PATERSON GROUP

Geotechnical Investigation

Proposed Commercial Development

2226 Mer Bleue Road
Ottawa, Ontario

Prepared for Richcraft

Report PG3130-4 dated April 30, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Richcraft to conduct a geotechnical investigation for the proposed commercial development to be located at 2226 Mer Bleue Road in the City of Ottawa (reference should be made to Figure 1 – Key Plan in Appendix 2 of this report for the general site location).

The objectives of the geotechnical investigation were to:

- Determine the subsoil and groundwater conditions at this site by means of boreholes.
- Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

This report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

2.0 Proposed Development

Based on the available conceptual plan, it is understood that the proposed commercial development will consist of one retail store, one grocery store, and six single-unit and three multi-unit commercial blocks.

The remainder of the site will generally be occupied by asphalt-paved access lanes and landscaped areas. It is also expected that the proposed development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on April 21st and 22nd, 2025 and consisted of advancing a total of 8 boreholes to a maximum depth of 8.9 m below the existing ground surface. A previous geotechnical investigation by Paterson also included boreholes BH 12A-17, BH 12B-17, BH 6-18, BH 15-08 and test pit TP 20-08 within the proposed development.

The test hole locations were determined in the field by Paterson personnel and distributed in a manner to provide general coverage of the subject site, taking into consideration existing site features and underground utilities. The test hole locations are presented on Drawing PG3130-9 – Test Hole Location Plan included in Appendix 2.

The boreholes were advanced with a low-clearance track-mounted drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from the geotechnical division. The drilling procedure consisted of augering to the required depth at the selected location, sampling, and testing the overburden.

Sampling and In Situ Testing

Soil samples were recovered from the boreholes using a 50 mm diameter split-spoon sampler or from the auger flights. The split spoon, and auger samples were classified on site and placed in sealed plastic bags. All soil samples were transported to our laboratory for further review. The depths at which the split spoon, and auger samples were recovered from the boreholes are shown as SS, and AU, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was carried out in cohesive soils using a field vane apparatus in all boreholes.

The overburden thickness was evaluated by a dynamic cone penetration test (DCPT) at borehole BH 8-25, completed during the current field program. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment. Due to the low resistance exerted by the silty clay in some boreholes, the cone was often pushed using the hydraulic head of the drill rig until resistance to penetration was encountered. The hammer was then used to further advance the cone to practical refusal.

Subsurface conditions observed in the test holes were recorded in detail in the field. Reference should be made to the Soil Profile and Test Data sheets presented in Appendix 1 for specific details of the soil profile encountered at the test hole locations.

Groundwater

Boreholes BH 1-25 through BH 8-25 were fitted with a flexible polyethylene standpipe to allow groundwater level monitoring. The groundwater level readings were obtained after a suitable stabilization period subsequent to the completion of the field investigation.

The groundwater observations are discussed in Section 4.3 and presented in the Soil Profile and Test Data sheets in Appendix 1.

Sample Storage

All samples from the current investigation will be stored in the laboratory for a period of 1 month after the issuance of this report. They will then be discarded unless directed otherwise.

3.2 Field Survey

The borehole locations and ground surface elevation at each borehole location were surveyed by Paterson using a high-precision handheld GPS and referenced to a geodetic datum. The locations of the boreholes, and the ground surface elevation at each borehole location, are presented on Drawing PG3130-9 – Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the test holes were examined in our laboratory to review the results of the field logging. From the current boreholes, one sample was submitted for Atterberg Limits testing and one sample was submitted for shrinkage testing.

The results of the Atterberg Limits testing and shrinkage testing are presented in Appendix 1 and are further discussed in Sections 4.2.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the sample. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently undeveloped but was historically occupied by a 1-storey building along the western portion, fronting onto Mer Bleue Road, and which was demolished in recent years. Furthermore, several soil stockpiles were observed around the central and southeast portions of the subject site. Standing water was observed at the surface along the entire western portion of the site.

The site is bordered by Mer Bleue Road and Brian Coburn Boulevard to the east and north, by undeveloped land to the south and west. The ground surface elevation across the subject site is relatively flat between a geodetic elevation 87 and 88 m, although due to the presence of stockpiles withing the central and southeast portions of the site, the piles were noted to be approximately 3 m higher than the existing grades.

4.2 Subsurface Profile

Generally, the subsurface profile at the subject site consists of topsoil and/or fill, extending to approximate depths of 0.5 to 1 m (with the exception of the fill stockpiles) overlying a silty clay deposit. The fill was generally observed to consist of brown silty clay with varying amounts of gravel and crushed stone.

The silty clay deposit, encountered underlying the topsoil and/or fill, was observed to have a hard to very stiff, brown silty clay crust, becoming a stiff to firm, grey silty clay below approximate depths of 3.1 to 3.8 m.

A DCPT was conducted at borehole BH 8-25. Practical refusal to the DCPT was encountered at the borehole location at 12.52 m below ground surface.

Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets in Appendix 1.

Bedrock

Based on available geological mapping, the bedrock in the subject area is part of the Lindsay formation, which consists of interbedded limestone and dolomite with an overburden drift thickness ranging between 10 to 15 m.

Atterberg Limits Testing

Atterberg limits testing was completed on recovered silty clay samples from select borehole locations. The results of the Atterberg limits test are presented in Table 1 below, and on the Atterberg Limits Results sheet in Appendix 1.

Table 1 – Atterberg Limits Results

Sample	Depth (m)	LL (%)	PL (%)	PI (%)	Classification
BH 1-25 SS3	2.1	66	31	35	CH
BH 15-08 TW2	4.9	66	28	38	CH

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index.
CL: Inorganic Clay of Low Plasticity, CH: Inorganic Clays of High Plasticity

Shrinkage Testing

Linear shrinkage testing was completed on one sample recovered at a depth of 2.10 m from BH 3-25. The shrinkage limit and shrinkage ratio of the tested silt clay sample were found to be 20.93% and 1.720, respectively. The results of the linear shrinkage testing are presented in Appendix 1.

Consolidation Testing

The results of the consolidation test from the previous investigation are presented in Table 2 on the page below, and in Appendix 1.

The value for p'_c is the preconsolidation pressure and p'_o is the effective overburden pressure of the test sample. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided. The values for C_{cr} and C_c are the recompression and compression indices, respectively. These soil parameters are a measure of compressibility due to stress increases below and above the preconsolidation pressures. The higher values for the C_c, as compared to the C_{cr}, illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 2 – Historical Consolidation Test Results

Borehole	Sample	Depth (m)	p'_c (kPa)	p'_o (kPa)	C_{cr}	C_c
BH 15-08	TW2	4.91	87	50	0.029	1.890

Notes: p'_c: Preconsolidation pressure; p'_o: Effective overburden pressure; C_{cr}: Recompression indice; C_c: Compression indice.

The values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering testing procedures and are estimates only. Natural variations within the soil deposit will affect the results. The p'_o parameter is directly influenced by the groundwater level. Groundwater levels were measured during the site investigation. Groundwater levels vary seasonally which has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The p'_o values for the consolidation tests during the investigation are based on the long term groundwater level being at 0.5 m below the existing groundwater table. The groundwater level is based on the colour and undrained shear strength profile of the silty clay.

The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

4.3 Groundwater

Groundwater levels were recorded at each borehole location and are presented in Table 3 below. The groundwater level readings are also presented in the Soil Profile and Test Data sheets in Appendix 1.

Table 3 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Depth (m)	Elevation (m)	
BH 1-25	87.80	4.75	83.05	April 28, 2025
BH 2-25	87.73	5.41	82.32	
BH 3-25	87.58	5.30	82.28	
BH 4-25	90.71	7.81	82.90	
BH 5-25	87.92	0.27	87.65	
BH 6-25	88.02	5.94	82.08	

Table 3 – Summary of Groundwater Levels				
Borehole Number	**Ground Surface Elevation (m)**	**Measured Groundwater Level**		**Date Recorded**
		Depth (m)	**Elevation (m)**	
BH 7-25	87.19	4.43	82.76	April 28, 2025
BH 8-25	87.78	0.19	87.59	
Note: The ground surface elevation at each borehole location was surveyed using a handheld GPS using a geodetic datum.				

It should be noted that surface water can become trapped within a backfilled borehole that can lead to higher than typical groundwater level observations. The long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples.

Based on these observations, the long-term groundwater table can be expected at a depth of approximately **3 to 4 m** below the existing ground surface.

However, groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. It is recommended that the proposed commercial development be founded on conventional spread footings placed on an undisturbed, hard to very stiff silty clay bearing surface.

Due to the presence of a silty clay deposit, a grade raise restriction will apply to the subject site. Permissible grade raise recommendations are discussed in Section 5.3.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Asphalt, topsoil, construction debris, and deleterious fill, such as those containing organic materials, should be removed from within the perimeters of the proposed buildings and from under paved areas, pipe bedding or other settlement sensitive structures.

Care should be taken not to disturb adequate bearing soils below the founding level during site preparation activities. Disturbance of the subgrade may result in having to sub-excavate the disturbed material and the placement of additional suitable fill material.

Fill Placement

Fill placed for grading beneath the proposed buildings should consist, unless otherwise specified, of clean imported granular fill such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the proposed building should be compacted to a minimum of 98% of the material's standard Proctor maximum dry density (SPMDD).

Non-specified site-excavated soil could be placed as general landscaping fill and beneath paved areas. In landscaped areas, these materials should be spread in lifts with a maximum thickness of 300 mm and compacted by the tracks of the spreading equipment to minimize voids. In areas to be paved, the site-excavated soils should be compacted to a minimum of 98% of the material's standard Proctor maximum dry density (SPMDD).

5.3 Foundation Design

Conventional Spread Footings

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, hard to very stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 is applied to the above noted bearing resistance value at ULS.

The above-noted bearing resistance values at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Permissible Grade Raise Recommendations

Due to the presence of the silty clay deposit, a permissible grade raise restriction of **0.8 m** is recommended for grading at and within 2.4 m of the proposed building footprints, and **1.5 m** for areas more than 2.4 m from the proposed building footprints. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

Lateral Support

The bearing medium under footing- and raft-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

5.4 Design for Earthquakes

The seismic site designation is **Class X_D** as referenced the Ontario Building Code (OBC) 2024. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code (OBC) 2024 for a full discussion of the earthquake design requirements.

5.5 Slab on Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the existing fill subgrade or native soil subgrade approved by the geotechnical consultant at the time of excavation will be considered an acceptable subgrade surface on which to commence backfilling for slab-on-grade construction. Where the subgrade consists of the existing fill, a vibratory drum roller should complete several passes over the subgrade surface as a proof-rolling program. Any poor performing areas should be removed and reinstated with an engineered fill, such as OPSS Granular B Type II.

It is recommended that the upper 200 mm of sub-floor fill consists of OPSS Granular A crushed stone. All backfill material within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

5.6 Pavement Design

Flexible Pavement Structure for Surface Parking

For design purposes, the following pavement structures, presented below, are recommended for the design of car only parking areas, access lanes, and heavy truck parking areas at the subject site.

Table 4 – Recommended Pavement Structure - Car-Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil.	

Table 5 – Recommended Pavement Structure - Access Lanes and Heavy Truck Parking Areas	
Thickness (mm)	**Material Description**
40	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular (base and subbase) should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity. For areas where silty clay is encountered at subgrade level, it is recommended that subdrains be installed during the pavement construction as per City of Ottawa standards. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Backfill against the exterior sides of the foundation walls should consist of free draining non-frost susceptible granular materials, such as clean sand or OPSS Granular B Type I granular material. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided for adequate frost protection of heated structures.

Exterior unheated footings, such as those for isolated exterior piers, retaining walls or loading ramps, are more prone to deleterious movement associated with frost action. These should be provided with a minimum 2.1 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation

6.3 Excavation Side Slopes

The temporary excavation side slopes anticipated should either be excavated to acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled. It is anticipated that sufficient space will be available from property lines such that the excavations can be sloped.

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level.

The subsurface soil is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain a safe working distance from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent material specifications and standard detail drawings from the department of public works and services, infrastructure services branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A or Granular B Type II with a maximum size of 25 mm. The bedding layer should be increased to a minimum thickness of 300 mm where the subgrade consists of grey silty clay. The bedding and cover materials should be placed in maximum 300 mm thick lifts and compacted to 98% of the SPMDD.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

To reduce long-term lowering of the groundwater level, clay seals should be provided in the service trenches. The seals should be a minimum of 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry impervious material placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at a maximum of 60 m intervals in the service trenches.

6.5 Groundwater Control

Groundwater Control for Building Construction

Based on our observations, it is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps.

The contractor should be prepared to direct water away from all subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Persons as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Impacts on Neighbouring Properties

As the proposed buildings will be a slab-on-grade structure, it is not anticipated that they will be founded below the long-term groundwater level. As a result, long-term groundwater lowering is not anticipated, and therefore no adverse effects are expected to neighbouring properties as a result of dewatering.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project.

The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Based on the results of our review, a low to medium sensitivity soil was encountered, and the modified plasticity index does not exceed 40%. Therefore, the following tree planting setbacks are recommended for the low to medium sensitivity area as per City Guidelines.

Large trees (mature height over 14 m) can be planted within these areas provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits may be **reduced to 4.5 m** for small (mature height up to 7.5 m) and medium size trees (mature height 7.5 to 14 m), provided that the conditions noted below are met.

- The underside of footing (USF) is 2.1 m or greater below the lowest finished grade. This footing level must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan.

- A small tree must be provided with a minimum 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- The tree species must be small (mature height up to 7.5 m) to medium size (mature height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❒ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall) to provide ductility.

- ❒ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree).

6.8 Corrosion Potential and Sulphate

The analytical test results of the soil sample indicate that the sulphate content is less than 0.1%. These results along with the chloride and pH value are indicative that Type 10 Portland cement (Type GU) would be appropriate for this site. The chloride content and the pH of the sample indicate they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of an aggressive to very aggressive corrosive environment.

7.0 Recommendations

It is recommended that the following be carried out by Paterson once preliminary and/or detailed designs of the proposed development have been prepared:

- ❑ Review detailed grading, servicing, landscaping, and structural plan(s) from a geotechnical perspective.

In addition, it is a requirement for the foundation design data provided herein to be applicable that a material testing and observation program be performed by the geotechnical consultant. The following aspects of the program should be performed by Paterson:

- ❑ Review and inspection of the installation of the foundation drainage systems.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials used.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine the level of compaction achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

All excess soils, with the exception of engineered crushed stone fill, generated by construction activities that will be transported on-site or off-site should be handled ***Ontario Regulation 406/19: On-Site and Excess Soil Management*.**

8.0 Statement of Limitations

The recommendations provided in this report are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Richcraft, or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Puneet Bandi, M.Eng.

Scott. S. Dennis, P.Eng.

Report Distribution:

- ❑ Richcraft Homes (Email Copy)
- ❑ Paterson Group (1 Copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMITS TESTING RESULTS

CONSOLIDATION TESTING RESULTS

LINEAR SHRINKAGE TESTING RESULTS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383098.02 **NORTHING:** 5034343.01 **ELEVATION:** 87.80

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

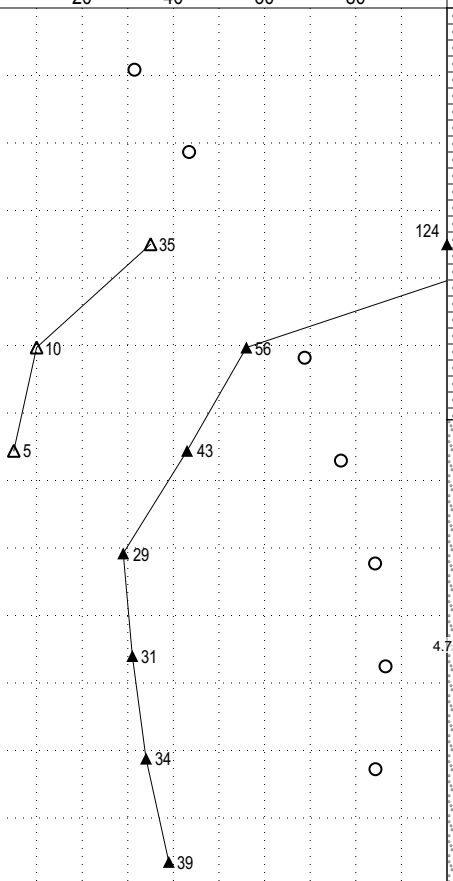
REMARKS:

DATE: April 21, 2025

FILE NO. : PG3130

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics			AU 1			31			
0.30m [87.50m]									
FILL: Firm, brown silty clay, trace gravel									
0.69m [87.11m]									
Very stiff to stiff, brown **SILTY CLAY**		1	SS 2	83	3-3-5-5 8	43			87
		2	SS 3	100	P				86
			SS 4	100	P	69			
- Frim and grey below 3.05 m depth		3	SS 5	100	P	77			85
		4	SS 6	100	P	84			84
		5	SS 7	100	P	87		4.75 m 2025-04-28	83
		6	SS 8	100	P	84			82
6.55m [81.25m]									
End of Borehole		7							81
(GWL at 4.75 m depth - April 28, 2025)		8							80
		9							79
		10							78



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383054.09 **NORTHING:** 5034296.57 **ELEVATION:** 87.73

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

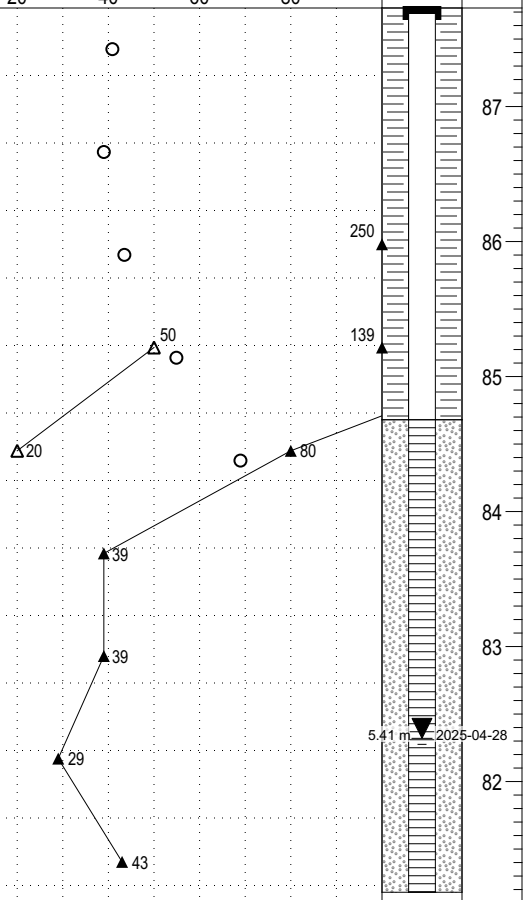
REMARKS:

DATE: April 21, 2025

FILE NO. : PG3130

HOLE NO. : BH 2-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Stiff, brown silty clay with gravel		0	AU 1			41			87
0.69m [87.04m]									
Very stiff to stiff, brown **SILTY CLAY**, trace sand		1	SS 2	79	2-3-4-6 7	39			
		2	SS 3	100	P	44			86
			SS 4	100	P	55			85
- Firm and grey below 3.05 m depth		3	SS 5	100	P	69			
6.55m [81.18m]		4							84
End of Borehole		5							83
(GWL at 5.41 m depth - April 28, 2025)		6							82
		7							81
		8							80
		9							79
		10							78



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383161.77 **NORTHING:** 5034295.41 **ELEVATION:** 87.58

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

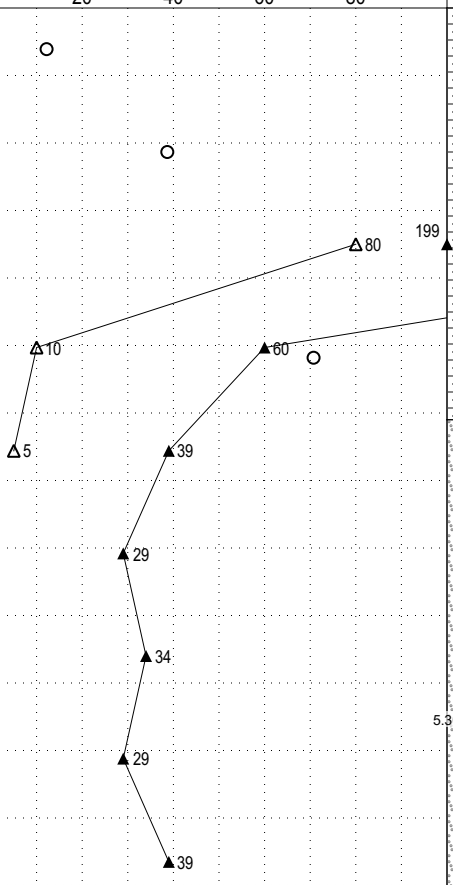
REMARKS:

DATE: April 21, 2025

FILE NO. : PG3130

HOLE NO. : BH 3-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Coarse granular base 0.08m [87.50m]		0	AU 1			12			87
FILL: Compact, brown silty sand with gravel and crushed stone 0.69m [86.89m]									
Very stiff to stiff, brown **SILTY CLAY**		1	SS 2	83	2-4-5-6 9	39			86
		2	SS 3	100	P				85
			SS 4	100	P	71			84
- Firm and grey below 3.05 m depth		3							83
		4							82
		5							81
6.55m [81.03m]		6							80
End of Borehole		7							79
(GWL at 5.30 m depth - April 28, 2025)		8							78
		9							
		10							



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383138.66 **NORTHING:** 5034233.31 **ELEVATION:** 90.71

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

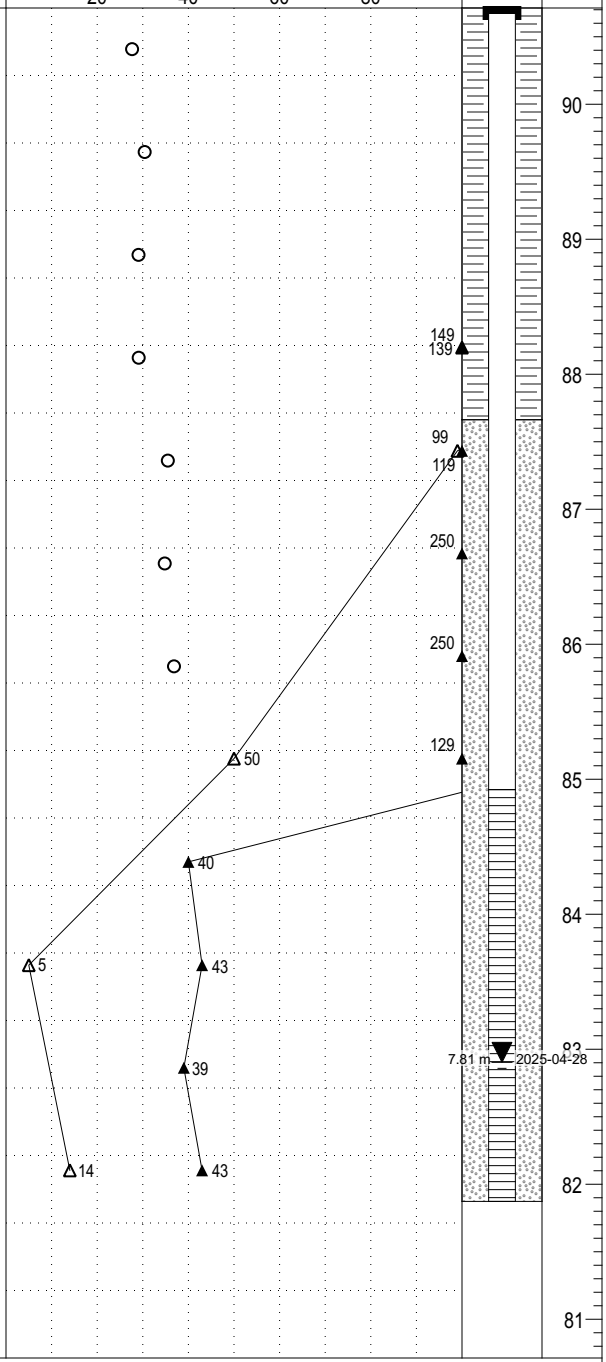
REMARKS:

DATE: April 21, 2025

FILE NO. : PG3130

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Very stiff to stiff, brown silty clay, trace gravel			AU 1			28			90
		1	SS 2	58	3-4-4-5 8	30			89
		2	SS 3	50	2-3-3-4 6	29			88
			SS 4	54	P	29			
3.73m [86.98m]		3	SS 5	42	P	35			87
Hard, brown **SILTY CLAY**, trace silt		4	SS 6	67	P	35			86
- Clay content increasing with depth		5	SS 7	83	P	37			85
- Firm and grey below 6.10 m depth		6							84
		7							83
8.84m [81.87m]		8							82
End of Borehole		9							81
(GWL at 7.81 m depth - April 28, 2025)		10							



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383107.51 **NORTHING:** 5034168.38 **ELEVATION:** 87.92

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS:

DATE: April 22, 2025

FILE NO. : PG3130

HOLE NO. : BH 5-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	SAMPLE WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) / PL (%) WATER CONTENT (%) LL (%)	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE							20 40 60 80		
FILL: Firm, brown silty clay with gravel and crushed stone		0	AU 1			18		0.27 m 2025-04-28	87
0.69m [87.23m]		1	SS 2	21	4-4-4-5 8	44			86
Very stiff to stiff, brown **SILTY CLAY**		2	SS 3		2-3-4-5 7	41			85
		3	SS 4	100	P	49			84
- Firm and grey below 3.81 m depth		4							83
6.55m [81.37m]		5							82
End of Borehole		6							81
(GWL at 0.27 m depth - April 28, 2025)		7							80
		8							79
		9							78
		10							

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383105.21 **NORTHING:** 5034210.97 **ELEVATION:** 88.02

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS:

DATE: April 22, 2025

FILE NO. : PG3130

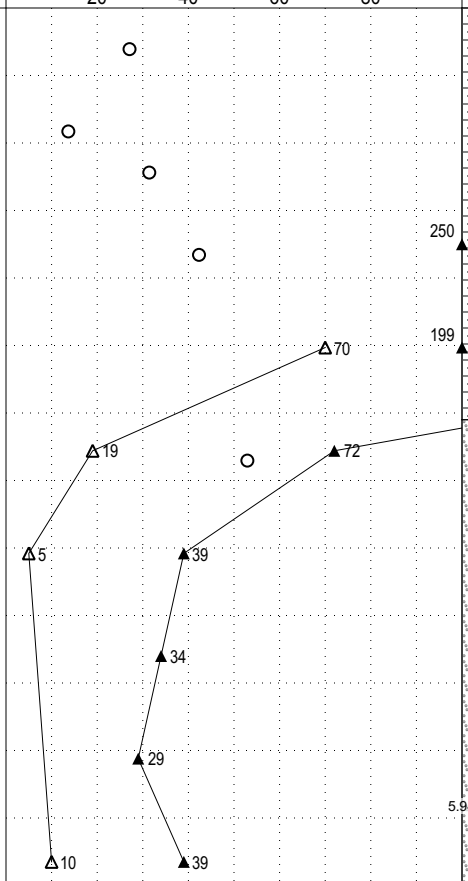
HOLE NO. : BH 6-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	ELEVATION (m)
GROUND SURFACE		0					88
FILL: Very stiff, brown silty clay with gravel			AU 1			27	
1.07m [86.95m]		1	SS 2	67	8-4-7-6	14	87
Hard, brown **SILTY CLAY**					11	31	
		2	SS 3		P	42	86
- Very stiff below 2.29 m depth							
- Stiff and grey below 3.05 m depth		3	SS 4	100	P	53	85
- Firm below 3.66 m depth							
6.55m [81.47m]		4					84
End of Borehole		5					83
(GWL at 5.94 m depth - April 28, 2025)		6					82
		7					81
		8					80
		9					79
		10					

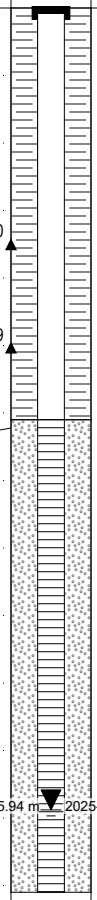
PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE)

REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa)

PL (%) WATER CONTENT (%) LL (%)



PIEZOMETER CONSTRUCTION



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383194.92 **NORTHING:** 5034185.29 **ELEVATION:** 87.19

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

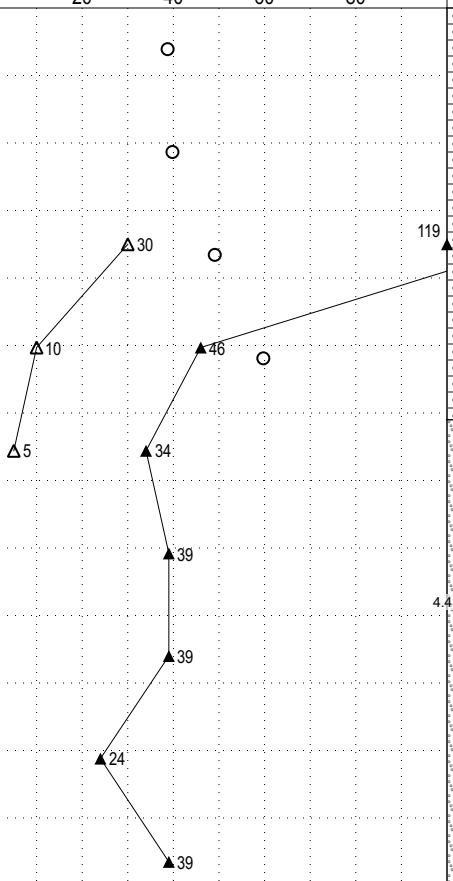
REMARKS:

DATE: April 22, 2025

FILE NO. : PG3130

HOLE NO. : BH 7-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.13m [87.06m]		0	AU 1			39			87
Very stiff to stiff, brown **SILTY CLAY**		1	SS 2	92	3-4-5-6 9	40			86
		2	SS 3		P	49			85
- Firm by 2.29 m to 2.74 m depth			SS 4	100	P	60			
-Grey below 3.05 m depth		3							84
		4							83
		5							82
- soft by 5.33 m to 5.79 m depth									
- Firm below 6.10 m depth		6							81
6.55m [80.64m]									
End of Borehole		7							80
(GWL at 4.43 m depth - April 28, 2025)		8							79
		9							78
		10							



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383018.43 **NORTHING:** 5034349.55 **ELEVATION:** 87.78

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS:

DATE: April 22, 2025

FILE NO. : PG3130

HOLE NO. : BH 8-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	SAMPLE RECOVERY (%)	SAMPLE N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL: with organics 0.20m [87.58m]			AU 1			56		0.19 m 2025-04-28	
FILL: Soft, brown silty clay, trace gravel 0.69m [87.09m]									
Hard, brown **SILTY CLAY**		1	SS 2	79	2-3-5-7 8	48			87
		2	SS 3		P	45			86
- Very stiff by 2.29 m depth			SS 4	100	P	53			85
		3							
-Firm and grey below 3.81 m depth		4							84
		5							83
		6							82
6.55m [81.23m]									
Dynamic Cone Penetration Test commenced at 6.55 m deph		7							81
		8							80
		9							79
		10							78

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2226 Mer Bleue Road Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 383018.43 **NORTHING:** 5034349.55 **ELEVATION:** 87.78

PROJECT: Proposed Commercial Development

ADVANCED BY: Track Mounted Drill Rig

REMARKS:

DATE: April 22, 2025

FILE NO. : PG3130

HOLE NO. : BH 8-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
12.52m [75.26m]		10							77
		11							76
		12							75
End of Borehole		13							74
Practical refusal to DCPT at 12.52 m depth		14							73
DCPT pushed from 6.55 m to 12.52 m depth		15							72
(GWL at 0.19 m depth - April 28, 2025)		16							71
		17							70
		18							69
		19							68
		20							

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
East Urban Community (EUC) Mixed-Use CDP
Mer Bleue Road, Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

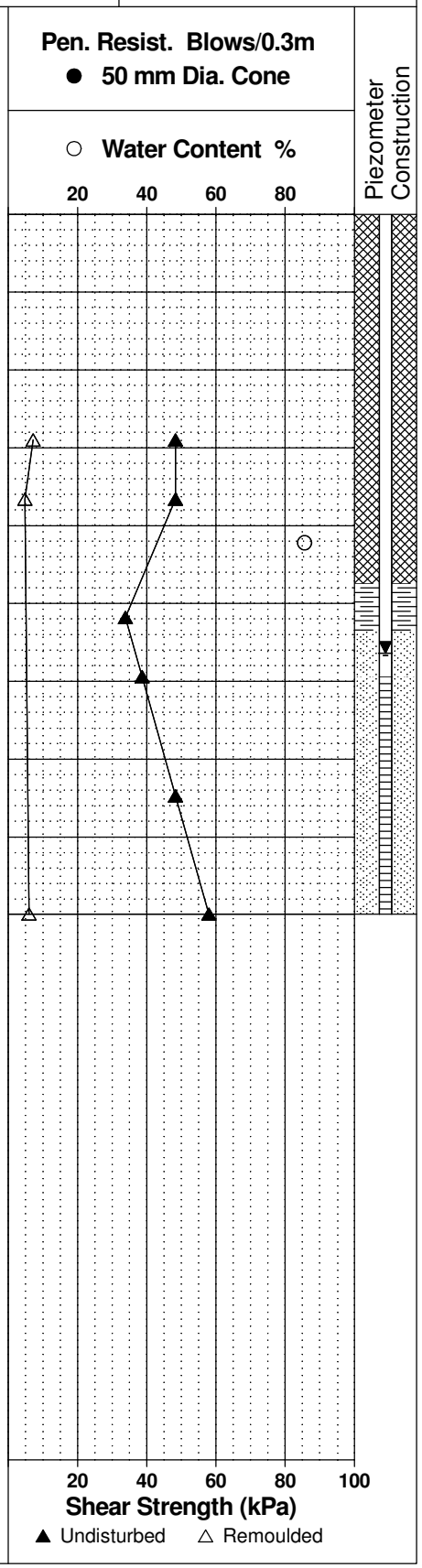
FILE NO. PG3130

REMARKS

HOLE NO. BH 6-18

BORINGS BY CME 55 Power Auger **DATE** June 12, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.79
FILL: Brown silty clay with sand, crushed stone and organics 0.28		AU	1				
		SS	2	21	8	1	86.79
		SS	3	38	8	2	85.79
Very stiff to stiff, brown **SILTY CLAY**							
- firm and grey by 2.2m depth						3	84.79
		TW	4	88		4	83.79
						5	82.79
		SS	5	96	W	6	81.79
						7	80.79
		SS	6	92	W	8	79.79
8.99 End of Borehole							
(GWL @ 5.64m - July 20, 2018)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

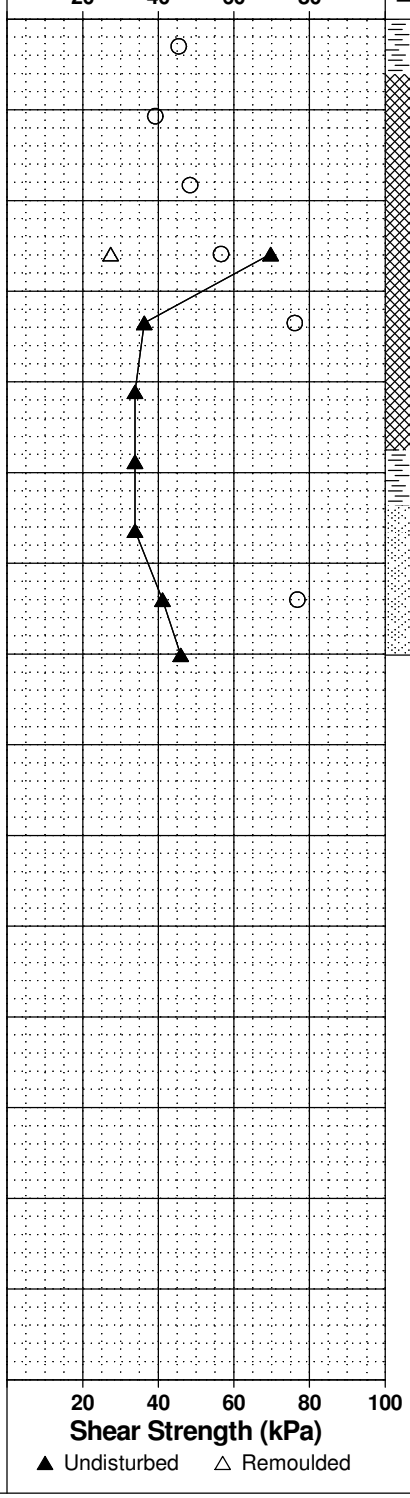
FILE NO. PG0861

REMARKS

HOLE NO. BH12A-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.35
TOPSOIL with organics 0.28		AU	1				
Stiff, brown **SILTY CLAY,** trace sand		SS	2	100	13	1	86.35
		SS	3	100	6	2	85.35
		SS	4	100	P	3	84.35
3.05		SS	5	100	P	4	83.35
Firm, grey **SILTY CLAY**						5	82.35
		SS	6	100	P	6	81.35
7.01						7	80.35
Dynamic Cone Penetration Test commenced @ 7.01m depth. Cone pushed to 16.3m depth.						8	79.35
						9	78.35
						10	77.35
Inferred **SILTY CLAY**						11	76.35
						12	75.35
						13	74.35
						14	73.35
						15	72.35



Piezometer Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

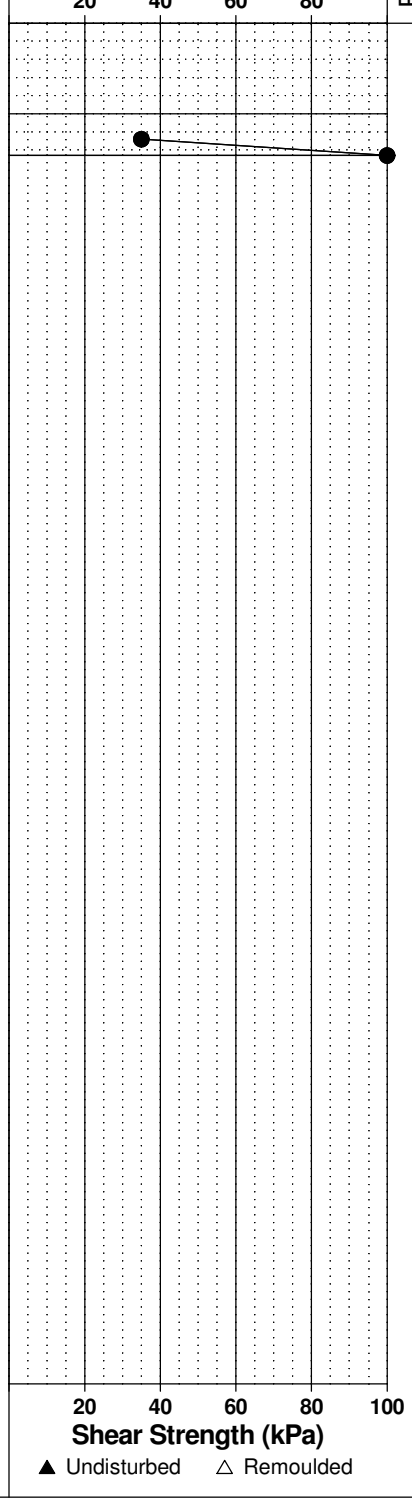
FILE NO. PG0861

REMARKS

HOLE NO. BH12A-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
Inferred **SILTY CLAY**						15	72.35		
						16	71.35		
16.28									
Inferred **GLACIAL TILL** 16.46									
End of Borehole									
Practical DCPT refusal @ 16.46m depth									
(GWL @ 6.16m - May 15, 2017)									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

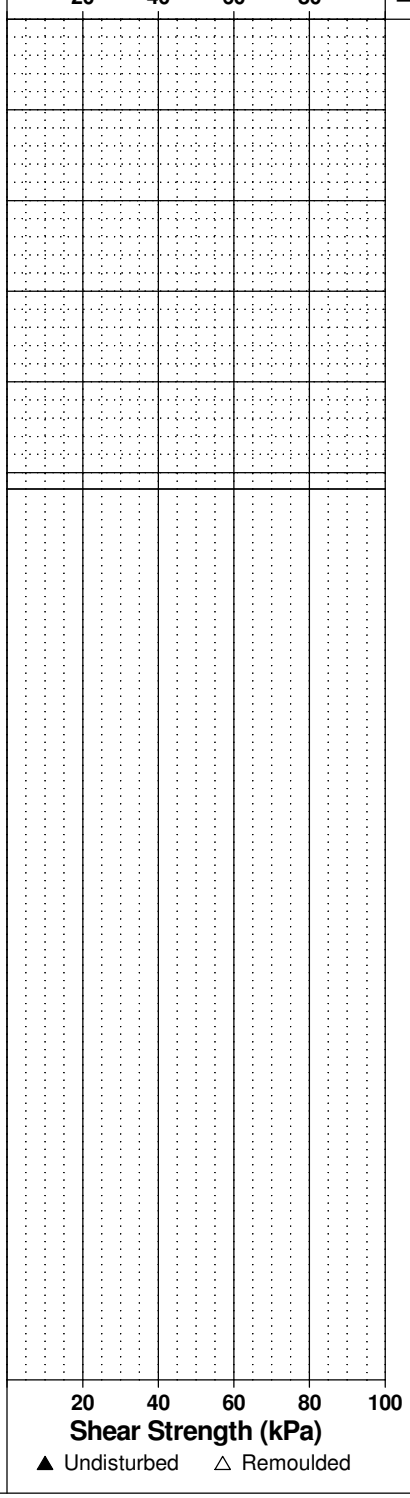
FILE NO. PG0861

REMARKS

HOLE NO. BH12B-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL with organics 0.28						0	87.35		
Stiff, brown **SILTY CLAY,** trace sand						1	86.35		
						2	85.35		
3.05						3	84.35		
Firm, grey **SILTY CLAY**						4	83.35		
5.18		TW	1	100		5	82.35		
End of Borehole									
Practical DCPT refusal @ 16.46m depth									
(GWL @ 6.16m - May 15, 2017)									



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

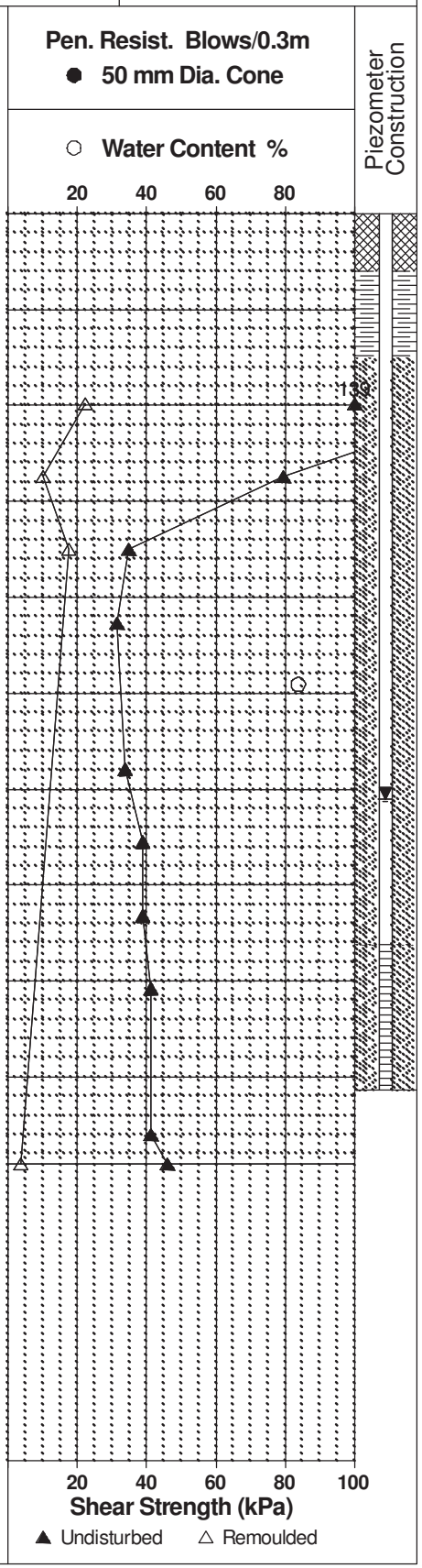
FILE NO. PG0861

REMARKS

HOLE NO. BH15-08

BORINGS BY CME 75 Power Auger **DATE** 16 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.24
TOPSOIL 0.20							
		SS	1	67	11	1	86.24
Very stiff to stiff, brown **SILTY CLAY**						2	85.24
						3	84.24
- stiff to firm and grey by 2.5m depth						4	83.24
		TW	2	100		5	82.24
						6	81.24
						7	80.24
		SS	3	100		8	79.24
		AU	5				
		TW	4	100		9	78.24
9.91							
End of Borehole							
(GWL @ 6.10m-Oct. 23/08)							



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Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Residential Development - Eden Park East Portion
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

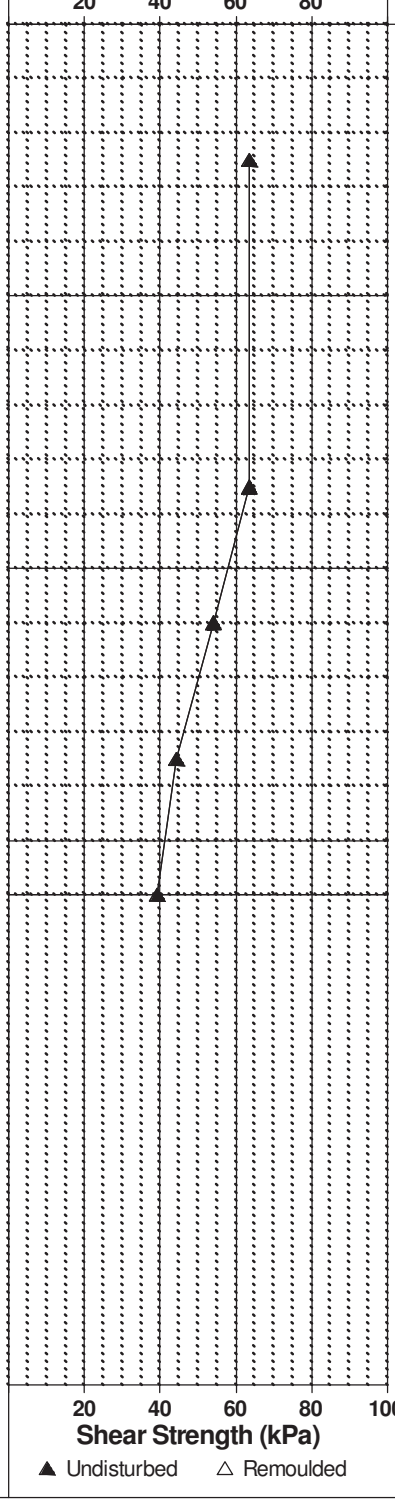
FILE NO. PG0861

REMARKS

HOLE NO. TP20-08

BORINGS BY Backhoe **DATE** 24 October 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.24		
TOPSOIL 0.30									
Stiff, brown **SILTY CLAY**						1	86.24		
- firm and grey by 2.5m depth						2	85.24		
3.20						3	84.24		▽
End of Test Pit (Groundwater infiltration @ 3.0m depth)									



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

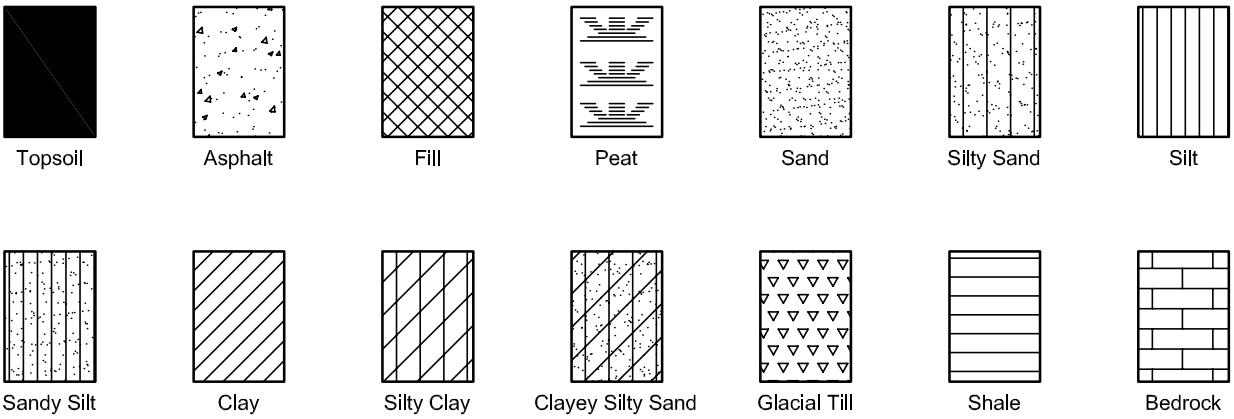
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

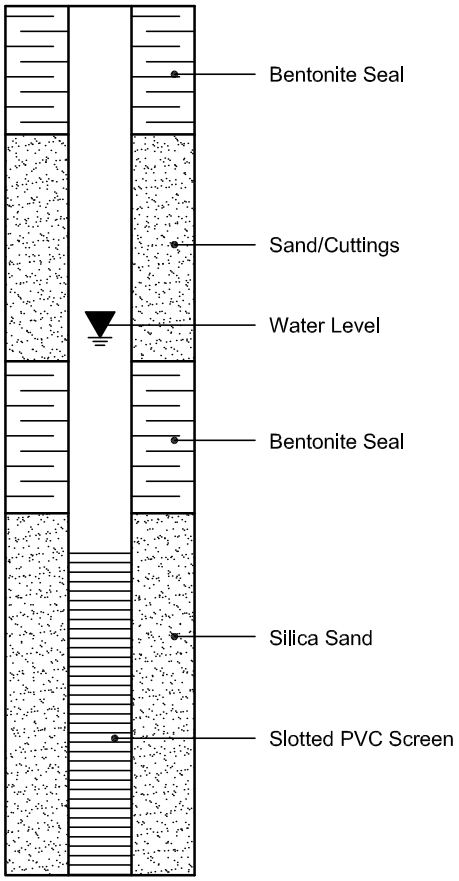
SYMBOLS AND TERMS (continued)

STRATA PLOT

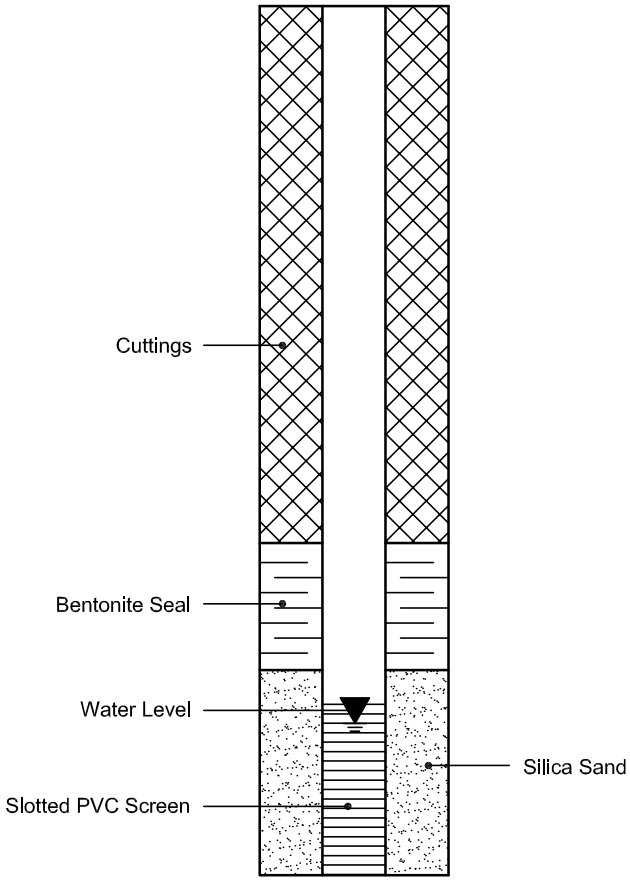


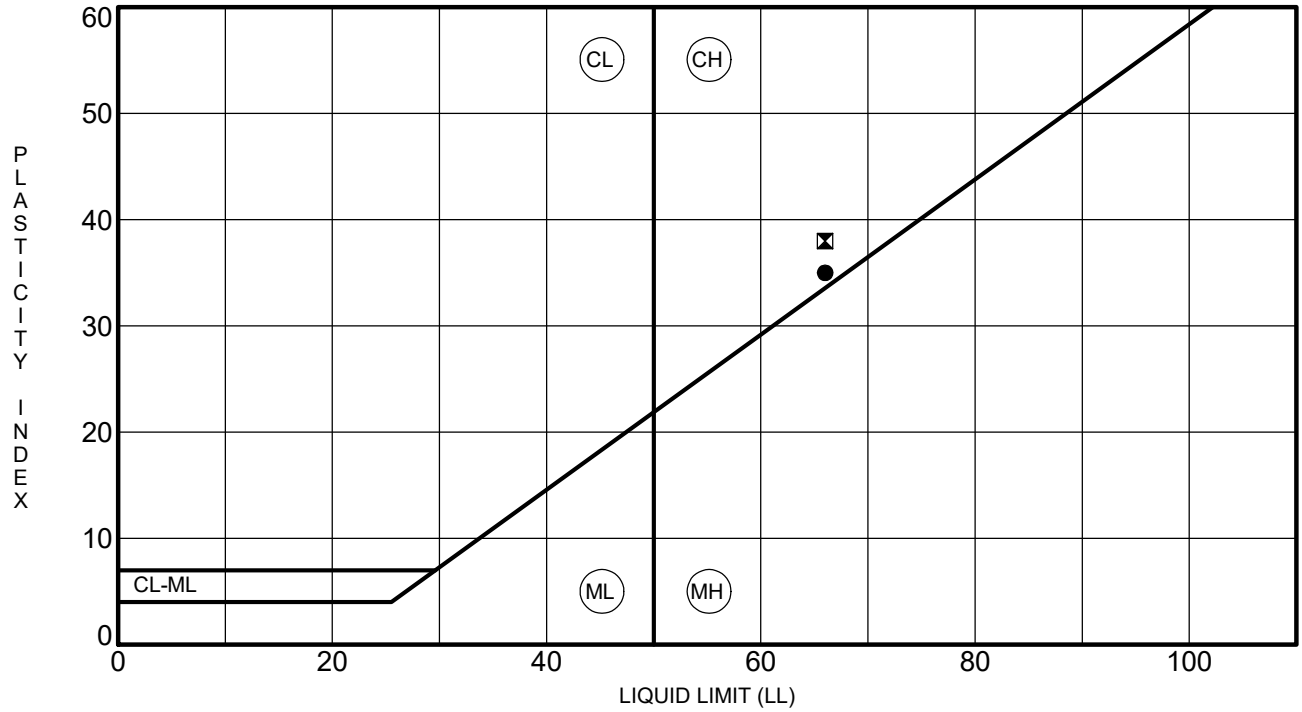
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





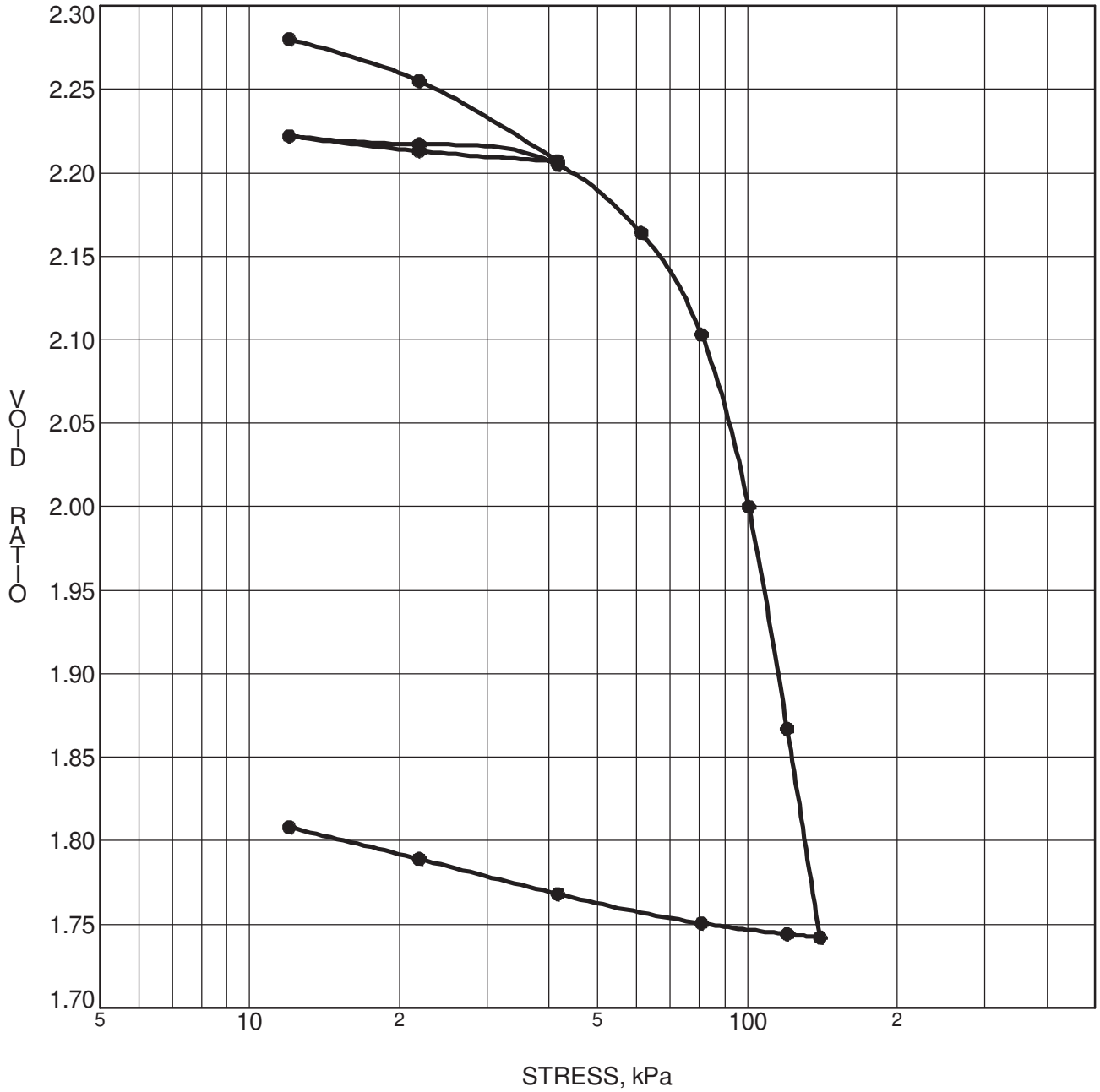
Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 1-25**	**SS3**	**66**	**31**	**35**		**CH - Inorganic Clays of High Plasticity**
⧓	**BH 15-08**	**TW2**	**66**	**28**	**38**		**CH - Inorganic Clays of High Plasticity**

CLIENT **Richcraft Homes** FILE NO. **PG3130**

PROJECT **Geotechnical Investigation Proposed Commercial Development 2226 Mer Bleue Road, Ottawa, Ontario** DATE **29 Apr 25**

PATERSON GROUP
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

ATTERBERG LIMITS' RESULTS



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH15-08**	p'_o	**50** kPa	Ccr	**0.029**
Sample No.	**TW 2**	p'_c	**87** kPa	Cc	**1.890**
Sample Depth	**4.91** m	OC Ratio	**1.7**	Wo	**83.8** %
Sample Elev.	**82.33** m	Void Ratio	**2.303**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT	**Richcraft Homes**	FILE NO.	**PG0861**
PROJECT	**Geotechnical Investigation - Residential Development - Eden Park East Portion**	DATE	**10/27/08**

patersongroup Consulting Engineers
28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

CONSOLIDATION TEST

PATERSON GROUP

Linear Shrinkage
ASTM D4943-02

CLIENT:	Richcraft Group	DEPTH	5' - 7'	FILE NO.:	PG3130
PROJECT:	2226 Mer Bleue	BH OR TP No:	BH3-25 SS3	DATE SAMPLED	-
LAB No:	59265	TESTED BY:	C.P	DATE RECEIVED	-
SAMPLED BY:	P.B.	DATE REPORTED:	29-Apr-25	DATE TESTED	29-Apr-25

LABORATORY INFORMATION & TEST RESULTS

	Moisture	**No. of Blows(7)**		**Calibration (Two Trials)**	**Tin NO.(A1)**
Tare	4.92		Tin	4.76	4.76
Soil Pat Wet + Tare	63.35		Tin + Grease	4.91	4.92
Soil Pat Wet	58.43		Glass	43.25	43.25
Soil Pat Dry + Tare	37.96		Tin + Glass + Water	85.86	85.84
Soil Pat Dry	33.04		Volume	37.70	37.67
Moisture	**76.85**		**Average Volume**	**37.69**	

Soil Pat + String	33.19
Soil Pat + Wax + String in Air	36.43
Soil Pat + Wax + String in Water	13.58
Volume Of Pat (Vdx)	22.85

RESULTS:

Shrinkage Limit	**20.93**
Shrinkage Ratio	**1.720**
Volumetric Shrinkage	**96.178**
Linear Shrinkage	**20.116**

REVIEWED BY:	**Curtis Beadow**	**Joe Forsyth, P. Eng.**
		

	Client ID:	BH4-25, SS3	-	-	-		
	Sample Date:	22-Apr-25 09:00	-	-	-	-	-
	Sample ID:	2517226-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	78.2	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.59	-	-	-	-	-
Resistivity	0.1 Ohm.m	20.2	-	-	-	-	-
Anions							
Chloride	10 ug/g	38	-	-	-	-	-
Sulphate	10 ug/g	132	-	-	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

DRAWING PG3130-9 – TEST HOLE LOCATION PLAN

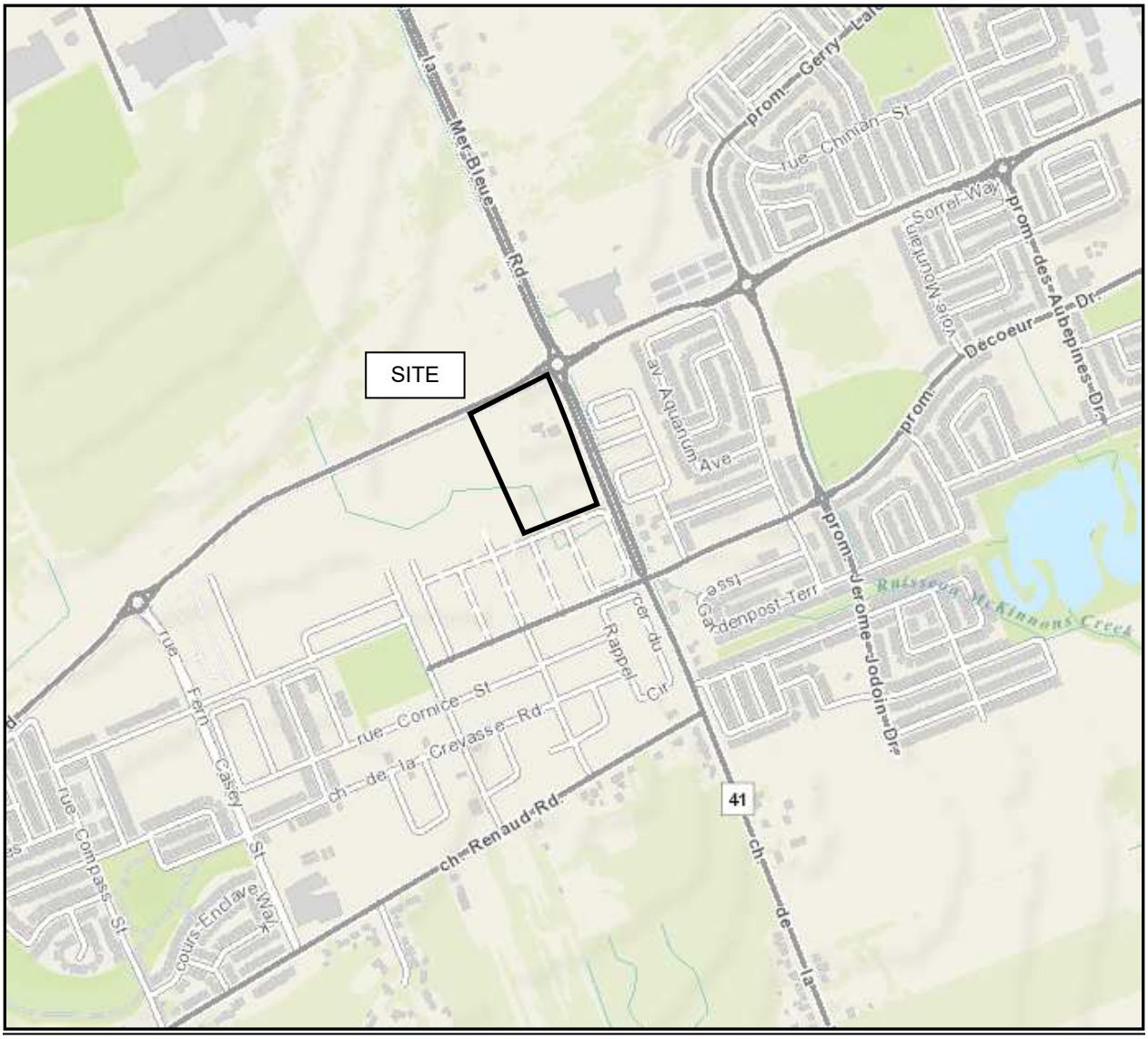
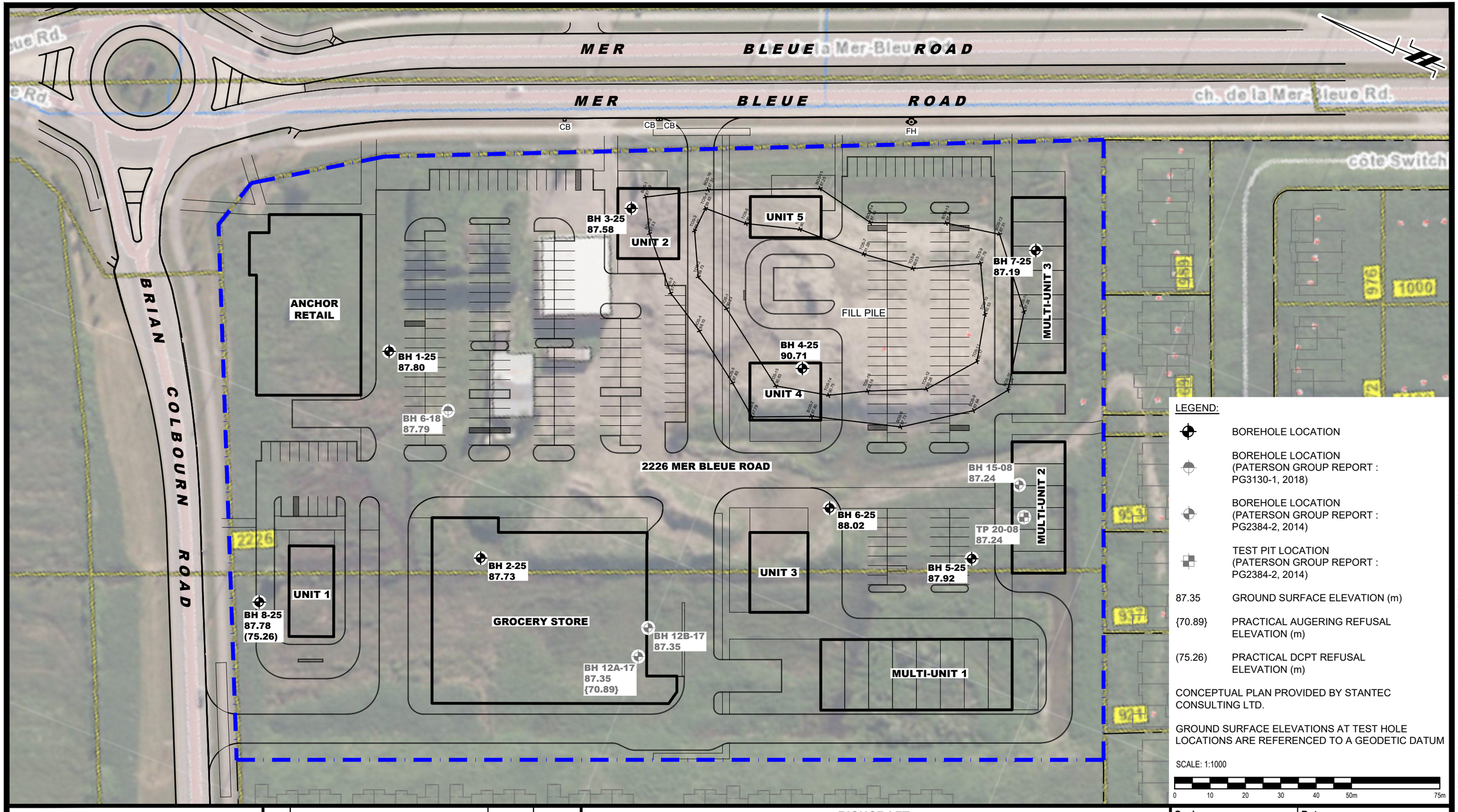


FIGURE 1

KEY PLAN

PATERSON GROUP



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE LOCATION (PATERSON GROUP REPORT : PG3130-1, 2018)
- BOREHOLE LOCATION (PATERSON GROUP REPORT : PG2384-2, 2014)
- TEST PIT LOCATION (PATERSON GROUP REPORT : PG2384-2, 2014)

87.35 GROUND SURFACE ELEVATION (m)

{70.89} PRACTICAL AUGERING REFUSAL ELEVATION (m)

(75.26) PRACTICAL DCPT REFUSAL ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY STANTEC CONSULTING LTD.

GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM

SCALE: 1:1000

0 10 20 30 40 50m 75m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

RICHCRAFT
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
2226 MER BLEUE ROAD
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 04/2025
Drawn by: YA	Report No.: PG3130-4
Checked by: PB	Dwg. No.: PG3130-9
Approved by: SD	Revision No.:

11x17

p:\autocad drawings\geotechnical\pg31xx\pg3130 - richcraft homes - eucl\existing conditions cad overlay\pg3130-9-test hole location plan (april 2025).dwg