Final

HYDROGEOLOGICAL INVESTIGATION REPORT
PROPOSED DEVELOPMENT AT 159 CONFEDERATION STREET, TOWN OF HALTON HILLS, ONTARIO

Prepared for:

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Project: SP23-01265-00

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1.0. INTRODUCTION AND BACKGROUND

Sirati & Partners Consultants Limited (SIRATI) was retained by Weston Consulting on behalf of Eden Oak (the Client) to conduct a Hydrogeological Investigation for a proposed residential development property located at 159 Confederation Street, Town of Halton Hills, Ontario (the Site). Figure 1 shows the Site Location Plan.

The work carried out for this Hydrogeological Investigation was completed in accordance with SIRATI's Proposal No. P23-09-112 (dated October 27, 2023). This report consists of the findings from the Hydrogeological Investigation. Concurrent with this Hydrogeological Investigation, a Geotechnical Investigation and a Phase One Environmental Site Assessment was also carried out by SIRATI at the Site, their reports are issued under separate covers.). Pertinent information from the Geotechnical Investigation was used to complete this hydrogeological investigation.

1.1. Objective

The purpose of this hydrogeological investigation was to assess the existing subsurface conditions, using select borehole locations at the Site to make preliminary recommendations regarding hydrogeological aspects of the Site as they pertain to the proposed development design. The hydrogeological investigation also provides an assessment of the potential dewatering and related permitting requirements for the proposed development, as well as the potential impacts to the surrounding environment from the proposed development and provides recommendations on potential mitigation measures, where possible.

This report is provided based on the provided concept design plan (Eden Oak, Bayfield Georgetown, Concept Plan, Concept-3; September 27, 2023) and all work has been completed in accordance with applicable codes and standards. The recommendations provided in this report generally follow accepted practice for hydrogeological consultants in Ontario.

If there are any changes to the design features that are relevant to the analyses included in this report, SIRATI should be contacted to review the design and confirm whether the conclusions and recommendations contained within this report still apply. It may then be necessary to carry out additional field investigation and analysis before the recommendations made by SIRATI can be relied upon.

This report has been prepared for the use by the Client and its architects and designers for this Site. Third party use of this report without Sirati & Partners Consultants Limited consent is

prohibited. The limitation conditions presented in Section 15.0 and Appendix H form an integral part of the report and they must be considered in conjunction with this report.

1.2 Scope of Work

The hydrogeological assessment was carried out based on the following scope of work:

- **Review of available background information**: a review of available geological and hydrogeological information for the Site and surrounding areas and review of other investigation reports completed for the Site was conducted. This is to provide background information to allow for characterization of regional and local geological and hydrogeological conditions.
- **Site inspection**: an inspection of the Property was conducted to review existing site conditions including identification of any hydrogeological features such as significant areas of potential groundwater recharge or areas of groundwater discharge.
- **Private well survey:** a water well inventory survey was conducted through the database maintained by the Ministry of Environment, Conservation and Parks (MECP) for the area within approximately 500 m radius of the Site. The well information was used in the assessment of potential impact on the water wells.
- **Completion of boreholes/monitoring wells:** Boreholes and monitoring wells were completed across the Site to obtain the information of soil and groundwater at the Site.
- **Measurement of groundwater levels:** groundwater levels were measured in the monitoring wells installed at the Site. The data was used to interpret the groundwater flow regime.
- **In-situ hydraulic conductivity tests:** in-situ hydraulic conductivity tests (rising head tests) were completed in three (3) of the monitoring wells (BH/MW-02, BH/MW-03 and BH/MW-04) to estimate hydraulic conductivity of the underlying soils. The estimated hydraulic conductivity was used for dewatering rate calculations.
- **Construction dewatering assessment:** the need for short-term construction dewatering and long-term drainage was assessed, and the dewatering rates were calculated based on the observed soil and groundwater conditions and the Preliminary design for the proposed construction.
- **PTTW and EASR:** the need for permit-to-take-water (PTTW) or Environmental Activity and Sector Registry (EASR) registration was evaluated, based on the short-term and long-term dewatering rates.

- **Water Balance (Preliminary):** a preliminary water balance was estimated for the proposed development in comparison to pre-development conditions using the Thornthwaite-Mather method based on the climate information obtained from the nearest Environment Canada weather station.
- **Assessment of potential impacts:** potential impacts due to the proposed development were assessed and when required, mitigation measures were discussed.
- **Reporting:** a hydrogeological investigation report was completed summarising the findings and results obtained from the investigation to provide recommendations.

The hydrogeological study was carried out in accordance with all the following acts and regulations:

- Ontario Water Resources Act.
- Ontario Regulation 387/04 (Water Taking Regulation).
- Ontario Regulation 63/16 (Water Taking under the Environmental Protection Act).
- City of Barrie Sewer Use By-Law 2021-002.

2.0. LAND USE

Currently the Property is located on the east side of Confederation Street and approximately 300 m northwest of Mountain Street, in Halton Hills, Ontario. The total area of the Phase One Property is approximately 122,647 sq.m. (12.2647 ha) according to J. D. Barners (Surveyor), October 31, 2023. The Property is undeveloped and covered with wooded areas. A tributary of the Credit River is located approximately 35 m east-northeast of the Property. The Property is planned to be transformed into a housing community with a residential subdivision.

The Property is surrounded by the following properties:

North: Residential buildings, wooded area, Credit River
East: Residential buildings
South: Residential buildings
West: Residential buildings, Confederation Street, Farmland and residential properties.

The site features are shown on the survey map (Plan of Survey Of Part Of Lot 26 Registrars Compiled Plan No. 1555 Formerly Part Of West Half Of Lot 22, Concession 10 Geographic Township Of Esquesing In The Town Of Halton Hills Regional Municipality Of Halton; J.D. Barnes Limited, October 31, 2023) included in Appendix A. See Figure 1 for the Site Location Plan drawing.

3.0. DEVELOPMENT PLAN

As presented in the provided Concept Plan (Eden Oak, Bayfield Georgetown, Concept Plan, Concept-3; September 27, 2023, see Appendix A), it is understood that the proposed development will include an 81 Townhomes incorporated into thirteen (13) Townhouse Blocks, two (2) semi-detached dwellings), access roadways, parking spaces, landscaping parkland areas, underground storm water management facility, site services (municipal) and undeveloped forested areas. It is assumed that the Townhome units will be constructed with one basement level.

4.0. ENVIRONMENTAL FEATURES

To assess environmental features, the databases maintained by the Ministry of Natural Resources and Forestry (MNRF), the Ministry of Environment, Conservation and Parks (MECP) and the Credit Valley Conservation (CVC) were reviewed.

Based on the data reviewed, the Site is situated within the Sixteen Mile Creek-Credit River Tertiary Watershed, Credit River West Branch – Credit River Quaternary Watershed. The Credit River is located between +/- 35 m east to +/- 200 m east of the east property boundary of the Site. The topography of the Site slopes from west to east (toward the Credit River), with an approximate elevation of +/- 239 mASL (meters above sea level) at the east site boundary to +/- 264 mASL at Confederation Street (west boundary of the Site). The Credit River is at an approximate elevation of +/- 232 mASL. Figure 3 presents the location of the Site and natural features. Based on the available mapping, two (2) tributaries of the Credit River flow from west to east across the Site.

Based on review of the MNRF database, the Site is not located in any area identified as an area of natural heritage & scientific interests (ANSI), (Figure 3).

A regulated area represents the greatest physical extent of the combined hazards, plus a prescribed allowance as set out in the Conservation Authorities Act to protect and safeguard watershed health in terms of environmental areas such as wetlands, shorelines and watercourses. As such, a site located within a regulation area, development restrictions shall likely apply to the proposed development. Portions of the north and east areas of the Site lie within a CVC regulated area (as shown on Figure 5).

5.0. SOURCE WATER PROTECTION AREA

Based on review of the MECP's Source Protection Information Atlas, the Site is located within the Credit Valley S.P.A. (Source Protection Area). The Site is not within in an area identified as a Quantity Wellhead Protection Area (WHPA-Q1 and WHPA-Q2). The Site is located within a Significant Groundwater Recharge Area (see Figure 6).

5.1. Quantity Wellhead Protection Area (WHPA-Q)

Based on review of the MECP's Source Protection Information Atlas, the Site is not within a Wellhead Protection Area, the Site is not within an Intake Protection Zone, the Site is not within an Issue Contributing Area. The Site is greater than 3 km north of the nearest municipal groundwater supply well head. It is not likely that temporary shallow construction dewatering at the Site will significantly impact the deeply seated municipal groundwater supply.

5.2. Wellhead Protection Area -D (WHPA-D)

Wellhead Protection Area (WHPA) is an area that is related to a wellhead, within which it is desirable to regulate or monitor drinking water threats. WHPAs are delineated for threats to quality and quantity.

Wellhead Protection Areas for Quality (WHPA-A, -B, -C, -D) are the areas near a municipal well which are sensitive to contamination, and which are arranged according to either a set distance or delineated based on the time of-travel (up to 25 years) that it would take for water entering the ground to reach the well. WHPAs are also delineated for municipal wells where nearby surface water flows can seep through soil and influence the well (WHPA-E). This situation is known as groundwater under the direct influence of surface water, or a GUDI well.

The Site is not located within a Wellhead Protection Area.

6.0. PHYSICAL SETTING

6.1. Topography and Drainage

Using the interactive topographic map generator (https://atlas.gc.ca), the topography in the vicinity of the Site gently slopes from the west to the east. The area slopes from Confederation Street to the west of the Site at elevation +/-265 mASL, eastwards toward the east property boundary of the Site at elevation +/-245 mASL (towards steep ravine and the Credit River). Drainage is anticipated to follow the local topography, towards the east/southeast to the Credit River (as shown in Figure 4).

6.2. Physiography

According to Chapman and Putnam (1984), the Site is located within or bordering the Horseshoe Moraines physiographic region and Peel Plains physiographic region. Physiographic mapping shows the Site to be within Spillways physiography. See Figure 7.

6.3. Overburden

According to the Surficial Geology of Southern Ontario (Ontario Geological Survey, 2003) the Site (as shown in Figure 8) is covered by Glaciofluvial deposits consisting of river deposits and delts topset facies, gravelly deposits. The Site is located within a former sand and gravel extraction site based on the mapping. Based on information from Ontario Geologic Survey, Aggregate Resources Inventory, Regional Municipality of Halton, ARIM 184-2 Bedrock Resources (2009) mapping, the Paleozoic bedrock is covered by drift. The overburden/drift thickness around the Site is generally 8 to 15 m, isolated bedrock outcrops may occur.

6.4. Bedrock Geology

According to the Paleozoic Geology of Southern Ontario (Ontario Geological Survey, 2007), the Site (shown in Figure 9) is underlain by the Queenston formation, limestone, shale, siltstone and sandstone.

7.0. HYDROGEOLOGY

Water well records on file with the Ministry of the Environment, Conservation and Parks (MECP) serve as a database for this hydrogeological assessment. The well locations were provided from the MECP interactive water well record database. According to the well records, there appears to be nine (9) well record for the Site. There are 97 well records within a 500 m radius around the property (including the well records for the property). The locations of the recorded water wells are shown on Figure 10, see Appendix G for Well Record information.

The water well records in the site area include domestic water wells and abandoned water wells. Based on the details in the well records, overburden materials are present in the study area, extending to depths of 8.5 mbgs (28 ft) to 26 mbgs (85ft). Red shale bedrock was encountered below the overburden materials. The maximum water well depth extended to approximately 43 mbgs. The groundwater levels recorded in the water wells ranged from dry conditions to 1.8 mbgs. Based on the details in the water well records, the overburden material noted consisted primarily of sandy and gravelly deposit with interbedded clayey deposits over red shale bedrock. Groundwater wells encountered potable groundwater within the upper aquifer zones, lower confined sandy aquifer levels and within the shale bedrock levels.

Note, no domestic type of potable groundwater wells were observed at the site during the site reconnaissance completed for the Phase One Environmental Site Assessment. Test holes/groundwater monitoring wells were observed at the property.

8.0. FIELD WORK METHODOLOGY

8.1. Borehole Drilling and Monitoring Well Installation

As part of the SIRATI geotechnical investigation, four (4) boreholes equipped with monitoring wells (numbered as BH/MW-01, BH/MW-02, BH/MW-03 and BH/MW-04) were drilled at the site in December 2023. The approximate borehole and monitoring well locations are shown in Figure 2, borehole logs are within Appendix B.

The boreholes were advanced to depths ranging from 6.2 mbgs to 10.8 mbgs, and monitoring wells were constructed using 2-inch diameter, 1.5 m or 3 m PVC screens at depths from 6.1 mbgs to 10.7 mbgs. The construction details for the monitoring wells are presented in the table below.

Table 8-1 Monitoring Well Construction Details

Monitoring Well	Ground Elevation (mAMSL)	Monitoring Well Depth (mbgs)	Screen Interval (mbgs)	Screened Soil
BH/MW-01	254.2	6.2	3.1 ~ 6.2	Sand & Gravel to sand silt
BH/MW-02	257.0	9.4	6.3 ~ 9.4	Sand and silt till
BH/MW-03	253.3	6.1	3.0 ~ 6.1	Sand and silt till
BH/MW-04	249.1	10.7	7.6 ~ 10.7	Sand to silty sand

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface

8.2. Groundwater Monitoring and Elevation Survey

After the well installation, groundwater levels were measured in the newly installed monitoring wells. In addition, a location and elevation survey were conducted using a GPS unit for both the boreholes and the monitoring wells advanced at the Site.

8.3. Hydraulic Conductivity Test (Single Well Response Test/Slug Test)

In-situ hydraulic conductivity tests, also called single well response test or slug test, were conducted on three (3) monitoring wells, BH/MW-02, BH/MW-03 and BH/MW-04 on January 5, 2024. During the test, a datalogger was placed in the monitoring well after the initial water level was measured. Then, a certain amount of water was removed from the test well (for a rising head test) to create a water level drawdown in the well. The water level recovery was recorded by the datalogger, and the data was then used for estimating the hydraulic conductivity of the screened soil.

8.4. Groundwater Sampling and Chemical Testing

Groundwater samples were collected on December 12, 2023, from groundwater monitoring wells BH/MW-02 and BH/MW-04. Chemical testing was completed on the groundwater samples to assess the general water quality for the purpose of excess water disposal (potentially generated from the Site).

The groundwater samples were submitted to AGAT Laboratories for analysis as per Halton Sanitary and Combined Sewer Use By-Law Guidelines (a By-Law to prohibit, regulate and control discharges into bodies of waters within regional boundaries or into the regional sanitary sewers, storm sewers, sanitary sewage works and all tributary sewer systems).

9.0. SUMMARIZED SITE CONDITIONS

9.1. Soil Stratigraphy

The soil stratigraphy as recorded from the advanced boreholes completed by SIRATI, generally consisted of a thin topsoil deposit with a thickness of 150 mm to 200mm. A layer of fill soil material extending to a depth of 0.8 m to 1.0 m below the ground surface was encountered. Cohesionless soils consisting of gravel deposits, sand deposits and silty sand glacial till deposits extended from the fill base levels to the borehole termination depths. No bedrock was encountered at the maximum explored depth of 10.8 mbgs.

Following is the generalized stratigraphy encountered at 159 Confederation Street (the Site), as depicted in the borehole logs.

Topsoil: A surficial layer of topsoil was encountered at the location of boreholes BH/MW-01 and BH-04 with thickness ranging between 150 mm to 200 mm.

Fill Material:

A layer of fill material was found in all boreholes BH/MW-01 thorough BH/MW-04 beneath the topsoil layer or on the surface extended to depths ranging between 0.8 m and 1 m below the existing ground surface. This layer is generally brown in color and consists of gravelly sand, silty sand with different proportions, occasional trace cobbles, trace organics, occasional trace rootlets, occasional trace wood fragments.

The moisture content in fill layer was found to range from 5.0% to 24.0% indicating relatively moist to very moist conditions.

The measured SPT ‘N’ values in the fill layer ranged from 4 to 9 blows per 300 mm penetration, indicating a loose material.

Cohesionless Soil Deposits: Native cohesionless soil deposits were observed in all boreholes, underlying topsoil layer or fill flayer. This layer is generally reddish brown to brown and brown to grey in color and is comprised of sand and gravel, silty sand, sandy silt with different proportions, occasional trace cobbles, trace to some clay. The cohesionless soil stratum extended to depths ranging between 6.2 m and 10.8 m below the existing ground surface.

The moisture content in cohesionless soil deposit was found to range from 4.0% to 21.0% indicating moist to very moist conditions.

The measured SPT 'N' values in the cohesionless soil deposit ranged from 15 to more than 50 blows per 300 mm penetration, indicating a compact to very dense material.

Grain size and hydrometer analyses on five (5) representative soil samples of cohesionless soil deposit (BH/MW-01/SS2, BH/MW-02/SS6, BH/MW-02/SS10, BH/MW-03/SS4, BH/MW-04/SS5) were conducted and the results are presented in Appendix B with the following fractions:

Clay: 3% to 8%
Silt: 18% to 52%
Sand: 33% to 59%
Gravel: 3% to 39%

9.2. Groundwater Conditions

Groundwater conditions were observed during the borehole drilling. The boreholes were open and dry upon completion.

9.2.1 Groundwater Levels and Elevations

Groundwater levels were measured in all the newly installed monitoring wells on Six (6) occasions, December 12, 2023, to March 01, 2024. The measured and recorded groundwater levels are presented in Table 9-1A and 9-1B below.

Table 9-1A: Measured Groundwater Levels from December 12, 2023, to January 22, 2024

Monitoring Well	Ground Elevation (mAMSL)	Date: 12/12/2023		Date: 05/01/2024		Date: 22/01/2024	
		Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)	Depth to Ground water (mbgs)	Groundwater Elevation (mAMSL)	Groundwater Elevation (mAMSL)	Groundwater Elevation (mAMSL)
BH/MW-01	254.2	6.07	248.13	5.90	248.30	5.66	248.54
BH/MW-02	257.0	4.43	252.57	4.20	252.80	3.98	253.02
BH/MW-03	253.3	2.44	250.86	2.36	250.94	2.20	251.10
BH/MW-04	249.1	8.32	240.78	8.39	240.71	8.43	240.67

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface.

Table 9-1B: Measured Groundwater Levels from February 02, 2024, to March 01, 2024

Monitoring Well	Ground Elevation (mAMSL)	Date: 02/02/2024		Date: 15/02/2024		Date: 01/03/2024	
		Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)	Depth to Ground water (mbgs)	Groundwater Elevation (mAMSL)	Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)
BH/MW-01	254.2	5.58	248.62	5.60	248.60	5.62	248.58
BH/MW-02	257.0	3.34	253.66	3.55	253.45	3.64	253.36
BH/MW-03	253.3	1.55	251.75	1.46	251.84	1.44	251.86
BH/MW-04	249.1	8.40	240.70	8.36	240.74	8.30	240.80

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface.

As presented above, the groundwater levels measured in the monitoring wells across the Site ranged from 1.44 mbgs at BH/MW-03 on March 01, 2024, to 8.43 mbgs at BH/MW-04 on January 22, 2024, while groundwater elevations ranged from 240.67 mAMSL at BH/MW-04 on January 22, 2024, to 253.66 mAMSL at BH/MW-02 on February 02, 2024.

It should be noted that groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

9.2.2 Inferred Groundwater Flow Direction

Based on the water level elevations obtained from December 12, 2023, to March 01, 2024, the groundwater elevation contours were established and are shown on Figure 11. The shallow unconfined aquifer groundwater flow direction was inferred to be in a easterly direction.

The hydraulic gradient is a gradient or slope between two or more hydraulic head measurements over the length of the flow path. The hydraulic gradients help determine the groundwater flux or discharge. Groundwater will flow down the hydraulic gradient. Based on the groundwater elevation data for the shallow monitoring wells, horizontal hydraulic gradient (geometric mean) was calculated to be approximately 0.0325 m/m (Table 9.2).

Table 9.2: Horizontal Hydraulic Gradients

Monitoring Well	Groundwater Elevation (mAMSL) (22/01/2024)		Distance Between Monitors (m)	Gradient (m/m)
BH/MW-01 to BH/MW-02	248.54	253.02	305	0.0147
BH/MW-01 to BH/MW-04	248.54	240.67	135	0.0583
BH/MW-02 to BH/MW-04	253.02	240.67	310	0.0400
Geometric Mean				**0.0325**

9.3. Estimated Hydraulic Conductivity

The hydraulic conductivity (K-value) of the soils was estimated based on the results obtained from the single well response tests (slug tests).

Single well response tests or slug tests were conducted as part of this hydrogeological study at three (3) monitoring well locations (namely BH/MW-02, BH/MW-03 and BH/MW-04) on January 5, 2024. Either a falling head test or a rising head test was performed on the wells. BH/MW-01 did not contain sufficient groundwater levels for testing. Based on the data obtained from the single well response test/slug test, the hydraulic conductivity for the screened soils was estimated utilizing the Aqtesolv pumping test software with the Hvorslev method. Records of the slug tests and the data processing are provided in Appendix C.

The results of the estimated hydraulic conductivity are summarized in Table 9-3 below.

Table 9-3: Results of Estimated Hydraulic Conductivity as per Slug Tests

Monitoring Well	Screen Depth (mbgs)	Tested Soil Type	Hydraulic Conductivity (m/s)
BH/MW-02	6.3 ~ 9.4	Sand and silt till	1.399×10^{-6}
BH/MW-03	3.0 ~ 6.1	Sand and silt till	1.572×10^{-6}
BH/MW-04	7.6 ~ 10.7	Sand to silty sand	3.333×10^{-6}
Geometric Mean			1.942×10^{-6}

As presented above, the estimated hydraulic conductivity of BH/MW-02 was 1.399 x 10^{-6} m/s, BH/MW-03 was 1.572 x 10^{-6} m/s and BH/MW-04 was 3.333 x 10^{-6} m/s, with a geometric mean of 1.942 x 10^{-6} m/s.

9.4. Water Quality

Groundwater samples were collected on December 12, 2023, from groundwater monitoring wells BH/MW-02 and BH/MW-04 and were submitted to AGAT Laboratories for general chemistry compared to the Halton Sanitary and Combined Sewer Use By-Law Guidelines. It should be noted that AGAT Laboratories is accredited by the Canadian Association of Laboratory Accreditation (CALA).

The analyzed parameters for the groundwater included E.Coli, CBOD5, Organics, Inorganics and Dissolved Metals in Water. A copy of the laboratory Certificate of Analysis is presented in Appendix D.

Table 9-3 below summarizes the exceeded parameters of groundwater sampled from BH/MW-02 and BH/MW-04 when compared to the Halton Sanitary and Combined Sewer Use By-Law Guidelines:

Table 9-3 Guideline Violation of Halton Sanitary and Combined Sewer Use By-Law (Unit in mg/L)

Sample Source	Sample ID	Parameter	Guideline	Guideline Value	Measured Concentration
BH/MW-04	BH/MW-04	E.Coli (MI-Agar)	Halton Sewer Use By-Law	**200**	900

All other tested groundwater parameters met the Halton Sanitary and Combined Sewer Use By-Law Guidelines.

Filtration is likely to improve the water quality, meanwhile onsite treatment options might be required in addition to filtration for removing excess concentration of E.Coli. Otherwise, the treated groundwater can be discharged into the Municipal Storm Sewer system upon meeting the applicable water quality guidelines and approval from the Regional Municipality of Halton.

10.0. CONSTRUCTION DEWATERING

Construction dewatering is intended to lower the groundwater levels in the excavation area to ensure a dry working condition.

The requirements for construction dewatering generally depend on the Site's soil and groundwater conditions including soil type, soil permeability or hydraulic conductivity, local groundwater levels, and

the design of the proposed development such as the foundation and/or basement elevation, as well as the size of proposed structure, etc.

10.1. Proposed Development, Anticipated Excavation and Dewatering

As presented in the provided Concept Plan (Eden Oak, Bayfield Georgetown, Concept Plan, Concept-3; September 27, 2023, see Appendix A), it is understood that the proposed development will include an 81, Townhomes incorporated into (thirteen (13) Townhouse Blocks, two (2) semi-detached dwellings), access roadways, parking spaces, landscaping parkland areas, underground storm water management facility, site services (municipal) and undeveloped forested areas. It is assumed that the Townhome house units will be constructed with one basement level. The geodetic elevations for the proposed basement levels and site services were not provided in the Concept Plan.

SIRATI boreholes BH/MW-01 and BH/MW-04 were advanced in the proposed development area. Ground surface elevation at BH/MW-01 is 254.2 mASL and at BH/MW-04 is 249.1 mASL. Groundwater levels measured in BH/MW-01 was found at 5.6 mbgs (248.62 mASL) and in BH/MW-04 was found at 8.3 mbgs (240.80 mASL) on 01/March/2024. It is assumed the cut and fill operations will be required across the development portion of the Property.

It should be noted that groundwater levels can vary and are subject to seasonal fluctuations and in response to major weather events.

Please contact SIRATI for re-evaluation of the construction dewatering analyses once the preliminary design is finalized (final site grades, finalized basement floor slab elevations, finalized foundation elevations, storm and septic sewer design).

10.2. Construction Dewatering Rate Estimation (Short-term)

As discussed, groundwater control in the form of construction dewatering would be considered for the proposed basement excavations, foundation excavations and associated site services in saturated sandy soils below the groundwater levels.

For dewatering rate assessment, the following measurements and assumptions based on available information would be made (See Appendix A for Concept Plan, Concept 3, 27-Sep-2023).

- Highest measured groundwater level: 248.6 mASL (BH/MW-01)
- Highest measured groundwater level: 240.7 mASL (BH/MW-04)
- Ground surface level measured at BH/MW-01: 254.2 mASL
- Ground surface level measured at BH/MW-04: 249.1 mASL

- Target groundwater level: 242.1 mAMSL to 247.2 mASL for possible deep services base depth at 6.0 m
- Excavation area: possible total excavation area of 739.5 m^2 for 6.0 m deep service trenching
- Target groundwater level: 252.2 mAMSL for possible basement construction
- Excavation area: possible total excavation area of 4,000 m^2 for basements
- Target groundwater level: 252.2 mAMSL for possible U/G SWM Tank
- Excavation area: possible total excavation area of 616 m^2 for U/G SWM Tank, base depth 6.0m
- Hydraulic conductivity: 1.942 x 10^{-6} m/s (geometric mean measured hydraulic conductivity)
- Positive dewatering would be completed using well points or educators in combination with sump pumps.

To estimate the construction dewatering volume, the following equation for an unconfined aquifer can be used at a steady-state condition.

$$Q = K*(H^2-h_w^2) / [0.733 * \log (R/r_e)]$$

Where: Q = dewatering rate (m^3/s)
K = average hydraulic conductivity for silt (m/s)
H = aquifer thickness or initial water level to reference datum (m)
h_w = target water level to a reference datum (m)
r_e = effective radius = (excavation area/π)$^{1/2}$ (m)
R = zone of influence = 3000 x (H-h_w) x $K^{1/2}$ (m, from the edge of excavation)
R_o = zone of influence = r_e + R_o (m, from the centre of excavation)

Based on the available information, the above assumptions and groundwater measurements, groundwater dewatering was not anticipated for excavation and construction of the foundations and/or underground basements. The assumed basement levels and assumed foundation levels are above the measured groundwater levels.

Based on the available information, the above assumptions and groundwater measurements, groundwater dewatering was not anticipated for excavation and construction of the proposed U/G SWM

Tank. The assumed base level for the proposed U/G SWM Tank (6.0m depth) is above the measured groundwater levels.

Based on the available information, above assumptions and measurements, the dewatering rate for excavation and construction of possible deep site services (pipe base depth of 6.0m) was estimated to be approximately 31,590 L/day, with an applied safety factor of 3.0. The estimated zone of influence was about 4 m from the edge of excavation. This estimation is anticipated for the western portion of the proposed development area. Dewatering is not anticipated at the east area of the proposed development. Groundwater levels are greater than 6.0m in the east area of the proposed development.

It should be noted that the application of a safety factor is for a more conservative assessment to cover or address some uncertainties (such as coarser textured soils with higher hydraulic conductivity to be encountered during excavation) in order to provide the reference for dewatering designing and/or for permit application. It is known that the equation used in dewatering rate estimation is applied for a steady state condition. In general, at the beginning of the pumping, the pumping rate may be greater than that at the steady state condition, because the water stored in the soils shall be removed as well.

To account for the stormwater runoff on a rainy day during the construction at the Site, a 20 mm daily rainfall was considered for the purpose of dewatering design. The total runoff volume is given by the following formula:

Total Runoff Volume (V) per day = Excavation Area x Rainfall Intensity
= Area m^2 x 0.02 m/day
= m^3 /day or L/day.

Based on the above assumptions and measurements stormwater volume estimated to accumulate for excavation and construction of the foundations and/or underground basements (all Blocks combined) would be approximately 80,000 L/day.

Based on the above assumptions and measurements, stormwater volume estimated to accumulate at the U/G SWM Tank would be approximately 12,320 L/day.

Based on the above assumptions and measurements, stormwater volume estimated to accumulate at the open deep service trench excavations (total area combined) would be approximately 14,790 L/day.

The design and installation of a construction dewatering system is usually the responsibility of the construction contractor. The contractor should verify the information presented in this report. This may

be done by examining the groundwater conditions in test pits or by a full-range pumping test carried out by the dewatering subcontractor.

During the period of active dewatering, water levels should be monitored within the excavation footprints and around the perimeter of the excavation to confirm the zone of influence from dewatering area. In addition, the discharge quality should be monitored according to the permit or agreement if the local sewer systems are to be used. All water taking and discharge volume is recommended to be recorded and maintained.

Design of a dewatering system is generally the responsibility of the Contractor. To this end, appropriate measures should be taken during construction to deal with surface water and groundwater infiltration into excavation to enable construction. Around the perimeter of the excavation, an inceptor perimeter trench should be constructed to prevent surface water ingress entering the excavation areas. Any implemented dewatering system must also include an appropriate filtration mechanism to prevent the pumping of fines and loss of ground.

Please contact SIRATI for re-evaluation of the construction dewatering analyses once the design is finalized (final site grades, finalized basement floor slab elevations, finalized foundation elevations, storm and septic sewer design).

The details of the construction dewatering calculations are provided in Appendix E.

10.3. Sub-drain Dewatering (Long-term)

In general, a subdrainage system or weeping tile system is typically recommended to be constructed for the proposed building(s) to avoid hydrostatic pressure from groundwater on the footing walls as well as to achieve a dry condition for the basement level.

Long term sub-drain dewatering may not be anticipated for the residential housing blocks, as per the assumptions and results listed in Section 10.2 (based on the available information).

It should be noted that should finalized detail drawings of a weeping tile or sub-drain system be made available, the long-term dewatering estimation is recommended to be re-evaluated accordingly (contact SIRATI in this regard). The civil engineers should at their discretion consider a safety factor when doing the design.

Please contact SIRATI for re-evaluation of the construction dewatering analyses once the design is finalized (final site grades, finalized basement floor slab elevations, finalized foundation elevations, storm and septic sewer design).

10.4. Regulatory Permits or Registration

Any construction dewatering or water taking in Ontario are governed by Ontario Regulation 387/04 – Water Taking and Transfer, an Ontario regulation made under the Ontario Water Resource Act (OWRA), and/or Ontario Regulation 63/16 – Registration under Part II.2 of the Act – Water Taking, made under Environmental Protection Act and/or Section 34 of the Ontario Water Resources Act (OWRA).

According to Section 34 of the OWRA, any water taking over 50,000 litres per day may not take place without a valid permit, which shall be applied and obtained in accordance with the MECP's permit-to-take-water (PTTW) Manual, dated April 2005.

According to O. Reg. 63/16, a PTTW will not be required for temporary construction dewatering (for six months or less) in an amount greater than 50,000 L/day but less than 400,000 L/day. However, a registration or posting shall be processed through Environmental Activity and Sector Registry (EASR).

Based on the available information, above assumptions and measurements, the temporary construction dewatering rate for the development will be anticipated at 31,590 L/day, and the stormwater volume estimate would be approximately 107,110 L/day for a total of 138,700 L/day. Therefore, a PTTW will not be required for the short-term dewatering. However, an EASR registration is required for temporary construction dewatering (pending final design of the development Site).

10.5. Point of Discharge

For land developments in an urban area, the local sewer systems are usually used to receive the water generated from a development site. Filtered dewatering discharge is recommended to meet the applicable Municipal discharge guidelines/By-Law (Regional Municipality of Halton) prior to discharge.

Catch basins or local sewer systems were not observed on Confederation Street. Roadway ditching was observed on Confederation Street. If the local roadway ditching system is selected as a discharge point by the contractor, a permit or application to use the Halton Region ditching may likely be required. Treatment such as diffusers, silt bags, sediment control, flow check dams (and/or other methods of filtration/control measures) may be required as per permitting requirements.

11.0. WATER BALANCE

A preliminary water balance for the 159 Confederation Road property was completed. The water balance was calculated for both pre-development and post-development conditions to assess the change in overall rate of infiltration.

11.1. Site Condition

The 159 Confederation Road Site is currently undeveloped and does not contain any residential dwellings or paved areas. The total area of the Site is approximately 122,647 sq.m. (12.2647 ha) according to J. D. Barners (Surveyor), October 31, 2023. One (1) small sized shed (+/- 10 m^2 in size) was observed to be on the property at the time of the site reconnaissance. Based on the available mapping, two (2) tributaries of the Credit River flow from west to east across the Site.

As presented in the provided Concept Plan (Eden Oak, Bayfield Georgetown, Concept Plan, Concept-3; September 27, 2023, see Appendix A), it is understood that the proposed development will include 81 Townhomes (thirteen (13) townhouse blocks, two (2) semi-detached dwellings), access roadways, parking spaces, parkland, underground storm water management facility, site services (municipal) and undeveloped forested areas. It is assumed that the townhouse units will be constructed with one basement level.

For water balance assessment, the development area can be categorized into three (3) types of areas: paved area, building/roof area and landscape/vegetated area, which are shown in Appendix A. A summary of the site area is listed in Table 11-1.

Table 11-1: Pre-and Post-Development Site Conditions

Type of Land Coverage	Pre-Development Area (m^2)	Post- Development Area (m^2)
Paved Area	0	10,840
Building/Roof Area	10	17,822
Landscape/Vegetated Area	122,637	93,985
Total (m^2)	122,647	122,647

11.2. Site Level Water Balance

Based on the Thornthwaite and Mather methodology (1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams

(R), infiltrate to the groundwater table (I), or evaporate from ground or evapotranspiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage (ΔS).

The annual water budget can be expressed as:

$$P = ET + R + I + \Delta S$$

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Run-off (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero) (mm/year).

11.3. Climate Data

The climatic data including monthly average temperature and precipitation were obtained from Environment Canada, for Georgetown WWTP weather station (Climate Identifier: 6152695) located at about 3 km distance from the Site.

Data was available between the years 1979 to 2006, i.e., 27 years. Temporal variations of mean annual temperature and precipitation are shown on Figures 11-3 and 11-4.

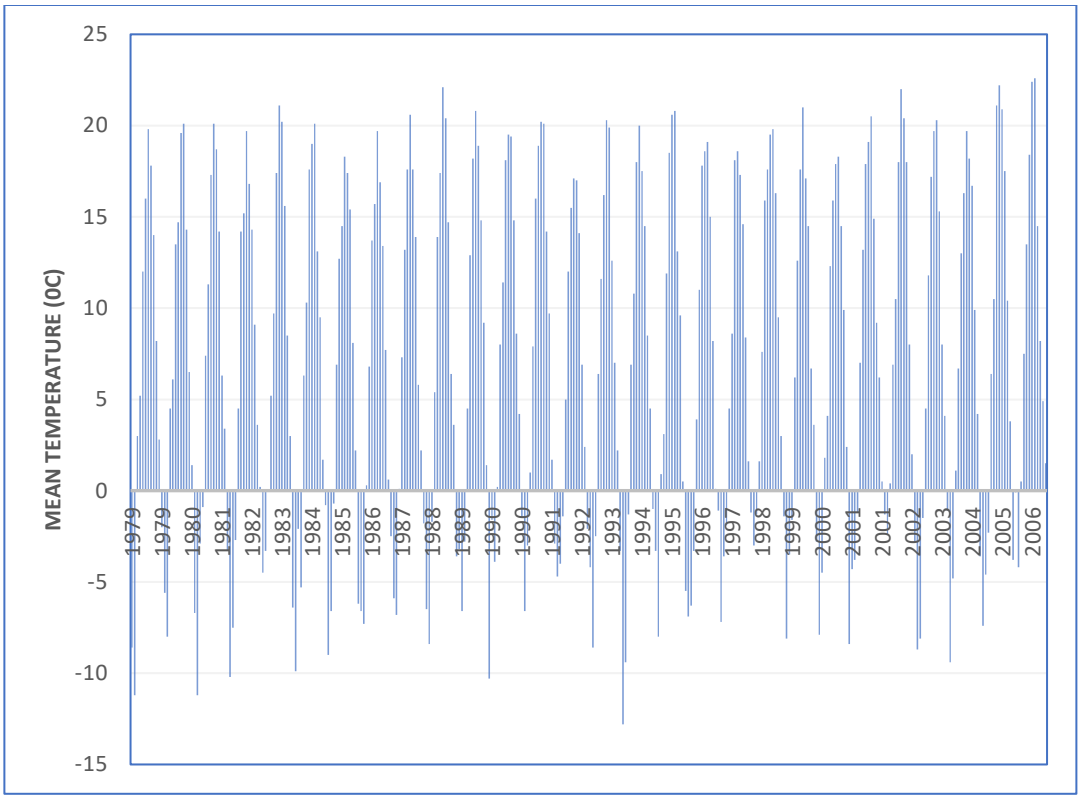

Figure 11-3: Mean Monthly Temperature at the Site

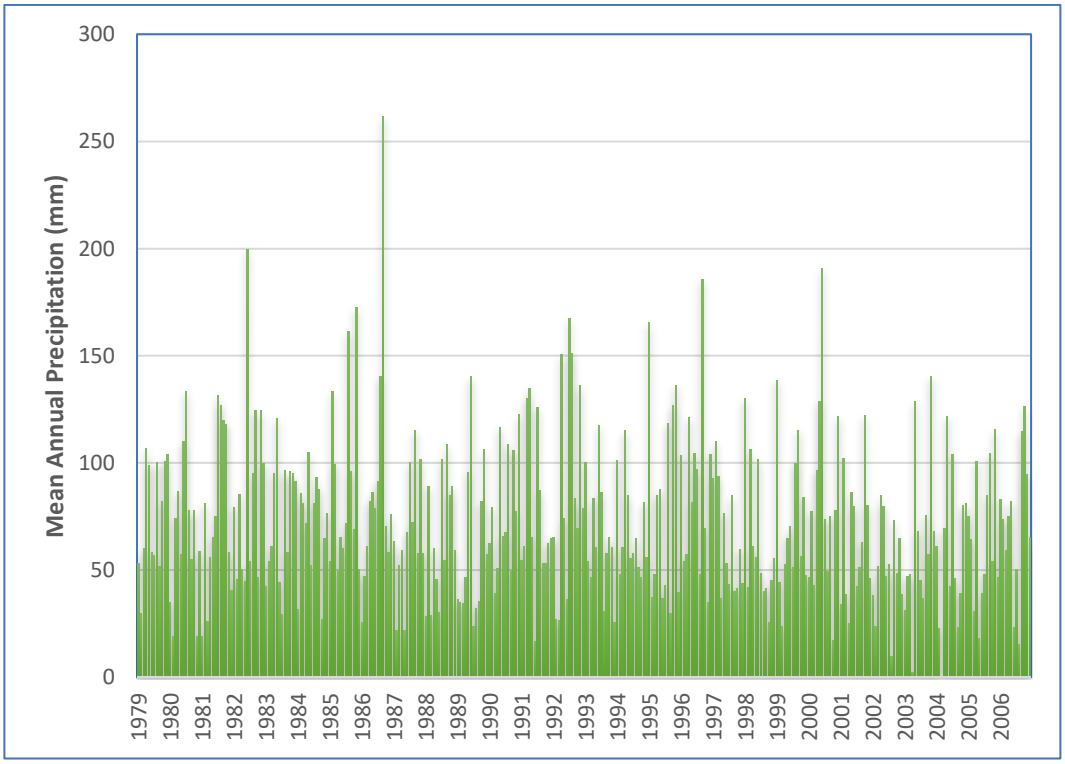

Figure 11-4: Mean Monthly Precipitation at the Site

Average monthly variations of both temperature and precipitation were calculated for the period from 1979 to 2006 (27 years) and is presented below in Figure 11-5. The highest average temperature was recorded in the month of July, while the highest precipitation was in the month of November.

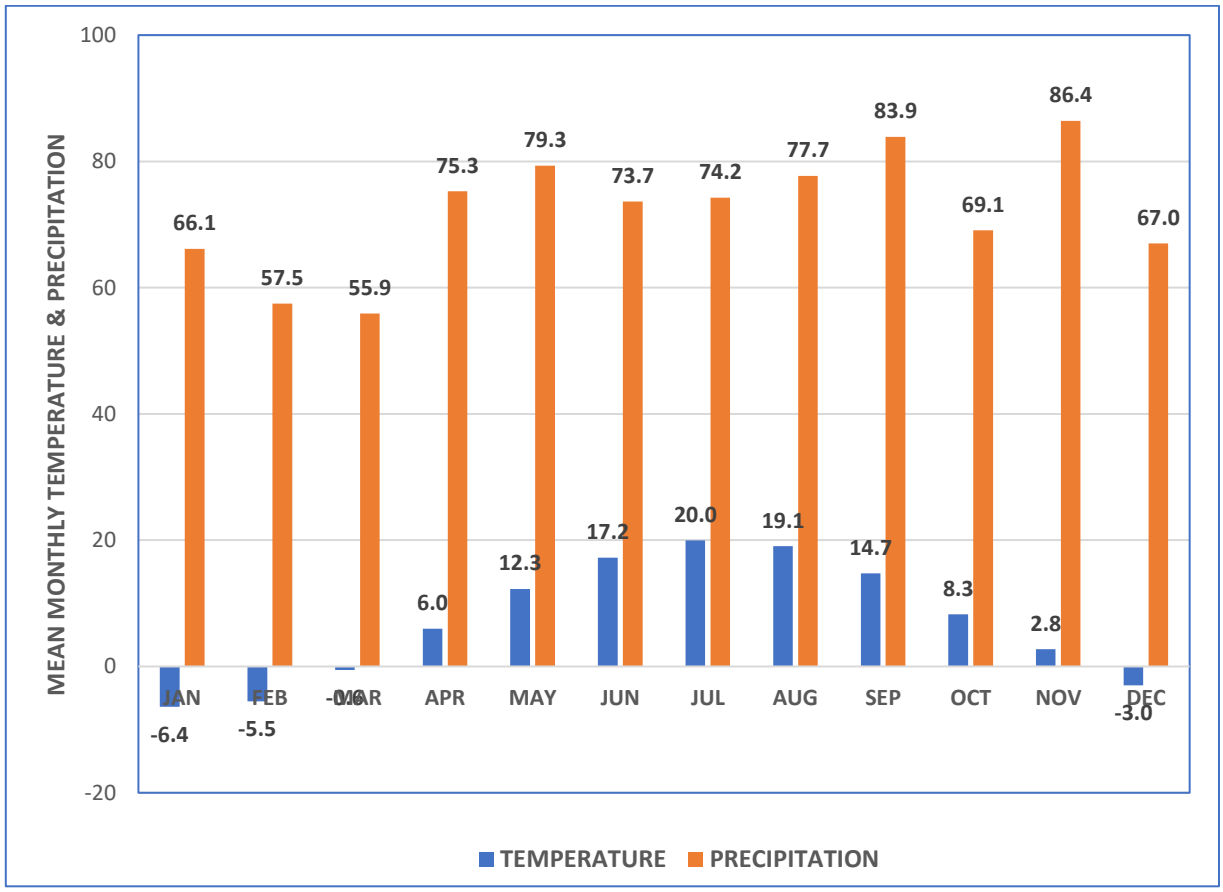

Figure 11-5: Mean Monthly Average Temperature and Precipitation at the Site

Based on the data for the precipitation and temperature, actual evapotranspiration was estimated to be about 529 mm/annum using the USGS Thornthwaite Monthly Water Balance software (Appendix F), and the average annual precipitation was recorded to be 898 mm/annum.

11.4. Infiltration and Run-off

As mentioned above, the actual evapotranspiration was estimated to be 529 mm/annum. Given the average annual precipitation of 898 mm/annum, there is a water surplus of 369 (=898-529) mm/annum occurring at the Site, which can either infiltrate into subsurface or go as run-off.

The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface run-off, the MECP infiltration factor was used. The MECP Storm Water Management Planning and Design Manual

(2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding run-off component was calculated for the soil moisture storage conditions.

11.5. Water Balance

The calculation of infiltration and runoff in the stages of pre-development and post-development is provided in Appendix F and are presented in Tables 11-2 to 11-5 below.

Table 11-2: Annual Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	0.0	0	0	0	0
	Building/ Roof Area	10.0	9	1	0	8
Pervious Areas	Landscape/ Vegetated Area	122,637	110,128	64,875	33,940	11,313
		122,647	110,137	64,876	33,940	11,321

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-3: Annual Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	10,840	9,734	973	0	8,761
	Building/ Roof Area	17,822	16,004	1,600	0	14,404
Pervious Areas	Landscape/ Vegetated Area	93,985	84,399	49,718	26,010	8,670
		122,647	110,137	52,292	26,010	31,835

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-4: Comparison of Pre- and Post Development Water Balance Components

	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	110,137	64,876	33,940	11,321
Post-Development	110,137	52,292	26,010	31,835
Change in Volume		-12,584	-7,929	20,513
Change in %			-23	181

Table 11-5: Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration (m^3/annum)	33,940
Volume of Post-Development Infiltration (m^3/annum)	26,010
Deficit from Pre to Post Development Infiltration (m^3/annum)	7,929
Percentage of Roof Runoff required to match the pre-development infiltration (%)	55

11.6. Summary of Water Balance Calculation

Based on the above calculations, a water balance summary for 159 Confederation Street is listed below:

1) There is a net increase in run-off at the Site of about 20,513 m^3/annum (or 181% increase), from 11,321 m^3/annum to 31,835 m^3/annum. This increase is as a result of the development of the Site with more impervious areas such as roof and paved areas and reduction in pervious landscaped areas.
2) Without implementation of mitigation measures, there is a net deficit of about 7,929 m^3 /annum (23% decrease) in the post-development infiltration from 33,940 m^3 to 26,010 m^3 on a yearly basis.
3) There is a net volume of 7,929 m^3/annum potentially available to be collected from roof areas, which is sufficient to fully compensate for the post-development infiltration deficit. A diversion of 55% of roof runoff will compensate the total infiltration deficit.

11.7. Discussions on LID Measures

Based on the above water balance calculations for 159 Confederation Street, an infiltration deficit will be anticipated in an amount of 7,929 m^3/year due to the development of the Site. On the other hand, a total amount of 14,404 m^3/year of roof water is anticipated to be available from the roofs of the buildings, which is sufficient to compensate for the infiltration deficit caused due to the proposed development.

The soil stratigraphy as recorded from the advanced boreholes completed by SIRATI, generally consisted of a thin topsoil deposit with a thickness of 150 mm to 200mm. A layer of fill soil material extending to a depth of 0.8 m to 1.0 m below the ground surface was encountered. Cohesionless soils consisting of gravel deposits, sand deposits and silty sand glacial till deposits extended from the fill

base levels to the borehole termination depths. No bedrock was encountered at the maximum explored depth of 10.8 mbgs. The soils identified at the Site, generally have a fair to good infiltration capacity.

12.0. ASSESSMENT OF POTENTIAL IMPACTS

An assessment was made on the potential impacts due to short-term construction dewatering or long-term drainage on the natural features, use of water wells and source protection areas.

As discussed, the construction dewatering under the existing concept design plan (Eden Oak, Bayfield Georgetown, Concept Plan, Concept-3; September 27, 2023), based on the available information, above assumptions and measurements, the temporary construction dewatering rate for the development will be anticipated at 31,590 L/day, and the stormwater volume estimate would be approximately 107,110 L/day for a total of 138,700 L/day. The long-term drainage discharge from the residential blocks may not be anticipated.

Based on the above water balance calculations for 159 Confederation Street, an infiltration deficit will be anticipated in an amount of 7,929 m^3/year due to the development of the Site. On the other hand, a total amount of 14,404 m^3/year of roof water is anticipated to be available from the roofs of the buildings, which is sufficient to compensate for the infiltration deficit caused due to the proposed development.

No significant potential impacts would be anticipated.

12.1. Natural Features

The topography of the Site slopes from west to east (toward the Credit River), with an approximate elevation of +/- 239 mASL (meters above sea level) at the east site boundary to +/- 264 mASL at Confederation Street (west boundary of the Site). The Credit River is at an approximate elevation of +/- 232 mASL. Figure 4 presents the location of the Site and natural features. Based on the available mapping, two (2) tributaries of the Credit River flow from west to east across the Site.

Based on review of the MNRF database, the Site is not located in any area identified as an area of natural heritage & scientific interests (ANSI), (Figure 4). Portions of the north and east areas of the Site lie within a CVC regulated area. Based on the existing concept design plan, the proposed development area of the Property may be located outside of the CVC regulated area (as shown on Figure 5).

Significant impacts would not be expected due to the proposed development given the distance and the limited zone of influence that has been estimated for construction dewatering, long term dewatering may not be anticipated, 14,404 m^3/year of roof water is anticipated to be available from the roofs of the

buildings, which is sufficient to compensate for the infiltration deficit caused due to the proposed development.

12.2. Private Water Wells on and near the Site

As discussed in Section 7, water well records on file with the Ministry of the Environment, Conservation and Parks (MECP) serve as a database for this hydrogeological assessment. The well locations were provided from the MECP interactive water well record database. According to the well records, there appears to be nine (9) well records for the Site. There are 97 well records within a 500 m radius around the property (including the well records for the property). The water well records include domestic water wells abandoned water well. The maximum water well depth extended to approximately 43 mbgs. The groundwater levels recorded in the water wells ranged from dry conditions to 1.8 mbgs. Based on the details in the water well records, the overburden material noted consisted primarily of sandy and gravelly deposit with interbedded clayey deposits over red shale bedrock. Groundwater wells encountered potable groundwater within the upper aquifer zones, lower confined sandy aquifer levels and within the shale bedrock levels. Local groundwater flow is in an east to southeast direction.

According to Section H4.3.5 Water and Wastewater Services (Hamlet of Glenn Williams Secondary Plan), a piped regional water system currently services the majority of the Hamlet of Glenn Williams. No expansions of the water service are permitted without approval and all new development shall be serviced by piped regional water. The primary method of wastewater servicing for new development within the Hamlet shall be piped regional wastewater services, with connection to the Georgetown Wastewater Treatment Plant. Water mains were observed in the area of the proposed development (including on the Confederation St. R.O.W.). Therefore, significant impact may not be anticipated on the deeply seated private water wells or water uses.

It is recommended the existing groundwater wells be decommissioned in accordance with O.Reg. 903 and Municipal guidelines prior to construction activities at the Site.

12.3. Quantity Wellhead Protection Area (WHPA-Q)

The Site is not located in a Wellhead Protection Area. Therefore, the proposed development would not potentially cause an impact or a threat on municipal wells.

12.4. Wellhead Protection Area -D (WHPA-D)

The Site is not located in a WHPA-D area. Therefore, the proposed development would not likely cause an impact or a threat on municipal wells.

12.5. Ground Settlement/Subsidence

Under certain conditions, dewatering activities can cause ground settlement or subsidence. The ground settlement/subsidence results from the increase in effective stresses caused by the lowering of ground water level and subsequent decrease in pore pressure.

It should be noted that there may be existing buildings (residential structures) and potentially existing underground structures (sewer pipes) on the adjacent properties, which are located within the estimated zone of influence. Considering the drawdown of dewatering and the distance from the excavation/dewatering area, the impacts due to the temporary dewatering would be minor. However, it would be prudent to conduct a monitoring program prior to and during construction dewatering and assess any settlement effects on the existing buildings and structures due to the proposed development.

12.6. Local Sewage Works

The water generated during the construction dewatering may be discharged to local sewer systems (storm and/or sanitary) or ditching. As discussed, the groundwater generated from the construction dewatering at the Site may be discharged to the local sewer systems or ditching after appropriate treatment. Treated discharge may increase the load to the local sewer systems.

It should be noted that a permit or agreement to use the local sewer system and/or local ditching shall be obtained prior to treated water discharge.

According to Section H4.3.5 Water and Wastewater Services (Hamlet of Glenn Williams Secondary Plan), a piped regional water system currently services the majority of the Hamlet of Glenn Williams. No expansions of the water service are permitted without approval and all new development shall be serviced by piped regional water. The primary method of wastewater servicing for new development within the Hamlet shall be piped regional wastewater services, with connection to the Georgetown Wastewater Treatment Plant. Storm sewers were noted to exist on Bishop Ct., located northwest of the Site. Roadway ditching was observed on Confederation Street at the Site, storm sewers were not observed on Confederation St. near the Site.

13.0. CONCLUSIONS AND RECOMMENDATIONS

This report was prepared by SIRATI in support of proposed residential development at 159 Confederation Street, Halton Hills, Ontario (the Site). Based on the hydrogeological investigation conducted on the subject Property, the following conclusions are presented:

- The Site is situated within the Sixteen Mile Creek-Credit River Tertiary Watershed, Credit River West Branch – Credit River Quaternary Watershed. The Credit River is located between +/- 35 m east to +/- 200 m east of the east property boundary of the Site. Based on the available mapping, two (2) tributaries of the Credit River flow from west to east across the Site.
- The Site is located within the or bordering the Horseshoe Moraines physiographic region and Peel Plains physiographic region. Physiographic mapping shows the Site to be within Spillways physiography. The Site is covered by Glaciofluvial deposits consisting of river deposits and delts topset facies, gravelly deposits. The overburden/drift thickness around the Site is generally 8 to 15 m. The Site is underlain by the Queenston formation, limestone, shale, siltstone and sandstone.
- The soil stratigraphy as recorded from the advanced boreholes completed by SIRATI, generally consisted of a thin topsoil deposit with a thickness of 150 mm to 200mm. A layer of fill soil material extending to a depth of 0.8 m to 1.0 m below the ground surface was encountered. Cohesionless soils consisting of gravel deposits, sand deposits and silty sand glacial till deposits extended from the fill base levels to the borehole termination depths. No bedrock was encountered at the maximum explored depth of 10.8 mbgs.
- The static groundwater levels measured in the monitoring wells across the Site ranged from 1.44 mbgs at BH/MW-03 to 8.43 mbgs at BH/MW-04, while groundwater elevations ranged from 240.67 mAMSL at BH/MW-04 to 253.66 mAMSL at BH/MW-02 between December 12, 2023, to March 01, 2024. Inferred groundwater flow direction is to the east, southeast.
- The hydraulic conductivity of the screened soils is estimated to be 1.942 x 10^{-6} m/s (geometric mean).
- Based on the available information, the temporary construction dewatering rate for the development will be anticipated at 31,590 L/day, and the stormwater volume estimate would be approximately 107,110 L/day for a total of 138,700 L/day. Therefore, a PTTW is not considered to be required for the short-term dewatering. However, an EASR registration is required for temporary construction dewatering (pending final design of the development Site).
- Positive dewatering such as well points or educators will be required prior to any excavations in the soils below the groundwater table. A contractor specializing in dewatering should be retained to design the dewatering systems. The groundwater table must be lowered to at least 1.0 m below

the lowest excavation level, prior to bulk excavation. Limited temporary dewatering above the groundwater table (and above target dewatering levels) may be completed using sump pumps.

- Using Dupuit's equation for unconfined aquifers (based on available information and Preliminary design assumptions), long-term dewatering may not be required.
- The maximum estimated zone of influence from the edge of the excavation due to the dewatering is anticipated. Ground settlement/subsidence should be considered on the existing buildings and/or underground structures (sewer pipes) adjacent to the Site. It would be prudent to conduct a monitoring program prior to and during construction dewatering and assess any settlement effects on the existing buildings and structures due to the proposed development.
- Please contact SIRATI for re-evaluation of the construction dewatering analyses and long-term dewatering once a site design is Finalized (final site grades, finalized basement floor slab elevations, finalized foundation elevations, storm and septic sewer design).
- Based on the groundwater quality assessment, the groundwater taken from the site may meet the criteria for Halton Sewer Use By-Law Guidelines after proper filtration and treatment for E.coli. Therefore, the water generated during construction could be discharged into local sanitary sewer system after proper filtration/treatment. Otherwise, the groundwater can be discharged into the Municipal storm sewer upon meeting the applicable water quality guidelines. However, a discharge permit or agreement shall be obtained from Halton Region prior to discharge.
- Based on the preliminary water balance assessment, an infiltration deficit will be anticipated in an amount of 7,929 m^3/year due to the development of the Site. A total amount of 14,404 m^3/year of roof water is anticipated to be available from the roofs of the buildings, which is sufficient to compensate for the infiltration deficit.
- The Site is not located in WHPA areas. It is recommended that infiltration facilities or low-impact development (LID) measures would be incorporated into the design. It should be noted that selection and design of the LID methods should be carried out by the project engineer. If required, SIRATI can conduct in-situ infiltration tests to assess the soil infiltration capacity.
- Existing test wells and domestic type, metal cased potable groundwater wells (if identified at the Site) are recommended to be decommissioned in accordance with O.Reg. 903 and local Municipal guidelines.
- The design and installation of a construction dewatering system is usually the responsibility of the construction contractor. The contractor should verify the information presented in this report. This may be done by examining the groundwater conditions in test pits or by a full-range pumping test carried out by the dewatering subcontractor.

- During the period of active dewatering, water levels should be monitored within the excavation footprints and around the perimeter of the excavation to confirm the zone of influence from dewatering area. In addition, the discharge quality should be monitored according to the permit or agreement if the local sewer systems are to be used. All water taking and discharge would be recorded and maintained.
- Design of a dewatering system is generally the responsibility of the Contractor. To this end, appropriate measures should be taken during construction to deal with surface water and groundwater infiltration into excavation to enable construction. Around the perimeter of the excavation, an inceptor perimeter trench should be constructed to prevent surface water ingress entering the excavation areas. Any implemented dewatering system much also include appropriate filtration mechanisms to prevent the pumping of fines and loss of ground.
- Please contact SIRATI if you require a door-to-door well survey for the proposed development.

14.0. SELECTED BIBLIOGRAPHY

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15.0. LIMITATIONS AND USE OF THE REPORT

This report was produced by SIRATI for the sole use of the Client for the Site and may not be relied upon by any other person or entity without the written authorization of SIRATI. The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SIRATI cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SIRATI has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

The scope of services performed in the execution of this investigation may not be appropriate to satisfy third parties. SIRATI accepts no responsibility for damages if any, suffered by any third party as a result of decisions made or action taken based on this report. Any use, copying or distribution of the report in whole or in part is not permitted without the express written permission of SIRATI and use of findings, conclusions and recommendations represented in this report, is at the sole risk of third parties.

In the event that during future work new information regarding the environmental condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SIRATI should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.

16.0. SIGNATURES

Should you have any questions regarding the information presented or limitation set in this report, please do not hesitate to contact our office.

Yours truly,

Sirati and Partners Consultants Ltd.

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Aug. 26, 2024

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Aug. 26, 2024.

FIGURES

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

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North:

Legend:

Approximate Property Boundary

Project Title:

Hydrogeological Investigations

Site Location:

159 Confederation Street, Halton Hills, ON.

Figure Title:

Site Location Plan

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	1

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

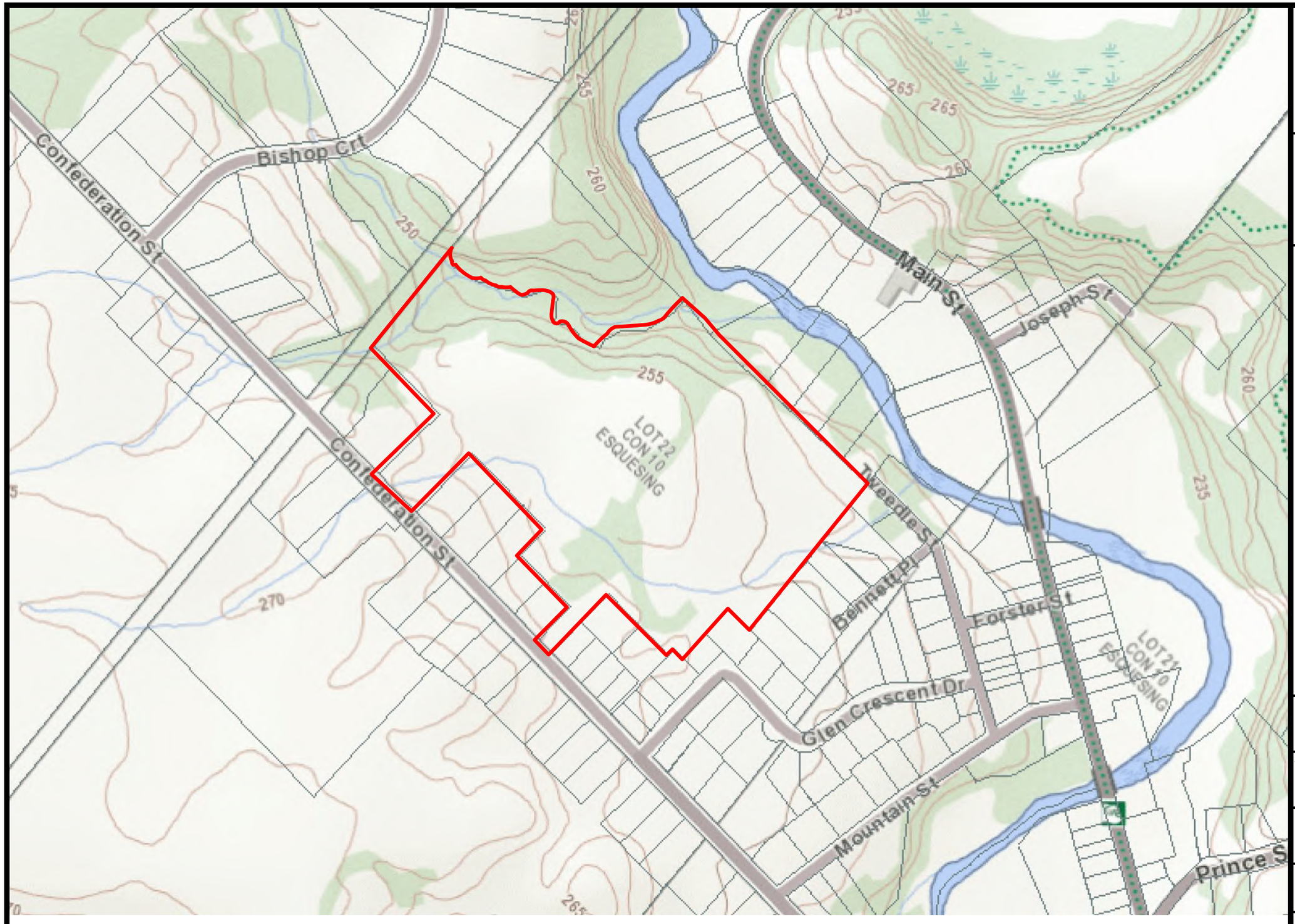
- Approximate Property Boundary
- Borehole/ monitoring Well

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street, Halton Hills, ON.

Figure Title:
Borehole/Monitoring Well Location Plan

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
February, 2024	2



Source: Ontario Ministry of Natural Resources and Forestry (OMNRF)

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

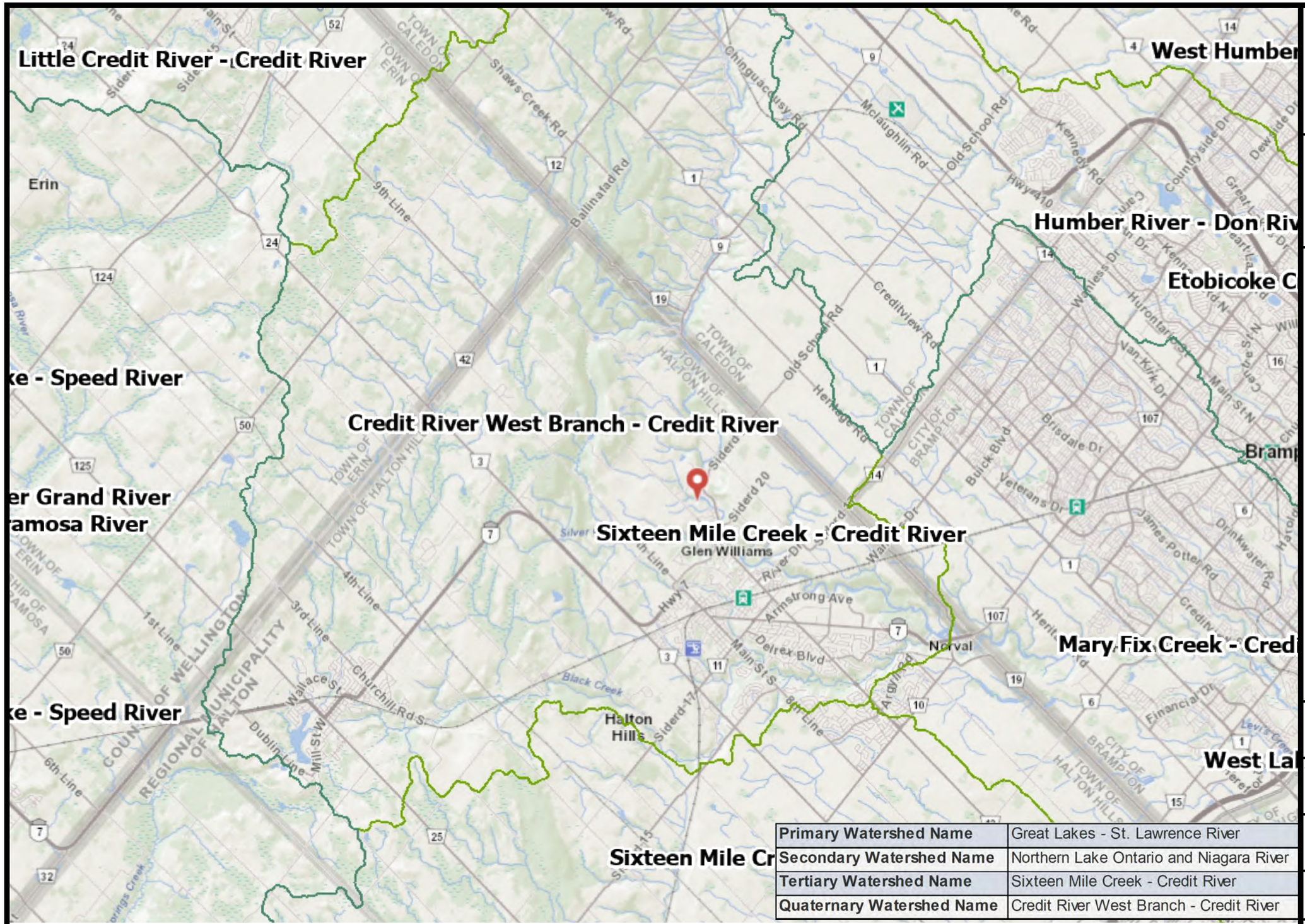
Approximate Property Boundary

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street,
Halton Hills, Ontario

Figure Title:
Topographic & Surface Water Feature Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	3



Primary Watershed Name	Great Lakes - St. Lawrence River
Secondary Watershed Name	Northern Lake Ontario and Niagara River
Tertiary Watershed Name	Sixteen Mile Creek - Credit River
Quaternary Watershed Name	Credit River West Branch - Credit River

0 km 2.66 5.3

Source: Ontario Watershed Information Tool

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

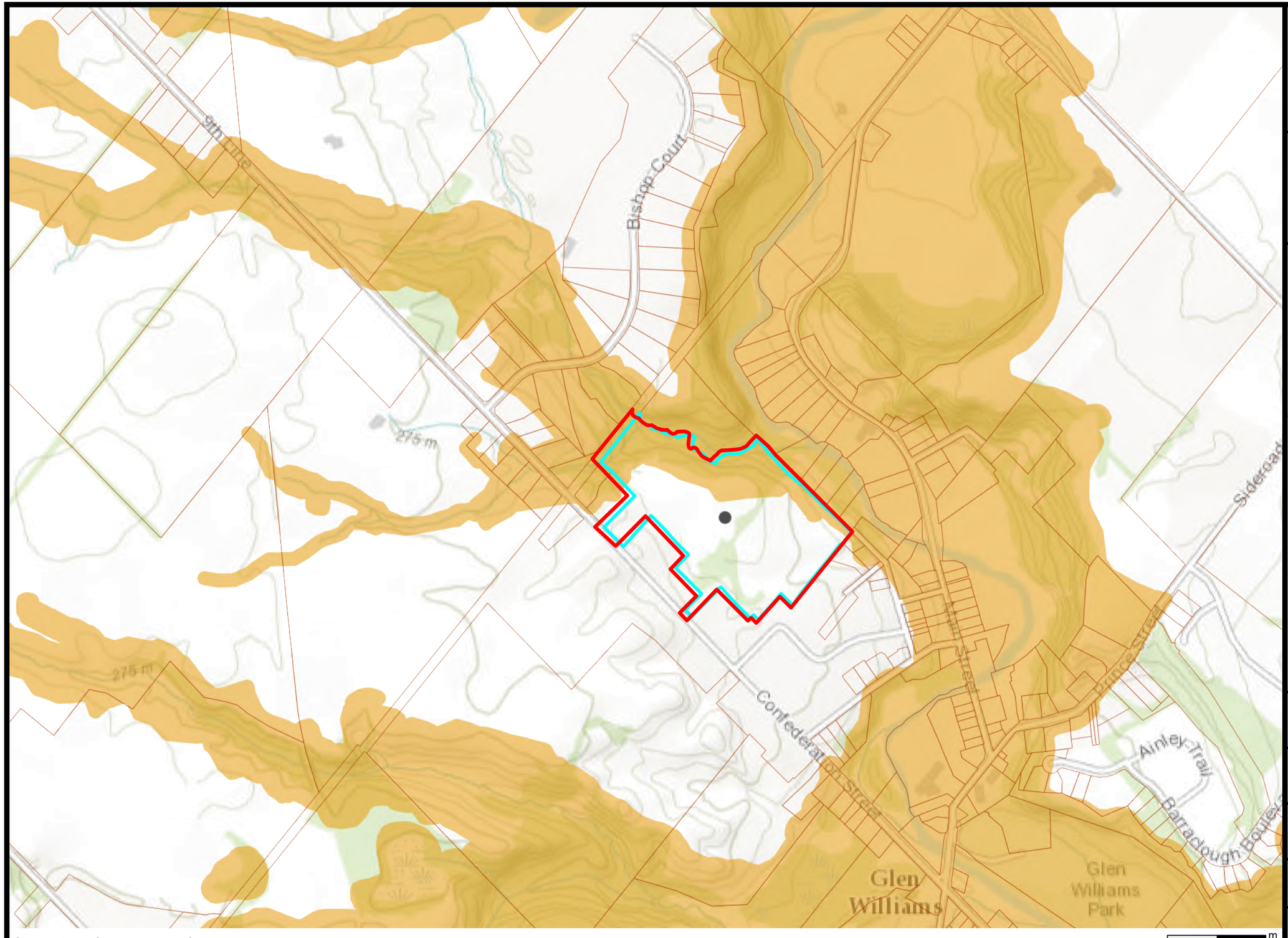
Legend:

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street,
Halton Hills, Ontario

Figure Title:
Watershed Map

Scale: As Shown	**Project Number:** SP23-01265-00
Date: January, 2024	**Figure Number:** 4



Source: Lake Simcoe Region Conservation Authority

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Approximate Property Boundary
- Credit River Watershed Boundary
- Parcels around Regulated Area
- Generic Regulation Mapping

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street, Halton Hills, ON.

Figure Title:
CVC Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	**5**

Original: Source Protection Information Atlas
Source: https://www.ontario.ca/page/source-protection

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions
12700- Keele Street
King City, ON. L7B 1H5
Phone# 905 833 1582, Fax# 905 833 5360

North:

N

Legend:

Approximate Site Location

Legend

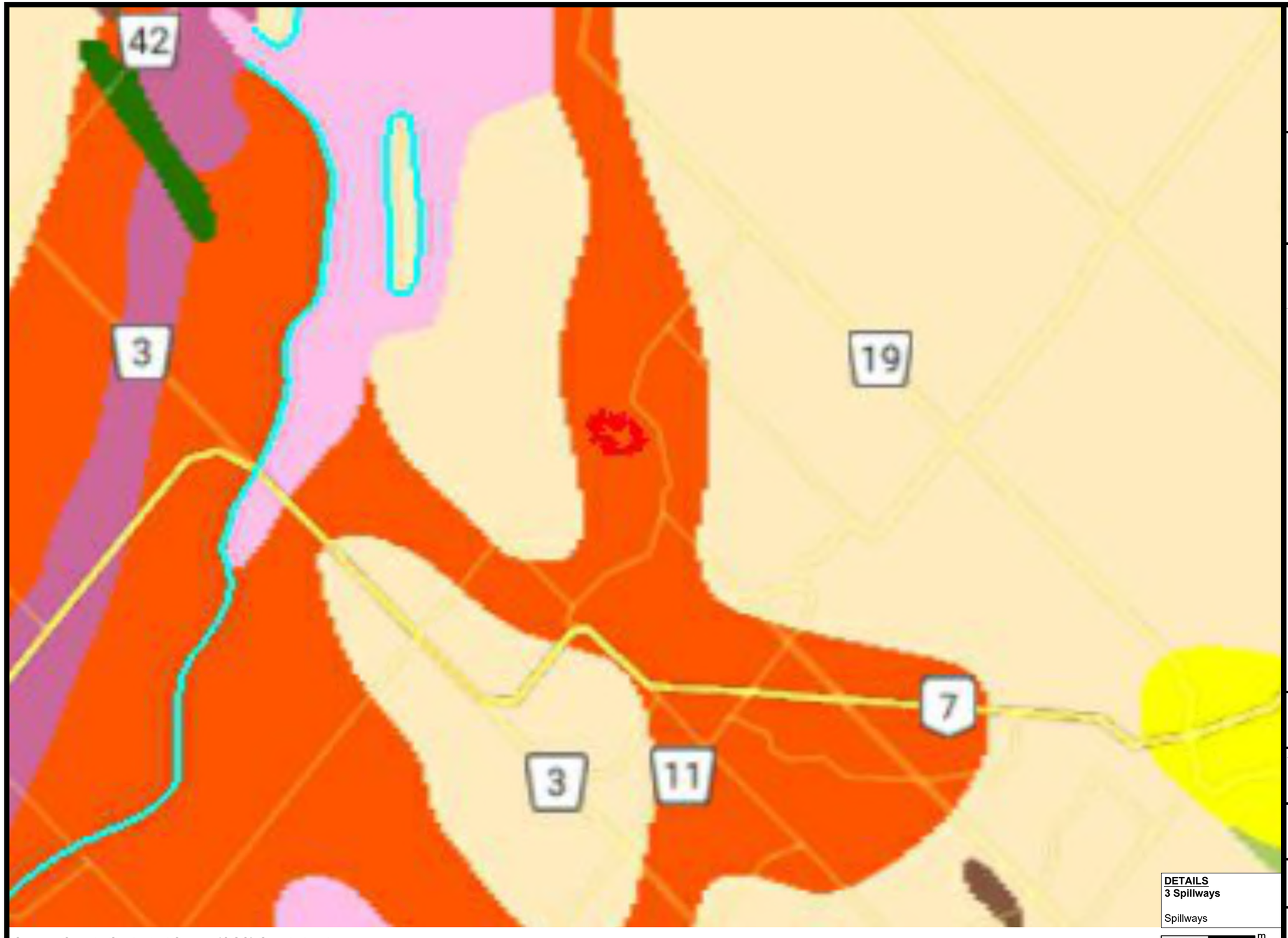
- Issue Contributing Areas
- WHPA-E
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Source Protection Areas

Project Title:
Hydrogeological Investigation

Site Location:
159 Confederation Street, Halton Hills, ON

Figure Title:
MECP Source Water Protection Mapping

Scale:	Project Number:
As Shown	SP23-01265-00
Date: January 2024	**Figure Number** 6



Source: Ontario Geological Survey (OGS) Google Earth

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

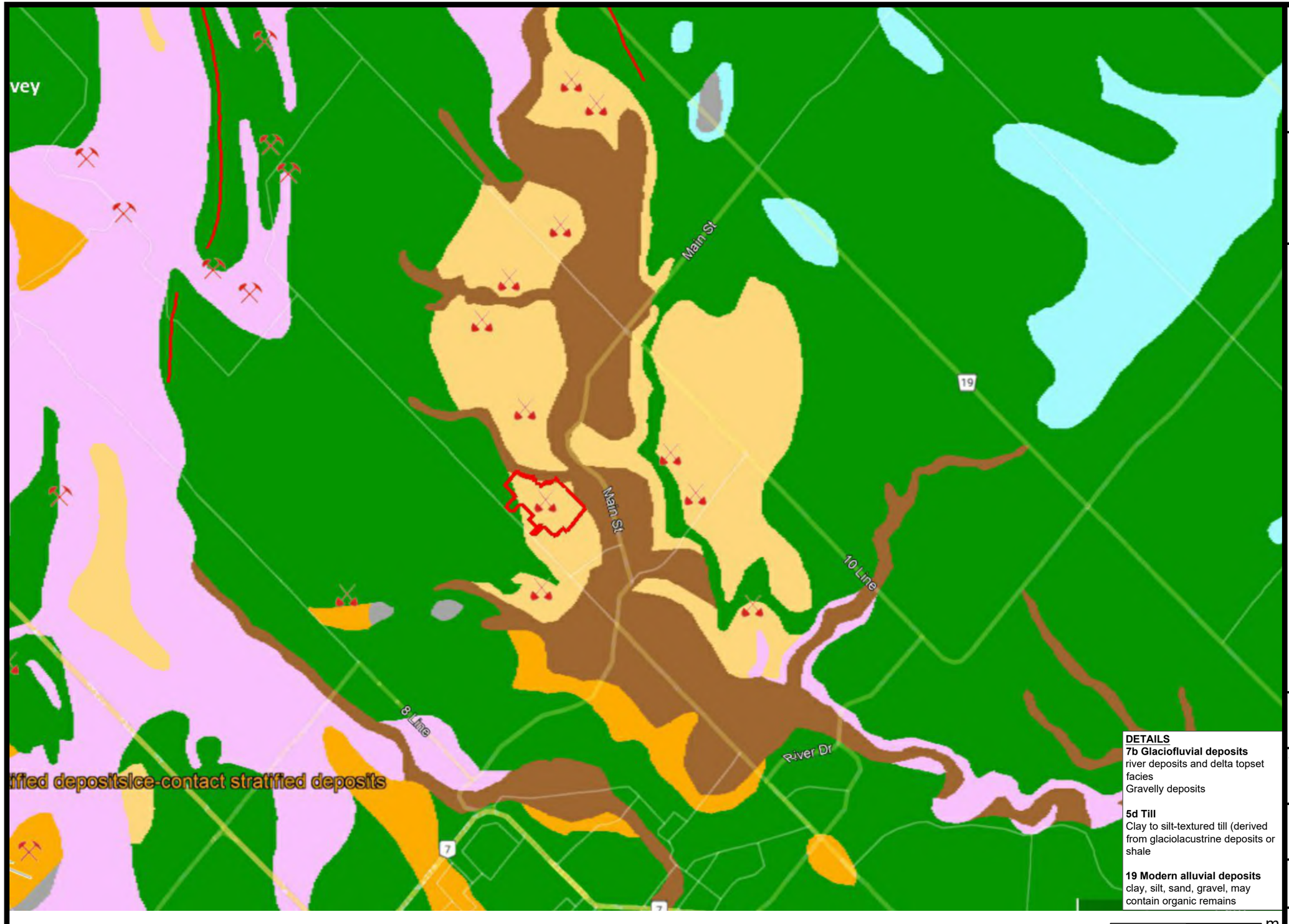
Approximate Property Boundary

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street, Halton Hills, ON.

Figure Title:
Physiography Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	7



DETAILS

7b Glaciofluvial deposits
river deposits and delta topset facies
Gravelly deposits

5d Till
Clay to silt-textured till (derived from glaciolacustrine deposits or shale

19 Modern alluvial deposits
clay, silt, sand, gravel, may contain organic remains

0 1000 m

Source: Ontario Geological Survey (OGS) Google Earth

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

- 7 — **Glaciofluvial deposits:** river deposits and delta topset facies; 7a Sandy deposits; 7b Gravelly deposits
- 6 — **Ice-contact stratified deposits:** sand and gravel, minor silt, clay and till; 6a In moraines, eskers, kames and crevasse fills; 6b In subaquatic fans
- 5a — **Till:** Silty sand to sand-textured till on Precambrian terrain; 5a Silty sand to sand-textured till on Precambrian terrain
- 5b — 5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain
- 5c — 5c Stony, sandy silt to silty sand-textured till on Paleozoic terrain
- 5d — 5d Clay to silt-textured till (derived from glaciolacustrine deposits or shale)
- 5e — 5e Undifferentiated older tills, may include stratified deposits

PALEOZOIC

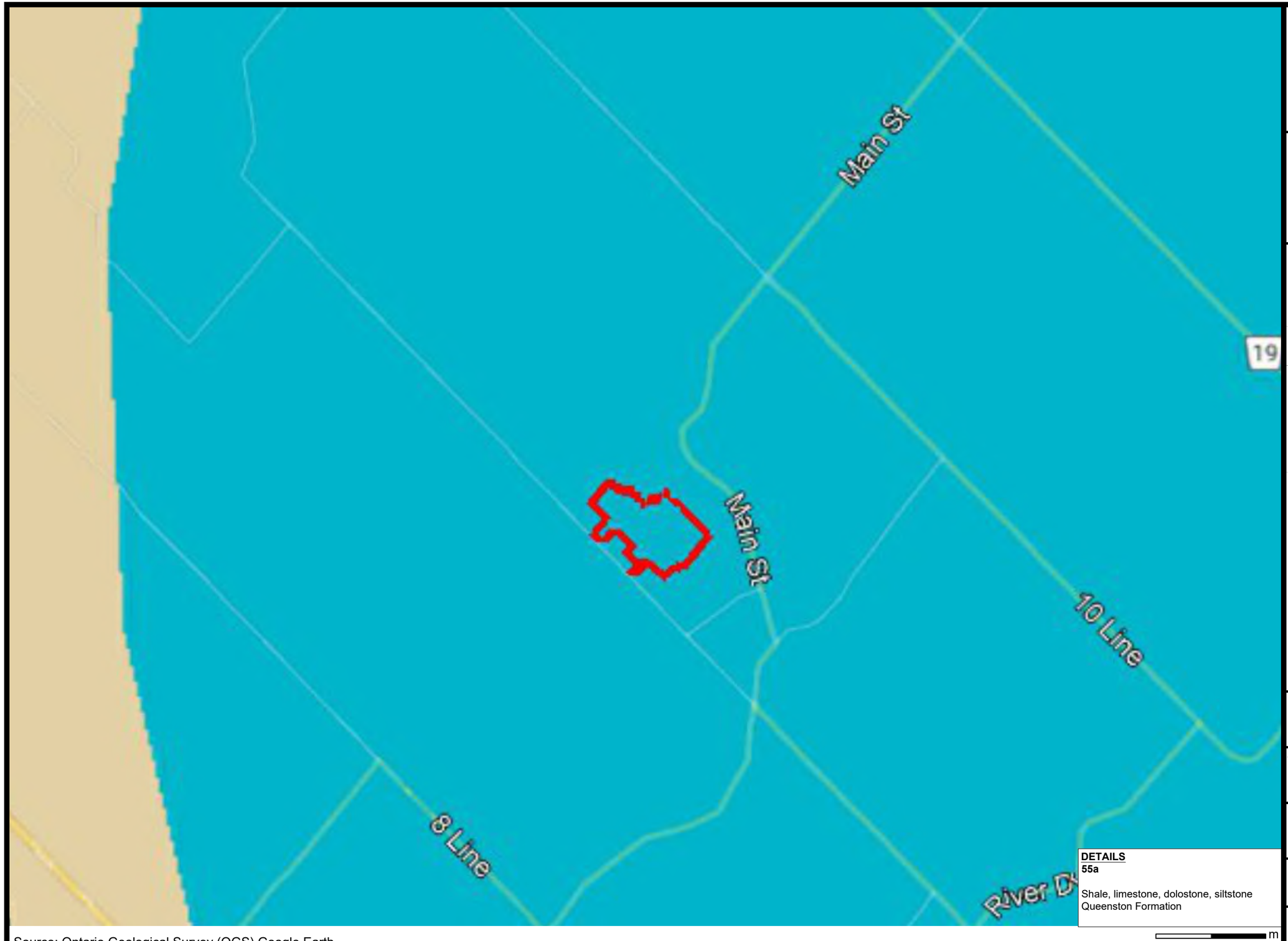
- 4 — **Bedrock-drift complex in Paleozoic terrain:** 4a Primarily till cover; 4b Primarily stratified drift cover
- 3 — **Paleozoic bedrock**
- 21 — **Man-made deposits:** fill, sewage lagoon, landfill, urban development
- 20 — **Organic Deposits:** peat, muck, marl
- 19 — **Modern alluvial deposits:** clay, silt, sand, gravel, may contain organic remains
- 18 — **Colluvial deposits:** boulders, scree, talus, undifferentiated landslide materials
- 17 — **Eolian deposits:** fine to very fine sand and silt
- 16 — **Coarse-textured marine deposits:** sand, gravel, minor silt and clay; 16a Deltaic deposits

Project Title:
Phase One Environmental Site Assessment

Site Location:
159 Confederation Street,
Halton Hills, Ontario

Figure Title:
Surficial Geology Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
December, 2023	**8**



Source: Ontario Geological Survey (OGS) Google Earth

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

Project Title:

Hydrogeological Investigations

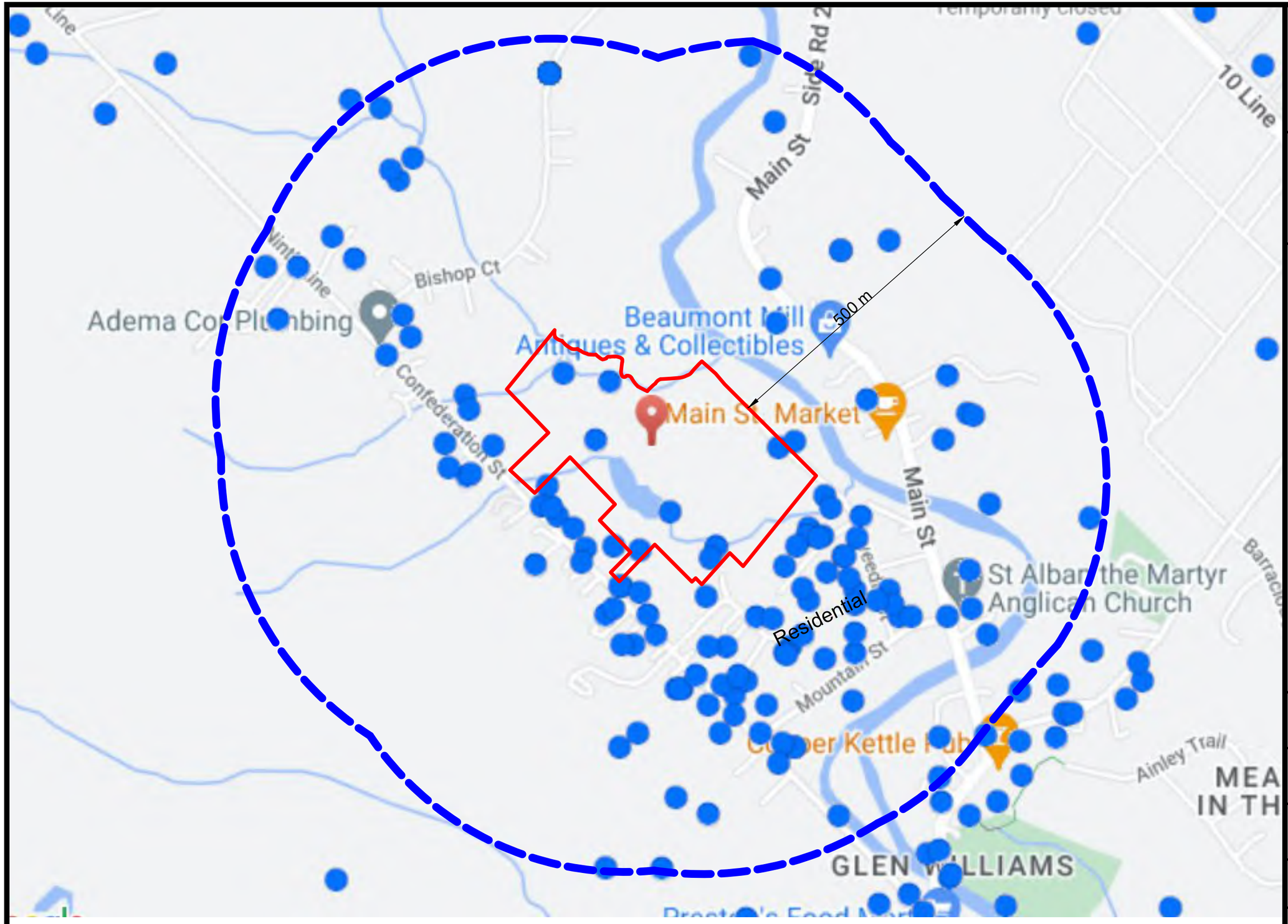
Site Location:

159 Confederation Street, Halton Hills, ON.

Figure Title:

Bedrock Geology Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	9



Source: https://www.ontario.ca/page/map-well-records

m
0 200

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

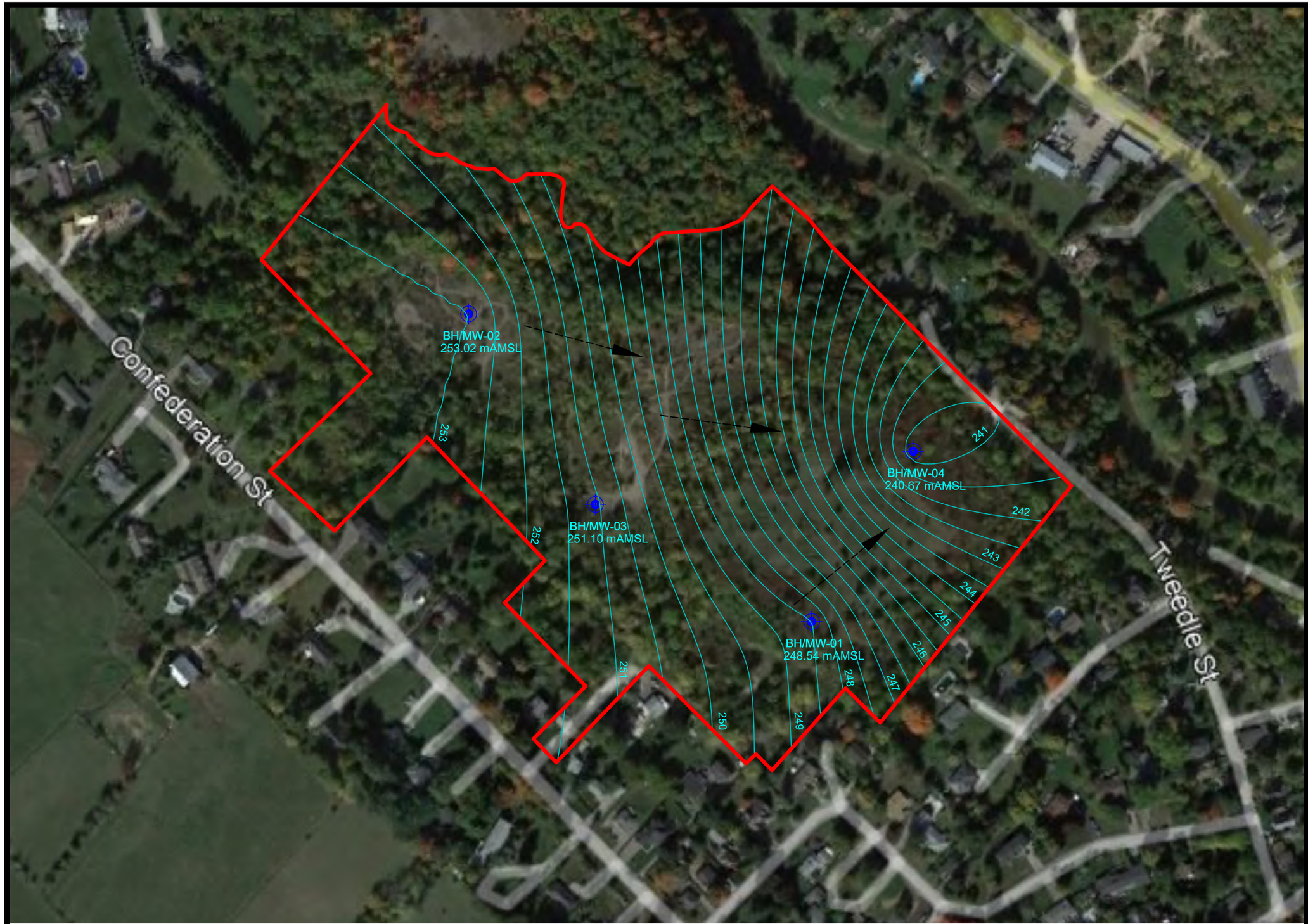
- Approximate Property Boundary
- 500 M Study Area
- MECP Wells

Project Title:
Hydrogeological Investigations

Site Location:
159 Confederation Street,
Halton Hills, Ontario

Figure Title:
MECP Water Well Records Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
January, 2024	10



SIRATI & PARTNERS

160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Approximate Property Boundary
- Monitoring well
- Contour Line
- Inferred Shallow Groundwater Flow Direction

Note: Groundwater Elevation were obtained on January 22, 2024

Project Title:

Hydrogeological Investigation

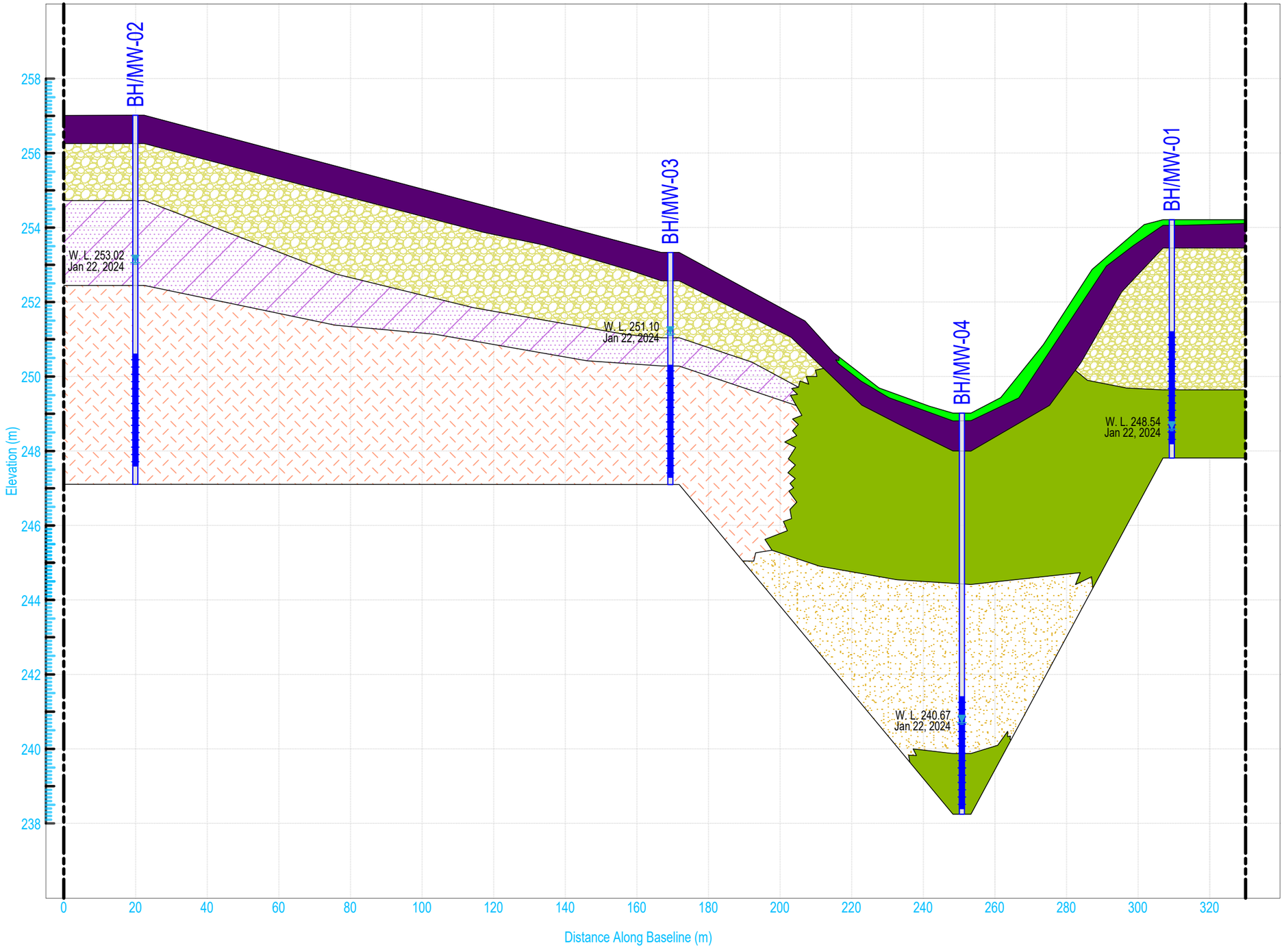
Site Location:

159 Confederation Street, Halton Hills, ON.

Figure Title:

Inferred Shallow Groundwater Flow Direction Map

Scale:	Project Number:
As Shown	SP23-01265-00
Date:	**Figure Number:**
February, 2024	11



SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

Legend:

Approximate Property Boundary

- Topsoil
- Fill
- Sand & Gravel
- Silty Sand Till
- Sandy Silt
- Sand
- Sand & Silt Till

BH/MW-XX
- Borehole / Well ID
- Water Level
- Well Screen

Note: Groundwater Elevation were obtained on January 22, 2024

Project Title:

Hydrogeological Investigations

Site Location:

159 Confederation Street, Halton Hills, ON.

Figure Title:

Geologic Cross Section A - A'

Scale:	Project Number:
N.T.S	SP23-01265-00
Date:	**Figure Number:**
February, 2024	**12**

APPENDICES

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

APPENDIX A

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

SCHEDULE				
PART	LOT	PLAN	PIN	AREA (sq.m.)
1	PART OF LOT 26	REGISTRAR'S COMPILED PLAN No. 1555	ALL OF PIN 25011-0064 (LT)	120886±
2				980
3				781

PART 2 - SUBJECT TO A RIGHT-OF-WAY AS IN INST. No.'s 242783 AND 701169.
PART 3 - SUBJECT TO A RIGHT-OF-WAY AS IN INST. No. 701169.

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.

DATE _____

THOMAS J. SALB
ONTARIO LAND SURVEYOR

PLAN 20R-

RECEIVED AND DEPOSITED

DATE _____

REPRESENTATIVE FOR THE LAND REGISTRAR FOR THE LAND TITLES DIVISION OF HALTON (No. 20)

PLAN OF SURVEY OF

PART OF LOT 26
REGISTRAR'S COMPILED PLAN No. 1555

FORMALLY PART OF WEST HALF OF LOT 22, CONCESSION 10
GEOGRAPHIC TOWNSHIP OF ESQUESING
IN THE
TOWN OF HALTON HILLS
REGIONAL MUNICIPALITY OF HALTON

SCALE 1 : 1000

20 0 20 40 60 metres

J.D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).

FOR BEARING COMPARISONS, A ROTATION OF 00°40'15" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 20R-8779.

FOR BEARING COMPARISONS, A ROTATION OF 00°45'35" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 20R-9284 AND 20R-6532.

FOR BEARING COMPARISONS, A ROTATION OF 00°45'50" CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 20R-5977 AND 20R-10733.

FOR BEARING COMPARISONS, A ROTATION OF 00°44'45" COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN P8.

FOR BEARING COMPARISONS, A ROTATION OF 00°40'20" CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 20M-765.

INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORPs): UTM ZONE 17, NAD83 (CSRS) (2010.0).

COORDINATES TO URBAN ACCURACY PER SECTION 14 (2) OF O.REG 216/10.

POINT ID	EASTING	NORTHING
ORP (A)	585 766.79	4 836 310.82
ORP (B)	586 020.15	4 836 055.88
ORP (C)	586 123.76	4 836 469.33

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999658.

LEGEND

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
SSIB	DENOTES	SHORT STANDARD IRON BAR
RIB	DENOTES	ROUND IRON BAR
IB	DENOTES	IRON BAR
IP	DENOTES	IRON PIPE
WIT	DENOTES	WITNESS
MEAS	DENOTES	MEASURED
JDB	DENOTES	J.D. BARNES LIMITED
375	DENOTES	BLACK, SHOEMAKER, ROBINSON & DONALDSON LIMITED
752	DENOTES	W.H. CARR, O.L.S.
1254	DENOTES	R.E. CLIPSHAM LIMITED
1312	DENOTES	JOSEPH STEL, O.L.S.
1521	DENOTES	DOLLIVER SURVEYING INC.
OU	DENOTES	ORIGIN UNKNOWN
P1	DENOTES	PLAN 20R-8779
P2	DENOTES	PLAN 20R-14513
P3	DENOTES	PLAN 20R-5977
P4	DENOTES	PLAN 20R-10733
P5	DENOTES	REGISTERED PLAN 20M-765
P6	DENOTES	PLAN 20R-9284
P7	DENOTES	PLAN 20R-6532
P8	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY DOLLIVER SURVEYING INC. DATED NOVEMBER 11, 2011
P9	DENOTES	REGISTERED PLAN 510
P10	DENOTES	INSTRUMENT NUMBER 242783
P11	DENOTES	INSTRUMENT NUMBER 415702
P12	DENOTES	PLAN 20R-19875
P13	DENOTES	PLAN 20R-4866
P14	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY R.E. CHIPSHAM, O.L.S. DATED OCTOBER, 1990
P15	DENOTES	PLAN 20R-11716
HP	DENOTES	HYDRO POLE
PWF	DENOTES	POST & WIRE FENCE
S.T. R.O.W.	DENOTES	SUBJECT TO A RIGHT OF WAY

ALL SET SSIB AND PB MONUMENTS WERE USED DUE TO LACK OF OVERBURDEN AND/OR PROXIMITY OF UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF O.REG. 525/91.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 28th DAY OF SEPTEMBER, 2023.

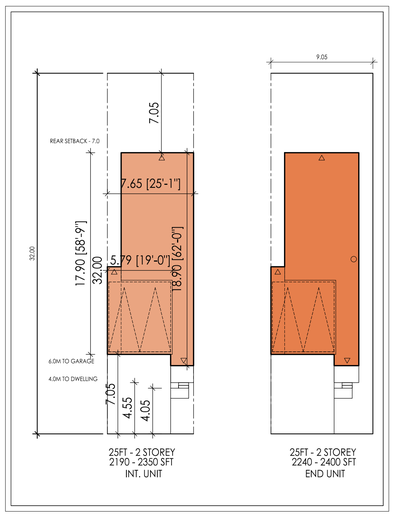
DATE — THOMAS J. SALB, ONTARIO LAND SURVEYOR

J.D. BARNES LIMITED — SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
401 WHEELABRATOR WAY, SUITE A, MILTON, ON L9T 3C1
T: (905) 875-9955 F: (905) 875-9956 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
AP&MD		14-30-651-00-A

FILE: G:\14-30-651\03\Drawing\14-30-651-03-a.dgn DATED: OCTOBER 31, 2023

PLOTTED: OCTOBER 31, 2023



THESE DRAWINGS ARE NOT TO BE SCALED:

ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR PRIOR TO COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES MUST BE REPORTED DIRECTLY TO SRN ARCHITECTS INC.

PROJECT CONSULTANTS:

LEGEND

FSE FINISHED SECOND FLOOR ELEVATION	WATER CONNECTION
FFE FINISHED FLOOR ELEVATION	WATER VALVE CHAMBER
TOW TOP OF FOUNDATION WALL	HYDRANT AND VALVE
TBS TOP OF BASEMENT SLAB	HYDRO METER
USF UNDER SLAB FOOTING	GAS METER
USFR UNDER SIDE FOOTING @ REAR	DOWN LIGHT
USFG UNDER SIDE FOOTING @ GARAGE	1# POLE LIGHTING
R NUMBER OF RISERS TO GRADE	2# POLE LIGHTING
WOD WALKOUT DECK	BOLLARD LIGHTING
LOB LOOKOUT BASEMENT	STOP SIGN
WOB WALK OUT BASEMENT	NO PARKING
WUB WALK UP BASEMENT	NO PARKING IN LANEWAY
REV REVISED PLAN	FIRE ROUTE
STD STANDARD PLAN	3HRS PARKING (RIGHT)
DOOR	3HRS PARKING (LEFT)
WINDOW	PROPOSED SPOT GRADE
BELL PEDESTAL	EXISTING SPOT GRADE
CABLE PEDESTAL	EXISTING TREE (TO BE REMOVED)
CATCH BASIN	EXISTING TREE (TO BE RETAINED)
DBL. CATCH BASIN	MUNICIPAL ADDRESS
ENGINEERED FILL	RETAINING WALL (SEE SECTION)
HYDRO CONNECTION	SNOW STORAGE AREAS
FIRE HYDRANT	CHAINLINK FENCE
STREET LIGHT	PRIVACY FENCE
MAIL BOX	SOUND BARRIER
TRANSFORMER	EXISTING TO BE EXTENDED
SEWER CONNECTIONS (2 LOTS)	EXISTING TO BE REMOVED
SEWER CONNECTIONS (1 LOT)	FIRE FIGHTER TRAVEL PATH
AIR CONDITIONING	REVERSE CHECK FOUNDATION
DOWN SPOUT TO SPLASH PAD	
SWALE DIRECTION	
SUMP PUMP	

ISSUED OR REVISION COMMENTS

NO.	DESCRIPTION	DATE	DWN	CHK
1	ISSUED FOR REVIEW	25-SEPT-2023	MTL	MTL
1	ISSUED FOR REVIEW	27-SEPT-2023	AG	

RN DESIGN
WWW.RNDESIGN.COM
T:905-738-3177
WWW.THEPLUSGROUP.CA

CLIENT: EDEN OAK

PROJECT/LOCATION: BAYFIELD GEORGETOWN

DRAWING: CONCEPT PLAN

DATE	SCALE
27-SEP-2023	1:750
DRAWN BY: RP	CHECKED BY: RN
PROJECT NUMBER: 23020	DRAWING NUMBER: CONCEPT 3

File:D:\RN 2023 Projects\23020\2 - Site Planning\1 - Architectural (RN)\1 - Site Plan\1 - Site Plan SP100\23020-SP100.dwg Plotted: Oct 27, 2023 By:RonP

APPENDIX B

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW 01

PROJECT: Geotechnical and Hydrogeological Investigations and Excess Soil
CLIENT: Eden Oak
PROJECT LOCATION: 159 Confederation Street, Town of Halton Hills
DATUM: Geodetic
BH LOCATION: N 4836219 E 586124

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Dec-01-2023

REF. NO.: SP23-01265-00
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
254.2												
254.0 0.2	**TOPSOIL:** 150 mm thick											
	FILL: silty sand, trace cobbles, trace gravel, trace organics, brown, very moist, loose		1	SS	4		254					
253.5 0.8	**SAND AND GRAVEL:** some silt, trace cobbles, trace clay, brown, moist, compact		2	SS	25							39 39 18 4
			3	SS	23		253					
	dense		4	SS	34		252					
			5	SS	30		251					
249.6 4.6	**SANDY SILT:** trace to some clay, trace gravel, brown, moist, very dense		6	SS	50/ 150mm		250					
							249					
247.8 6.4	grey, very moist		7	SS	50/ 150mm	W. L. 248.1 m Dec 12, 2023						
	END OF BOREHOLE:											

1. Borehole was open and dry upon completion of drilling.
2. Nested monitoring well was installed (Deep well).
3. Monitoring well observations for long-term stabilized groundwater levels:

Date	Depth (mbgs)
Dec 12, 2023	6.07m

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

SPCL SOIL LOG /DRAFT SP23-01265-00.GPJ SPCL.GDT 23-12-13

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW 02

PROJECT: Geotechnical and Hydrogeological Investigations and Excess Soil
CLIENT: Eden Oak
PROJECT LOCATION: 159 Confederation Street, Town of Halton Hills
DATUM: Geodetic
BH LOCATION: N 4836417 E 585897

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Dec-04-2023

REF. NO.: SP23-01265-00
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
257.0												
0.0 / 256.2	**POSSIBLE FILL:** gravelly sand, trace silt, trace rootlets, brown, moist, loose		1	SS	9				○			
0.8 / 254.7	**SAND AND GRAVEL:** trace to some silt, trace cobbles, trace clay, brown, moist, dense		2	SS	31		256		○			
	very dense		3	SS	50/ 100mm		255		○			
2.3 / 252.4	**SILTY SAND TILL:** trace cobbles, trace gravel, brown, moist, very dense		4	SS	50/ 140mm		254		○			
			5	SS	50/ 50mm		253		○			
4.6	**SAND AND SILT TILL:**trace cobbles, trace gravel, trace clay, brown, moist, very dense		6	SS	50/ 130mm	W. L. 252.6 m Dec 12, 2023	252		○			3 41 50 6
			7	SS	50/ 140mm		251		○			
			8	SS	50/ 100mm		250		○			
							249					
	very moist		9	SS	50/ 140mm		248		○			
247.1			10	SS	50/ 150mm				○			9 41 46 4
9.9	**END OF BOREHOLE:**											

1. Borehole was open upon completion of drilling.
2. Groundwater was encountered at 9.1 mbgs upon completion of drilling.
3. Nested monitoring well was installed (Deep well).
4. Monitoring well observations for long-term stabilized groundwater levels:

Date	Depth (mbgs)
Dec 12, 2023	4.43m

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SPCL SOIL LOG /DRAFT SP23-01265-00.GPJ SPCL.GDT 23-12-13

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW 03

PROJECT: Geotechnical and Hydrogeological Investigations and Excess Soil
CLIENT: Eden Oak
PROJECT LOCATION: 159 Confederation Street, Town of Halton Hills
DATUM: Geodetic
BH LOCATION: N 4836294 E 585981

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Dec-04-2023

REF. NO.: SP23-01265-00
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
253.3						
0.0	**POSSIBLE FILL:** gravelly sand, trace silt, trace rootlets, trace wood fragments, brown, moist, loose	1	SS	7	253	
252.6						
0.8	**SAND AND GRAVEL:** trace to some silt, trace cobbles, trace clay, brown, moist, dense	2	SS	40		
		3	SS	46	252	
251.0						
2.3	**SILTY SAND TILL:** trace cobbles, trace gravel, trace clay, brown, moist, dense	4	SS	31	251	8 59 30 3
250.3						
3.1	**SAND AND SILT TILL:** trace gravel, trace clay, reddish brown, very moist, compact	5	SS	18	250	
	very dense	6	SS	50/100mm	249	
247.1					248	
6.2	**END OF BOREHOLE:**	7	SS	50/140mm		

1. Borehole was open upon completion of drilling.
2. Groundwater was encountered at 3.0 mbgs upon completion of drilling.
3. Nested monitoring well was installed (Deep well).
4. Monitoring well observations for long-term stabilized groundwater levels:

Date	Depth (mbgs)
Dec 12, 2023	2.44m

W. L. 250.9 m
Dec 12, 2023

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

SPCL SOIL LOG /DRAFT SP23-01265-00.GPJ SPCL.GDT 23-12-13

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW 04

PROJECT: Geotechnical and Hydrogeological Investigations and Excess Soil
CLIENT: Eden Oak
PROJECT LOCATION: 159 Confederation Street, Town of Halton Hills
DATUM: Geodetic
BH LOCATION: N 4836331 E 586190

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Dec-01-2023

REF. NO.: SP23-01265-00
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
249.1												
249.0 / 0.1	**TOPSOIL:** 200mm											
0.2 / 248.0	**POSSIBLE FILL:** silty sand, trace cobbles, trace gravel, trace organics, brown, very moist, loose		1	SS	6							
			2	SS	23		248					
1.0	**SANDY SILT:** trace to some clay, trace gravel, brown, very moist, compact											
			3	SS	15		247					
	dense		4	SS	38							
	oxidated		5	SS	36		246					Non-plastic 7 33 52 8
244.5							245					
4.6	**SAND:** trace to some silt, trace gravel, brown, moist, dense		6	SS	37							
	very dense		7	SS	50/ 130mm		244					
			8	SS	85		243					
239.9							242					
9.1	**SANDY SILT:** trace to some clay, trace gravel, brown, very moist, very dense		9	SS	50/ 150mm		241					
238.3								W. L. 240.7 m Dec 12, 2023				
10.8	reddish brown **END OF BOREHOLE:**		10	SS	50/ 100mm		240					
	1. Borehole was open upon completion of drilling. 2. Nested monitoring well was installed (Deep well). 3. Monitoring well observations for long-term stabilized groundwater levels: Date Dec 12, 2023 — Depth (mbgs) 8.32m						239					

SPCL SOIL LOG /DRAFT SP23-01265-00.GPJ SPCL.GDT 23-12-13

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

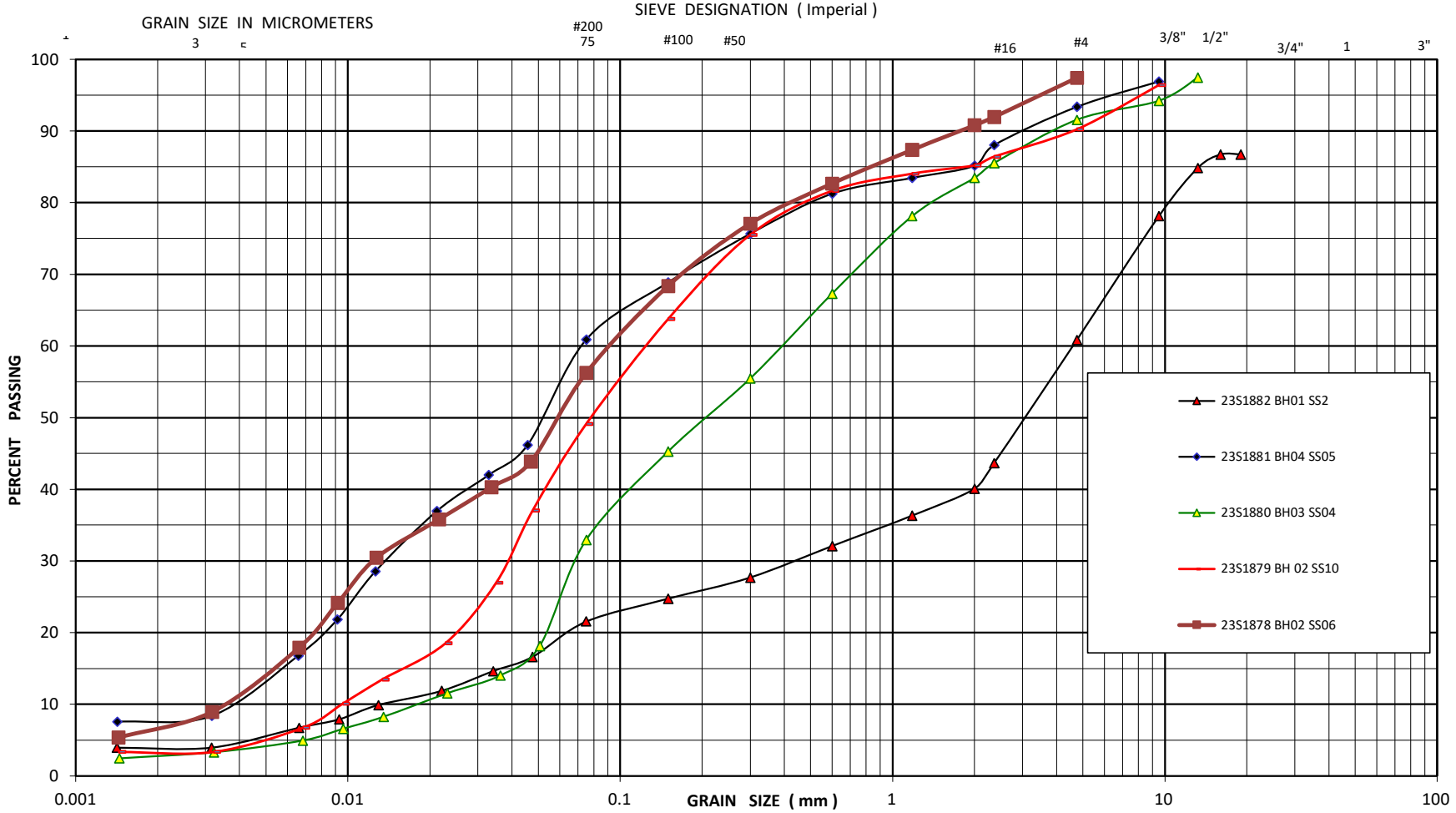
GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SIRATI & PARTNERS

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

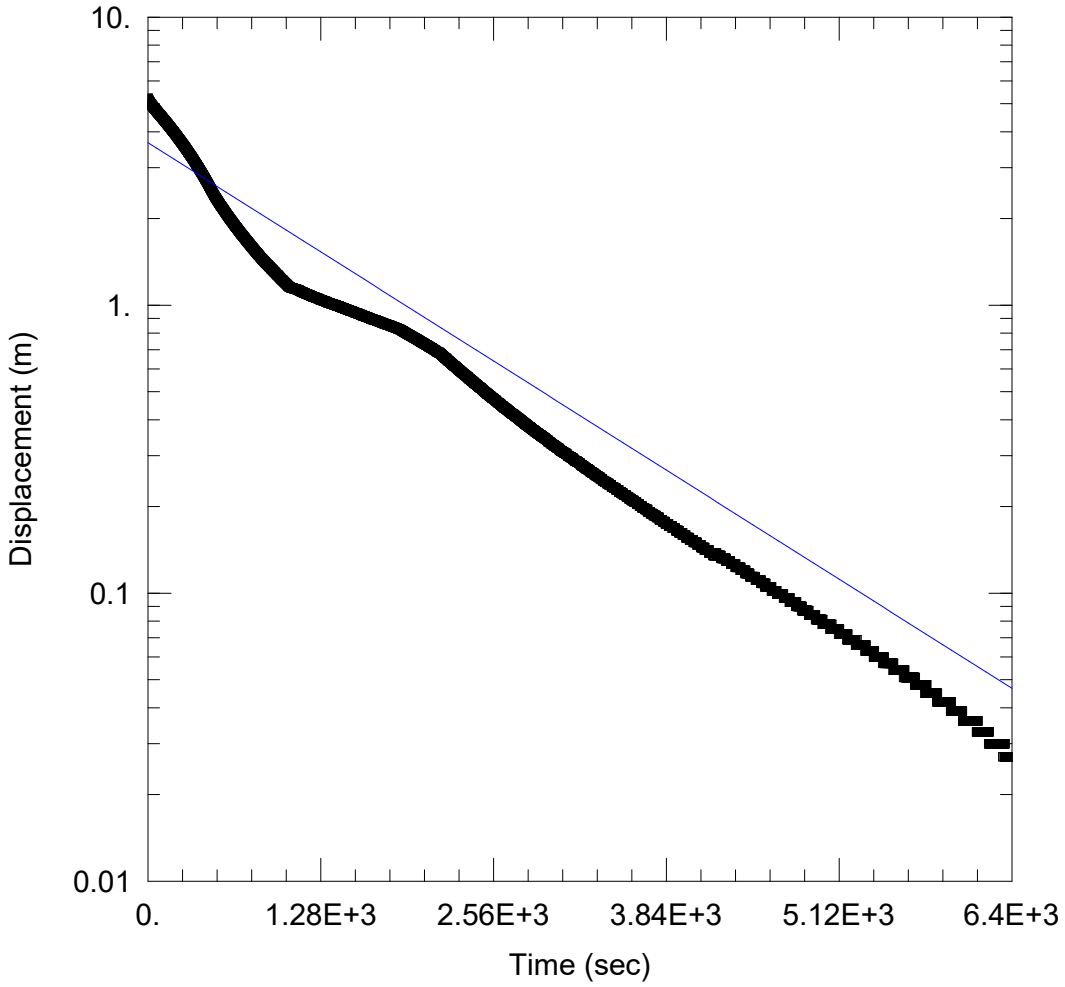


Project No.	:	SP23-01265-00
Date	:	08 December 2023
Figure No.	:	1

APPENDIX C

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions



RISING HEAD

Data Set: Z:\...\BH MW-02.aqt
Date: 01/05/24 Time: 16:35:51

PROJECT INFORMATION

Company: Sirati & Partners Consultants
Client: Weston Consulting
Project: SP23-1265-00
Location: 159 Confederation St., Halton
Test Well: BH-02
Test Date: January 05, 2024

AQUIFER DATA

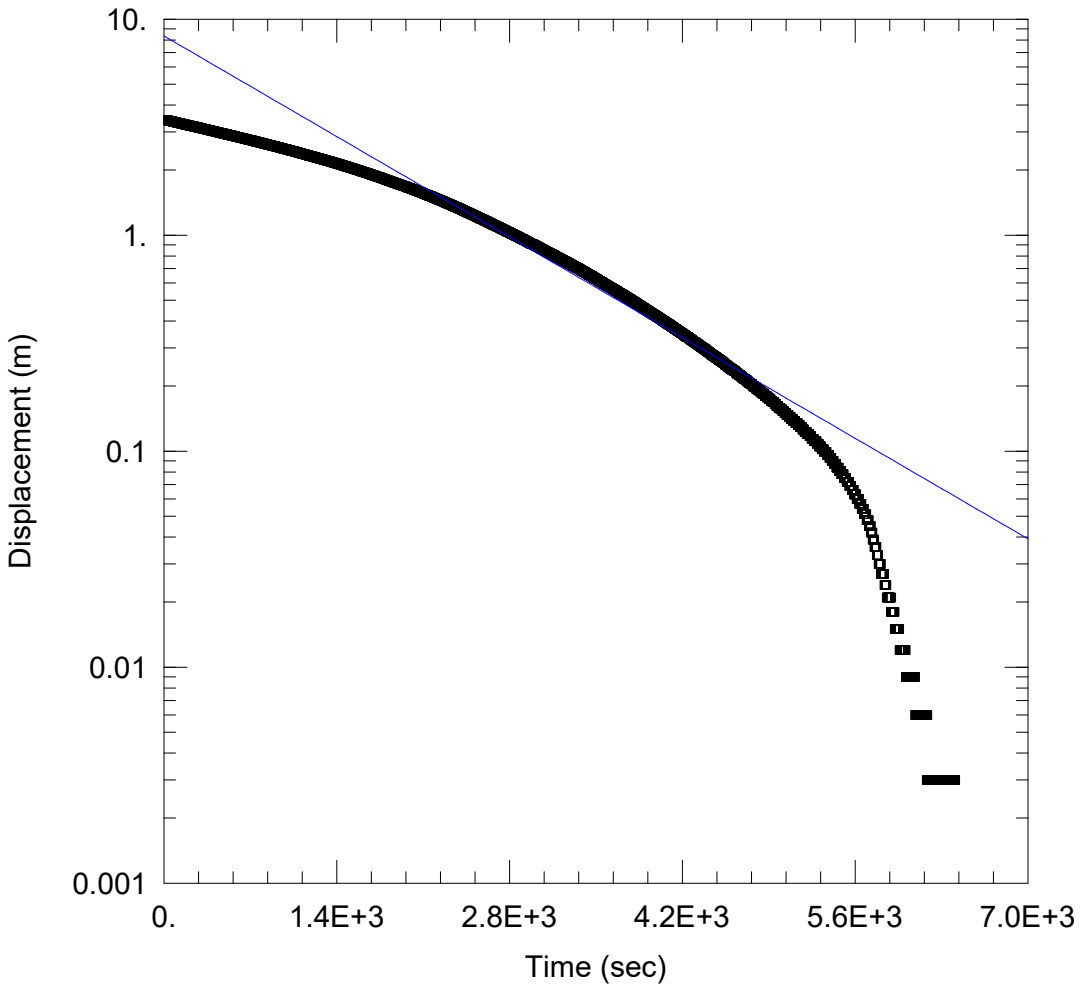
Saturated Thickness: 5.3 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW-02)

Initial Displacement: 5.229 m
Total Well Penetration Depth: 9.4 m
Casing Radius: 0.0508 m
Static Water Column Height: 5.3 m
Screen Length: 3. m
Well Radius: 0.0508 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.399E-6 m/sec
y0 = 3.662 m



RISING HEAD

Data Set: Z:\...\BH MW-03.aqt
Date: 01/05/24 Time: 16:52:33

PROJECT INFORMATION

Company: Sirati & Partners Consultants
Client: Weston Consulting
Project: SP23-1265-00
Location: 159 Confederation St., Halton
Test Well: BH-03
Test Date: January 05, 2024

AQUIFER DATA

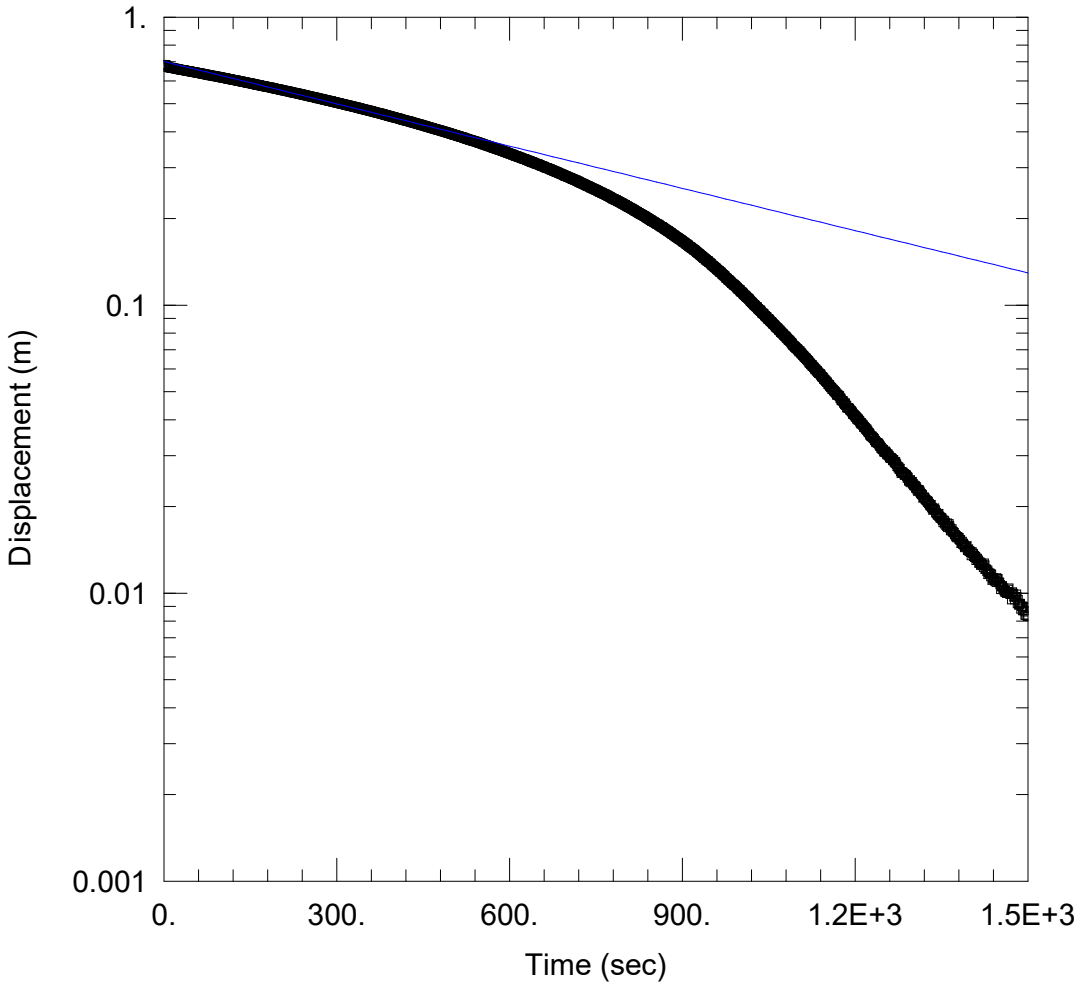
Saturated Thickness: 3.74 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW-03)

Initial Displacement: 3.426 m
Total Well Penetration Depth: 6.1 m
Casing Radius: 0.0508 m
Static Water Column Height: 3.74 m
Screen Length: 3. m
Well Radius: 0.0508 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.572E-6 m/sec
y0 = 8.351 m



RISING HEAD

Data Set: Z:\...\BH MW-04.aqt
Date: 01/08/24 Time: 15:43:38

PROJECT INFORMATION

Company: Sirati & Partners Consultants
Client: Weston Consulting
Project: SP23-1265-00
Location: 159 Confederation St., Halton
Test Well: BH-04
Test Date: January 05, 2024

AQUIFER DATA

Saturated Thickness: 2.31 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW-04)

Initial Displacement: 0.6836 m
Total Well Penetration Depth: 10.7 m
Casing Radius: 0.0508 m
Static Water Column Height: 2.31 m
Screen Length: 3. m
Well Radius: 0.0508 m
Water level was below the top of screen.

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
K = 3.333E-6 m/sec y0 = 0.7008 m

APPENDIX D

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD
160 KONRAD CRESCENT UNIT 4
MARKHAM, ON L3R 9T9
(905) 833-1582

ATTENTION TO: Hiva Elhami

PROJECT: SP23-1265-00

AGAT WORK ORDER: 23T103703

MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead

DATE REPORTED: Dec 21, 2023

PAGES (INCLUDING COVER): 16

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.
- For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

E.Coli (MI-Agar)

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

				SAMPLE DESCRIPTION:	BH/MW-02	BH/MW-04
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2023-12-12 13:30	2023-12-12 15:30
Parameter	Unit	G / S	RDL		5542216	5542305
Escherichia coli	CFU/100mL	200			0	900

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Halton Storm Sewer
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5542216-5542305 Escherichia coli RDL = 100 CFU/100mL.
RDL > 1 indicates dilutions of the sample.

The sample was diluted prior to filtration due to the presence of sediments.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Halton Sanitary and Combined Sewer Use By-law - Organics

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

				SAMPLE DESCRIPTION:	BH/MW-02	BH/MW-04
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2023-12-12 13:30	2023-12-12 15:30
Parameter	Unit	G / S	RDL		5542216	5542305
Oil and Grease (animal/vegetable) in water	mg/L		0.5		<0.5	<0.5
Oil and Grease (mineral) in water	mg/L		0.5		<0.5	<0.5
Methylene Chloride	mg/L		0.0003		<0.0003	<0.0003
Chloroform	mg/L		0.0002		<0.0002	<0.0002
Benzene	mg/L		0.0002		0.0005	<0.0002
Trichloroethene	mg/L		0.0002		0.0024	0.0139
Toluene	mg/L		0.0002		0.0006	<0.0002
Tetrachloroethene	mg/L		0.010		<0.010	<0.010
Ethylbenzene	mg/L		0.0001		<0.0001	<0.0001
1,4-Dichlorobenzene	mg/L		0.0002		<0.0002	<0.0002
Naphthalene	mg/L		0.0003		<0.0003	<0.0003
Surrogate	Unit	Acceptable Limits				
Toluene-d8	% Recovery	50-140			100	104
4-Bromofluorobenzene	% Recovery	50-140			65	64
Naphthalene-d8	%	50-140			68	84

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5542216-5542305 Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.

Analysis performed at AGAT Toronto (unless marked by *)

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Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

CBOD5

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

				SAMPLE DESCRIPTION:	BH/MW-02	BH/MW-04
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2023-12-12 13:30	2023-12-12 15:30
Parameter	Unit	G / S	RDL		5542216	5542305
Biochemical Oxygen Demand, Carbonaceous	mg/L		6		<6	<6

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5542216 RDL for BOD is raised due to insufficient DO depletion at selected dilution levels.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Dissolved Metals in Water (mg/L)

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

				SAMPLE DESCRIPTION:	BH/MW-02	BH/MW-04
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2023-12-12 13:30	2023-12-12 15:30
Parameter	Unit	G / S	RDL		5542216	5542305
Dissolved Aluminum	mg/L		0.007		0.013	0.008
Dissolved Antimony	mg/L		0.001		<0.001	<0.001
Dissolved Arsenic	mg/L		0.001		0.002	<0.001
Dissolved Beryllium	mg/L		0.0005		<0.0005	<0.0005
Dissolved Cadmium	mg/L		0.0001		<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002		<0.002	<0.002
Dissolved Cobalt	mg/L		0.0008		<0.0008	<0.0008
Dissolved Copper	mg/L		0.001		<0.001	0.002
Dissolved Iron	mg/L		0.020		0.046	0.026
Dissolved Lead	mg/L		0.0005		<0.0005	<0.0005
Dissolved Manganese	mg/L		0.002		0.049	0.113
Dissolved Molybdenum	mg/L		0.002		0.009	<0.002
Dissolved Nickel	mg/L		0.001		0.007	0.012
Dissolved Selenium	mg/L		0.001		<0.001	0.003
Dissolved Silver	mg/L		0.0001		<0.0001	<0.0001
Dissolved Tin	mg/L		0.002		<0.002	<0.002
Dissolved Titanium	mg/L		0.003		<0.003	<0.003
Dissolved Zinc	mg/L		0.005		<0.005	<0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5542216-5542305 Metals analysis completed on a filtered sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Halton Sanitary and Combined Sewer Use By-law - Inorganics

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

				SAMPLE DESCRIPTION:		BH/MW-04
				SAMPLE TYPE:		Water
				DATE SAMPLED:		2023-12-12 15:30
Parameter	Unit	G / S	RDL	5542216	RDL	5542305
pH	pH Units	6.5-8.5	NA	7.64	NA	7.67
Total Suspended Solids	mg/L		10	24300	10	5600
Fluoride	mg/L		0.05	<0.05	0.05	<0.05
Sulphate	mg/L		0.10	28.2	0.10	18.9
Cyanide, SAD	mg/L		0.002	0.003	0.002	0.006
Phenols	mg/L		0.002	0.044	0.002	0.056
Total Kjeldahl Nitrogen	mg/L		0.10	5.35	0.10	17.9
Total Phosphorus	mg/L		0.02	0.04	0.02	0.06
Total Aluminum	mg/L		0.50	230	0.50	267
Total Antimony	mg/L		0.003	<0.003	0.003	<0.003
Total Arsenic	mg/L		0.006	0.103	0.006	0.287
Total Beryllium	mg/L		0.002	0.009	0.002	0.009
Total Cadmium	mg/L		0.0002	0.0024	0.0002	0.0044
Total Chromium	mg/L		0.006	0.530	0.006	0.752
Total Cobalt	mg/L		0.0010	0.224	0.0010	0.431
Total Copper	mg/L		0.004	0.541	0.004	2.11
Total Iron	mg/L		0.50	430	1.00	674
Total Lead	mg/L		0.0010	0.185	0.0010	0.373
Total Manganese	mg/L		0.004	24.2	0.02	45.7
Total Mercury	mg/L		0.0002	0.0002	0.0002	<0.0002
Total Molybdenum	mg/L		0.004	0.024	0.004	0.020
Total Nickel	mg/L		0.006	0.547	0.006	0.806
Total Selenium	mg/L		0.004	0.046	0.004	0.078
Total Silver	mg/L		0.0002	0.0006	0.0002	0.0008
Total Tin	mg/L		0.004	<0.004	0.004	<0.004
Total Titanium	mg/L		0.10	2.74	0.020	1.65
Total Zinc	mg/L		0.040	0.991	0.040	1.90

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Halton Sanitary and Combined Sewer Use By-law - Inorganics

DATE RECEIVED: 2023-12-13

DATE REPORTED: 2023-12-21

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Halton Storm Sewer
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5542216-5542305 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Exceedance Summary

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
5542305	BH/MW-04	ON Halton SM	E.Coli (MI-Agar)	Escherichia coli	CFU/100mL	200	900

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Microbiology Analysis

RPT Date: Dec 21, 2023			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
E.Coli (MI-Agar)															
Escherichia coli	5542216	5542216	0	0	NA										

Comments: NA - % RPD Not Applicable.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

Trace Organics Analysis

RPT Date: Dec 21, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Halton Sanitary and Combined Sewer Use By-law - Organics															
Oil and Grease (animal/vegetable) in water	5522846		< 0.5	< 0.5	NA	< 0.5	102%	60%	130%	108%	60%	130%	108%	60%	130%
Oil and Grease (mineral) in water	5522846		< 0.5	< 0.5	NA	< 0.5	84%	60%	130%	89%	60%	130%	83%	60%	130%
Methylene Chloride	5510971		< 0.0003	< 0.0003	NA	< 0.0003	110%	50%	140%	80%	60%	130%	104%	50%	140%
Chloroform	5510971		< 0.0002	< 0.0002	NA	< 0.0002	119%	50%	140%	106%	60%	130%	117%	50%	140%
Benzene	5510971		< 0.0002	< 0.0002	NA	< 0.0002	112%	50%	140%	103%	60%	130%	112%	50%	140%
Trichloroethene	5510971		< 0.0002	< 0.0002	NA	< 0.0002	85%	50%	140%	96%	60%	130%	108%	50%	140%
Toluene	5510971		< 0.0002	< 0.0002	NA	< 0.0002	98%	50%	140%	98%	60%	130%	102%	50%	140%
Tetrachloroethene	5510971		< 0.010	< 0.010	NA	< 0.010	86%	50%	140%	110%	60%	130%	90%	50%	140%
Ethylbenzene	5510971		< 0.0001	< 0.0001	NA	< 0.0001	103%	50%	140%	107%	60%	130%	104%	50%	140%
1,4-Dichlorobenzene	5510971		< 0.0002	< 0.0002	NA	< 0.0002	112%	50%	140%	91%	60%	130%	102%	50%	140%
Naphthalene	5542797		<0.0003	<0.0003	NA	< 0.0003	101%	50%	140%	78%	50%	140%	100%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

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Water Analysis

RPT Date: Dec 21, 2023

PARAMETER	Batch	Sample Id	DUPLICATE Dup #1	DUPLICATE Dup #2	DUPLICATE RPD	Method Blank	REFERENCE MATERIAL Measured Value	REFERENCE MATERIAL Acceptable Limits Lower	REFERENCE MATERIAL Acceptable Limits Upper	METHOD BLANK SPIKE Recovery	METHOD BLANK SPIKE Acceptable Limits Lower	METHOD BLANK SPIKE Acceptable Limits Upper	MATRIX SPIKE Recovery	MATRIX SPIKE Acceptable Limits Lower	MATRIX SPIKE Acceptable Limits Upper
Halton Sanitary and Combined Sewer Use By-law - Inorganics															
pH	5543207		7.66	7.83	2.2%	NA	100%	90%	110%						
Total Suspended Solids	5543135		<10	<10	NA	< 10	94%	80%	120%						
Fluoride	5542874		<0.05	<0.05	NA	< 0.05	109%	70%	130%	96%	80%	120%	102%	70%	130%
Sulphate	5542874		217	216	0.5%	< 0.10	94%	70%	130%	98%	80%	120%	NA	70%	130%
Cyanide, SAD	5537724		0.008	0.008	NA	< 0.002	107%	70%	130%	93%	80%	120%	108%	70%	130%
Phenols	5544045		<0.002	<0.002	NA	< 0.002	92%	90%	110%	95%	90%	110%	94%	80%	120%
Total Kjeldahl Nitrogen	5537724		4.63	4.63	0.0%	< 0.10	101%	70%	130%	97%	80%	120%	87%	70%	130%
Total Phosphorus	5542216	5542216	0.04	0.04	NA	< 0.02	99%	70%	130%	107%	80%	120%	120%	70%	130%
Total Aluminum	5543207		<0.010	<0.010	NA	< 0.010	94%	70%	130%	102%	80%	120%	90%	70%	130%
Total Antimony	5543207		<0.003	<0.003	NA	< 0.003	99%	70%	130%	101%	80%	120%	99%	70%	130%
Total Arsenic	5543207		<0.003	<0.003	NA	< 0.003	96%	70%	130%	99%	80%	120%	96%	70%	130%
Total Beryllium	5543207		<0.001	<0.001	NA	< 0.001	99%	70%	130%	108%	80%	120%	99%	70%	130%
Total Cadmium	5543207		<0.0001	<0.0001	NA	< 0.0001	101%	70%	130%	102%	80%	120%	96%	70%	130%
Total Chromium	5543207		<0.003	<0.003	NA	< 0.003	100%	70%	130%	100%	80%	120%	103%	70%	130%
Total Cobalt	5543207		<0.0005	<0.0005	NA	< 0.0005	100%	70%	130%	104%	80%	120%	103%	70%	130%
Total Copper	5543207		0.003	0.002	NA	< 0.002	100%	70%	130%	99%	80%	120%	98%	70%	130%
Total Iron	5543207		<0.050	<0.050	NA	< 0.050	96%	70%	130%	101%	80%	120%	97%	70%	130%
Total Lead	5543207		<0.0005	<0.0005	NA	< 0.0005	99%	70%	130%	95%	80%	120%	90%	70%	130%
Total Manganese	5543207		0.009	0.009	NA	< 0.002	99%	70%	130%	107%	80%	120%	103%	70%	130%
Total Mercury	5536620		<0.0002	<0.0002	NA	< 0.0002	99%	70%	130%	98%	80%	120%	93%	70%	130%
Total Molybdenum	5543207		<0.002	<0.002	NA	< 0.002	104%	70%	130%	88%	80%	120%	109%	70%	130%
Total Nickel	5543207		<0.003	<0.003	NA	< 0.003	99%	70%	130%	106%	80%	120%	100%	70%	130%
Total Selenium	5543207		<0.002	<0.002	NA	< 0.002	96%	70%	130%	100%	80%	120%	96%	70%	130%
Total Silver	5543207		0.0003	0.0003	NA	< 0.0001	103%	70%	130%	100%	80%	120%	97%	70%	130%
Total Tin	5543207		<0.002	<0.002	NA	< 0.002	99%	70%	130%	102%	80%	120%	100%	70%	130%
Total Titanium	5543207		0.039	0.037	NA	< 0.010	98%	70%	130%	100%	80%	120%	96%	70%	130%
Total Zinc	5543207		<0.020	<0.020	NA	< 0.020	105%	70%	130%	110%	80%	120%	105%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Dissolved Metals in Water (mg/L)															
Dissolved Aluminum	5542216	5542216	0.013	0.012	NA	< 0.004	105%	70%	130%	104%	80%	120%	106%	70%	130%
Dissolved Antimony	5542216	5542216	<0.001	<0.001	NA	< 0.001	99%	70%	130%	106%	80%	120%	109%	70%	130%
Dissolved Arsenic	5542216	5542216	0.002	0.002	NA	< 0.001	101%	70%	130%	101%	80%	120%	109%	70%	130%
Dissolved Beryllium	5542216	5542216	<0.0005	<0.0005	NA	< 0.0005	105%	70%	130%	98%	80%	120%	118%	70%	130%
Dissolved Cadmium	5542216	5542216	<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	96%	80%	120%	101%	70%	130%
Dissolved Chromium	5542216	5542216	<0.002	<0.002	NA	< 0.002	100%	70%	130%	100%	80%	120%	98%	70%	130%
Dissolved Cobalt	5542216	5542216	<0.0008	<0.0008	NA	< 0.0005	101%	70%	130%	97%	80%	120%	106%	70%	130%

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Water Analysis (Continued)

RPT Date: Dec 21, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Copper	5542216	5542216	<0.001	<0.001	NA	< 0.001	100%	70%	130%	99%	80%	120%	100%	70%	130%
Dissolved Iron	5542216	5542216	0.046	0.027	NA	< 0.010	96%	70%	130%	117%	80%	120%	99%	70%	130%
Dissolved Lead	5542216	5542216	<0.0005	<0.0005	NA	< 0.0005	103%	70%	130%	101%	80%	120%	100%	70%	130%
Dissolved Manganese	5542216	5542216	0.049	0.046	6.3%	< 0.002	96%	70%	130%	100%	80%	120%	102%	70%	130%
Dissolved Molybdenum	5542216	5542216	0.009	0.006	NA	< 0.002	102%	70%	130%	107%	80%	120%	106%	70%	130%
Dissolved Nickel	5542216	5542216	0.007	0.007	NA	0.002	102%	70%	130%	97%	80%	120%	100%	70%	130%
Dissolved Selenium	5542216	5542216	<0.001	<0.001	NA	< 0.001	98%	70%	130%	100%	80%	120%	101%	70%	130%
Dissolved Silver	5542216	5542216	<0.0001	0.0002	NA	< 0.0001	100%	70%	130%	100%	80%	120%	95%	70%	130%
Dissolved Tin	5542216	5542216	<0.002	<0.002	NA	< 0.002	101%	70%	130%	101%	80%	120%	104%	70%	130%
Dissolved Titanium	5542216	5542216	<0.003	<0.003	NA	< 0.002	96%	70%	130%	87%	80%	120%	95%	70%	130%
Dissolved Zinc	5542216	5542216	<0.005	<0.005	NA	< 0.005	101%	70%	130%	94%	80%	120%	100%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

CBOD5

Biochemical Oxygen Demand, Carbonaceous	5538272		<120	<120	NA	< 2	96%	70%	130%						

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

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Method Summary

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AGAT WORK ORDER: 23T103703

PROJECT: SP23-1265-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:159 Confederation St., Halton

SAMPLED BY:Hiva Elhami

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Trace Organics Analysis			
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 3510C & SM5520	BALANCE
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 3510C & SM5520	BALANCE
Methylene Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Chloroform	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Trichloroethene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Naphthalene	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS
Toluene-d8	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Naphthalene-d8	ORG-91-5105	modified from EPA 3510C and EPA 8270E	GC/MS

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Biochemical Oxygen Demand, Carbonaceous	INOR-121-6023	SM 5210 B	INCUBATOR
Dissolved Aluminum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Antimony	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Arsenic	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Beryllium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cobalt	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Iron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Manganese	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Molybdenum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Nickel	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Selenium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Silver	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Tin	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Titanium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Cyanide, SAD	INOR-93-6051	modified from MOECC E3015; SM 4500-CN- A, B, & C	SEGMENTED FLOW ANALYSIS
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

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PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Titanium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

APPENDIX E

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Short Term Dewatering Calculations for 159 Confederation St. (BH/MW-01) Service Trenching

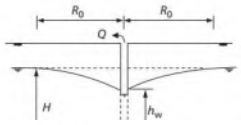
Groundwater Dewatering Calculation (Q1)

A- Initial Water Level Elevation (m)	B - Assumed Aquifer Bottom Elevation (m)	C - Target Water Level Elevation (m)	D - Assumed Bottom of Dewatering Well (m)
248.6		247.2	246.2

Partially Penetrating Well Method

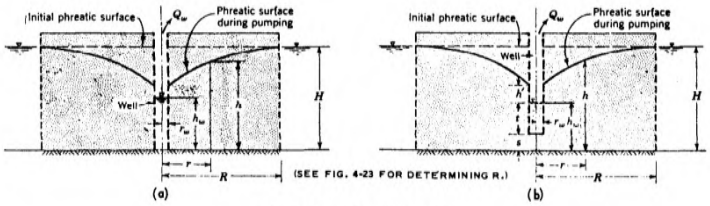
H-s = A-D (m)	t =C-D (m)	s=D-B (m)	k (m/s)	a (m)	b (m)	Eq. 7.1 re (m)	Eq. 7.2 re (m)	Average re (m)	Zone of Influence from Center of Excavation Ro (m)	Zone of Influence from Edge of Excavation R	No safety factor Q1 (L/day)	safety factor of 3.0 Q1 (L/day)
2.4	1		1.94E-06	333.5	6	18.3	25.2	21.8	28	6	**10,530**	**31,590**

Fully penetrating well, unconfined aquifer, circular source at distance R_0 (Dupuit–Forcheimer equation)



$$Q = \frac{\pi k\left(H^2 - h_w^2\right)}{\ln\left[R_0/r_e\right]} \qquad (7.5)$$

k = soil permeability;
H = initial water table level in aquifer;
h_w = lowered water level in equivalent well;
r_e = equivalent radius of well;
R_0 = radius of influence.



FULLY PENETRATING WELL

FLOW, Q_w, OR DRAWDOWN, $H^2 - h^2$, NEGLECTING HEIGHT OF FREE DISCHARGE, h' (CONDITION (a)).

$$Q_w = \frac{\pi k (H^2 - h^2)}{\ln (R/r)} \qquad (1) \qquad \text{OR} \qquad Q_w = \frac{\pi k \left(H^2 - h_w^2\right)}{\ln (R/r_w)} \qquad (2)$$

FLOW, Q_w, TAKING h' INTO ACCOUNT (b) CAN BE ESTIMATED ACCURATELY FROM EQ 2 USING HEIGHT OF WATER, $t + s$ ($s = 0$ FOR FULLY PENETRATING WELL), FOR THE TERM h_w.

FULLY OR PARTIALLY PENETRATING WELL

FLOW, Q_w, FOR ANY GRAVITY WELL WITH A CIRCULAR SOURCE

$$Q_w = \frac{\pi k[(H - s)^2 - t^2]}{\ln (R/r_w)} \left[1 + \left(0.30 + \frac{10 r_w}{H}\right) \sin \frac{1.8s}{H}\right] \qquad (3)$$

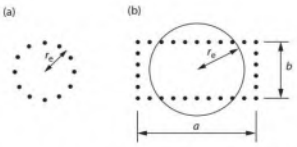


Figure 7.5 Equivalent radius of arrays of wells. (a) Circular system of radius r_e. (b) Rectangular system.

plan dimensions a by b, the equivalent radius can be estimated by assuming a well of equal perimeter

$$r_e = \frac{(a+b)}{\pi} \qquad (7.1)$$

or equal area

$$r_e = \sqrt{\frac{ab}{\pi}} \qquad (7.2)$$

RADIUS OF INFLUENCE, R, CAN BE ESTIMATED FOR BOTH ARTESIAN AND GRAVITY FLOWS BY

$$R = C\,(H - h_w)\sqrt{k} \qquad (1)$$

WHERE R, H, AND h_w ARE DEFINED PREVIOUSLY AND EXPRESSED IN FEET. COEFFICIENT OF PERMEABILITY, k, IS EXPRESSED IN 10^{-4} CM/SEC.

AND C = 3 FOR ARTESIAN AND GRAVITY FLOWS TO A WELL.

C = 1.5 TO 2.0 FOR A SINGLE LINE OF WELLPOINTS.

2) Stormwater runoff as per 20 mm per day

Precipitation	Site Area	Q2
m/day	m2	L/day
0.02	333.5	6670

Total Dewatering Volume Q = Q1 + Q2

Q= **6,670** L/day

Total Q **38,260** L/day

APPENDIX F

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

DETAILED WATER BALANCE CALCULATIONS

159 Confederation Street, Halton Hills, ON

1 Climate Information

Precipitation	898	mm/a
Actual Evapotranspiration	529	mm/a
Water Surplus	369	mm/a

2 Infiltration Rates

Table 2 Approach - Infiltration factors

Topography: Flat to rolling Land	0.25	
Soil Type: predominantly open sandy loam	0.4	
Cover: Open Land	0.1	
Total	**0.75**	
Infiltration (0.75 x 369)	277	mm/a
Run-off (369-277)	92	mm/a

Table 3 Approach - Typical Recharge Rates

Coarse Sand and Gravel	>250	mm/a
Fine to medium sand	200-250	mm/a
Silty sand to sandy silt	150-200	mm/a
Silt	125-150	mm/a
Clayey Silt	100- 125	mm/a
Clay	<100	mm/a

Site development area is underlain predominantly by SILTY SAND to SANDY SILT soils

Based on the above, the recharge rate is typically 150-200 mm/a

3 Pre-Development Property Statistics	**ha**	**m2**
Paved Area	0	0
Roof Area	0.001	10
Landscape Area	12.2637	122637
Total	**12.2647**	**122647**

4 Post-Development Property Statistics	**ha**	**m2**
Paved Area	1.08398	10840
Total Building Roof Area	1.7822	17822
Landscape Area	9.3985	93985
Total Land Area	**12.26468**	**122647**

5. Annual Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	0	0	0	0	0
	Roof Area	10	9	1	0	8
Pervious Areas	Landscape Area	122,637	110,128	64,875	33,940	11,313
		122,647	**110,137**	**64,876**	**33,940**	**11,321**
Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.						

6. Annual Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	10840	9,734	973	0	8,761
	Roof Area	17822	16,004	1,600	0	14,404
Pervious Areas	Landscape Area	93985	84,399	49,718	26,010	8,670
		122,647	**110,137**	**52,292**	**26,010**	**31,835**
Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and general roof areas.						

7. Comparision of Pre- and Post -Development

	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	**110,137**	**64,876**	**33,940**	**11,321**
Post-Development	**110,137**	**52,292**	**26,010**	**31,835**
Change in Volume		**-12584**	**-7929**	**20513**
Change in %			**-23**	**181**

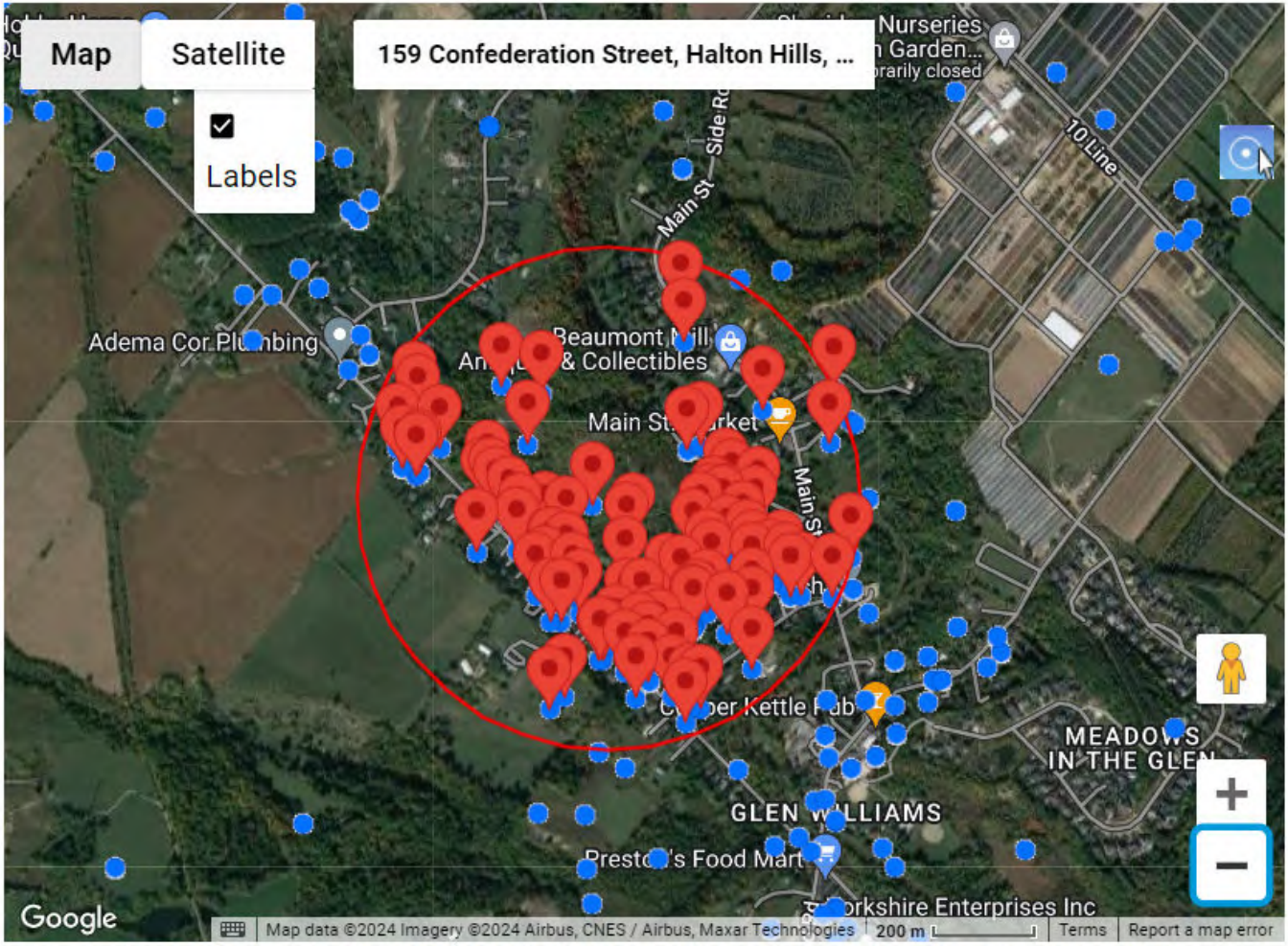
8. Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration (m^3/annum)	**33,940**
Volume of Post-Development Infiltration (m^3/annum)	**26,010**
Deficit from Pre to Post Development Infiltration (m^3/annum)	**7,929**
Percentage of Roof Runoff required to match the pre-development infiltration (%)	**55**

APPENDIX G

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions



Latitude:43.68279, Longitude:-79.93932 (UTM Zone:17, Easting:585491, Northing:4837189)

UTM Z E
9 R N
Elev. 5 R 9
Basin 2 4
Lot - 22
(Glen Williams)

ONTARIO

28 No 1491

The Well Drillers Act

Department of Mines, Province of Ontario

Water Well Record

County or Territorial District Halt — ESQUESSING. — (Glen Williams)
[redacted] ~~Village, Town or City~~ (Town or City) Glen Williams P.O.
(day) (month) (year) Cost of Well (excluding pump)

Pipe and Casing Record

Casing diameter(s) 4½"
Length(s) of casing(s) 63' 6"
Type of screen
Length of screen
Distance from top of screen to ground level
Is well a gravel-wall type?

Pumping Test

Date May 7
Static level 32 ft
Pumping level to the bottom
Pumping rate 1 gal per min
Duration of test
Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral) slightly mineral brine
Quality (hard, soft, contains iron, sulphur, etc.) hard
Appearance (clear, cloudy, coloured) clear
For what purpose(s) is the water to be used? house

How far is well from possible source of contamination?
What is the source of contamination?
Enclose a copy of any mineral analysis that has been made of water

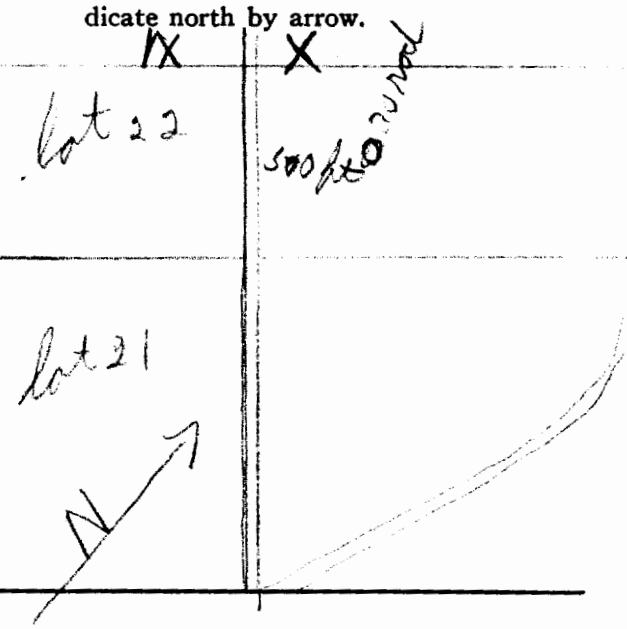
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
63+85	slightly mineral	

Well Log

Overburden and Bedrock Record	From	To
Clay with gravel stones	0 ft.	60 ft.
red shale	60	85'

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside? upland
Drilling Firm J. R. Sprowl & son
Address RR 4 Acton
Name of Driller J. R. Sprowl & son — Address RR 4 Acton
Date May 1954 — Licence Number 222
John R Sprowl
Signature of Licensee
Per B D

FORM 5

UTM | Z | E | N

Elev. 95 R

Basin 24

Lot 22 (Glen Williams)

ONTARIO

The Water-well Drillers Act, 1954

Department of Mines

RECEIVED
MAR 14 1957
GEOLOGICAL BRANCH
DEPARTMENT OF MINES

28 No 1493

Water-Well Record

County or Territorial District Halton

[redacted]

Township, Village, Town or City Esquesing (Glen

Town Village, Town or City) Williams)

Address Glen Willams P.O.

Date completed [redacted] (day) [redacted] (month) 1956 (year)

Pipe and Casing Record

Casing diameter(s) 6½

Length(s) 86'

Type of screen

Length of screen

Pumping Test

Static level Nil dry

Pumping rate

Pumping level

Duration of test

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
Loose fill(cinders)	0	5			
Sandy clay	5	26			
Blue Clay	26	52			
Red clay Till(pebble)	52	71			
Silt	71	75			
very fine sand	75	85			
Shale (red)	85	150			

For what purpose(s) is the water to be used?
Concrete Block Plant Dry

Is water clear or cloudy?

Is well on upland, in valley, or on hillside?
Hillside

Drilling firm Brodie & Dennis

Address 11 Byron Street
Georgetown, Ont.

Name of Driller F.M. Dennis

Address 11 Byron St. Georgetown, Ont.

Licence Number 81

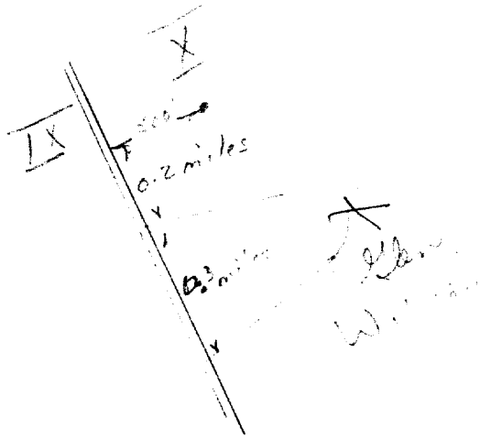
I certify that the foregoing statements of fact are true.

Date Mar 6/57 [signature]

Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

UTM Z unplot E
9 R N
Elev. 5 R
Basin C 24 X
LOT 22

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

28 No 1496
WATER BRANCH
1958
WATER COMMISSION

Water-Well Record

County or Territorial District HALTON Township, ~~Village, Town or City~~ ESQUESING
[redacted] n Village, ~~Town or City~~)
Address GLEN WILLIAMS

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 6 1/4"
Length(s) 19 FT
Type of screen
Length of screen

Pumping Test

Static level 6 FT
Pumping rate 2½ G.P.M.
Pumping level 24 FT
Duration of test 2 HRS

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
TOP SOIL	0	1			
YELLOW CLAY	1	15'			
RED CLAY	15'	17			
RED SHALE	17	42	42	36	FRESH

For what purpose(s) is the water to be used? HOUSE
Is water clear or cloudy? CLEAR
Is well on upland, in valley, or on hillside? VALLEY
Drilling firm F.M. DENNIS
Address GEORGETOWN

Name of Driller SAME
Address

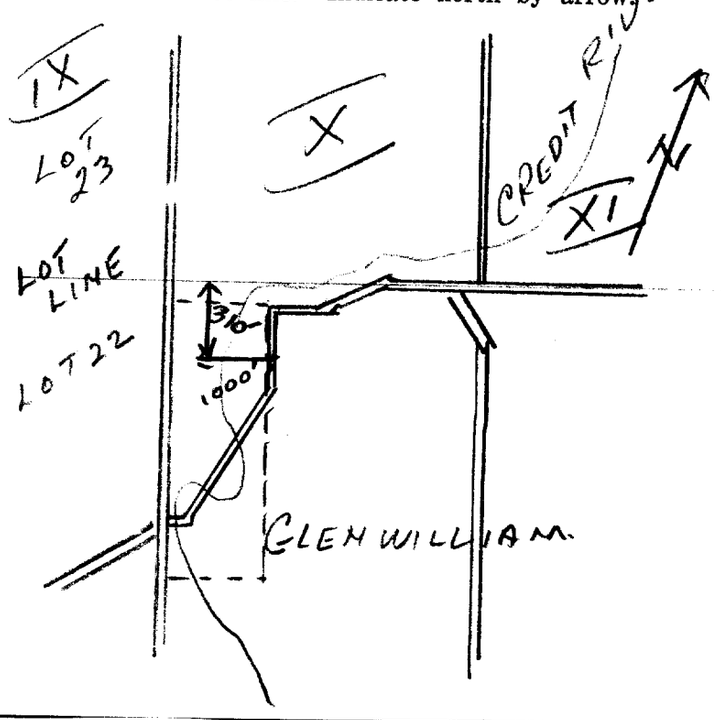
Licence Number

I certify that the foregoing statements of fact are true.

Date NOV 5/58 J. Dennis
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

UTM | | Z | | | | | | | E unplot.

	5	R							N

Elev. 4 R X

Basin 24 Z 2

The Ontario Water Resources Commission Act, 1957

28 No. 1497

WATER WELL RECORD

County or District HALTON Township, Village, Town or City

Con. [redacted] Lot Date completed 15 July (day month year)

[redacted] dress

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 68'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 30

Test-pumping rate 6 G.P.M.

Pumping level 45

Duration of test pumping 8 HRS.

Water clear or cloudy at end of test CLEAR

Recommended pumping rate 6 G.P.M.

with pumping level of 45

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
BROWN CLAY	0	37			
GRAVEL & BOULDERS	37	62			
BLUE SHALE	62	67			
RED SHALE	67	96	72		
			96	66	FR

For what purpose(s) is the water to be used?

HOUSE

Is well on upland, in valley, or on hillside?

Drilling Firm J. E. O'ROURKE

Address [redacted]

Licence Number

Name of Driller

Address

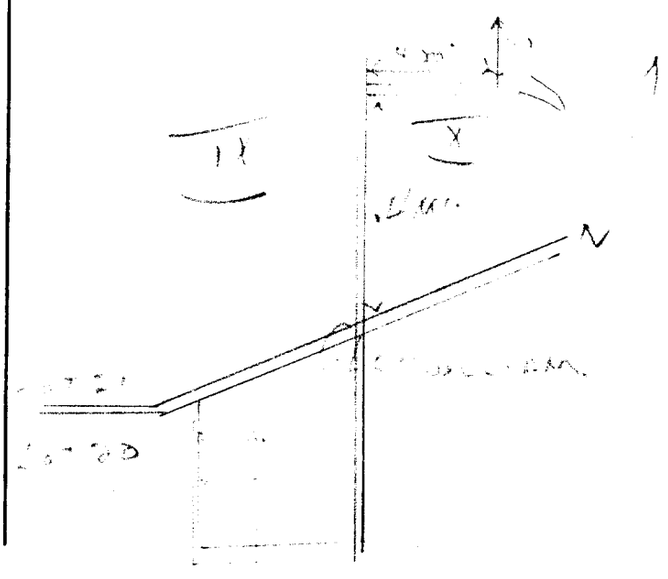
Date JAN. 7/60

J E O'Rourke

(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



UTM Z E unplot.
R N
Elev. R
Basin 29 X
Lot 22

The Ontario Water Resources Commission Act, 1957

GROUND WATER BRANCH
28 No. 1498
DEC 7 1960
ONTARIO WATER RESOURCES COMMISSION

WATER WELL RECORD

County or District Halton Township, Village, Town or City Esquesing
Con 10 Lot 22 Date completed 3 (day) Dec. (month) 1960 (year)
[redacted] Address Glen Williams (Crescent Drive)

Casing and Screen Record

Inside diameter of casing 5"
Total length of casing aprox 72½ ft.
Type of screen none
Length of screen —
Depth to top of screen —
Diameter of finished hole 5"

Pumping Test

Static level 47 ft.
Test-pumping rate 1 G.P.M.
Pumping level 104
Duration of test pumping 3 hrs
Water clear or cloudy at end of test clear
Recommended pumping rate ¾ G.P.M.
with pumping level of aprox 95 ft.

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
Previously Drilled to 96' and caved back to 57'	0	96'	73-96 (¾ gpm. aprox)	10'	fresh
Red shale	96'	106'	102' (½ gal per min)	55'	fresh

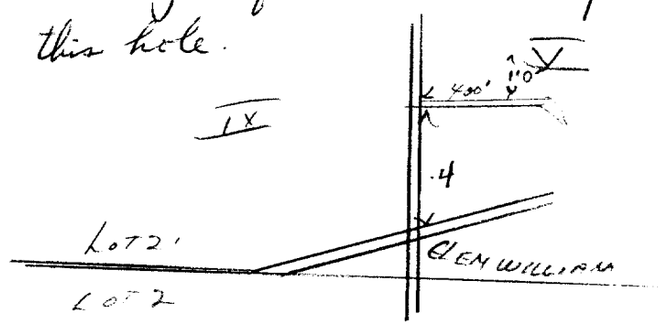
Water Record

For what purpose(s) is the water to be used?
Domestic Supply
Is well on upland, in valley, or on hillside?
On hillside
Drilling Firm
Address
Licence Number 419
Name of Driller Alon P. Jacobson.
Address 175 Main St. N. Georgetown
Date Dec 3/60.
Alon P Jacobson.
(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.

See J. O'Rourke's map for location & previous drilling information on this hole.



Form 5
15M-58-4149

UTM Z E unplot.
R N
Elev R
Basin 24

The Ontario Water Resources Commission Act

WATER WELL RECORD

GROUND WATER BRANCH
28 No. 1560

County or District HALTON Township, Village, Town or City ESQUISING
Con. 10 Lot WEST PART 22 Date completed SEPT. 14 (day) month 1962 (year)
[redacted] dress GLEN WILLIAMS

Casing and Screen Record

Inside diameter of casing 7"
Total length of casing 39'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 7"

Pumping Test

Static level 29-2½"
Test-pumping rate 1½ to 2 G.P.M.
Pumping level 35'
Duration of test pumping 6 hrs.
Water clear or cloudy at end of test A LITTLE CLOUDY
Recommended pumping rate 1½ G.P.M.
with pump setting of 40 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
GRAVEL + LOAM	0	4		
CLAY + GRAVEL	4	13		
BROWN CLAY	13	23		
SANDY CLAY	23	34		
SILTY SAND	34	38		
SAND + GRAVEL	38	41	38 - 41	FRESH.

For what purpose(s) is the water to be used? HOUSE

Is well on upland, in valley, or on hillside? HILLSIDE
Drilling or Boring Firm N. BARNHARDT
Address R.R.2 BRAMPTON
Licence Number 774
Name of Driller or Borer N. BARNHARDT
Address R.R. 2 BRAMPTON
Date SEPT. 14 1962

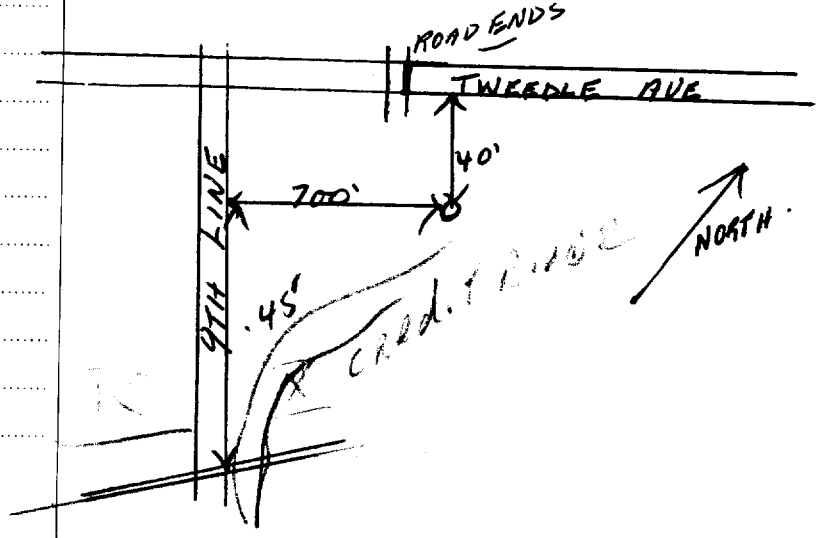
N. Barnhardt
(Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

30M12W-

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11) 2805318 MUNICIP. 28001 CON. CON 10

COUNTY OR DISTRICT: [redacted] Hills | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: ESQUESING | CON., BLOCK, TRACT, SURVEY, ETC.: 10 | 022

[redacted] GLEN CRESCENT GLEN WILLIAMS | DATE COMPLETED: DAY 27 MO 11 YR 78

[redacted] 835950 5 0830 5 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
DK. BROWN	TOPSOIL			0	1
BROWN	SAND MED.			1	15
BROWN	~~SAND~~ SILT	SAND		15	38
GREY	SILT	SAND		38	49

(31) 0001160265 0015609 0038606028 0049206628

(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0036	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
30"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE		0	~~49~~ 0049
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET	MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER ETC.)
~~0~~ 10-13	~~10~~ 14-17	PUDDLED CLAY
18-21	22-25	
26-29	30-33	

(71) PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	GPM	HOURS MINS

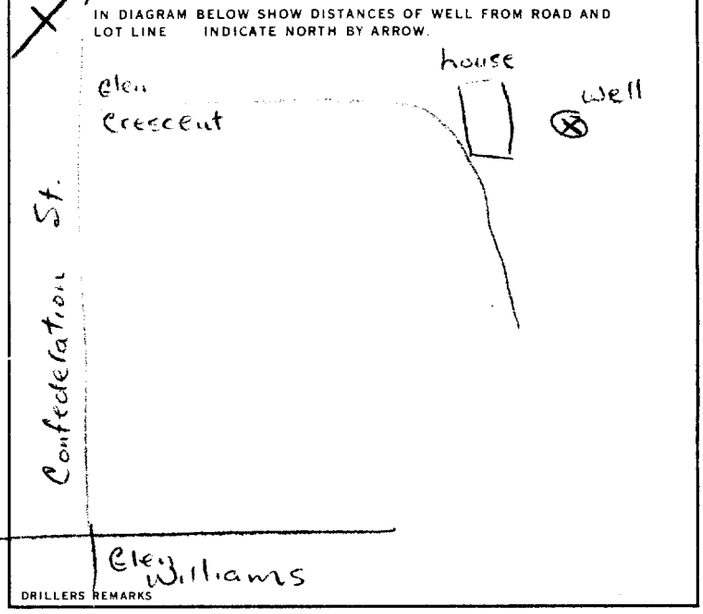
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING 1 ☐ PUMPING 2 ☒ RECOVERY			
		~~048~~ 5 MINUTES	~~048~~ 10 MINUTES	~~047~~ 30 MINUTES	60 MINUTES
035 FEET	048 FEET	~~FEET~~	~~FEET~~	~~FEET~~	047 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	047 FEET	0003 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: Glen Williams

FINAL STATUS OF WELL 1
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 6
1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☒ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: LEONARD RHODES | LICENCE NUMBER: 4640
ADDRESS: 20 JOSEPH ST STREETSVILLE
NAME OF DRILLER OR BORER: LEN RHODES | LICENCE NUMBER: 4640
SIGNATURE OF CONTRACTOR: L. Rhodes | SUBMISSION DATE: DAY 8 MO 2 YR 79

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 4640 | DATE RECEIVED 150279
DATE OF INSPECTION | INSPECTOR
REMARKS: Plotted June 21, 1979

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-4-77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 — 2807652 — MUNICIP 28091 — CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY ETC	LOT
Halton	Halton Hills	10	21

[redacted] tweedle St Glen Williams

DATE COMPLETED: DAY 25 MO 1 YR 90

NG 3614142 — RC. — ELEVATION 240 — RC. — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	GRAVEL	BOULDERS	HARD	0'	14'
BROWN	SAND	GRAVEL, BOULDERS	FIRM	14'	15'
RED	CLAY	BOULDERS	HARD	15'	26'
RED	GRAVEL	SAND	LOOSE	26'	28'
RED	SHALE	LIMESTONE SEAMS	HARD	28'	33'

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER (TASTE TEST ONLY)
14'	1 ☑ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
26'	1 ☑ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
32'	1 ☑ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
36"	1 ☐ STEEL 2 ☑ GALVANIZED 3 ☑ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	3"	2'6"	0
36"	1 ☐ STEEL 2 ☑ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	16 GAGUE	0'	20'
30" 28"	1 ☐ STEEL 2 ☑ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	16 GAGUE PEASTONE	18' 30'	30 33'

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	10	BENSEAL, NATIVE CLAY
		CEMENT TILE JOINT.

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☑ PUMP 2 ☐ BAILER	15 GPM	1 HOURS — MINS

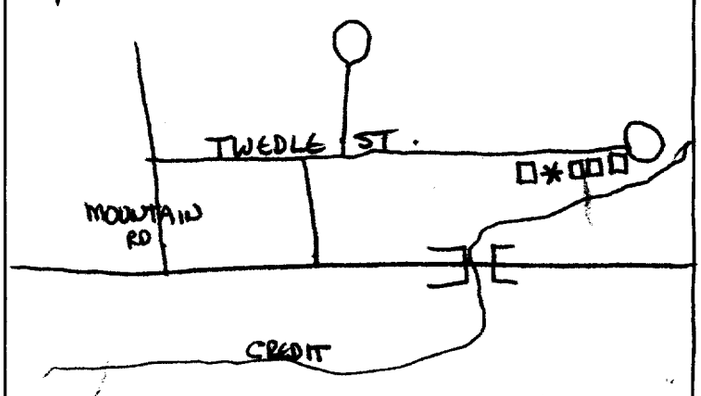
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☑ RECOVERY)	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
27' FEET	26'6" FEET		27' FEET	— FEET	— FEET	— FEET

IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST	RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
— GPM	31' FEET	1 ☑ CLEAR 2 ☐ CLOUDY	☐ SHALLOW ☑ DEEP	31' FEET	5 GPM

LOCATION OF WELL

N

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



GLEN WILLIAMS

41676

DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☑ WATER SUPPLY — 2 ☐ OBSERVATION WELL — 3 ☐ TEST HOLE — 4 ☐ RECHARGE WELL — 5 ☐ ABANDONED, INSUFFICIENT SUPPLY — 6 ☐ ABANDONED, POOR QUALITY — 7 ☐ UNFINISHED — ☐ DEWATERING

WATER USE

1 ☑ DOMESTIC — 2 ☐ STOCK — 3 ☐ IRRIGATION — 4 ☐ INDUSTRIAL — ☐ OTHER — 5 ☐ COMMERCIAL — 6 ☐ MUNICIPAL — 7 ☐ PUBLIC SUPPLY — 8 ☐ COOLING OR AIR CONDITIONING — 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL — 2 ☐ ROTARY (CONVENTIONAL) — 3 ☐ ROTARY (REVERSE) — 4 ☐ ROTARY (AIR) — 5 ☐ AIR PERCUSSION — 6 ☑ BORING — 7 ☐ DIAMOND — 8 ☐ JETTING — 9 ☐ DRIVING — ☐ DIGGING — ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: S.D. Smith Drilling Co Ltd — WELL CONTRACTOR'S LICENCE NUMBER: 4868

ADDRESS: RR#2 Acton Ontario L7J2L8

NAME OF WELL TECHNICIAN: Simon Smith — WELL TECHNICIAN'S LICENCE NUMBER: 7346

SIGNATURE OF TECHNICIAN/CONTRACTOR — SUBMISSION DATE: DAY 2 MO 2 YR 90

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR: 4868 — DATE RECEIVED: MAR 19 1990

DATE OF INSPECTION — INSPECTOR

REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Well ID	Well Record Information	Well Tag # (since 2003)	Audit #	Contractor Lic#	Well Depth (m)	Da Co (MI
2801403	PDF | HTML	N/A	N/A	4838	26.5	07/
2801413	PDF | HTML	N/A	N/A	4838	29.0	05/
2801414	PDF | HTML	N/A	N/A	4838	30.5	06/
2801415	PDF | HTML	N/A	N/A	4838	27.4	06/
2801416	PDF | HTML	N/A	N/A	4101	36.6	04/
2801417	PDF | HTML	N/A	N/A	1307	10.4	01/
2801418	PDF | HTML	N/A	N/A	1613	61.0	06/
2801419	PDF | HTML	N/A	N/A	1613	36.0	06/
2801420	PDF | HTML	N/A	N/A	1307	11.9	08/
2801471	PDF | HTML	N/A	N/A	4838	28.0	01/
2801474	PDF | HTML	N/A	N/A	4838	25.9	03/
2801476	PDF | HTML	N/A	N/A	4838	24.4	07/
2801477	PDF | HTML	N/A	N/A	4838	23.8	10/
2801483	PDF | HTML	N/A	N/A	1613	36.3	05/

2801484	PDF | HTML	N/A	N/A	1613	10.4	03/
2801486	PDF | HTML	N/A	N/A	1613	27.4	11/
2801488	PDF | HTML	N/A	N/A	4838	28.7	03/
2801489	PDF | HTML	N/A	N/A	4838	27.7	04/
2801490	PDF | HTML	N/A	N/A	4838	29.0	04/
2801491	PDF | HTML	N/A	N/A	4838	25.9	05/
2801492	PDF | HTML	N/A	N/A	1718	22.9	01/
2801493	PDF | HTML	N/A	N/A	1718	45.7	03/
2801495	PDF | HTML	N/A	N/A	4838	29.6	03/
2801496	PDF | HTML	N/A	N/A	1718	12.8	07/
2801497	PDF | HTML	N/A	N/A	4101	29.3	07/
2801498	PDF | HTML	N/A	N/A	2904	32.3	12/
2801500	PDF | HTML	N/A	N/A	1309	12.5	09/
2801501	PDF | HTML	N/A	N/A	1307	13.7	10/
2801504	PDF | HTML	N/A	N/A	1325	4.9	12/
2801506	PDF | HTML	N/A	N/A	1307	11.6	10/

2801507	PDF | HTML	N/A	N/A	4838	25.3	06/
2802908	PDF | HTML	N/A	N/A	4919	8.5	08/
2802909	PDF | HTML	N/A	N/A	1612	29.3	04/
2802910	PDF | HTML	N/A	N/A	1612	29.3	04/
2802943	PDF | HTML	N/A	N/A	3414	25.9	08/
2802997	PDF | HTML	N/A	N/A	1612	27.4	09/
2802998	PDF | HTML	N/A	N/A	1612	27.4	07/
2803078	PDF | HTML	N/A	N/A	1307	13.7	05/
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2804121	PDF | HTML	N/A	N/A	3637	11.3	12/
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2806258	HTML	N/A	N/A	3637	9.4	04/
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2806359	HTML	N/A	N/A	3637	7.0	04/
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2807021	PDF | HTML	N/A	35096	4919	8.2	07/
2807142	PDF | HTML	N/A	41618	4868	7.6	12/
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2807237	PDF | HTML	N/A	41627	4868	12.2	03/

2807250	PDF | HTML	N/A	47202	3349	35.1	01/
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2807552	PDF | HTML	N/A	41676	4868	10.1	01/
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2808063	PDF | HTML	N/A	104058	3349	27.4	05/
2810043	PDF | HTML	N/A	Z17922	2663	N/A	08/
7164858	PDF | HTML	N/A	Z127519	7407	N/A	06/
7247808	PDF | HTML	N/A	Z215253	7385	N/A	08/
7262263	PDF | HTML	N/A	Z216892	7407	N/A	04/
7272362	PDF | HTML	N/A	Z216909	7407	N/A	09/
7309092	PDF | HTML	N/A	Z267421	7556	N/A	03/
7331309	PDF | HTML	N/A	Z291469	7556	N/A	03/
7394399	HTML	A297049	C49711	7725	N/A	06/
7397616	HTML	A316588	Z367585	7230	N/A	07/
7397617	HTML	A316587	Z367586	7230	N/A	07/

7397617	HTML	A316587	Z367586	7230	N/A	07/
7397625	HTML	A316582	Z367584	7230	N/A	07/
7397626	HTML	A316583	Z367582	7230	N/A	07/
7397627	HTML	A316569	Z367583	7230	N/A	07/

APPENDIX H

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

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This report was produced by SIRATI for the Client and may not be relied upon by any other person or entity without the written authorization of SIRATI. The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SIRATI cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SIRATI has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

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In the event that during future work new information regarding the environmental/hydrogeological condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SIRATI should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.