Geotechnical Investigation Report Proposed Residential Development, 5868 County Road 65, Port Hope, Ontario

April 5, 2024

Prepared for:
Hillstreet Developments Ltd

Cambium Reference: 15091-002 Rev2

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1.0 Introduction

Cambium Inc. (Cambium) was retained by Hillstreet Developments Ltd. (The Client) to conduct a geotechnical investigation and provide geotechnical engineering design advice for the proposed residential subdivision to be located at the current municipal address of 5868 County Road 65 in Port Hope, Ontario. A Site Location Plan is provided as Figure 1.

This report encompasses the geotechnical findings of this initial investigation on this property. Cambium is also providing Phase One and Phase Two Environmental Site Assessments (ESAs) for this property. The boreholes advanced and described in this investigation were also used for the Phase Two ESA. The results of the ESAs are providing under separate report covers.

1.1 Site Description

The existing site is an irregular shaped parcel of land that fronts on to County Road 65 on the north and east sides. The site is located between the intersection of County Road 65 at Bells Hill Road and about 200 m south of the intersection at Mastwood Road. The site is predominantly farmland that is currently still in use and includes some dense forested areas along the southern and western part of the property. Water features were also identified on the property; however development is not planned for these areas with the exception of a crossing for a proposed roadway.

1.2 The Project

Based on a preliminary draft plans provided to us, dated October 12, 2023, the proposed subdivision will be composed of forty-eight (48) lots which are assumed to include single home residential dwellings. It is assumed that some of the buildings may have up to 1 underground level and be privately serviced.

At the time of writing this report, the finished floor elevations (FFE) were not provided. However, it is anticipated that the site grade will be at or above the elevation of County Road

65, and based on conventional design, that any basements will extend, at most, 1.8 meters below ground surface (mbgs).

2.0 Investigation Methodology

2.1 Field Work

The field investigation involved advancing eleven (11) boreholes across the site from September 22nd to 23rd, 2022. Boreholes BH101-22 through BH110-22 were advanced to a depth of 6.7 mbgs. BH201-22 was advanced at the request of the Phase Two ESA to a depth of 1.5 mbgs. BH101-22 and BH201-22 were advanced in the northern portion of the property, north of the water feature. The remaining boreholes were advanced across the southern part of the property. The locations of the boreholes relative to the existing site conditions are provided on Figure 2. Records of the individual boreholes are provided on the Borehole Logs in Appendix A.

Drilling and sampling was completed using a track mounted drill rig operating under the fulltime supervision of a Cambium technician. The boreholes were advanced to the sampling depths by means of continuous flight stem augers and 50 mm O.D. split spoon samplers. Standard Penetration Test (SPT) results (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.

Borehole samples were inspected and logged in the field using visual and tactile methods. Soil samples were placed in labelled plastic containers for transport and sent to our geotechnical laboratory for review by a senior geotechnical engineer, physical laboratory testing, and temporary storage. Open boreholes were checked for groundwater and stability prior to backfilling and were backfilled in accordance with O.Reg. 903, as amended. Three groundwater monitoring wells were installed in select boreholes (BH101-22, BH107-22, and BH110-22) to measure stabilized groundwater levels.

GPS coordinates of each borehole were obtained using a handheld GPS device. Boreholes were survey using real-time kinematic (RTK) surveying equipment systems referenced to a site benchmark (utility box south of Mastwood Road). The elevations provided in this report are relative to the site benchmark and assumes the benchmark elevation to be 200 m.

2.2 Physical Laboratory Testing

Physical laboratory testing was completed on select soil samples to assess geotechnical parameters. Natural moisture contents were measured for all soil samples (ASTM D2216), and particle size distribution testing and Atterberg index tests were completed on select samples (ASTM D6913, D1140, and D4318). The results are summarized in the respective stratigraphy sections in Section 3.0 and noted on the corresponding borehole logs. Detailed results diagrams of the particle size distribution testing and Atterberg Limits tests are provided in Appendix B.

3.0 Subsurface Conditions

The subsurface soil and groundwater conditions encountered in the boreholes are presented on the attached Borehole Logs in Appendix A. The stratigraphic boundaries indicated on the logs are inferred from non-continuous samples and observations of drilling resistance and typically represent a transition from one soil type to another, sometime gradually. The boundaries should not be interpreted to represent exact planes of geologic change. The subsurface conditions have been confirmed in a series of widely spaced boreholes and will vary between and beyond the borehole locations.

3.1 Stratigraphy

The following stratigraphy is based on the borehole findings, as well as the geotechnical laboratory testing conducted on representative soil samples.

3.1.1 Topsoil

Topsoil was encountered from the surface of all borehole locations. The topsoil thickness varies from 125 to 250 mm.

3.1.2 Upper Sand Deposit

The topsoil at the site is underlain by a native deposit of sand. The upper portion of the deposit extending approximately 0.8 to 1.1 mbgs has been weathered and/or disturbed. The sand deposit was encountered at all borehole locations and is composed grey brown to grey sand with some silt and trace clay. The thickness of the sand deposit, where fully penetrated ranges from 2.1 to 4.8 m. At locations where full penetrated (BH101-22 through BH107-22) the sand deposit extends to depths ranging from 2.7 to 4.9 mbgs. Boreholes BH108-22 through BH110-22 and BH201-22 terminated within the sand deposit at depths of 6.7 mbgs and 1.5 mbgs, respectively.

SPT N-values measured in the undisturbed sand deposit range from a highly variable 3 to 43 blows per 305 mm of penetration (bpf), indicative of a very loose to dense relative density. It

should be noted that removing the extreme points, the average N-values were indicative of a loose to compact relative density.

Grain size analysis testing was completed on two samples taken from the sand deposit and the results are summarized in Table 1 Detailed result diagrams are provided in Appendix B.

Table 1 Particle Size Distribution Results – Upper Sand Deposit

Sample Location	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay
BH101-22 SS3	1.5 – 2.1	Sand, some silt, trace clay	0	87	11	2
BH110-22 SS4	2.3 – 2.9	Sand, some silt, trace clay	0	82	16	2

3.1.3 Clayey Silt

A native deposit of clayey silt was encountered underlying the sand deposit five (5) borehole locations (BH101-22 through BH104-22, and BH107-22). Additionally, clayey silt seams ranging from 25 to 200 mm were encountered in BH105-22, BH106-22, and BH109-22.

The clayey silt is grey in colour and contains trace sand. The thickness of the deposit, not including the encountered seams, ranges from 1.0 to 2.3 m and extends to depths ranging from 3.4 to 6.1 mbgs. The clayey silt seams encountered in the other 3 boreholes were encountered at depths ranging from 2.3 to 4.6 mbgs.

SPT N-values measured in the clayey silt range from 4 to 10 bpf, indicative of a firm to stiff consistency. One shear vane test completed in the clayey silt measured an undrained shear strength of 88 kPa, indicative of a stiff consistency. The remoulded value measured 44 kPa, indicating the clayey silt is a low to medium sensitivity.

Grain size analysis testing was completed on one sample taken from the clayey silt deposit and the results are summarized in Table 2. A detailed result diagram is provided in Appendix B.

Table 2 Particle Size Distribution Results – Clayey Silt

Sample Location	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay
BH102-22 SS5	3.0 – 3.7	Clayey silt, trace sand	0	1	66	33

Atterberg Limits testing was completed on a sample of the clayey silt and summarized in Table 3 below. A detailed result diagram is provided in Appendix B.

Table 3 Atterberg Limits Testing – Clayey Silt

Sample Location	Depth (mbgs)	Soil	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
BH102-22 SS5	3.0 – 3.7	Clayey silt, trace sand	25.0	13.6	11.4

The results of the Atterberg limits testing indicate that the clayey silt deposit is of low plasticity in nature. Natural moisture contents of the clayey silt deposit range from 16.8 to 21.3 %.

3.1.4 Lower Sands and Silts

A deposit varying from sandy silt to sand and silt to silty sand was encountered underlying the clayey silt deposit in BH101-22 through BH104-22, and BH107-22. Trace clay was noted in the lower sands and silts. The deposit was also encountered underlying upper sand deposit in BH105-22 and BH106-22. It should be noted that a clayey silt seam was encountered in BH105-22 and BH106-22 where the material transitions between the upper sands and the lower sands and silts.

Where encountered, all boreholes terminated within the lower sands and silts at a depth of 6.7 mbgs, with the exception of BH106-22. In BH106-22, the lower silty sand terminates at a depth of 6.5 mbgs, with a thickness of 2.0 m at this location.

SPT N-values measured in the lower sands and silts range from 1 to 27 bpf, indicative of a very loose to compact relative density.

Grain size analysis testing was completed on three (3) samples taken from the lower sands and silts and the results are summarized in Table 4. Detailed result diagrams are provided in Appendix B.

Table 4 Particle Size Distribution Results – Lower Sands and Silts

Sample Location	Depth (mbgs)	Soil	% Gravel	% Sand	% Silt	% Clay
BH102-22 SS7	6.1 – 6.7	Sandy silt, trace clay	0	22	76	2
BH105-22 SS5	3.0 – 3.7	Silty sand, trace clay	0	66	26	8
BH107-22 SS7	6.1 – 6.7	Sand and silt, trace clay	0	60	38	2

3.1.5 Glacial Till

A deposit of native glacial till was encountered underlying the silty sand deposit in BH106-22 at a depth of 6.5 mbgs. BH106-22 terminated within the glacial till at a depth of 6.7 mbgs.

Glacial till is a heterogeneous mixture of all grain sizes. At this location the glacial till is composed of grey silty gravelly sand, with trace clay. The natural moisture content of the glacial till was measured lower than the overlying deposits.

3.2 Groundwater

Unstabilized groundwater level observations were made following drilling at all borehole locations. Three groundwater monitoring wells were installed in select boreholes to measure stabilized groundwater conditions. Groundwater measurements were taken from all wells in October 2022 and periodically between October 2023 to April 2024 in order to capture fluctuating conditions during seasonal high and low groundwater levels. A summary of the groundwater conditions is provided in Table 5 below.

Table 5 Summary of Groundwater Measurements

Borehole Location	Groundwater Level Following Drilling (mbgs)	Groundwater Level (m/m rel. El.)				
		October 2022	October 2023	December 2023	February 2024	April 2024
BH101-22	-	2.9/197.0	2.8/197.1	2.9/197.0	2.5/197.4	2.3/197.6
BH102-22	4.1	-	-	-	-	-
BH103-22	3.2	-	-	-	-	-
BH104-22	3.6	-	-	-	-	-
BH105-22	3.2	-	-	-	-	-
BH106-22	3.0	-	-	-	-	-
BH107-22	-	2.5/197.9	2.7/197.7	2.9/197.5	2.4/198.0	2.0/198.4
BH108-22	2.6	-	-	-	-	-
BH109-22	2.9	-	-	-	-	-
BH110-22	-	2.6/196.1	2.7/196.0	3.0/195.7	2.5/196.2	2.2/196.5
BH201-22	Dry	-	-	-	-	-

Based on the above measurements, that the static groundwater level varies from about 2.9±0.1 mbgs during the seasonal low in winter, to about 2.2±0.2 mbgs during the seasonal high in the spring.

Seasonal fluctuations and precipitation events may cause significant changes to the depth of the groundwater table.

4.0 Geotechnical Design and Recommendations

The following discussion and recommendations are based on the factual data obtained from this investigation and are intended for use by the owner and the design engineer. Contractors bidding or providing services on this project should review the factual data and determine their own conclusions regarding the construction methods and scheduling.

This report assumes that the design features relevant to the geotechnical analysis will be completed in accordance with applicable codes, standards, and guidelines of practice. If there are changes to the site development features, or there are any significant variations in the subsurface conditions that are found before or during construction, Cambium should be retained to review the implications of these changes with respect to the contents of this report.

It is anticipated that the proposed dwellings will be constructed with, at most, one basement level extending at most 1.8 mbgs.

4.1 Excavations

Excavations for the proposed development will extend through the topsoil and the upper deposits of the native sand. It should be noted that the proposed finished floor elevations (FFE) have not been provided at the time of completing this report. It is not anticipated that excavations will extend into the underlying cohesive deposits and/or lower sands and silts.

Temporary excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91 (as amended). For practical purposes, the overburden soils at the site above the water table can be considered to be Type 3 soils, as such excavation side slopes should be no steeper than 1H:1V. The overburden soils at this site below the water table should be considered as Type 4 soils, as such excavations extending below the water table should have side slopes no steeper than 3H:1V or appropriately shored.

Minimum support system requirements (shoring) are stipulated in Sections 235 through 238 of the Occupational Health and Safety Act (OHSA), Construction Projects, Part III.

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 excavation or if wet conditions are encountered, the side slopes should be flattened as required to maintain safe working conditions or the excavation sidewalls must be fully supported (shored).

4.2 Groundwater Control

For design purposes, the prevailing stabilized groundwater levels can be taken as 2.5 mbgs. Seasonal high groundwater levels were measured at high as 2.0 mbgs in Spring 2024. As such, excavations for the proposed dwellings, if existing grades are maintained or raised, are not anticipated to extend below the prevailing groundwater table, provided that the proposed buildings will be founded no deeper than 1.8 m below current existing grades.

Due to the high permeability of the sandy soils, and the low relative density of the native deposits, it is recommended that excavations not advance deeper than the prevailing groundwater table without advanced dewatering. Excavations in to wet loose sands may cause disturbance of the native subgrades which will then require subexcavation and replacement for any disturbed material within future building footprints.

The Ministry of the Environment, Conservation and Parks stipulate the requirements for Permit to Take Water (PTTW) approvals for construction related activities. Under the requirements, specific construction related water taking activities are eligible for Environmental Activity and Sector Registry (EASR). The trigger volume for EASR is water taking more than 50,000 litres/day. Volumes beyond 400,000 litres/day will require the application of a PTTW. This includes water that is collected from open excavations as well as precipitation and/or surface runoff that enters the excavation.

4.3 Foundation Design

The proposed development will consist of low-rise residential buildings. Foundations for such structures at this site may consist of shallow spread footings founded directly on native,

undisturbed sand or on a pad of compacted engineered fill placed directly on native, undisturbed sand.

The native deposits at this site consist of loose and very loose deposits which have a limited capacity to support loads imposed by building foundations. Prior to construction of foundations, it is recommended that all bearing soils beneath the building footprints are proofrolled and compacted using a minimum 10 tonne smooth drum roller under vibratory conditions and inspected by geotechnical personnel.

Foundations made to bear directly on the native, undisturbed sand, or on top of adequately compacted engineered fill should be sized using a net reaction at **SLS** of **75 kPa** and factored geotechnical resistance at **ULS** of **150 kPa**. Pad foundations should be limited to, at most, 2 m in length, and continuous strip foundations should be limited to, at most, 1 m in width. Settlement potential at these loadings' conditions should be less than 25 mm and differential settlement should be less than 20 mm.

Engineered fill placed directly under foundations should be placed directly on undisturbed native sands and should conform to Ontario Provincial Standards Specification (OPSS.MUNI) Granular B Type II. The imported engineered fill should be placed in maximum 200 mm thick lifts to at least 98 % of the standard proctor maximum dry density (SPMDD) value. To allow for adequate spread of the loading below and beyond the footings, the engineered fill should extend a horizontal distance of at least 300 mm beyond the edge of the footings and then down and away from the edges at an angle of 1H:1V, or flatter. Excavations should be sized to accommodate fill placement.

To reduce cracking in the footings, foundation walls, and concrete slab on grades where footings change between different subgrade materials, suitable transition zones should be created and the footings adequately reinforced.

Footings stepped from one level to another must be at a slope no exceeding 10H:7V from the outside edges of each foundation.

4.4 Frost Protection of Foundations

All exterior footings of the proposed building should be provided with at least 1.3 m of earth cover for frost protection purposes. If the required depth of earth cover is not practicable, a combination of earth cover and polystyrene insulation could be considered. An insulation detail could be provided upon request.

4.5 Site Grade Raise

The site grading plan has not yet been provided to Cambium at the time of writing this report. The design may require the grade of the site to be raised.

The site is underlain by loose and very loose deposits of non cohesive sands and silts. These deposits will be sensitive to excess settlement caused by additional loading. The settlement response of the loose deposits will depend on the amount of material placed as grade raise fill, the compaction effort, and the groundwater levels at the time of placement. Post development settlement will consist of primary settlement and should be relatively immediate (within 1 month). It is recommended that the proposed grading plan is reviewed by Cambium.

All fill material placed for proposed grade raises must be composed of engineered fill placed directly on undisturbed native sand. The existing earth fill at the site may be used as grade raise fill in landscaped areas and beneath roadways. Any material contaminated with organics or topsoil is not appropriate for use as grade raise fill.

Engineered fill and earth fill must be placed in loose lifts of 200 mm and compacted to a minimum of 98% of the SPMDD value and at a moisture content within 2 % of the optimum. Engineered fill must be placed and verified under full time supervision of geotechnical personnel, who shall perform in-situ density measurements to ensure uniformity and adequacy of compaction efforts. Compaction requirements may be reduced to 95% in landscaped areas.

4.6 Foundation Wall Backfill

To avoid frost adhesion and possible heaving, all foundation walls are to be backfilled with non-frost susceptible granular material such as imported material meeting OPSS Granular B

Type I or II for a minimum lateral distance of 0.6 m out from foundation walls. The existing native sands may be reused as backfill material. If the existing sand is reused as foundation wall backfill, the material must be free of organic material and verified by geotechnical personnel. Adequate bond break should be applied against foundation walls to reduce the effects of frost heaving.

Where backfill will support areas of hard surfacing (pavements, walkways, etc.) the backfill should be placed in maximum 200 mm thick lifts and compacted to at least 95% of the SPMDD value. Light, walk behind compaction equipment should be used in proximity to foundation walls.

4.7 Earth Pressure Design Parameters

The appropriate values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows in Table 6:

Table 6 Earth Pressure Design Values

Stratum/Parameter	γ	φ	Ka	Ko	Kp
Earth Fill (reused native sand)	18	30	0.33	0.50	3.00
Granular Backfill	22	35	0.27	0.42	3.70

Where: γ = bulk unit weight of soil (kN/m^3)

φ = internal angle of friction (degrees)

K_a = Rankine active earth pressure coefficient (dimensionless)

K_o = Rankine at-rest earth pressure coefficient (dimensionless)

K_p = Rankine passive earth pressure coefficient (dimensionless)

The above earth pressure parameters pertain to a horizontal grade condition behind a retaining structure. Values of earth pressure parameters for an inclined retained grade condition will vary.

Walls subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following equation:

$$\boldsymbol{P = K[\gamma(h - h_w) + \gamma' h_w + q] + \gamma_w h_w}$$

Where, P = the horizontal pressure at depth, h (m)

K = the earth pressure coefficient

hw = the depth below the ground water level (m)

γ = the bulk unit weight of soil, (kN/m3)

γ’ = the submerged unit weight of the exterior soil, (γ - 9.8 kN/m3)

q = the complete surcharge loading (kPa)

The wall backfill must be drained effectively to eliminate hydrostatic pressures on the wall that would otherwise act in conjunction with the earth pressure. In this case, the above equation is simplified to:

$$\boldsymbol{P = K[\gamma h + q]}$$

4.8 Sliding Resistance

The factored geotechnical resistance to sliding of foundation elements is developed by friction between the base of the concrete footing and the soil. This friction (**R**) depends on the normal load at the soil contact (**N**) and the frictional resistance of the soil (**tan φ**) expressed as $\boldsymbol{R_f = N\ tan\varphi}$, which is the unfactored resistance. The factored geotechnical resistance at ULS is $\boldsymbol{R_f = 0.8\ N\ tan\varphi}$ for foundations on soil.

4.9 Floor Slab Design Parameters

The finished floor elevations for the proposed dwellings have not been provided to us at the time of preparation of this report. It is anticipated that the basement floors will be set at about 1.8 mbgs.

All organic material, deleterious material, and disturbed material must be removed prior to constructing floor slabs. These materials do not constitute an adequate subgrade for support of a slab on grade. Compacted engineered fill such as material meeting OPSS.MUNI 1010 Granular A, or B Type I or II placed directly on undisturbed native sand is suitable for the support of a conventional slab on grade following approval by Cambium.

The modulus of subgrade reaction appropriate for slab design on the soils at the site can be taken as 18,000 kPa/m.

It is recommended that the slabs are provided with a capillary moisture barrier. This is made by placing the slab on a minimum 200 mm layer of clear stone and nominally compacted by vibration to a dense state. The upper 50 mm of clear stone can be replaced with OPSS.MUNI 1010 Granular A to create a working surface, if required.

4.10 Basement Drainage

The groundwater level measured at this site is estimated at about 2.5 mbgs.

To assist in maintaining basements dry from seepage, it is recommended that exterior grades around the buildings be sloped away for a distance of at least 1.2 m. As well, perimeter foundation drains should be provided, consisting of perforated pipe with filter fabric (minimum 100 mm diameter) surrounded by granular filter (minimum 150 mm thick), and freely out letting. The granular filter should consist of 19 mm Clear Stone (OPSS.MUNI 1004) surrounded by filter fabric (Terrafix 270 R or approved equivalent).

The basement walls, in the case of open excavations, should be provided with damp-proofing provisions in conformance to the Section 9.13.2 (1 through 8) of the Ontario Building Code (2017). Backfill requirements for the foundation walls are provided in Section 4.6.

Perimeter foundation drainage, underfloor drainage systems and the installation and outlets must conform to applicable plumbing code requirements.

4.11 Pavement Design Consideration

4.11.1 Subgrade Preparation

The performance of the pavement is dependent upon proper subgrade preparation. All topsoil and organic materials should be removed from the subgrade. The subgrade should be proof rolled and inspected by Cambium personnel. Any areas where rutting or appreciable deflection is noted should be sub-excavated and replaced with suitable earth fill. The earth fill may be taken from other parts of the site for reuse. The fill should be compacted to at least 98% of SPMDD.

The most severe loading conditions on pavement subgrades may occur during construction, and subgrades may become disturbed due to construction operations. Therefore, the recommended pavement structure provided may not be adequate due to the presence of localized disturbed areas and it may be necessary to increase the thickness of the Granular B Type II subbase and/or incorporate a woven geotextile separator between the subgrade surface and the granular base. The requirement for an increase in the pavement structure and/or incorporating geotextile will be evaluated by Cambium personnel during proof roll inspections.

4.11.2 Flexible Pavement Structure

The pavement structure recommended in Table 7 below assumes that traffic flow will be limited to residential use and that the subgrades will be prepared as described above.

Table 7 Recommended Minimum Pavement Structure

Pavement Layer	Residential Roadways
Surface Course Asphalt	40 mm HL3
Binder Course Asphalt	50 mm HL8
Granular Base	150 mm OPSS 1010 Granular A
Granular Subbase	300 mm OPSS 1010 Granular B

Material and thickness substitutions must be approved by the Design Engineer. The thickness of the subbase layer could also be increased at the discretion of the Engineer, to

accommodate site conditions at the time of construction, including soft or weak subgrade soil replacement.

Compaction of the subgrade should be verified by the Engineer prior to placing the granular fill. Granular layers should be placed in no more than 300 mm thick lifts and compacted to at least 98% of SPMDD (ASTM D698) standard. The granular materials specified should conform to OPSS standards, as confirmed by appropriate materials testing.

4.11.3 Pavement Transitions

Existing asphaltic concrete should be neatly saw cut at pavement transition areas. The joints should tack coat in accordance with OPSS.MUNI 310 requirements.

4.11.4 Pavement Drainage

The design of a storm water management system is beyond the scope of this investigation; however, it is recommended that the subgrade, subbase, base, and asphalt surfaces should be shaped and crown to promote drainage of the pavement structure.

5.0 Report Limitations

5.1 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. It is important that onsite geotechnical supervision be provided at this site for excavation and backfill procedures, deleterious soil removal, subgrade inspections and compaction testing.

As indicated, season high groundwater levels will be just below anticipated founding elevations, assuming existing grades are maintained. Cambium should be retained to review the proposed final site grading plan to confirm the recommendations provided in this report.

5.2 Changes in Site and Project Scope

This geotechnical engineering report is intended for planning and design purposes only.

Subsurface conditions can be altered by the passage of sufficient time, natural occurrences, and human intervention. In particular, consideration should be given to contractual responsibilities as they relate to control of groundwater seepage, disturbance of soils, and frost protection.

The design parameters provided, and the engineering advice offered in this report are intended for use by the owner and its retained design consultants. If there are changes to the project scope and development features, these interpretations made of the subsurface information, for geotechnical design parameters, advice, and comments relating to constructability issues and quality control may not be complete for the project. Cambium should be retained to conduct further review to interpret the implications of such changes with respect to this report.

6.0 Closing

We trust that the information contained in this report meets your current requirements. If you have questions or comments regarding this document, please do not hesitate to contact the undersigned reviewer at (705) 719-0700.

Respectfully submitted,

Cambium Inc.

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7.0 Standard 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.

Reliance

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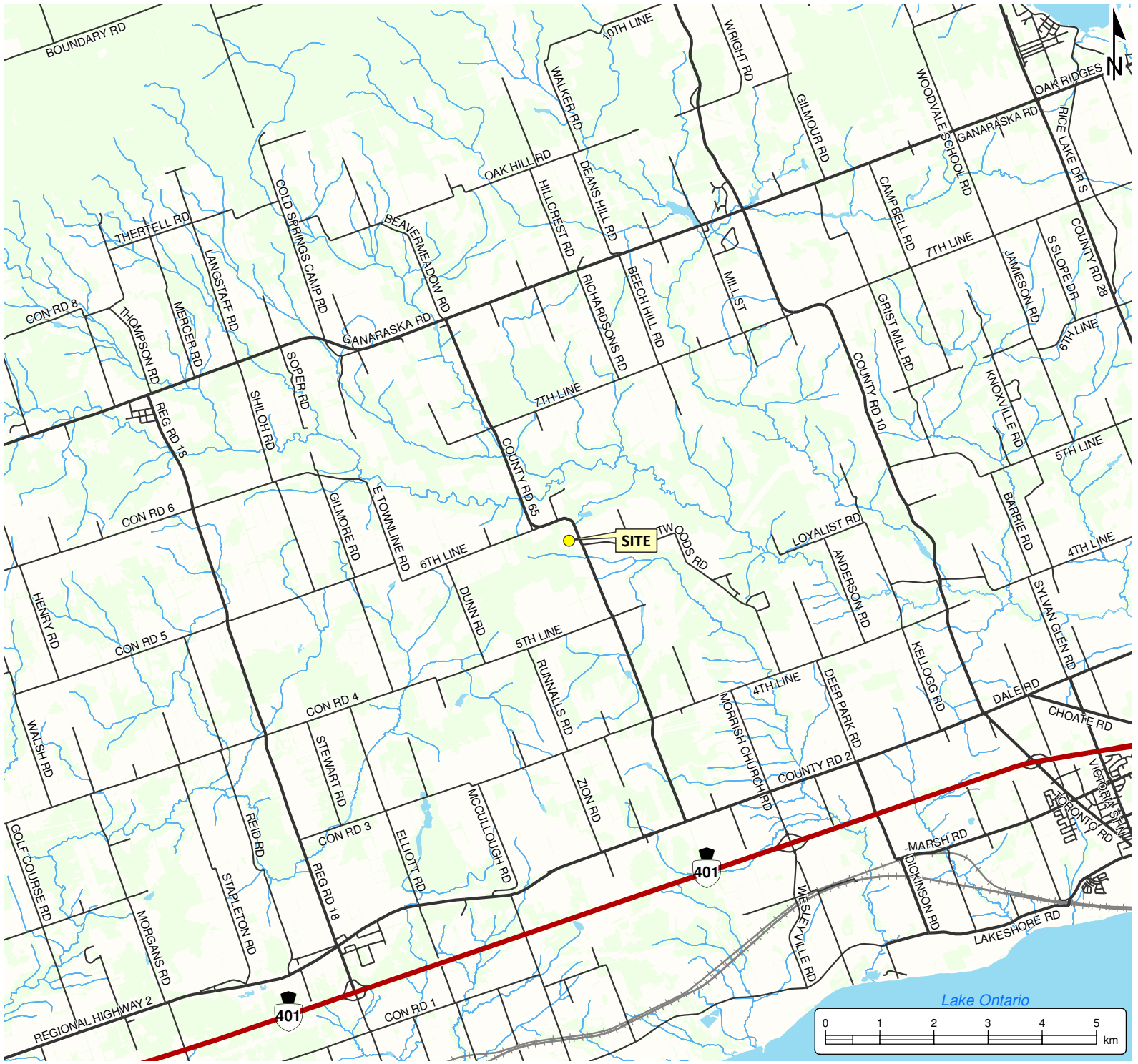
Appended Figures



GEOTECHNICAL INVESTIGATION

HILLSTREET DEVELOPMENTS LTD.
5868 County Road 65,
Port Hope, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Railroad
- Watercourse
- Water Area
- Wooded Area

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- 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.

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SITE LOCATION MAP

Project No.: 15091-002		Date: October 2022	Rev.:
Scale: 1:100,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: BVj	Figure: 1	

O:\GIS\MXDs\15000-15099\15091-002 Hillstreet Development - GEO - 5868 Cty Rd 65, Port Hope\2022- 10 - 14 FIG 1 Site Location Plan.mxd

GEOTECHNICAL INVESTIGATION

HILLSTREET DEVELOPMENTS LTD.
5868 County Road 65,
Port Hope, Ontario

LEGEND

- Bench Mark
- Borehole
- MW
- Site(approximate)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- 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.

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BOREHOLE LOCATION PLAN- EXISTING LOCATIONS

Project No.: 15091-002		Date: October 2022	Rev.:
Scale: 1:4,500		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: BVj	Figure: 2	

O:\GIS\MXDs\15000-15099\15091-002 Hillstreet Development - GEO - 5868 Cty Rd 65, Port Hope\2022- 10 - 14 FIG 2 Borehole Location Plan- Existing Conditions.mxd

Appendix A

Borehole Logs

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH101-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	199.9 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875980 **E:** 705489		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
199.9	0	**(OL) ORGANIC SILT:** TOPSOIL, 200 mm	199.7 / 0.2							Cap	
199.4	0.5	**(SW) SAND:** Weathered/Disturbed, grey-brown	199.14 / 0.76	1	SS	87	2	10.3%	2		
198.9	1	**(SW) SAND:** some silt, trace clay, compact, grey, moist		2	SS	80	11	2.7%	11	Bentonite Plug	
198.4	1.5									Riser	
197.9	2			3	SS	90	23	5.1%	23		
		-Wet below									
197.4	2.5			4	SS	75	23		23		Groundwater level measured at 2.9, 2.8, 2.9, 2.5 and 2.3 mbgs in Oct 2022, Oct 2023, Dec 2023, Feb 2024 and April 2024 repectively.
196.9	3		196.55 / 3.35	5	SS	100	7	20.5%	7		
196.4	3.5	**(ML) CLAYEY SILT:** trace sand, wet									
195.9	4									Sand Pack	
195.4	4.5		195.33 / 4.57							PVC Screen	
		(ML) sandy SILT: trace clay, compact, grey, wet		6	SS	40	27	17.3%	27		
194.9	5										
194.4	5.5										
193.9	6									Cap	
193.4	6.5		193.19 / 6.71	7	SS	45	12	15.6%	12		
192.9		Borehole terminated @ 6.7 mbgs Targeted depth reached									

GRAINSIZE DISTRIBUTION

SAMPLE	GRAVEL	SAND	SILT	CLAY
3	0	87	11	2

1m = 26 units

Logged By: FI **Input By:** SP

Client: Hillstreet Developments Ltd
Contractor: CDN
Project No.: 15091-002
Location: Port Hope, Ontario

Project Name: GEO - 5868 County Road 65, Port Hope ON
Method: Track Mounted Solid Stem Auger
Elevation: 200.1 m Rel.
UTM: 17 **N:** 4875847 **E:** 705397

Log of Borehole: BH102-22
Page: 1 of 1
Date Completed: 09-22/23-2022

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) / % Moisture	Shear Strength Cu, kPa / SPT (N)	Well Installation	Log Notes
200.1	0	**(OL) ORGANIC SILT:** Topsoil, 150 mm (199.95)								
199.6	0.5	**(SW) SAND:** Weathered/Disturbed, with organics, dark brown, wet (0.15 – 199.34)	1	SS	80	4	21.2%	4		
199.1	1	**(SW) SAND:** some silt, trace clay, compact, grey brown, wet (0.76 – 197.81)	2	SS	83	10		10		
198.6	1.5		3	SS	100	13	22.1%	13		
198.1	2									
197.6	2.5	**(ML) CLAYEY SILT:** trace sand, stiff, grey brown, wet (2.29 – 195.48)	4	SS	100	7		7		
197.1	3		5	SS	100	4	16.8%	4		3m: Atterberg Limits SS 5: LL 25% PL 13.6%
196.6	3.5	Shear vane testing: 88kPa Peak / 44kPa Residual								
196.1	4									
195.6	4.5									
195.1	5	**(ML) sandy SILT:** trace clay, loose to very loose, grey, wet (4.62 – 193.39)	6	SS	60	5	22.2%	5		
194.6	5.5									
194.1	6									
193.6	6.5		7	SS	100	2	17.0%	2		
193.1		Borehole terminated @ 6.7 mbgs (6.71) Targeted depth reached								

GRAINSIZE DISTRIBUTION

SAMPLE	GRAVEL	SAND	SILT	CLAY
5	0	1	66	33
7	0	22	76	2

Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

CAMBIUM

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH103-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	200.4 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875788.7 **E:** 705550.5		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
200.4	0	**(OL) ORGANIC SILT:** Topsoil, 250 mm	200.15								
		(SW) SAND: Weathered/Disturbed	0.25	1	SS	70	4	10.4%	4		0.4m: OC pesticides, Hydride metals, and cyanide
199.9	0.5		199.64								
		(SW) SAND: some silt, trace clay, compact to loose, moist	0.76								
199.4	1			2	SS	85	10	2.3%	10		1.1m: OC pesticides, Hydride metals, and Cyanide
198.9	1.5			3	SS	60	5	6.1%	5		
198.4	2										
197.9	2.5			4	SS	40	7	15.4%	7		
197.4	3		197.05								
		(ML) CLAYEY SILT: trace sand, stiff, grey, wet	3.35	5	SS	80	10	20.0%	10		
196.9	3.5										
196.4	4										
195.9	4.5		195.83								
		(ML) sandy SILT: trace clay, loose, wet	4.57	6	SS	90	10	17.4%	10		
195.4	5										
194.9	5.5										
194.4	6			7	SS	100	7	15.7%	7		
193.9	6.5		193.69								
193.4		Borehole terminated @ 6.7 mbgs Targeted depth reached	6.71								

GRAINSIZE DISTRIBUTION: SAMPLE | GRAVEL | SAND | SILT | CLAY

1m = 26 units

Logged By: FI **Input By:** SP

CAMBIUM

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH104-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	200.1 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875710.9 **E:** 705451.9		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
200.1	0	**(OL) ORGANIC SILT:** Topsoil, 125 mm	199.97								
		(SW) SAND: Weathered/Disturbed, with organics, brown	0.13 / 199.34	1	SS	85	4	7.8%	4		0.4m: OC pesticides, Hydride metals, and Cyanide
199.6	0.5										
		(SW) SAND: some silt, trace clay, loose, grey brown, moist	0.76	2	SS	75	6	3.4%	6		1.1m: OC pesticides, Hydride metals, and Cyanide
199.1	1										
198.6	1.5			3	SS	70	8	18.8%	8		
198.1	2		197.81								
		(ML) CLAYEY SILT: trace sand, firm, grey, wet	2.29	4	SS	85	6	21.0%	6		
197.6	2.5										
197.1	3		196.8								
		(SM) SILTY SAND: trace clay, compact, brown, wet	3.3	5	SS	85	9	18.5%	9		
196.6	3.5										
196.1	4										
195.6	4.5			6	SS	100	11	17.7%	11		
195.1	5										
194.6	5.5										
194.1	6			7	SS	50	11	18.3%	11		
193.6	6.5		193.39								
193.1		Borehole terminated @ 6.7 mbgs Targeted depth reached	6.71								

GRAINSIZE DISTRIBUTION: SAMPLE | GRAVEL | SAND | SILT | CLAY

1m = 26 units

Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH105-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	200 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875702.9 **E:** 705638.8		

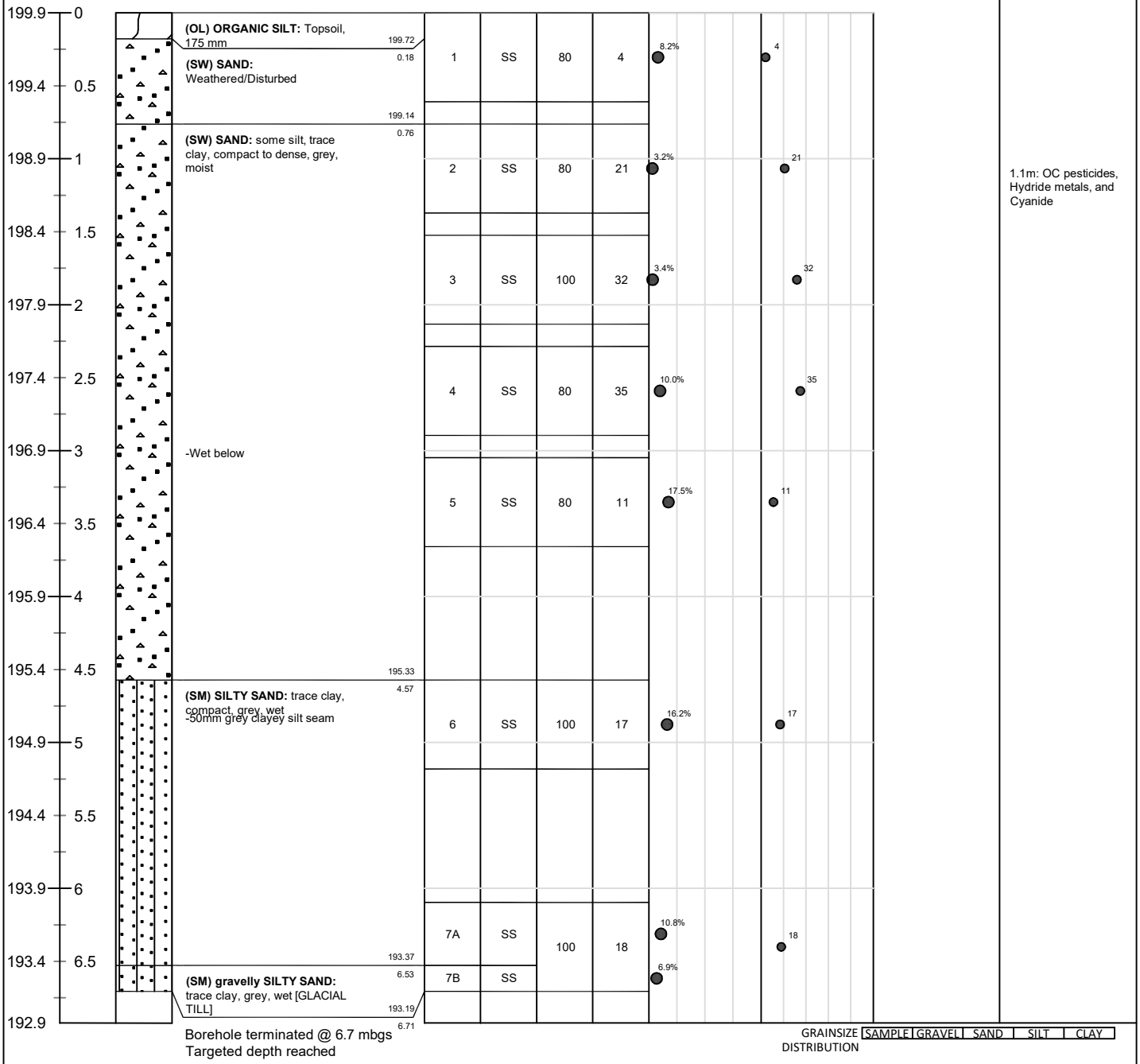
Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) LL PL PI / % Moisture	Shear Strength Cu, kPa (nat V., rem V.) / SPT (N)	Well Installation	Log Notes
200	0	**(OL) ORGANIC SILT:** Topsoil, 150 mm	199.85								
		(SW) SAND: Weathered/Disturbed	0.15 / 199.24	1	SS	50	4	7.5%	4		0.4m: OC pesticides, Hydride metals, and Cyanide
199.5	0.5										
		(SW) SAND: some silt, trace clay, loose to compact, moist	0.76								
199	1			2	SS	65	8	2.0%	8		
198.5	1.5										
				3	SS	80	13	2.9%	13		
198	2										
		-Grey and wet below									
197.5	2.5			4	SS	100	21	8.2%	21		
197	3	-200mm grey clayey silt seam	196.95								
		(SM) SILTY SAND: trace clay, compact, grey, wet	3.05								
196.5	3.5			5	SS	75	19	16.1%	19		
196	4										
195.5	4.5										
				6	SS	65	15	18.8%	15		
195	5										
194.5	5.5										
194	6										
				7	SS	100	12	18.0%	12		
193.5	6.5		193.29								
193		Borehole terminated @ 6.7 mbgs Targeted depth reached	6.71								

GRAINSIZE DISTRIBUTION	SAMPLE	GRAVEL	SAND	SILT	CLAY
	5	0	66	26	8

Logged By: FI **Input By:** SP

CAMBIUM

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH106-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	199.9 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875644.2 **E:** 705574.2		



Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH107-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	200.4 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875603.9 **E:** 705359.7		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
200.4	0	**(OL) ORGANIC SILT:** Topsoil, 125 mm	200.27							Cap	
		(SW) SAND: Weathered/Disturbed, with organics	0.13 / 199.64 / 0.76	1	SS	65	5	11.2%	5		
199.4	1	**(SW) SAND:** some silt, trace clay, compact to dense, grey brown, moist		2	SS	65	16	3.2%	16	Bentonite Plug	
198.9	1.5									Riser	
				3	SS	75	32	9.9%	32		
198.4	2	-Wet below									
197.9	2.5			4	SS	80	28	18.8%	28		Groundwater level measured at 2.5, 2.7, 2.9, 2.4 and 2.0 mbgs in Oct 2022, Oct 2023, Dec 2023, Feb 2024 and April 2024 respectively
197.4	3										
				5	SS	55	16	18%	16		
196.9	3.5										
196.4	4									Sand Pack	
195.9	4.5									PVC Screen	
			195.5 / 4.9	6	SS	100	3	18.7%	3		
195.4	5	**(ML) CLAYEY SILT:** trace sand, grey, wet									
194.9	5.5										
194.4	6		194.3 / 6.1							Cap	
		(SW) SAND and SILT: trace clay, very loose, grey, wet		7	SS	90	1	19.2%	1		
193.9	6.5		193.69 / 6.71								
193.4		Borehole terminated @ 6.7 mbgs Targeted depth reached									

GRAINSIZE DISTRIBUTION	SAMPLE	GRAVEL	SAND	SILT	CLAY
	7	0	60	38	2

1m = 26 units

Logged By: FI **Input By:** SP

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH108-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	199.9 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875548.1 **E:** 705469.7		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
199.9	0	**(OL) ORGANIC SILT:** Topsoil, 175 mm	199.72								
		(SW) SAND: Weathered/Disturbed, with organics	0.18 / 199.14	1	SS	80	4	7.7%	4		0.4m: OC pesticides, Hydride metals, Cyanide
			0.76								
198.9	1	**(SW) SAND:** some silt, trace clay, compact, grey brown, moist		2	SS	60	22	3.0%	22		
198.4	1.5			3	SS	60	28	3.6%	28		
197.9	2	-Grey, wet below									
197.4	2.5			4	SS	70	19	15.7%	19		
196.9	3			5	SS	80	10	18.4%	10		
196.4	3.5										
195.9	4										
195.4	4.5	-Dense		6	SS	100	43	17.7%	43		
194.9	5										
194.4	5.5										
193.9	6	-Compact									
193.4	6.5			7	SS	100	14	19.4%	14		
			193.19								
192.9		Borehole terminated @ 6.7 mbgs Targeted depth reached	6.71								

GRAINSIZE DISTRIBUTION: SAMPLE | GRAVEL | SAND | SILT | CLAY

1m = 26 units

Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH109-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	199.3 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875566.8 **E:** 705668.3		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
199.3	0	**(OL) ORGANIC SILT:** Topsoil, 150 mm	199.15 / 0.15								
198.8	0.5	**(SW) SAND:** Weathered/Disturbed	198.54 / 0.76	1	SS	75	4	7.3%	4		
198.3	1	**(SW) SAND:** some silt, trace clay, compact to loose, grey, moist		2	SS	80	15	4.4%	15		1.1m: OC pestitcides, Hydride metals, and Cyanide.
197.8	1.5			3	SS	80	23	5.2%	23		
197.3	2	-25 and 50mm grey clayey silt seams, wet below									
196.8	2.5			4	SS	80	10	17.3%	10		
196.3	3			5	SS	80	5	20.2%	5		
195.8	3.5										
195.3	4										
194.8	4.5			6	SS	80	5	21.6%	5		
194.3	5										
193.8	5.5										
193.3	6			7	SS	100	11	18.1%	11		
192.8	6.5		192.59								
192.3		Borehole terminated @ 6.7 mbgs Targeted depth reached	6.71								

GRAINSIZE DISTRIBUTION: SAMPLE | GRAVEL | SAND | SILT | CLAY

Logged By: FI **Input By:** SP

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH110-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	198.7 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875462.8 **E:** 705737.4		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) LL PL PI 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa nat V. rem V. 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
198.7	0	**(OL) ORGANIC SILT:** Topsoil, 150 mm	198.55 / 0.15	1	SS	95	5	7.1%	5	Cap	
198.2	0.5	**(SW) SAND:** Weathered/Disturbed, with organics	197.94 / 0.76								
197.7	1	**(SW) SAND:** some silt, trace clay, loose to compact, grey brown, moist -Wet below		2	SS	80	8	6.2%	8	Bentonite Plug	
197.2	1.5			3	SS	80	3	17.1%	3	Riser	
196.7	2										
196.2	2.5			4	SS	100	12	19.8%	12		Groundwater level measured at 2.6, 2.7, 3.0, 2.5 and 2.2 mbgs in Oct 2022, Oct 2023, Dec 2023, Feb 2024 and April 2024 respectively.
195.7	3			5	SS	100	18	18.1%	18		
195.2	3.5										
194.7	4									Sand Pack	
194.2	4.5									PVC Screen	
193.7	5			6	SS	100	19	18.1%	19		
193.2	5.5										
192.7	6									Cap	
192.2	6.5			7	SS	100	22	16.1%	22		
191.7		Borehole terminated @ 6.7 mbgs Targeted depth reached	191.99 / 6.71								

GRAINSIZE DISTRIBUTION	SAMPLE	GRAVEL	SAND	SILT	CLAY
	4	0	82	16	2

Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

Client:	Hillstreet Developments Ltd	**Project Name:**	GEO - 5868 County Road 65, Port Hope ON	**Log of Borehole:**	BH201-22
Contractor:	CDN	**Method:**	Track Mounted Solid Stem Auger	Page:	1 of 1
Project No.:	15091-002	**Elevation:**	201.1 m Rel.	**Date Completed:**	09-22/23-2022
Location:	Port Hope, Ontario	**UTM:**	17 **N:** 4875974.2 **E:** 705409.3		

Elevation (m)	Depth	Description	Elevation / Depth	Number	Type	% Recovery	SPT (N)	Atterberg Limits (%) 25 50 75 / % Moisture 25 50 75	Shear Strength Cu, kPa (nat V., rem V.) 20 40 60 80 / SPT (N) 20 40 60 80	Well Installation	Log Notes
201.1	0	**(OL) ORGANIC SILT:** Topsoil, 200 mm	200.9								
		(SW) SAND: Weathered/Disturbed	0.2	1	SS	90	4	11.6%	4		
200.6	0.5										
200.1	1		199.83	2	SS	100	13	8.3%	13		
		(SW) SAND: some silt, trace clay, compact, grey brown, wet	1.27 / 199.58								
199.6	1.5	Borehole terminated @ 1.5 mbgs Targeted depth reached	1.52								
199.1	2										
198.6	2.5										
198.1	3										
197.6	3.5										
197.1	4										
196.6	4.5										
196.1	5										
195.6	5.5										
195.1	6										
194.6	6.5										
194.1											

GRAINSIZE DISTRIBUTION: SAMPLE | GRAVEL | SAND | SILT | CLAY

1m = 26 units

Logged By: FI **Input By:** SP

Peterborough, Barrie, Oshawa, Kingston, Ottawa

Appendix B

Physical Laboratory Testing Results

Grain Size Distribution Chart

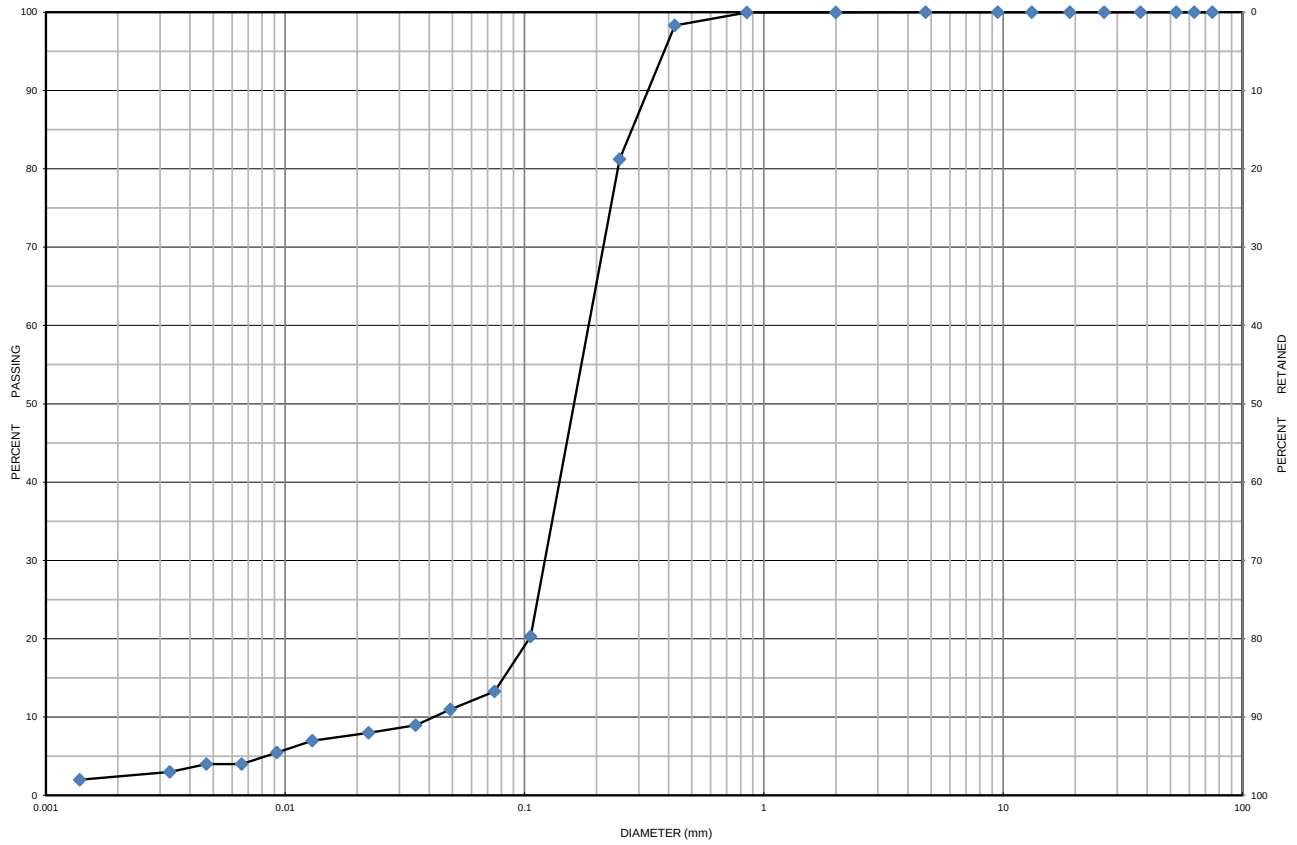
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 101-22 SS 3* **Depth:** *1.5 m to 2.1 m* **Lab Sample No:** *S-22-1451*

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 101-22	SS 3	1.5 m to 2.1 m	0	87	11	2	5.1

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand some Silt trace Clay	SM	0.185	0.130	0.041	4.51	2.23

Additional information available upon request

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Grain Size Distribution Chart

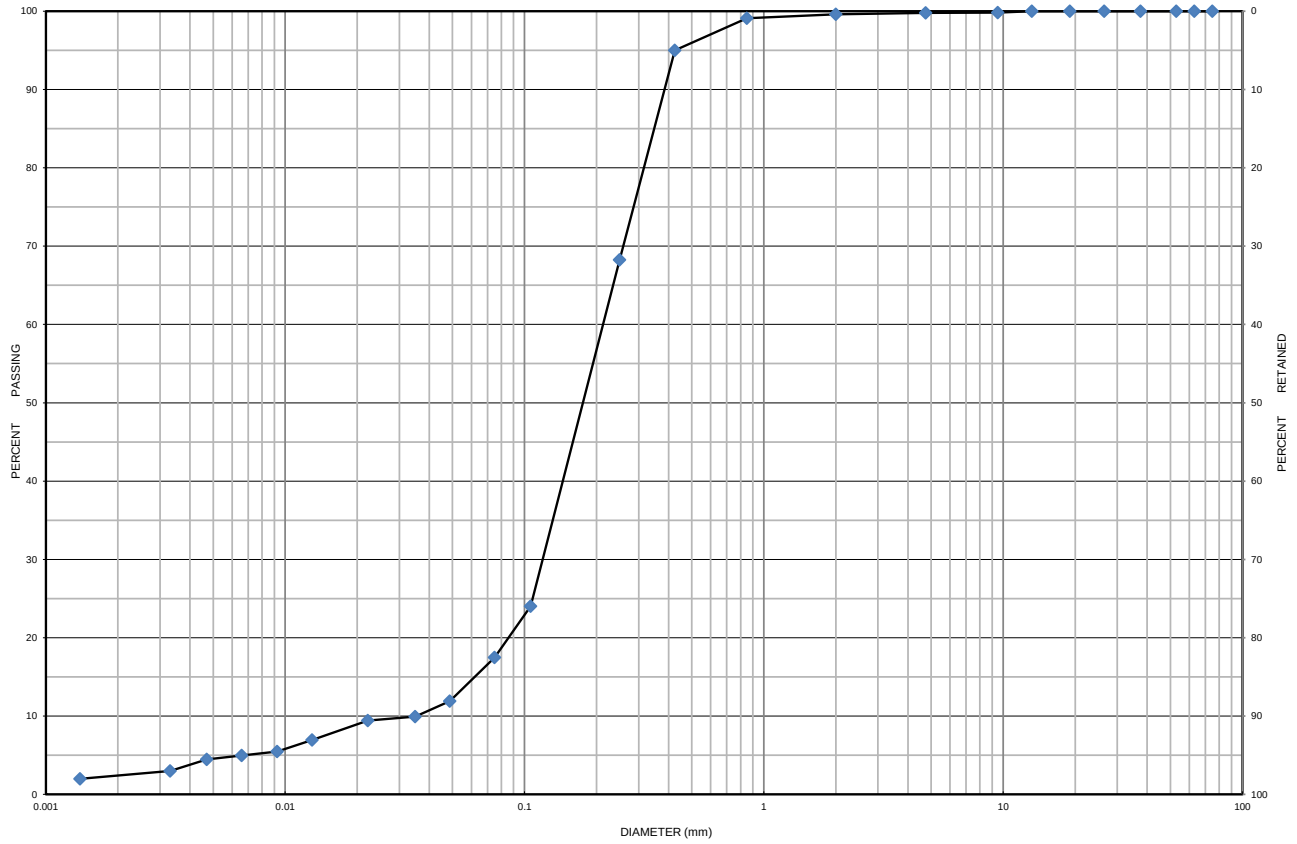
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 110-22 SS 4* **Depth:** *2.3 m to 2.9 m* **Lab Sample No:** *S-22-1455*

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 110-22	SS 4	2.3 m to 2.9 m	0	82	16	2	19.8

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand some Silt trace Clay	SM	0.220	0.125	0.030	7.33	2.37

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Grain Size Distribution Chart

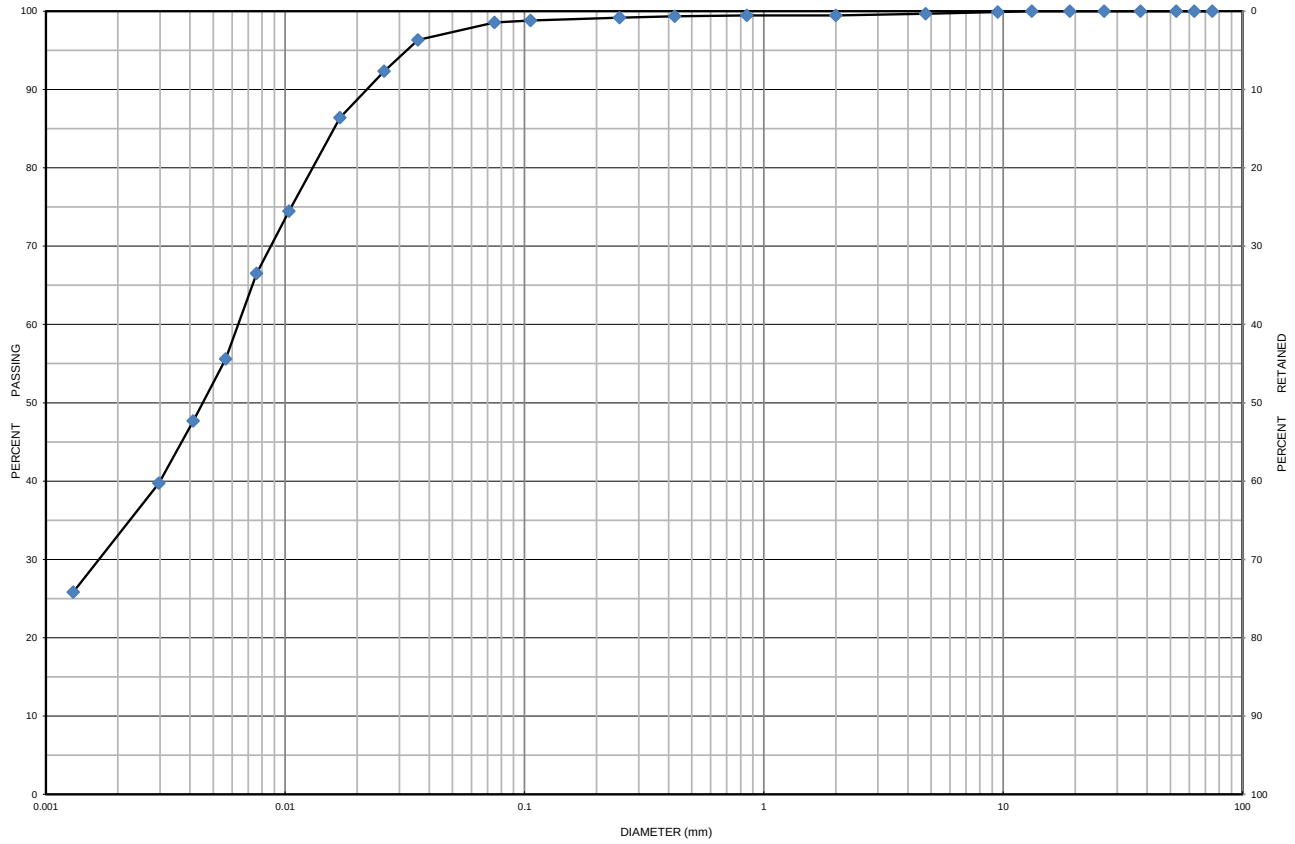
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 102-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-1456*

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 102-22	SS 5	3 m to 3.7 m	0	1	66	33	16.8

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt trace Sand	ML	0.0064	0.0016	-	-	-

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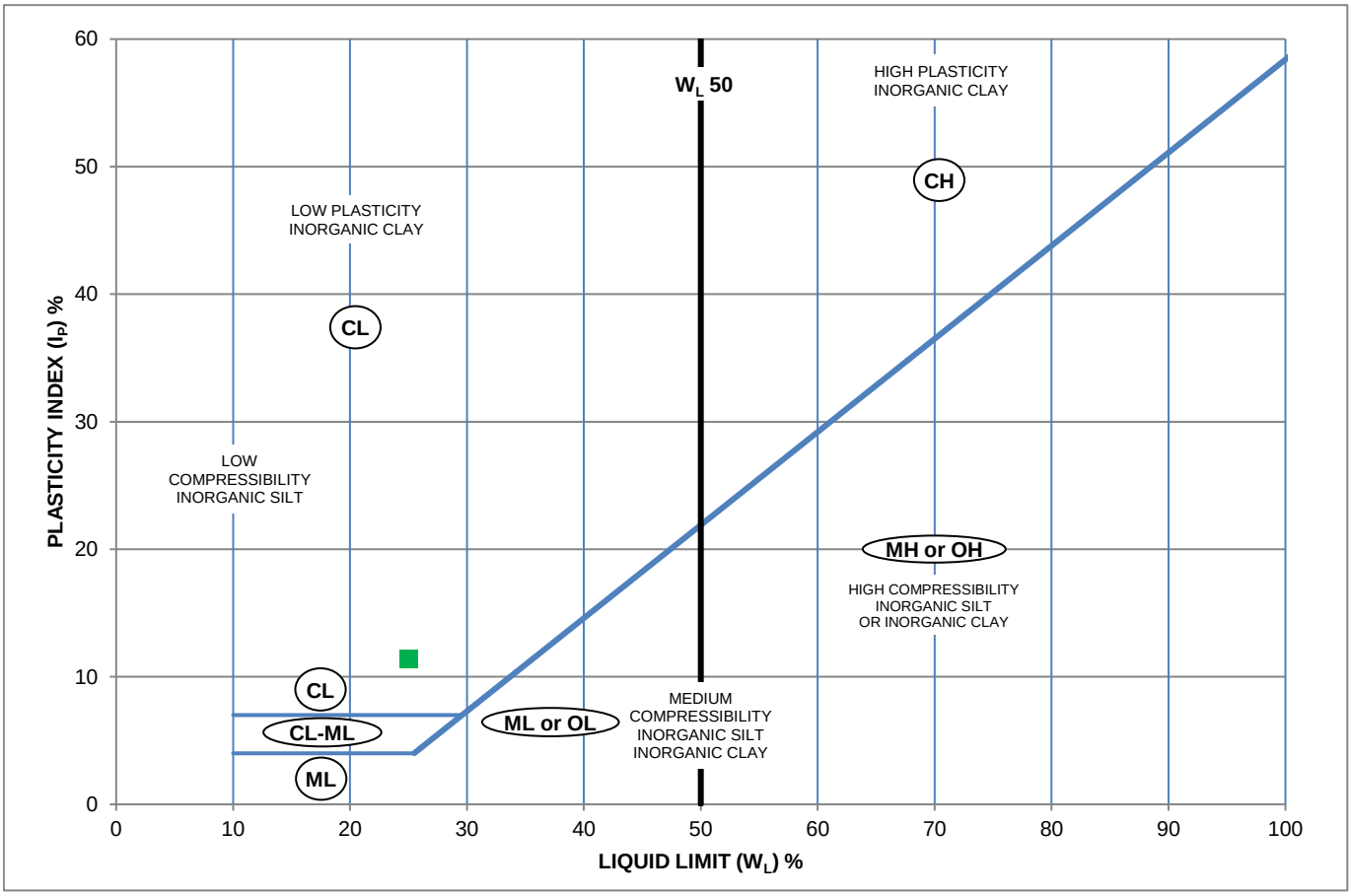
Plasticity Chart

Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sampled By: *Farhan Imtiaz - Cambium Inc.* **Sample Date:** *September 23, 2022*

Hole No.: *102-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-1456*



Symbol	Borehole	Sample	Depth	Description
■	102-22	SS 5	3 m to 3.7 m	Clayey Silt trace Sand

Liquid Limit (%)	Plastic Limit	Plasticity Index (%)
25.0	***13.6***	***11.4***

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Grain Size Distribution Chart

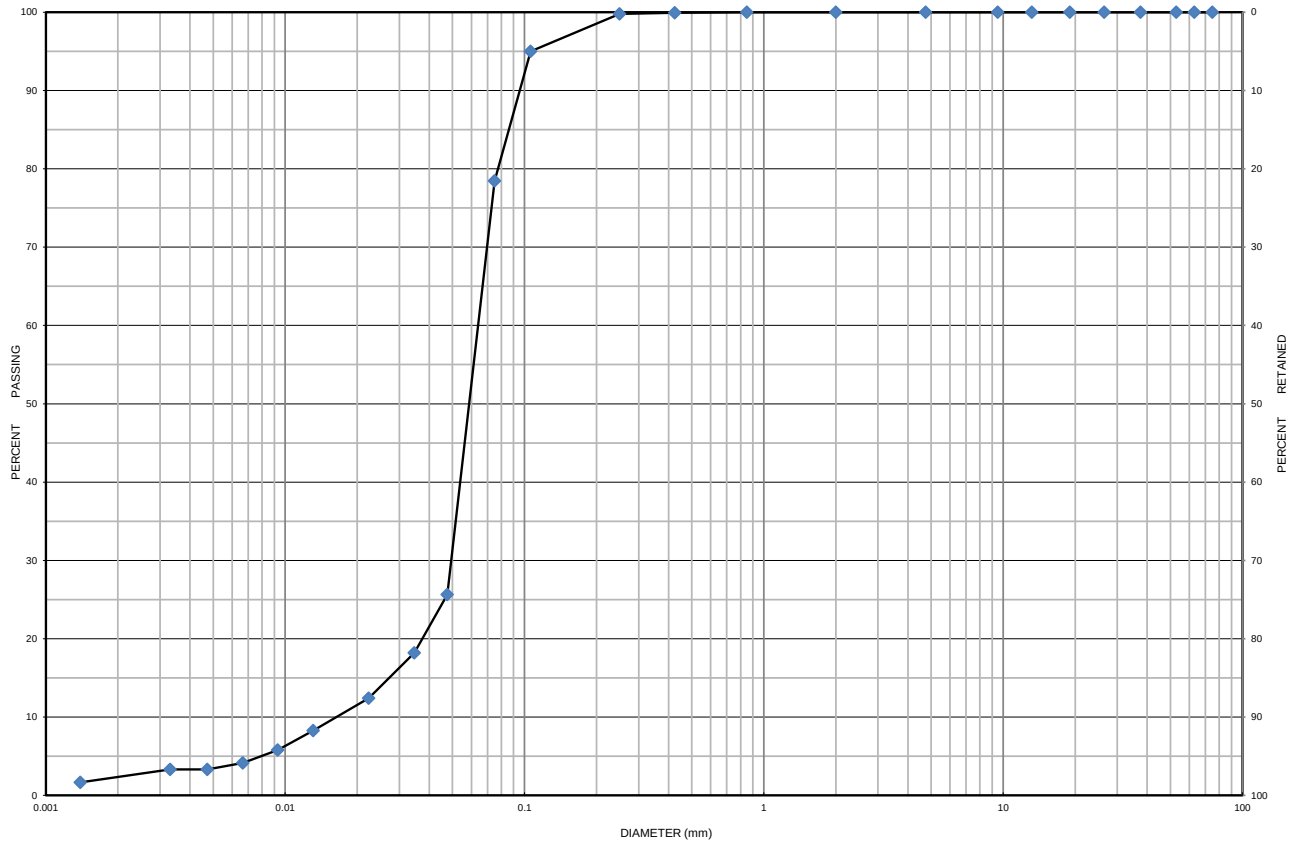
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 102-22 SS 7* **Depth:** *6.1 m to 6.7 m* **Lab Sample No:** *S-22-1452*

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 102-22	SS 7	6.1 m to 6.7 m	0	22	76	2	17.0

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sandy Silt trace Clay	ML	0.064	0.049	0.016	4.00	2.34

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Grain Size Distribution Chart

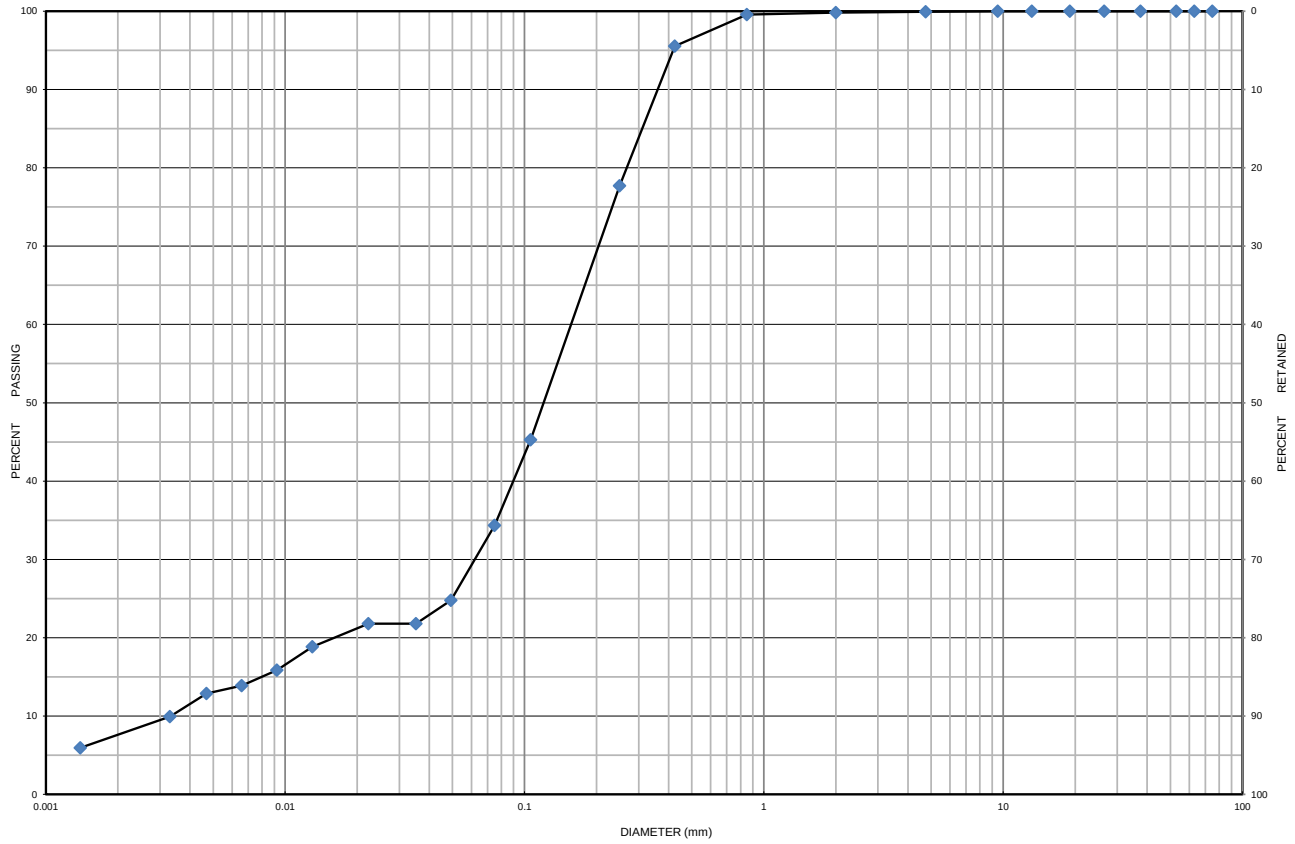
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 105-22 SS 5* **Depth:** *3 m to 3.7 m* **Lab Sample No:** *S-22-1453*

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 105-22	SS 5	3 m to 3.7 m	0	66	26	8	16.1

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Sand trace Clay	SM	0.1600	0.0610	0.0034	47.06	6.84

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Grain Size Distribution Chart

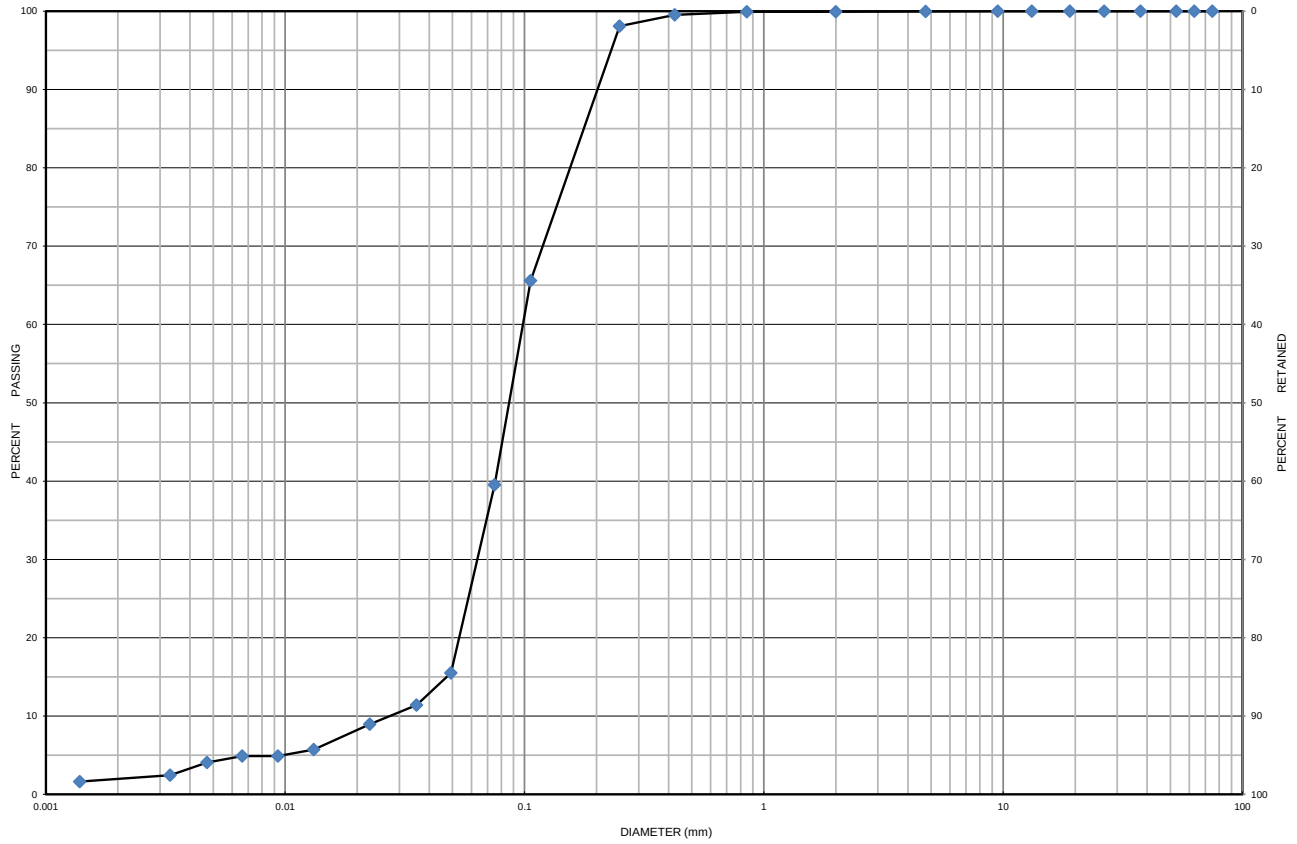
Project Number: *15091-002* **Client:** *Hillstreet Developments Ltd*

Project Name: *GEO - 5868 County Road 65, Port Hope ON*

Sample Date: *September 23, 2022* **Sampled By:** *Farhan Imtiaz - Cambium Inc.*

Location: *BH 107-22 SS 7* **Depth:** *6.1 m to 6.7 m* **Lab Sample No:** *S-22-1454*

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 107-22	SS 7	6.1 m to 6.7 m	0	60	38	2	19.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Sand and Silt trace Clay	SM	0.099	0.063	0.027	3.67	1.48

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