Peto MacCallum Ltd.
CONSULTING ENGINEERS

HYDROGEOLOGICAL SITE ASSESSMENT
81 MARY STREET
BARRIE, ONTARIO
FOR
KBK ARCHITECTS INC.

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PML Ref.: 22TX030
Report 2
January 17, 2023

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ATTACHMENTS:

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PML Ref.: 22TX030
Report 2

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Dear Mr. Khadra

Hydrogeological Site Assessment
81 Mary Street
Barrie, Ontario

1. INTRODUCTION AND OBJECTIVES

1.1 Introduction

Peto MacCallum Ltd. (PML) was retained by KBK Architects to conduct a Hydrogeological Site Assessment (HSA) for developing the property at 81 Mary Street, Barrie, Ontario. The property (hereinafter referred to as the Site) area is about 518 m^2 located in the north western part of the City of Barrie (see Drawing 1). The Site is bounded by residential dwellings to the north and south, Mary Street to the west, and a parking lot to the east. It is understood that a three-storey building with no basement level is planned on the Site. Currently the Site is vacant with an existing granular driveway. The ground cover is mainly topsoil, and surficial fill in the central portion of the site with grass and brush near the site boundary. Several fill mounds were observed near the central portion of the Site. The existing ground surface at the site slopes down towards the east with topographic relief across the site being less than 0.5 m.

1.2 Previous Investigations

This assessment will utilize the findings of the following previous investigation of the Site:

- Geotechnical Investigation, Proposed Three Storey Building, 81 Mary Street, Barrie, Ontario, PML Ref.: 22TX030, Report:1, dated October 20, 2022.

1.3 Construction Dewatering Water Taking Permitting

Construction dewatering, like other water takings in Ontario, is governed by the Ontario Water Resources Act (OWRA) and the Water Taking and Transfer Regulation 387/04, a regulation under the OWRA. In accordance with these regulatory requirements, if the dewatering discharge is expected to be greater than 50,000 L/d and less than 400,000 L/d, and meets the requirements of Ontario Regulation (O. Reg.) 63/16, the water taking can be registered with the Ministry of Environment, Conservation and Park's (MECP's) Environmental Activity and Sector Registry (EASR). Otherwise, if the dewatering discharge is expected to be greater than 400,000 L/d, an application for a Permit-To-Take-Water (PTTW) must be filed with the MECP. Note that the 400,000 L/d threshold is during normal operations (i.e. extreme weather events are not included).

1.4 Objectives and Scope of Work

The objective of this investigation was to carry out a Hydrogeological Site Assessment to provide observations, assessment findings and recommendations in support of the proposed work and potential permitting for construction dewatering activities. The report has been prepared in accordance with the Ontario Water Resources Act (OWRA), O. Reg. 387/04 (Water Taking and Transfer) and is to be used in accordance with our Statement of Limitations, Appendix G.

Based on our knowledge of the regulatory compliance requirements and experience with the Site and similar assignments, the following paragraphs outline the tasks to be undertaken:

Task 1: Conduct a site background/historical review of the site information, geological and hydrogeological settings, previous water well records, water courses, topographic and hydrogeological maps, reports and documents compiled to date, review the proposed improvement conceptual drawings to estimate the scope of earthwork operations, determine the zone of influence;

Task 2: Review the geotechnical borehole locations, locate, clear, drill, log and install monitoring well in three (3) boreholes to a depth of about 7 m below grades (50 mm diameter with required screen, riser and casings) for groundwater sampling, level monitoring and borehole permeability testing;

The monitoring wells will be installed in accordance with the procedures outlined in Ontario Regulation 903 as amended to 128/03;

Select about three (3) samples and carry out grain size analyses (sieve and hydrometer) to determine the water bearing characteristics of the subsurface soil;

Task 3: Revisit the site to measure the ground water levels, conduct borehole permeability testing for hydraulic conductivity analysis/estimating soil permeability and retrieve representative ground water samples;

Task 4: Conduct chemical analyses on the ground water samples for parameters/substances listed in the listed in the City of Barrie Sewer Use By-Law to determine the ground water quality;

Task 5: Carry out a water balance study for the development area;

Task 6: Evaluate the site setting, background information, and field and laboratory data, and prepare a hydrogeological site conceptual model (HCSM) of the subject site and surrounding lands. Based on the investigation findings and geometric configuration of the proposed development features, characterize infiltration potential, water balance studies, carry out hydrogeological analyses, determine the requirements of temporary and permanent water taking and requirements of an EASR or PTTW and assess potential impacts, if any;

Task 7: Prepare a hydrogeological site assessment report including factual data, our interpretations, mitigation options and recommendations in relation to the work objectives and tasks outlined above;

Note: The hydrogeological investigation report will form the basis of PTTW and/or EASR application process, whichever is required for the respective Site.

The comments and recommendations provided in this report are based on the Site conditions at the time of the investigation, and are for preliminary design purposes only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed to ensure their applicability.

2. BACKGROUND REVIEW

2.1 Site Physiographic, Geologic and Hydrogeologic Settings

The Site is located within a broad physiographic region known as Simcoe Lowlands, within the mapped physiographic landform known as Sand Plains (“The Physiography of Southern Ontario”, Ministry of Natural Resources, 1984, Chapman, L.J. and Putnam, D.E.).

The OGS Earth map of Surficial Geology of Southern Ontario (Ontario Geological Survey, 2010), indicates that the overburden primarily consists of Glaciolacustrine deposits, such as sand and gravel.

The OGS Earth map of Paleozoic Geology of Southern Ontario (Armstrong and Dodge, 2007), indicates that the bedrock geology at the project area comprised mainly of Verulam of the Simcoe Group. According to the Ministry of Natural Resources Canada (Toporama) mapping, the ground surface elevation of the Site ranges from El. 227.0 to El. 228.0 m ASL.

The local conservation authority is the Lake Simcoe Region Conservation Authority (LSRCA). According to the LSRCA, the project area is located within the Barrie Creeks Watershed. Lake Simcoe is located about 510 m south east of the Site.

2.2 Site Vulnerability

According to the MECP's Source Protection Information Atlas, the Site is within the Lakes Simcoe and Couchiching/Black River Source Protection Area (SPA) and is in Wellhead Protection Area (WHPA) "C", as shown in Figure A - 1. The Site is within an area of Highly Vulnerable Aquifers or a Significant Groundwater Recharge Area (SGRA), as shown in Figure A - 2. The Site is within an issue contributing area, as shown in Figure A - 3. According to the Ministry of Natural Resources and Forestry, there are no designated wetlands within Site limits, as shown in Figure A - 4. The Site is not within a LSRCA regulated area.

2.3 MECP Water Well Records Review

The MECP Water Well Records database was searched for water well records in the vicinity of the Site (a 1030 m by 1030 m square area in UTM coordinates around the Site) and a summary list of the well record information is included in Appendix B. Several monitoring wells and domestic wells were found within a 500 m radius of the Site. The wells were drilled about 3.9 m to 91 m below ground surface. The overburden was typically loam or sand fill was encountered at depths of about 1.5 m to 12 m. Steady state groundwater levels were measured typically between depths of 0.6 m and 12 m.

3. FIELD WORK AND LABORATORY ANALYSES

3.1 Borehole Drilling and Monitoring Well Installation

This assessment will be based primarily on the findings at the boreholes drilled by a specialist contractor on September 23, 2022, and comprised five boreholes carried out at the locations indicated on Drawing 1, appended.

The boreholes were advanced using a drill rig fitted with continuous flight solid stem augers, powered by a truck mounted drill rig supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of PML's engineering staff who directed the drilling and sampling operations, documented the soil stratigraphy, monitored groundwater conditions and processed the recovered samples. The geodetic ground surface elevations and UTM co-ordinates at the borehole locations were determined by PML. The elevations provided in this report should not be used or relied upon for any other purposes.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) (ASTM D1586) were carried out during sampling operations in the boreholes using conventional split spoon equipment. Groundwater observations were made in the boreholes during and upon completion of drilling. The recovered soil samples were returned to PML's laboratory for detailed visual examination, and classification. The laboratory testing also included particle size distribution analyses on soil samples from each borehole.

Monitoring wells were installed in Boreholes 2, 3 and 4 to more accurately measure groundwater levels and to allow in-situ hydraulic conductivity testing and groundwater quality testing. The monitoring wells comprised 50 mm diameter Schedule 40 PVC pipes, slotted screens, filter sand, bentonite seals and protective casings and were constructed in accordance with O. Reg. 903 under the Water Resources Act. The well screens were installed at about 6.0 to 9.0 m depth, with a screened length of 1.5 m. The annular space of the borehole around the screen was backfilled with clean filter sand covered by a bentonite seal and stick-up protective cover set in concrete. The details, of the monitoring well construction, are shown on the appended Log of Borehole/Monitoring Well sheets. Well records will be kept on file by PML for future reference in accordance with O. Reg. 903/90, as amended

It is recommended that the wells be kept for monitoring purposes as long as possible and then decommissioned in accordance with O. Reg. 903 once they are no longer needed.

3.2 Purging and Groundwater Level Monitoring

The monitoring wells were purged, and after stabilization, the groundwater levels were recorded using a Solinst electric water meter tape. Groundwater level readings were measured manually on three (3) site visits from September 27, 2022 to November 8, 2022.

The results of the groundwater monitoring are listed on Table 1 and are discussed in Section 4.2.

3.3 Borehole Permeability Testing

To estimate the hydraulic conductivity of the overburden deposits, borehole permeability testing was conducted using a slug test in the monitoring wells of Boreholes 2, 3 and 4.

In the test, a volume of water (the ‘slug’) was rapidly removed from the monitoring well using a bailer, and periodic water level measurements were recorded manually using a Solinst flat tape water level meter and with an electronic transducer (a Solinst Levelogger), as the water level recovered to its natural state inside the well (a rising head test). If necessary, instead of removing water, a volume of water may be added to the well (a falling head test).

The hydraulic conductivity was estimated using Advanced Aquifer Test Solver Software (AQTESOLV PRO) for the hydro-stratigraphic units in which the monitoring wells were screened. A summary of well test analysis results for Boreholes 2, 3, and 4 are included in Appendix C.

To determine the hydraulic conductivity of the unconfined aquifers around tested boreholes, AQTESOLV was used to match a type curve solution to the water-level displacement data collected during slug test. The data was fitted on a semi-logarithmic scale, which, combined with the well- aquifer geometry, resulted in an estimation of hydraulic conductivity (K-value) for the soils in the vicinity of the well screen.

3.4 Soil Particle Size Distribution Analyses and Hydraulic Conductivity Estimate

Soil samples obtained from the boreholes were submitted to the PML laboratories for particle size distribution analyses.

In addition to in-situ permeability testing (Section 3.3), the hydraulic conductivity (K) value of three (3) selected soil samples was estimated using the grain size distribution and an empirical formula as described below. The particle size distribution curves of these soil samples are shown on Figures GS – 1 to GS – 2, attached.

The hydraulic conductivity of the sandy soils was estimated using the grain size distribution and the following equation (Vukovic and Soro, 1992):

$$K = C\, f(n) d_e^2 \frac{g}{\nu}$$

where:

- Hydraulic conductivity K has units of m/s
- Constant C = 8.3 x 10^{-3}, 2.4 x 10^{-3}, or 0.7 x 10^{-3} for coarse, medium, or fine-grained sand, respectively.
- Porosity function $f(n) = \frac{n^3}{(1-n)^2}$ where $n = 0.255\left(1 + 0.83^{C_u}\right)$ and $C_u = \frac{d_{60}}{d_{10}}$.
- Grain diameter d_x = grain diameter, in mm, for which x% of the sample is finer based on the grain size distribution curve.
- Effective grain size diameter, $d_e = f\left(\frac{d_{30}}{d_5}\right)$, where the soil uniformity d_{30}/d_5 and an empirical relationship (Vukovic and Soro, 1992) are applied to estimate the effective grain size diameter d_e.
- Gravitational constant g = 9.81 m/s^2.
- Groundwater kinematic viscosity ν = 1.3 x 10^{-6} m^2/s (at assumed 10°C).

The results of field permeability tests as well as the estimated K-values from particle size distribution test results are listed on Table 2.

3.5 Ground Water Sampling

In order to determine the management options for the potential discharge of groundwater, groundwater samples were collected from Borehole 4 on October 21, 2022. The groundwater samples were collected and analyzed in raw, unfiltered form.

The groundwater samples were collected using a Waterra Ecobailer. The samples obtained were immediately placed in bottles supplied by SGS Canada Inc. (SGS) and stored at low temperatures. The groundwater samples collected were delivered to SGS Canada Inc for chemical analyses. SGS is accredited by The Standards Council of Canada (SCC) and The Canadian Association for Laboratory Accreditation (CALA).

The chemical parameters analyzed and results are discussed in Section 4.4 and the Chain-of-Custody Record and the laboratory reports are included in Appendix D.

4. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the field work including soil classification, inferred stratigraphy, standard penetration resistance N-values, groundwater observations, piezometer details and laboratory test results.

Due to the soil sampling procedures and limited sample size, the depth/elevation demarcations on the borehole logs must be viewed as “transitional” zones between layers and cannot be construed as exact geologic boundaries between layers. PML should be retained during site works for further guidance if required.

4.1 Stratigraphy

The soil stratigraphy revealed in the boreholes generally consisted of topsoil veneer underlain by fill over variable layers of sand and/or silty sand, over a major sand and gravel deposits over sand.

Our summarized findings from the current investigation and interpretation of the Site subsurface conditions are presented below:

Topsoil

At the ground surface, about 50 to 200 mm of topsoil was contacted in Boreholes 1, 4 and 5.

Fill

Below the topsoil in Boreholes 1, 4 and 5 and from the ground surface in Boreholes 2 and 3, fill was contacted to 0.7 m depth in all boreholes. The fill consisted of silty sand, sand with trace to some gravel and sand and gravel. SPT N values in the fill ranged from 8 to 17, generally indicating a loose to compact condition. Moisture contents ranged from 2 to 9 %.

Upper Sand / Silty Sand

Variable layers of native sand and/or silty sand were contacted in all the boreholes to 2.4 to 4.0 m depth. SPT N values in this stratum ranged between 11 to 38 indicating a compact to dense condition. Moisture contents ranged from 2 to 18 %.

Sand and Gravel

Sand and gravel were contacted in all the boreholes and extended to 7.1 to 7.7 m in Boreholes 2 to 4. Boreholes 1 and 5 were terminated within this stratum at 5.0 m. SPT N values in this stratum ranged from 19 to 88 indicating a dense to very dense condition. Moisture contents ranged from 3 to 6 %.

Lower Sand

Below the sand and gravel, a lower sand with trace to some gravel was contacted in Boreholes 2 to 4, which were terminated at 8.1 to 9.6 m within this stratum.

4.2 Groundwater Conditions

The groundwater conditions at the Site are represented by the observations of the soil conditions recorded during drilling, groundwater level upon drilling completion and the groundwater levels recorded in the monitoring wells.

4.2.1 Observations During Drilling

Groundwater was first contacted (first strike) in boreholes 2 to 4 at a depth of 7.0 m. Ground water was measured in the open boreholes at 5.9 to 6.2 m on completion of drilling. The remaining boreholes were dry on completion of drilling. Boreholes 2 to 4 were open to the drilled depth on completion of drilling. Boreholes 1 and 5 caved at 4.0 and 3.4 m, respectively, on completion of drilling. Monitoring wells were installed in Boreholes 2 to 4. Groundwater levels were measured at 6.3 to 6.4 m within the monitoring wells installed in Boreholes 2 to 4 on September 27, 2022, about four days after completion of drilling.

Groundwater levels are subject to seasonal fluctuation and should be expect Groundwater levels are subject to seasonal variation and will fluctuate in response to precipitation.

4.2.2 Groundwater Level Monitoring

Hydrostatic groundwater level readings were measured manually at three (3) monitoring wells during three (3) Site visits from September 27, 2022 to November 8, 2022. The groundwater levels are summarized in Table 1. The highest hydrostatic groundwater level (El. 222.6 m ASL) was measured at Borehole 2 on September 27, 2022 and November 8, 2022 and in Borehole 4 on November 8, 2022. During the period monitored, the groundwater elevations in all Boreholes were relatively stable due to the urban setting of the Site and vicinity. However, groundwater levels at the Site are subject to seasonal fluctuations due to weather patterns and variations in precipitation and climate.

The findings indicate that groundwater was typically encountered during drilling in the sandy gravel in all boreholes.

4.3 Estimated Hydraulic Conductivity

The hydraulic conductivity K-values of the soils encountered surrounding the monitoring well screens at Boreholes 2, 3, and 4 were estimated using in-situ permeability test data (slug tests) as described in Section 3.3. Hydraulic conductivity was also estimated using grain size distribution test results as described in Section 3.4. The results are listed on Table 2.

The hydraulic conductivity estimated at boreholes 2, 3, and 4 ranged from 5×10^{-3} cm/s to 4×10^{-2} cm/s based on slug tests. In addition, hydraulic conductivity was estimated from soil sample grain size distribution (GSD) results. For the sand and gravel samples, the estimated hydraulic conductivity at Boreholes 2 and 3 ranges from 5×10^{-4} cm/s to 3×10^{-3}. For the silty sand sample, the estimated hydraulic conductivity at Borehole 4 was estimated to be 8×10^{-5} cm/s.

4.4 Groundwater Sample Chemical Test Results

The chemical analysis carried out by SGS on the groundwater samples were conducted in accordance with the protocols described in Section 3.5 and the chain-of-custody records included in the laboratory reports in Appendix D.

To provide an assessment of how the dewatering discharge water may compare to expected regulatory compliance criteria for discharge to a municipal sewer, the water quality of the non-filtered water samples collected from Borehole 4 was compared to the City of Barrie storm and sanitary sewer by-law limits.

The non-filtered groundwater sample was analyzed and the results complied with the criteria of the storm and sanitary sewer by-law limits with the exception of the elevated parameters listed in Table A below.

TABLE A

ELEVATED GROUNDWATER SAMPLE CONCENTRATIONS
FOR VARIOUS DISCHARGE RECEIVERS

PARAMETER	WATER SAMPLE CONCENTRATION	SEWER BY-LAW CONCENTRATION LIMIT	
	Borehole 4	City of Barrie Sanitary	City of Barrie Storm
Total Suspended Solids (TSS)	17	350	15

The unfiltered groundwater sample findings indicate that the discharge water, if untreated, is expected be compliant City of Barrie storm and sanitary sewer discharge with the exception of Total Suspended Solids (TSS).

It is recommended that the discharge water be treated by filter bags or a sedimentation tank to reduce the suspended solids concentration prior to discharge to a sewer system. Additional treatment methods may be required to achieve compliance. It is recommended that a dewatering specialist be consulted for treatment options. Prior to dewatering, additional groundwater sampling with field-filtering of the groundwater samples could be used to assess the potential effectiveness of filtering or sedimentation as a treatment method. PML should be consulted for a discharge water quality analysis and the compliance monitoring plan.

4.5 Infiltration

4.5.1 Introduction

Due to wetting and drying cycles of soils, water flow occurs in two zones: the aeration (capillary fringe) zone, and below it, the saturated zone, where the demarcation between the two zones is usually referred to as the groundwater phreatic surface or water table. The movement of water in the aeration zone is infiltration and is governed by negative capillary suction (less than atmospheric pressure) whereas the water flow in the saturated zone is percolation and is controlled by positive hydrostatic pressure (or head).

4.5.2 Infiltration Assessment

As a preliminary assessment of infiltration at the Site, the findings from the grain size distribution assessment of soil samples and borehole permeability testing conducted in the boreholes and corresponding percolation T-value and infiltration rate are summarized in Table B, below.

TABLE B

SUMMARIZED K- VALUE, T-VALUE, AND INFILTRATION RATE

BOREHOLE (BH) / MONITORING WELL (MW) No.	SOIL DEPOSIT (SAMPLE NO., DEPTH)	FIELD SATURATED HYDRAULIC CONDUCTIVITY K_{fs} (cm/s)	PERCOLATION TIME T-VALUE(2) (mins/cm)	INFILTRATION RATE(2) (mm/hr)
BH/MW 2	Sand and Gravel (SS 5, 3.1 to 3.5)	5×10^{-4} to 3×10^{-3} (1)	5 to 8	71 to 115
BH/MW 3	Sand and Gravel (SS 5, 3.1 to 3.5)			
BH/MW 4	Silty Sand (SS 3, 1.5 to 2.1)	8×10^{-5} (1)	14	44

Notes:

1. K_{fs} determined from assessment of soil sample grain size curve (see Section 3.4).
2. Interpolated T-value and Infiltration rate based on K_{fs} according to TRCA Stormwater Management Criteria.

4.5.3 Discussion

The near-surface soils at the boreholes typically consisted of topsoil veneer underlain by fill over variable layers of sand and / or silty sand overlain by sand and gravel. For the preliminary infiltration assessment, soil sample grain size findings were used to determine the hydraulic conductivity of the sand and gravel and silty sand.

In general, the encountered soils have high infiltration potential according to the Ontario Building Code (2003). The estimated infiltration rate for sand and gravel (71 to 115 mm/hr) falls within the range of infiltration rate values provided in the Ontario Building Code (2003) reported to be from 50 to 300 mm/hr. The estimated infiltration rate for silty sand mixtures (71 to 115 mm/hr) falls within the range of infiltration rate values provided in the Ontario Building Code (2003) reported to be from 30 to 75 mm/hr.

Since the minimum guideline value recommended for underground infiltration facilities, such as, infiltration trenches and soakaway pits in “Stormwater Management and Planning Design Manual”, by MECP, dated 2003, is 15 mm/hr, the silty sand, sand and sand and gravel at this site is suitable for underground infiltration facilities and would generally be deemed acceptable soil for underground infiltration. The bottom of any proposed infiltration facilities must be at least 1.0 m above the high ground water level.

5. WATER BALANCE, RECHARGE AND BASEFLOW

5.1 Introduction

The precipitation of the hydrologic cycle partitions into runoff, evapotranspiration and infiltration. The portion of the infiltration that reaches the ground water table is considered the “ground water recharge” and the portion of the ground water flow to wetlands, ponds, and creeks is considered the “baseflow”. The main purpose of the water balance (or budget) analysis is to estimate the current (or predevelopment) infiltration rates to the subsurface to allow comparison with the estimated rates expected after development of the site (which change primarily due to the increase in hard-surfaced area, such as roof tops, streets and driveways).

The amount of infiltration in an area to be developed is largely dependent not only on precipitation rates, but upon the infiltration capacity of the area and the nature of the proposed development. For example, areas underlain by fine-grained silt and clayey soils and dense till materials, having naturally low infiltration capacity, will likely experience relatively little reduction in infiltration as a result of hard surfacing by a development compared to more permeable soils which may become partially covered with impermeable surfaces.

5.2 Precipitation and Temperature

The method for estimating the infiltration rate and volume involves the use of a site-specific climate water budget and applying it to the area proposed for development. For this assessment, the monthly total precipitation and average monthly temperature were obtained from the Government of Canada’s Canadian Climate Normals website for a nearby weather station, Barrie, which is about 1.58 km away from the Site. The temperature and a daylight correction factor, based on the site’s latitude, are used to estimate the monthly adjusted potential evapotranspiration, summarized at the top of the water balance for the Site catchment area. See Tables E-1 to E-3 in Appendix E.

5.3 Pre-Development and Post-Development Characteristics

Based on the pre-development and post development infiltration factors (slope, soil types and cover), anticipated runoff directions and the design drawings, the site characteristics are as listed in Tables C and D below. The site is depicted in drawing “Site Plan” by KBK Architects, included in Appendix E.

The monthly and total yearly evapotranspiration and monthly and total surplus were estimated using the Thornthwaite and Mather method. The model accounts for changes in water storage based on a catchment-specific maximum soil moisture capacity (Stormwater Management Planning and Design Manual, Ministry of the Environment, March 2003) to arrive at the actual evapotranspiration and water surplus. The surplus was divided into infiltration and runoff rates using the infiltration factors of the former Ministry of Environment and Energy (MOEE) “Hydrogeological Technical Information, Requirements for Land Development Application” (dated April 1995). These parameters are summarized in Tables C and D, below. In the method, outlined in “Conservation Authority Guidelines for Hydrogeological Assessments”, dated June 2013, the infiltration is calculated by applying the cumulative infiltration factors to the available surplus water. The infiltration factors provided by the above document are based on a hydrologic analysis of the peak runoff for stormwater management purposes. This provides a worst-case scenario with respect to runoff and is conservative in estimating the amount of ground infiltration.

The water balance model divides the catchment area into pervious and impervious areas based on the expected hardcover area in the catchment area. This percentage, and the estimated run-on, for post-development, are listed in Table D, below. Run-on is added to the monthly precipitation, where applicable. It has been assumed that 20% of the runoff from impervious surfaces is lost to evaporation.

TABLE C

WATER BALANCE
PRE-DEVELOPMENT CATCHMENT CHARACTERISTICS

CATCHMENT	INFILTRATION FACTORS (PERVIOUS AREA)				SOIL MOISTURE STORAGE CAPACITY (mm)	RUN-ON SOURCE	IMPERVIOUS AREA (%)
	SLOPE	SOIL	COVER	TOTAL			
Site	0.2	0.3	0.05	0.55	75	None	31

Pre-development, the catchment area is considered to be relatively flat. The near-surface soils at the Site catchment area are generally sand and silt mixes, with an urban lawn cover.

TABLE D

WATER BALANCE
POST-DEVELOPMENT CATCHMENT CHARACTERISTICS

CATCHMENT	INFILTRATION FACTORS (PERVIOUS AREA)				SOIL MOISTURE STORAGE CAPACITY (mm)	RUN-ON SOURCE	IMPERVIOUS AREA (%)
	SLOPE	SOIL	COVER	TOTAL			
Site	0.25	0.3	0.05	0.60	75	None	73

Post-development, the catchment area is slightly flatter, but otherwise the infiltration factors are unchanged. Runoff from the catchment areas either runs off-site or to storm water sewers.

By applying the areas of the pervious and impervious features existing pre-development and comparing to post-development, the water balance provides a high-level estimate of the expected change in infiltration and runoff, as further described in the following sections.

5.4 Pre-Development Water Balance

The water balance for the pre-development conditions is presented for the catchment area of the Site in Tables E-1 to E-3. The volumetric quantities are summarized in the summary table, Table E-3.

The vegetation at the site prior to development was assumed to be primarily urban lawn, with 31 % hard cover. The amount of infiltration at the site was estimated by applying the cumulative infiltration factors to the available surplus water. Thus, based on the cumulative infiltration factors and other parameters, as shown in the calculations presented in Tables E-1 to E-3 in Appendix E, the infiltration at the existing site is estimated to be about 75 m^3/year and the runoff is estimated at about 179 m^3/year. This infiltration contributes to pre-development ground water recharge.

5.5 Post-Development Water Balance

Post-development, the increase in the area of pavement and buildings were assumed as presented above in Table D. For the pervious and impervious surfaces, the amount of infiltration and runoff at the site is estimated by applying the factors as above. Based on the estimated proposed pervious and impervious surface areas at the site, and as shown in the calculations presented in Tables E-1 to E-3 in Appendix E, the post-development infiltration rate is estimated at about 32 m^3/year and the runoff is estimated at 298 m^3/year.

5.6 Conclusion

Comparing the infiltration rates estimated above results in a deficit of ground water infiltration due to development of the properties amounting to about 43 m^3/year. Runoff is estimated to increase by about 119 m^3/year. A ground water infiltration deficit reflects a decrease in contribution to ground water recharge. Low impact development (LID) features may be incorporated at the site to compensate for the infiltration deficit; however, consideration must be made to the anticipated infiltration rate and ground water level at the specific location of the LID feature.

6. CONSTRUCTION DEWATERING REQUIREMENTS

6.1 Introduction

Typically, construction dewatering is required where a proposed excavation will be deeper than the groundwater strike level and/or hydrostatic groundwater level and the groundwater level must be lowered to maintain dry working conditions and a stable excavation bottom and slopes. The anticipated construction dewatering rates depend on the proposed dimensions and depth of the excavations, shoring used, if any, and the Site and surrounding groundwater conditions (groundwater levels, groundwater sources, and hydraulic conductivities). It is prudent to note that groundwater control and construction dewatering requirements should be re-evaluated after the design footprint and invert depths are finalized. The design and implementation of the dewatering system is the responsibility of the dewatering contractor.

6.2 Hydrogeological Conceptual Site Models

The construction regions included in the assessment of potential dewatering are listed below:

i) Building

ii) Utilities

For the assessment, a simplified hydrogeological conceptual site model (HCSM) was developed based on the field and laboratory data compiled to date, and excavation dimensions based on the design drawings. For modelling purposes, the assumed excavation elevation of the building was 226.4 m ASL based on design drawings. The assumed excavation elevation of the utilities was 225.4 m ASL. Excavation for the building will be primarily in the upper silty sand and sand. Excavation for the utilities is to be primarily in silty sand except in the vicinity of Boreholes 1 and 2 (south western quadrant) is to be in sand.

An initial groundwater level of El. 222.6 was assumed for the building and utilities based on the ground water measurements in Boreholes 2 and 4.

In addition, a scenario was included with an additional 0.5 m added to the high ground water level to account for uncertainty due to seasonal variability and additional potential dewatering requirements. If required, the groundwater level is to be lowered at least 0.5 m below the lowest excavation level to maintain dry working conditions.

For the building and utilities, the model hydraulic conductivity is based on slug test results were used. The HSCM assumptions are summarized in Table 3A and 3B.

6.3 Construction Dewatering Discharge Rates

The construction dewatering discharge rates are estimated for the assumed construction activities based on the above-noted HCSMs and associated assumptions described below. The relevant assumptions, calculations, and results are summarized on Table 3A and 3B.

The estimated total discharge rate with a factor of safety (FOS) of 3.0 and the estimated zone of influence for potential dewatering are summarized on Table E and Table F.

TABLE E

APPROXIMATE CONSTRUCTION DEWATERING
DISCHARGE RATES AND ZONES OF INFLUENCE
BASED ON HIGHEST MEASURED GROUND WATER LEVEL

ACTIVITY	EXCAVATION AREA L x W (m)	DRAWDOWN (m)	DEWATERING ZONE OF INFLUENCE (DZOI) (m)	DISCHARGE RATE (FOS = 3.0) (L/d)
Building	8.1 x 15.7	Minimal dewatering expected; Excavation elevation above groundwater elevation		
Utilities	L = 30	Minimal dewatering expected; Excavation elevation above groundwater elevation		
TOTAL DEWATERING VOLUME				**Minimal Dewatering**

TABLE F

APPROXIMATE CONSTRUCTION DEWATERING
DISCHARGE RATES AND ZONES OF INFLUENCE
BASED ON ESTIMATED SEASONAL HIGH GROUND WATER LEVEL

ACTIVITY	EXCAVATION AREA L x W (m)	DRAWDOWN (m)	DEWATERING ZONE OF INFLUENCE (DZOI) (m)	DISCHARGE RATE (FOS = 3.0) (L/d)
Building	8.1 x 15.7	Minimal dewatering expected; Excavation elevation above groundwater elevation		
Utilities	L = 30	Minimal dewatering expected; Excavation elevation above groundwater elevation		
TOTAL DEWATERING VOLUME				**Minimal Dewatering**

The "dewatering zone of influence" (or DZOI) is the maximum radius of the cone-shaped profile of the temporary lowered groundwater level if no barriers are used during construction dewatering.

With regards to the above assessment, please note the following:

- According to the regulations (see Section 1.3), since the construction dewatering discharge rates are expected to be less than 50,000, water taking does not need a permit.

- The construction dewatering rates are estimated based on assumed dewatering locations, footprints and depths.
- Surface water, which is to be prevented from entering the excavation area, is not included directly, but should be accounted for by the factor of safety.

7. CONCLUDING REMARKS AND RECOMMENDATIONS

For the proposed redevelopment, the salient assessment findings are outlined as follows:

- The soil stratigraphy revealed in the boreholes generally consisted of topsoil veneer underlain by fill over variable layers of sand and/or silty sand, over a major sand and gravel deposits over sand.

- Hydrostatic groundwater level readings were measured manually at three (3) monitoring wells during three (3) Site visits from September 27, 2022 to November 8, 2022. The groundwater levels are summarized in Table 1. The highest hydrostatic groundwater level (El. 222.6 m ASL) was measured at Borehole 2 on September 27, 2022 and November 8, 2022 and in Borehole 4 on November 8, 2022.

- The hydraulic conductivity estimated at boreholes 2, 3, and 4 ranged from 5×10^{-3} cm/s to 4×10^{-2} cm/s based on slug tests.

- Hydraulic conductivity was estimated from soil sample grain size distribution (GSD) results. For the sand and gravel samples, the estimated hydraulic conductivity at Boreholes 2 and 3 ranged from 5 x 10^{-4} cm/s to 3 x 10^{-3}. For the silty sand sample, the estimated hydraulic conductivity at Borehole 4 was estimated to be 8 x 10^{-5} cm/s.

- The ground water infiltration deficit due to the development was estimated at about 43 m^3/year. Runoff is estimated to increase by about 119 m^3/year. A ground water infiltration deficit reflects a decrease in contribution to ground water recharge. See Section 5 for details.

- The native soil at this site facilities and would generally be deemed acceptable soil for underground infiltration.

- The unfiltered groundwater sample findings indicate that the discharge water, if untreated, is expected be compliant City of Barrie storm and sanitary sewer discharge with the exception of Total Suspended Solids (TSS).

- Based on our estimates the construction dewatering rates will be less than 50,000 L/d and no water taking permitting with the MECP is required.

We recommend the following:

- It is recommended that steps be taken to minimize the potential for dewatering. For example, it is best to schedule excavation for periods of low groundwater level. Also, excavation footprints and depths should be no more than is needed, and surface water intrusion minimized.

- To reduce the erosion of fines around the sump pumps or wellpoints, it is imperative that the filter packs are sufficiently designed and installed and the discharge is monitored for fines content.

- The contractor's dewatering plan to be implemented for this project should be reviewed by PML for proper implementation of the hydrogeological findings and recommendations presented in this report.

- Low impact development (LID) features may be incorporated at the site to compensate for the infiltration deficit, however consideration must be made to the anticipated infiltration rate and ground water level at the specific location of the LID feature.

- At minimum, construction dewatering discharge water should be treated using a sedimentation tank and/or filtration. Further treatment may be needed to achieve compliance with the storm sewer by-law.

- Ground water levels were only measured between September and November 2022. A higher confidence in the findings will be possible if additional ground water levels are measured, especially in the spring.

We trust you will find this report complete within our terms of reference. Should you have any questions, please do not hesitate to contact this office.

Sincerely

Peto MacCallum Ltd.

LICENSED PROFESSIONAL ENGINEER
A. J. COOKE
90442021
Jan. 17 2023
PROVINCE OF ONTARIO

Majid Touqan

Majid Touqan, PhD
Engineer in Training
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Andrew Cooke, PhD, P.Eng.
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TABLE 1

GROUND WATER LEVEL READINGS IN MONITORING WELLS

BOREHOLE (BH)/ MONITORING WELL (MW) No. (1)	**GROUND SURFACE ELEVATION (2)**	**MID-SCREEN ELEVATION (2) (DEPH, m)**	**OBSERVED OR INTERPRETED GROUND WATER STRIKE ELEVATION (2) (DEPH, m)**	**GROUND WATER LEVEL ELEVATION (DEPTH, m) (3)**		
				September 27, 2022	**October, 7 2022**	**November 8, 2022**
BH/MW 2	228.0	221.1 (6.9)	221.0 (7.0)	221.6 (6.4)	221.5 (6.5)	222.6 (5.4)
BH/MW 3	227.9	221.0 (6.9)	220.9 (7.0)	221.5 (6.4)	221.4 (6.5)	22.5 (5.4)
BH/MW 4	227.8	219.4 (8.4)	220.8 (7.0)	221.5 (6.3)	221.3 (6.5)	222.6 (5.2)

Notes:

(1) See Drawing 1 for approximate borehole locations and Log of Borehole sheets for details of monitoring well installation.
(2) Ground surface elevations at the monitoring well locations were surveyed by PML and are geodetic.
(3) Water levels measured using a Solinst flat tape water level reader.

TABLE 2

ESTIMATED HYDRAULIC CONDUCTIVITY (K) VALUES FROM SOIL SAMPLE GRAIN SIZE DISTRIBUTION AND BOREHOLE PERMEABILITY TEST RESULTS

BOREHOLE (BH) / MONITORING WELL (MW) No.(1)	MW MID-SCREEN ELEVATION (DEPTH, m)	SOIL TYPE (SAMPLE NO., DEPTH) (1)	% CLAY (2)	ESTIMATED K-VALUES FROM GRAIN SIZE DISTRIBUTION TEST RESULTS (3) (cm/sec)	ESTIMATED K-VALUES FROM BOREHOLE PERMEABILITY TESTS (4) (cm/sec)
BH/MW 2	-	Sand (SS 5, 3.1 to 3.5)	3	3×10^{-3} (V)	4×10^{-2}
	221.2 (6.8)	Sand and Gravel	-	-	
BH/MW 3	-	Sand and Gravel (SS 5, 3.1 to 3.5)	5	5×10^{-4} (V)	4×10^{-3}
	221.1 (6.8)	Sand and Gravel / Sand	-	-	
BH/MW 4	-	Silty Sand (SS 3, 1.5 to 2.1)	5	8×10^{-5} (V)	5×10^{-3}
	219.4 (8.4)	Sand	-	-	

Notes:

(1) Log of Borehole Sheets for soil sample description.
(2) % Clay is percentage of the total soil sample finer than 0.002 mm by weight.
(3) K-value determination using grain size distribution method by Vukovic and Soro (1992) (V) or Puckett (1985) (P).
(4) K-value estimated from analyzed single well response data using a comprehensive suite of solution methods (AQTESOLV program).

TABLE 3A

SUMMARIZED CALCULATIONS OF ESTIMATED CONSTRUCTION DISCHARGE RATES AND ZONES OF INFLUENCE BASED ON HIGHEST MEASURED GROUND WATER LEVEL

ACTIVITY / FEATURE	PROPOSED EXCAVATION ELEVATION (mASL) (1)	REPRESENTATIVE MONITORING WELLS OR BOREHOLES (2)	GROUND WATER STRIKE ELEVATION (mASL) (3)	MODEL GROUND WATER LEVEL ELEVATION (mASL) (4)	LOWERED GROUND WATER LEVEL ELEVATION (mASL) (5)	AVERAGE DRAW-DOWN REQUIRED S_0 (m) (6)	SOIL TYPE (7)	ASSUMED DIMENSIONS OF DEWATERED AREA (m) (8)	K (m/s)	EQUIVALENT RADIUS, re (m) (9)	ESTIMATED DISTANCE OF INFLUENCE R_0 or L_0 (m) (10)	ESTIMATED DEWATERING DISCHARGE RATE, Q (FOS = 3) (L/day) (11)
Building	226.4	BH 2, BH 3	221.0	221.6	Minimal dewatering expected (12); Excavation elevation above groundwater elevation							
Utilities	225.4	BH 2, BH 3	221.0	221.6	Minimal dewatering expected (12); Excavation elevation above groundwater elevation							
TOTAL DEWATERING VOLUME												**Minimal (12)**

Notes:

(1) Estimated elevation.
(2) See Drawing 1 for approximate borehole locations.
(3) Model value based on highest reported or interpreted depth to ground water strike. N.E. = not encountered or unknown.
(4) Model value based on highest measured hydrostatic ground water level, or expected seasonal high.
(5) Ground water level lowered during construction dewatering is assumed to be 0.5 m below the general excavation level.
(6) Difference between the hydrostatic ground water level measured in the monitoring wells and the lowered ground water level elevation.
(7) See Log of Borehole Sheets for soil description.
(8) Estimated.
(9) Equivalent radius, r_e is the radius that approximates a rectangular or square system area. $r_e = \sqrt{(a \times b / \pi)}$. Not applied to trenches.
(10) $R_0 = 3000 S_o K^{1/2}$ or $L_0 = 1750\ S_o K^{1/2}$, R_o in m, L_o in m, S_o in m and K in m/s.
(11) Estimated dewatering rate from Dupuit-based formulas (Powers et al, 2007), with a factor of safety (FOS) multiplier.
(12) Minor dewatering may be needed due to unforeseen perched groundwater conditions not encountered in locations of drilled boreholes.

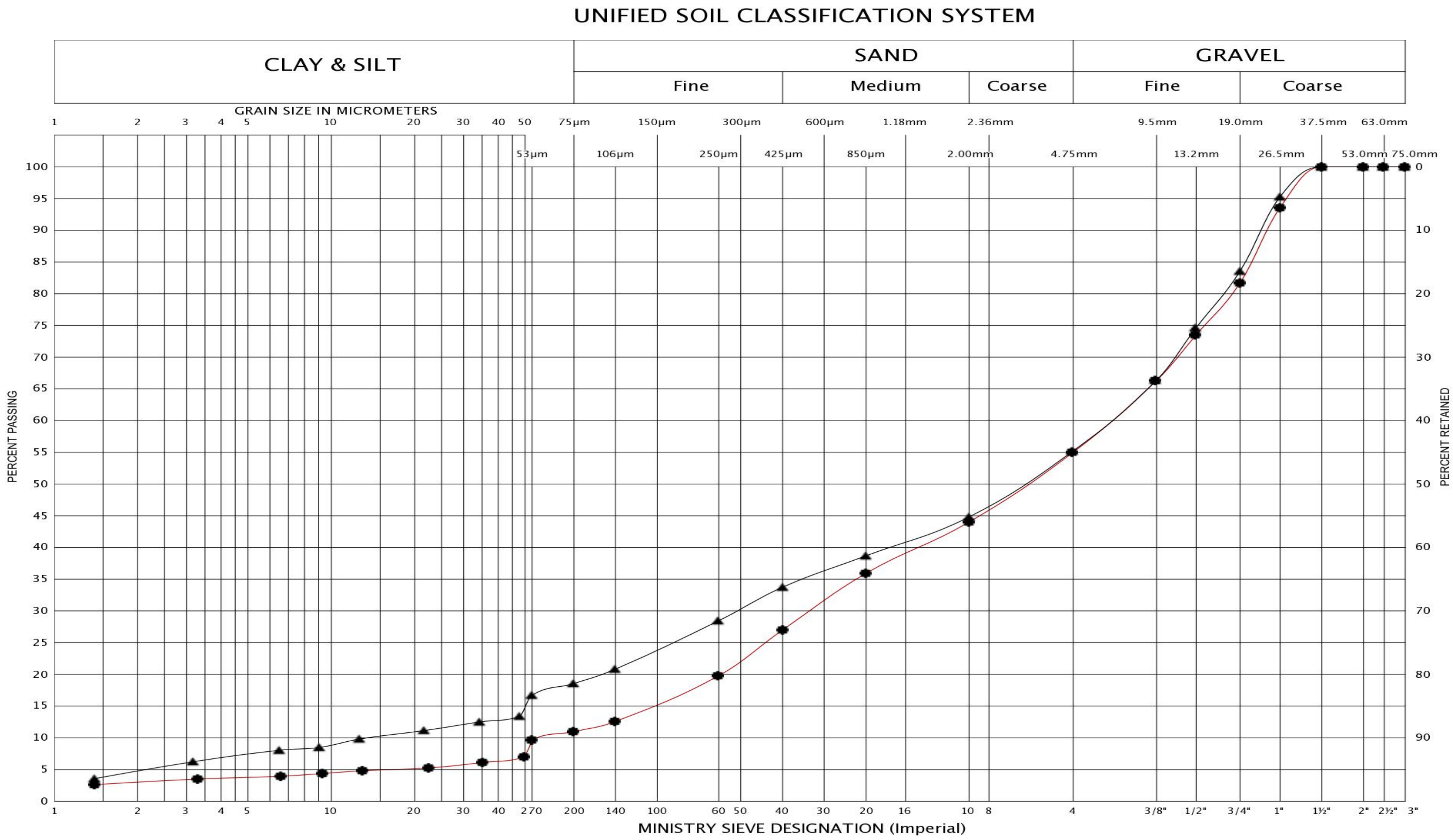
TABLE 3B

SUMMARIZED CALCULATIONS OF ESTIMATED CONSTRUCTION DISCHARGE RATES AND ZONES OF INFLUENCE BASED ON ESTIMATED SEASONALLY HIGH GROUND WATER LEVEL

ACTIVITY / FEATURE	**PROPOSED EXCAVATION ELEVATION (mASL) (1)**	**REPRESENTATIVE MONITORING WELLS OR BOREHOLES (2)**	**GROUND WATER STRIKE ELEVATION (mASL) (3)**	**MODEL GROUND WATER LEVEL ELEVATION (mASL) (4)**	**LOWERED GROUND WATER LEVEL ELEVATION (mASL) (5)**	**AVERAGE DRAW-DOWN REQUIRED S_0 (m) (6)**	**SOIL TYPE (7)**	**ASSUMED DIMENSIONS OF DEWATERED AREA (m) (8)**	**K (m/s)**	**EQUIVALENT RADIUS, re (m) (9)**	**ESTIMATED DISTANCE OF INFLUENCE R_0 or L_0 (m) (10)**	**ESTIMATED DEWATERING DISCHARGE RATE, Q (FOS = 3) (L/day) (11)**
Building	226.4	BH 2, BH 3	221.0 (7.0)	222.1	Minimal dewatering expected (12); Excavation elevation above groundwater elevation							
Utilities	225.4	BH 2, BH 3	221.0 (7.0)	222.1	Minimal dewatering expected (12); Excavation elevation above groundwater elevation							
TOTAL DEWATERING VOLUME												**Minimal (12)**

Notes:

(1) Estimated elevation.
(2) See Drawing 1 for approximate borehole locations.
(3) Model value based on highest reported or interpreted depth to ground water strike. N.E. = not encountered or unknown.
(4) Model value based on highest measured hydrostatic ground water level, or expected seasonal high.
(5) Ground water level lowered during construction dewatering is assumed to be 0.5 m below the general excavation level.
(6) Difference between the hydrostatic ground water level measured in the monitoring wells and the lowered ground water level elevation.
(7) See Log of Borehole Sheets for soil description.
(8) Estimated.
(9) Equivalent radius, r_e is the radius that approximates a rectangular or square system area. $r_e = \sqrt{(a \text{ x } b / \pi)}$. Not applied to trenches.
(10) $R_0 = 3000 S_o K^{1/2}$ or $L_0 = 1750\ S_o K^{1/2}$, R_o in m, L_o in m, S_o in m and K in m/s.
(11) Estimated dewatering rate from Dupuit-based formulas (Powers et al, 2007), with a factor of safety (FOS) multiplier.
(12) Minor dewatering may be needed due to unforeseen perched groundwater conditions not encountered in locations of drilled boreholes.



LEGEND	**BH**	2	3
	SAMPLE	5	5
	SYMBOL	●	▲

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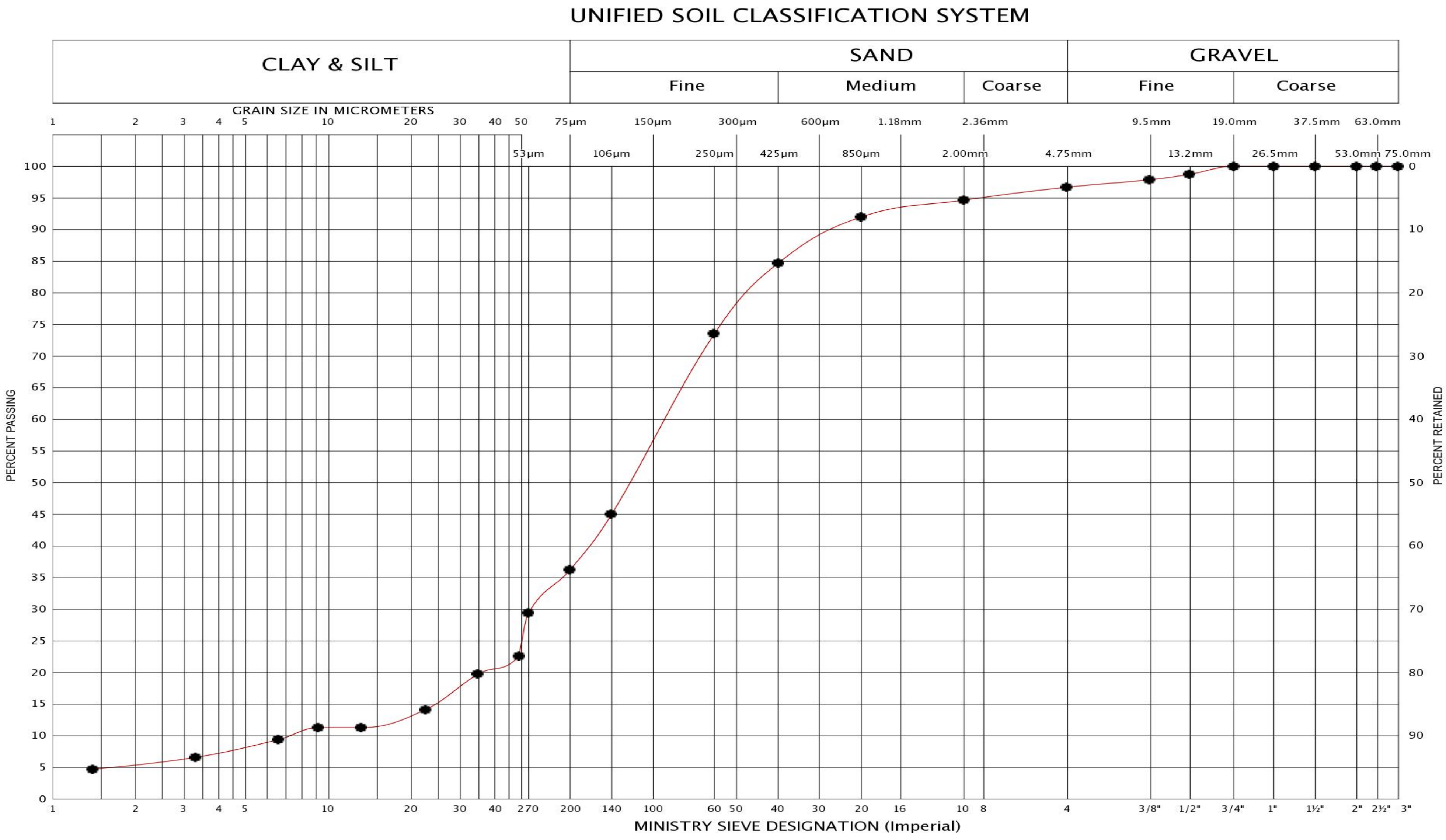
GRAIN SIZE DISTRIBUTION

SANDY GRAVEL, Trace To Some Silt, Trace Clay

FIG No.: 1

Project No.: 22TX030



LEGEND	BH	4
	SAMPLE	3
	SYMBOL	●

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GRAIN SIZE DISTRIBUTION

SILTY SAND, Trace Clay, Trace Gravel

FIG No.: 2

Project No.: 22TX030

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. - Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample	USS	Undisturbed Shear Strength
PH	Sample Advanced Hydraulically	RSS	Remoulded Shear Strength
PM	Sample Advanced Manually		

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

LOG OF BOREHOLE NO. 1

1 of 1

17T 604047E 4916024N

PROJECT Proposed Three Storey Building

PML REF. 22TX030

LOCATION 81 Mary Street, Barrie, ON

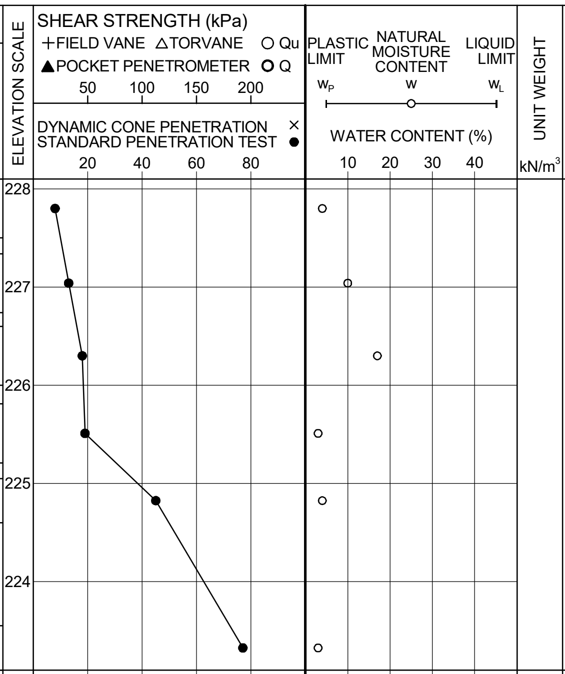
BORING DATE September 23, 2022

ENGINEER HG

BORING METHOD Continuous Flight Hollow Stem Augers

TECHNICIAN NG

SOIL PROFILE		SAMPLES			GROUND WATER OBSERVATIONS AND REMARKS
DEPTH / ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES	
	SURFACE ELEVATION 228.10				
0.20 227.90	TOPSOIL: Black, silty sand, trace organics, moist	1	SS	8	
0.70 227.40	FILL: Brown, sand. trace gravel, trace silt, moist				
	SAND: Compact, brown, sand, trace silt, trace gravel, moist	2	SS	13	
1.4 226.7	SILTY SAND: Compact, brown, silty sand, trace gravel, trace clay, moist to very moist	3	SS	18	
2.1 226.0	SAND: Compact, brown, sand, trace silt, some gravel to gravelly, moist	4	SS	19	
3.2 224.9	SAND AND GRAVEL: Dense to very dense, brown, sand and gravel, some silt, trace clay, trace cobbles, moist	5	SS	45	
		6	SS	77	
5.0 223.1	BOREHOLE TERMINATED AT 5.0 m				Upon completion of augering No water Cave at 4.0 m



GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

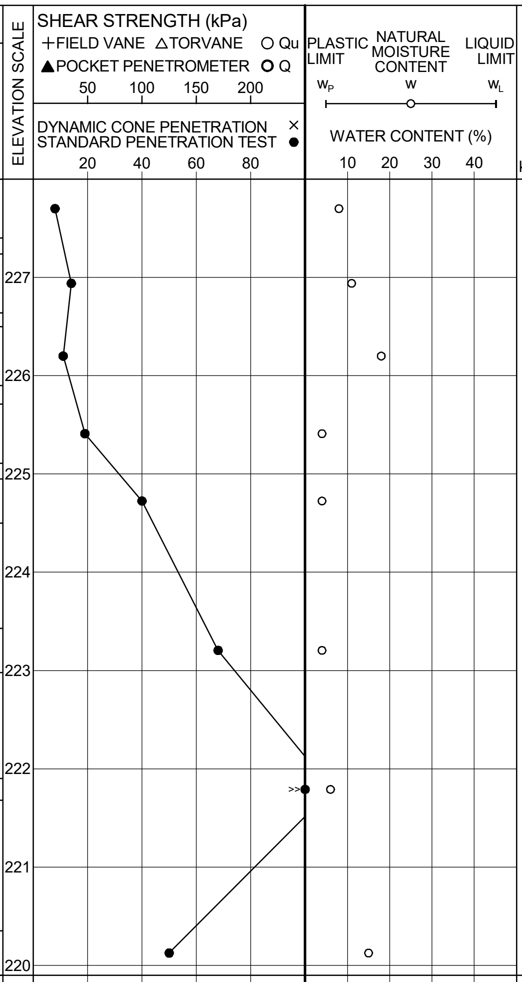
LOG OF BOREHOLE/MONITORING WELL NO. 2

17T 604054E 4916021N

1 of 1

PROJECT Proposed Three Storey Building
PML REF. 22TX030
LOCATION 81 Mary Street, Barrie, ON
BORING DATE September 23, 2022
ENGINEER HG
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN NG

DEPTH / ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 228.00			
0.0	FILL: Brown, silty sand, trace gravel, trace organics, trace brick and asphalt pieces, moist	1	SS	8
0.70 227.30	SAND: Compact, brown, sand, trace to some silt, moist	2	SS	14
1.4 226.6	SILTY SAND: Compact, brown, silty sand, trace gravel, trace clay, moist to very moist with wet layer	3	SS	11
2.4 225.6	SAND: Compact to dense, brown, sand, some gravel to gravelly, trace to some silt, trace cobbles, moist	4	SS	19
		5	SS	40
4.0 224.0	SAND AND GRAVEL: Very dense, brown, sand and gravel, trace to some silt, trace clay, trace cobbles, moist to wet	6	SS	68
		7	SS	50/80 mm
7.7 220.3	SAND: Very dense, brown, sand, trace silt, trace gravel, wet	8	SS	50
8.1 219.9	BOREHOLE TERMINATED AT 8.1 m			

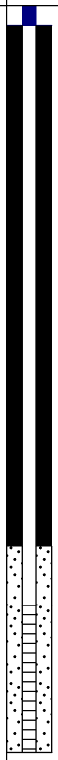


UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI&CL
45	44	8 3



Flushmount casing
Concrete

Bentonite seal

50 mm slotted pipe
Filter sand
First water strike
at 7.0 m

Upon completion of augering
Water at 6.2 m
No cave

Water Level Readings:

Date	Depth	Elev.
2022-09-27	6.4	221.6
2022-10-07	6.5	221.5
2022-11-08	5.4	222.6

NOTES

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LOG OF BOREHOLE/MONITORING WELL NO. 3

1 of 1

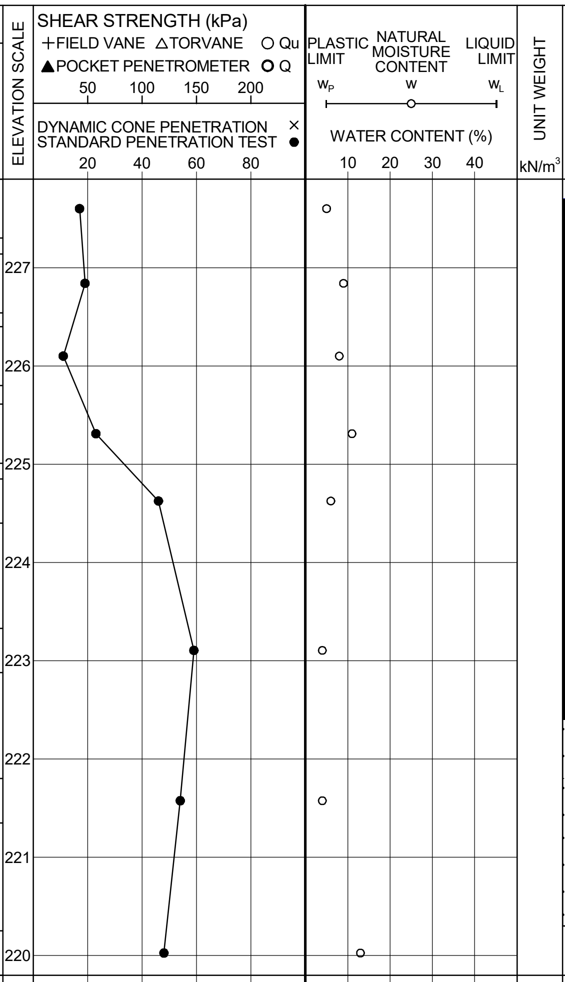
17T 604065E 4916033N

PROJECT Proposed Three Storey Building
PML REF. 22TX030
LOCATION 81 Mary Street, Barrie, ON
BORING DATE September 23, 2022
ENGINEER HG
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN NG

SURFACE ELEVATION 227.90

DEPTH / ELEV (metres)	DESCRIPTION
0.0	FILL: Brown, silty sand, some gravel, trace organics, moist
0.70 / 227.20	SAND: Compact, brown, sand, some silt to silty, trace organics, trace gravel, moist
2.1 / 225.8	SILTY SAND: Compact, brown, silty sand, some gravel to gravelly, trace clay, moist
2.9 / 225.0	SAND AND GRAVEL: Very dense, brown, sand and gravel, trace silt to silty, trace clay, trace cobbles, moist
7.1 / 220.8	SAND: Dense, brown, sand, some gravel, trace silt, wet
8.1 / 219.8	BOREHOLE TERMINATED AT 8.1 m

NUMBER	TYPE	"N" VALUES
1	SS	17
2	SS	19
3	SS	11
4	SS	23
5	SS	46
6	SS	59
7	SS	54
8	SS	48



GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI&CL
45	36	14 5

Flushmount casing
Concrete

Bentonite seal

50 mm slotted pipe
Filter sand
First water strike at 7.0 m

Upon completion of augering
Water at 5.9 m
No cave
Water Level Readings:

Date	Depth	Elev.
2022-09-27	6.4	221.5
2022-10-07	6.5	221.4
2022-11-08	5.4	222.5

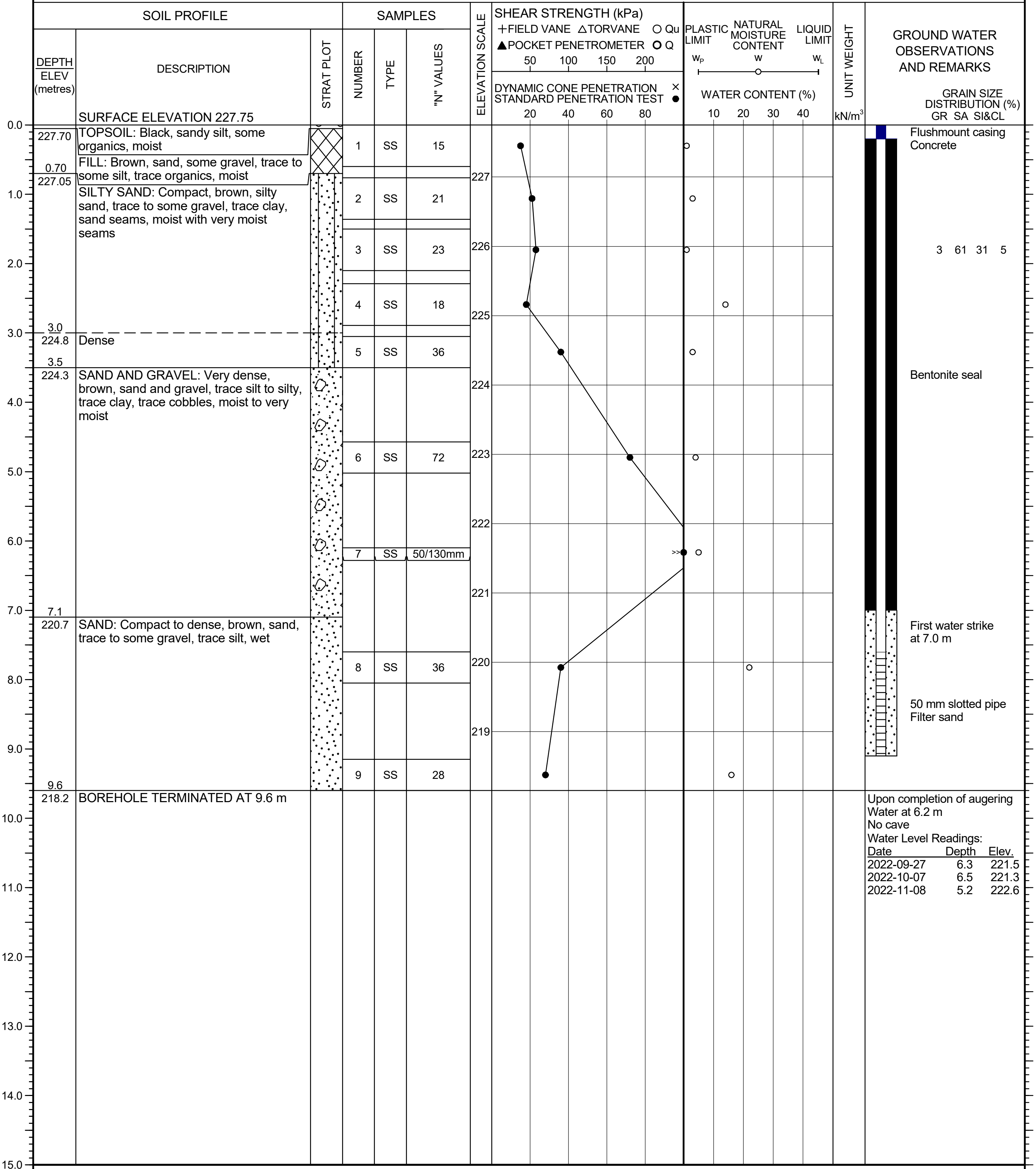
NOTES

LOG OF BOREHOLE/MONITORING WELL NO. 4

1 of 1

17T 604079E 4916036N

PROJECT Proposed Three Storey Building
PML REF. 22TX030
LOCATION 81 Mary Street, Barrie, ON
BORING DATE September 23, 2022
ENGINEER HG
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN NG



SURFACE ELEVATION 227.75

DEPTH / ELEV (metres)	DESCRIPTION
227.70	TOPSOIL: Black, sandy silt, some organics, moist
0.70 227.05	FILL: Brown, sand, some gravel, trace to some silt, trace organics, moist
	SILTY SAND: Compact, brown, silty sand, trace to some gravel, trace clay, sand seams, moist with very moist seams
3.0 224.8	Dense
3.5 224.3	SAND AND GRAVEL: Very dense, brown, sand and gravel, trace silt to silty, trace clay, trace cobbles, moist to very moist
7.1 220.7	SAND: Compact to dense, brown, sand, trace to some gravel, trace silt, wet
9.6 218.2	BOREHOLE TERMINATED AT 9.6 m

NUMBER	TYPE	"N" VALUES	GR	SA	SI&CL
1	SS	15			
2	SS	21			
3	SS	23	3	61	31 5
4	SS	18			
5	SS	36			
6	SS	72			
7	SS	50/130mm			
8	SS	36			
9	SS	28			

Flushmount casing
Concrete

Bentonite seal

First water strike at 7.0 m

50 mm slotted pipe
Filter sand

Upon completion of augering
Water at 6.2 m
No cave
Water Level Readings:

Date	Depth	Elev.
2022-09-27	6.3	221.5
2022-10-07	6.5	221.3
2022-11-08	5.2	222.6

NOTES

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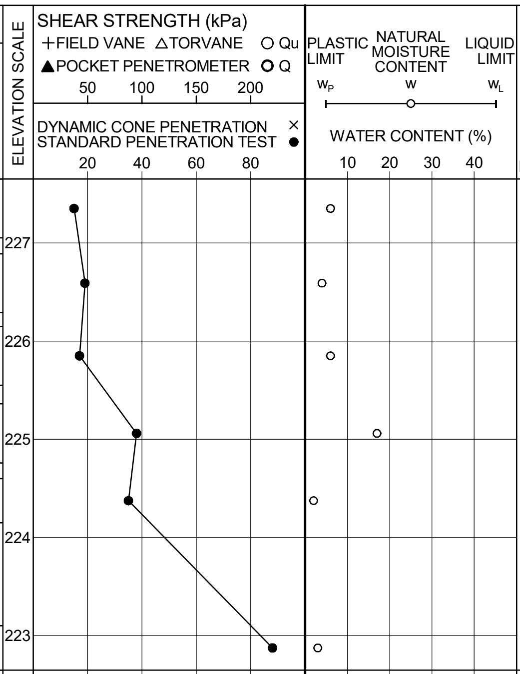
LOG OF BOREHOLE NO. 5

1 of 1

17T 604081E 4916042N

PROJECT Proposed Three Storey Building
PML REF. 22TX030
LOCATION 81 Mary Street, Barrie, ON
BORING DATE September 23, 2022
ENGINEER HG
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN NG

DEPTH / ELEV (metres)	SOIL PROFILE DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER OBSERVATIONS AND REMARKS
0.0	SURFACE ELEVATION 227.65				
227.55	TOPSOIL: Black, sandy silt, some organics, moist	1	SS	15	
0.70 226.95	FILL: Brown, sand and gravel, ytace silt to silty sand, trace gravel, trace organics, moist				
	SAND: Compact, brown, trace silty to silty, trace gravel, moist	2	SS	19	
		3	SS	17	
2.1 225.6	SILTY SAND: Dense, brown, silty sand, trace gravel, trace clay, moist with very moist seams	4	SS	38	
		5	SS	35	
3.4 224.3	SAND: Dense, brown, sand, some gravel to gravelly, trace silt, moist				
4.0 223.7	SAND AND GRAVEL: Very dense, brown, sand and gravel, trace to some silt, trace clay, trace cobbles, moist	6	SS	88	
5.0 222.7	BOREHOLE TERMINATED AT 5.0 m				Upon completion of augering No water Cave at 3.4 m

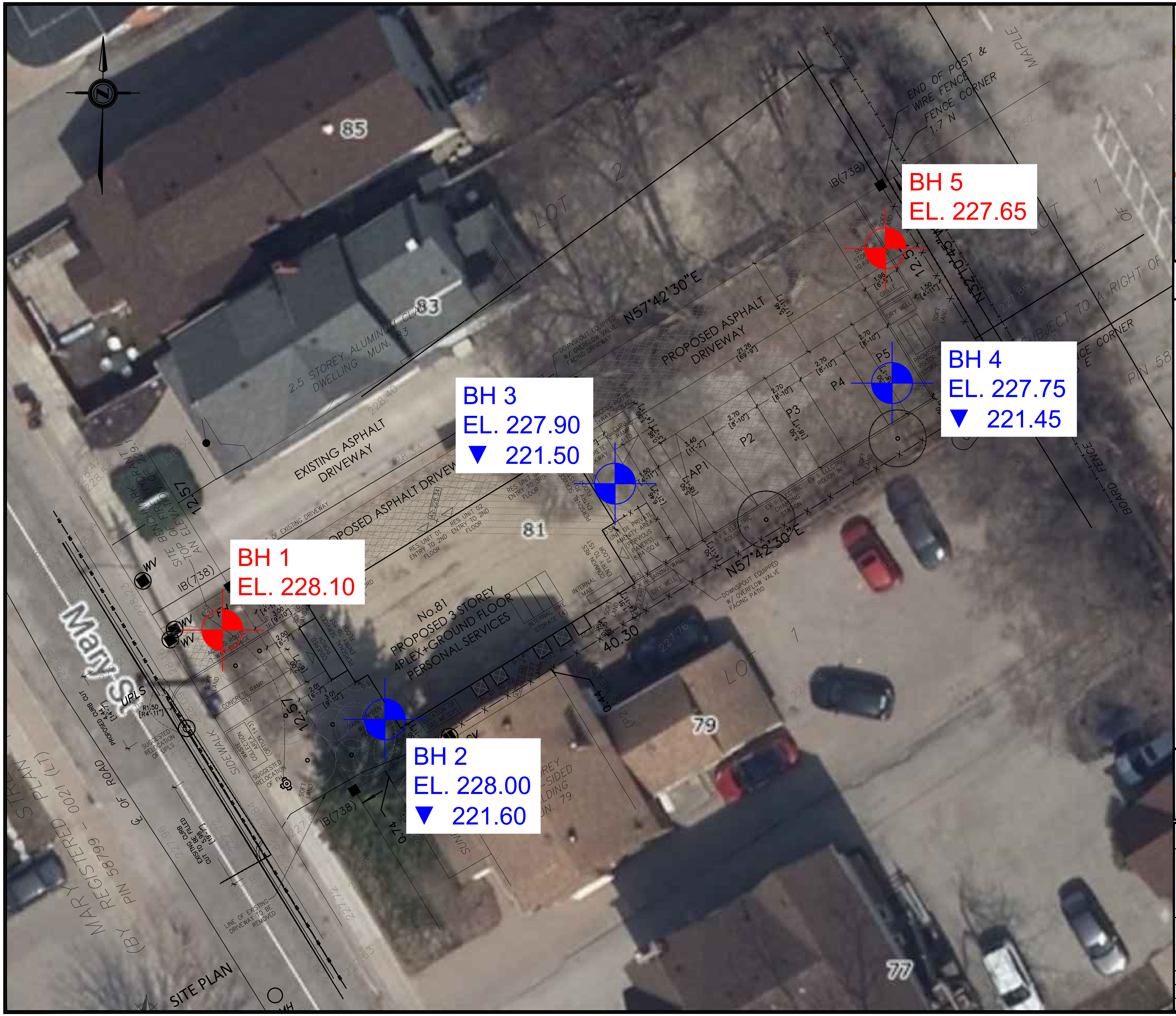


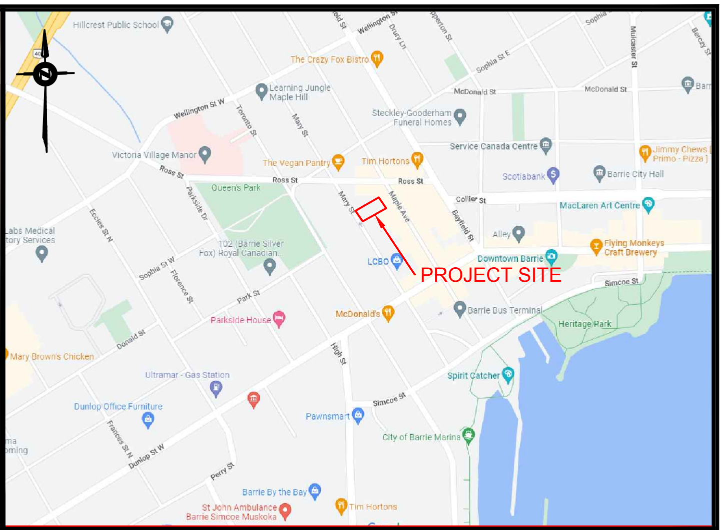
STRAT PLOT

UNIT WEIGHT kN/m^3

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES





KEY PLAN
BARRIE, ONTARIO

LEGEND:

BH 1 EL. 228.10	BOREHOLE 1 SURFACE ELEVATION
BH 2 EL. 228.00 ▼ 221.60	BOREHOLE 2 (MONITORING WELL) SURFACE ELEVATION GROUND WATER ELEVATION (SEPTEMBER 27, 2022)

REFERENCE:
BASE PLAN PRODUCED USING GOOGLE MAPS 2022.

0m 2.5 5 7.5 10 15
SCALE

BOREHOLE/MONITORING WELL LOCATION PLAN

PROPOSED THREE STOREY BUILDING
81 MARY STREET
BARRIE, ONTARIO

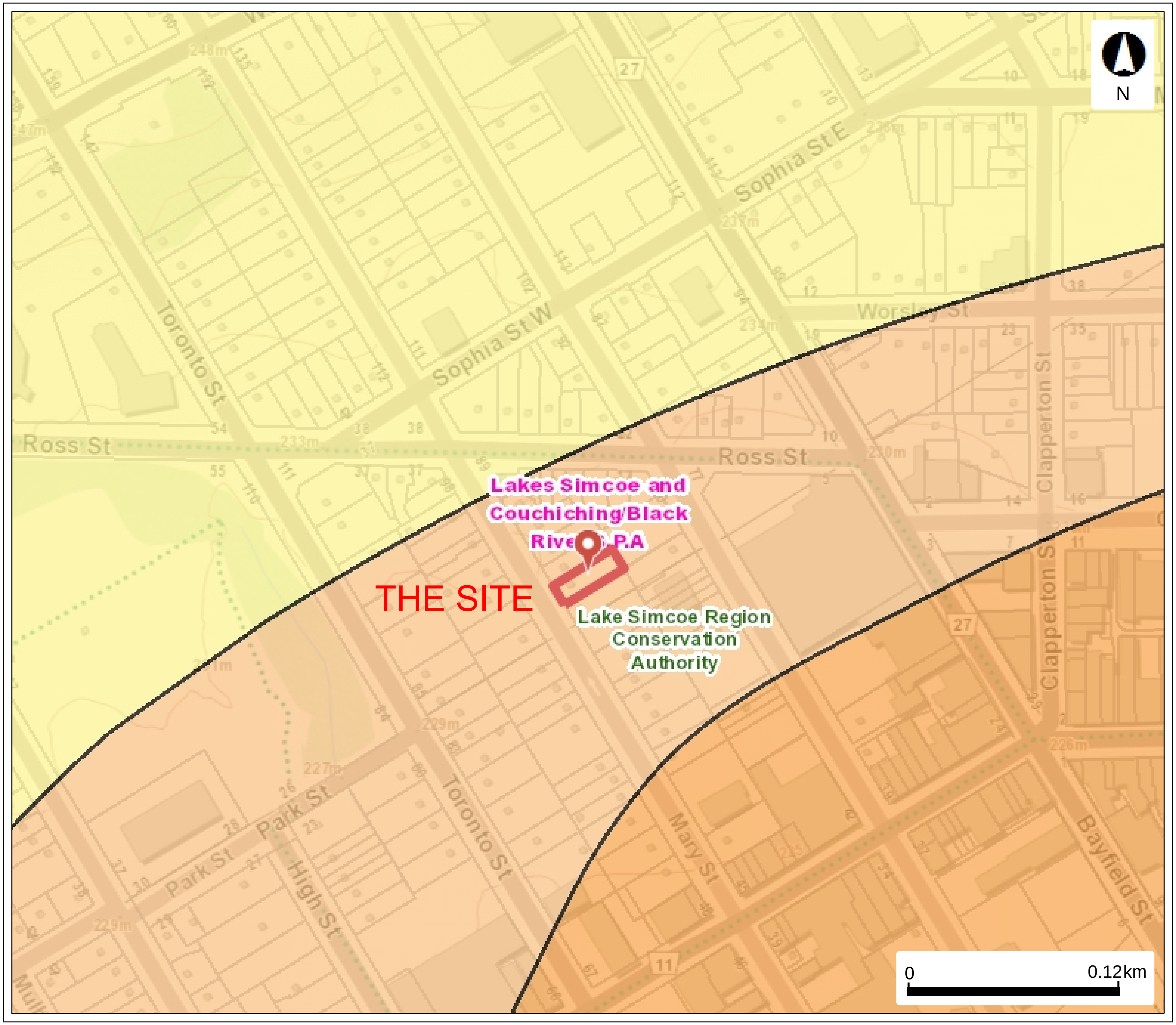
Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	NG	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	HG	SEPT 2022	AS SHOWN	22TX030	1
APPROVED	HG				

APPENDIX A

Site and Vicinity Maps

Figure A-1



Legend

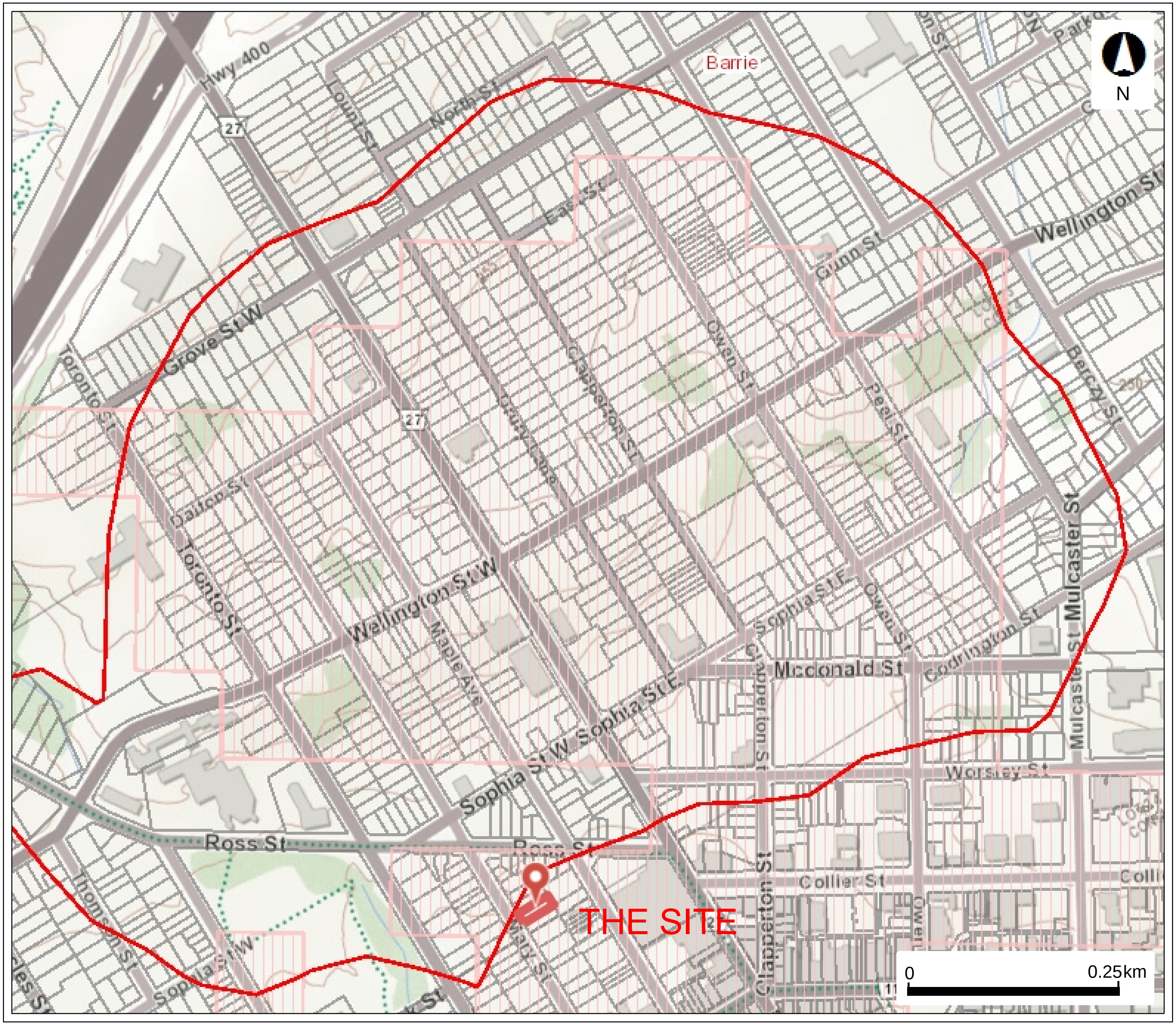
- 🟧 Niagara Escarpment Plan (NEI
- ☐ Oak Ridges Moraine
- ☐ Source Protection Areas
- 🟩 Conservation Authority
- Wellhead Protection Area
  - 🟫 A
  - 🟧 B
  - ☐ C
  - ☐ C1
  - 🟨 D
  - ☐ F
- ☐ Assessment Parcel with Addre

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 1/17/2023
Map Center: 44.39044 N, -79.6934 W

Figure A-2



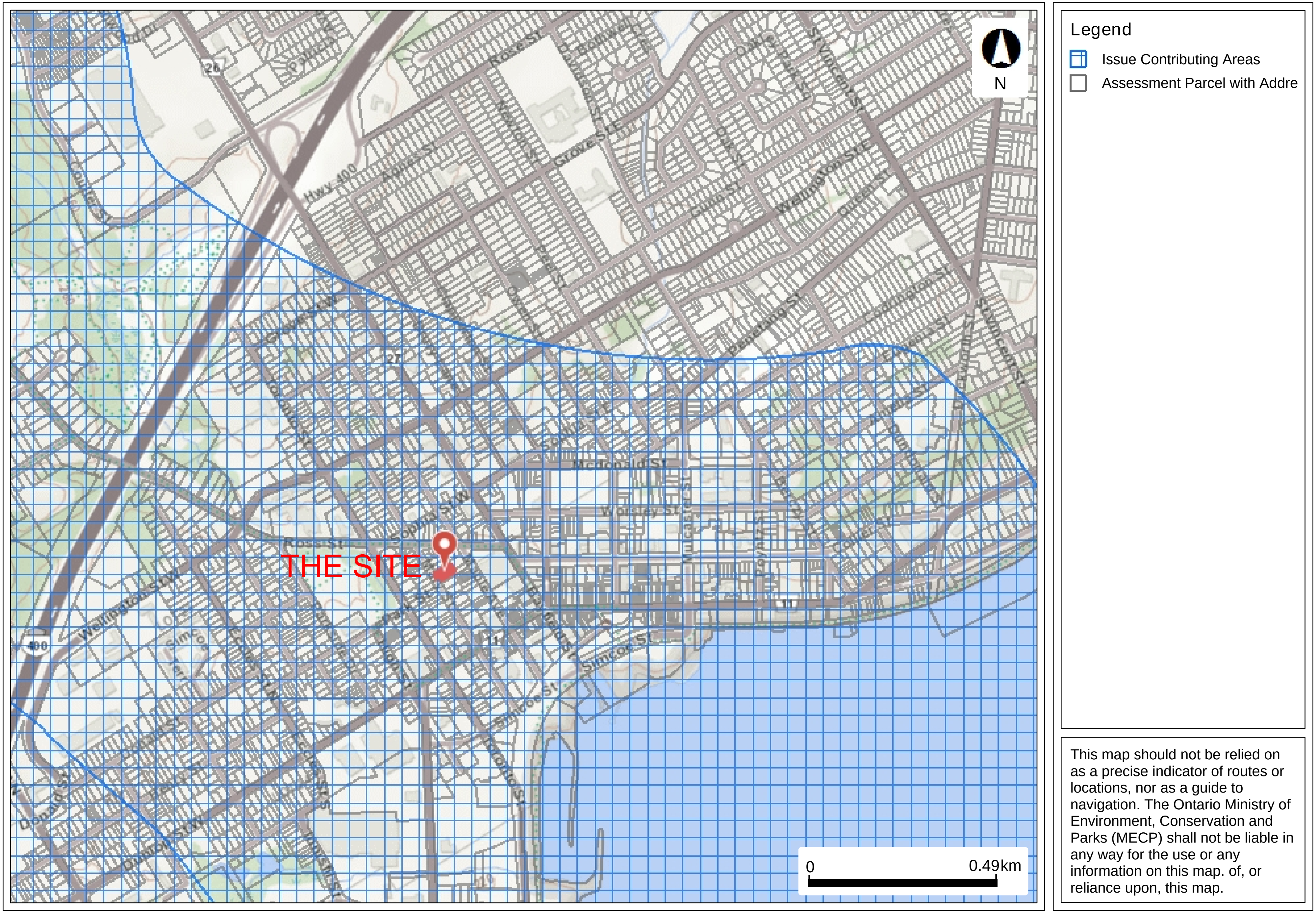
Legend

- ● Permits To Take Water: Active
- 🟩 Intake Protection Zone Q
- 🟥 Wellhead Protection Area Q1
- 🟦 Wellhead Protection Area Q2
- ▨ Highly Vulnerable Aquifers
- ▨ WHPA Groundwater Under Direct Influence (WHPA-E)
- ☐ Assessment Parcel with Addre

Ontario

Map Created: 1/17/2023
Map Center: 44.39422 N, -79.69263 W

Figure A-3



This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 1/17/2023
Map Center: 44.39281 N, -79.69081 W

Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Figure A-4

Legend

- ☐ Assessment Parcel
- 🟩 Greenbelt Area Boundary
- ● Greenbelt Hamlets
- ☐ ORM Boundary
- 🟧 NEP Boundary
- — Greenbelt External Connections
- ▨ NEP Minor Urban Centres
- ANSI
  - ☐ Earth Science Provincially Significant/sciences de la terre d'importance provinciale
  - ☐ Earth Science Regionally Significant/sciences de la terre d'importance régionale
  - ☐ Life Science Provincially Significant/sciences de la vie d'importance provinciale
  - ☐ Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
  - ▨ Provincially Significant/considérée d'importance provinciale
  - ▨ Non-Provincially Significant/non considérée d'importance provinciale
- ☐ Unevaluated Wetland
- 🟩 Woodland

0.2 0 0.08 0.2 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

APPENDIX B

MECP Water Well Records Summary and Map

MECP WELL RECORD TABLE ABBREVIATIONS AND DESCRIPTIONS

Header Descriptions

ABBREVIATION	DESCRIPTION
UTM	UTM in Zone, Easting, Northing and Datum is NAD83
LOT	UTM estimated from Centroid of Lot
W	UTM not from Lot Centroid
DATE CNTR	Date Work Completed and Well Contractor Licence Number
CASING DIA	Casing diameter in inches
WATER	Depth of water found, in Feet. See Water Kind, below for meaning of Code
PUMP TEST	Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour:Minutes
WELL USE	See below for Meaning of Code
SCREEN	Screen Depth and Length in feet
WELL	Well ID, AUDIT #, Well Tag, A for abandonment; P for Partial Data Entry Only
FORMATION	See below for Meaning of Code

Meaning of Core Material and Descriptive Terms

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

Core Color

ABBV	DESCRIPTION
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLC K	BLACK
BLGY	BLUE-GREY

Well Use

ABBV	DESCRIPTION
DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling And AC
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring and Test Hole

Water Kind

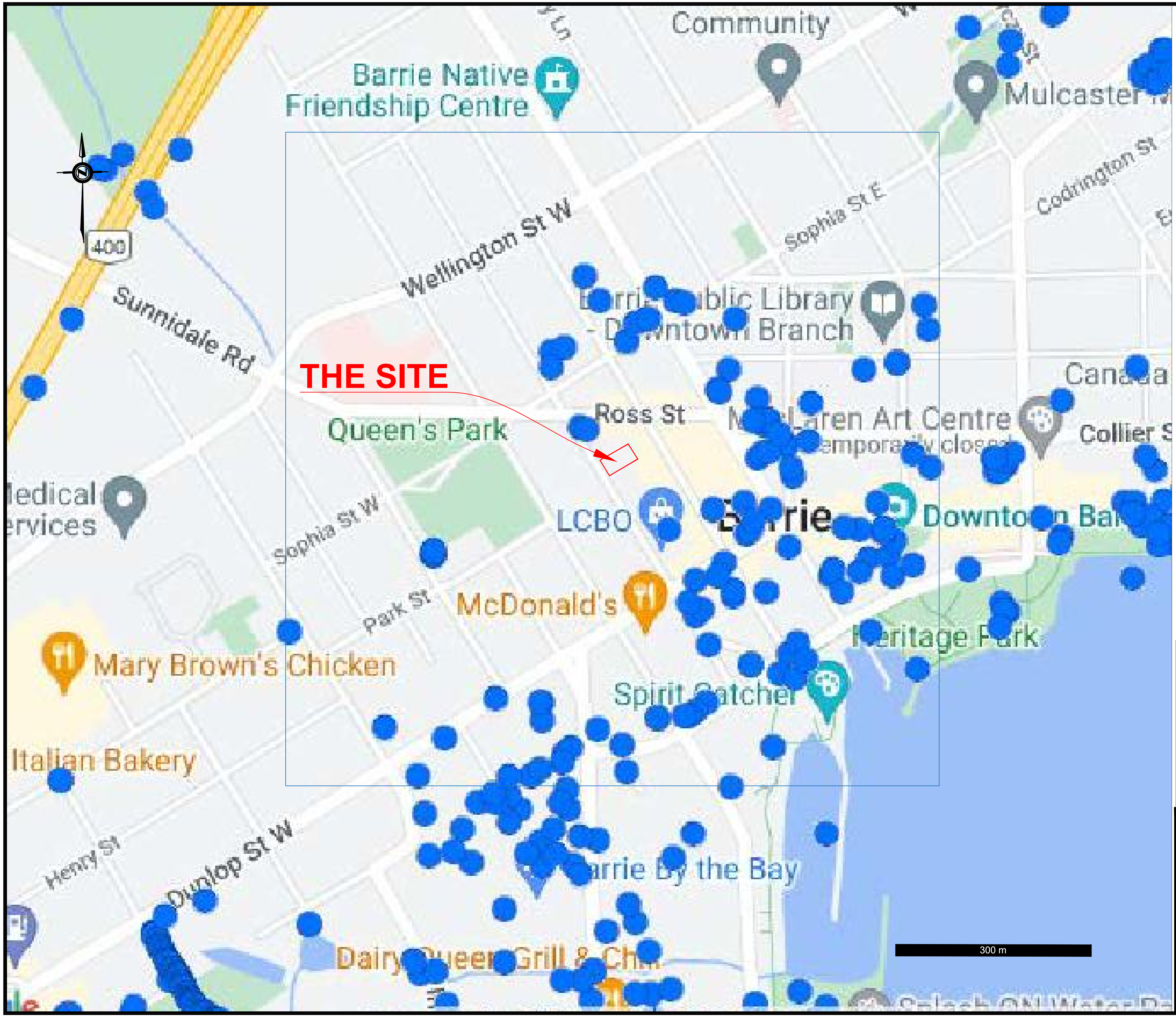
ABBV	DESCRIPTION
FR	Fresh
SA	Salty
SU	Sulphur
MN	Minerial
UK	Not Stated
GS	Gas
IR	Iron
UT	Untested
OT	Other

TABLE B-1
MECP WATER WELL RECORD SUMMARY

UTM ZONE	EASTING	NORTHING	LOT	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
17	604239	4916174	W	2021/01 7241						7381281 (Z353711) A311916 P	
17	604227	4916139	W	2021/01 7241						7381283 (Z353709) A311914 P	
17	604221	4916142	W	2021/01 7241						7381282 (Z353710) A311915 P	
17	604281	4915944	W	2020/11 7644						7376843 (Z348161) P	
17	603888	4915516	W	2020/10 7190	1.5 6	UT 0014	14///:	MO	0010 10	7371717 (AR33CTI8) A305938	BRWN SAND LOOS 0020
17	604265	4915969	W	2020/08 7644						7367651 (Z344284) A297607 P	
17	604306	4915960	W	2020/08 7644						7367650 (Z344283) A297608 P	
17	604219	4915958	W	2020/08 7644						7367652 (Z344285) A297606 P	
17	603912	4915543	W	2020/06 7190	2 4	UT 0012	12///:	MO	0010 10	7371976 (79SXZFY5) A291220	BRWN SAND 0020
17	603959	4915557	W	2020/06 7190	2 4	UT 0012	12///:	MO	0010 10	7371977 (QSSR49IP) A291222	BRWN SAND 0020
17	604015	4916313	W	2020/03 7241						7358541 (Z334618) A288721 P	
17	604040	4916276	W	2020/03 7241						7358540 (Z334677) A291909 P	
17	604113	4916251	W	2020/03 7241						7358539 (Z334616) A288711 P	
17	604095	4916241	W	2020/03 7241						7358538 (Z334617) A288720 P	
17	604011	4916081	W	2019/08 7190	6 1.25			MO	0015 5	7341963 (LFJRL8Z9) A273482	BRWN SAND GRVL 0010 BRWN SAND SLTY 0020
17	604021	4916078	W	2019/08 7190	6 1.25	UT 0020	20///:	MO	0015 5	7341964 (G6NFSM3X) A273483	BRWN SAND GRVL 0010 BRWN FSND SLTY 0015 GREY SAND SLTY 0020
17	604546	4916240	W	2019/07 7190	6 2	UT 0040		MO	0035 10	7339329 (68FKX286) A264229	BRWN SAND SLTY FILL 0002 BRWN SAND SILT 0015 BRWN SAND SLTY GVLY 0035 BRWN SAND GRVL 0040 GREY SAND SILT 0045
17	603966	4916197	W	2019/05 7644	2	UT 0009		MT	0003 12	7336966 (Z311668) A260048	BRWN LOAM SOFT 0000 BRWN SILT SAND GRVL 0013
17	603964	4916173	W	2019/05 7644	2	UT 0012		TH MO	0003 10	7368458 (Z311669) A260047	BRWN LOAM SOFT 0000 BRWN SAND GRVL SILT 0013
17	603987	4916204	W	2019/05 7644	2	UT 0010		TH MO	0003 10	7337081 (Z311667) A260045	BRWN LOAM SOFT 0000 BRWN SILT SAND PCKD 0013
17	604110	4916248	W	2019/05 7201	2				0040 10	7355097 (Z310178) A239857	BRWN FILL SAND DRY 0002 GREY SAND SLTY WBRG 0050
17	603944	4915546	W	2018/12 7190	2 4	15	15///:	MT	0020 10	7327115 (Z290092) A250336	BRWN SAND LOOS DNSE 0020
17	603992	4915566	W	2018/12 7190	2 4	12	12///:	MT	0018 11	7327114 (Z290091) A250338	BRWN SAND LOOS DNSE 0018
17	604526	4916047	W	2018/08 7464						7332759 (C39941) A244617 P	
17	604319	4916077	W	2018/05 7391						7315719 (C29149) A231310 P	
17	604081	4916214	W	2018/05 7314						7312682 (C38608) A139474 P	
17	604194	4915796	W	2018/03 7241	2.04			TH MO	0010 10	7313005 (Z281935) A215635	GREY GRVL LOOS 0005 BRWN SAND SILT SOFT 0010 BRWN SAND SOFT 0020
17	604251	4915835	W	2018/03 7241	2.04			TH MO	0020 10	7313004 (Z281934) A215636	GREY GRVL LOOS 0005 BRWN SAND SILT SOFT 0015 BRWN SAND SOFT 0030
17	604251	4915826	W	2018/03 7241	2.04			TH MO	0010 10	7313003 (Z281936) A215637	GREY GRVL LOOS 0005 BRWN SAND SOFT 0010 BRWN SAND SILT SOFT 0020
17	604538	4916277	W	2017/10 7464						7303226 (C39148) A231701 P	
17	603887	4915662	W	2017/09 7320	2	UT 0013		TH	0003 10	7297313 (Z268753) A234429	BRWN SAND GRVL LOOS 0008 BRWN SAND GRVL WBRG 0013
17	603959	4915657	W	2017/09 7320	2	UT 0012		TH	0045 5	7297315 (Z272026) A234430	BRWN SAND GRVL LOOS 0010 BLCK PEAT WDFR SOFT 0027 BRWN SAND GRVL LOOS 0040 GREY SILT CLAY SOFT 0050
17	604529	4915878	W	2017/09 7201						7301015 (Z275998) A	
17	603962	4915630	W	2017/09 7190	2	10	10///:	TH MO	0020 10	7299289 (Z271508) A229655	BRWN FILL SAND 0003 BRWN SAND GRVL 0020
17	603957	4915659	W	2017/09 7190	2 4	10	10///:	TH MO	0015 10	7299290 (Z271507) A229656	BRWN FILL SAND 0003 BRWN SAND GRVL 0015
17	604000	4915527	W	2017/09 7190	2 4	10	10///:	TH MO	0015 10	7299292 (Z271513) A229660	BRWN FILL SAND 0005 BRWN SAND GRVL 0015
17	604418	4915836	W	2017/06 2801						7289191 (C35945) P	
17	604156	4916279	W	2016/10 7383	2	10		TH	0008 10	7277585 (Z241707) A211996	SAND SILT 0025
17	604168	4916276	W	2016/10 7383	2	10		TH	0010 15	7277586 (Z241706) A211995	SAND SILT 0025
17	604444	4915865	W	2016/10 2801						7274933 (C22975) P	
17	604004	4915589	W	2016/09 7190	6 2	UT 0010		MT	0005 10	7276985 (Z238667) A177522	BRWN LOAM SAND 0000 BRWN SAND GRVL FSND 0001 BRWN SAND 0010 GREY SAND SILT CGRD 0015
17	604405	4915868	W	2016/07 2801						7269389 (C22972) P	
17	604138	4915636	W	2016/06 7190						7269454 (Z228481) A201216 A	
17	604551	4916028	W	2016/05 7190	0.75	UT 0020		MO	0035 10	7264495 (Z228510) A156769	BRWN FILL LOOS 0010 BRWN SAND LOOS 0035
17	604336	4916026	W	2016/05 6607	2			MO	0030 10	7265124 (Z223920) A179853	SAND GRVL FILL 0015 SILT SAND 0040
17	604365	4916065	W	2016/05 6607	2			MO	0030 10	7265149 (Z223923) A202664	SAND GRVL FILL 0015 SILT SAND 0040
17	604365	4916123	W	2016/05 6607	2			MO	0030 10	7265150 (Z223922) A202665	SAND GRVL FILL 0015 SILT SAND 0040
17	604340	4916013	W	2016/05 6607	2			MO	0025 10	7265151 (Z223921) A202663	SAND GRVL FILL 0015 SILT SAND 0035
17	603786	4915883	W	2016/03 7383	2			MO		7262774 (Z222159) A	
17	603789	4915884	W	2016/03 7383	2			MO		7262775 (Z222160) A	
17	603789	4915889	W	2016/03 7383	1			MO		7262776 (Z222162) A	
17	603790	4915879	W	2016/03 7383	2			MO		7262773 (Z222158) A	
17	604138	4915636	W	2016/03 7190	2	2		MO	0005 10	7264472 (Z228478) A201216	GREY SAND GRVL LOOS 0010 BRWN WDFR LOOS 0015
17	604249	4916251	W	2015/11 7201	2			MO	0040 10	7254305 (Z223280) A196051	BRWN SAND GRVL LOOS 0004 BRWN SAND SILT LOOS 0028 BRWN SAND SILT LOOS 0050
17	604214	4915661	W	2014/08 7282	2	4		MO	0004 10	7231048 (Z191729) A167637	BRWN LOAM 0001 BRWN SAND 0014
17	604195	4915648	W	2014/08 7282	2	UT 0004		MO	0004 10	7231049 (Z191736) A167638	BRWN LOAM 0001 BRWN SAND 0010 BRWN PEAT STNS 0015

TABLE B-1
MECP WATER WELL RECORD SUMMARY

UTM ZONE	EASTING	NORTHING	LOT	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
17	604187	4915642	W	2014/08 7282	2	UT 0004		MO	0003 12	7231050 (Z191728) A167639	BRWN LOAM 0001 BRWN SAND 0014 BRWN PEAT 0015
17	604180	4915642	W	2014/08 7282	2	UT 0004		MO	0003 3	7231051 (Z191730) A167640	BRWN LOAM 0002 BRWN SAND GRVL 0008 GREY SAND 0015
17	604537	4915718	W	2013/11 2801						7214974 (Z174068) A	
17	604301	4915834	W	2013/09 7241	1			MT	0015 10	7209558 (Z177904) A154195	BLCK 0000 BRWN FILL 0002 BRWN SAND 0017 GREY SILT SAND 0025
17	604279	4916097	W	2013/09 7190	2	20		MO	0035 10	7213134 (Z169392) A146194	BRWN GRVL SAND LOOS 0010 GREY SILT SAND DNSE 0035
17	604284	4916039	W	2013/08 7241	1			MT	0015 10	7209555 (Z177930) A150760	BLCK 0000 BRWN SAND SILT LOOS 0017 GREY SILT SAND LOOS 0025
17	604291	4916045	W	2013/08 7241	1			MT	0015 10	7209556 (Z177929) A154115	BLCK 0000 BRWN SAND SILT LOOS 0017 GREY SILT SAND LOOS 0025
17	604303	4916049	W	2013/08 7241	1			MT	0015 10	7209557 (Z177928) A154279	BLCK 0000 BRWN SAND SILT LOOS 0017 GREY SILT SAND LOOS 0025
17	604300	4916098	W	2012/07 6607				MO		7186921 (Z147857) A	
17	604302	4916096	W	2012/07 6607	2.04	FR 0036		MO	0032 10	7186920 (Z147856) A126223	BRWN SAND GRVL LOOS 0008 BRWN SAND GRVL STNS 0017 BRWN SAND SAND DNSE 0021 GREY SILT SAND SOFT 0042
17	603717	4915615	W	2012/05 7215						7188954 (C18409) A118069 P	
17	603997	4915581	W	2012/03 7190	2	15		MO	0012 10	7179174 (Z146932) A105855	BRWN SAND GRVL 0015 BRWN SAND GRVL WBRG 0025
17	604296	4916090	W	2011/12 6607						7176638 (M10518) A115215 P	
17	604498	4915860	W	2011/10 7282						7176288 (M10866) A120815 P	
17	604481	4915934	W	2011/09 7241	1.75			MO	0016 10	7169805 (Z136814) A111577 A	
17	604471	4915972	W	2011/09 7241	1.75			MO	0020 10	7169806 (Z136815) A111575 A	
17	604149	4915926	W	2011/09 7241	1.75			MO	0013 10	7169804 (Z136813) A111574 A	
17	604403	4915858	W	2011/06 7215	2			TH	0020 10	7166918 (Z129066) A117960	BRWN FILL 0005 BRWN SAND WBRG 0020
17	604447	4916176	W	2010/12 7241	1.75			MT	0013 10	7157663 (Z124104) A111574	BRWN FILL ROCK SAND 0008 BRWN SAND ROCK 0016 BRWN GRVL DNSE 0018 GREY SAND SOFT 0023
17	604499	4916187	W	2010/12 7241	1.75			MT	0014 15	7157664 (Z126400) A111575	BRWN LOAM LOOS 0004 BRWN SAND ROCK SOFT 0016 BRWN SAND 0020 BRWN SAND ROCK DNSE 0029
17	604499	4916187	W	2010/12 7241	1.75			MT	0013 15	7157665 (Z126401) A111577	BRWN LOAM ROCK LOOS 0005 BRWN SAND SOFT 0016 BRWN SAND ROCK 0020 BRWN SAND DNSE 0028
17	604285	4916129	W	2010/12 6607	2.00 2.00	FR 0035		MO		7157255 (M07428) A110288	BRWN SAND GRVL LOOS 0025 BRWN SAND SILT SOFT 0032 GREY SAND SILT SOFT 0042
17	603567	4915761	W	2009/01 7075	1.97				0020 2	7122264 (Z94380) A082206	BLCK 0000 BRWN FILL SAND 0002 BRWN SAND GRVL 0022
17	604278	4915927	W	2008/11 7190	2			OT	0015 10	7118162 (Z49976) A047896	BRWN SAND CLAY HARD 0025
17	604251	4915534	W	2008/08 7201	2			MO		7117031 (M03701) A076544	BRWN LOAM SAND 0000 BRWN FILL SAND GRVL 0007 BRWN PEAT SOFT 0016
17	604281	4915720	W	2008/07 7314	2			MO		7108757 (M03598) A066457 A	BRWN LOAM SAND 0002 BRWN FILL SAND 0018 BRWN SILT SAND 0022
17	604460	4915886	W	2008/05 7201				MO		7110081 (M02617) A060470	BRWN SAND GRVL 0012 BRWN SAND SILT WBRG 0018
17	604336	4915902	W	2007/12 7075	1.76			OT	0016 10	7128381 (Z73382) A045967	BRWN FILL PCKD 0010 BRWN SAND DNSE 0026
17	604338	4915739	W	2007/07 6607	2	10			0008 10	7048372 (Z64635) A053606	FILL 0010 BRWN SAND SILT WBRG 0018
17	604330	4916058	W	2006/11 7314		FR 0038				5741335 (Z46068) A041511	BLCK 0000 BRWN SAND GRVL 0005 BRWN SAND SILT GRVL 0020 GREY SILT CLAY GRVL 0038 GREY SAND SILT GRVL 0043
17	604083	4915595	W	2005/11 1663	2.46	7	6/26/40/4:0	NU	0030 5	5740454 (Z36760) A023455	BRWN GRVL SAND LOAM 0007 BRWN FSND 0010 BRWN FSND GRVL 0025 BRWN SAND GRVL 0035 BRWN FSND CLAY 0040
17	604045	4915618	W	2005/11 1663	2.46	7	5//3/0:20	NU	0033 5	5740457 (Z36761) A023454	BRWN FSND GRVL 0005 BLCK LOAM 0006 BRWN FSND WDFR 0010 BRWN FSND CLAY 0028 BRWN FSND 0038
17	604092	4915556	W	2005/05 7215	0.79				0016 33	5739834 (Z28578) A025575	
17	603811	4915602	W	2001/07 2801						5736428 (232040) A	
17	604464	4915774	W	1983/08 2801	18 10 2	FR 0086	4/8/50/3:0	NU	0122 20	5719338 ()	TILL 0019 CLAY GRVL WDFR 0044 CLAY GRVL 0086 SAND GRVL 0125 SAND GRVL BLDR 0147 CLAY STKY 0185 CLAY GRVL 0234 SAND GRVL BLDR 0249 CLAY BLDR SLTY 0300
17	604270	4915921	W	1966/12 3414	6	FR 0130	28/45/10/4:0	AC	0127 3	5700290 ()	CLAY BLDR 0018 BLDR CLAY 0026 GRVL CLAY 0118 CSND 0130
17	603772	4915544	W	1953/11 2529	7 5	FR 0170	3/19/1/48:0	CO		5700238 ()	MSND 0140 MSND GRVL 0150 GRVL 0170
17	604216	4915751	W	1937/07 2801	26 14		-20/27/1107/24:0	NU	0129 20	5700230 ()	FILL 0005 PEAT 0026 MSND GRVL 0042 MSND GRVL BLDR 0056 MSND GRVL CLAY 0075 CLAY GRVL 0085 FSND 0096 MSND GRVL 0125 HPAN 0129 GRVL MSND 0148 CLAY MSND 0149
17	604081	4916214	W	7314	2				0015 5	7312681 (Z103058) A139474	BRWN SAND GRVL FILL 0005 BRWN SAND SILT 0013 GREY TILL SAND SILT 0020



LEGEND:

● MECP RECORDED WELLS

☐ APPROXIMATE 500 M DISTANCE FROM THE SITE

☐ THE SITE

REFERENCE:
PRODUCED FROM MECP WELL RECORD MAP.

KBK ARCHITECTS INC.

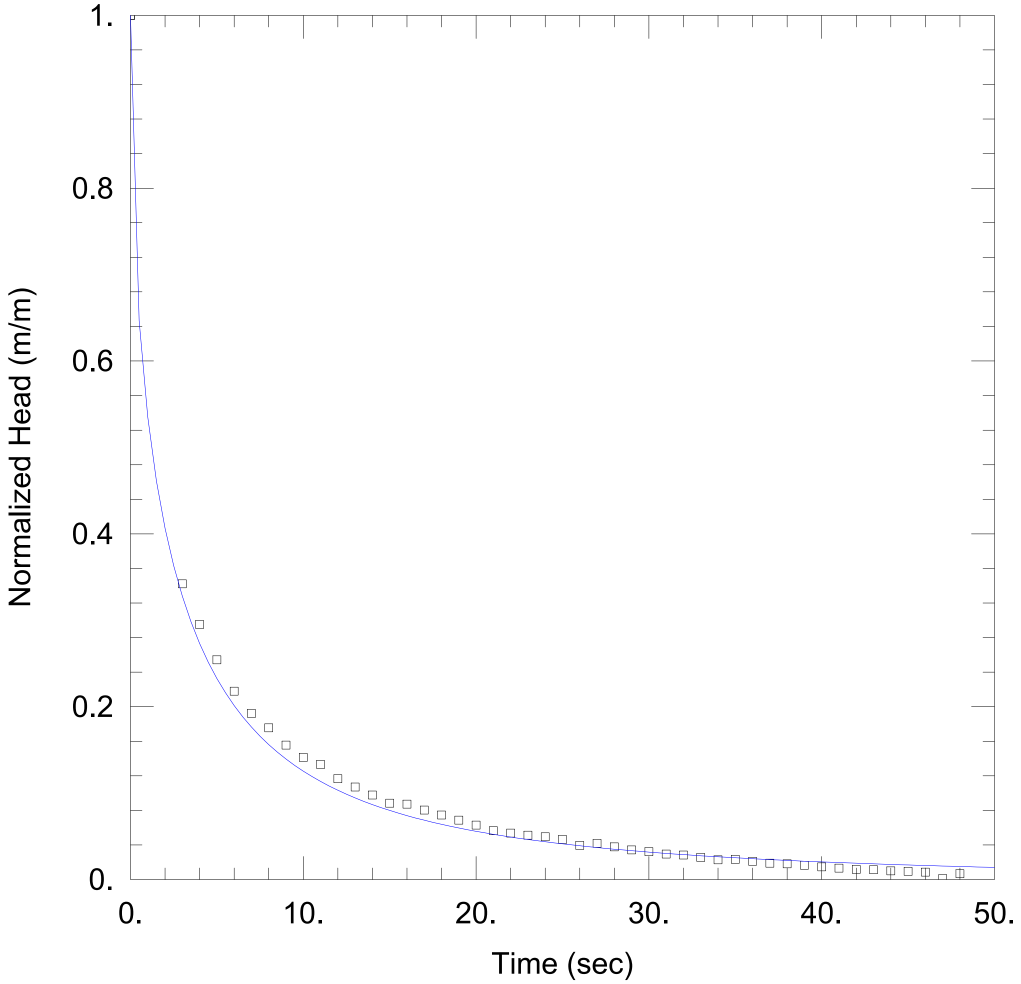
MECP RECORDED WELL MAP
HYDROGEOLOGICAL SITE ASSESSMENT
81 MARY STREET
BARRIE, ONTARIO

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	A. SURESAN	DATE	SCALE	PML REF.	FIGURE NO.
CHECKED	A. COOKE	JANUARY 2023	AS SHOWN	22TX030	B-1
APPROVED	A. COOKE				

APPENDIX C

Borehole Permeability Testing Plots



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: Peto MacCallum Limited
Client: Bradford Heating & Air Inc.
Project: 22TX030
Location: Barrie, Ontario

AQUIFER DATA

Saturated Thickness: 1.22 m

WELL DATA (BH 2)

Initial Displacement: 0.4134 m
Total Well Penetration Depth: 1.22 m
Casing Radius: 0.03 m
Well Skin Radius: 0.15 m

Static Water Column Height: 1.22 m
Screen Length: 1.22 m
Well Radius: 0.1 m

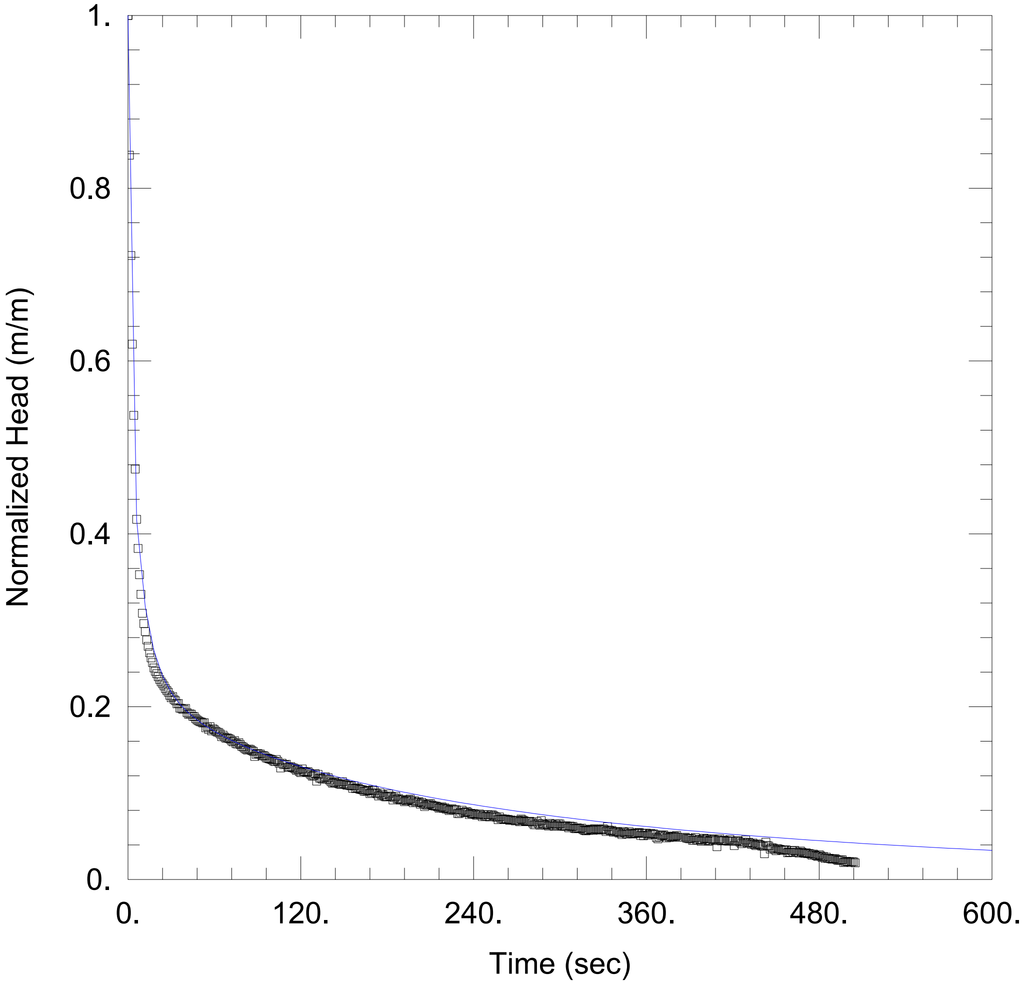
SOLUTION

Aquifer Model: Unconfined

Kr = 0.0003476 m/sec
Kz/Kr = 1.
Ss' = 0.056 m^{-1}

Solution Method: KGS Model w/skin

Ss = 0.04205 m^{-1}
Kr' = 0.0003476 m/sec
Kz/Kr' = 1.



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: Peto MacCallum Limited
Client: Bradford Heating & Air Inc.
Project: 22TX030
Location: Barrie, Ontario

AQUIFER DATA

Saturated Thickness: 1.22 m

WELL DATA (BH 3)

Initial Displacement: 0.2558 m
Total Well Penetration Depth: 1.22 m
Casing Radius: 0.03 m
Well Skin Radius: 0.15 m

Static Water Column Height: 1.22 m
Screen Length: 1.22 m
Well Radius: 0.1 m

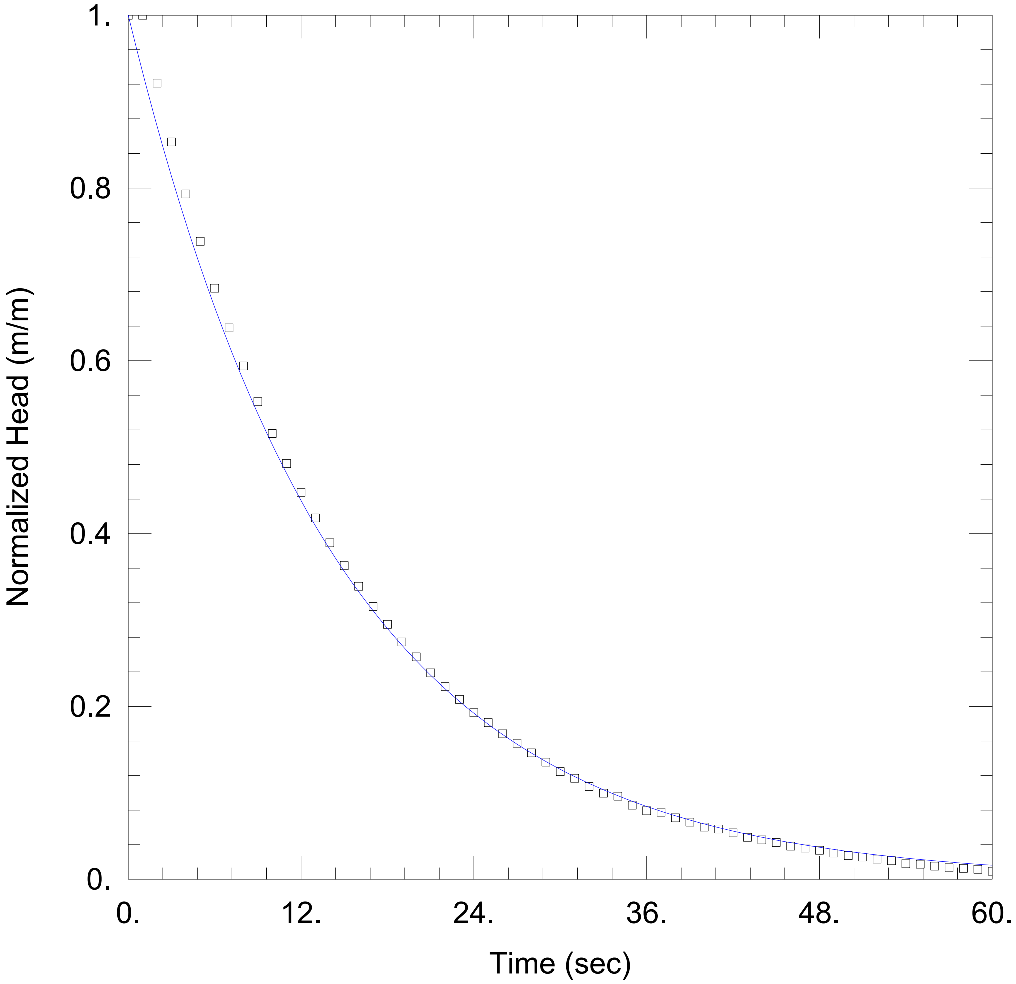
SOLUTION

Aquifer Model: Unconfined

Kr = 3.895E-5 m/sec
Kz/Kr = 1.
Ss' = 0.7952 m^{-1}

Solution Method: KGS Model w/skin

Ss = 0.04205 m^{-1}
Kr' = 3.895E-5 m/sec
Kz/Kr' = 1.



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: Peto MacCallum Limited
Client: Bradford Heating & Air Inc.
Project: 22TX030
Location: Barrie, Ontario

AQUIFER DATA

Saturated Thickness: 2.77 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 4)

Initial Displacement: 0.5347 m
Total Well Penetration Depth: 2.77 m
Casing Radius: 0.03 m
Static Water Column Height: 2.77 m
Screen Length: 1.5 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Springer-Gelhar

K = 4.784E-5 m/sec
Le = 0.1 m

APPENDIX D

Ground Water Sample Laboratory Results

FINAL REPORT

CA40295-OCT22 R1

22TX030

Prepared for

Peto MacCallum Ltd

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Peto MacCallum Ltd	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	165 Cartwright Ave Toronto, ON M6A 1V5, Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Andrew Cooke	Telephone	705-652-2143
Telephone	416-785-5110	Facsimile	705-652-6365
Facsimile	416-785-5120	Email	brad.moore@sgs.com
Email	acooke@petomaccallum.com	SGS Reference	CA40295-OCT22
Project	22TX030	Received	10/21/2022
Order Number		Approved	10/31/2022
Samples	Ground Water (1)	Report Number	CA40295-OCT22 R1
		Date Reported	10/31/2022

COMMENTS

RL - SGS Reporting Limit

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 029613

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

MATRIX: WATER

Sample Number 8
Sample Name BH 4
Sample Matrix Ground Water
Sample Date 21/10/2022

L1 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002

L2 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002

Parameter	Units	RL	L1	L2	Result
General Chemistry					
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	< 4↑
Total Suspended Solids	mg/L	2	350	15	17
Total Kjeldahl Nitrogen	as N mg/L	0.5	100		< 0.5
Chemical Oxygen Demand	mg/L	8	600		15
Metals and Inorganics					
Sulphide	mg/L	0.02	1		< 0.02
Cyanide (total)	mg/L	0.01	1.2		< 0.01
Fluoride	mg/L	0.06	10		< 0.06
Sulphate	mg/L	2	1500		53
Aluminum (total)	mg/L	0.001	50		0.139
Antimony (total)	mg/L	0.0009	5		< 0.0009
Arsenic (total)	mg/L	0.0002	1		0.0004
Barium (total)	mg/L	0.00008	5		0.355
Bismuth (total)	mg/L	0.00001	5		< 0.00001
Cadmium (total)	mg/L	0.000003	0.7	0.001	0.000013
Chromium (total)	mg/L	0.00008	2	0.08	0.00128
Cobalt (total)	mg/L	0.000004	5		0.000585
Copper (total)	mg/L	0.0002	2	0.01	0.0012
Iron (total)	mg/L	0.007	50		0.227
Lead (total)	mg/L	0.00009	0.7	0.05	0.00015
Manganese (total)	mg/L	0.00001	5		0.0746

MATRIX: WATER

Sample Number 8
Sample Name BH 4
Sample Matrix Ground Water
Sample Date 21/10/2022

L1 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002

L2 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002

Parameter	Units	RL	L1	L2	Result
Metals and Inorganics (continued)					
Molybdenum (total)	mg/L	0.00004	5		0.00060
Nickel (total)	mg/L	0.0001	2	0.05	0.0015
Phosphorus (total)	mg/L	0.003	10		0.020
Selenium (total)	mg/L	0.00004	1		0.00131
Silver (total)	mg/L	0.00005	0.4		< 0.00005
Tin (total)	mg/L	0.00006	5		0.00063
Vanadium (total)	mg/L	0.00001	5		0.00054
Zinc (total)	mg/L	0.002	2	0.04	0.003
Gold (total)	mg/L	0.00001	5		< 0.00001
Platinum (total)	mg/L	0.0001	5		< 0.0001
Rhodium (total)	mg/L	0.00001	5		< 0.00001
Oil and Grease					
Oil & Grease (total)	mg/L	2			< 2
Oil & Grease (animal/vegetable)	mg/L	4	150		< 4
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4

MATRIX: WATER

L1 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002

L2 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002

Sample Number 8
Sample Name BH 4
Sample Matrix Ground Water
Sample Date 21/10/2022

Parameter	Units	RL	L1	L2	Result
Other (ORP)					
pH	No unit	0.05	9.5	9.5	7.33
Chloride	mg/L	1	1500		660
Mercury (total)	mg/L	0.00001	0.01		< 0.00001
PAHs					
Benzo(b+j)fluoranthene	mg/L	0.0001			< 0.0001
1-Methylnaphthalene Uncertainty	mg/L	0.0005			< 0.0005
2-Methylnaphthalene Uncertainty	mg/L	0.0005			< 0.0005
Methylnaphthalene, 2-(1-)	mg/L	0.0005			< 0.0005
Phenols					
4AAP-Phenolics	mg/L	0.002	0.1		0.004
SVOCs					
PAHs (Total)	mg/L		0.005		< 0.001
Hexachlorobenzene	mg/L	0.0001	0.0001		< 0.0001

FINAL REPORT

Client: Peto MacCallum Ltd

Project: 22TX030

Project Manager: Andrew Cooke

Samplers: Niklas Gardlund

MATRIX: WATER

Sample Number 8

Sample Name BH 4

Sample Matrix Ground Water

Sample Date 21/10/2022

L1 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002

L2 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002

SVOCs - PAHs

Parameter	Units	RL	L1	L2	Result
Acenaphthene	mg/L	0.0001			< 0.0001
Acenaphthylene	mg/L	0.0001			< 0.0001
Anthracene	mg/L	0.0001			< 0.0001
Benzo(a)anthracene	mg/L	0.0001			< 0.0001
Benzo(a)pyrene	mg/L	0.0001			< 0.0001
Benzo(ghi)perylene	mg/L	0.0002			< 0.0002
Benzo(k)fluoranthene	mg/L	0.0001			< 0.0001
Chrysene	mg/L	0.0001			< 0.0001
Dibenzo(a,h)anthracene	mg/L	0.0001			< 0.0001
Fluoranthene	mg/L	0.0001			< 0.0001
Fluorene	mg/L	0.0001			< 0.0001
Indeno(1,2,3-cd)pyrene	mg/L	0.0002			< 0.0002
Naphthalene	mg/L	0.0005			< 0.0005
Phenanthrene	mg/L	0.0001			< 0.0001
Pyrene	mg/L	0.0001			< 0.0001

FINAL REPORT

Client: Peto MacCallum Ltd
Project: 22TX030
Project Manager: Andrew Cooke
Samplers: Niklas Gardlund

MATRIX: WATER

L1 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002

L2 = SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002

Sample Number 8
Sample Name BH 4
Sample Matrix Ground Water
Sample Date 21/10/2022

Parameter	Units	RL	L1	L2	Result
VOCs					
1,2-Dichlorobenzene	mg/L	0.0005	0.05		< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005	0.08		< 0.0005
Methylene Chloride	mg/L	0.0005	0.09		< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.06		< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.06		< 0.0005
Trichloroethylene	mg/L	0.0005	0.05		< 0.0005
VOCs - BTEX					
Benzene	mg/L	0.0005	0.01		< 0.0005
Ethylbenzene	mg/L	0.0005	0.06		< 0.0005
Toluene	mg/L	0.0005	0.02		< 0.0005
Xylene (total)	mg/L	0.0005	0.3		< 0.0005
m-p-xylene	mg/L	0.0005			< 0.0005
o-xylene	mg/L	0.0005			< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	SANSEW / WATER / - - Barrie Sewer Use ByLaw - Sanitary and Combined Sewer Discharge - BL_2021_002 L1	SANSEW / WATER / - - Barrie Sewer Use ByLaw - Storm Sewer Discharge - BL_2021_002 L2
BH 4					
Total Suspended Solids	SM 2540D	mg/L	17		15

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5106-OCT22	mg/L	1	<1	3	20	104	80	120	99	75	125
Sulphate	DIO5106-OCT22	mg/L	2	<2	3	20	108	80	120	94	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0045-OCT22	mg/L	2	< 2	10	30	105	70	130	71	70	130

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0559-OCT22	mg/L	8	<8	10	20	102	80	120	100	75	125

QC SUMMARY

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0253-OCT22	mg/L	0.01	<0.01	ND	10	92	90	110	100	75	125

Fluoride by Specific Ion Electrode

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0562-OCT22	mg/L	0.06	<0.06	0	10	101	90	110	107	75	125

Mercury by CVAAS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0042-OCT22	mg/L	0.00001	< 0.00001	ND	20	82	80	120	105	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0189-OCT22	mg/L	0.00005	<0.00005	ND	20	102	90	110	99	70	130
Aluminum (total)	EMS0189-OCT22	mg/L	0.001	<0.001	3	20	97	90	110	98	70	130
Arsenic (total)	EMS0189-OCT22	mg/L	0.0002	<0.0002	1	20	98	90	110	102	70	130
Gold (total)	EMS0189-OCT22	mg/L	0.00001	<0.00001	ND	20	105	90	110	NV	70	130
Barium (total)	EMS0189-OCT22	mg/L	0.00008	<0.00002	0	20	103	90	110	106	70	130
Bismuth (total)	EMS0189-OCT22	mg/L	0.00001	<0.00001	ND	20	101	90	110	93	70	130
Cadmium (total)	EMS0189-OCT22	mg/L	0.000003	<0.000003	2	20	100	90	110	101	70	130
Cobalt (total)	EMS0189-OCT22	mg/L	0.000004	<0.000004	6	20	101	90	110	102	70	130
Chromium (total)	EMS0189-OCT22	mg/L	0.00008	<0.00008	11	20	104	90	110	110	70	130
Copper (total)	EMS0189-OCT22	mg/L	0.0002	<0.0002	0	20	102	90	110	116	70	130
Iron (total)	EMS0189-OCT22	mg/L	0.007	<0.007	3	20	101	90	110	100	70	130
Manganese (total)	EMS0189-OCT22	mg/L	0.00001	<0.00001	5	20	103	90	110	125	70	130
Molybdenum (total)	EMS0189-OCT22	mg/L	0.00004	<0.00004	1	20	102	90	110	107	70	130
Nickel (total)	EMS0189-OCT22	mg/L	0.0001	<0.0001	0	20	100	90	110	105	70	130
Lead (total)	EMS0189-OCT22	mg/L	0.00009	<0.00001	2	20	104	90	110	111	70	130
Phosphorus (total)	EMS0189-OCT22	mg/L	0.003	<0.003	3	20	98	90	110	NV	70	130
Platinum (total)	EMS0189-OCT22	mg/L	0.0001	<0.0001	ND	20	95	90	110	NV	70	130
Rhodium (total)	EMS0189-OCT22	mg/L	0.00001	<0.0001	ND	20	97	90	110	NV	70	130
Antimony (total)	EMS0189-OCT22	mg/L	0.0009	<0.0009	ND	20	98	90	110	113	70	130
Selenium (total)	EMS0189-OCT22	mg/L	0.00004	<0.00004	ND	20	101	90	110	101	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Tin (total)	EMS0189-OCT22	mg/L	0.00006	<0.00006	ND	20	101	90	110	NV	70	130
Vanadium (total)	EMS0189-OCT22	mg/L	0.00001	<0.00001	10	20	98	90	110	109	70	130
Zinc (total)	EMS0189-OCT22	mg/L	0.002	<0.002	14	20	100	90	110	105	70	130

Oil & Grease

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0323-OCT22	mg/L	2	<2	NSS	20	102	75	125			

QC SUMMARY

Oil & Grease-AV/MS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0323-OCT22	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0323-OCT22	mg/L	4	< 4	NSS	20	NA	70	130			

pH

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0549-OCT22	No unit	0.05	NA	0		100			NA		

Phenols by SFA

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0268-OCT22	mg/L	0.002	<0.002	ND	10	106	80	120	87	75	125

QC SUMMARY

Semi-Volatile Organics

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1-Methylnaphthalene Uncertainty	GCM0374-OCT22	mg/L	0.0005	< 0.0005	NSS	30	73	50	140	NSS	50	140
2-Methylnaphthalene Uncertainty	GCM0374-OCT22	mg/L	0.0005	< 0.0005	NSS	30	72	50	140	NSS	50	140
Acenaphthene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	80	50	140	NSS	50	140
Acenaphthylene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	76	50	140	NSS	50	140
Anthracene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	87	50	140	NSS	50	140
Benzo(a)anthracene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	88	50	140	NSS	50	140
Benzo(a)pyrene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	93	50	140	NSS	50	140
Benzo(b+j)fluoranthene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	96	50	140	NSS	50	140
Benzo(ghi)perylene	GCM0374-OCT22	mg/L	0.0002	< 0.0002	NSS	30	93	50	140	NSS	50	140
Benzo(k)fluoranthene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	94	50	140	NSS	50	140
Chrysene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140
Dibenzo(a,h)anthracene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140
Fluoranthene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	91	50	140	NSS	50	140
Fluorene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	85	50	140	NSS	50	140
Hexachlorobenzene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	83	50	140	NSS	50	140
Indeno(1,2,3-cd)pyrene	GCM0374-OCT22	mg/L	0.0002	< 0.0002	NSS	30	88	50	140	NSS	50	140
Naphthalene	GCM0374-OCT22	mg/L	0.0005	< 0.0005	NSS	30	71	50	140	NSS	50	140
Phenanthrene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	87	50	140	NSS	50	140
Pyrene	GCM0374-OCT22	mg/L	0.0001	< 0.0001	NSS	30	90	50	140	NSS	50	140

QC SUMMARY

Sulphide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	SKA0259-OCT22	mg/L	0.02	<0.02	ND	20	103	80	120	NA	75	125

Suspended Solids

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0597-OCT22	mg/L	2	< 2	0	10	99	90	110	NA		

Total Nitrogen

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0250-OCT22	as N mg/L	0.5	<0.5	5	10	100	90	110	102	75	125

QC SUMMARY

Volatile Organics

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	92	60	130	96	50	140
1,2-Dichlorobenzene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	91	60	130	99	50	140
1,4-Dichlorobenzene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	91	60	130	97	50	140
Benzene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	90	60	130	98	50	140
Ethylbenzene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	91	60	130	98	50	140
m-p-xylene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	91	60	130	99	50	140
Methylene Chloride	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	89	60	130	94	50	140
o-xylene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	90	60	130	99	50	140
Tetrachloroethylene (perchloroethylene)	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	92	60	130	99	50	140
Toluene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	90	60	130	98	50	140
Trichloroethylene	GCM0345-OCT22	mg/L	0.0005	<0.0005	ND	30	90	60	130	97	50	140

QC SUMMARY

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: 029613

Page ______ of ______

Laboratory Information Section - Lab use only

Received By: B. Cannon

Received By (signature):

Received Date: 10 / 21 / 22 (mm/dd/yy)

Received Time: 14 : 30 (hr : min)

Custody Seal Present: Yes ☑ No ☐

Custody Seal Intact: Yes ☑ No ☐

Cooling Agent Present: Yes ☑ No ☐

Type: ICE.

Temperature Upon Receipt (°C) 9,9,9

LAB LIMS #: CA-40295-OCT22

REPORT INFORMATION

Company: Peto MacCallum Ltd.

Contact: Andrew Cooke

Address: 165 Cartwright Ave.
Toronto, ON

Phone: (416) 785-5110

Fax: (416) 785-5120

Email: acooke@petomaccallum.com
ngardlund@petomaccallum.com

INVOICE INFORMATION

☐ (same as Report Information)

Company: PML

Contact: Niklas Gardlund

Address: 19 Churchill Dr.
Barrie, ON

Phone: (705) 734-3900

Email: ngardlund@petomaccallum.com

Quotation #: PML RATE

P.O. #: N/A

Project #: 22TX030

Site Location/ID: Barrie, ON

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

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

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

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: ______________________

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

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19

☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ________ Appx. ________
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other: ________
☐ MISA
☐ ODWS Not Reportable *See note

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

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	M & I: Field Filtered (Y/N)	M & I: Metals & Inorganics incl CrVI, CN, Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M & I: Full Metals Suite ICP metals plus B(HWS-soil only) Hg, CrVI	M & I: ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify)	Other (please specify)	Other (please specify)	Other (please specify)	Sewer Use: Specify pkg: Sanitary & Storm	Water Characterization Pkg General ☐ Extended ☐	SPLP Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	BH 4	Oct 21, 2022	10-11 am	16	Water	N																✓				
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): Niklas Gardlund Signature: Date: 10 / 21 / 22 (mm/dd/yy) Pink Copy - Client

Relinquished by (NAME): Niklas Gardlund Signature: Date: 10 / 21 / 22 (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 02 May 2022

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

APPENDIX E

Water Balance and Site Plan (Not to Scale)

Peto MacCallum Ltd.
CONSULTING ENGINEERS

Table: **E-1, Monthly Water Balance by the Thornthwaite Method**
Project No.: **22TX030**
Project: **Mary Street, Barrie**

Area Name: **Site Catchment Area**
Scenerio: **Pre-Development**

Month	**Units**	**Jan.**	**Feb.**	**Mar.**	**Apr.**	**May**	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**SUM**	**MISC**
Daily Average Temp.	**°C**	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5		
Monthly Heat Index, It		0.00	0.00	0.00	1.19	3.91	6.90	8.66	7.97	5.44	2.31	0.39	0.00	36.8	1.08
Potential Evapotranspiration (PET)	**mm**	0.00	0.00	0.00	25.21	59.00	88.49	104.08	98.15	74.69	40.58	11.46	0.00	502	
Daylight Correction Factor	**mm**	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.76		
Adjusted PET	**mm**	0.0	0.0	0.0	28.4	75.2	113.7	135.8	118.4	77.7	38.2	9.1	0.0	**597**	
Mean Monthly Precip.	**mm**	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	**933**	
Other Inputs	**mm**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Sum:
Total Inputs, PI	**mm**	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	**933**	**933**
Pervious Region		(Pasture and Shrub, sandy loam)													
PI-AdjPET	**mm**	82.5	61.8	58.1	33.8	7.2	-28.9	-58.6	-28.5	16.3	39.3	79.8	73.6		
Accumulated Water loss (WL)	**mm**	0.0	0.0	0.0	0.0	0.0	-28.9	-87.6	-116.0	-116.0	-116.0	-116.0	-116.0		
Soil Moisture Storage Capacity	**mm**	75	75	75	75	75	75	75	75	75	75	75	75		
Water Stored (WS)	**mm**	75	75	75	75	75	50	22	15	31	70	75	75		
Change in Water Storage (CWS)	**mm**	0	0	0	0	0	-25	-28	-7	16	39	5	0		
Actual Evapotranspiration (AET)	**mm**	0	0	0	28	75	110	105	97	78	38	9	0	**541**	
Surplus	**mm**	83	62	58	34	7	0	0	0	0	0	75	74	**392**	
MECP Infiltration Factor (Total)	**mm**	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		
Infiltration	**mm**	45	34	32	19	4	0	0	0	0	0	41	40	**216**	Check Sum:
Runoff	**mm**	37	28	26	15	3	0	0	0	0	0	34	33	**176**	**933**
Impervious Region															
Runoff from Impervious Surfaces	**mm**	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
Surplus	**mm**	66	49	46	50	66	68	62	72	75	62	71	59	**746**	
Evaporation	**mm**	17	12	12	12	16	17	15	18	19	16	18	15	**187**	
Rooftop Infiltration	**mm**	0	0	0	0	0	0	0	0	0	0	0	0	**0**	Check Sum:
Runoff	**mm**	66	49	46	50	66	68	62	72	75	62	71	59	**746**	**933**
Total Area	**m^2**	506	506	506	506	506	506	506	506	506	506	506	506		
% Impervious Area	**%**	31	31	31	31	31	31	31	31	31	31	31	31		Sum:
Precipitation	**m^3/month**	42	31	29	31	42	43	39	45	48	39	45	37	**472**	
Other Inputs	**m^3/month**	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Total Input	**m^3/month**	42	31	29	31	42	43	39	45	48	39	45	37	**472**	**472**
Pervious Area	**m^2**	349	349	349	349	349	349	349	349	349	349	349	349		
Evapotranspiration (AET)	**m^3/month**	0	0	0	10	26	38	37	34	27	13	3	0	**189**	
Infiltration	**m^3/month**	16	12	11	6	1	0	0	0	0	0	14	14	**75**	
Runoff	**m^3/month**	13	10	9	5	1	0	0	0	0	0	12	12	**62**	
Impervious Area	**m^2**	157	157	157	157	157	157	157	157	157	157	157	157		
Evaporation	**m^3/month**	3	2	2	2	3	3	2	3	3	2	3	2	**29**	
Rooftop Infiltration	**m^3/month**	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Runoff	**m^3/month**	10	8	7	8	10	11	10	11	12	10	11	9	**117**	
Total Evap*	**m^3/month**	3	2	2	12	29	41	39	37	30	16	6	2	**218**	
Total Infiltration	**m^3/month**	16	12	11	6	1	0	0	0	0	0	14	14	**75**	Check Sum:
Total Runoff	**m^3/month**	23	17	16	13	11	11	10	11	12	10	23	21	**179**	**472**

Soil Moisture Storage Capacity Source	Stormwater Management Planning and Design Manual, March 2003, MOE
Weather station is at Latitude:	44 deg 22 min
Site is at Latitude:	44 deg 38 min
Weather Source:	Source: Canadian Climate Normals, 1981 to 2010, "Georgetown" weather station

* Evapotranspiration and Evaporation

Peto MacCallum Ltd.
CONSULTING ENGINEERS

Table: E-2, Monthly Water Balance by the Thornthwaite Method
Project No.: 22TX030
Project: Mary Street, Barrie

Area Name: Site Catchment Area
Scenerio: Post Development

Month	Units	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	SUM	MISC
Daily Average Temp.	°C	-7.7	-6.6	-2.1	5.6	12.3	17.9	20.8	19.7	15.3	8.7	2.7	-3.5		
Monthly Heat Index, It		0.00	0.00	0.00	1.19	3.91	6.90	8.66	7.97	5.44	2.31	0.39	0.00	36.8	1.08
Potential Evapotranspiration (PET)	mm	0.00	0.00	0.00	25.21	59.00	88.49	104.08	98.15	74.69	40.58	11.46	0.00	502	
Daylight Correction Factor	mm	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.76		
Adjusted PET	mm	0.0	0.0	0.0	28.4	75.2	113.7	135.8	118.4	77.7	38.2	9.1	0.0	**597**	
Mean Monthly Precip.	mm	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	**933**	
Other Inputs	mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		Sum:
Total Inputs, PI	mm	82.5	61.8	58.1	62.2	82.4	84.8	77.2	89.9	94.0	77.5	88.9	73.6	**933**	**933**
Pervious Region		(Urban lawns, fine sandy loam)													
PI-AdjPET	mm	82.5	61.8	58.1	33.8	7.2	-28.9	-58.6	-28.5	16.3	39.3	79.8	73.6		
Accumulated Water loss (WL)	mm	0.0	0.0	0.0	0.0	0.0	-28.9	-87.6	-116.0	-116.0	-116.0	-116.0	-116.0		
Soil Moisture Storage Capacity	mm	75	75	75	75	75	75	75	75	75	75	75	75		
Water Stored (WS)	mm	75	75	75	75	75	50	22	15	31	70	75	75		
Change in Water Storage (CWS)	mm	0	0	0	0	0	-25	-28	-7	16	39	5	0		
Actual Evapotranspiration (AET)	mm	0	0	0	28	75	110	105	97	78	38	9	0	**541**	
Surplus	mm	83	62	58	34	7	0	0	0	0	0	75	74	**392**	
MECP Infiltration Factor (Total)	mm	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60		
Infiltration	mm	50	37	35	20	4	0	0	0	0	0	45	44	**235**	Check Sum:
Runoff	mm	33	25	23	14	3	0	0	0	0	0	30	29	**157**	**933**
Impervious Region															
Runoff from Impervious Surfaces	mm	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
Surplus	mm	66	49	46	50	66	68	62	72	75	62	71	59	**746**	
Evaporation	mm	17	12	12	12	16	17	15	18	19	16	18	15	**187**	
Rooftop Infiltration	mm	0	0	0	0	0	0	0	0	0	0	0	0	**0**	Check Sum:
Runoff	mm	66	49	46	50	66	68	62	72	75	62	71	59	**746**	**933**
Total Area	m^2	506	506	506	506	506	506	506	506	506	506	506	506		
% Impervious Area	%	73	73	73	73	73	73	73	73	73	73	73	73		Sum:
Precipitation	m^3/month	42	31	29	31	42	43	39	45	48	39	45	37	**472**	
Other Inputs	m^3/month	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Total Input	m^3/month	42	31	29	31	42	43	39	45	48	39	45	37	**472**	**472**
Pervious Area	m^2	136	136	136	136	136	136	136	136	136	136	136	136		
Evapotranspiration (AET)	m^3/month	0	0	0	4	10	15	14	13	11	5	1	0	**73**	
Infiltration	m^3/month	7	5	5	3	1	0	0	0	0	0	6	6	**32**	
Runoff	m^3/month	4	3	3	2	0	0	0	0	0	0	4	4	**21**	
Impervious Area	m^2	370	370	370	370	370	370	370	370	370	370	370	370		
Evaporation	m^3/month	6	5	4	5	6	6	6	7	7	6	7	5	**69**	
Rooftop Infiltration	m^3/month	0	0	0	0	0	0	0	0	0	0	0	0	**0**	
Runoff	m^3/month	24	18	17	18	24	25	23	27	28	23	26	22	**276**	
Total Evap*	m^3/month	6	5	4	8	16	21	20	20	18	11	8	5	**142**	
Total Infiltration	m^3/month	7	5	5	3	1	0	0	0	0	0	6	6	**32**	Check Sum:
Total Runoff	m^3/month	29	22	20	20	25	25	23	27	28	23	30	26	**298**	**472**

Soil Moisture Storage Capacity Source	Stormwater Management Planning and Design Manual, March 2003, MOE
Weather station is at Latitude:	44 deg 22 min
Site is at Latitude:	44 deg 38 min
Weather Source:	Source: Canadian Climate Normals, 1981 to 2010, "Georgetown" weather station

* Evapotranspiration and Evaporation

Table: **E-3: Water Balance / Water Budget Assessment - Summary**
Project No: **22TX030**
Project: **Mary Street, Barrie**

Peto MacCallum Ltd.
CONSULTING ENGINEERS

	Pre-Development (Volumes in m^3/year) **Site**	**Post-Development (Volumes in m^3/year)** **Site**	**Change (Pre- to Post)**
INPUTS (by VOLUME)			
Precipitation	472	472	(0)
Other Inputs	-	-	-
Total Inputs	472	472	(0)
OUTPUTS (by VOLUME)			
Pervious Region			
Evapotranspiration	189	73	(115)
Infiltration	75	32	(43)
Runoff	62	21	(40)
Impervious Region			-
Evaporation	**29**	69	40
Rooftop Infiltration	-	-	-
Runoff	117	276	159
Totals			
Total Evap*	218	142	(76)
Total Infiltration	75	32	(43)
Total Runoff	179	298	119
Total Outputs	472	472	(0)

* Evapotranspiration and evaporation

81 MARY STREET
BARRIE, ON

KBK ARCHITECTS INC.
T: 1(800)-203-7010
INFO@KBKARCHITECTS.CA
SUITE #300, 25 SHEPPARD AVE. W, TORONTO

SCOPE

1. DEMOLISH EXISTING DWELLING
2. PROPOSED 3 STOREY 4PLEX BUILDING + GROUND FLOOR PERSONAL SERVICES

GENERAL NOTES

1. CONTRACTOR MUST VISIT SITE TO FAMILIARIZE WITH EXISTING CONDITIONS BEFORE QUOTING FOR THE JOB.
2. VERIFY ALL EXISTING MEMBER SIZES, ELEVATIONS, AND DIMENSIONS ON SITE PRIOR TO COMMENCING ANY WORKS.
3. REPORT ANY DISCREPANCIES TO ENGINEER IMMEDIATELY FOR ADVISE.
4. CONTRACTOR TO SUBMIT DETAIL SHOP DRAWINGS PRIOR TO FABRICATION.
5. REFER TO NOTES AND SCHEDULES FOR SPECIFICATIONS & GENERAL NOTES.
6. DIMENSIONS MARKED ON STRUCTURAL DRAWINGS ARE FOR DESIGN ONLY. CONTRACTOR IS REQUIRED TO FOLLOW MEASURE ALL DIMENSIONS, LEVELS & CONDITIONS ON SITE.

DISCREPANCY BETWEEN STRUCTURAL & ON SITE CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF ENGINEER & OWNER PRIOR TO COMMENCING ANY CONSTRUCTION AND FABRICATION.

7. THESE NOTES AND ALL NOTES ARE PART OF THE WHOLE APPLICATION.

CONTRACTOR(S) MUST GO THOUGHT NOTES AND TREAT ALL DRAWINGS AS PART OF ONE APPLICATION.

8. PRIOR TO THE REMOVAL OF ANY INTERIOR WALLS, VERIFY THE CONSTRUCTION AND SUPPORT REQUIREMENTS OF THE CEILING JOISTS OR BOTTOM CHORDS OF ROOF TRUSSES (ABOVE).
IF CEILING JOISTS BEAR ON INTERIOR WALLS, METHOD AND DESIGN OF SUPPORT FOR THE CEILING AREA TO BE PROVIDED TO INSPECTOR ON SITE FOR APPROVAL.

9. CONTRACTORS AND OWNERS REQUIRING ADDITIONAL INFORMATION OR CLARIFICATIONS ON THE DRAWINGS DURING CONSTRUCTION MUST CONTACT KBK ARCHITECTS INC BY EMAIL TO [INFO@KBKARCHITECTS.CA].

CONTRACTOR(S) AND CLIENT(S) ARE REQUESTED TO SEND A REQUEST FOR INFORMATION IN SUCH CASES, AND UNDERSTAND THAT THE REPLY TYPICALLY TAKES 48 HOURS. CLIENT(S) AND CONTRACTOR(S) ARE ASKED NOT TO MAKE PHONE CALLS WITH SUCH INQUIRES TO AVOID MISCOMMUNICATION, AND TO HAVE ALL COMMUNICATIONS AS RFI'S IN WRITING

KEY PLAN

ONTARIO BUILDING CODE MATRIX

PROPOSED THREE STOREY BUILDING (2 STOREY RESIDENTIAL + GROUND FLOOR PERSONAL SERVICES)
81 MARY ST. BARRIE, ON

		OBC REFERENCE
PROJECT DESCRIPTION: EXISTING BUSINESS PROPOSED BUSINESS CENTRE	☒NEW ☐ALTERATION ☐ADDITION ☐CHANGE OF USE	☒PART 9, 1.1.2.[A] & 9.10.1.3
MAJOR OCCUPANCY(S): BUILDING AREA: GROSS AREA:	GROUP C 52.63 SQM 300.71 SQM	9.10.2
MINOR OCCUPANCY BUILDING AREA: GROSS AREA:	GROUP D 71.41 SQM 71.41 SQM	9.10.2
TOTAL BUILDING AREA:	124.04 SQM	
TOTAL GROSS AREA:	372.12 SQM	
NUMBER OF STOREY'S:	3 (THREE)	1.4.1.2 [A] & 9.10.4
NUMBER OF STREETS/FIRE FIGHTER ACCESS:	1	9.10.20
BUILDING CLASSIFICATION:	GROUP C, GROUP D (MINOR)	9.10.2
SPRINKLER SYSTEM	☐ENTIRE BUILDING ☐BASEMENT ONLY ☐IN LIEU OF ROOF RATING ☒NOT REQUIRED (NONE EXISTING)	index 9.10.8.2
STANDPIPE REQUIRED:	☐YES ☒NO	N/A
FIRE ALARM REQUIRED:	☐YES ☒NO	9.10.18
WATER SERVICE/SUPPLY IS ADEQUATE:	☒YES ☐NO	N/A
HIGH BUILDING	☐YES ☒NO	N/A
PERMITTED CONSTRUCTION:	☐COMBUSTIBLE ☐NON-COMBUSTIBLE ☒BOTH	9.10.6
ACTUAL CONSTRUCTION:	☐COMBUSTIBLE ☐NON-COMBUSTIBLE ☒BOTH	
MEZZANINE(S) AREA:	N/A SQ.M.	9.10.4.1
OCCUPANT LOAD BASED ON:	☒SQ.M./PERSON OCCUPANCY: 71.41 / 4.6 PERSONS COMM = 16 PERSONS TOTAL = 26 PERSONS ☒BUILDING DESIGN LOAD (IN PERSONS): 4UNIT X 2 PERSONS RES = 10 PERSONS	9.9.1.3
BARRIER-FREE DESIGN:	☒YES ☐NO	9.5.2.
HAZARDOUS SUBSTANCES:	☐YES ☒NO	9.10.1.3.(4)
REQUIRED FIRE RESISTANCE RATINGS (FRR):		9.10.8 9.10.9

HORIZONTAL ASSEMBLIES	FRR (HRS)
FLOORS	45MIN
MEZZANINE	N/A
ROOF	N/A

SUPPORTING ASSEMBLIES	FRR (HRS)	Listed Design or Descrip.
FLOORS	45MIN	(N.C.C.)*
COLUMNS	45MIN	(N.C.C.)*

*(N.C.C.= NON COMBUSTIBLE CONSTRUCTION)

Zoning Information	Commercial Zone: C2-1	Residential RA2	
Lot area	506.05		sqm
	Allowed		Provided
Max Height (Flat roof)	15m	7.0m	
Max Heght	30m	20m	9.08m
Max Coverage		35%	25.15%
Min Coverage Comm	50%		14.05%
Min Open Landscape		N/A	26.83%
Parking Spaces		5 Spaces	5 Spaces
Setbacks			
Front Yard		7m	3m
Rear Yard		7m	21.26m
Side Yard	3m	0.9m	1.5m
Driveway Side Yard	3m	0.9m	3.0m

a. Maximum Expected Depth of Excavation (masl or m below current grade)	1.32m
b. Maximum Expected Depth of Foundation (masl or m below current grade)-i.e.piles, caissons, raft slab etc.	1.32m
c. Percentage of site to be developed	25.15%

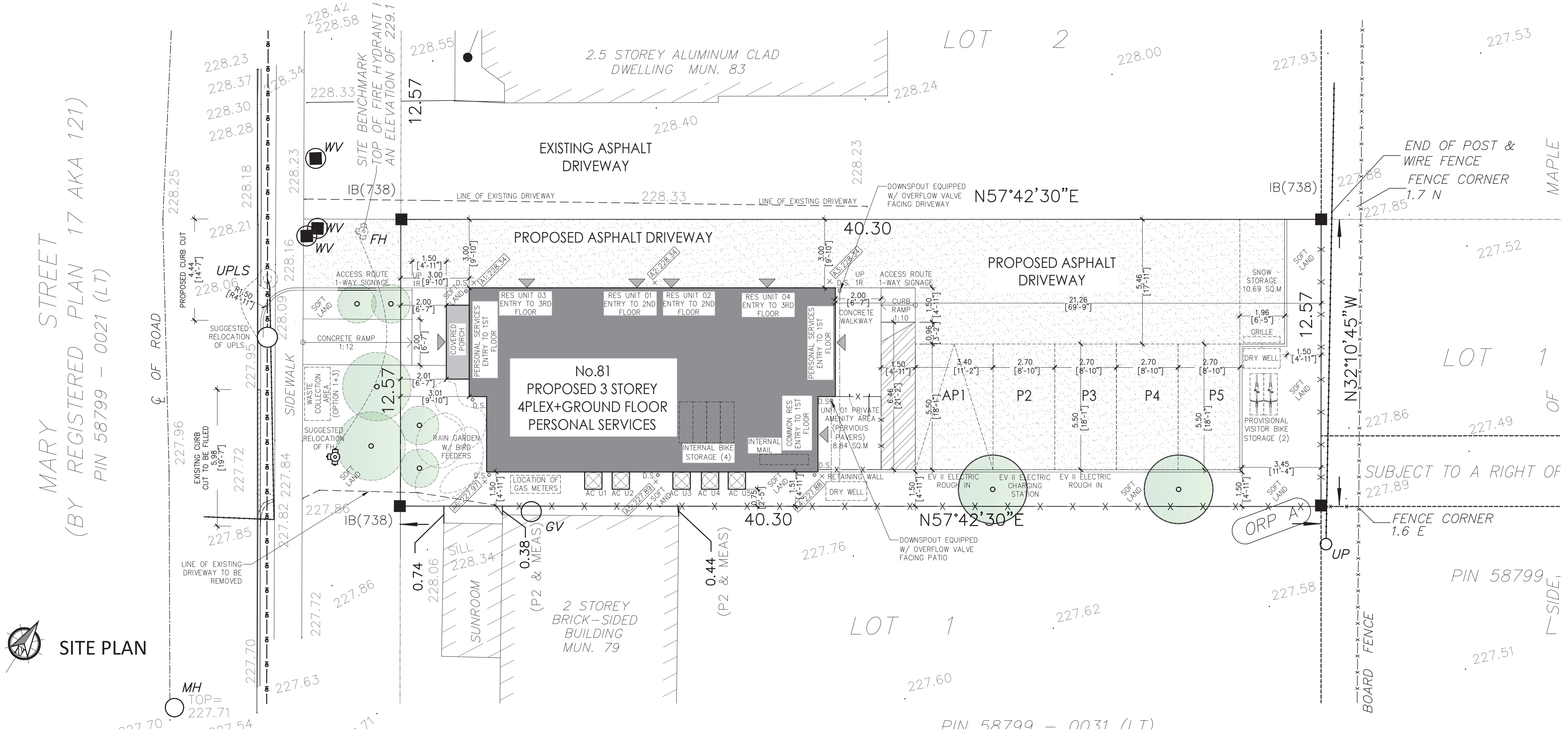
Apartment Unit	Floor	Area including Exterior wall	
Residential	First	52.63	sqm
Commercial		71.41	sqm
Unit 02	Second	57.84	sqm
Unit 03		57.84	sqm
Unit 04	Third	68.24	sqm
Unit 05		68.24	sqm

Floor Area Calculation	sqm	sqft
Lot Area	506.05	5,447.07
	Proposed	
	sqm	sqft
First Floor Area	124.04	1,335.15
Second Floor Area	124.04	1,335.15
Third Floor Area	124.04	1,335.15
Net GFA	**372.12**	4,005.46
FSI	**73.53%**	

Average Grade	
A1	228.34
A2	228.34
A3	228.34
A4	227.88
A5	227.89
A6	227.97
	228.126

Open Landscape	sqm	
Lot Area	506.05	
Building Coverage	127.27	25.15%
Asphalt Driveway	242.99	48.02%
Total Hardscape	370.26	73.17%
Total Soft Landscape	**135.79**	**26.83%**

Lot Coverage	sqm
Lot Area	506.05
Building Footprint	124.04
Porch Canopy	3.23
Total	**127.27**
Percentage	**25.15%**



SITE PLAN

DESIGNER'S STAMP

GENERAL NOTES

ALL DRAWINGS ARE THE PROPERTY OF KBK ARCHITECTS AND THEY ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT WRITTEN CONSENT FROM KBK ARCHITECTS INC.

CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS BEFORE COMMENCING WORK AND TO REPORT ANY DISCREPANCIES TO THE ENGINEER OR KBK ARCHITECTS

ALL CONSTRUCTION TO BE ACCORDING TO BEST COMMON PRACTICE AND CONFORM TO THE ONTARIO BUILDING CODE.

NO.	ISSUED FOR	DATE
1	PRE–CONSULATION	FEB 19, 2021
2	SPA SUBMISSION	OCT 29, 2021
3	SPA SUBMISSION	APR 14, 2022

KBK ARCHITECTS INC.
T: 1 (800)-203-7010
INFO@KBKARCHITECTS.CA
Suite 300, 25 Sheppard Ave. West
Toronto M2N 6S6 Ontario

PROJECT ADDRESS
81 MARY STREET
BARRIE, ON

DRAWING
SITE PLAN

DRAWN: JL
MNGR.: JL
PLOTTED DATE: APR 14, 2022
SCALE @18"X24": 1 : 150
CHECKED: KYLE KHADRA
DRAWING NO: A0.1

APPENDIX F

Statement of Limitations

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

STATEMENT OF LIMITATIONS
(continued)

The findings and comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may affect the validity of the findings and recommendations given in this report.

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence an action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.