**PDF – A18 COPY OF THE GEOTECHNICAL REPORT, DATED JULY 9, 2019, REF: 8964-001, PREPARED BY CAMBIUM INC.**

# Geotechnical Investigation Report - 5329 Old Brock Road, Pickering, Ontario

2019-07-09

Prepared for:
1972229 Ontario Ltd.

 Reference No.: 8964-001

**CAMBIUM INC.**
866.217.7900
cambium-inc.com

**Peterborough | Barrie | Oshawa | Kingston**

# Table of Contents

## List of Embedded Tables



## List of Appended Figures



## List of Appendices

# 1.0 INTRODUCTION

Cambium Inc. (Cambium) was retained by 1972229 Ontario Ltd. (Client) to complete a geotechnical investigation in support of the design and construction of a metal fabricated storage barn and a trailer office located at 5329 Old Brock Road in Pickering, Ontario (Site).

The Site is located approximately 100 m north of the CP rail line within Hamlet of Claremont, Pickering. The purpose of this geotechnical investigation was to obtain information about the subsurface conditions by means of a number of boreholes and based on the findings provide recommendations pertaining to the geotechnical design of the proposed structure and facilities. This report presents the methodology and findings of the geotechnical investigation at the Site and addresses requirements and constraints for the design and construction of the proposed structure and facilities.

# 2.0 METHODOLOGY

## 2.1 Borehole Investigation

Cambium completed a geotechnical investigation at the Site on June 20, 2019. A total of Four (4) boreholes, designated as BH (MW)101-19 through BH (MW)104-19, were advanced into the subsurface at predetermined locations throughout the Site. One (1) borehole (BH (MW)102-19) was terminated at depths of 6.5 m below ground surface (mgs). The other Three (3) boreholes were terminated at 5.0 mbgs. The location of the boreholes was obtained from a handheld GPS unit while the elevation of the boreholes was surveyed relative to BM (culvert at the entrance of the property as benchmark). The elevation of the top of culvert at inlet side is having a geodetic elevation of 270.53 masl according to the survey plan provided by the client. A Site Plan, including borehole locations and benchmark is appended as Figure 1 of this report.

Drilling and sampling was completed using a track-mounted drill rig operating under the supervision of a Cambium technician. The boreholes were advanced to the sampling depths by means of continuous flight solid or hollow stem augers with 50 mm O.D. split spoon samplers. Standard Penetration Test (SPT) N values were recorded for the sampled intervals as the number of blows required to drive a split spoon sampler 305 mm into the soil, using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. The SPT N values are used in this report to assess consistency of cohesive soils and relative density of non-cohesive materials. Soil samples were collected at approximately 0.75 m intervals in the upper 3.0 m depth and in 1.5 m intervals below 3.0 m depth. The encountered soil units were logged in the field using visual and tactile methods, and samples were placed in labelled plastic bags for transport, future reference, possible laboratory testing, and storage.

Open boreholes were checked for groundwater and general stability prior to backfilling. Borehole BH101-19, BH102-19 and BH104-19 were outfitted as monitoring wells in order to understand the groundwater conditions at the site. All other boreholes were backfilled and sealed in accordance with Ontario Regulation (O.Reg.) 903, as amended, and the property was reinstated to pre-existing conditions.

Borehole logs are provided in Appendix A. Site soil and groundwater conditions are described and geotechnical recommendations are discussed in the following sections of this report.

## 2.2 Physical Laboratory Testing

Physical laboratory testing, including Three (3) particle size distribution analyses (LS-702,705), was completed on selected soil samples to confirm textural classification and to assess geotechnical parameters. Moisture content testing was completed on all soil samples. Testing results are presented in Appendix B and are discussed in Section 3.0.

# 3.0 SUBSURFACE CONDITIONS

The detailed soil profiles encountered in the boreholes are indicated on the attached borehole logs in Appendix A. It should be noted that the conditions indicated on the borehole logs are for specific locations only, and can vary between and beyond the borehole locations. It should be also noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones and should not be interpreted as exact planes of geological change. In addition, the descriptions provided in the borehole logs are inferred from a variety of factors, including: visual observations of the soil samples retrieved, laboratory testing, measurements prior to and after drilling, and the drilling process itself (speed of drilling, shaking/grinding of the augers, etc.).

Based on the results of the borehole investigation, subsurface conditions at the Site generally consist of silty sand overlying deposits of sandy silt till materials. Bedrock was not encountered during the investigation.

## 3.1 Silty Sand

A layer of silty sand was found in all boreholes, the thickness of the silty sand deposit was between 0.6 m to 1.2 m. Standard Penetration Test (SPT) “N”-values measured within the silty sand ranged from 2 blows to over 25 blows per 0.3 m of penetration, and as such, the compactness of the silty sand deposit ranges from very loose to compact. The natural water content of the silty sand deposit ranges from 9.3% to 21.8%.

A laboratory particle size distribution analysis was completed for one (1) sample of the silty sand material, taken from a depth of between 0.8 mbgs and 1.2 mbgs. The analysis results are summarized in Table 1 and provided in Appendix B.

***Table 1 Particle Size Distribution Analysis – Silty Sand***

| Borehole | Depth (mbgs) | Soil | % Gravel | % Sand | % Silt | % Clay | % Moisture Content |
|---|---|---|---|---|---|---|---|
| BH104-19-SS2 | 0.8 – 1.2 | Silty Sand, some Gravel, some Clay | 13 | 52 | 22 | 12 | 16.8 |

## 3.2 Sandy Silt Till

Beneath the silty sand, a layer of sandy silt was encountered at all boreholes at a depth of 0.6 to 1.2 mbgs and extended to the depth of borehole termination between 5.0 mbgs to 6.5 mbgs. The texture of this light brown native till was predominantly sandy silt with trace gravel and some clay.

This soil was encountered in a damp to moist in-situ condition with moisture contents varying from 12.2% to 22.6% and loose to compact relative density based on SPT N values between 8 and 22 per 0.3 m of penetration.

Laboratory particle size distribution analyses were completed for two (2) samples of the native sandy silt material, taken from a depth of between 1.5 mbgs to 2.7 mbgs. The analysis results are summarized in Table 2 and provided in Appendix B.

***Table 2 Particle Size Distribution Analysis – Sandy Silt***

| Borehole | Depth (mbgs) | Soil | % Gravel | % Sand | % Silt | % Clay | % Moisture Content |
|---|---|---|---|---|---|---|---|
| BH102-19-SS3 | 1.5 – 2.0 | Sandy Silt some Clay trace Gravel | 6 | 32 | 46 | 16 | 11.8 |
| BH101-19-SS4 | 2.3 – 2.7 | Sandy Silt some Clay trace Gravel | 5 | 29 | 54 | 12 | 12.7 |

## 3.3 Bedrock

No bedrock was encountered during the course of this investigation.

## 3.4 Groundwater

All boreholes were found to have some groundwater seepage upon completion excluding. The water elevations were measured on completion of drilling and prior to backfill. During drilling, short-term groundwater table was found at depths of 1.0 m to 3.4 m below the existing grade as listed on Table 3 below. The stabilized groundwater levels observed in the monitoring wells on June 24, 2019 were at depth ranging from 0.70 mbgs to 0.84 mbgs, corresponding to Elevations from 269.3 m to 269.9 m, as listed on Table 3. It should be noted that the groundwater levels at the site may fluctuate seasonally and in response to climatic events.

***Table 3 Groundwater Levels Observed in Boreholes***

| Borehole | Date of Drilling | Date of Observation | Depth of Groundwater (mbgs) | Notes |
|---|---|---|---|---|
| MW101-19 | June 20, 2019 | June 20, 2019<br>June 24, 2019 | 2.4<br>0.84 | During drilling<br>Monitoring Well |
| MW102-19 | June 20, 2019 | June 20, 2019<br>June 24, 2019 | 3.4<br>0.70 | During drilling<br>Monitoring Well |
| BH103-19 | June 20, 2019 | June 20, 2019 | 1.8 | During drilling |
| MW104-19 | June 20, 2019 | June 20, 2019<br>June 24, 2019 | 1.0<br>0.84 | During drilling<br>Monitoring Well |

# 4.0 GEOTECHNICAL CONSIDERATIONS

The following recommendations are based on the borehole information and are intended to assist designers. Recommendations should not be construed as providing instructions to contractors, who should form their own opinions about site conditions. It is possible that subsurface conditions beyond the borehole locations may vary from those observed. If significant variations are found before or during construction, Cambium should be contacted so that we can reassess our findings, if necessary.

## 4.1 General Site Preparation

Although no boreholes were advanced in vegetated area during this investigation. The existing site vegetation, surficial topsoil/organics materials and other near surface soils containing significant amounts of organic matter are not considered to be suitable for the subgrade support of building foundations, floor slabs, or other settlement sensitive structures or engineered fill materials that support these structures. The non-organic granular fill material however can be excavated and stockpiled on Site for reuse as backfill for trenches and site grading.

Based on the recommended excavation depths for the foundation area, the subgrade material is expected to consist of loose to compact sandy silt material. The native subgrade at the base of the trenches should be inspected by a Geotechnical Engineer and proof rolled prior to backfilling.

In areas of cut or minor fill where the proof roll and/ or inspection has identified unsuitable subgrade conditions, whether too soft or too wet, material is to be removed and replaced with an approved OPSS 1010 SSM or Granular ‘B’ Type I compacted material, under guidance of Cambium Staff.

## 4.2 Frost Penetration

Based on the Ontario Provincial Standard Drawing (OPSD) 3090.101, the typical frost penetration depth for the proposed structure is expected to be approximately 1.4 mbgs.

Footings for the proposed structure should be situated at or below this depth for frost penetration or should be protected. If construction is carried out during the winter months, all footing locations where excavated soils become exposed to potential frost penetration should be poured within the day to prevent potential future settlements. If the footings cannot be poured within the same day the soils are excavated, the surface should be covered with thermal insulation equivalent to 1.4 m of soil cover to prevent potential freezing of the frost susceptible soils at the Site.

It is assumed that any pavement structure thickness will be less than 1.4 m; therefore, grading and drainage are important for good pavement performance and life expectancy. Any utilities should be located below this depth or be appropriately insulated.

## 4.3 Excavations

Temporary excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). As per the OHSA, excavations less than 1.2 m deep can have unsupported vertical walls. Areas of compact to dense soils encountered above the groundwater table may be generally be classified as Type 3 soils in accordance with OHSA, with unsupported side slopes no steeper than 1H:1V to the bottom of the excavation.

Excavation side slopes should be protected from exposure to precipitation and associated ground surface runoff and should be inspected regularly for signs of instability. If localized instability is noted during excavations or if wet conditions are encountered, the side slopes should be flattened as required to maintain safe working conditions or excavation sidewalls must be fully supported (shored).

## 4.4 Dewatering

As discussed in previous section, groundwater was observed on monitoring well at a depth between 0.7 mbgs and 0.84 mbgs. It should be noted that the groundwater table is influenced by seasonal fluctuations and major precipitation events.

It is understood the proposed development will not involved large or deep excavations. Overall, minor groundwater seepage may be anticipated during typical excavations and any

groundwater seepage that is encountered should be controllable with filtered sumps and pumps. Registration on the Environmental Activity and Sector Registry (EASR) or a Permit to Take Water (PTTW) is likely not required from the Ministry of the Environment Conservation and Parks (MOECP) as pumping rates should not exceed 50,000 L/day or 400,000 L/day respectively. Large open excavations or excavations extending significantly below the groundwater table will experience a larger volume of groundwater seepage and may require more advanced dewatering efforts.

## 4.5 Backfill and Compaction

Excavated non-organic fill and native sand and silt soils from the site may be appropriate for use as fill below grading and parking areas, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities. Some moisture content adjustments may be required depending on seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Engineered fill for foundations should consist of free-draining granular material meeting the specifications of OPSS 1010 Granular B or an approved equivalent, and should be placed in maximum 200 mm thick lifts compacted to a minimum of 100 percent standard Proctor maximum dry density (SPMDD) as confirmed by nuclear densometer testing. Foundation wall backfill should consist of imported free-draining granular material meeting the specifications for OPSS Granular B, or an approved equivalent, compacted to 98 percent SPMDD, taking care to keep heavy compaction equipment from damaging the walls.

The backfill material, if any, in the upper 300 mm below the pavement subgrade elevation should be compacted to 100 percent SPMDD in all areas.

## 4.6 Foundation Design

If the Site is prepared as outlined in Section 4.1, the native sandy silt soil is competent to support the building on conventional strip and spread footings at a minimum depth of 1.4 mbgs. Assuming any new exterior footings will be placed a minimum of 1.4 m below final

adjacent grade for frost protection, these footings can be founded on compact native sandy silt material at depth. Conventional spread and strip footings foundations for lightly structures on the competent native soils may be designed using a factored geotechnical resistance at Ultimate Limit States (ULS) of 125 kPa and a geotechnical resistance at Serviceability Limit States (SLS) of 75 kPa (assuming 25 mm total and 19 mm differential of settlement).

If a higher allowable bearing capacity than that outlined above is required, it may be achievable at a greater depth.

The quality of the subgrade should be inspected by Cambium during construction, prior to constructing the footings and placing engineered fill, to confirm bearing capacity estimates. Engineered fill should be placed and compacted as discussed in Section 4.5.

## 4.7 Floor Slabs

The floor slabs for the proposed structures may be constructed using conventional concrete poured slab techniques, following removal of soft soils otherwise deleterious soils and preparation of the subgrade as outlined in Section 4.1. To create a stable working surface, to distribute loadings, and for drainage purposes, the floor slabs should be constructed on a minimum of 200 mm of OPSS 1010 Granular A compacted to 98% of SPMDD.

## 4.8 Buried Utilities

Trench excavations should generally consider Type 3 soil conditions which require side slopes no steeper than 1H:1V to the bottom of the excavation. Where very loose or very soft to soft soils are encountered during excavations, trench slopes should generally consider Type 4 soil conditions which require side slopes no steeper than 3H:1V to the bottom of the excavation. The bedding and cover material for any buried utilities should consist of OPSS 1010 Granular A or B Type II, placed in accordance with pertinent Ontario Provincial Standard Drawings (OPSD 802.013). The bedding and cover material shall be placed in maximum 200 mm thick lifts and should be compacted to at least 98% of SPMDD. The cover material shall be a minimum of 300 mm over the top of the pipe and compacted to 98% of SPMDD, taking care not to damage the utility pipes during compaction.

If wet or saturated conditions exist within any utility excavation, consideration should be given to using 19 mm diameter crushed clear stone wrapped in a geotextile filter fabric as pipe bedding.

## 4.9 Design Review and Inspections

Cambium should be contacted to review and approve design drawings, prior to tendering or commencing construction, to ensure that all pertinent geotechnical-related factors have been addressed.

Cambium should be retained to complete testing and inspections during construction operations to examine and approve subgrade conditions, placement and compaction of fill materials, granular base courses, and asphaltic concrete.

## 5.0 CLOSING

Please note that this report is governed by the attached qualifications and limitations. If you have questions or comments regarding this document, please do not hesitate to contact the undersigned at 905-725-6280.

**Cambium Inc.**

Zhaochang Luo, M.Eng., P.Eng.
Project Manager – Geotechnical

Stuart Baird, M.Eng., P.Eng.
General Manager - Geotechnical

*ZL/seb*

*P:\8900 to 8999\8964-001 Grant Morris Associates Ltd. - Geo-Environmental Studies - 5329 Old Brock Road\Deliverables\REPORT - Geotech\Draft\2019-07-08 RPT Geotech 5329 Old Brock Rd, Pickering.docx*

## *Qualifications and Limitations*

*Limited Warranty*

*In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis; Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.*

*Reliance on Materials and Information*

*The findings and results presented in reports prepared by Cambium are based on the materials and information provided by the client to Cambium and on the facts, conditions and circumstances encountered by Cambium during the performance of the work requested by the client. In formulating its findings and results into a report, Cambium assumes that the information and materials provided by the client or obtained by Cambium from the client or otherwise are factual, accurate and represent a true depiction of the circumstances that exist. Cambium relies on its client to inform Cambium if there are changes to any such information and materials. Cambium does not review, analyze or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Cambium will not be responsible for matters arising from incomplete, incorrect or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Cambium during the provision of services, work or reports.*

*Facts, conditions, information and circumstances may vary with time and locations and Cambium's work is based on a review of such matters as they existed at the particular time and location indicated in its reports. No assurance is made by Cambium that the facts, conditions, information, circumstances or any underlying assumptions made by Cambium in connection with the work performed will not change after the work is completed and a report is submitted. If any such changes occur or additional information is obtained, Cambium should be advised and requested to consider if the changes or additional information affect its findings or results.*

*When preparing reports, Cambium considers applicable legislation, regulations, governmental guidelines and policies to the extent they are within its knowledge, but Cambium is not qualified to advise with respect to legal matters. The presentation of information regarding applicable legislation, regulations, governmental guidelines and policies is for information only and is not intended to and should not be interpreted as constituting a legal opinion concerning the work completed or conditions outlined in a report. All legal matters should be reviewed and considered by an appropriately qualified legal practitioner.*

*Site Assessments*

*A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the*

*extent that Cambium 's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.*

*Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.*

*No Reliance*

*Cambium's services, work and reports are provided solely for the exclusive use of the client which has retained the services of Cambium and to which its reports are addressed. Cambium is not responsible for the use of its work or reports by any other party, or for the reliance on, or for any decision which is made by any party using the services or work performed by or a report prepared by Cambium without Cambium's express written consent. Any party that relies on services or work performed by Cambium or a report prepared by Cambium without Cambium's express written consent, does so at its own risk. No report of Cambium may be disclosed or referred to in any public document without Cambium's express prior written consent. Cambium specifically disclaims any liability or responsibility to any such party for any loss, damage, expense, fine, penalty or other such thing which may arise or result from the use of any information, recommendation or other matter arising from the services, work or reports provided by Cambium .*

*Limitation of Liability*

*Cambium is not responsible for any lost revenues, lost profits, cost of capital, or any special, indirect, consequential or punitive damages suffered by the client or any other party in reliance on any Cambium work or report. Cambium's total liability and responsibility to the client or any other person for any and all losses, costs, expenses, damages, claims, causes of action or other liability whatsoever which do or may result or arise from or be in relation to Cambium's services, work (or failure to perform services or work) or reports shall be limited to the invoiced charges for the work performed by Cambium.*

# Appended Figures

# GEOTECHNICAL INVESTIGATION - 5329 OLD BROCK ROAD

GRANT MORRIS ASSOCIATES LTD.
5329 Old Brock Road,
Pickering, Ontario


**LEGEND**

- Borehole
- Benchmark
- Monitoring Well
- Subject Property

**Notes:**
- Base mapping features were obtained from Google Earth 2018 imagery, retrieved June 2019.
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

**Benchmarks:**
BM1 - The top edge of a culvert located at the northern end of the driveway, adjacent to Old Brock Road.


CAMBIUM
P.O. Box 325, 52 Hunter Street East
Peterborough, Ontario, K9H 1G5
Tel: (705) 742.7900 Fax: (705) 742.7907
www.cambium-inc.com


## BOREHOLE LOCATION PLAN

| | | | |
|---|---|---|---|
| Project No.: | 8964-001 | Date: | June 2019 |
| | | Rev.: | |
| Scale: | 1:750 | Projection: | NAD 1983 UTM Zone 17N |
| Created by: | MAT | Checked by: | ZL |
| Figure: | 1 | | |

O:\GIS\project_MXDs\8900 to 8999\8964-001 Grant Morris Associates Ltd. - Geo-Environmental Studies - 5329 Old Brock Road\2019-06-26 FIG 1 Borehole Location Plan.mxd

# Appendix A
# Borehole Logs

Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

# Log of Borehole: MW101-19



| | | | | | |
|---|---|---|---|---|---|
| **Client:** | 1972229 Ontario Ltd. | **Project Name:** | Geo-Environmental Studies | **Project No.:** | 8964-001 |
| **Contractor:** | Drilltech | **Method:** | Solid Stem Auger | **Date Completed:** | June 20, 2019 |
| **Location:** | 5329 Old Brock Road, Pickering | **UTM:** | 17T 649875 m E 4871967 m N | **Elevation:** | 270.730 masl |

| SUBSURFACE PROFILE | | | SAMPLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) / DCPT | % Moisture (25 50 75) | SPT (N) / DCPT (10 20 30 40) | Well Installation | Remarks |
| 271 / 0 | | SILTY SAND: Brown silty sand, some gravel, trace clay, compact | 1 | SS | 70 | 9 | | | | |
| 270 / 1 | | SANDY SILT: Light brown sandy silt till, trace gravel, some clay, compact | 2 | SS | 100 | 16 | | | PVC Riser; Bentonite Plug | |
| 269 / 2 | | | 3 | SS | 100 | 21 | | | | |
| 268 / 3 | | SANDY SILT: -become grey | 4 | SS | 100 | 17 | | | | : GSA SS4: 5% Gravel 29% Sand 54% Silt 12% Clay |
| 267 / 4 | | | 5 | SS | 75 | 22 | | | Sand Pack; PVC Screen | |
| 266 / 5 | | | 6 | SS | 85 | 13 | | | Cap | Water level at 2.4 mbgs upon completion |
| | | Borehole terminated at 5.0 mbgs in sandy silt till | | | | | | | | |

**Logged By:** P.Ahuja **Input By:** Z. Luo

Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

# Log of Borehole: MW102-19



**Client:** 1972229 Ontario Ltd. **Project Name:** Geo-Environmental Studies **Project No.:** 8964-001

**Contractor:** Drilltech **Method:** Solid Stem Auger **Date Completed:** June 20, 2019

**Location:** 5329 Old Brock Road, Pickering **UTM:** 17T 649896 m E 4871971 m N **Elevation:** 270.630 masl

| Elevation (m) / Depth | Description | Number | Type | % Recovery | SPT (N) / DCPT | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|
| 270 / 0 | SILTY SAND: Brown silty sand, some gravel, trace clay, compact | 1 | SS | 75 | 14 | | |
| 269 / 1 | SANDY SILT: Light brown sandy silt till, trace gravel, some clay, compact | 2 | SS | 60 | 8 | PVC Riser; Bentonite Plug | |
| 268 / 2 | | 3 | SS | 100 | 13 | | : GSA SS3: 6% Gravel 32% Sand 46% Silt 16% Clay |
| 267 / 3 | | 4 | SS | 100 | 12 | | |
| 266 / 4 | SANDY SILT: -become grey | 5 | - | 0 | 10 | | Water level at 3.4 mbgs upon completion |
| 265 / 5 | | 6 | SS | 90 | 9 | Sand Pack; PVC Screen | |
| 264 / 6 | | 7 | SS | 75 | 14 | Cap | |
| 7 | Borehole terminated at 6.5 mbgs in sandy silt till | | | | | | |

% Moisture: 25 50 75

SPT (N) / DCPT: 10 20 30 40

**Logged By:** P.Ahuja **Input By:** Z. Luo

Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

# Log of Borehole: BH103-19



| | | | | | |
|---|---|---|---|---|---|
| **Client:** | 1972229 Ontario Ltd. | **Project Name:** | Geo-Environmental Studies | **Project No.:** | 8964-001 |
| **Contractor:** | Drilltech | **Method:** | Solid Stem Auger | **Date Completed:** | June 20, 2019 |
| **Location:** | 5329 Old Brock Road, Pickering | **UTM:** | 17T 649876 m E 4871956 m N | **Elevation:** | 270.523 masl |

| SUBSURFACE PROFILE | | | SAMPLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) / DCPT | % Moisture (25 50 75) | SPT (N) / DCPT (10 20 30 40) | Well Installation | Remarks |
| 270 / 0 | | SILTY SAND: Brown silty sand, some gravel, trace clay, compact | 1 | SS | 100 | 25 | | | | |
| 269 / 1 | | SANDY SILT: Light brown sandy silt till, trace gravel, some clay, loose to compact | 2 | SS | 100 | 4 | | | | |
| 268 / 2 | | | 3 | SS | 90 | 7 | | | | |
| | | | 4 | SS | 90 | 9 | | | | |
| 267 / 3 | | SANDY SILT: -become grey | 5 | SS | 80 | 17 | | | | |
| 266 / 4 | | | 6 | SS | 80 | 16 | | | | Water level at 1.8 mbgs upon completion |
| 265 / 5 | | Borehole terminated at 5.0 mbgs in sandy silt till | | | | | | | | |

**Logged By:** P.Ahuja **Input By:** Z. Luo

Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

# Log of Borehole: MW104-19



| | | | | | |
|---|---|---|---|---|---|
| **Client:** | 1972229 Ontario Ltd. | **Project Name:** | Geo-Environmental Studies | **Project No.:** | 8964-001 |
| **Contractor:** | Drilltech | **Method:** | Solid Stem Auger | **Date Completed:** | June 20, 2019 |
| **Location:** | 5329 Old Brock Road, Pickering | **UTM:** | 17T 649895 m E 4871955 m N | **Elevation:** | 270.555 masl |

| SUBSURFACE PROFILE | | | SAMPLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) / DCPT | % Moisture (25 50 75) | SPT (N) / DCPT (10 20 30 40) | Well Installation | Remarks |
| 270 / 0 | | SILTY SAND: Brown sand and silt, some gravel, trace clay, compact | 1 | SS | 60 | 10 | | | | |
| 270 / 1 | | | 2 | SS | 75 | 2 | | | PVC Riser; Bentonite Plug | |
| 269 / 2 | | SANDY SILT: Light brown sandy silt till, trace gravel, some clay, very loose to compact | 3 | SS | 90 | 6 | | | | |
| 268 / 3 | | | 4 | SS | 75 | 6 | | | | : GSA SS4: 13% Gravel 52% Sand 22% Silt 12% Clay |
| 267 / 4 | | SANDY SILT: -become grey | 5 | SS | 100 | 9 | | | Sand Pack; PVC Screen | |
| 266 / 5 | | | 6 | SS | 100 | 12 | | | Cap | Water level at 1.0 mbgs upon completion |
| | | Borehole terminated at 5.0 mbgs in sandy silt till | | | | | | | | |

**Logged By:** P.Ahuja **Input By:** Z. Luo

# Appendix B

# Physical Laboratory Testing Results

# Grain Size Distribution Chart

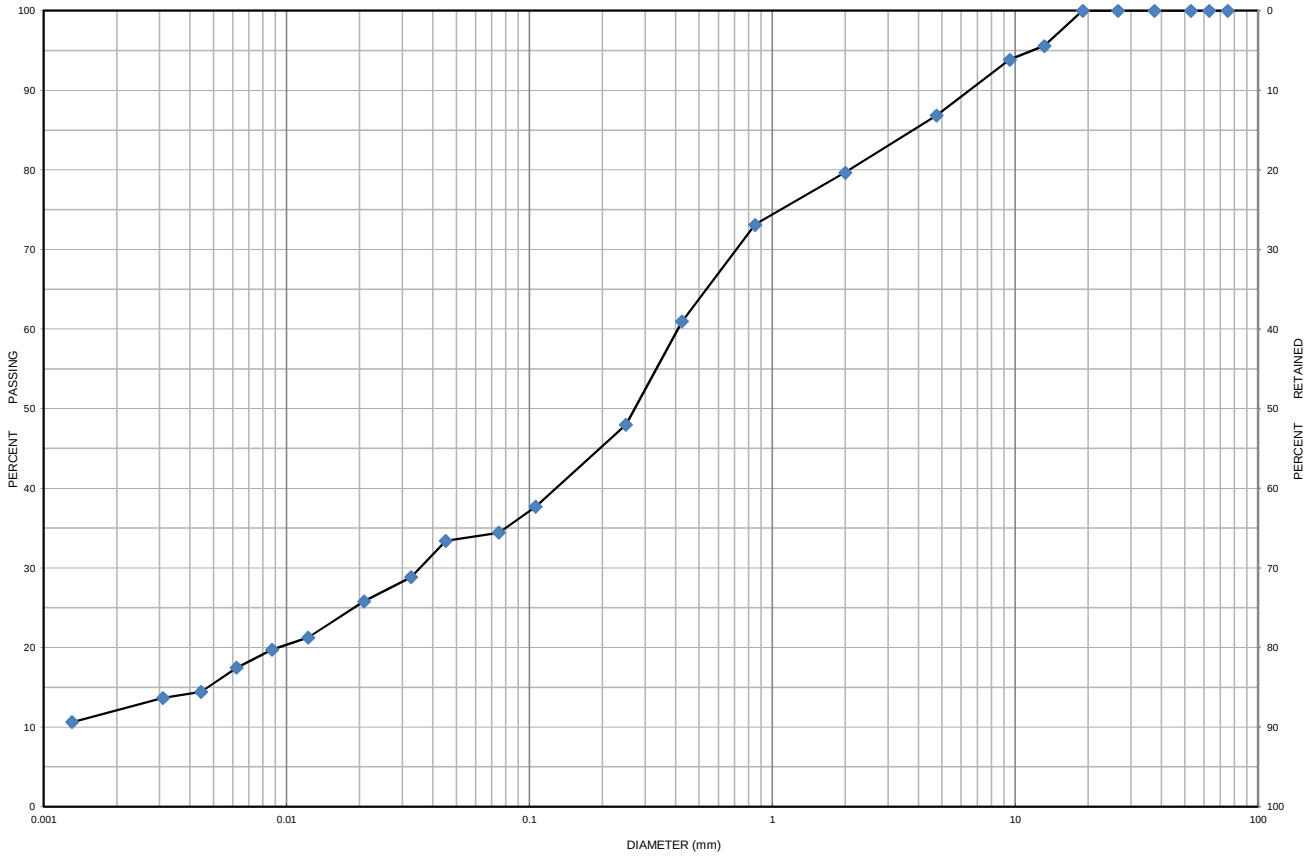
**Project Number:** *8964-001* **Client:** *1972229 Ontario Ltd.*

**Project Name:** *Geo-Environmental Studies - 5329 Old Brock Road*

**Sample Date:** *June 24, 2019* **Sampled By:** *Prateek Ahuja - Cambium Inc.*

**Location:** *BH 104-19 SS 2* **Depth:** *0.8 m to 1.2 m* **Lab Sample No:** *S-19-0462*

| UNIFIED SOIL CLASSIFICATION SYSTEM | | | | | |
|---|---|---|---|---|---|
| CLAY & SILT (<0.075 mm) | SAND (<4.75 mm to 0.075 mm) | | | GRAVEL (>4.75 mm) | |
| | FINE | MEDIUM | COARSE | FINE | COARSE |




| MIT SOIL CLASSIFICATION SYSTEM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLAY | SILT | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | BOULDERS |
| | | SAND | | | GRAVEL | | | |

| Borehole No. | Sample No. | Depth | Gravel | Sand | Silt | Clay | Moisture |
|---|---|---|---|---|---|---|---|
| BH 104-19 | SS 2 | 0.8 m to 1.2 m | 13 | 52 | 34 | | 16.8 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Silty Sand some Gravel some Clay | SM | 0.410 | 0.036 | - | - | - |

*Issued By:* _____ *Date Issued:* *July 8, 2019*

(Senior Project Manager)


**Cambium Inc. (Laboratory)**

866.217.7900 | cambium-inc.com

701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

# Grain Size Distribution Chart

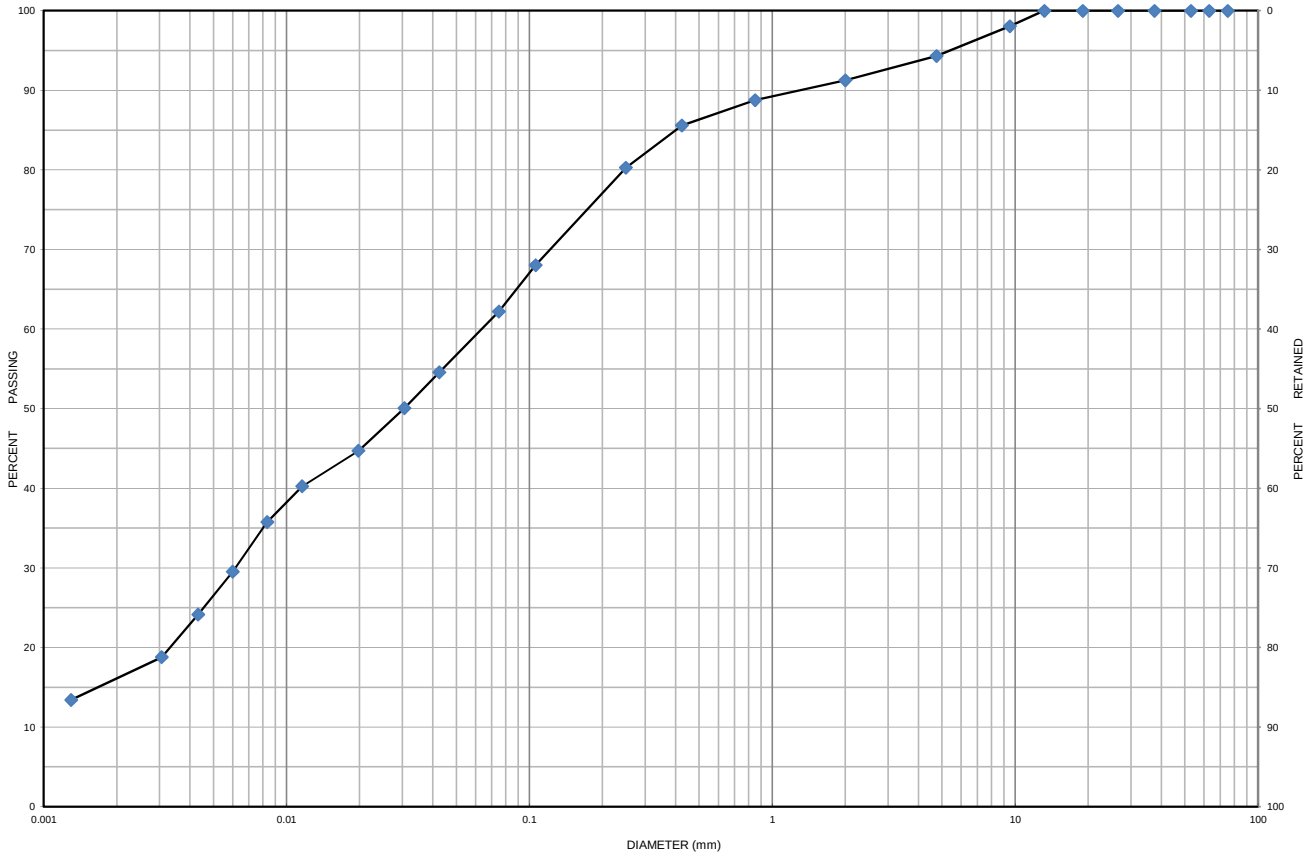
**Project Number:** *8964-001* **Client:** *1972229 Ontario Ltd.*

**Project Name:** *Geo-Environmental Studies - 5329 Old Brock Road*

**Sample Date:** *June 24, 2019* **Sampled By:** *Prateek Ahuja - Cambium Inc.*

**Location:** *BH 102-19 SS 3* **Depth:** *1.5 m to 2 m* **Lab Sample No:** *S-19-0461*

| UNIFIED SOIL CLASSIFICATION SYSTEM | | | | | |
|---|---|---|---|---|---|
| CLAY & SILT (<0.075 mm) | SAND (<4.75 mm to 0.075 mm) | | | GRAVEL (>4.75 mm) | |
| | FINE | MEDIUM | COARSE | FINE | COARSE |




| MIT SOIL CLASSIFICATION SYSTEM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLAY | SILT | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | BOULDERS |
| | | SAND | | | GRAVEL | | | |

| Borehole No. | Sample No. | Depth | Gravel | Sand | Silt | Clay | Moisture |
|---|---|---|---|---|---|---|---|
| BH 102-19 | SS 3 | 1.5 m to 2 m | 6 | 32 | 62 | | 11.8 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Sandy Silt some Clay trace Gravel | ML | 0.064 | 0.0063 | - | - | - |

*Issued By:* _____ *Date Issued:* *July 8, 2019*

(Senior Project Manager)


**Cambium Inc. (Laboratory)**

866.217.7900 | cambium-inc.com

701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

# Grain Size Distribution Chart

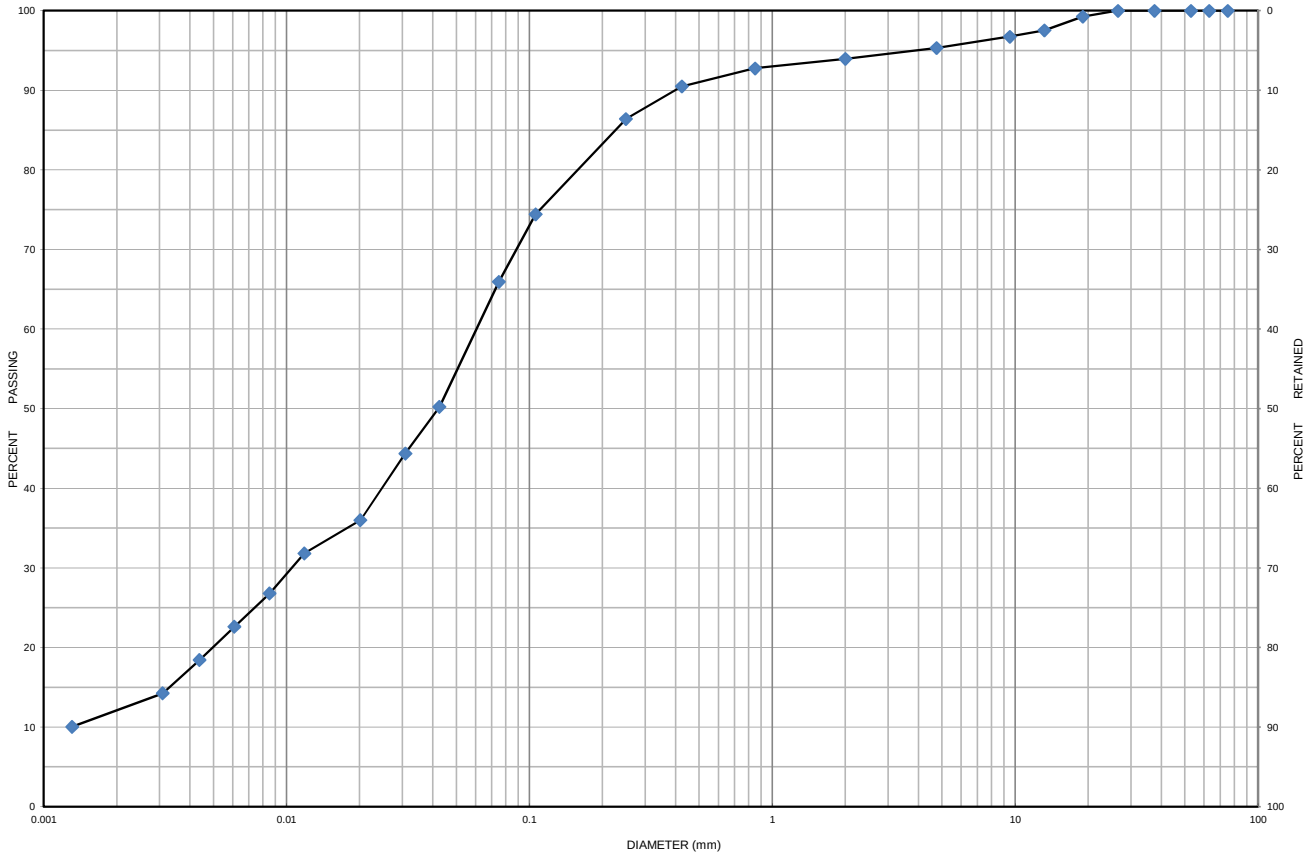
**Project Number:** *8964-001* **Client:** *1972229 Ontario Ltd.*

**Project Name:** *Geo-Environmental Studies - 5329 Old Brock Road*

**Sample Date:** *June 24, 2019* **Sampled By:** *Prateek Ahuja - Cambium Inc.*

**Location:** *BH 101-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-0460*

| UNIFIED SOIL CLASSIFICATION SYSTEM | | | | | |
|---|---|---|---|---|---|
| CLAY & SILT (<0.075 mm) | SAND (<4.75 mm to 0.075 mm) | | | GRAVEL (>4.75 mm) | |
| | FINE | MEDIUM | COARSE | FINE | COARSE |




| MIT SOIL CLASSIFICATION SYSTEM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CLAY | SILT | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | BOULDERS |
| | | SAND | | | GRAVEL | | | |

| Borehole No. | Sample No. | Depth | Gravel | Sand | Silt | Clay | Moisture |
|---|---|---|---|---|---|---|---|
| BH 101-19 | SS 4 | 2.3 m to 2.7 m | 5 | 29 | 66 | | 12.7 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Sandy Silt some Clay trace Gravel | ML | 0.062 | 0.011 | 0.0013 | 47.69 | 1.50 |

*Issued By:* _____ *Date Issued:* *July 8, 2019*

(Senior Project Manager)

**Cambium Inc. (Laboratory)**
866.217.7900 | cambium-inc.com
701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6