GEOTECHNICAL INVESTIGATION
PROPOSED THREE STOREY BUILDING
81 MARY STREET
BARRIE, ONTARIO

for

KBK ARCHITECTS INC.

PETO MacCALLUM LTD.
19 CHURCHILL DRIVE
BARRIE, ONTARIO
L4N 8Z5
PHONE: (705) 734-3900
FAX: (705) 734-9911
EMAIL: barrie@petomaccallum.com

Distribution:
1 cc: KBK Architects Inc. (email only)
1 cc: PML Barrie
1 cc: PML Toronto

PML Ref.: 22TX030
Report 1
October 20, 2022

TABLE OF CONTENTS

ATTACHMENTS

Peto MacCallum Ltd.
CONSULTING ENGINEERS

October 20, 2022

PML Ref.: 22TX030

Mr. Kyle Khadra
Director, Principal Architect
KBK Architects Inc.
25 Sheppard Avenue West
Toronto, ON M2N 6S6

Dear Mr. Khadra

Geotechnical Investigation
Proposed Three Storey Building
81 Mary Street
Barrie, Ontario

We are pleased to present the results of the geotechnical investigation recently completed for the above referenced project. Authorization to proceed with this assignment was provided by Mr. Jake Locke of KBK Architects via email dated July 28, 2022. We will retain the soil samples obtained during the investigation for three months from the date of this report. The samples will be discarded at the end of the three-month period, unless we are instructed otherwise. If you would like the samples stored beyond the three-month period, this can be arranged for a service fee.

We thank you for the opportunity to have been of service on this assignment and trust that this report is complete within the term of reference. Please contact this office should you have any questions and comments on this report.

Sincerely

Peto MacCallum Ltd.

Harry Gharegrat, MS, MBA, P.Eng.
Senior Associate
Manager, Geotechnical Services

HG:mc/tc

19 Churchill Drive, Barrie, Ontario L4N 8Z5
Tel: (705) 734-3900 Fax: (905) 734-9911
E-mail: barrie@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

1. INTRODUCTION

It is understood that a three-storey building with no basement level is planned at 81 Mary Street in Barrie, Ontario. Structural loading and grading information for the building was not available at the time of this report. Associated utilities, driveways and parking areas are planned around the building.

Currently the site is vacant with an existing granular driveway. The ground cover is mainly topsoil, and surficial fill in the central portion of the site with grass and brush near the site boundary. Several fill mounds were observed near the central portion of the site. The existing ground surface at the site slopes down towards the east with topographic relief across the site being less than 0.5 m. No existing geotechnical reports or foundation drawings were provided to PML for review.

The purpose of this investigation was to assess the subsurface soil and groundwater conditions at the site, and based on the information obtained, to provide geotechnical recommendations pertaining to the design and construction of the proposed building and parking lots.

Hydrogeological studies were conducted in conjunction with this geotechnical investigation, the results of which will be sent under separate cover. The scope of work included limited chemical testing to determine offsite disposal options for excavated soil. The scope of work for this investigation does not include the observation, recording, testing or assessment of the environmental condition of the ground water within the subject area.

The recommendations provided in this report are based on preliminary information available at the time of this report. Peto MacCallum Ltd. (PML) should review the final drawings when they are available. The review may result in a modification of our recommendations or require additional field or laboratory work to examine whether the design changes are acceptable from a geotechnical viewpoint.

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

2. INVESTIGATION PROCEDURES

The field work for this investigation was carried out on September 23, 2022, and comprised five boreholes carried out at the locations indicated on Drawing 1, appended. The boreholes were drilled to depths of 5.0 to 9.6 m.

The test hole locations were selected by PML. The underground services were cleared with assistance from Ontario-One-Call and a specialist utility locating company. The ground surface elevations at the test hole locations were determined by PML with a differential GPS. It should be noted that the ground surface elevations at the test holes are approximate and are referenced for describing the soil stratigraphy. The provided elevations should not be used or relied upon for any other purpose.

The boreholes were advanced using continuous flight solid stem augers, powered by a truck mounted drill rig, supplied and operated by a specialist drilling contractor. The drilling operations were supervised by PML personnel.

Representative samples of the overburden were recovered from the boreholes at frequent depth intervals using a conventional split spoon sampler. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata in the boreholes.

The groundwater conditions in the open boreholes were closely monitored during the course of the borehole drilling. The boreholes were backfilled in accordance with MTO Regulation 903 upon completion of drilling. Monitoring wells, comprised of 50 mm diameter pipe, filter sand, bentonite seal, and flush mounted covers, were installed in three boreholes. The details of the monitoring well installation are shown on the applicable Log of Borehole Sheets. It should be noted that the wells become the property of the Owner and will have to be decommissioned by the Owner when no longer required. PML would be pleased to assist, if requested. The boreholes without wells were backfilled in accordance with O.Reg. 903.

3. LABORATORY TESTING

All the recovered samples were returned to PML's geotechnical laboratory in Toronto for detailed visual examination and moisture content determinations. Three grain size analyses were conducted on a representative sample of the native sandy silt. Results of the grain size analysis are shown on Figures GS-1 and GS-2. Corrosivity tests were conducted on three soil samples and are discussed in Section 7.0. The results of chemical testing for soil disposal options are discussed in Section 8.0.

4. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets 1 to 5 for details of the subsurface conditions, including soil classifications, inferred soil stratigraphy, standard penetration test data, groundwater observations as well as the results of laboratory grain size distributions, and moisture content determinations.

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

Subsurface conditions encountered within the boreholes are described below:

From the ground surface, about 50 to 200 mm of topsoil was contacted in Boreholes 1, 4 and 5. It is important to note that topsoil thicknesses as determined from standard penetration testing are approximate only. Actual thicknesses can vary significantly and therefore, additional investigations are recommended for quantity surveying purposes relating to site grading works.

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

fill, native sand/silty sand was contacted in all the boreholes to 2.4 to 4.0 m. SPT N values in this stratum ranged between 11 to 38 indicating a compact to dense condition. Moisture contents ranged from 2 to 18%. One grain size analysis conducted on a representative sample from this stratum indicated a grain size distribution as shown in the Table below.

TABLE 1
RESULTS OF GRAIN SIZE ANALYSIS

BOREHOLE AND SAMPLE ID.	MATERIAL	GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)
BH4, SS3	Silty Sand	3	61	31	5

The grain size distribution is shown on Figure GS-1.

Below this stratum, sand and gravel/gravelly sand/sandy gravel was contacted in all the boreholes and extended to 7.1 to 7.7 m in Boreholes 2 to 4. Boreholes 1 and 5 were terminated within this stratum at 5.0 m. N values in this stratum ranged from 19 to 88 indicating a dense to very dense condition. Moisture contents ranged from 3 to 6%. Two grain size analyses conducted on representative samples from this stratum indicated grain size distributions as shown in the Table below.

TABLE 2
RESULTS OF GRAIN SIZE ANALYSIS

BOREHOLE AND SAMPLE ID.	MATERIAL	GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)
BH2, SS5	Sandy Gravel	45	34	8	3
BH3, SS5	Sandy Gravel	45	26	14	5

The grain distribution curves are shown on Figure GS-2.

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

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

Groundwater levels are subject to seasonal fluctuation and should be expected to be somewhat higher during the spring months and in response to major weather events.

5. ENGINEERING DISCUSSION AND RECOMMENDATIONS

5.1 Site Grading

The condition of existing structures (buildings, utilities etc.) near the proposed building should be documented prior to commencement of construction.

It is assumed that the building will have a finished floor elevation at 227.9. Based on current site grades, about 0.3 m of engineered fill and excavation will be required to achieve the finished floor elevation. The following general procedures are recommended for preparation of the site for fill placement. Reference is made to Appendix A for Engineered Fill Placement Guidelines.

- Demolition of the existing structures should include complete removal of all foundation systems, below-grade structural elements, and pavements within the proposed construction area. This should include removal of any utilities to be abandoned along with any loose utility trench backfill or loose backfill found adjacent to existing buildings. All materials derived from the demolition of existing structures and pavements should be removed from the site. Voids resulting from the removal of underground obstructions extending below the proposed finish grades should be cleared and backfilled with suitable properly compacted fill. If the existing buildings within the footprint of the proposed buildings are founded on deep foundations, these elements should be removed down to at least 1.5 m below bottom of proposed garage slab.

- The existing pavement structure and fill should be removed to a distance equal to at least 1.2 m from the building footprint.

- The slab subgrade should be inspected and any deleterious materials found during subgrade inspection, should be removed/excavated.

- The exposed slab subgrade surface should be proof rolled with a tandem truck or equivalent and inspected by geotechnical personnel from PML. Any soft/loose spots encountered during the process should be sub-excavated and replaced with approved on-site or imported material, compacted to at least 98% of the Standard Proctor Maximum Dry Density (SPMDD).

- Fill placement should be conducted with approved on site or imported material placed in lifts not exceeding 200 mm and compacted to at least 98% of the SPMDD.

- All backfilling and compaction operations should be supervised on a full-time basis by geotechnical personnel from PML to examine and approve backfill materials, evaluate placement operations and verify that the specified degree of compaction is achieved uniformly throughout the fill.

5.2 Building Foundations

Assuming a foundation support below the existing fill, at about 1.5 m below existing ground surface (near elevation 226.4), it is anticipated that the foundations will bear within compact native silty sand/ sand.

Conventional spread footings placed within native compact silty sand/sand should be designed for a factored net Ultimate Limit State (ULS) resistance of 150 kPa and a Serviceability Limit State (SLS) resistance of 100 kPa, subject to inspection during construction.

It should be noted that relatively loose pockets of the native soil may be contacted at the footing bearing elevation in some areas, which may need to be sub excavated to a depth of up to 1.0 m and replaced with engineered fill to achieve the recommended bearing resistance.

The recommended bearing resistances have been estimated from the borehole data for the design stage only. As more specific information with respect to subsurface conditions becomes

available during foundation excavation, the interpretation of the subsurface conditions from borehole data and the recommendations of the report must be validated with field observations.

The geotechnical resistance for the founding soils at SLS normally allows for 25 mm of compression of the founding medium. Based on the borehole findings, differential settlement is expected to be less than 20 mm, provided the subgrade is not loosened or softened by construction activity or prolonged exposure to the elements.

If the footing concrete is not placed on the day of the footing inspection, it is recommended that the founding surfaces be covered with a 50 mm thick concrete mud slab immediately after excavation and approval to maintain the integrity of the subgrade.

Footings exposed to seasonal freezing conditions must be protected against frost. Thermal insulation equivalent to that of 1.5 m of earth cover should be provided as foundation frost protection. In general, a 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.

New footings which are placed at higher elevations should be placed such that the higher footings are placed below a line drawn from the near edge of the lower footing at 10H:7V. The lower footing must be constructed before the higher footing to prevent undermining of the higher footing. Stepped footings should be constructed at a slope no steeper than 10 horizontal to 7 vertical. A maximum vertical step of 600 mm should be maintained.

Prior to placement of concrete, all founding surfaces must be inspected by geotechnical personnel from PML to ensure that the founding soils are capable of supporting the recommended bearing resistances.

5.3 Seismic Site Classification

Based on the soil profile revealed in the geotechnical investigation, the site classification for the seismic site response may be considered as “Site Class D” according to Table 4.1.8.4.A of the Ontario Building Code of Canada (OBC, 2006).

It should be noted that the OBC site class is determined based on the average properties of the top 30.0 m of the soil profile below founding level. The site class is provided based on average subsurface conditions encountered in the boreholes and assumes that similar conditions will be encountered to a depth of 30.0 m below the founding depth.

5.4 Slab-on-Grade

The boreholes have revealed about 0.7 m of undocumented fill consisting mainly of silty sand/sand overlying native soil. The N value in the fill is variable ranging from 8 to 17. Normally floor slabs-on-grade are not founded on undocumented fill unless the fill was constructed as an engineered fill comprising select material placed and compacted in a controlled manner to ensure a uniform, reliable founding medium.

We are not aware if the existing fill was engineered. There are no fill records available for review. It is recommended that the existing fill be removed to a depth of about 0.6 m below the slab finished floor elevation and replaced with engineered fill which is placed and compacted in accordance with the recommendations of this report.

A Subgrade Reaction Modulus of 27 MPa/m can be used for the design of the floor slab supported on compacted engineered soil fill. The provided modulus value is subject to review and approval of the slab subgrade by the geotechnical engineer immediately prior to construction.

The slab subgrade should be prepared in accordance with Section 5.1. A minimum 200 mm thick layer of well compacted 19 mm clear crushed stone or equivalent is recommended directly beneath the floor slab for bedding purposes and as a vapour barrier. If a moisture sensitive floor finish is to be provided, extra vapour barrier may be necessary. To this end, heavy duty polyethylene sheeting may be installed between the concrete slab and the compacted granular base to act as the vapour barrier. This requirement should be selected by the Architect/Engineer considering the specification of the floor finish product and both the thickness and type of concrete floor slab.

The floor slab should be structurally separate from the foundation walls and columns. Control joints should be provided along column lines and at regular intervals to minimise temperature cracks and to allow for any differential movement of the floor slab.

The finished floor should be established at least 200 mm above the exterior ground level which should be sloped to promote surface drainage away from the building.

5.5 Temporary Excavations

The excavations will consist mainly of foundation excavations and excavations conducted to remove surficial fill for construction of the spread footings and the slab-on-grade for the addition.

It is anticipated that excavation can be carried out with conventional equipment. Obstructions due to presence of debris within the fill should be anticipated.

All construction work must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and local regulations. With respect to the OHSA, the undocumented fill materials should be considered Type 3 soils. The loose to compact native silty sand/sand should be considered a Type 3 soil.

The OSHA requires that the excavation be cut at a predetermined inclination based on soil types. Excavations in Type 3 soil, should be cut at an inclination of 1H:1V from the base of the excavation. If an excavation contains more than one soil type, the excavation slope geometry shall be governed by the highest soil type. Based on this, the excavations will be in Type 3 soil and sloped at 1H:1V.

Foundations of heavily loaded/settlement sensitive structures and/or utilities located within close proximity to the excavation may require underpinning or support to preserve the integrity of these structures. Further comments and general guidelines in this regard are presented in Figure 1.

All work should be carried out in accordance with the Occupational Health and Safety Act, 1990 and Ontario Regulation 213/91 for construction projects and with local regulations.

It is recommended that trench excavations be supervised on a full-time basis by experienced geotechnical personnel from Peto MacCallum Ltd. to examine actual in-situ soil conditions and verify that proper trenching procedures are implemented.

No surcharge should be placed in close proximity of excavation and trenches.

For safety reasons, excavations should not be left open overnight. Backfilling should be carried out as soon as possible following excavation and foundation or pipe installation to minimize potential soil loosening, sloughing and groundwater seepage.

5.6 Groundwater Control

The foundation excavations for the building are anticipated to extend to a maximum depth of about 2 m below ground surface. Long term ground water levels were measured at 6.3 to 6.4 m below ground surface.

The long-term groundwater level appears to be below the foundation excavation depth; however, perched groundwater may be encountered in the foundation excavations.

In general, it is expected that seepage or surface water that enters temporary excavations can be adequately handled by conventional sump pumping techniques. The possibility of encountering concentrated seepage from more permeable sections of the fill stratum or relatively permeable sand seams and layers within the native soil which require more active dewatering methods such as well points should not be overlooked.

Reference is made to the PML Hydrogeological Site Assessment for Construction Dewatering Requirements and the need for a Permit-To-Take-Water (PTTW) and/or Environmental Activity and Sector Registry (EASR).

5.7 Pipe Bedding

It is assumed that planned utilities will have an invert between 1.5 and 2.5 m below ground surface. At this depth, native silty sand/sand was encountered in the boreholes.

Based on the estimated invert levels, bearing capacity or basal instability issues are not anticipated for the underground utility installations founded in native materials provided adequate groundwater control measures are implemented.

Pipe bedding thickness, composition and compaction should conform to OPSD 802.010 for flexible pipes and OPSD 802.03 for rigid pipes and should meet municipal standards. As a general guideline, a minimum 150 mm thick layer of OPSS Granular A bedding material is recommended for pipes 450 mm diameter or less; for larger diameter pipes, the thickness of the bedding should be increased to 200 mm. The selection of bedding material for large pipes may also be determined by the Engineer based on the types of pipe, bedding factors and installation methods. If the subgrade becomes unduly wet during construction, additional bedding material should be provided. The granular bedding material should be placed in thin lifts not more than 150 mm thick and compacted to at least 98% SPMDD. The bedding requirement should also satisfy local standards and regulations.

As an alternative, 19 mm clear crushed stone or High Performance Bedding Material (HPBM) may be used as pipe bedding. The 19 mm clear crushed stone or HPBM bedding material must be wrapped with an approved synthetic fabric (Terrafix 270 R or equivalent) particularly where the subgrade is predominantly silt or fine sand below the groundwater table. Otherwise, the soil fines from the subgrade could infiltrate into the voids of the bedding materials, causing potential loss of subgrade support and subsequent failure of the pipe.

Sand cover material should be carried up as backfill at least 300 mm above the top of the pipe or as per local practice. The material should be placed in thin lifts not more than 300 mm thick and compacted to at least 95% of the SPMDD.

5.8 Backfill Considerations

5.8.1 Structural Backfill within Building Footprint

The excavated soil will consist of fill comprising of mainly silty sand/sand with trace to some gravel or sand and gravel and native soil consisting of silty sand/sand. Fill materials which are relatively clean and the native soil can be used as engineered backfill in areas where free draining materials are not needed. Moisture content adjustments will be required in order to achieve optimum moisture content for fill placement. It is recommended that several Proctor compaction tests be conducted to determine the suitability of the borrow materials for fill placement, prior to commencement of the construction tendering process.

Any frozen, organic, excessively wet or other deleterious materials should not be used for backfill purposes. These materials should be separated and set aside for non-critical purposes.

The native soils that are not free-draining should not be used in areas where this characteristic is necessary or in confined spaces (for instance, around manholes and catch basins). Imported granular material conforming to OPSS Granular B Type I would be suitable for these purposes.

5.8.2 Utility Trench Backfill

To reduce post construction settlement, the trench backfill should be placed in maximum 300 mm thick loose lifts compacted to 95% of the SPMDD. The upper 600 mm zone of the trench backfill under pavement areas should be compacted to at least 100% of the SPMDD. Trench backfilling should be carried out as soon as possible following trench excavation and pipe installation to avoid excessive wetting of the subgrade.

Heavy compactors that generate large lateral stress should be kept at a safe distance from existing structures to avoid structural damage. At locations where compaction equipment operates close to retaining walls, the walls should be suitably braced or supported.

All backfill and compaction operations should be monitored by qualified geotechnical personnel from PML to approve material, evaluate placement operations and verify that the specified degree of compaction has been achieved uniformly throughout the fill.

6. PAVEMENT DESIGN AND CONSTRUCTION

As part of the subgrade preparation, proposed new pavement subgrade areas should be stripped of all deleterious and unsuitable material. Fill required to raise the grades to design elevations should be organic free and at a moisture content that will permit compaction to the densities indicated.

The anticipated subgrade materials for the parking and driveway areas will consist of existing undocumented fill. The existing fill is variable and will present a non-uniform subgrade for support of vehicles. The pavement can be constructed on existing fill; however, some settlement and cracking which will require maintenance over the life of the pavement must be anticipated. In order to improve performance of the newly constructed pavement, it is recommended that the uncontrolled fill soils under pavement areas be removed to a depth of 0.6 m below the underside of the pavement granular and subbase, and replaced with engineered fill.

Based on the strength and frost susceptibility of the anticipated subgrade materials, loading requirements and assuming adequate drainage, the recommended minimum flexible pavement structure thickness for the parking area and driveways is as follows.

TABLE 3
RECOMMENDED PAVEMENT STRUCTURE

MATERIAL	CAR PARKING (mm)	DRIVEWAY/FIRE ROUTE (mm)
Asphaltic Concrete HL-3	40	40
Asphaltic Concrete HL-8	60	100
OPSS Granular A Base Course	150	150
OPSS Granular B Type I Subbase Course	250	300

The granular base and subbase courses should conform to the gradation specifications of the Ontario Provincial Standards Specifications (OPSS) Form 1010 for select granular materials and should be compacted to a minimum of 100 % SPMDD.

Asphalt concrete should conform to latest edition of OPSS 310. It is recommended that the asphalt design be reviewed by PML before selection of the final mix design and prior to the start of paving.

It is recommended that the roads be constructed during the drier time of the year. The pavement design assumes that a stable subgrade under construction equipment/traffic. If the subgrade is wet and unstable, additional thicknesses of the subbase course material may be required.

For the pavement to function properly, provision must be made for water to drain out of, and not collect in the granular base courses. If curb and gutter construction is used, continuous perforated corrugated steel or plastic longitudinal sub-drains (minimum diameter 100 mm) should be used to prevent built-up of water in the pavement granular base courses. The pipes should be surrounded by a geotextile filter fabric. The sub-drains should be at least 300 mm below the subgrade level. Backfill above the drains comprise free draining OPSS Granular B Type 1 or equivalent granular filter material. The sub-drains should be on a positive grade leading to frost-free sumps or catch basins.

The backfill used for catch basins and manholes should consist of compacted Granular B Type 1 or Type II material with provision for infiltration from the granular base course into these drainage structures. The catch basins and manholes and manholes should be perforated just above the drain obvert level, and these holes screened with geotextile filter fabric. This procedure will also alleviate the problems of differential movement between the pavement and catch basins or manholes due to frost heave.

7. CORROSIVITY AND SULPHATE TESTING

7.1 Corrosivity of Soil

The corrosivity of the on-site soils on ductile iron pipe was evaluated in accordance with the American Water Works Association (AWWA) system that uses resistivity, sulphides, pH, redox potential and drainage characteristics as the main indicators of soil aggressiveness. In this procedure, a point system is used to evaluate the corrosivity of the soil. Points are assigned to each indicator in accordance with its anticipated contribution to the total corrosion potential of the soil as determined by laboratory testing and visual examination of the soil.

Three samples were tested for corrosive potential. The laboratory Certificate of Analysis is included in Appendix C. The designated point totals are indicated in Table 3 on the following page. The results of the AWWA analysis indicated that none of the tested samples are corrosive to ductile iron pipe.

It should be noted that our conclusions are based on results of three tests and analytical results are a broad indicator of corrosion potential. Further external factors may have an influence on corrosive potential of soil such as application of deicing salts which may penetrate into the soil over a period of time. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained for further guidance.

TABLE 4

SUMMARY OF DUCTILE IRON PIPE CORROSIVITY ANALYSIS ON SOIL SAMPLES

BOREHOLE NO.	SAMPLE NO.	PH POINTS	SULPHIDE (%) POINTS	MOISTURE POINTS	RESISTIVITY (OHM-CM) POINTS	REDOX POTENTIAL (MV) POINTS	POINTS[1] TOTAL
BH2	SS4	8.64 3	<0.04 2	Moist 1	6170 0	164 0	6
BH3	SS3	8.55 3	<0.04 2	Moist 1	7630 0	185 0	6
BH5	SS4	8.64 3	<0.04 2	Moist 1	7940 0	184 0	6

Note:

1. Point total is the sum of the points assessed from pH, sulphide, moisture, resistivity and redox potential tests. Corrosion potential is based on the A.W.W.A. evaluation system for ductile iron pipe. Ten points or greater indicate that soil is corrosive to ductile iron pipe: protection is needed.

7.2 Sulphate Attack on Concrete

Three soil samples were submitted for sulphate analysis. The Certificate of Analysis is provided in Appendix C, and summarized below:

TABLE 5
RESULTS OF SOLUBLE SULPHATE TESTS

BOREHOLE NO.	SAMPLE NO.	SOLUBLE SULPHATE1 (μG/G) / (%)
BH2	SS4	26/0.0026
BH3	SS3	8.0/0.0008
BH5	SS4	5.2/0.0005

Note:

1. Based on CSA Standard A23.1-04 – Percent water soluble sulphate in soil sample
   0.10 to 0.20 - Moderate
   0.20 to 2.0 - Severe
   >2.0 - Very severe

The results of soluble sulphate tests indicate that the potential for sulphate attack on buried concrete is negligible. For further comments regarding cement requirements, refer to the current CSA A23.1 standard.

8. GEOENVIRONMENTAL CONSIDERATIONS

8.1 Site Background and Purpose of Work

The subject site is located on the east side of Mary Street about 80 m south of Ross Street and Mary Street intersection. A brief review of the site background history revealed that the site and general area was historically used for mixed residential and commercial purposes. Historically, the subject site houses a single-family residential dwelling.

The purpose of current sampling and testing program was to characterize the geoenvironmental quality of the on-site soil in comparison with the applicable regulatory requirements to determine disposal options during construction.

8.2 Field Work

The geoenvironmental sampling and chemical testing program involved collection of representative soil samples from the geotechnical boreholes drilled to a depth of about 5.0 to 9.6 m below existing grades by a specialist contractor using a truck mounted drill rig under the supervision of a member of our geotechnical/geoenvironmental staff.

Details of the soil stratigraphy are outlined in the summarized subsurface condition section.

Soil vapour concentration (SVC) of the collected samples was measured on-site by a portable gas detector, Eagle RK 1, calibrated to hexane for screening purposes. The measured SVC readings in the soil samples were 10 to 60 ppm, which were considered to be insignificant.

Appropriate precautions were taken and soil sampling tools were decontaminated during field work to minimize potential cross-contamination between sampling events.

Soil samples obtained were immediately placed and labelled in glass jars and plastic bags. Observations of visible foreign materials and odours were recorded during sampling. The soil samples collected in plastic bags were brought to Peto MacCallum Ltd. (PML) laboratory for detailed visual examination.

8.3 Applicable Regulatory Standards for Chemical Analyses

In general, the standards of applicable environmental quality depend on the location, land use, and source of potable water at the location of disposal and/or re-use of the excess soils. Regarding geoenvironmental characterization, off-site disposal, the following provincial Standards are applicable for this project:

- Ontario Regulation 153/04; *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act* dated March 9, 2004 (amended) Table 3 Site Condition Standards for residential/parkland and industrial/commercial/community land uses.

8.4 Chemical Analyses

Based on the visual examination of soils in the boreholes, gas readings and the site background information, the retrieved soil samples were submitted to SGS Laboratories Inc. (SGS), located in Lakefield, Ontario for chemical testing. SGS is accredited by the Canadian Association for Laboratory Accreditation (CALA).

- Three soil samples were analyzed for metals and inorganic parameters listed in the Ontario Regulation 153/04 (amended).

8.5 Findings of Chemical Analyses

The results of chemical analyses carried out by SGS in accordance with the protocol described above are attached in Appendix A and are outlined below.

For reuse and/or off-site disposal, the results of the soil chemical analyses were compared with the Ontario Regulation 153/04 (amended) Tables 2 and 3 Standards for residential/parkland and industrial/ commercial Property Uses in both potable and non-potable ground water situations. The results were also compared with Table 1 Full Depth Background Site Condition Standards for residential/parkland/institutional/industrial/commercial land uses.

The results of chemical analyses for metals and inorganic parameters complied with Tables 1, 2 and 3 Standards for residential/parkland and industrial/commercial land uses in the potable and non-potable ground water situations, respectively.

8.6 Conclusions and Recommendations

Based on the results of the current geoenvironmental sampling and chemical testing program, the following recommendations are made.

- Based on the current geoenvironmental sampling and testing program, the soils analyzed from the above-noted site are considered to be environmentally suitable for dispose and/or re-use at residential/parkland/institutional and industrial/commercial land use properties (Ontario Regulation 153/04 Tables 1, 2 and 3 Site Condition Standard properties).

- It is recommended that the site earthwork operations and removal of the soils be monitored under full-time inspection and review of our field staff to ensure that the soils are consistent with the geoenvironmental soil characterization programs recently carried out and presented in this report.

- If indications of questionable materials, or evidence of higher concentrations or other contaminants, and/or other deleterious materials are observed during placement, the soils should be segregated for further assessment.

This report should be read in conjunction with a Statement of Limitations provided in Appendix A.

9. GEOTECHNICAL DESIGN AND CONSTRUCTION REVIEWS

Peto MacCallum Ltd. technical staff should review the site-specific conditions during foundation installation, earthwork, and dewatering operations to verify the following:

- Appropriate incorporation of the geotechnical recommendations provided in this report in the design and construction drawings.

- Geotechnical aspects of excavation and ground control measures.

- The adequacy of subgrade soil for supporting the design foundation loading.

- Monitoring of fill placement and its degree of compaction.

10. CLOSURE

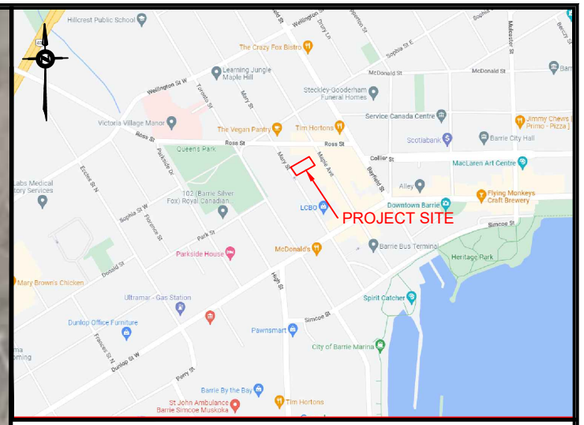
The field work for this project was carried out by Mr. Niklas Gardlund. The geotechnical component of this report was prepared by Mr. Harry Gharegrat, MS, P.Eng. The section on chemical testing for soil disposal options was prepared by Mr. Mahboob Alam, PhD., P.Eng. We trust that the information presented in this report is sufficient for your present purposes. Please do not hesitate to contact our office should you have any questions.

Sincerely

Peto MacCallum Ltd.

Harry Gharegrat, MS, MBA, P.Eng.
Senior Associate
Manager, Geotechnical Services

HG:mc/tc



KEY PLAN
BARRIE, ONTARIO

LEGEND:

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

REFERENCE:
BASE PLAN PRODUCED USING GOOGLE MAPS 2022 AND SITE PLAN DATED APRIL 14, 2022 PREPARED BY KBK ARCHITECTS INC

0m 2.5 5 7.5 10 15
SCALE

BOREHOLE/MONITORING WELL LOCATION PLAN

PROPOSED THREE STOREY BUILDING
81 MARY STREET
BARRIE, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

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

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 604047E 4916024N

PROJECT Proposed Three Storey Building — **PML REF.** 22TX030

LOCATION 81 Mary Street, Barrie, ON — **BORING DATE** September 23, 2022 — **ENGINEER** HG

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

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES
	228.10	SURFACE ELEVATION 228.10				
0.0	228.10					
0.20	227.90	TOPSOIL: Black, silty sand, trace organics, moist		1	SS	8
0.70	227.40	FILL: Brown, sand. trace gravel, trace silt, moist				
1.0		SAND: Compact, brown, sand, trace silt, trace gravel, moist		2	SS	13
1.4	226.7	SILTY SAND: Compact, brown, silty sand, trace gravel, trace clay, moist to very moist		3	SS	18
2.0	226.0	SAND: Compact, brown, sand, trace silt, some gravel to gravelly, moist		4	SS	19
3.0						
3.2	224.9	SANDY GRAVEL: Dense to very dense, brown, sandy gravel, some silt, trace clay, trace cobbles, moist		5	SS	45
4.0						
5.0	223.1	BOREHOLE TERMINATED AT 5.0 m		6	SS	77
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 228, 227, 226, 225, 224

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
Cave at 4.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 2

17T 604054E 4916021N

PROJECT Proposed Three Storey Building — **PML REF.** 22TX030

LOCATION 81 Mary Street, Barrie, ON — **BORING DATE** September 23, 2022 — **ENGINEER** HG

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

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

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 6.2 m
No cave
Water Level Readings:

Date	Depth	Elev.
2022-09-27	6.4	221.6

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 3

17T 604065E 4916033N

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

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	227.90	SURFACE ELEVATION 227.90				
0.0	227.20	FILL: Brown, silty sand, some gravel, trace organics, moist		1	SS	17
0.70						
1.0		SAND: Compact, brown, sand, some silt to silty, trace organics, trace gravel, moist		2	SS	19
2.0	225.8			3	SS	11
2.1		SILTY SAND: Compact, brown, silty sand, some gravel to gravelly, trace clay, moist		4	SS	23
2.9	225.0					
3.0		SANDY GRAVEL: Very dense, brown, sandy gravel, trace silt to silty, trace clay, trace cobbles, moist		5	SS	46
4.0						
5.0				6	SS	59
6.0				7	SS	54
7.0	220.8					
7.1		SAND: Dense, brown, sand, some gravel, trace silt, wet		8	SS	48
8.0	219.8					
8.1		BOREHOLE TERMINATED AT 8.1 m				
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 227, 226, 225, 224, 223, 222, 221, 220

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

Flushmount casing
Concrete
Bentonite seal
45 26 14 5
50 mm slotted pipe
Filter sand
First water strike at 7.0 m

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

Date	Depth	Elev.
2022-09-27	6.4	221.5

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 4

17T 604079E 4916036N

PROJECT Proposed Three Storey Building — **PML REF.** 22TX030

LOCATION 81 Mary Street, Barrie, ON — **BORING DATE** September 23, 2022 — **ENGINEER** HG

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

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 227.75			
0.0	227.70	TOPSOIL: Black, sandy silt, some organics, moist	1	SS	15
0.70	227.05	FILL: Brown, sand, some gravel, trace to some silt, trace organics, moist			
1.0		SILTY SAND: Compact, brown, silty sand, trace to some gravel, trace clay, sand seams, moist with very moist seams	2	SS	21
2.0			3	SS	23
			4	SS	18
3.0	224.8	Dense	5	SS	36
3.5	224.3	SANDY GRAVEL: Very dense, brown, sandy gravel, trace silt to silty, trace clay, trace cobbles, moist to very moist			
4.0			6	SS	72
5.0					
6.0			7	SS	50/130mm
7.0	7.1				
	220.7	SAND: Compact to dense, brown, sand, trace to some gravel, trace silt, wet	8	SS	36
8.0					
9.0			9	SS	28
	9.6				
	218.2	BOREHOLE TERMINATED AT 9.6 m			
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 227, 226, 225, 224, 223, 222, 221, 220, 219

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 6.2 m
No cave
Water Level Readings:

Date	Depth	Elev.
2022-09-27	6.3	221.5

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 604081E 4916042N

PROJECT Proposed Three Storey Building — **PML REF.** 22TX030

LOCATION 81 Mary Street, Barrie, ON — **BORING DATE** September 23, 2022 — **ENGINEER** HG

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

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 227.65					
227.55	TOPSOIL: Black, sandy silt, some organics, moist		1	SS	15	
0.70	FILL: Brown, sand and gravel, trace silt to silty sand, trace gravel, trace organics, moist					
226.95	SAND: Compact, brown, trace silty to silty, trace gravel, moist		2	SS	19	227
			3	SS	17	226
2.1						
225.6	SILTY SAND: Dense, brown, silty sand, trace gravel, trace clay, moist with very moist seams		4	SS	38	225
3.4			5	SS	35	
224.3	SAND: Dense, brown, sand, some gravel to gravelly, trace silt, moist					224
4.0						
223.7	SANDY GRAVEL: Very dense, brown, sandy gravel, trace to some silt, trace clay, trace cobbles, moist		6	SS	88	223
5.0						
222.7	BOREHOLE TERMINATED AT 5.0 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

UNIT WEIGHT kN/m³

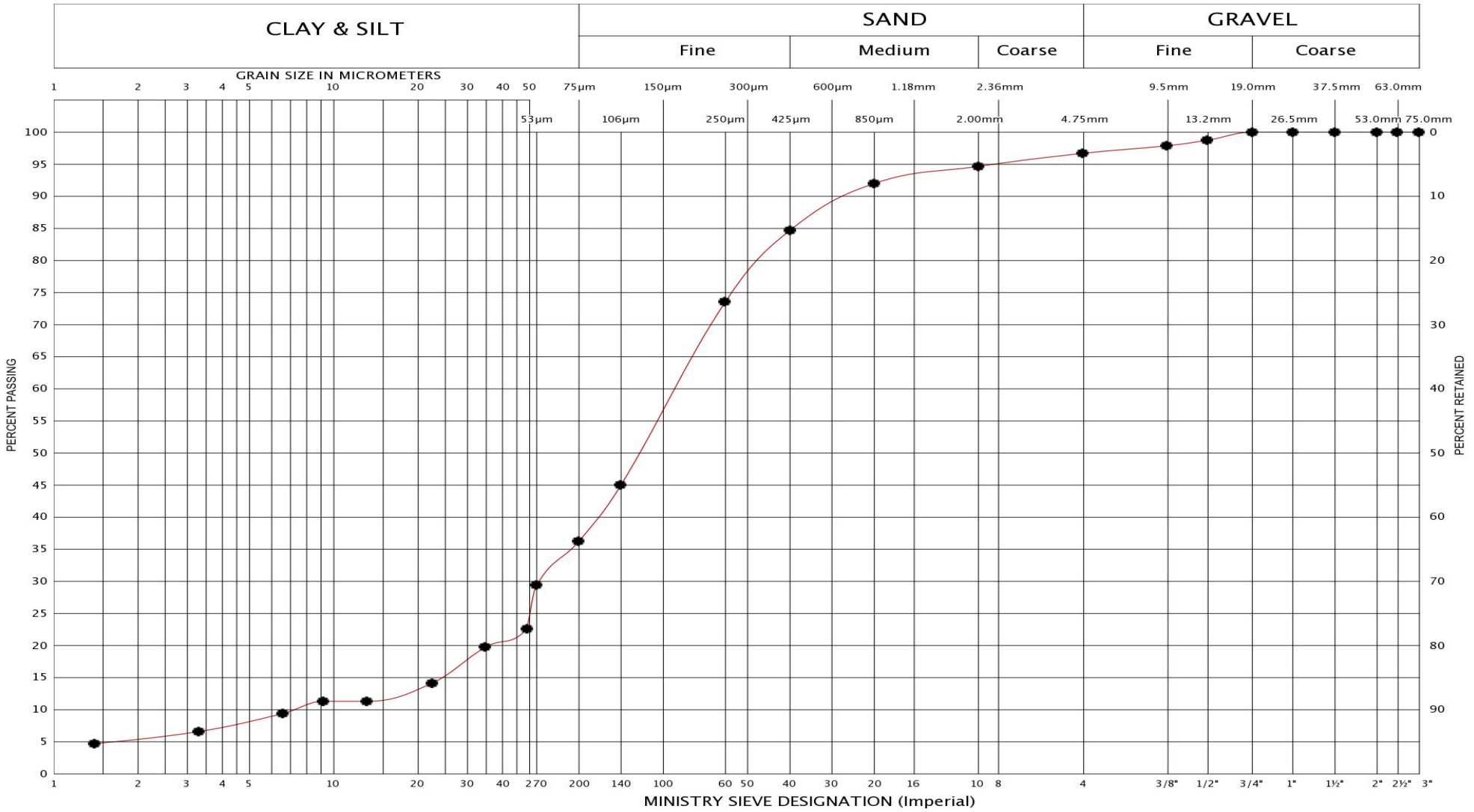
GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
Cave at 3.4 m

NOTES

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	4
	SAMPLE	3
	SYMBOL	●

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

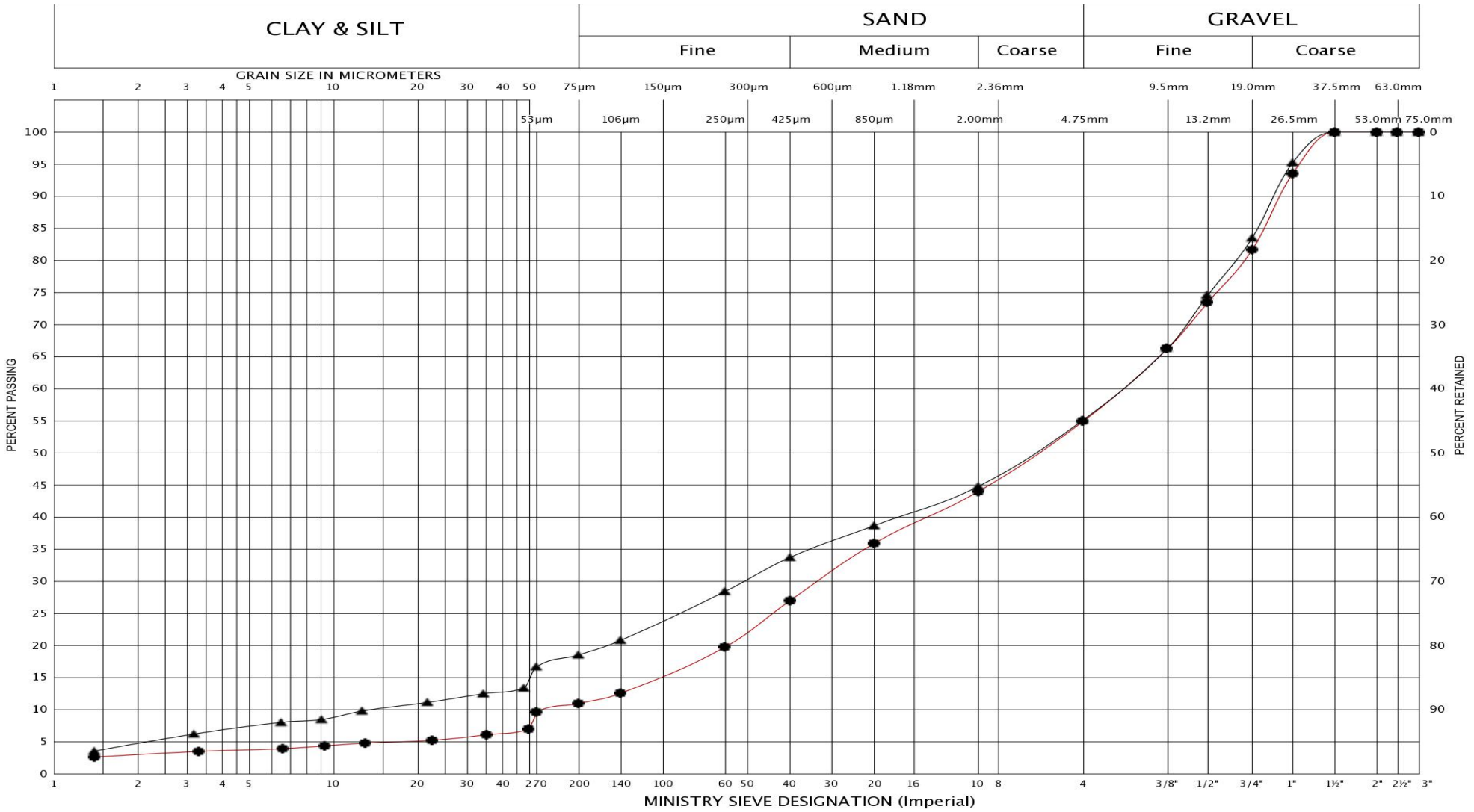
GRAIN SIZE DISTRIBUTION

SILTY SAND, Trace Clay, Trace Gravel

FIG No.: GS-1

Project No.: 22TX030

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	2	3
	SAMPLE	5	5
	SYMBOL	●	▲

PML Peto MacCallum Ltd. CONSULTING ENGINEERS

GRAIN SIZE DISTRIBUTION

SANDY GRAVEL, Trace To Some Silt, Trace Clay

FIG No.: GS-2

Project No.: 22TX030

NOTES

1. The need to underpin existing footings/utilities is dependent upon soil type, proximity of the existing facility to the face of the excavation, loads imposed on the foundation and permissible movements.

   ZONE A:
   Foundations of relatively heavy and/or settlement sensitive structures/ utilities located in Zone A generally require underpinning.

   ZONE B:
   Foundations of structures located within Zone B generally do not require underpinning. Consideration should be given to underpinning of settlement sensitive utilities or heavy foundation units located in this zone.

   ZONE C:

   Utilities and foundations located within Zone C do not normally require underpinning.

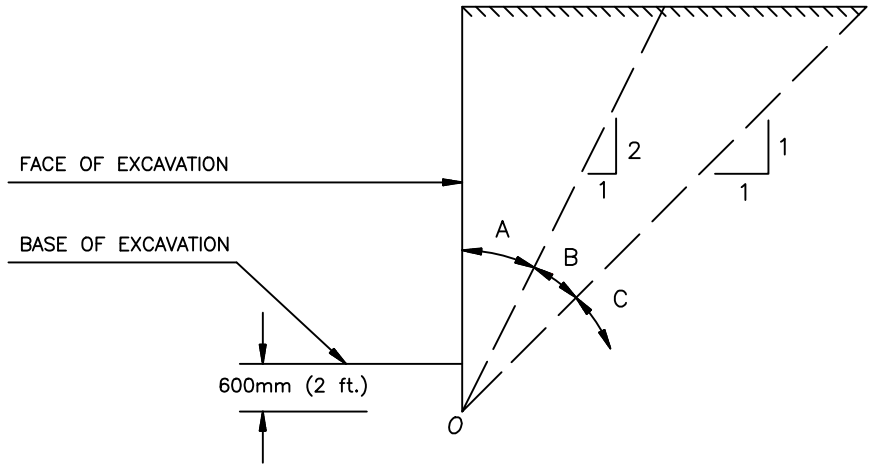
   Underpinning of foundations located in Zones A and B should extend at least into Zone C.

2. As an alternative to underpinning, it may be possible to control movement of existing utilities and foundations by supporting the face of the excavation with bracing/tiebacks or a rigid (caisson) wall. Horizontal and vertical earth pressures imposed on the excavation wall by non–underpinned foundations must be considered in the design of the support system.

3. A condition survey should be conducted prior to construction and appropriate monitoring (surface and insitu) carried out during construction to monitor any movement which may occur.

4. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.

5. This sheet is to be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.



– If the base of excavation is in bedrock, point "O" is drawn through the intersection point of the wall and the surface of sound bedrock.

KBK ARCHITECTS INC.

PROPOSED THREE STOREY BUILDING
81 MARY STREET, BARRIE, ONTARIO

GENERAL GUIDELINES REGARDING UNDERPINNING OF FOUNDATIONS / UTILITIES LOCATED CLOSE TO EXCAVATION

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	H.G.	DATE	SCALE	PML REF.	FIG. NO.
CHECKED	H.G.	OCT 2022	N.T.S.	22TX030	1
APPROVED	H.G.				

APPENDIX A

Statement of Limitations

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client. 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.

Environmental site assessment studies are performed in different phases by the application of different levels of effort and expense. The phase or phases in this report and the level of effort proposed for this assignment were based solely on PML's understanding of the client's needs as described in the scope of services contained in this report.

This assessment does not wholly eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with the subject property and must be viewed as a mechanism to reduce risk rather than eliminate the risk of contamination concerns.

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.

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

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

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

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

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

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

SGS Certificate of Analysis for Corrosivity and Chemical Testing

FINAL REPORT

CA40247-SEP22 R1

22TXO30, Barrie

Prepared for

Peto MacCallum Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	Peto MacCallum Ltd
Address	165 Cartwright Ave Toronto, ON M6A 1V5. Canada
Contact	M. Alam
Telephone	416-785-5110
Facsimile	416-785-5120
Email	starafder@petomaccallum.com; malam@petomaccallum.com
Project	22TXO30, Barrie
Order Number	
Samples	Soil (3)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA40247-SEP22
Received	09/28/2022
Approved	10/06/2022
Report Number	CA40247-SEP22 R1
Date Reported	10/06/2022

COMMENTS

Temperature of Sample upon Receipt: 8 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

FINAL REPORT

CA40247-SEP22 R1

Client: Peto MacCallum Ltd
Project: 22TXO30, Barrie
Project Manager: M. Alam
Samplers: Nikolas G

MATRIX: SOIL

Sample Number	5	6	7
Sample Name	BH5, SS4	BH2, SS4	BH3, SS3
Sample Matrix	Soil	Soil	Soil
Sample Date	23/09/2022	23/09/2022	23/09/2022

Parameter	Units	RL		Result	Result	Result
Corrosivity Index						
Corrosivity Index	none	1		4	4	4
Soil Redox Potential	mV	no		184	164	185
Sulphide (Na2CO3)	%	0.04		< 0.04	< 0.04	< 0.04
pH	pH Units	0.05		8.64	8.64	8.55
Resistivity (calculated)	ohms.cm	-9999		7940	6170	7630
General Chemistry						
Conductivity	uS/cm	2		126	162	131
Metals and Inorganics						
Moisture Content	%	0.1		9.5	12.3	9.6
Sulphate	µg/g	0.4		5.2	26	8.0
Other (ORP)						
Chloride	µg/g	0.4		17	14	23

FINAL REPORT

CA40246-SEP22 R

22TXO30, Barrie

Prepared for

Peto MacCallum Ltd

FINAL REPORT

CA40246-SEP22 R

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Peto MacCallum Ltd	Project Specialist	Maarit Wolfe, Hon.B.Sc
		Laboratory	SGS Canada Inc.
Address	165 Cartwright Ave Toronto, ON M6A 1V5. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	M. Alam	Telephone	705-652-2000
Telephone	416-785-5110	Facsimile	705-652-6365
Facsimile	416-785-5120	Email	Maarit.Wolfe@sgs.com
Email	starafder@petomaccallum.com; malam@petomaccallum.com	SGS Reference	CA40246-SEP22
Project	22TXO30, Barrie	Received	09/28/2022
Order Number		Approved	10/03/2022
Samples	Soil (3)	Report Number	CA40246-SEP22 R
		Date Reported	10/03/2022

COMMENTS

CCME Method Compliance: Analyses were conducted using analytical procedures that comply with the Reference Method for the CWS for Petroleum Hydrocarbons in Soil and have been validated for use at the SGS laboratory, Lakefield, ON site.

Quality Compliance: Instrument performance / calibration quality criteria were met and extraction and analysis limits for holding times were met.

nC6 and nC10 response factors within 30% of response factor for toluene: YES

nC10, nC16 and nC34 response factors within 10% of the average response for the three compounds: YES

C50 response factors within 70% of nC10 + nC16 + nC34 average: YES

Linearity is within 15%: YES

Temperature of Sample upon Receipt: 8 degrees C

Cooling Agent Present:Yes

Custody Seal Present:Yes

Chain of Custody Number:022970

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

FINAL REPORT

CA40246-SEP22 R

Client: Peto MacCallum Ltd
Project: 22TXO30, Barrie
Project Manager: M. Alam
Samplers: Nikolas Garland

MATRIX: SOIL

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

Sample Number				8	9	10
Sample Name				BH1, SS2	BH2, SS3	BH4, SS3
Sample Matrix				Soil	Soil	Soil
Sample Date				23/09/2022	23/09/2022	23/09/2022
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Hydrides						
Antimony	µg/g	0.8	1.3	< 0.8	< 0.8	< 0.8
Arsenic	µg/g	0.5	18	0.8	0.5	1.1
Selenium	µg/g	0.7	1.5	< 0.7	< 0.7	< 0.7
Metals and Inorganics						
Moisture Content	%	no		3.8	4.0	3.5
Barium	µg/g	0.1	220	18	14	43
Beryllium	µg/g	0.02	2.5	0.11	0.09	0.15
Boron	µg/g	1	36	2	1	2
Cadmium	µg/g	0.05	1.2	< 0.05	< 0.05	< 0.05
Chromium	µg/g	0.5	70	6.3	5.9	9.3
Cobalt	µg/g	0.01	21	1.7	1.5	2.8
Copper	µg/g	0.1	92	3.5	1.8	7.0
Lead	µg/g	0.1	120	2.6	1.2	5.0
Molybdenum	µg/g	0.1	2	< 0.1	< 0.1	0.4
Nickel	µg/g	0.5	82	3.3	2.7	5.8
Silver	µg/g	0.05	0.5	< 0.05	< 0.05	< 0.05
Thallium	µg/g	0.02	1	< 0.02	< 0.02	< 0.02
Uranium	µg/g	0.002	2.5	0.17	0.20	0.28
Vanadium	µg/g	3	86	11	13	17
Zinc	µg/g	0.7	290	9.4	6.4	15
Water Soluble Boron	µg/g	0.5		---	< 0.5	---

Client: Peto MacCallum Ltd
Project: 22TXO30, Barrie
Project Manager: M. Alam
Samplers: Nikolas Garland

MATRIX: SOIL

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	8	9	10
			Sample Name	BH1, SS2	BH2, SS3	BH4, SS3
			Sample Matrix	Soil	Soil	Soil
			Sample Date	23/09/2022	23/09/2022	23/09/2022
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**
Other (ORP)						
Mercury	ug/g	0.05	0.27	---	< 0.05	---
Sodium Adsorption Ratio	No unit	0.2	2.4	< 0.2	0.6	< 0.2
SAR Calcium	mg/L	0.2		11.0	15.5	16.2
SAR Magnesium	mg/L	0.3		0.6	0.6	0.7
SAR Sodium	mg/L	0.1		1.2	8.7	3.0
Conductivity	mS/cm	0.002	0.57	0.10	0.11	0.10
pH	pH Units	0.05		7.95	7.82	7.92
Chromium VI	µg/g	0.2	0.66	---	< 0.2	---
Free Cyanide	µg/g	0.05	0.051	---	< 0.05	---

EXCEEDANCE SUMMARY

No exceedances are present above the regulatory limit(s) indicated

QC SUMMARY

Conductivity

Method: EPA 6010/SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0580-SEP22	mS/cm	0.002	<0.002	3	10	99	90	110	NA		
Conductivity	EWL0623-SEP22	mS/cm	0.002	<0.002	2	10	99	90	110	NA		

Cyanide by SFA

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Free Cyanide	SKA5104-SEP22	µg/g	0.05	<0.05	ND	20	104	80	120	98	75	125

Hexavalent Chromium by SFA

Method: EPA218.6/EPA3060A | Internal ref.: ME-CA-[ENV]SKA-LAK-AN-012

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chromium VI	SKA5113-SEP22	ug/g	0.2	<0.2	ND	20	103	80	120	100	75	125

QC SUMMARY

Mercury by CVAAS

Method: EPA 7471A/EPA 245 | Internal ref.: ME-CA-IENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury	EMS0264-SEP22	ug/g	0.05	<0.05	ND	20	93	80	120	95	70	130

Metals in aqueous samples - ICP-OES

Method: MOE 4696e01/EPA 6010 | Internal ref.: ME-CA-IENVISPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
SAR Calcium	ESG0075-SEP22	mg/L	0.2	<0.09	3	20	105	80	120	96	70	130
SAR Magnesium	ESG0075-SEP22	mg/L	0.3	<0.02	3	20	105	80	120	95	70	130
SAR Sodium	ESG0075-SEP22	mg/L	0.1	<0.15	4	20	109	80	120	92	70	130
SAR Calcium	ESG0078-SEP22	mg/L	0.2	<0.09	1	20	106	80	120	98	70	130
SAR Magnesium	ESG0078-SEP22	mg/L	0.3	<0.02	6	20	106	80	120	99	70	130
SAR Sodium	ESG0078-SEP22	mg/L	0.1	<0.15	1	20	97	80	120	92	70	130

QC SUMMARY

Metals in Soil - Aqua-regia/ICP-MS

Method: EPA 3050/EPA 200.8 | Internal ref.: ME-CA-[ENVISPE-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver	EMS0264-SEP22	ug/g	0.05	<0.05	ND	20	94	70	130	107	70	130
Arsenic	EMS0264-SEP22	µg/g	0.5	<0.5	14	20	103	70	130	93	70	130
Barium	EMS0264-SEP22	ug/g	0.1	<0.1	14	20	107	70	130	76	70	130
Beryllium	EMS0264-SEP22	µg/g	0.02	<0.02	4	20	97	70	130	82	70	130
Boron	EMS0264-SEP22	µg/g	1	<1	2	20	94	70	130	73	70	130
Cadmium	EMS0264-SEP22	ug/g	0.05	<0.05	ND	20	96	70	130	93	70	130
Cobalt	EMS0264-SEP22	µg/g	0.01	<0.01	3	20	99	70	130	105	70	130
Chromium	EMS0264-SEP22	µg/g	0.5	<0.5	2	20	98	70	130	101	70	130
Copper	EMS0264-SEP22	µg/g	0.1	<0.1	7	20	95	70	130	99	70	130
Molybdenum	EMS0264-SEP22	µg/g	0.1	<0.1	ND	20	90	70	130	106	70	130
Nickel	EMS0264-SEP22	ug/g	0.5	<0.5	9	20	98	70	130	105	70	130
Lead	EMS0264-SEP22	µg/g	0.1	<0.1	5	20	105	70	130	91	70	130
Antimony	EMS0264-SEP22	µg/g	0.8	<0.8	ND	20	103	70	130	92	70	130
Selenium	EMS0264-SEP22	µg/g	0.7	<0.7	ND	20	106	70	130	97	70	130
Thallium	EMS0264-SEP22	µg/g	0.02	<0.02	ND	20	96	70	130	87	70	130
Uranium	EMS0264-SEP22	µg/g	0.002	<0.002	11	20	99	70	130	95	70	130
Vanadium	EMS0264-SEP22	µg/g	3	<3	6	20	98	70	130	103	70	130
Zinc	EMS0264-SEP22	µg/g	0.7	<0.7	10	20	101	70	130	101	70	130

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	ARD0127-SEP22	pH Units	0.05		0	20	100	80	120			
pH	ARD0136-SEP22	pH Units	0.05		0	20	100	80	120			

Water Soluble Boron

Method: O.Reg. 15 3/04 I Internal ref.: ME-CA-[ENV] SPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Water Soluble Boron	ESG0072-SEP22	µg/g	0.5	<0.5	ND	20	104	80	120	99	70	130

QC SUMMARY

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

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

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

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

CA-40247-SEP-22
CA-40246-SEP-22
~~CA-40~~ No. ~~029370~~ Page of

~~CA-40...-SEP-22~~

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

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

Laboratory Information Section - Lab use only

Received By: Majeed Almandalawi
Received Date: SEP 2 8 2022 (mm/dd/yy)
Received Time: 11:00 (hr : min)
Received By (signature): Majeed Almandalawi
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Icepack
Temperature Upon Receipt (°C): 8, 8, 8
LAB LIMS #: CA

REPORT INFORMATION

Company: PETO MACCALLUM.COM
Contact: M. Alawi/S. Tarafder
Address: 165 CARTWRIGHT TORONTO, ONT
Phone: 416 785 5110
Fax:
Email: starafder@petomaccallum.com; malawi@petomaccallum.com

INVOICE INFORMATION

☐ (same as Report Information)
Company: Peto MacCallum Ltd
Contact: Niklas Gardlund
Address: 19 Churchill Dr, Barrie, ON
Phone: 705-734-3900
Email: ngardlund@petomaccallum.com

Quotation #: PML RATE
P.O. #:
Project #: 22TX030
Site Location/ID: BARRIE

TURNAROUND TIME (TAT) REQUIRED

☐ Regular TAT (5-7days)

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

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

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

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

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☑ Table 1 ☑ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ___ Appx. ___
Soil Volume ☐ <350m3 ☐ >350m3

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

Sewer By-Law: ☐ Sanitary ☐ Storm Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

#	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics	M & I: Full Metals Suite	M & I: ICP Metals only	SVOC: PAHs only	SVOC: SVOCs	PCB: PCBs	PHC: F1-F4 + BTEX	PHC: F1-F4 only	VOC: VOCs	VOC: BTEX only	Pest: Pesticides	Other: PH, EC, SAR	Other: CORROSIVITY	Other	Other	Other	Sewer Use	Water Characterization Pkg	SPLP	TCLP	COMMENTS
1	BH1, SS2	09/23		1	SOIL				✓									✓									
2	BH2, SS3	"		1	"		✓																				
3	BH4, SS3	"		1	"				✓									✓									
4	BH5, SS4	"		2	"														✓								
5	BH2, SS4	"		2	"														✓								
6	BH3, SS3	"		2	"														✓								
7																											
8																											
9																											
10																											
11																											
12																											

Observations/Comments/Special Instructions

Sampled By (NAME): Niklas Gardlund Signature: N Gardlund Date: 09/23/2022 (mm/dd/yy) Pink Copy - Client

Relinquished by (NAME): Signature: Date: / / (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.5
Date of Issue: 11 June 2021

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0659-SEP22	µg/g	0.4	<0.4	0	35	105	80	120	105	75	125
Sulphate	DIO0659-SEP22	µg/g	0.4	<0.4	10	35	96	80	120	94	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide (Na2CO3)	ECS0001-OCT22	%	0.04	< 0.04	ND	20	106	80	120			

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0615-SEP22	uS/cm	2	< 2	0	20	98	90	110	NA		

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0615-SEP22	pH Units	0.05	NA	0		100			NA		

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

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

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

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

CA-40247-SEP-22
CA-40246-SEP-22

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: ~~CA-40247-SEP-22~~ CA-40246-SEP-22 Page ___ of ___

Laboratory Information Section - Lab use only

Received By: Majed Hmandalawi
Received Date: SEP 28 2022 (mm/dd/yy)
Received Time: 11:10 (hr : min)
Received By (signature): Majed Hmandalawi
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Icepack
Temperature Upon Receipt (°C): 8 & 8.2
LAB LIMS #: CA

REPORT INFORMATION

Company: PETO MACCALLUM LTD
Contact: M. Alawis, Tara7der
Address: 165 CARTWRIGHT AVE TORONTO, ONT
Phone: 416 785 5110
Fax:
Email: tara7der@petomaccallum.com; malawi@petomaccallum.com

INVOICE INFORMATION

☐ (same as Report Information)
Company: Peto MacCallum Ltd
Contact: Niklas Gardlund
Address: 19 Churchill Dr, Barrie, ON
Phone: 705-734-3900
Email: ngardlund@petomaccallum.com

Quotation #: PML RATE
Project #: 22TX030
P.O. #:
Site Location/ID: BARRIE

TURNAROUND TIME (TAT) REQUIRED

☐ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends, TAT begins next business day
RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION
Specify Due Date: ___
*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☑ Table 1 ☑ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ___ Appx. ___
Soil Volume ☐ <350m3 ☐ >350m3

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

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M&I: Metals & Inorganics	M&I: Full Metals Suite	M&I: ICP Metals only	SVOC: PAHs only	SVOC: SVOCs	PCB: PCBs	PHC: F1-F4 + BTEX	PHC: F1-F4 only	VOC: VOCs	VOC: BTEX only	Pest: Pesticides	Other: PH, EC, SAR	Other: CORROSIVITY	SPLP: Specify tests	TCLP: Specify tests	COMMENTS:
1	BH1, SS2	09/23		1	SOIL				✓									✓				
2	BH2, SS3	"		1	"		✓											✓				
3	BH4, SS3	"		1	"				✓									✓				
4	BH5, SS4	"		1	"														✓			
5	BH 2, SS 4	"		2	"														✓			
6	BH 3, SS 3	"		2	"														✓			
7																						
8																						
9																						
10																						
11																						
12																						

Observations/Comments/Special Instructions

Sampled By (NAME): Niklas Gardlund
Signature: N Gardlund
Date: 09, 23, 2022 (mm/dd/yy)
Pink Copy - Client

Relinquished by (NAME):
Signature:
Date: / / (mm/dd/yy)
Yellow & White Copy - SGS

Revision # 1.5
Date of Issue: 11 June 2021