Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED BISTRO 6 WEST DEVELOPMENT
KNEESHAW DRIVE
BARRIE, ONTARIO

for

PRATT HANSEN

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PML Ref.: 21BF002
Report: 2 Revised
May 2021

Peto MacCallum Ltd.
CONSULTING ENGINEERS

May 19, 2021

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Report: 2 Revised

Ms. Taylor Pratt
Pratt Hansen
301 King Street
Barrie, Ontario
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Dear Ms. Pratt

Geotechnical Investigation
Proposed Bistro 6 West Development
Kneeshaw Drive
Barrie, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the Geotechnical investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Ms. T. Pratt in an email dated January 13, 2021.

The Bistro 6 West development is being proposed. The site plan comprises three condominium buildings with one level of underground parking similar to the original Bistro 6 condominium buildings on the east side of Kneeshaw Drive. Full site servicing and paved parking and access will be provided. Three Low Impact Development (LID) areas are being proposed around the parking areas. It is understood the site has been pre-graded.

The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and Geotechnical engineering recommendations for earthworks, building foundations and basements, site servicing, pavement design and preliminary infiltration parameters.

A Hydrogeological Site Assessment was carried out concurrently with the Geotechnical work and is provided under separate cover in Report 1.

A total of 14 boreholes were advanced across the site. As noted above, the site has been pre-graded and below local fill the native soil comprise sand and silt mixtures. Ground water was encountered typically at depth and is under slight artesian pressure in some locations.

Typical construction methods should be applicable for the site with consideration for higher ground water in some areas.

Geoenvironmental services (observations, recording, chemical testing or assessment of the environmental conditions of the soil and ground water) were not within the terms of reference for this assignment, and no work has been carried out in this regard. If excess excavated soils requiring transportation off-site are generated, a program of sampling and chemical testing will be needed to determine the chemical properties of the soil to evaluate appropriate receiving site options, in accordance with O.Reg. 406/19.

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

GRW:tc

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1. INTRODUCTION

Peto MacCallum Ltd. (PML) is pleased to present the results of the Geotechnical investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Ms. T. Pratt in an email dated January 13, 2021.

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A Hydrogeological Site Assessment was carried out concurrently with the Geotechnical work and is provided under separate cover in Report 1.

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.

Geoenvironmental services (observations, recording, chemical testing or assessment of the environmental conditions of the soil and ground water) were not within the terms of reference for this assignment, and no work has been carried out in this regard. If excess excavated soils requiring transportation off-site are generated, a program of sampling and chemical testing will be needed to determine the chemical properties of the soil to evaluate appropriate receiving site options, in accordance with O.Reg. 406/19.

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

The field work for this investigation was conducted on March 9, 11, 18 and 19. Boreholes 201 to 214 were drilled across the site, to depths ranging from 3.5 to 10.0 m, for the various proposed facilities. Borehole locations are shown on Drawing 2-1, appended.

The boreholes were laid out in the field by The Jones Consulting Group and ground surface elevations were provided to PML. All elevations in this report are geodetic and expressed in metres.

Co-ordination for clearances of underground utilities was provided by PML with the aid of a private locating service. The boreholes were drilled cognizant of the underground utilities.

The boreholes were advanced using continuous flight solid stem augers, powered by track mounted CME 55 drill-rigs, equipped with an automatic hammer, supplied and operated by specialist drilling contractors, 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. Where pavement was encountered at the surface, the pavement component thicknesses were measured and samples of the granular materials were collected.

Representative samples of the overburden were recovered at frequent depth intervals for identification purposes using a conventional 51 mm OD split spoon sampler. The sampler excludes 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.

A monitoring well, comprised of 50 mm diameter PVC pipe with a 1.5 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 installations 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.

PML is currently carrying out a six-month long ground water level monitoring program. Results will be presented under separate cover when the program is completed.

All recovered samples were returned to our laboratory for detailed examination and moisture content determinations. Grain size analyses were carried out on five samples of the major soil units. The laboratory test results are provided on Figures 2-1 to 2-3, appended.

3. SITE SETTING

The site has been pre-graded with topsoil removed and minor cut and fill carried out to level the site. A sales office is in the north portion of the site, that will eventually be demolished/relocated.

The existing ground surface, based on the boreholes, ranges from 254.80 to 259.60 (generally sloping down from west to east).

4. GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Geology

The Site lies in the physiographic region known as the Peterborough Drumlin Field characterized by drumlinized till plains (Chapman and Putnam, 1984). Newmarket Till (Simcoe Lobe) comprising sandy silt to silt till is noted in the vicinity of the Site. The bedrock underlying the Site comprises limestone, dolostone, shale, arkose and sandstone of the Simcoe Group from the Middle Ordovician Period. Bedrock is over 100 m depth based on the MECP WWRs.

4.2 Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including topsoil thicknesses, pavement component 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.

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.

Topsoil and/or pavement was encountered locally at the surface, over local fill, overlying native layers/units of till, sand/silty sand, sand and silt and silt/sandy silt. A description of the distribution of the subsurface conditions encountered is provided below.

4.2.1 Soil

Topsoil was present at the surface of Borehole 201, and was 100 mm thick.

Pavement associated with the sales office parking area was at the surface of Borehole 203, comprising 50 mm of asphalt over 300 mm of granular material.

Surface granular material associated with construction haul roads was noted at Boreholes 205 and 210, and was 200 to 300 mm thick.

Local fill was noted at the surface or locally below the sales office pavement. Beyond the sales office area, fill appears to be associated with site grading and may comprise engineered fill (to be confirmed). The N Values ranged from 4 to 34 indicating variable compaction when placed. The fill comprised sand, silty sand, sandy silt and silt. The fill was typically moist with moisture contents of 6 to 13%.

A till deposit was noted in Boreholes 201 to 204, 209, 210, and 212 to 214. The till was at the surface or underlying the fill or other local upper layers. In Boreholes 201 to 204, 209 and 210 the till was penetrated at 2.1 to 5.5 m depth (elevation 251.3 to 256.4). In Boreholes 212 to 214 the till extended to the 3.5 m depth of exploration. The till was variable and the matrix comprised silty sand trace gravel and trace clay to sandy silt trace gravel and trace clay. Cobbles and boulders were noted during augering. Two samples of the material were submitted for grain size analysis and the results are provided in Figure 2-1, attached. The till was typically moist with moisture contents of about 10%. N Values in the till ranged from 7 to greater than 50, indicating loose to very dense conditions (typically compact to very dense).

A local silt layer was observed in Borehole 203 from 1.4 to 2.1 m depth (elevation 254.2 to 254.9). A local sandy silt layer was observed in Borehole 211 from 0.7 to 2.1 m depth (elevation 254.35 to 253.7) and a lower silt layer was noted from 7.0 m depth to the 8.1 m depth of exploration. A sample of the material was submitted for grain size analysis and the results are provided in Figure 2-2, attached. The upper layers were dense (N Value 42) or loose (N Value of 9) and the lower unit was very dense (N Value of 81). Moisture contents were 2 to 19% (moist).

A sand and silt unit was revealed in Boreholes 205 to 208 and 210, between 0.2 and 1.4 m depth (elevation 253.8 and 257.95) and extending to 2.9 to 5.5 m depth (elevation 251.6 to 255.3), locally the 6.5 m depth of exploration. The material was silty fine sand to sandy silt. Moisture contents were 8 to 30% (moist to wet). The N Values in the soil were 21 to 58 indicating compact to very dense conditions.

Sand/silty sand was encountered in all boreholes, except Boreholes 213 and 214, typically beneath the till to the depth of exploration. Locally in Boreholes 208, 209, 211 and 212 the sand/silty sand unit was penetrated at 2.1 to 7.0 m depth (elevation 248.1 to 255.6). Also, an upper layer of sand was noted beneath the fill or till extending to 1.4 to 4.0 m depth (elevation 253.8 to 257.1) in Boreholes 206, 207 and 210. Grain size analysis results on two samples of the silty sand material are presented on Figure 2-3, attached. The sandy units were loose to very dense with N Values of 9 to 71, typically compact to very dense. Moisture contents ranged from 4 to 26%, being moist to wet with depth.

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 levels measured in the wells on May 6, 2021, 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 MAY 6, 2021 DEPTH (m) / ELEVATION
201	5.5 / 251.5	5.3 / 251.7	1.5 / 255.5
202	5.5 / 251.3	4.0 / 252.8	--
203	4.9 / 251.4	No Water	3.3 / 253.0
204	4.0 / 252.6	1.2 / 255.4	--
205	2.4 / 255.8	2.3 / 255.9	--
206	2.4 / 254.7	6.0 / 251.1	0.8 / 256.3
207	2.1 / 256.4	0.9 / 257.6	--
208	2.1 / 257.5	No Water	2.8 / 256.8
209	2.1 / 256.5	2.3 / 256.3	--
210	3.2 / 254.6	No Water	2.9 / 254.9
211	1.5 / 253.6	No Water	0.6 / 254.5
212	2.9 / 251.9	2.6 / 252.2	--
213	No Water	2.7 / 253.1	--
214	No Water	No Water	--

The ground water table is believed to be in the sand/silty sand at depth and under slight artesian pressure. Local perched water in the fill/upper sand above the till or wet layers in the till, are also present.

Historical ground water level monitoring data showed May to typically have the highest ground water levels for the year.

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

5. GEOTECHNICAL ENGINEERING CONSIDERATIONS

5.1 General

The Bistro 6 West development is being proposed. The site plan comprises three condominium buildings with one level of underground parking similar to the original Bistro 6 condominium buildings on the east side of Kneeshaw Drive. Full site servicing and paved parking and access will be provided. Three LID areas are being proposed around the parking areas. It is understood the site has been pre-graded.

The currently proposed underground parking floor slab elevations for the three buildings are provided below. It is understood that it is desired to lower the underground parking floor slab elevations. Based on the subsurface conditions, the lowest floor slab elevation currently recommended for each building, considering ground water levels measured to date (floor slab minimum 0.5 m above ground water level readings), is also provided in the table.

BUILDING	PROPOSED UNDERGROUND PARKING FLOOR SLAB ELEVATION	CURRENTLY RECOMMENDED LOWEST UNDERGROUND PARKING FLOOR SLAB ELEVATION
A	259.3	256.0
B	258.8	257.3
C	259.95	258.2

The underground parking slab elevation selected for each building will dictate the level of additional site grading required.

5.2 Foundations

Considering underground parking level will be implemented it is assumed that footings will vary between 0.5 m and 1.2 m below the underground slab for all buildings.

The available bearing capacity on native soils or engineered fill (constructed as described later in the report) for both underground parking floor slab elevations for each building, on a borehole by borehole basis, is provided below:

BOREHOLE	ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
Building A				
201	255.5	Till	250	375
	258.8	Eng. Fill over Till	150	225
202	255.5	Till	200	300
	258.8	Eng. Fill over Till	150	225
203	255.5	Eng. Fill over Silt	150	225
	258.8	Eng. Fill over Silt	150	225
Building B				
204	256.8	Eng. Fill over Till	250	375
	258.3	Eng. Fill over Till	150	225
205	256.8	Sand & Silt	200	300
	258.3	Eng. Fill over Sand & Silt	150	225
206	256.8	Sand	200	300
	258.3	Eng. Fill over Sand	150	225
207	256.8	Sand & Silt	300	450
	258.3	Eng. Fill over Sand	200	300

BOREHOLE	ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
Building C				
208	257.7	Sand	300	400
	259.4	Eng. Fill over Sand	150	225
209	257.7	Till	100	150
	259.4	Eng. Fill over Till	100	150
210	257.7	Eng. Fill over Till	150	225
	259.4	Eng. Fill over Till	150	225

Footing/foundation details will need to be confirmed prior to finalizing the bearing capacity.

It is noted that existing fill is present in some building areas. It speculated that this is engineered fill, however this will need to be confirmed. Notwithstanding some of the fill showed low blow counts, unsuitable for building construction, and regardless will have to be removed prior to building construction.

Any upfilling under buildings to remove existing fill will need to be constructed as engineered fill as discussed later in the report.

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.

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.

5.3 Basement Walls and Floor Slabs

Based on the available data to date, the lowest underground floor levels for each building have been provided above.

A six-month ground water level monitoring program is being undertaken by PML and will be reported under separate cover upon its completion. It is recommended that underground floor levels 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 buildings. 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.

It is noted that elevator pits typically extend below the floor slab elevation and will likely have to be fully water-proofed and/or a dedicated sump provided.

Basement wall backfill should be placed in thin lifts compacted to a minimum 95% Standard Proctor maximum dry density (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. 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 2-4, for general recommendations regarding drainage and backfill requirements.

5.4 Site Grading and Engineered Fill

The underground parking levels have been proposed, however may be lowered.

The existing topsoil, pavement and fill are not suitable to support footings or floor slabs due to concerns with settlement. Any existing engineered fill will have to be confirmed, notwithstanding some of the fill showed low blow counts, unsuitable for building construction, and regardless will have to be removed prior to building construction.

All unsuitable soil/materials within the proposed building footprint will need to be removed entirely (vertically and laterally). Grades under the buildings 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 fill 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 or pavement and 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;

- Proofroll exposed subgrade using a heavy vibrator roller to targeted 100% SPmdd for the building areas and 95% SPmdd for parking areas, under geotechnical review.

- 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 generally 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.

5.5 Site Servicing

Based on drawings provided, service inverts are currently planned about 3 m below existing site grade, locally as deep as 5 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.

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 predominately comprise the native sand and silt soils. 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 Excavation and Ground Water Control

It is anticipated that excavation for the buildings and site serving will extend about 3.0 m below existing grade, locally a deep as 5.0 m below existing grade for some servicing. Excavation will encounter topsoil, pavement, fill, and native sand/silt soils. The native soils were typically compact to very dense 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.

Excavation side slopes will need to be continuously examined and reviewed for evidence of instability, particularly following periods of heavy rain or thawing. When required, remedial action must be taken to ensure the continued stability of the excavation slope and the safety of the workers.

Excavation for the proposed buildings is mainly designed to be above the ground water level noted to date, other than perched water, and conventional sump pumping techniques should be sufficient for ground water control in building areas. Local sandy zones may yield higher ground water seepage volumes and more aggressive pumping will be required.

For site servicing the excavation will be carried out in the sand units with ground water present in some areas and pumping from keg wells may be required to lower the ground water in these areas, in order to carry out excavation in the dry.

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, registry on the EASR system is anticipated for some the service installation. It is noted that some grading refinement may still be implemented, as such when servicing inverts are finalized they should be reviewed to confirm dewatering requirements. It may be possible to conduct excavation in small manageable sections to limit dewatering.

5.7 Pavement Design and Construction

It is anticipated that the pavement subgrade will predominantly comprise near surface soils which typically consist of moderately to highly frost susceptible soils. Based on the subgrade conditions, the following pavement structure thicknesses are recommended for a 20- year design life and should be reviewed when subgrade soils are confirmed:

MATERIAL	LIGHT DUTY (LOCAL RESIDENTIAL ROADS)	HEAVY DUTY (COLLECTOR ROADS /BUS ROUTE)
Asphalt - Surface (mm)	40	40
Asphalt – Binder (mm)	70	100
Granular A Base Course (mm)	150	150
Granular B Type I Subbase Course (mm)	450	550
Total Thickness (mm)	710	840

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.

5.8 Preliminary Infiltration Assessment

Infiltration features are proposed in the long north/south oriented parking island in the north half of the site (LID-1) and the two landscaped areas between the parking area and Kneeshaw Drive (north area is LID-2 and south area is LID-3).

Grain size analysis testing was carried out on two samples of the till soil that dominates the near surface soil within the infiltration areas. The grain size analyses for these two samples are presented on Figure 2-1, attached, with the coefficient of permeability, K, estimated to be 1×10^{-6} cm/sec. The Vukovic and Soro method was used to asses K.

As noted earlier, historically the May ground water levels are typically the highest for this site. The table below compiles the water level readings for the closest boreholes for each LID and the recommended lowest base for each LID is provided, considering the required 1 m buffer above the high ground water level.

LID	BOREHOLE	WATER LEVEL DEPTH (m) / ELEVATION	RECOMMENDED LID BASE
1	203	3.3 / 253.0	255.5
	213	2.7 / 253.1	
	211	0.6 / 254.5	
2	203	3.3 / 253.0	255.5
	211	0.6 / 254.5	
	212	2.9 / 251.9	
	213	2.7 / 253.1	
3	211	0.6 / 254.5	255.5
	214	2.7 / 253.1	

Guelph Permeameter testing should be completed at the appropriate depth to confirm design parameters when the design details are finalized.

5.9 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. 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.

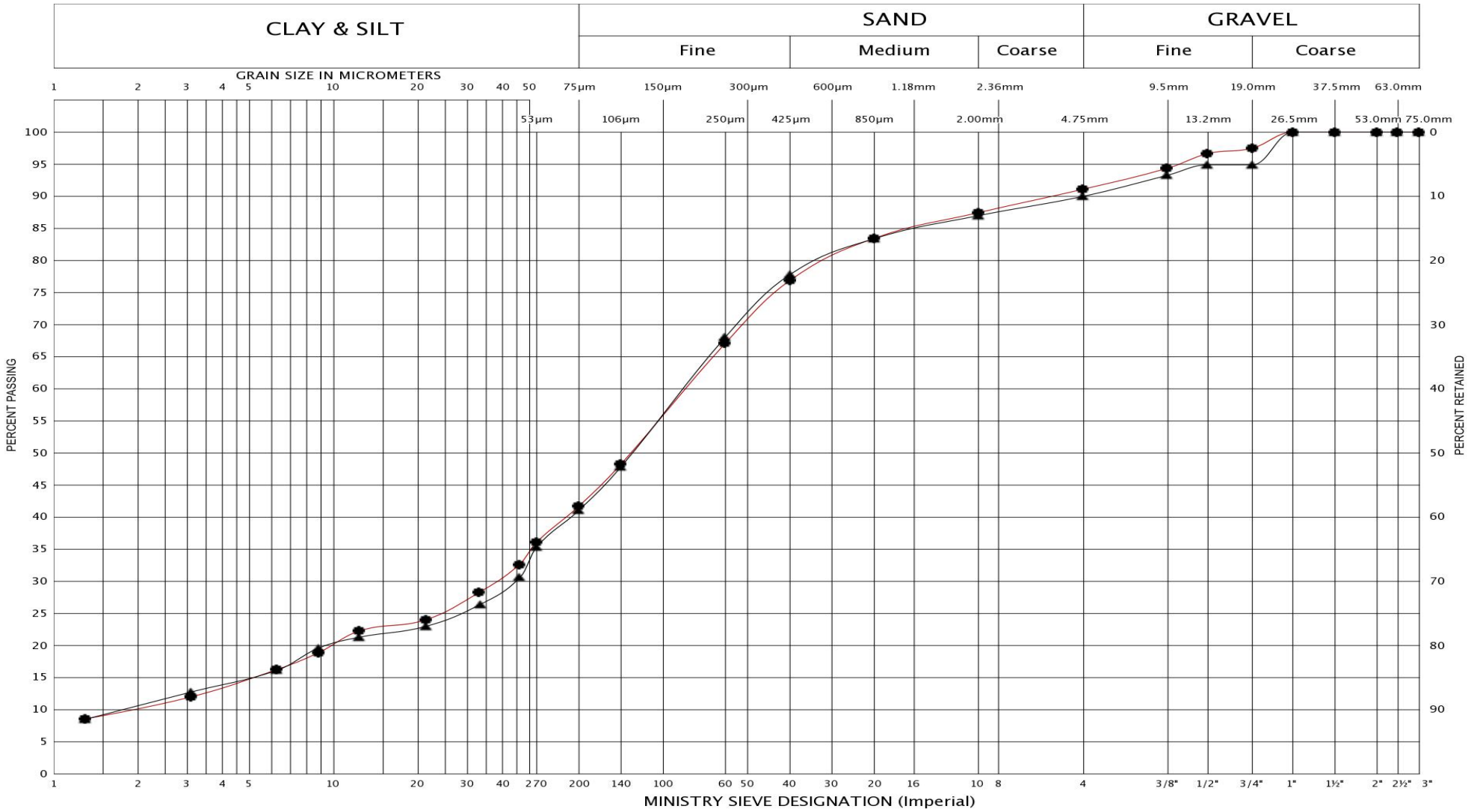
Sincerely

Peto MacCallum Ltd.

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

GRW:tc

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	212	213
	SAMPLE	4	3
	SYMBOL	●	▲

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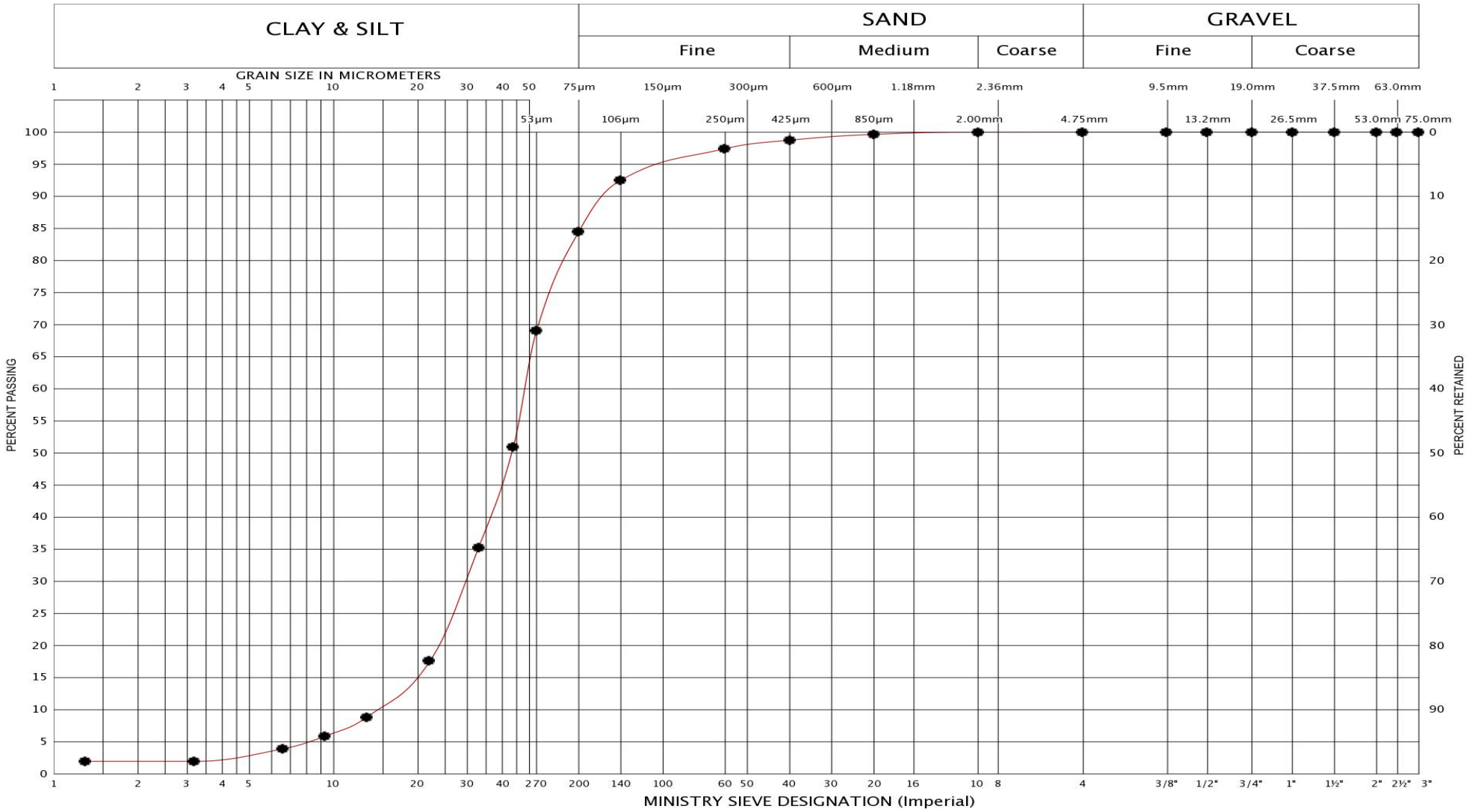
GRAIN SIZE DISTRIBUTION

TILL: Silty Sand, Trace Clay, Trace Gravel

FIG No.: 2-1

Project No.: 21BF002

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	211
	SAMPLE	8
	SYMBOL	●

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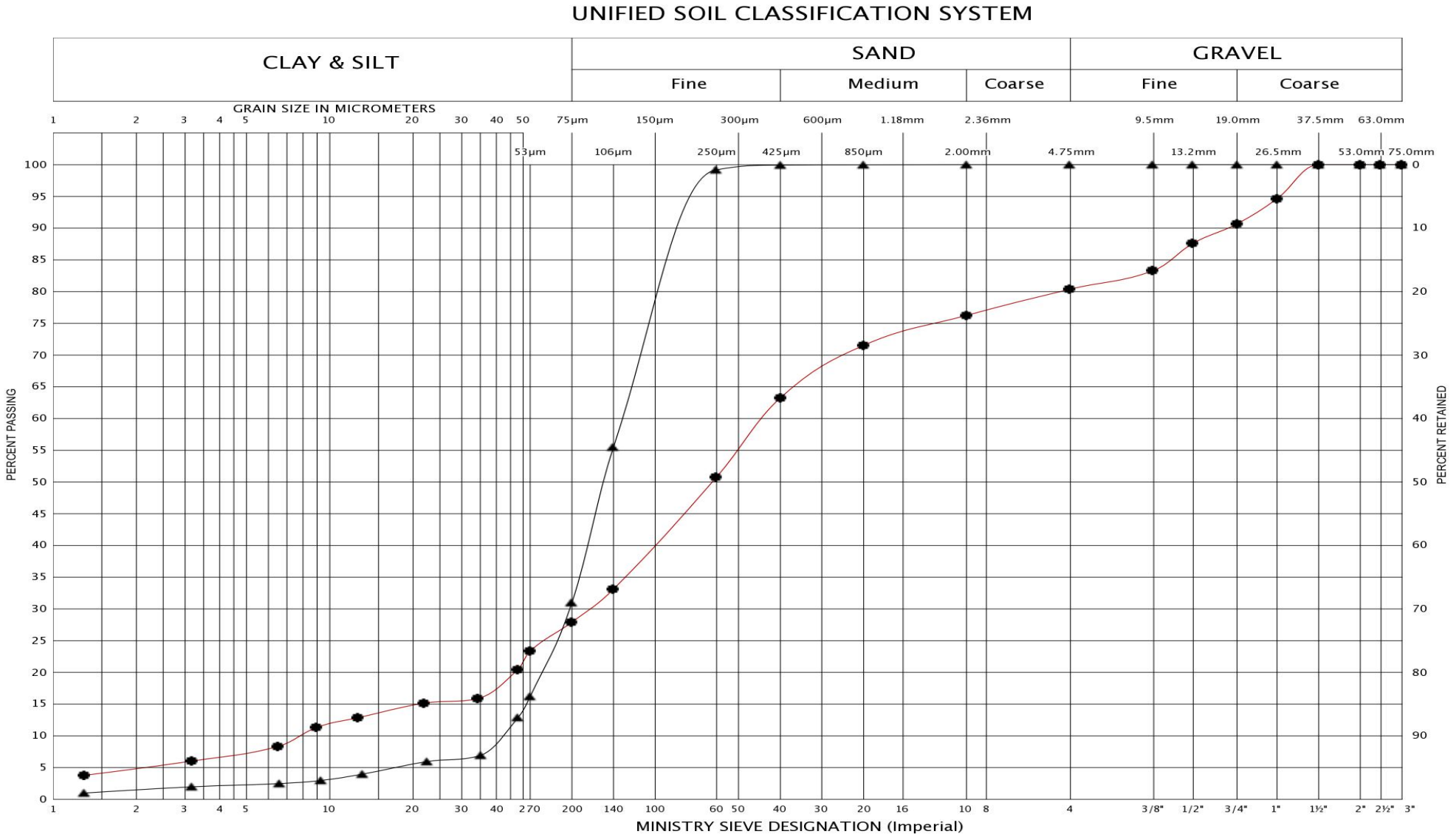
GRAIN SIZE DISTRIBUTION

SILT, Some Sand, Trace Clay

FIG No.: 2-2

Project No.: 21BF002



LEGEND	BH	203	210
	SAMPLE	6	9
	SYMBOL	●	▲

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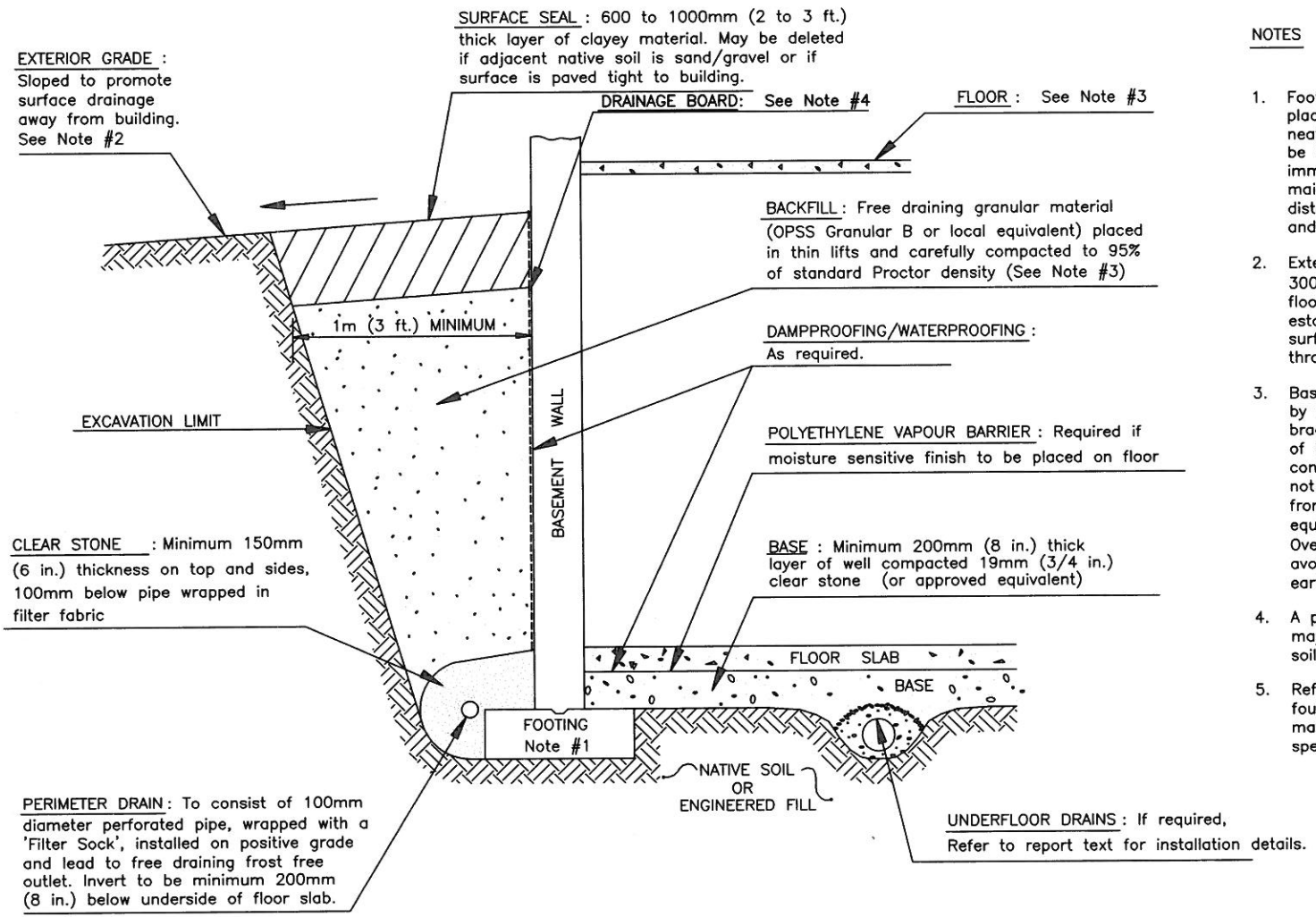
GRAIN SIZE DISTRIBUTION

SILTY SAND, Some Gravel, Trace Clay

FIG No.: 2-3

Project No.: 21BF002

STD – GEO–A REV 1/2004



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:	NT	DATE	SCALE	JOB NO.	FIGURE NO.
CHECKED:	GW	MAY, 2021	N.T.S.	21BF002	2–4
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		

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LOG OF BOREHOLE/MONITORING WELL NO. 201

17T 609678E 4911550N

PROJECT Proposed Bistro 6 West Development — **PML REF.** 21BF002

LOCATION Mapleview Drive East, Barrie, Ontario — **BORING DATE** March 11, 2021 — **ENGINEER** GW

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
		SURFACE ELEVATION 256.95				
0.0	256.85	TOPSOIL: Brown, sandy silt to silty sand, some gravel, wet		1	SS	15
		SANDY SILT TILL: Compact to very dense, brown to grey, sandy silt, trace gravel, trace clay, cobbles and boulders, moist to very moist		2	SS	18
				3	SS	25
				4	SS	50/50 mm
				5	SS	35
				6	SS	51
5.5	251.5	SAND: Very dense, grey, sand, trace silt, trace gravel, wet		7	SS	76
6.5	250.5	BOREHOLE TERMINATED AT 6.5 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

ELEVATION SCALE: 256, 255, 254, 253, 252, 251

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

WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

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

Upon completion of augering
Water at 5.3 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-04-07	1.5	255.5
2021-05-06	1.5	255.5

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 202

17T 609719E 4911555N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 19, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 256.75					
0.0	SANDY SILT TILL: Compact to very dense, brown, sandy silt, some gravel, trace clay, cobbles and boulders, moist to very moist		1	SS	13	256
			2	SS	11	
			3	SS	20	255
			4	SS	53	254
			5	SS	61	253
			6	SS	40	252
5.5 / 251.3	SAND: Dense, brown, sand, trace silt, trace gravel, wet		7	SS	39	251
6.5 / 250.3	BOREHOLE TERMINATED AT 6.5 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
UNIT WEIGHT kN/m³

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

First water strike at 5.5 m

Upon completion of augering
Water at 4.0 m
Cave at 5.8 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 203

17T 609755E 4911558N

PROJECT Proposed Bistro 6 West Development
LOCATION Mapleview Drive East, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 9, 2021
PML REF. 21BF002
ENGINEER GW
TECHNICIAN DP

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 256.30				
0.0	256.30					
0.35	255.95	PAVEMENT: 50 mm asphalt, over 300 mm granulars, moist		1	GS	-
		FILL: Brown, silt, trace sand, trace clay, trace organics, moist		2	SS	11
1.4	254.9	SILT: Dense, brown, silt, trace to some sand, trace gravel, moist		3	SS	42
2.1	254.2	SANDY SILT TILL: Dense to compact, brown, sandy silt, trace gravel, trace clay, cobbles and boulders, moist to very moist		4	SS	33
				5	SS	22
4.0	252.3	SAND: Dense to very dense, brown, sand, some silt, some gravel, trace clay, very moist to wet		6	SS	49
				7	SS	68
7.7	248.6	BOREHOLE TERMINATED AT 7.7 m		8	SS	30/120 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

UNIT WEIGHT kN/m³

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

Flush mount casing
Concrete
Bentonite seal
First water strike at 4.9 m
50 mm slotted pipe
Filter sand

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

Date	Depth	Elev.
2021-03-30	3.3	253.0
2021-04-07	3.3	253.0
2021-05-06	3.3	253.0

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 204

17T 609712E 4911504N

PROJECT Proposed Bistro 6 West Development
LOCATION Mapleview Drive East, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 19, 2021
PML REF. 21BF002
ENGINEER GW
TECHNICIAN NG

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
		SURFACE ELEVATION 256.60									
0.0		SANDY SILT TILL: Compact to very dense, brown, sandy silt, some gravel, trace clay, cobbles and boulders, moist		1	SS	27	256				
1.0				2	SS	39					
2.0				3	SS	80/145 mm	255				
3.0				4	SS	64	254				
				5	SS	62	253				
4.0	252.6	SAND: Dense, grey, sand, trace silt, wet		6	SS	48	252				First water strike at 4.0 m
5.0							251				
6.0				7	SS	47					
6.5	250.1	BOREHOLE TERMINATED AT 6.5 m									Upon completion of augering Water at 1.2 m Cave at 3.0 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

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 205

17T 609709E 4911470N

PROJECT Proposed Bistro 6 West Development
LOCATION Mapleview Drive East, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 11, 2021
PML REF. 21BF002
ENGINEER GW
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 258.15				
0.0	258.15					
	0.20	GRANULARS: 200 mm granular material, moist		1	SS	53
	257.95	SAND AND SILT: Very dense to compact, brown, silty fine sand to sandy silt, moist to very moist		2	SS	21
1.0						
				3	SS	31
2.0						
				4	SS	46
	2.9					
3.0	255.3	SAND: Compact to dense, brown to grey, sand, some silt, wet		5	SS	18
4.0						
				6	SS	26
5.0						
6.0				7	SS	47
	6.5					
	251.7	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 258, 257, 256, 255, 254, 253, 252

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

UNIT WEIGHT kN/m³

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

First water strike at 2.4 m

Upon completion of augering
Water at 2.3 m
Cave at 4.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 206

17T 609744E 4911425N

PROJECT Proposed Bistro 6 West Development
LOCATION Mapleview Drive East, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 11, 2021
PML REF. 21BF002
ENGINEER GW
TECHNICIAN NG

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 257.10			
0.20 / 256.90	FILL: Brown, sandy silt to silty sand, some gravel, very moist	1	SS	22
	SAND: Compact, brown, sand, trace to some silt, very moist to wet	2	SS	13
1.4 / 255.7	SAND AND SILT: Compact to dense, brown, silty fine sand to sandy silt, very moist to wet	3	SS	29
		4	SS	35
		5	SS	36
		6	SS	39
5.5 / 251.6	SAND: Very dense, grey, sand, trace silt, wet	7	SS	71
6.5 / 250.6	BOREHOLE TERMINATED AT 6.5 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

UNIT WEIGHT kN/m³

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

Upon completion of augering
Water at 6.0 m
No cave
Water Level Readings:

Date	Depth	Elev.
2021-04-07	0.8	256.3
2021-05-06	0.8	256.3

NOTES

Peto MacCallum Ltd
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 207

17T 609741E 4911379N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 18, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"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 258.50									
0.0		FILL: Dark brown, sand, trace to some silt, trace gravel, very moist		1	SS	20					
0.70	257.80	SAND: Dense, brown, sand, trace silt, moist		2	SS	38	258				
1.4	257.1	SAND AND SILT: Dense to very dense, brown, silty fine sand to sandy silt, very moist		3	SS	30	257				First water strike at 2.1 m
				4	SS	46	256				
				5	SS	43	255				
				6	SS	58	254				
5.5	253.0	SAND: Compact, dark grey, sand, trace silt, wet		7	SS	10	253				
6.5	252.0	BOREHOLE TERMINATED AT 6.5 m					252				Upon completion of augering Wet cave at 0.9 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

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 208

17T 609747E 4911332N

PROJECT Proposed Bistro 6 West Development — **PML REF.** 21BF002

LOCATION Mapleview Drive East, Barrie, Ontario — **BORING DATE** March 11, 2021 — **ENGINEER** GW

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** NG

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 259.60				
0.0	259.6	FILL: Dark brown, sand, trace gravel, some silt, moist		1	SS	19
1.0				2	SS	8
1.4	258.2	SAND: Compact to dense, brown, sand, trace to some silt, moist to wet		3	SS	31
2.0				4	SS	29
3.0				5	SS	45
4.0	255.6	SAND AND SILT: Dense to very dense, brown, silty fine sand to sandy silt, wet		6	SS	48
5.0						
6.0				7	SS	59
6.5	253.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 259, 258, 257, 256, 255, 254

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

UNIT WEIGHT kN/m³

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
No water
No cave
Water Level Readings:

Date	Depth	Elev.
2021-04-07	2.7	256.9
2021-05-06	2.8	256.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 209

17T 609789E 4911339N

PROJECT Proposed Bistro 6 West Development — **PML REF.** 21BF002

LOCATION Mapleview Drive East, Barrie, Ontario — **BORING DATE** March 18, 2021 — **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
		SURFACE ELEVATION 258.45					
0.0	258.45	FILL: Brown, sandy silt, some gravel, moist		1	SS	34	258
0.70	257.75	SANDY SILT TILL: Compact, brown grey, sandy silt, some sand, trace gravel, trace clay, cobbles and boulders, moist		2	SS	11	
1.0							257
2.0				3	SS	10	
2.1	256.4	SAND: Loose to dense, brown, sand, trace to some silt, wet					
3.0				4	SS	9	256
				5	SS	18	255
4.0							
							254
5.0				6	SS	34	
5.5	253.0	SILTY SAND: Very dense, brown, silty sand, wet					253
6.0				7	SS	75	
6.5	252.0	BOREHOLE TERMINATED AT 6.5 m					252
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

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

First water strike at 2.1 m

Upon completion of augering
Wet cave at 2.3 m

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 210

17T 609825E 4911354N

PROJECT Proposed Bistro 6 West Development — **PML REF.** 21BF002

LOCATION Mapleview Drive East, Barrie, Ontario — **BORING DATE** March 9, 2021 — **ENGINEER** GW

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** DP

DEPTH (m)	ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 257.80			
0.0	257.80	GRANULARS: 300 mm graular material, moist	1	GS	-
0.30	257.50	FILL: Brown, silt, trace clay, moist	2	SS	8
1.4	256.4	SANDY SILT TILL: Loose to compact, brown, sandy silt, some sand, trace gravel, cobbles and boulders, moist	3	SS	26
2.9	254.9	SAND: Compact, brown, sand, some silt, wet	4	SS	20
4.0	253.8	SAND AND SILT: Compact, brown, silty fine sand to sandy silt, trace clay, very moist to wet	5	SS	19
5.5	252.3	SILTY SAND: Compact to very dense, brown, silty sand, trace clay, very moist to wet	6	SS	25
			7	SS	26
			8[1]	SS	59
			9	SS	47
10.0	247.8	BOREHOLE TERMINATED AT 10.0 m			

ELEVATION SCALE: 257, 256, 255, 254, 253, 252, 251, 250, 249, 248

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

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete

First water strike at 3.2 m
Bentonite seal

50 mm slotted pipe
Filter sand

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

Date	Depth	Elev.
2021-03-30	2.9	254.9
2021-04-07	2.9	254.9
2021-05-06	2.9	254.9

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 211

17T 609801E 4911434N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 9, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN DP

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 255.05				
0.70	FILL: Brown, silty sand, wet		1	SS	4
254.35 1.4	SANDY SILT: Loose, brown, sandy silt, trace gravel, moist		2	SS	9
253.7	SAND: Compact to very dense, brown, sand, some silt to silty sand, trace clay, trace gravel, wet		3	SS	23
			4	SS	25
			5	SS	31
			6	SS	60
7.0			7	SS	55
248.1 8.1	SILT: Very dense, brown, silt, some sand, trace clay, very moist		8	SS	81
247.0	BOREHOLE TERMINATED AT 8.1 m				

ELEVATION SCALE: 254, 253, 252, 251, 250, 249, 248, 247

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

UNIT WEIGHT kN/m³

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.
2021-03-30	0.7	254.4
2021-04-07	0.7	254.4
2021-05-06	0.6	254.5

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 212

17T 609782E 4911473N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 18, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN NG

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 254.80					
0.0	SILTY SAND TILL: Compact, brown, silty sand, trace gravel, trace clay, cobbles and boulders, moist		1	SS	22	
			2	SS	21	254
1.4 / 253.4	SAND: Dense, brown, sand, trace silt, moist		3	SS	35	253
2.1 / 252.7	SILTY SAND TILL: Compact to loose, brown, silty sand, trace gravel, trace clay, cobbles and boulders, moist to wet		4	SS	24	252
3.0			5	SS	7	
3.5 / 251.3	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

UNIT WEIGHT kN/m³

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

First water strike at 2.9 m

Upon completion of augering
Water at 2.6 m
Cave at 2.7 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 213

17T 609754E 4911491N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 19, 2021
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 / STANDARD PENETRATION TEST	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 255.80									
0.0	SILTY SAND TILL: Compact to dense, brown, silty sand, trace gravel, trace clay, cobbles and boulders, moist to wet		1	SS	45					
1.0			2	SS	40	255				
2.0			3	SS	35	254				
3.0			4	SS	33	253				
3.5			5	SS	28					
252.3	BOREHOLE TERMINATED AT 3.5 m									Upon completion of augering Water at 2.7 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 ○ Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 214

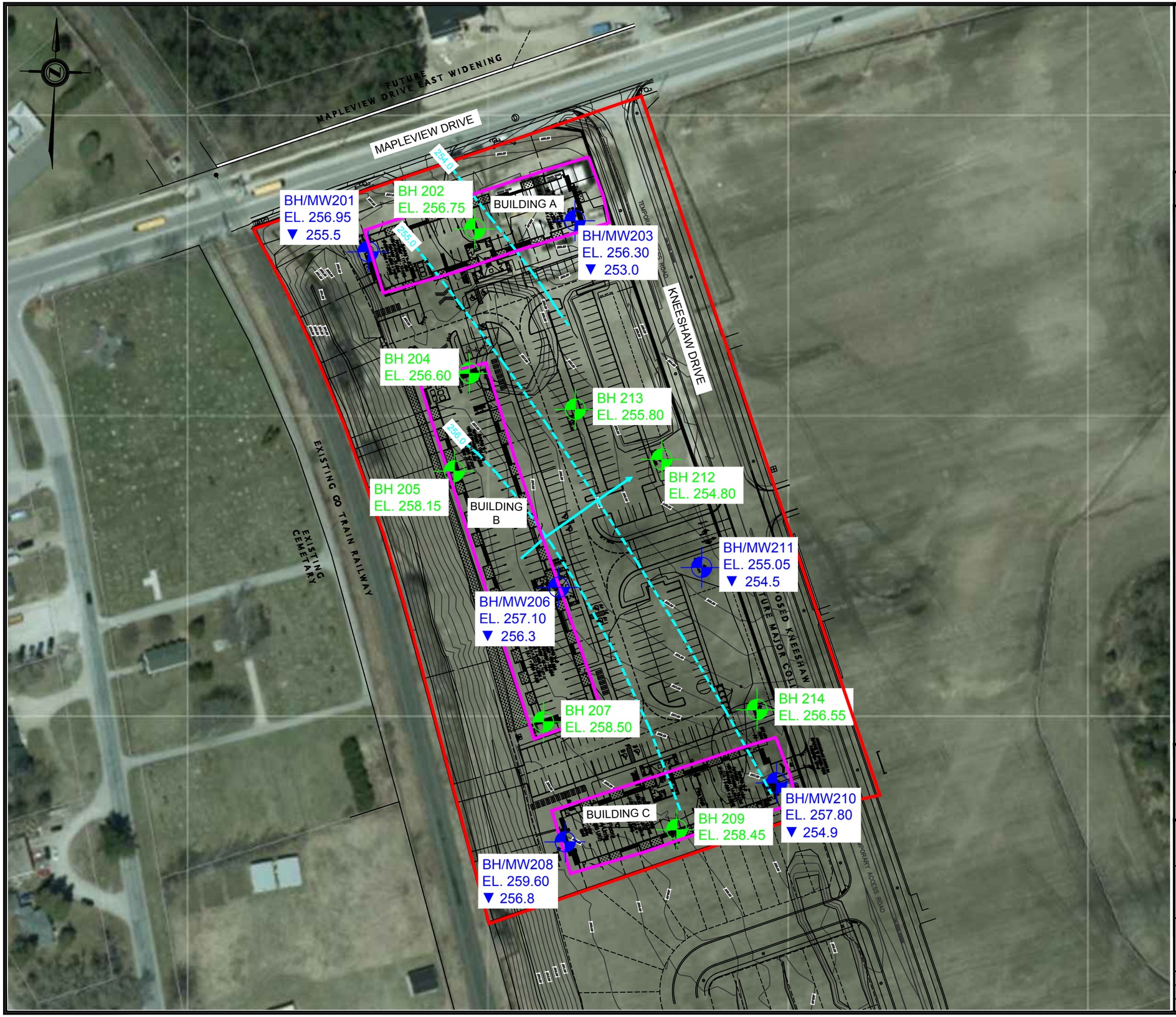
17T 609821E 4911383N

PROJECT Proposed Bistro 6 West Development
PML REF. 21BF002
LOCATION Mapleview Drive East, Barrie, Ontario
BORING DATE March 18, 2021
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 / STANDARD PENETRATION TEST	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 256.55									
0.0		FILL: Dark brown, silty sand to sandy silt, trace gravel, trace clay, moist		1	SS	5	256				
1.0				2	SS	22					
1.4	255.2	SILTY SAND TILL: Loose, brown, silty sand, trace gravel, trace clay, cobbles and boulders, moist		3	SS	8	255				
2.0				4	SS	8	254				
3.0				5	SS	9					
3.5	253.1	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 ● Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT
w_P w w_L
WATER CONTENT (%)
10 20 30 40

NOTES



KEY PLAN
BARRIE, ONTARIO

LEGEND:

- SITE LIMITS
- APPROXIMATE BUILDING LOCATIONS
- BH 202 EL. 256.75 — BOREHOLE 202 SURFACE ELEVATION
- BH/MW 201 EL. 256.95 ▼255.5 — BOREHOLE 201 (WITH WELL) SURFACE ELEVATION GROUND WATER ELEVATION (2021-04-07)
- INFERRED HYDROSTATIC GROUND WATER
- INTERPRETTED GROUND WATER FLOW DIRECTION

REFERENCE:

BASE PLAN PROVIDED BY CLIENT.

0m 20 40 60 80 100

SCALE

BOREHOLE/MONITORING WELL LOCATION PLAN

PROPOSED BISTRO 6 WEST DEVELOPMENT
KNEESHAW DRIVE
BARRIE, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	AK	DATE	SCALE	PML REF.	DRAWING NO.
CHECKED	GW	MAY 2021	AS SHOWN	21BF002	2-1
APPROVED	GW				

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.