Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL/HYDROGEOLOGICAL INVESTIGATION
PROPOSED SIMCOE COUNTY SERVICE CAMPUS
2 BORLAND STREET EAST
ORILLIA, ONTARIO

for

THE CORPORATION OF THE COUNTY OF SIMCOE

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 12, 2021 PML Ref.: 20BF055
Report: 1

Mr. Jason Allan
The Corporation of The County of Simcoe
1110 Highway 26
Midhurst, Ontario
L9X 1N6

Dear Mr. Allan

Geotechnical/Hydrogeological Investigation
Proposed Simcoe County Service Campus
2 Borland Street East
Orillia, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the geotechnical/hydrogeological investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Mr. J. Allan in an email dated October 22, 2020 with provision of Purchase Order No.'s 4500083955, 4500083957 and 4500083959.

The 4.0 ha former school site at 2 Borland Street East, bounded by North Street East, Peter Street North, Borland Street East and West Street North, is to be redeveloped as a Simcoe County Service Campus. The former school building and paved areas have been demolished and/or removed. Only the existing playing field/track in the northeast quadrant of the site remains. A six-storey residential building with a basement is proposed at the campus site along with office space for various community and social services. The proposed site will have full municipal servicing. Paved access will be provided, along with over 250 parking spaces and infiltration features. The northeast quadrant of the site (playing field and track) will stay undeveloped at this time and remain for future development considerations or park area. The proposed building and paved areas are shown on Drawing 1, appended.

The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and geotechnical/hydrogeological engineering recommendations for earthworks, building foundations and basements, site servicing, pavement design, preliminary ground water control during construction including an assessment of the potential off-site impacts, ground water flow direction and gradient, and infiltration parameters for Low Impact Development features, a preliminary pre- and post-development water budget, and ground water level monitoring.

A total of 30 boreholes and three test pits were advanced across the site. Fill was encountered over till with local clayey sandy silt or silt units. Ground water was encountered locally as perched water in some of the boreholes.

Typical construction methods should be applicable for the site with consideration for the thicker fill associated with demolition across most of the area where proposed structures are to be constructed.

We trust the information in this report is sufficient for your present purpose. If you have any questions please do not hesitate to call our office.

Sincerely

Peto MacCallum Ltd.

Geoffrey R. White, P.Eng.
Director
Manager, Geotechnical Services

AK/GRW:tc

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1. INTRODUCTION

Peto MacCallum Ltd. (PML) is pleased to present the results of the geotechnical/hydrogeological investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Mr. J. Allan in an email dated October 22, 2020 with provision of Purchase Order No.'s 4500083955, 4500083957 and 4500083959.

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The orientation of the site is on a skewed angle. For purposes of this project, North Street East is considered to be at the north end of the project.

The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and geotechnical/hydrogeological engineering recommendations for earthworks, building foundations and basements, site servicing, pavement design, preliminary ground water control during construction including an assessment of the potential off-site impacts, and ground water flow direction and gradient, infiltration parameters for Low Impact Development (LID) features, a preliminary pre- and post-development water balance, and ground water level monitoring

A Phase Two Environmental Site Assessment (ESA) was completed concurrently and will be reported under separate cover in Report 2.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are applicable only to the proposed works as addressed in the report. Any changes in the proposed plans will require review by PML to re-assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis.

This report is subject to the Statement of Limitations that is included in Appendix A and must be read in conjunction with the report.

2. INVESTIGATION PROCEDURES

2.1 Geotechnical Investigation

2.1.1 Borehole Drilling

The geotechnical field work for this investigation included a program of borehole drilling from November 30 to December 11, 2020. Boreholes 1 to 11, 14, 15, 19 and 20 were advanced to 4.6 to 7.9 m depth for the proposed building. Boreholes 12, 13, 17, 18, 21 to 30 were advanced to 3.3 to 6.4 m depth in proposed paved areas/servicing and the existing playing field. It is noted that for the purposes of the concurrent Phase Two ESA, Boreholes 8, 17, 20, 28 and 30 were extended beyond the initial programmed depth. Borehole locations are shown on Drawing 1, appended.

PML laid out the boreholes in the field. The ground surface elevation at the borehole locations was obtained with a Sokkia SHC5000 Global Navigation Satellite System (GNSS). Vertical and horizontal accuracy of this unit are 0.1 and 0.5 m, respectively. All elevations in this report are geodetic and expressed in metres.

Co-ordination for clearances of underground utilities was provided by PML. The boreholes were drilled cognizant of the underground utilities.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted D-50 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of PML's engineering staff.

Where topsoil was encountered at the surface, the thickness was measured in hand dug divots.

Representative samples of the overburden were recovered at frequent depth intervals for identification purposes using a conventional 51 mm OD split spoon sampler. The sample excluded particles larger than 38 mm. Standard penetration tests were carried out simultaneously with the sampling operations to assess the strength characteristics of the subsoil. The ground water conditions in the boreholes were assessed during drilling by visual examination of the soil samples, the sampler, and drill rods as the samples were retrieved, and measurement of the water level in the open boreholes, if any.

All recovered samples were returned to our laboratory for detailed examination and moisture content determinations. Grain size analyses were carried out on eight samples of the major soil units. Atterberg Limits testing was carried out on two samples. The laboratory test results are provided on Figures 1 to 6, appended.

Geotechnical engineering considerations are addressed in Section 5.

2.1.2 Monitoring Well Installation

A monitoring well, comprised of 50 mm diameter PVC pipe with a 1.5 to 3.0 m long screen at the bottom, filter sand, bentonite seal and stick-up protective casing, was installed in six boreholes to permit ground water level monitoring. The details of the monitoring well installation are shown on the applicable Log of Borehole sheets. It should be noted that the well becomes the property of the Owner and will have to be decommissioned by the Owner in accordance with O.Reg. 903. PML would be pleased to assist, if requested.

2.2 Hydrogeological Investigation

2.2.1 Test Pit Excavation/Guelph Permeameter Testing

Three test pits were excavated on November 23, 2020 to as much as 3.0 m depth, in order to conduct Guelph Permeameter (GP) tests. The test pit locations are shown on Drawing 1, attached.

PML laid out the test pits for this investigation. The ground surface elevation at the test pit locations was also obtained with the same Sokkia SHC5000 GPS System as the boreholes (elevations in metres and geodetic).

Co-ordination for clearances of underground utilities was provided by PML. The test pits were excavated cognizant of the underground utilities.

All recovered samples were returned to our laboratory for detailed examination and moisture content determinations. Grain size analyses were carried out on three samples of the major soil units. The laboratory test results are provided on Figures 1 to 6, appended. The results are discussed in Section 6.2.1.

2.2.2 Borehole Permeability Testing

PML returned to site December 18, 2020 to complete borehole permeability testing in the monitoring wells in Boreholes 8, 17, 20, 28 and 30. It is noted that the monitoring well in Borehole 10 was dry and borehole permeability testing could not be completed. The borehole permeability testing was completed after well development, which consisted of removing an equivalent of about ten times the well volume. The field permeability testing was conducted by using the rising head method, in which periodic water level measurements were recorded manually, as well as using an electronic data recorder or transducer, as the water level recovered inside the monitoring wells after rapid removal of a volume of water.

Aqtesolv, which is a specialized software designed to interpret aquifer tests, was utilized in the interpretation of the field permeability results. The results are included in Appendix D and further discussed in Section 6.2.1.

2.2.3 Ground Water Sampling

During the December 18, 2020 site visit PML retrieved one ground water sample from the monitoring well in Borehole 17. Following well development and the borehole permeability testing the ground water sample was collected and submitted for chemical testing as described below. The ground water sample was kept cool with ice in a cooler until delivery to the laboratory for analysis.

The ground water sample was delivered to Caduceon Environmental Laboratories (Caduceon) for chemical analyses. Caduceon Laboratories is accredited by The Standards Council of Canada (SCC) and CALA.

To address the potential in-construction ground water dewatering discharge quality issues, the ground water sample was analyzed for the City of Orillia Storm and Sanitary ByLaw Criteria and Provincial Water Quality Objective (PWQO) metals.

The Chain-of-Custody Record and the laboratory certificates of analyses are discussed further in Section 6.4.

2.2.4 Ground Water Level Monitoring Program

An eight month ground water level monitoring program is currently on-going and results will be provided under a separate cover when completed. Ground water levels recorded to date are provided in this report.

Hydrogeological considerations are presented in Section 6.

3. SITE SETTING

The site is rectangular in shape and is approximately 4.0 ha in size. The site is located on the north side of Borland Street East between West Street North and Peter Street North, with the north limit being North Street East. The site is currently vacant with residential, commercial, and community properties surrounding the site.

3.1 Physiography and Topography

The site is located within the physiographic region known as the Simcoe Lowlands comprising sand plains (Chapman and Putnam, 1984). It is noted that the physiographic region known as the Simcoe Uplands comprising drumlinzed till plans lies to the northwest of the site.

The borehole elevations indicate about 3.0 m of relief across the site, with elevations ranging from 267.40 to 270.15, gently sloping down from the west to the east.

3.2 Drainage and Surface Water Flow

There are no apparent water courses on-site. The closest waterbody is Lake Couchiching which lies approximately 870 m to the east of the site. Surface drainage on the site is expected to follow the topography (east) towards Lake Couchiching and regional surface drainage is believed to be to the east and south towards Lake Couchiching and Lake Simcoe, respectively.

4. GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Geology

Bedrock below the overburden is mapped as limestone, dolostone, shale, arkose, and sandstone of the Simcoe Group from the Middle Ordovian period of the Paleozoic era of the Phanerzoic eon. Bedrock is anticipated at depths greater than 75 m based on the Ministry of Environment, Conservation and Parks (MECP) Water Well Records in the area.

4.2 Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including topsoil thicknesses, soil classifications, inferred stratigraphy and thicknesses, Standard Penetration test N Values (N Values, blows per 300 mm penetration of the split spoon sampler), well installation details, ground water level observations and the results of laboratory moisture content determinations and Atterberg Limits tests.

Due to the soil sampling procedures and the limited size of samples, the depth/elevation demarcations on the borehole logs must be viewed as “transitional” zones, and cannot be construed as exact geologic boundaries between layers. PML should be retained to assist in defining the geological boundaries in the field during construction, if required.

Reference is also made to the appended Log of Test Pit Sheets for details of the soil surface conditions exposed in the test pits.

It is noted the test pits encountered similar soils as the boreholes and are not described in detail below.

Topsoil and/or fill was encountered overlying a major native silt and sand till deposit. Local clayey sandy silt or silt layers were encountered. A description of the distribution of the subsurface conditions encountered is provided below.

4.2.1 Soil

Topsoil was present at the surface of Boreholes 16, 22, 25 and 27 to 29, ranging from 200 to 700 mm in thickness.

Fill was encountered in all boreholes (except Borehole 22) at surface or below the surficial topsoil extending to 0.7 to 4.0 m depth (elevation 265.2 to 268.5). The material was variable (typically silty sand). Two samples were submitted for gradation and the results are presented on Figure 1, appended. Trace organics were noted in most samples near the surface and brick fragments were noted locally. The material had N Values ranging from 2 to greater than 50 indicating variable compaction when placed. The layer was moist, locally very moist to wet, with water contents of 5 to 24%.

Below the topsoil in Borehole 22, a clayey sandy silt unit extended to 1.4 m depth (elevation 266.4). One representative sample was submitted for gradation and the results are presented on Figure 2, appended. Atterberg Limits are plotted on Figure 3 (plastic limit of 16 and liquid limit of 35). The material had a N Values of 11 indicating stiff conditions. The layer was about plastic limit with moisture content of 17%.

Locally in Borehole 23, below the fill, a silt unit was encountered to the 3.5 m exploration depth. A sample of the material was submitted for grain size analysis and the results are provided on Figure 4. The material had N Values of 5 to 22 indicating loose to compact conditions. The layer was wet to moist with water content of 14 to 31%.

Below the topsoil, fill and/or clayey sandy silt/silt units in all boreholes, with the exception of Borehole 23, a major silt and sand till unit extended to the 3.5 to 7.9 m exploration depth. The matrix comprises silty sand to sandy silt with trace to some gravel and clay. Cobbles and boulders were

noted during augering. Seven representative samples were submitted for gradation and the results are presented on Figure 5, appended. Atterberg Limits testing was carried out on one sample (Figure 6). The material had N Values of 5 to greater than 50 indicating loose to very dense conditions. The deposit was moist with water contents of 4 to 18%.

4.2.2 Ground Water

The first water strike (ground water first encountered during drilling), the ground water/wet cave levels measured in the boreholes upon completion of augering, and ground water level measured in the wells following completion are summarized in the table below, on a borehole by borehole basis.

BOREHOLE	FIRST STRIKE DURING DRILLING DEPTH (m) / ELEVATION	UPON COMPLETION OF AUGERING DEPTH (m) / ELEVATION	WATER LEVEL IN WELL DEPTH (m) / ELEVATION	
			2020-12-18	2021-01-11
1	No Water	No Water	--	--
2	No Water	No Water	--	--
3	3.4 / 265.5	5.2 / 263.7	--	--
4	No Water	No Water	--	--
5	No Water	No Water	--	--
6	1.4 / 266.5	3.0 / 264.9	--	--
7	6.1 / 262.0	6.1 / 262.0	--	--
8	No Water	No Water	2.5 / 266.5	2.8 / 266.2
9	No Water	No Water	--	--
10	No Water	No Water	Dry	Dry
11	No Water	No Water	--	--
12	1.4 / 267.8	No Water	--	--
13	3.0 / 266.5	1.8 /267.7	--	--
14	No Water	No Water	--	--
15	No Water	No Water	--	--
16	2.1 / 265.5	2.1 / 265.5	--	--
17	2.9 / 265.1	2.9 / 265.1	1.3 / 266.7	1.4 / 266.6

BOREHOLE	FIRST STRIKE DURING DRILLING DEPTH (m) / ELEVATION	UPON COMPLETION OF AUGERING DEPTH (m) / ELEVATION	WATER LEVEL IN WELL DEPTH (m) / ELEVATION	
			2020-12-18	2021-01-11
18	No Water	No Water	--	--
19	4.0 / 264.8	5.2 / 263.6	--	--
20	No Water	No Water	2.4 / 267.2	2.3 / 267.3
21	2.9 / 266.3	1.8 / 267.4	--	--
22	1.7 / 266.1	1.8 / 266.0	--	--
23	1.4 / 267.0	2.2 / 266.2	--	--
24	No Water	No Water	--	--
25	1.4 / 266.0	0.9 / 266.5	--	--
26	1.5 / 266.9	3.5 / 264.9	--	--
27	No Water	3.5 / 264.1	--	--
28	2.1 / 265.5	2.1 / 265.5	1.1 / 266.5	1.2 / 266.4
29	1.5 / 266.8	2.1 / 266.2	--	--
30	1.4 / 268.5	1.5 / 268.4	1.6 / 268.3	1.7 / 268.2

The regional ground water table is believed to be below the depth of exploration. Local perched water in the fill above the till stabilized at 1.1 to 2.8 m below existing grade, corresponding to elevation 266.2 to 268.3.

The perched ground water flow direction is towards the east, with a gradient of 1.0 to 2.0% towards Lake Couchiching.

Ground water levels will fluctuate seasonally, and in response to variations in precipitation.

5. GEOTECHNICAL ENGINEERING CONSIDERATIONS

5.1 General

The 4.0 ha former school site at 2 Borland Street East, bounded by North Street East, Peter Street North, Borland Street East and West Street North, is to be redeveloped as a Simcoe County Service Campus. The former school building and paved areas have been demolished and/or removed. Only the existing playing field/track in the northeast quadrant of the site remains. A six-storey residential building with a basement is proposed at the campus site along with office space for various community and social services. The proposed site will have full municipal servicing. Paved access will be provided, along with over 250 parking spaces and infiltration features. The northeast quadrant of the site (playing field and track) will stay undeveloped at this time and remain for future development considerations or park area. The proposed building and paved areas are shown on Drawing 1, appended.

5.2 Site Grading and Engineered Fill

It is understood that the ground floor level is currently set at elevation 270.2, with basement 3.0 m below this at elevation 267.2. The basement will be below grade in the west and central areas with a potential for a walkout at the east end where existing ground grades drop.

The existing topsoil and fill are not suitable to support footings or floor slabs due to concerns with settlement. In this regard, it is recommended that existing topsoil and fill be removed. Grades under the building can be raised as required, with engineered fill to required levels. Where grades are to be raised under structures (building, paved areas and site servicing) the full needs to be constructed as engineered fill.

Reference is made to Appendix B for guidelines for engineered fill construction. The following general highlights are provided:

- Strip existing topsoil and/or fill, and other deleterious materials down to competent native soil, subject to geotechnical review during construction. The excavated native soil should be segregated and stockpiled separately for reuse or disposal, subject to geotechnical review;

- It is noted that the subgrade soils will be easily disturbed and can become unstable under construction activity, if wet in-situ, or allowed to become wet. The contractor shall adopt methods and equipment accordingly;

- Proofroll exposed subgrade using a heavy roller to targeted 100% Standard Proctor maximum dry density (SPmdd) for the building areas and 95% SPmdd for parking areas, under geotechnical review. The exposed subgrade, if wet, will be sensitive to vibration. As such, vibration during proofrolling is subject to geotechnical review during construction;

- Following geotechnical review and approval of the subgrade, spread approved material in maximum 200 mm thick lifts and uniformly compacted to 100% SPmdd in building areas and 95% SPmdd in parking areas. If wet subgrade conditions are present the use of Granular B Type II may be required for the first lift or two of engineered fill;

- Organics, topsoil, oversized material (over 150 mm in diameter) or otherwise deleterious materials are not suitable for reuse as engineered fill. The excavated site soil is selectively considered suitable for reuse as engineered fill, subject to moisture content and geotechnical review during construction. In the regard, it is recommended to utilize imported material under the building and on-site soil elsewhere on the site. Imported material should comprise OPSS Granular B or OPSS Select Subgrade Material (SSM). Other sources of imported material should be reviewed by our office to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structure to be supported, then outwards and downwards at no steeper than 45° to the horizontal to meet the underlying approved native subgrade. In this regard, strict survey control and detailed documentation of the lateral and vertical extent of the engineered fill limits should be carried out to ensure that the engineered fill pad fully incorporates the structure to be supported;

- Engineered fill construction must be carried out under full-time field review by PML, to approve sub-excavation and subgrade preparation, backfill materials, placement and compaction procedures, and to verify that the specified compaction standards are achieved throughout.

5.3 Foundations

The basement floor slab is to be established at elevation 267.2. Footings would be established about elevation 266.8. Native soil and existing fill are present in the building area. As noted earlier, in-situ fill is not suitable to support footings. Existing fill will have to be removed and replaced with engineered fill. In general, it is anticipated footings would be supported on a combination of native soil and engineered fill.

The available bearing capacity on native soils, on a borehole by borehole basis (boreholes in building areas) is provided below:

BOREHOLE	DEPTH (m) / ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
1	2.2 / 265.3	Silt and Sand Till	200	300
2	2.2 / 265.5	Silt and Sand Till	200	300
3	2.0 / 266.9	Silt and Sand Till	100	150
	2.9 / 266.0		200	300
4	2.2 / 267.2	Silt and Sand Till	300	450
5	2.2 / 267.8	Silt and Sand Till	250	375
6	2.2 / 265.9	Silt and Sand Till	300	450
7	3.0 / 265.1	Silt and Sand Till	250	375
8	2.2 / 266.5	Silt and Sand Till	100	150
	2.9 / 266.1		300	450
9	4.1 / 265.5	Silt and Sand Till	300	450
10	2.8 / 267.4	Silt and Sand Till	300	450
11	2.2 / 267.9	Silt and Sand Till	300	450
14	2.2 / 267.3	Silt and Sand Till	200	300

BOREHOLE	DEPTH (m) / ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
15	1.5 / 268.4	Silt and Sand Till	150	225
	2.2 / 267.7		200	300
19	0.8 / 267.8	Silt and Sand Till	150	225
	2.9 / 365.9		300	450
20	1.5 / 268.1	Silt and Sand Till	200	300
	3.0 / 266.6		300	450

As discussed earlier, any upfilling under building to remove existing fill will need to be constructed as engineered fill. Footings founded on a minimum 1.0 m of engineered fill, constructed with Granular B, can be designed for a net geotechnical bearing resistance at SLS of 200 kPa and a factored bearing resistance at ULS of 300 kPa.

In general, it is recommended to adopt a geotechnical bearing resistance at SLS of 200 kPa and a factored bearing resistance at ULS of 300 kPa for design of footings.

The bearing resistance at SLS is based on total settlement of 25 mm in the bearing stratum with differential settlement of 75% of this value.

Footings subject to frost action should be provided with a minimum 1.2 m of earth cover or equivalent insulation. If there are any walkout basement areas, footings will have to be stepped down.

Prior to placement of structural concrete, all founding surfaces should be reviewed by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions revealed in the excavation.

Based on the soil profile revealed in the boreholes, Site Classification D is applicable for Seismic Site Response as set out in Table 4.1.8.4.A of the Ontario Building Code (2012). Based on the type and relative density of the soil cover at the site, there is a low potential for liquefaction of soils to occur.

5.4 Basement Walls and Floor Slabs

Based on the available data to date, the stabilized perched ground water is at 1.1 to 2.8 m below existing grade, corresponding to elevation 266.2 to 268.3.

An eight month ground water level monitoring program is being undertaken by PML and will be reported under separate cover upon its completion in November 2021. It is recommended that basements be established a minimum 0.5 m above the stabilized perched ground water level. Underfloor drains may be required when ground water is less than 1.0 m below the basement slab.

Full depth basements are proposed for the building. As such, perimeter walls must be designed to resist the unbalanced horizontal earth pressure imposed by the backfill adjacent to the walls. The lateral earth pressure, P, may be computed using the following equation and assuming a triangular pressure distribution:

$$P = K(\gamma h + q) + C_p$$

Where
- P = lateral pressure at depth h (m) below ground surface (kPa)
- K = lateral earth pressure coefficient of compacted backfill = 0.5
- h = depth below grade (m) at which lateral pressure is calculated
- γ = unit weight of compacted backfill = 21.0 kN/m^3
- q = surcharge loads (kPa)
- C_p = compaction pressure

The above equation assumes that drainage measures will be incorporated to prevent the buildup of hydrostatic pressure. In this regard, foundation wall backfill should comprise free draining granular material conforming to OPSS Granular B in conjunction with a weeping tile system. The weeping tiles should be protected by a properly designed granular filter or geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free outlet. The basement walls should be damp proofed. Alternatively, the native soil can be utilized with a proprietary drainage board product.

Basement wall backfill should be placed in thin lifts compacted to a minimum 95% SPmdd. Over compaction close to the walls should be avoided as this could generate excessive pressure on the walls.

Basement floor slab construction is feasible on native soils or engineered fill, as discussed above. A minimum 200 mm thick base layer of crushed stone (nominal 19 mm size) is recommended directly under the slab. A polyethylene sheet vapour barrier is recommended as a vapour barrier.

Exterior grades should be established to promote surface drainage away from the buildings.

Reference is made to appended Figure 7, for general recommendations regarding drainage and backfill requirements.

5.5 Site Servicing

Design details were not finalized at the time of this report. For purposes of this report, inverts are assumed to be as much as 3.0 m below existing grade.

5.5.1 Trench Excavation and Ground Water Control

Trench excavation and ground water control are described later in the report under Excavation and Ground Water Control (Section 6.5).

5.5.2 Pipe Support, Pipe Bedding and Cover

Native soil is generally expected at invert levels, which is considered satisfactory for pipe support. Where existing fill or other deleterious material is encountered at the design invert level, such material should be sub-excavated and replaced with an increased thickness of bedding material, subject to geotechnical field review and approval.

OPSS bedding and cover thickness and compaction standards are recommended. Bedding and cover material should comprise OPSS Granular A.

5.5.3 Trench Backfill

Backfill in trenches should comprise select inorganic soil and be placed in maximum 200 mm thick loose lifts compacted to at least 95% SPmdd to minimize post construction settlement in the backfill. Topsoil, organic, excessively wet, frozen, oversized (greater than 150 mm in diameter), or otherwise deleterious material should not be incorporated as trench backfill. The moisture content of the trench backfill should be within 2% of the optimum moisture content in order to achieve the specified compaction and be close to optimum moisture content in the upper 1 m to prevent subgrade instability issues. Ideally the backfill should comprise excavated site soil, in order to minimize differential frost heave.

The excavated soil will comprise the variable fill, native silt and sand till with variable clay and gravel content. Excavated inorganic site soil should generally be acceptable for reuse, subject to moisture content control (wet material will need to be dried out or mixed with drier soil in order to be suitable for reuse), removal of organics/deleterious material and geotechnical review during construction.

Earthworks operations should be inspected by PML to verify subgrade preparation, backfill materials, placement and compaction efforts and ensure the specified degree of compaction is achieved throughout.

5.6 Pavement Design and Construction

Grading was not finalized at the time of this report. It is anticipated that the pavement subgrade will predominantly comprise near surface soils which typically consist of moderately to high frost susceptible sand and silt soil. Based on the subgrade conditions, the following pavement structure thicknesses are recommended and should be reviewed when grading/subgrade soils are determined:

	LIGHT DUTY	HEAVY DUTY
Asphalt (mm) (Two Lifts)	90	120
Granular A Base Course (mm)	150	150
Granular B Subbase Course (mm)	350	500
Total Thickness (mm)	590	760

It is recommended that following rough grading to the subgrade level, subgrade preparation should include proofrolling and compacting the exposed subgrade with a heavy compactor to minimum 95% SPmdd under geotechnical review. Any unstable zones identified during this process should be sub-excavated and replaced with compacted select site material, subject to geotechnical field review. Any upfilling or soil replacement should be carried out as engineered fill.

Imported material for the granular base and subbase should conform to OPSS gradation specifications for Granular A and Granular B, and should be compacted to 100% SPmdd. Asphalt should be compacted in accordance with OPSS 310.

If wet or unstable subgrade is encountered, additional excavation, additional granular subbase, the use of Granular B Type II and/or geotextile may be provided, subject to geotechnical review during construction.

For the pavement to function properly, it is essential that provisions be made for water to drain out of and not collect in the base material. The incorporation of subdrains is recommended along pavement edges in conjunction with crowning of the final subgrade to promote drainage towards the pavement edge. Subdrains should be installed at least 300 mm below the subgrade level. Refer to OPSD 216 Series for details regarding pipe, filter fabric or filter sock, bedding and cover material. Maintenance hole/catchbasins should be backfilled with free draining Granular B and have

stub drains extend out from the structure. The above measures will help drain the pavement structure as well as alleviate the problems of differential frost movement between the catchbasins and pavement.

5.7 Geotechnical Review and Construction Inspection and Testing

It is recommended that the final design drawings be submitted to PML for geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures and check the specified degree of compaction is achieved throughout.

Prior to placement of structural concrete, all founding surfaces must be inspected by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions.

The comments and recommendations provided in the report are based on information revealed in the boreholes. Conditions away from and between boreholes may vary. Geotechnical review during construction should be ongoing to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

6. HYDROGEOLOGICAL CONSIDERATIONS

A hydrogeological investigation has also been requested for the site to provide recommendations for ground water control during construction including an assessment of the potential off-site impacts as well as a preliminary pre- and post-development water balance. The hydrogeological component includes ground water levels and gradient, ground water sampling, and a preliminary assessment for infiltration utilizing in-situ borehole permeability testing, GP testing and grain size distribution analysis.

6.1 Aquifers and Local Ground Water Use

The Water Well Records (WWRs) shown on the MECP website within a 500 m study area are tabulated in Appendix C. A total of nine WWRs were identified. One record indicated the well was for domestic water supply, one was listed as “not in use”, and seven were not listed. Limestone bedrock was noted in one WWR at a depth of 75 m.

The domestic water supply well was installed to a depth of 21 m below the ground surface at the time of drilling with fresh water typically encountered in the well. The well was developed in gravel hardpan and ground water was noted at a depth of 14.0 m.

It should be noted that the site is within both a Well Head Protection Area (WHPA) and an Intake Protection Zone (IPZ) for municipal water supply. The site is also located in a significant Ground Water Recharge Area.

The site is within the WHPA for Orillia’s municipal wells “Well 1” and “Well 2” located near the lakeshore near Jarvis Street (approximately 660 m southeast of the site). Well 1 and Well 2 are installed to depths of 15.2 and 20.4 m, respectively, in a confined sand and gravel aquifer referred to as the A4 aquifer. As such, the municipal water supply wells are considered to be sufficiently separated/protected from any activities at surface on-site such as construction dewatering for local perched water and/or LID infiltration.

With respect to the IPZ, the site is located approximately 1.0 km west of the Lake Couchiching surface water intake with several roads and developed properties separating the two sites. As the site and the surface water intake are separated by a considerable distance, and the roads and developed properties act as pathway interceptors for any potential contaminant movement originating for the site, it is considered unlikely that any potentially contaminating activities on-site would reach the Lake or impact the surface water intake. However, as the site is considered to contribute to Lake Couchiching with respect to available water, the proposed LID features to be incorporated on-site will channel the surface water run-off back into the ground, such that potential infiltration and/or recharge quantity on-site is minimally impacted by the proposed site development, and any water that reaches the Lake will proceed through the 'natural filters' already in place to preserve water quality.

6.2 Preliminary Infiltration Assessment

To assess the hydraulic conductivity (K) of the saturated soils and the field saturated hydraulic conductivity (K_{fs}) of the unsaturated soils on-site, in-situ permeability tests, GP testing and grain size distribution analysis were completed.

6.2.1 Borehole Permeability Testing

Aqtesolv, which is a specialized software geared towards interpreting aquifer tests, was utilized in the interpretation of the field permeability results.

The hydraulic conductivity (K, m/s), was estimated by performing a slug test in the wells in Boreholes 8, 17, 20, 26 and 30. The permeability testing results were inputted into Aqtesolv where the Hvorslev and Dagan (1978) expressions were applied. Dagan (1978) is specifically for monitoring wells where the water table straddles the well screen.

Borehole permeability testing was not conducted in the well in Borehole 10 as the well was dry at time of testing.

Borehole permeability test plots are provided in Appendix D and the estimated K values are listed below:

BH/MW	DEPTH (m)	MATERIAL TYPE	ESTIMATED HYDRAULIC CONDUCTIVITY, K (m/sec)
8	6.1 – 7.6	Silt and Sand Till	1.1×10^{-6}
17	4.6 – 6.1	Silt and Sand Till	7.2×10^{-7}
20	4.6 – 6.1	Silt and Sand Till	2.3×10^{-7}
28	3.1 to 4.6	Silt and Sand Till	4.6×10^{-7}
30	4.6 – 6.1	Silt and Sand Till	2.4×10^{-7}

6.3 In-Situ Guelph Permeameter Testing

Reference is made to the appended Log of Test Pits sheets for details of the subsurface conditions, including topsoil thicknesses, soil classifications, inferred stratigraphy, and ground water level.

Three test pits were excavated and one GP test was conducted in each test pit on November 23, 2020. The GP test was completed at depths of 0.7 to 1.7 m. The second test could not be completed due to seepage in the test pits and wet soils. The test pit locations are shown on Drawing 1, attached.

From the GP testing a field saturated Hydraulic Conductivity (K_{fs}) was estimated utilizing the Zhang et al. (1998) method:

$$K_{fs} = \frac{C_1 x Q_1}{2\pi {H_1}^2 + \pi a^2 C_1 + 2\pi \left(\frac{H_1}{a^*}\right)}$$

Where,

C = shape factor dependent on the soil texture-structure (Zhang et al., 1998)

Q = the steady-state rate of fall of water in reservoir (cm/s)

H = hydraulic head (cm)

α = borehole radius (cm)

An approximate relationship between K_{fs} and the infiltration rate is shown in the TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide and the equations was utilized to determine approximate infiltration rates for this project:

$$Infiltrate\ Rate = \sqrt[3.7363]{\frac{K_{fs}}{6\ x\ 10^{-11}}}$$

The test locations and results are summarized below:

TEST PIT	DEPTH (m)	ESTIMATED K_{fs} (m/sec)	UNFACTORED INFILTRATION RATE (mm/hr)	FACTORED INFILTRATION RATE (mm/hr)[2]
TP 1	0.7	2.8×10^{-7}	33	13.2
TP 2[1]	0.7	9.2×10^{-5}	155	62.0
TP 3	1.7	1.6×10^{-6}	52	20.8

Note:
1. Test was completed in fill due to saturated soils encountered during the test pitting program.
2. A factor of 2.5 was applied based on TRCA methods.

6.3.1 Grain Size Distribution

Grain size analysis testing was carried out on three samples of the native site soils encountered in each of the test pit locations. The grain size analyses results are presented on Figure 5, attached, with the estimated coefficient of permeability, K, of the tested site soils tabulated below.

SAMPLE	DEPTH (m)	SOIL TYPE	ESTIMATED K (m/sec)
Test Pit 1 GS2	2.3 to 2.5	Silt and Sand Till	$< 10^{-6}$
Test Pit 2 GS1	0.5 to 0.7	Silty Sand Fill	$< 10^{-6}$
Test Pit 3 GS2	2.8 to 3.0	Silt and Sand Till	$< 10^{-6}$

The Vukovic and Soro method was used to asses K.

The K value derived from the particle size distribution curve does not take into consideration site specific details such as compaction, soil structure, organic content and/or the degree of saturation.

6.4 Ground Water Sample Chemical Test Results

The laboratory certificate of chemical analyses for the analysis carried out by Caduceon on an unfiltered ground water sample from BH/MW 17, in accordance with the chain-of-custody records and the protocols described in Section 2.2.3, are in included in Appendix E.

The field filtered ground water sample were analyzed for the City of Orillia Storm and Sanitary ByLaw Criteria and Provincial Water Quality Objective (PWQO) metals. In accordance with the PWQO guidelines select metal parameters require field filtering and as such PML submitted one filtered mercury bottle, one filtered metals bottle and one unfiltered metals bottle to satisfy the PWQO requirements.

The chemical test results complied with the applicable City of Orillia Storm and Sanitary ByLaw Criteria and PWQO for the parameters tested with the exception of the parameters listed below:

Location	Parameter	Units	Orillia Storm Sewer ByLaw Criteria	Orillia Sanitary Sewer By-Law Criteria	PWQO	Measured Concentration
BH/MW 17	TSS	mg/L	15	350	--	12,800
	Cobalt	µg/L	--	--	0.9	1.1
	Iron		--	--	300	1,450

The unfiltered ground water sample indicates that the discharge water, if untreated, is expected to exceed both the City of Orillia Storm and Sanitary Sewer Use ByLaw Criteria and PWQO.

It is recommended that during construction dewatering, as a minimum, the pumped water be first discharged to a sedimentation tank to treat the water, then discharged through a silt bag before being discharged to surface (the preferred discharge method).

Filtration or sedimentation, to remove suspended particles prior to discharge, may result in discharge water that is compliant with the City of Orillia Storm and Sanitary Sewer Use ByLaw Criteria and PWQO. However, other treatment methods may be necessary to reduce the concentration of dissolved analytes.

6.5 Excavation and Ground Water Control

It is anticipated that excavation for engineered fill will extend about 1.4 to 4.0 m below existing grade. Excavation for site servicing is anticipated to 3.0 m below existing grade. Excavation will encounter native silty and sand till with variable clay and gravel content. The silt and sand till was very dense in some locations and harder digging and the occurrence of cobbles and boulders should be expected.

Subject to the ground water control as discussed below, the site soils encountered at the site should be considered as Type 3 soil requiring excavation sidewalls to be constructed at no steeper than one horizontal to one vertical (1H:1V) from the base of the excavation in accordance with the Occupational Health and Safety Act.

The perched stabilized ground water table was measured at 1.1 to 2.8 m depth below grade (elevation 266.2 to 268.3) within the silt and sand till unit. Based on the soil conditions observed on-site, excavation will generally be within the low permeable silt and sand till, as such conventional sump pumping techniques should be sufficient for ground water control. Local sandy areas may yield greater seepage volumes where more concentrated pumping may be required.

Based on the findings of this assessment, the proposed construction dewatering activities are expected to result in only relatively minor impacts. Only perched water was observed at the site with the regional ground water table below the proposed depth of excavation. No operating water wells are expected to be impacted by the construction dewatering, no contaminant plume is known to exist in the vicinity of the site, no settlement is expected, and the discharged ground water shall be treated to meet the City of Orillia Sanitary and Storm Sewer Criteria and PWQO.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Takings and Transfer Regulation O. Reg. 387/04. Section 34 of the OWRA requires anyone taking more than 50,000 L/d to notify the MECP. This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering, or permanent drainage improvements.

Where it is assessed than more than 50,000 L/d but less than 400,000 L/d of ground water taking is required, the Owner can register online via the Environmental Activity and Sector Registry (EASR) system. Where it is assessed that more than 400,000 L/d of ground water taking is required then a Category 3 Permit-To-Take-Water (PTTW) is required.

Based on the conditions revealed in the boreholes and anticipated excavation depths discussed above, a registry on the EASR is considered prudent and may be required depending on construction phasing. Once details of the site have been established, they should be reviewed by PML to establish dewatering requirements.

It is recommended that a test dig be conducted to permit prospective contractors an opportunity to observe and examine the conditions likely to be encountered, in order that they may assess for themselves the excavation and ground water control requirements.

6.6 Preliminary Water Balance

6.6.1 Climate

The site is located in Orillia, northern portion of Lake Simcoe within Simcoe County. The climate of Orillia is humid-continental, characterized by changeable weather patterns. Orillia's location relative to Lake Simcoe, can result in disparities in weather over short distances. From Environment Canada data, the average annual temperature recorded at the Shanty Bay station, (closest station with required data) located southwest of Orillia, averages 6.8°C. The highest monthly average temperature is in July, at 20.1°C and the lowest monthly average temperature is in January, at -7.7°C. The average annual precipitation recorded at the Shanty Bay weather station is 968 mm. Climate data is tabulated in Table 1, appended.

6.6.2 Water Balance: Pre-Development

To determine the amount of ground water infiltration relative to existing site conditions, a pre-development water balance was carried out to provide an estimate of the volume of infiltrating precipitation at the site. This method is based on classic storm water management principles and generally over-estimates the volume of runoff, providing a conservative assessment of infiltration volume. It is noted that the equations were developed for heavy rainfall events of short duration,

where as a large volume of the precipitation occurs at a light to moderate rate over an extended period of time and would result in a much higher volume of infiltration.

For the purposes of our analysis, the following parameters were assumed:

- The annual precipitation at the Shanty Bay weather station was recorded to be 968 mm/year, and the water surplus was computed to be 389.25 mm/year (computed by the Thornthwaite and Mather Method).
- The water available for infiltration was computed using the following infiltration factors:

  Topography……..0.30
  Soil……0.20
  Cover……0.10
  Total……..0.60

- By multiplying the water surplus of 389.25 mm/year by the infiltration factor of 0.60, the infiltration rate was computed to be 233.6 mm/year.

The total existing catchment area for infiltrating precipitation was computed as follows:

- Total Approximate Site Area = 38,000 m^2
- Approximate Area of Existing Buildings (2018) = 9,100 m^2
- Approximate Area of Existing Parking Lots and Paved Laneway Areas (2018) = 4,800 m^2
- Total Approximate Impermeable Surface Area (existing building, parking lots and laneways) = 13,900 m^2
- Total Site Area less the Impermeable Surface Area = Area of Potential Infiltration = 24,100 m^2

The total pre-development infiltration at the site (potential for ground water recharge) was calculated utilizing the LSRCA procedures and was found to be 5,629,000 L/year (5,629 m^3/year).

6.6.3 Water Balance: Post Development

In order to assess the effect of site development, a post-development water balance for the site was carried out using the same approach and infiltration factors noted above. The proposed site plans are shown on Drawing 1, attached. It is understood that development plans include:

- A new six storey residential building with a footprint of 4,545 m^2; and,
- New parking areas and access routes with an impermeable surface of 13,575 m^2.

The total post-development area for infiltrating precipitation was computed as follows:

- Total Approximate Site Area = 38,000 m^2
- Total Impermeable Surface Area (buildings, paved roads, and/or access routes) = 18,120 m^2
- Total Site Area less the Impermeable Surface Area = Area of Potential Infiltration = 19,880 m^2

Based on the current site conditions and proposed development, the total post development infiltration at the site (potential for ground water recharge) was calculated utilizing the LSRCA procedures and was found to be 4,644,000 L/year (4,644 m3/year), indicating a reduction of site infiltration of approximately 18%.

The results of the preliminary water balance for pre- and post-development are tabulated in Tables 2A to 2C.

6.7 Development Considerations

6.7.1 Ground Water Recharge Management

The LID guidelines call for the pre and post-development ground water infiltration volumes to be maintained as much as practically possible. The assessment provided above indicates a reduction in the volume of surface water infiltration following redevelopment of the site; hence, implementation of measures to reduce the infiltration deficit (such as the proposed LID features) should be considered.

Mitigation Measures, Opportunities and Constraints

The following measures should be considered to reduce the post-development infiltration:

- Reduce the area of the impermeable surfaces.
- Create swales/depressed areas that will retard the rate of storm water runoff and promote infiltration.
- Promote surface water flow from impermeable surfaces into infiltration facilities, as opposed to directing surface water to catchbasins connected to the municipal storm sewers.
- Ensure that roof drains are not connected to the municipal storm water control system.
- Reduce the slope of the ground surface to promote increased infiltration.

Once mitigation measures are finalized Table 2C should be updated to include a comparison of pre-development to post-development including all mitigation features.

This assessment is subject to the Statement of Limitations that is included with this report (Appendix A) which must be read in conjunction with the report.

7. CLOSURE

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to call our office.

Sincerely

Peto MacCallum Ltd.

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AK/DP/GRW:tc

TABLE 1

Water Budget Summary (Using Thornthwaite Empirical Approach)

Month	*Mean Daily Av. Temp (C)	I	*Mean Montly Precipitation (mm)	Days	^Daylight Hours	Evapotranspiration (mm)	Actual Evapotranspiration Adjusted for Month and Daylight (mm)	Actual Water Balance (mm)
January	-7.7	0.00	88.8	31	9.25	0.00	0.00	88.80
February	-6.5	0.00	69.8	28	10.83	0.00	0.00	69.80
March	-1.9	0.00	63.8	31	11.97	0.00	0.00	63.80
April	5.7	1.22	65	30	13.52	25.42	28.64	36.36
May	12.1	3.81	79.9	31	14.85	57.46	73.47	6.43
June	17.4	6.61	88.6	30	15.50	85.16	110.00	-21.40
July	20.1	8.22	73.2	31	15.13	99.57	129.72	-56.52
August	19.2	7.67	86.2	31	13.97	94.75	113.98	-27.78
September	15.2	5.38	92.2	30	12.47	73.56	76.44	15.76
October	8.7	2.31	78.2	31	10.93	40.19	37.83	40.37
November	2.6	0.37	98	30	9.57	10.86	8.66	89.34
December	-3.6	0.00	84.3	31	8.87	0.00	0.00	84.30
Yearly Av./Total:	6.78	1.58	**968.00**		12.24	486.97	578.75	**389.25**

I (heat index)	37.18
a	1.08

a is a function of heat index

*Data from Environment Canada web site - Shanty Bay
^from NSERC database

TABLE 2A
Water Budget Pre-Development (Water Balance/Water Budget Assessment)

Catchment Designation	Cultivated	Paved	Building	Total
Area (m^2)	24,100	4800	9100	38,000
Pervious Area (m^2)	24,100	-	-	24,100
Impervious Area (m^2)	-	4800	9100	13,900
Infiltration Factors				
Topography Infiltraton Factor	0.3	0.3	0.3	
Soil Infiltration Factor	0.2	0.2	0.2	
Land Cover Infiltration Factor	0.1	0.0	0.0	
MOE Infiltration Factor	0.6	0.0	0.0	--
Actual Infilration Factor	0.6	0.0	0.0	
Run-Off Co-efficient	0.4	1.0	1.0	
Runoff from Impervious Surfaces	-	0.8	0.8	
Inputs (per Unit Area)				
Precipitation (mm/yr)	968.0	968.0	968.0	968.0
Run-on (mm/yr)	0.0	0.0	0.0	0.0
Other inputs (mm/yr)	0.0	0.0	0.0	0.0
Total Imputs (mm/yr)	968.0	968.0	968.0	968.0
Outputs (per Unit Area)				
Precipitation Surplus (mm/yr)	389.3	774.4	774.4	530.2
Net Surplus (mm/yr)	389.3	774.4	774.4	530.2
Evapotranspiration (mm/yr)	578.7	193.6	193.6	437.8
Infiltration (mm/yr)	233.6	0.0	0.0	148.14
Rooftop Infiltration (mm/yr)	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	233.6	0.0	0.0	148.14
Runoff Pervious Areas (mm/yr)	155.7	0.0	0.0	155.7
Runoff Impervious Areas (mm/yr)	0.0	774.4	774.4	283.3
Total Runoff (mm/yr)	155.7	774.4	774.4	382.0
Total Outputs (mm/yr)	968.0	968.0	968.0	968.0
Difference (Inputs-Outputs)	0.00	0.00	0.00	0.00
Inputs (Volumes)				
Precipitation (m^3/yr)	23,328.8	4,646.4	8,808.8	36,784.0
Run-On (m^3/yr)	-	-	-	-
Other Inputs (m^3/yr)	-	-	-	-
Total Inputs (m3/yr)	23,328.8	4,646.4	8,808.8	36,784.0
Outputs (Volumes)				
Precipitation Surplus (m^3/yr)	9,382.1	3,717.1	7,047.0	20,146.3
Net Surplus (m^3/yr)	9,382.1	3,717.1	7,047.0	20,146.3
Evapotranspiration (m^3/yr)	13,946.7	929.3	1,761.8	16,637.7
Infiltration (m^3/yr)	5,629.3	-	-	5,629.3
Rooftop Infiltration (m^3/yr)	0.0	-	-	0.0
Total Infiltration (m^3/yr)	5,629.3	-	-	5,629.3
Runof Pervious Areas (m^3/yr)	3,752.9	-	-	3,752.9
Runoff Impervious Areas (m^3/yr)	0.0	3,717.1	7,047.0	10,764.2
Total Runoff (m^3/yr)	3,752.9	3,717.1	7,047.0	14,517.0
Total Outputs (m^3/yr)	23,328.8	4,646.4	8,808.8	36,784.0
Difference (Inputs-Outputs)	0.0	0.0	0.0	0.0

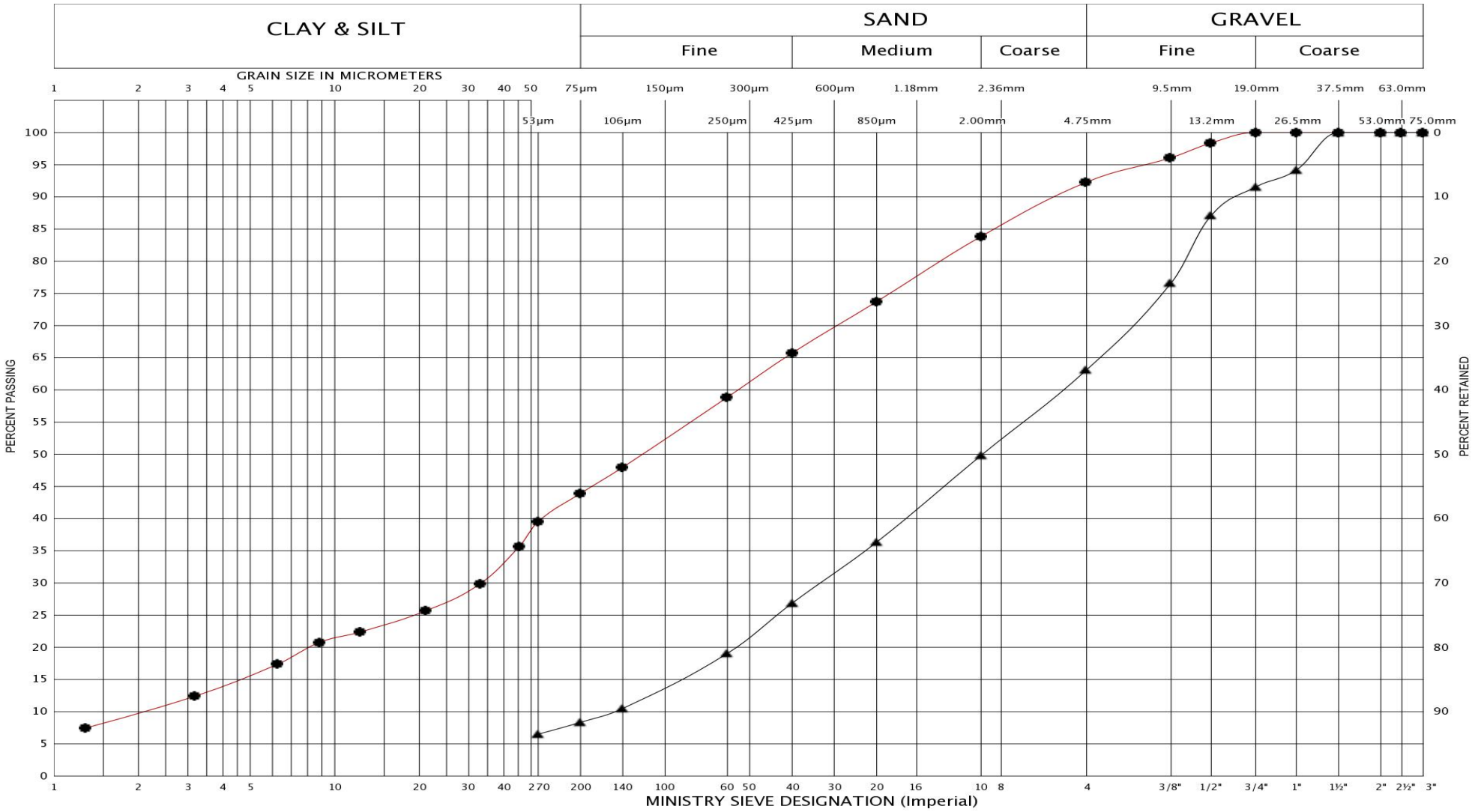
TABLE 2B
Water Budget Post-Development (Water Balance/Water Budget Assessment)

Catchment Designation	Cultivated	Paved	Building	Total
Area (m^2)	19,880	13,575	4,545	38,000
Pervious Area (m^2)	19,880	0.0	0.0	19,880
Impervious Area (m^2)	0.0	13,575	4,545	18,120
Infiltration Factors				
Topography Infiltraton Factor	0.3	0.3	0.3	
Soil Infiltration Factor	0.2	0.2	0.2	
Land Cover Infiltration Factor	0.1	0.0	0.0	
MOE Infiltration Factor	0.6	0.0	0.0	--
Actual Infilration Factor	0.6	0.0	0.0	
Run-Off Co-efficient	0.4	1.0	1.0	
Runoff from Impervious Surfaces	-	0.8	0.8	
Inputs (per Unit Area)				
Precipitation (mm/yr)	968.0	968.0	968.0	968.0
Run-on (mm/yr)	0.0	0.0	0.0	0.0
Other inputs (mm/yr)	0.0	0.0	0.0	0.0
Total Imputs (mm/yr)	968.0	968.0	968.0	968.0
Outputs (per Unit Area)				
Precipitation Surplus (mm/yr)	389.3	774.4	774.4	398.7
Net Surplus (mm/yr)	389.3	774.4	774.4	398.7
Evapotranspiration (mm/yr)	578.7	193.6	193.6	569.3
Infiltration (mm/yr)	233.6	0.0	0.0	122.2
Rooftop Infiltration (mm/yr)	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	233.6	0.0	0.0	122.2
Runoff Pervious Areas (mm/yr)	155.7	0.0	0.0	155.7
Runoff Impervious Areas (mm/yr)	0.0	774.4	774.4	369.3
Total Runoff (mm/yr)	155.7	774.4	774.4	276.5
Total Outputs (mm/yr)	968.0	968.0	968.0	968.0
Difference (Inputs-Outputs)	-	-	-	-
Inputs (Volumes)				
Precipitation (m^3/yr)	19,243.8	13,140.6	4,399.6	36,784.0
Run-On (m^3/yr)	-	-	-	-
Other Inputs (m^3/yr)	-	-	-	-
Total Inputs (m3/yr)	19243.8	13140.6	4399.6	36,784.0
Outputs (Volumes)				
Precipitation Surplus (m^3/yr)	7,739.3	10,512.5	3,519.6	21,771.4
Net Surplus (m^3/yr)	7,739.3	10,512.5	3,519.6	21,771.4
Evapotranspiration (m^3/yr)	11,504.6	2,628.1	879.9	15,012.6
Infiltration (m^3/yr)	4,643.6	0.0	0.0	4,643.6
Rooftop Infiltration (m^3/yr)	0.0	0.0	0.0	0.0
Total Infiltration (m^3/yr)	4,643.6	0.0	0.0	4,643.6
Runof Pervious Areas (m^3/yr)	3,095.7	0.0	0.0	3,095.7
Runoff Impervious Areas (m^3/yr)	0.0	10,512.5	3,519.6	14,032.1
Total Runoff (m^3/yr)	3,095.7	10,512.5	3,519.6	17,127.8
Total Outputs (m^3/yr)	19,243.8	13,140.6	4,399.6	36,784.0
Difference (Inputs-Outputs)	0.0	0.0	0.0	0.0

TABLE 2C
Water Budget Summary (Water Balance / Water Budget Assessment)

	Pre-Development	Post-Developmemt	Change (Pre- to Post-)
Inputs (Volumes)			
Precipitation (m^3/yr)	36,784.0	36,784.0	0%
Run-On (m^3/yr)	-	-	0%
Other Inputs (m^3/yr)	-	-	0%
Total Inputs (m3/yr)	36,784.0	36,784.0	0%
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	20,146.3	21,771.4	8%
Net Surplus (m^3/yr)	20,146.3	21,771.4	8%
Evapotranspiration (m^3/yr)	16,637.7	15,012.6	-10%
Infiltration (m^3/yr)	5,629.3	4,643.6	-18%
Rooftop Infiltration (m^3/yr)	0.0	0.0	0%
Total Infiltration (m^3/yr)	5,629.3	4,643.6	-18%
Runof Pervious Areas (m^3/yr)	3,752.9	3,095.7	-18%
Runoff Impervious Areas (m^3/yr)	10,764.2	14,032.1	30%
Total Runoff (m^3/yr)	14,517.0	17,127.8	18%
Total Outputs (m^3/yr)	36,784.0	36,784.0	0%

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	7	14
	SAMPLE	3	3
	SYMBOL	▲	●

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CONSULTING ENGINEERS

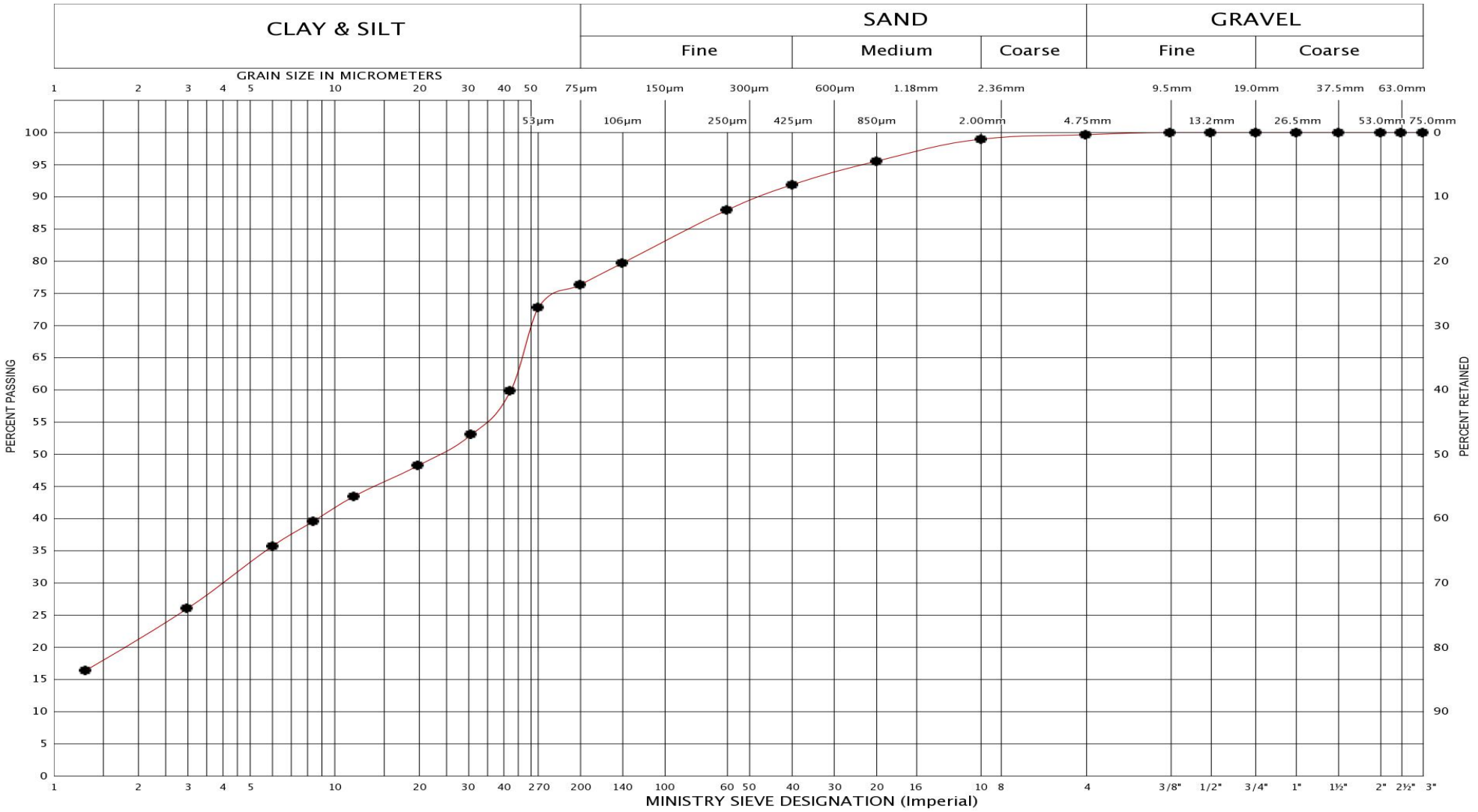
GRAIN SIZE DISTRIBUTION

FILL: SAND AND GRAVEL, Trace Silt/
SILTY SAND, Trace Gravel, Trace Clay

FIG No.: 1

Project No.: 20BF055

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
	BH	22
	SAMPLE	2
	SYMBOL	●

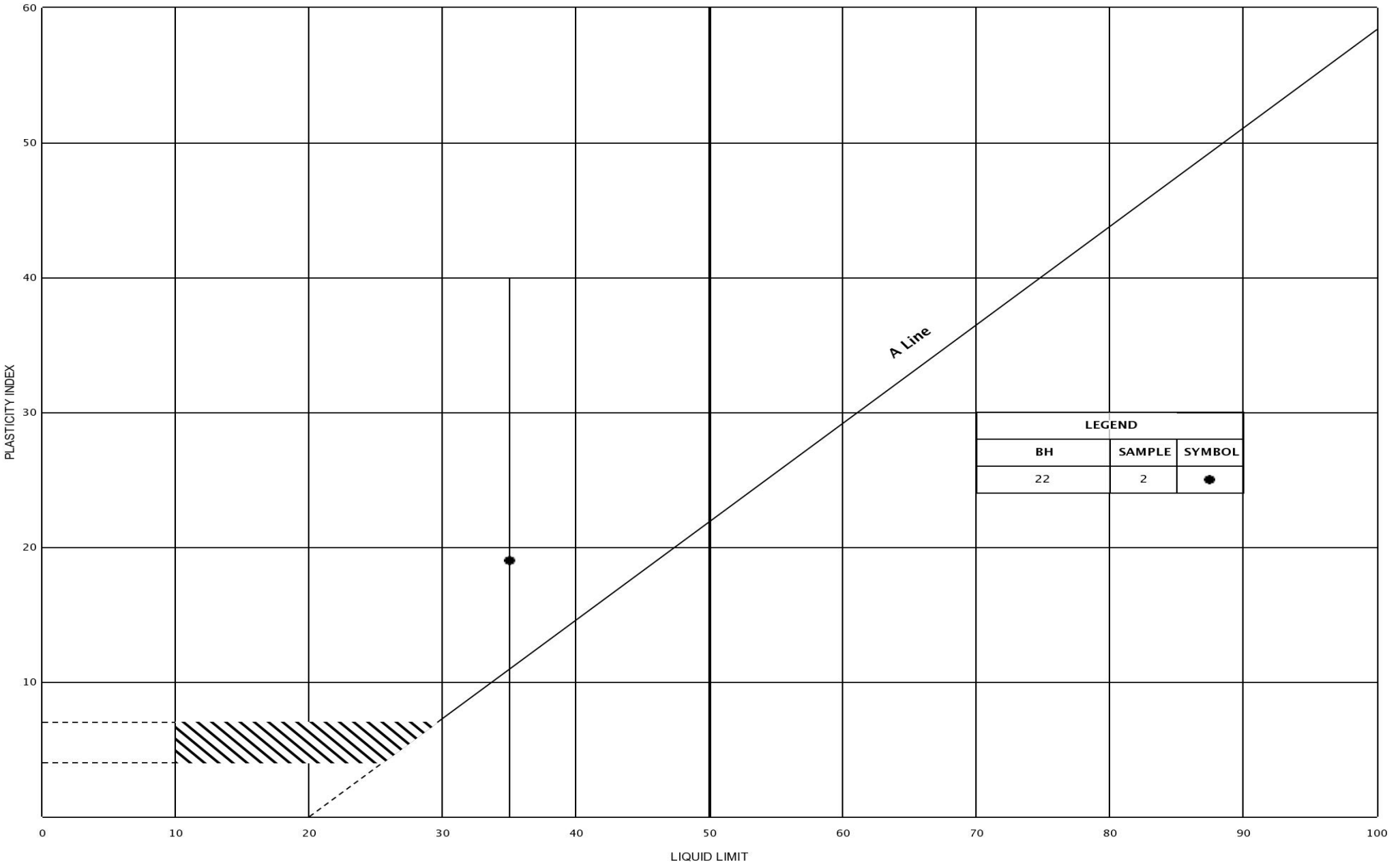
Peto MacCallum Ltd.
CONSULTING ENGINEERS

GRAIN SIZE DISTRIBUTION

CLAYEY SANDY SILT

FIG No.: 2

Project No.: 20BF055



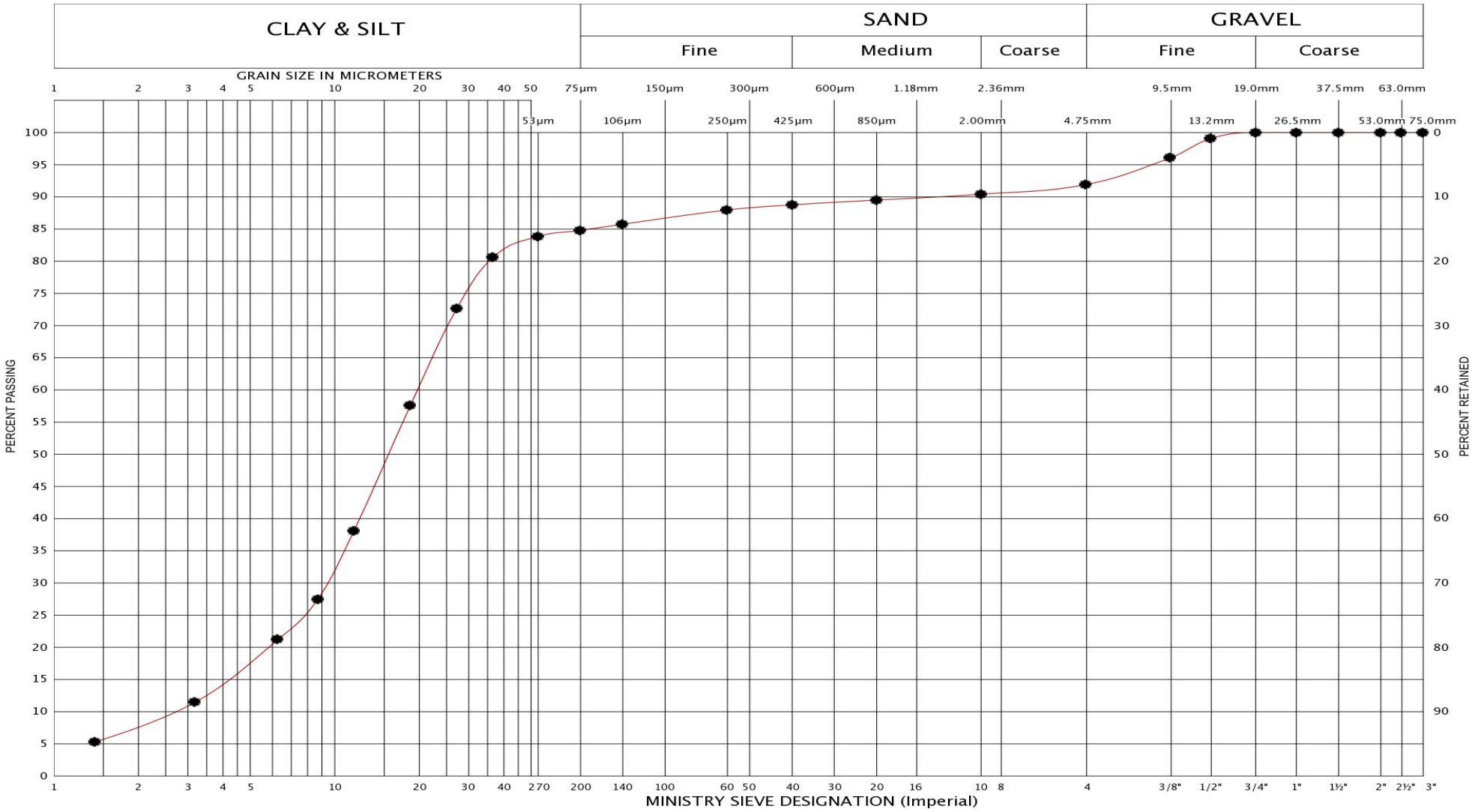
Ontario

PLASTICITY CHART

CLAYEY SANDY SILT

FIG No.:	3
HWY.:	
Proj No.	20BF055

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	23
	SAMPLE	5
	SYMBOL	●

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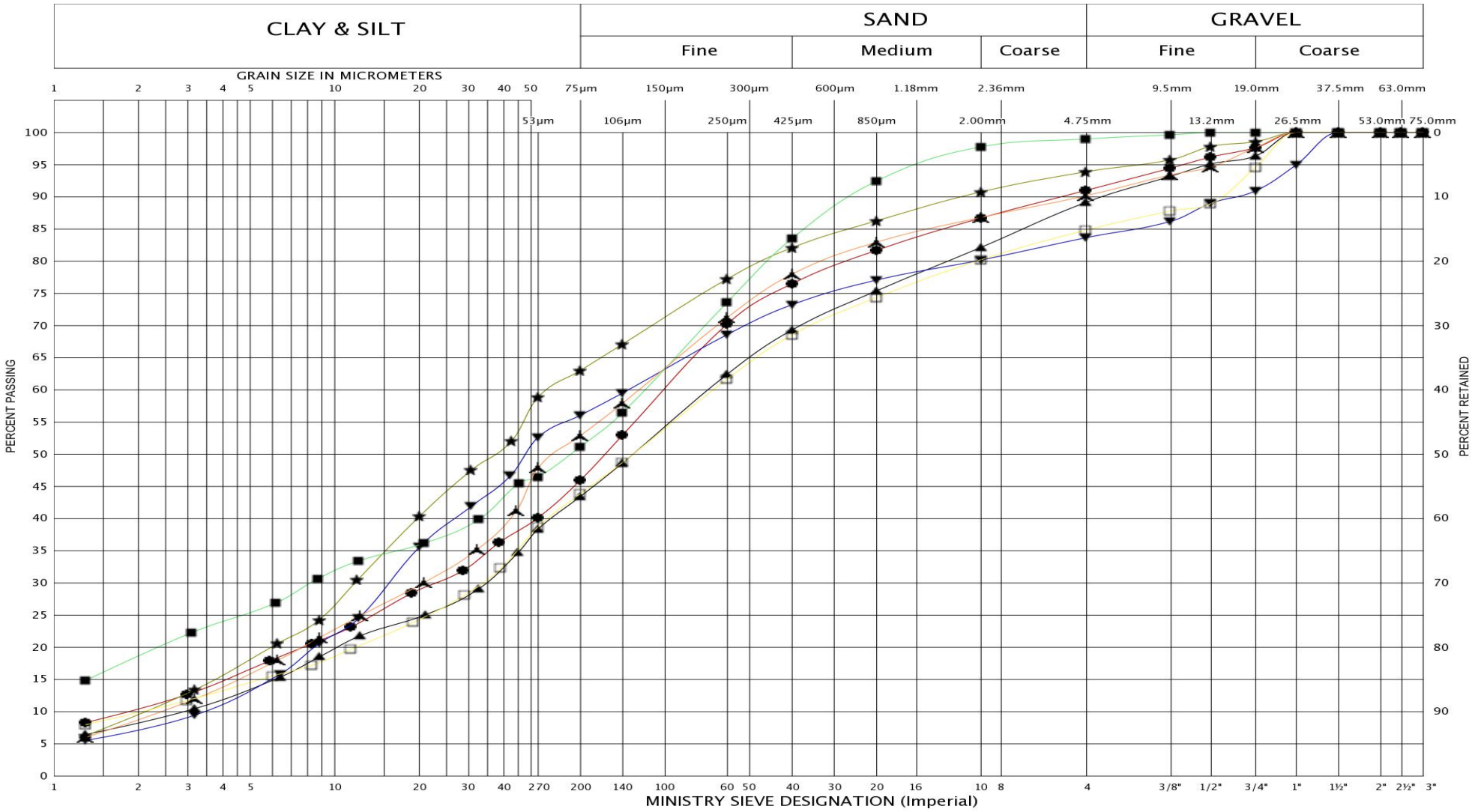
GRAIN SIZE DISTRIBUTION

SILT, Trace Clay, Sand and Gravel

FIG No.: 4

Project No.: 20BF055

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH/TP	TP1	TP2	TP3	10	15	17	26
	SAMPLE	2	1	2	6	4	4	2
	SYMBOL	●	■	□	▲	★	▼	⅄

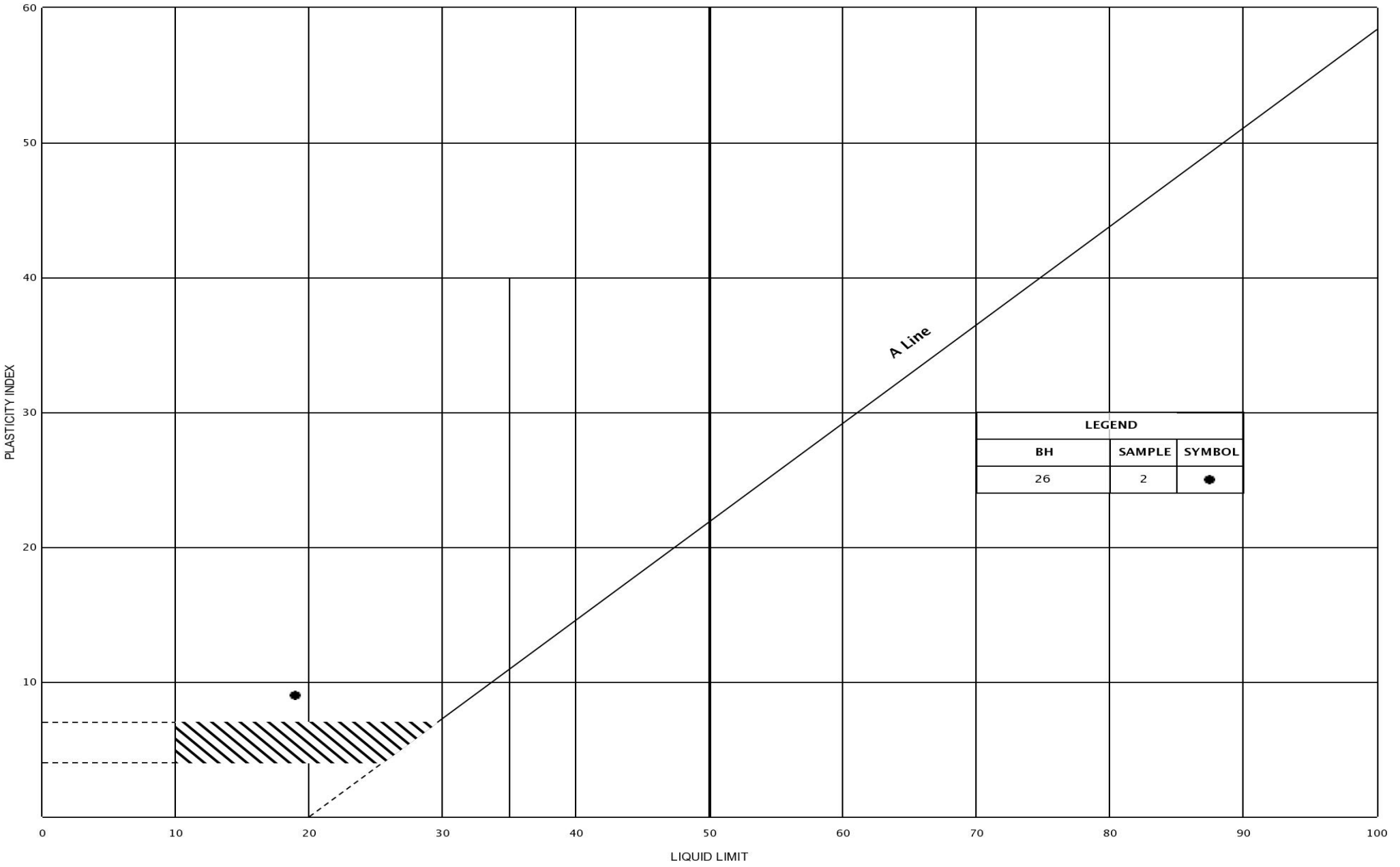
PML Peto MacCallum Ltd. CONSULTING ENGINEERS

GRAIN SIZE DISTRIBUTION

SILT AND SAND TILL, Trace to Some Gravel and Clay

FIG No.: 5

Project No.: 20BF055

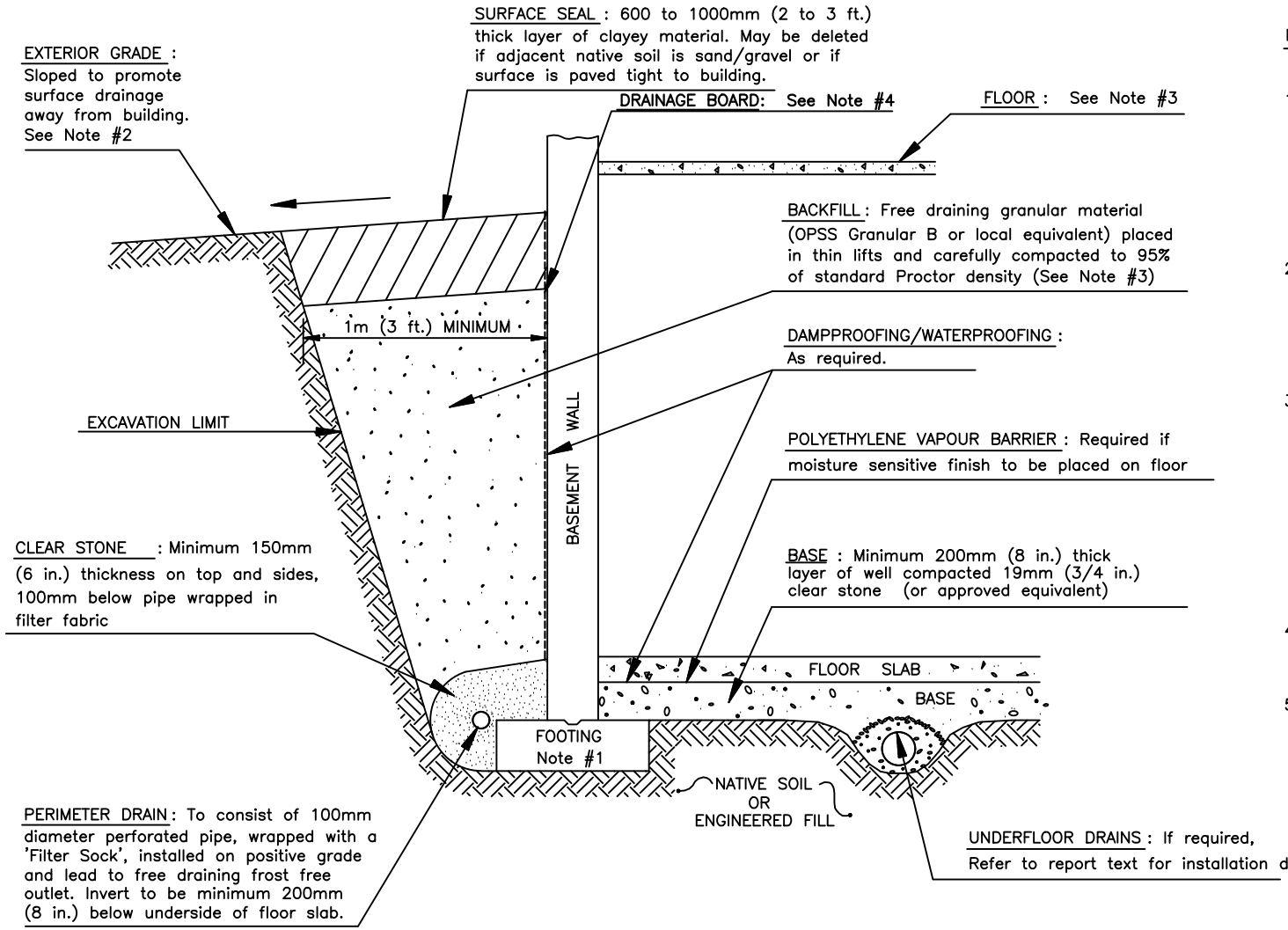


Ontario

PLASTICITY CHART

SILT AND SAND TILL, Trace to Some Clay and Gravel

FIG No.:	6
HWY.:	
Proj No.	20BF055



NOTES

1. Footing may be constructed by placement of structural concrete neat against natural soil. Drain to be installed in a similar manner immediately above footing maintaining 200mm (8 in.) distance between top of drain and underside of floor slab.
2. Exterior grade to be minimum 300mm (12 in.) below interior floor slab, or other means established to prevent entry of surface water into building through building openings.
3. Basement wall to be supported by floor system or interior bracing prior to commencement of backfill placement. Heavy construction equipment should not be permited within a distance from the foundation wall equivalent to half the wall height. Overcompaction of backfill to be avoided as excessive lateral earth pressure may result.
4. A proprietary drainage board product may be used with compacted native soil as backfill against the wall.
5. Refer to text for details regarding founding levels, competent bearing material and construction details specific to particular site.

STANDARD DRAWING

GENERAL RECOMMENDATIONS REGARDING DRAINAGE AND BACKFILL REQUIREMENTS FOR BASEMENT WALL AND FLOOR SLAB CONSTRUCTION

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN:	N/A	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED:	GW	JAN. 2021	N.T.S.	20BF055	7
APPROVED:	GW				

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		

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

TYPE OF SAMPLE

SS	Split Spoon	ST	Slotted Tube Sample
WS	Washed Sample	TW	Thinwall Open
SB	Scraper Bucket Sample	TP	Thinwall Piston
AS	Auger Sample	OS	Oesterberg Sample
CS	Chunk Sample	FS	Foil Sample
GS	Grab Sample	RC	Rock Core

PH	Sample Advanced Hydraulically
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		

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

17T 625032E 4941513N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 8, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 267.50				
0.0		FILL: Brown, silty sand, trace gravel, trace organics in upper 1 m, moist		1	SS	22
1.0				2	SS	30
2.0				3	SS	50/100 mm
2.1	265.4	SILT AND SAND TILL: Compact to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		4	SS	20
3.0				5	SS	26
4.0						
5.0				6	SS	44
6.0						
6.4	261.1	BOREHOLE TERMINATED AT 6.4 m		7	SS	50/130 mm
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 267, 266, 265, 264, 263, 262

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

17T 625018E 4941505N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE November 30, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 267.70			
0.0	FILL: Dark brown, silty sand, trace gravel, cobbles and bolders, trace organics in upper 1 m, wet to moist	1	SS	66/290 mm
		2	SS	50/100 mm
		3	SS	50/100 mm
2.1				
265.6	SILT AND SAND TILL: Compact to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist	4	SS	18
		5	SS	21
		6	SS	81/290 mm
6.3		7	SS	50/50 mm
261.4	BOREHOLE TERMINATED AT 6.3 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
Cave at 5.8 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

17T 624984E 4941484N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE November 30, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 268.85						
0.0	FILL: Dark brown, loose to very dense, silty sand, trace clay, cobbles and boulders, wet to moist		1	SS	4		
1.0			2	SS	22		
1.4 / 267.5	SILT AND SAND TILL: Loose to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist to wet		3	SS	7		
2.0			4	SS	11		
3.0			5	SS	19		First water strike at 3.4 m
4.0							
5.0			6	SS	50/100 mm		
6.0							
6.4 / 262.5	BOREHOLE TERMINATED AT 6.4 m		7	SS	50/100 mm		Upon completion of augering Water at 5.2 m Cave at 5.5 m
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

ELEVATION SCALE: 268, 267, 266, 265, 264, 263

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 624958E 4941469N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE November 30, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 269.35				
0.0	FILL: Dark brown, silty sand, some gravel, trace organics in upper 1 m, moist to wet		1	SS	22
			2	SS	9
			3	SS	8
2.1 / 267.3	SILT AND SAND TILL: Very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		4	SS	52
			5	SS	50/80 mm
			6	SS	50/145 mm
6.3			7	SS	90/145 mm
263.1	BOREHOLE TERMINATED AT 6.3 m				

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
Cave at 5.8 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 624941E 4941459N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE November 30, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 269.95				
0.0	FILL: Dark brown, silty sand, some gravel, trace organics in upper 1 m, moist to very moist		1	SS	19
			2	SS	7
			3	SS	7
2.1 / 267.9	SILT AND SAND TILL: Compact to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		4	SS	24
			5	SS	21
			6	SS	50/145 mm
6.4 / 263.6	BOREHOLE TERMINATED AT 6.4 m		7	SS	50/100 mm

ELEVATION SCALE: 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
Cave at 5.2 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

17T 625025E 4941526N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 8, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 267.85					
0.0	FILL: Brown, sand to silty sand, some gravel, trace organics in upper 1 m, moist to wet		1	SS	34	
			2	SS	50	267
1.0						
			3	SS	6	266
2.0						
2.1 / 265.8	SILT AND SAND TILL: Compact to very dense, grey, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		4	SS	29	265
3.0			5	SS	32	
						264
4.0						
4.6 / 263.3	BOREHOLE TERMINATED UPON AUGER REFUSAL AT 4.6 m		6	SS	50/100 mm	
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

First water strike at 1.4 m

Upon completion of augering
Wet cave at 3.0 m

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 7

17T 625010E 4941517N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 7, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 268.05								
0.0	FILL: Brown, silty sand and gravel, to sand and gravel, moist to very moist		1	SS	50/280 mm			30	
1.0			2	SS	50/130 mm	267		30	
2.0			3[1]	SS	44	266		35	
2.9			4	SS	25			45	
3.0	265.2 SILT AND SAND TILL: Compact to very dense, grey, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		5	SS	23	265		35	
4.0						264			
5.0			6	SS	50/80 mm	263		30	
6.0			7	SS	50/100 mm	262		35	First water strike at 6.1 m
6.4	261.7 BOREHOLE TERMINATED AT 6.4 m								Upon completion of augering Water at 6.1 m No cave
7.0									
8.0									
9.0									
10.0									
11.0									
12.0									
13.0									
14.0									
15.0									

SHEAR STRENGTH (kPa): +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER O Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L; WATER CONTENT (%): 10 20 30 40

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 8

17T 624977E 4941499N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 8, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 269.00				
0.0	FILL: Brown, silty sand, some gravel, trace organics in upper 1 m, very moist		1	SS	7
			2[1]	SS	3
			3	SS	10
2.1 / 266.9	SILT AND SAND TILL: Compact to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist to very moist		4	SS	11
			5	SS	32
			6	SS	50/145 mm
			7[1]	SS	50/80 mm
7.9 / 261.2	BOREHOLE TERMINATED AT 7.9 m		8	SS	75/250 mm

ELEVATION SCALE: 268, 267, 266, 265, 264, 263, 262

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS (ppm): 50, 50, 60, 65, 70, 30, 20, 25

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete
Bentonite Seal
50 mm slotted pipe
Filter sand

Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	2.5	266.5
2021-01-11	2.8	266.2

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 9

17T 624951E 4941481N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 8, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 269.55				
0.0		FILL: Brown, silty sand, some gravel, trace red brick fragments, trace organics, moist		1	SS	58/295 mm
				2	SS	16
				3	SS	27
				4	SS	49
				5	SS	9
4.0	265.6	SILT AND SAND TILL: Very dense, grey, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		6	SS	50/100 mm
6.2	263.4	BOREHOLE TERMINATED AT 6.2 m		7	SS	50/100 mm

ELEVATION SCALE: 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 10

17T 624924E 4941465N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 8, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 270.15				
0.0	FILL: Brown, sand, some gravel, some silt, trace organics in upper 1 m, moist		1	SS	30
			2[1]	SS	50/130 mm
			3[1]	SS	22
2.6			4	SS	10
267.6	SILT AND SAND TILL: Dense to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		5	SS	41
			6[1]	SS	97/200 mm
6.4			7	SS	50/145 mm
263.8	BOREHOLE TERMINATED AT 6.4 m				

ELEVATION SCALE: 270, 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS (ppm): 35, 35, 25, 15, 15, 15, 10

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete
Bentonite Seal
50 mm slotted pipe
Filter sand

Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	DRY	
2021-01-11	DRY	

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 11

17T 624926E 4941485N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 9, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 270.05					
0.0	FILL: Brown, silty sand, some gravel, trace organics, trace brick and concrete fragments, moist		1	SS	17	
			2	SS	50/100 mm	269
			3	SS	34	
2.1						268
268.0	SILT AND SAND TILL: Compact to very dense, grey, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		4	SS	31	
			5	SS	25	267
			6	SS	50/100 mm	266
6.4			7	SS	50/145 mm	265
263.7	BOREHOLE TERMINATED AT 6.2 m					264

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
Cave at 5.8 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

17T 624976E 4941530N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 9, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.20									
0.0	FILL: Brown, silty sand, some gravel, trace organics in upper 1 m, moist to wet		1	SS	18	269				
1.0			2	SS	7	268				
	Becoming clayey silt		3	SS	14					First water strike at 1.4 m
2.0										
2.1 / 267.1	SILT AND SAND TILL: Very dense, grey, sandy silt to silty sand, trace to some gravel and clay, clayey silt layers, cobbles and boulders, moist		4	SS	50/20 mm	267				
3.0			5	SS	69	266				
3.5 / 265.7	BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering No water Cave at 2.8 m
4.0										
5.0										
6.0										
7.0										
8.0										
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 13

17T 624951E 4941515N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 8, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.45							
0.0	FILL: Brown, silty sand, moist to wet		1	SS	90	269	25	
1.0	Clayey silt pockets		2[1]	SS	90		35	
2.0			3[1]	SS	50/100 mm	268	30	
			4	SS	50/80 mm	267	30	
2.9								
3.0	266.6 SILT AND SAND TILL: Compact, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, wet		5	SS	17	266	35	First water strike at 3.0 m
3.5	266.0 BOREHOLE TERMINATED AT 3.5 m							Upon completion of augering Water at 1.8 m Cave at 2.0 m

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 14

17T 624912E 4941513N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 9, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 269.50			
0.0		FILL: brown, sandy silt, some gravel, to silty sand, trace gravel, trace clay, trace organics, trace brick fragments, moist	1	SS	11
			2	SS	20
			3[1]	SS	18
2.1	267.4	SILT AND SAND TILL: Compact to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist	4	SS	21
			5	SS	14
			6	SS	50/100 mm
6.2	263.4	BOREHOLE TERMINATED AT 6.5 m	7	SS	50/50 mm

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
Cave at 5.8 m

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 15

17T 624899E 4941504N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 9, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.90						
0.0	FILL: Brown, silty sand, some gravel, cobbles and boulders, moist to very moist		1	SS	22	35	
1.0			2	SS	8	25	
1.4 / 268.5	SAND AND SILT TILL: Compact to very dense, brown to grey, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist		3	SS	16	25	
2.0			4[1]	SS	21	25	
3.0			5	SS	29	25	
4.0							
5.0			6	SS	50/130 mm	25	
6.0 / 6.2 / 263.7	BOREHOLE TERMINATED AT 6.2 m		7	SS	50/130 mm	30	Upon completion of augering No water Cave at 5.6 m

ELEVATION SCALE: 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 16

17T 624980E 4941605N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 267.60			
0.30 / 267.30	TOPSOIL: Dark brown, silty sand, some organics, very moist to wet	1	SS	4
0.70 / 266.90	FILL: Dark brown, sand, some silt, very moist			
	SILT AND SAND TILL: Loose to very dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist	2	SS	8
		3	SS	52
		4	SS	56
		5	SS	50/130 mm
		6	SS	50/130 mm
6.3 / 261.3	BOREHOLE TERMINATED AT 6.3 m	7	SS	50/50 mm

SHEAR STRENGTH (kPa): +FIELD VANE △TORVANE ○ Qu; ▲POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION ×; STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)

GAS READINGS (ppm)

GROUND WATER OBSERVATIONS AND REMARKS

First water strike at 2.1 m

Upon completion of augering
Water at 2.1 m
No cave

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 17

17T 624958E 4941571N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 6, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 268.00			
0.0	FILL: Dark brown, silty sand, some gravel, moist	1	SS	16
1.4 / 266.6	SILT AND SAND TILL: Compact to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist to wet	2	SS	20
		3	SS	11
		4[1]	SS	14
		5	SS	30
		6	SS	50/100 mm
6.1 / 261.9	BOREHOLE TERMINATED AT 6.1 m	7	SS	50/25 mm

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

ELEVATION SCALE: 267, 266, 265, 264, 263, 262

GAS READINGS (ppm): 35, 30, 25, 25, 25, 25, 25

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Water at 2.9 m
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	1.3	266.7
2021-01-11	1.4	266.6

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 18

17T 624931E 4941557N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 268.20									
0.0	FILL: Brown silty sand, some gravel, wet to moist		1	SS	7	268			30	
1.0			2	SS	9	267			20	
	Clayey silt pockets		3	SS	7				25	
2.0	2.1									
	266.1 SAND AND SILT TILL: Compact to dense, brown sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist		4	SS	17	266			30	
3.0			5	SS	47	265			35	
	3.5									
	264.7 BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering No water No cave
4.0										
5.0										
6.0										
7.0										
8.0										
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 19

17T 624900E 4941538N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 9, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 268.80									
0.0		FILL: Brown, sandy silt, some gravel, trace organics, moist		1	SS	19					
0.70	268.10	SAND AND SILT TILL: Compact to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist to wet		2	SS	13	268				
1.0											
				3	SS	18	267				
2.0											
				4	SS	15	266				
3.0											
				5	SS	32	265				
4.0											First water strike at 4.0 m
				6	SS	50/145 mm	264				
5.0											
							263				
6.0	6.2										
	262.6	BOREHOLE TERMINATED AT 6.2 m		7	SS	50/100 mm					Upon completion of augering Water at 5.2 m No cave
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q (50 100 150 200)
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ● (20 40 60 80)
PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT
WATER CONTENT (%) (10 20 30 40)

NOTES

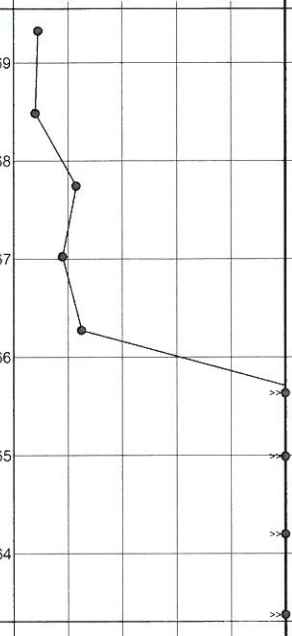
Peto MacCallum Ltd.
CONSULTING ENGINEERS

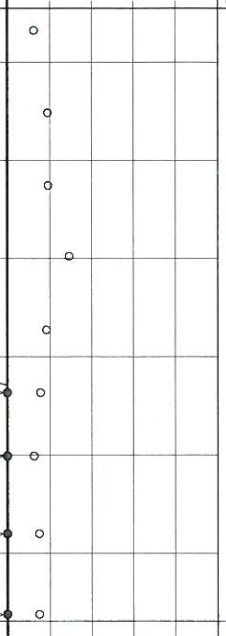
LOG OF BOREHOLE/MONITORING WELL NO. 20

17T 624884E 4941530N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 10, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 269.55				
0.0	269.6	FILL: Brown, sandy silt, some gravel, moist		1	SS	9
1.0				2	SS	8
1.4	268.2	SAND AND SILT TILL: Compact to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist and wet seams		3	SS	23
2.0				4	SS	18
3.0				5	SS	25
4.0				6	SS	50/80 mm
5.0				7	SS	50/120 mm
				8	SS	50/100 mm
6.0				9	SS	50/145 mm
6.2	263.3	BOREHOLE TERMINATED AT 6.3 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						





GAS READINGS ppm
45
25
35
30
35
25
35
30
25

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	2.4	267.2
2021-01-11	2.3	267.3

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 21

17T 624867E 4941554N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.15									
	FILL: Brown, silty sand, some gravel, trace organics in upper 1 m, very moist to moist		1	SS	14	269				
			2	SS	9	268				
1.4										
267.8	SAND AND SILT TILL: Loose to dense, brown, sandy silt to silty sand, trace to some gravel and clay, clayey silt layers, cobbles and boulders, moist to wet		3	SS	8	267				
			4	SS	11					
3.5			5	SS	37	266				First water strike at 2.9 m
265.7	BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering Water at 1.8 m No cave

SHEAR STRENGTH (kPa): +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 22

17T 624917E 4941605N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 267.80									
0.0		TOPSOIL: Dark brown, silty clay, some organics, moist		1	SS	4					
0.70	267.10	CLAYEY SANDY SILT: Stiff, brown, clayey sandy silt, APL		2	SS	11	267				
1.4	266.4	SILT AND SAND TILL: Loose to dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist		3	SS	11	266				First water strike at 1.7 m
				4	SS	20	265				
3.5	264.3	BOREHOLE TERMINATED AT 3.5 m		5	SS	44					Upon completion of augering Water at 1.8 m No cave

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT; WATER CONTENT (%): 10 20 30 40

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 23

17T 624892E 4941587N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 268.35									
0.0	FILL: Dark brown, silty sand to sandy silty, trace gravel, trace organics, moist to very moist		1	SS	3	268				
0.90										
1.0	267.45 SILT: Loose to compact, brown, silt, trace sand, clay and gravel, wet to moist		2	SS	5					
						267				First water strike at 1.4 m
2.0			3	SS	5					
						266				
			4	SS	6					
3.0										
3.5			5	SS	22	265				
	264.9 BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering Water at 2.2 m No cave
4.0										
5.0										
6.0										
7.0										
8.0										
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; 50 100 150 200; DYNAMIC CONE PENETRATION ×; STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%): 10 20 30 40

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 24

17T 624851E 4941579N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 10, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.20									
	FILL: Brown to black, sandy silt, trace gravel, trace clay, moist		1	GS		269			35	
1.4			2	SS	7	268			25	
267.8	SAND AND SILT TILL: Loose to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist		3	SS	8				25	
			4	SS	23	267			25	
3.5			5	SS	52	266			25	
265.7	BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering No water No cave

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q (50 100 150 200); DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ● (20 40 60 80)

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%) (10 20 30 40)

0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 25

17T 624950E 4941659N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 267.40						
0.20 267.20	TOPSOIL: Dark brown, silty sand, some organics, moist		1	SS	4		
	FILL: Brown, silty sand, some gravel, trace clay, trace organics, very moist		2	SS	2		
1.5 265.9	SAND AND SILT TILL: Loose to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, very moist to moist		3	SS	7		First water strike at 1.4 m
			4	SS	34		
3.3 264.1	BOREHOLE TERMINATED AT 3.3 m		5	SS	97/250 mm		Upon completion of augering Water at 0.9 m Cave at 2.1 m

ELEVATION SCALE: 267, 266, 265

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

NOTES

Peto MacCallum Ltd
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 26

17T 624875E 4941614N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE December 11, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 268.40									
0.70	FILL: Brown to dark brown, sand and gravel, trace silt, trace clay, moist to very moist		1	SS	8	268				
267.70	SAND AND SILT TILL: Loose to dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist, wet seams		2[1]	SS	5					First water strike at 1.5 m
			3	SS	9	267				
			4	SS	52	266				
3.5			5	SS	43	265				
264.9	BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering Water at 3.5 m Cave at 2.1 m

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES 1. Samples submitted for laboratory analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 27

17T 624896E 4941644N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 10, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 267.60					
0.20 / 267.40	TOPSOIL: Dark brown, silty sand, some organics, moist to very moist		1	SS	3	267
0.70 / 266.90	FILL: Brown, sand, some gravel, trace silt, moist					
	SAND AND SILT TILL: Compact to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist, wet seams		2	SS	13	
			3	SS	12	266
			4	SS	28	265
			5	SS	56	
3.5 / 264.1	BOREHOLE TERMINATED AT 3.5 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering
Water at 3.5 m
No cave

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 28

17T 624901E 4941664N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 11, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 267.60				
0.30 / 267.30	TOPSOIL: Dark brown, sandy silt, some organics, trace gravel, moist to very moist		1	SS	6
0.70 / 266.90	FILL: Brown, silty sand, trace gravel, moist		2	SS	6
	SAND AND SILT TILL: Loose to very dense, brown, clayey sandy silt to silty sand, trace to some gravel and clay, very moist to moist		3	SS	13
			4	SS	30
			5	SS	71
4.7 / 263.0	BOREHOLE TERMINATED UPON AUGER REFUSAL AT 4.7 m		6	SS	50/100 mm

ELEVATION SCALE: 267, 266, 265, 264, 263

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm: 30, 30, 25, 20, 20, 20

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete
Bentonite Seal
First water strike at 2.1 m
50 mm slotted pipe
Filter sand

Upon completion of augering
Water at 2.1 m
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	1.1	266.5
2021-01-11	1.2	266.4

Moved borehole over 1.5 m North, met auger refusal at 4.0 m

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 29

17T 624870E 4941646N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 11, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) +FIELD VANE △TORVANE ○Qu ▲POCKET PENETROMETER ○Q / DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 268.30									
0.20	268.10	TOPSOIL: Dark brown, sandy silt, some organics, trace gravel, moist to wet		1	SS	5	268				
0.70	267.60	FILL: Brown, sand, some gravel, trace silt, moist									
		SAND AND SILT TILL: Loose to very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, wet to moist		2	SS	5	267				
				3	SS	11					First water strike at 1.5 m
				4	SS	43	266				
3.3	265.0	BOREHOLE TERMINATED AT 3.3 m		5	SS	79/280 mm	265				Upon completion of augering Water at 2.1 m No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 30

17T 624829E 4941617N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE December 11, 2020
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	GAS READINGS (ppm)
		SURFACE ELEVATION 269.85						
0.0		FILL: Brown to dark brown, sandy silt, some gravel, trace silt, moist to wet		1	GS	-		
				2	SS	27	269	30
1.0								
				3	SS	31	268	30
2.0	2.1							
	267.8	SAND AND SILT TILL: Very dense, brown, sandy silt to silty sand, trace to some gravel and clay, cobbles and boulders, moist		4	SS	54		25
3.0							267	
				5	SS	67		25
4.0							266	
				6	SS	50/130 mm		20
5.0							265	
							264	
6.0	6.4			7	SS	50/ 250 mm		20
	263.5	BOREHOLE TERMINATED AT 6.4 m						
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								
13.0								
14.0								
15.0								

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Water at 1.5 m
No cave
Water Level Readings:

Date	Depth	Elev.
2020-12-18	1.2	268.7
2021-01-11	1.7	268.2

NOTES 1. Samples submitted for chemical analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF TEST PIT NO. 1

17T 624903.9E 4941645N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
EXCAVATION METHOD Excavator
BORING DATE November 23, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN SG

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 267.60									
0.0	TOPSOIL: Dark brown, sandy silt, moist									
0.30										
267.30	SILT AND SAND TILL: Compact to dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, moist to wet		1	GS		267				GP Test 1 at 0.7 m
1.0										
2.0						266				
2.5			2	GS						
265.1	TEST PIT TERMINATED AT 2.5 m									Upon completion of excavation Seepage at 0.7 m
3.0										
4.0										
5.0										

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF TEST PIT NO. 2

17T 624867.9E 4941622N

PROJECT Proposed Simcoe County Service Campus
PML REF. 20BF055
LOCATION 2 Borland Street East, Orillia, Ontario
BORING DATE November 23, 2020
ENGINEER GW
EXCAVATION METHOD Excavator
TECHNICIAN SG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
0.0		SURFACE ELEVATION 268.30									
	268.25	TOPSOIL: Dark brown, sandy silt, moist									
		FILL: Brown, silty sand to sandy silt, trace to some gravel and clay, moist		1	GS		268				GP Test 1 at 0.7 m
1.0	1.00										
	267.30	SILT AND SAND TILL: Compact to dense, brown, silty sand to sandy silt, trace to some gravel and clay, cobbles and boulders, very moist to wet					267				
2.0											
							266				
3.0	3.0			2	GS						
	265.3	TEST PIT TERMINATED AT 3.0 m									Upon completion of excavation Seepage at 1.0 m
4.0											
5.0											

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

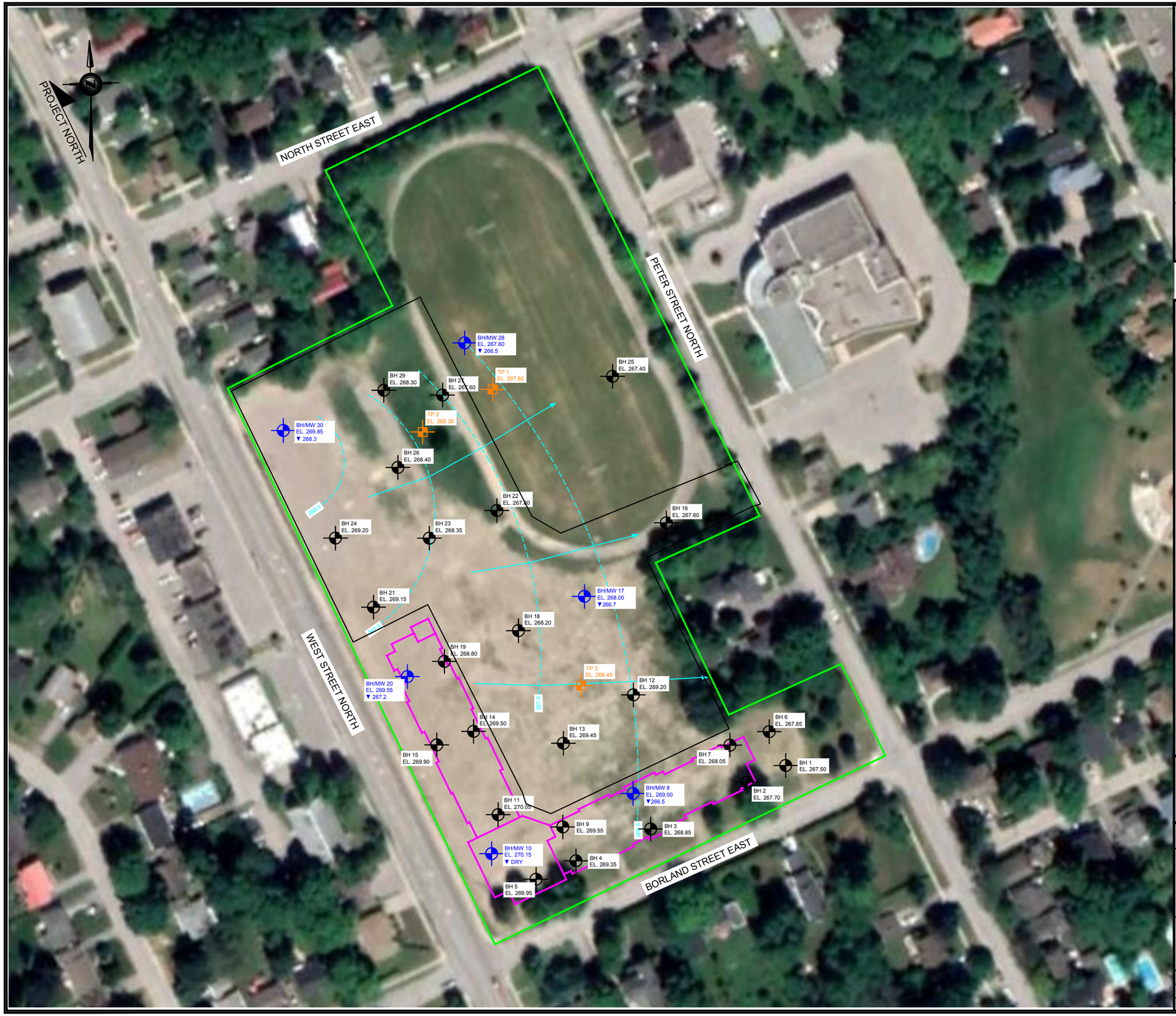
LOG OF TEST PIT NO. 3

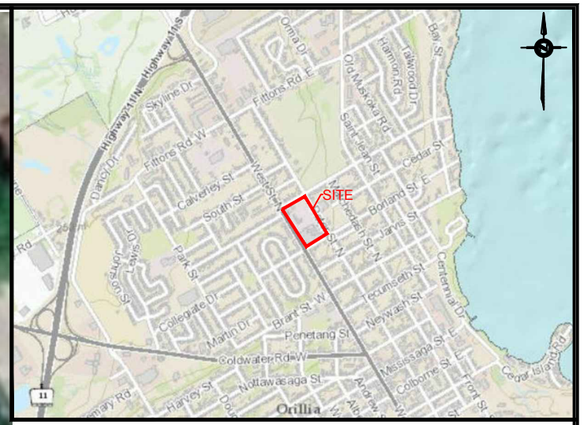
17T 624959.5E 4941529N

PROJECT Proposed Simcoe County Service Campus
LOCATION 2 Borland Street East, Orillia, Ontario
EXCAVATION METHOD Excavator
BORING DATE November 23, 2020
PML REF. 20BF055
ENGINEER GW
TECHNICIAN SG

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) +FIELD VANE △TORVANE ○ Qu ▲POCKET PENETROMETER ● Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L); WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.45						50 100 150 200; 20 40 60 80	10 20 30 40		
0.0	TOPSOIL: Dark brown, sandy silt, moist									
269.40	FILL: Brown, silty sand to sandy silt, trace to some gravel and clay, moist					269				
0.70										
268.75	SILT AND SAND TILL: Compact to dense, brown, silty sand to sandy silt, trace to some gravel and clay, moist to wet					268				
1.0			1	GS						GP Test 1 at 1.7 m
2.0						267				
3.0			2	GS						
3.0										
266.5	TEST PIT TERMINATED AT 3.0 m									Upon completion of excavation Seepage at 2.3 m
4.0										
5.0										

NOTES





KEY PLAN
ORILLIA, ONTARIO

LEGEND:

- SITE LIMITS
- PROPOSED BUILDING
- PROPOSED PAVED PARKING AND ACCESS AREA
- BH 1 EL. 267.50 — BOREHOLE LOCATION, SURFACE ELEVATION
- BH/MW 8 EL. 269.00 ▼266.5 — BOREHOLE/MONITORING WELL LOCATION, SURFACE ELEVATION, GROUND WATER ELEVATION (DEC 18, 2020)
- TP 1 EL. 269.45 — TEST PIT LOCATION, SURFACE ELEVATION
- INTERPRETTED GROUND WATER CONTOURS
- INFERRED GROUND WATER FLOW DIRECTION

REFERENCE:
BASE PLAN PRODUCED USING GOOGLE EARTH AUG.2020

0m 20 40 60 80 100
SCALE

BOREHOLE/MONITORING WELL AND TEST PIT LOCATION PLAN

PROPOSED SIMCOE COUNTY SERVICE CAMPUS
2 BORLAND STREET EAST
ORILLIA, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

		DATE	SCALE	PML REF.	DRAWING NO.
DRAWN	SB	JAN. 2021	AS SHOWN	20BF055	1
CHECKED	AK				
APPROVED	GRW				

APPENDIX A

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 effect 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.

APPENDIX B

Engineered Fill

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.

APPENDIX C

MECP Water Well Records

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
ORILLIA CITY	17 624637 4940970 W	1962/09 1312	6	FR 0065	46/57/ 3/10:0	DO	0066 4	5702968 ()	GRVL CLAY 0006 GREY HPAN 0055 CLAY BLDR 0065 GRVL HPAN 0070
ORILLIA TOWNSHIP SD 04 007	17 624439 4940788 W	2009/04 2576			4///:			7124251 (Z90758) A079678 A	
ORILLIA CITY SD 04 007	17 624614 4941263 W	2010/02 7075	2 2		89///:	NU	0220 20 0095 10	7150636 (Z73386) A086851	FSND CLAY PCKD 0105 GREY CLAY TILL HARD 0133 BRWN SAND GRVL STNS 0246 GREY LMSN FCRD FCRD 0258
ORILLIA CITY	17 625094 4941041 W	2014/11 6032						7236986 (C24640) A102041 P	
ORILLIA CITY	17 625092 4941015 W	2014/12 6032						7237241 (C20066) A102041 P	
ORILLIA CITY	17 625041 4940968 W	2015/08 6946						7258237 (C30677) A165526 P	
ORILLIA CITY	17 624891 4941503 W	2018/02 7190						7309980 (C39464) A235881 P	
ORILLIA CITY	17 625134 4941034 W	7314						7317082 (C38620) A139435 P	
ORILLIA CITY SD 04 008	17 625089 4941037 W	2017/06 3266						7332159 (C06544) P	

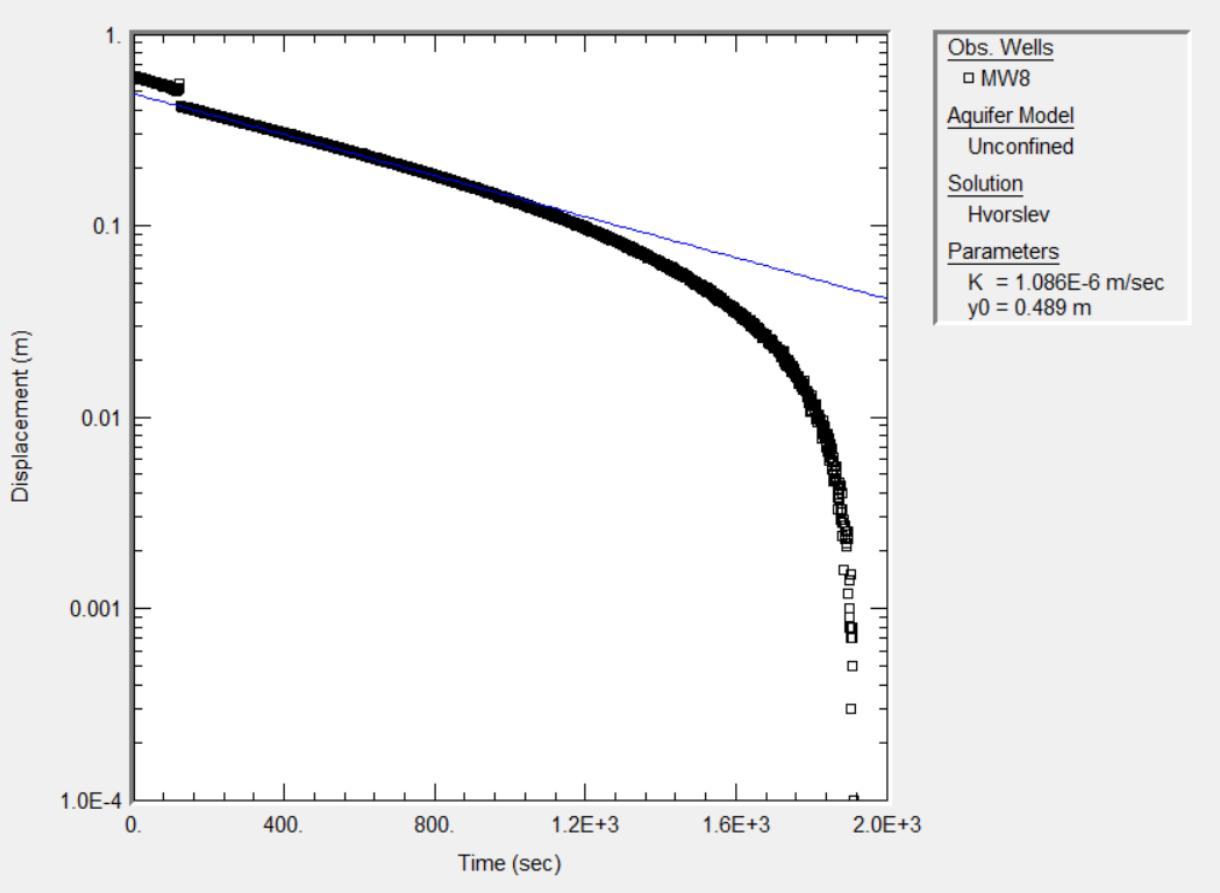
APPENDIX D

Borehole Permeability Testing

Estimation of K by Slug Test, based on Hvorslev equation

Date:	December 18, 2020
Conducted by:	S. Griffith

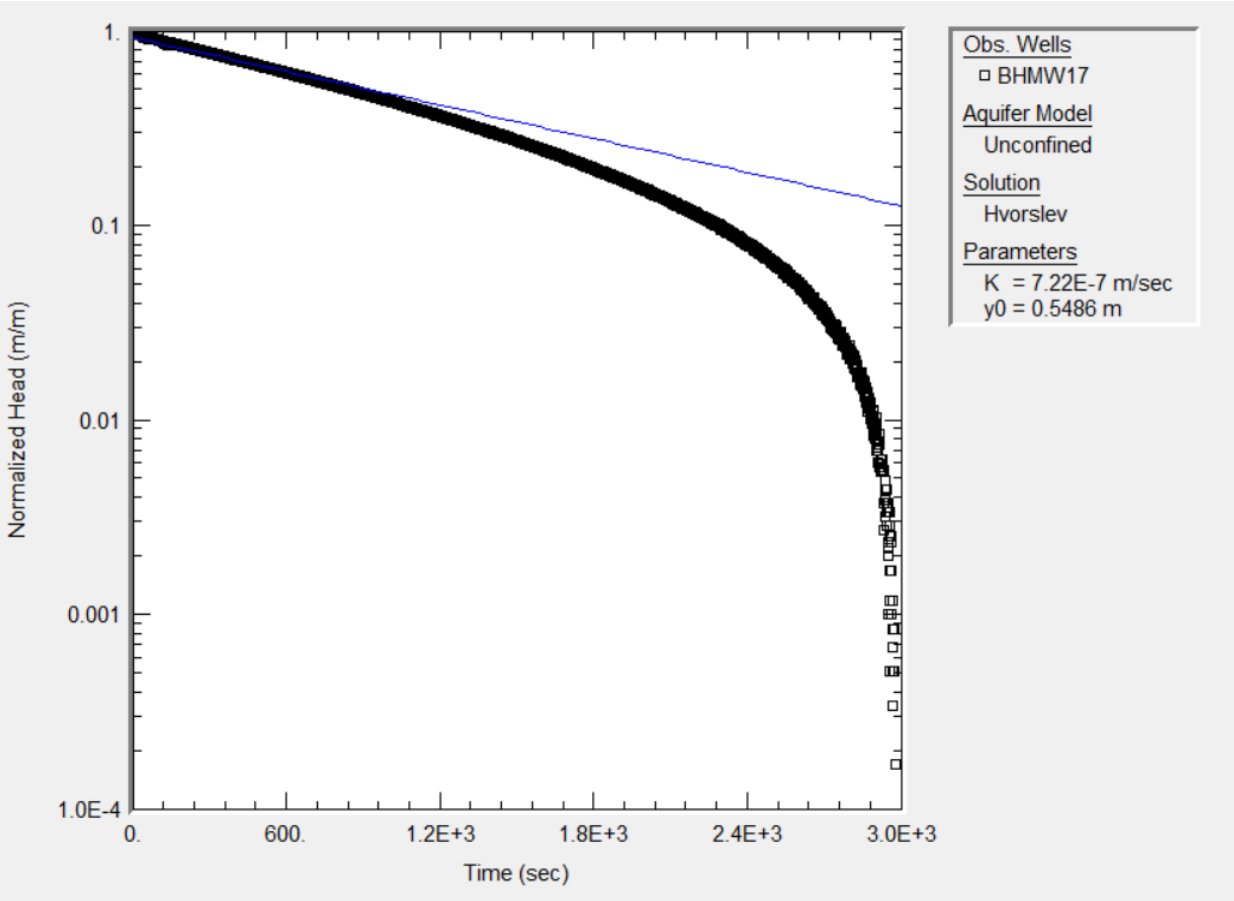
Well Number:	BH/MW8	
Well Screen Bottom:	7.60	mbgs
Top of Pipe:	1.12	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	269.00	masl
Static Water Level:	2.66	mbgs
$K = r^2 \ln(L/R)/(2LTo) =$	**1.1×10^{-6}**	m/s



Estimation of K by Slug Test, based on Hvorslev equation

Date:	December 18, 2020
Conducted by:	S. Griffith

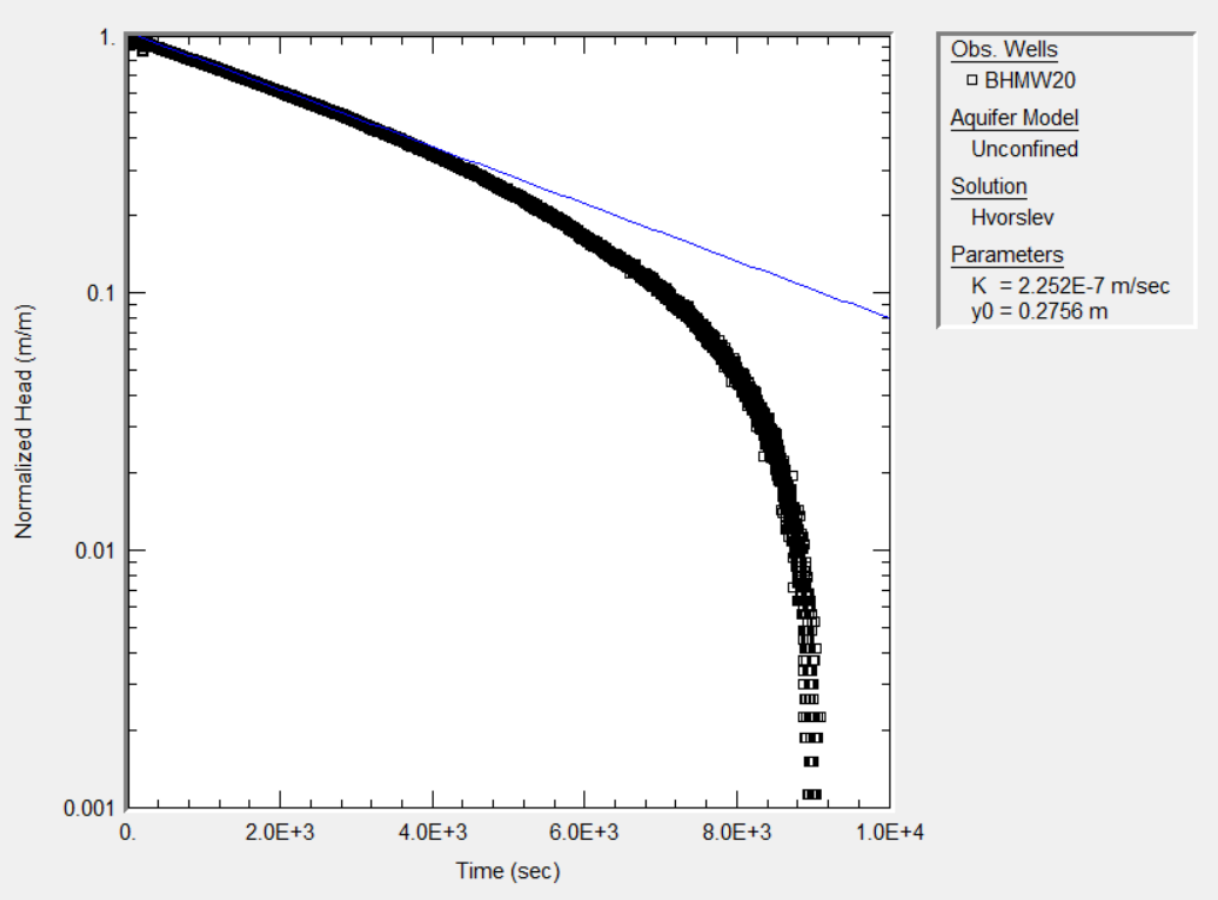
Well Number:	BH/MW17	
Well Screen Bottom:	6.10	mbgs
Top of Pipe:	1.07	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	268.00	masl
Static Water Level:	1.34	mbgs
$K = r^2\ln(L/R)/(2LTo)$ =	**$7.2x10^{-7}$**	m/s



Estimation of K by Slug Test, based on Hvorslev equation

Date:	December 18, 2020
Conducted by:	S. Griffith

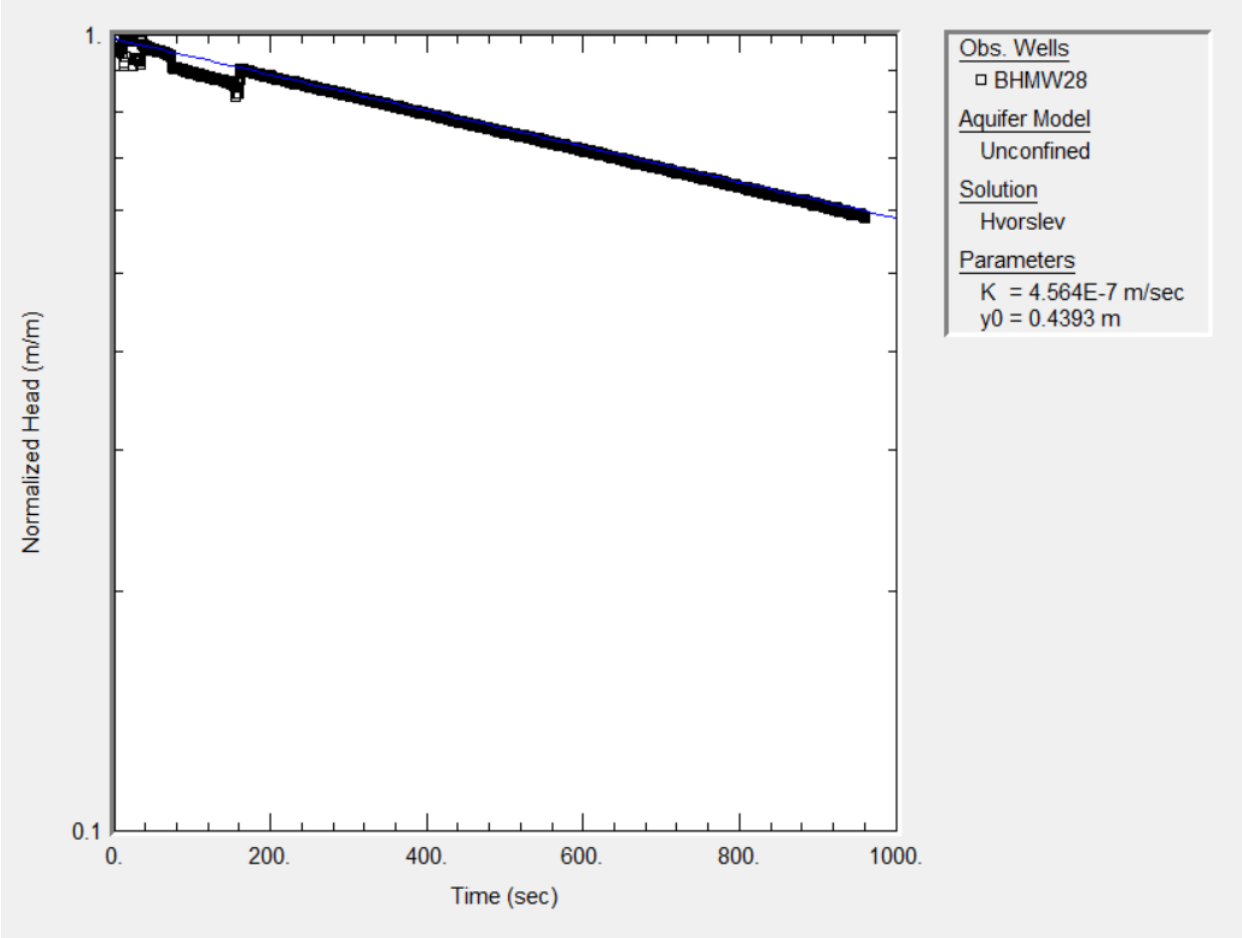
Well Number:	BH/MW20	
Well Screen Bottom:	6.10	mbgs
Top of Pipe:	0.96	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	269.55	masl
Static Water Level:	2.41	mbgs
$K = r^2\ln(L/R)/(2LTo)$ =	**$2.3x10^{-7}$**	m/s



Estimation of K by Slug Test, based on Hvorslev equation

Date:	December 18, 2020
Conducted by:	S. Griffith

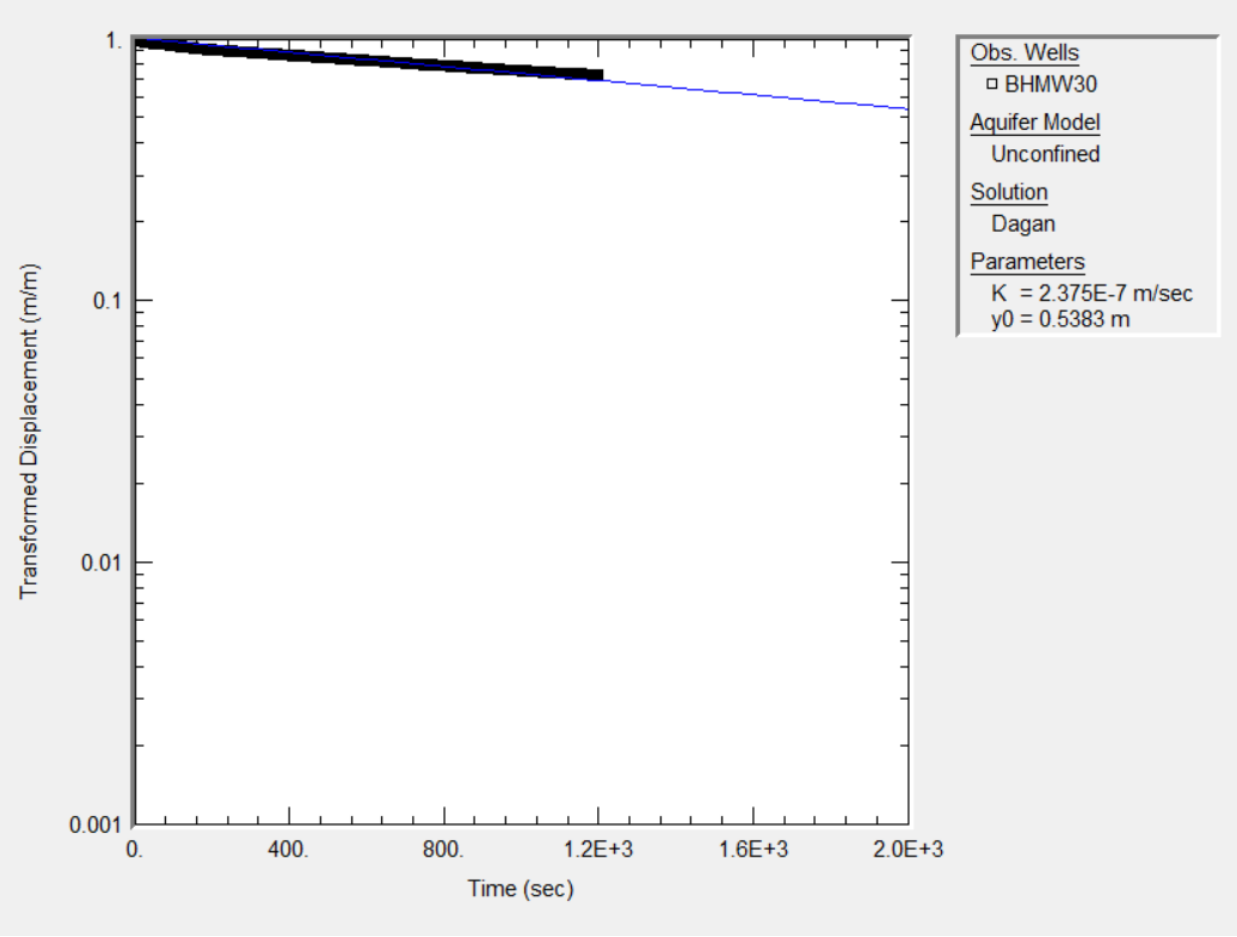
Well Number:	BH/MW28	
Well Screen Bottom:	4.60	mbgs
Top of Pipe:	1.10	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	267.60	masl
Static Water Level:	1.17	mbgs
$K = r^2\ln(L/R)/(2LTo)$ =	**4.6×10^{-7}**	m/s



Estimation of K by Slug Test, based on Dagan equation

Date:	December 18, 2020
Conducted by:	S. Griffith

Well Number:	BH/MW30	
Well Screen Bottom:	6.10	mbgs
Top of Pipe:	1.07	mags
Well Casing Diameter:	5.08	cm
Well Elevation:	269.85	masl
Static Water Level:	4.84	mbgs
$K = r^2 \ln(L/R)/(2LTo) =$	**2.4×10^{-7}**	m/s



APPENDIX E

Chain-of-Custody Records and Certificates of Analyses for Chemical Testing

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: GH0121 **REPORT No. B20-40118**

Report To:

Peto MacCallum Ltd
19 Churchill Drive,
Barrie ON L4N 8Z5
Attention: Alicia Kimberley

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

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Cyanide	1	Kingston	US	29-Dec-20	A-CN-001 (k)	SM 4500CN
Anions	1	Holly Lane	VK	24-Dec-20	A-IC-01 (o)	SM4110C
pH	1	Holly Lane	SYL	24-Dec-20	A-PH-01 (o)	SM 4500H
A - Wet Chem	1	Kingston	KD	29-Dec-20	A-TPTKN-001 (N)(k)	E3199A.1
A - Wet Chem	1	Kingston	KD	29-Dec-20	A-TPTKN-001 (P)(k)	E3199A.1
Total Suspended Solids	1	Kingston	TK	23-Dec-20	A-TSS-001 (k)	SM2540D
Comment	1	Default Site	CS	29-Dec-20	C-Arochlor Comment	-
BOD	1	Kingston	JWF	23-Dec-20	C-BOD-001 (k)	SM 5210B
SVOC	1	Kingston	sge	29-Dec-20	C-NAB-W-001 (k)	EPA 8270
Oil & Grease	1	Kingston	jda	24-Dec-20	C-O&G-001 (k)	SM 5520
PCB's	1	Kingston	CS	29-Dec-20	C-PCB-03 K	EPA 8082
Phenolics (4-aap)	1	Kingston	TK	24-Dec-20	C-PHEN-01 (k)	MOEE 3179
VOC's	1	Richmond Hill	JE	23-Dec-20	C-VOC-02 (rh)	EPA 8260
Chromium (VI)	1	Holly Lane	LMG	30-Dec-20	D-CRVI-01 (o)	MOE E3056
Mercury	1	Holly Lane	PBK	29-Dec-20	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	1	Holly Lane	hmc	23-Dec-20	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	1	Holly Lane	TPR	29-Dec-20	D-ICPMS-01 (o)	EPA 200.8
Subcontracted	1	Default Site	TES	30-Dec-20	S-Nonylphenols	Subcontract

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

Christine Burke
Lab Manager

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

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Barrie ON L4N 8Z5
Attention: Alicia Kimberley

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

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				Orillia Sani/ Storm Sewer	
	Sample I.D.		B20-40118-1				Orilla Storm Sewer	Orillia Sanitary Sewer
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
pH @25°C	pH Units		7.47					9.5
Oil and Grease-Mineral	mg/L	1.0	< 1.0					15
Oil and Grease-Anim/Veg.	mg/L	1.0	< 1.0					150
Oil & Grease-Total	mg/L	1.0	< 1.0					
BOD(5 day)	mg/L	3	< 6				15	
Total Suspended Solids	mg/L	3	**12800**				15	350
Phosphorus-Total	mg/L	0.01	0.08				400	10
Total Kjeldahl Nitrogen	mg/L	0.1	0.3					100
Phenolics	mg/L	0.002	< 0.002					1
Aluminum (total)	mg/L	0.01	1.08					50
Antimony	mg/L	0.0001	0.0003					5
Arsenic	mg/L	0.0001	0.0004				200	1
Beryllium	mg/L	0.002	< 0.002					
Bismuth	mg/L	0.02	< 0.02					5
Boron	mg/L	0.005	0.040					
Cadmium	mg/L	0.000015	0.000020				1	1
Chloride	mg/L	0.5	207					1500
Chromium	mg/L	0.001	0.002				200	2
Chromium (VI)	mg/L	0.001	< 0.001					
Cobalt	mg/L	0.0001	0.0011					5
Copper	mg/L	0.0001	0.0036				10	2
Cyanide (Total)	mg/L	0.005	< 0.005				1	2
Fluoride	mg/L	0.1	< 0.1					10
Iron	mg/L	0.005	1.45					50

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

Christine Burke
Lab Manager

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Attention: Alicia Kimberley

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Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 22-Dec-20
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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				Orillia Sani/ Storm Sewer	
	Sample I.D.		B20-40118-1				Orilla Storm Sewer	Orillia Sanitary Sewer
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
Lead	mg/L	0.00002	0.00062				50	1
Manganese (Total)	mg/L	0.001	0.157					5
Mercury	mg/L	0.00002	< 0.00002				0.5	0.05
Molybdenum	mg/L	0.0001	0.0028					5
Nickel	mg/L	0.0002	0.0031				50	3
Selenium	mg/L	0.001	< 0.001					1
Silver	mg/L	0.0001	< 0.0001				120	5
Sulphate	mg/L	1	47					1500
Thallium	mg/L	0.00005	< 0.00005					
Tungsten	mg/L	0.01	< 0.01					
Uranium	mg/L	0.00005	0.00105					
Vanadium	mg/L	0.0001	0.0026					
Zinc	mg/L	0.005	0.009				50	2
Zirconium	mg/L	0.003	< 0.003					
Benzene	mg/L	0.0005	< 0.0005					0.01
Chloroform	mg/L	0.001	< 0.001					0.04
Dichlorobenzene,1,2-	mg/L	0.0005	< 0.0005					0.05
Dichlorobenzene,1,4-	mg/L	0.0005	< 0.0005					0.08
Ethylbenzene	mg/L	0.0005	< 0.0005					0.16
Dichloromethane (Methylene Chloride)	mg/L	0.005	< 0.005					2
Tetrachloroethane,1,1,2,2-	mg/L	0.0005	< 0.0005					1.4
Tetrachloroethylene	mg/L	0.0005	< 0.0005					1

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

Christine Burke
Lab Manager

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Fax: 705-252-5746

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				Orillia Sani/ Storm Sewer	
	Sample I.D.		B20-40118-1				Orilla Storm Sewer	Orillia Sanitary Sewer
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
Toluene	mg/L	0.0005	< 0.0005					0.08
Trichloroethylene	mg/L	0.0005	< 0.0005					0.4
Xylene, m,p,o-	mg/L	0.0011	< 0.0011					1.4
Xylene, m,p-	µg/L	1.0	< 1.0					
Xylene, o-	µg/L	0.5	< 0.5					
Nonylphenols	mg/L	0.001	< 0.001 [1]					0.02
Nonylphenol Ethoxylates	mg/L	0.01	< 0.01 [1]					
Nonylphenol Monoethoxylate	µg/L	10	< 10 [1]					
Nonylphenol Diethoxylate	µg/L	10	< 10 [1]					
Total PAH	mg/L	0.0001	0.00023					0.005
Acenaphthene	µg/L	0.05	< 0.05					
Acenaphthylene	µg/L	0.05	< 0.05					
Anthracene	µg/L	0.05	< 0.05					
Benzo(a)anthracene	µg/L	0.05	< 0.05					
Benzo(a)pyrene	µg/L	0.01	< 0.01					
Benzo(b)fluoranthene	µg/L	0.05	< 0.05					
Benzo(k)fluoranthene	µg/L	0.05	< 0.05					
Benzo(b+k)fluoranthene	µg/L	0.1	< 0.1					
Benzo(g,h,i)perylene	µg/L	0.05	< 0.05					
Chrysene	µg/L	0.05	< 0.05					
Dibenzo(a,h)anthracene	µg/L	0.05	< 0.05					
Fluoranthene	µg/L	0.05	0.08					
Fluorene	µg/L	0.05	< 0.05					

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

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

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				Orillia Sani/ Storm Sewer	
	Sample I.D.		B20-40118-1				Orilla Storm Sewer	Orillia Sanitary Sewer
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
Indeno(1,2,3,-cd)pyrene	µg/L	0.05	< 0.05					
Methylnaphthalene,1-	µg/L	0.05	< 0.05					
Methylnaphthalene,2-	µg/L	0.05	< 0.05					
Naphthalene	µg/L	0.05	< 0.05					
Phenanthrene	µg/L	0.05	< 0.05					
Pyrene	µg/L	0.05	0.11					
Poly-Chlorinated Biphenyls (PCB's)	mg/L	0.00005	< 0.00005					
Aroclor	-		-					

1 . Subcontracted to SGS Lakefield

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

Christine Burke
Lab Manager

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DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

Summary of Exceedances

Orilla - Storm Sewer Dishcarge

BH/MW17	Found Value	Limit
Total Suspended Solids (mg/L)	12800	15

Orillia - Sanitary Sewer Disharge

BH/MW17	Found Value	Limit
Total Suspended Solids (mg/L)	12800	350

Orillia Sani/ Storm Sewer - Orillia Sanitary/Storm Sewer Dishcarge Bylaw
Orilla Storm Sewer - Orilla - Storm Sewer Dishcarge
Orillia Sanitary Sewer - Orillia - Sanitary Sewer Disharge

Christine Burke
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: GH0121

REPORT No. B20-40118 (i)

Rev. 1

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Barrie ON L4N 8Z5
Attention: Alicia Kimberley

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112 Commerce Park Drive
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DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Chromium (VI)	1	Holly Lane	LMG	30-Dec-20	D-CRVI-01 (o)	MOE E3056
Mercury	1	Holly Lane	PBK	29-Dec-20	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	1	Holly Lane	hmc	23-Dec-20	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	1	Holly Lane	TPR	29-Dec-20	D-ICPMS-01 (o)	EPA 200.8

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

Christine Burke
Lab Manager

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Rev. 1

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Fax: 705-252-5746

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				PWQO	
	Sample I.D.		B20-40118-1				Interim PWQO	PWQO
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
Aluminum (total)	µg/L	10	1080					
Antimony	µg/L	0.1	0.3					20
Arsenic	µg/L	0.1	0.4				100	5
Beryllium	µg/L	2	< 2					11
Bismuth	µg/L	20	< 20					
Boron	µg/L	5	40				200	
Cadmium	µg/L	0.015	0.020				0.1	0.2
Chromium	µg/L	1	2					
Chromium (VI)	µg/L	1	< 1					1
Cobalt	µg/L	0.1	**1.1**					0.9
Copper	µg/L	0.1	3.6					5
Iron	µg/L	5	**1450**					300
Lead	µg/L	0.02	0.62				1	5
Manganese (Total)	µg/L	1	157					
Mercury	µg/L	0.02	< 0.02					0.2
Molybdenum	µg/L	0.1	2.8					40
Nickel	µg/L	0.2	3.1					25
Selenium	µg/L	1	< 1					100
Silver	µg/L	0.1	< 0.1					0.1
Thallium	µg/L	0.05	< 0.05					0.3
Tungsten	µg/L	10	< 10					30
Uranium	µg/L	0.05	1.05					5
Vanadium	µg/L	0.1	2.6					6
Zinc	µg/L	5	9				20	30

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

Christine Burke
Lab Manager

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

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: GH0121

REPORT No. B20-40118 (i)

Rev. 1

Report To:

Peto MacCallum Ltd
19 Churchill Drive,
Barrie ON L4N 8Z5
Attention: Alicia Kimberley

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

DATE RECEIVED: 22-Dec-20
DATE REPORTED: 31-Dec-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.:
P.O. NUMBER: 20BF055
WATERWORKS NO.

	Client I.D.		BH/MW17				PWQO	
	Sample I.D.		B20-40118-1				Interim PWQO	PWQO
	Date Collected		21-Dec-20					
Parameter	**Units**	**R.L.**						
Zirconium	µg/L	3	< 3					4

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Interim PWQO - Interim PWQO
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Summary of Exceedances

Provincial Water Quality Objectives		
BH/MW17	Found Value	Limit
Iron (µg/L)	1450	300
Cobalt (µg/L)	1.1	0.9

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

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Christine Burke
Lab Manager

CADUCEON™ ENVIRONMENTAL LABORATORIES
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TESTING REQUIREMENTS

O.Reg 153 [X] Table 1 Medi[ ]Fine Coars[ ] MISA G[ ]lines
F[ ] IC[ ] Ag[ ]tural (O.Reg 153) O.Reg 5[ ]Leachate Analysis
Y[ ] N[ ] Record of Site Condition (O.Reg 153) Disposal Site: _____
Provincial Water Quality Objectives Landfill [ ]nitoring
Sewer Use By-Law: _____ Other: _____

REPORT NUMBER (Lab Use): B20-40108

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

Indicate Laboratory Samples are submitted to: Kingston[ ] Ottawa[ ] Richmond Hill[ ] Windsor[ ] Barrie[X] London[ ]

Organization: Peto MacCallum Ltd.	Address and Invoicing Address (if different): 19 Churchill Drive, Barrie, ON L4N8Z5, barrie@petomaccallum.com
Contact: A. Kimberley	
Tel: 705-734-3900	
Fax: 705-734-9911	Quote No.:
Email: akimberley@petomaccallum.com	P.O. No.:
	Project Name: 20BF055
	Additional Info: sgriffith@petomaccallum.com

TURNAROUND SERVICE REQUESTED (see back page)

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

ANALYSES REQUESTED (Print Test in Boxes)

Orillia Storm & Sanitary | PWQO metals | O.Reg 153/04 metals | PHC | PAH | VOC Including BTEX | VOC Trip Blank | Suspected Highly Contaminated

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

Lab No:	Sample Identification	S.P.L.	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample By Using A Check Mark In The Box Provided												Field pH	Field Temp.	# Bottles Sample	Field Filtered(Y/N)
																		✓			N
1	BH/MW17		GW	2020-12-21	15:00	X	X														Y
2	BH/MW5		GW	2020-12-21	13:30			X	X	X	X	X									Y
3	BH/MW20		GW	2020-12-21	15:30			X	X	X	X	X									Y
4	DUP A		GW	2020-12-21	14:00			X	X	X	X	X									Y

SAMPLE SUBMISSION INFORMATION

	Sampled By:	Submitted by:
Print:	S.Griffith	S.Griffith
Sign:		
Date (yy-mm-dd)/Time:	2020-12-21	2020-12-22

SHIPPING INFORMATION

Client's Courier
Caduceon's Courier
Drop Off
Caduceon (Pick-up)

Invoice
[ ] # of Pieces
[ ] 1
[X]
[ ]

REPORTING / INVOICING

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

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print): [illegible] Signature: [illegible]
Date Received (yy-mm-dd): 20-12-22 Time Received: 11:30
Laboratory Prepared Bottles: (Yes) No
Sample Temperature °C: 9.0
Labeled by: AM

Page 1 of 1
GH0121

Comments:
Vials → RH
1L Amber → SGS
gen chem + Hg + metals + chromium → O
3x 1L Amber + gen chem + nut + phenols + cyanide → R

Gen NP NPR.