Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

GEOTECHNICAL INVESTIGATION AND SLOPE STABILITY ASSESSMENTS 7200 AND 7290 LESLIE STREET THORNHILL, ONTARIO

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Distribution of Report:
1 Copy - National Spiritual Assembly of the Bahá'is of Canada
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1.0 THE PROJECT

Terraprobe was retained by National Spiritual Assembly of the Bahá'is of Canada to conduct a subsurface investigation and a slope stability assessment for a proposed development project at 7200 Leslie Street, Markham, Ontario (Site). The proposed development comprises the demolition the existing Baha'i National Centre, construction of a one storey House of Worship (temple) with one level of basement, a one-storey visitor centre with one or two level of basement, a one to three-storey National Centre with 3 levels of underground parking (under the western portion), one storey additions to a heritage building and log shed, and a one storey washroom building. It is understood that a tunnel would connect the Level -1 parking level of the National Centre to the basement of the Visitor Centre. The development will include the construction of parking areas and associated landscaping. It is also proposed to construct a staircase connecting the main parking area at the slope toe to the Temple at the slope crest, a switchback/meandering trail is also proposed from the parking area to the temple although its alignment was not finalized at the time of this report was written.

It is important to note that only preliminary design information was available with respect to the Visitor Centre, Temple, building additions, and trail alignment. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters, advice and comments relating to constructability issues and quality control may not be relevant or complete for the project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report.

This report encompasses the results of slope stability analysis and the geotechnical investigation conducted for the proposed development to determine the prevailing subsurface soil and groundwater conditions, and provide geotechnical design recommendations for the building foundations, basement floor slab, basement drainage and earth pressure and seismic design parameters. Geotechnical comments are also included on pertinent construction aspects, excavation, backfill and groundwater control.

Terraprobe has also conducted Hydrogeological Study (File No. 1-20-0109-46) and Environmental Site Assessment (ESA) Phase One and Phase Two (File Nos. 1-20-0109-41 and 1-20-0109-42, respectively) for this property. The findings of the investigations are being reported under separate covers.

2.0 SITE AND PROJECT DESCRIPTIONS

The site is located in the northwest quadrant of the intersection of Leslie Street and Steeles Avenue, with the municipal address of 7200 and7290 Leslie Street, in the District of Thornhill, Region Municipality of York. The site currently occupied by an existing one-storey national centre and heritage building. A creek traverses north to south beyond the east property line. The location of the site is presented on Figure 1.

It is proposed to construct a one-storey House of Worship (temple) with one level of basement, a one-storey Visitor Centre with one or two level of basement, a one to three-storey National Centre with 3 levels of underground parking (under the western portion), two one-storey additions to a heritage building and log shed, a one-storey restroom facility, a staircase on the slope face and an emergency access route & parking.

3.0 INVESTIGATION PROCEDURE

The field investigation was conducted on May 24 to 27, 30 & 31, and June 1 & 2, 6, and 8, 2022, and consisted of drilling and sampling a total of Twenty six (26) boreholes, extending to depths varying from about 2.0 to 17.2 m depth below grade. The approximate location of the boreholes is shown on the enclosed Borehole and Section Location Plan (Figure 2).

- Boreholes 1 to 7 were advanced within close proximity to the proposed Baha'i National Centre.
- Boreholes 8 to 10, and 11 to 14 were advanced in close proximity to the proposed Visitor Centre and Temple respectively.
- Borehole 15 was not advanced due to site access limitations.
- Boreholes 16 to 18 were advanced within close proximity to the proposed heritage building additions and new restroom building.
- Boreholes 19 to 23 were advanced for the proposed parking/pavement areas.
- Boreholes 24 to 27 were advanced as part of the environmental investigation.

The boreholes were drilled by a specialist drilling contractor using track-mounted drill rig power auger. The borings were advanced using continuous flight solid stem augers, hollow stem augers, and mud rotary drilling technique and were sampled at 0.75 m intervals (up to 3.0 m depth) and 1.5 m intervals (below 3.0 m depth) with a conventional 50 mm diameter split barrel samplers when the Standard Penetration Test (SPT) was carried out (ASTM D1586). The field work (drilling, sampling, and testing) was observed and recorded by a member of our field engineering staff, who logged the borings and examined the soil samples as they were obtained.

All samples obtained during the field investigation were sealed into clean plastic jars and transported to our geotechnical testing lab oratory for detailed inspection and testing. All borehole samples were examined (tactile) in detail by a geotechnical engineer and classified according to visual and index properties. Laboratory tests consisted of water content determination on all samples; Sieve and Hydrometer analysis on six (6) selected soil samples (Borehole 2, Sample 3; Borehole 4, Sample 6; Borehole 5, Sample 8; Borehole 9, Sample 5; Borehole 11, Sample 11; and Borehole 13, Sample 6) and Atterberg Limit Test on two (2) selected soil samples (Borehole 9, Sample 5; and Borehole 13, Sample 6). The measured natural

water contents of individual samples and the results of the Sieve and Hydrometer analysis and Atterberg Limit test are plotted on the enclosed Borehole Logs at respective sampling depths. The results of Sieve and Hydrometer analysis and Atterberg Limit tests are also summarized in Section 4.7 of this report and appended.

Water levels were measured in boreholes upon completion of drilling. Monitoring wells comprising 50 mm diameter PVC pipes were installed in Boreholes 3, 4, 8, 11, 14, 18, and 24 to 27 to facilitate groundwater monitoring and the purpose of hydrogeological study. The PVC tubing was fitted with a bentonite clay seal as shown on the accompanying Borehole Logs. Water levels in the monitoring wells were measured on June 23, 2022. The results of groundwater monitoring are presented in Section 4.8 of this report.

The borehole ground surface elevations were surveyed by Terraprobe using a Trimble R10 GNSS System. The Trimble R10 system uses the Global Navigation Satellite System and the Can-Net reference system to determine target location and elevation. The Trimble R10 system is reported to have an accuracy of up to 10 mm horizontally and up to 30 mm vertically.

It should be noted that the elevations provided on the Borehole Logs are approximate only, for the purpose of relating soil stratigraphy and should not be used or relied on for other purposes.

4.0 SUBSURFACE CONDITIONS

The specific soil conditions encountered at each borehole location are described in greater detail on the Borehole Logs, with a summary of the general subsurface soil conditions outlined below. This summary is intended to correlate this data to assist in the interpretation of the subsurface conditions encountered at the site.

It should be noted that the subsurface conditions are confirmed at the borehole locations only and may vary between and beyond the borehole locations. The boundaries between the various strata as shown on the logs are based on non-continuous sampling. These boundaries represent an inferred transition between the various strata, rather than a precise plane of geologic change.

4.1 Surficial Layer

A surficial layer of asphaltic concrete about 75 mm (thick) was encountered in Boreholes 6 & 7 and was underlain by an aggregate layer of about 115 and 90 mm (thick), respectively.

A layer of topsoil of about 25 to 320 mm thick was encountered in all other boreholes. The topsoil was noted to be dark brown to black in colour and predominantly consisted of a sandy silt/sand and gravel matrix with organics.

The pavement structure component and topsoil thicknesses measured from the borings are approximate. The reported component thickness data may vary between and beyond the borehole locations. This information is not sufficient for estimating topsoil/pavement component quantities and/or associated costs. Consideration should be given to conduct shallow test pit investigation to obtain accurate thickness information of the topsoil, if required.

4.2 Earth Fill

A zone of earth fill material was encountered in all boreholes (except Boreholes 14, 19, 22, and 24) beneath the surficial layer and extended to depths varying from about 0.8 m (Borehole 2) to 6.1 m (Borehole 27) below existing grade. The earth fill material consisted of clayey silt with trace to some amounts of sand and trace amount of gravel / sandy silt with trace to some amounts of clay and trace amounts of gravel. The presence of trace organic was also noted within the fill materials at varying depths. Borehole 27 was advanced within the approximate area of the East Fill area (refer to Figure 2).

The Standard Penetration Test results ('N' Values) obtained from the clayey silt earth fill materials varied from 4 to 20 blows per 300 mm of penetration, indicating a soft to very stiff consistency. 'N' Values obtained from the sandy silt earth fill materials varied from 2 to 20 blows per 300 mm of penetration, indicating a very loose to compact relative density.

Measured moisture contents of the earth fill materials samples generally varied from about 2 to 24 percent by weight, indicating a moist condition.

4.3 Clayey Silt to Silt and Clay Till

Undisturbed native clayey silt to silt and clay till deposit with variable sand (some sand to sandy) and trace amounts of gravel was encountered beneath the earth fill/surficial layers in Boreholes 3, 6 to 14, and 23 to 27 at depths varying from about 0.2 m (Borehole 6) to 6.1 m (Borehole 27) and extended to depths varying from about 2.3 m (Borehole 3) to about 13.7 m (Borehole 4). In Boreholes 4 & 5 the clayey silt to silt and clay till was encountered underlying native sand and sandy silt to silt and sand till, respectively. Layers of sand were noted in the clayey silt to silt and clay till.

N-values obtained from the undisturbed native clayey silt to silt and clay till ranged from about 3 to greater than 50 blows per 150 mm of penetration, indicating a soft to hard (typically very stiff to hard) consistency. The in-situ moisture contents of the clayey silt to silt and clay till samples ranged from 6 to 31 percent, indicating a moist condition.

It should be noted that the glacial till deposit is likely to contain larger size particles (cobbles and boulders) that are not specifically identified in the boreholes. The size and distribution of such obstructions cannot

be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for the particles of this size.

4.4 Sandy Silt to Silt and Sand Till

Undisturbed native sandy silt to silt and sand deposit with trace to some clay and trace amount of gravel was encountered in Borehole 5 beneath the earth fill at 1.5 m below grade. A layer of sand interrupts the till deposit from 2.3 m to 4.6 m below grade, the sandy silt to silt and sand till extends from 4.6 m to 9.1 m below grade.

N-values obtained from the undisturbed native sandy silt to silt and sand till ranged from about 24 to greater than 50 blows per 150 mm of penetration, indicating a compact to very dense (typically very dense) relative density. The in-situ moisture contents of the sandy silt to silt and sand till samples ranged from 4 to 13 percent, indicating a moist condition.

It should be noted that the glacial till deposit is likely to contain larger size particles (cobbles and boulders) that are not specifically identified in the boreholes. The size and distribution of such obstructions cannot be predicted with borings, because the borehole sampler size is insufficient to secure representative samples for the particles of this size.

4.5 Clayey Silt to Clay and Silt

Undisturbed native clayey silt to clay and silt deposit with trace to some sand and trace amounts of gravel was encountered beneath the clayey silt to silt and clay till layers in Boreholes 4, 6, 7, and 13 at depths varying from about 4.6 m (Boreholes 6 & 13) to 13.7 m (Borehole 4) and extended to depths varying from about 7.6 m (Boreholes 6 & 13) to about 17.1 m (Borehole 4).

N-values obtained from the undisturbed native clayey silt to clay and silt ranged from about 15 to greater than 50 blows per 150 mm of penetration, indicating a very stiff to hard (typically hard) consistency. The in-situ moisture contents of the sandy silt to sand and silt till samples ranged from 15 to 26 percent, indicating a moist condition.

4.6 Sand

Undisturbed native sand deposit with trace to some silt and trace amounts of clay was encountered beneath the various layers in Boreholes 1 to 9, 11 to 22, and 27 at depths varying from about 0.8 m (Boreholes 19 to 22) to 9.1 m (Borehole 7) and extended to the full depth of investigation where encountered, with the exception of Boreholes 4 & 5 where the sand terminates at 2.3 and 4.6 m below grade, respectively.

N-values obtained from the undisturbed native sand ranged from about 6 to greater than 50 blows per 150 mm of penetration, indicating a loose to very dense (typically dense to very dense) consistency. The in-situ moisture contents of the sandy silt to sand and silt till samples ranged from 1 to 23 percent, indicating a moist to wet condition.

4.7 Geotechnical Laboratory Test Results

The geotechnical laboratory testing consisted of natural water content determination for all samples, while a Sieve and Hydrometer analysis and Atterberg Limit test were conducted on selected native soil samples. The test results are plotted on the enclosed Borehole Logs at respective sampling depths. The results (graphs) of the Sieve and Hydrometer (grain size) analysis and Atterberg Limit Test are appended and a summary of these results are presented as follows:

Borehole No. Sample No.	Sampling Depth below Grade	Percentage (by mass)				Descriptions (MIT System)
		Gravel	Sand	Silt	Clay	
Borehole 2, Sample 3	1.8	0	91	8	1	SAND, trace silt, trace clay
Borehole 4, Sample 6	4.8	1	25	48	26	SANDY CLAYEY SILT, trace gravel
Borehole 5, Sample 8	7.7	1	40	42	17	SILT AND SAND, some clay, trace gravel
Borehole 9, Sample 5	3.3	1	15	48	36	SILT AND CLAY, some sand, trace gravel
Borehole 11, Sample 11	12.3	0	85	13	2	SAND, some silt, trace clay
Borehole 13, Sample 6	4.8	0	1	39	60	CLAY AND SILT, trace sand

The results of Atterberg Limits tests were plotted on A-Line Graph (refer to enclosed appendix). The results of Atterberg Limits Tests are summarized below:

Borehole No. Sample No.	Sampling Depth below Grade	Liquid Limit (W_L) %	Plastic Limit (W_P) %	Plasticity Index (I_P) %	Natural Water Content (W_N) %	Plasticity	Compressibility
Borehole 9 Sample 5	3.3 m	27	15	12	11	Slightly Plastic	-
Borehole 13 Sample 6	4.8 m	32	19	13	20	Slightly Plastic	-

4.8 Groundwater Monitoring

Observations pertaining to the depth of water level and caving were made in the open boreholes upon completion of drilling (where applicable), and are noted on the enclosed borehole logs. Monitoring Wells comprising 50 mm diameter PVC tubing were installed in Boreholes 3, 4, 8, 11, 14, 18, and 24 to 27 to facilitate shallow groundwater monitoring. The PVC tubing was fitted with a bentonite clay seal as shown on the accompanying borehole logs. Water levels in the monitoring wells were measured on June 23, 2022 and are noted on the enclosed Borehole Logs. A summary of measured groundwater levels is provided below:

Borehole No.	Depth of Boring (m)	Depth to Cave (m)	Water Level at the Time of Drilling	Water Level in Well, Depth/Elev. (m) June 23, 2022
1	6.6	Open	Dry	NP
2	8.1	Open	Dry	NP
3	14.2	N/A	N/A	11.5/152.2
4	17.1	N/A	N/A	6.6/165.8
5	17.2	N/A	N/A	NP
6	17.1	N/A	N/A	NP
7	17	N/A	N/A	NP
8	8.1	Open	6.1	2.9/172.9
9	8.1	Open	6.1	NP
10	8.1	Open	Dry	NP
11	15.4	N/A	N/A	Dry
12	9.4	Open	Dry	NP
13	9.3	7.0	6.1	NP
14	9.5	Open	Dry	Dry
16	6.2	5.2	4.6	NP
17	6.6	4.9	3.0	NP
18	9.2	Open	Dry	4.8/152.3
19	2	Open	Dry	NP

Borehole No.	Depth of Boring (m)	Depth to Cave (m)	Water Level at the Time of Drilling	Water Level in Well, Depth/Elev. (m) June 23, 2022
20	2	Open	Dry	NP
21	2	Open	Dry	NP
22	2	Open	Dry	NP
23	2	Open	Dry	NP
24	6.6	Open	Dry	Dry
25	9.3	Open	Dry	8.4/178.3
26	9.4	Open	Dry	5.6/181.1
27	9.4	Open	Dry	Dry

NP – No piezometer/well installed N/A – Could not be measured due to use of mud rotary technique

For practical purposes, the design ground water table at this site may be taken as:

- Area 1 - Baha'i National Centre
    - Western Section – Elev. 166.2 ± m (about 6 m below existing grade)
    - Central and Eastern Sections – Elev. 153.0 ± m (about 5 to 10 m below existing grade)
- Area 2 – Tableland Developments
    - Visitor Centre, Lobby Connection and Tunnel – Elev. 172.8 ± m (about 3 to 4 m below existing grade)
    - Temple – Elev. 167.8 ± m to 169.7 ± m (about 7 to 11 m below existing grade)
- Area 3 – Parking Lot Area Developments
    - All Structures/additions - Elev. 152.3 ± m (about 5 m below grade)

The sand unit will produce water when penetrated below the water table, if not dewatered. There may also be perched water in the earth fill and wet sand/silt seams present in the clayey silt to silt and clay till.

Groundwater levels may fluctuate due to local dewatering efforts, and also with time, and seasonally, depending on the amount of precipitation and surface runoff.

Terraprobe is also providing Phase One and Two Environmental Site Assessment, a Hydrogeological Report for this site, under separate covers (File No. 1-20-0109-41, 1-21-0779-42 and 1-20-0109-46, respectively).

5.0 GEOTECHNICAL ENGINEERING DESIGN

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

This report is based on the assumption 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 Terraprobe should be retained to review the implications of these changes with respect to the contents of this report.

The site can be roughly divided into three separate development areas for discussion purposes:

Area 1. Baha'i National Centre (Boreholes 1 to 7)

Area 2. Tableland – Temple and Visitor's Centre (Boreholes 8 to 14)

Area 3. Parking Lot Area Developments – Heritage Buildings and Parking (Boreholes 16 to 23)

The existing ground surface elevation at the borehole locations varied from about 160.4 m to about 172.8 m (Area 1); 175.8 m to about 179.1 m (Area 2); and 155.4 m to about 162.1 m (Area 3). Based on the project design information (Baha'I National Centre and Temple Master Plan, prepared by Hariri Pontarini Architects, provided by Email September 27, 2022) and subsequent emails (Additional foundation information sent by Shaz Nasiri of Hariri Pontarini Architects September 28, 2022) it is understood that the following is proposed:

Area 1 – Baha'i National Centre (Lowest Finished Floor Level -3 Elev. 161.5± m):

The proposed Baha'i National Centre (BNC) will be a large structure constructed on sloped ground with a constant (lowest) Finished Floor Elevation (FFE) of about 161.5± m. The proposed BNC is about 178.2 m in length, hereafter this report will make reference to the structure with respect to its length with the west end of the parking structure as 0 m. The west end of the structure (about 0 m to 50.4 m) will comprise 3-levels of underground parking (Level -3, Elev. 161.5) with additional parking at surface. The central portion of the structure (about 50.4 m to 74.5 m) will have only a partial basement at Level -3 (Elev. 161.5 m), the northern portion of the building will have an FFE at Level -2 (Elev. 165.00 m). The eastern portion of the structure (about 74.5 m to 178.2 m) will have FFE of about 161.5. The level of basement varies over the building's length as the existing grade slopes down from west to east, from 3 levels of basement at the west

end to slab-on-grade at the east end. The underside of the footing level would be set at about Elev. 160.5± m (Level -3) and 164.00± m (Level -2).

Area 2 – Tableland Developments (Lowest Finished Floor Elev. 173.00± m & 168.5 ± m):

The proposed developments within the tableland include the Visitor Centre, Temple, and Tunnel & Lobby Connection. The proposed Temple will be a 1-storey structure (up to 30 m high) with one level of basement (FFE 173.00± m). The proposed Visitor Centre will be a one storey structure connected to the Lobby Connection & Tunnel (FFE 168.5± m) the Lobby Connection & Tunnel connect the Visitor Centre to the Level -1 (Elev. 168.5± m) of the BNC parking garage. It is important to note that the designs for the Area 2 developments at the time this report is written are conceptual and no drawings were available for review, with the exception of the Lobby Connection & Tunnel which were shown in plan. The recommendations provided for the Area 2 developments are considered preliminary and all recommendations should be revisited with respect to the finalized designs when available.

Area 3 – Parking Lot Area Developments (Slab-on-Grade, Finished Floor Elev. 156 to 157± m):

The Area 3 developments include one-storey slab-on-grade additions to the existing log heritage structure and shed, and a new one-storey slab-on-grade restroom facility. It is assumed the FFE for these structures will match the exiting grade/FFE (about 156± m to 157± m) and the underside of the footings are assumed to be about 1.2 m below the final grade for frost protection.

The foundation installations must be reviewed in the field by Terraprobe. The on-site review of the condition of the foundation subgrade as the foundations are constructed is an integral part of the geotechnical engineering design function and is not to be considered as third-party inspection services. If Terraprobe is not retained to carry out all of the foundation evaluations during construction, then Terraprobe accepts no responsibility for the performance of the foundations.

5.1 Foundation Design Parameters

Area 1 – Baha'i National Centre (Lowest Finished Floor Elev. 161.5 ± m):

Seven (7) boreholes (Boreholes 1 to 7) were advanced within or in the vicinity of the BNC footprint. Out of seven boreholes, four boreholes (Boreholes 4 to 7) were advanced in the vicinity of the footprint of the proposed three levels of underground parking, Borehole 3 was advanced in the vicinity of the footprint with one level of basement, and the remaining boreholes (Boreholes 1 & 2) were advanced within the vicinity of the footprint that is slab-on-grade. The boreholes encountered earth fill zone beneath the surficial topsoil layer extended to depths varying from about 0.8 m (Borehole 2) to 1.5 m (Boreholes 1, 3 to 7) below existing grade, underlain by undisturbed native glacial till, sand, and clayey silt to clay and silt deposits, extending to the full depth of the investigation (up to about 17.0 m depth below existing grade).

Western Section Baha'i National Centre (0 m to 50.4 m)

The borehole information indicates that the foundation subgrade at the Level -3 for the western portion of the structure (about 0 m to 50.4 m) is expected to consist of competent undisturbed native clayey silt to silt and clay till of hard consistency (Boreholes 4 & 5) to undisturbed native sand of very dense relative density (Borehole 6).

For the western portion (about 0 m to 50.4 m) a net geotechnical reaction of up to 600 kPa (Serviceability Limit States, SLS) and 900 kPa (factored geotechnical resistance at Ultimate Limit States, ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of very dense relative density and hard consistency.

Central Section Baha'i National Centre (50.4 m to 74.5 m)

The borehole information indicates that the foundation subgrade at the Level -2 for the northeastern portion of the structure (about 50.4 m to 74.5 m) is expected to consist of competent undisturbed native clayey silt to clay and silt of hard consistency (Borehole 7).

For the northeastern portion (about 50.4 m to 74.5 m) a net geotechnical reaction of up to 600 kPa (SLS) and factored geotechnical resistance of 900 kPa (ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of very dense relative density and hard consistency.

Eastern Section Baha'i National Centre (74.5 m to 178.2 m)

The borehole information indicates that the foundation subgrade at the Level -3 for the eastern portion of the structure (about 74.5 m to 178.2 m) is expected to consist of competent undisturbed native sand of compact to dense relative density (Boreholes 1 to 3).

For the eastern portion (about 74.5 m to 178 m) a net geotechnical reaction of up to 200 kPa (SLS) and factored geotechnical resistance of 300 kPa (ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of compact to dense relative density.

Boreholes 1 and 2 remained open and dry upon completion of drilling. Unstabilized groundwater levels and cave could not be measured in Boreholes 3 to 7 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 3 and 4 to monitor water level. One water level reading was taken from the wells. Groundwater levels were about 6.6 m and 11.5 m below grade (Elev. 165.8 m and 152.2 m) for Boreholes 4 and 3 respectively which is about 5 m above the underside of footing level for the western section of the BNC. Therefore, dewatering will likely be required for the western section. In

addition, perched seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present with the glacial till soils.

Area 2 – Tableland Developments (Lowest Finished Floor Elev. 173.00± m & 168.5 ± m):

Seven (7) boreholes (Boreholes 8 to 14) were advanced within the tableland and near the slope crest. Out of seven boreholes, three boreholes (Boreholes 8 to 10) were advanced in the vicinity of the footprint of the proposed Visitor Centre and Lobby Connection & Tunnel, and the remaining boreholes (Boreholes 11 to 14) were advanced within the vicinity of the footprint of the proposed Temple. The boreholes encountered earth fill zone beneath the surficial topsoil layer extended to depths varying from about 0.8 m (Boreholes 9, and 11 to 13) to 1.5 m (Boreholes 8 & 10) below existing grade, weathered/disturbed materials were encountered from surface to about 0.8 m below existing grade in Borehole 14. Underlying the earth fill and weathered/disturbed material is undisturbed native glacial till, sand, and clayey silt to silt and clay deposits, extending to the full depth of the investigation (up to about 15.4 m depth below existing grade).

Visitor Centre and Lobby Connection & Tunnel:

We understand that the Visitor Centre and Lobby Connection and Tunnel information/concept provided to us may undergo further changes. Currently the basement/lobby connection/tunnel FFE is assumed to be at Elev. 168.5 m. The borehole information indicates that the foundation subgrade at the Visitor Centre is expected to consist of competent undisturbed native clayey silt to silt and clay till/clayey silt to clay and silt of hard consistency to sand of very dense relative density. It should be noted that the boreholes located in the vicinity of the proposed Visitor Centre footprint terminated at about the design FFE, deeper stratigraphy was inferred from the nearby boreholes.

A net geotechnical reaction of up to 600 kPa (Serviceability Limit States, SLS) and 900 kPa (factored geotechnical resistance at Ultimate Limit States, ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of very dense relative density.

Borehole 10 remained open and dry upon completion of drilling. Unstabilized groundwater level were measured at about 6.1 and 5.8 m below grade in Boreholes 8 and 9, respectively. Monitoring well was installed in Borehole 8 to monitor water level. One water level reading was taken from the well. Groundwater level was at about 2.9 m below grade (Elev. 172.9 m) in Borehole 8. Groundwater seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present in the glacial till soils.

Temple:

The borehole information indicates that the foundation subgrade at the Temple is expected to consist of competent undisturbed native clayey silt to silt and clay till/ clayey silt to clay and silt of very tiff to hard consistency (Boreholes 11 & 13) to sand of very dense relative density (Boreholes 12 & 14).

A net geotechnical reaction of up to 400 kPa (Serviceability Limit States, SLS) and 600 kPa (factored geotechnical resistance at Ultimate Limit States, ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of very tiff to hard consistency and very dense relative density.

Boreholes 12 and 14 remained open and dry upon completion of drilling. Unstabilized groundwater level was measured at about 6.1 m below grade in Borehole 13. Borehole 13 caved at a depth of about 7.0 m below grade. Unstabilized groundwater could not be measured in Borehole 11 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 11 and 14 to monitor water level. One water level reading was taken from the wells. Monitoring wells in both Boreholes 11 and 14 were noted to be dry. However, perched ground water seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present in the glacial till soils.

Area 3 – Parling Lot Area Developments (Lowest Finished Floor (slab-on-grade) Elev. 156 to 157 ± m):

Three (3) boreholes (Boreholes 16 to 18) were advanced within the valley land in the vicinity of the proposed additions and washroom facility. The boreholes encountered earth fill zone beneath the surficial topsoil layer extending to depths varying from about 1.5 m (Boreholes 16 & 17) to 2.3 m (Boreholes 18) below existing grade, underlain by undisturbed native sand deposit, extending to the full depth of the investigation (up to about 9.2 m depth below existing grade).

The borehole information indicates that the foundation subgrade is expected to consist of competent undisturbed native sand generally compact to very dense relative density.

A net geotechnical reaction of up to 200 kPa (SLS) and factored geotechnical resistance of 300 kPa (ULS) are recommended for the design of the conventional spread footing foundations (for vertical and concentric loads) supported on the underlying undisturbed native soils of compact relative density.

The foundation installations must be reviewed in the field by Terraprobe. The onsite review of the condition of the foundation subgrade as the foundations are constructed is an integral part of the geotechnical engineering design function, and is not to be considered as third-party inspection services. If Terraprobe is not retained to carry out all of the foundation evaluations during construction, then Terraprobe accepts no responsibility for the performance of the foundations.

For these bearing pressures, the minimum width of continuous strip footings supported must be 0.8 m, and the minimum size of isolated footings must be 2 m. These minimum dimensions apply regardless of loading considerations, in conjunction with the above recommended geotechnical resistance.

For house additions and restroom facility the minimum width of continuous strip footings should be 500 mm, and the minimum size of isolated footings should be 900 mm x 900 mm in conjunction with the above bearing pressure regardless of loading considerations. The footing sizes for housing and small buildings are stipulated in the Ontario Building Code (2012), Division B, Part 9, and must be followed.

The estimated total settlement for undisturbed native soil is expected to be less than 25 mm under the above recommended design loading. This settlement will occur as load is applied and is linear elastic and non-recoverable under load. Differential settlement is a function of spacing, loading and foundation size.

Prior to pouring concrete for the footings, the footing subgrade must be cleaned of deleterious materials, softened, disturbed, or caved materials, and any standing water. As per the Ontario Building Code, the footing excavations must be inspected and approved by Terraprobe to ensure the bearing capacities stated above are applicable. If incompetent soils are encountered at the proposed bearing depths during footing excavation, sub-excavation to the underlying competent soil and dewatering may be required under the direction of the geotechnical engineer. Furthermore, native soils tend to weather and deteriorate on exposure to the atmosphere or to surface water, therefore, foundation bases that will remain open and exposed to the atmosphere for an extended period of time shall be protected by applying a skim coat of lean concrete. If construction is to proceed in freezing conditions, temporary frost protection for the footing bases and concrete must be provided.

Footings stepped from one level to another must be at a slope not exceeding 7 vertical to 10 horizontal. The design earth cover for frost protection of foundations exposed to ambient environmental temperatures is 1.2 metres in the Greater Toronto area. Experience suggests that the temperature in "unheated" underground parking levels two or more levels below grade with normal ventilation provisions is not as severe as the ambient open-air condition. Certainly, the earth cover required to prevent frost effects on foundations in the lower parking levels need not be any greater than 1.2 metres, and experience in a number of structures has shown that perimeter foundations provided with 600 mm of cover perform adequately as do interior isolated foundations with 900 mm of cover. At locations adjacent to ventilation shafts, it is normal practice to provide insulation to ensure that foundations are not affected by the cold air flow.

It is noted that the native soils tend to weather rapidly and deteriorate on exposure to the atmosphere or surface water. Hence, foundation bases which remain open for an extended period of time should be protected by a skim coat of lean concrete not less than 50 mm thick. Provisions should be made to minimize disturbance to the exposed foundation subgrade.

Staircase Foundation

As noted before, the proposed woks include the construction of a staircase connecting the main valley land parking area (near the bottom of the slope) to the proposed Temple.

Boreholes 14 and 16 were advanced at the upper and lower ends of the stairs, respectively, to provide recommendations for stair system foundations. The results of Borehole 14 indicate that the slope would consist of a thin layer (about 0.8 m deep) weathered/disturbed material underlain by undisturbed native clayey silt to silt and clay till to a depth of about 7.6 m (Elev. 171.5 ± m) underlain by very dense sand up to full depth of the borehole (about 9.5 m below grade, Elev. 169.6 ± m). The results of Borehole 16 indicate that the lower end of the staircase foundation location would consist of a thin layer (about 1.5 m deep) of earth fill materials underlain by undisturbed native sand to the full depth of the borehole (about 6.2 m below grade, Elev. 150.3 ± m).

The stairs can be supported on conventional spread footing foundations bearing onto the underlying very stiff to hard cohesive clay and compact to very dense sand. A net geotechnical reaction of 200 kPa at Serviceability Limit States (SLS) and factored geotechnical resistance of 300 kPa at Ultimate Limit States (ULS) are recommended for the design of the conventional spread footing foundations.

Consideration may also be given to support the staircase structure on helical pier foundation system (see Appendix K). Helical screw anchors can be drilled to sufficient depth in order to obtain adequate resistance for required support. Screw anchors require little to no excavation and therefore, it is generally a suitable foundation option as helical screw anchors can be installed with minimum ground disturbance on the slope face.

There are specific companies which specialize in the helical screw anchor design and installation, and can provide further information on the methodology, detailed design, installation and certification. The following average soil strength parameters may be used for the site soils:

Stratum	Unit Weight (kN/m^3)	Cohesion (kPa)	Angle of Internal Friction
Weathered/disturbed soil/Earth fill/Loose native sand	19	0	29°
Clayey Silt to Silt and Clay Till	21	10	32°
Sand (compact to very dense)	20	0	38°

5.2 Earthquake Design Parameters

The Ontario Building Code stipulates the methodology for earthquake design analysis. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

Under Ontario Regulation 88/19, the ministry amended Ontario's Building Code (O. Reg 332/12) to further harmonize Ontario's Building Code with the 2015 National Codes. These changes will help reduce red tape for businesses and remove barriers to interprovincial trade throughout the country. The amendments are based on code change proposals the ministry consulted in 2016 and 2017. The majority of the amendments came into effect on January 1, 2020, which includes structural sufficiency of buildings to withstand external forces and improve resilience.

Seismic hazard is defined in the Ontario Building Code (OBC) by uniform hazard spectra (UHS) at spectral coordinates of 0.2s, 0.5s, 1.0s and 2.0s and a probability of exceedance of 2% in 50 years. The OBC method uses a site classification system defined by the average soil/bedrock properties e.g. shear wave velocity (v_s), Standard Penetration Test (SPT) resistance, and undrained shear strength (s_u) in the top 30 meters of the site stratigraphy below the foundation level, as set out in the Ontario Building Code. There are 6 site classes from A to F, decreasing in ground stiffness from A, hard rock, to E, soft soil; with site class F used to denote problematic soils (e.g. sites underlain by thick peat deposits and/or liquefiable soils). The site class is then used to obtain peak ground acceleration (PGA), peak ground velocity (PGV) site coefficients F_a and F_v, respectively, used to modify the UHS to account for the effects of site-specific soil conditions.

Based on the above noted information, it is recommended that the site designation for seismic analysis be '**Site Class C**', as per the Ontario Building Code. Consideration may be given to conducting a site-specific Multichannel Analysis of Surface Waves (MASW) at this site to confirm the average shear wave velocity in the top 30 metres of the site stratigraphy.

5.3 Earth Pressure Design Parameters

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

Stratum/Parameter	γ (kN/m³)	φ (degrees)	K_a	K_o	K_p
Existing Earth Fill	19	29	0.35	0.52	2.88
Clayey Silt to Silt and Clay Till	21	32	0.31	0.47	3.25
Sandy Silt to Sand and Silt Till	21	38	0.24	0.38	4.20
Clayey Silt to Clay and Silt	20	30	0.33	0.50	3.00
Sand	20	38	0.24	0.38	4.20

where:
γ = bulk unit weight of soil (kN/m³)
φ = internal angle of friction (degrees)
K_a = Rankine active earth pressure coefficient (dimensionless)
K_o = Rankine at-rest earth pressure coefficient (dimensionless)
K_p = Rankine passive earth pressure coefficient (dimensionless)

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

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

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

where,

P	=	the horizontal pressure at depth, **h** (m)
K	=	the earth pressure coefficient
h_w	=	the depth below the ground water level (m)
γ	=	the bulk unit weight of soil, (kN/m^3)
γ'	=	the submerged unit weight of the exterior soil, (γ - 9.8 kN/m^3)
q	=	the complete surcharge loading (kPa)

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

5.4 Slab on Grade Design Parameters

The excavated subgrade should be assessed by a qualified geotechnical engineer. The modulus of subgrade reactions appropriate for the slab design constructed on various materials on site is as follows:

- Clayey Silt to Silt and Clay Till subgrade is 40,000 kPa/m.
- Clayey Silt to Clay and Silt subgrade is 40,000 kPa/m.
- Sand subgrade is 40,000 kPa/m
- Engineered Fill is 16,000 kPa/m

The basement floor slab should be provided with a capillary moisture barrier and drainage layer. This can be made by placing the slab on a minimum of 300 mm thick 19 mm clear stone layer (OPSS.MUNI 1004) compacted by vibration to a dense state. This material also serves as the drainage media for the subfloor drainage system. Provision of subfloor drainage is required in conjunction with the perimeter drainage of the structure. Suitable geotextile (for instance OPSS.MUNI 1860 Class II non-woven geotextile) needs to be placed to separate granular base course from the subgrade to prevent migration of soil fines where the silt/sand subgrade soils are encountered.

Prior to the construction of the slab on grade, it is recommended that the cut subgrade be proof-rolled and inspected under the supervision of Terraprobe for obvious loose or disturbed areas as exposed, or for areas containing excessively 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).

5.5 Basement Drainage

Area 1 – Baha'i National Centre

Boreholes 1 and 2 remained open and dry upon completion of drilling. Unstabilized groundwater could not be measured in Boreholes 3 to 7 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 3 and 4 to monitor water level. One water level reading was taken from the wells. Groundwater levels were about 6.6 m and 11.5 m below grade (Elev. 165.8 m and 152.2 m) for Boreholes 4 and 3 respectively. The lowest finished floor elevation of Level -2 and Level -3 would be set at 165.0± m and 161.5± m., which is about 0.8 m and 4.3 m below the measured groundwater level for the western end of the site. The groundwater level for the central and eastern sections of the site is expected to be up to 9 m below the FFE. It must be noted that the groundwater levels may fluctuate seasonally depending upon the amount of precipitation and surface runoff.

Area 2 – Tableland Developments

Visitor Centre and Lobby Connection & Tunnel

Borehole 10 remained open and dry upon completion of drilling. Unstabilized groundwater level were measured at about 6.1 and 5.8 m below grade in Boreholes 8 and 9, respectively. Monitoring well was installed in Borehole 8 to monitor water level. One water level reading was taken from the well. Groundwater level was at about 2.9 m below grade (Elev. 172.9 m) in Borehole 8.

As noted before the proposed Visitor Centre will connect to the Lobby Connection at Tunnel at Level -1. The finished floor elevation of the Visitor Centre (and Tunnel) is expected to be set at about at Elev. 168.5 ± m which is about 4.4 m below the measured groundwater level. It must be noted that the groundwater levels may fluctuate seasonally depending upon the amount of precipitation and surface runoff.

Temple

Boreholes 12 and 14 remained open and dry upon completion of drilling. Unstabilized groundwater level was measured at about 6.1 m below grade in Borehole 13. Borehole 13 caved at a depth of about 7.0 m below grade. Unstabilized groundwater could not be measured in Borehole 11 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 11 and 14 to monitor water level. One

water level reading was taken from the wells. Monitoring wells in both Boreholes 11 and 14 were noted to be dry.

The exterior grade around all buildings should be sloped away at a 2 percent gradient or more for a distance of at least 1.2 m to assist in maintaining basement dry from seepage. The basement wall (for basement) must be provided with damp-proofing provisions in conformance to the Section 9.13.2 of the Ontario Building Code (2012). In case of open excavation, the basement wall backfill for a minimum lateral distance of 0.6 m out from the wall should consist of free-draining granular material (OPSS.MUNI 1010 Granular B), or provided with a suitable alternative drainage cellular media, see Appendix C Typical Basement Drainage Details. The perimeter and subfloor drain installation and outlet provisions must conform to the plumbing code requirements.

Where the structures are made directly against a shored excavation, drainage is provided by forming a drained cavity with prefabricated drain material, such as CCW MiraDRAIN 6000 series (or Terrafix Terradrain 600 or Delta-Drain 6000 HI-X, or approved equivalent) which can be incorporated between the shoring and the cast-in-place concrete foundation wall. The drainage composite material can be outlet into the basement sumps using a solid pipe (separate from the subfloor drainage system) to remove collected water from the building sumps. (Refer to enclosed Appendix D & E).

The sub-floor drainage system should consist of perforated pipes (minimum 100 mm diameter) located at a spacing of about 4.0 m centre to centre (Refer to Appendix F Basement Floor Subdrain Details). If subdrain elevation conflicts with top of footing elevation, footings should be lowered as necessary. The subdrain system should be outlet to a suitable discharge point under gravity flow, or connected to a sump located in the lowest level of the basement. The water from the sump must be pumped out to a suitable discharge point/positive outlet. The installation of the drains as well as the outlet must conform to the applicable plumbing code requirements.

The size of the sump should be adequate to accommodate the anticipated water seepage. An industrial duplex pumping arrangement (main pump with a provision of a backup pump) on emergency backup power is recommended. The pump capacity must be adequate to accommodate peak flow conditions expected during the wet seasons (i.e., spring melt and fall). Refer to the Hydrogeological report for groundwater seepage rates and volumes.

The subfloor drainage system is an important building element at this site, as such the storm sump that ensures the performance of this system must have an industrial duplexed pump arrangement on emergency power, as noted above, for 100 percent pumping redundancy.

It is anticipated that the seepage can be controlled with typical, widely available, commercial sump pumps.

The City of Markham will require a detailed hydrogeological study for this site, Permit to Discharge in the short term, and a Discharge Agreement in the long term, if any water is to be discharged to the storm or sanitary sewers.

Terraprobe is also providing a hydrogeological report for this site, under a separate cover.

5.6 Pavement

It is understood that the paved areas at this site would consist of driveway(s)/access routes, and parking lots. Design recommendations for pavement structure are provided in this section.

5.6.1 Pavement Design

A pavement design for the development is presented below. The industry pavement design methods are based on a design life of 15 to 20 years for typical weather conditions and for the design traffic loadings.

The following pavement design is considered a performance structure which will have a better life cycle cost.

Performance Asphaltic Concrete Pavement Structure

Pavement Layer	Compaction Requirements	Light-Duty Minimum Component Thickness (car parking areas)	Heavy-Duty Minimum Component Thickness
Surface Course Asphaltic Concrete: HL3 (OPSS 1150) with PG Asphalt Cement (OPSS.MUNI 1101)	OPSS 310	40 mm	40 mm
Base Course Asphaltic Concrete: HL8 (OPSS 1150) with PG Asphalt Cement (OPSS.MUNI 1101)	OPSS 310	50 mm	80 mm
Base Course: Granular A (OPSS.MUNI 1010) or 19mm Crusher Run Limestone	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150 mm	150 mm
Subbase Course: Granular B Type I (OPSS.MUNI 1010) or 50mm Crusher Run Limestone	100% Standard Proctor Maximum Dry Density (ASTM- D698)	300 mm	400 mm

The granular materials should be placed in lifts 150 mm thick or less and be compacted to a minimum of 100 percent and 98 percent SPMDD for granular base and granular sub-base, respectively. Asphalt materials should be rolled and compacted as per OPSS 310. The granular and asphalt pavement materials and their placement should conform to OPSS Forms 310, 501, 1010 and 1150 and pertinent City specifications. It is recommended to use higher grade of asphalt cement (PGAC 64-28) for asphaltic concrete where applicable, particularly in the areas of intense truck turning and loading docks.

HL 3 and HL 8 hot mix asphalt mixes should be designed, produced and placed in conformance with OPSS 1150 and OPSS.MUNI 310 requirements and the relevant City's requirements.

Portland cement concrete should be designed in accordance with CAN/CSA-A23.1 to provide a minimum 28-day compressive strength of 32 MPa.

Both the Granular A and Granular B Type I materials should meet the requirements of OPSS.MUNI 1010 requirements and the relevant City's standards. Granular materials should be compacted to 100 percent of SPMDD.

HL3 HS hot mix asphalt is recommended as padding. Padding should be placed in lifts not exceeding 50 mm.

Performance graded asphalt cement, PG 58-28, conforming to OPSS.MUNI 1101 requirements, should be used in both HMA binder and surface courses.

A tack coat (SS1) should be applied to all construction joints prior to placing hot mix asphalt to create an adhesive bond. SS1 tack coat should also be applied between hot mix asphalt binder and surface courses.

5.6.2 Drainage

Control of water is an important factor in achieving a good pavement life. The need for adequate subgrade drainage cannot be over-emphasized. The subgrade must be free of depressions and sloped (preferably at a minimum grade of 3%) to provide effective drainage toward subgrade drains. Grading adjacent to the pavement areas should be designed to ensure that water is not allowed to pond adjacent to the outside edges of the pavement.

Continuous pavement subdrains should be provided along both sides of the driveway and drained into respective catchbasins to facilitate drainage of the subgrade and granular materials. Continuous subdrains should be also provided for the parking lot/driveway pavement areas along the curb-lines/sidewalk and at all catchbasins within the parking areas. Two lengths of subdrain (each minimum of about 3 m long) should be installed at each catchbasin. The subdrain invert should be maintained at least 0.3 m below subgrade level.

5.6.3 Subgrade Preparation

All topsoil, organics and soft/loose fill materials should be stripped from the subgrade areas. The subgrade soil is expected to consist of fill material, sand or clayey silt till deposit and the fine-grained soils will be weakened by construction traffic when wet; especially if site work is carried out during the periods of wet weather. An adequate granular working surface would be likely required in order to minimize subgrade disturbance and protect its integrity in wet periods.

Immediately prior to placing the granular subbase, the exposed subgrade should be compacted and then proof rolled with a heavy rubber-tired vehicle (such as a loaded gravel truck). The subgrade should be inspected for signs of rutting or displacement. Areas displaying signs of rutting or displacement should be compacted and tested or the material should be excavated and replaced with the Granular B Type I. Backfill material should be placed and compacted to at least 98 percent of SPMDD. The final subgrade surface should be sloped at a grade of 3 percent to provide positive subgrade drainage.

5.7 Pipe Bedding

The site stratigraphy generally consists of the surficial topsoil and earth fill zone, generally extending to a depth of about 0.8 to 2.3 m below grade, underlain by undisturbed native soils deposit extending to the full depth of investigation (up to about 17.2 m below grade).

The undisturbed native materials and the earth fill material compacted to 98 percent SPMDD will be suitable for support of buried services on conventional well graded granular base material. It is recommended that the utility subgrade should be inspected by a geotechnical engineer or its representative during construction. If disturbance of the trench base has occurred, such as due to groundwater seepage, or construction traffic, the disturbed soils should be subexcavated and replaced with suitably compacted granular fill.

Granular bedding material should consist of a well graded, free draining soil, such as OPSS.MUNI Granular "A" or 19 mm Crusher Run Limestone or its equivalent as per the pertinent City/Region specifications. The bedding materials should be placed in 150 mm thick lifts and compacted to a minimum of 95 percent SPMDD or vibrated/tempted to a dense state in case of a clear stone bedding. A clear stone type bedding may be considered if approved by the City/Region, however, on a silt/sand subgrade it must be utilized only in conjunction with a suitable geotextile filter (Terrafix 270R or equivalent). Without proper filtering, there may be entry of fines from the subgrade soils into the bedding. This loss of ground could result in loss of support to the pipes and possible future settlements. A geotextile is not required where subgrade consists of cohesive clayey soils.

5.8 Infiltration Rates from Gradation Curves

A total of six (6) selected borehole soil samples were analyzed and grain size distribution curves were plotted for the estimation of Coefficient of Permeability and Infiltraiton Rate. The results of the analyses are appended and summarized below:

Borehole No. Sample No.	Sampling Depth Below Grade	Soil Description (MIT)	Coefficient of Permeability (on the order of), K (cm/sec)	Infiltration Rate (mm/hour)
Borehole 2, Sample 3	1.8 m	Sand, trace silt, trace clay	10^{-3}	75
Borehole 4, Sample 6	4.8 m	Sandy Clayey Silt, trace gravel	10^{-7}	8
Borehole 5, Sample 8	7.7 m	Silt and Sand, some clay, trace gravel	10^{-6}	12
Borehole 9, Sample 5	3.3 m	Silt and Clay, some sand, trace gravel	10^{-7}	8
Borehole 11, Sample 11	12.3 m	Sand, some silt, trace clay	10^{-3}	75
Borehole 13, Sample 6	4.8 m	Clay and Silt, trace sand	10^{-7}	8

The Supplementary Standards to the Ontario Building Code 2012 document Percolation Time and Soil Descriptions (SB-6) assigns a Coefficient of Permeability based on the soil type. Based on the percentage of the silt and clay sized particles, the estimated percolation rates of the samples analyzed are summarized in the table above. Based on the grain size analysis, the hydraulic conductivity is estimated to be on the order of 10^{-3} to 10^{-7} cm/s, which corresponds to infiltration rate of about 8 to 75 mm/hour based on Table C1 of TRCA's Low Impact Development Stormwater Management Planning and Design Guide.

6.0 DESIGN CONSIDERATIONS FOR CONSTRUCTABILITY

6.1 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 clayey silt to silt and clay till and clayey silt to clay and silt are Type 2 soils.
- The sandy silt to sand and silt till is a Type 3 soil below groundwater, and Type 2 soil above groundwater or if dewatered.
- The sand is a Type 3 soil below groundwater, and Type 2 soil above groundwater or if dewatered.

Where workmen must enter a trench or excavation deeper than 1.2 m, the soil must be suitably sloped and/or braced in accordance with the regulation requirements. The regulation stipulates safe excavation slopes by soil type as follows:

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.

Large size particles (cobbles and boulders) that are not specifically identified in the boreholes may be present in the native soils and earth fill. The size and distribution of such obstructions cannot be predicted with boreholes, as the sampler size is insufficient to secure representative samples of 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.

6.2 Groundwater Control

Terraprobe will provide Hydrogeological Report (File No. 1-20-0109-46) for this site to provide groundwater control measures and estimated groundwater discharge volume (Refer to this report for detailed information about groundwater volumes, quality and control provisions).

Area 1 – Baha'i National Centre

Boreholes 1 and 2 remained open and dry upon completion of drilling. Unstabilized groundwater could not be measured in Boreholes 3 to 7 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 3 and 4 to monitor water level. One water level reading was taken from the wells. Groundwater levels were about 6.6 m and 11.5 m below grade (Elev. 165.8 ± m and 152.2 ± m) for Boreholes 4 and 3 respectively. As noted before, the proposed structure consists of up to 3 levels of basement, the lowest basement level would be set at about Elev. 161.5 m which is about 4 m below the measured groundwater level at the west end of the site. However, the FFE at the east end of the would be set about 9 m above the measured groundwater level. It must be noted that the groundwater levels may fluctuate seasonally depending upon the amount of precipitation and surface runoff.

Based on the borehole information and preliminary design information provided, it is understood that the site excavations for the Level -2 and Level -3 within the western section of Area 1 will likely extend to be about 7 m and 11 m depth below existing grade (Elev. 164.0 ± m to 160.5 ± m, respectively. Based on the above information, groundwater table will be encountered during the excavations within the western section of Area 1. Excavation will extend into the wet sand layer (Borehole 6 area) and significant ground water seepage will be encountered. In addition, perched seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present in the glacial till soils.

Area 2 – Tableland Developments

Visitor Centre and Lobby Connection & Tunnel

Borehole 10 remained open and dry upon completion of drilling. Unstabilized groundwater level were measured at about 6.1 and 5.8 m below grade in Boreholes 8 and 9, respectively. Monitoring well was installed in Borehole 8 to monitor water level. One water level reading was taken from the well. Groundwater level was at about 2.9 m below grade (Elev. 172.9 m) in Borehole 8.

For the proposed Visitor Centre and Lobby Connection and Tunnel area the lowest basement level would be set at Elev. 168.5 ± m and excavation will extend to Elev. 167.5 ± m. However, excavation is not expected to extend into the wet sand deposit below. The underlying clayey silt to silt and clay glacial till deposit is expected to have a relatively low permeability and should not yield in significant free flowing ground water seepage, specially in the short-term. Groundwater seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present in the glacial till soils. This (perched) ground water seepage should diminish slowly and can be controlled by continuous pumping from a conventional sump and pump arrangement at the base of the excavation.

Temple

Boreholes 12 and 14 remained open and dry upon completion of drilling. Unstabilized groundwater level was measured at about 6.1 m below grade in Borehole 13. Borehole 13 caved at a depth of about 7.0 m below grade. Unstabilized groundwater could not be measured in Borehole 11 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 11 and 14 to monitor water level. One water level reading was taken from the wells. Monitoring wells in both Boreholes 11 and 14 were noted to be dry.

The proposed Temple will have one level of basement, the lowest basement level would be set at Elev. 173.00 ± m and excavation will extend to Elev. 172.00 ± m which is above the measured groundwater level. However, some groundwater seepage may be encountered during the excavations primarily emanating from the earth fill zone and wet sand/silt seams present in the glacial till soils. The perched ground water seepage should diminish slowly and can be controlled by continuous pumping from a conventional sump and pump arrangement at the base of the excavation.

Area 3 – Parking Lot Area Developments

Borehole 18 remained open and dry upon completion of drilling. Unstabilized groundwater level was measured at about 4.6 m and 3 m below grade in Boreholes 16 and 17, respectively. Boreholes 16 and 17 caved at a depth of about 5.2 m and 4.9 below grade, respectively. A monitoring well was installed in Borehole 18 to monitor water level. One water level reading was taken from the well. The groundwater level was found to be at about 4.8 m below grade (Elev. 152.3 m) in Borehole 18. It must be noted that the groundwater levels may fluctuate seasonally depending upon the amount of precipitation and surface runoff.

As noted before, the proposed structure and additions will be slab on grade construction and only shallow excavation will be required in this area. Based on the above information, groundwater table will likely not be encountered during the excavations within Area 3. Perched groundwater seepage may be encountered during the excavations primarily emanating from the earth fill zone. The perched ground water seepage should diminish slowly and can be controlled by continuous pumping from a conventional sump and pump arrangement at the base of the excavation.

For excavations extending below the prevailing groundwater level in the wet sand deposit at the westerly portion of the Baha'i National Centre where three levels of underground parking is proposed, it will be necessary to lower the groundwater level and maintain it below the excavation base (at least 1.0 m) prior to and during the subsurface construction. A professional dewatering expert should review the subsurface information to assess the potential requirement of dewatering and establish appropriate dewatering methodology which will be responsibility of the dewatering contractor.

In designing the approach to groundwater control during construction at this site, the shoring approach (Section 6.4) must also be considered for Areas 1 where three levels of underground parking is proposed .

A close well point dewatering system may prove to be most effective, however we recommend that a professional dewatering contractor be consulted to review the subsurface conditions and to design a site-specific dewatering system. It is the dewatering contractor's responsibility to make an assessment of the factual data and to provide recommendations and design the site-specific dewatering system.

A rigid shoring system (interlocking caissons) adequately designed and installed along the excavation perimeter will help preclude some of the groundwater seepage into the excavation from wet soils and can significantly reduce the amount of groundwater seepage and pumping for both during and post-construction conditions.

Dewatering will take some time to accomplish prior to the start of excavation. The dewatering for the pre and post construction conditions will require an ESAR or a Permit to Take Water from the Ministry of Environment, Conservation and Parks (MECP), and an Agreement to Discharge from the City.

6.2.1 Regulatory Requirements

The volume of water entering the excavation will be based on both ground water infiltration and precipitation events. Based on recent regulation changes within O.Reg. 63/16, the dewatering limits and requirements are as follows:

- Construction Dewatering less than 50,000 L/day: The takings of both groundwater and storm water does not require a Construction Dewatering Assessment Report (CDAR) and does not require a Permit to Take Water (PTTW) from the Ministry of Environment, Conservation and Parks (MECP).

- Construction Dewatering greater than 50,000 L/day and less than 400,000 L/day: The taking of groundwater and/or storm water requires a Construction Dewatering Assessment Report (CDAR) and does not require a Permit to Take Water (PTTW) from the Ministry of Environment, Conservation and Parks (MECP).

- Construction Dewatering greater than 400,000 L/day: The taking of groundwater and/or storm water requires a Construction Dewatering Assessment Report (CDAR) and requires a Permit to take Water (PTTW) from the Ministry of Environment, Conservation and Parks (MECP).

If it is expected that greater than 50,000 L/day of water will be pumped, a CDAR and/or a PTTW should be obtained as soon as possible in advance of construction to avoid possible delays. Depending on the construction methodology for the site servicing (trench boxes or open cut, and length of trench) and the time of year (high versus low ground water levels), there is the possibility that water taking of greater than 50,000 L/day may occur at this site.

A CDAR takes up to 1 month to complete if monitoring wells are already installed on site. Once the CDAR is completed, it is uploaded to the Environmental Activity and Sector Registry (EASR), which registers the construction dewatering with the MECP without the need for a permit. If the results of the CDAR indicate that greater than 400,000 L/day will be pumped, a PTTW application must be submitted to the MECP. A PTTW application can take up to an additional 3 months for the MECP to process upon completion of the CDAR. Note that Environmental Compliance Assessments, Impact Study, Reports and applicable municipal, provincial and conservation authority approvals (completed by others) will be required as part of the CDAR.

6.3 Backfill

In general, excavated soils encountered on site may be re-used as backfill, provided the moisture content of these materials is within ±2% of optimum to ensure adequate compaction, the trenches are wide enough to accommodate large compaction equipment, and the soil is free of any deleterious material (e.g. concrete fragments, construction debris). Soils wet of optimum could be put aside to dry, tilled to reduce the moisture content so that they can be effectively compacted, or could be mixed with relatively dry material.

Alternatively, materials of higher moisture content could be wasted and replaced with imported material which can be readily compacted.

The backfill should consist of clean earth fill and should be placed in lifts of 150 mm thickness or less and compacted to a minimum of 98% SPMMD (in settlement sensitive areas) and 95% SPMDD (in non-settlement sensitive areas) at a water content within 2% of optimum. Existing earth fill and native soils will be difficult to place and compact successfully in narrow trench excavations, where large compaction equipment could not operate. For narrow trench excavations, it is recommended that free draining granular material, such as OPSS.MUNI 1010 Granular 'B' be used in order to allow for adequate compaction using vibratory equipment. The placement and inspection of any earth fill as backfill must be conducted under the full-time observation of Terraprobe, the geotechnical engineer.

The site soils may be difficult to handle and compact if they become wet as a result of inclement weather or seepage. Hence, it can be expected that earthworks carried out during wet periods (i.e., spring and fall) of the year may result in increased earthwork costs. The site soils have a moderate susceptibility to frost effects. If the building has flush entrances, care must be taken in detailing the exterior slabs/sidewalks, providing insulation and/or drainage and/or non-frost susceptible backfill/frost slab to maintain the flush threshold during freezing weather conditions.

6.4 Earth-Retention Shoring Systems

Terraprobe, through its shoring design section, can provide detailed shoring design and engineering services for this site.

Decisions regarding shoring methods and sequencing are the responsibility of the Contractor. Temporary shoring system design should be carried out by a licensed Professional Engineer experienced in shoring design.

A special attention should be made along the proposed excavation shoring sections adjacent to the limits of the existing buildings/structures. No excavation shall extend below a line cast as one vertical to one horizontal from foundations of an existing structure without adequate alternate support being provided. Underpinning guidelines are provided as Appendix G.

The shoring requirements for the site will have to be examined in detail with respect to the proximity of existing structures and buried utilities, and site boundary constraints. Depending upon the site conditions, the shoring system may need to consist of a rigid (interlocking drilled caissons) or a steel soldier piles and timber lagging shoring system, or a combination of both. The site conditions must be carefully assessed by the shoring designer to select appropriate type of shoring system in light of the close proximity of the existing structures/roads. It is imperative that the shoring system provides adequate support to the existing building foundations.

As noted before, a rigid shoring system (interlocking caissons) adequately designed and installed along the excavation perimeter will help preclude some of the groundwater seepage into the excavation from wet soils and can significantly reduce the amount of groundwater seepage and pumping for both during and post-construction conditions, otherwise wet soils have a potential to yield significant amounts of groundwater seepage.

6.4.1 Lateral Earth Pressure Distribution

Applicable soil parameters are included in the Earth Pressure Design Parameters Section (Section 5.3).

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

Where multiple rows of lateral supports are used to support the shoring walls, research has shown that a distributed pressure diagram more realistically approximates the earth pressure on a shoring system of this type, when restrained by pre-tensioned anchors. A multi-level supported shoring system can be designed based on an earth pressure distribution with a maximum pressure defined by:

$$\boldsymbol{P = 0.8\,K[\gamma H + q]}\ \textbf{... cohesive soils (e.g. clayey silt till)}$$
$$\boldsymbol{P = 0.65\,K[\gamma H + q]}\ \textbf{... cohesionless soils (e.g. sands)}$$

where, P = the maximum horizontal pressure (kPa)
K = the earth pressure coefficient
H = the total depth of the excavation (m)
γ = the bulk unit weight of soil, (kN/m3)
q = the complete surcharge loading (kPa)

In cohesive soils, the trapezoidal pressure distribution uniformly increases from zero to the maximum pressure defined above, over the top and bottom quarter (H/4) of the shoring. In cohesionless soils, the pressure distribution is rectangular.

6.4.2 Soldier Pile Toe Embedment

The soils that soldier pile toes and fillers will be made vary over the site and the detailed shoring design should account for the changes across the site. Typically, it is expected that the soldier pile toes and fillers would be made in very stiff to hard clayey silt to silt and clay till and/or very dense sand units. The horizontal resistance of the soldier pile toes will be developed by embedment below the base of excavation, where resistance is developed from passive earth pressure. It is noted that the resistance will be different depending on whether the soils are dewatered, or remain below the nominal groundwater level. Where soils exist beneath the groundwater level, the unit weight of the soil is diminished by buoyancy. The design of the shoring will therefore have to consider the construction plan and sequence with respect to depth of groundwater control.

The sandy silt to sand and silt till and sand at this site are cohesionless, permeable and moist to wet (at deeper depth) such that augered holes made into these soils will be unstable. It is necessary to advance temporarily cased holes that intersect these layers to prevent excess caving during all augered hole installations. Drill holes for piles, caissons, and/or fillers, utilizing temporary liners, polymer mud/slurry drilling techniques, and/or other methods as deemed necessary by the contractor may be required to prevent issues such as: groundwater inflow or loss of soil into the drill holes, and disturbance to placed concrete. It will also be necessary to control the bases of any augered holes below the design groundwater elevation, to protect them against basal disturbance caused by the ingress of groundwater and to prevent loss of ground. This may include dewatering to below the shoring toe depths prior to installation, or the use of drilling muds, pre-advancing casing, or other techniques as deemed necessary by the shoring contractor.

6.4.3 Lateral Bracing Elements

If anchor support is necessary and determined to be feasible, the shoring system should be supported by pre-stressed soil anchors extending beneath the adjacent lands. Pre-stressed anchors are installed and stressed in advance of excavation and this limits movement of the shoring system as much as is practically possible. The use of anchors on adjacent properties requires the consent of the adjacent land owners, expressed in encroachment agreements.

Conventional earth anchors could be made with continuous hollow stem augers or alternatively post-grouted anchors can be made. The design adhesion for earth anchors is controlled as much by the installation technique as the soil and therefore a proto-type anchor must be made in each anchor level executed to demonstrate the anchor capacity and validate the design assumptions. A proto-type anchor must be made to demonstrate the anchor capacity (performance tested to 200% of the design load). All production anchors must be proof-tested to 133% of the design load, to validate the design assumptions.

Conventional earth anchors made in the dense to very dense cohesionless soils can be designed using a working adhesion of 50 kPa to 60 kPa. It is expected that post-grouted anchors can be made such that an anchor will safely carry about 70 kN/m of adhered anchor length (at a nominal diameter of 150 mm) in the typically the dense to very dense cohesionless and hard cohesive soils and must be confirmed by a performance/load test.

Depending upon the location and elevation of the soil anchors, the conventional earth anchors made in the hard cohesive soil deposits are expected to develop ultimate adhesion of about 80 to 100 kPa for a working adhesion of 40 to 50 kPa. The post-grouted anchors made in these soils may carry a transfer load of 50 to 60 kN/metre of post-grouted anchor length (for a 150 mm nominal diameter of anchor), as confirmed by a performance/load test.

The above values are provided as preliminary guidance only and the bond strength values to be used for design and the actual anchor performance must be verified by a performance/load test.

If adjacent land owners are not agreeable to anchored support, then internal bracing or rakers would be necessary. The compact to very dense sandy silt to sand and silt till/sand and clayey silt to silt and clay till deposits is suitable for the placement of raker foundations. Raker footings established on the native soils at an inclination of 45 degrees can be designed for a maximum factored geotechnical resistance of 200 kPa.

6.5 Corrosivity and Sulphate Attack

Six (6) soil samples (Borehole 3, Sample 6; Borehole 5, Sample 7; Borehole 7, Sample 8; Borehole 9, Sample 4; Borehole 14, Sample 5; and Borehole 17, Sample 3) were selected by Terraprobe and submitted to AGAT Laboratories for corrosivity package analysis, consisting of concentration of sulfide, chloride and sulphate, pH, electrical conductivity, resistivity and redox potential. The complete analysis results, including Certificate of Analysis, are presented in Appendix L.

These parameters are used for assessing soil corrosivity applicable to cast iron alloys, according to the 10-points soil evaluation procedure described in AWWA C105. It should be noted that the analytical results only provide an indication of the potential for corrosion. Based on this 10-points evaluation procedure, the severity ranking of the tested samples is tabulated in the following table. Typically, if the total points are 10 or more, the soil is considered potentially corrosive and warrants taking protective measures. Based on the testing results, it appears that the protective measures to control potential corrosion risk of cast iron alloys are not required at this site. The resistivity of soil samples analyzed ranged from 1140 ohm.cm (Borehole 3, Sample 6) to 13,200 ohm.cm (Borehole 17, Sample 3). A more recent study has suggested that soil with a resistivity of less than about 2,000 ohm.cm should be considered aggressive (refer to Certificate of Analysis). It should also be noted that this rating scale remain relatively simplistic, subjective procedure for specific alloys. Therefore, it should be viewed as a broad indicator and should not be expected to accurately predict specific cases of corrosion damage.

Soil Samples	Borehole 3, Sample 6	Borehole 5, Sample 7	Borehole 7, Sample 8	Borehole 9, Sample 4	Borehole 14, Sample 5	Borehole 17, Sample 3
Depth below Grade (m)	4.7 to 5.0	6.1 to 6.4	7.6 to 8.1	2.3 to 2.7	3.1 to 3.5	1.5 to 2
Total Points	6	3	1	1	1	4

Concrete material embedded in soil may be subjected to potential sulphate attack depending upon the site-specific soil conditions. The above samples were also analyzed for soluble sulphate concentration. The test results indicated that the concentration of sulphate in soil ranged from <2 to 27 µg/g (0.0002< to 0.0027 percent by mass). The analytical results were compared to the Canadian Standard CAN3/CSA A23.1-M94 Table 3, Additional Requirements for Concrete Subjected to Sulphate Attack. It is anticipated that these results would be used to determine the type of cementing materials to be used to produce concrete for this project. Comparison of the test results indicates that the water-soluble sulphate concentrations in soil are

lower than 0.1 percent in all samples, therefore, there is a negligible potential for sulphate attack on the concrete.

6.6 Site Work

The earth fill and native soils at this site will become disturbed and may lose their integrity to support when subjected to traffic, particularly when wet. It can be expected that a subgrade made in the native soils will be disturbed unless an adequate granular working surface is provided to protect the integrity of the subgrade soils from construction traffic, especially during periods of wet weather. Subgrade preparation works cannot be adequately accomplished during wet weather and the project must be scheduled accordingly. The disturbance caused by the traffic may require in the removal of disturbed soil and use of granular fill material for site restoration or underfloor fill that is not intrinsic to the project requirements.

The most severe loading conditions on the subgrade may occur during construction. Consequently, 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.

If construction proceeds during freezing weather conditions, adequate temporary frost protection for the founding subgrade and concrete must be provided. The native soils at this site are susceptible to frost damage. Consideration must be given to frost effects, such as heave or softening, on exposed soil surfaces in the context of this particular project development. Depending on the weather at the time of construction it could be necessary to install a skim coat of lean concrete (mud-slab) to preserve the subgrade integrity, and to provide a trafficable surface.

6.7 Quality Control

Excavations on this site must be shored to preserve the integrity of the surrounding properties and structures. The Ontario Building Code 2012 stipulates that engineering review of the subsurface conditions is required on a continuous basis during the installation of earth retaining structures. Terraprobe should be retained to provide this review, which is an integral part of the geotechnical design function as it relates to the shoring design considerations. Terraprobe can provide detailed shoring design services for the project, if requested.

All foundation installations must be reviewed in the field by Terraprobe, the geotechnical engineer, as they are constructed. The on-site review of the condition of the foundation soil as the foundations are constructed is an integral part of the geotechnical engineering design function and is required by Section 4.2.2.2 of the Ontario Building Code. If Terraprobe is not retained to carry out foundation engineering field review during construction, then Terraprobe accepts no responsibility for the performance or non-performance of the foundations, even if they are ostensibly constructed in accordance with the conceptual design advice contained in this report.

The long-term performance of the slab on grade is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically 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 Terraprobe at the time of construction to confirm material quality, thickness, and to ensure adequate compaction.

The requirements for fill placement on this project have been stipulated relative to Standard Proctor Maximum Dry Density (SPMDD). In situ determinations of density during fill and asphaltic pavement placement on site are required to demonstrate that the specified placement density is achieved. Terraprobe is a CNSC certified operator of appropriate nuclear density gauges for this work and can provide sampling and testing services for the project as necessary, with our qualified technical staff.

Concrete will be specified in accordance with the requirements of CAN3 - CSA A23.1. Terraprobe maintains a CSA certified concrete laboratory and can provide concrete sampling and testing services for the project as necessary.

Terraprobe staff can also provide quality control services for Building Envelope, Roofing and Structural Steel, as necessary, for the Structural and Architectural quality control requirements of the project. Terraprobe is certified by the Canadian Welding Bureau under W178.1-1996.

Terraprobe can also provide shoring design, tender package and shoring monitoring services.

7.0 SLOPE STABILITY AND STREAMBANK EROSION RISKS

The property consists of an irregular shaped tableland abutting a valley slope to the east. The topography of the tableland portion is relatively flat to gently sloping followed by the valley slope extending to slope toe.

The proposed development would comprise construction of a temple and a visitor centre on the tableland and two slab-on-grade building additions and a washroom at the base. The siting of the buildings would depend upon the long-term stability and streambank erosion risks of the valley slope.

7.1 Visual Slope Inspection

A visual inspection of the site slope was conducted on April 6, 2022. General information pertinent to the existing slope features such as slope profile, slope drainage, watercourse features, vegetation cover, structures in the vicinity of the slope, erosion and slope slide features was obtained during this inspection. A brief summary of the results of the visual inspection is presented as follows.

The topographic information and sections of the slope profiles for the site slopes were prepared using Site Survey Plan (prepared by Erti Surveyors, OLS, Project No. 21470, Dated September 9, 2022) provided by the client. A total of seven (7) slope cross-sections (Sections A-A' to E-E') were derived from the topographic information for slope stability analysis, additional sections (Sections F-F' & A1-A1') were derived along and across the emergency access route, respectively. The cross-section locations were selected on the basis of the slope height and inclination as well as proximity to the location of the proposed buildings/additions, to represent critical slope conditions present within the study area. The sections extended through the tableland across the slope surface, down to the slope toe. The locations of the slope cross-sections are presented on Figure 2, and the details of the corresponding slope profiles are presented on Figures 3A to 3D.

Based on our site visit and review of the site plan, the valley slope is about 12 to 31 m high with relatively gentle overall inclinations varying from about 2.4 to 6.0 horizontal to 1.0 vertical, with locally relatively steeper inclinations at the lower slope varying from about 1.7 to 2.6 horizontal to 1.0 vertical (refer to Figures 3A to 3D). The tableland within the study area is currently undeveloped woodland, a golf course occupies the tableland west of the study area (Photographs 4 & 5). An existing log cabin and associate shed occupy the valley land set back about 37 and 12 m from the slope toe respectively (Photograph 2). The parking lot area development includes a small, paved driveway and landscaping. An existing trail occupies the proposed Leslie Street alignment east of the main slope to and valley land. A small watercourse (about 5 - 6 m wide) is located east of this trail, typically more than 100 m from the subject slope toe.

The upper and lower slopes within the study area are well vegetated with young and mature trees, low lying brush and shrubs. The tree growth within the study area was noted to be typically upright and straight with occasional exceptions. In general, the visual slope inspection did not identify any obvious signs of slope instability (slump, scar, tension cracks etc.) and erosion features. The subject slope, appeared to be in a stable condition.

The watercourse is separated from the slope toe by a wide valley base (about 100 to 130 m wide). No active erosion was noticed along the slope toe during our site visit.

7.2 Slope Stability Analysis

The borehole data obtained from a series of boreholes advanced on or in a relatively close proximity of the subject slope portions indicates that except for a surficial earth fill layer (about 0.8 to 2.3 m thick), the site slope comprises competent undisturbed native soil deposits. It should be noted that the northern portion of the site (north of Lot 3) is partially occupied by a landfill, the approximate extent is shown in Figure 2. The fill depth near the slope crest within the landfill area was noted to extend up to 6.1 m below grade (Borehole 27). As mentioned before the scope of the slope stability study is limited to the main site slope within Lot 2.

Out of nine prepared slope cross-sections, two (2) cross-sections (Sections C-C' and E-E') were selected for slope stability analysis. These cross-sections were selected on the basis of the slope height, inclination and fill depth to represent the critical slope conditions present within the study area.

A detailed engineering analysis of slope stability was carried out utilizing computer software SLIDE (Version 7.0) developed by Rocscience Inc. and several standard methods of limit equilibrium analysis (Bishop's, Janbu, and Spencer). These methods of analysis allow the calculation of Factors of Safety for hypothetical or assumed failure surfaces through the slope. The analysis method is used to assess potential for movements of large masses of soil over a specific failure surface which is often curved or circular. The analysis involves dividing the sliding mass into many thin slices and calculating the forces on each slice. The normal and shear forces acting on the sides and base of each slice are calculated. It is an iterative process that converges on a solution.

For a specific failure surface, the Factor of Safety is defined as the ratio of the available soil strength resisting movement, divided by the gravitational forces tending to cause movement. The Factor of Safety of 1.0 represents a "limiting equilibrium" condition where the slope is at a point of pending failure since the soil resistance is equal to forces tending to cause movement. It is usual to require a Factor of Safety greater than one (1) to ensure stability of the slope. The typical Factor of Safety used for engineering design of slopes for stability, ranges from about 1.3 to 1.5 for developments situated close to the slope crest. The most common design guidelines are based on a 1.5 minimum Factor of Safety against potential slope slides.

The analysis was carried out by preparing a model of the slope geometry and subsurface conditions, and analyzing numerous failure surfaces through the slope in search of the minimum or critical Factor of Safety for specific slope conditions. The pertinent data obtained from topographic mapping, slope profiles, slope mapping and the borehole information were input in the slope stability analysis. Many calculations were carried out to examine the Factor of Safety for varying depths of potential failure surfaces. Based on the borehole results, and our previous detailed slope stability investigations conducted in the general area, the following average soil properties were utilized for the soil strata in the slope stability analysis:

Stratum	Unit Weight (kN/m^3)	Angle of Internal Friction, ϕ'	Cohesion, c' (kPa)
Earth Fill	19.0	29°	0
Clayey Silt to Silt and Clay Till (Cohesive Tills)	21.0	32°	10
Clayey Silt to Clay and Silt	20.0	30°	10
Sand	20.0	38°	0

The above soil strength parameters are based on effective stress analysis for long-term slope stability. It is considered that these soil properties are relatively conservative, and the site soils are actually stronger.

Boreholes 10, 12 and 14 remained open and dry upon completion of drilling. Unstabilized groundwater level was measured at about 6.1 m below grade in Boreholes 8, 9, and 13. Borehole 13 caved at a depth of about 7.0 m below grade. Unstabilized groundwater could not be measured in Borehole 11 due to the use of mud rotary drilling technique. Monitoring wells were installed in Boreholes 8, 11 and 14 to monitor water level. One water level reading was taken from the wells. Groundwater levels were found to be dry in Boreholes 11 and 14 and at about 2.9 m below grade (Elev. 172.9 ± m) in Borehole 8. The slope stability analysis was conducted for normal water level condition incorporating the above noted groundwater levels and also for elevated groundwater level condition (with an assumed water level located within about 1 to 2 metres of the ground surface to model high, temporary and infrequent water level condition), for a conservative analysis.

The results of the slope stability analysis are presented on enclosed figures, and are summarized as follow:

Setback Analysis	Approximate Slope Inclination	Minimum Factor of Safety for Potential Slope Slides		Type of Slope Slide
		Normal Ground Water Condition	Elevated Ground Water Condition	
Section C-C'	2.5 H : 1.0 V (Upper) 2.6 H : 1.0 V (Lower)	2.07 (Lower Slope)	1.81 (Lower Slope)	Lower and Upper Slope/Overall Slope Slide
		2.21 (Upper Slope)	2.21 (Upper Slope)	
Section E-E'	5.0 H : 1.0 V (Upper) 1.7 H : 1 V (Lower)	1.53	1.41	Lower Slope/Overall Slope Slide

For residential and commercial developments, the MNR Policy Guidelines allow a minimum Factor of Safety of 1.3 to 1.5 for slope stability, as follows:

Type	Land-Uses	Design Minimum Factor of Safety
A	PASSIVE: no buildings near slope; farm field, bush, forest, timberland, woods, wasteland, badlands, tundra	1.1
B	LIGHT: no habitable structures near slope; recreational parks, golf courses, buried small utilities, tile beds, barns, garages, swimming pools, sheds, satellite dishes, dog houses	1.20 to 1.30
C	ACTIVE: habitable or occupied structures near slopes; residential, commercial, and industrial buildings, retaining walls, storage/warehousing of non-hazardous substances	1.30 to 1.50
D	INFRASTRUCTURE and PUBLIC USE: public use structures and buildings (i.e. hospitals, schools, stadiums), cemeteries, bridges, high voltage power transmission lines, towers, storage/warehousing of hazardous materials, waste management areas	1.40 to 1.50

TRCA policy guidelines require a 1.5 minimum F.S. for slope stability for land development and planning. A minimum factor of safety of 1.5 is required for normal ground water condition and a minimum factor of safety of 1.3 is required for elevated, short term and infrequent ground water condition.

The above computed minimum Factors of Safety for the slope profile(s) C-C' and E-E′ were 2.07 and 1.53, respectively, for normal groundwater level and 1.81 and 1.41 for elevated groundwater level, respectively, which are considered to be adequate, and are in conformance to the MNR and TRCA Policy Guidelines as well as industry standards. The detailed results of the slope stability analysis are appended.

7.3 Toe Erosion Allowance

In addition to a stability set-back, an erosion allowance is also recommended in areas where the watercourse position is within 15 m of the slope toe. A Guideline Table (MNR) recommended for estimating the toe erosion allowance is presented as follows:

Minimum Toe Erosion Allowance - River Within 15 m of Slope Toe *				
Type of Material Native Soil Structure	**Evidence of Active Erosion** or Bankfull Flow Velocity > Competent Flow Velocity*** Range of Suggested Toe Erosion Allowances**	**No evidence of Active Erosion** or Flow Velocity < Competent Flow Velocity*** Bankfull Width**		
		< 5 m	**5 - 30 m**	**> 30 m**
1. Hard Rock (granite)	0 - 2 m	0 m	0 m	1 m
2. Soft Rock (shale, limestone) Cobbles, Boulders	2 - 5 m	0 m	1 m	2 m
3. Stiff/Hard Cohesive Soil (clays, clayey silt) Coarse Granular (gravels) Tills	5 - 8 m	1 m	2 m	4 m
4. Soft/Firm Cohesive Soil Fine Granular (sand, silt) Fill	8 - 15 m	1 - 2 m	5 m	7 m

* If a valley floor is > 15m width, still may require study or inclusion of a toe erosion allowance.

** Active Erosion is defined as: bank material is bare and exposed directly to stream flow under normal or flood flow conditions and, where undercutting, over steepening, slumping of a bank or high down stream sediment loading is occurring. An area may be exposed to river flow but may not display "active erosion" (i.e. is not bare or undercut) either as a result of well rooted vegetation or as a result of shifting of the channel or because flows are relatively low velocity. The toe erosion allowances presented in the right half of Table 2 are suggested for sites with this condition.

*** Competent Flow velocity; the flow velocity that the bed material in the stream can support without resulting in erosion or scour.
Consideration must also be given to potential future meandering of the watercourse channel.

Source: Ontario Ministry of Natural Resources (2002), "Technical Guide River & Stream Systems: Erosion Hazard Limit, pp38

The MNR Guidelines "Geotechnical Principles for Stable Slopes" recommend an erosion setback where the watercourse is located within 15 m of the slope toe. As noted before, the watercourse within the study area is separated from the slope toe by a wide valley base (more than 100 m) and there was no evidence of slope toe erosion, therefore, the slope toe within the study area is not subjected to erosion risk and a toe erosion setback is not required.

Therefore, the existing slope is considered to be stable in the long-term with respect to potential slope slides, and stability and erosion setbacks are not required. Therefore, the existing slope crest position as staked by TRCA on June 17, 2022, and as identified by the survey can be taken as the Long-Term Stable Slope Crest (LTSSC) location for the site. Further the slope toe position as identified by the survey, and estimated by Terraprobe where required, can be taken as the Long-Term Stabel Toe of Slope (LTSTOS). The location of the estimated LTSSC and LTSTOS are shown on Figure 2 (Plan), and Figures 3A to 3D (Profiles). It should be noted that the proposed parking area within the valley land is outside of the hazard zone and can therefore be constructed without impacting the long term stability of the slope.

7.4 Slope Protection and Maintenance Considerations

As noted before, the site slope height is relatively high, about 12 to 31 m high and all proposed buildings on the tableland and on the valley base would be setback more than 10 m from the LTSSC and the slope toe, respectively. Therefore, the proposed development at the site should not have an adverse impact on the long-term stability of the site slope.

The following general maintenance as well as construction considerations and constraints are recommended to maintain and enhance the slope condition, and to help protect against surficial soil erosion during the development phase as well as in the long-term horizon:

a) site development and construction activities should be conducted in a manner which do not result in surface erosion of the slope. In particular, site grading and drainage should be designed to prevent direct concentrated or channelized surface runoff from flowing directly over the slope. Water drainage from down-spouts, sumps, swimming pools, road drainage, and the like should not be permitted to flow over the slope, but a minor sheet flow may be acceptable,

b) a healthy vegetative cover should be maintained on the slope. Any slope areas, disturbed by construction should be restored with suitable native vegetation as approved by TRCA and the city, however we understand that there will be no construction beyond the top of bank,

c) the configuration of the slope should not be altered without prior consultation with a geotechnical engineer and conservation authority approval. In particular, the slope should not be steepened, and fill materials/stockpiles should not be placed on the slope or within about 5 m of the slope crest, and

d) a temporary silt/sediment control fence must be erected prior to the commencement of the site works and maintained until the completion of work or as required by the applicable authorities.

e) necessary permits and approvals must be obtained from applicable authorities prior to the commencement of site works.

7.5 Proposed Emergency Access Road Alignment

It is understood that it is proposed to construct an emergency access route along the unopened Leslie Street Right of Way (ROW). This access route would extend north from the current termination of Leslie Street and would ascend the valley slope into the City's parklands. It is noted that the maximum grade of the access route cannot exceed an 8% to 10% slope (about 12 to 10 horizontal to 1 vertical). Section F-F' was prepared along the proposed access route., and section A1-A1' was prepared across the proposed access route.

Based on our site visit and review of the site plan, the valley slope within the road alignment is about 4 to 8 m high with relatively gentle inclinations varying locally from about 4.8 to 5.4 horizontal to 1.0 vertical at the south and north ends, with relatively flatter inclinations at the central section of about 9.5 to 19 horizontal to 1.0 vertical (refer to Figure 3D). The inclination of Section F-F' is steeper than the maximum allowable grade at the south and north ends, and locally through the central sections. As such minor cut and fill operations will be required in order to meet the allowable maximum grade. The area of the slope/valley land within the proposed access route alignment is typically well vegetated with young and mature trees, no obvious signs of slope instability (slump, scar, tension cracks etc.) and erosion features were noted.

Where cut and fill operations are undertaken outside of the future paved areas of the road, consideration should be given to install erosion protection measures on the finished re-graded slope surface (i.e. erosion control blanket/turf) to minimize surface erosion and help establish the vegetation. Periodic maintenance of the slope surface (regraded areas) during the first couple of years would be required until the vegetation becomes well established.

The subgrade along the road alignment is expected to be composed of compact to very dense native sands which are considered competent with respect to slope stability, and cut & fill and regrading operations are not expected to impact the long term stability of the valley slopes. The slopes along/in the vicinity of the proposed emergency access route are flatter and smaller (lower height) than the analysed critical sections (Sections C-C' and E-E') and can be considered stable in the long term. The proposed road alignment is about 40 m or more from the creek and creek bank erosion is not expected to affect the proposed road.

8.0 LIMITATIONS AND USE OF REPORT

8.1 Procedures

This investigation has been carried out using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by Terraprobe and other engineering practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to this project. The discussions and recommendations that have been presented are based on the factual data obtained from this investigation.

The drilling work was carried out by a drilling contractor and was observed and recorded by Terraprobe on a full-time basis. The boreholes were made by a continuous flight power auger machine. A Terraprobe technician logged the boreholes and examined the samples as they were obtained. The samples obtained were sealed in clean, air-tight containers and transferred to the Terraprobe laboratory, where they were reviewed for consistency of description by a geotechnical engineer. Ground water observations were made in the boreholes as drilling proceeded.

The samples of the strata penetrated were obtained using the Split-Barrel Method technique (ASTM D1586). The samples were taken at intervals. The conventional interval sampling procedure used for this investigation does not recover continuous samples of soil at any borehole location. There is consequently some interpolation of the borehole layering between samples and indications of changes in stratigraphy as shown on the borehole logs are approximate.

It must be recognized that there are special risks whenever engineering or related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with the most stringent level of care may fail to detect certain conditions. Terraprobe has assumed for the purposes of providing design parameters and advice, that the conditions that exist between sampling points are similar to those found at the sample locations. The conditions that Terraprobe has interpreted to exist between sampling points can differ from those that actually exist.

It may not be possible to advance a sufficient number of boreholes, or sample and report them in a way that would provide all the subsurface information and geotechnical advice to completely identify all aspects of the site and works that could affect construction costs, techniques, equipment and scheduling. Contractors bidding on or undertaking work on the project must be directed to draw their own conclusions as to how the subsurface conditions may affect them, based on their own investigations and their own interpretations of the factual investigation results, and their approach to the construction works, cognizant of the risks implicit in the subsurface investigation activities so that they may draw their own conclusions as to how the subsurface conditions may affect them.

8.2 Changes in Site and Scope

The passage of time, natural occurrences, and direct or indirect human intervention at or near the site have the potential to alter subsurface conditions. In particular, caution should be exercised in the consideration of contractual responsibilities as they relate to control of seepage, disturbance of soils, and frost protection.

The design parameters provided and the engineering advice offered in this report are based on the factual data obtained from this investigation made at the site by Terraprobe and are intended for use by the owner and its retained design consultants in the design phase of the project. If there are changes to the project scope and development features, the interpretations made of the subsurface information, the geotechnical design parameters, advice and comments relating to constructability issues and quality control may not be

relevant or complete for the project. Terraprobe should be retained to review the implications of such changes with respect to the contents of this report.

8.3 Use of Report

This report is prepared for the express use of National Spiritual Assembly of the Bahá'is of Canada and their retained design consultants. It is not for use by others. This report is copyright of Terraprobe Inc., and no part of this report may be reproduced by any means, in any form, without the prior written permission of Terraprobe. National Spiritual Assembly of the Bahá'is of Canada and their retained design consultants are authorized users.

It is recognized that the City of Markham, in their capacity as the planning and building authority under Provincial statues, will make use of and rely upon this report, cognizant of the limitations thereof, both as are expressed and implied.

We trust that this report meets your present requirements. Should you have any questions regarding the information presented, please do not hesitate to contact our office.

Terraprobe Inc.

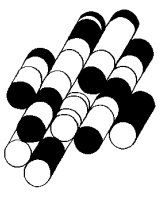
Connor McCormick P.Eng.
Geotechnical Engineer

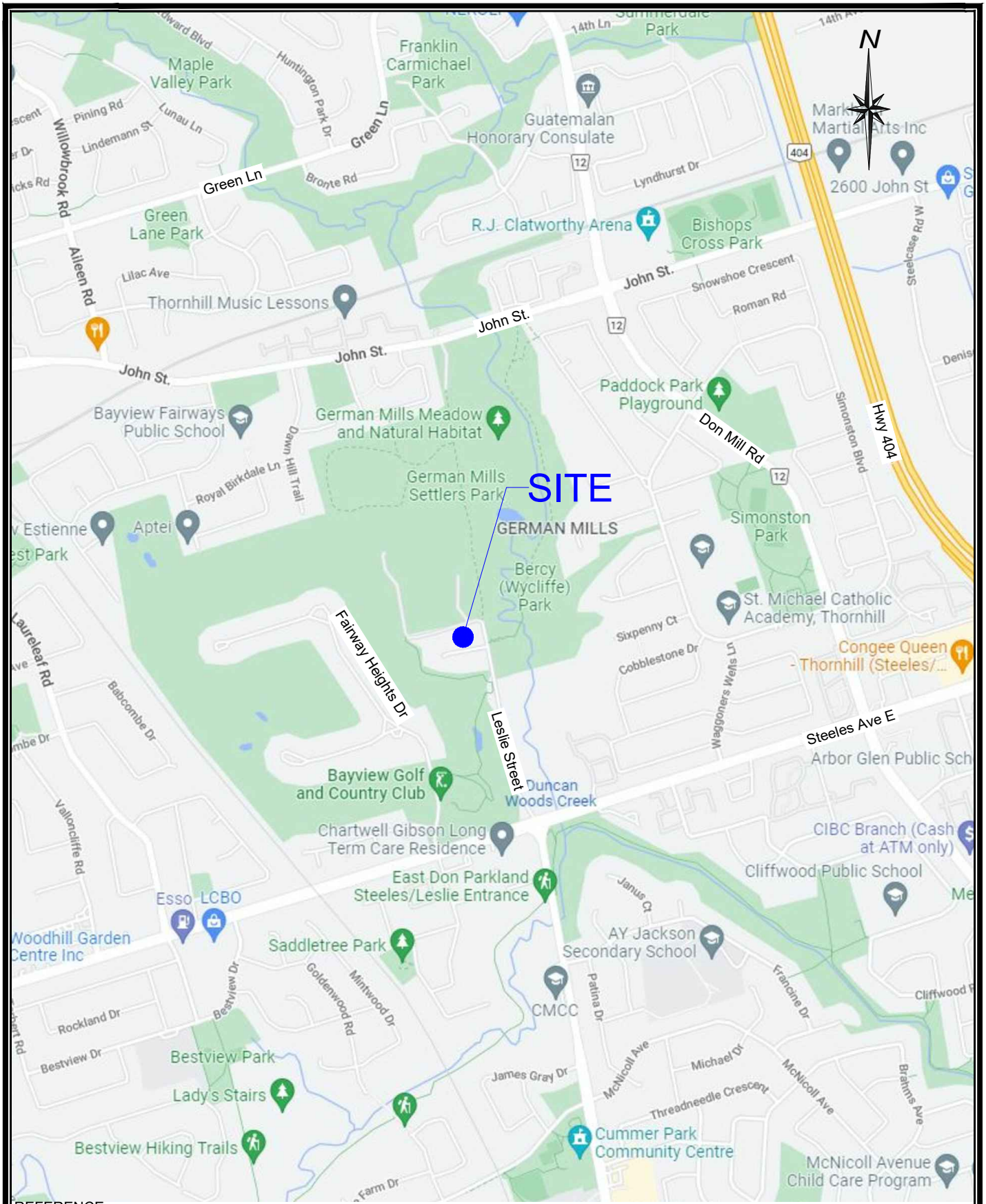
Madan Talukdar, P.Eng.
Associate

Michael Tanos, P.Eng.
Consulting Principal

FIGURES

TERRAPROBE INC.





REFERENCE
Map data ©2022 Google

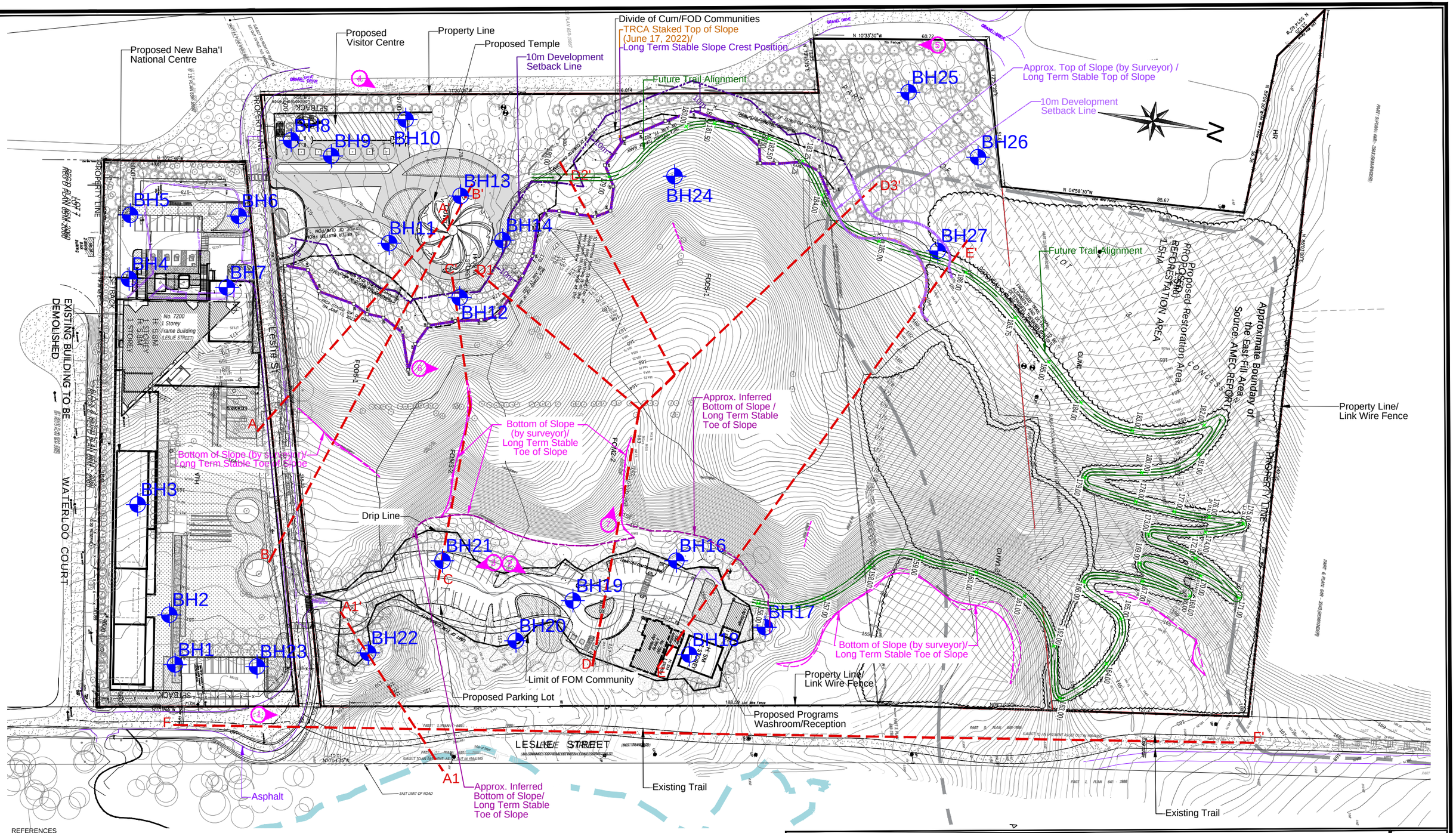
SCALE 80 0 200m

Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title: **SITE LOCATION PLAN**

File. No.: 1-20-0109-01

FIGURE : 1



REFERENCES

1. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham
   Project: 21470, Drawing: 21470-Topo
   Date: September 9, 2022
   By: Erti Surveyors (Ontario Land Surveyors)
2. Site Plan, Proj. No.: 1709
   Date: Jan. 15, 2024
   By: Hariri Potarini Architects

LEGEND

- Approximate Borehole Location
- Photo Location and Direction
- Section Location

SCALE 8 0 20m

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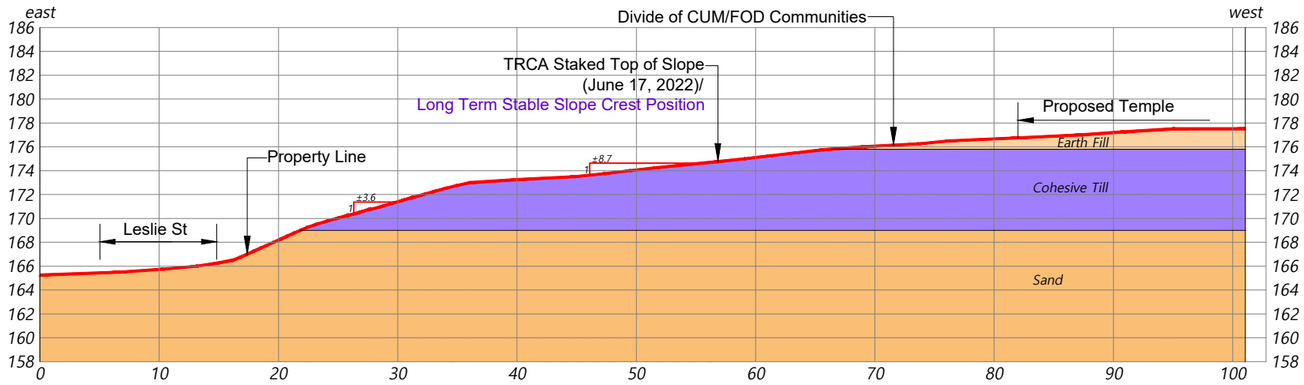
Title: BOREHOLE AND SECTION LOCATION PLAN

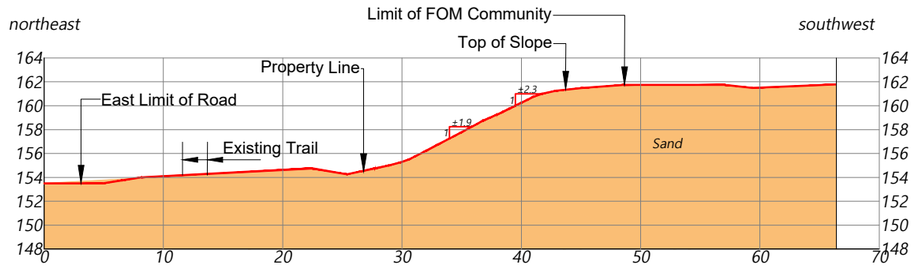
File No. T1200109.006

FIGURE : 2

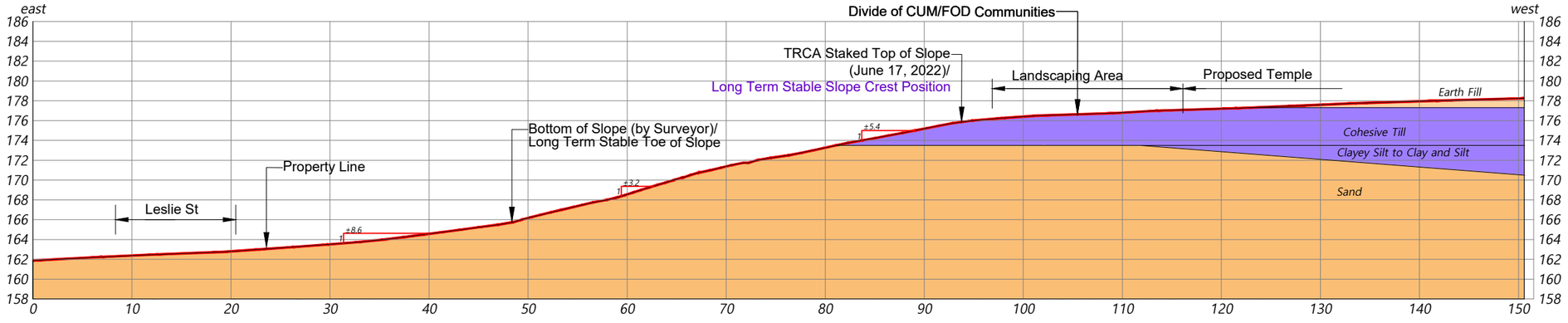
CROSS SECTION A-A'



CROSS SECTION A1-A1'



CROSS SECTION B-B'



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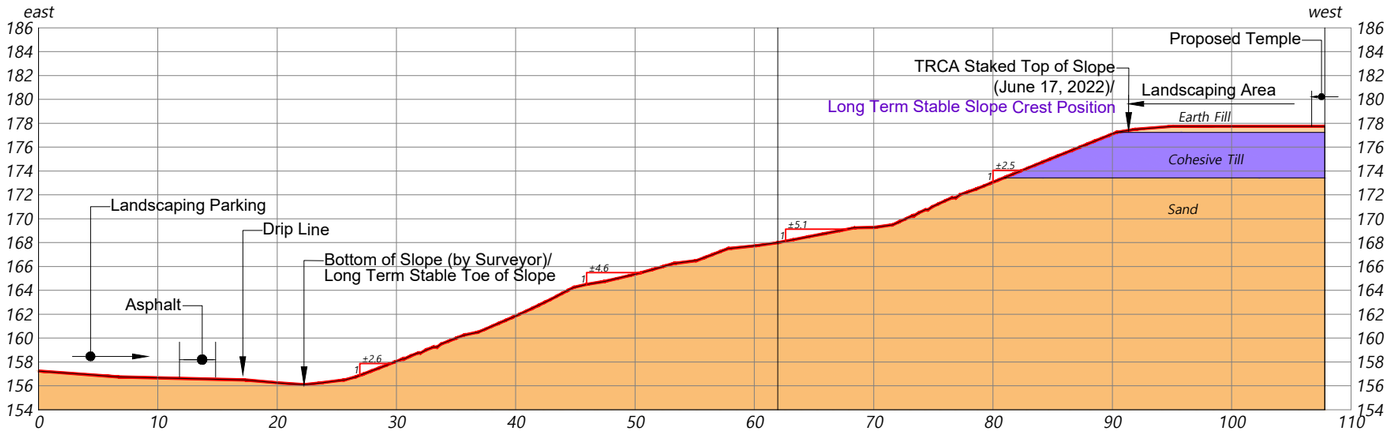
Title: **DETAILED CROSS SECTIONS SECTION A-A', SECTION A1-A1' AND SECTION B-B'**

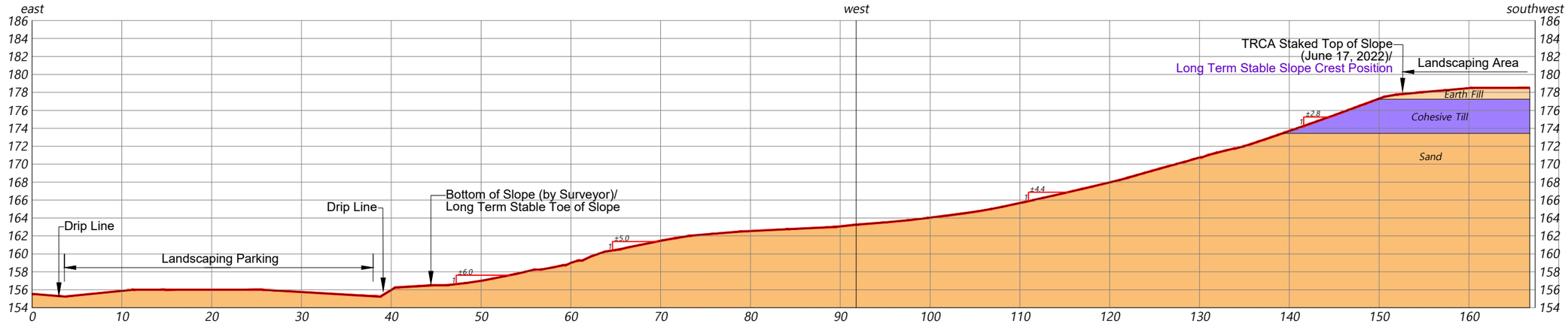
File No. 1-20-0109-01

FIGURE : 3A

CROSS SECTION C-C'



CROSS SECTION D-D1'



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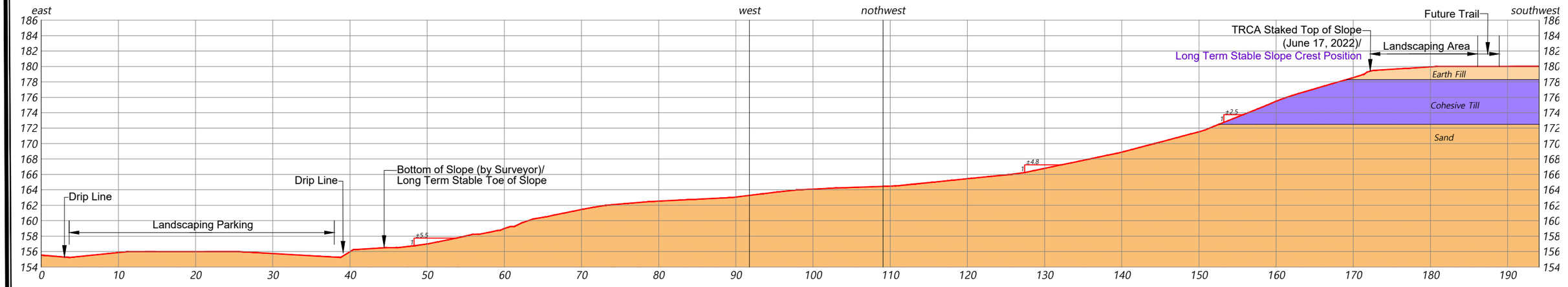
Title: **DETAILED CROSS SECTIONS SECTION C-C' AND SECTION D-D1'**

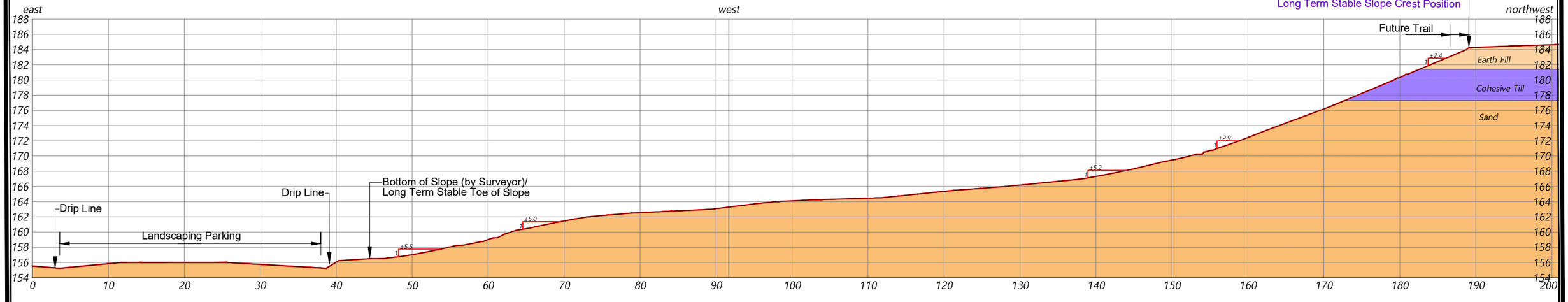
File No. 1-20-0109-01

FIGURE : 3B

CROSS SECTION D-D2'



CROSS SECTION D-D3'



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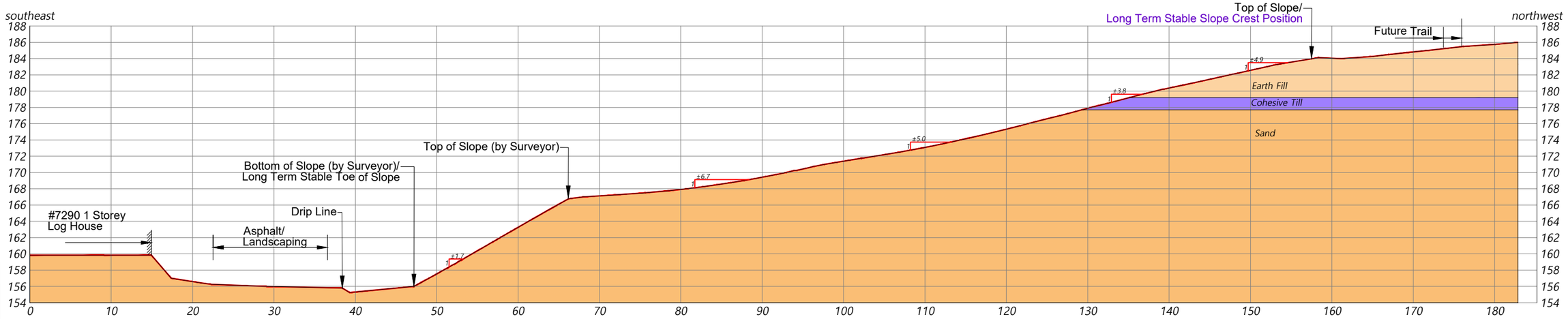
Title:
DETAILED CROSS SECTIONS
SECTION D-D2' AND SECTION D-D3'

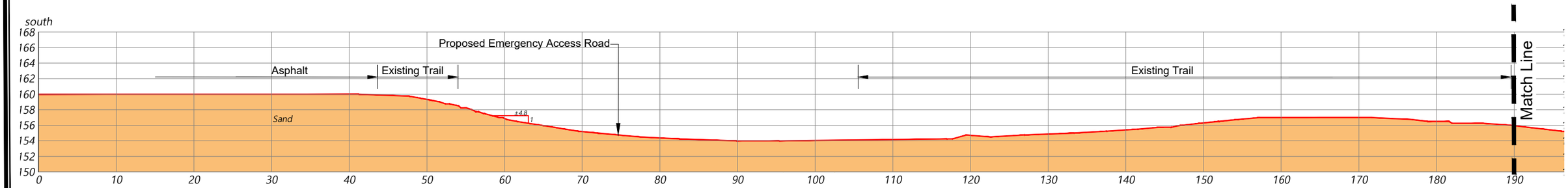
File No.
1-20-0109-01

FIGURE :
3C

CROSS SECTION E-E'



CROSS SECTION F-F'



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SCALE 1:500

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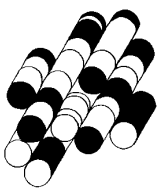
Title: **DETAILED CROSS SECTIONS SECTION E-E' AND SECTION F-F'**

File No. 1-20-0109-01

FIGURE : 3D

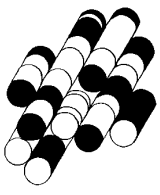
APPENDIX

TERRAPROBE INC.



APPENDIX A

TERRAPROBE INC.



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ABBREVIATIONS AND TERMINOLOGY

SAMPLING METHODS

AS	auger sample
CORE	cored sample
DP	direct push
FV	field vane
GS	grab sample
SS	split spoon
ST	shelby tube
WS	wash sample

PENETRATION RESISTANCE

Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.)."

COHESIONLESS SOILS

Compactness	'N' value
very loose	< 4
loose	4 – 10
compact	10 – 30
dense	30 – 50
very dense	> 50

COHESIVE SOILS

Consistency	'N' value	Undrained Shear Strength (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

COMPOSITION

Term (e.g)	% by weight
trace silt	< 10
some silt	10 – 20
silty	20 – 35
sand *and* silt	> 35

TESTS AND SYMBOLS

MH	mechanical sieve and hydrometer analysis
w, w_c	water content
w_L, LL	liquid limit
w_P, PL	plastic limit
I_P, PI	plasticity index
k	coefficient of permeability
γ	soil unit weight, bulk
G_s	specific gravity
φ'	internal friction angle
c'	effective cohesion
c_u	undrained shear strength

▽	Unstabilized water level
▼	1st water level measurement
▼	2nd water level measurement
▼	Most recent water level measurement
3.0 +	Undrained shear strength from field vane (with sensitivity)
C_c	compression index
c_v	coefficient of consolidation
m_v	coefficient of compressibility
e	void ratio

FIELD MOISTURE DESCRIPTIONS

Damp	refers to a soil sample that does not exhibit any observable pore water from field/hand inspection.
Moist	refers to a soil sample that exhibits evidence of existing pore water (e.g. sample feels cool, cohesive soil is at plastic limit) but does not have visible pore water
Wet	refers to a soil sample that has visible pore water

LOG OF BOREHOLE 1

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 24, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630722, N: 4852427 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	**160.4**	**GROUND SURFACE**										
	160.2	175mm **TOPSOIL**										
	0.2	**FILL**, silty sand, trace gravel, trace clay, very loose, dark brown to brown, moist		1	SS	4	160			PID: 0 FID: 0		
1				2	SS	2	159			PID: 0 FID: 0		
	158.9											
	1.5	**SAND**, trace to some silt, trace clay, compact to dense, brown, moist		3	SS	19				PID: 0 FID: 0		
2				4	SS	22	158			PID: 0 FID: 0		
3				5	SS	38	157			PID: 0 FID: 0		
4							156					
5				6	SS	30				PID: 0 FID: 0		
							155					
6				7	SS	42	154			PID: 0 FID: 0		
	153.8											
	6.6	**END OF BOREHOLE**										

Penetration Test Values (Blows / 0.3m): ×Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit | Natural Water Content | Liquid Limit; PL MC LL; 10 20 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 2

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 8, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630705, N: 4852421 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)
	160.8	**GROUND SURFACE**					
0	160.6	165mm **TOPSOIL**					
	0.2	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, dark brown, moist		1	SS	7	
	160.0						
	0.8	**SAND**, trace to some silt, trace clay, compact to dense, brown, moist		2	SS	14	160
1				3	SS	19	159
2				4	SS	23	
							158
3				5	SS	26	
							157
4							
				6	SS	27	156
5							
							155
6				7	SS	24	
							154
7							
				8	SS	44	153
8	152.7						
	8.1	**END OF BOREHOLE**					

Borehole was dry and open upon completion of drilling.

Penetration Test Values (Blows / 0.3m)
Dynamic Cone: 10 20 30 40
Undrained Shear Strength (kPa)
Unconfined / Pocket Penetrometer / Field Vane / Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm)

PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0
PID: 0	FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

SS1 Analysis:
M&I, PAH, PCB

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR	SA	SI	CL
0	94	5	1

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 3

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: IH
Date started	: June 2, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630670, N: 4852402 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers / mud rotary with casing

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)
	163.7	**GROUND SURFACE**					
0	163.4	320mm **TOPSOIL**		1	SS	6	
	0.3	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, dark brown, moist		2	SS	5	163
1	162.2						
	1.5	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, stiff, brown, moist (GLACIAL TILL)		3	SS	3	162
2	161.4						
	2.3	**SAND**, trace to some silt, trace clay, compact to very dense, brown, moist		4	SS	18	161
3				5	SS	27	
							160
4							
				6	SS	47	159
5							
							158
6				7	SS	46	
							157
7							
				8	SS	89 / 250mm	156
8							
							155
9				9	SS	50 / 125mm	
							154
10							
				10	SS	90 / 250mm	153
11							
		...wet below		11	SS	92 / 250mm	152
12							

Penetration Test Values (Blows / 0.3m) — Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity — Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details — Unstabilized Water Level

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

(continued next page)

LOG OF BOREHOLE 3

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : IH
Date started : June 2, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 2 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630670, N: 4852402 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers / mud rotary with casing

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Unstabilized Water Level	Lab Data and Comments
		(continued)											
13		**SAND**, trace to some silt, trace clay, compact to very dense, brown, moist *(continued)*					151						
14	149.5			12	SS	84	150			PID: 0 FID: 0			
	14.2												

Penetration Test Values (Blows / 0.3m): ×Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit — Natural Water Content — Liquid Limit; PL MC LL; 10 20 30

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	11.5	152.2

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 4

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : June 2, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630593, N: 4852382 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers / mud rotary with casing

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	172.3	**GROUND SURFACE**					172			PID: 0 FID: 0		
		100mm **TOPSOIL**		1	SS	14						SS1 Analysis: M&I, PAH, PCB
	171.5	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, stiff, brown, moist										
1	0.8	**FILL**, silty sand, trace gravel, trace clay, loose, dark brown to brown, moist		2	SS	10	171			PID: 0 FID: 0		
	170.8											
	1.5	**SAND**, trace to some silt, trace clay, compact, brown, moist		3	SS	12				PID: 0 FID: 0		
2	170.0						170					
	2.3	**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		4	SS	23				PID: 0 FID: 0		
3				5	SS	54	169			PID: 0 FID: 0		SS5 Analysis: .pH
4							168					
5				6	SS	81				PID: 0 FID: 0		1 25 48 26
6							167					
				7	SS	47	166			PID: 0 FID: 0		
7												
				8	SS	76 / 275mm	165			PID: 0 FID: 0		
8							164					
9		...grey below		9	SS	80	163			PID: 0 FID: 0		SS9 Analysis: BTEX, VOC, PHC
10				10	SS	50 / 150mm	162			PID: 0 FID: 0		
11				11	SS	50 / 125mm	161					
12							160			PID: 0 FID: 0		

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Unstabilized Water Level

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

(continued next page)

LOG OF BOREHOLE 4

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : June 2, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 2 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630593, N: 4852382 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers / mud rotary with casing

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
		(continued)										
13		**CLAYEY SILT**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL) *(continued)*										
	158.6						159					
14	13.7	**CLAYEY SILT**, trace to some sand, trace gravel, varved, hard, grey, moist		12	SS	78 / 275mm				PID: 0 FID: 0		
							158					
15				13	SS	50 / 150mm	157			PID: 0 FID: 0		
16							156					
17	155.2			14	SS	50/ 125mm				PID: 0 FID: 0		
	17.1											

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	6.6	165.7

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 5

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : SM/DH
Date started : May 25, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630571, N: 4852378 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Hollow stem augers / mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL MC LL)	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	172.8	**GROUND SURFACE**										
	172.6	175mm **TOPSOIL**										
	0.2	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, soft to firm, dark brown to brown, moist to wet		1	SS	4				PID: 0 FID: 0		
1				2	SS	5	172			PID: 0 FID: 0		
	171.3											
	1.5	**SANDY SILT to SILT AND SAND**, trace to some clay, trace gravel, compact, brown, moist (GLACIAL TILL)		3	SS	24	171			PID: 0 FID: 0		
2	170.5											
	2.3	**SAND**, trace to some silt, trace clay, trace gravel, dense to very dense, brown, moist		4	SS	47				PID: 0 FID: 0		
3				5	SS	54	170			PID: 0 FID: 0		
	168.2											
	4.6	**SANDY SILT to SILT AND SAND**, trace to some clay, trace gravel, very dense, brown, moist (GLACIAL TILL)		6	SS	73 / 250mm	169					
4												
5							168			PID: 0 FID: 0		
6				7	SS	50 / 150mm	167			PID: 0 FID: 0		
7				8	SS	50 / 75mm	166			PID: 0 FID: 0		1 40 42 17
	163.7											
8	9.1	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, hard, grey, moist (GLACIAL TILL)		9	SS	50 / 150mm	165			PID: 0 FID: 0		
9							164					
10				10	SS	62	163			PID: 0 FID: 0		
11							162					
12				11	SS	50 / 150mm	161			PID: 0 FID: 0		

Penetration Test Values (Blows / 0.3m): × Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit | Natural Water Content | Liquid Limit; PL MC LL; 10 20 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

(continued next page)

LOG OF BOREHOLE 5

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : SM/DH
Date started : May 25, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 2 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630571, N: 4852378 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Hollow stem augers / mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Unstabilized Water Level	Lab Data and Comments
		(continued)						Dynamic Cone 10 20 30 40; Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160	Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL 10 20 30				GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
13		**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, hard, grey, moist (GLACIAL TILL) *(continued)*					160						
14				12	SS	83	159			PID: 0 FID: 0			
15							158						
16				13	SS	64	157			PID: 0 FID: 0			
17	155.6 17.2			14	SS	58	156			PID: 0 FID: 0			

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 6

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 26, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630563, N: 4852415 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)
0	172.6	**GROUND SURFACE**					
	172.4	75mm **ASPHALTIC CONCRETE**					
	0.2	115mm **AGGREGATE**		1	SS	16	172
		CLAYEY SILT to SILT AND CLAY, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	39	
1							
				3	SS	32	171
2		...grey below					
				4	SS	31	170
3							
				5	SS	30	169
4							
	168.0						168
	4.6	**CLAYEY SILT to CLAY AND SILT**, trace to some sand, varved, hard, grey, moist		6	SS	32	
5							
				7	SS	31	167
6							
	165.0						166
	7.6	**SAND**, trace to some silt, trace clay, very dense, greyish brown, wet		8	SS	85 / 250mm	
7							
				9	SS	30	165
8							
							164
9							
							163
10							
		...trace gravel		10	SS	50 / 125mm	162
11							
							161
12				11	SS	50 / 100mm	

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SS1 Analysis: M&I, PAH, PCB

(continued next page)

LOG OF BOREHOLE 6

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 26, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 2 of 2	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630563, N: 4852415 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Unstabilized Water Level	Lab Data and Comments / GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
		(continued)											
13		**SAND**, trace to some silt, trace clay, very dense, greyish brown, wet *(continued)*					160						
				12	SS	50 / 150mm	159			PID: 0 FID: 0			
14													
							158						
15				13	SS	50 / 125mm				PID: 0 FID: 0			
							157						
16													
							156						
17	155.5 17.1			14	SS	50 / 150mm				PID: 0 FID: 0			

Penetration Test Values (Blows / 0.3m): ×Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ✚ Field Vane ● Pocket Penetrometer ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit | Natural Water Content | Liquid Limit; PL MC LL; 10 20 30

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 7

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 27, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630589, N: 4852417 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	172.0	**GROUND SURFACE**					172					
	171.8	75mm **ASPHALTIC CONCRETE**										
	0.2	90mm **AGGREGATE**		1	SS	12				PID: 0 FID: 0		
1		**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm to stiff, brown, moist		2	SS	6	171			PID: 0 FID: 0		
	170.5											
	1.5	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, brown, moist (GLACIAL TILL)		3	SS	23				PID: 0 FID: 0		
2				4	SS	50	170			PID: 0 FID: 0		
3				5	SS	35	169			PID: 0 FID: 0		
4							168					
		...grey below		6	SS	32				PID: 0 FID: 0		
5							167					
6	165.9						166					
	6.1	**CLAYEY SILT to CLAY AND SILT**, trace to some sand, trace gravel, hard, grey, moist		7	SS	36				PID: 0 FID: 0		
7							165					
				8	SS	61				PID: 0 FID: 0		
8							164					
9	162.9						163					
	9.1	**SAND**, trace to some silt, trace clay, very dense, grey, moist		9	SS	50 / 100mm				PID: 0 FID: 0		
10	161.3						162					
	10.7	**CLAYEY SILT to CLAY AND SILT**, trace to some sand, trace gravel, hard, grey, moist		10	SS	50/ 150mm				PID: 0 FID: 0		
11							161					
12				11	SS	50 / 150mm	160			PID: 0 FID: 0		

(continued next page)

LOG OF BOREHOLE 7

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 27, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 2 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630589, N: 4852417 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Unstabilized Water Level	Lab Data and Comments / GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL
		(continued)											
13		**CLAYEY SILT to CLAY AND SILT**, trace to some sand, trace gravel, hard, grey, moist *(continued)*					159						
	158.3 13.7												
14		**SAND**, trace to some silt, trace clay, very dense, grey, wet		12	SS	50 / 125mm	158			PID: 0 FID: 0			
15				13	SS	50 / 125mm	157			PID: 0 FID: 0			
16							156						
	155.0 17.0			14	SS	50 / 75mm				PID: 0 FID: 0			

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

LOG OF BOREHOLE 8

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: May 31, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630533, N: 4852428 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	175.8	**GROUND SURFACE**				
	175.6 / 0.2	150mm **TOPSOIL**				
		FILL, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, dark brown to brown, moist		1	SS	7
1				2	SS	8
	174.3 / 1.5	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		3	SS	12
2				4	SS	21
3				5	SS	69
4						
5				6	SS	48
6				7	SS	30
7	168.2 / 7.6					
		SAND, trace to some silt, trace clay, very dense, brown, moist		8	SS	97
8	167.7 / 8.1					

Penetration Test Values (Blows / 0.3m) — Dynamic Cone; Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane

Moisture / Plasticity — Plastic Limit (PL), Natural Water Content (MC), Liquid Limit (LL)

Headspace Vapour (ppm): PID: 0 / FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SS1 Analysis: Pest.

END OF BOREHOLE

Unstabilized water level measured at 6.1 m below ground surface; borehole was open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	2.9	172.9

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 9

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: May 30, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630536, N: 4852443 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	176.0	**GROUND SURFACE**				
	175.8	150mm **TOPSOIL**				
	0.2	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, dark brown, moist		1	SS	5
	175.2					
	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	8
1						
				3	SS	20
2						
				4	SS	60
3		...grey below				
				5	SS	49
4						
		...sand lens, brown, wet		6	SS	47
5						
6	169.9					
	6.1			7	SS	50 / 100mm
	169.7	**SAND**, trace to some silt, trace clay, very dense, brown, moist				
	6.3	.				
7						
				8	SS	60
8	167.9					
	8.1					

END OF BOREHOLE

Unstabilized water level measured at 5.8 m below ground surface; borehole caved to 6.1 m below ground surface upon completion of drilling.

Elevation Scale (m): 175, 174, 173, 172, 171, 170, 169, 168

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

SS1 Analysis: Pest.

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

1 15 48 36

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 10

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: May 31, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630518, N: 4852465 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)
	177.1	**GROUND SURFACE**					
0	176.9 / 0.2	150mm **TOPSOIL**					177
		FILL, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, brown, moist		1	SS	6	
1				2	SS	6	176
	175.6 / 1.5	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		3	SS	23	
2				4	SS	41	175
3				5	SS	46	174
4		...grey below		6	SS	31	173
5							172
6				7	SS	47	171
7							170
8	169.0 / 8.1			8	SS	69	

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SS1 Analysis: Metals, Pest.

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 11

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: June 1, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630561, N: 4852469 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	176.6	**GROUND SURFACE**				
	176.4	200mm **TOPSOIL**				
	0.2	**FILL**, silty sand, trace gravel, trace clay, very loose, dark brown to brown, moist		1	SS	5
	175.8					
1	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	13
2				3	SS	31
3				4	SS	41
4				5	SS	34
5				6	SS	45
6				7	SS	31
7	169.0					
	7.6	**SAND**, trace to some silt, trace clay, very dense, greyish brown, moist to wet		8	SS	50 / 100mm
8						
9				9	SS	50 / 100mm
10				10	SS	50 / 100mm
11						
12				11	SS	50 / 100mm

Elevation Scale (m): 176, 175, 174, 173, 172, 171, 170, 169, 168, 167, 166, 165

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10 20 30 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40 80 120 160

Moisture / Plasticity — Plastic Limit, Natural Water Content, Liquid Limit: PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

SS1 Analysis: Pest.

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

0 85 13 2

(continued next page)

LOG OF BOREHOLE 11

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: June 1, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 2 of 2	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630561, N: 4852469 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Mud rotary

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
		(continued)										
13		**SAND**, trace to some silt, trace clay, very dense, greyish brown, moist to wet *(continued)*					164					
14				12	SS	50 / 75mm	163			PID: 0 FID: 0		
15	161.2						162					
	15.4			13	SS	50 / 150mm				PID: 0 FID: 0		

Penetration Test Values (Blows / 0.3m): ×Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit PL | Natural Water Content MC | Liquid Limit LL; 10 20 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Unstabilized water level and cave could not be measured due to the use of mud rotary drill technique.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	dry	n/a

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 12

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 1, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630575, N: 4852497 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
	178.0	**GROUND SURFACE**										
0	177.8	200mm **TOPSOIL**										
	0.2	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, trace wood pieces, firm, dark brown, moist		1	SS	7				PID: 0 FID: 0		SS1 Analysis: Pest.
	177.2											
1	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	20	177			PID: 0 FID: 0		
				3	SS	25				PID: 0 FID: 0		
2				4	SS	40	176			PID: 0 FID: 0		SS4 Analysis: .pH
3				5	SS	72	175			PID: 0 FID: 0		
4	173.4						174					
	4.6	**SAND**, trace to some silt, trace clay, very dense, brown, damp to moist		6	SS	60				PID: 0 FID: 0		
5							173					
6				7	SS	70	172			PID: 0 FID: 0		
7							171					
8				8	SS	85	170			PID: 0 FID: 0		
9							169					
	168.6			9	SS	50 / 150mm				PID: 0 FID: 0		
	9.4	**END OF BOREHOLE**										

Penetration Test Values (Blows / 0.3m): Dynamic Cone — 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL), Natural Water Content (MC), Liquid Limit (LL) — 10 20 30

Unstabilized Water Level

Lab Data and Comments — GRAIN SIZE DISTRIBUTION (%) (MIT) — GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 13

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: SM
Date started	: May 31, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630540, N: 4852490 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	178.1	**GROUND SURFACE**				
	177.9	150mm **TOPSOIL**				
	0.2	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm, dark brown, moist		1	SS	7
	177.3					
1	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	36
				3	SS	15
2				4	SS	42
3				5	SS	32
4	173.5					
	4.6	**CLAYEY SILT to CLAY AND SILT**, trace to some sand, trace gravel, very stiff, grey, moist		6	SS	28
5						
6				7	SS	15
7	170.5					
	7.6	**SAND**, trace to some silt, trace clay, very dense, brown, moist		8	SS	50 / 150mm
8						
9	168.8	...damp		9	SS	50 / 150mm
	9.3					

END OF BOREHOLE

Unstabilized water level measured at 6.1 m below ground surface; borehole caved to 7.0 m below ground surface upon completion of drilling.

Elevation Scale (m): 178, 177, 176, 175, 174, 173, 172, 171, 170, 169

Penetration Test Values (Blows / 0.3m)
× Dynamic Cone
10 20 30 40
Undrained Shear Strength (kPa)
○ Unconfined + Field Vane
● Pocket Penetrometer ■ Lab Vane
40 80 120 160

Moisture / Plasticity
Plastic Limit | Natural Water Content | Liquid Limit
PL MC LL
10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

SS1 Analysis: Metals, Pest.

GRAIN SIZE DISTRIBUTION (%) (MIT)
GR SA SI CL
0 1 39 60

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 14

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: HR
Date started	: June 2, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630552, N: 4852508 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
	179.1	**GROUND SURFACE**				
0	178.8 / 0.3	280mm **TOPSOIL**		1	SS	6
	178.3 / 0.8	(WEATHERED/DISTURBED)				
1		**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	19
				3	SS	30
2				4	SS	43
3				5	SS	46
4						
5				6	SS	87 / 250mm
6	173.0 / 6.1	**SAND**, trace to some silt, trace clay, very dense, brown, moist		7	SS	39
	172.5 / 6.6	.				
7	171.5 / 7.6	**SAND**, trace to some silt, trace clay, very dense, brown, damp to moist		8	SS	81 / 250mm
8						
9				9	SS	85 / 250mm
	169.6 / 9.5					

Elevation Scale (m): 179, 178, 177, 176, 175, 174, 173, 172, 171, 170

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) 10, Natural Water Content (MC) 20, Liquid Limit (LL) 30

Headspace Vapour (ppm): PID: 0 / FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SS1 Analysis: Pest.

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	dry	n/a

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 16

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 25, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630649, N: 4852591 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	156.5	**GROUND SURFACE**				
		140mm **TOPSOIL**		1	SS	5
	155.7 (0.8)	**FILL**, sandy silt, trace clay, trace rootlets, trace organics, loose to compact, dark brown, moist				
1		**FILL**, silty sand, trace gravel, trace clay, compact, dark brown, moist		2	SS	11
	155.0 (1.5)	**SAND**, trace to some silt, trace clay, compact to very dense, brown, moist to wet ...loose		3	SS	6
2				4	SS	14
3				5	SS	23
4						
5				6	SS	59
6	150.3 (6.2)			7	SS	50 / 125mm

END OF BOREHOLE

Unstabilized water level measured at 4.6 m below ground surface; borehole caved to 5.2 m below ground surface upon completion of drilling.

Elevation Scale (m): 156, 155, 154, 153, 152, 151

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 17

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 25, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630665, N: 4852626 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
	155.4	**GROUND SURFACE**				
0	155.2	150mm **TOPSOIL**				
	0.2	**FILL**, silty sand, trace gravel, trace clay, loose, dark brown, moist		1	SS	5
1				2	SS	8
	153.9					
	1.5	**SAND**, trace to some silt, trace clay, compact, brown, moist		3	SS	13
2						
		...wet below		4	SS	25
3				5	SS	21
4						
				6	SS	24
5						
				7	SS	26
6	148.8					
	6.6	**END OF BOREHOLE**				

Elevation Scale (m): 155, 154, 153, 152, 151, 150, 149

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm)

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Unstabilized water level measured at 3.0 m below ground surface; borehole caved to 4.9 m below ground surface upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 18

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: May 24, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630680, N: 4852602 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	157.1	**GROUND SURFACE**				
	156.8	250mm **TOPSOIL**				
	0.3	**FILL**, silty sand, trace gravel, trace clay, very loose to loose, dark brown to brown, moist		1	SS	5
1				2	SS	4
2				3	SS	2
	154.8					
	2.3	**SAND**, trace to some silt, trace clay, compact to very dense, brown, moist		4	SS	28
3				5	SS	36
4		...wet below		6	SS	37
5						
6				7	SS	77
7				8	SS	50 / 125mm
8						
9	147.9			9	SS	50 / 100mm
	9.2	**END OF BOREHOLE**				

Elevation Scale (m): 157, 156, 155, 154, 153, 152, 151, 150, 149, 148

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40 80 120 160

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) — 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details: Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

SS2 Analysis: M&I, PAH, PCB

SS4 Analysis: .pH

SS6 Analysis: BTEX, VOC, PHC

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	4.8	152.3

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 19

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 24, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 1	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630671, N: 4852559 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	155.4	**GROUND SURFACE**				
	155.2 / 0.2	150mm **TOPSOIL**				
		(WEATHERED/DISTURBED)		1	SS	3
	154.6 / 0.8	**SAND**, trace to some silt, trace clay, compact, brown, moist		2	SS	14
1				3	SS	20
	153.4 / 2.0	**END OF BOREHOLE**				

Elevation Scale (m): 155, 154

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 20

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 24, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 1	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630688, N: 4852542 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Unstabilized Water Level	Lab Data and Comments
0	**157.2**	**GROUND SURFACE**											
	157.0	175mm **TOPSOIL**											
	0.2	**FILL**, silty sand, some gravel to gravelly, loose, brown, moist		1	SS	4	157			PID: 0 FID: 0			
	156.4												
1	0.8	**SAND**, trace to some silt, trace clay, compact, brown, moist		2	SS	21	156			PID: 0 FID: 0			
				3	SS	20				PID: 0 FID: 0			
	155.2												
	2.0	**END OF BOREHOLE**											

Penetration Test Values (Blows / 0.3m): × Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): ○ Unconfined ● Pocket Penetrometer + Field Vane ■ Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit | Natural Water Content | Liquid Limit; PL MC LL; 10 20 30

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 21

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 24, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 1	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630667, N: 4852511 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value
0	157.7	**GROUND SURFACE**				
	157.5	165mm **TOPSOIL**				
	0.2	**FILL**, silty sand, trace gravel, trace clay, loose to compact, dark brown to brown, moist		1	SS	12
	156.9					
1	0.8	**SAND**, trace to some silt, trace clay, trace to some gravel, loose to compact, brown, moist		2	SS	6
				3	SS	28
	155.7					
	2.0	**END OF BOREHOLE**				

Borehole was dry and open upon completion of drilling.

Elevation Scale (m): 157, 156

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Headspace Vapour (ppm): PID: 0 FID: 0 / PID: 0 FID: 0 / PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT)

GR SA SI CL

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 22

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 25, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 1	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630704, N: 4852492 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	162.1	**GROUND SURFACE**					162	Dynamic Cone: 10 20 30 40; Unconfined / Pocket Penetrometer / Field Vane / Lab Vane: 40 80 120 160	Plastic Limit / Natural Water Content / Liquid Limit: PL MC LL; 10 20 30			
	161.9 0.2	175mm **TOPSOIL**										
		(WEATHERED/DISTURBED)		1	SS	5				PID: 0 FID: 0		
	161.3 0.8	**SAND**, trace to some silt, trace clay, compact to dense, brown, moist		2	SS	20	161			PID: 0 FID: 0		SS2 Analysis: M&I, PAH, PCB
1				3	SS	42				PID: 0 FID: 0		
	160.1 2.0	**END OF BOREHOLE**										

Borehole was dry and open upon completion of drilling.

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 23

Terraprobe

Project No. : 1-20-0109-01	Client : National Spiritual Assembly of the Baha'i of Canada	Originated by : DH
Date started : May 25, 2022	Project : 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by : HR
Sheet No. : 1 of 1	Location : Thornhill, Ontario	Checked by : MMT

Position : E: 630717, N: 4852455 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Sample Number	Sample Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity (PL, MC, LL)	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	**160.4**	**GROUND SURFACE**										
	160.2	165mm **TOPSOIL**										
	0.2	**FILL**, silty sand, trace gravel, trace to some clay, loose, brown, moist		1	SS	5	160					
1				2	SS	4						
	158.6			3	SS	7	159					
	158.4	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, firm, brown, moist (GLACIAL TILL)										
	2.0	**END OF BOREHOLE**										

Penetration Test Values (Blows / 0.3m): Dynamic Cone — 10, 20, 30, 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane — 40, 80, 120, 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit — PL, MC, LL — 10, 20, 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) — GR SA SI CL

Borehole was dry and open upon completion of drilling.

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 24

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 8, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630517, N: 4852562 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	177.1	**GROUND SURFACE**				
0		140mm **TOPSOIL**		1	SS	6
		(WEATHERED/DISTURBED)				
	176.3					
	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		2	SS	15
1						
				3	SS	26
2						
				4	SS	46
		...grey below				
3				5	SS	27
4						
				6	SS	41
5						
		...brown		7	SS	71
6						
	170.5					
	6.6					

Elevation Scale (m): 177, 176, 175, 174, 173, 172, 171

Penetration Test Values (Blows / 0.3m) — Dynamic Cone: 10, 20, 30, 40

Undrained Shear Strength (kPa) — Unconfined, Pocket Penetrometer, Field Vane, Lab Vane: 40, 80, 120, 160

Moisture / Plasticity — Plastic Limit, Natural Water Content, Liquid Limit: PL, MC, LL; 10, 20, 30

Headspace Vapour (ppm): PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	dry	n/a

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 25

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 6, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630471, N: 4852636 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value	Elevation Scale (m)	Penetration Test Values (Blows / 0.3m) / Undrained Shear Strength (kPa)	Moisture / Plasticity	Headspace Vapour (ppm)	Instrument Details	Lab Data and Comments
0	186.7	**GROUND SURFACE**					186			PID: 0 FID: 0		
		90mm **TOPSOIL**		1	SS	11						SS1 Analysis: M&I, PAH, PCB
	185.9	**FILL**, silty sand, trace gravel, trace clay, compact, dark brown, moist										
1	0.8	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, stiff to hard, brown, moist (GLACIAL TILL)		2	SS	17	185			PID: 0 FID: 0		
2				3	SS	14				PID: 0 FID: 0		SS3 Analysis: M&I, PAH, PCB
3				4	SS	40	184			PID: 0 FID: 0		
4				5	SS	36	183			PID: 0 FID: 0		
5				6	SS	87	182			PID: 0 FID: 0		SS6 Analysis: BTEX, VOC, PHC
6		...grey below		7	SS	76 / 275mm	181			PID: 0 FID: 0		
7							180					
8				8	SS	50 / 100mm	179			PID: 0 FID: 0		SS8 Analysis: BTEX, VOC, PHC, pH
9	177.4 9.3			9	SS	50 / 125mm	178			PID: 0 FID: 0		

Penetration Test Values (Blows / 0.3m): Dynamic Cone; 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane; 40 80 120 160

Moisture / Plasticity: Plastic Limit, Natural Water Content, Liquid Limit; PL MC LL; 10 20 30

Unstabilized Water Level

Lab Data and Comments: GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

END OF BOREHOLE

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	8.4	178.3

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 26

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 6, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630488, N: 4852665 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
	186.7	**GROUND SURFACE**				
		25mm **TOPSOIL**		1	SS	13
	185.9	**FILL**, silty sand, trace gravel, trace clay, compact, brown, moist				
	0.8	**FILL**, clayey silt, some sand, trace gravel, trace rootlets, trace organics, stiff, brown, moist		2	SS	9
	185.2					
	1.5	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff to hard, brown, moist (GLACIAL TILL)		3	SS	15
				4	SS	26
				5	SS	32
				6	SS	46
		...grey below		7	SS	26
				8	SS	40
				9	SS	50 / 150mm
	177.3					
	9.4	**END OF BOREHOLE**				

Penetration Test Values (Blows / 0.3m): Dynamic Cone (10, 20, 30, 40)

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane (40, 80, 120, 160)

Moisture / Plasticity: Plastic Limit (PL), Natural Water Content (MC), Liquid Limit (LL) (10, 20, 30)

Headspace Vapour (ppm): PID: 0 / FID: 0

Instrument Details

Lab Data and Comments

SS1 Analysis: M&I, PAH, PCB

SS3 Analysis: M&I, PAH, PCB

SS6 Analysis: BTEX, VOC, PHC

SS8 Analysis: BTEX, VOC, PHC

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

WATER LEVEL READINGS

Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	5.6	181.1

file: 1-20-0109-01 bh logs.gpj

LOG OF BOREHOLE 27

Terraprobe

Project No.	: 1-20-0109-01	Client	: National Spiritual Assembly of the Baha'i of Canada	Originated by	: DH
Date started	: June 6, 2022	Project	: 7200 & 7290 Leslie Street, Baha'i National Centre	Compiled by	: HR
Sheet No.	: 1 of 1	Location	: Thornhill, Ontario	Checked by	: MMT

Position : E: 630523, N: 4852658 (UTM 17T) Elevation Datum : Geodetic

Rig type : Track-mounted Drilling Method : Solid stem augers

Depth Scale (m)	Elev Depth (m)	Description	Graphic Log	Number	Type	SPT 'N' Value
0	185.3	**GROUND SURFACE**				
		75mm **TOPSOIL**		1	SS	20
		FILL, clayey silt, some sand, trace gravel, trace rootlets, trace organics, firm to very stiff, dark brown to brown, moist		2	SS	11
				3	SS	7
				4	SS	10
				5	SS	6
				6	SS	13
6	179.2					
	6.1	**CLAYEY SILT to SILT AND CLAY**, some sand to sandy, trace gravel, very stiff, brown, moist (GLACIAL TILL)		7	SS	18
	177.7					
	7.6	**SAND**, trace to some silt, trace clay, dense to very dense, brown, moist		8	SS	44
	175.9			9	SS	50 / 125mm
	9.4	**END OF BOREHOLE**				

Penetration Test Values (Blows / 0.3m): Dynamic Cone 10 20 30 40

Undrained Shear Strength (kPa): Unconfined, Pocket Penetrometer, Field Vane, Lab Vane 40 80 120 160

Elevation Scale (m): 185 184 183 182 181 180 179 178 177 176

Moisture / Plasticity: Plastic Limit (PL) Natural Water Content (MC) Liquid Limit (LL) 10 20 30

Headspace Vapour (ppm):
- PID: 0 FID: 0
- PID: 0 FID: 0
- PID: 0 FID: 0
- PID: 0 FID: 0
- PID: 10 FID: 0
- PID: 0 FID: 0
- PID: 0 FID: 0
- PID: 0 FID: 0

Instrument Details

Unstabilized Water Level

Lab Data and Comments

GRAIN SIZE DISTRIBUTION (%) (MIT) GR SA SI CL

- SS1 Analysis: M&I, PAH, PCB
- SS2 Analysis: M&I, PAH, PCB
- SS5 Analysis: BTEX, VOC, PHC
- SS8 Analysis: BTEX, VOC, PHC

Borehole was dry and open upon completion of drilling.

50 mm dia. monitoring well installed.

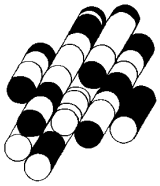
WATER LEVEL READINGS

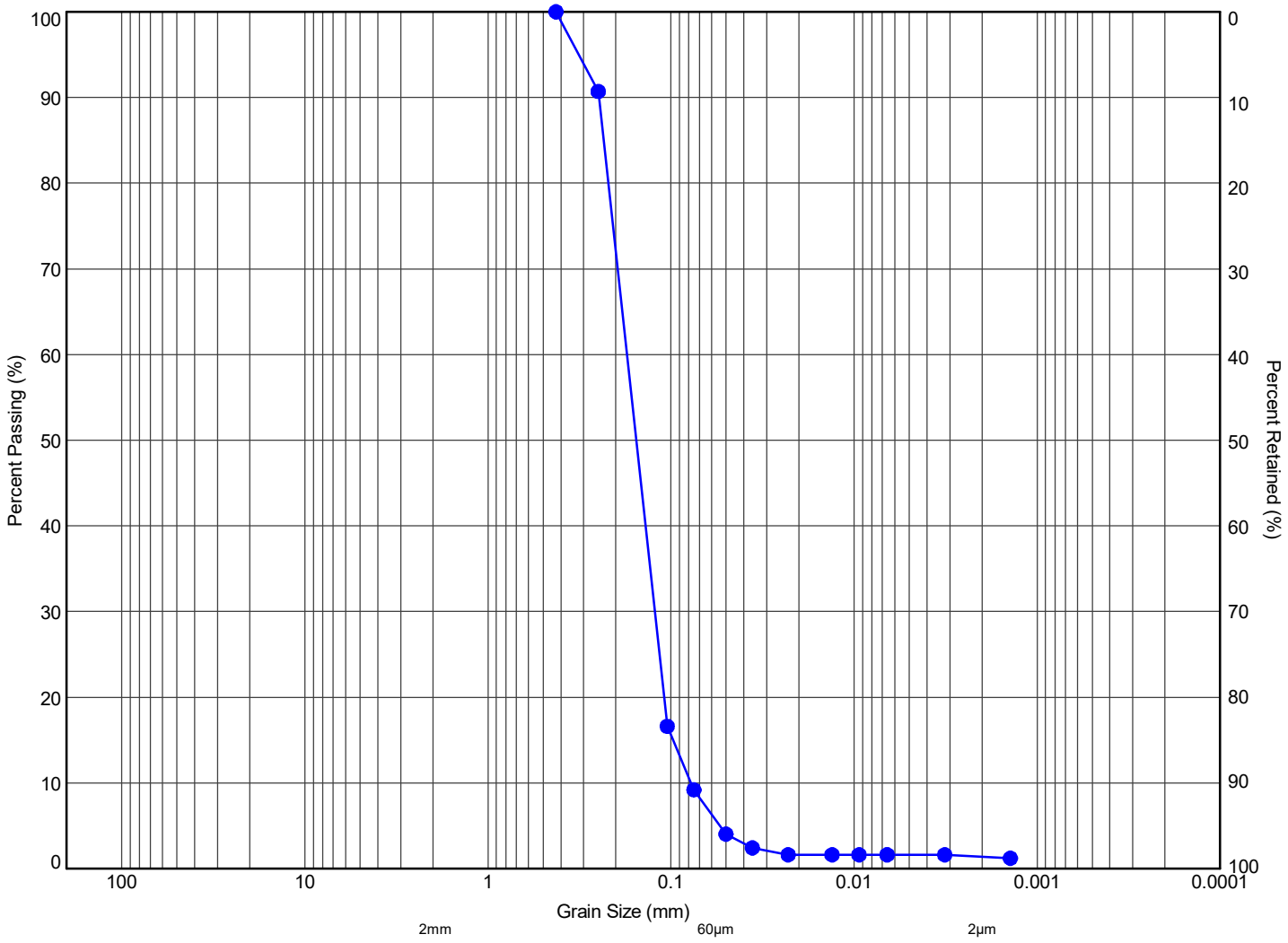
Date	Water Depth (m)	Elevation (m)
Jun 23, 2022	dry	n/a

file: 1-20-0109-01 bh logs.gpj

APPENDIX B

TERRAPROBE INC.





MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

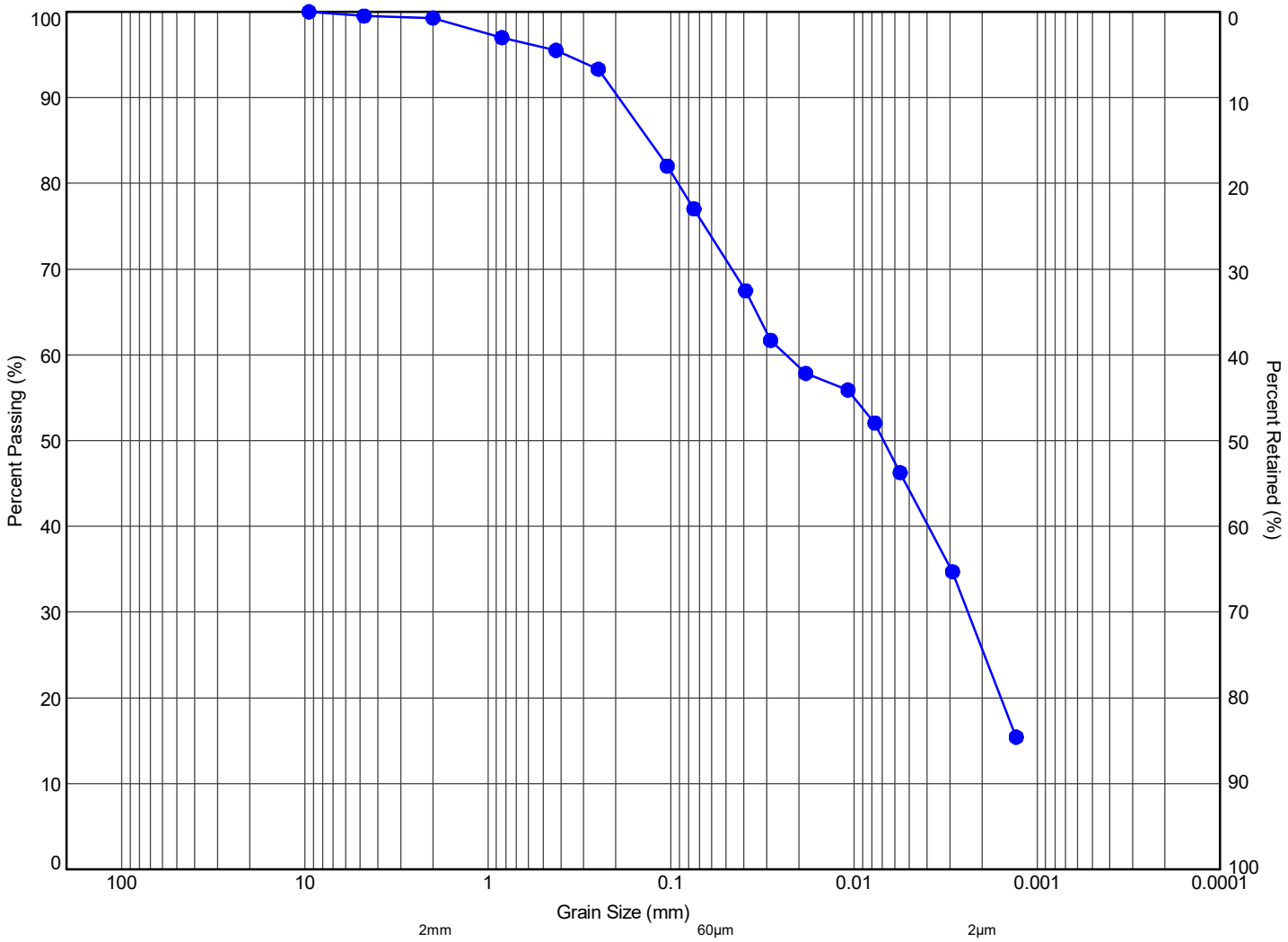
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**2**	SS3	1.8	159.0	0	94	5	1	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SAND, TRACE SILT, TRACE CLAY

File No.: **1-20-0109-01**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**4**	SS6	4.8	167.5	1	25	48	26	

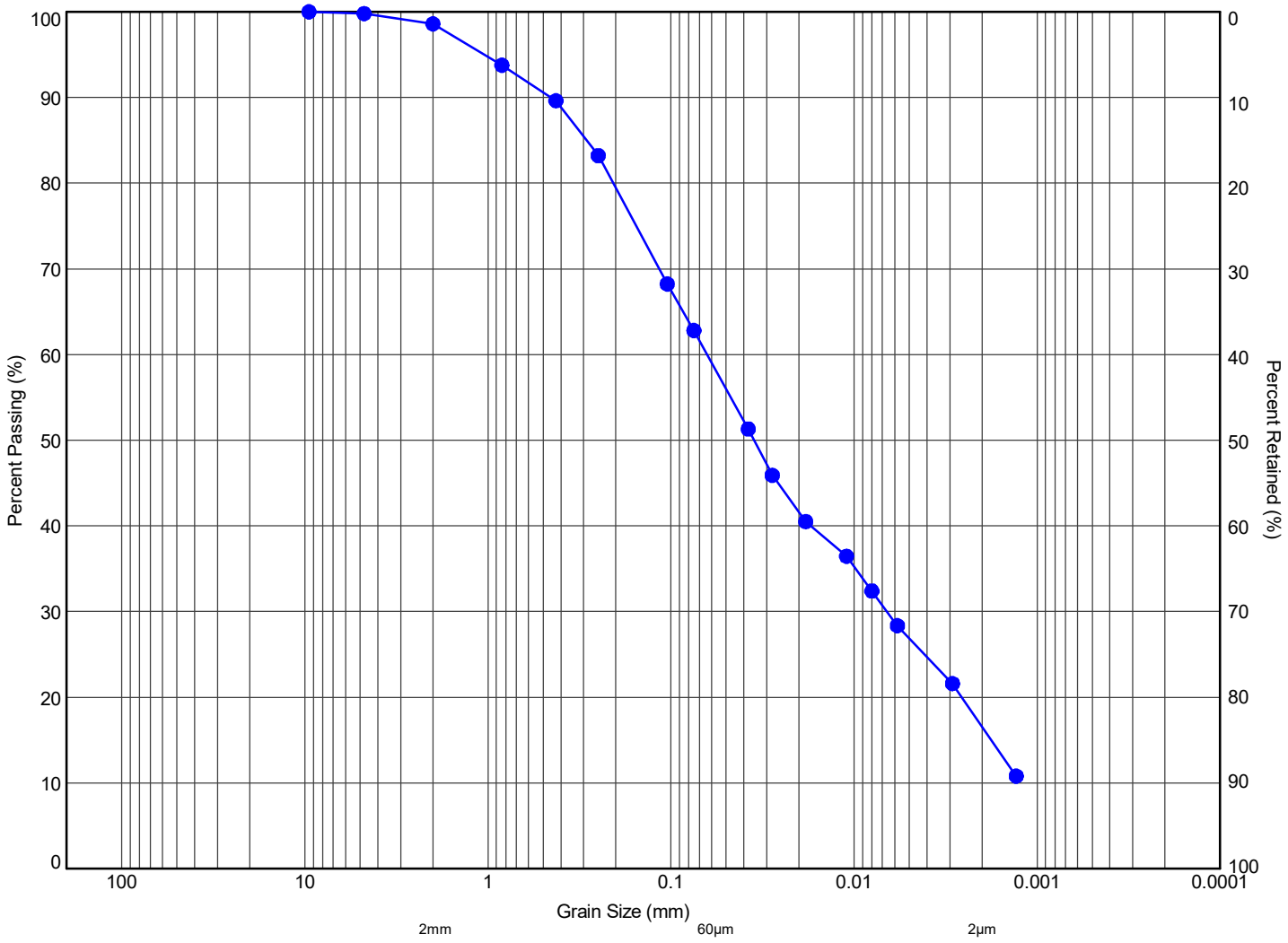
Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SANDY CLAYEY SILT, TRACE GRAVEL

File No.: **1-20-0109-01**



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

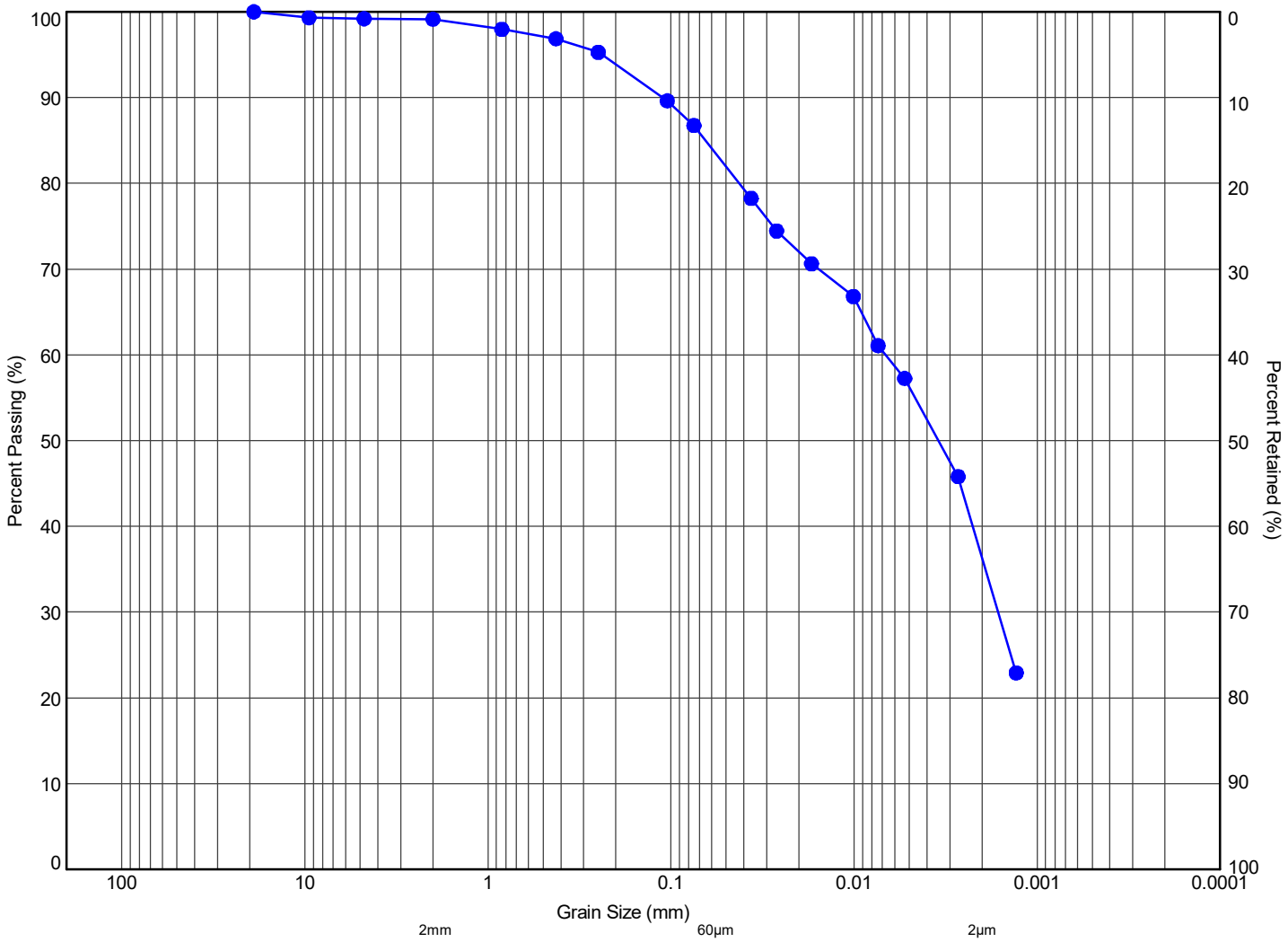
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**5**	SS8	7.7	165.1	1	40	42	17	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILT AND SAND, SOME CLAY, TRACE GRAVEL

File No.: **1-20-0109-01**



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

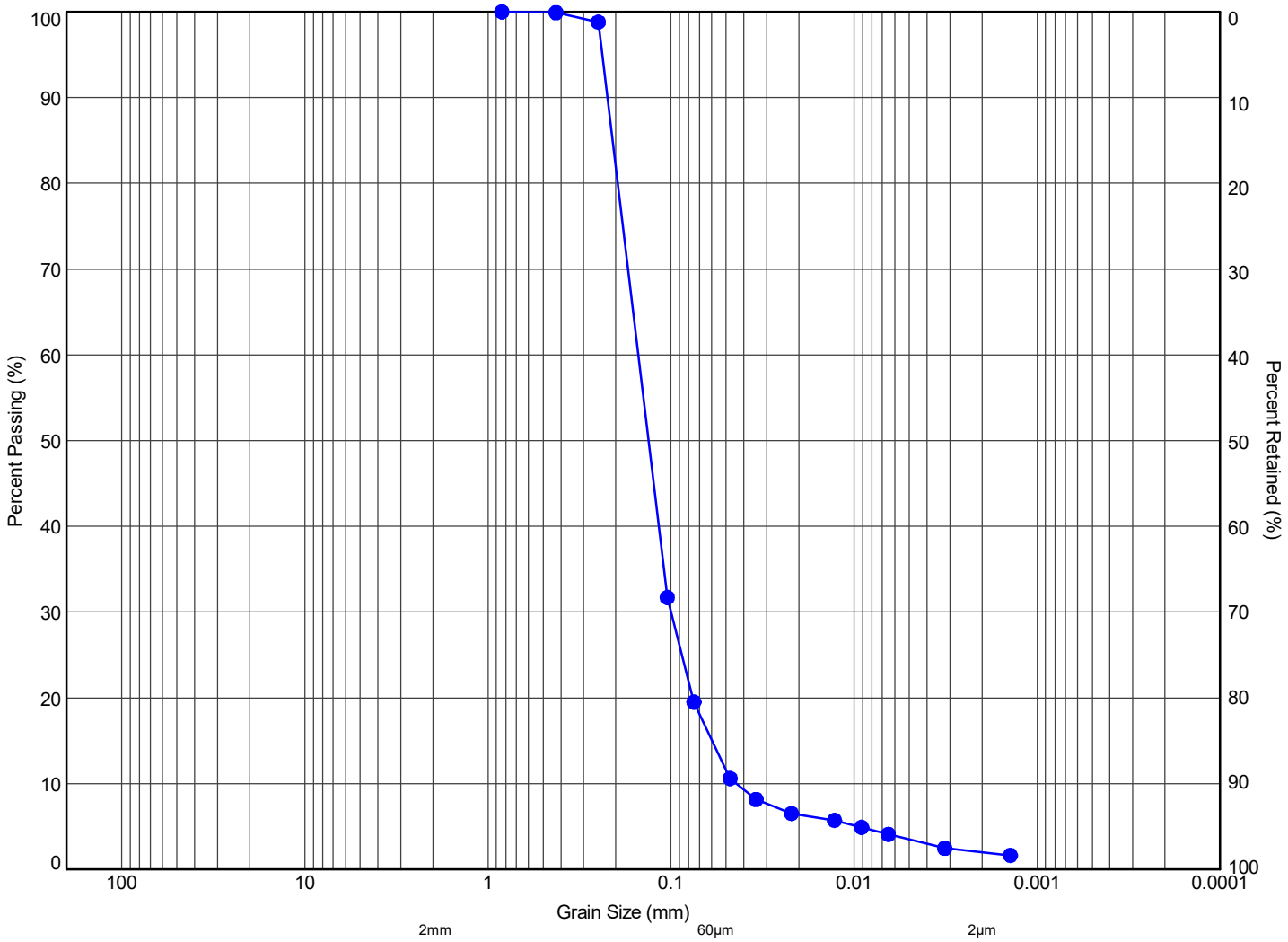
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**9**	SS5	3.3	172.7	1	15	48	36	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SILT AND CLAY, SOME SAND, TRACE GRAVEL

File No.: **1-20-0109-01**



MIT SYSTEM	COBBLES	GRAVEL			SAND			SILT	CLAY
		COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE		

MIT SYSTEM

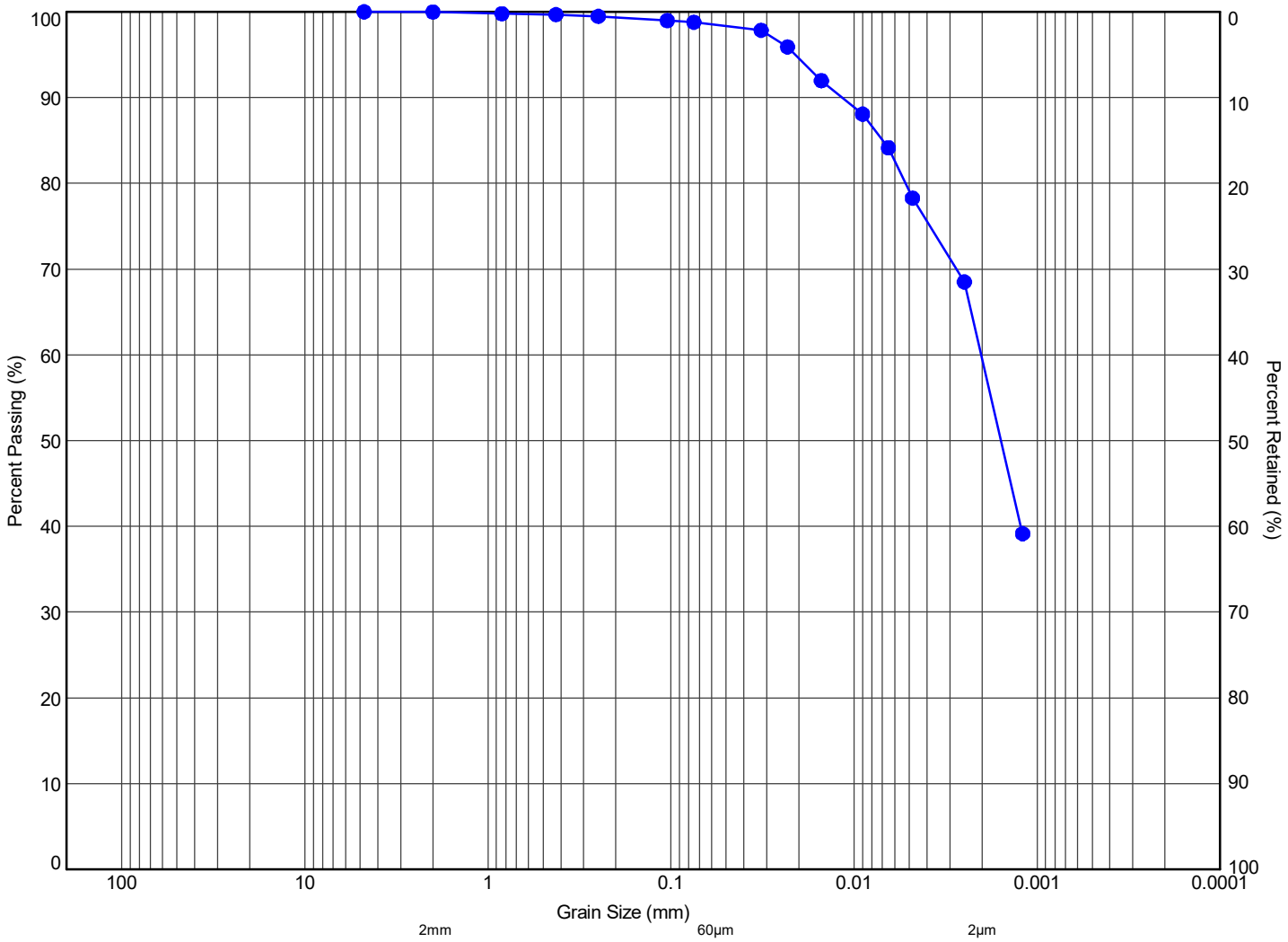
	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**11**	SS11	12.3	164.3	0	85	13	2	

Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
SAND, SOME SILT, TRACE CLAY

File No.: **1-20-0109-01**



MIT SYSTEM

	Hole ID	Sample	Depth (m)	Elev. (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	*(Fines, %)*
●	**13**	SS6	4.8	173.3	0	1	39	60	

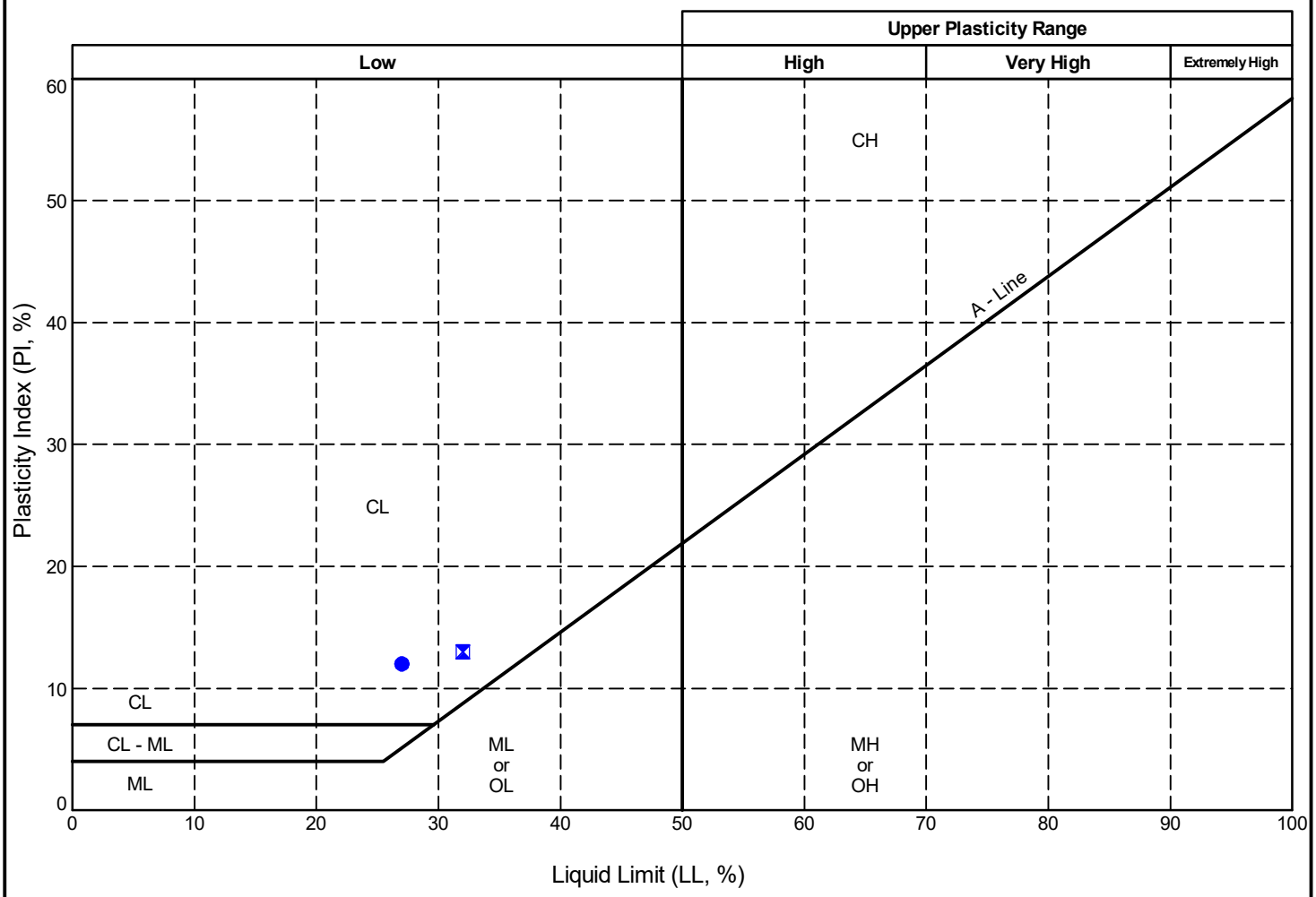
Terraprobe

11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

Title:

GRAIN SIZE DISTRIBUTION
CLAY AND SILT, TRACE SAND

File No.: **1-20-0109-01**



	Borehole	Sample	Depth (m)	Elev. (m)	LL (%)	PL (%)	PI (%)	Description
●	9	SS5	3.3	172.7	27	15	12	SLIGHTLY PLASTIC
⊠	13	SS6	4.8	173.3	32	19	13	SLIGHTLY PLASTIC

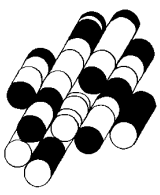
Terraprobe
11 Indell Lane, Brampton Ontario L6T 3Y3
(905) 796-2650

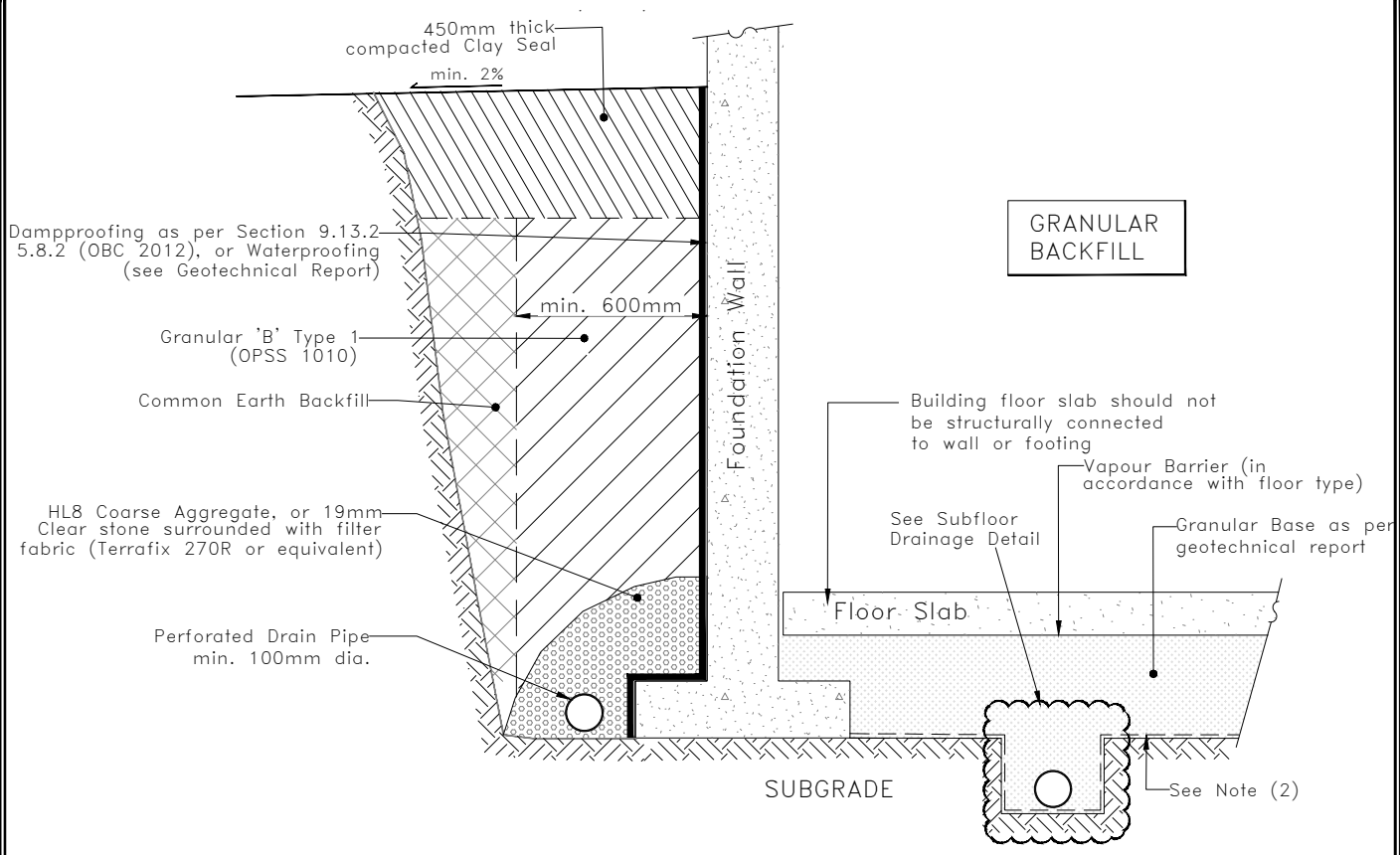
Title: **ATTERBERG LIMITS CHART**

File No.: **1-20-0109-01**

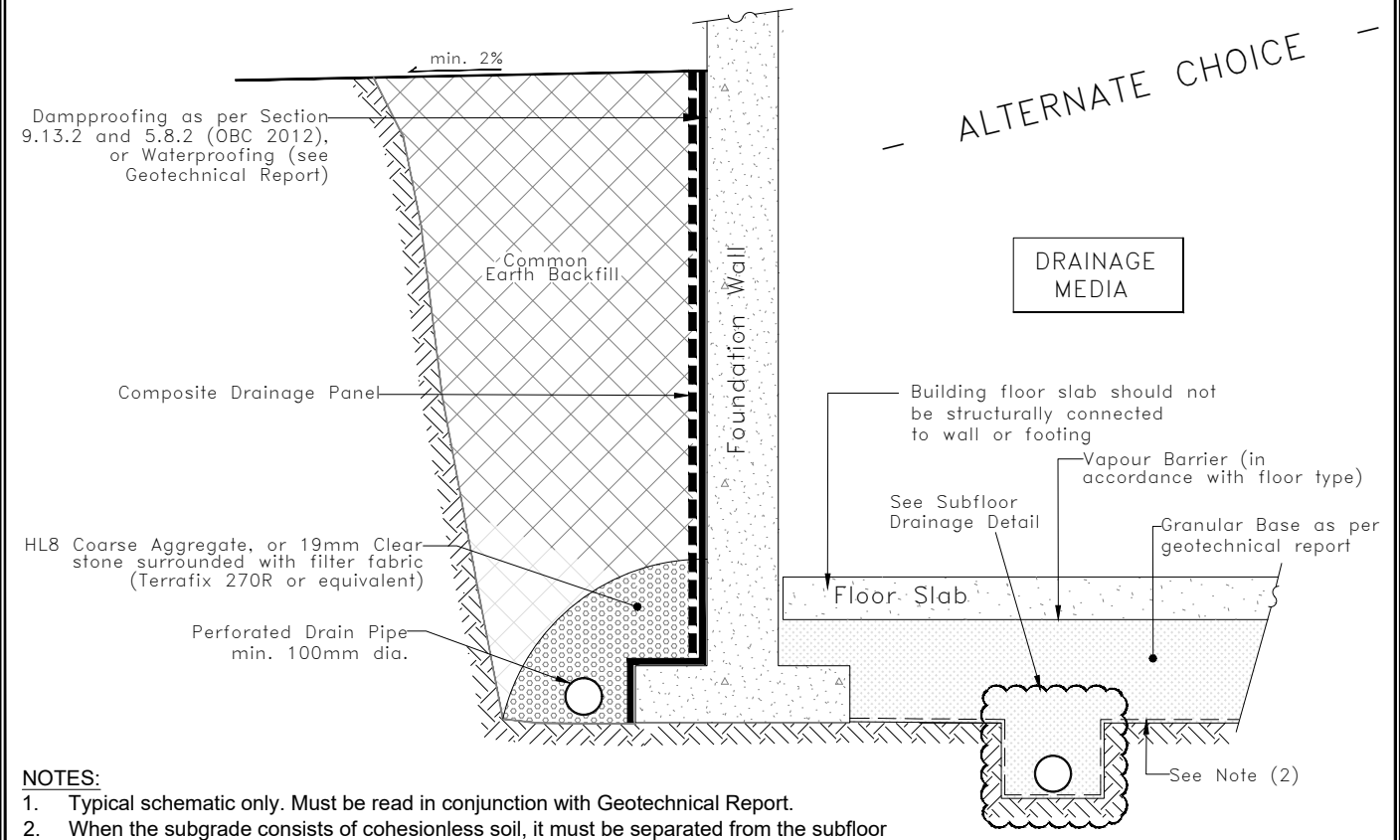
APPENDIX C

TERRAPROBE INC.





ALTERNATE CHOICE



NOTES:

1. Typical schematic only. Must be read in conjunction with Geotechnical Report.
2. When the subgrade consists of cohesionless soil, it must be separated from the subfloor drainage layer using a non-woven geotextile (Terrafix 360R or approved equivalent).
3. Not to Scale

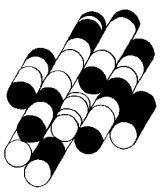
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

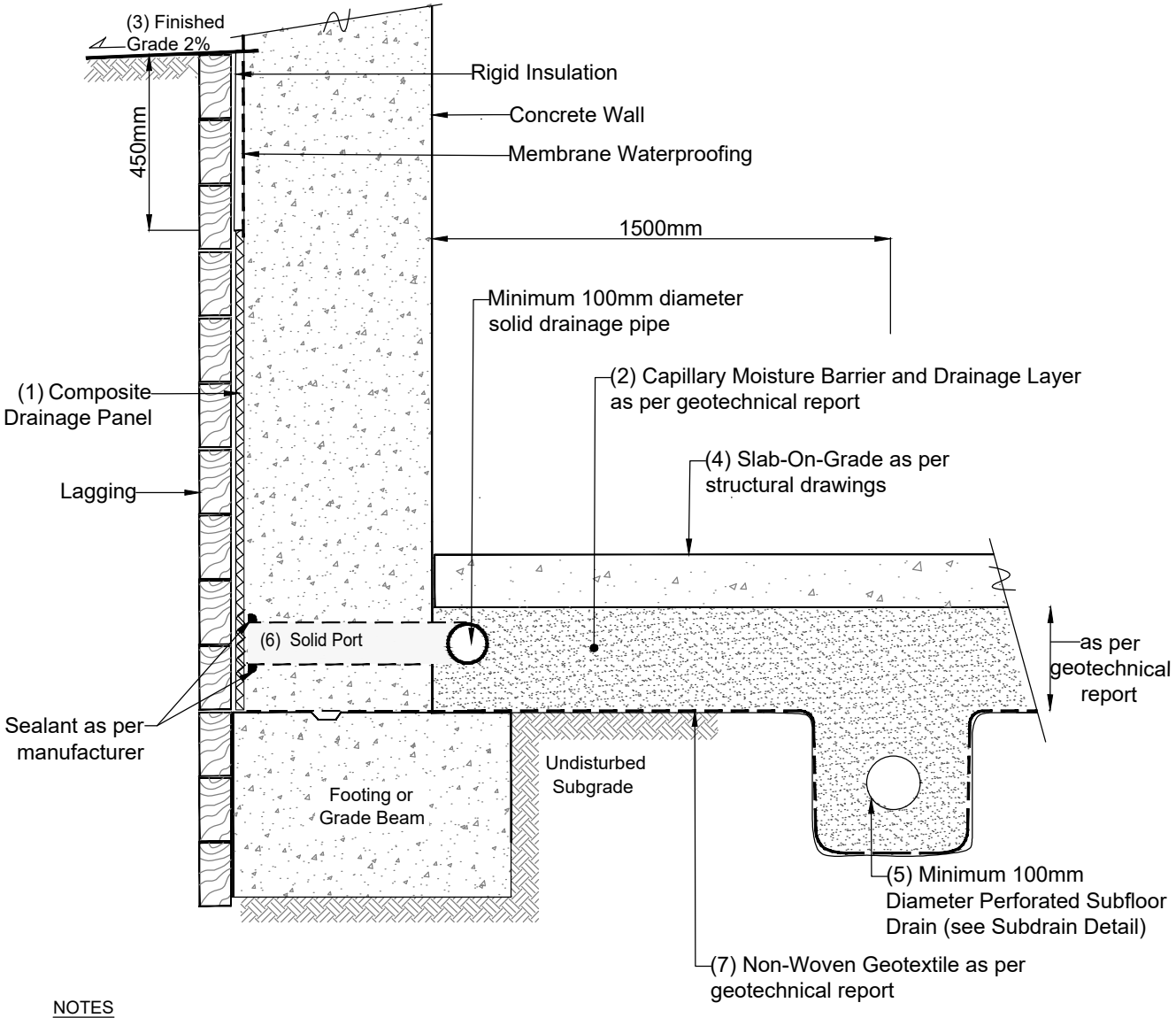
Title:

TYPICAL BASEMENT DRAINAGE SCHEMATIC

APPENDIX D

TERRAPROBE INC.





NOTES

1) Prefabricated composite drainage panels to consist of Miradrain 6000, or approved equivalent. Panels should provide continuous cover as per manufacturer's requirements.

2) Capillary moisture barrier/drainage layer to consist of a minimum 200mm layer of 19mm clear stone (OPSS. MUNI 1004), or as indicated in geotechnical report, compacted to a dense state. Upper 50mm can be replaced with Granular "A" (OPSS. MUNI 1010) compacted to 98% SPMDD where vehicular traffic is required. A vapour barrier may be required depending on floor type.

3) Exterior finished grade away from wall at a minimum grade of 2% for min. 1.2m.

4) Building floor slab-on-grade shall not be structurally connected to foundation wall or footing.

5) Subfloor drain invert to be a minimum of 300mm below underside of floor slab, to be set in parallel rows, one way, and at the spacing specified in the geotechnical report. Don't connect subfloor drains to perimeter drains.

6) Embedded ports to be set a distance of maximum 3m on-centre. Each port to have a minimum cross-sectional area of 1500mm². Perimeter drainage must be collected and conveyed directly to the building sumps in solidpipe.

7) When the subgrade consists of a cohesionless soil, the subgrade must be separated from the subfloor drainage layer using a non-woven geotextile (Terrafix 360R or approved equivalent).

8) Geotechnical report contains specific details. Final detail must be reviewed before system is considered acceptable to use.

N.T.S.

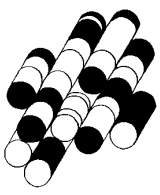
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

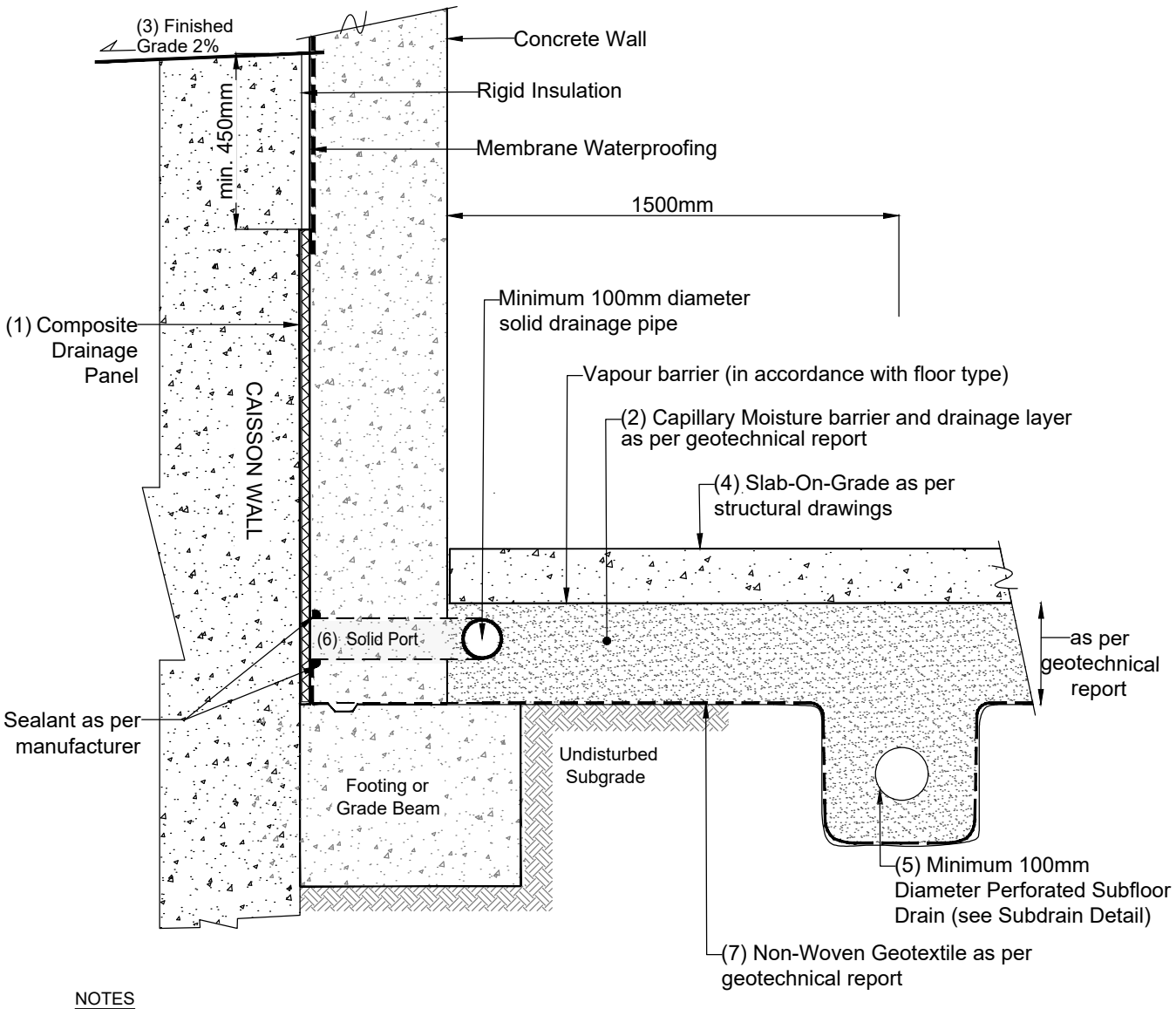
Title:

SCHEMATIC DRAINAGE DETAIL
SOLDIER PILE & LAGGING SHORING SYSTEM
(DRAINED BASEMENT CONDITION)

APPENDIX E

TERRAPROBE INC.





NOTES

1) Prefabricated composite drainage panels to consist of Miradrain 6000, or approved equivalent. Panels should provide continuous cover as per manufacturer's requirements.

2) Capillary moisture barrier/drainage layer to consist of a minimum 200mm layer of 19mm clear stone (OPSS. MUNI 1004), or as indicated in geotechnical report, compacted to a dense state. Upper 50mm can be replaced with Granular “A” (OPSS. MUNI 1010) compacted to 98% SPMDD where vehicular traffic is required. A vapour barrier may be required depending on floor type.

3) Exterior finished grade away from wall at a minimum grade of 2% for min. 1.2m.

4) Building floor slab-on-grade shall not be structurally connected to foundation wall or footing.

5) Subfloor drain invert to be a minimum of 300mm below underside of floor slab, to be set in parallel rows, one way, and at the spacing specified in the geotechnical report. Don't connect subfloor drains to perimeter drains.

6) Embedded ports to be set a distance of maximum 3m on-centre. Each port to have a minimum cross-sectional area of 1500mm². Perimeter drainage must be collected and conveyed directly to the building sumps in solidpipe.

7) When the subgrade consists of a cohesionless soil, the subgrade must be separated from the subfloor drainage layer using a non-woven geotextile (Terrafix 360R or approved equivalent).

8) Geotechnical report contains specific details. Final detail must be reviewed before system is considered acceptable to use.

N.T.S

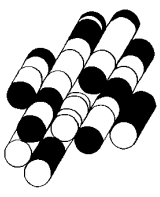
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

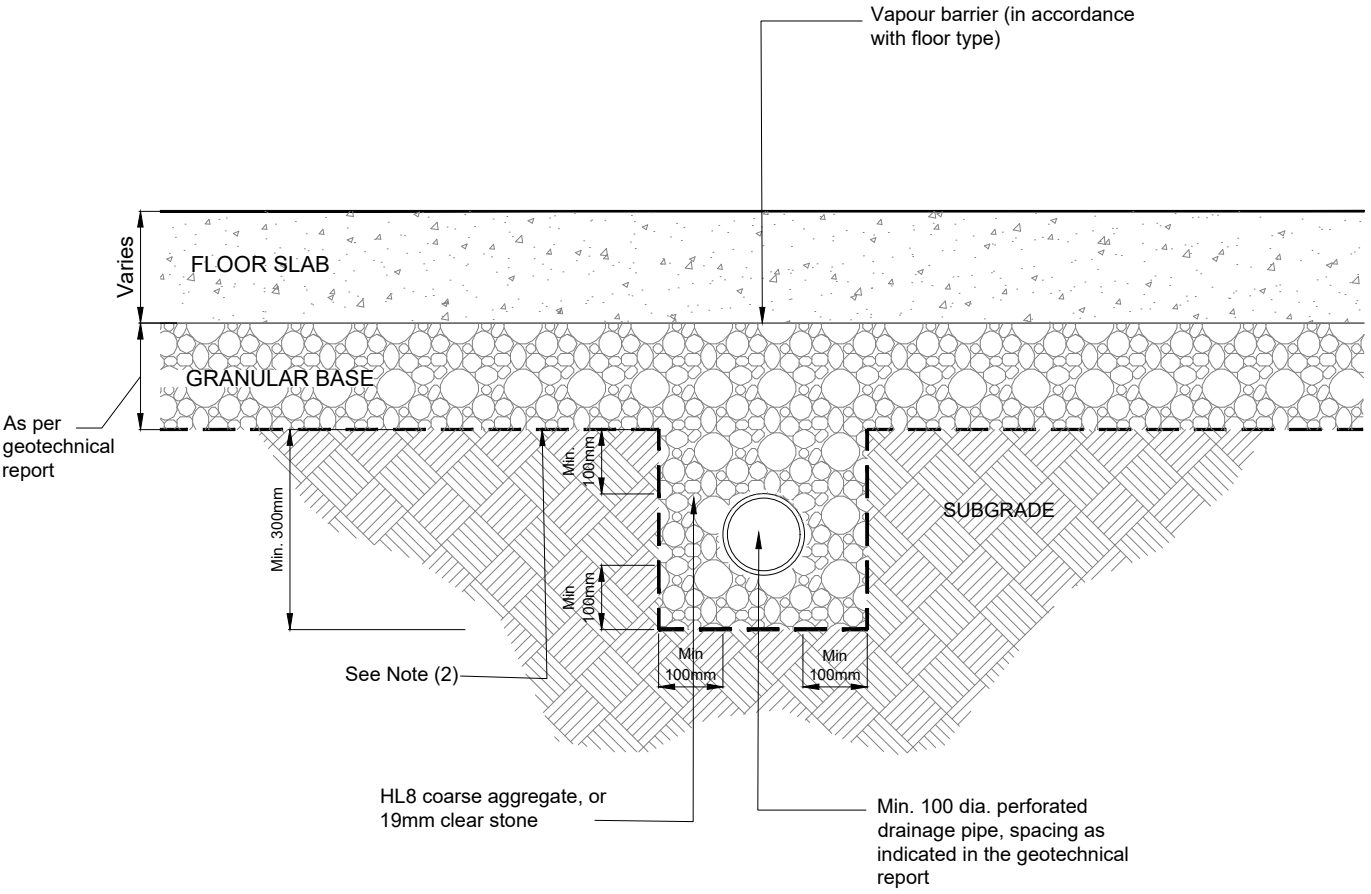
Title:

SCHEMATIC DRAINAGE DETAIL
CASSION WALL SHORING SYSTEM
(DRAINED BASEMENT CONDITION)

APPENDIX F

TERRAPROBE INC.





NOTES:

1. Typical schematic only. Must be read in conjunction with Geotechnical Report.
2. When the subgrade consists of cohesionless soil, it must be separated from the subfloor drainage layer using a non-woven geotextile (Terrafix 360R or approved equivalent).
3. Not to Scale

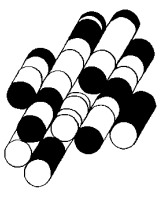
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

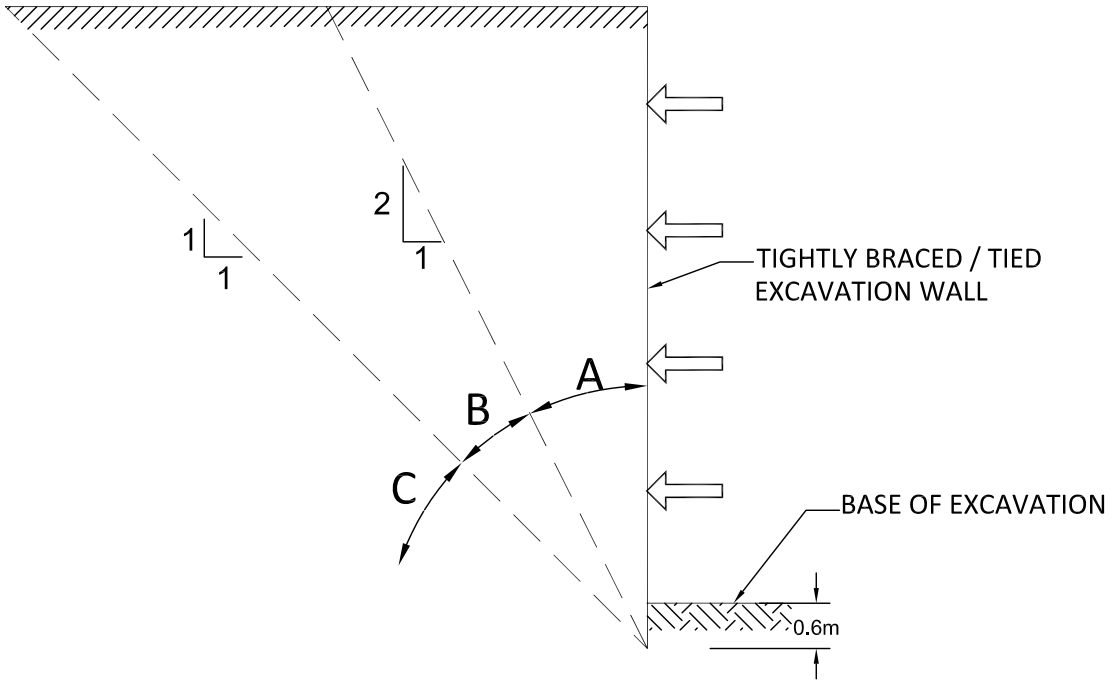
Title:

TYPICAL BASEMENT SUBDRAIN DETAIL

APPENDIX G

TERRAPROBE INC.





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.

REFERENCE:

User's Guide - NBC 2005 Structural Commentaries
(Part 4 of Division B) - Commentary K

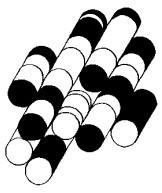
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

Title:

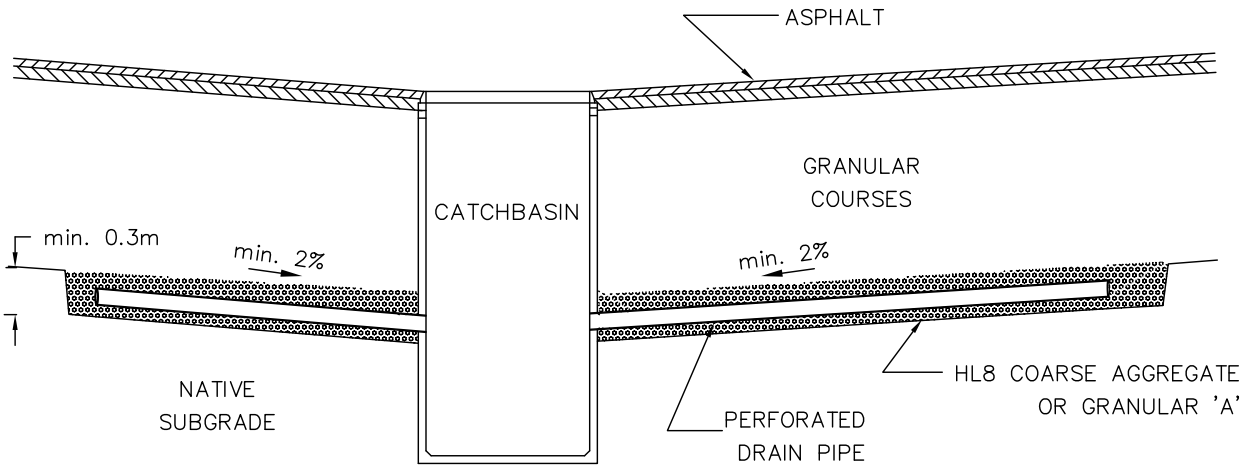
GUIDELINES FOR UNDERPINNING SOILS

APPENDIX H

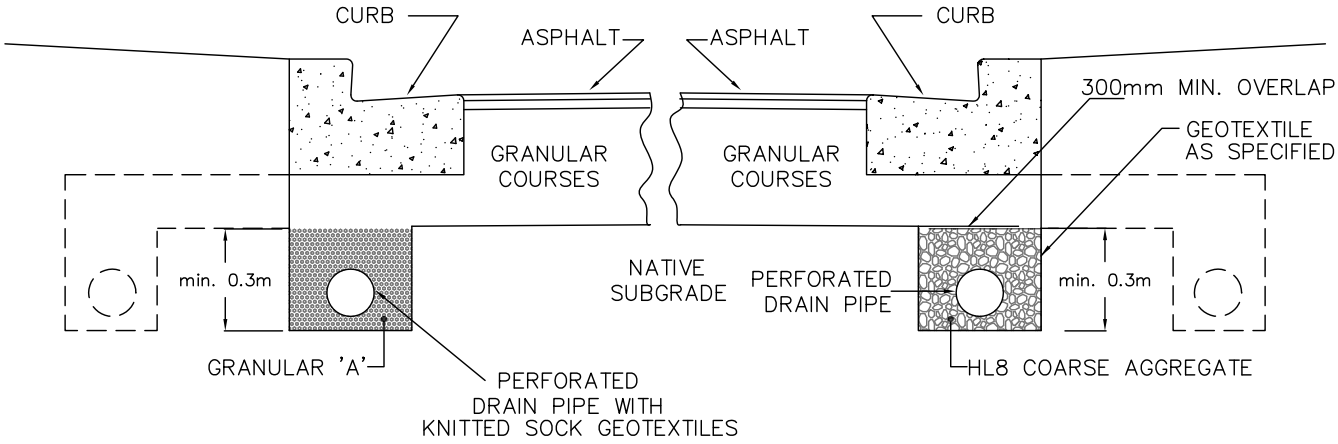
TERRAPROBE INC.



Longitudinal Subdrain Connection to Catchbasin



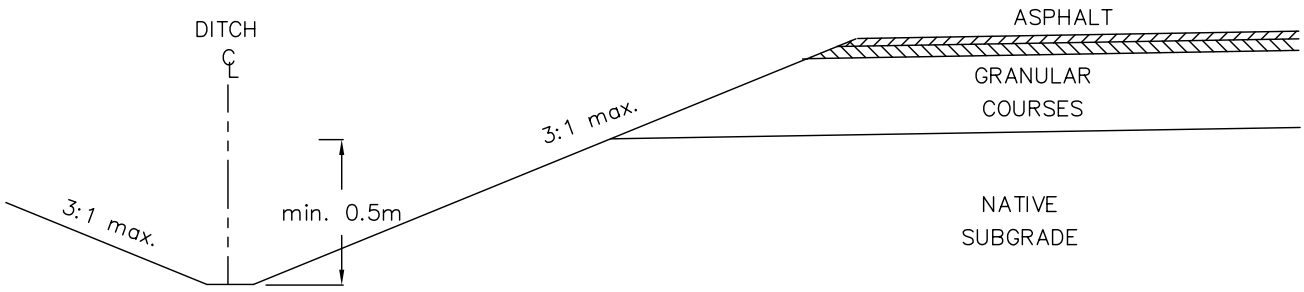
Urban Cross Sections



Unwrapped Trench

Wrapped Trench

Rural Cross Section



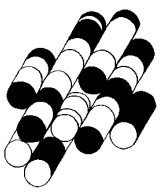
Terraprobe
11 Indell Lane, Brampton, Ontario, L6T 3Y3
Tel: (905) 796-2650 Fax: (905) 796-2250

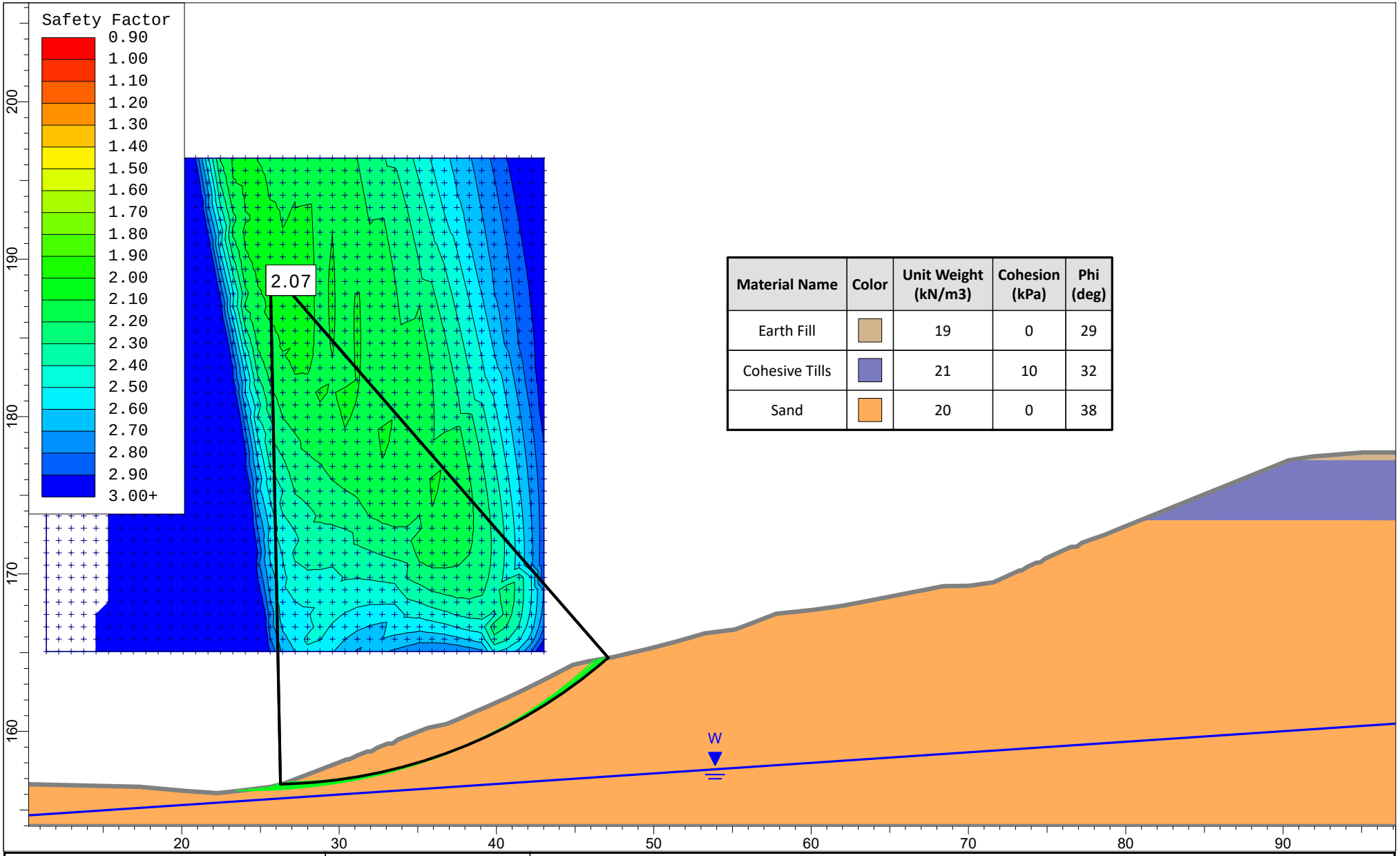
Title:

PAVEMENT DRAINAGE ALTERNATIVES

APPENDIX I

TERRAPROBE INC.





Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill		19	0	29
Cohesive Tills		21	10	32
Sand		20	0	38

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

SLIDEINTERPRET 7.036

Notes
Refer to appended Slope Stability Analysis Explanation sheets for legend. Refer to cross-sections for inclinations and other pertinent slope information.

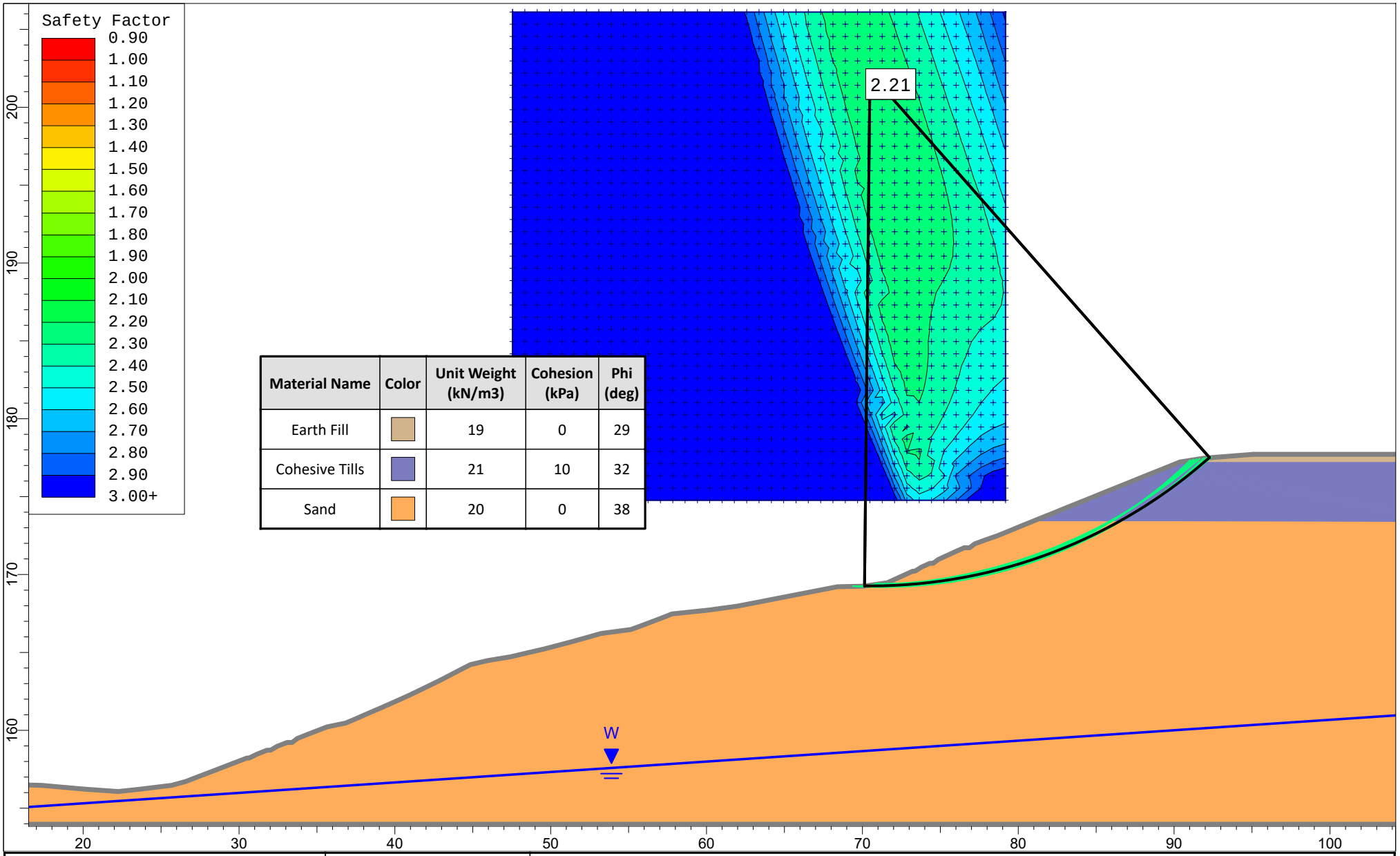
Project: **Baha'i National Centre Site | 1-20-0109-01**

Analysis: Slope Stability: Section C-C', Normal GWT

Date: 9/27/2022 | Scale: 1:332 | File: 7200 Leslie Street Slope Stability.slmd

By: CM

Ref. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham Project: 21470, Drawing: 21470-Topo, Date: September 9, 2022 By: Erti Surveyors (OLS)



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill		19	0	29
Cohesive Tills		21	10	32
Sand		20	0	38

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

SLIDEINTERPRET 7.036

Notes
Refer to appended Slope Stability Analysis Explanation sheets for legend. Refer to cross-sections for inclinations and other pertinent slope information.

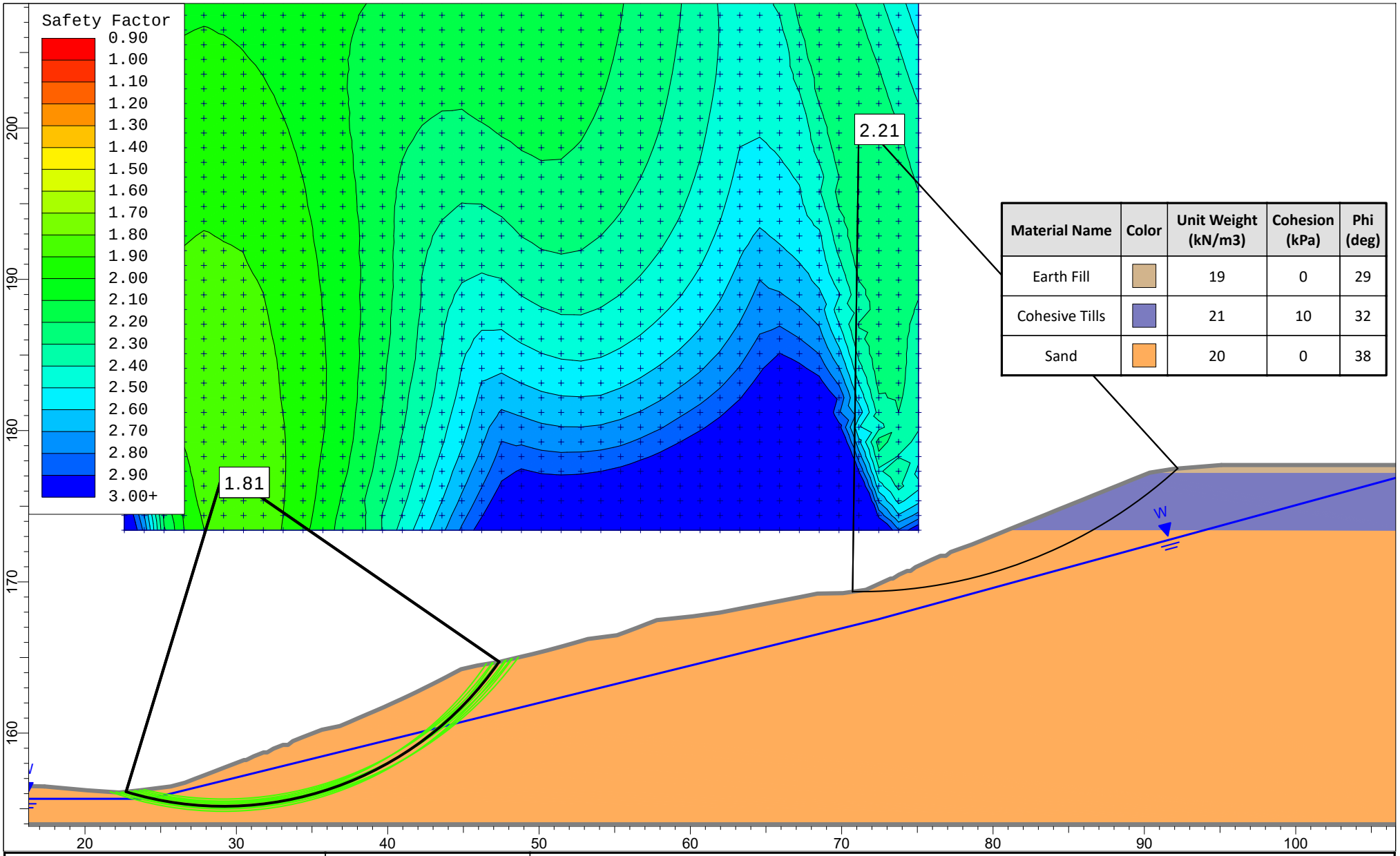
Project **Baha'i National Centre Site | 1-20-0109-01**

Analysis Slope Stability: Section C-C', Upper Slope, Normal GWT

Date 10/12/2022 | Scale 1:335 | File 7200 Leslie Street Slope Stability.slmd

By CM

Ref. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham Project: 21470, Drawing: 21470-Topo, Date: September 9, 2022 By: Erti Surveyors (OLS)



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill		19	0	29
Cohesive Tills		21	10	32
Sand		20	0	38

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

SLIDEINTERPRET 7.036

Notes
Refer to appended Slope Stability Analysis Explanation sheets for legend. Refer to cross-sections for inclinations and other pertinent slope information.

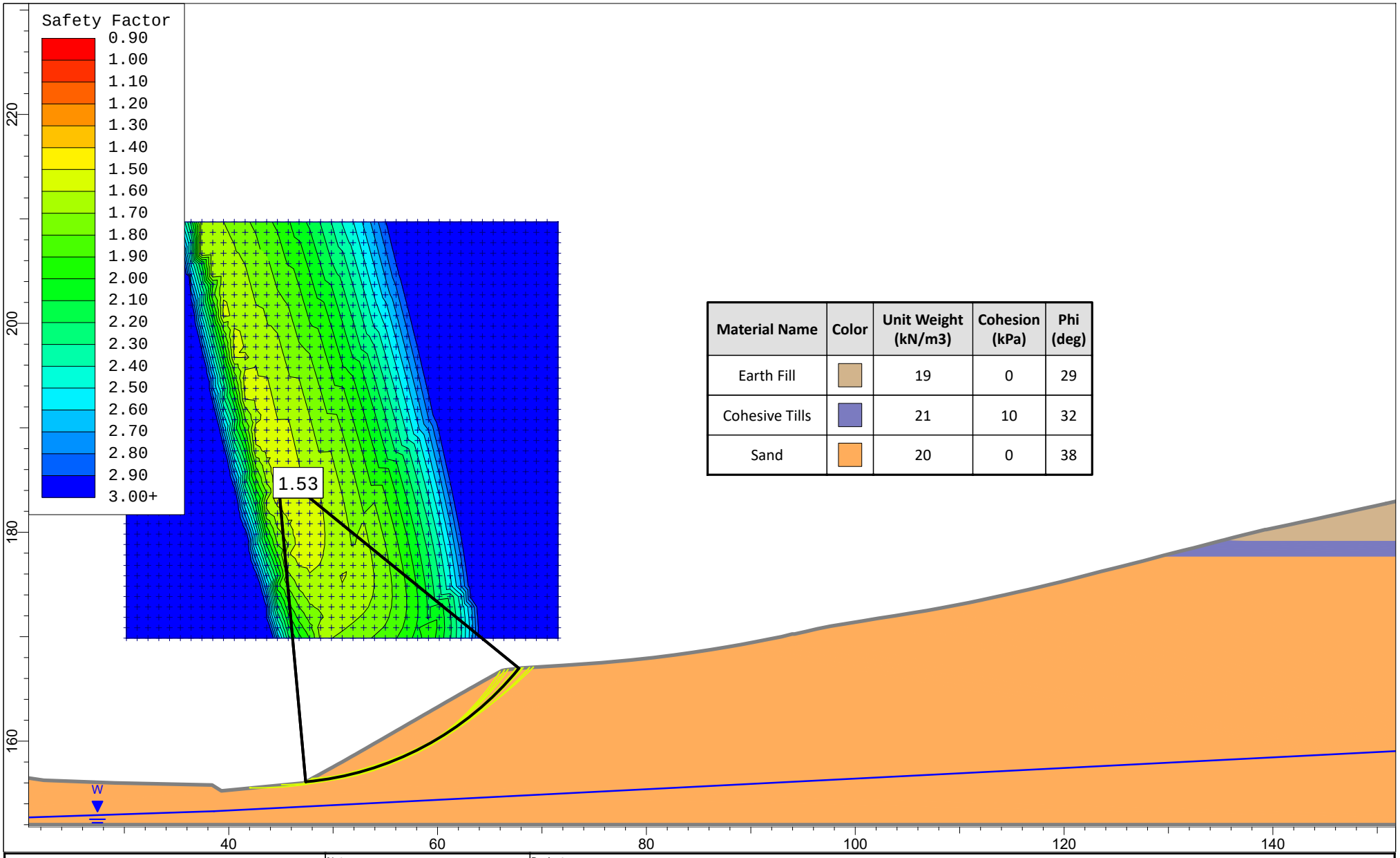
Project: **Baha'i National Centre Site | 1-20-0109-01**

Analysis: Slope Stability: Section C-C', Upper Slope, High GWT

Date: 10/12/2022 | Scale: 1:345 | File: 7200 Leslie Street Slope Stability.slmd

By: CM

Ref. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham Project: 21470, Drawing: 21470-Topo, Date: September 9, 2022 By: Erti Surveyors (OLS)



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill		19	0	29
Cohesive Tills		21	10	32
Sand		20	0	38

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

SLIDEINTERPRET 7.036

Notes
Refer to appended Slope Stability Analysis Explanation sheets for legend. Refer to cross-sections for inclinations and other pertinent slope information.

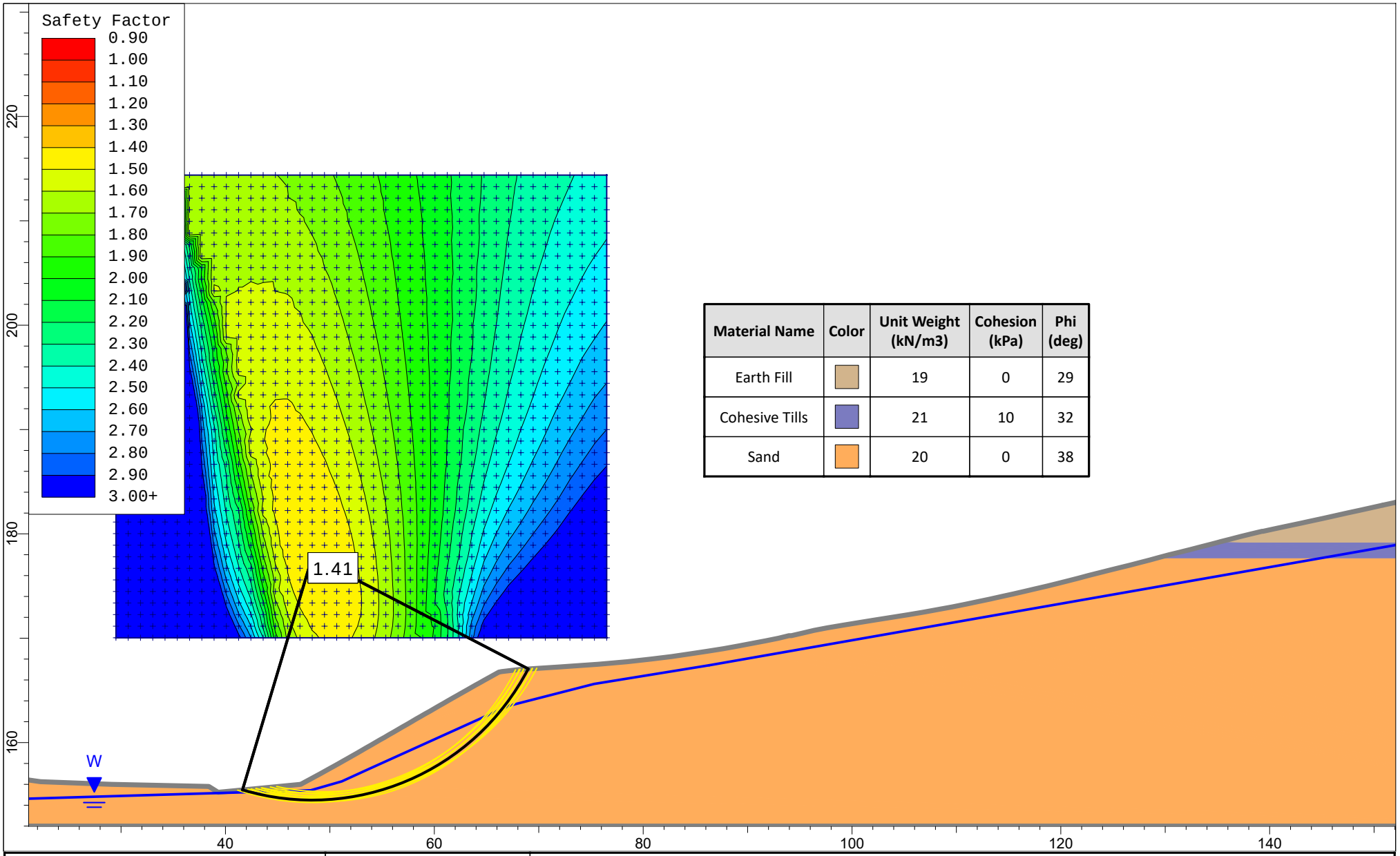
Project **Baha'i National Centre Site | 1-20-0109-01**

Analysis Slope Stability: Section E-E', Normal GWT

Date 9/27/2022 | Scale 1:500 | File 7200 Leslie Street Slope Stability.slmd

By CM

Ref. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham Project: 21470, Drawing: 21470-Topo, Date: September 9, 2022 By: Erti Surveyors (OLS)



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill		19	0	29
Cohesive Tills		21	10	32
Sand		20	0	38

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

SLIDEINTERPRET 7.036

Notes
Refer to appended Slope Stability Analysis Explanation sheets for legend. Refer to cross-sections for inclinations and other pertinent slope information.

Project **Baha'i National Centre Site | 1-20-0109-01**

Analysis Slope Stability: Section E-E', High GWT

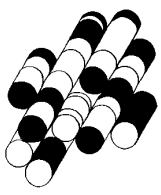
Date 10/18/2022 | Scale 1:500 | File 7200 Leslie Street Slope Stability.slmd

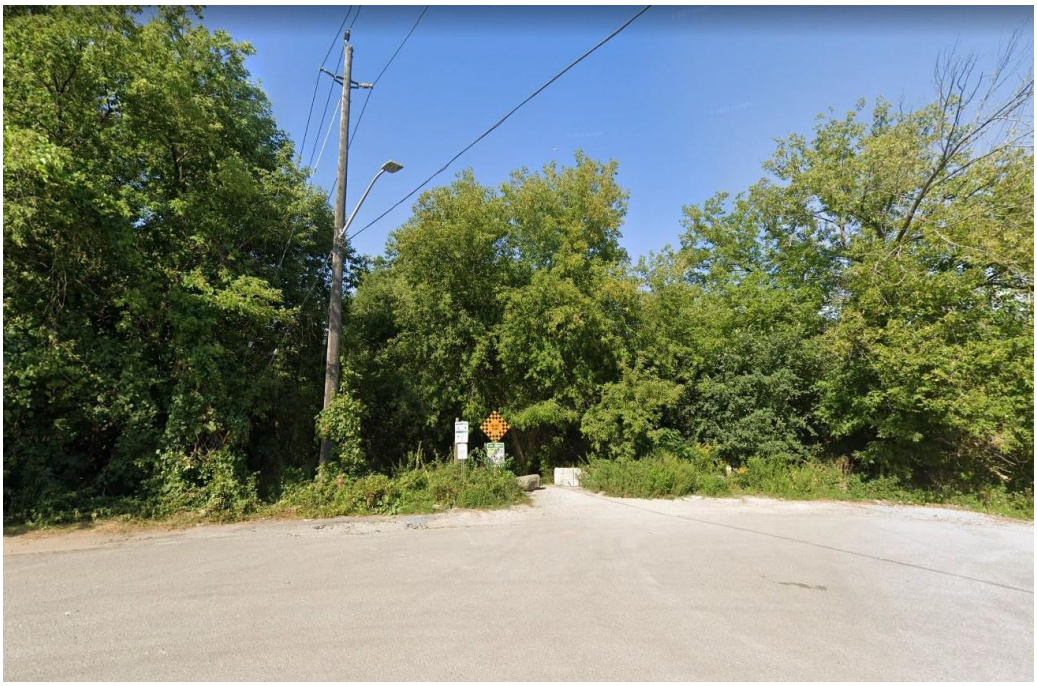
By CM

Ref. Topographic Detail of Part of Lots 2 and 3, Concession 2, City of Markham Project: 21470, Drawing: 21470-Topo, Date: September 9, 2022 By: Erti Surveyors (OLS)

APPENDIX J

TERRAPROBE INC.





PHOTOGRAPH 1 Standing at the north-end of Leslie St and looking north. The slope is covered with trees.

PHOTOGRAPH 2. Looking north, a view of the 7290 Leslie St with associated driveway, garage and grass lawn

PHOTOGRAPH 3. Looking south, view of the driveway and grass lawn at the bottom of the slope. Slope toe is well vegetated with young to mature trees.

PHOTOGRAPH 4. Looking north at the top of the tableland. A private gravel roadway runs north-south on the tableland.

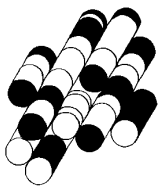
PHOTOGRAPH 5. Looking south at the top of the tableland. A private gravel roadway runs north-south on the tableland. The Golf course can be seen on the background.

PHOTOGRAPH 6. Looking north standing on upper portion of the slope, an overall view of the slope. The slope is well vegetated with young to mature trees and some undergrowth. Tree trunk growth is generally straight and upright.

PHOTOGRAPH 7. Looking west, standing at the bottom of the slope and looking towards the slope. The slope is well vegetated with young to mature trees and some undergrowth. Tree trunk growth is generally straight and upright.

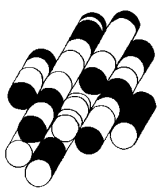
APPENDIX K

TERRAPROBE INC.



INFORMATION ON HELICAL-PIER™ FOUNDATION SYSTEM

TERRAPROBE INC.

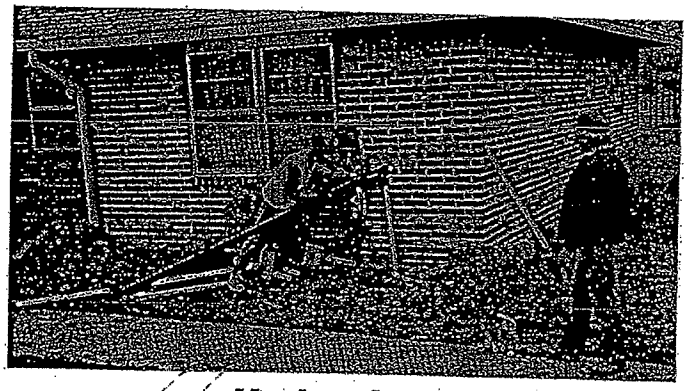


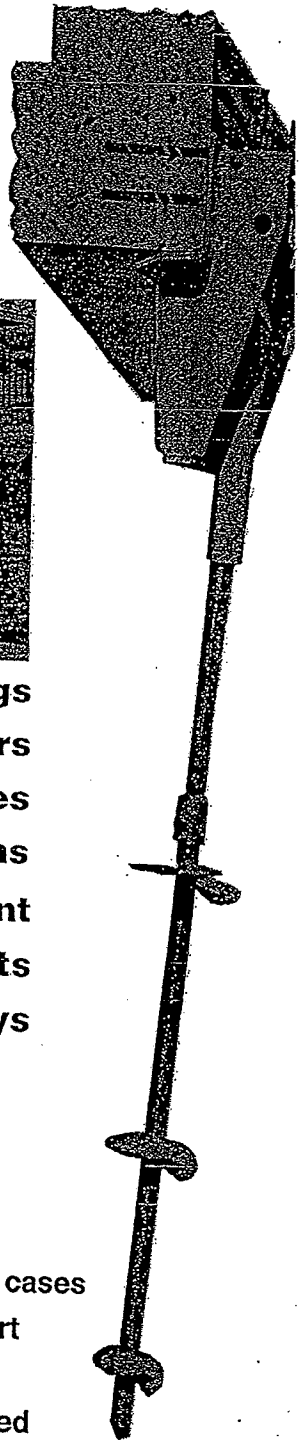
HUBBELL® CHANCE®
POWER SYSTEMS

A109
02150/CHA
BuyLine 1386

HELICAL-PIER®
FOUNDATION SYSTEM

Saves days and dollars compared to concrete piers, spread footings or other pile methods





- **Underpinning buildings**
- **New-construction piers**
- **Lifting existing structures**
- **Seismic applications**
- **Environment enhancement**
- **Retaining walls • Revetments**
- **Dams • Levees • Roadways**

Immediate benefits:

- Predictable results
- Lower installed costs
- One-trip convenience: No site preparation or concrete required in many cases
- Holds design loads in specific soils
- Easy to store and transport
- Installs in any weather and in limited-access situations
- Clean – no excavation spoils to remove
- Reusable
- U.S. Patented
- Less equipment needed: No concrete trucks or grout pumps

WORLDWIDE EXPERIENCE IN HELICAL-PIER® SYSTEMS SINCE 1907

PRODUCT SPECIFICATION (continued)

Specification References

Details on the Chance Helical Pier® Foundation Support System are available upon request in the three-part section Manu-Spec® format (of the Spec-Data® program copyrighted by The Construction Specifications Insitute). Filed under the identical 02150 designation as Sweet's, highlights include:

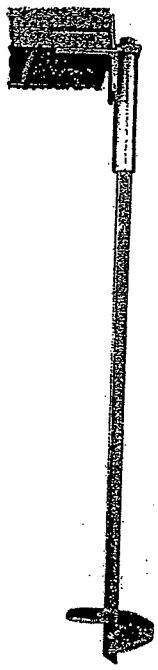
Part 1 — General
1.01Section includes: New and remedial building foundation piering and stabilization, retaining walls, tieback systems.
1.02 Related sections: Excavating to working level, load tests, cast-in-place concrete reinforcement.
1.03 References: Fifteen ASTM and one SAE standards specifications.
1.04 Definition of system
1.05 Quality Assurance: Dealer certification, code requirement.

Part 2 — Products
2.01 Manufacturer: Chance Co.
2.02 Manufactured components: Helical plate, pier shaft, bolts, steel bracket.

Part 3 — Execution
3.01 Examination: Verify site conditions under Sect. 01039.
3.02 Preparation: Spare nearby structures; varying elevations.
3.03 Installation: Certified contractor, connect to structure, torque power units, adapters, extensions, torque recording, proper alignment, revolutions per minute, down pressure, coupling bolts, obstructions, minimum depth and torque.
3.04 Field quality control: Inspection, field testing, torque monitoring.
3.05 Project record documents: Submit 8 data records per Sect. 01700.
3.06 Depth and torque tolerances: Maximum torque prior to minimum depth, A/E approval, pier replacement.

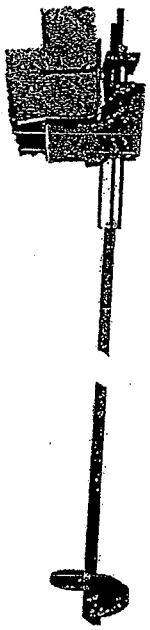
Business Practices

Before each job by contractors certified to install the Chance Helical Pier® Foundation Support System, a quotation is prepared. Customarily, the bid for work is based on the amount to be billed per pier, access and final details required.



Light Duty Bracket

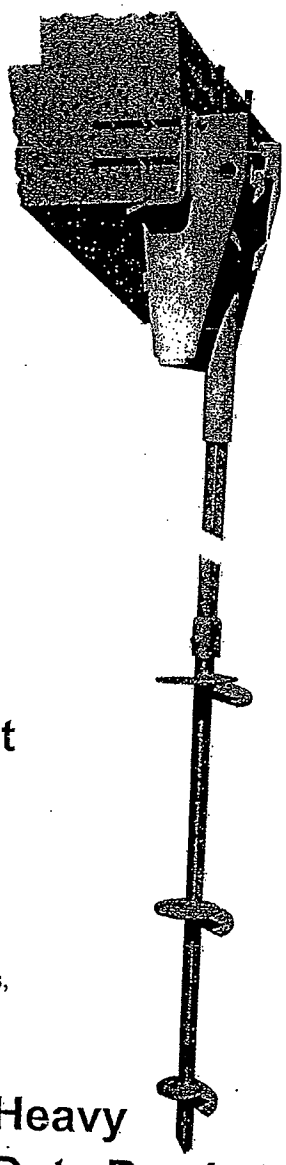
Primarily for correcting sagging lesser loads, affordable "quick fix" outlasts the porches, stairways, decks and patios it repairs.



Standard Duty Bracket

Applied in multiple locations along the foundation to stabilize and correct problems caused by poor soil conditions.

For seismic uplift loads, the Uplift Restraint Bracket may be added.



Heavy Duty Bracket

For such higher loads as commercial buildings and larger residences. Applied in multiples to stop settled areas, resist new movement.

All components are hot-dip galvanized to increase product life in aggressive soils.

PRODUCT SPECIFICATION

Lead and extension section lengths

The standard Helical Pier® foundation lead-section lengths are 5, 7, and 10 ft. The standard extension section lengths are 3½, 5, 7, and 10 ft. long. These combinations of leads and extensions provide for a variety of helical foundation lengths for each specific project.

Helix areas

Standard helices manufactured by the Chance Company are:

6 in. diameter = 26.7 sq. in.

8 in. diameter = 48.4 sq. in.

10 in. diameter = 76.4 sq. in.

12 in. diameter = 111.0 sq. in.

14 in. diameter = 151.0 sq. in.

Helix configuration

Standard helices are ⅜ inch thick helically shaped steel plates with outer diameters of 6, 8, 10, 12 and 14 inches. The lead section, or first section installed into the soil, contains the helix plate(s). Multihelix foundations have more than one helix arranged in increasing diameters from the foundation tip to the uppermost helix. If more than one helix is used, the typical spacing between helical plates is three times the diameter of the next lower helix. For example, a helical foundation with an 8-, 10-, and 12- inch helix combination has a 24-inch space between the 8- and 10-inch helix and a 30-inch space between the 10- and 12-inch helix. Helix plates can be added to extension sections if necessary. Extensions with helices should be installed immediately after the lead section.

Capacities listed in the Ratings Table here are system ratings. One must be aware that the actual installed load capacities are dependent on actual soil conditions at each

Minimum pier type required based on mechanical ratings

Design Load, Kips	Minimum Pier Type Required
0 to 25	SS5
25 to 35	SS150
35 to 50	SS175 or HS

Note: This chart uses a factor of safety vs. ultimate capacity = 2.

System Ratings Table		Helical Pier® Family			
		*SS5 1½" Square Shaft	*SS150 1½" Square Shaft	SS175 1¾" Square Shaft	HS 3½" OD Pipe Shaft
		Column 1	Column 2	Column 3	Column 4
Allowable Torque Capacity (ft.-lbs.)	Row A	5,500	7,000	10,000	11,000
Allowable Capacity per Helix (Tension/Compression)	Row B	(1) 20 Kips	20 Kips	25 Kips	25 Kips
Ultimate Capacity per Helix (Tension/Compression)	Row C	(2) 40 Kips	(2) 40 Kips	(2) 50 Kips	(2) 50 Kips
Rated Capacity(4, 5) Underpinning - Retrofit	Row D	20 Kips	25 Kips	40 Kips	____ (3)
Ultimate Capacity(4, 5) Underpinning - Retrofit	Row E	40 Kips	40 Kips	80 Kips	____ (3)
Ultimate Capacity(6) for Axially Loaded Foundation (Torque Limited)	Row F	55 Kips	70 Kips	100 Kips	100 Kips

*SS150 shafts have paint stripe at top to distinquish from Type SS5.

(1)For 14"-dia. Helical Pier foundations, reduce allowable capacity by 20% per building code requirements.

(2)For 14"-dia. helices, reduce ultimate capacity by 20%.

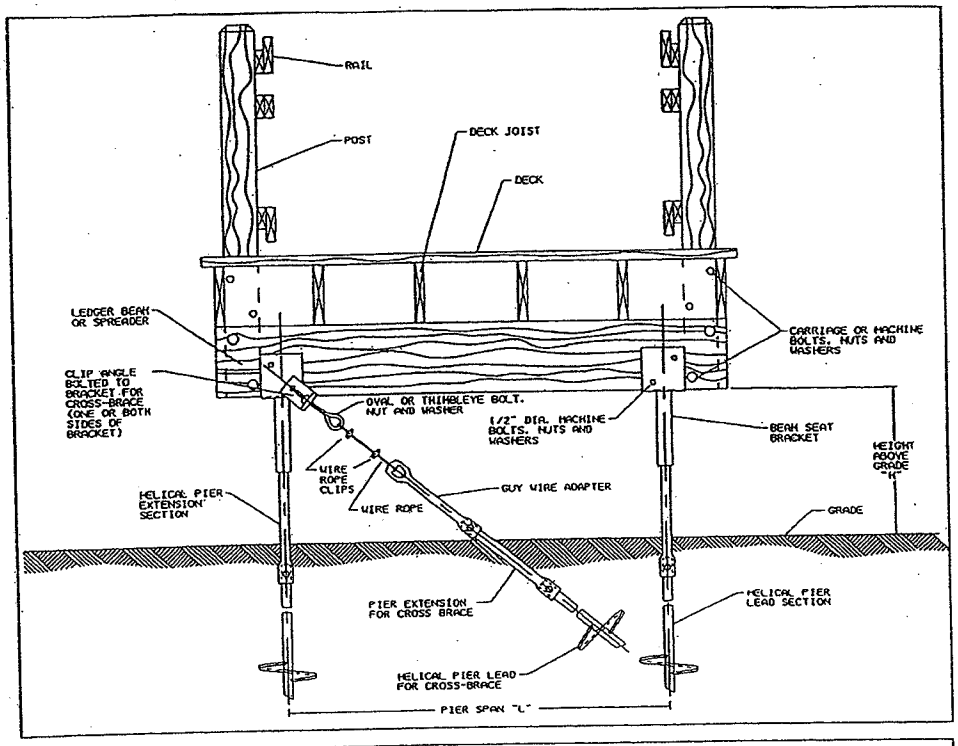
(3)Determined by bracket and haunch design.

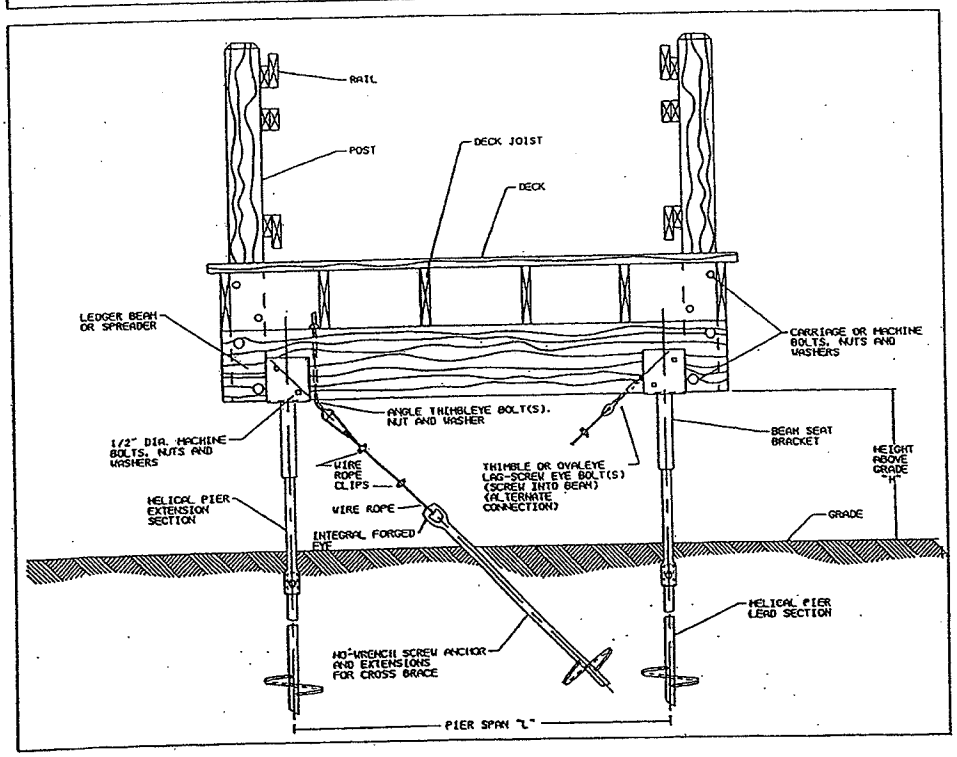
(4)Anchor installed into and supported by soil with SPT blow count (N-value) greater than 4.

(5)Rating with Helical Pier Foundation bracket.

(6)Actual installed capacities are dependent on existing soil conditions.

Typical Walkway Hardware Application





NOTE:

Where applicable, hardware manufactured by A. B. Chance Company is made from steel produced in accordance with ASTM A5 and/or ASTM A576. When galvanized, items are manufactured in accordance with ASTM A153.

Where appropriate, these hardware items comply to the following ANSI specifications:

ANSI

C135.1
C135.2
C135.22
C135.14
C135.17

ON THE COVER: Aerial view of a 1 1/2-mile boardwalk constructed at a wetlands site for the Fairfax County, Virginia Park Authority. No wheel or track vehicles were allowed into the wetlands. The Helical Pier® foundation anchors (Type SS5 — 1 1/2"-square solid-steel shaft, 10"-dia. helix, hot-dip glavanized) were installed to 7- and 10-ft. depths with average above-grade reveal of 1 to 2 ft. Maximum reveal was 4 1/2 ft.

THE C3 GROUP

EBS

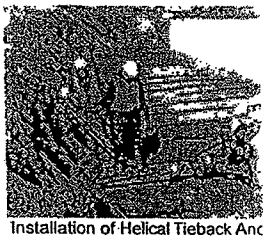
EBS ENGINEERING & CONSTRUCTION LIMITED

Solves Foundation & Soil Stabilization Problems

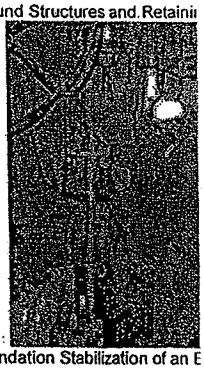
EBS Engineering and Construction Limited is the Foundation Division of the C3 Group. EBS delivers a comprehensive service package to both residential and industrial clients. As specialis in foundation restoration and repair, including foundation stabilization, underpinning, floor lowering and waterproofing, EBS is in the business of problem solving. From new construction t industrial retrofits and environmentally sensitive installations, EBS is your comprehensive foundation resource.

Foundation Stabilization

- CHANCE® HELICAL PIER® Foundation System
- CHANCE® Helical Tieback Anchors
- CHANCE® Soil Screw™ Retention Wall System
- CHANCE® Instant Foundation® System for Walkways
- CHANCE® Helical Pulldown™ Micropiles
- Conventional Foundation Underpinning



Installation of Helical Tieback Anc In-Ground Structures and Retaini



Foundation Stabilization of an E Story Structure

Structural Repair/Renovation

- Basement Lowering
- Masonry Repair/Stabilization
- Retaining Walls
- Basement Wall Stabilization and Realignment

Basement Floor Lowering a Underpinning

Water Proofing

- Installation of Interior/Exterior Membranes

- Epoxy and Urethane Resin Injection for Structural Repair and Water Control
- Underfloor Drainage Systems
- Installation and Replacement of Exterior Drainage Systems

Interior Waterproofing Using an A Membrane

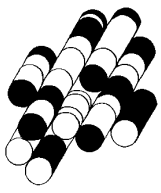
Injection/Grouting/Coatings

- Cementitious and Polymer Grouting for Structural Repair, Water Control and Stabilization
- Slab Jacking
- Concrete Sealers/Epoxy Coatings

Return to the top

APPENDIX L

TERRAPROBE INC.



AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERRAPROBE INC.
11 INDELL LANE
BRAMPTON, ON L6T3Y3
(905) 796-2650
ATTENTION TO: Hasanus Rashid
PROJECT: 1-20-0109-01(7200 Leslie St.)
AGAT WORK ORDER: 22T909012
ROCK ANALYSIS REVIEWED BY: Heather Offord, Client Service Representative
SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Lab Manager
DATE REPORTED: Jun 27, 2022
PAGES (INCLUDING COVER): 8
VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*Notes

VERSION 2:Version 2 supersedes Version 1, June 27, 2022- complete.
Version 1: June 23, 2022- Partial excluding sulphide analyses.

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T909012

PROJECT: 1-20-0109-01(7200 Leslie St.)

CLIENT NAME: TERRAPROBE INC.

ATTENTION TO: Hasanus Rashid

SAMPLING SITE:Thornhill

SAMPLED BY:DH

(283-042) Sulfide (CGY)

DATE RECEIVED: 2022-06-16

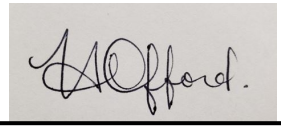
DATE REPORTED: 2022-06-27

		SAMPLE DESCRIPTION:		BH3, SS6	BH5, SS7	BH7, SS8	BH9, SS4	BH14, SS5	BH17, SS3
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2022-06-06	2022-06-07	2022-06-07	2022-06-08	2022-06-08	2022-06-07
Parameter	Unit	G / S	RDL	3989971	3989973	3989974	3989975	3989976	3989977
Sulfide	%		0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Calgary (unless marked by *)

Certified By:



AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T909012

PROJECT: 1-20-0109-01(7200 Leslie St.)

CLIENT NAME: TERRAPROBE INC.

ATTENTION TO: Hasanus Rashid

SAMPLING SITE:Thornhill

SAMPLED BY:DH

Corrosivity Package

DATE RECEIVED: 2022-06-16

DATE REPORTED: 2022-06-27

		SAMPLE DESCRIPTION:		BH3, SS6	BH5, SS7	BH7, SS8	BH9, SS4	BH14, SS5	BH17, SS3
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2022-06-06	2022-06-07	2022-06-07	2022-06-08	2022-06-08	2022-06-07
Parameter	Unit	G / S	RDL	3989971	3989973	3989974	3989975	3989976	3989977
Chloride (2:1)	µg/g	NA	2	500	87	21	20	18	8
Sulphate (2:1)	µg/g		2	<2	25	24	27	20	3
pH (2:1)	pH Units		NA	7.46	8.02	8.28	8.25	8.24	8.75
Electrical Conductivity (2:1)	mS/cm	0.57	0.005	**0.876**	0.216	0.169	0.151	0.153	0.076
Resistivity (2:1) (Calculated)	ohm.cm		1	1140	4630	5920	6620	6540	13200
Redox Potential 1	mV		NA	317	320	351	318	313	309
Redox Potential 2	mV		NA	313	322	365	319	314	310
Redox Potential 3	mV		NA	322	323	369	319	315	310

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

3989971-3989977 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil). Resistivity is a calculated parameter.
Redox potential measured on as received sample. Due to the potential for rapid change in sample equilibrium chemistry with exposure to oxidative/reduction conditions laboratory results may differ from field measured results.
Redox potential measurement in soil is quite variable and non reproducible due in part, to the general heterogeneity of a given soil. It is also related to the introduction of increased oxygen into the sample after extraction. The interpretation of soil redox potential should be considered in terms of its general range rather than as an absolute measurement.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Amanjot Bhela

CHARTERED AMANJOT BHELA CHEMIST — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Exceedance Summary

AGAT WORK ORDER: 22T909012

PROJECT: 1-20-0109-01(7200 Leslie St.)

CLIENT NAME: TERRAPROBE INC.

ATTENTION TO: Hasanus Rashid

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
3989971	BH3, SS6	ON T1 S RPI/ICC	Corrosivity Package	Electrical Conductivity (2:1)	mS/cm	0.57	0.876

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPROBE INC.

PROJECT: 1-20-0109-01(7200 Leslie St.)

SAMPLING SITE:Thornhill

AGAT WORK ORDER: 22T909012

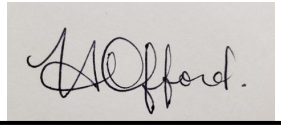
ATTENTION TO: Hasanus Rashid

SAMPLED BY:DH

Rock Analysis

RPT Date: Jun 27, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(283-042) Sulfide (CGY)															
Total Sulfur	1	3921391	0.36	0.40	10.1%	< 0.01	104%	90%	110%						
Sulfate	3989971	3989971	<0.01	<0.01	0.0%	< 0.01	90%	80%	120%						

Certified By:



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SAMPLING SITE:Thornhill

AGAT WORK ORDER: 22T909012

ATTENTION TO: Hasanus Rashid

SAMPLED BY:DH

Soil Analysis

RPT Date: Jun 27, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Corrosivity Package															
Chloride (2:1)	3990186		30	30	0.0%	< 2	94%	70%	130%	103%	80%	120%	109%	70%	130%
Sulphate (2:1)	3990186		89	88	1.1%	< 2	99%	70%	130%	102%	80%	120%	113%	70%	130%
pH (2:1)	3992125		9.60	9.58	0.2%	NA	100%	80%	120%	NA			NA		
Electrical Conductivity (2:1)	3992125		0.391	0.396	1.3%	< 0.005	94%	80%	120%	NA			NA		
Redox Potential 1	3989971						100%	90%	110%	NA			NA		

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

Amanjot Bhela

CHARTERED CHEMIST AMANJOT BHELA — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

AGAT Laboratories

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CALGARY, ALBERTA
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Method Summary

CLIENT NAME: TERRAPROBE INC.

AGAT WORK ORDER: 22T909012

PROJECT: 1-20-0109-01(7200 Leslie St.)

ATTENTION TO: Hasanus Rashid

SAMPLING SITE:Thornhill

SAMPLED BY:DH

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE
Resistivity (2:1) (Calculated)	INOR-93-6036	McKeague 4.12, SM 2510 B,SSA #5 Part 3	CALCULATION
Redox Potential 1	INOR-93-6066	G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 2	INOR-93-6066	G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE
Redox Potential 3	INOR-93-6066	G200-20, SM 2580 B	REDOX POTENTIAL ELECTRODE

AGAT Laboratories

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 22T909012

Cooler Quantity: 1 box

Arrival Temperatures: 15.3 | 13.8 | 17.1

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: No Ice

Report Information:

Company: Terraprobe Inc.

Contact: Hasanwr Rashid

Address: 11 Indell Lane Brampton, Ontario L6T 3Y3

Phone: 905-796-2650 Fax:

Reports to be sent to:

1. Email: hrashid@terraprobe.ca

2. Email:

Regulatory Requirements:

(Please check all applicable boxes)

☑ Regulation 153/04 — Table (Indicate One): ☐ Ind/Com ☐ Res/Park ☐ Agriculture; Soil Texture (Check One): ☐ Coarse ☐ Fine

☐ Excess Soils R406 — Table (Indicate One)

☐ Regulation 558

☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm — Region

☐ Prov. Water Quality Objectives (PWQO)

☐ Other — Indicate One

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT (Most Analyses) ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT

TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 1-20-0109-01 (7200 leslie St.)

Site Location: Thornhill

Sampled By: DH

AGAT ID #: PO: 1-20-0109-01

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:

Contact:

Address:

Email: lrossi@terraprobe.ca

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y / N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: Total PCBs ☐ Aroclor	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	corrosivity with sulphide test.							Potentially Hazardous or High Concentration (Y/N)
BH3, SS6	June 6	AM PM	2	Solid													X	X						
BH5, SS7	June 7	AM PM	2	Solid													X	X						
BH7, SS8	June 7	AM PM	2	Solid													X	X						
BH9, SS4	June 8	AM PM	2	"													X	X						
BH14, SS5	June 8	AM PM	2	"													X	X						
BH17, SS3	June 7	AM PM	2	"													X	X						
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Hasanwr Rashid	June 16	10.30am	Anthony Daniels		

22 JUN 16 2:45PM

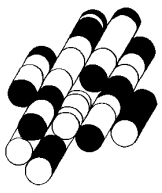
Page _____ of _____

N:

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

APPENDIX M

TERRAPROBE INC.



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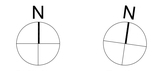


Project North | True North

DRAWING LIST

DWG#	DRAWING SHEET TITLE	PHASE	SCALE	ISSUED FOR OPA/ZBA					
ARCHITECTURAL									
A0.00	COVER PAGE & DRAWING LIST		N.T.S	●					
A0.01	SITE AERIAL / CONTEXT PLAN / SITE STATS		N.T.S	●					
A1.00	MASTERPLAN		1:1250	●					
A1.00a	MASTERPLAN		1:750	●					
A1.01	PROPOSED SITE PLAN		1:500	●					
A2.00	GROUND FLOOR PLAN		1:200	●					
A2.01	FLOOR PLAN -1		1:200	●					
A2.02	FLOOR PLAN -2		1:200	●					
A2.03	FLOOR PLAN -3		1:200	●					
A3.00	NORTH ELEVATION		1:200	●					
A3.01	SOUTH ELEVATION		1:200	●					
A3.02	EAST ELEVATION		1:200	●					
A3.03	WEST ELEVATION		1:200	●					
A4.00	EAST-WEST SECTION		1:200	●					
A4.01	EAST-WEST SECTION		1:200	●					

Rev.	Issue / Description	Date
1	ISSUED FOR OPA & ZBA	September 15, 2022

Architect of Record:

HARIRI PONTARINI ARCHITECTS

235 Carlaw Avenue
Suite 201
Toronto, Canada M4M 2S1
TEL 416 929 4901
FAX 416 929 8924
info@hp-arch.com
hariripontarini.com

Project Title:

Bahá'í National Centre and Temple

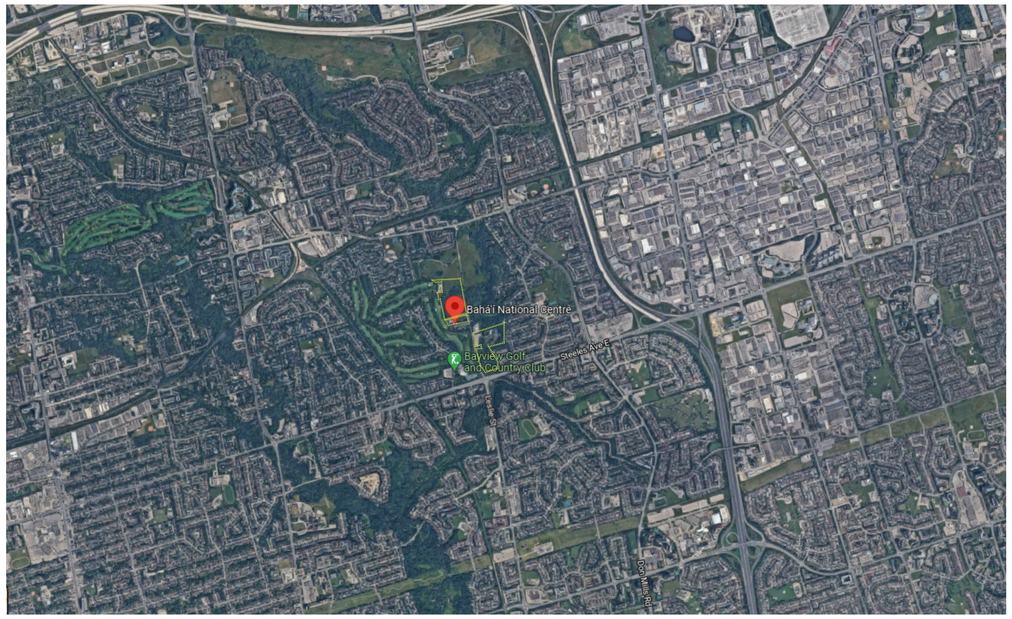
7200 Leslie St, Thornhill, ON L3T 6L8

Cover page & Drawings list

Project number: 1709
Scale:
Date: September 15, 2022
Drawn by: HPA

Drawing No.: Revision:

A0.00



HARIRI PONTARINI ARCHITECTS

Project Name Bahá'í National Centre and Temple Proposal
Project No. 1709

SITE STATISTICS

7015 - 7200 Leslie St, Thornhill, ON L3T 6L8

Proposed Uses:
Lot 1: Place of Worship Administration / Institutional
Lot 2+3: Cultural / Place of Worship

	LOT1	LOT 2+ Lot 3
Lot Area (Within City of Markham Property)	11548.5 sqm	56404.7 + 16743.6= 73148.3sqm
Lot Depth	191 m	215m
Setbacks:		
From Staked Top of Bank	N/A	10m
Proposed Minimum Yard	N: 1m; S: 4.8m; E: 6.8m; W: 6m	S: 3.4m; W: 6m
Lot Coverage	24%	4%
Landscaped Open Space	6487.0 sqm	32587.0 sqm
Open Space %	56%	77%
Ancillary Bdg Area	0.0 sqm	249.0 sqm
Bdg Area (Ground Fl Area)	2775.0 sqm	1316.0 sqm
Gross Floor Area (Total All Fl)	5163.0 sqm	1774.6 sqm
No.Parking Spaces	152 spaces	50 spaces
No. of Accessible Parking Spaces	8	3
Building Height	5.20 m	30.00 m
Driveway Width at Property Line	11.00 m	13.50 m

These statistics/numbers are preliminary.

General Notes:

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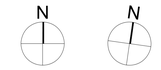

Project North | True North

Rev.	Issue / Description	Date
1	ISSUED FOR OPA & ZBA	September 15, 2022

Architect of Record:
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235 Carlaw Avenue
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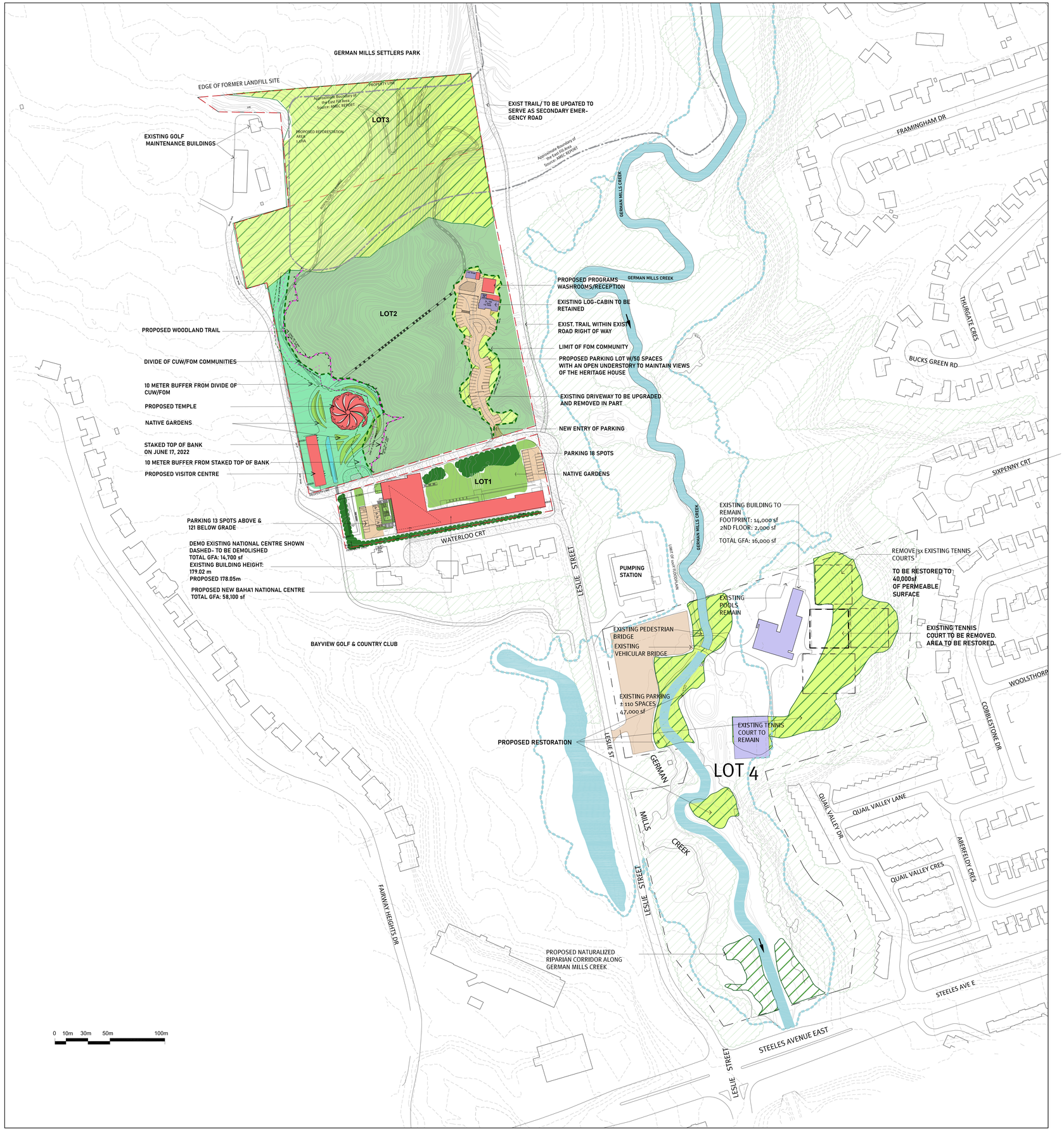
FAX 416 929 8924
info@hp-arch.com
hariripontarini.com

Project Title:
Bahá'í National Centre and Temple
7200 Leslie St, Thornhill, ON L3T 6L8

Site Aerial
Context Plan
Site Statistics

Project number: 1709
Scale:
Date: September 15, 2022
Drawn by: HPA

Drawing No.: A0.01
Revision:



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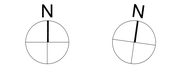

Project North | True North

LEGEND:

- Cultural Woodland (Former orchard/ plantation)
- Native Gardens
- Existing Woodland Areas Survey with TRCA
- Existing Woodland Areas (approximately)
- Hedgerow
- Landscape Restoration and Enhancement Area
- Proposed Buildings
- Proposed Parking Areas
- Existing Buildings To Be Retained Within Property
- TRCA Regulatory Floodplain
- Subject Property Boundaries
- Staked Top of Bank On June 17,2022
- 10 Meter Buffer From Staked Top Of Bank
- Divide of CUW/FOM Communities & Limit of FOM Community
- 10 Meter Buffer From Divide of CUW/FOM Communities

Rev.	Issue / Description	Date
1	ISSUED FOR OPA & ZBA	September 15, 2022

Architect of Record:

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Masterplan

Project number:	1709
Scale:	1:1250 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A1.00

Revision:

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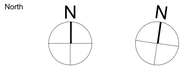

LEGEND:

- Cultural Woodland (Former orchard/ plantation)
- Native Gardens
- Existing Woodland Areas Survey with TRCA
- Existing Woodland Areas (approximately)
- Hedgerow
- Landscape Restoration and Enhancement Area
- Proposed Buildings
- Proposed Parking Areas
- Existing Buildings To Be Retained Within Property
- TRCA Regulatory Floodplain
- Subject Property Boundaries
- Staked Top of Bank On June 17,2022
- 10 Meter Buffer From Staked Top Of Bank
- Divide of CUW/FOM Communities & Limit of FOM Community
- 10 Meter Buffer From Divide of CUW/FOM Communities

Rev.	Issue / Description	Date
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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Masterplan

Project number: 1709
Scale: 1:750 @ A0
Date: September 15, 2022
Drawn by: HPA

Drawing No.: A1.00a

Revision:

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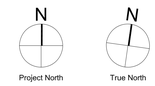

LEGEND:

- Existing Trees to Remain
- Existing Trees In Poor Condition
- Existing Trees to be Removed
- Proposed Trees
- Top of Slope
- Limit of Cultural Woodland

Rev.	Issue / Description	Date
1	ISSUED FOR OPA & ZBA	September 15, 2022

Architect of Record:

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235 Carlaw Avenue
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hariripontarini.com

Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Site Plan

Project number: 1709
Scale: 1:500 @ A0
Date: August 23, 2022
Drawn by: HPA

Drawing No.: A1.01

Revision:

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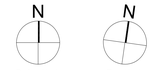

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Project Title:

Bahá'í National Centre and Temple

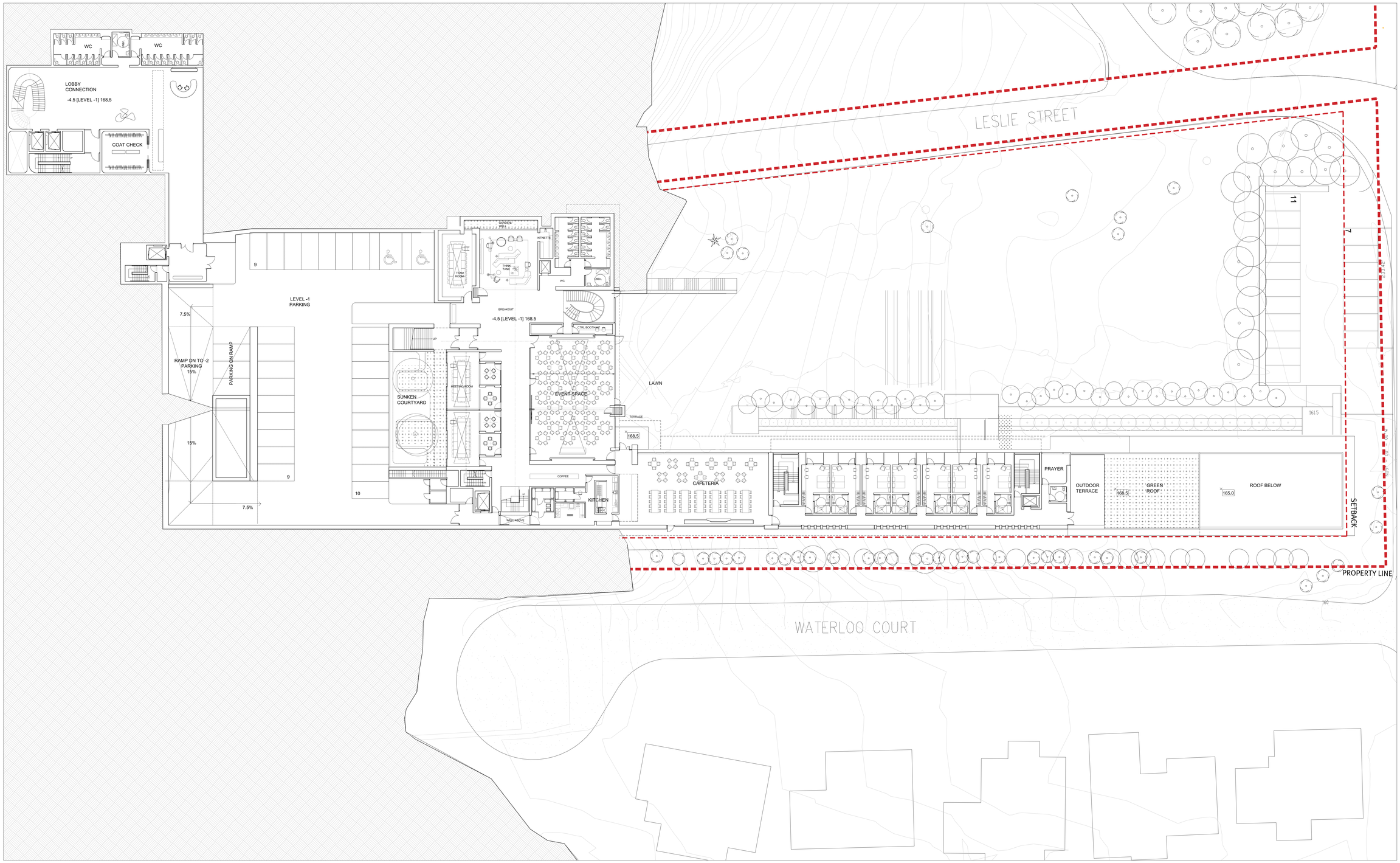
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
Ground Floor Plan

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.00

Revision:



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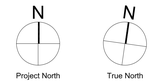

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Floor Plan -1

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.01

Revision:

General Notes:

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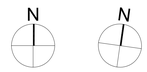

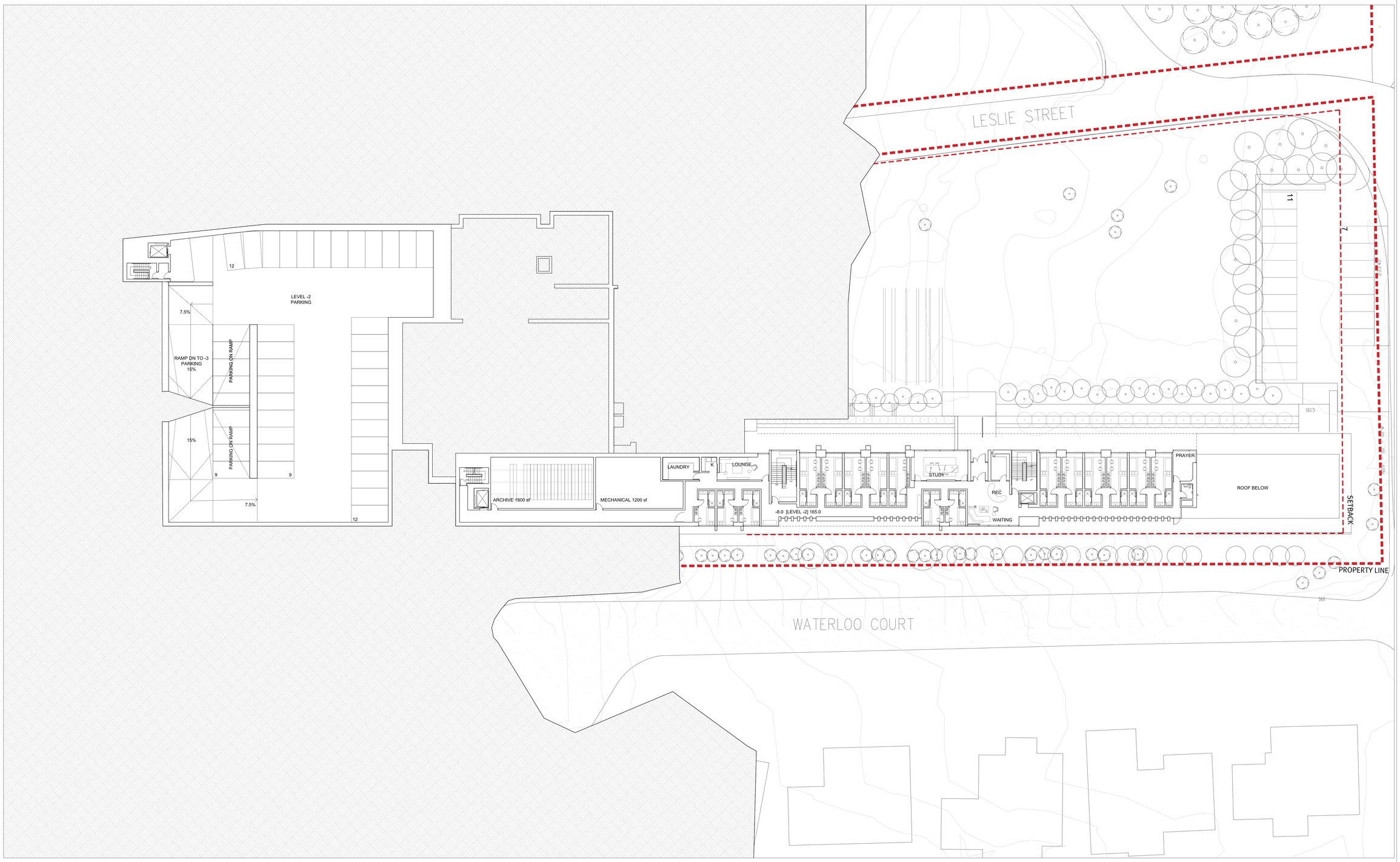

Rev.	Issue / Description	Date
1	ISSUED FOR OPA & ZBA	September 15, 2022

Architect of Record:

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Project Title:

Bahá'í National Centre and Temple

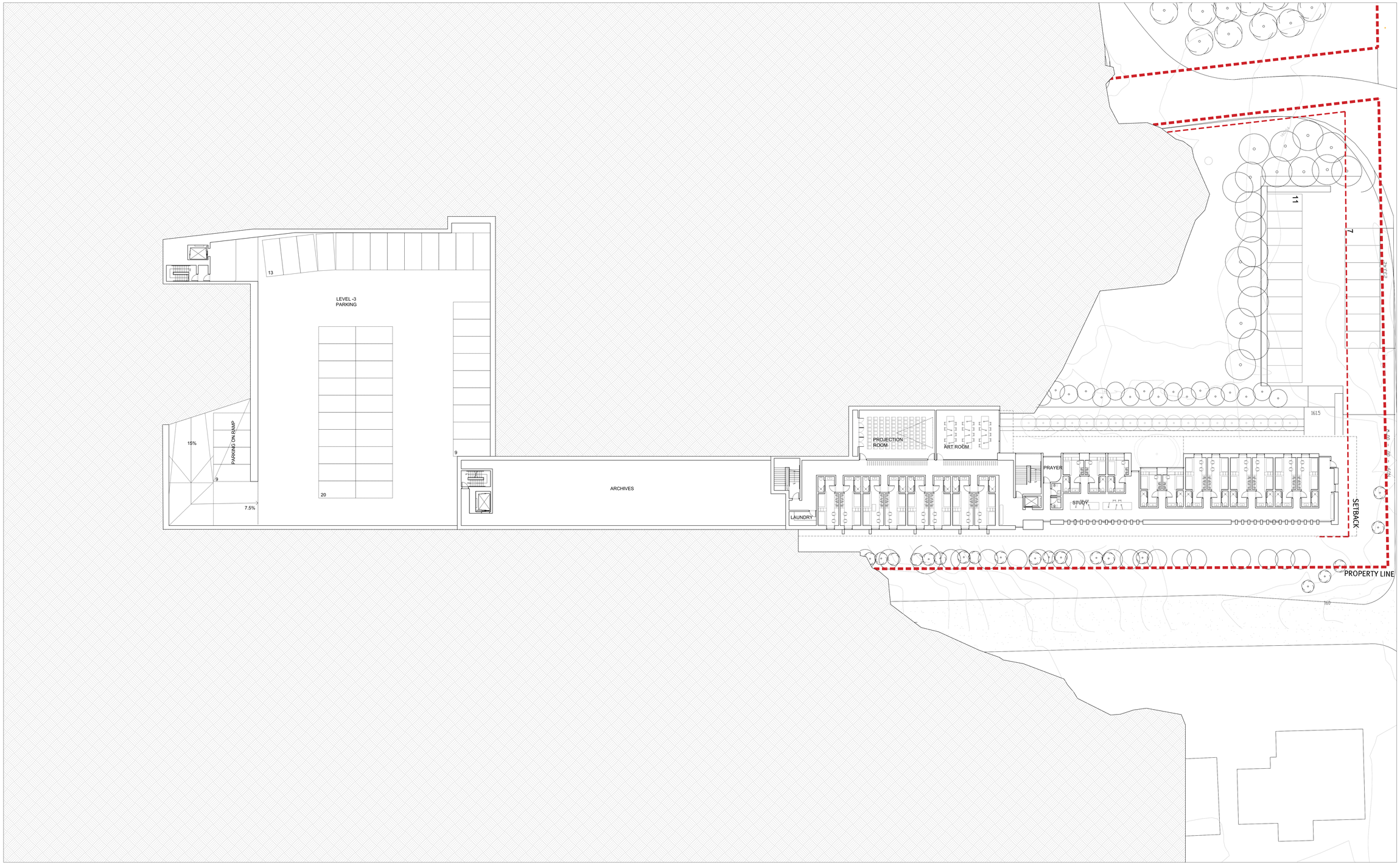
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Floor Plan -2

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.02

Revision:



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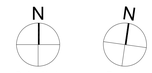

Project North | True North

Rev.	Issue / Description	Date
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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre Floor Plan -3

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.03

Revision:

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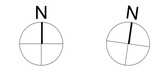

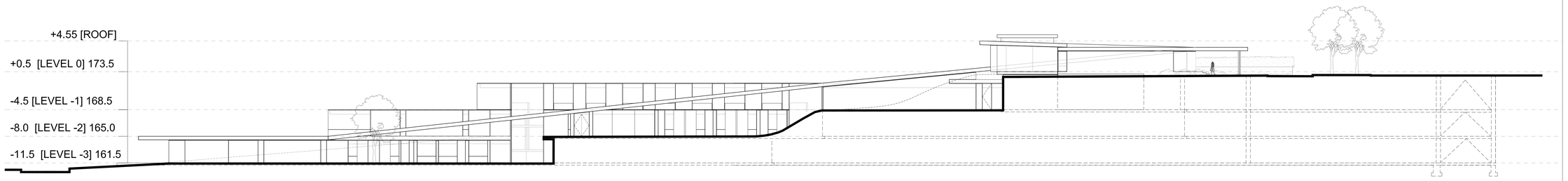

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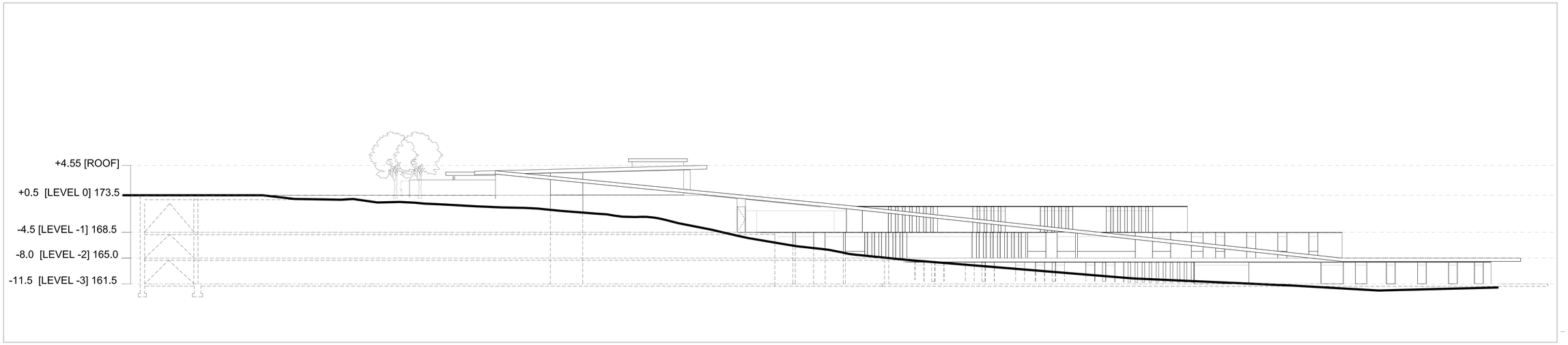
Project Title:
Bahá'í National Centre and Temple
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
NORTH ELEVATION

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A3.00
Revision:



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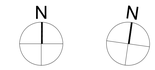

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Project Title:

Bahá'í National Centre and Temple

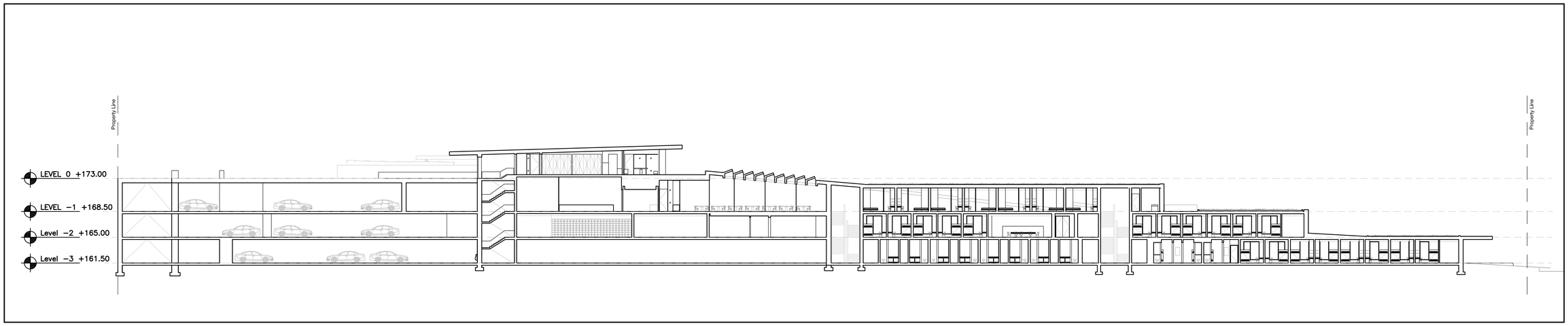
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
SOUTH ELEVATION

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A3.01

Revision:



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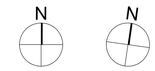

Project North True North

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Project Title:

Bahá'í National Centre and Temple

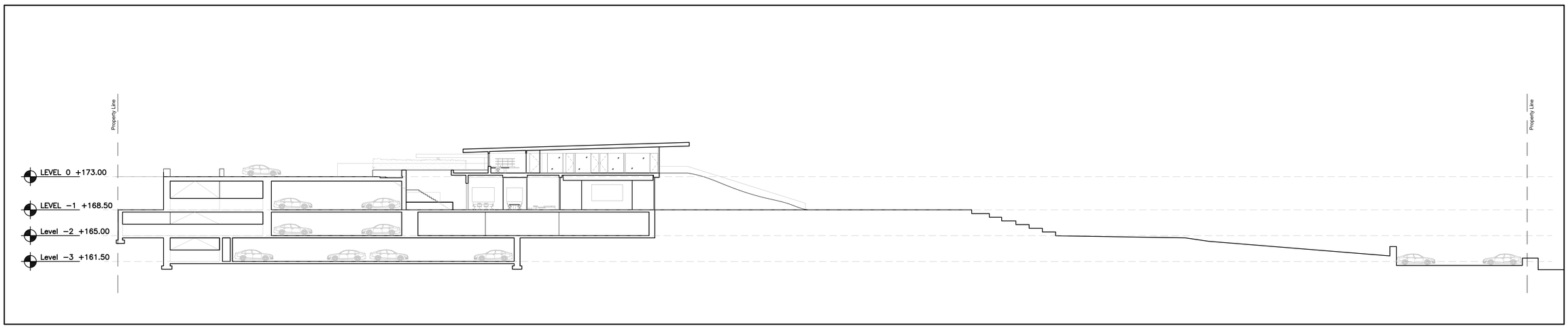
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
EAST-WEST SECTION

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: Revision:

A4.01



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Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
EAST-WEST SECTION

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
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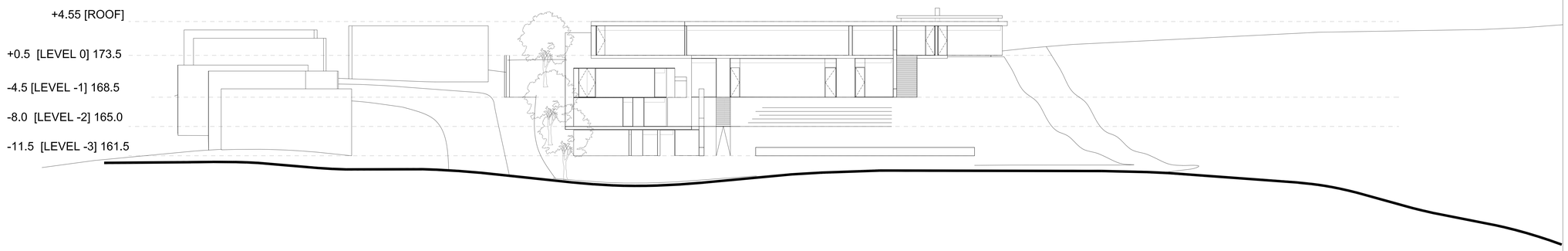
Drawing No.: Revision:

A4.00



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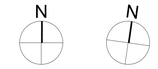

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
EAST ELEVATION

Project number: 1709
Scale: 1:200 @ A0
Date: September 15, 2022
Drawn by: HPA

Drawing No.: Revision:

A3.02

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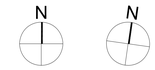

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Project Title:

Bahá'í National Centre and Temple

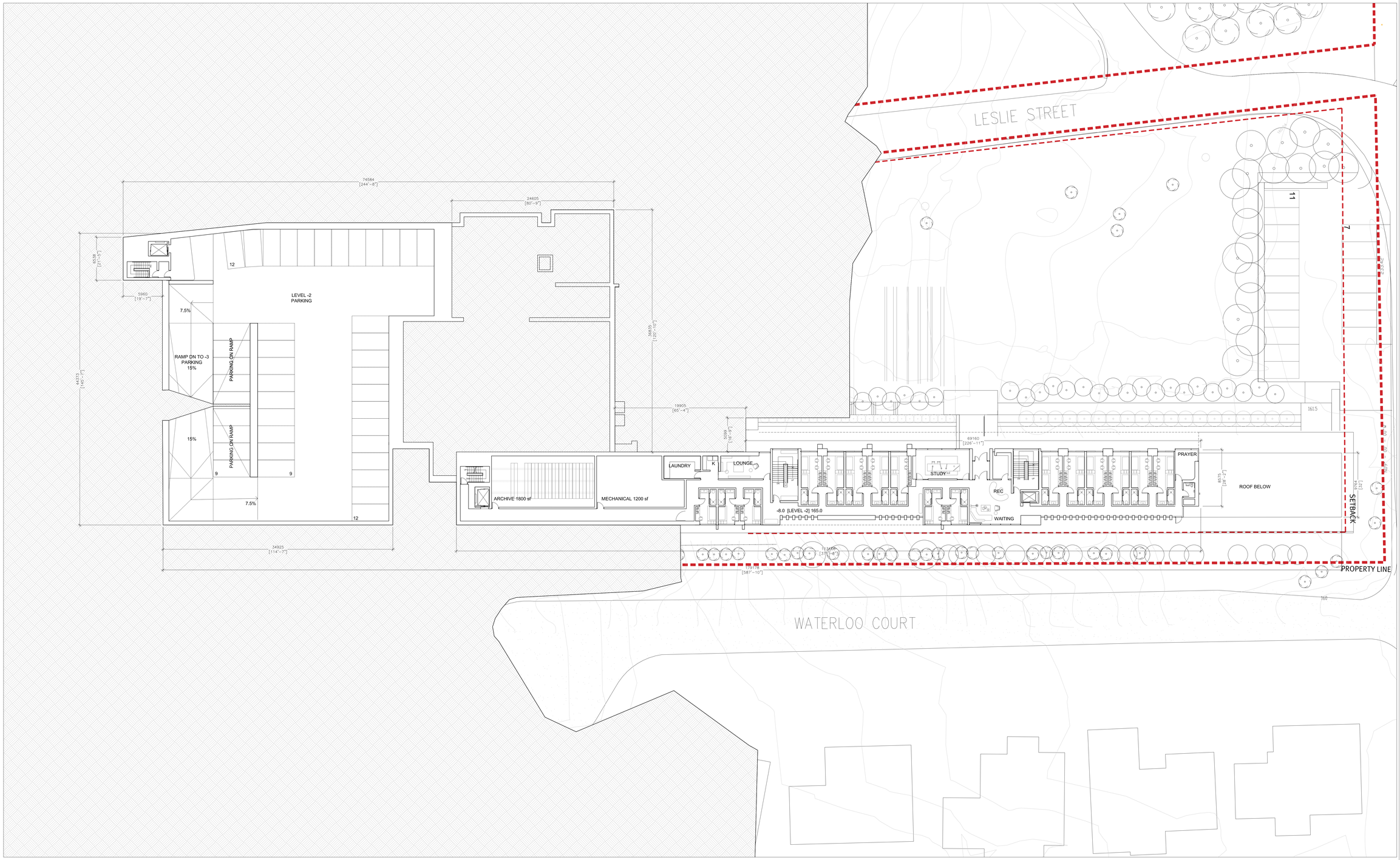
7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
WEST ELEVATION

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A3.03

Revision:



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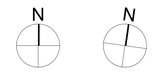

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
Floor Plan -2

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
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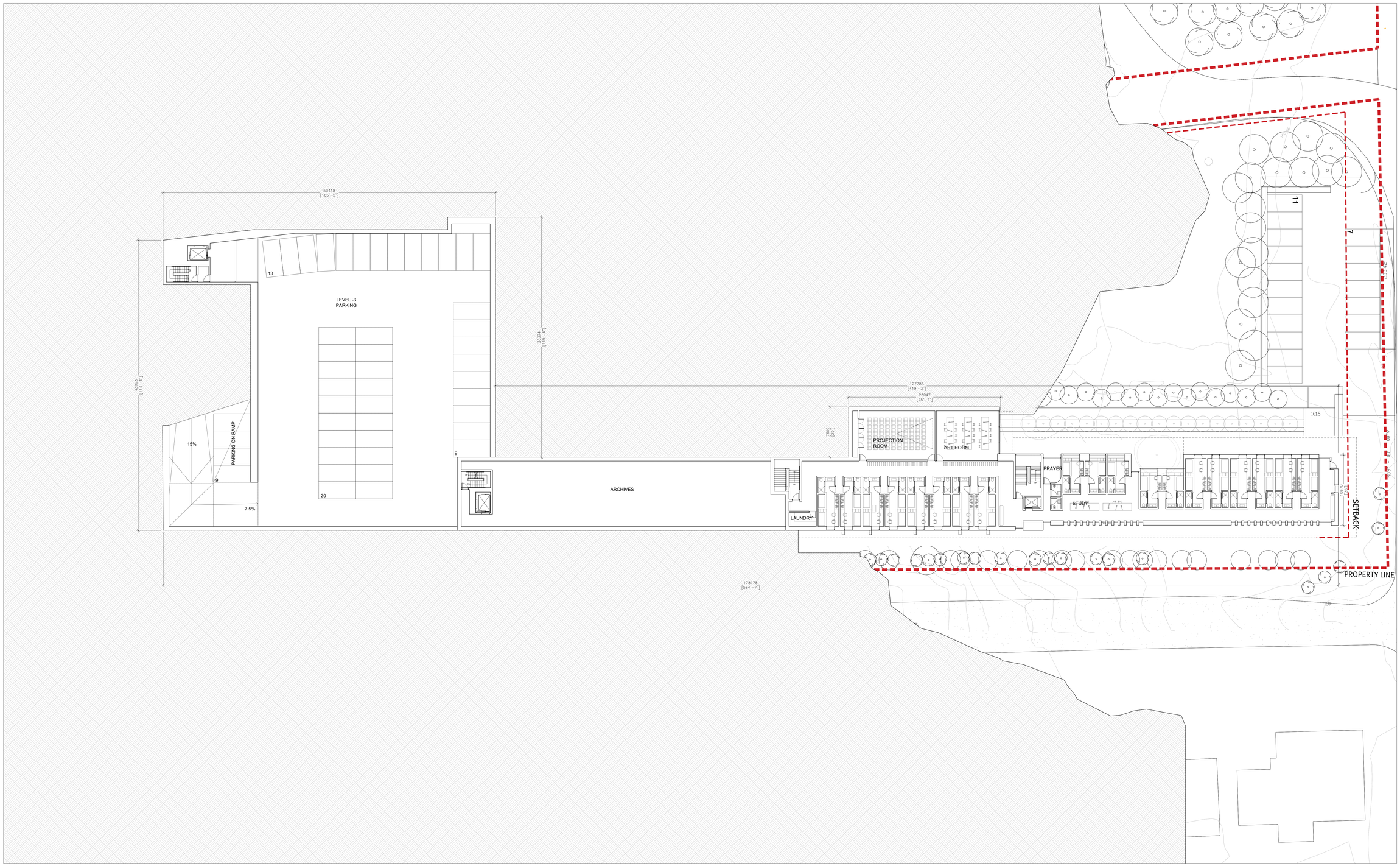
Drawing No.: Revision:

A2.02



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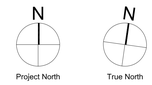

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
Floor Plan -3

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.03

Revision:

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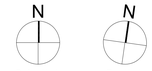

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
Ground Floor Plan

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.00

Revision:

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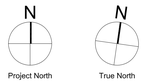

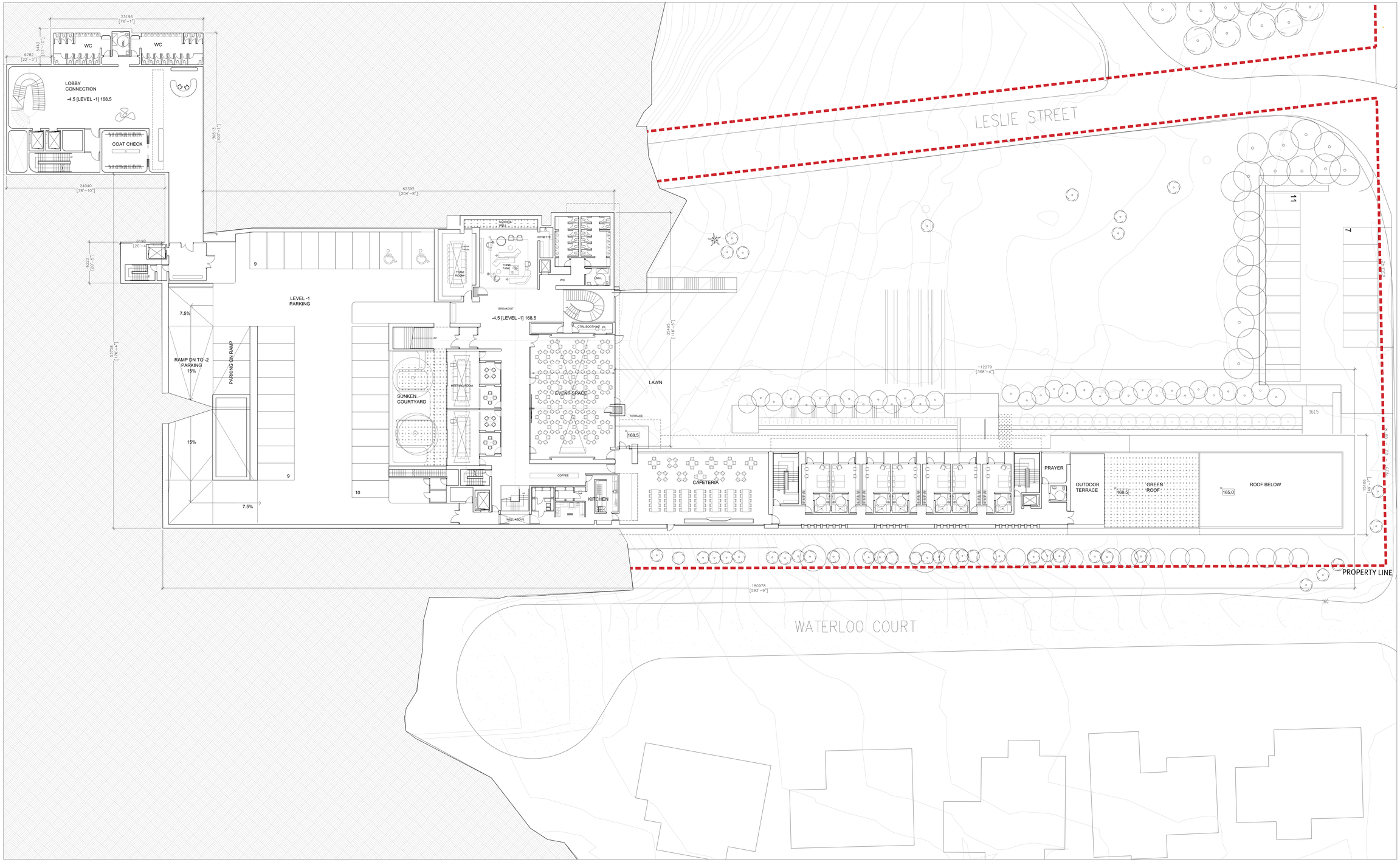

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Project Title:

Bahá'í National Centre and Temple

7200 Leslie St, Thornhill, ON L3T 6L8

New Bahá'í National Centre
Floor Plan -1

Project number:	1709
Scale:	1:200 @ A0
Date:	September 15, 2022
Drawn by:	HPA

Drawing No.: A2.01

Revision: