GEOTECHNICAL INVESTIGATION REPORT

Proposed Commercial Development
5650 Manotick Main Street
Manotick, Ontario

Revision 1

February 29, 2024

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APPENDICES

1 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) was retained by Hawkins Properties to carry out a geotechnical investigation for the proposed commercial development at the properties located at 5646 and 5650 Manotick Main Street, Manotick, Ontario (hereafter referred to as the "Site"). Authorization to proceed with this study was given by Mr. Jade Hawkins.

The Site is located on the west side of Manotick Main Street, approximately 250 m south of Eastman Avenue and approximately 30 m north of Mahogany Harbour Lane in Manotick, Ontario. The north section of the Site (5646 Manotick Main Street) is developed by a two-storey building that consist of a storefront on the main floor, two apartment units on the second floor, and a two-bay car wash. The south section of the Site is developed with a single storey detached home.

Based on the findings of the Phase One Environmental Site Assessment undertaken previously at the site by Terrapex, the Site previously contained a fueling station.

It was originally planned to demolish the existing buildings at the Site and redevelop the Site with a 5-bay car wash building and a Starbucks restaurant building. The carwash building was to be situated in the northwest corner of the site, and the Starbucks building near the southeast corner. Terrapex was subsequently advised that the proposed development scheme has changed, and the Site will be developed with a new drive through restaurant building located southeast of the property and the existing carwash will remain. A new mechanical room will be constructed just south of the carwash, with the remainder of the Site being developed with driveways, parking lots and some other soft and hard landscaping features.

The locations of the Proposed New Buildings are shown on Figure 3 "Site Plan – Proposed" Attached in Appendix B.1 of this report.

The recommendations provided in this report are preliminary in nature, subject to review and revision upon completion of the grading and architectural plans. If there are any changes to the proposed project relevant to the geotechnical aspects, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review our report.

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 geotechnical engineering recommendations for the proposed development.

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 during the period October 11 to 13, 2022. It consisted of 13 boreholes advanced by a drilling contractor commissioned and supervised by Terrapex. The boreholes are designated as MW101, BH102 through BH108, MW109, BH110, MW111, MW112 and BH113, advanced to depths ranging from of 1.2 m to 9.3 m below ground surface (mbg). Boreholes MW111 and MW112 were advanced by direct push technology. The remaining boreholes were advanced by conventional drilling techniques.

The locations of the boreholes are shown on Figure 2 in Appendix B. The borehole log sheets are enclosed in Appendix C of this report.

Standard penetration tests were carried out while advancing all the boreholes, except for MW111 and MW112, 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.

In situ vane tests were carried out in several of the boreholes, and a pocket penetrometer was used on samples retained from the boreholes to estimate the undrained shear strength of the clayey soils.

Groundwater level observations were made in all boreholes during their advancement. Monitoring wells were installed in Boreholes MW101, MW109, MW111, and MW112.

The ground surface elevations at the locations of the boreholes were established on site by **Terrapex** using a rod and survey level. The elevations of the boreholes were referenced to the top of the bolt collar of fire hydrant HO11559, located northeast of the site on the east side of Manotick Main Street. The reference elevation was assumed as 100 m.

The fieldwork for this project was carried out under the full-time supervision of an experienced geotechnical 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 delivered to our laboratory. They were visually classified and water content tests were conducted on all samples retained from Boreholes MW101, BH102, BH104, BH106, MW109, and BH113. The results of the classification, water contents, and Standard Penetration tests are presented on the borehole log sheets in Appendix C.

Grain-size analyses and Atterberg Limits tests were carried out on three (3) soil samples (MW101

Samples 3 and 6, and MW109 Sample 2). The results of these tests are enclosed in Appendix D.

In addition, BH106 Sample 5, was submitted to AGAT Laboratories for 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; discussed in Section 5.12 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 contacted 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 located on the west side of Manotick Main Street, approximately 250 m south of Eastman Avenue and approximately 30 m north of Mahogany Harbour Lane in Manotick, Ontario. It has a trapezoidal shape with an approximate width of 70 m and depths ranging from 48 to 68 m.

The north section of the Site (5646 Manotick Main Street) is developed with a two-storey building that consists of a storefront on the main floor, two apartment units on the second floor, and a two-bay car wash. The south section of the Site is developed with a single storey detached home.

Based on the findings of the Phase One Environmental Site Assessment undertaken previously at the site by Terrapex, a fueling station existed at the Site.

The Site is bounded by residential properties to the north, east and west.

The ground surface topography of the site is relatively flat. The ground surface elevations at the borehole locations range between 99.91 m at Borehole MW109, and 100.86 m at BH113.

4.2. TOPSOIL, ASPHALTIC CONCRETE AND GRANULAR MATERIAL

Topsoil is present at the ground surface in Boreholes BH102, BH103, BH104, BH108, MW109, BH110, and MW112. The thickness of the topsoil ranges from 200 to 600 mm. A 200 mm thick

layer of topsoil is also present below fill soil in Borehole BH103.

The ground at the locations of Boreholes MW101, BH105 and BH113 is covered with a thin layer of asphaltic concrete.

Crusher run limestone granular material is present below the asphaltic concrete at Boreholes MW101, BH105, and BH113, and at the ground surface at Boreholes BH106, BH107 and MW111. The crusher-run limestone extends to depths ranging from 0.2 to 1.5 m.

4.3. FILL MATERIAL

Clayey silt fill with traces of sand and gravel is present below the topsoil in Boreholes BH102, BH103, and BH104, and below the asphaltic concrete pavement at Boreholes BH105 and BH113. Sandy silt fill followed by sand fill is present at the surface of the ground at Borehole BH106. Sandy silt fill is also present below the topsoil in BH110. The fill materials extend to the termination depth of Borehole BH104, to a depth of 3.4 m at Borehole BH106, and to depths ranging from 0.6 to 1.5 mbg at the remaining boreholes. The indications are that the sand fill present at Borehole BH106 was placed to backfill the excavation resulting from decommissioning of an underground storage tank associated with the former fueling station.

The fill is dark brown and brown in colour and moist in appearance. The water content of the samples of the fill obtained from Boreholes MW101, BH102, BH106, MW109, and BH113 range from 4 to 32% by weight. SPT in the fill provided N-values ranging from 0 to 17, indicating a very loose to compact condition or very soft to stiff consistency.

4.4. NATIVE SOIL

The native overburden soils below the fill material consist of clayey silt followed by silty clay.

4.4.1. CLAYEY SILT

Clayey silt is present below the asphaltic concrete pavement in Borehole MW101, below the buried topsoil layer in Borehole BH103, below the clayey silt fill in Boreholes BH105 and BH113, below the crusher-run limestone fill in Boreholes BH107 and MW111, below the surface topsoil in Boreholes BH108, MW109, and MW112, and below the sandy silt fill in Borehole BH110. The layer extends to depths ranging from 1.3 to 4.5 mbg.

The clayey silt is brown in colour with the water content of samples ranging from 14% to 40% by weight; moist to wet in appearance.

SPT carried out in the clayey silt layer provided N-values ranging from 1 to 8 indicating a very soft to stiff consistency, more typically being firm.

Grain size analysis and Atterberg Limits test was carried out on a representative sample of the clayey silt. The test result is enclosed in Appendix D and summarized in the following table.

Sample No. and Depth	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH101 Sample 3; 1.8 m	Clayey sandy silt	0	35.1	40.2	24.1

Based on the results of the grain size analyses, the Coefficient of Permeability (k) of the clayey silt is estimated to be less than 10^{-7} cm/sec, corresponding to low relative permeability.

Atterberg Limits test conducted on MW101, Sample 3 revealed that the clayey silt has a Liquid Limit of 51 and a Plasticity Index of 32. The test results are enclosed in Appendix D.

4.4.2. SILTY CLAY

Silty clay underlies the clayey silt extending to the explored depths of the deep boreholes. The layer is grey in color with its water content ranging from 30 to 59% by weight, wet to very wet in appearance.

SPT carried out in the layer provided N-values ranging from 0 to 5, indicating a soft to firm consistency. In situ vain shear tests performed in the silty clay provided shear strengths ranging from 50 to 100 kPa with remoulded strengths of 50 to 80 kPa.

Penetrometer measurements performed on samples of the silty clay provided shear strength estimates of 100 kPa at shallow depths reducing with depth to 25 kPa.

Grain size analyses and Atterberg Limits tests were carried out on two (2) representative samples of the silty clay. The test results are enclosed in Appendix D and summarized in the following table.

Sample No. and Depth	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH101 Sample 6; 6 m	Grey Silty Clay	0	1.4	52.6	46
BH109 Sample 2; 1 m	Grey Silty clay	0	2.1	46.3	51.1

Based on the results of the grain size analysis, the Coefficient of Permeability (k) of the silty clay is estimated to be less than 10^{-9} cm/sec, corresponding to a very low relative permeability.

Atterberg Limits test conducted on Sample MW101, Sample 6 revealed that the sample has a Liquid Limit of 39 and a Plasticity Index of 21. Atterberg Limits test conducted on sample MW109, Sample 2 revealed that the sample has a Liquid Limit of 31 and a Plasticity Index of 20. The test

results are enclosed in Appendix D.

4.5. BEDROCK

According to available surficial geology maps, the bedrock at the site is expected to be comprised of limestone, dolostone, shale, arkose, sandstone of Ottawa Group, Simcoe Group, Shadow Lake Formation.

Rock coring was not carried out in the drilled boreholes. According to available well records and historic borehole data, bedrock of limestone/sandstone is expected to be situated at depths ranging from 7.6 to 12 mbg in the general area of the site.

The depths at which auger refusal was encountered in the drilled boreholes are presented in the Table below.

Borehole No.	Auger Refusal Depth (mbgs)	Auger Refusal Elevation (m)
MW101	8.2	92.43
BH102	9.0	91.69
BH103	9.3	91.20
BH106	8.4	92.23
MW109	8.5	91.41

4.6. GROUNDWATER

Groundwater levels were measured in the boreholes during their advancement and subsequently in the monitoring wells on October 27, 2022. The groundwater levels measured in the monitoring wells are tabulated below.

Borehole No.	Date	Groundwater Depth (mbg)	Groundwater Elevation (m)
MW101	October 27, 2022	2.56	98.07
MW109	October 27, 2022	2.90	97.01
MW1113	October 27, 2022	2.00	98.36
MW112	October 27, 2022	2.02	98.57

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 RECOMMENDATIONS

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

We understand that it is proposed to demolish the existing buildings at the Site and redevelop the Site with two single storey drive through restaurant buildings located at the northwest and southwest corners of the Site with the remainder of the Site being developed with driveways, parking lots and other soft and hard landscaping features. The locations of the previous proposed buildings are shown on Figure 2, in Appendix B and proposed new buildings are shown on Figure 3, in Appendix B.1 of this report.

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 foundations and utility trenches 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 and the underlying native soils above the groundwater table are expected to conform to Type 3 soils. Soils situated below the water table are considered Type 4 soils.

Temporary excavation sidewalls in Type 3 soils should not exceed 1.0 horizontal to 1.0 vertical. Excavations extended below the water table must be sloped at a maximum inclination of 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.

Excavations resulting from removal of remnants of the former buildings in the form of buried foundations and slabs and old utilities would need to be backfilled with an engineered fill material if the fill is to support underground services and the pavement structure.

5.2. GROUNDWATER CONTROL

Based on observations made during drilling of the boreholes, and close examination of the soil samples extracted from the boreholes, significant groundwater seepage is not expected to occur from the cohesive (clayey) fill and native soils. It is anticipated that adequate control of groundwater seepage can be achieved with a series of filter sump pumps in the bases of the excavations.

Excavations extending below the groundwater table into the wet sand fill deposits encountered in Borehole BH106 will require active dewatering.

Surface water should be directed away from open excavations.

It will be necessary to determine the construction dewatering requirements and to collect the information required for the application for Permit to Take Water (PTTW), should this be deemed necessary.

5.3. SITE GRADING

Grading and architectural plans were not available at the time of preparation of this report. It is assumed that only minor modifications to site grading will be required. The existing services will have to be decommissioned, and the excavations left behind will need to be engineered.

The site is underlain by a soft to firm silty clay layer that is prone to settlement when subjected to additional loads. It is recommended that the site grade be kept at approximately the current elevations to avoid long-term settlement of the roads and any other rigid landscape areas. The proposed grading plan must be reviewed by Terrapex when it becomes available.

5.4. ENGINEERED FILL

The following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, loose or soft fill soils, and softened and/or disturbed soils must be removed, and the exposed subgrade soils proof-rolled under the supervision of the Geotechnical Engineer prior to placement of new fill.
- If the fill will be used to support structures, the existing fill must be removed in its entirety

prior to placement of new fill.

- Soils used as engineered fill should be free of organics and/or other unsuitable material. The engineered fill must be placed in lifts not exceeding 200 mm in thickness and compacted to at least 98% Standard Proctor maximum Dry Density (SPMDD).
- Engineered fill operations should be monitored and compaction tests should be performed on a full-time basis by a qualified engineering technician supervised by the project engineer.
- The boundaries of the engineered fill must be clearly and accurately laid out in the field by qualified surveyors prior to the commencement of engineered fill construction. The top of the engineered fill should extend a minimum of 2.5 m beyond the envelope of the proposed structures. Where the depth of engineered fill exceeds 1.5 m, this horizontal distance of 2.5 m beyond the perimeter of the structure should be increased by at least 1 m for each 1.5 m depth of fill.
- The engineered fill operation should take place in favorable climatic conditions. If the work is carried out in months where freezing temperatures may occur, all frost affected material must be removed prior to the placement of frost-free fill.
- If unusual soil conditions become apparent during construction, due to subsurface groundwater influences, our office should be contacted in order to assess the conditions and recommend appropriate remedial measures.

5.5. 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 14 to 59%. The native soils are very wet, unsuitable for use as engineered fill.

5.6. SERVICE TRENCHES

Based on the assumed site grades, sewer pipes and water mains are anticipated to be supported on undisturbed native deposits which are considered suitable for supporting water mains, sewer pipes, manholes, catch basins and other related structures.

The type of bedding depends mainly on the strength of the subgrade immediately below the invert levels.

Normal Class ‘B’ bedding is recommended for underground utilities. Granular ‘A’ or 19 mm crusher-run limestone can be used as bedding material; all granular materials should meet OPS

1010 specifications. The bedding material should be compacted to a minimum of 95% SPMDD. Bedding details should follow the applicable governing design detail. Trenches dug for these purposes should not be unduly left exposed to inclement weather.

Pipe bedding and backfill for flexible pipes should be undertaken in accordance with OPSD 802.010. Pipe embedment and cover for rigid pipes should be undertaken in accordance with OPSD 802.030.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to sewer installation will be required. The subgrade may be strengthened by placing a thick mat consisting of 50 mm crusher-run limestone. Field conditions will determine the depth of stone required. Geotextiles and/or geogrids may be helpful, and these options should be reviewed by Terrapex on a case-by-case basis.

Sand cover material should be placed as backfill to at least 300 mm above the top of pipes. Placement of additional granular material (thickness dictated by the type of compaction equipment) as required or use of smaller compaction equipment for the first few lifts of native material above the pipe will probably be necessary to prevent damage to the pipe during the trench backfill compaction.

It is recommended that service trenches be backfilled with on-site native materials such that at least 95% of SPMDD is obtained in the lower zone of the trench and 98% of SPMDD for the upper 1 m.

In areas of narrow trenches or confined spaces such as around manholes, catch basins, etc., the use of aggregate fill such as Granular ‘B’ Type I (OPSS 1010) is required if there is to be post-construction grade integrity.

5.7. FOUNDATION DESIGN

We understand that the proposed buildings will be lightly loaded single storey structures. It is anticipated that only minor modifications to site grading will be required.

5.7.1. SHALLOW FOOTINGS

Based on the soil stratigraphy observed in MW101, BH102, BH103 and MW109, situated within the footprints or close proximity of the proposed buildings, conventional spread or strip footings may be used to support the proposed buildings.

Foundations founded on the undisturbed native silty clay soil above elevation 98.0 m with maximum dimensions of 2 m for pad footings and 1 m for strip footing may be designed based on a bearing resistance of 50 kPa at Serviceability Limit States (SLS) and factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 75 kPa.

The total and differential settlements of spread footings designed in accordance with the recommendations provided above should not exceed the conventional limits of 25 mm and 19 mm respectively.

Due to variations in the consistency of the founding soils and/or loosening caused by excavating disturbance and/or seasonal frost effects, all footing subgrades must be evaluated by the Geotechnical Engineer prior to placing formwork and foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

In the event necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontals (clear horizontal distance between footings) to 1 vertical (difference in elevation) and no individual footing step should be greater than 0.60 m.

Rainwater or groundwater seepage entering the foundation excavations must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation, and equipment traffic. If unstable subgrade conditions develop, Terrapex should be contacted to assess the conditions and make appropriate recommendations.

All exterior footings and footings in unheated areas should be provided by at least 1.8 m of soil cover or equivalent artificial thermal insulation for frost protection purposes. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided.

5.7.2. GROUND IMPROVEMENT

Ground improvement techniques, such as Controlled Modulus Columns (CMC) or Geopiers extended to an approximate depth of 8 mbg could be used to improve the condition of the native soils. CMCs consist of thin concrete columns, and Geopiers consist of rammed aggregate piers installed throughout the footprints of the buildings. The composite of the native silty clay and ground improvement system could provide bearing resistances ranging to 250 kPa at SLS. The spread and strip footings for the building would be constructed using conventional methods, supported on a granular load transfer platform overlying the ground improvement system.

The ground improvement system should be designed, installed, and certified by a specialist ground improvement contractor.

5.7.3. DEEP FOUNDATION

Caissons may also be considered to support the building. Caissons founded on the bedrock, at depths ranging from 8 to 9 mbg may be designed based on end bearing resistance of 1 MPa at ULS.

Temporary liners will be required at the site due to the presence of soft clay and wet sands to prevent caving of the sides of the drilled holes. The installation of the caissons must be inspected by a qualified geotechnical engineer to ensure that the caissons are constructed on bedrock in accordance with the design intent. The contractor must take into consideration the excavation method to be used through the loose and water bearing soils (continuous liners, mud drilling, etc.) and the concreting technique for installing caissons in accordance with good construction practice.

The hole base should be cleaned using the auger and observed and approved by the Geotechnical Engineer.

Concrete should be placed to a minimum thickness of 600 mm in the caisson hole and mixed with the auger. The concrete should then be extracted from the caisson hole and disposed. Concrete placement for the caisson foundation may then proceed.

In the event that more than 150 mm of water is present in the base of the hole, it will be necessary to place concrete using the tremie method to ensure proper placement of the concrete in water.

5.8. FLOOR SLAB

It is expected that the subgrade below the floor slabs of the buildings will consist of engineered fill.

Subgrade preparation should include the removal of all organic soil, loose or soft fill materials and any wet, and disturbed native soils. After removal of all unsuitable materials, the subgrade should be inspected and adjudged as satisfactory before placement and compaction of new fill. The excavation must be backfilled with suitable approved fill; placed in maximum lifts of 200 mm thickness and compacted to at least 98% of SPMDD.

It is recommended that a combined moisture barrier and a levelling course, having a minimum thickness of 200 mm and comprised of free draining material such as Granular A compacted to minimum 100 % of its SPMDD or 19 mm clear stone compacted to a dense condition be provided as a base for the slab-on-grade.

Perimeter drainage at the foundation level is not required provided the finished floor surface is at least 150 mm above the prevailing grade and the surrounding surfaces slope away from the buildings.

5.9. 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°	20.0	0.36	2.77	0.53
Clayey Silt	29°	19.0	0.35	2.88	0.52
Silty Clay	27°	18.0	0.39	2.66	0.54

1. Passive and sliding resistance within the zone subject to frost action (i.e. within 1.8 m below finished grade) should be disregarded in the lateral resistance computations.
2. Temporary and/or permanent surcharges at the ground surface should be considered in accordance with the applicable Soil Mechanics methods.

The design earth pressures in compacted backfill should be augmented with the dynamic effects of the compaction efforts, which typically are taken as a uniform 12 kPa pressure over the entire depth below grade where the calculated earth pressure based on the above earth pressure factors is less than 12 kPa.

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

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 foundation walls to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

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.

5.10. PAVEMENT DESIGN

Based on the existing topography of the site and the presumption that there will be minor re-grading, it is anticipated that the sub-grade material for the pavement will generally comprise of native clayey silt or fill soil.

The subgrade should be thoroughly proof-rolled and re-compacted to ensure uniformity in subgrade strength and support. Lift thicknesses should not exceed 200 mm in loose state and the excavated site material should be compacted using heavy vibratory rollers. As an alternative, if suitable on-site native material is not available, the upper part of the subgrade could be improved by placing imported granular material.

Given the frost susceptibility and drainage characteristics of the subgrade soils, the pavement design presented below is recommended.

RECOMMENDED ASPHALTIC CONCRETE PAVEMENT STRUCTURE DESIGN
(MINIMUM COMPONENT THICKNESSES)

Pavement Layer	Compaction Requirements	Light Duty Pavement	Heavy Duty Pavement
Surface Course Asphaltic Concrete	97% Marshall Density	40 mm Hot-Laid HL3	50 mm Hot-Laid HL3
Binder Course Asphaltic Concrete	97% Marshall Density	50 mm Hot-Laid HL8	70 mm Hot-Laid HL8
Granular Base	100% SPMDD	150 mm compacted depth OPSS Granular A	150 mm compacted depth Granular A
Granular Sub-Base	100% SPMDD	300 mm compacted depth Granular B	450 mm compacted depth Granular B

* Standard Proctor maximum dry density (ASTM-D698)

The subgrade must be compacted to at least 98% of SPMDD for at least the upper 1.0 m and 95% below this level. The granular base and sub-base materials should be compacted to a minimum of 100% SPMDD.

The long-term performance of the proposed pavement structure 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 when fill is placed and that the subgrade is not disturbed and weakened after it is exposed.

Control of surface water is a significant factor in achieving good pavement life. Grading adjacent to the pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb. In addition, the need for adequate drainage cannot be over-emphasized. The subgrade must be free of depressions and sloped (preferably at a minimum gradient of three percent) to provide effective drainage toward subgrade drains. Sub-drains are recommended to intercept excess subsurface moisture at the curb lines and catch basins. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

Additional comments on the construction of pavement areas are as follows:

- As part of the subgrade preparation, the proposed pavement areas should be stripped of vegetation, topsoil, unsuitable earth fill and other obvious objectionable material. The subgrade should be properly shaped and sloped as required, and then proof-rolled. Loose/soft or spongy subgrade areas should be sub-excavated and replaced with suitable approved material compacted to at least 98% of SPMDD.

- Where new fill is needed to increase the grade or replace disturbed portions of the subgrade, excavated inorganic soils or similar clean imported fill materials may be used, provided their moisture content is maintained within 2 % of the soil's optimum moisture content. All fill must be placed and compacted to not less than 98% of SPMDD.

- For fine-grained soils, as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling must be carried out and witnessed by Terrapex personnel for final recommendations of sub-base thicknesses.

- In the event that pavement construction takes place in the spring thaw, the late fall, or following periods of significant rainfall, it should be anticipated that an increase in thickness of the granular sub-base layer will be required to compensate for reduced subgrade strength.

5.11. EARTHQUAKE DESIGN PARAMETERS

The Ontario Building Code (2012) 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 (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (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 consists of fill material, followed by firm to soft clayey silt and silty clay underlain by bedrock at an approximate depth of 8 m below grade. Accordingly, the site designation for seismic analysis is Class D.

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2012 Ontario Building Code - Supplementary Standard SB-1 (August 15, 2006), Table 1.2, location Ottawa, Ontario.

5.12. CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

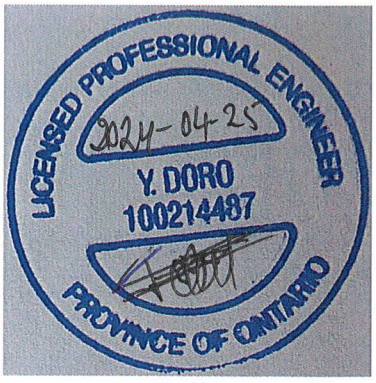
A native soil sample obtained from Borehole BH106 Sample 6 from an approximate depth of 4 mbg was submitted to AGAT Laboratories for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix E of this report.

The test result reveals that the pH index of the soil sample is 7.19. The water-soluble sulphate content of the tested sample is 0.0178%. The concentration of water-soluble sulphate content of the tested sample 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 buildings.

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.



Meysam Najari, Ph.D.
Geotechnical designer

Yacouba Doro, P.Eng.
Senior Geotechnical Project Manager

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 Tara Developments (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.

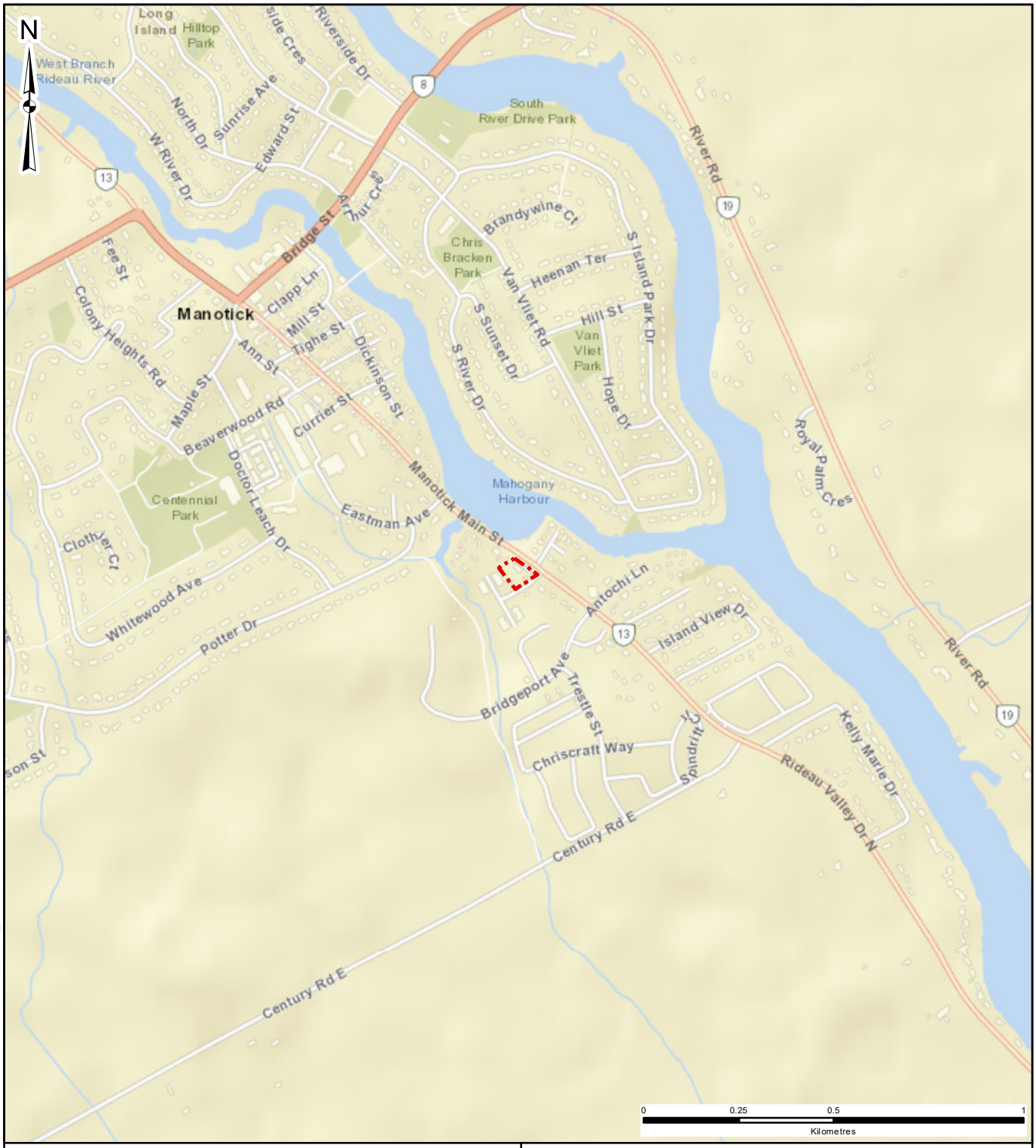
The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain 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 Hawkins Properties. 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 Tara Developments. 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



LEGEND

PROPERTY BOUNDARY

DATA SOURCE: ESRI
MAP PROJECTION: NAD 1983 UTM Zone 18N

CLIENT: 595831 ONTARIO INC.

SITE LOCATION: 5646 AND 5650 MANOTICK MAIN STREET, MANOTICK, ONTARIO

TERRAPEX

TITLE: **SITE LOCATION**

DRAWN BY: JS	PROJECT NO.: CO884.01	CHECKED BY: MG
REVISION: 00	DATE: DECEMBER 2022	**FIGURE: 1**

jserroul C:\Users\JSerroul\OneDrive - Terrapex Environmental Ltd\PROJECTS\Ottawa\CO800\CO884.01 5646_5650 Manotick Main St, Manotick\MXD\FIG 1 SITE LOCATION.mxd

LEGEND

- PROPERTY BOUNDARY
- BOREHOLE
- MONITORING WELL

0 10 20 30
Metres

DATA SOURCE: CITY OF OTTAWA
MAP PROJECTION: NAD 1983 UTM ZONE 18N

CLIENT:
595831 ONTARIO INC.

SITE LOCATION:
5646 AND 5650 MANOTICK MAIN STREET, MANOTICK, ONTARIO

TERRAPEX

TITLE:
GENERAL SITE LAYOUT

DRAWN BY:	PROJECT NO.:	CHECKED BY:
JS	CO884.01	MG
REVISION: 00	DATE: DECEMBER 2022	FIGURE: **2**

C:\Users\JSerroul\OneDrive - Terrapex Environmental Ltd\PROJECTS\Ottawa\CO800\CO884.01 5646_5650 Manotick Main St, Manotick\MXD\FIG 2 GENERAL SITE LAYOUT.mxd

APPENDIX B.1

SITE PLAN - PROPOSED

N

MANOTICK MAIN ST.

MAHOGANY HARBOUR LANE

SITE PLAN - PROPOSED 1 : 200

LEGEND

- PROPERTY BOUNDARY
- EXISTING BUILDING - TO REMAIN
- PROPOSED BUILDING

0 10 20 30

Metres

DATA SOURCE: CITY OF OTTAWA, PROPOSED SITE PLAN PROVIDED BY CLIENT.
MAP PROJECTION: NAD 1983 UTM ZONE 18N

CLIENT:

595831 ONTARIO INC.

SITE LOCATION:

5646 AND 5650 MANOTICK MAIN STREET, MANOTICK, ONTARIO

TERRAPEX

TITLE:

SITE PLAN - PROPOSED

DRAWN BY:	PROJECT NO.:	CHECKED BY:
JS	CO884.01	YD
REVISION:	DATE:	FIGURE:
00	FEBRUARY 2024	**3**

C:\Users\JSerrault\OneDrive - Terrapex Environmental Ltd\PROJECTS\Ottawa\CO800\CO884.01 5646_5650 Manotick Main St, Manotick\MXD\FIG 3 PROPOSED SITE PLAN.mxd

APPENDIX C

BOREHOLE LOG SHEETS

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**MW101**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.63
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		asphaltic concrete and crusher run limestone FILL	0	100.5	12	20.1	1		55	<10			
		firm, moist, brown CLAYEY SILT trace sand some rootlets	0.5	100									
			1	99.5	4	25.1	2		56	<10			
		firm to soft SILTY CLAY	1.5	99	5	100 / 34.6	3		100	<10	BTEX F1-F4 pH		
		moist	2	98.5									
		brown	2.5	98									
		----											
		grey	3	97.5	2 / 50	43.6	4		100	<10			
			3.5	97	50+								
			4	96.5									
			4.5	96	50+								
			5	95.5	3	56.4	5		100	<10			
			5.5	95									
		wet	6	94.5									
		-----											
		very wet	6.5	94	0	36.9	6		100	<10			
			7	93.5									
			7.5	93									
			8	92.5	100	32.2	7			<10			
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 11-Oct-2022
INPUT BY: UB	MONITORING DATE: 27-10-22
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties		PROJECT NO.: CO884.01	**RECORD OF: BH102**
ADDRESS: 5646/5650 Manotick Main Street.			
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.49
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-2	SEALANT TYPE: Bentonite

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

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
Topsoil	0										
moist, dark brown clayey silt trace sand with organics FILL	0.5	100	2	32.3	1		100	<10			
	1	99.5	1	24.4	2		100	<10			
firm to soft SILTY CLAY	1.5	99	4 / 100	37.3	3		100	<10	pH		
	2	98.5									
	2.5	98	50+								
	3	97.5									
	3.5	97	5 / 75	38.2	4		100	<10	BTEX F1-F4		
olive brown ---- grey	4	96.5	50+								
	4.5	96									
	5	95.5	50+								
	5.5	95									
	6	94.5									
	6.5	94	1	37.8	5		100	<10			
	7	93.5									
wet ----- very wet	7.5	93									
	8	92.5	0	30.3	6			<10			
	8.5	92									
	9	91.5									
END OF BOREHOLE											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 11-Oct-2022
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 2

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: BH102**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 100.49
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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 (%)	(new title) SV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 11-Oct-2022
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REVIEWED BY: JM	PAGE 2 OF 2

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: BH103**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 100.5
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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
		Topsoil	0	100.5									
		dark brown clayey silt trace sand trace organics FILL	0.5	100	2		1		100	<10			
		saturated grey silty clay FILL											
		Topsoil	1	99.5	4		2		100	<10			
		firm, brown, CLAYEY SILT trace rootlets sand and gravel	1.5	99	38								
		firm to soft, grey SILTY CLAY	2	98.5	50+		3		100	<10			
			2.5	98									
			3	97.5									
			3.5	97	4		4		100	<10	BTEX F1-F4		
			4	96.5	50+								
			4.5	96									
			5	95.5	50+								
			5.5	95	5		5		100	<10			
		moist ----- very wet	6	94.5									
			6.5	94	1		6		100	<10			
			7	93.5									
			7.5	93									
			8	92.5	0		7		100	<10			
			8.5	92									
			9	91.5									

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-2022
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REVIEWED BY: JM	PAGE 1 OF 2

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: BH103**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 100.5
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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
		pieces of limestone					8			<10			
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-2022
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REVIEWED BY: JM	PAGE 2 OF 2

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**BH104**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.6
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		TopSoil	0	100.5	4	16.7	1		83	<10			
		moist, dark brown clayey silt traces of sand and gravel some rootlets FILL	0.5	100									
			1	99.5	3	27.3	2		83	<10			
					2	18	3		100	<10			
		END OF BOREHOLE	1.5										

TERRAPEX

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INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**BH105**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.61
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		ASPHALTIC CONCRETE	0	100.5					66	<10			
		moist, grey, crusher run limestone			17		1						
		dark brown clayey silt trace sand and gravel FILL	0.5	100									
		brown, clayey silt FILL	1	99.5	4		2		50	<10	M+1 BTEX F1-F4		
		grey crusher run limestone	1.5		3		3		100	<10			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: BH106**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 100.63
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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) / 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
		grey crusher run limestone	0	100.5	17	5.8	1		66	<10			
		moist, brown silty sand FILL	0.5	100									
			1	99.5	5	17.8	2		41	<10			
			1.5	99	5								
		wet, brown sand traces of silt and gravel FILL	2		0	16	3		83	<10	pH		
				98.5	0								
			2.5	98	0	17	4		83	<10			
		firm to soft SILTY CLAY	3	97.5	3	50.2	5		75	<10	BTEX F1-F4		
			3.5	97									
			4	96.5	2	58.7	6		100	<10			
		olive brown ---- grey	4.5	96									
					90/70								
			5	95.5									
			5.5	95									
		brown ---- grey	6	94.5									
			6.5		2	32	7		100	<10			
				94									
			7	93.5									
			7.5	93									
		limetone pieces				11.4							
			8	92.5	20		8		100	<10			
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**BH107**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.82
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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) / 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
		moist grey crusher run limestone	0	100.5	13		1		50	<10			
		moist brown CLAYEY SILT	0.5 1	100	4		2		42	<10	M+I dup BH107-12 BTEX F1-F4		
			1.5	99.5	8		3		42	<10			
		END OF BOREHOLE		99									

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**BH108**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.16
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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) / 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
		Topsoil	0	100	4		1		66	<10			
			0.5										
		firm, brown CLAYEY SILT trace sand and gravel		99.5	4		2		92	<10	pH BTEX F1-F4		
		END OF BOREHOLE	1	99									

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: MW109**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 99.91
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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) / 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
		Topsoil	0	99.5	6	24.2	1		100	<10	M+I		
		firm, moist, brown CLAYEY SILT trace sand	0.5										
			1	99	2	24.6	2		100	<10			
			1.5	98.5									
			2	98	2 60 70/50	40.3	3		100	<10			
			2.5	97.5									
		firm to soft, moist SILTY CLAY	3	97									
			3.5	96.5	2 60 100/80	46.4	4		2	<10	BTEX F1-F4		
			4	96									
			4.5	95.5	80/50								
			5	95	4 50	42	5		100	<10			
			5.5	94.5									
		olive brown ---- grey	6	94									
			6.5	93.5	25	38	6		100	<10			
			7	93									
			7.5	92.5									
			8	92	0	43	7		100	<10			
			8.5	91.5									
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE: 27-10-2022
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties		PROJECT NO.: CO884.01	**RECORD OF: BH110**
ADDRESS: 5646/5650 Manotick Main Street.			
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.23
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		Topsoil	0	100	4								
		moist dark brown sandy silt trace clay organics FILL	0.5				1		100	<10			
		firm moist brown CLAYEY SILT trace sand some rootlets	1	99.5	5		2		100	<10			
				99									
			1.5		5		3		100	<10	BTEX F1-F4		
				98.5									
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties		PROJECT NO.: CO884.01	**RECORD OF: MW111**
ADDRESS: 5646/5650 Manotick Main Street.			
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.41
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		crusher run limestone	0	100			1		13	<10			
		brown CLAYEY SILT trace sand	1.5	99.5			2		100	<10			
		moist olive brown SILTY CLAY	3	98.5			3		100	<10	BTEX F1-F4		
			4.5	97.5			4		100	<10			
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK	6	94.5									

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE: 27-10-22
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF: MW112**
ADDRESS: 5646/5650 Manotick Main Street.		
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m): ELEV. (m) 100.58
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers	
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 SAND TYPE: No-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
		Topsoil	0	100.5					100	<10			
		moist grey CLAYEY SILT	0.5	100									
			1	99.5			1		100	<10			
			1.5	99									
			2	98.5			2		100	8% LEL	BTEX F1-F4 dup MW112-12		
			2.5	98									
			3	97.5									
			3.5	97			3		100	10 ppm	BTEX F1-F4		
			4	96.5									
		olive brown SILTY CLAY	4.5	96									
			5	95.5			4		100	<10			
			5.5	95									
			6	94.5									
		END OF BOREHOLE BOREHOLE TERMINATED ON ASSUMED BEDROCK											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE: 27-10-22
REVIEWED BY: JM	PAGE 1 OF 1

CLIENT: Hawkins Properties	PROJECT NO.: CO884.01	**RECORD OF:**	
ADDRESS: 5646/5650 Manotick Main Street.		**BH113**	
CITY/PROVINCE: Ottawa,ON	NORTHING (m):	EASTING (m):	ELEV. (m) 100.86
CONTRACTOR: Strata Drilling Group	METHOD: 7822 DT Geoprobe equipped with hollow stem augers		
BOREHOLE DIAMETER (cm): 9.5	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: No-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
		asphaltic concrete and crusher run limestone	0										
		dark brown clayey silt FILL	0.5	100.5	6	20.9	1		46	<10			
		firm brown CLAYEY SILT trace sand	1	100	5	34.2	2		66	<10			
			1.5	99.5	3	36.8	3		100	<10			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 12-Oct-22
INPUT BY: UB	MONITORING DATE:
REVIEWED BY: JM	PAGE 1 OF 1

KEY TO SYMBOLS

Symbol Description

Strata symbols


Fill


Description not given for:
"OZ"


Description not given for:
"0T"


Low plasticity
clay


Silty sand


Description not given for:
"ST"


Description not given for:
"OZS8"


Limestone


Topsoil


Paving


Description not given for:
"8SZ"


Description not given for:
"ZOS"

Symbol Description


Description not given for:
"SZOJ"


Description not given for:
"S8"


Silty low plasticity
clay

Misc. Symbols


Description not given for:
"GWATER2"


Description not given for:
"FTRANGLE"


Description not given for:
"FSQUARE"

Soil Samplers


Split Spoon

Monitor Well Details


top of well,
recessed pipe


bentonite pellets


silica sand, blank PVC


slotted pipe w/ sand

Notes:

1. Exploratory borings were drilled on 12-Oct-22 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

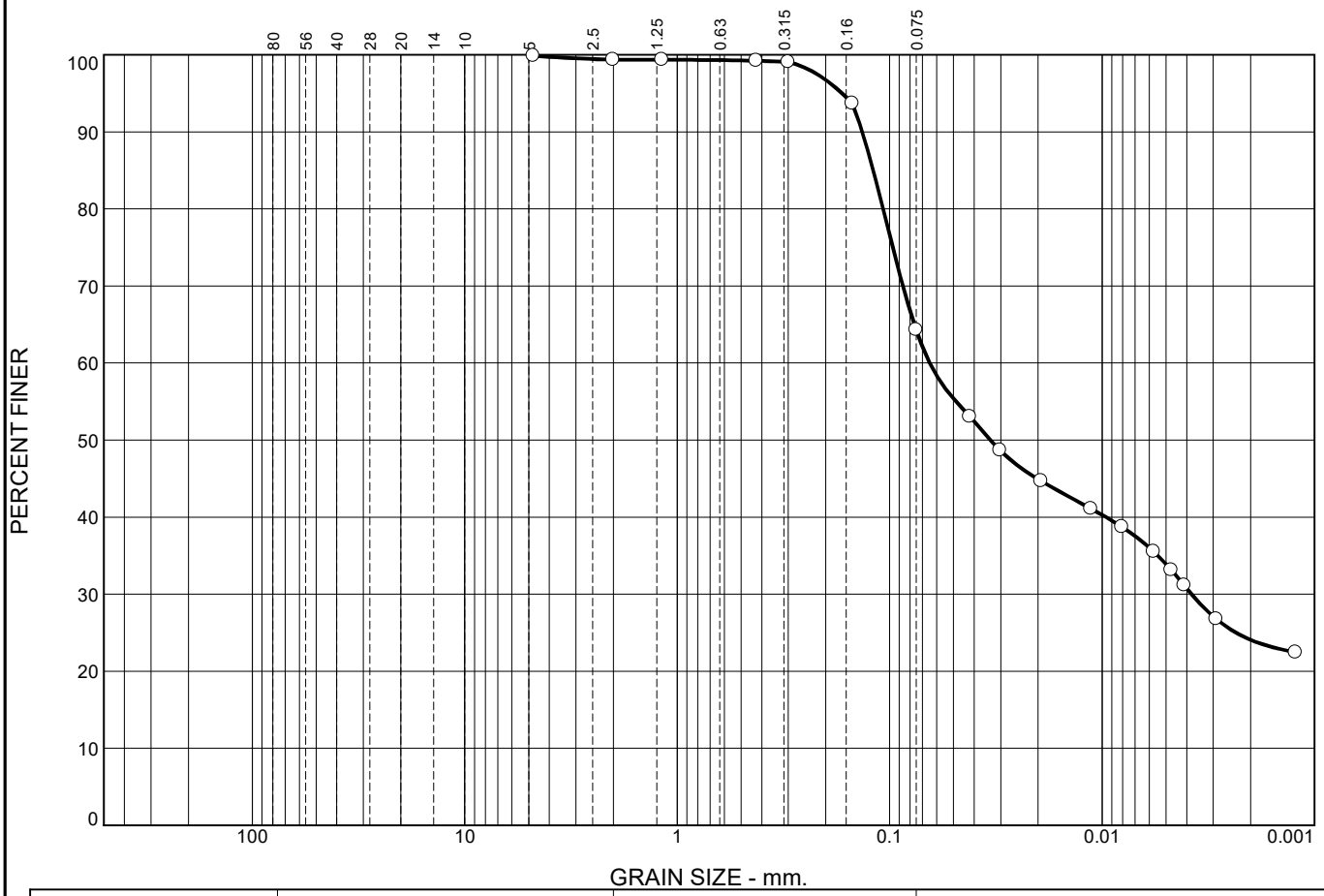
4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

APPENDIX D

GEOTECHNICAL LABORATORY TEST RESULTS

Particle Size Distribution Report



	% +75mm	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○			0.2	34.9	40.2	24.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	51	19	0.1194	0.0646	0.0335	0.0038				

Material Description	USCS	AASHTO
○ sandy, SILT AND CLAY	CH	A-7-6(18)

Project No. CO884.01 **Client:** Hawkins Properties

Project:

○ **Location:** Hawkins Properties **Sample Number:** BH 101-SS3

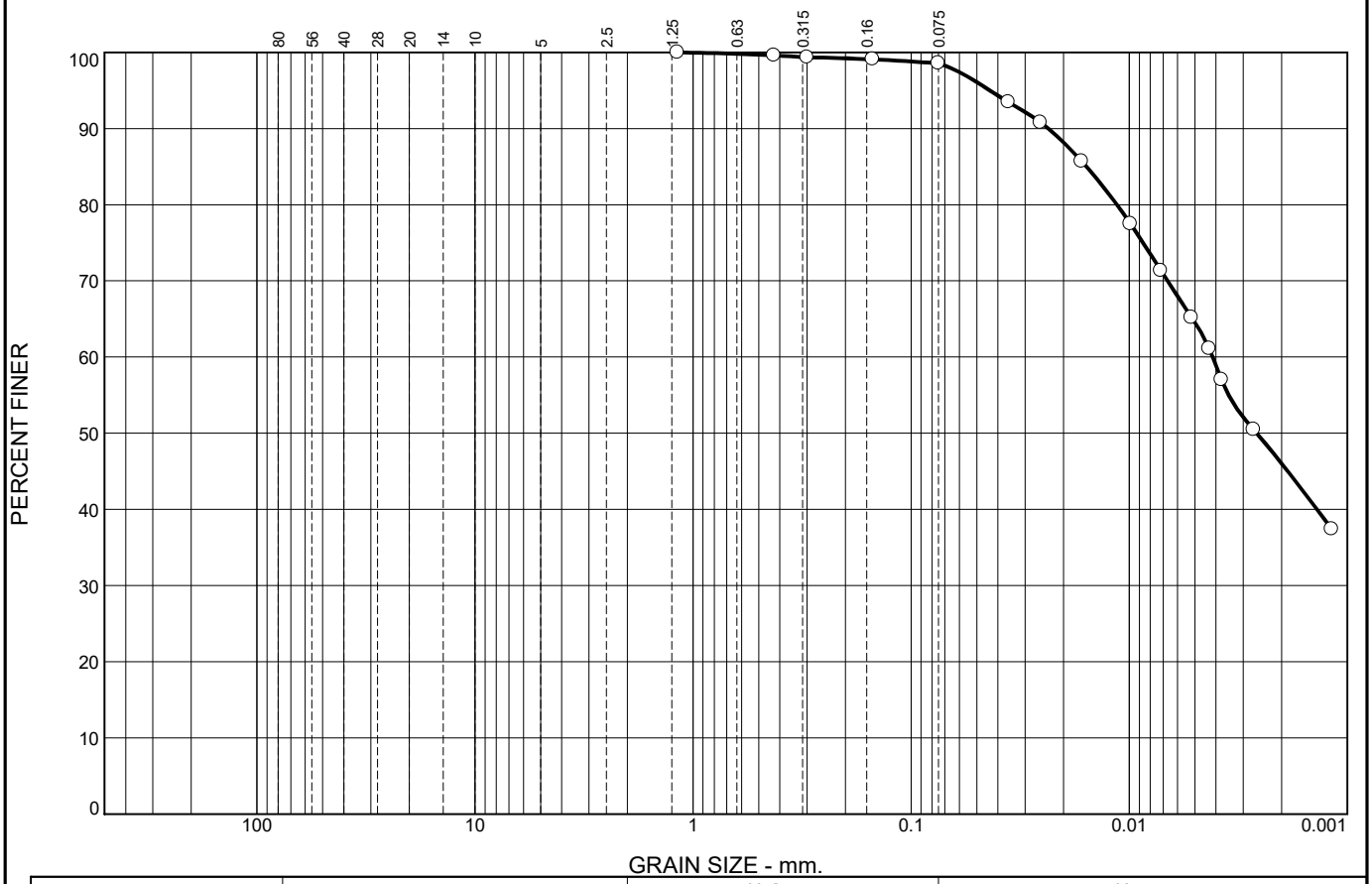
Remarks:

Terrapex

Ottawa, ON

Figure 1

Particle Size Distribution Report



	% +75mm	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0.0	0.0	0.4	1.0	52.6	46.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	39	18	0.0157	0.0041	0.0026					

Material Description	USCS	AASHTO
○ SILT AND CLAY, trace sand	CL	A-6(22)

Project No. CO884.01 **Client:** Hawkins Properties

Project:

○ **Location:** Hawkins Properties **Sample Number:** BH 101-SS6

Terrapex

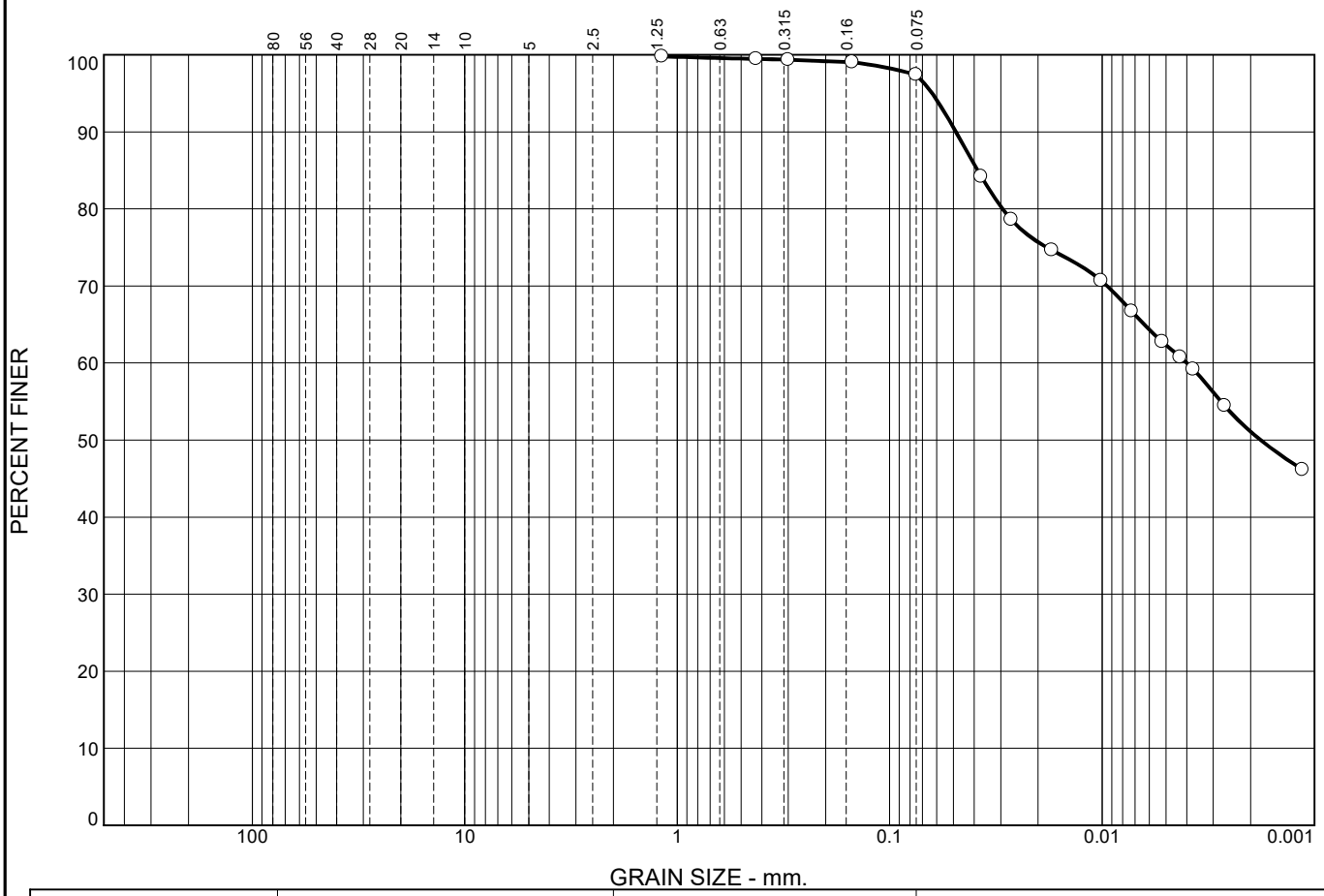
Ottawa, ON

Remarks:

Figure 2

Tested By: UB

Particle Size Distribution Report



	% +75mm	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○				2.1	46.3	51.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	31	11	0.0385	0.0040	0.0018					

Material Description	USCS	AASHTO
○ CLAY AND SILT, trace sand		

Project No. CO884.01 **Client:** Hawkins Properties

Project:

○ **Location:** Hawkins Properties **Sample Number:** BH 109-SS2

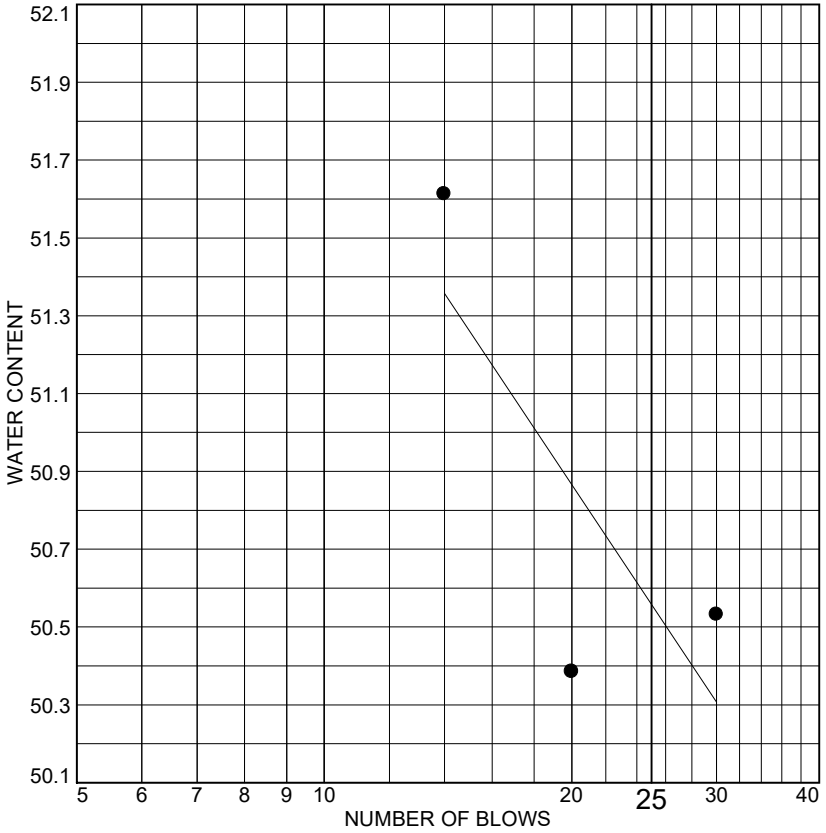
Remarks:

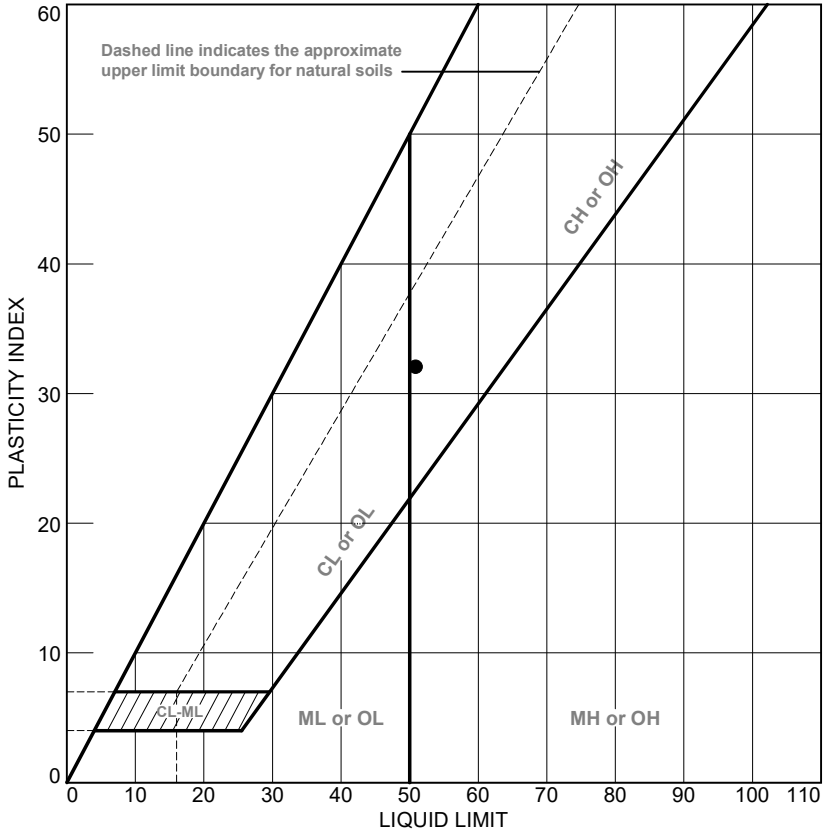
Terrapex

Ottawa, ON

Figure 3

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●		BH 101-SS3			CH	sandy, SILT AND CLAY		51	32

Client Hawkins Properties

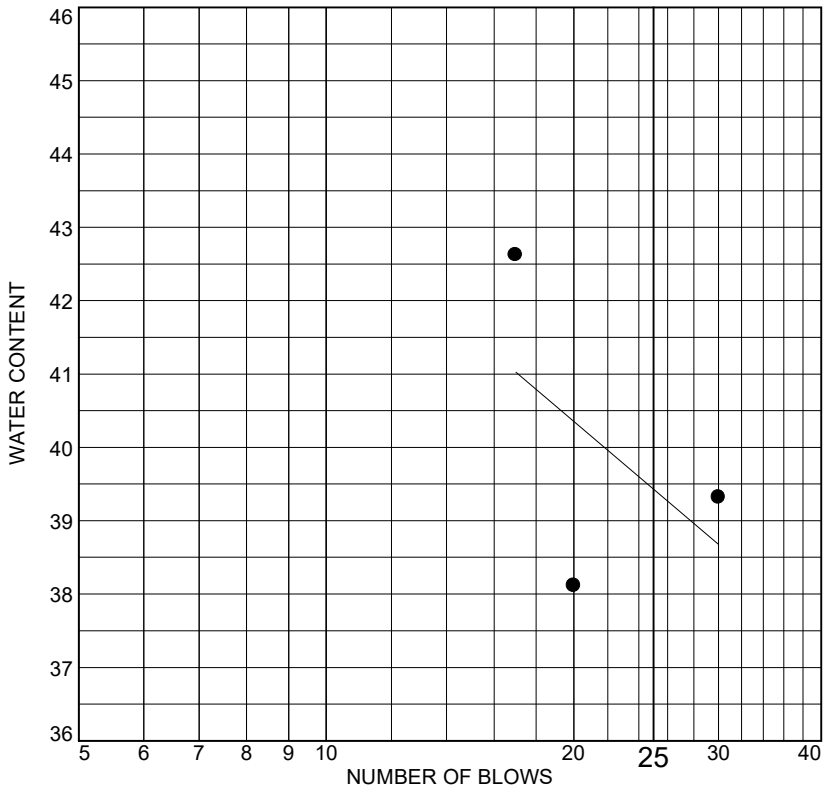
Project

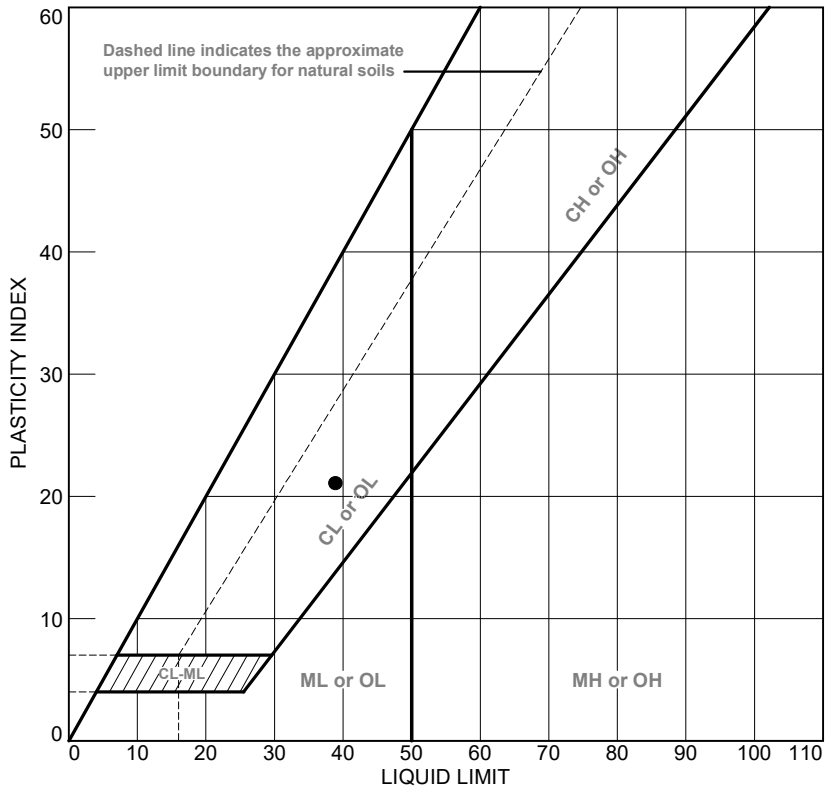
Project No. CO884.01 Figure 4

Terrapex

Ottawa, ON

LIQUID AND PLASTIC LIMITS TEST REPORT





	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●		BH 101-SS6			CL	SILT AND CLAY, trace sand		39	21

Client Hawkins Properties	**Terrapex**	
Project		
Project No. CO884.01 Figure 5	**Ottawa, ON**	

Tested By: UB

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 LIMITED
20 GURDWARA ROAD, UNIT 1
OTTAWA, ON K2E 8B3
613-745-6471

ATTENTION TO: Ottawa Location

PROJECT: CO884.01

AGAT WORK ORDER: 22Z964139

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 02, 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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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 22Z964139

PROJECT: CO884.01

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: Ottawa Location

SAMPLING SITE:Hawkin Properties

SAMPLED BY:

Inorganic Chemsitry (Soil)

DATE RECEIVED: 2022-10-31

DATE REPORTED: 2022-11-02

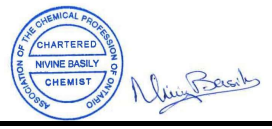
		SAMPLE DESCRIPTION:		BH-106-SS-6
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2022-10-12
Parameter	Unit	G / S	RDL	4477265
Sulphate (2:1)	µg/g		2	178
pH (2:1)	pH Units		NA	7.19

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

4477265 pH and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

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

Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 22Z964139

PROJECT: CO884.01

ATTENTION TO: Ottawa Location

SAMPLING SITE:Hawkin Properties

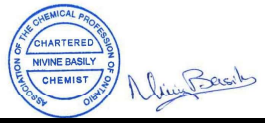
SAMPLED BY:

Soil Analysis

RPT Date: Nov 02, 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 Chemsitry (Soil)															
Sulphate (2:1)	4474463		15	15	0.0%	< 2	94%	70%	130%	93%	80%	120%	96%	70%	130%
pH (2:1)	4345153		6.96	7.39	6.0%	NA	99%	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.

Certified By:



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

Time Markers

AGAT WORK ORDER: 22Z964139

PROJECT: CO884.01

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: Ottawa Location

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
4477265	BH-106-SS-6	Soil	12-OCT-2022	31-OCT-2022

Inorganic Chemsitry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
Sulphate (2:1)	02-NOV-2022	02-NOV-2022	LC
pH (2:1)	02-NOV-2022	02-NOV-2022	SR

AGAT Laboratories

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 LIMITED

AGAT WORK ORDER: 22Z964139

PROJECT: CO884.01

ATTENTION TO: Ottawa Location

SAMPLING SITE:Hawkin Properties

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

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 #: 22Z964139

Cooler Quantity: One - ice

Arrival Temperatures: 6.0 16.2 15.9
1.3 12.0 11.5

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: Resolpex
Contact: 613-745-6471
Address: 20 Gwendwaasa Rd

Phone: Fax:

Reports to be sent to:
1. Email:
2. Email:

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table ___ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm

Region ___ *Indicate One*
☐ MISA

☐ Regulation 558
☐ CCME
☐ 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 ☐ 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: 08-54-01
Site Location: Hawkin properties
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:

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	Y / N
BH-106-SS-6	12-Oct-2022		1			

O. Reg 153

Field Filtered - Metals, Hg, CrVI	Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_4 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	
														PH and Sulphides
														✓

Samples Relinquished By (Print Name and Sign): Mraug	Date: 31-10-2022	Time: 12:15pm	Samples Received By (Print Name and Sign): Berthelet	Date: 22-10-31	Time: 12h20	'22 NOV 1 9:41 a
Samples Relinquished By (Print Name and Sign):	Date: 22-10-31	Time:	Samples Received By (Print Name and Sign): M. GRASIC	Date:	Time:	Page ___ of ___
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:	N°: T 085438