CLAYEY SILT GLACIAL TILL: Some gravel, inferred cobbles and boulders, very stiff, grey, moist	SS	7	85	7	6	226.5	7	15		5	22	45	28
	6.6 226.0 Borehole Terminated at 6.6 m													

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T : (705) 719-7994
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Groundwater depth encountered on completion of drilling: 5.4 m. Cave depth after auger removal: Open

Groundwater depth observed on: Groundwater Elevation:

RECORD OF BOREHOLE No. 8

Project Number:	2301130				
Project Client:	Simpson Road Landowners Group Inc.				
Project Name:	South Simpson (Headwaters of West	Drilling Method:	Track Mount	Drilling Machine:	Solid Stem Augers
Project Location:	Caledon, ON	Logged By:	TA	Northing: 4855027.8	Date Started: May 17/23
Drilling Location:	See Borehole Location Plan	Reviewed By:	GW	Easting: 603918.9	Date Completed: May 17/23
Local Benchmark:					

Depth (m)	Elevation (m)	Description	Sample Type	Sample Number	Recovery (%)	SPT "N" Value	Field Testing (Penetration Testing: SPT / DCPT)	Lab Testing (Water Content %)	Instrumentation Installation	GR	SA	SI	CL
0	231	GRANULAR: 720 mm	AS	1				10					
0.7 / 0.8	231.0 / 231.0	FILL: 40 mm											
		CLAYEY SILT: Some sand, stiff to very stiff, brown, moist	SS	2	80	10	10	15					
1.5	230.2												
		CLAYEY SILT GLACIAL TILL: Some sand, inferred cobbles and boulders, hard, brown, moist	SS	3	100	28	28	15					
1.5	229.5		SS	4	100	35	35	13					
3	228		SS	5	100	20	20	13					
4.5	226.5	- - - Stiff, grey - - -	SS	6	45	15	15	16					
6.1	225.6												
6.6	225.2	SAND AND SILT: Trace clay, compact, grey, wet	SS	7	100	24	24	13		0	43	53	4
		Borehole Terminated at 6.6 m											

First Water Strike SS5

Shear Strength Testing (kPa): Other Test; Pocket Penetrometer; Field Vane (Intact); Field Vane (Remolded) — 40 80 120 160

Lab Testing: Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm) — 100 200 300 400; Atterberg Limits PL LL

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Groundwater depth encountered on completion of drilling: 5.4 m. Cave depth after auger removal: Open

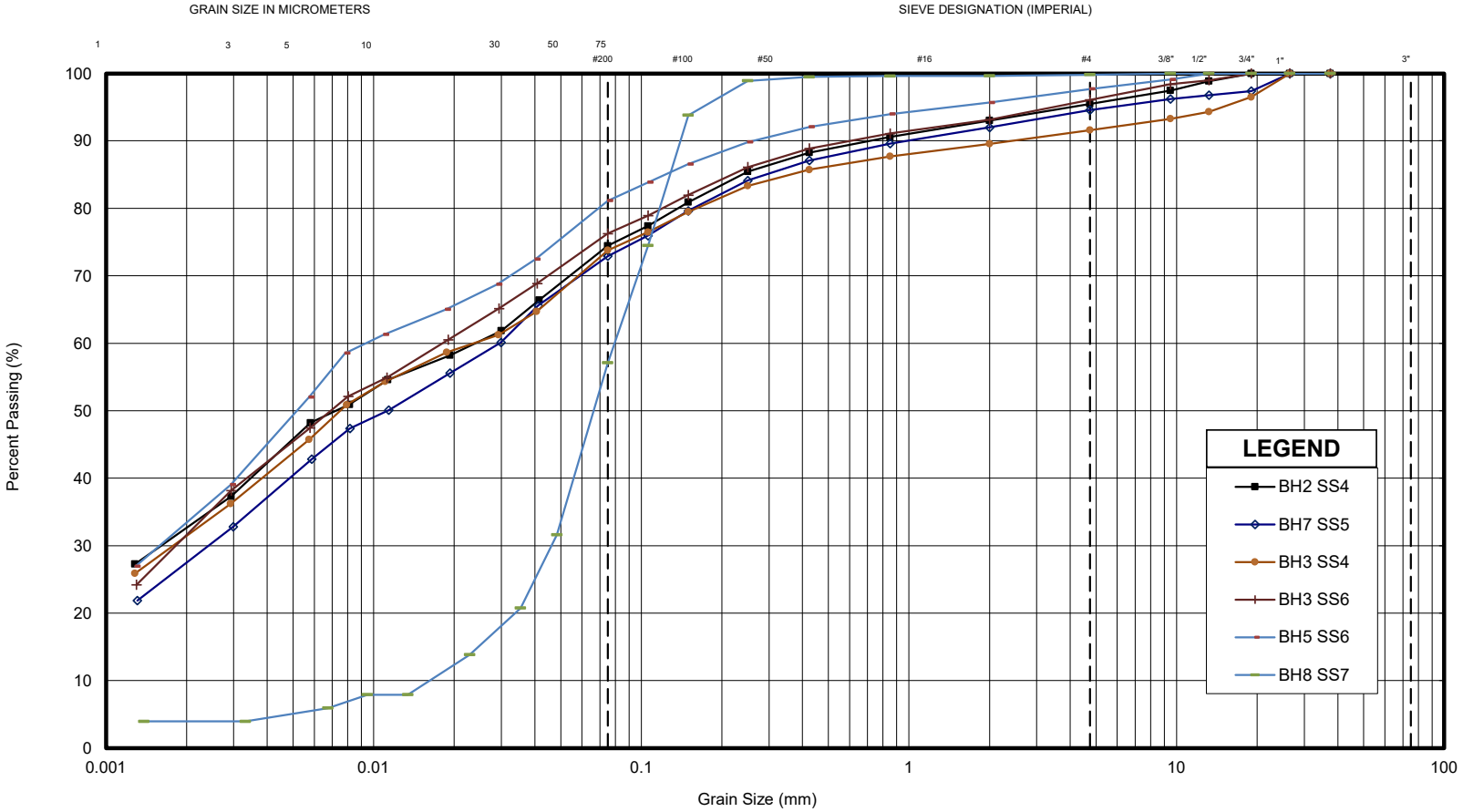
Groundwater depth observed on: Jun 7/23 at depth of: 2.0 m. Groundwater Elevation: 229.7 m

Appendix C

Geotechnical Laboratory Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
BH2 SS4	SANDY CLAYEY SILT, Trace Gravel	5	21	42	32	-	0.002	0.024	-	-
BH7 SS7	SANDY CLAYEY SILT, Trace Gravel	5	22	45	28	-	0.002	0.030	-	-
BH3 SS4	CLAYEY SILT, Some Sand, Trace Gravel	8	18	42	32	-	0.002	0.024	-	-
BH3 SS6	SANDY CLAYEY SILT, Trace Gravel	4	20	45	31	-	0.002	0.018	-	-
BH5 SS6	CLAYEY SILT, Some Sand, Trace Gravel	2	17	48	33	-	0.002	0.009	-	-
BH8 SS7	SAND AND SILT, Trace Clay	-	43	53	4	0.016	0.046	0.079	4.9	1.7

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GRAIN SIZE DISTRIBUTION - South Simpson (Headwaters of West Rainbow Creek)

Master Graph

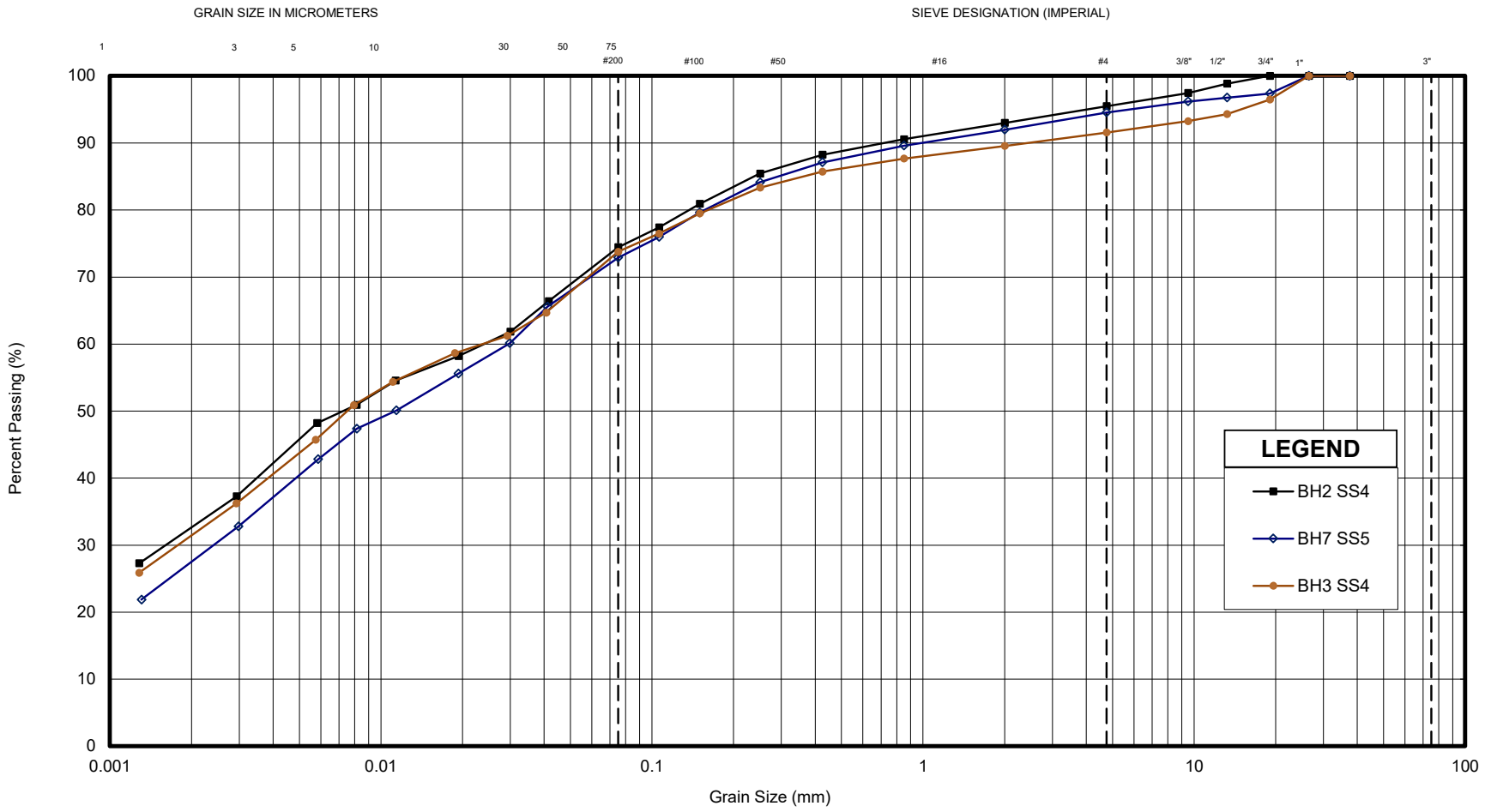
FIGURE No. App C - Master

REF. No. 2301130

DATE August 2023

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
BH2 SS4	SANDY CLAYEY SILT, Trace Gravel	5	21	42	32	-	0.002	0.024	-	-
BH7 SS7	SANDY CLAYEY SILT, Trace Gravel	5	22	45	28	-	0.002	0.030	-	-
BH3 SS4	CLAYEY SILT, Some Sand, Trace Gravel	8	18	42	32	-	0.002	0.024	-	-

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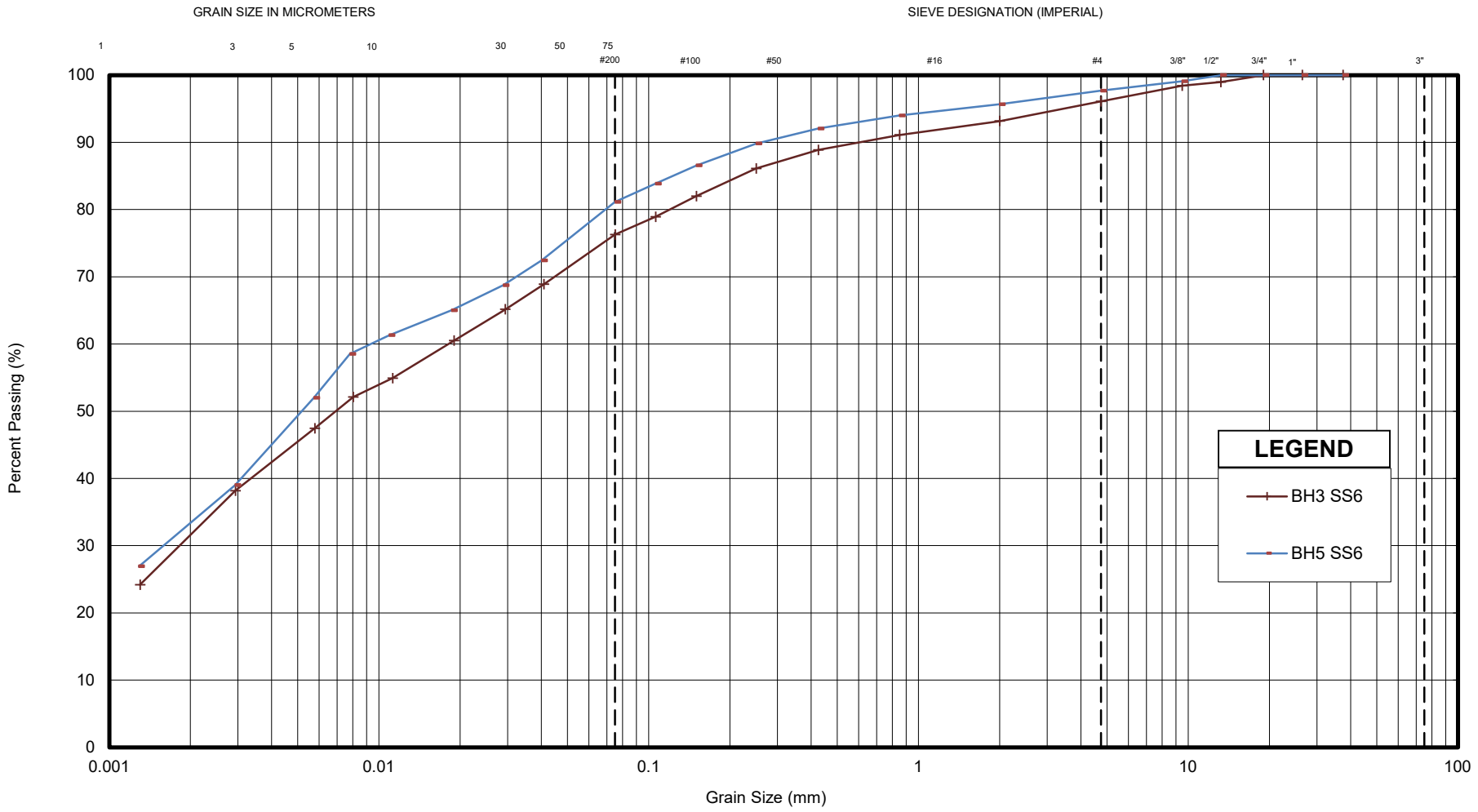
GRAIN SIZE DISTRIBUTION - South Simpson (Headwaters of West Rainbow Creek)

GLACIAL TILL

FIGURE No.	App C - A
REF. No.	2301130
DATE	App C - Master

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
BH3 SS6	SANDY CLAYEY SILT, Trace Gravel	4	20	45	31	-	0.002	0.018	-	-
BH5 SS6	CLAYEY SILT, Some Sand, Trace Gravel	2	17	48	33	-	0.002	0.009	-	-

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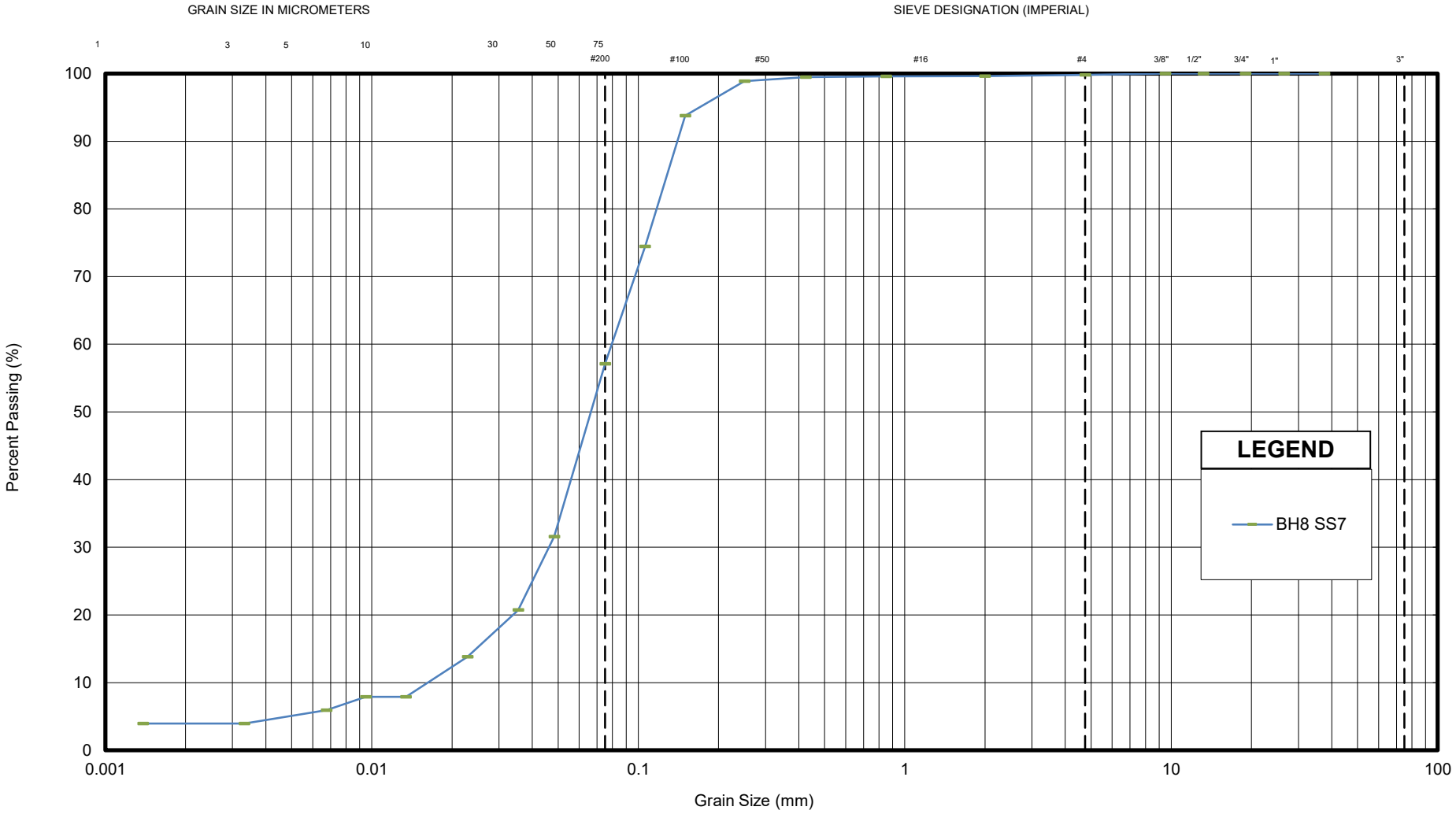
GRAIN SIZE DISTRIBUTION - South Simpson (Headwaters of West Rainbow Creek)

CLAYEY SILT

FIGURE No.	APP C - B
REF. No.	2301130
DATE	August 2023

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
BH8 SS7	SAND AND SILT, Trace Clay	-	43	53	4	0.016	0.046	0.079	4.9	1.7

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GRAIN SIZE DISTRIBUTION - South Simpson (Headwaters of West Rainbow Creek)

SAND AND SILT

FIGURE No.	App C - C
REF. No.	2301130
DATE	August 2023

Appendix D

Rising Head Test Results

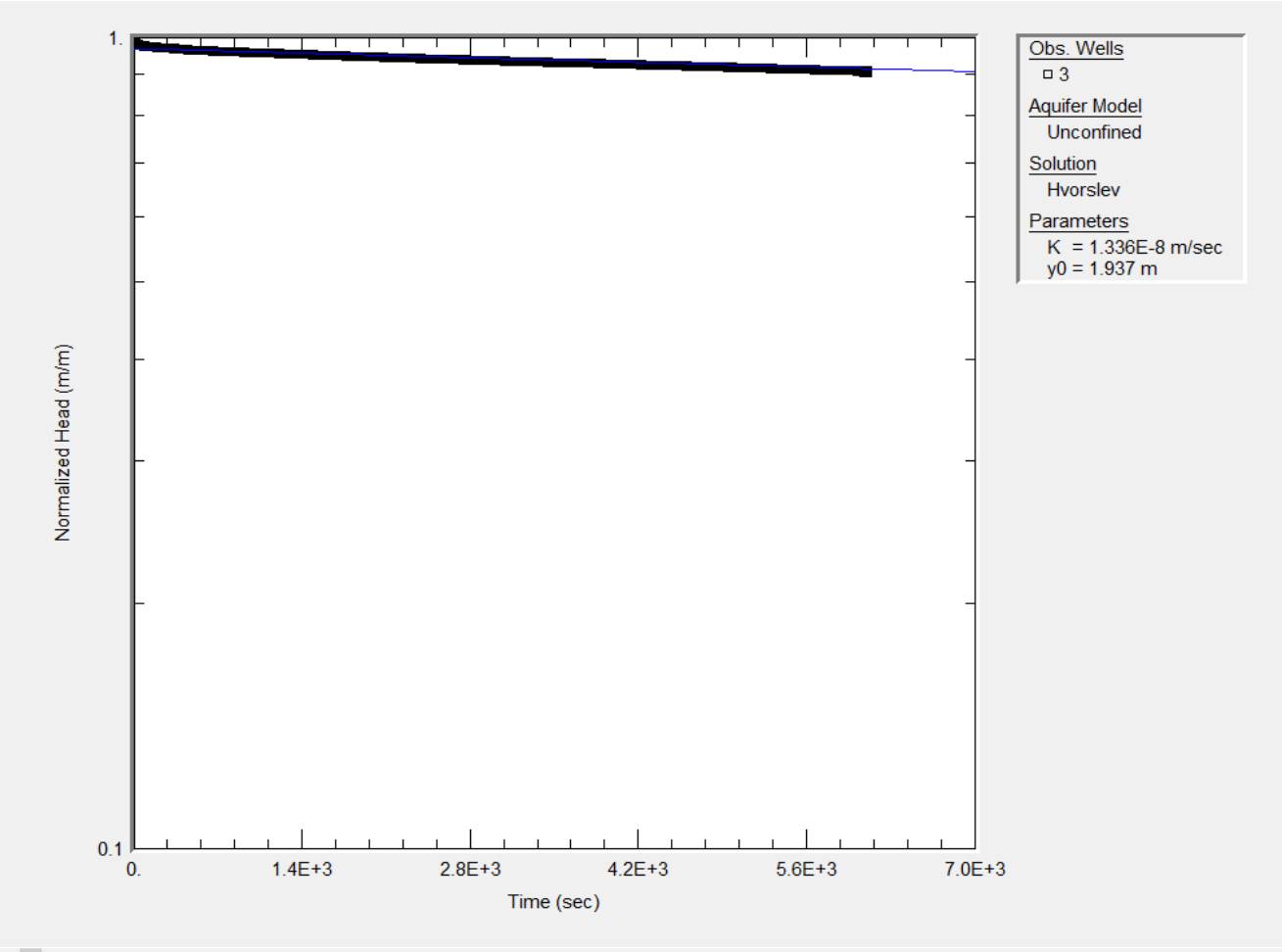
Hydrogeological Investigation
South Simpson (Headwaters of West Rainbow Creek),
Northeast corner of Coleraine Drive and Mayfield Road, Caledon, ON
Project No.: 2301130

Estimation of K by Slug Test, based on Horslev equation

Date:	July 3, 2023
Conducted by:	S. Patrick

Well Number:	MW3	
Well Screen Bottom:	6.10	mbgs
Top of Pipe:	0.88	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	233.3	masl
Static Water Level:	2.33	mbgs
$K = r^2\ln(L/R)/(2LTo) =$	**$1.3x10^{-8}$**	m/s

** this is the ground elevation



Hydrogeological Investigation
South Simpson (Headwaters of West Rainbow Creek),
Northeast corner of Coleraine Drive and Mayfield Road, Caledon, ON
Project No.: 2301130

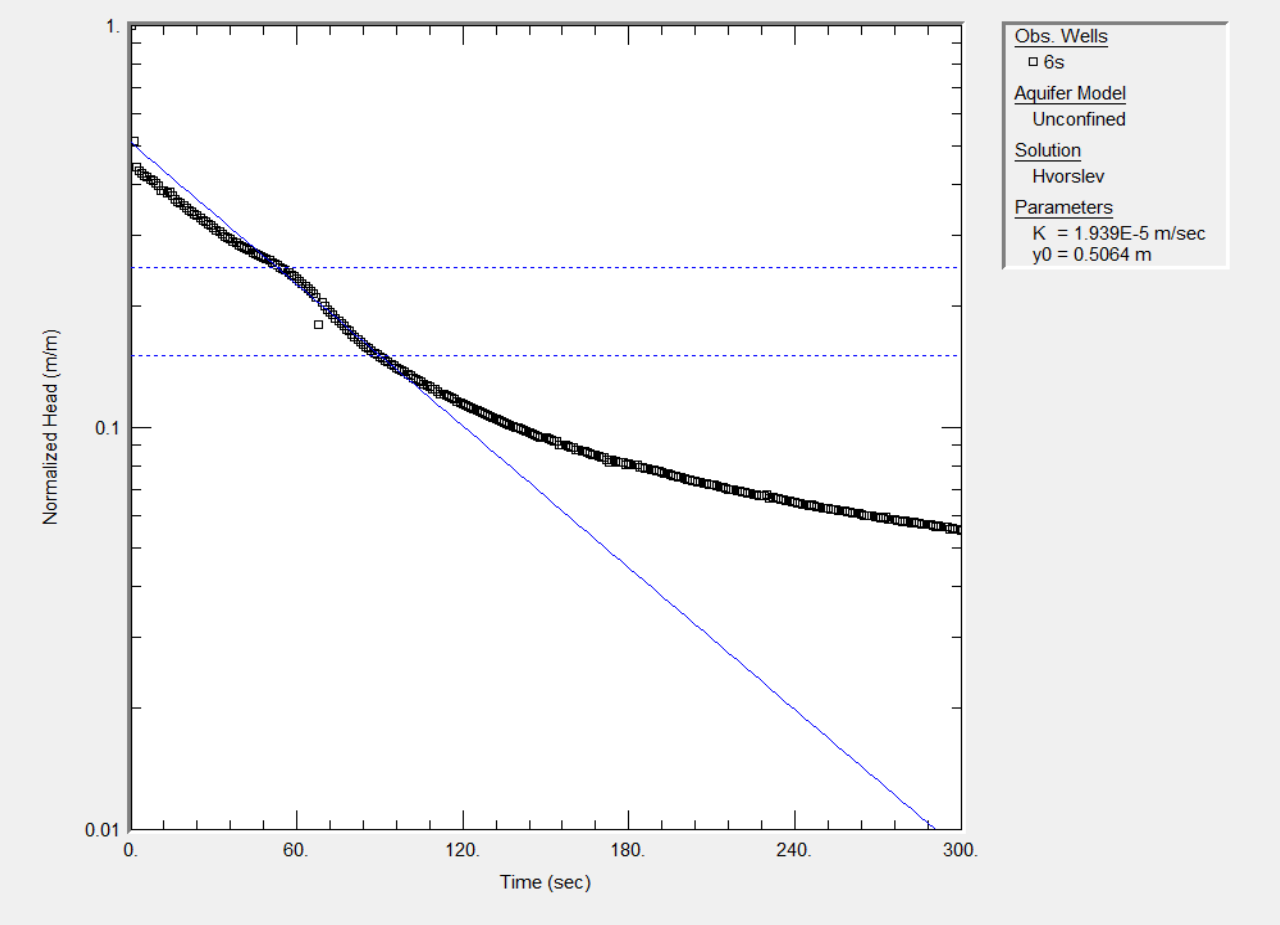
GEI Consultants

Estimation of K by Slug Test, based on Dagan equation

Date:	June 8, 2023
Conducted by:	S. Patrick

Well Number:	MW6S	
Well Screen Bottom:	2.30	mbgs
Top of Pipe:	0.00	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	231.4	masl
Static Water Level:	0.62	mbgs
$K = r^2\ln(L/R)/(2LTo) =$	**1.9×10^{-5}**	m/s

** this is the ground elevation



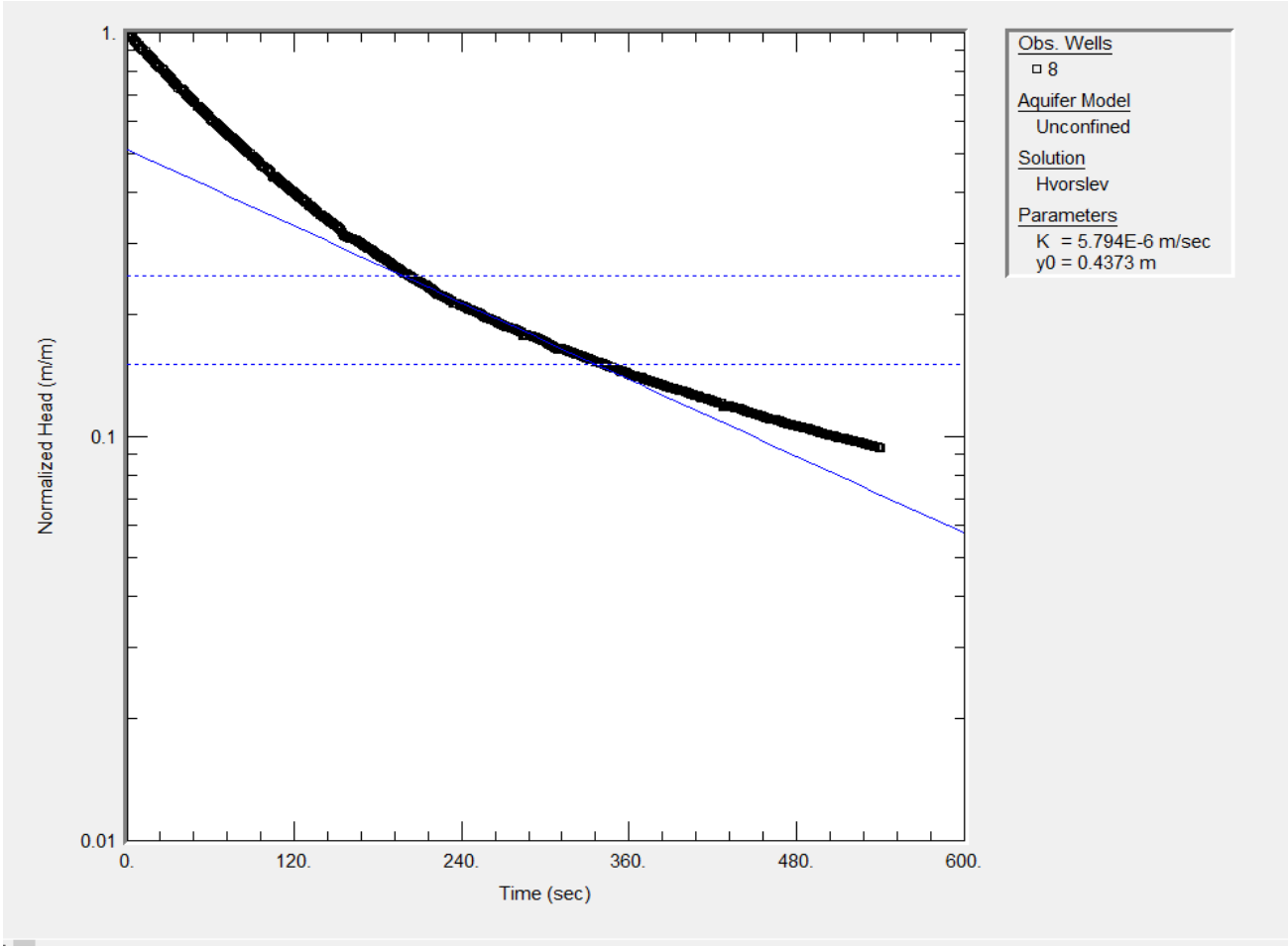
Hydrogeological Investigation
South Simpson (Headwaters of West Rainbow Creek),
Northeast corner of Coleraine Drive and Mayfield Road, Caledon, ON
Project No.: 2301130

Estimation of K by Slug Test, based on Horslev equation

Date:	June 8, 2023
Conducted by:	S. Patrick

Well Number:	MW8	
Well Screen Bottom:	6.10	mbgs
Top of Pipe:	0.00	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	234.7	masl
Static Water Level:	1.99	mbgs
$K = r^2\ln(L/R)/(2LTo) =$	**$5.8x10^{-6}$**	m/s

** this is the ground elevation



Appendix E

Water Quality Laboratory Certificate Of Analysis And Chain Of Custody

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B23-03752 (i)

Report To:

GEI Consultants
647 Welham Rd, Unit 14,
Barrie ON L4N 0B7 Canada
Attention: Sarah Griffith

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 08-Jun-23
DATE REPORTED: 29-Jun-23
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:

P.O. NUMBER: 2301130
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Cyanide	1	Kingston	kwe	13-Jun-23	A-CN-001 (k)	SM 4500CN
Anions	1	Holly Lane	pcu	14-Jun-23	A-IC-01 (o)	SM4110C
pH	1	Holly Lane	SYL	12-Jun-23	A-PH-01 (o)	SM 4500H
A - Wet Chem	1	Kingston	JWF	14-Jun-23	A-TPTKN-001 (N)(k)	E3516.2
A - Wet Chem	1	Kingston	JWF	14-Jun-23	A-TPTKN-001 (P)(k)	E3516.2
Total Suspended Solids	2	Kingston	mci	12-Jun-23	A-TSS-001 (k)	SM2540D
B - Bacteriological	1	Barrie	NME	09-Jun-23	B-EC-001 (b)	SM9222D
Comment	1	Default Site	CS	14-Jun-23	C-Arochlor Comment	-
BOD	1	Kingston	JWF	12-Jun-23	C-BOD-001 (k)	SM 5210B
SVOC	1	Kingston	esi	13-Jun-23	C-NAB-W-001 (k)	EPA 8270
Oil & Grease	1	Kingston	TMM	14-Jun-23	C-O&G-001 (k)	SM 5520
PCB's	1	Kingston	CS	14-Jun-23	C-PCB-03 K	EPA 8082
Phenolics (4-aap)	1	Kingston	kwe	14-Jun-23	C-PHEN-01 (k)	MOEE 3179
Chromium (VI)	2	Holly Lane	ST	15-Jun-23	D-CRVI-01 (o)	MOE E3056
Mercury	2	Holly Lane	APR	14-Jun-23	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	2	Holly Lane	aoz	16-Jun-23	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	2	Holly Lane	TPR	14-Jun-23	D-ICPMS-01 (o)	EPA 200.8
Subcontracted	1	Default Site	CWp	29-Jun-23	S-Nonylphenols	Subcontract

Peel Sanitary/Storm - Peek Sanitary/Storm Sewer
Peel Sanitary Sewer - Peel Sanitary Sewer
Peel Storm Sewer - Peel Storm Sewer

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B23-03752 (i)

Report To:

GEI Consultants
647 Welham Rd, Unit 14,
Barrie ON L4N 0B7 Canada
Attention: Sarah Griffith

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 08-Jun-23
DATE REPORTED: 29-Jun-23
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D.		MW4d	MW4d-F			Peel Sanitary/Storm	
	Sample I.D.		B23-03752-1	B23-03752-2			Peel Sanitary Sewer	Peel Storm Sewer
	Date Collected		08-Jun-23	08-Jun-23				
Parameter	**Units**	**R.L.**						
E coli	cfu/100mL	1	< 2					200
pH @25°C	pH Units		7.67				10.0	9.0
BOD(5 day)	mg/L	3	< 3				300	15
Cyanide (Total)	mg/L	0.005	< 0.005				2	0.02
Fluoride	mg/L	0.1	< 0.1				10	
Total Kjeldahl Nitrogen	mg/L	0.1	0.2				100	1
Oil and Grease-Anim/Veg. (Calculation)	mg/L	1.0	1.3				150	
Oil and Grease-Mineral	mg/L	1.0	< 1.0				15	
Oil & Grease-Total	mg/L	1.0	1.5					
Phenolics	mg/L	0.001	< 0.001				1.0	0.008
Phosphorus-Total	mg/L	0.01	0.04				10	0.4
Total Suspended Solids	mg/L	3	**380**	< 3			350	15
Aluminum	mg/L	0.01	0.48	0.07			50	
Hardness (as CaCO3)	mg/L	1	907	895				
Antimony	mg/L	0.0001	0.0002	0.0002			5	
Arsenic	mg/L	0.0001	0.0021	0.0013			1	0.02
Beryllium	mg/L	0.002	< 0.002	< 0.002				
Boron	mg/L	0.005	0.051	0.046				
Cadmium	mg/L	0.000015	0.000023	< 0.000015			0.7	0.008
Chromium	mg/L	0.001	0.001	< 0.001			5	0.08
Chromium (VI)	mg/L	0.001	< 0.001	< 0.001 [1]				
Cobalt	mg/L	0.0001	0.0016	0.0012			5	
Copper	mg/L	0.0001	0.0014	0.0002			3	0.05

Peel Sanitary/Storm - Peek Sanitary/Storm Sewer
Peel Sanitary Sewer - Peel Sanitary Sewer
Peel Storm Sewer - Peel Storm Sewer

Christine Burke
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B23-03752 (i)

Report To:

GEI Consultants
647 Welham Rd, Unit 14,
Barrie ON L4N 0B7 Canada
Attention: Sarah Griffith

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 08-Jun-23
DATE REPORTED: 29-Jun-23
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D.		MW4d	MW4d-F			Peel Sanitary/Storm	
	Sample I.D.		B23-03752-1	B23-03752-2			Peel Sanitary Sewer	Peel Storm Sewer
	Date Collected		08-Jun-23	08-Jun-23				
Parameter	**Units**	**R.L.**						
Iron (Total)	mg/L	0.005	1.82	0.123				
Lead	mg/L	0.00002	0.00039	0.00007			3	0.120
Manganese (Total)	mg/L	0.001	**0.203**	**0.175**			5	0.05
Mercury	mg/L	0.00002	< 0.00002	< 0.00002			0.01	0.0004
Molybdenum	mg/L	0.0001	0.0017	0.0017			5	
Nickel	mg/L	0.0002	0.0039	0.0029			3	0.08
Selenium	mg/L	0.001	0.001	0.002			1	0.02
Silver	mg/L	0.0001	< 0.0001	< 0.0001			5	0.12
Sulphate	mg/L	1	204				1500	
Thallium	mg/L	0.00005	< 0.00005	< 0.00005				
Tin	mg/L	0.05	< 0.05	< 0.05			5	
Titanium	mg/L	0.005	0.011	< 0.005			5	
Tungsten	mg/L	0.01	< 0.01	< 0.01				
Uranium	mg/L	0.00005	0.00661	0.00772				
Vanadium	mg/L	0.0001	0.0015	0.0007				
Zinc	mg/L	0.005	0.012	< 0.005			3	0.04
Zirconium	mg/L	0.003	< 0.003	< 0.003				
Poly-Chlorinated Biphenyls (PCB's)	mg/L	0.00005	< 0.00005				0.001	0.0004
Aroclor	-		-					
Nonylphenols	mg/L	0.001	< 0.001 [2]				0.02	
Nonylphenol Ethoxylates	mg/L	0.01	< 0.01 [2]				0.2	
Nonylphenol Monoethoxylate	µg/L	10	< 10 [2]					

Peel Sanitary/Storm - Peek Sanitary/Storm Sewer
Peel Sanitary Sewer - Peel Sanitary Sewer
Peel Storm Sewer - Peel Storm Sewer

Christine Burke
Lab Manager

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DATE RECEIVED: 08-Jun-23
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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D.		MW4d	MW4d-F			Peel Sanitary/Storm	
	Sample I.D.		B23-03752-1	B23-03752-2			Peel Sanitary Sewer	Peel Storm Sewer
	Date Collected		08-Jun-23	08-Jun-23				
Parameter	**Units**	**R.L.**						
Nonylphenol Diethoxylate	µg/L	10	< 10 [2]					
Bis(2-ethylhexyl) Phthalate	mg/L	0.005	< 0.005				0.012	0.0088
Di-n-butyl Phthalate	mg/L	0.001	< 0.001				0.08	0.015

1. Chromium (VI) result is based on total Chromium

2. Subcontracted to SGS Lakefield

Peel Sanitary/Storm - Peek Sanitary/Storm Sewer
Peel Sanitary Sewer - Peel Sanitary Sewer
Peel Storm Sewer - Peel Storm Sewer

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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

Summary of Exceedances

Peel Sanitary Sewer

MW4d	Found Value	Limit
Total Suspended Solids (mg/L)	380	350

Peel Storm Sewer

MW4d	Found Value	Limit
Total Suspended Solids (mg/L)	380	15
Manganese (Total) (mg/L)	0.203	0.05

MW4d-F	Found Value	Limit
Manganese (Total) (mg/L)	0.175	0.05

Peel Sanitary/Storm - Peek Sanitary/Storm Sewer
Peel Sanitary Sewer - Peel Sanitary Sewer
Peel Storm Sewer - Peel Storm Sewer

Christine Burke
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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:

P.O. NUMBER: 2301130
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Chromium (VI)	2	Holly Lane	ST	15-Jun-23	D-CRVI-01 (o)	MOE E3056
Mercury	2	Holly Lane	APR	14-Jun-23	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	2	Holly Lane	aoz	16-Jun-23	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	2	Holly Lane	TPR	14-Jun-23	D-ICPMS-01 (o)	EPA 200.8

PWQO - Provincial Water Quality Objectives
Interim PWQO - Interim PWQO
PWQO - Provincial Water Quality Objectives

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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D.		MW4d	MW4d-F			PWQO	
	Sample I.D.		B23-03752-1	B23-03752-2			Interim PWQO	PWQO
	Date Collected		08-Jun-23	08-Jun-23				
Parameter	**Units**	**R.L.**						
Hardness (as CaCO3)	mg/L	1	907	895				
Aluminum	µg/L	10	**480**	70			75	
Antimony	µg/L	0.1	0.2	0.2			20	
Arsenic	µg/L	0.1	2.1	1.3			5	5
Beryllium	µg/L	2	< 2	< 2				11
Boron	µg/L	5	51	46			200	
Cadmium	µg/L	0.015	0.023	< 0.015			0.1	0.2
Chromium	µg/L	1	1	< 1				
Chromium (VI)	µg/L	1	< 1	< 1 [1]				1
Cobalt	µg/L	0.1	**1.6**	**1.2**			0.9	
Copper	µg/L	0.1	1.4	0.2			5	
Iron (Total)	µg/L	5	**1820**	123				300
Lead	µg/L	0.02	0.39	0.07			1	5
Manganese (Total)	µg/L	1	203	175				
Mercury	µg/L	0.02	< 0.02	< 0.02				0.2
Molybdenum	µg/L	0.1	1.7	1.7			40	
Nickel	µg/L	0.2	3.9	2.9				25
Selenium	µg/L	1	1	2				100
Silver	µg/L	0.1	< 0.1	< 0.1				0.1
Thallium	µg/L	0.05	< 0.05	< 0.05			0.3	0.3
Tin	µg/L	50	< 50	< 50				
Titanium	µg/L	5	11	< 5				
Tungsten	µg/L	10	< 10	< 10			30	
Uranium	µg/L	0.05	**6.61**	**7.72**			5	

PWQO - Provincial Water Quality Objectives
Interim PWQO - Interim PWQO
PWQO - Provincial Water Quality Objectives

Christine Burke
Lab Manager

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DATE RECEIVED: 08-Jun-23
DATE REPORTED: 29-Jun-23
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D.		MW4d	MW4d-F			PWQO	
	Sample I.D.		B23-03752-1	B23-03752-2			Interim PWQO	PWQO
	Date Collected		08-Jun-23	08-Jun-23				
Parameter	**Units**	**R.L.**						
Vanadium	µg/L	0.1	1.5	0.7			6	
Zinc	µg/L	5	12	< 5			20	30
Zirconium	µg/L	3	< 3	< 3			4	

1. Chromium (VI) result is based on total Chromium

PWQO - Provincial Water Quality Objectives
Interim PWQO - Interim PWQO
PWQO - Provincial Water Quality Objectives

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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

Summary of Exceedances

Interim PWQO

MW4d	Found Value	Limit
Uranium (µg/L)	6.61	5
Cobalt (µg/L)	1.6	0.9
Aluminum (µg/L)	480	75

MW4d-F	Found Value	Limit
Uranium (µg/L)	7.72	5
Cobalt (µg/L)	1.2	0.9

Provincial Water Quality Objectives

MW4d	Found Value	Limit
Iron (Total) (µg/L)	1820	300

PWQO - Provincial Water Quality Objectives
Interim PWQO - Interim PWQO
PWQO - Provincial Water Quality Objectives

Christine Burke
Lab Manager

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DATE RECEIVED: 08-Jun-23
DATE REPORTED: 29-Jun-23
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:

P.O. NUMBER: 2301130
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
PHC(F2-F4)	1	Kingston	KPR	14-Jun-23	C-PHC-W-001 (k)	MOE E3421
VOC's	1	Richmond Hill	JE	12-Jun-23	C-VOC-02 (rh)	EPA 8260
PHC(F1)	1	Richmond Hill	JE	12-Jun-23	C-VPHW-01 (rh)	MOE E3421

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - GW (µg/L) - Table 1 - Ground Water

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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D. / Sample I.D. / Date Collected		MW4d B23-03752-1 08-Jun-23				O. Reg. 153 Tbl. 1 - GW (µg/L)	
Parameter	**Units**	**R.L.**						
Acetone	µg/L	30	< 30				2700	
Benzene	µg/L	0.5	< 0.5				0.5	
Bromodichloromethane	µg/L	2	< 2				2	
Bromoform	µg/L	5	< 5				5	
Bromomethane	µg/L	0.5	< 0.5				0.89	
Carbon Tetrachloride	µg/L	0.2	< 0.2				0.2	
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	< 0.5				0.5	
Chloroform	µg/L	1	< 1				2	
Dibromochloromethane	µg/L	2	< 2				2	
Dichlorobenzene,1,2-	µg/L	0.5	< 0.5				0.5	
Dichlorobenzene,1,3-	µg/L	0.5	< 0.5				0.5	
Dichlorobenzene,1,4-	µg/L	0.5	< 0.5				0.5	
Dichlorodifluoromethane	µg/L	2	< 2				590	
Dichloroethane,1,1-	µg/L	0.5	< 0.5				0.5	
Dichloroethane,1,2-	µg/L	0.5	< 0.5				0.5	
Dichloroethylene,1,1-	µg/L	0.5	< 0.5				0.5	
Dichloroethene, cis-1,2-	µg/L	0.5	< 0.5				1.6	
Dichloroethene, trans-1,2-	µg/L	0.5	< 0.5				1.6	
Dichloropropane,1,2-	µg/L	0.5	< 0.5				0.5	
Dichloropropene, cis-1,3-	µg/L	0.5	< 0.5					
Dichloropropene, trans-1,3-	µg/L	0.5	< 0.5					

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - GW (µg/L) - Table 1 - Ground Water

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Lab Manager

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JOB/PROJECT NO.:
P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D. / Sample I.D. / Date Collected		MW4d B23-03752-1 08-Jun-23				O. Reg. 153 Tbl. 1 - GW (µg/L)	
Parameter	**Units**	**R.L.**						
Dichloropropene 1,3-cis+trans	µg/L	0.5	< 0.5				0.5	
Ethylbenzene	µg/L	0.5	< 0.5				0.5	
Dibromoethane,1,2-(Ethylene Dibromide)	µg/L	0.2	< 0.2				0.2	
Hexane	µg/L	5	< 5				5	
Methyl Ethyl Ketone	µg/L	20	< 20				400	
Methyl Isobutyl Ketone	µg/L	20	< 20				640	
Methyl-t-butyl Ether	µg/L	2	< 2				15	
Dichloromethane (Methylene Chloride)	µg/L	5	< 5				5	
Styrene	µg/L	0.5	< 0.5				0.5	
Tetrachloroethane,1,1,1,2-	µg/L	0.5	< 0.5				1.1	
Tetrachloroethane,1,1,2,2-	µg/L	0.5	< 0.5				0.5	
Tetrachloroethylene	µg/L	0.5	< 0.5				0.5	
Toluene	µg/L	0.5	< 0.5				0.8	
Trichloroethane,1,1,1-	µg/L	0.5	< 0.5				0.5	
Trichloroethane,1,1,2-	µg/L	0.5	< 0.5				0.5	
Trichloroethylene	µg/L	0.5	< 0.5				0.5	
Trichlorofluoromethane	µg/L	5	< 5				150	
Vinyl Chloride	µg/L	0.2	< 0.2				0.5	
Xylene, m,p-	µg/L	1.0	< 1.0					
Xylene, o-	µg/L	0.5	< 0.5					
Xylene, m,p,o-	µg/L	1.1	< 1.1				72	

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - GW (µg/L) - Table 1 - Ground Water

Christine Burke
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P.O. NUMBER: 2301130
WATERWORKS NO.

	Client I.D. / Sample I.D. / Date Collected		MW4d B23-03752-1 08-Jun-23				O. Reg. 153 Tbl. 1 - GW (µg/L)	
Parameter	**Units**	**R.L.**						
PHC F1 (C6-C10)	µg/L	25	< 25				420	
PHC F2 (>C10-C16)	µg/L	50	< 50				150	
PHC F3 (>C16-C34)	µg/L	400	< 400				500	
PHC F4 (>C34-C50)	µg/L	400	< 400				500	

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Summary of Exceedances

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Tbl. 1 - GW (µg/L) - Table 1 - Ground Water

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GENERAL SAMPLE SUBMISSION FORM

CADUCEON ENVIRONMENTAL LABORATORIES
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SAMPLES SUBMITTED TO:

Kingston	
Ottawa	
Richmond Hill	
Barrie	X
Windsor	

TESTING REQUIREMENTS

	O'Reg 153/04	Table (1 - 9)		Record of Site	
	O'Reg 406/19	Table (1 - 9.1)		SPLP Table (1-9.1)	
	RPI		ICC		Agricultural
	Coarse		Medium/Fine		O'Reg 558 TCLP
	MISA		PWQO		Landfill Monitoring
X	Other:		Region of Peel Combined Sewer		

REPORT NUMBER (Lab Use)

B23-03752

Are any samples to be submitted intended for Human Consumption under any Drinking Water Regulations? [ ] Yes [✓] No (If yes, submit all Drinking Water Samples on a Drinking Water Chain of Custody)

Organization: GEI Consultants Ltd	Address: 647 Welham Road, Unit 14, Barrie, ON, L4N 0B7	Invoicing Address (if different):
Contact: S Griffith		
Tel: 226-791-5382 / Fax:		
Email: sgriffith@geiconsultants.com	Quote #:	Project Name or #: 2301130
Additional Info (email, cell, etc):	P.O. #:	Additional Info:

ANALYSES REQUESTED

Region of Peel Combined Sewer	E. Coli	Metals	TSS	PHCs	VOCs	Suspected Highly Contaminated

TURNAROUND SERVICE REQUESTED (see back page)

*Must be arranged in advance

	Platinum*	200% Surcharge
	Gold*	100% Surcharge
	Silver	50% Surcharge
	Bronze	25% Surcharge
X	Standard	5-7 days
	Specific Date:	

* Sample Matrix Legend: WW=Waste Water, SW=Surface Water, GW=Groundwater, LS=Liquid Sludge, SS=Solid Sludge, S=Soil, Sed=Sediment, PC=Paint Chips, F=Filter, Oil = Oil

Lab No.	Sample Source and/or Sample Identification	S.P.L. (Watertrax)	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	X	Field pH	Field Temp.	# Bottles/ Sample	Field Filtered Y/N
1	MW 4d		GW	23-06-08	PM	X X X X				16	N
2	MW4d-F		" "	"	"	X X				4	Y
	Bacti → B (EC)										
	1x 1L amber (w NaHSO4) → SGS (NP/NPE)										
	vials → RH										
	K: 2x 1L amber unpres. + 1x Oil & Grease + CN + nut + phenols + 500ml (PHC) amber + 2x (1x Filtered) Genchem										
	O: 1x Genchem + metals + CrVI + Hg										

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:	SCOTT PATRICK	SCOTT PATRICK
Sign:		
	26-06-08	26-06-08
	Date (yy-mm-dd)/Time:	Date (yy-mm-dd)/Time:

SHIPPING INFORMATION

Courier (Client account)	
Courier (Caduceon account)	
Drop Off	X
Caduceon (Pick-up)	

Invoice

# of Pieces

REPORTING / INVOICING

Report by Fax	
Report by Email	X
Invoice by Email	X
Invoice by Mail	

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print):	Nathalie	Signature:	NA
Date Received (yy-mm-dd):	23-06-08	Time Received:	16:25
Laboratory Prepared Bottles:	[✓] Yes	[ ] No	✓
Sample Temperature °C:	9.0	Labeled by:	BA

Comments:

Appendix F

Preliminary Dewatering Calculations

Hydrogeological Investigation
South Simpson (Headwaters of West Rainbow Creek)
Project No.: 2201130

Equivalent Well Radius Method

Site Servicing - Excavation Depth 4.5 m

Inputs

Rs (m)	Ro (m)	H (m)	h (m)	K (m/s)	Trench Length, x (m)	Trench Width, b (m)
1.7	86.3	7.6	1.0	1.90E-05	100	3

Elevations (m)

Ground Surface	230.4
Highest Water Level	232.0
Base of Excavation	225.9
Drawdown Target	225.4
Aquifer Bottom	224.4

Groundwater Flows		
Flow Rate, Q=	0.0021	m3/s
Q=	182,049	L/day
Safety Factor	2	
Q factored =	**364,097**	L/day

Precipitation		
Rainfall Event	10	mm
Excavation Area	300	m2
Rainfall Q =	**3,000**	L/day

TOTAL Factored Q : 367,097 L/day

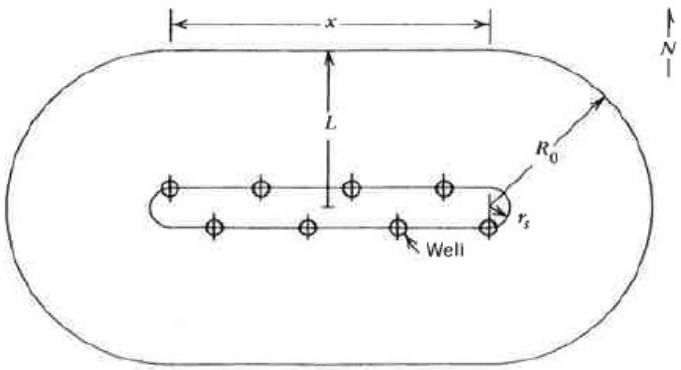

Figure 6.8 Approximate analysis of long, narrow systems.

of the actual system is finite, the end effects must be considered. This can be done by assuming that at each end of the system there is a flow equal to one half the flow to a circular well of radius r_s. The total flow to the system may be approximated by adding Eqs. 6.1 and 6.6 for a confined aquifer, or Eqs. 6.3 and 6.7 for a water table aquifer:

$$Q = \frac{2\pi KB(H - h)}{\ln R_0/r_s} + 2\left[\frac{xKB(H - h)}{L}\right] \qquad (6.10a)$$

$$Q = \frac{\pi K(H^2 - h^2)}{\ln R_0/r_s} + 2\left[\frac{xK(H^2 - h^2)}{2L}\right] \qquad (6.10b)$$