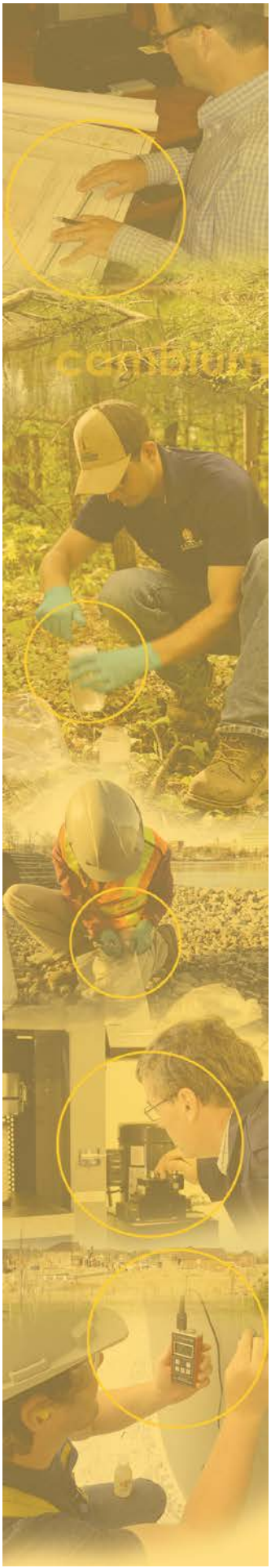

# Geotechnical Investigation - PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario Revision 1

Cambium Reference No.: 10131-001

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## 1.0 INTRODUCTION

Cambium Inc. was retained by M. Romanin Contracting Ltd., to complete a geotechnical investigation in support of the design and construction of a mixed use residential development located at PART Lot 34 and 35, Concession 3, Town of Wasaga Beach, Ontario (site).

The property is an irregularly shaped lot, approximately 5.88 hectares in size, which at the time of investigation predominately consisted of a forested area, with adjacent residential buildings bordering the northeast perimeter of the lot.

At the time of investigation, the proposed development consists of a mix of residential densities, two (2) six (6) storey residential buildings, eight (8) blocks of townhomes, various single lot homes, two (2) parking lots, parkland, private amenity area and a storm water management area.

The geotechnical investigation was required to confirm the subsurface conditions at the Site to provide geotechnical design parameters as input into the design and construction of the proposed development. A Site Plan, including borehole locations and draft development plan, is included as Figure 1 of this report.

# 2.0 METHODOLOGY

## 2.1 BOREHOLE INVESTIGATION

A borehole investigation was completed between December 2nd and December 5th, 2019 to assess subsurface conditions at the site. A total of seven (7) boreholes were advanced within the site, designated as BH101-19 through BH107-19. The boreholes were terminated at depths ranging from 2.7 m to 9.6 m below ground surface (mbgs). Due to shallow refusal encountered across the site, the original investigation scope had to be modified in order to determine the deeper soil conditions. In addition, BH107-19 had to be moved eastward of its original position due to difficult access conditions.

The borehole and monitoring well elevations were surveyed using a Sokkia RTK GNSS system. The elevations were adjusted based on a geodetic benchmark provided by the Jones Consulting Group Ltd., which was the top bolt of a fire hydrant located on the northwest corner of 74 Street N. and Beachwood Road behind the Canada Post mailboxes, which was assigned an elevation of 182.32 meters above sea level (mASL). The borehole UTMs and elevations are provided on the borehole logs in Appendix A. Borehole locations are shown on Figure 1.

Drilling and sampling was completed using a track-mounted drill rig, under the supervision of a Cambium Geotechnical Analyst. The boreholes were advanced to the pre-determined depths by means of continuous flight 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 (SS) sampler 305 mm into the soil using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. Soil samples were collected at 0.75 m intervals from 0 to 3 m and 1.5 m intervals after 3 m.

Given the encountered shallow refusal, Dynamic Cone Penetration Testing (DCPT) was carried out adjacent to boreholes BH101-19 and BH105-19. BH101-19 was augured and sampled from ground surface to 5.0 mbgs before advancing to 6.7 mbgs using DCPT, and BH105-19 was augured and sampled from ground surface to 2.7 mbgs before advancing to 5.8 mbgs using DCPT. DCPT involves a 51 mm diameter, 60 degree Apex cone point, screw-attached to the tip of A-size rods, is driven into the ground using the same driving energy as in the SPT method. By recording the number of blows to drive the cone/rod assembly into the soil every 305 mm, a qualitative record of relative density/consistency is obtained. Although the interpretation of the test results may be difficult because no soil samples are obtained through this method, and the penetration resistances are not necessarily equivalent to N values of undrained shear strengths, useful information is gained by the continuity of the results and by the elimination of the unbalanced hydrostatic effects which may affect SPT N values. In some deposits, soil adhesion to the drill rod assembly may affect DCPT results, and therefore should be taken into account in the geotechnical assessments.

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, laboratory testing, and storage. Open boreholes were checked for groundwater and general stability prior to backfilling.

Four (4) boreholes; BH103-19, BH104-19, BH105-19, and BH107-19 were outfitted as monitoring wells to allow for measurement of the static groundwater elevation at the site.

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 four (4) sieve and hydrometer analyses (LS-702, 705), was completed on selected soil samples to confirm textural classification and to assess geotechnical parameters. Natural moisture content testing (LS-701) was completed on all retrieved soil samples. Results are presented in Appendix B and are discussed in Section 3.0.

## 2.3 CHEMICAL LABORATORY TESTING

Three (3) soil samples were submitted to CALA-certified AGAT Laboratories for analytical testing. The samples were submitted for analysis of the following parameters: metals and inorganics, petroleum hydrocarbons (PHC F1-F4), volatile organic compounds and polycyclic aromatic hydrocarbons. The tests performed are summarized in Table 1 below.

***Table 1 Summary of Environmental Sampling and Laboratory Analysis***

| Sample Identification | Depth of Sample (mbgs) | Date Sampled | Tests Performed |
|---|---|---|---|
| BH101-19 | 0.8 – 2.0 | December 2, 2019 | Metals and Inorganics, PHC F1-F4, Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons |
| BH103-19 | 0.1 – 2.0 | December 4, 2019 | Metals and Inorganics, PHC F1-F4, Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons |
| BH107-19 | 0.0 – 2.0 | December 2, 2019 | Metals and Inorganics, PHC F1-F4, Volatile Organic Compounds and Polycyclic Aromatic Hydrocarbons |

The environmental testing results are discussed in Section 3.5 and the laboratory certificates of analysis are included in Appendix C.

# 3.0 SUBSURFACE CONDITIONS

Based on available quaternary geological mapping, the site consists of till deposits generally grading from sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content (OGS, 2020). The subsurface conditions at the site consist predominantly of topsoil overlying sand, silty sand to silt and sand and silty clay. These soils were encountered throughout the boreholes to the termination depths ranging from 2.7 mbgs to 9.6 mbgs. The borehole locations are shown on Figure 1 and the individual soil units are described in detail below with the borehole logs provided in Appendix A.

It was noted that shallow refusal was encountered across the site on likely cobbles or boulders. Given the low recovery noted on samples gathered where SPT N values of 50 were recorded, there is a chance that the N values may have been influenced because of likely cobbles or boulders.

Conditions indicated on the borehole logs are for specific locations only and can vary between and beyond the borehole locations. 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 on 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 (drilling speed, shaking/grinding of the augers, etc.).

## 3.1 TOPSOIL

A layer of black or brown topsoil was encountered at the surface of four (4) of the seven (7) boreholes. The topsoil varied in thickness from 150 mm to 750 mm, with an average thickness of approximately 450 mm.

The topsoil was generally very loose to loose in relative density, and moist at the time of the investigation with natural moisture content ranging from 9% to 26% based on laboratory testing.

## 3.2 NATIVE SOILS

Beneath the topsoil discussed above, the native soils predominately consist of interbedded sand, silty sand, silt and sand and silty clay extending to borehole termination depths of 2.7 mbgs to 9.6 mbgs.

### *3.2.1 SAND*

Native sand soils were found throughout the site except in boreholes BH103-19 and BH105-19. The sand soils were found to be interbedded between other native soils and extended to termination depths in boreholes BH101-19, BH104-19, BH106-19, and BH107-19. The sand was brown to grey in colour and contained varying amounts of gravel, silt, and clay. The SPT N values ranged from 7 to 50 blows for 50 mm of penetration, indicating a

relative density of loose to very dense. The native sand soils were found to be moist to wet at the time of the investigation with natural moisture contents ranging from 7% to 16% based on laboratory testing.

### *3.2.2 SILTY SAND TO SILT AND SAND*

Native silty sand to silt and sand soils were encountered as interbedded layers in boreholes BH102-19 through BH105-19. The silty sand to silt and sand soils were generally grey in colour and contained varying amounts of gravel, sand and clay. The SPT N values ranged from 19 to 50 blows for 75 mm of penetration indicating a compact to very dense relative density. The silt and sand soil were generally wet at the time of the investigation with a natural moisture content ranging from 5% to 28% based on laboratory testing.

Laboratory particle size distribution analyses was completed for two (2) samples of the native silty sand to silt and sand soils, taken from the boreholes and depths provided in Table 2 in order to identify the varying textures encountered throughout the overburden material. The testing results are provided in Appendix B and are summarized in Table 2 based on the Unified Soils Classification System (USCS).

***Table 2 Particle Size Distribution – Silty Sand to Silt and Sand Soils***

| Borehole ID | Depth (mbgs) | Description | % Gravel | % Sand | % Silt | % Clay |
|---|---|---|---|---|---|---|
| BH102-19 | 2.3 – 2.7 | Silt and Sand some Clay some Gravel | 16 | 32 | 34 | 18 |
| BH104-19 | 2.3 – 2.7 | Silty Sand some Clay some Gravel | 11 | 45 | 33 | 11 |

### *3.2.3 SILTY CLAY*

Silty clay soils were found throughout each of the boreholes advanced throughout the site at depths from ground surface to 1.5 mbgs extending to depths between 2.3 mgs and 4.6 mbgs. The silty clay soils were generally brown in colour and contained varying amounts of sand and gravel. The consistency of the silty clay ranged from soft to very stiff with SPT N values ranging from 3 to 22. The silty clay soils were moist to wet at the time of investigation with a moisture contents ranging from 7% to 49% based on laboratory testing.

Laboratory particle size distribution analyses were completed for two (2) samples of the silty clay soils taken from the borehole and depths provided in Table 3 in order to identify the varying textures encountered throughout the overburden material. The testing results are provided in Appendix B and are summarized in Table 3 based on the USCS.

***Table 3 Particle Size Distribution – Silty Clay Soils***

| Borehole ID | Depth (mbgs) | Description | % Gravel | % Sand | % Silt | % Clay |
|---|---|---|---|---|---|---|
| BH101-19 | 2.3 – 2.7 | Silty Clay some Sand trace Gravel | 6 | 13 | 29 | 52 |
| BH107-19 | 2.3 – 2.7 | Silty Clay some Sand trace Gravel | 2 | 16 | 40 | 42 |

## 3.3 BEDROCK

Bedrock was not encountered within the investigation depths however the majority of the boreholes were terminated due to both SPT and practical auger refusal indicating likely cobbles or boulders. The boreholes were terminated at depths ranging from 2.7 mbgs to 9.6 mbgs in native soils. The termination depth and elevation of each borehole is summarized in Table 4.

***Table 4 Borehole Termination Depth and Elevation***

| Borehole ID | Borehole Elevation (mASL) | Borehole Termination Depth (mbgs) | Borehole Termination Elevation (mASL) |
|---|---|---|---|
| BH101-19 | 181.52 | 5.0 (6.7*) | 176.52 (174.82*) |
| BH102-19 | 180.01 | 3.5 | 176.51 |
| BH103-19 | 179.41 | 9.6 | 169.81 |
| BH104-19 | 178.68 | 5.0 | 173.68 |
| BH105-19 | 180.49 | 2.7 (5.8*) | 177.79 (174.69*) |
| BH106-19 | 180.59 | 5.0 | 175.59 |
| BH107-19 | 182.20 | 5.0 | 177.20 |

**DCPT Termination Depth/Elevation*

## 3.4 GROUNDWATER

In general wet soils were encountered at a depth of approximately 1.5 mbgs, except in boreholes BH104-19 and BH105-19 were wet soils were found at approximately 0.8 mbgs. Caving (sloughing) was observed in borehole BH102-19 at a depth of 3.0 mgs. During the site investigation four (4) monitoring wells were installed in boreholes BH103-19, BH104-19, BH105-19, and BH107-19. On December 9$^{th}$, 2019, January 17$^{th}$, 2020 and February 4$^{th}$, 2020, a Cambium technician measured the groundwater levels in each of the monitoring wells installed throughout the site, groundwater monitoring observations are summarized below in Table 5.

The moisture content of the soils generally ranged from 4% to 49% and the soils were generally brown to grey in colour. It should be noted that soil moisture and groundwater levels at the site may vary seasonally and in response to climatic events.

It is noted that a monthly groundwater measurement program is currently being implement over the course of twelve months, the results of which will be submitted under a separate cover.

***Table 5 Groundwater Observations***

| Date | Borehole | Depth of Groundwater (mbgs) | Elevation of Groundwater (mASL) |
|---|---|---|---|
| December 9th 2019 | MW/BH103-19 | 1.48 | 177.93 |
| | MW/BH104-19 | 1.15 | 177.54 |
| | MW/BH105-19 | 0.86 | 179.63 |
| | MW/BH107-19 | Dry | Dry |
| January 17th, 2020 | MW/BH103-19 | 1.77 | 177.64 |
| | MW/BH104-19 | 0.77 | 177.92 |
| | MW/BH105-19 | 0.82 | 179.67 |
| | MW/BH107-19 | 3.71 | 178.49 |
| February 4th, 2020 | MW/BH103-19 | 1.76 | 177.65 |
| | MW/BH104-19 | 0.82 | 177.87 |
| | MW/BH105-19 | 0.81 | 179.68 |
| | MW/BH107-19 | 3.33 | 178.87 |
| March 9th, 2020 | MW/BH103-19 | 1.79 | 177.62 |
| | MW/BH104-19 | 0.80 | 177.89 |
| | MW/BH105-19 | 0.99 | 179.50 |
| | MW/BH107-19 | 2.83 | 179.37 |

## 3.5 ENVIRONMENTAL TESTING RESULTS

### *3.5.1 SOIL CRITERIA*

The Ministry of the Environment (MOE) document *Soil, Groundwater and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act* (Ministry of the Environment, 2011), herein referred to as the *Standard,* was referenced in determining the applicable criteria for the Site. Analytical results were compared to Table 1 (Full Depth Background Site Condition Standards) and Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) for residential/parkland/institutional (RPI) land use and coarse-textured soils.

### *3.5.2 SOIL QUALITY*

Three (3) soil samples were submitted to Caduceon Environmental Laboratories for analysis of the parameters identified in Section 2.3. The results were compared to the MOE tables detailed in Section 3.5.1. The **Sodium Absorption Ratio** in the soil sample submitted from BH103-19 exceeded the Table 1 standard and the **Sodium Absorption Ratio** in the soil sample submitted from BH107-19 exceeded the Table 1 and Table 2 standards. The Certificate of Analysis is provided in Appendix C.

Table 6 shows the parameters which exceeded the MOE Table 1 and Table 2 standards.

***Table 6 Chemical Testing Exceedances***

| Parameter | Sample Taken | Value | Table 1 Standard (RPI) | Table 2 Standard (RPI Coarse) |
|---|---|---|---|---|
| Sodium Absorption Ratio | BH103-19 | 2.86 | 2.4 | 5 |
| Sodium Absorption Ratio | BH107-19 | 5.41 | 1 | 5 |

*Red text denotes sample exceedance*

The results are summarized on the Certificate of Analysis provided in Appendix C and indicate the following:

- Metals and Inorganics; parameters tested did not exceed Table 1 or Table 2 criteria.
- Petroleum Hydrocarbons (PHC F1-F4); parameters tested did not exceed Table 1 or Table 2 criteria.
- Volatile Organic Compounds (VOCs); parameters tested did not exceed Table 1 or Table 2 criteria.
- Polycyclic Aromatic Hydrocarbons (PAHs); parameters tested did not exceed Table 1 or Table 2 criteria.

Based on the test results the following handling options are available for soils sampled and analyzed under this program:

- Remain on-site to be appropriately reused as backfill or for re-grading, under the guidance of a Qualified Person (QP) as defined by Ontario Regulation 153/04, and as approved by a geotechnical engineer;
- Accepted by a Receiving Site with specifications for receipt of soil based on the above test results under the guidance of the receiving site's QP and Fill Management Plan, and subject to the municipality's fill bylaw;
- Disposed of at a waste disposal landfill appropriately certified by the Ministry of the Environment, Conservation and Parks. Additional testing may be required for O. Reg. 347 waste characterization analysis as directed by the receiver.

It is noted that the chemical parameters tested and the number of samples likely do not meet the requirements of a Record of Site Condition nor meet the requirements of the intended receiving site. This report should not be construed as an Environmental Site Assessment. Handling options provided herein are based solely on the chemical analysis of soil located at Site, and does not represent acceptance or suitability of this material on behalf of the intended receiving site. Should conditions encountered or the proposed work scopes vary from those described in the report, Cambium should be notified to evaluate the need for further work.

Test results and associated samples detailed within this report do not represent any areas or soil depths beyond the aforementioned sampling event.

Handling options provided herein are based solely on the chemical analysis of the sampled soil located at Site, specifically soil from all of the boreholes advanced on the Site, and does not represent acceptance or suitability of

this material on behalf of an intended receiving site. Should conditions encountered or the proposed work scopes vary from those described in this report, Cambium should be notified to evaluate the need for further work.

# 4.0 GEOTECHNICAL CONSIDERATIONS

The following recommendations are based on 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 SITE PREPARATION

It is understood that regrading of the site will likely occur to accommodate the proposed development. The existing topsoil, any encountered fill and any organic materials encountered should be excavated and removed from beneath the proposed building footprints; additionally, this material should be excavated and removed to a minimum distance of 3 m around the building footprints. Any topsoil and materials with significant quantities of organics are not appropriate for use as fill below buildings or grading and parking areas.

On completion of regrading, the exposed subgrade should be proof-rolled and inspected by a qualified Geotechnical Engineer prior to placement of granular fill or foundations. Any loose/soft soils identified at the time of proof-rolling that are unable to uniformly be compacted should be sub-excavated and removed. The excavations created through the removal of these materials should be backfilled with approved engineered fill consistent with the recommendations provided below.

The near surface silty clay and silty sand soils can become unstable if they are wet or saturated. Such conditions are common in the spring and late fall. Under these conditions, temporary use of granular fill, and possible reinforcing geotextiles, may be required to prevent severe rutting on construction access routes.

## 4.2 FROST PENETRATION

Based on climate data and design charts, the maximum frost penetration depth below the surface at the site is estimated at 1.4 mbgs.

Exterior footings for the proposed structures should be situated at or below this depth for frost penetration or should be adequately protected.

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

## 4.3 EXCAVATIONS AND BACKFILL

All excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). The generally firm to stiff or compact native soils encountered above the water table may be classified as Type 3 soils accordance with OHSA. Type 3 soils may be excavated with side slopes no steeper than 1H:1V. Beneath the water table the native soils would be classified as Type 4 soils and may be excavated with side slopes no steeper than 3H:1V. Dependant on excavation depths and site conditions, shoring may be necessary.

## 4.4 DEWATERING

Groundwater was encountered in all of the boreholes and monitoring wells onsite, as summarised in Section 3.4.

Additional seepage may occur across the Site if high groundwater conditions are present during construction due to seasonal fluctuations. If groundwater seepage is encountered it should be manageable with filtered sumps and pumps and depending on size of excavation, a Permit to Take Water (PTTW) or registry in the Environmental Activity and Sector Registry (EASR) of the Ministry of the Environment Conservation and Parks (MOECP) may be required. It is noted that the elevation of the groundwater table will vary due to seasonal conditions and in response to heavy precipitation events. In order to minimize predictable water issues and costs, it is recommended that excavation and in-ground construction be performed in drier seasons.

## 4.5 BACKFILL AND COMPACTION

Excavated topsoil from the Site is not appropriate for use as fill below grading and parking areas. Excavated native soils not containing significant quantities of clay 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 the required densities. Some moisture content adjustments may be required depending upon seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Consideration could be given to using a material meeting the specifications of OPSS 1010 Granular B or an approved equivalent. Foundation wall and any buried utility backfill material should consist of free-draining imported granular material. Backfill should be placed in maximum 300 mm thick lifts and should be compacted to a minimum of 98% of Standard Proctor Maximum Dry Density (SPMDD). The backfill material in the upper 300 mm below the pavement subgrade elevation should be compacted to 100% of SPMDD in all areas.

All slopes and embankments, and any drainage runoff areas must be protected from surficial erosion by means of erosion mats, sodding, deep rooted vegetation, or other stabilizing features.

All existing vegetation, topsoil, organic and non-organic fills, and any loose soils shall be removed down to a competent base. Backfill areas must be approved by Cambium prior to placement of any new fill, to ensure the suitability of subgrade conditions.

### *4.5.1 ENGINEERED FILL*

When the fill is treated as an engineered fill to support structural elements such as foundations and / or floor slabs the following is recommended for the construction of engineered fill:

I. Remove any and all existing vegetation, surficial topsoil / organics, organic fills or fills and any loose soils to a competent subgrade for a suitable envelope;

II. The area of the engineered fill should extend horizontally 1 m beyond the outside edge of the foundations then extend downward at a 1:1 slope to the competent native soil;

III. The subgrade or base of the engineered fill area must be approved by Cambium prior to placement of any new fill, to ensure that suitability of subgrade condition;

IV. Place approved OPSS 1010 SSM or Granular 'B' Type I material at a moisture content at or near optimum moisture in suitable maximum 200 mm thick lifts, compacted to 100% of SPMDD. If native soils from the site are not used as engineered fill, imported material for engineered fill should consist of clean, non-organic soils, free of chemical contamination or deleterious material. Any frost penetration into the fill material must be removed prior to placement of subsequent lifts of fill and reviewed by Cambium;

V. Full time testing and inspection of the engineered fill will be required for it to be used as a founding material, as outlined in Section 4.2.2.2 of the Ontario Building Code.

## 4.6 FOUNDATION DESIGN

Design and construction recommendations for potential foundation systems are outlined below. It is understood that the site may be regraded and our foundation recommendations may change depending upon the final grades. Cambium should be contacted to review the final grading plan and provide any necessary changes to our foundation recommendations below.

Given that the encountered cohesive soils (silty clay, etc.) are likely susceptible to consolidation, if any fill is placed above the native compressible soils it is recommended that the Client wait at least six months following completion of fill grades prior to construction of new structures, pavements or utilities in order to avoid damage due to initial settlement.

The quality of the subgrade should be inspected by Cambium during construction, prior to constructing the footings in order to confirm bearing capacity estimates. Settlement potential at the noted at serviceability limit state (SLS) loadings is less than 25 mm and differential settlement should be less than 10 mm.

### *4.6.1 DETACHED HOMES AND TOWNHOMES*

Based on the undisturbed firm to stiff silty clay soils encountered throughout the site, footings situated at a minimum depth of 1.4 metres below existing grade may be designed for an allowable bearing capacity of 60 kPa at service limit state (SLS) and 85 kPa at ultimate limit state (ULS).

Footings placed on at least 1.0 metre of approved engineered fill, founded at or below 1.4 mbgs on firm to stiff silty clay soils, may be designed for an allowable bearing capacity of 90 kPa at SLS and 120 kPa at ULS if the engineered fill consists of Granular B, Type II or materials approved by Cambium.

Depending upon groundwater levels at the time of construction and the proposed depth of the foundations, advance dewatering using a well-point system may be required to lower groundwater levels to below the proposed footing grade to ensure that the subgrade soils are not disturbed.

### *4.6.2 SIX STOREY CONDOMINIUMS*

Footings founded on compact to dense sand to silty sand materials, encountered within boreholes adjacent to the proposed condominium buildings, at a depth of approximately 3.0 mbgs (178 mASL) may be designed for an allowable bearing capacity of 180 kPa at SLS and 225 kPa at ULS. It is noted that excavations to reach such depths will likely extend significantly below the groundwater table and require advance dewatering using a well-point system. Pumping rates for such a well-point dewatering system would mean that registry in the MOECP's EASR would likely be required.

Alternatively, if a greater bearing capacity is required or it is not economically viable to excavate to such depths, the footings may be supported by helical, micropiles or driven piles. A specialty pile contractor should be contacted to provide specified installation torques, pile spacing, and other relevant parameters. Cambium can provide relevant driven pile design parameters if required. It should be noted that additional geotechnical investigations may be required if deep foundations are chosen as the preferred foundation solution, in addition, the cobbles and boulders noted within our investigation may prove challenging.

## 4.7 LATERAL EARTH PRESSURE

Lateral earth pressure coefficients (K) are shown in Table 7. It is assumed that potential lateral loads will result from cohesionless, frictional materials, such as granular backfill.

***Table 7 Lateral Earth Pressure Coefficients***

| K | Unfactored |
|---|---|
| Ko (at rest) | 0.42 |
| Ka (active) | 0.27 |
| Kp (passive) | 3.70 |

The coefficients provided in Table 7 assume that the surface of the granular backfill is horizontal against any proposed retaining wall, and the wall is vertical and smooth. Cambium should be contacted to provide updated lateral earth pressure coefficients should the assumptions differ to those noted and if the soil slopes at an angle against the retaining wall.

A unit weight of 22 kN/m$^3$ should be assumed for compacted granular backfill loadings.

## 4.8 FLOOR SLABS

To create a stable working surface, to distribute loadings, and for drainage purposes, an allowance should be made to provide at least 200 mm of OPSS 1010 Granular A compacted to 98% of SPMDD beneath all floor slabs. It is recommended that all floor slabs are situated at least 500 mm above the seasonal high groundwater elevation. Any basement floor slabs should be underlain by a 300 mm thickness of 19 mm diameter crushed clear stone wrapped in a geotextile (Terrafix 270R or equivalent) and connected to perimeter subdrains as discussed below.

## 4.9 SUBDRAINAGE

Given the potential for shallow groundwater elevations, Cambium recommends installation of geotextile wrapped subdrains set in a trench of clear stone and connected to a sump or other frost-free positive outlet below the floor slab and around the perimeter of any building foundations. It is noted that the slab and foundation walls should be water proofed.

## 4.10 BURIED UTILITIES

Trench excavations must be completed per the requirements outlined above in Section 4.3.

Bedding and cover material for any services should consist of OPSS 1010-3 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.

## 4.11 SEISMIC SITE CLASSIFICATION

The Ontario Building Code (OBC) specifies that the structures should be designed to withstand forces due to earthquakes. For the purpose of earthquake design, geotechnical information shall be used to determine the "Site Class". Based on the explored soil properties and in accordance with Table 4.1.8.4.A of the OBC (2006), it is recommended that Site Class "D" (stiff soil) be applied for structural design at the Site.

Peak ground acceleration and spectral acceleration (period of 0.2 seconds) for the site are calculated to be 0.057g and 0.098g respectively using the 2015 National Building Code Seismic Hazard Calculation.

## 4.12 PAVEMENT DESIGN

The performance of the pavement is dependent upon proper subgrade preparation. All topsoil and organic materials should be removed down to native material and backfilled with approved engineered fill or native material, compacted to 98% of SPMDD. The subgrade should be proof rolled and inspected by a Geotechnical Engineer. Any areas where boulders, rutting, or appreciable deflection is noted should be subexcavated and replaced with suitable fill. The fill should be compacted to at least 98% of SPMDD.

The recommended pavement structure should satisfy applicable standards for parking and driving areas and should, as a minimum, consist of the pavement layers identified in Table 8. The light duty pavement structure is intended for parking areas while the heavy duty pavement structure is appropriate for areas where heavy traffic or heavy loads are anticipated.

Cambium should be retained to review grading drawings as the recommended pavement structure may be modified dependent on subgrade elevation and engineered fill (if any) thickness.

***Table 8 Recommended Minimum Pavement Structure***

| Pavement Layer | Light Duty | Heavy Duty |
|---|---|---|
| Surface Course Asphalt | 40 mm HL3 or HL4 | 40 mm HL3 or HL4 |
| Binder Course Asphalt | 50 mm HL8 | 90 mm HL8 (2 lifts) |
| Granular Base | 150 mm OPSS 1010 Granular A | 200 mm OPSS 1010 Granular A |
| Granular Subbase | 450 mm OPSS 1010 Granular B | 450 mm OPSS 1010 Granular B |

Material and thickness substitutions must be approved by the Design Engineer.

The thickness of the subbase layer could 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 150 mm maximum loose 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.

Subdrains are recommended beneath the pavement structure, connecting to the storm sewer or an alternate frost-free outlet as outlined above, to extend the lifespan of the structure.

The final asphalt surface should be sloped at a minimum of 2% to shed runoff. Abutting pavements should be sawcut to provide clean vertical joints with new pavement areas.

## 4.13 DESIGN REVIEW AND INSPECTIONS

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.

We 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.

## 5.0 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 at (705) 719-0700 ext. 405.

Respectfully submitted,

**CAMBIUM INC.**


Rob Gethin, P.Eng.
Senior Project Manager

*RLG/SEB/jsb*

# Appended Figures

# GEOTECHNICAL INVESTIGATION

M. ROMANIN CONTRACTING LTD.
PART Lot 34 & 35, Concession 3
Wasaga Beach, Ontario


**LEGEND**

- Borehole
- Monitoring Well

**Notes:**
- Overlay image: Romanin - Concept Plan 14, Town of Wasaga Beach, County of Simcoe by Jones Consulting Group LTD, dated January 27, 2020.
- Imagery was obtained from Simcoe County online GIS database, accessed December 2019.
- 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

| | | | |
|---|---|---|---|
| Project No.: 10131-001 | | Date: October 2019 | Rev.: |
| Scale: 1:2,500 | | Projection: NAD 1983 UTM Zone 17N | |
| Created by: MAT | Checked by: RG | Figure: 1 | |

O:\GIS\project_MXDs\10100-10199\10131-001 The Jones Consulting Group - Geotechnical - Shore Lane Wasaga Beach, ON\2019-12-06 FIG 1 - Borehole Location Plan.mxd

# Appendix A
# Borehole Logs

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# Log of Borehole: BH101-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 2, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 570045, 4924260 **Elevation:** 181.52 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 181 / 0 | | Topsoil: Brown sandy topsoil, trace gravel, trace silt, loose, moist | 1 | SS | 5 | 5 | | | | |
| 1 | | Sand: Brown sand, trace gravel, trace silt, compact, moist | 2 | SS | 50 | 15 | | | | |
| 180 | | Silty Clay: Brown silty clay, some sand, trace gravel, firm, wet | 3 | SS | 100 | 8 | | | | |
| 2 | | | | | | | | | | |
| 179 | | | 4 | SS | 100 | 5 | | | | GSA SS4:<br>6% Gravel<br>13% Sand<br>29% Silt<br>52% Clay |
| 3 | | | | | | | | | | |
| 178 | | Sand: Brown sand, trace gravel, trace silt, trace clay, occasional cobbles, compact, wet | 5 | SS | 5 | 18 | | | | |
| 4 | | | | | | | | | | |
| 177 | | Very dense | 6 | SS | 0 | 50/ 50 mm | | | | Spoon bouncing at 4.6 mbgs |
| 5 | | Borehole terminated at 5.0 mbgs due to SPT and practical auger refusal. | | | | 49* | | | | Dynamic Cone Penetration Test (DCPT) began at 5.2 mbgs, terminated at 6.7 mbgs. DCPT was advanced in a separate borehole adjacent to BH101-19. |
| 176 | | | | | | 62* | | | | |
| 6 | | | | | | 59* | | | | |
| 175 | | | | | | 55* | | | | |
| 7 | | | | | | 60* | | | | Wet soils encountered at 1.5 mbgs, borehole open upon completion. |
| 174 | | | | | | | | | | |

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# Log of Borehole: BH102-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 2, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 569925, 4924337 **Elevation:** 180.01 mASL

| SUBSURFACE PROFILE | | | SAMPLE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
| 180 / 0 | | Topsoil: Black topsoil, trace sand, trace gravel, occasional cobbles, loose, moist | 1A / 1B | SS | 10 | 7 | | | | |
| | | Sand: Brown sand, some clay, some silt, trace gravel, loose, moist | | | | | | | | |
| 179 / 1 | | Compact | 2 | SS | 50 | 24 | | | | |
| | | Silty Clay: Brown silty clay, trace gravel, trace sand, very stiff, wet | 3 | SS | 50 | 17 | | | | |
| 178 / 2 | | | | | | | | | | |
| | | Silt and Sand: Grey silt and sand, some clay, some gravel, compact, wet | 4 | SS | 100 | 19 | | | | GSA SS4:<br>16% Gravel<br>32% Sand<br>34% Silt<br>18% Clay |
| 177 / 3 | | Very Dense | 5 | SS | 0 | 50/ 75 mm | | | | |
| | | Borehole terminated at 3.5 mbgs due to SPT and practical auger refusal. | | | | | | | | Wet soils encountered at 1.5 mbgs and caving at 3.0 mbgs upon completion. |
| 176 / 4 | | | | | | | | | | |

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# Log of Borehole: BH103-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 4, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 569967, 4924336 **Elevation:** 179.41 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 179 / 0 | | Topsoil: Black sandy topsoil, trace sand, loose, moist | 1A | | | | | | Cap | Top of Standpipe (TOS) elevation: 180.31 mASL. Groundwater measured at 1.76 mbgs (177.65 mASL) on February 4, 2020. |
| | | | 1B | SS | 40 | 6 | | | Sand Pack | |
| | | Silty Clay: Brown silty clay, trace sand, trace gravel, firm, moist | | | | | | | | |
| 178 / 1 | | | 2 | SS | 100 | 5 | | | | |
| | | Wet | 3 | SS | 100 | 6 | | | | |
| 177 / 2 | | Grey, some sand, very stiff | 4 | SS | 40 | 22 | | | | |
| 176 / 3 | | Silty Sand: Grey silty sand, trace clay, trace gravel, very dense, wet | 5 | SS | 55 | 50/ 255 mm | | | PVC Standpipe | |
| | | | | | | | | | Bentonite Plug | |
| 175 / 4 | | | 6 | SS | 50 | 50 | | | | |
| 174 / 5 | | | | | | | | | | |
| 173 / 6 | | | 7 | SS | 90 | 50/ 255 mm | | | | |
| 172 / 7 | | | | | | | | | Sand Pack | |
| | | | 8 | SS | 80 | 50/ 75 mm | | | PVC Screen | |
| 8 | | | | | | | | | | |

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# Log of Borehole: BH103-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 4, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 569967, 4924336 **Elevation:** 179.41 mASL

| SUBSURFACE PROFILE | | | SAMPLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
| 171 / 9 | | | | | | | | | | |
| 170 | | | 9 | SS | 80 | 50/ 255 mm | | | Cap | |
| | | Borehole terminated at 9.6 mbgs. | | | | | | | | |
| 10 / 169 | | | | | | | | | | Wet soils encountered at 1.5 mbgs. |

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# Log of Borehole: BH104-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 4, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 570105, 4924317 **Elevation:** 178.68 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 178 / 0 | | Silty Sand: Brown silty sand, trace gravel, trace clay, compact, moist | 1 | SS | 30 | 29 | | | Cap | Top of Standpipe (TOS) elevation: 179.65 mASL. Groundwater measured at 0.82 mbgs (177.87 mASL) on February 4, 2020. |
| 178 / 1 | | Silty Clay: Brown silty clay, some sand, trace gravel, occasional cobbles, firm, wet | 2 | SS | 40 | 6 | | | Bentonite Plug | |
| | | | | | | | | | PVC Standpipe | |
| 177 / 2 | | | 3 | SS | 90 | 4 | | | | |
| 176 / 3 | | Silty Sand: Grey silty sand, some clay, some gravel, dense, wet | 4 | SS | 50 | 43 | | | Sand Pack | GSA SS4: 11% Gravel 45% Sand 33% Silt 11% Clay |
| | | | 5 | SS | 60 | 42 | | | PVC Screen | |
| 175 / 4 | | | | | | | | | | |
| 174 / 5 | | Sand: Grey sand, some gravel, trace silt, compact, wet | 6 | SS | 50 | 25 | | | Cap | |
| 173 / 6 | | Borehole terminated at 5.0 mbgs. | | | | | | | | Wet soils encountered at 0.8 mbgs. |

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# Log of Borehole: BH105-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 4, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 570086, 4924257 **Elevation:** 180.49 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 / 0 | | Topsoil: Black sandy topsoil, trace clay, very loose, moist | 1 | SS | 30 | 2 | | | Cap | Top of Standpipe (TOS) elevation: 181.58 mASL. Groundwater measured at 0.81 mbgs (179.68 mASL) on February 4, 2020. |
| 1 | | Silty Clay: Grey silty clay, trace sand, soft, wet | 2 | SS | 95 | 3 | | | Bentonite Plug | |
| | | | | | | | | | PVC Standpipe | |
| 179 / 1 | | Firm | 3 | SS | 95 | 4 | | | | |
| 2 | | | | | | | | | Sand Pack | |
| | | | | | | | | | PVC Screen | |
| 178 / 2 | | Silty Sand: Grey silty sand, trace clay, trace gravel, occasional cobbles, very dense, wet | 4 | SS | 10 | 50/ 280 mm | | | | |
| 3 | | Borehole terminated at 2.7 mbgs due to SPT and practical auger refusal. | | | | 35* | | | Cap | Dynamic Cone Penetration Test (DCPT) began at 3.0 mbgs, terminated at 5.8 mbgs. DCPT was advanced in a separate borehole adjacent 10 BH105-19. |
| 177 | | | | | | 25* | | | | |
| | | | | | | 23* | | | | |
| 4 | | | | | | 24* | | | | |
| 176 | | | | | | 31* | | | | |
| | | | | | | 59* | | | | |
| 5 | | | | | | 72* | | | | |
| | | | | | | 82* | | | | |
| 175 | | | | | | 80* | | | | Wet soils encountered at 0.8 mbgs. |
| 6 | | | | | | | | | | |

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# Log of Borehole: BH106-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 4, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 569994, 4924294 **Elevation:** 180.59 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 180 / 0 | | Sand: Brown sand, some organics, trace gravel, trace silt, loose, moist | 1 | SS | 20 | 7 | | | | |
| 180 / 1 | | Grey, some silt, no organics, compact | 2 | SS | 80 | 14 | | | | |
| 179 / 2 | | Silty Clay: Brown silty clay, some sand, trace gravel, occasional cobbles, firm, wet | 3 | SS | 60 | 8 | | | | |
| 178 / 3 | | Grey, wet | 4 | SS | 60 | 7 | | | | |
| 177 / 4 | | | | | | | | | | |
| 176 / 5 | | Sand: Grey sand, some silt, trace gravel, occasional cobbles, very dense, wet | 5 | SS | 20 | 50/ 205 mm | | | | |
| 175 / 6 | | Borehole terminated at 5.0 mbgs due to SPT and practical auger refusal. | | | | | | | | Wet soils encountered at 1.5 mbgs. |

**Logged By:** CM **Input By:** CM

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# Log of Borehole: BH107-19



**Client:** M. Romanin Contracting Ltd. **Project Name:** Geotech Investigation - Romanin Development **Project No.:** 10131-001

**Contractor:** Walker Drilling Ltd. **Method:** Hollow Stem Augers **Date Completed:** December 5, 2019

**Location:** PART Lot 34 & 35, Concession 3, Wasaga Beach, Ontario **UTM:** 17T, 569899, 4924243 **Elevation:** 182.20 mASL

| Elevation (m) / Depth | Lithology | Description | Number | Type | % Recovery | SPT (N) | % Moisture (25 50 75) | SPT (N) (10 20 30 40) | Well Installation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 182 / 0 | | Silty Clay: Brown silty clay, some sand, trace organics, stiff, moist | 1 | SS | 20 | 11 | | | Cap | Top of Standpipe (TOS) elevation: 183.27 mASL. Groundwater measured at 3.3 mbgs (179.94 mASL) on February 4, 2020. |
| | | | | | | | | | Bentonite Plug | |
| | | | | | | | | | PVC Standpipe | |
| 181 / 1 | | Very stiff | 2 | SS | 40 | 17 | | | | |
| | | Grey, less organics, stiff, wet | 3 | SS | 50 | 11 | | | | |
| 180 / 2 | | | | | | | | | | |
| | | Trace gravel, firm | 4 | SS | 85 | 7 | | | Sand Pack | GSA SS4: 2% Gravel 16% Sand 40% Silt 42% Clay |
| | | | | | | | | | PVC Screen | |
| 179 / 3 | | | 5 | SS | 100 | 6 | | | | |
| 178 / 4 | | | | | | | | | | |
| | | Sand: Grey sand, some silt, trace gravel, trace clay, occasional cobbles, very dense, wet | 6 | SS | 50 | 50/ 230 mm | | | Cap | |
| 177 / 5 | | Borehole terminated at 5.0 mbgs. | | | | | | | | Wet soils encountered at 1.5 mbgs. |
| 6 | | | | | | | | | | |

**Logged By:** CM **Input By:** CM

# Appendix B

# Physical Laboratory Testing Results

# Grain Size Distribution Chart

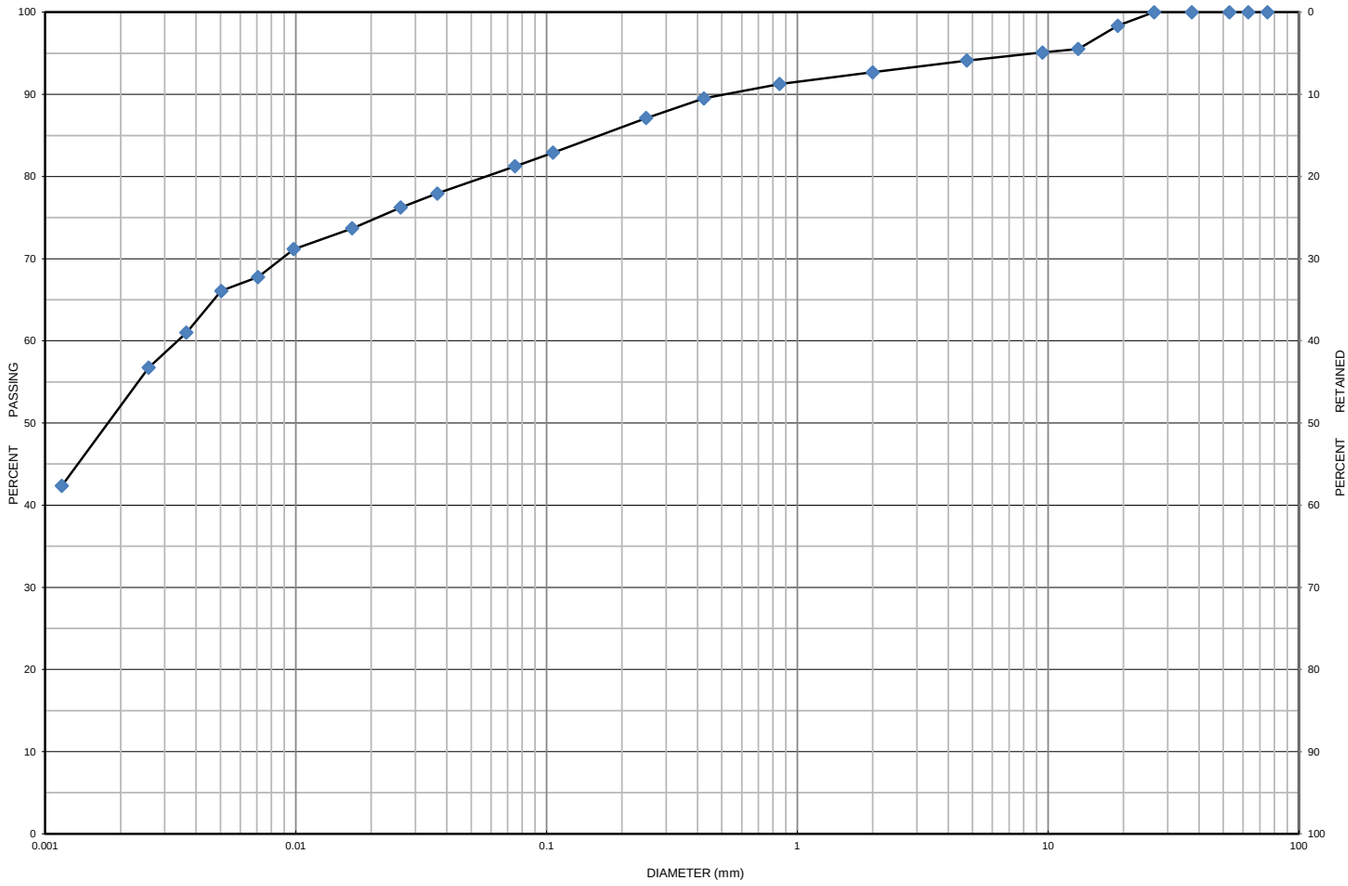
**Project Number:** *10131-001* **Client:** *M. Romanin Contracting Ltd.*

**Project Name:** *PART Lot 34 & 35, Concession 3, Town of Wasaga Beach*

**Sample Date:** *December 2, 2019* **Sampled By:** *Chris Malliaros - Cambium Inc.*

**Location:** *BH 101-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-1131*

| 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 | 6 | 13 | 81 | | 23.4 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Silty Clay some Sand trace Gravel | CL | 0.0035 | - | - | - | - |

*Issued By:* _____ *Date Issued:* *February 14, 2020*

(Senior Project Manager)

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# Grain Size Distribution Chart

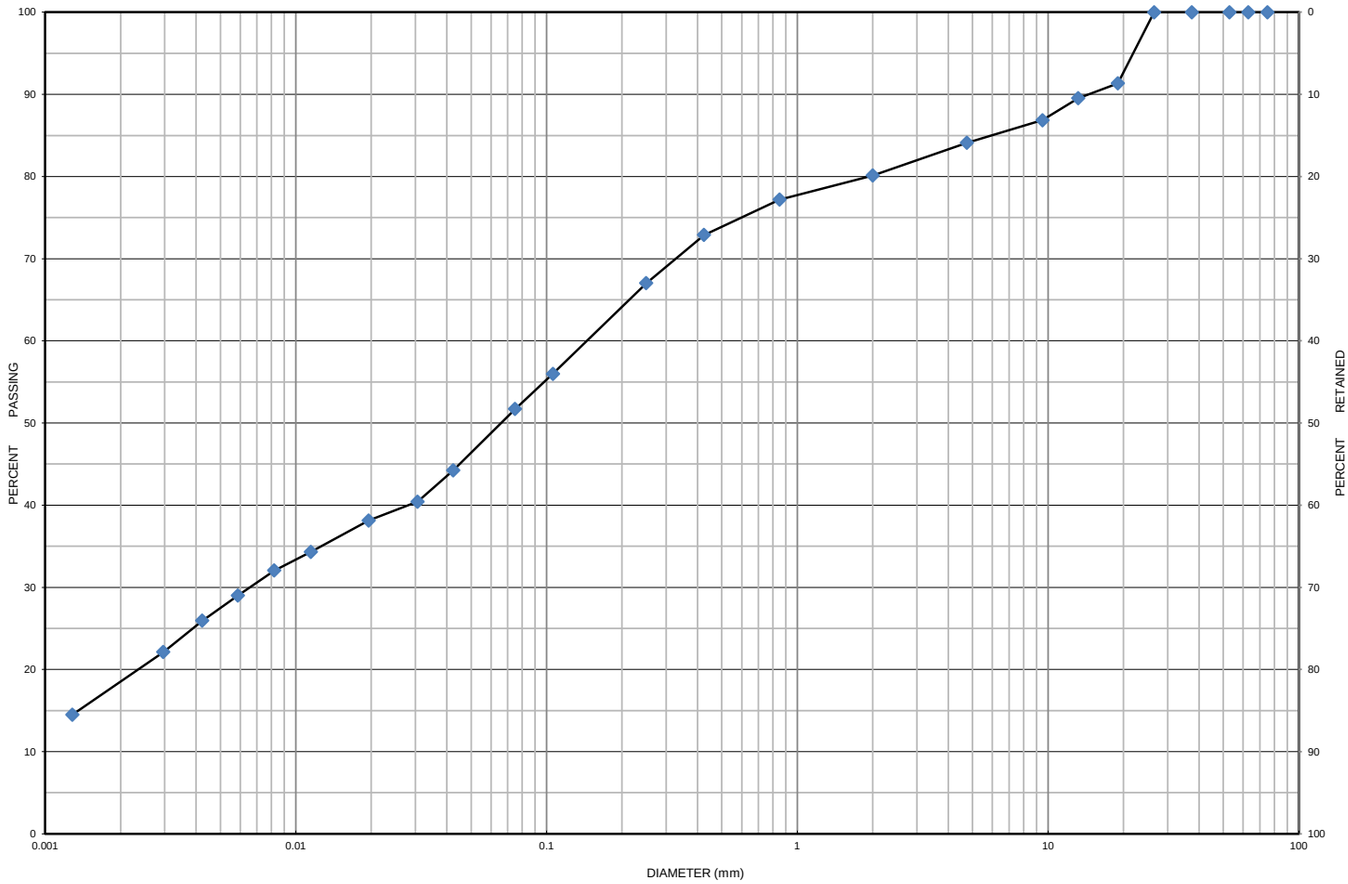
**Project Number:** *10131-001* **Client:** *M. Romanin Contracting Ltd.*

**Project Name:** *PART Lot 34 & 35, Concession 3, Town of Wasaga Beach*

**Sample Date:** *December 2, 2019* **Sampled By:** *Chris Malliaros - Cambium Inc.*

**Location:** *BH 102-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-1132*

| 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 4 | 2.3 m to 2.7 m | 16 | 32 | 52 | | 9.6 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Silt and Sand some Clay some Gravel | ML | 0.1500 | 0.0065 | - | - | - |

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# Grain Size Distribution Chart

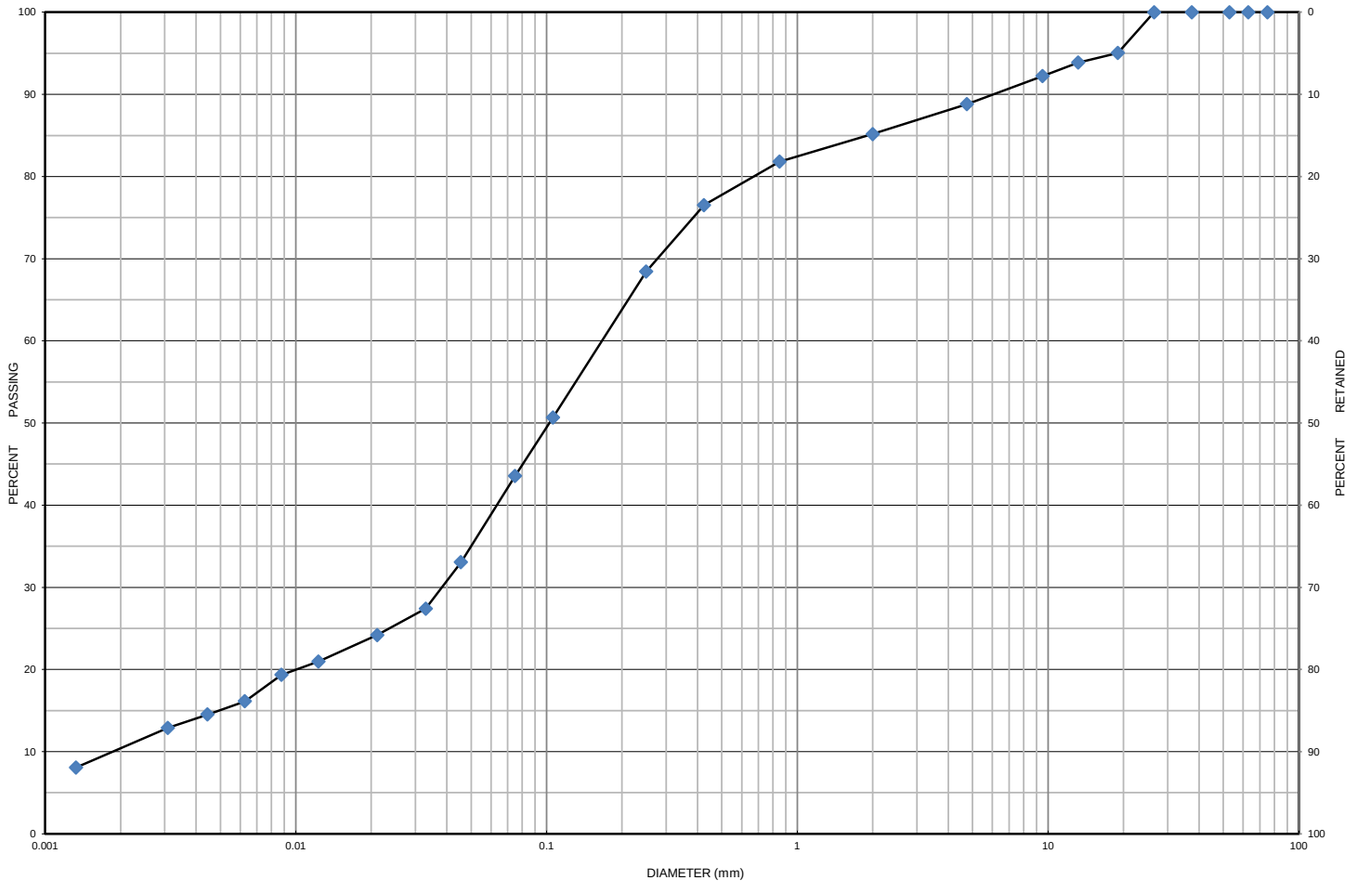
**Project Number:** *10131-001* **Client:** *M. Romanin Contracting Ltd.*

**Project Name:** *PART Lot 34 & 35, Concession 3, Town of Wasaga Beach*

**Sample Date:** *December 4, 2019* **Sampled By:** *Chris Malliaros - Cambium Inc.*

**Location:** *BH 104-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-1133*

| 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 4 | 2.3 m to 2.7 m | 11 | 45 | 44 | | 7.8 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Silty Sand some Clay some Gravel | SM | 0.1800 | 0.0390 | 0.0019 | 94.74 | 4.45 |

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# Grain Size Distribution Chart

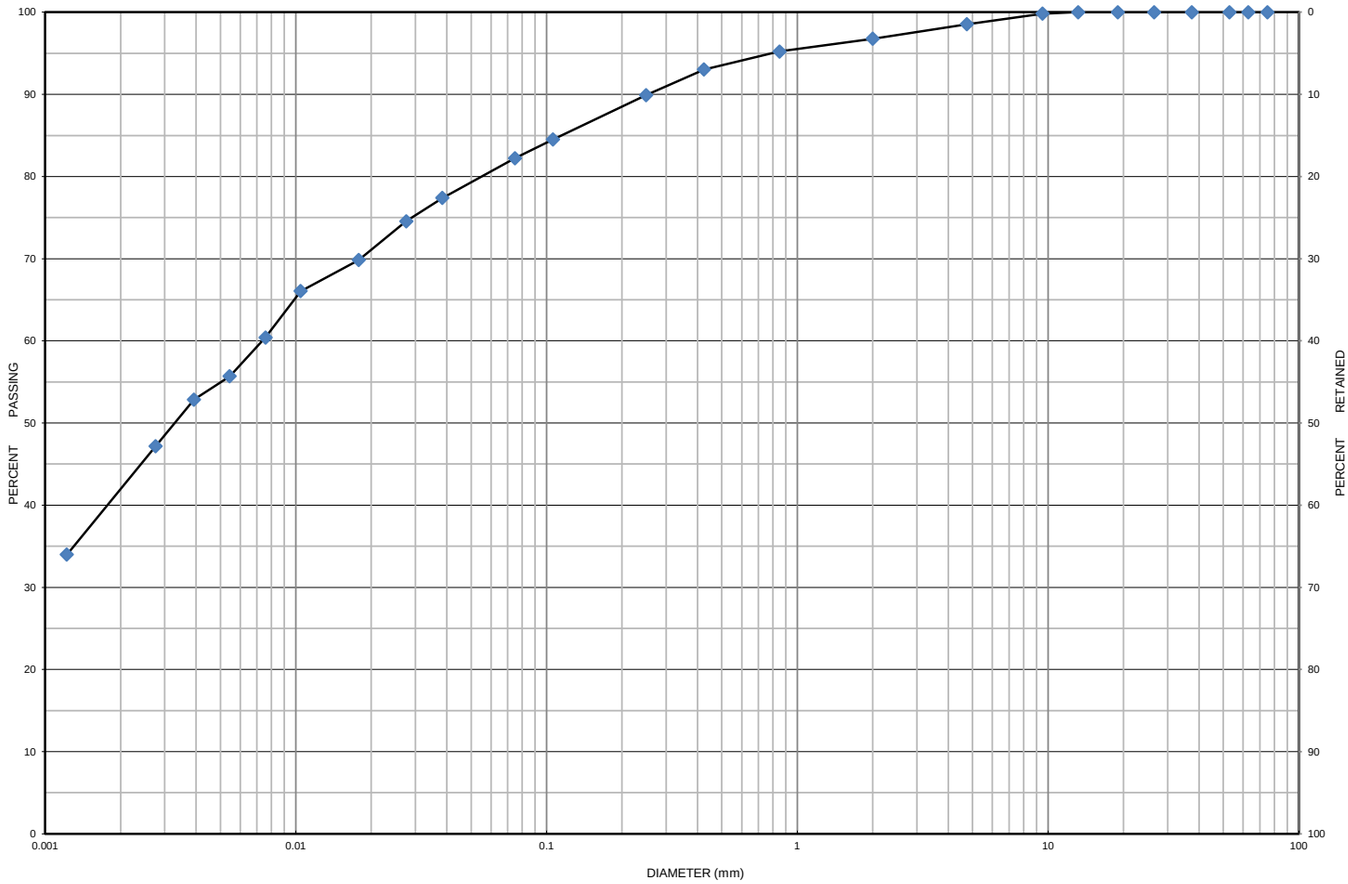
**Project Number:** *10131-001* **Client:** *M. Romanin Contracting Ltd.*

**Project Name:** *PART Lot 34 & 35, Concession 3, Town of Wasaga Beach*

**Sample Date:** *Decemeber 5, 2019* **Sampled By:** *Chris Malliaros - Cambium Inc.*

**Location:** *BH 107-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-1134*

| 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 107-19 | SS 4 | 2.3 m to 2.7 m | 2 | 16 | 82 | | 20.2 |

| Description | Classification | $D_{60}$ | $D_{30}$ | $D_{10}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|
| Clay and Silt some Sand trace Gravel | CL | 0.0075 | - | - | - | - |

*Issued By:* _____ *Date Issued:* *February 14, 2020*

(Senior Project Manager)


**Cambium Inc. (Laboratory)**

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# Appendix C

# Soil Chemical Laboratory Testing Results

CAMBIUM

## Table 1 - Summary of Soil Quality: Metals

| Sample Location | Note | Units | RDL | Table 1 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| **Sample ID** | | | | | | | |
| **Sample Date (dd-mmm-yy)** | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| **Sample Depth (mbgs)** | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| pH | | N/A | | NV | 7.78 | 7.78 | 7.6 |
| Conductivity | | mS/cm | 0.001 | BH | 0.118 | 0.428 | 0.399 |
| Sodium Adsorption Ratio | | N/A | | 1 | 0.257 | **2.86** | **5.41** |
| Antimony | | µg/g | 0.5 | 1 | < 0.5 | < 0.5 | < 0.5 |
| Arsenic | | µg/g | 0.5 | 11 | 0.8 | 1.8 | 1.5 |
| Barium | | µg/g | 1 | 210 | 10 | 63 | 27 |
| Beryllium | | µg/g | 0.2 | 2.5 | < 0.2 | 0.4 | 0.2 |
| Boron | | µg/g | 0.5 | 36 | 2.7 | 8.9 | 6 |
| Cadmium | | µg/g | 0.5 | 1 | < 0.5 | < 0.5 | < 0.5 |
| Chromium | | µg/g | 1 | 67 | 4 | 15 | 8 |
| Cobalt | | µg/g | 1 | 19 | 1 | 6 | 3 |
| Copper | | µg/g | 1 | 62 | 3 | 12 | 6 |
| Lead | | µg/g | 5 | 45 | < 5 | 7 | < 5 |
| Mercury | | µg/g | 0.005 | 0.16 | 0.009 | 0.014 | 0.007 |
| Molybdenum | | µg/g | 1 | 2 | < 1 | < 1 | < 1 |
| Nickel | | µg/g | 1 | 37 | 3 | 15 | 7 |
| Selenium | | µg/g | 0.5 | 1.2 | < 0.5 | < 0.5 | < 0.5 |
| Silver | | µg/g | 0.2 | 0.5 | < 0.2 | < 0.2 | < 0.2 |
| Thallium | | µg/g | 0.1 | 1 | < 0.1 | < 0.1 | < 0.1 |
| Uranium | | µg/g | 0.1 | 1.9 | 0.2 | 0.6 | 0.5 |
| Vanadium | | µg/g | 1 | 86 | 5 | 17 | 11 |
| Zinc | | µg/g | 3 | 290 | 7 | 30 | 15 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
N/A - not applicable
NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
NV - no value
"-" not analyzed
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
8 - Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
9 - Standard is for benzo(b)fluoranthene; however, the laboratory can not distinguish between benzo(b)fluoranthene and benzo(k)fluoranthene.
10 - Analysis for methyl mercury applies only when standard for mercury (total) is exceeded .

## Table 2 - Summary of Soil Quality: Metals

| Sample Location | Note | Units | RDL | Table 2 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| **Sample ID** | | | | | | | |
| **Sample Date (dd-mmm-yy)** | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| **Sample Depth (mbgs)** | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| pH | | N/A | | NV | 7.78 | 7.78 | 7.6 |
| Conductivity | | mS/cm | 0.001 | 0.7 | 0.118 | 0.428 | 0.399 |
| Sodium Adsorption Ratio | | N/A | | 5 | 0.257 | 2.86 | **5.41** |
| Antimony | | µg/g | 0.5 | 7.5 | < 0.5 | < 0.5 | < 0.5 |
| Arsenic | | µg/g | 0.5 | 18 | 0.8 | 1.8 | 1.5 |
| Barium | | µg/g | 1 | 390 | 10 | 63 | 27 |
| Beryllium | | µg/g | 0.2 | 4 | < 0.2 | 0.4 | 0.2 |
| Boron | | µg/g | 0.5 | 120 | 2.7 | 8.9 | 6 |
| Cadmium | | µg/g | 0.5 | 1.2 | < 0.5 | < 0.5 | < 0.5 |
| Chromium | | µg/g | 1 | 160 | 4 | 15 | 8 |
| Cobalt | | µg/g | 1 | 22 | 1 | 6 | 3 |
| Copper | | µg/g | 1 | 140 | 3 | 12 | 6 |
| Lead | | µg/g | 5 | 120 | < 5 | 7 | < 5 |
| Mercury | | µg/g | 0.005 | 0.27 | 0.009 | 0.014 | 0.007 |
| Molybdenum | | µg/g | 1 | 6.9 | < 1 | < 1 | < 1 |
| Nickel | | µg/g | 1 | 100 | 3 | 15 | 7 |
| Selenium | | µg/g | 0.5 | 2.4 | < 0.5 | < 0.5 | < 0.5 |
| Silver | | µg/g | 0.2 | 20 | < 0.2 | < 0.2 | < 0.2 |
| Thallium | | µg/g | 0.1 | 1 | < 0.1 | < 0.1 | < 0.1 |
| Uranium | | µg/g | 0.1 | 23 | 0.2 | 0.6 | 0.5 |
| Vanadium | | µg/g | 1 | 86 | 5 | 17 | 11 |
| Zinc | | µg/g | 3 | 340 | 7 | 30 | 15 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
N/A - not applicable
NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
NV - no value
"-" not analyzed
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
8 - Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
9 - Standard is for benzo(b)fluoranthene; however, the laboratory can not distinguish between benzo(b)fluoranthene and benzo(k)fluoranthene.
10 - Analysis for methyl mercury applies only when standard for mercury (total) is exceeded .

**Table 3 - Summary of Soil Quality: VOC's & PHC F1-F4**

| Sample Location | Note | Units | RDL | Table 1 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| Sample ID | | | | | | | |
| Sample Date (dd-mmm-yy) | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| Sample Depth (mbgs) | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| Acetone | | µg/g | 0.5 | 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Benzene | | µg/g | 0.02 | 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Bromodichloromethane | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Bromoform | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Bromomethane | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Carbon Tetrachloride | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Chlorobenzene | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Chloroform | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dibromochloromethane | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichlorobenzene,1,2- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorobenzene,1,3- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorobenzene,1,4- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorodifluoromethane | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dichloroethane,1,1- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethane,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethylene,1,1- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethene, cis-1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethene, trans-1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropane,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene, cis-1,3- | | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene, trans-1,3- | | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene 1,3- cis+trans | 7 | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Ethylbenzene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dibromoethane,1,2- (Ethylene Dibromide) | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Hexane | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Methyl Ethyl Ketone | | µg/g | 0.5 | 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Methyl Isobutyl Ketone | | µg/g | 0.5 | 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Methyl-t-butyl Ether | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Dichloromethane (Methylene Chloride) | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Styrene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Tetrachloroethane,1,1,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Tetrachloroethane,1,1,2,2- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Tetrachloroethylene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Toluene | | µg/g | 0.2 | 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Trichloroethane,1,1,1- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Trichloroethane,1,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Trichloroethylene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Trichlorofluoromethane | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Vinyl Chloride | | µg/g | 0.02 | 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Xylene, m,p- | | µg/g | 0.03 | NV | < 0.03 | < 0.03 | < 0.03 |
| Xylene, o- | | µg/g | 0.03 | NV | < 0.03 | < 0.03 | < 0.03 |
| Xylene, m,p,o- | 6 | µg/g | 0.03 | 0.05 | < 0.03 | < 0.03 | < 0.03 |
| PHC F1 (C6-C10) | | µg/g | 10 | 17 | < 10 | < 10 | < 10 |
| F1-BTEX (C6-C10) | 3 | µg/g | 10 | 17 | < 10 | < 10 | < 10 |
| PHC F2 (>C10-C16) | 4 | µg/g | 5 | 10 | < 5 | < 5 | < 5 |
| PHC F3 (>C16-C34) | 5 | µg/g | 10 | 240 | 50 | 85 | 33 |
| PHC F4 (>C34-C50) | | µg/g | 10 | 120 | < 10 | < 10 | < 10 |
| % moisture | | #N/A | | #N/A | 12.3 | 18.7 | 8.8 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
N/A - not applicable
NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
NV - no value
"-" not analyzed
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
8 - Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
9 - Standard is for benzo(b)fluoranthene; however, the laboratory can not distinguish between benzo(b)fluoranthene and

**Table 4 - Summary of Soil Quality: VOC's & PHC F1-F4**

| Sample Location | Note | Units | RDL | Table 2 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| Sample ID | | | | | | | |
| Sample Date (dd-mmm-yy) | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| Sample Depth (mbgs) | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| Acetone | | µg/g | 0.5 | 16 | < 0.5 | < 0.5 | < 0.5 |
| Benzene | | µg/g | 0.02 | 0.21 | < 0.02 | < 0.02 | < 0.02 |
| Bromodichloromethane | | µg/g | 0.02 | 1.5 | < 0.02 | < 0.02 | < 0.02 |
| Bromoform | | µg/g | 0.02 | 0.27 | < 0.02 | < 0.02 | < 0.02 |
| Bromomethane | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Carbon Tetrachloride | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Chlorobenzene | | µg/g | 0.02 | 2.4 | < 0.02 | < 0.02 | < 0.02 |
| Chloroform | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dibromochloromethane | | µg/g | 0.02 | 2.3 | < 0.02 | < 0.02 | < 0.02 |
| Dichlorobenzene,1,2- | | µg/g | 0.05 | 1.2 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorobenzene,1,3- | | µg/g | 0.05 | 4.8 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorobenzene,1,4- | | µg/g | 0.05 | 0.083 | < 0.05 | < 0.05 | < 0.05 |
| Dichlorodifluoromethane | | µg/g | 0.05 | 16 | < 0.05 | < 0.05 | < 0.05 |
| Dichloroethane,1,1- | | µg/g | 0.02 | 0.47 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethane,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethylene,1,1- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethene, cis-1,2- | | µg/g | 0.02 | 1.9 | < 0.02 | < 0.02 | < 0.02 |
| Dichloroethene, trans-1,2- | | µg/g | 0.02 | 0.084 | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropane,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene, cis-1,3- | | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene, trans-1,3- | | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Dichloropropene 1,3- cis+trans | 7 | µg/g | 0.02 | NV | < 0.02 | < 0.02 | < 0.02 |
| Ethylbenzene | | µg/g | 0.05 | 1.1 | < 0.05 | < 0.05 | < 0.05 |
| Dibromoethane,1,2- (Ethylene Dibromide) | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Hexane | | µg/g | 0.02 | 2.8 | < 0.02 | < 0.02 | < 0.02 |
| Methyl Ethyl Ketone | | µg/g | 0.5 | 16 | < 0.5 | < 0.5 | < 0.5 |
| Methyl Isobutyl Ketone | | µg/g | 0.5 | 1.7 | < 0.5 | < 0.5 | < 0.5 |
| Methyl-t-butyl Ether | | µg/g | 0.05 | 0.75 | < 0.05 | < 0.05 | < 0.05 |
| Dichloromethane (Methylene Chloride) | | µg/g | 0.05 | 0.1 | < 0.05 | < 0.05 | < 0.05 |
| Styrene | | µg/g | 0.05 | 0.7 | < 0.05 | < 0.05 | < 0.05 |
| Tetrachloroethane,1,1,1,2- | | µg/g | 0.02 | 0.058 | < 0.02 | < 0.02 | < 0.02 |
| Tetrachloroethane,1,1,2,2- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Tetrachloroethylene | | µg/g | 0.05 | 0.28 | < 0.05 | < 0.05 | < 0.05 |
| Toluene | | µg/g | 0.2 | 2.3 | < 0.2 | < 0.2 | < 0.2 |
| Trichloroethane,1,1,1- | | µg/g | 0.02 | 0.38 | < 0.02 | < 0.02 | < 0.02 |
| Trichloroethane,1,1,2- | | µg/g | 0.02 | 0.05 | < 0.02 | < 0.02 | < 0.02 |
| Trichloroethylene | | µg/g | 0.05 | 0.061 | < 0.05 | < 0.05 | < 0.05 |
| Trichlorofluoromethane | | µg/g | 0.02 | 4 | < 0.02 | < 0.02 | < 0.02 |
| Vinyl Chloride | | µg/g | 0.02 | 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Xylene, m,p- | | µg/g | 0.03 | NV | < 0.03 | < 0.03 | < 0.03 |
| Xylene, o- | | µg/g | 0.03 | NV | < 0.03 | < 0.03 | < 0.03 |
| Xylene, m,p,o- | 6 | µg/g | 0.03 | 3.1 | < 0.03 | < 0.03 | < 0.03 |
| PHC F1 (C6-C10) | | µg/g | 10 | 55 | < 10 | < 10 | < 10 |
| F1-BTEX (C6-C10) | 3 | µg/g | 10 | 55 | < 10 | < 10 | < 10 |
| PHC F2 (>C10-C16) | 4 | µg/g | 5 | 98 | < 5 | < 5 | < 5 |
| PHC F3 (>C16-C34) | 5 | µg/g | 10 | 300 | 50 | 85 | 33 |
| PHC F4 (>C34-C50) | | µg/g | 10 | 2800 | < 10 | < 10 | < 10 |
| % moisture | | #N/A | | #N/A | 12.3 | 18.7 | 8.8 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
N/A - not applicable
NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
NV - no value
"-" not analyzed
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
8 - Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
9 - Standard is for benzo(b)fluoranthene; however, the laboratory can not distinguish between benzo(b)fluoranthene and

## Table 5 - Summary of Soil Quality: PAH's

| Sample Location | Note | Units | RDL | Table 1 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| Sample ID | | | | | | | |
| Sample Date (dd-mmm-yy) | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| Sample Depth (mbgs) | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| Acenaphthene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | | µg/g | 0.05 | 0.093 | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | | µg/g | 0.05 | 0.095 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)pyrene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b)fluoranthene | 9 | µg/g | 0.05 | 0.3 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b+k)fluoranthene | | µg/g | 0.05 | NV | < 0.05 | < 0.05 | < 0.05 |
| Benzo(g,h,i)perylene | | µg/g | 0.05 | 0.2 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(k)fluoranthene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Chrysene | | µg/g | 0.05 | 0.18 | < 0.05 | < 0.05 | < 0.05 |
| Dibenzo(a,h)anthracene | | µg/g | 0.05 | 0.1 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | | µg/g | 0.05 | 0.24 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Indeno(1,2,3,-cd)pyrene | | µg/g | 0.05 | 0.11 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene,1- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene,2- | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene 2-(1-) | 2 | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Naphthalene | | µg/g | 0.05 | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | | µg/g | 0.05 | 0.19 | < 0.05 | < 0.05 | < 0.05 |
| Pyrene | | µg/g | 0.05 | 0.19 | < 0.05 | < 0.05 | < 0.05 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
NV - no value
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should be added for comparison.
8 - Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.

## Table 6 - Summary of Soil Quality: PAH's

| Sample Location | Note | Units | RDL | Table 2 Standards | B 101-19 | BH 103-19 | BH 107-19 |
|---|---|---|---|---|---|---|---|
| Sample ID | | | | | | | |
| Sample Date (dd-mmm-yy) | | | | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 |
| Sample Depth (mbgs) | | | | | 0.8 - 2.0 | 0.1 - 2.0 | 0.0 - 2.0 |
| Acenaphthene | | µg/g | 0.05 | 7.9 | < 0.05 | < 0.05 | < 0.05 |
| Acenaphthylene | | µg/g | 0.05 | 0.15 | < 0.05 | < 0.05 | < 0.05 |
| Anthracene | | µg/g | 0.05 | 0.67 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)anthracene | | µg/g | 0.05 | 0.5 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(a)pyrene | | µg/g | 0.05 | 0.3 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b)fluoranthene | 9 | µg/g | 0.05 | 0.78 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(b+k)fluoranthene | | µg/g | 0.05 | NV | < 0.05 | < 0.05 | < 0.05 |
| Benzo(g,h,i)perylene | | µg/g | 0.05 | 6.6 | < 0.05 | < 0.05 | < 0.05 |
| Benzo(k)fluoranthene | | µg/g | 0.05 | 0.78 | < 0.05 | < 0.05 | < 0.05 |
| Chrysene | | µg/g | 0.05 | 7 | < 0.05 | < 0.05 | < 0.05 |
| Dibenzo(a,h)anthracene | | µg/g | 0.05 | 0.1 | < 0.05 | < 0.05 | < 0.05 |
| Fluoranthene | | µg/g | 0.05 | 0.69 | < 0.05 | < 0.05 | < 0.05 |
| Fluorene | | µg/g | 0.05 | 62 | < 0.05 | < 0.05 | < 0.05 |
| Indeno(1,2,3,-cd)pyrene | | µg/g | 0.05 | 0.38 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene,1- | | µg/g | 0.05 | 0.99 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene,2- | | µg/g | 0.05 | 0.99 | < 0.05 | < 0.05 | < 0.05 |
| Methylnaphthalene 2-(1-) | 2 | µg/g | 0.05 | 0.99 | < 0.05 | < 0.05 | < 0.05 |
| Naphthalene | | µg/g | 0.05 | 0.6 | < 0.05 | < 0.05 | < 0.05 |
| Phenanthrene | | µg/g | 0.05 | 6.2 | < 0.05 | < 0.05 | < 0.05 |
| Pyrene | | µg/g | 0.05 | 78 | < 0.05 | < 0.05 | < 0.05 |

Notes:
Table 1 Standards - Full Depth Background Site Condition Standards - All Types
N/A - not applicable
NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
NV - no value
"-" not analyzed
Bold and shaded - value exceeds standard
Bold and underline - RDL exceeds standard
1 - Standard for Boron (HWS) is applicable only to surface soil (<1.5 mbgs).
2 - Standard is applicable to 1-methylnaphthallene and 2- methylnaphthalene, with the provision that if both are detected the sum of the two must not exceed the standard.
3 - Standard is applicable to PHC in the F1 range minus BTEX.
4 - Standard is applicable to PHC F2 minus naphthalene. If naphthalene is not analyzed, the standard is applied to F2.
5 - Standard is applicable to PHC F3 minus PAHs (other than naphthalene). If PAHs have not been measured, the standard is applied to F3.
6 - Standard is applicable to total xylenes, and m & p-xylenes and o-xylenes should be summed for comparison.
7 - Standard is applicable to 1,3-Dichloropropene, and the individual isomers (cis + trans) should

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# CERTIFICATE OF ANALYSIS

## Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (i)**

**Report To:**

**Cambium Environmental**
74 Cedar Pointe Drive, Unit 1009
Barrie ON L4N 5R7
**Attention:** Jacob Bell

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

DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| Parameter | Qty | Site Analyzed | Analyst Initials | Date Analyzed | Lab Method | Reference Method |
|---|---|---|---|---|---|---|
| Conductivity | 3 | Holly Lane | ROD | 11-Dec-19 | A-COND-01 (o) | SM 2510B |
| pH | 3 | Holly Lane | ROD | 11-Dec-19 | A-PH-01 (o) | SM 4500H |
| Mercury | 3 | Holly Lane | PBK | 11-Dec-19 | D-HG-01 (o) | EPA 7471A |
| Sodium Adsorption Ratio | 3 | Holly Lane | AHM | 11-Dec-19 | D-ICP-01 SAR (o) | SM 3120 |
| Metals - ICP-OES | 3 | Holly Lane | AHM | 11-Dec-19 | D-ICP-02 (o) | EPA 6010 |
| Metals - ICP-MS | 3 | Holly Lane | TPR | 11-Dec-19 | D-ICPMS-01 (o) | EPA 6020 |

µg/g = micrograms per gram (parts per million) and is equal to mg/Kg
F1 C6-C10 hydrocarbons in µg/g, (F1-btex if requested)
F2 C10-C16 hydrocarbons in µg/g, (F2-napth if requested)
F3 C16-C34 hydrocarbons in µg/g, (F3-pah if requested)
F4 C34-C50 hydrocarbons in µg/g
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
Any deviations from the method are noted and reported for any particular sample.
nC6 and nC10 response factor is within 30% of response factor for toluene:
nC10,nC16 and nC34 response factors within 10% of each other:
C50 response factors within 70% of nC10+nC16+nC34 average:
Linearity is within 15%:
All results expressed on a dry weight basis.
Unless otherwise noted all chromatograms returned to baseline by the retention time of nC50.

Unless otherwise noted all extraction, analysis, QC requirements and limits for holding time were met.
If analyzed for F4 and F4G they are not to be summed but the greater of the two numbers are to be used in application to the CWS PHC
QC will be made available upon request.

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - Agricultural - Table 1 - Agricultural/Other Soil Std
Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun

Christine Burke
Lab Manager

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

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# CERTIFICATE OF ANALYSIS

## Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (i)**

**Report To:**

**Cambium Environmental**
74 Cedar Pointe Drive, Unit 1009
Barrie ON L4N 5R7
**Attention:** Jacob Bell

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

DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| | Client I.D. | | B 101-19 | BH 103-19 | BH 107-19 | | O. Reg. 153 | |
|---|---|---|---|---|---|---|---|---|
| | Sample I.D. | | B19-39460-1 | B19-39460-2 | B19-39460-3 | | Tbl. 1 - Agricultural | Tbl. 1 - All |
| | Date Collected | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 | | | |
| **Parameter** | **Units** | **R.L.** | | | | | | |
| pH @25°C | pH Units | | 7.78 | 7.78 | 7.60 | | | |
| Conductivity @25°C | mS/cm | 0.001 | 0.118 | 0.428 | 0.399 | | 0.47 | 0.57 |
| Sodium Adsorption Ratio | units | | 0.257 | **2.86** | **5.41** | | 1 | 2.4 |
| Antimony | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 1 | 1.3 |
| Arsenic | µg/g | 0.5 | 0.8 | 1.8 | 1.5 | | 11 | 18 |
| Barium | µg/g | 1 | 10 | 63 | 27 | | 210 | 220 |
| Beryllium | µg/g | 0.2 | < 0.2 | 0.4 | 0.2 | | 2.5 | 2.5 |
| Boron | µg/g | 0.5 | 2.7 | 8.9 | 6.0 | | 36 | 36 |
| Cadmium | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 1 | 1.2 |
| Chromium | µg/g | 1 | 4 | 15 | 8 | | 67 | 70 |
| Cobalt | µg/g | 1 | 1 | 6 | 3 | | 19 | 21 |
| Copper | µg/g | 1 | 3 | 12 | 6 | | 62 | 92 |
| Lead | µg/g | 5 | < 5 | 7 | < 5 | | 45 | 120 |
| Mercury | µg/g | 0.005 | 0.009 | 0.014 | 0.007 | | 0.16 | 0.27 |
| Molybdenum | µg/g | 1 | < 1 | < 1 | < 1 | | 2 | 2 |
| Nickel | µg/g | 1 | 3 | 15 | 7 | | 37 | 82 |
| Selenium | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 1.2 | 1.5 |
| Silver | µg/g | 0.2 | < 0.2 | < 0.2 | < 0.2 | | 0.5 | 0.5 |
| Thallium | µg/g | 0.1 | < 0.1 | < 0.1 | < 0.1 | | 1 | 1 |
| Uranium | µg/g | 0.1 | 0.2 | 0.6 | 0.5 | | 1.9 | 2.5 |
| Vanadium | µg/g | 1 | 5 | 17 | 11 | | 86 | 86 |
| Zinc | µg/g | 3 | 7 | 30 | 15 | | 290 | 290 |

O. Reg. 153 - Soil, Ground Water and Sediment Standards
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Lab Manager

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# CERTIFICATE OF ANALYSIS

Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (i)**

**Report To:**

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74 Cedar Pointe Drive, Unit 1009
Barrie ON L4N 5R7
**Attention:** Jacob Bell

**Caduceon Environmental Laboratories**
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Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

## Summary of Exceedances

| Table 1 - Agricultural/Other Soil Std | | |
|---|---|---|
| **BH 103-19** | Found Value | Limit |
| Sodium Adsorption Ratio (units) | 2.86 | 1 |
| **BH 107-19** | Found Value | Limit |
| Sodium Adsorption Ratio (units) | 5.41 | 1 |

| Table 1 - Res/Park/Institutional/Indus/Com/Commun | | |
|---|---|---|
| **BH 103-19** | Found Value | Limit |
| Sodium Adsorption Ratio (units) | 2.86 | 2.4 |
| **BH 107-19** | Found Value | Limit |
| Sodium Adsorption Ratio (units) | 5.41 | 2.4 |

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## Final Report

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Barrie ON L4N 5R7
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DATE RECEIVED: 05-Dec-19
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SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| Parameter | Qty | Site Analyzed | Analyst Initials | Date Analyzed | Lab Method | Reference Method |
|---|---|---|---|---|---|---|
| % Moisture | 3 | Richmond Hill | FAL | 09-Dec-19 | A-% moisture RH | |
| PHC(F2-F4) | 3 | Kingston | KPR | 09-Dec-19 | C-PHC-S-001 (k) | CWS Tier 1 |
| VOC's | 3 | Richmond Hill | FAL | 09-Dec-19 | C-VOC-02 (rh) | EPA 8260 |
| PHC(F1) | 3 | Richmond Hill | FAL | 09-Dec-19 | C-VPHS-01 (rh) | CWS Tier 1 |

µg/g = micrograms per gram (parts per million) and is equal to mg/Kg
F1 C6-C10 hydrocarbons in µg/g, (F1-btex if requested)
F2 C10-C16 hydrocarbons in µg/g, (F2-napth if requested)
F3 C16-C34 hydrocarbons in µg/g, (F3-pah if requested)
F4 C34-C50 hydrocarbons in µg/g
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
Any deviations from the method are noted and reported for any particular sample.
nC6 and nC10 response factor is within 30% of response factor for toluene:
nC10,nC16 and nC34 response factors within 10% of each other:
C50 response factors within 70% of nC10+nC16+nC34 average:
Linearity is within 15%:
All results expressed on a dry weight basis.
Unless otherwise noted all chromatograms returned to baseline by the retention time of nC50.

Unless otherwise noted all extraction, analysis, QC requirements and limits for holding time were met.
If analyzed for F4 and F4G they are not to be summed but the greater of the two numbers are to be used in application to the CWS PHC
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DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| | Client I.D. | | B 101-19 | BH 103-19 | BH 107-19 | | O. Reg. 153 | |
|---|---|---|---|---|---|---|---|---|
| | Sample I.D. | | B19-39460-1 | B19-39460-2 | B19-39460-3 | | Tbl. 1 - Agricultural | Tbl. 1 - All |
| | Date Collected | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 | | | |
| **Parameter** | **Units** | **R.L.** | | | | | | |
| Acetone | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 0.5 | 0.5 |
| Benzene | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.02 | 0.02 |
| Bromodichloromethane | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Bromoform | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Bromomethane | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Carbon Tetrachloride | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Monochlorobenzene (Chlorobenzene) | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Chloroform | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dibromochloromethane | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichlorobenzene,1,2- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dichlorobenzene,1,3- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dichlorobenzene,1,4- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dichlorodifluoromethane | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dichloroethane,1,1- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloroethane,1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloroethylene,1,1- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloroethene, cis-1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloroethene, trans-1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloropropane,1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Dichloropropene, cis-1,3- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | | |
| Dichloropropene, trans-1,3- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | | |

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - Agricultural - Table 1 - Agricultural/Other Soil Std
Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun

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# CERTIFICATE OF ANALYSIS

Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (ii)**

**Report To:**

**Cambium Environmental**
74 Cedar Pointe Drive, Unit 1009
Barrie ON L4N 5R7
**Attention:** Jacob Bell

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

DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| | Client I.D. | | B 101-19 | BH 103-19 | BH 107-19 | | O. Reg. 153 | |
|---|---|---|---|---|---|---|---|---|
| | Sample I.D. | | B19-39460-1 | B19-39460-2 | B19-39460-3 | | Tbl. 1 - Agricultural | Tbl. 1 - All |
| | Date Collected | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 | | | |
| **Parameter** | **Units** | **R.L.** | | | | | | |
| Dichloropropene 1,3-cis+trans | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Ethylbenzene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dibromoethane,1,2-(Ethylene Dibromide) | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Hexane | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Methyl Ethyl Ketone | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 0.5 | 0.5 |
| Methyl Isobutyl Ketone | µg/g | 0.5 | < 0.5 | < 0.5 | < 0.5 | | 0.5 | 0.5 |
| Methyl-t-butyl Ether | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Dichloromethane (Methylene Chloride) | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Styrene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Tetrachloroethane,1,1,1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Tetrachloroethane,1,1,2,2- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Tetrachloroethylene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Toluene | µg/g | 0.2 | < 0.2 | < 0.2 | < 0.2 | | 0.2 | 0.2 |
| Trichloroethane,1,1,1- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Trichloroethane,1,1,2- | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.05 |
| Trichloroethylene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.05 |
| Trichlorofluoromethane | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.05 | 0.25 |
| Vinyl Chloride | µg/g | 0.02 | < 0.02 | < 0.02 | < 0.02 | | 0.02 | 0.02 |
| Xylene, m,p- | µg/g | 0.03 | < 0.03 | < 0.03 | < 0.03 | | | |
| Xylene, o- | µg/g | 0.03 | < 0.03 | < 0.03 | < 0.03 | | | |

O. Reg. 153 - Soil, Ground Water and Sediment Standards
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**Attention:** Jacob Bell

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Tel: 705-252-5743
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DATE RECEIVED: 05-Dec-19
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SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

| | Client I.D. | | B 101-19 | BH 103-19 | BH 107-19 | | O. Reg. 153 | |
|---|---|---|---|---|---|---|---|---|
| | Sample I.D. | | B19-39460-1 | B19-39460-2 | B19-39460-3 | | Tbl. 1 - Agricultural | Tbl. 1 - All |
| | Date Collected | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 | | | |
| **Parameter** | **Units** | **R.L.** | | | | | | |
| Xylene, m,p,o- | µg/g | 0.03 | < 0.03 | < 0.03 | < 0.03 | | 0.05 | 0.05 |
| PHC F1 (C6-C10) | µg/g | 10 | < 10 | < 10 | < 10 | | 17 | 25 |
| PHC F1 - BTEX | µg/g | 10 | < 10 | < 10 | < 10 | | 17 | 25 |
| PHC F2 (>C10-C16) | µg/g | 5 | < 5 | < 5 | < 5 | | 10 | 10 |
| PHC F3 (>C16-C34) | µg/g | 10 | 50 | 85 | 33 | | 240 | 240 |
| PHC F4 (>C34-C50) | µg/g | 10 | < 10 | < 10 | < 10 | | 120 | 120 |
| % moisture | % | | 12.3 | 18.7 | 8.8 | | | |

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 1 - Agricultural - Table 1 - Agricultural/Other Soil Std
Tbl. 1 - All - Table 1 - Res/Park/Institutional/Indus/Com/Commun

Christine Burke
Lab Manager

R.L. = Reporting Limit
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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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# CERTIFICATE OF ANALYSIS

Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (ii)**

**Report To:**

**Cambium Environmental**
74 Cedar Pointe Drive, Unit 1009
Barrie ON L4N 5R7
**Attention:** Jacob Bell

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

DATE RECEIVED: 05-Dec-19
DATE REPORTED: 12-Dec-19
SAMPLE MATRIX: Soil

JOB/PROJECT NO.:
P.O. NUMBER: 10131-001
WATERWORKS NO.

**Summary of Exceedances**

O. Reg. 153 - Soil, Ground Water and Sediment Standards
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# CERTIFICATE OF ANALYSIS

Final Report

**C.O.C.: G85596** **REPORT No. B19-39460 (iii)**

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| Parameter | Qty | Site Analyzed | Analyst Initials | Date Analyzed | Lab Method | Reference Method |
|---|---|---|---|---|---|---|
| SVOC | 3 | Kingston | sge | 10-Dec-19 | C-NAB-S-001 (k) | EPA 8270 |

µg/g = micrograms per gram (parts per million) and is equal to mg/Kg
F1 C6-C10 hydrocarbons in µg/g, (F1-btex if requested)
F2 C10-C16 hydrocarbons in µg/g, (F2-napth if requested)
F3 C16-C34 hydrocarbons in µg/g, (F3-pah if requested)
F4 C34-C50 hydrocarbons in µg/g
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
Any deviations from the method are noted and reported for any particular sample.
nC6 and nC10 response factor is within 30% of response factor for toluene:
nC10,nC16 and nC34 response factors within 10% of each other:
C50 response factors within 70% of nC10+nC16+nC34 average:
Linearity is within 15%:
All results expressed on a dry weight basis.
Unless otherwise noted all chromatograms returned to baseline by the retention time of nC50.

Unless otherwise noted all extraction, analysis, QC requirements and limits for holding time were met.
If analyzed for F4 and F4G they are not to be summed but the greater of the two numbers are to be used in application to the CWS PHC
QC will be made available upon request.

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| | Client I.D. | | B 101-19 | BH 103-19 | BH 107-19 | | O. Reg. 153 | |
|---|---|---|---|---|---|---|---|---|
| | Sample I.D. | | B19-39460-1 | B19-39460-2 | B19-39460-3 | | Tbl. 1 - Agricultural | Tbl. 1 - All |
| | Date Collected | | 02-Dec-19 | 02-Dec-19 | 02-Dec-19 | | | |
| **Parameter** | **Units** | **R.L.** | | | | | | |
| Acenaphthene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.072 |
| Acenaphthylene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.093 | 0.093 |
| Anthracene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.16 |
| Benzo(a)anthracene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.095 | 0.36 |
| Benzo(a)pyrene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.3 |
| Benzo(b)fluoranthene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.3 | 0.47 |
| Benzo(b+k)fluoranthene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | | |
| Benzo(g,h,i)perylene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.2 | 0.68 |
| Benzo(k)fluoranthene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.48 |
| Chrysene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 7.8 | 2.8 |
| Dibenzo(a,h)anthracene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.1 | 0.1 |
| Fluoranthene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.24 | 0.56 |
| Fluorene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.12 |
| Indeno(1,2,3,-cd)pyrene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.11 | 0.23 |
| Methylnaphthalene,1- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.59 |
| Methylnaphthalene,2- | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.59 |
| Methylnaphthalene 2-(1-) | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.59 |
| Naphthalene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.05 | 0.09 |
| Phenanthrene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.19 | 0.69 |
| Pyrene | µg/g | 0.05 | < 0.05 | < 0.05 | < 0.05 | | 0.19 | 1 |

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