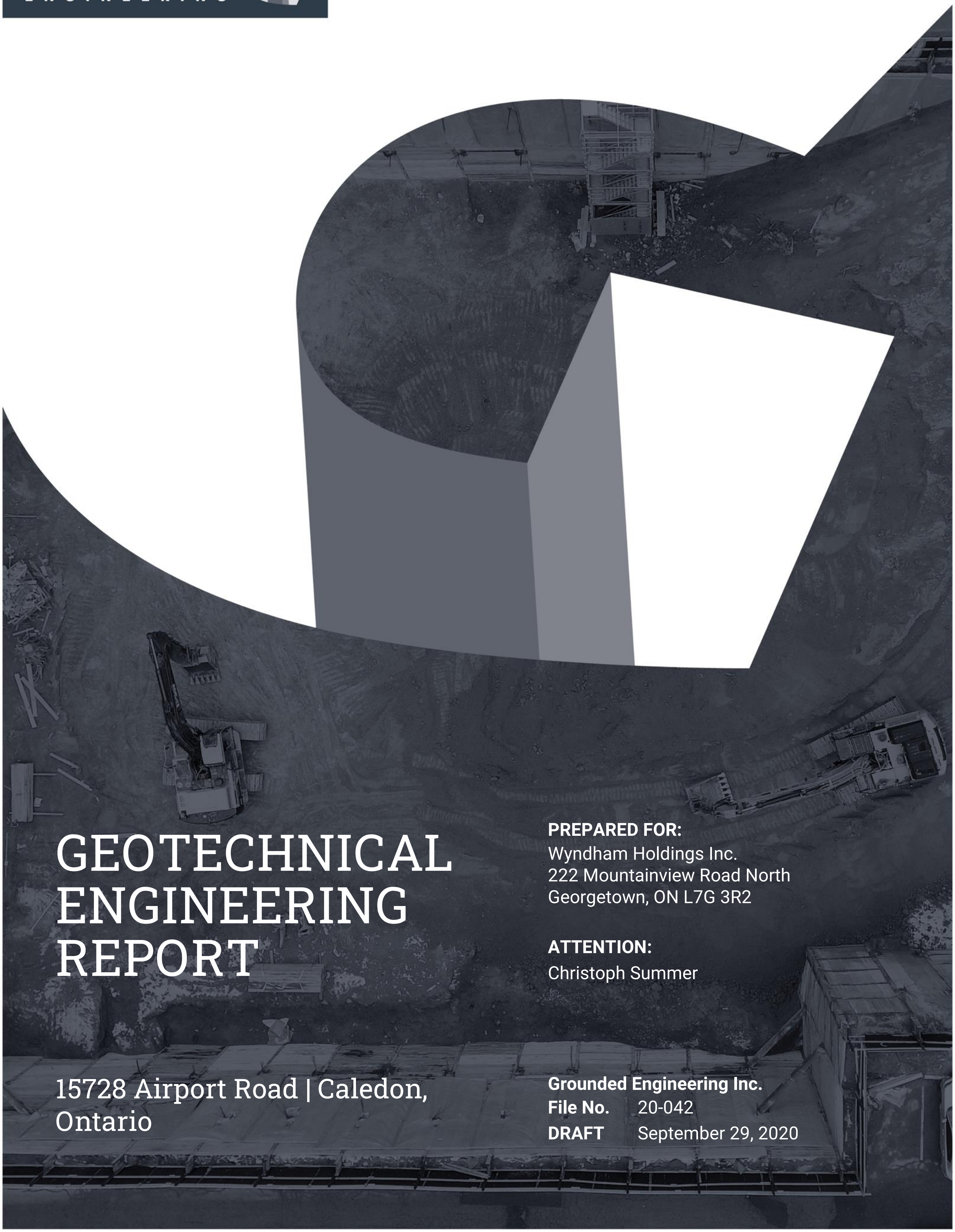

GEOTECHNICAL ENGINEERING REPORT

15728 Airport Road | Caledon, Ontario

PREPARED FOR:
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222 Mountainview Road North
Georgetown, ON L7G 3R2

ATTENTION:
Christoph Summer

Grounded Engineering Inc.
File No. 20-042
DRAFT September 29, 2020

TABLE OF CONTENTS

FIGURES

APPENDICES

TABLES AND FIGURES

1 Introduction

Wyndham Holdings Inc. has retained Grounded Engineering Inc. (“Grounded”) to provide geotechnical engineering design advice for their proposed development at 15728 Airport Road, in Caledon, Ontario.

The proposed project includes demolishing the existing dwelling on the site and constructing a 3-storey retirement home, with a walkout basement level under the building footprint set at a Finished Floor Elevation (FFE) of 307.8 ±m. There are grade raises of 2 to 3 metres proposed across the site. The redevelopment of the site will include a new pavement structure for internal parking areas.

Grounded has been provided with the following drawings to assist in our geotechnical scope of work:

- ABA Architects Inc., “Wyndham Residence”, Project No. 2018-127, Site Plan SK.1.1, dated May 19, 2020
- Crozier Consulting Engineers, “Preliminary Site Grading Plan, Wyndham Residence, 15728 Airport Road, Town of Caledon”, Project No. 1856-5524, dated June 5, 2020

Grounded’s subsurface investigation of the site to date includes eight (8) boreholes (BHs 101 to 105 and P1 to P3) which were advanced from March 5th to 6th, 2020.

Based on the borehole findings, geotechnical engineering advice for the proposed development is provided for foundations, seismic site classification, earth pressure design, slab on grade design, basement drainage, and pavement design. Construction considerations including excavation, groundwater control, and shoring design advice are also provided.

Grounded Engineering must conduct the on-site evaluation of founding subgrade as foundation and slab construction proceeds. This is a vital and essential part of the geotechnical engineering function and must not be grouped together with other “third-party inspection services”. Grounded will not accept responsibility for foundation performance if Grounded is not retained to carry out all the foundation evaluations during construction.

2 Ground Conditions

The borehole results are detailed on the attached borehole logs. Our assessment of the relevant stratigraphic units is intended to highlight the strata as they relate to geotechnical engineering. The ground conditions reported here will vary between and beyond the borehole locations.

The stratigraphic boundary lines shown on the borehole logs are assessed from non-continuous samples supplemented by drilling observations. These stratigraphic boundary lines represent transitions between soil types and should be regarded as approximate and gradual. They are not exact points of stratigraphic change.

Elevations are measured relative to geodetic datum. The horizontal coordinates are provided relative to the Universal Transverse Mercator (UTM) geographic coordinate system.

The boreholes were surveyed for horizontal coordinates and geodetic elevations with a Trimble R10 Receiver connected to the Global Navigation Satellite System and the Can-Net Virtual Reference Station Network.

2.1 Soil Stratigraphy

The following soil stratigraphy summary is based on the borehole results and the geotechnical laboratory testing.

Cross-sections showing stratigraphy and engineering units are appended and include the relevant borehole and well information from the other consultants.

A summary of the relevant stratigraphic units is provided as follows. The summary elevations are provided for general guidance only. Details are provided on the borehole logs and in the following subsections. In general, four main stratigraphic units were encountered on site as follows:

1. earth fill and topsoil, overlying
2. an "**upper glacial till**" deposit extending up to 3 m depth, overlying
3. a "**sand**" deposit encountered at about at Elev. 306.9 to 304.7 m, extending past the vertical depth of the investigation or overlying
4. a "**lower glacial till**" deposit encountered at 7.6 m (Elev. 300.6 to 299.2 m) below grade.

The groundwater table is approximately at Elev. 302 ±m.

2.1.1 Surficial and Earth Fill

All boreholes encountered 100 to 500 mm of topsoil at ground surface.

Underlying the surficial topsoil, the boreholes observed a layer of earth fill that extends to depths of 0.8 to 1.4 metres below grade (Elev. 307.6 to 304.9 ±m). The earth fill varies in composition but generally consists of sands and silts with trace to some clay and gravel. The earth fill is typically dark brown to black, moist, and contains rootlets and has an organic odour. Due to inconsistent placement and the inherent heterogeneity of earth fill materials, the relative density of the earth fill varies but is on average loose.

2.1.2 Upper Glacial Till

Underlying the earth fill in all boreholes except Borehole P1 and P2, a glacial till deposit was encountered at 0.8 to 1.4 m below grade (Elev. 307.6 to 305.2 m) and extends down to a depth of 1.8 to 3.0 m below grade (Elev. 304.5 to 306.2 m). The upper glacial till is weathered in Boreholes 101 and 102. The upper glacial till comprises sand and silt to sandy silt with trace to some clay and trace gravel. The upper till is brown and moist.

Standard Penetration Test (SPT) results (N-Values) measured in the upper till range from 5 to 32 blows per 300 mm of penetration (“bpf”). The upper glacial till is loose and wet in Boreholes 101 and 102 (north portion of the site), and elsewhere is on average compact.

2.1.3 Sand

Underlying the fill or glacial till materials in all boreholes (except Borehole P3), a native deposit of sand with some silt, trace clay, and trace gravel was encountered at 0.8 to 3.0 m below grade (Elev. 306.2 to 304.5 m). The sand unit extends to 7.6 m below grade (Elev. 299.2 to 300.6 m) or past the vertical extent of the borehole (Elev. 299.6 m). The sand unit is generally light brown to brown and moist transitioning to wet at 6.1 m depth below existing grade.

SPT N-values measured in this unit range from 7 to 53 bpf. The sands and silts are compact to dense below Elev. 305± m.

2.1.4 Lower Glacial Till

Underlying the sand deposit, Boreholes 101, 103, and 104 encountered a cohesionless glacial till comprising sandy silt with some clay and trace gravel. This unit was encountered at 7.6 m below grade (Elev. 300.6 to 299.2 m) and extends down to the full depth of the subsurface investigation in Boreholes 101, 103, and 104 at 8.1 m below grade (Elev. 300.1 to 298.7 ±m). The lower till is generally brown and moist.

SPT N-values measured in this unit range from 25 to 35 bpf, indicating on average a compact relative density.

2.2 Groundwater

The depth to groundwater and caved soils was measured in each of the boreholes immediately following the drilling. Monitoring wells were installed in boreholes 101 to 105 (5 total), and stabilized groundwater levels were measured in each of the monitoring wells after the completion of drilling.

The groundwater observations are shown on the Borehole Logs and are summarized as follows.

Table 2.1 – Summary of Groundwater Observations

Borehole No.	Depth of borehole (m)	Upon completion of drilling		Screen Elevation Interval (m)	Strata Screened	Water Level in Well, Depth/Elev. (m)	
		Depth to cave (m)	Unstabilized water level (m)			March 9, 2020	March 23, 2020
101	8.1	No Cave	Dry	303.7 to 300.6	Sand unit	7.1 / 301.1	7.1 / 301.2
102	8.1	No Cave	Dry	302.3 to 300.8	Sand unit	6.4 / 302.0	6.4 / 302.0
103	8.1	No Cave	Dry	303.5 to 300.4	Sand unit	Dry	Dry
104	8.1	No Cave	Dry	303.2 to 300.1	Sand unit	5.7 / 301.1	5.4 / 301.4
105	8.1	No Cave	Dry	303.2 to 300.1	Sand unit	6.3 / 301.4	6.0 / 301.7
P1	1.8	No Cave	Dry	Monitoring well not installed in borehole			
P2	1.8	No Cave	Dry	Monitoring well not installed in borehole			
P3	1.8	No Cave	Dry	Monitoring well not installed in borehole			

For design purposes, the groundwater table is at around Elev. 302 ±m, or approximately 5.8 m below the proposed lowest level finished floor elevation in the native sand unit.

Groundwater levels fluctuate with time depending on the amount of precipitation and surface runoff.

2.3 Corrosivity and Sulphate Attack

One (1) soil sample was submitted for corrosivity testing parameters (pH, Resistivity, Electrical Conductivity, Redox Potential, Sulphate, Sulphide and Chloride). The Certificate of Analyses is appended.

The soil samples were analysed for soluble sulphate concentration and compared to the Canadian Standard CAN3/CSA A23.1-M94 Table 3, *Additional Requirements for Concrete Subjected to Sulphate Attack*. Based on this table, the test results indicate that the water soluble sulphate concentrations in the soil subgrade are lower than 0.1 percent. As such, there is a negligible potential for sulphate attack on the concrete, regardless of cementing material used.

Corrosivity parameters are also used for assessing soil corrosivity applicable to cast iron alloys, according to the 10-point soil evaluation procedure described in the American Water Work Association (AWWA) C-105 standard. The analytical results only provide an indication of the potential for corrosion. The sample scored less than 10 points and corrosion protective measures are therefore not recommended for cast iron alloys. A more recent study by the AWWA has suggested that soil with a resistivity of less than about 2000 ohm.cm should be considered aggressive. The sample had resistivity measurements exceeding 2000 ohm.cm.

3 Geotechnical Engineering Recommendations

Based on the factual data summarized above, we are providing the following geotechnical engineering design recommendations. Contractors must review the factual data while bidding or scoping services for this project and must provide their own opinion as to means, methods, and schedule.

This report assumes that the design features relevant to the geotechnical analyses will be in accordance with applicable codes, standards and guidelines of practice. If there are any changes to the site development features, or there is any additional information relevant to the interpretations made of the subsurface information with respect to the geotechnical analyses or other recommendations, then Grounded should be retained to review the implications of these changes with respect to the contents of this report.

The proposed project includes demolishing the existing dwelling on the site and constructing a 3-storey retirement home structure, with a walkout basement level set at a Finished Floor Elevation (FFE) of 307.8 ±m, and a new pavement structure for internal parking areas.

3.1 Site Grading

The existing site grade ranges from Elev. 308 ±m at the north west end of the site to Elev. 306 ±m at the south east end of the site. The redevelopment is designed as a walkout, where grades will be raised up to 3 ±m to Elev. 311 ±m at the north west end, and up to 1.8 ±m to Elev. 307.8 ±m at the south east end.

All footings will be founded on a native soil subgrade or on an engineered fill pad. Compacted earth fill does not constitute adequate footing subgrade.

The grades at site may be raised in the areas of the building slab, internal courtyard and proposed paved areas using compacted earth fill. Any vegetation, topsoil, standing water, or organic rich soils must be removed prior to any grading activities. Topsoil thicknesses measured within the eight boreholes advanced on the site range from 100 to 500 mm but may vary in thickness across the property.

Due to the loose, wet, and organic nature of the existing earth fill, it is not adequate as a subgrade for grade raises. Only earth fill that is not wet or full or organics may be used as a subgrade for grade raises. Prior to any grade raises, the subgrade must be proof-rolled and inspected under the supervision of Grounded for obvious exposed loose or disturbed areas, or for areas containing excessive deleterious materials or moisture. Any unstable, organic, wet, loose, or soft areas identified in the subgrade should be sub-excavated and backfilled with Grounded approved clean earth fill (from the site or imported). Of note, the existing wet, loose glacial till identified in Boreholes 101 and 102 may also need to be removed prior to grade raises at the discretion of the Geotechnical Engineer during site grading activities. All backfilled fill must be placed in 150 mm thick lifts, compacted to a minimum of 98% SPMDD, and be within 2% of optimum moisture content.

Where grade raises occur, compacted earth fill can be expected to experience post-construction settlement. The amount of settlement may be approximated by about 1 percent of the depth of compacted fill. An approximation of the time it will take for the compacted fill to settle is provided below, the length of which depends on the fill material composition:

Table 3.1 – Post-construction settlement of earth fill

Material	Approximate settlement time frame
Sand and gravel	Several days
Silts	Several weeks
Clay or clayey soils	Several months

If foundation will be placed on engineered fill, then all grade raises should be done using engineered fill. Engineered fill is earth fill constructed to support foundations without causing significant differential settlement. The placement of earth fill as engineered fill must be conducted under the full-time supervision of Grounded and must be certified by Grounded.

Prior to the placement of engineered fill, the full depth of all existing topsoil, earth fill, and excessive wet and loose soils (loose wet glacial till encountered in Boreholes 101 and 102) must be removed. The native subgrade must be proof-rolled and inspected under the supervision of Grounded for obvious exposed loose or disturbed areas, or for areas containing excessive deleterious materials or moisture. These areas shall be recompacted in place and retested, or else replaced with clean earth fill or Granular B in lifts 150 mm thick or less and compacted to a minimum of 98 percent SPMDD.

Earth fill to be used as engineered fill must not contain organic material and must have a moisture content within 2 percent of optimum moisture content.

Approved earth fill material placed as engineered fill must be placed in lifts 150 mm thick or less and compacted to a minimum of 98 percent SPMDD. The engineered fill must be provided with a minimum 1.5 m of earth cover or equivalent insulation for frost protection. The engineered fill will experience post construction settlement, as outlined in Table 3.1 above.

3.2 Foundation Design Parameters

3.2.1 Spread Footings

Foundations must extend down to bear on undisturbed native soils or on an engineered fill pad. Native soil was encountered in each of the boreholes at depths summarized in the table below.

Table 3.2 – Depth and Elevation to Top of Native Soil

Borehole	Borehole Elevation (m)	Depth of top of native (m)	Elevation of top of undisturbed native (m)
101	308.2	2.3	305.9
102	308.4	2.3	306.1
103	308.0	1.1	306.9
104	306.8	0.8	306.0
105	307.7	1.1	306.6
P1	306.3	1.4	304.9
P2	306.9	0.8	306.1
P3	306.6	1.4	305.2

Conventional spread footings bearing on undisturbed native soils (outlined in the table above) may be designed using a maximum factored geotechnical resistance at ULS of 300 kPa. The net geotechnical reaction at SLS is 120 kPa, for an estimated total settlement of 25 mm.

If spread footing foundations are made to bear on an engineered fill pad, they can be designed using a maximum factored geotechnical resistance at ULS of 225 kPa. The net geotechnical reaction at SLS is 150 kPa, for an estimated total settlement of 25 mm.

The geotechnical reaction at SLS refers to a settlement which, for practical purposes, is linear and non-recoverable. Differential settlement is related to column spacing, column loads, and footing sizes.

When exposed to ambient environmental temperatures in Caledon, the design earth cover for frost protection of foundations is 1.5 metres.

Footings stepped from one elevation to another should be offset at a slope not steeper than 7 vertical to 10 horizontal.

The topsoil and earth fill surficial soils are considered unsuitable for the support of the proposed building foundations. The founding subgrade must be cleaned of all unacceptable materials and approved by Grounded prior to pouring concrete for the footings. Such unacceptable materials may include disturbed or caved soils, ponded water, or similar as indicated by Grounded during founding subgrade inspection. During the winter, adequate temporary frost protection for the footing bases and concrete must be provided if construction proceeds during freezing weather conditions.

Soils at the base of the foundation excavation shall not exceed a maximum particle size of 75 mm. Backfill shall not exceed a maximum particle size of 75 mm in foundation excavations exceeding 1 m in depth. If cobbles and boulders exceeding this maximum particle size are encountered, they will be deemed unsuitable and must be subexcavated and replaced with suitable material.

3.2.2 Drilled Piers

If higher bearing capacities are required, footings may be made as drilled piers extending down to bear on compact to dense native soils encountered in each of the boreholes as summarized in the table below.

Table 3.3 – Depth to Dense to Very Dense Native Soils

Borehole	Borehole Elevation (m)	Depth of top of founding subgrade (m)	Elevation of top of founding subgrade (m)	Encountered strata
101	308.2	2.3	305.9	Dense to very dense native sands
102	308.4	3.0	305.4	Compact native sands
103	308.0	1.5	306.5	Compact to dense native sand and glacial till
104	306.8	2.3	304.5	Dense to very dense native sands
105	307.7	2.3	305.4	Dense native glacial till

Conventional spread footings made as drilled piers made to bear on the compact to dense native soils may be designed using a maximum factored geotechnical resistance at ULS of 500 kPa. The net geotechnical reaction at SLS is 300 kPa, for an estimated total settlement of 25 mm. These foundations will be as much as 3 ±m below the basement FFE and can likely be inspected from the top subgrade elevation.

3.3 Earthquake Design Parameters

The Ontario Building Code (2012) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration, and the site classification.

The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the Ontario Building Code (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated from the rational analysis of undrained shear strength (s_u) or penetration resistance (N-values) according to the OBC and National Building Code of Canada.

Below the founding elevation the boreholes observe compact to dense sand (Boreholes 101 to 104) and dense cohesionless upper till (Borehole 105). Based on this information, the site designation for seismic analysis is **Class D**, per Table 4.1.8.4.A of the Ontario Building Code

(2012). Tables 4.1.8.4.B and 4.1.8.4.C. of the same code provide the applicable acceleration- and velocity-based site coefficients.

We have estimated the site designation based on quantitative analysis of penetration resistance (N-values) with assumed N-values for the soil stratigraphy beyond the investigation depth. If an improved seismic site class provides economic benefit to the project, consideration should be given to conducting a site-specific Multichannel Analysis of Surface Waves (MASW) to determine the average shear wave velocity in the top 30 meters of the site stratigraphy. The site-specific shear wave analysis may result in an improved seismic site designation (to a Class C) which may reduce the cost implication for the structure designed.

3.4 Earth Pressure Design Parameters

At this site, the design parameters for structures subject to unbalanced earth pressures are as follows:

Table 3.4 – Earth Pressure Design Parameters

Stratigraphic Unit	γ	φ	K_a	K_o	K_p
Compact Granular Fill Granular ‘B’ (OPSS 1010)	21	32	0.31	0.47	3.26
Existing Earth Fill	19	29	0.35	0.52	2.88
Upper Glacial Till	21	30	0.33	0.50	3.00
Sand Unit	20	34	0.28	0.44	3.54
Lower Glacial Till	21	34	0.28	0.44	3.54

γ = soil bulk unit weight (kN/m^3)
φ = internal friction angle (degrees)
K_a = active earth pressure coefficient (Rankine, dimensionless)
K_o = at-rest earth pressure coefficient (Rankine, dimensionless)
K_p = passive earth pressure coefficient (Rankine, dimensionless)

These earth pressure parameters assume that grade is horizontal behind the retaining structure. If retained grade is inclined, these parameters do not apply and must be re-evaluated.

The following equation can be used to calculate the unbalanced earth pressure imposed on walls:

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

P = horizontal pressure (kPa) at depth h
h = the depth at which P is calculated (m)
K = earth pressure coefficient
h_w = height of groundwater (m) above depth h
γ = soil bulk unit weight (kN/m^3)
γ' = submerged soil unit weight (γ - 9.8 kN/m^3)
q = total surcharge load (kPa)

If the wall backfill is drained such that hydrostatic pressures on the wall are effectively eliminated, this equation simplifies to:

$$P = K[\gamma h + q]$$

Where walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Water from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. This is discussed in Section 3.6.

The possible effects of frost on retaining earth structures must be considered. In frost-susceptible soils, pressures induced by freezing pore water are basically irresistible. Insulation typically addresses this issue. Alternatively, non-frost-susceptible backfill may be specified.

Foundation resistance to sliding is proportional to the friction between the soil subgrade and the base of the footing. The factored geotechnical resistance to friction (**R_f**) at ULS provided in the following equation:

$$R_f = \Phi N \tan \varphi$$

R_f = frictional resistance (kN)
Φ = reduction factor per CFEM Ed. 4 (0.8)
N = normal load at base of footing (kN)
φ = internal friction angle (see table above)

3.5 Slab on Grade Design Parameters

At Elev. 307.8 ±m the building slab on grade will be made on compacted fill or on an engineered fill pad. The modulus of subgrade reaction for slab-on-grade design supported by compacted earth fill is 12,000 kPa/m and on engineered fill is 18,000 kPa/m.

The topsoil and wet, loose, or organic-rich earth fill soils are considered unsuitable for the support of the proposed building slab. Moist, compact, and non-organic earth fill may be reusable as a subgrade for the proposed building slab. The slab on grade must be provided with a drainage layer and capillary moisture break, which is achieved by forming the slab on a minimum 200 mm thick layer of 19 mm clear stone (OPSS 1004) vibrated to a dense state.

Prior to the placement of the drainage layer and capillary moisture breaks, the subgrade must be proof-rolled and inspected under the supervision of Grounded for obvious exposed loose or disturbed areas, or for areas containing excessive deleterious materials or moisture. These areas shall be recompacted in place and retested, or else replaced with Granular B placed as engineered fill (in lifts 150 mm thick or less and compacted to a minimum of 98 percent SPMDD).

3.6 Long-Term Groundwater and Seepage Control

To limit seepage to the extent practicable, exterior grades adjacent to foundation walls should be sloped at a minimum 2 percent gradient away from the wall for 1.2 m minimum.

For a conventional drained basement approach, perimeter and subfloor drainage are required for the underground structure. Subfloor drainage collects and removes the seepage that infiltrates under the floor. Perimeter drainage collects and removes seepage that infiltrates at the foundation walls.

Subfloor drainage pipes are to be spaced at an average 6 m (measured on-centres).

The walls of the substructure are to be fully drained to eliminate hydrostatic pressure. How the drainage system is installed depends on whether the basement wall is made in an open cut or over a shored excavation face. Where drained basement walls are made directly against shoring, prefabricated composite drainage panel covering the blind side of the wall is used to provide drainage. Seepage from the composite drainage panel is collected and discharged through the basement wall in solid ports directly to the sumps. A layer of waterproofing placed between the drain core product and the basement wall should be considered to protect interior finishes from moisture.

In an open cut excavation, basement wall drainage is installed directly against the basement wall from the open cut side. Perimeter foundation drains made in this application comprise perforated pipe (minimum 100 mm diameter) surrounded by a granular filter of OPSS HL-8 Coarse Aggregate providing a minimum 300 mm of cover over the drain pipe.

Typical basement drainage details are appended.

The perimeter and subfloor drainage systems are critical structural elements since they eliminate hydrostatic pressure from acting on the basement walls and floor slab. The sumps that ensure the performance of these systems must have a duplexed pump arrangement providing 100% redundancy, and they must be on emergency power. The sumps should be sized by the mechanical engineer to adequately accommodate the estimated volume of water seepage.

4 Pavement Design Advice

The following design pertains to asphaltic concrete pavements (‘pavement’) where the pavement will rest on a soil subgrade.

The following Ontario Provincial Standards Specifications (OPSS) apply to the pavement construction and material requirements:

- OPSS 310 - Hot Mix Asphalt
- OPSS 501 - Compacting
- OPSS 1010 - Aggregates – Base, Subbase, Select Subgrade, and Backfill Material
- OPSS 1101 - Performance Graded Asphalt Cement
- OPSS 1150 - Hot Mix Asphalt

The pavement construction and material should also follow the relevant city specifications, as applicable.

4.1.1 Pavement Subgrade Preparation

Earth fill and undisturbed native soil cleared of organic rich or wet soils will provide adequate subgrade for the support of the pavement. Topsoil, organic rich, and wet soils are considered unsuitable for the pavement subgrade.

The subgrade must be proof-rolled and inspected under the supervision of Grounded for obvious loose or disturbed soils or where there is deleterious materials or moisture. These areas can either be recompacted in place and retested, or replaced with Granular B in lifts 150 mm thick or less, and compacted to a minimum of 98% SPMDD.

4.1.2 Pavement Design

Minimum and performance asphaltic concrete pavement designs are outlined in the tables below.

The following **minimum pavement design** will last for 8 to 10 years before significant maintenance is required, depending on the traffic volume.

Table 4.1 – Minimum asphaltic concrete pavement design

Minimum **Pavement Structure**	**Compaction Requirement**	**Car Parking Minimum Component Thickness**	**Bus/Truck Traffic Minimum Component Thickness**
Asphalt Top Lift HL-3 (OPSS 1150), and PG 58-28 (OPSS 1101)	OPSS 310	65 mm	40 mm
Asphalt Base Course HL-8 (OPSS 1150), and PG 58-28 (OPSS 1101)	OPSS 310	N/A	50 mm
Granular Base Course 19 mm diameter crusher run limestone or Granular A (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Granular Subbase Course 50 mm diameter crusher run limestone or Granular B Type II (OPSS 1010)	98% Standard Proctor Maximum Dry Density (ASTM-D698)	300 mm	350 mm
Total Thickness		**515 mm**	**590 mm**

The following **performance pavement design** will last approximately twice as long before significant maintenance is required. The performance pavement design considers that the top layer of asphalt will be damaged over time, and therefore, will contribute less to the structural strength of the asphalt.

Table 4.2 – Performance asphaltic concrete pavement design

Performance Pavement Structure	Compaction Requirement	Car Parking Minimum Component Thickness	Bus/Truck Traffic Minimum Component Thickness
Asphalt Top Lift HL-3 (OPSS 1150), and PG 58-28 (OPSS 1101)	OPSS 310	40 mm	40 mm
Asphalt Base Course HL-8 (OPSS 1150), and PG 58-28 (OPSS 1101)	OPSS 310	50 mm	80 mm
Granular Base Course 19 mm diameter crusher run limestone or Granular A (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Granular Subbase Course 50 mm diameter crusher run limestone or Granular B Type II (OPSS 1010)	98% Standard Proctor Maximum Dry Density (ASTM-D698)	400 mm	500 mm
Total Thickness		**640 mm**	**770 mm**

4.1.3 Pavement Drainage

Adequate drainage of the pavement subgrade is required. Prior to paving, the subgrade should be free of any depressions and sloped at a minimum grade of 2% to provide positive drainage. Perforated plastic subdrains (100 mm diameter) should be designed to collect subgrade water and positively outlet it at the catch basins. Typical pavement drainage details are appended.

Controlling surface water is important in keeping pavements in good maintenance. Grading adjacent pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb.

5 Considerations for Construction

5.1 Excavations

Excavations must be carried out in accordance with the *Occupational Health and Safety Act and Regulations for Construction Projects, November 1993 (Part III - Excavations, Section 222 through 242)*. These regulations designate four (4) broad classifications of soils to stipulate appropriate measures for excavation safety. For practical purposes:

- The earth fill is a Type 3 soil
- The glacial till is a Type 2 soil
- The sand unit is a Type 3 soil, or Type 4 soil when wet

In accordance with the regulation's requirements, the soil must be suitably sloped and/or braced where workmen must enter a trench or excavation deeper than 1.2 m. Safe excavation slopes by soil type are stipulated as follows:

Table 5.1 – OHSA excavation guidelines

Soil Type	Base of Slope	Steepest Slope Inclination
1	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
2	within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	from bottom of trench	1 horizontal to 1 vertical
4	from bottom of trench	3 horizontal to 1 vertical

Minimum support system requirements for steeper excavations are stipulated in Sections 235 through 238 and 241 of the Act and Regulations and include provisions for timbering, shoring and moveable trench boxes.

Larger obstructions (e.g. buried concrete debris, other obstructions) not directly observed in the boreholes are likely present in the earth fill. Similarly, larger inclusions (e.g. cobbles and boulders) may be encountered in the native soils. The size and distribution of these obstructions cannot be predicted with boreholes, as the split spoon sampler is not large enough to capture particles of this size. Provision must be made in excavation contracts to allocate risks associated with the time spent and equipment utilized to remove or penetrate such obstructions when encountered.

Within the zone of excavation, the boreholes were generally dry and open with no seepage. There may be perched water in the fill. On this basis, it is expected that groundwater if encountered will be of limited extent. Groundwater may be allowed to drain into the excavation and then pumped out. The volume of seepage anticipated in open excavations is limited to the extent that temporary pumping from the excavations is expected to sufficiently control groundwater seepage. Regardless, excavation delays will occur as seepage (however limited) is controlled. These delays should be anticipated in the construction schedule.

5.2 Earth-Retention Shoring Systems

Based on the provided grading plans, shoring is not expected to be required at this site. The shoring recommendations are provided upon the request of the Wyndham Holdings Inc.

The site is immediately bounded by Airport Road to the east, an existing single dwelling house to the south, Caledon East Public School to the west, and a paved laneway that provides access to Caledon East Public School to the north of the site. No excavation shall extend below the foundations of existing adjacent structures without adequate alternative support being provided.

Underpinning guidelines are appended.

5.2.1 Lateral Earth Pressure Distribution

If the shoring is cantilevered or supported with a single level of earth anchor or bracing, a triangular earth pressure distribution like that used for the basement wall design is appropriate.

The following equation can be used to calculate the unbalanced earth pressure imposed on walls:

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

P = horizontal pressure (kPa) at depth h
h = the depth at which P is calculated (m)
K = earth pressure coefficient
h_w = height of groundwater (m) above depth h
γ = soil bulk unit weight (kN/m^3)
γ' = submerged soil unit weight (γ - 9.8 kN/m^3)
q = total surcharge load (kPa)

Where shoring walls are drained to effectively eliminate hydrostatic pressure on the shoring system (e.g. pile and lagging walls), h_w is equal to zero.

5.2.2 Soldier Pile Toe Embedment

Soldier pile toes must be extended down to the compact to dense sands and silts below Elev. 306.9 to 304.7 ±m. Soldier pile toes resist horizontal movement due to the passive earth pressure acting on the toe below the base of excavation.

5.2.3 Lateral Bracing Elements

If the shoring system at this site requires lateral bracing, internal corner braces, pre-stressed soil anchors (tiebacks), and rakers may be used.

To limit the movement of the shoring system as much as is practically possible, tiebacks are installed and stressed as excavation proceeds. The use of tiebacks through adjacent properties requires the consent (through encroachment agreements) of the adjacent property owners.

In the compact to dense sands and silts below Elev. 306.9 to 304.7 ±m, it is expected that post-grouted anchors can be made such that an anchor will safely carry up to 60 kN/m of adhered anchor length (at a nominal borehole diameter of 150 mm).

At least one prototype anchor must be performance-tested to 200% of the design load to demonstrate the anchor capacity and validate design assumptions. Given the potential variability in soil conditions or installation quality, all production anchors must also be proof-tested to 133% of the design load.

The earth fill at the FFE (Elev. 307.8 m) is not suitable for the placement of raker foundations. Raker footings must be extended down to the compact to dense sands and silts below Elev. 306.9 to 304.7 ±m. Raker footings established on undisturbed compact to dense soils at an inclination of 45 degrees can be designed for a maximum factored geotechnical resistance at ULS of 150 kPa, or at ULS of 110 kPa on engineered fill. Rakers on existing earth fill are not recommended.

5.3 Site Work

To better protect wet undisturbed subgrade, excavations exposing wet soils must be cut neat, inspected, and then immediately protected with a skim coat of concrete (i.e. a mud mat). Wet sands are susceptible to degradation and disturbance due to even mild site work, frost, weather, or a combination thereof.

The effects of work on site can greatly impact soil integrity. Care must be taken to prevent this damage. Site work carried out during periods of inclement weather may result in the subgrade becoming disturbed, unless a granular working mat is placed to preserve the subgrade soils in their undisturbed condition. Subgrade preparation activities should not be conducted in wet weather and the project must be scheduled accordingly.

If site work causes disturbance to the subgrade, removal of the disturbed soils and the use of granular fill material for site restoration or underfloor fill will be required at additional cost to the project.

It is construction activity itself that often imparts the most severe loading conditions on the subgrade. Special provisions such as end dumping and forward spreading of earth and aggregate fills, restricted construction lanes, and half-loads during placement of the granular base and other work may be required, especially if construction is carried out during unfavourable weather.

Adequate temporary frost protection for the founding subgrade must be provided if construction proceeds in freezing weather conditions. The subgrade at this site is susceptible to frost damage. Depending on the project context, consideration should be given to frost effects (heaving, softening, etc.) on exposed subgrade surfaces.

5.4 Engineering Field Review

By issuing this report, Grounded Engineering has assumed the role of Geotechnical Engineer of Record for this site.

The proposed structure will be founded on conventional spread footings or drilled piers. All foundation installations must be reviewed in the field by Grounded, the Geotechnical Engineer of Record, as they are constructed. The on-site review of the condition of the founding subgrade as the foundations are constructed is as much a part of the geotechnical engineering design function as the design itself; it is also required by Section 4.2.2.2 of the Ontario Building Code. If Grounded is not retained to carry out foundation engineering field review during construction, then Grounded accepts no responsibility for the performance or non-performance of the foundations, even if they are constructed in general conformance with the engineering design advice contained in this report.

The long-term performance of a slab on grade is highly dependent upon the subgrade support and drainage conditions. Strict procedures must be maintained during construction to ensure that uniform moisture and density conditions are achieved in the subgrade to the extent possible. The design advice in this report is based on an assessment of the subgrade support capabilities as indicated by the boreholes. These conditions may vary across the site depending on the final design grades and therefore, the preparation of the subgrade and the compaction of all fill should be monitored by Grounded at the time of construction to confirm material quality, thickness, and to ensure adequate compaction.

6 Limitations and Restrictions

This report provides specifications which are to be used as technical specifications only. These technical specifications do not cover contract issues (quantities, insurance, other tender specifications, etc.) and as such must not be regarded as final tender specifications. The technical specifications provided in this report may form part of a complete set of tender documents prepared by others.

6.1 Investigation Procedures

The geotechnical engineering analysis and advice provided are based on the factual borehole information observed and recorded by Grounded. The investigation methodology and engineering analysis methods used to carry out this scope of work are consistent with conventional standard practice by Grounded as well as other geotechnical consultants, working under similar conditions and constraints (time, financial and physical).

Borehole drilling services were provided to Grounded by a specialist professional contractor. The drilling was observed and recorded by Grounded's field supervisor on a full-time basis. Drilling was conducted using conventional drilling rigs equipped with hollow stem augers. As drilling proceeded, groundwater observations were made in the boreholes. Based on examination of recovered borehole samples, our field supervisor made a record of borehole and drilling observations. The field samples were secured in air-tight clean jars and bags and taken to the Grounded soil laboratory where they were each logged and reviewed by the geotechnical engineering team and the senior reviewer.

The Split-Barrel Method technique (ASTM D1586) was used to obtain the soils samples. The sampling was conducted at conventional intervals for Boreholes 101 to 105, and continuously for Boreholes P1 to P3. As such, in Boreholes 101 to 105, stratigraphic interpolation between samples is required and stratigraphic boundary lines do not represent exact depths of geological change. They should be taken as gradual transition zones between soil or rock types.

A carefully conducted, fully comprehensive investigation and sampling scope of work carried out under the most stringent level of oversight may still fail to detect certain ground conditions. As such, users of this report must be aware of the risks inherent in using engineered field investigations to observe and record subsurface conditions. As a necessary requirement of working with discrete test locations, Grounded has assumed that the conditions between test locations are the same as the test locations themselves, for the purposes of providing geotechnical engineering advice.

It is not possible to design a field investigation with enough test locations that would provide complete subsurface information, nor is it possible to provide geotechnical engineering advice that completely identifies or quantifies every element that could affect construction, scheduling, or tendering. Contractors undertaking work based on this report (in whole or in part) must make their own determination of how they may be affected by the subsurface conditions, based on their own analysis of the factual information provided and based on their own means and methods. Contractors using this report must be aware of the risks implicit in using factual information at discrete test locations to infer subsurface conditions across the site and are directed to conduct their own investigations as needed.

6.2 Site and Scope Changes

Natural occurrences, the passage of time, local construction, and other human activity all have the potential to directly or indirectly alter the subsurface conditions at or near the project site. Contractual obligations related to groundwater or stormwater control, disturbed soils, frost protection, etc. must be considered with attention and care as they relate this potential site alteration.

The geotechnical engineering advice provided in this report is based on the factual observations made from the site investigations as reported. It is intended for use by the owner and their retained design team. If there are changes to the features of the development or to the scope, the interpreted subsurface information, geotechnical engineering design parameters, advice, and discussion on construction considerations may not be relevant or complete for the project. Grounded should be retained to review the implications of such changes with respect to the contents of this report.

6.3 Report Use

The authorized users of this report are Wyndham Holdings Inc. and their design team, for whom this report has been prepared. Grounded Engineering Inc. maintains the copyright and ownership of this document. Reproduction of this report in any format or medium requires explicit prior authorization from Grounded Engineering Inc.

The local municipal/regional governing bodies may also make use of and rely upon this report, subject to the limitations as stated.

7 Closure

If the design team has any questions regarding the discussion and advice provided, please do not hesitate to contact our office. We trust that this report meets your requirements at present.

For and on behalf of our team,

GROUNDED
ENGINEERING

LICENSED PROFESSIONAL ENGINEER
J. J. CROWDER
100077148
29/09/2020
PROVINCE OF ONTARIO

Jory Hunter, B.Sc.(Eng.), EIT

Jason Crowder, Ph.D., P.Eng.
Principal

FIGURES

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12 Banigan Drive, Toronto, Ont., M4H 1E9
www.groundedeng.ca

LEGEND

▬ SITE

Note

Reference
Google, 2020

Project

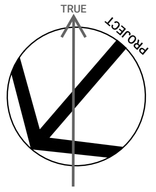
WYNDHAM RESIDENCE

15728 AIRPORT ROAD
TOWN OF CALEDON, ON

Figure Title

SITE LOCATION PLAN

North

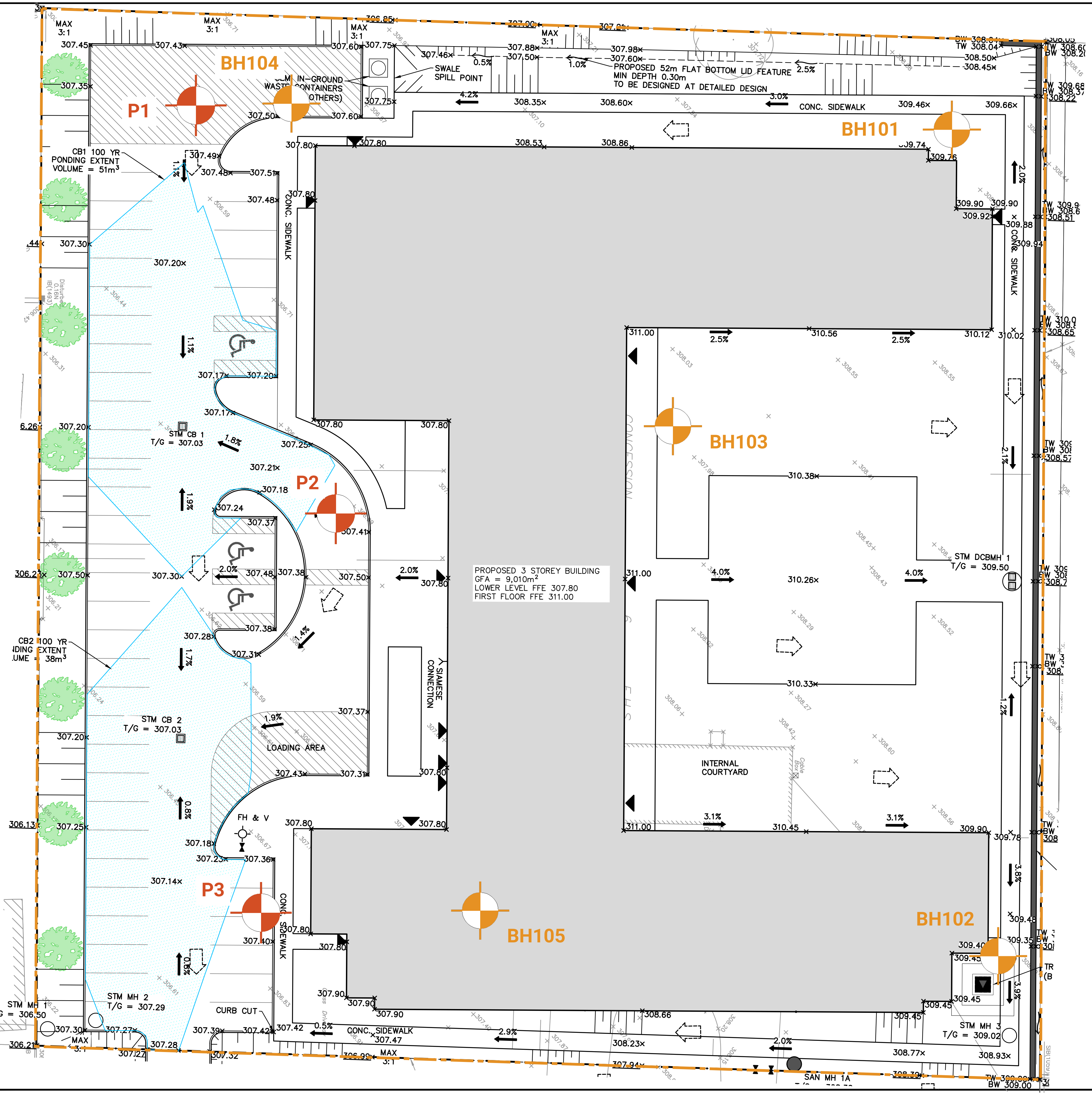


Date
APRIL 2020

Scale
N.T.S.

Job No
20-042

Figure No
FIGURE 1



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LEGEND

▬ ▬	PROPERTY BOUNDARY
✛	BOREHOLE
✛	PARKING BOREHOLE

Note

Reference

Crozier Consulting Engineers, "Preliminary Site Grading Plan, Wyndham Residence", Project No. 1856-5524, dated June 5, 2020

Project

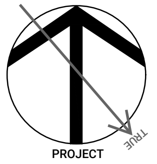
WYNDHAM RESIDENCE

15728 AIRPORT ROAD
TOWN OF CALEDON, ON

Figure Title

BOREHOLE LOCATION PLAN

North



Date

APRIL 2020

Scale

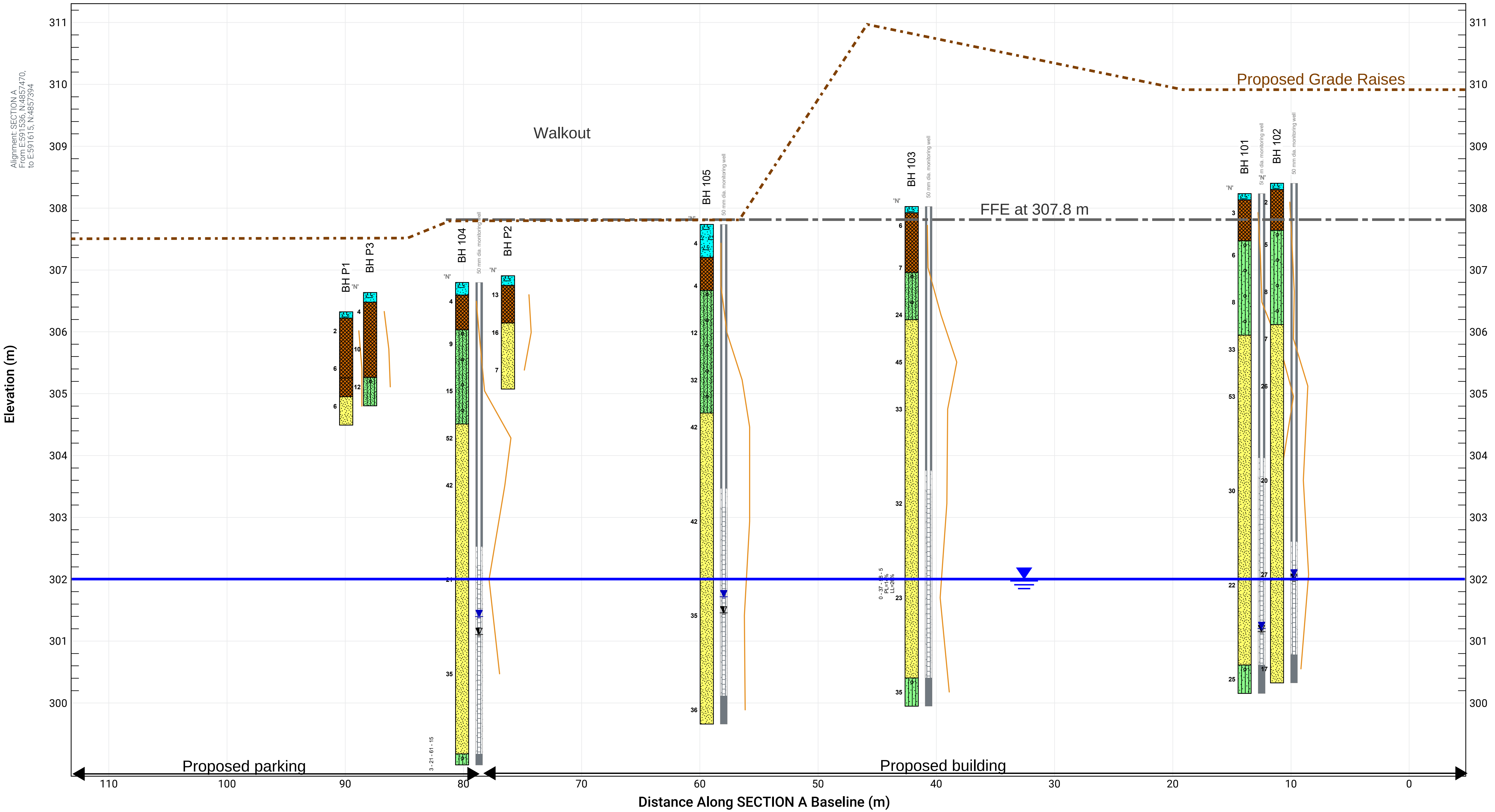
N.T.S.

Job No

20-042

Figure No

FIGURE 2



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LEGEND

- 🟧 FILL
- 🟧 GRAVELS (gravel to gravelly sand)
- 🟨 SILT TO SAND (not till)
- 🟩 COHESIONLESS TILLS
- 🟦 COHESIVE SOILS (clayey silt to clay, incl. tills)
- 🟦 DISTURBED/REWORKED SOILS
- ▽ water level, unstabilized
- ▼ water level, stabilized

Note

Reference

Project

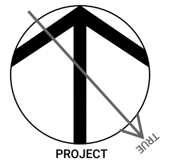
WYNDHAM RESIDENCE

15728 AIRPORT ROAD
TOWN OF CALEDON, ON

Figure Title

CROSS SECTION

North



Date

MAY 2020

Scale

AS INDICATED

Job No

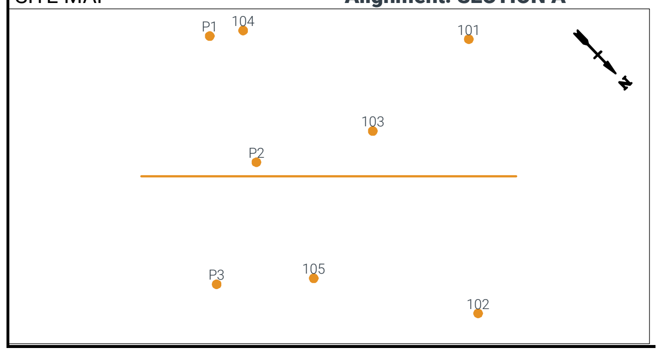
20-042

Figure No

FIGURE 3

SITE MAP

Alignment: SECTION A



LITHOLOGY GRAPHIC LEGEND

- ▨ Topsoil
- ▨ Sand and Silt
- ▨ Fill
- ▨ Silt and Sand
- ▨ Sand
- ▨ Sand and Silt Till
- ▨ Sandy Silt Till

APPENDIX A

BOREHOLE LOG TERMINOLOGY

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ENGINEERING

SAMPLING/TESTING METHODS

SS: split spoon sample

AS: auger sample

GS: grab sample

FV: shear vane

DP: direct push

PMT: pressuremeter test

ST: shelby tube

CORE: soil coring

RUN: rock coring

SYMBOLS & ABBREVIATIONS

MC: moisture content

LL: liquid limit

PL: plastic limit

PI: plasticity index

γ: soil unit weight (bulk)

G_s: specific gravity

S_u: undrained shear strength

▽ unstabilized water level

▼ 1st water level measurement

▼ 2nd water level measurement most recent

▼ water level measurement

ENVIRONMENTAL SAMPLES

M&I: metals and inorganic parameters

PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

VOC: volatile organic compound

PHC: petroleum hydrocarbon

BTEX: benzene, toluene, ethylbenzene and xylene

PPM: parts per million

FIELD MOISTURE (based on tactile inspection)

DRY: no observable pore water

MOIST: inferred pore water, not observable (i.e. grey, cool, etc.)

WET: visible pore water

COMPOSITION

Term	**% by weight**
trace silt	<10
some silt	10 - 20
silt***y***	20 - 35
sand ***and*** silt	>35

COHESIONLESS

Relative Density	**N-Value**
Very Loose	<4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	>50

COHESIVE

Consistency	**N-Value**	**Su (kPa)**
Very Soft	<2	<12
Soft	2 - 4	12 - 25
Firm	4 - 8	25 - 50
Stiff	8 - 15	50 - 100
Very Stiff	15 - 30	100 - 200
Hard	>30	>200

ASTM STANDARDS

ASTM D1586 Standard Penetration Test (SPT)
Driving a 51 mm O.D. split-barrel sampler ("split spoon") into soil with a 63.5 kg weight free falling 760 mm. The blows required to drive the split spoon 300 mm ("bpf") after an initial penetration of 150 mm is referred to as the N-Value.

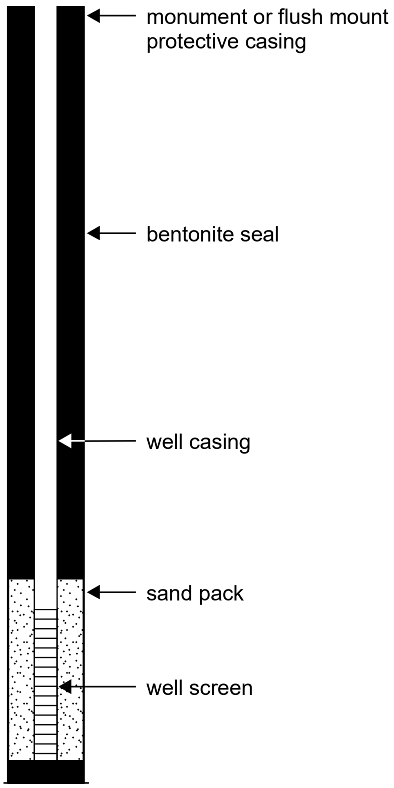
ASTM D3441 Cone Penetration Test (CPT)
Pushing an internal still rod with a outer hollow rod ("sleeve") tipped with a cone with an apex angle of 60° and a cross-sectional area of 1000 mm^2 into soil. The resistance is measured in the sleeve and at the tip to determine the skin friction and the tip resistance.

ASTM D2573 Field Vane Test (FVT)
Pushing a four blade vane into soil and rotating it from the surface to determine the torque required to shear a cylindrical surface with the vane. The torque is converted to the shear strength of the soil using a limit equilibrium analysis.

ASTM D1587 Shelby Tubes (ST)
Pushing a thin-walled metal tube into the in-situ soil at the bottom of a borehole, removing the tube and sealing the ends to prevent soil movement or changes in moisture content for the purposes of extracting a relatively undisturbed sample.

ASTM D4719 Pressuremeter Test (PMT)
Place an inflatable cylindrical probe into a pre-drilled hole and expanding it while measuring the change in volume and pressure in the probe. It is inflated under either equal pressure increments or equal volume increments. This provides the stress-strain response of the soil.

WELL LEGEND



GROUNDED ENGINEERING

Date Started : Mar 5, 2020
Position : E: 591518, N: 4857431 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 101

File No. : 20-042

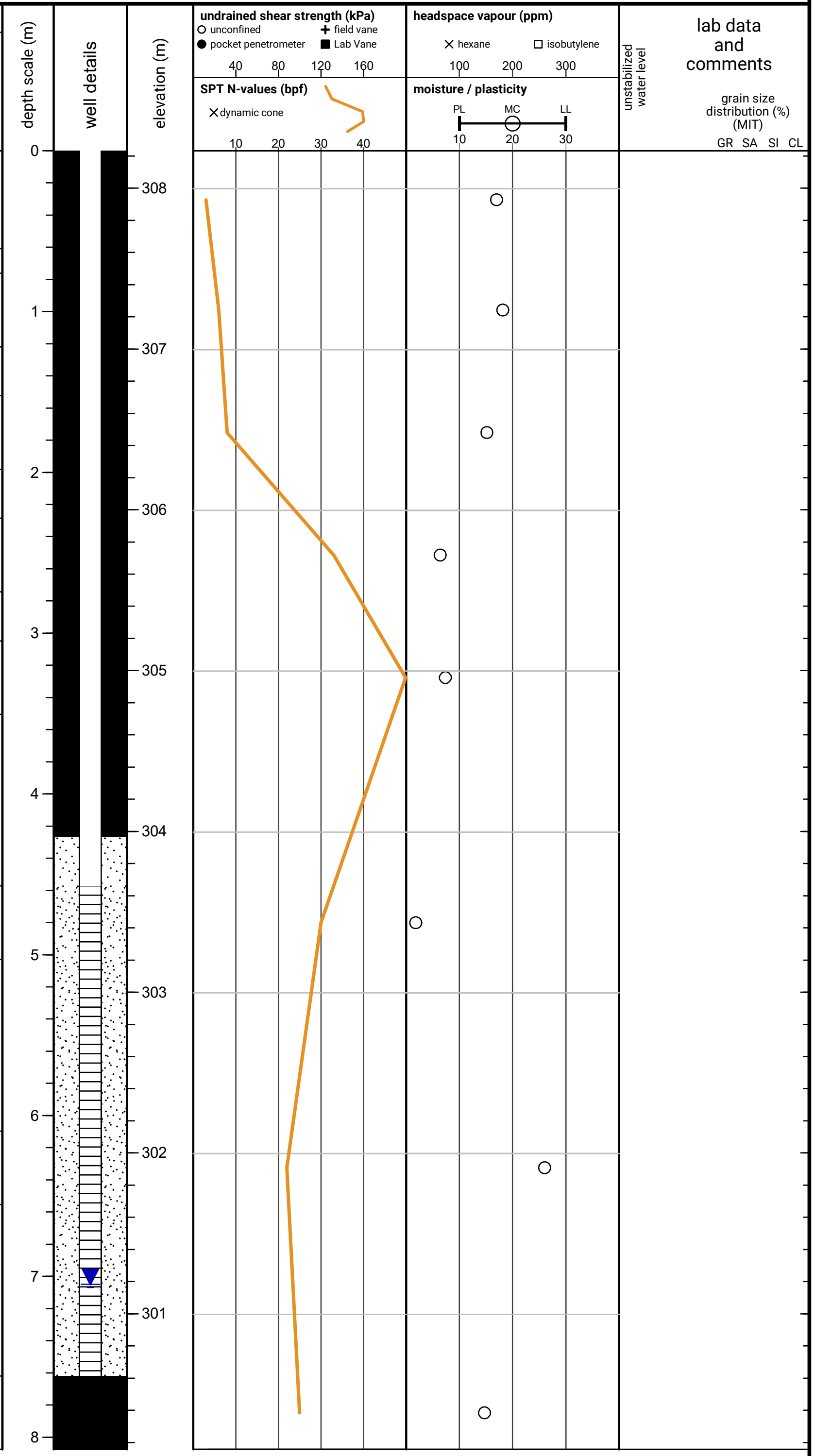
Project : 15728 Airport Road, Caledon

Client : Wyndham Holdings Inc.

drill method : CME 45

hollow stem augers OD=215 mm

elev depth (m)	description	number	type	SPT N-value
308.2	**GROUND SURFACE**			
	100mm **TOPSOIL**			
	FILL, sandy silt, trace clay, trace gravel, trace rootlets, very loose, brown to dark brown, moist	1	SS	3
307.4 0.8	**SANDY SILT**, trace clay, trace gravel, loose, brown, moist to wet (GLACIAL TILL)	2	SS	6
		3	SS	8
305.9 2.3	**SAND**, some silt, dense to very dense, light brown, moist	4	SS	33
		5	SS	53
		6	SS	30
	...at 6.1 m, compact, wet	7	SS	22
300.6 7.6	**SANDY SILT**, some clay, trace gravel, compact, brown, moist (GLACIAL TILL)	8	SS	25
300.1 8.1				



END OF BOREHOLE

Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

Date	Water Depth (m)	Elevation (m)
Mar 9, 2020	7.1	301.1
Mar 23, 2020	7.1	301.2

Tech : JN | **PM** : JH | **Rev** : MD

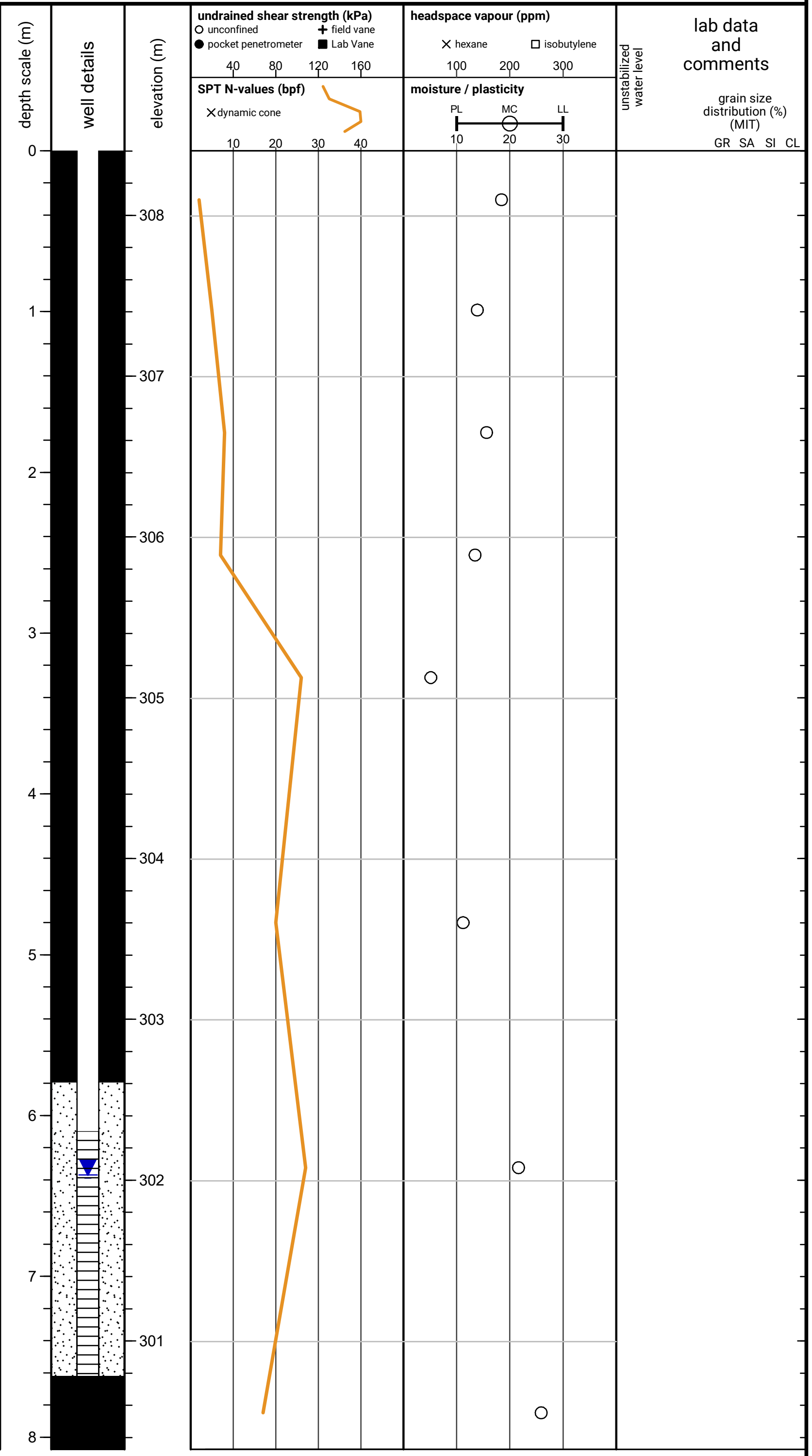
BOREHOLE LOG 102

Date Started : Mar 5, 2020
Position : E: 591572, N: 4857491 (UTM 17T)
Elev. Datum : Geodetic

File No. : 20-042 **Project** : 15728 Airport Road, Caledon **Client** : Wyndham Holdings Inc.

drill method : CME 45 — hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
308.4	**GROUND SURFACE**				
	100mm **TOPSOIL**				
	FILL, sandy silt, trace clay, trace gravel, organic odour, very loose, dark brown to brown, moist		1	SS	2
307.6 0.8	**SANDY SILT**, trace clay, trace gravel, loose, brown, moist to wet (GLACIAL TILL)		2	SS	5
	...at 1.5 m, moist to wet		3	SS	8
306.1 2.3	**SAND**, some silt, loose, brown, moist		4	SS	7
	...at 3.0 m, compact		5	SS	26
			6	SS	20
	...at 6.1 m, wet		7	SS	27
			8	SS	17
300.3 8.1	**END OF BOREHOLE**				



Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

Date	Water Depth (m)	Elevation (m)
Mar 9, 2020	6.4	302.0
Mar 23, 2020	6.4	302.0

file: 20-042 15728 airport rd.gpj

Tech : JN | **PM** : JH | **Rev** : MD

Date Started : Mar 6, 2020
Position : E: 591557, N: 4857431 (UTM 17T)
Elev. Datum : Geodetic

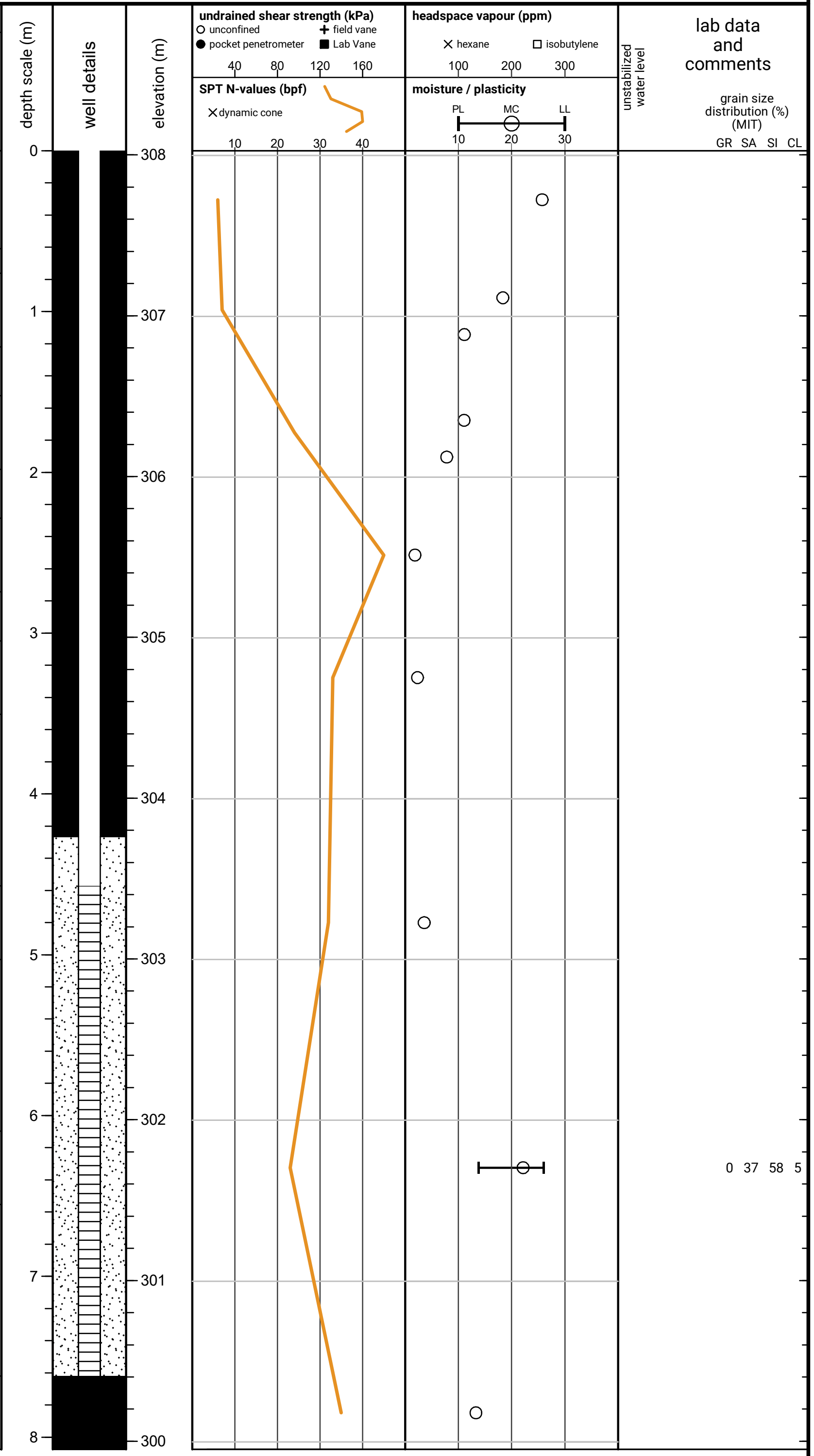
BOREHOLE LOG 103

File No. : 20-042 **Project** : 15728 Airport Road, Caledon **Client** : Wyndham Holdings Inc.

drill method : CME 45
hollow stem augers OD=215 mm

elev depth (m)	description
308.0	**GROUND SURFACE**
	100mm **TOPSOIL**
	FILL, sandy silt, some clay, trace gravel, trace rootlets, organic odour, loose, dark brown to brown, moist
306.9 1.1	**SAND AND SILT**, trace clay, trace gravel, loose, brown, moist to wet (GLACIAL TILL) ...at 1.5 m, compact
306.2 1.8	**SAND**, some silt, compact to dense, brown, moist ...at 2.3 m, light brown, trace rock fragments (inferred cobble) ...at 6.1 m, sand and silt, trace clay, wet
300.4 7.6	**SANDY SILT**, some clay, trace gravel, dense, brown, moist (GLACIAL TILL)
299.9 8.1	**END OF BOREHOLE**

number	type	SPT N-value	grain size distribution (%) (MIT) GR SA SI CL
1	SS	6	
2A	SS	7	
2B	SS		
3A	SS	24	
3B	SS		
4	SS	45	
5	SS	33	
6	SS	32	
7	SS	23	0 37 58 5
8	SS	35	



Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

Date	Water Depth (m)	Elevation (m)
Mar 9, 2020	dry	n/a
Mar 23, 2020	dry	n/a

GROUNDED ENGINEERING

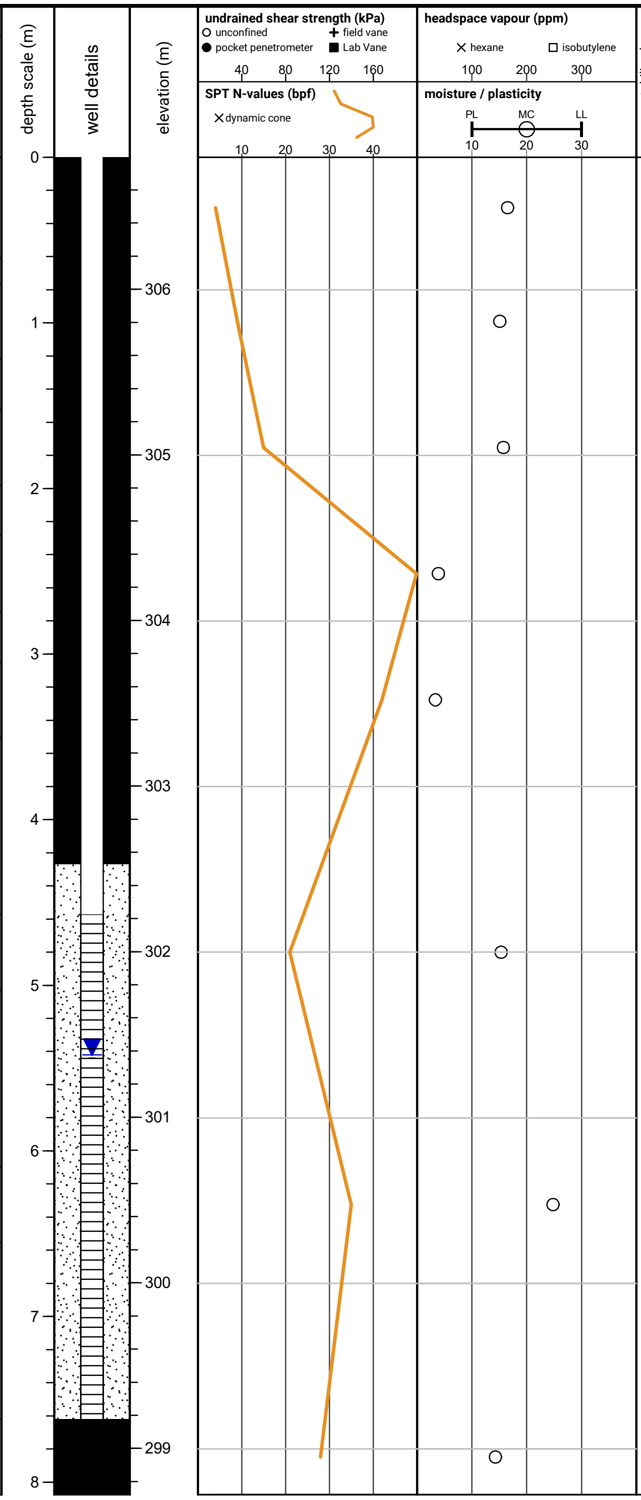
Date Started : Mar 5, 2020
Position : E: 591564, N: 4857383 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 104

File No. : 20-042
Project : 15728 Airport Road, Caledon
Client : Wyndham Holdings Inc.

drill method : CME 45
hollow stem augers OD=215 mm

elev depth (m)	description	graphic log	number	type	SPT N-value	lab data and comments grain size distribution (%) (MIT) GR SA SI CL
306.8	**GROUND SURFACE**					
	200mm **TOPSOIL**					
306.6 0.2	**FILL**, sandy silt, trace clay, trace gravel, trace rootlets, organic odour, loose, dark brown to brown, moist		1	SS	4	
306.0 0.8	**SILT AND SAND**, trace gravel, loose to compact, brown, moist to wet (GLACIAL TILL)		2	SS	9	
			3	SS	15	
304.5 2.3	**SAND**, some silt, trace gravel, very dense to dense, light brown, moist		4	SS	52	
			5	SS	42	
	...at 4.6 m, compact to dense		6	SS	21	
	...at 6.1 m, wet		7	SS	35	
299.2 7.6	**SANDY SILT**, some clay, trace gravel, compact, brown, moist (GLACIAL TILL)		8	SS	28	3 21 61 15
298.7 8.1						



END OF BOREHOLE

Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

Date	Water Depth (m)	Elevation (m)
Mar 9, 2020	5.7	301.1
Mar 23, 2020	5.4	301.4

file: 20-042 15728 airport rd.gpj

Tech : JN | **PM** : JH | **Rev** : MD

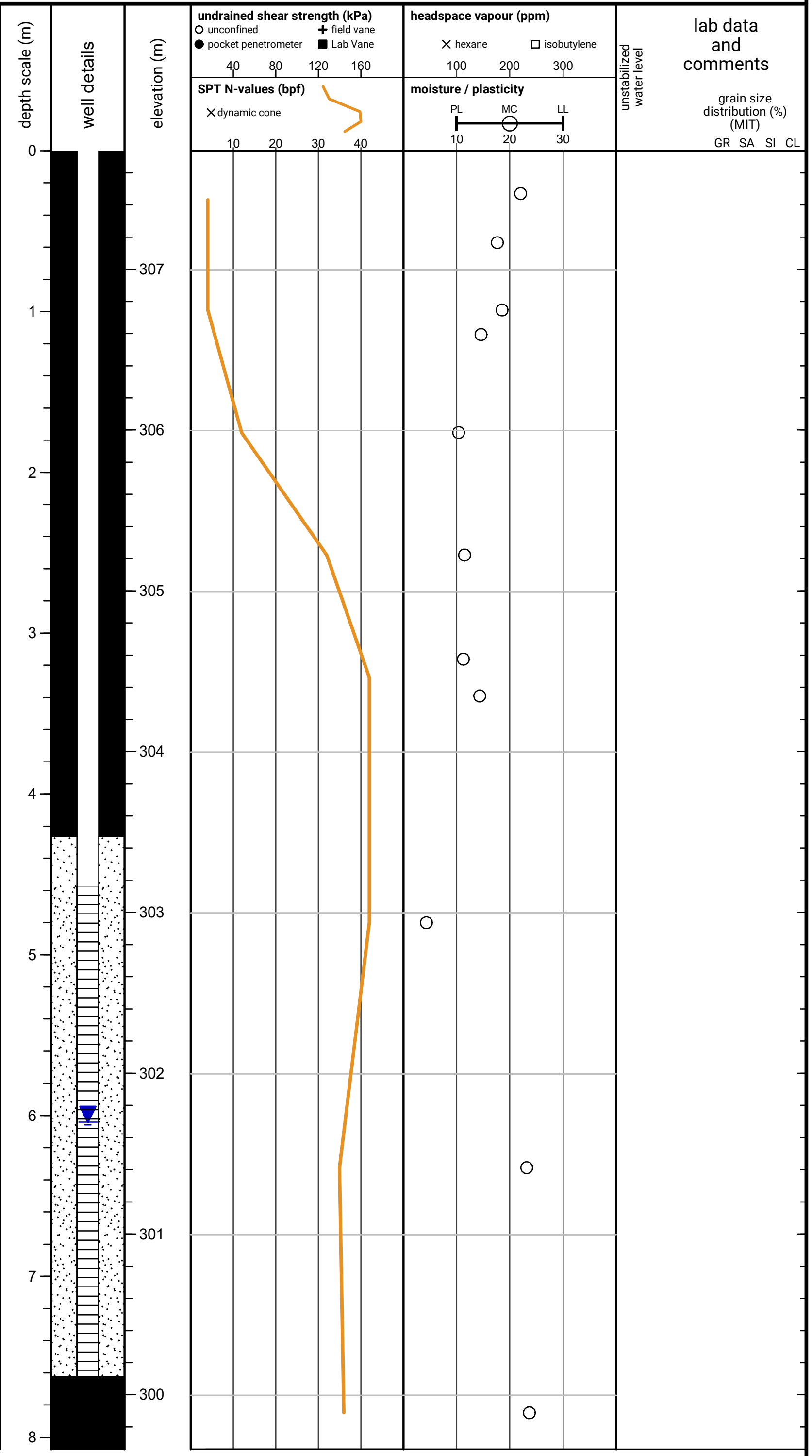
Date Started : Mar 6, 2020
Position : E: 591599, N: 4857450 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG 105

File No. : 20-042 **Project** : 15728 Airport Road, Caledon **Client** : Wyndham Holdings Inc.

drill method : CME 45
hollow stem augers OD=215 mm

elev depth (m)	description	number	type	SPT N-value
307.7	**GROUND SURFACE**			
	500mm **TOPSOIL**	1A	SS	4
307.2 0.5	**FILL**, silt and sand, trace clay, trace gravel, loose, dark brown to brown, moist to wet	1B	SS	
		2A	SS	4
		2B	SS	
		2C	SS	
306.6 1.1	**SAND AND SILT**, trace clay, trace gravel, loose, brown, moist (GLACIAL TILL) ...at 1.5 m, compact to dense	3	SS	12
		4	SS	32
304.7 3.0	**SAND**, some gravel, some silt, trace rock fragments, dense, brown, moist	5A	SS	42
		5B	SS	
	...at 4.6 m, trace gravel, no rock fragments	6	SS	42
	...at 6.1 m, wet	7	SS	35
		8	SS	36
299.6 8.1				



END OF BOREHOLE

Dry and open upon completion of drilling.

50 mm dia. monitoring well installed.
No. 10 screen

GROUNDWATER LEVELS

Date	Water Depth (m)	Elevation (m)
Mar 9, 2020	6.3	301.4
Mar 23, 2020	6.0	301.7

file: 20-042 15728 airport rd.gpj

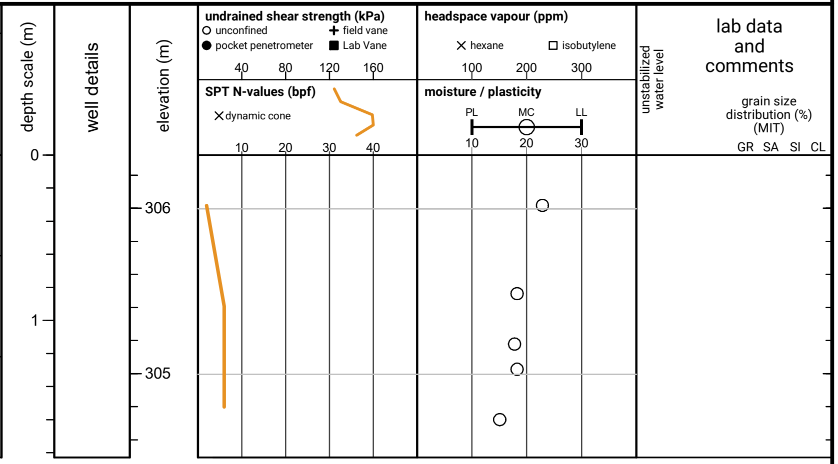
Date Started : Mar 6, 2020
Position : E: 591572, N: 4857378 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG P1

File No. : 20-042
Project : 15728 Airport Road, Caledon
Client : Wyndham Holdings Inc.

drill method : *CME 45*
MSPT OD=50 mm

elev depth (m)	description	graphic log	number	type	SPT N-value
306.3	**GROUND SURFACE**				
	100mm **TOPSOIL**				
	FILL, sandy silt, trace clay, trace gravel, very loose to loose, dark brown to brown, moist	▩	1	SS	2
	...at 0.6 m, moist to wet	▩	2A	SS	6
305.2 1.1	**FILL**, silty sand, trace gravel, loose, dark brown, wet	▩	2B	SS	
304.9 1.4	...at 1.2 m, moist to wet	▩	3A	SS	
	SAND, some silt, loose, brown, moist	⁘	3B	SS	6
304.5 1.8					



END OF BOREHOLE

Dry and open upon completion of drilling.

file: 20-042 15728 airport rd.gpj

Tech : MG | **PM** : JH | **Rev** : MD

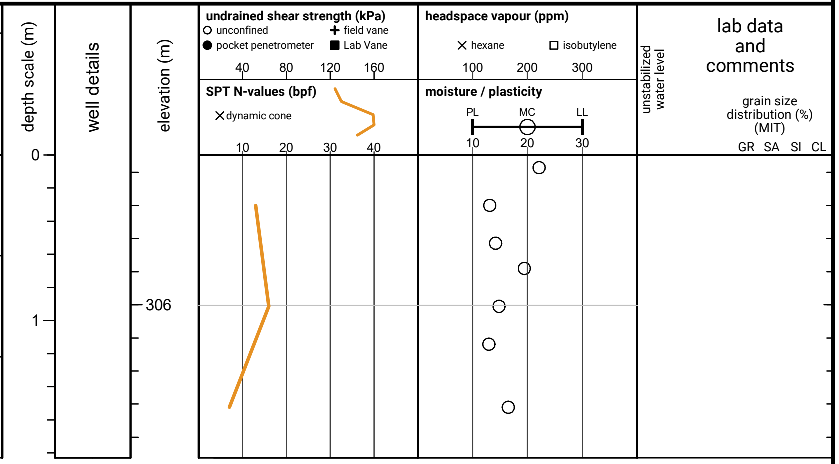
Date Started : Mar 6, 2020
Position : E: 591588, N: 4857414 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG P2

File No. : 20-042 **Project** : 15728 Airport Road, Caledon **Client** : Wyndham Holdings Inc.

drill method : *CME 45*
MSPT OD=50 mm

elev depth (m)	stratigraphy: description	graphic log	samples: number	samples: type	samples: SPT N-value
306.9	**GROUND SURFACE**				
306.7 0.2	150mm **TOPSOIL**		1A	SS	13
306.1 0.8	**FILL**, sand, some gravel, some silt, trace rootlets, organic odour, compact, dark brown, moist ...at 0.5 m, trace gravel ...at 0.6 m, silty sand		1B	SS	
			1C	SS	
305.1 1.8	**SAND**, some silt, compact to loose, dark orangey brown, moist ...at 1.1 m, silty sand		2A	SS	16
			2B	SS	
			2C	SS	
			3	SS	7



END OF BOREHOLE

Dry and open upon completion of drilling.

Date Started : Mar 6, 2020
Position : E: 591621, N: 4857432 (UTM 17T)
Elev. Datum : Geodetic

BOREHOLE LOG P3

File No. : 20-042

Project : 15728 Airport Road, Caledon

Client : Wyndham Holdings Inc.

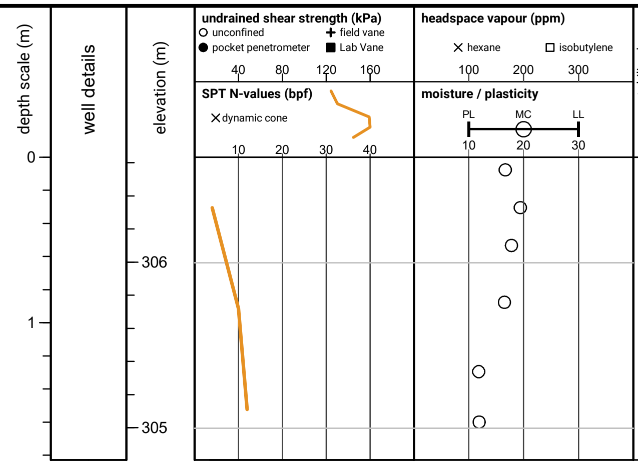
drill method : *CME 45*

MSPT OD=50 mm

elev depth (m)	stratigraphy description	graphic log	samples number	type	SPT N-value
306.6	**GROUND SURFACE**				
306.4 0.2	150mm **TOPSOIL**		1A	SS	4
	FILL, sand and silt, trace clay, trace gravel, organic odour, loose to compact, dark brown to brown, moist ...at 0.5 m, moist to wet, trace rootlets	▩	1B	SS	
		▩	1C	SS	
		▩	2A	SS	10
		▩	2B	SS	
305.2 1.4	**SAND AND SILT**, trace clay, trace gravel, compact, brown, moist (GLACIAL TILL)		3A	SS	12
304.8 1.8			3B	SS	

END OF BOREHOLE

Dry and open upon completion of drilling.



unstabilized water level

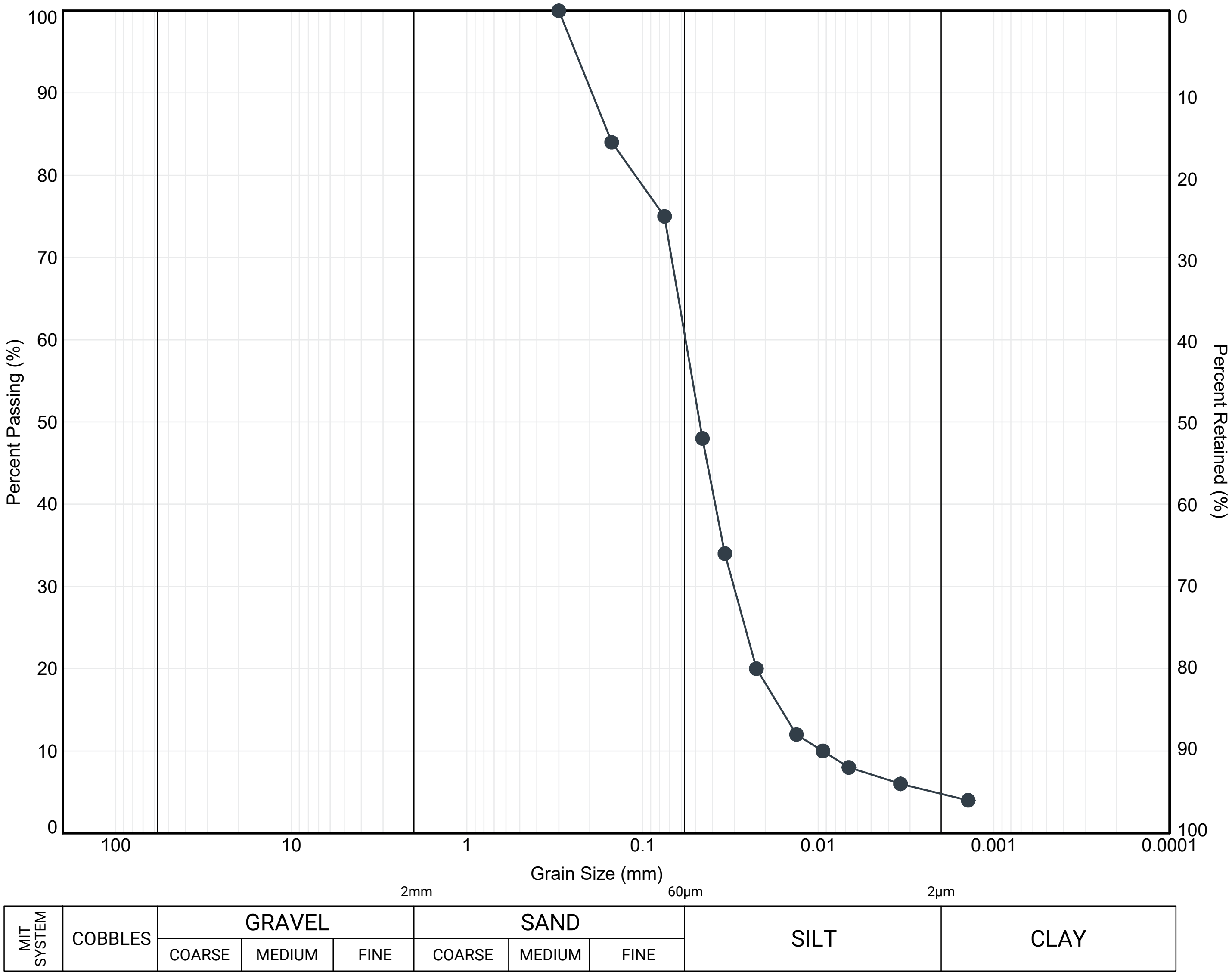
lab data and comments

grain size distribution (%) (MIT)

GR SA SI CL

Tech : MG | **PM** : JH | **Rev** : MD

APPENDIX B



					MIT SYSTEM			
	Borehole	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
●	**103**	SS7	6.3	265.6	0	37	58	5

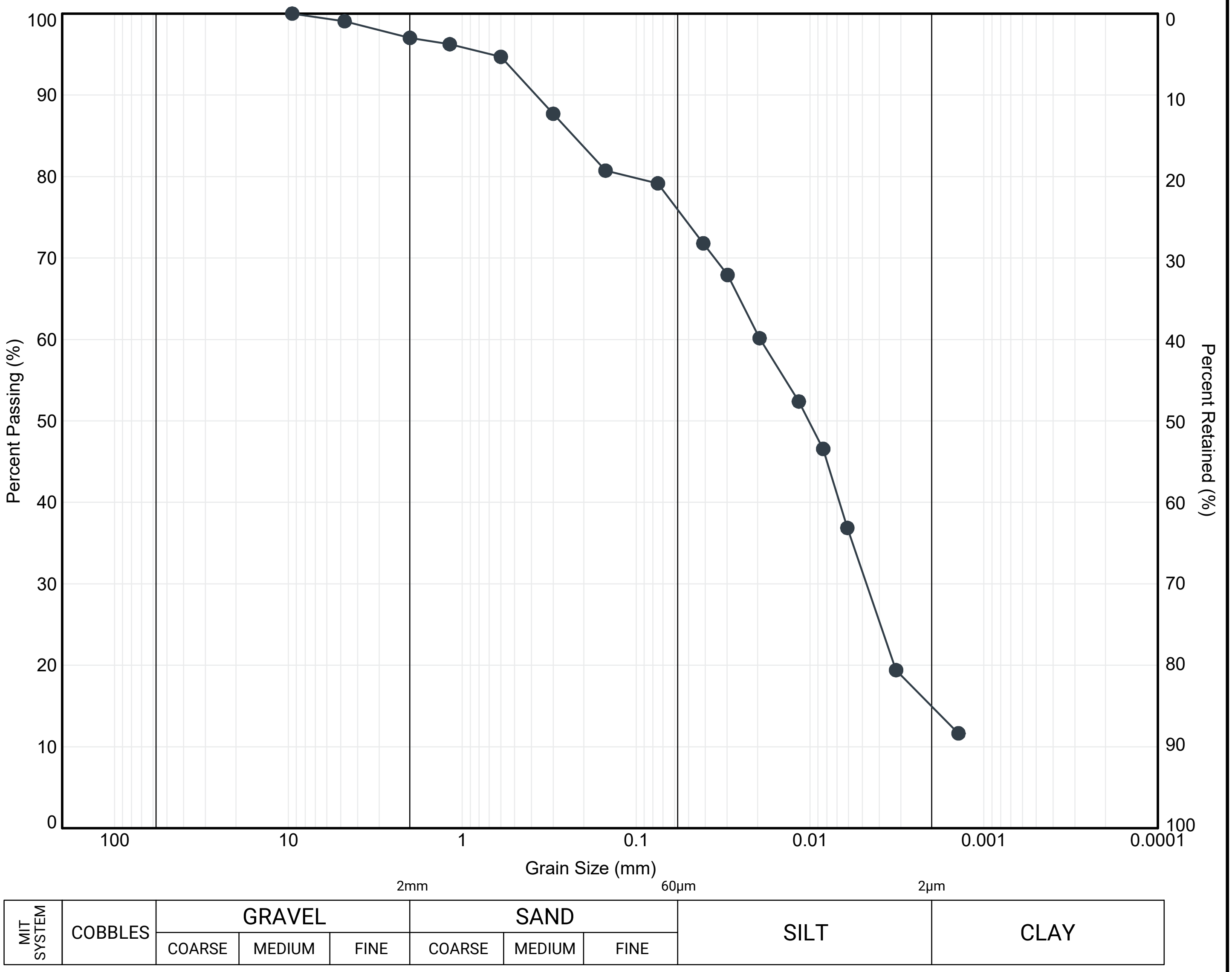
GROUNDED
ENGINEERING

Title:

GRAIN SIZE DISTRIBUTION
SANDS

File No.:

20-042

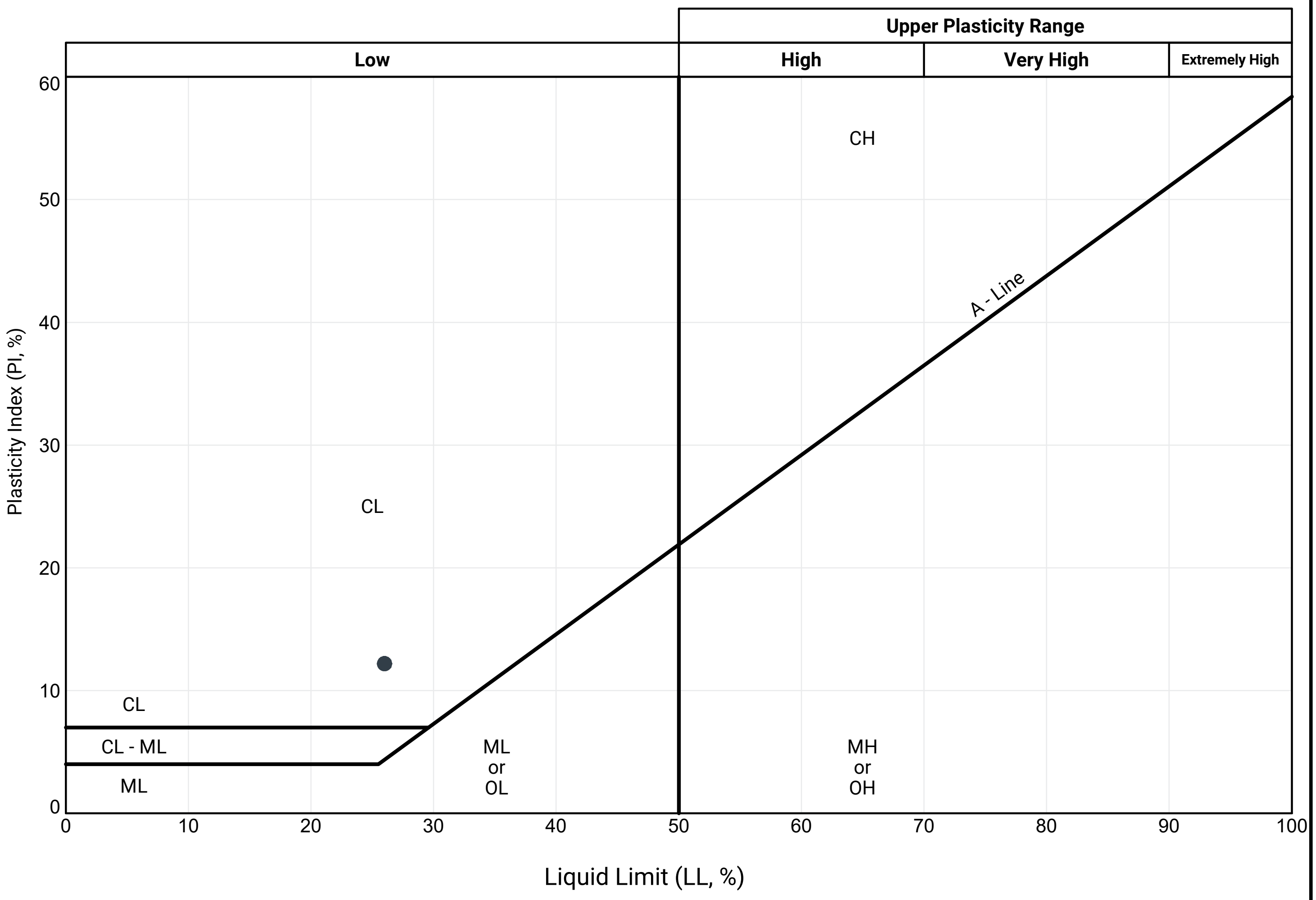


					MIT SYSTEM			
	Borehole	**Sample**	**Depth (m)**	**Elev. (m)**	**Gravel (%)**	**Sand (%)**	**Silt (%)**	**Clay (%)**
●	**104**	SS8	7.8	262.8	3	21	61	15

GROUNDED ENGINEERING

Title: **GRAIN SIZE DISTRIBUTION**
GLACIAL TILL

File No.: **20-042**



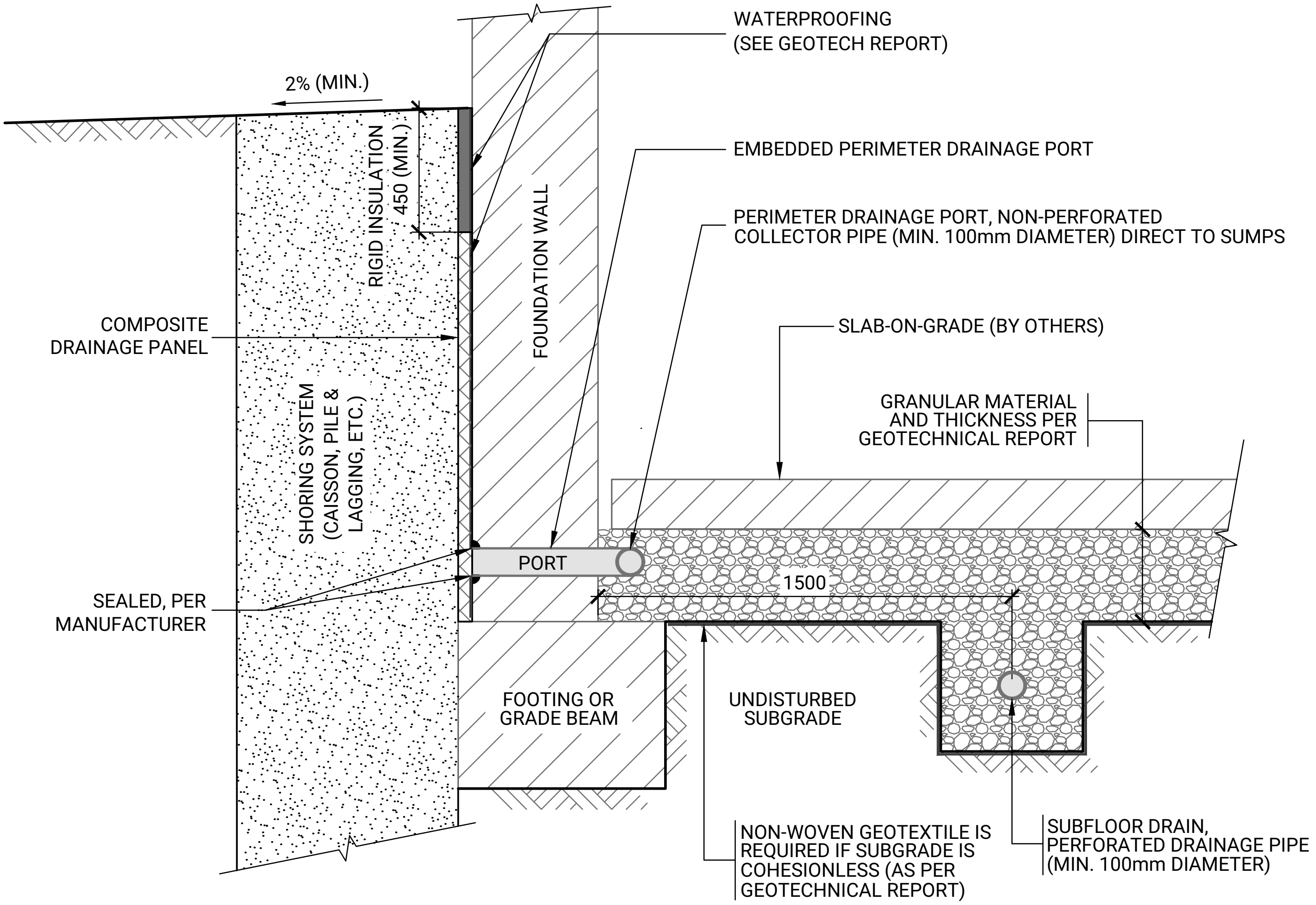
	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)
●	103	SS7	6.3	265.6	26	14	12

GROUNDED
ENGINEERING

Title: **ATTERBERG LIMITS CHART**

File No.: **20-042**

APPENDIX C



SUBFLOOR DRAINAGE SYSTEM

1. THE SUBFLOOR DRAINS SHOULD BE SET IN PARALLEL ROWS, IN ONE DIRECTION, AND SPACED AS PER THE GEOTECHNICAL REPORT.
2. THE INVERT OF THE PIPES SHOULD BE A MINIMUM OF 300 MM BELOW THE UNDERSIDE OF THE SLAB-ON-GRADE.
3. A CAPILLARY MOISTURE BARRIER (I.E. DRAINAGE LAYER) CONSISTING OF A MINIMUM 200 MM LAYER OF CLEAR STONE (OPSS MUNI 1004) COMPACTED TO A DENSE STATE (OR AS PER THE GEOTECHNICAL REPORT). WHERE VEHICULAR TRAFFIC IS REQUIRED, THE UPPER 50 MM OF THE CAPILLARY MOISTURE BARRIER MAY BE REPLACED WITH GRANULAR A (OPSS MUNI 1010) COMPACTED TO A MINIMUM 98% SPMDD.
4. A NON-WOVEN GEOTEXTILE MUST SEPARATE THE SUBGRADE FROM THE SUBFLOOR DRAINAGE LAYER IF THE SUBGRADE IS COHESIONLESS. THE NON-WOVEN GEOTEXTILE MAY CONSIST OF TERRAFIX 360R OR AN APPROVED EQUIVALENT.

PERIMETER DRAINAGE SYSTEM

1. FOR A DISTANCE OF 1.2 M FROM THE BUILDING, THE GROUND SURFACE SHOULD HAVE A MINIMUM 2% GRADE.
2. PREFABRICATED COMPOSITE DRAINAGE PANEL (CONTINUOUS COVER, AS PER MANUFACTURER'S REQUIREMENTS) IS RECOMMENDED BETWEEN THE BASEMENT WALL AND RIGID SHORING WALL. THE DRAINAGE PANEL MAY CONSIST OF MIRADRAIN 6000 OR AN APPROVED EQUIVALENT.
3. PERIMETER DRAINAGE IS TO BE COLLECTED IN NON-PERFORATED PIPES AND CONVEYED DIRECTLY TO THE BUILDING SUMPS.
4. PERIMETER DRAINAGE PORTS SHOULD BE SPACED A MAXIMUM 3 M ON-CENTRE. EACH PORT SHOULD HAVE A MINIMUM CROSS-SECTIONAL AREA OF 1500 MM^2.

GENERAL NOTES

5. THERE SHOULD BE NO STRUCTURAL CONNECTION BETWEEN THE SLAB-ON-GRADE AND THE FOUNDATION WALL OR FOOTING.
6. THERE SHOULD BE NO CONNECTION BETWEEN THE SUBFLOOR AND PERIMETER DRAINAGE SYSTEMS.
7. THIS IS ONLY A TYPICAL BASEMENT DRAINAGE DETAIL. THE GEOTECHNICAL REPORT SHOULD BE CONSULTED FOR SITE SPECIFIC RECOMMENDATIONS.
8. THE FINAL BASEMENT DRAINAGE DESIGN SHOULD BE REVIEWED BY THE GEOTECHNICAL ENGINEER TO CONFIRM THE DESIGN IS ACCEPTABLE.

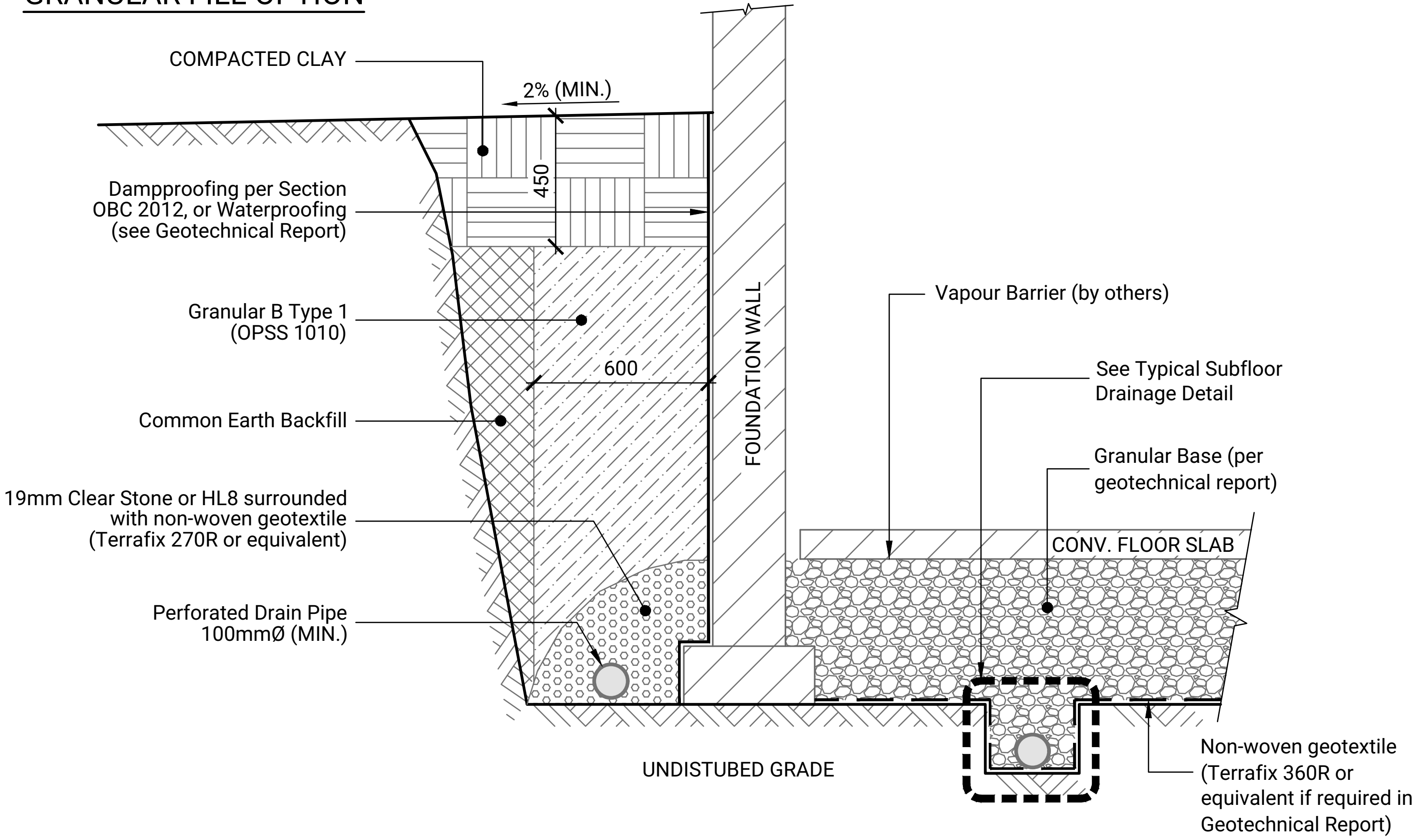
*THE DRAWING PROVIDED IS NOT TO SCALE

GROUNDED ENGINEERING

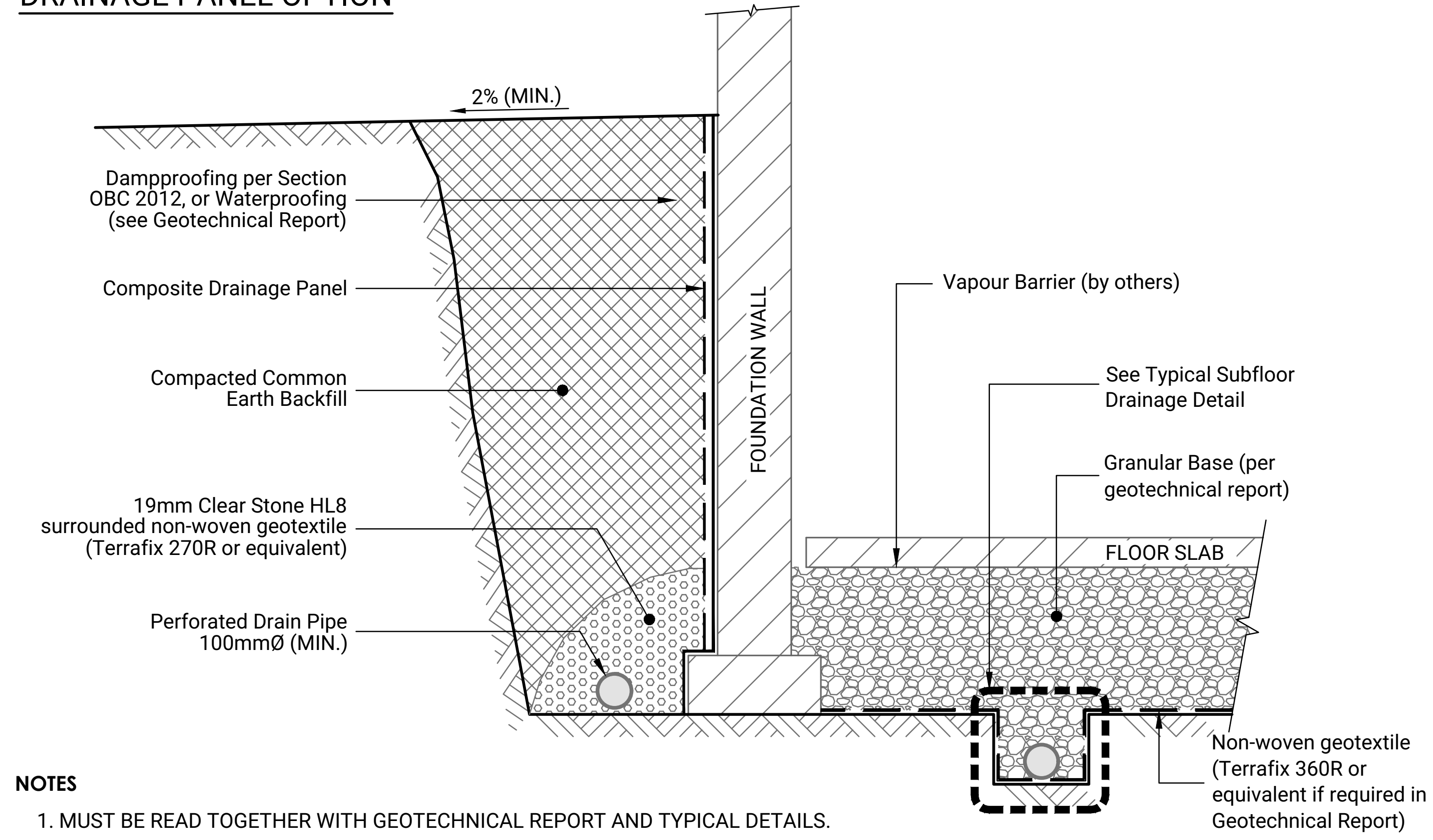
Title

BASEMENT DRAINAGE SHORING SYSTEM
TYPICAL DETAILS

GRANULAR FILL OPTION



DRAINAGE PANEL OPTION



NOTES

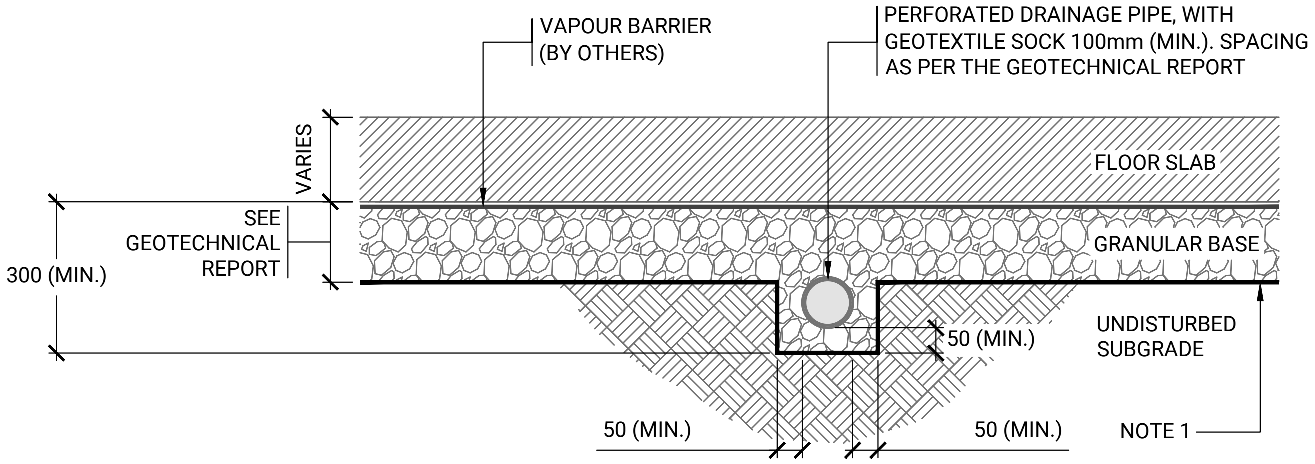
1. MUST BE READ TOGETHER WITH GEOTECHNICAL REPORT AND TYPICAL DETAILS.

*THE DRAWING PROVIDED IS NOT TO SCALE

GROUNDED
ENGINEERING

Title

BASEMENT DRAINAGE
TYPICAL DETAIL



NOTES

1. WHEN THE SUBGRADE CONSISTS OF COHESIONLESS SOIL, IT MUST BE SEPARATED FROM THE SUBFLOOR DRAINAGE LAYER USING A NON-WOVEN GEOTEXTILE (WITH AN APPARENT OPENING SIZE OF < 0.250mm AND A TEAR RESISTANCE OF > 200 N).
2. TYPICAL SCHEMATIC ONLY. MUST BE READ IN CONJUNCTION WITH GEOTECHNICAL REPORT.

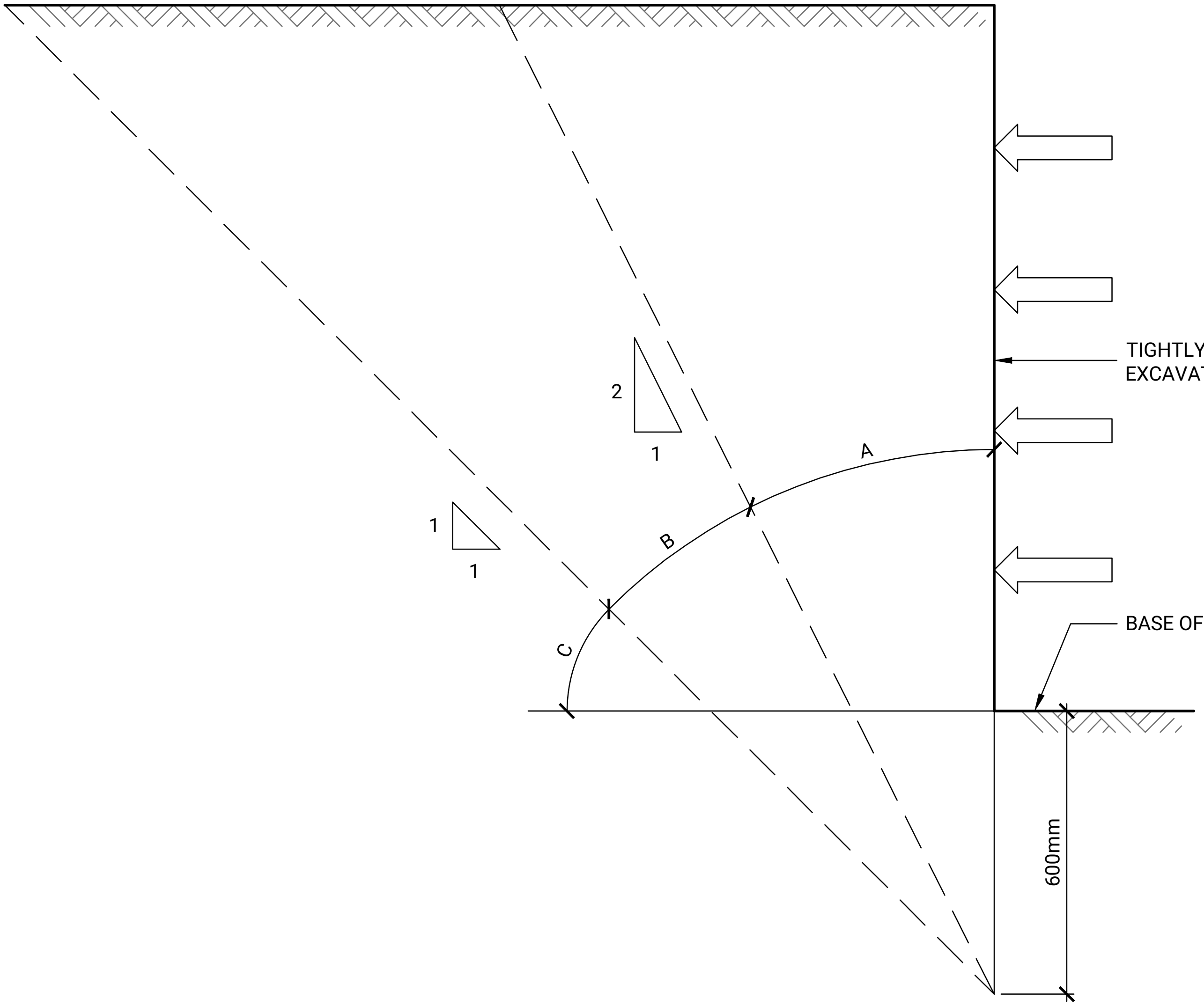
*THE DRAWING PROVIDED IS NOT TO SCALE

GROUNDED
ENGINEERING

Title

BASEMENT SUBDRAIN
TYPICAL DETAIL

APPENDIX D



ZONE A: FOUNDATIONS WITHIN THIS ZONE OFTEN REQUIRE UNDERPINNING. HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATIONS MUST BE CONSIDERED.

ZONE B: FOUNDATION WITHIN THIS ZONE OFTEN DO NOT REQUIRE UNDERPINNING. HORIZONTAL AND VERTICAL PRESSURES ON EXCAVATION WALL OF NON-UNDERPINNED FOUNDATIONS MUST BE CONSIDERED.

ZONE C: FOUNDATIONS WITHIN THIS ZONE USUALLY DO NOT REQUIRE UNDERPINNING.

NOTES

1. USER'S GUIDE - NBC 2005 STRUCTURAL COMMNETARIES (PART 4 OF DIVISION B) - COMMENTARY K.

*THE DRAWING PROVIDED IS NOT TO SCALE

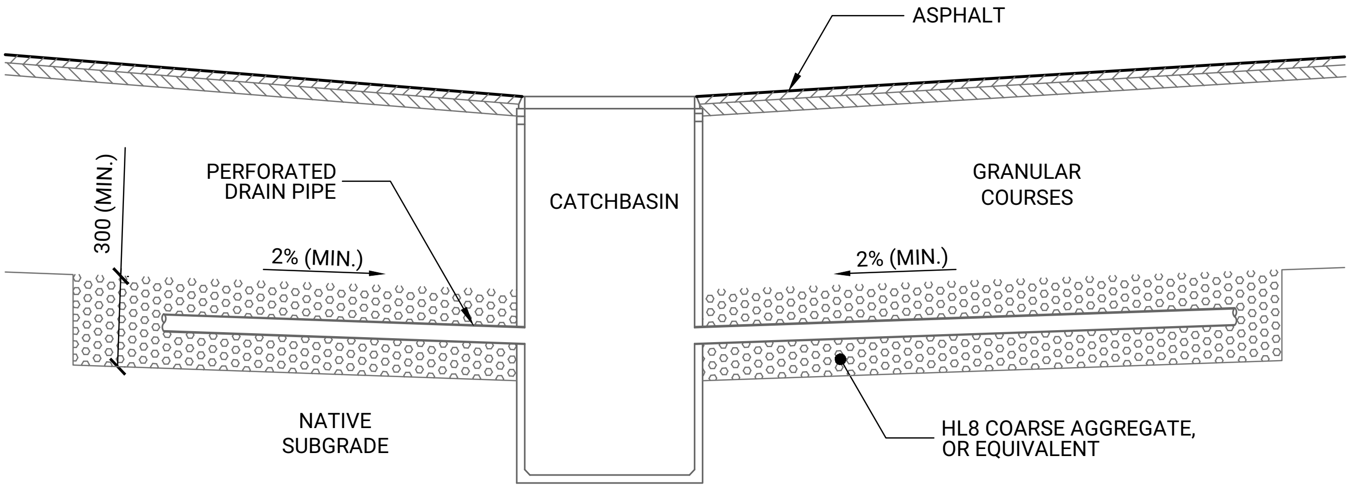
GROUNDED ENGINEERING

Title

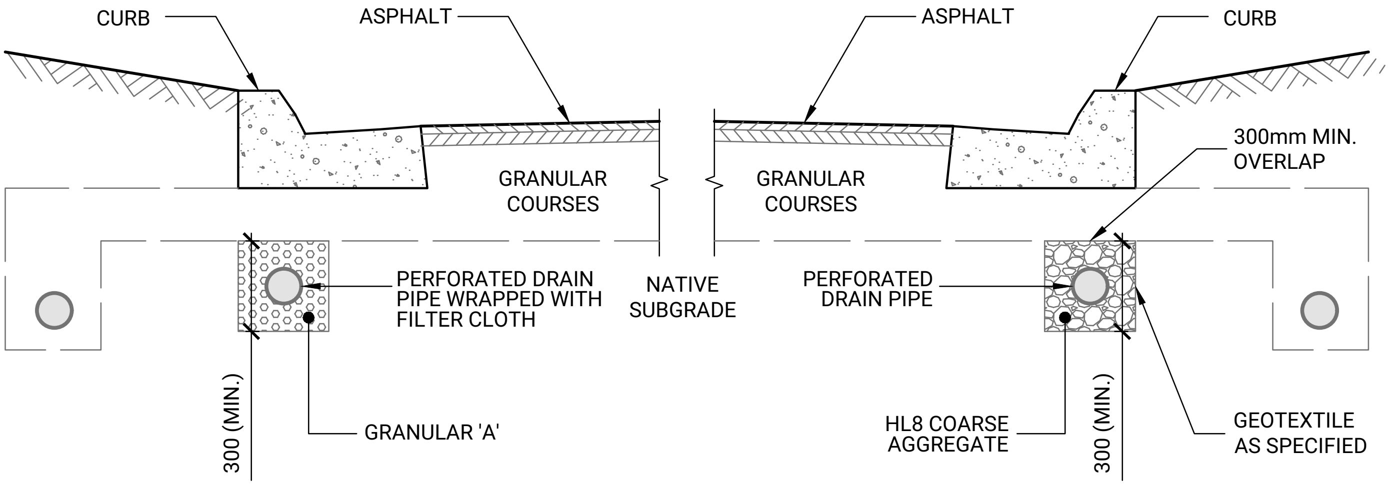
GUIDELINES FOR UNDERPINNING SOILS

APPENDIX E

LONGITUDINAL SUBDRAIN CONNECTION TO CATCHBASIN



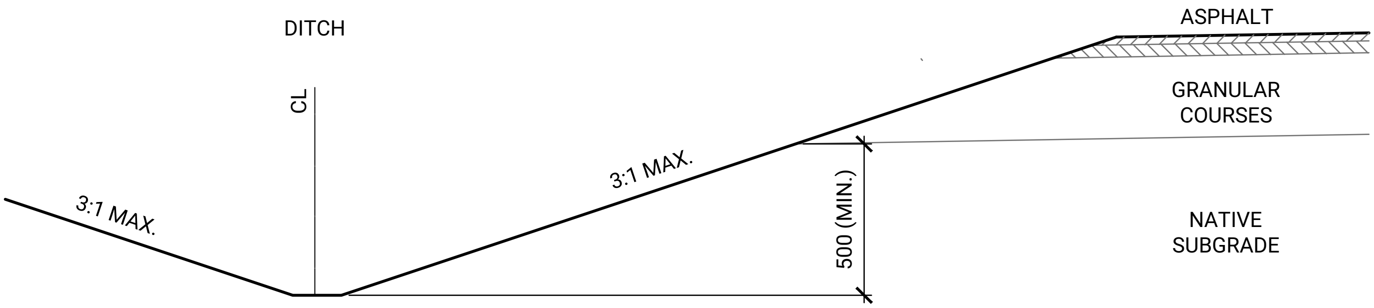
URBAN CROSS SECTIONS DDD



UNWRAPPED OPTION

WRAPPED OPTION

RURAL CROSS SECTIONS



*THE DRAWING PROVIDED IS NOT TO SCALE

GROUNDED
ENGINEERING

Title

PAVEMENT DRAINAGE
TYPICAL DETAILS

APPENDIX F

FINAL REPORT

CA15431-APR20 R1

20-042 15728 Airport Rd

Prepared for

Grounded Engineering Inc.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Grounded Engineering Inc.
Address	12 Banigan Drive Toronto, Ontario M4H1E9. Canada
Contact	Jory Hunter
Telephone	613-539-0347
Facsimile	
Email	jhunter@groundedeng.ca
Project	20-042 15728 Airport Rd
Order Number	
Samples	Soil (1)

LABORATORY DETAILS

Project Specialist	Jill Campbell, B.Sc.,GISAS
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	2165
Facsimile	705-652-6365
Email	jill.campbell@sgs.com
SGS Reference	CA15431-APR20
Received	04/22/2020
Approved	04/28/2020
Report Number	CA15431-APR20 R1
Date Reported	04/28/2020

COMMENTS

Temperature of Sample upon Receipt: 7 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:012640

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

RPD outside acceptable criteria for Cl & SO4 due to homogeneity of sample

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

Jill Campbell

TABLE OF CONTENTS

FINAL REPORT

Client: Grounded Engineering Inc.

Project: 20-042 15728 Airport Rd

Project Manager: Jory Hunter

Samplers: Jory Hunter

PACKAGE: **- Corrosivity Index** (SOIL)

Sample Number 5
Sample Name BH104 SS2
Sample Matrix Soil
Sample Date 21/04/2020

Corrosivity Index

Parameter	Units	RL		Result
Corrosivity Index	none	1		1
Soil Redox Potential	mV	-		370
Sulphide	%	0.04		< 0.04
pH	pH Units	0.05		8.33
Resistivity (calculated)	ohms.cm	-9999		17200

PACKAGE: **- General Chemistry** (SOIL)

Sample Number 5
Sample Name BH104 SS2
Sample Matrix Soil
Sample Date 21/04/2020

General Chemistry

Parameter	Units	RL		Result
Conductivity	uS/cm	2		58

PACKAGE: **- Metals and Inorganics** (SOIL)

Sample Number 5
Sample Name BH104 SS2
Sample Matrix Soil
Sample Date 21/04/2020

Metals and Inorganics

Parameter	Units	RL		Result
Moisture Content	%	0.1		10.8
Sulphate	µg/g	0.4		1.2

PACKAGE: **- Other (ORP)** (SOIL)

Sample Number 5
Sample Name BH104 SS2
Sample Matrix Soil
Sample Date 21/04/2020

Parameter	Units	RL		Result
Other (ORP)				
Chloride	µg/g	0.4		4.3

QC SUMMARY

Anions by IC

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0363-APR20	µg/g	0.4	<0.4	28	20	93	80	120	110	75	125
Sulphate	DIO0363-APR20	µg/g	0.4	<0.4	35	20	92	80	120	93	75	125

Carbon/Sulphur

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	ECS0045-APR20	%	0.04	< 0.04	ND	20	106	80	120			

Conductivity

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0349-APR20	uS/cm	2	< 0.002	2	10	98	90	110	NA		

QC SUMMARY

pH

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0349-APR20	pH Units	0.05	NA	0		101			NA		

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

Samples analysed as received. Solid samples expressed on a dry weight basis. “Temperature Upon Receipt” is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act” published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

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-- End of Analytical Report --

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

Request for Laboratory Services and CHAIN OF CUSTODY

No: 012640
Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Oleg Mozhin
Received Date: 4 / 22 / 20 (mm/dd/yy)
Received Time: 11 : 20 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice pack
Temperature Upon Receipt (°C) 7, 7, 7
LAB LIMS #: CA-1543/APR20

REPORT INFORMATION

Company: GROUNDED ENGINEERING
Contact: Jory Hunter
Address: 12 Banigan Dr, Toronto
ON M
Phone: 613-539-0347.
Fax:
Email: jhunter@groundedeng.ca

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 20-042
Site Location/ID: 15728 Airport Rd

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)

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

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

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

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

REGULATIONS

Regulation 153/04:
☐ Table 1 ☐ Res/Park
☐ Table 2 ☐ Ind/Com
☐ Table 3 ☐ Agri/Other
☐ Table ____

Soil Texture:
☐ Coarse
☐ Medium
☐ Fine

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

							M & I			SVOC		PCB	PHC		VOC		Pest	Other (please specify)							TCLP	
	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	Metals & Inorganics incl CrVI, CN,Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na-water)	Full Metals Suite ICP metals plus B(HWS-soil only) Hg, CrVI	ICP Metals only Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni, Se,Ag,Tl,U,V,Zn	PAHs only	SVOCs all incl PAHs, ABNs, CPs	PCBs Total ☐ Aroclor ☐	F1-F4 + BTEX	F1-F4 only no BTEX	VOCs all incl BTEX	BTEX only	Pesticides Organochlorine or specify other	Corrosivity					Sewer Use: Specify pkg:	Water Characterization Pkg General ☐ Extended ☐	Specify TCLP tests ☐M&I ☐VOC ☐PCB ☐B(a)P ☐ABN ☐Ignit.	COMMENTS:
1	BH104SS2.	21/04/20	9:00.	1	Soil													X								
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): Jory Hunter **Signature:** Jory Hunter **Date:** 04 / 21 / 20 (mm/dd/yy)
Relinquished by (NAME): Jory Hunter **Signature:** **Date:** 04 / 21 / 20 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.2
Date of Issue: 09 Sept, 2019

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.