GEOTECHNICAL INVESTIGATION REPORT

Proposed Mixed-Use Development
15 and 17 Elm Street
Toronto, Ontario

August 5, 2022

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PROJECT # CT3453.00

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APPENDICES

1 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) has been retained by 17 Elm Limited Partnership to carry out a geotechnical investigation for the proposed development of a 25 to 30-storey building constructed over 2 to 3 levels of underground parking garage at the property with the municipal addresses of 15 and 17 Elm Street, Toronto, Ontario (the Site). It should be noted that at the time of field investigation the site only included 17 Elm Street. The Client later acquired the neighbouring property at 15 Elm Street.

Authorization to proceed with the study was given by Mr. Lyle Levine of Elm Limited Partnership.

The purpose of this investigation was to characterize the underlying soil and groundwater conditions, to determine the relevant geotechnical properties of encountered soils and to provide recommendations for the proposed development, including foundation type and design, temporary shoring, basement slab construction, seismic site classification, etc.

The geotechnical investigation was carried out in conjunction with the environmental site assessment undertaken by **Terrapex**, and hydrogeological assessment undertaken by GEMS Environmental, the findings of which are reported under separate covers.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the owner and the design architects or engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

2 FIELD WORK

The field work for this study was carried out within the property of 17 Elm Street during the period March 2 to March 16, 2022 for the exterior boreholes and during May 9 to May 10, 2022 for the interior boreholes. It consisted of four (4) boreholes at four (4) locations, advanced by a drilling contractor commissioned by **Terrapex**. The boreholes are designated as MW101 through MW104. The boreholes were advanced to depths ranging from 10.6 m to 20.5 m below ground surface (mbg). Bedrock coring was carried out at Boreholes MW101 and MW102 to the depths of 19.8 and 20.3 mbg, respectively

Monitoring wells were installed in all the boreholes for long-term monitoring of the groundwater table necessary for the Environmental and Hydrogeological Assessments.

The locations of the boreholes and monitoring wells are shown on Figure 1 ‘Borehole Location Plan’ in Appendix B. The borehole log sheets are enclosed in Appendix C of this report.

Standard penetration tests were carried out in the course of advancing Boreholes MW101 and MW102 to take representative soil samples and to measure penetration index values (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler through 300 mm depth increments was recorded and these are presented on the logs as penetration index values. Boreholes MW103 and MW104 were advanced by direct push technique.

Groundwater level observations were made by Terrapex in the monitoring wells on May 26 and 30, and June 1, 2022.

The geodetic ground surface elevations at the locations of the boreholes and monitoring wells were measured using a Total Station unit, with reference to an geodetic benchmark established in Lane West Yonge South Elm, using a Topcon GPS unit.

The field work for this project was carried out under the supervision of an experienced technician from this office who laid out the positions of the boreholes in the field; arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

3 LABORATORY TESTS

The soil samples recovered from the split spoon sampler were properly sealed, labelled and brought to our laboratory. They were visually classified and water content tests were conducted on all samples retained from Boreholes MW101 and MW102. The results of the classification, water contents, and Standard Penetration tests are presented on the borehole log sheets in Appendix C.

Grain-size analyses were carried out on three (3) soil samples (MW102 Samples 5, 11 and 14). Out of the above, Atterberg Limits tests were carried out on samples 5 and 11. The results of these tests are enclosed in Appendix D as Figures 1 through 4.

In addition, two (2) soil samples, MW102 Samples 16 and 21 were submitted to AGAT Laboratories for the determination of pH and sulphate content and its potential for sulphate attack on buried concrete. The results of these tests are enclosed in Appendix E and discussed in Section 5.10 of this report.

4 SITE AND SUBSURFACE CONDITONS

Full details of the subsurface soil and groundwater conditions at the site are given on the Borehole Log Sheets attached in Appendix C of this report.

The following paragraphs present a description of the site and a commentary on the engineering properties of the various soil materials encountered in the boreholes.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1. SITE DESCRIPTION

The Site is situated south of Elm Street, approximately 65 m east of Yonge Street. It is bound by Elm Street to the north, Harry Barberian Lane to the east, Lane West Yonge South Elm to the south, and a high-rise building to the west. The number of underground levels of the neighbouring high-rise building was not known to Terrapex at the time of preparation of this report. The Site is rectangular shaped, spanning approximately 790 m^2. It is occupied by a two storey and a single storey commercial building.

The site is relatively flat, with the ground surface elevations at the borehole locations ranging from 95.4 to 95.6 m.

4.2. Ground Cover

Concrete pavement was encountered at all boreholes with a thickness of 75 mm to 150 mm. No granular bedding was observed underlying the concrete slabs.

4.3. FILL MATERIAL

Fill material is present below the concrete slabs in all boreholes, extending from 1.7 m to 2.6 m below the existing grade. The fill material consists of silty sand, trace gravel, with some clay in MW101, underlying the concrete slab.

The fill is brown in colour and moist to wet in appearance. The water content of the samples of fill obtained from Boreholes MW101 and MW102 range from 19% to 29% by weight. SPT in the fill provided N-values ranging from 2 to 6, indicating a very loose to loose compactness.

4.4. NATIVE SOIL

The native soils below the fill material consist of silty clay till to sandy silt till, underlain by shale bedrock.

4.4.1 SILTY CLAY TILL

Silty clay till with trace sand and gravel is present below the fill material in all boreholes from depths of 1.7 m to 1.9 mbg, and extending to 8.3 m to 8.5 mbg, and again from 11.5 m to 15.4 mbg, where weathered shale was encountered. An interbedded thin layer of sand was encountered within the silty clay till layer, at 9.15 m depth, with an approximate thickness of 0.3 m.

The silty clay till layer is brown in colour, becoming grey below the depths of 2.3 m to 3.7 mbg. The water content of samples obtained from Boreholes MW101 and MW102 range from 11% to 24% by weight; moist to wet in appearance.

SPT carried out in the till provided N-values ranging from 4 to 50 blows for 125 mm of penetration, more commonly between 4 to 18 blows for 300 m penetration, indicating a generally firm to very stiff consistency.

Grain size analyses were carried out on two (2) representative silty clay till samples. The test results are enclosed in Appendix D as Figures 1 and 2 and summarized in the following table.

Sample No. and Depth	Sample Description	Gravel %	Sand %	Silt %	Clay %
MW102 Sample 5; 3.1 m	SANDY SILTY CLAY, trace gravel	2	22	49	26
MW102 Sample 11; 6.8 m	SILTY CLAY	0	1	58	41

Atterberg Limits tests conducted on samples 5 and 11 revealed that the silty clay till has Liquid Limits of 29.5 and 41.7 and Plasticity Indices of 14.3 and 24.3, indicating that the soil has a low to medium plasticity. The test results are enclosed in Appendix D as Figure 4.

Based on the results of the grain size analyses, the Coefficient of Permeability (k) of the silty clay till is estimated to be approximately 1 x 10^{-8} cm/sec, corresponding to very low relative permeability.

4.4.2 SANDY SILT TILL

A sandy silt till layer was encountered within the silty clay till deposit, extending from 8.5 m to 11.5 mbg. The layer contains trace to some clay.

The sandy silt till deposit is grey in colour in MW101 and MW102. The water content of samples obtained from MW101 and MW102 range from 15% to 25% by weight, moist to wet in appearance.

SPT carried out in the till deposits provided N-values ranging from 14 to 23 blows for 300 mm of penetration, indicating a generally compact condition.

Grain size analysis were carried out on a representative sandy silt till sample. The test result is enclosed in Appendix D as Figure 3 and summarized in the following table.

Sample No. and Depth	Sample Description	Gravel %	Sand %	Silt %	Clay %
MW102 Sample 14; 9.9 m	SILT AND FINE SAND, some clay	0	50	39	11

Based on the results of the grain size analyses, the Coefficient of Permeability (k) of the sandy stilt till is estimated to be approximately, 3×10^{-7} cm/sec, respectively corresponding to low relative permeability.

4.4.3 SHALE BEDROCK

The native soils are underlain by bedrock, consisting predominately of grey shale with limestone and siltstone interbedding. The rockhead is found to lie at an approximate depth of 15.4 mbgs in MW101 and MW102.

Review of the rock core samples in Boreholes MW101 and MW102 revealed the bedrock to be highly to slightly weathered within the top 2 m, becoming fresh from thereafter and intensely to moderately fractured. The engineering properties of the shale are represented by rock quality designation (RQD) values of 21% to 89%. A rock core with an RQD between 25% and 50% is considered to be poor, more than 50% is considered fair, more than 75% is considered good. The limestone and siltstone interbedding varied between 13% and 45%, as shown in the borehole logs.

Unconfined compressive strength (UCS) tests and wet unit weight (γ_w) determinations were completed on four (4) shale bedrock samples. The UCS and γ_w values of the tested shale samples are given below.

Borehole No.	Sample Depth (mbgs) / Elevation (m)	Unconfined Compressive Strength (MPa)	γ_w (kN/m^3)
MW101	16.46 / 79.17	42.8	24.9
MW101	17.65 / 77.98	39.5	25.4
MW102	19.89 / 75.67	15.2	25.1
MW102	18.01 / 77.55	11.3	24.9

The results of the unconfined compression tests carried out on the core samples indicate rock strengths ranging from 11.3 to 42.8 MPa. The test results are enclosed in Appendix D as Figure 5. These test results indicate that the shale may be classified as weak to medium strong. The unit weight of the rock cores ranges from 24.9 to 25.4 kN/m^3. Photos of the rock cores extracted from the boreholes are enclosed in Appendix F.

4.5. GROUNDWATER

Groundwater level measurements were made in the monitoring wells following their installation. Given that mud rotary drilling method was used, groundwater measurement s could not be made during or upon completion of drilling of the boreholes.

The groundwater levels measured in the monitoring wells are shown on the individual borehole logs and are summarized in the following table.

Borehole No.	Ground Surface Elevation (m)	Date	Groundwater Depth (mbgs)	Groundwater Elevation (m)
MW101	95.63	May 26, 2022	9.49	86.14
		May 30, 2022	9.92	85.71
		June 1, 2022	9.56	86.07
MW102	95.56	May 26, 2022	14.51	81.05
		May 30, 2022	14.91	80.65
		June 1, 2022	14.93	80.63
MW103	95.60	May 26, 2022	Not accessible	-
		May 30, 2022	9.70	85.90
		June 1, 2022	9.66	85.94
MW104	95.44	May 26, 2022	Not accessible	-
		May 30, 2022	9.93	85.51
		June 1, 2022	9.66	85.78

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher

groundwater level condition may also develop following significant rainfall events.

5 DISCUSSION AND PRELIMINARY RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the site by **Terrapex** and are intended for use by the client and design architects and engineers only.

We understand that it is proposed to redevelop the site with a 25- to 30-storey building to be constructed over 2 to 3 levels of underground parking garage. It is anticipated that the lowest floor slab of 2 and 3 level underground parking garage would be situated at about 6 and 9 mbgs, respectively. It is also understood that the building will be supported by a raft foundation to facilitate waterproofing of the substructure of the building. It is anticipated that the underside of the raft foundation will be situated about 2.5 m below the lowest parking floor slab at approximate elevations of 87 and 84 m, for 2 and 3 levels of underground parking, respectively.

The construction methods described in this report are not specifications or recommendations to the contractors or as the only suitable methods. The collected data and the interpretation presented in this report may not be sufficient to assess all the factors that may influence the construction. Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations as they might deem necessary. The contractor should also select the method of construction, equipment and sequence based on their previous experience on similar projects.

5.1. EXCAVATION

Based on the field results, excavations for the basement and foundations are not expected to pose any unusual difficulty. Excavation of the soils at this site can be carried out with hydraulic excavators.

All excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA). With respect to the OHSA, the fill materials are expected to conform to Type 3 soils. The native clayey silt till and sandy silt till deposits are expected to conform to Type 2 soils. Sand and silt soils, if encountered within the till deposits are considered Type 3 Soil above the groundwater table and Type 4 Soil below the groundwater table.

Temporary excavation sidewalls in Type 3 soils should not exceed 1.0 horizontal to 1.0 vertical. Temporary excavation sidewalls in Type 2 soils may be cut with vertical sidewalls within the lower 1.2 m height of excavation and 1.0 horizontal to 1.0 vertical above this height. Side slopes of excavations extended into Type 4 soil should not be any steeper than 3.0 horizontal to 1.0 vertical.

In the event very loose and/or soft soils are encountered at shallow depths or within zones of

persistent seepage, it will be necessary to flatten the side slopes to achieve stable conditions.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation sidewalls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

Given the basement/underground parking garage will extend to the property limits, it will be necessary to shore the excavation walls. Shoring recommendations are provided in Section 5.7 of this report.

5.2. GROUNDWATER CONTROL

The general subsurface soil profile at the site consists of fill material underlain by silty clay till to sandy silt till deposits, with seams of sand. Bedrock was encountered at an approximate depth of 15.4 m. As noted in Section 4.5, the groundwater level was measured generally at 9.6 to 14.9 mbg.

With two to three levels of underground parking and anticipation that raft foundation would be used to support the building, it is assumed that the excavation will extend to 8.5 m to 11.5 m below the existing grade, corresponding to approximate geodetic elevations of 87 and 84 m, respectively.

With two levels of underground parking, groundwater level will not be intercepted and as such, any dewatering will be limited to fill material and any potential wet seams of sandy material that may be encountered within till deposit above groundwater level. However, with three levels of underground parking, the excavation will likely extend below the groundwater level and as such, additional groundwater ingress from the till deposit and sand seams is expected.

Groundwater yield from the fill layer is not expected to be significant. The native sandy silt till and silty clay till soils possess low hydraulic conductivities. The groundwater yield from these soils is expected to be small. It is anticipated that adequate control of groundwater can be achieved by pumping from filtered sumps in the base of the excavation.

It will be necessary to completely waterproof the floor slab/raft foundation and the walls of the basement and design them to resist hydrostatic pressure.

Surface water should be directed away from open excavations.

5.3. REUSE OF ON-SITE EXCAVATED SOIL

On-site excavated inorganic soils, and soils free of construction debris and other deleterious materials are considered suitable for reuse as backfill provided their water content is within 2% of their optimum water contents (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with a heavy sheepsfoot compactor.

While the quality of the on-site soils is considered suitable for backfilling; the moisture content of the soils and the lift thickness for compaction must be properly controlled during backfilling. Measured water content within the fill and native soils within the presumed excavation depth generally range from approximately 11 to 25%; typically, being above the optimum water content of the soils.

5.4. FOUNDATION DESIGN

In order to construct the underground parking garage / basement levels to be watertight, it will be necessary to use a raft foundation to support the proposed building.

With 2 to 3 levels of underground parking, the raft foundation is anticipated to be founded at the geodetic elevations of 87m and 84 m, respectively.

Based on the borehole findings, the soil at the anticipated foundation founding levels will generally consist of compact sandy silt till and very stiff silty clay till soils.

The foundation and foundation walls must be designed to resist hydrostatic pressures resulting from water head equivalent to the height of historical high water table from the base of the proposed raft. It will be necessary to maintain the water table below the base of the excavation at all times during construction of the foundation and until such time when the foundation is sufficiently loaded to prevent its uplift.

The bearing resistance of the soil across the site is not sufficient to support the proposed building, accordingly it will be necessary to utilize caisson foundations to support the raft foundation and the building above. The caissons must be extended to elevation 78 m or lower and be founded in sound shale bedrock; designed on the basis of end bearing resistance of 7.0 MPa at SLS and ULS.

The following factored shaft resistances for caissons extended through the overburden soils and shale bedrock can be used to determine axial capacity of the caissons due to shaft skin friction.

Material type	Factored Shaft Resistance
Compact to dense till deposits	80 KPa
Weathered Shale bedrock (top 2 m)	200 kPa
Intact Bedrock (below 2 m)	700 kPa

The uplift resistance of the piles would be 75% of the piles shaft resistance.

The centre to centre spacing between adjoining caissons should not be less than twice the largest diameter (B) of the caissons. The following reduction factors for pile group effects should be applied.

c/c pile spacing	axial capacity efficiency reduction factor
2B to 3B	0.7
3B to 6B	linear interpolation between 0.7 and 1.0

The foundation construction must be closely monitored and inspected by qualified geotechnical personnel to ensure that the founding soil is consistent with the findings of the geotechnical investigation.

5.5. BASEMENT FLOOR SLAB

As raft foundation system will have to be implemented, the floor slab is anticipated to be constructed over an approximately 500 mm thick layer of granular soil such as 19 mm clear stone placed directly over the raft foundation to permit placement of sub-floor drainage piping and other utility lines.

5.6. LATERAL EARTH PRESSURE

Parameters used in the determination of earth pressure acting on structures subject to unbalanced pressures are defined below.

SOIL PARAMETERS

Parameter	Definition	Units
Φ’	angle of internal friction	degrees
γ	bulk unit weight of soil	kN/m^3
Ka	active earth pressure coefficient (Rankine)	dimensionless
Ko	at-rest earth pressure coefficient (Rankine)	dimensionless
Kp	passive earth pressure coefficient (Rankine)	dimensionless

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

SOIL PARAMETER VALUES

SOIL	Parameters				
	Φ'	γ	Ka	Kp	Ko
Fill Material	28°	19.0	0.36	2.77	0.53
Silty Clay Till - Firm	28°	19.0	0.36	2.77	0.53
Silty Clay Till - Stiff to Very Stiff	30°	19.5	0.33	3.0	0.50
Sandy Silt Till - Compact	32°	20.0	0.31	3.25	0.47

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

$$\mathbf{P = K (\gamma h + q)}$$

where **P** = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient (Use Ko for basement wall design)

γ = bulk unit weight of backfill (kN/m^3)

h = height at any point along the interface (m)

q = the complete surcharge loading (kPa)

This equation assumes that free-draining backfill and positive drainage is provided behind the basement walls.

Subsurface walls that are subject to unbalanced earth and hydrostatic pressures must be designed to resist a pressure that can be calculated based on the following formula:

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

where **P** = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient

H = height at any point along the interface (m)

$\mathbf{h_w}$ = depth below the groundwater level at point of interest (m)

γ = bulk unit weight of backfill (kN/m^3)

γ' = the submerged unit weight (kN/m^3) of exterior soil ($\gamma' = \gamma - \gamma_w$)

γ_w = unit weight of water, assume a value of 9.8 kN/m^3

q = the complete surcharge loading (kPa)

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (R) depends on the normal load on the soil contact (N) and the frictional resistance of the soil (tan Φ') expressed as: **R = N tan Φ'**. This is an ultimate resistance value and does not contain a factor of safety.

5.7. SHORING DESIGN

A soldier-pile and timber lagging wall system may be used as the shoring system for the basement excavation wall. Based on proximity to neighbouring structures the shoring designer may choose to use caisson wall system to limit the lateral earth movement due to excavation.

The design of temporary shoring for the support of the excavation walls must account for the presence of structures and buried services on the adjacent properties, and the existing subsurface conditions at the site.

The lateral restraining force for the shoring system may be provided by employing either rakers or tieback anchors. The latter is favorable because they do not protrude into the excavations as is the case with rakers. The use of tieback anchors will depend on whether permission is obtained to extend the anchors to the required distance on to the neighboring properties.

Provisions should be made to install temporary liners for the excavation of the soldier pile holes. The shoring contractor must also provide construction method(s) to overcome any groundwater seepage into the pile holes during excavation and subsequent concreting of the piles to comply with good construction practice.

The shoring design should be based on the procedure detailed in the latest edition of the Canadian Foundation Engineering Manual.

The earth pressure coefficients applicable for the design of the shoring system are:

= $\mathbf{K_o}$ the 'at rest' earth pressure coefficient, applicable where no movement in the retained soil can be permitted, such as the presence of buried services or foundations close to the wall, = 0.45

= $\mathbf{K_a}$ the active pressure coefficient,

= 0.4 - where adjacent building footings or buried services fall within an envelope formed by a 60° line drawn from the base of the excavation wall to the ground surface

= 0.3 - where adjacent building footings or buried services fall outside an envelope formed by a 60° line drawn from the base of the excavation wall to the ground surface

= 0.25 - where adjacent building footings or buried services are outside an envelope formed by a 45° line drawn from the base of the excavation wall to the ground surface

The minimum depth of penetration (d) of soldier piles may be estimated from the following expression:

$\mathbf{R = NB}\ (\frac{1}{2}\gamma \mathbf{d^2 K_p})$

where **R** = required toe resistance

$\mathbf{K_p}$ = passive earth pressure coefficient

N = factor according to three dimensional effect around an isolated pile,

B = diameter of concrete filled hole

d = required penetration depth

γ = bulk unit weight of soil

Raker footings should be designed in accordance with the design principles for shallow foundations subject to inclined loading. All raker footings should be located outside the zone of influence of the buried portion of soldier piles, and at a distance of no less than 1.5D from the piles, where D = Depth of penetration of the piles below the base of the excavation. No excavation should be made within two footing widths of the raker footings, on the side opposite the rakers.

Anchors extended into native till deposits may be designed based on soil/grout bond value of 50 kPa. This value depends on the anchor installation method and grouting procedures. Gravity poured concrete can result in low bond values, while pressure grouted anchors will give higher values and produce a more satisfactory anchor.

It will be necessary to perform load tests on the tiebacks to confirm the bond stresses assumed in the design of anchors.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical loads on the soldier piles resulting from the inclined tiebacks and inward horizontal movement will result from the earth and water pressures. The magnitude of this movement can be controlled by sound construction practices. The lateral and vertical movement of the shoring system must be monitored especially at locations in which settlement sensitive structures are present, to ensure that movements are kept within an acceptable range.

5.8. PAVEMENT DESIGN

It is anticipated that the majority of the pavement at the site will be situated on the parking garage roof slab. In this regard, the pavement may be comprised of a minimum of 75 mm thick layer of Granular 'A' topped with asphaltic concrete having a minimum thickness of 100 mm (a 40 mm-thick surface course of SP12.5B and 60 mm-thick base course of SP19.5B).

Pavement which will be supported by soil subgrade should comprise a minimum 300 mm compacted depth of OPSS Granular B Type I sub-base, followed by a minimum 150 mm

compacted depth of Granular A base material, 60 mm of SP19.5B asphaltic concrete base course, and 40 mm of SP12.5B asphaltic concrete surface course.

The critical section of pavement will be at the transition between the pavement on subgrade and the pavement above the garage roof slab. In order to alleviate the detrimental effects of dynamic loading / settlement / pavement depression in the backfill to the rigid garage roof structure, it is recommended that an approach type slab be constructed at the entrance/exit points, by extending the granular sub-base to greater depths along the exterior garage wall.

5.9. EARTHQUAKE DESIGN PARAMETERS

The Ontario Building Code (2006) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.18.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the Ontario Building Code (2006). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (vs) measurements have been taken. In the absence of such measurements, the classification is estimated on the basis of empirical analysis of undrained shear strength or penetration resistance. The applicable penetration resistance is that which has been corrected to a rod energy efficiency of 60% of the theoretical maximum or the (N60) value.

Based on the borehole information, the subsurface stratigraphy generally comprises fill material, followed by compact to very dense sandy silt till and very stiff to hard silt and clay, and very dense sand. Provided that the proposed buildings are founded on dense to very dense native soils, the site designation for seismic analysis is Class C.

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2006 Ontario Building Code - Supplementary Standard SB-1 (August 15, 2006), Table 1.2, location Toronto, Ontario.

5.10. CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

Two (2) native soil samples were obtained from Borehole MW101 (SS16 and SS21) and submitted to AGAT Laboratories for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix E of this report.

The test results revealed that the pH indices of the soil samples are 8.14 and 8.30, indicating a slight alkalinity.

The water-soluble sulphate contents of the tested samples are 0.008% and 0.0115%. The concentration of water-soluble sulphate content of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack are therefore not required for the sub-surface concrete of the proposed building.

6 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

Yours respectfully,
Terrapex Environmental Ltd.

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Vice President, Geotechnical Services

Vic Nersesian, P.Eng.
Senior Geotechnical Engineer

APPENDIX A

LIMITATIONS OF REPORT

LIMITATIONS OF REPORT

This report has been completed in accordance with the terms of reference for this project as agreed upon by Bousfields Inc. (the Client) and Terrapex Environmental Ltd. (Terrapex) and generally accepted engineering consulting practices in this area.

The conclusion and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation. If new or different information is identified, Terrapex should be requested to re-evaluate its conclusions and recommendations and amend the report as appropriate.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for the sole use of Bousfields Inc.. Terrapex accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than Bousfields Inc..The material herein reflects Terrapex's judgement in light of the information available to it at the time of preparation. We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations, or the assumptions made in our analysis. We also recommend that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, Terrapex's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. Contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

APPENDIX B

BOREHOLE LOCATION PLAN

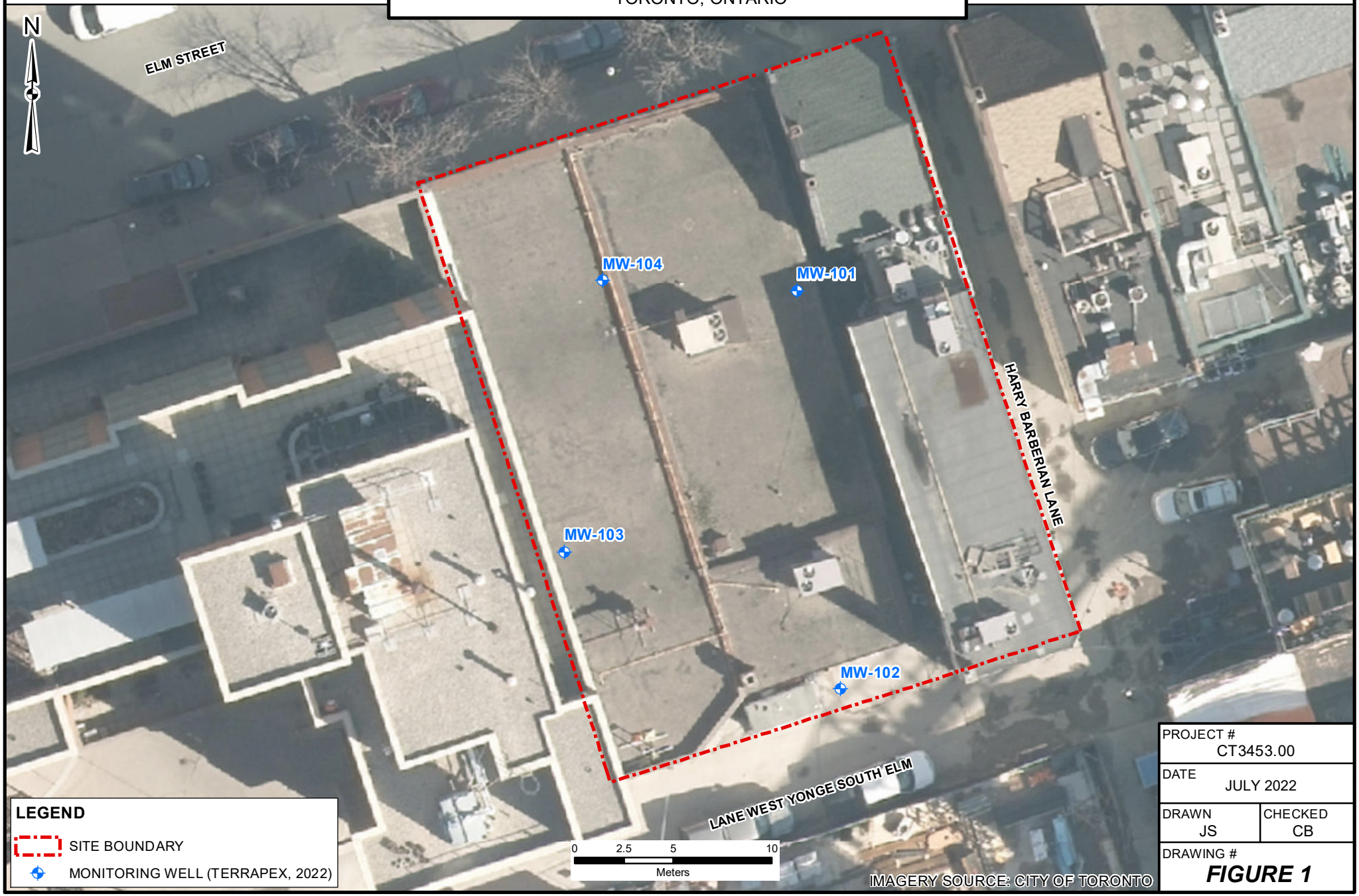
TERRAPEX

GENERAL SITE LAYOUT

15 AND 17 ELM STREET
TORONTO, ONTARIO

CLIENT

17 ELM LIMITED PARTNERSHIP



LEGEND

- SITE BOUNDARY
- MONITORING WELL (TERRAPEX, 2022)

PROJECT #	CT3453.00
DATE	JULY 2022
DRAWN	JS
CHECKED	CB
DRAWING #	**FIGURE 1**

jserroul W:\PROJECTS\Toronto\CT3453.00 17 Elm Street, Toronto\MXD\Phase I\CT3453.00 FIG1 GENERAL SITE LAYOUT.mxd

APPENDIX C

BOREHOLE LOG SHEETS

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW101**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.63
CONTRACTOR: Pontil Drilling	METHOD: Hilti and Mud Rotary	
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: 2 SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) / N-VALUE (Blows/300mm)	WATER CONTENT (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		Concrete (75mm)	0	95.5	2	19	1		12	10p/0p		Bentonite	
		very loose to loose, moist, brown silty sand trace gravel, some clay (FILL)	0.5	95	3	29	2		37	10p/0p			50mm monitoring well was insalled. water level measured on June 1, 2022: 9.57mbgs
			1	94.5									
			1.5	94	6	29	3		50	<5p/0p			
		SILTY CLAY trace gravel, some sand (TILL)	2	93.5	18	21	4		83	15p/1p			
		very stiff moist brown	2.5	93	18	16	5		100	<5p/0p			
		----------	3	92.5	15	20	6		75	<5p/0p			
		stiff ---------- grey	3.5	92									
			4	91.5	9	19	7		95	<5p/0p			
		----------	4.5	91	6	22	8		16	<5p/0p			
			5	90.5	4	20	9		79	<5p/0p			
		firm	5.5	90	5	15	10		45	<5p/0p			
		----------	6	89.5	11	11	11		62	5p/0p			
			6.5	89									
		stiff	7	88.5	11	16	12		79	<5p/0p			
			7.5	88	11	17	13		79	<5p/0p			
		----------	8	87.5	18	14	14		33	15p/0p			Sand
		very stiff	8.5	87									Screen + Sand
		compact, moist, grey SANDY SILT trace gravel, trace to some clay (TILL)	9	86.5	18	16	15		91	<5p/0p			

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 02 March 2022
INPUT BY: RA/EM	MONITORING DATE: 01-Jun-2022
REVIEWED BY: VN	PAGE 1 OF 3

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW101**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.63
CONTRACTOR: Pontil Drilling	METHOD: Hilti and Mud Rotary	
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: 2 SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) ▲ PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		compact, moist, grey SANDY SILT trace gravel, trace to some clay (TILL)	9.5	86	17	22	16		95	<5p/0p			
			10	85.5	14	17	17		91	<5p/0p			
			10.5	85	15	23	18		95	<5p/0p			
			11	84.5	16	24	19		95	<5p/0p			
		very stiff to hard, moist, grey SILTY CLAY trace gravel, some sand (TILL)	11.5	84	18	22	20		91	<5p/0p			
			12	83.5	17	22	21		95	<5p/0p			
		---------- trace shale fragments	12.5	83									
			13	82.5									
			13.5	82									
			14	81.5	31	21	22		100	<5p/0p			
			14.5	81									
			15	80.5	50/125	12	23		64	<5p/0p			
		Georgian Bay Formation Grey Medium Strong SHALE Moderately fractured With limestone/siltstone beddings Hard Layers (%): RC1: 25% RC2: 45% RC3: 38% RC4: 13% RC5: 25%	15.5	80			RC1						TCR= 100% RQD= 67%
			16	79.5			RC2						TCR= 100% RQD= 58%
			16.5	79			RC3						TCR= 97% RQD= 72%
			17	78.5									
			17.5	78			RC4						TCR= 97% RQD= 89%
			18	77.5									
			18.5										

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 02 March 2022
INPUT BY: RA/EM	MONITORING DATE: 01-Jun-2022
REVIEWED BY: VN	PAGE 2 OF 3

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW101**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.63
CONTRACTOR: Pontil Drilling	METHOD: Hilti and Mud Rotary	
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: 2 SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) ▲ PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
			19	77									
				76.5			RC5						TCR= 97% RQD= 87%
			19.5	76									
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: AMD | DRILLING DATE: 02 March 2022

INPUT BY: RA/EM | MONITORING DATE: 01-Jun-2022

REVIEWED BY: VN |

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW102**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.56
CONTRACTOR: Pontil Drilling	METHOD: CME 55, Hollow Stem	
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: 2 SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) / N-VALUE (Blows/300mm)	WATER CONTENT (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		Concrete (150mm)	0	95.5	2	24	1		37	<5p/0p		Bentonite	
		very loose, wet, borwn silty sand trace gravel (FILL)	0.5	95									50mm monitoring well was insalled. water level measured on June 1, 2022: 14.93mbgs
			1	94.5	3	22	2		75	<5p/0p			
			1.5	94	12	24	3A		62				
						11	3B			<5/0p			
		stiff moist SILTY CLAY trace gravel, trace sand (TILL) brown	2	93.5									
			2.5	93	25	12	4		66	<5p/0p			
		grey	3	92.5									
		very stiff	3.5	92	19	15	5		75	<5p/0p			
			4	91.5	-	176 14	6		75	<5p/0p			
			4.5	91									
			5	90.5	10	16	7		79	<5p/0p			
			5.5	90	- 82	18	8		50	<5p/0p			
		stiff	6	89.5									
			6.5	89	7	21	9		58	<5p/0p			
			7	88.5	-	176 16	10		100	<5p/0p			
			7.5	88									
		very stiff	8	87.5	24	21	11		91	5p/0p			
		compact, moist, grey SANDY SILT trace gravel, trace to some clay (TILL)	8.5	87	23	15	12		95	<5p/0p			
			9	86.5									

TERRAPEX	LOGGED BY: AMD	DRILLING DATE: 15 March 2022
	INPUT BY: RA/EM	MONITORING DATE: 01-Jun-2022
	REVIEWED BY: VN	PAGE 1 OF 3

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW102**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.56
CONTRACTOR: Pontil Drilling	METHOD: CME 55, Hollow Stem	
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: 2 SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		compact, moist, grey SANDY SILT trace gravel, trace to some clay (TILL)	9.5	86	14	22	13		100	<5p/0p			
			10	85.5	14	25	14		91	15p/0p			
			10.5	85									
			11	84.5	15	22	15		-	<5p/0p			
		very stiff, moist, grey SILTY CLAY trace gravel, trace sand (TILL)	11.5	84									
			12	83.5	29	19	16		-	<5p/0p			Sand
			12.5	83									Screen + Sand
			13	82.5									
			13.5	82									
			14	81.5	27	24	17		100	<5p/0p			
			14.5	81									
			15	80.5									
		Georgian Bay Formation Grey Weak to Medium Strong SHALE Intense to Moderately fractured With limestone/siltstone beddings Hard Layers (%): RC1: 19% RC2: 36% RC3: 13% RC4: 15%	15.5	80			RC1						TCR= 95% RQD= 52%
			16	79.5									
			16.5	79			RC2						TCR= 100% RQD= 21%
			17	78.5									
			17.5	78									
			18	77.5			RC3						TCR= 100% RQD= 55%
			18.5										

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 15 March 2022
INPUT BY: RA/EM	MONITORING DATE: 01-Jun-2022
REVIEWED BY: VN	PAGE 2 OF 3

CLIENT: 17 Elm Limited Partnership		PROJECT NO.: CT3453.00	**RECORD OF: MW102**
ADDRESS: 17 Elm Street			
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m):	ELEV. (m) 95.56
CONTRACTOR: Pontil Drilling	METHOD: CME 55, Hollow Stem		
BOREHOLE DIAMETER (cm): 10	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10	SAND TYPE: 2	SEALANT TYPE: Holeplug 3/8

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) ▲ PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
			19	77									
			19.5	76.5			RC4						TCR=100% RQD=72%
			20	76									
				75.5									
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 15 March 2022
INPUT BY: RA/EM	MONITORING DATE: 01-Jun-2022
REVIEWED BY: VN	PAGE 3 OF 3

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW103**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.60
CONTRACTOR: PONTIL DRILLING	METHOD: MUD ROTARY	
BOREHOLE DIAMETER (cm): 20	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: #2 SEALANT TYPE: BENTONITE

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		CONCRETE Topsoil	0 0.5	95.5 95			1		95	<5/0			50mm monitoring well was insalled. water level measured on June 1, 2022: 9.66mbgs
		brown to black, moist SILTY SAND (FILL) trace oxidation, gravel, debris	1 1.5	94.5 94			2		75	<5/0			
			2	93.5			3		80	<5/0			
		light brown to grey, moist SILTY CLAY trace gravel, oxidation, sand (TILL)	2.5	93			4A		92	25/0			
							4B			25/0			
		--- grey	3 3.5	92.5 92			5		90	25/0			
			4	91.5			6		100	35/0			
		--- moist to wet	4.5	91			7		100	25/0			
			5 5.5	90.5 90			8		98	25/0			
			6	89.5			9		100	<5/0			
			6.5 7	89 88.5			10		100	5/0			
			7.5	88			11		100	35/0			
			8	87.5			12						
			8.5 9	87 86.5									

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 9,10 MAY 2022
INPUT BY: JS	MONITORING DATE: 01-Jun-2022
REVIEWED BY: CB	PAGE 1 OF 2

CLIENT: 17 Elm Limited Partnership | PROJECT NO.: CT3453.00 | **RECORD OF: MW103**

ADDRESS: 17 Elm Street

CITY/PROVINCE: Toronto, Ontario | NORTHING (m): | EASTING (m): | ELEV. (m) 95.60

CONTRACTOR: PONTIL DRILLING | METHOD: MUD ROTARY

BOREHOLE DIAMETER (cm): 20 | WELL DIAMETER (cm): 5 | SCREEN SLOT #: 10 | SAND TYPE: #2 | SEALANT TYPE: BENTONITE

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) ▲ PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		brown, moist FINE SAND trace oxidation	9.5	86			13A 13B		100	30/0 30/0			
		grey, moist to wet SANDY SILT sand seams, trace clay trace shale fragments (TILL)	10	85.5			14		100	45/0			
			10.5	85									
			11	84.5			15			30/0			
			11.5										
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: AMD | DRILLING DATE: 9,10 MAY 2022

INPUT BY: JS | MONITORING DATE: 01-Jun-2022

REVIEWED BY: CB |

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW104**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.44
CONTRACTOR: PONTIL DRILLING	METHOD: MUD ROTARY	
BOREHOLE DIAMETER (cm): 20	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: #2 SEALANT TYPE: BENTONITE

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
0	95	CONCRETE Topsoil	1		98	15/0			50mm monitoring well was insalled. water level measured on June 1, 2022: 9.66mbgs
0.5		brown to black, moist SILTY SAND to CLAYEY SILT (FILL) trace oxidation, gravel, debris							
1	94.5	---	2		88	35/0			
		trace brick, wood asphalt fragments							
1.5	94	---	3		98	5/0			
		trace clay							
2	93.5								
2.5	93	brown to grey, moist SILTY CLAY trace gravel, sand, oxidation (TILL)	4		100	<5/0			
3	92.5								
3.5	92		5		100	<5/0			
		---							
		moist to wet							
4	91.5		6		100	25/0			
4.5	91								
5	90.5		7		98	20/0			
5.5	90		8		100	15/0			
6	89.5								
6.5	89		9		25	<5/0			

7	88.5	moist	10		88	15/0			
7.5	88								
8	87.5		11		100	15/0			

8.5	87	sand seams(0.5-3")	12		100	35/0			
9	86.5								

SHEAR STRENGTH (kPa) ● 40 80 120 160
N-VALUE (Blows/300mm) ▲ 20 40 60 80
WATER CONTENT (%) PL W.C. LL 20 40 60 80

TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 10 MAY 2022
INPUT BY: JS	MONITORING DATE: 01-Jun-2022
REVIEWED BY: CB	PAGE 1 OF 2

CLIENT: 17 Elm Limited Partnership	PROJECT NO.: CT3453.00	**RECORD OF: MW104**
ADDRESS: 17 Elm Street		
CITY/PROVINCE: Toronto, Ontario	NORTHING (m):	EASTING (m): ELEV. (m) 95.44
CONTRACTOR: PONTIL DRILLING	METHOD: MUD ROTARY	
BOREHOLE DIAMETER (cm): 20	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: #2 SEALANT TYPE: BENTONITE

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) ▲ PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		grey, moist to wet SANDY SILT trace clay sand seams (0.1-3 cm) present (TILL)	9.5 10 10.5	86 85.5 85			13 14		98 100	30/0 30/0			
		END OF BOREHOLE											

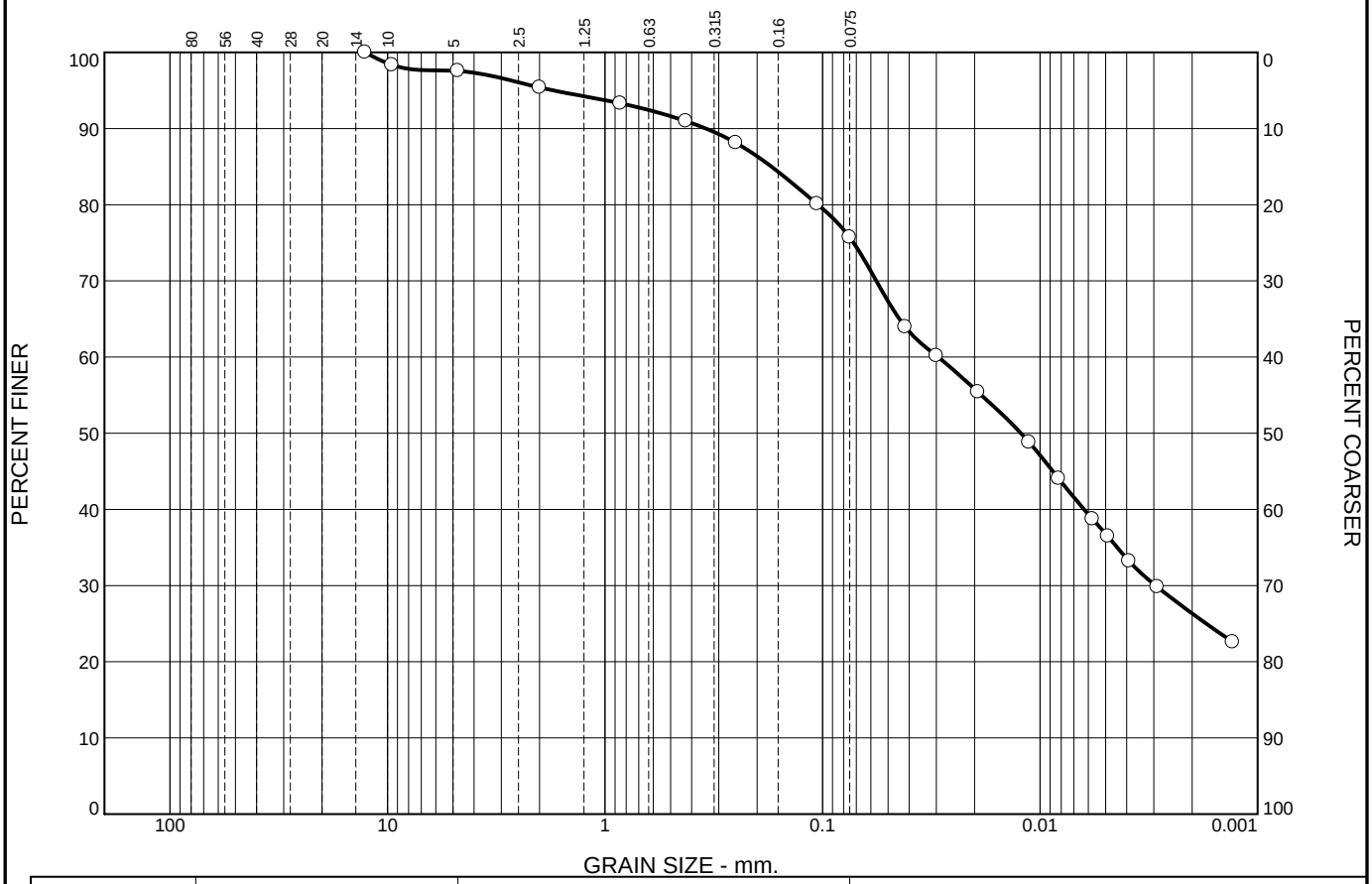
TERRAPEX

LOGGED BY: AMD	DRILLING DATE: 10 MAY 2022
INPUT BY: JS	MONITORING DATE: 01-Jun-2022
REVIEWED BY: CB	PAGE 2 OF 2

APPENDIX D

GEOTECHNICAL LABORATORY TEST RESULTS

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.4	2.2	4.4	15.3	49.4	26.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	29.5	15.2	0.1720	0.0294	0.0123	0.0029				

Material Description	USCS	AASHTO
○ SANDY SILTY CLAY, trace gravel	CL	A-6(9)

Project No. CT3453.00 **Client:** Fora Developments

Project: 17 Elm Street, Toronto

○ **Sample Number:** MW102, Sample 5

Remarks:

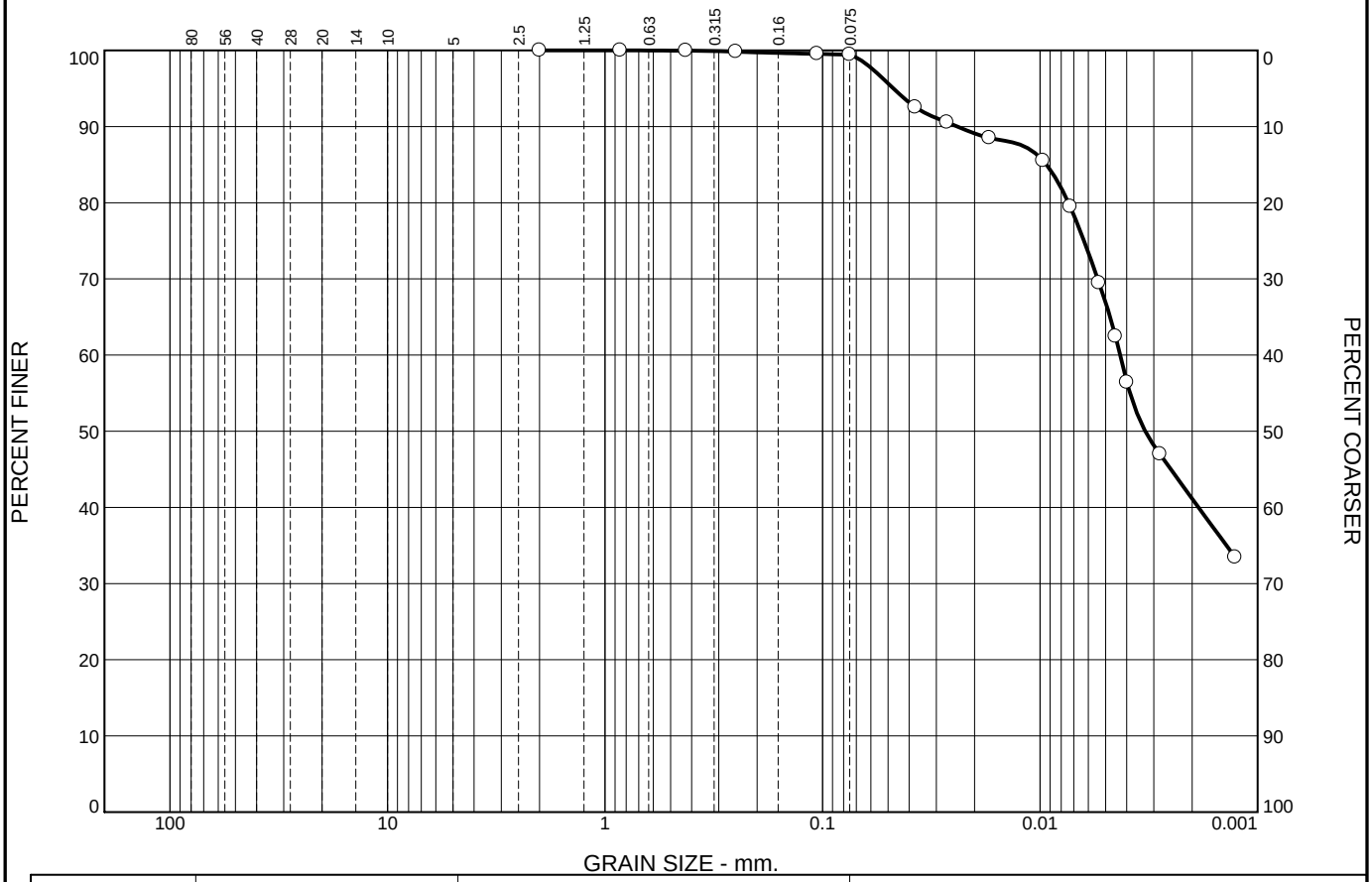
Terrapex

Markham, ON

Figure 1

Tested By: AM **Checked By:** DM

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.6	58.3	41.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	41.7	17.4	0.0094	0.0043	0.0033					

Material Description	USCS	AASHTO
○ SILTY CLAY	CL	A-7-6(26)

Project No. CT3453.00 **Client:** Fora Developments

Project: 17 Elm Street, Toronto

○ **Sample Number:** MW102, Sample 11

Remarks:

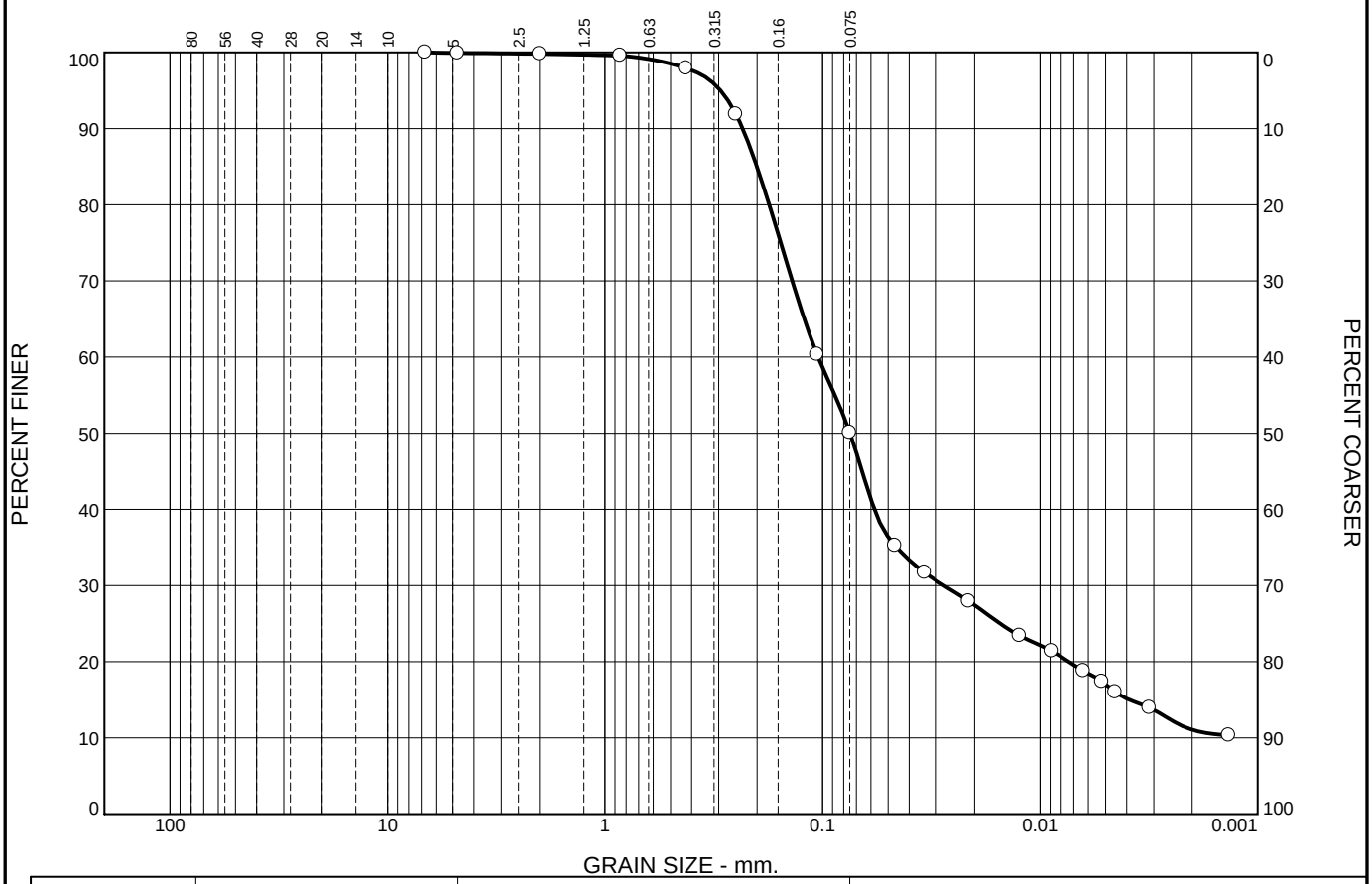
Terrapex

Markham, ON

Figure 2

Tested By: AM **Checked By:** DM

Grain Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	0.1	1.9	47.8	39.0	11.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2003	0.1048	0.0748	0.0277	0.0039			

Material Description	USCS	AASHTO
○ SILT and fine SAND, some clay		

Project No. CT3453.00 **Client:** Fora Developments

Project: 17 Elm Street, Toronto

○ **Sample Number:** MW102, Sample 14

Remarks:

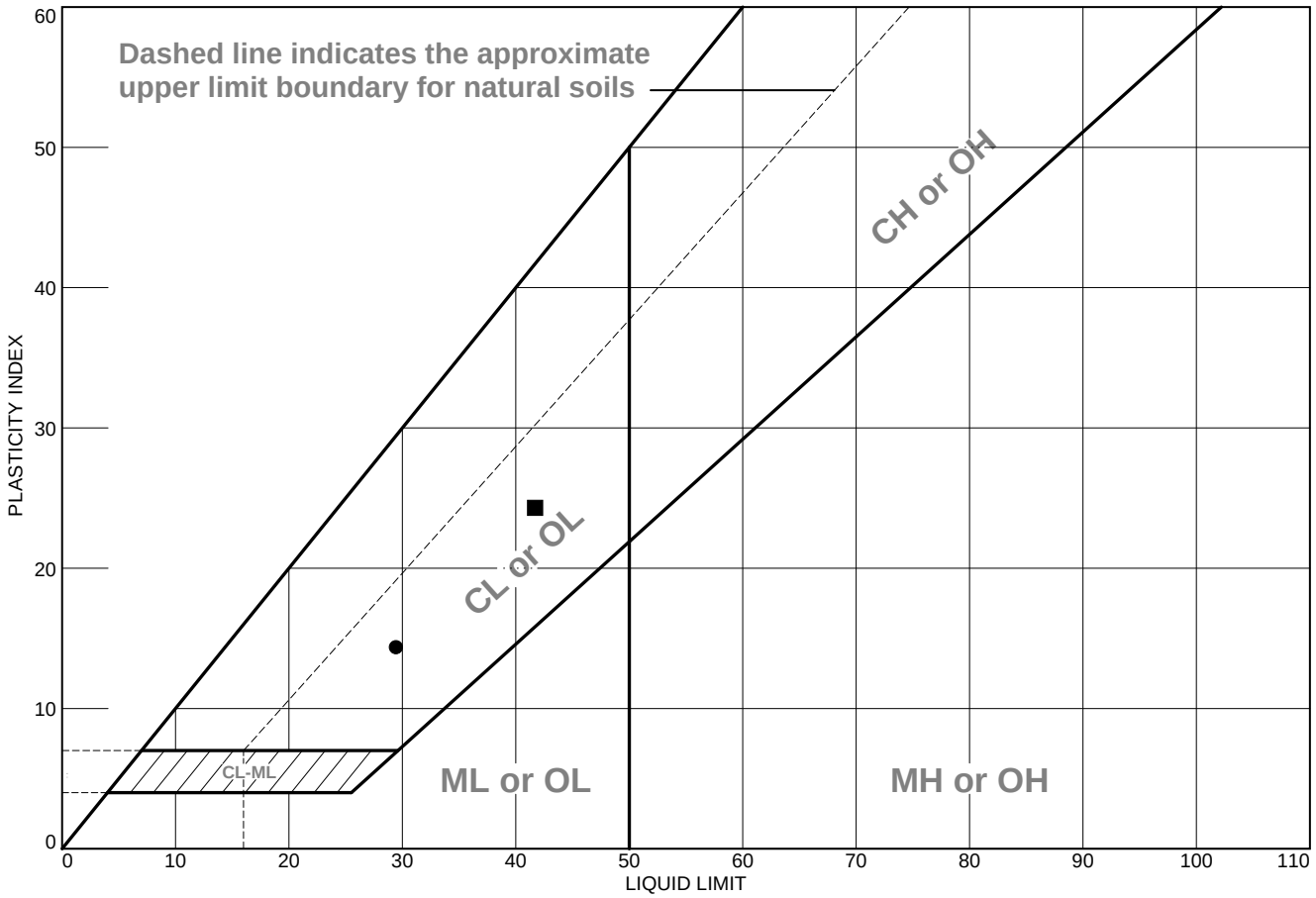
Terrapex

Markham, ON

Figure 3

Tested By: AM **Checked By:** DM

LIQUID AND PLASTIC LIMITS TEST REPORT



	Material Description	Sampled	Tested	Technician	LL	PL	PI	%<#40	USCS
●	SANDY SILTY CLAY, trace gravel		14/4/2022	AM	29.5	15.2	14.3	91.0	CL
■	SILTY CLAY		14/04/2022	AM	41.7	17.4	24.3	100.0	CL

Project No. CT3453.00 **Client:** Fora Developments

Project: 17 Elm Street, Toronto

○ **Sample Number:** MW102, Sample 5

□ **Sample Number:** MW102, Sample 11

Terrapex

Markham, ON

Checked by: DM

Title: Lab Manager

Figure 4

Tested By: AM **Checked By:** DM

Figure 5: Unconfined Compressive Strength Test Results on Rock Samples

Testing Date: 30-Mar-22 **Project No. : CT3453.00** Sampling Date: 02-Mar-22

Sample	Diameter (mm)	Length (mm)	Mass (g)	Unit Weight (kN/m3)	Maximum Aggregate Size (mm)	Maximum Load (kN)	Failure Type (A/B/C)	Uncorrected Compressive Strength (MPa)	L/D Ratio	Correction Factor	Corrected Compressive Strength (MPa)
MW101-54'	55.36	83.79	512.2	24.9	NA	107.4	c	44.6	1.52	0.9616	42.8
MW101-57'11"	55.3	105.55	655.5	25.4	NA	95.6	c	39.7	1.91	0.9928	39.5
MW102-64'3"	63.45	85.34	690.2	25.1	NA	51	c	16.1	1.35	0.9420	15.2
MW102-59'1"	62.71	98.14	770.0	24.9	NA	36.1	c	11.7	1.57	0.9656	11.3

Failure Type A = Cone, B = Diagonal, C = Vertical

APPENDIX E

CERTIFICATE OF CHEMICAL ANALYSES

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPEX ENVIRONMENTAL LTD
65 NEBO ROAD
HAMILTON, ON L8W 2C9
(905) 632-5939
ATTENTION TO: Vic Nersesian
PROJECT: CT3453.00
AGAT WORK ORDER: 22T879060
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: Apr 05, 2022
PAGES (INCLUDING COVER): 6
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

AGAT Laboratories

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22T879060

PROJECT: CT3453.00

CLIENT NAME: TERRAPEX ENVIRONMENTAL LTD

ATTENTION TO: Vic Nersesian

SAMPLING SITE:13 Elm St., Toronto, ON

SAMPLED BY:

Inorganic Chemistry (Soil)

DATE RECEIVED: 2022-03-30

DATE REPORTED: 2022-04-05

			SAMPLE DESCRIPTION:	MW101/S16	MW101/S21
			SAMPLE TYPE:	Soil	Soil
			DATE SAMPLED:	2022-03-02 10:00	2022-03-02 10:00
Parameter	Unit	G / S	RDL	3697465	3697474
Sulphate (2:1)	µg/g		2	80	115
pH (2:1)	pH Units		NA	8.14	8.30

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

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories
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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LTD
AGAT WORK ORDER: 22T879060
PROJECT: CT3453.00
ATTENTION TO: Vic Nersesian
SAMPLING SITE:13 Elm St., Toronto, ON
SAMPLED BY:

Soil Analysis

RPT Date: Apr 05, 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
Inorganic Chemistry (Soil)															
Sulphate (2:1)	3701957		4	4	NA	< 2	93%	70%	130%	97%	80%	120%	96%	70%	130%
pH (2:1)	3699228		7.99	8.07	1.0%	NA	98%	80%	120%						

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:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Time Markers

AGAT WORK ORDER: 22T879060
PROJECT: CT3453.00

CLIENT NAME: TERRAPEX ENVIRONMENTAL LTD

ATTENTION TO: Vic Nersesian

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
3697465	MW101/S16	Soil	02-MAR-2022	30-MAR-2022

Inorganic Chemistry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
Sulphate (2:1)	04-APR-2022	04-APR-2022	LC
pH (2:1)	01-APR-2022	01-APR-2022	AB

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
3697474	MW101/S21	Soil	02-MAR-2022	30-MAR-2022

Inorganic Chemistry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
Sulphate (2:1)	04-APR-2022	04-APR-2022	LC
pH (2:1)	01-APR-2022	01-APR-2022	AB

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPEX ENVIRONMENTAL LTD

AGAT WORK ORDER: 22T879060

PROJECT: CT3453.00

ATTENTION TO: Vic Nersesian

SAMPLING SITE:13 Elm St., Toronto, ON

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
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

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

1.42

Chain of Custody Record

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

Report Information:

Company: TERRAPEX
Contact: VIC NERSESIAN
Address: 90 Scarsdale Road, Toronto
Phone: 416-220-3067 Fax:
Reports to be sent to:
1. Email: v.nersesian@terrapex.com
2. Email: e.montag@terrapex.com

Project Information:

Project: CT3453.07
Site Location: 13 Elm St., Toronto, ON.
Sampled By:
AGAT Quote #: PO:
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:

Regulatory Requirements: N/A

(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

Laboratory Use Only

Work Order #: 22T879060
Cooler Quantity: #B 1 cm
Arrival Temperatures: 3.4 | 4.2 | 3.7
4.9 | 6.0 | 6.4
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: FREE ICE

Turnaround Time (TAT) Required:

Regular TAT ☑ 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

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: PCBs	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	Water soluble sulphates	pH						Potentially Hazardous or High Concentration (Y/N)
MW101 / S16	2-3-22	10:00 AM PM	1	S														1	1					N
MW101 / S21	2-3-22	11:00 AM PM	1	S														1	1					N
		AM PM																						
		AM PM																						
		AM PM																						
		AM PM																						
		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
John Ramachandran	29-3-22	5:30 pm	Amber Amber		
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

'22 MAR 30 3:24 PM

Page 1 of 1

N°: T 125587

APPENDIX F

Photographs of Rock Cores

Extracted rock cores from MW101: RC1

Extracted rock cores from MW101: RC2

Extracted rock cores from MW101: RC3

Extracted rock cores from MW101: RC4

Extracted rock cores from MW101: RC5

Extracted rock cores from MW102: RC1

Extracted rock cores from MW102: RC2

Extracted rock cores from MW102: RC3

Extracted rock cores from MW102: RC4