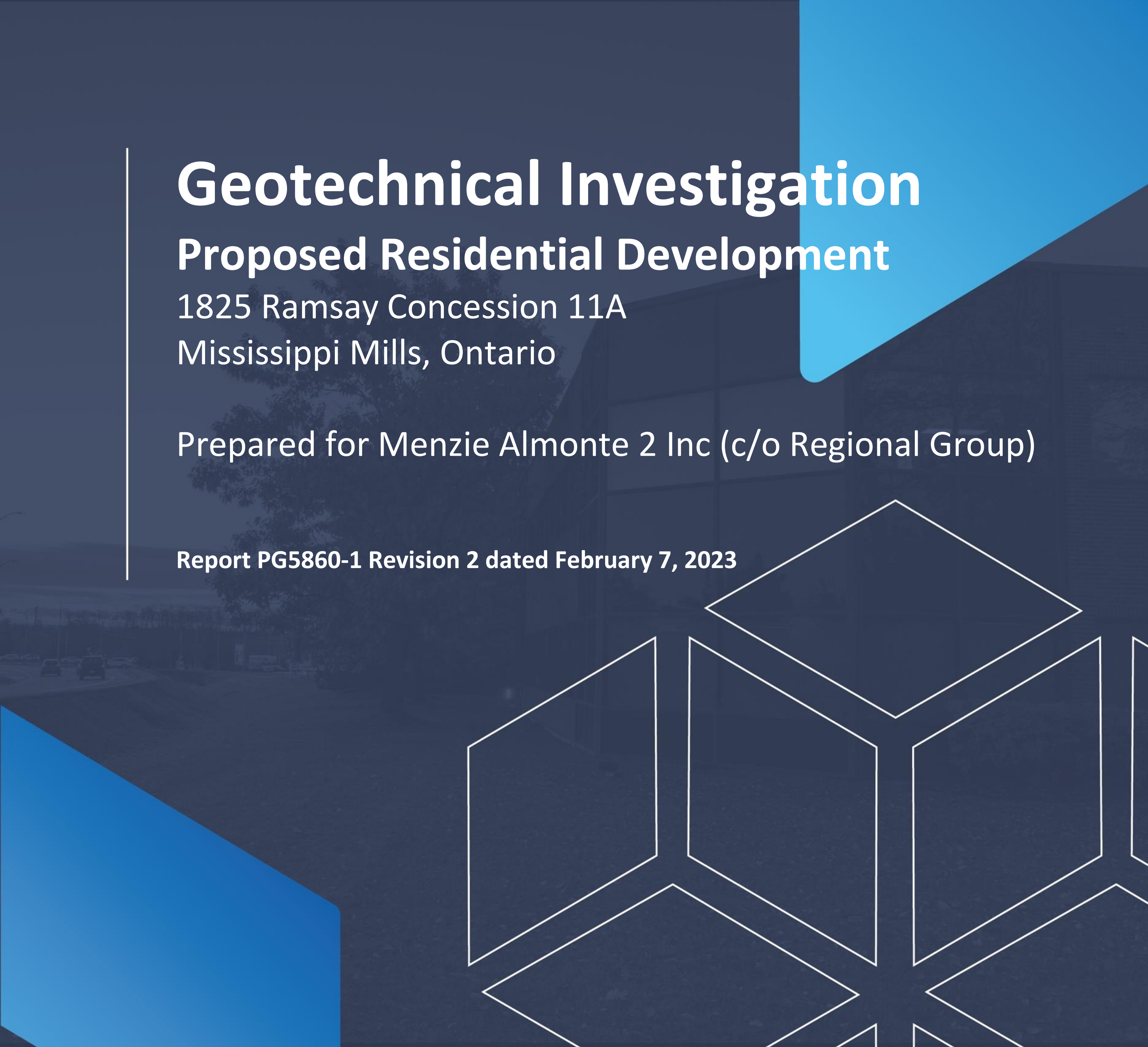
PATERSON GROUP



# Geotechnical Investigation

## Proposed Residential Development

1825 Ramsay Concession 11A
Mississippi Mills, Ontario

Prepared for Menzie Almonte 2 Inc (c/o Regional Group)

**Report PG5860-1 Revision 2 dated February 7, 2023**

# Table of Contents

# Appendices

# 1.0 Introduction

Paterson Group (Paterson) was commissioned by Menzie Almonte 2 Inc (c/o Regional Group) to prepare a geotechnical investigation report for the proposed residential development to be located at 1825 Ramsey Concession 11A, in the Village of Mississippi Mills, Ontario (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the geotechnical investigation was to:

- determine the subsoil and groundwater conditions at the site by means of test holes

- provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect its design.

The following 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 drawings, it is understood that the proposed development will consist of residential dwellings with driveways, local roadways, walkways and landscaped areas. It is further understood that a stormwater management pond and a park are to be located within the southwestern portion of the subject site. It is 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 November 24, 2021. The program consisted of one (1) test pit and fifteen (15) hand augered test holes advanced down to a maximum depth of 2.2 m below ground surface. A previous geotechnical investigation program was completed on June 11, 2021 and consisted of excavating a total of (6) test pits down to a maximum depth of 2.6 m below ground surface. The test pit locations were distributed in a manner to provide general coverage of the subject site and taking into consideration underground utilities and site features. The test hole locations are shown on Drawing PG5860-1 - Test Hole Location Plan attached.

The test pits were completed using an excavator and backfilled with the excavated soil upon completion. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The test pit procedures consisted of excavating to the required depth at the selected location and sampling the overburden.

### Sampling and In Situ Testing

The soil samples from the test pits were recovered from the side walls of the open excavation. The samples were initially classified on site, placed in sealed plastic bags and transported to our laboratory. The depths at which the auger and grab samples were recovered from the test pits are shown as AU, and G respectively, on the Soil Profile and Test Data sheets in Appendix 1.

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

The subsurface conditions observed in the test pits were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets in Appendix 1 of this report.

## 3.2 Field Survey

The test hole locations were selected by Paterson to provide general coverage of the subject site. The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson using a high precision, handheld GPS and referenced to a geodetic datum. The location of the boreholes is presented on Drawing PG5860-1 - Test Hole Location Plan in Appendix 2.

## 3.3 Laboratory Review

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. All test results are included in Appendix 1 and further discussed in Subsection 4.2 of the current report.

## 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 by others. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples.  The results are discussed further in Subsection 6.7.

# 4.0 Observations

## 4.1 Surface Conditions

The site is currently undeveloped, and grass covered. The ground surface across the subject site is relatively flat and approximately 1.5 m lower than the neighbouring roadway. The site was observed to be sparsely vegetated with brush and small adolescent trees. It is worth noting that extremely soft ground conditions were encountered at ground surface within the western portion of the site due to the presence of a peat layer. Furthermore, surface water was observed to vary between 0 and 100 mm across the western portion of the site where the peat was encountered.

The site is bound by a residential subdivision and a storm water pond to the south, a single house and associated landscaped areas to the east, and by similar land to the north and west.

## 4.2 Subsurface Profile

### Overburden

Generally, the subsurface profile encountered at the test pit locations excavated within the eastern portion of the site consists of topsoil with high organic content overlying very stiff brown glacial till. On the other hand, the subsurface profile encountered at the test pit locations excavated within the western portion of the site consists of an organic peat overlying a firm to soft grey silty clay deposit. A layer of marl was encountered below the peat at the location of TP1 and TP5. The marl layer extended to an approximate depth of 0.75m to 1.0m below grade level at the test pit locations. Practical refusal to excavation on bedrock was encountered in all test pits at approximate depths ranging between 2.2 and 2.6 m. Reference should be made to the Soil Profile and Test Data sheets in the attachments for specific details of the soil profiles encountered at each test hole location.

### Bedrock

Based on available geological mapping, the local bedrock consists of limestone and dolomite of the Gull River formation with an anticipated overburden thickness of 1 to 3 m depth.

## 4.3 Groundwater

Groundwater levels were recorded in the open test holes at the time of the investigation and are presented on the Soil Profile and Test Data Sheets Attached in Appendix 1.

Long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, it is estimated that the long-term groundwater table can be expected at approximately 1.5 to 2.0 m below ground surface. However, it should be noted that surface water was observed within the organic containing layers within the southwest portion of the site, which could lead to an initial heavy in-flux of water within open excavations.

It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

# 5.0 Discussion

## 5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered acceptable for the future phase of the proposed residential development. However, due to the presence of a peat/marl layer and shallow groundwater within the southwest portion of the site, additional site preparation recommendations are required.

Due to the presence of a sensitive silty clay layer, the western portion of the site will be subjected to grade raise restrictions. The recommended permissible grade raise restriction is presented in Drawing PG5860-2 – Permissible Grade Raise Plan in Appendix 2. If a higher permissible grade raise is required, preloading with or without surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction and differential settlements.

Depending on depth of services and building foundations, bedrock removal may be required.

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

## 5.2 Site Grading and Preparation

### Stripping Depth

Topsoil and deleterious fill, such as those containing significant amounts of organics, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

A peat layer was noted within TP 1, TP2, TP5 and TP6 excavated within the western portion of the site. Marl was also noted below the peat at the location of TP1 and TP5. The peat and marl layers may also be encountered in other areas within the site and should be removed from under any settlement sensitive structures.

### Fill Placement

Fill used for grading beneath the building footprints, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site.

It should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building area should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

### Bedrock Removal

Where bedrock removal is needed to accommodate services, this can be done using line-drilling in conjunction with hoe-ramming or controlled blasting to remove the bedrock. In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.

Prior to considering blasting operations, the blasting effects on the existing nearby services, buildings and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in proximity to the blasting operations should be carried out prior to commencing construction. The extent of the survey should be determined by the blasting consultant and sufficient to respond to any inquiries/claims related to the blasting operations.

As a general guideline, peak particle velocity (measured at the structures) should not exceed 25 mm/s during the blasting program to reduce the risks of damage to the existing structures. The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is an experienced blasting consultant.

## 5.3 Foundation Design

Based on the subsurface profile encountered, it is expected that footings for the proposed buildings can be founded on either an undisturbed, firm grey silty clay, compact brown glacial till or bedrock bearing surface. Also, footings can be founded on an engineered pad over an approved undisturbed firm grey silty clay, compact brown glacial till, or clean surface sounded bedrock surface.

### Bearing Capacity of Conventional Footings

Footings placed on an undisturbed firm, grey silty clay layer or on an engineered pad over undisturbed native soil approved by Paterson at the time of construction, can be designed using a bearing resistance value at serviceability limit states (SLS) of **60 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **125 kPa**.

Footings placed on an undisturbed, compact, brown glacial till bearing surface can be designed using a bearing resistance value at SLS of **150 kPa** and a factored bearing resistance value at ULS of **225 kPa**.

An undisturbed soil bearing surface consists of one from which all topsoil, peat, marl, and deleterious materials, such as loose, frozen or disturbed soil, have been removed, in the dry, prior to the placement of concrete for footings.

Footings placed on a clean, surface sounded bedrock bearing surface can be designed using a bearing resistance value at ULS of **500 kPa**.

A clean surface sounded bedrock bearing surface consists of one from which all loose materials have been removed, and has no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

A geotechnical resistance factor of 0.5 was applied to the reported bearing resistance values at ULS.

Footings placed on a soil bearing surface and designed using the bearing resistance values at SLS given above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. Footings placed on a clean surface sounded bedrock bearing surface will be subjected to negligible post construction settlements.

The bearing medium under footing-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 native soil, above the groundwater table, 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 or engineered granular fill, as described above. In sound unfractured bedrock, a 1H:6V slope may be used.

### Permissible Grade Raise Recommendations

Our permissible grade raise recommendations are summarized on Drawing PG5860-2 - Permissible Grade Raise Plan in Appendix 2. Where the grade raise cannot be accommodated with soil fill, the following options could be used alone or in combination.

*Option 1 - Use of Lightweight Fill*

Lightweight fill (LWF) can be used, consisting of EPS (expanded polystyrene) Type 12 or 15 blocks or other lightweight materials which allow for raising the grade without adding a significant load to the underlying soils. However, these materials are expensive and, in the case of the EPS, are more difficult to use under the groundwater level, as they are buoyant, and must be protected against potential hydrocarbon spills. Use lightweight fill within the interior of the garage and porch areas to reduce the fill-related loads.

*Option 2 - Preloading or Surcharging*

It is possible to preload or surcharge the proposed site in localized areas provided sufficient time is available to achieve the desired settlements based on theoretical values from the settlement analysis. If this option is considered, a monitoring program using settlement plates and electronic piezometers will have to be implemented. This program will determine the amount of settlement in the preloaded or surcharged areas. Obviously, preloading to proposed finished grades will allow for consolidation of the underlying clays over a longer time period. Surcharging the site with additional fill above the proposed finished grade will add additional load to the underlying clays accelerating the consolidation process and allowing for accelerated settlements. Once the desired settlements are achieved, the site can be unloaded and the fill can be used elsewhere on site.

## 5.4 Floor Slab Construction

With the removal of all topsoil, peat, marl, and deleterious fill within the footprints of the proposed buildings, the native soil or bedrock surface approved by Paterson will be considered an acceptable subgrade upon which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Types I or II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab (outside the zones of influence of the footings). It is recommended that the upper 200 mm of sub-floor fill consists of 19 mm clear crushed stone.

## 5.5 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the shallow footings founded on glacial till or bedrock and **Class D** for shallow footings founded on the silty clay deposit of the subject site. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

## 5.6 Pavement Design

For design purposes, the pavement structure presented in the following tables could be used for the design of driveways and local residential roadways:

**Table 1 - Recommended Pavement Structure – Driveways**

| 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 fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or fill | |

**Table 2 - Recommended Pavement Structure – Local Roadways**

| 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 |
| 400 | **SUBBASE** - OPSS Granular B Type II |
| **SUBGRADE** - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill | |

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 I or II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material’s SPMDD using suitable vibratory equipment.

### Pavement Structure Drainage

The pavement structure performance is largely dependent on 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 load carrying capacity.

Due to the impervious nature of the subgrade and fill materials and transitions between various pavement structures, consideration should be provided to installing subdrains during the pavement construction.  At transition zones between various pavement structures, subdrains should be installed longitudinally to drain any potential water trapped in the granular layers. The subdrains at catch basins should extend in four orthogonal directions and longitudinally when placed along a curb.

# 6.0 Design and Construction Precautions

## 6.1 Foundation Drainage and Backfill

### Foundation Drainage

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the sump pump pit or storm sewer.

### Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free draining non frost susceptible granular materials. 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, unless a composite drainage system (such as System Platon or Miradrain) is used. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose.

## 6.2 Protection Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. A minimum of 1.5 m of soil cover alone, or a minimum of 0.6 m of soil cover, in conjunction with foundation insulation, should be provided in this regard.

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure proper and require additional protection, such as soil cover of 2.1 m or a combination of soil cover and foundation insulation.

## 6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should be either cut back to acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. 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 subsoil at this site is considered to be mainly 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 be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by Paterson 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

A minimum of 150 mm of OPSS Granular A should be placed for pipe bedding for sewer and water pipes for a soil subgrade. The bedding should be increased to 300 mm for areas where the subgrade consists of bedrock. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to a minimum of 95% 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.

## 6.5 Groundwater Control

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

The rate of flow of groundwater into the excavation through the overburden soil should be moderate to high for expected founding levels and the conditions within the southwest portion of this site. It is anticipated that pumping from open sumps will be sufficient to control the groundwater influx through the sides of the excavations.

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

For typical ground or surface water volumes being pumped during the construction phase (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 Person as stipulated under O.Reg. 63/16.

## 6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site mostly consist of frost susceptible materials. In 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.

The trench excavations should be carried out in a manner to avoid the introduction of frozen materials, snow or ice into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. Also, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure.

## 6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site.

The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a moderate slightly aggressive corrosive environment.

# 7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

☐ Review of the grading plan from a geotechnical perspective.

☐ Observation of all bearing surfaces prior to the placement of concrete.

☐ Sampling and testing of the concrete and fill materials.

☐ 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 ensure that the specified level of compaction has been achieved.

☐ Sampling and testing of the bituminous concrete including mix design reviews.

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 as per *Ontario Regulation 406/19: On-Site and Excess Soil Management.*

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

# 8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the drawings and specifications are completed.

A geotechnical investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test hole locations, we request 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 our 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 Menzie Almonte 2 Inc (c/o Regional Group) or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

**Paterson Group Inc.**

Maha K. Saleh, M.A.Sc., P.Eng.

David J. Gilbert, P.Eng.

LICENSED PROFESSIONAL ENGINEER
February 7, 2023
D. J. GILBERT
100116130
PROVINCE OF ONTARIO

**Report Distribution:**

- ❑ Menzie Almonte 2 Inc (c/o Regional Group) (email copy)
- ❑ Paterson Group (1 copy)

# APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

**patersongroup** Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

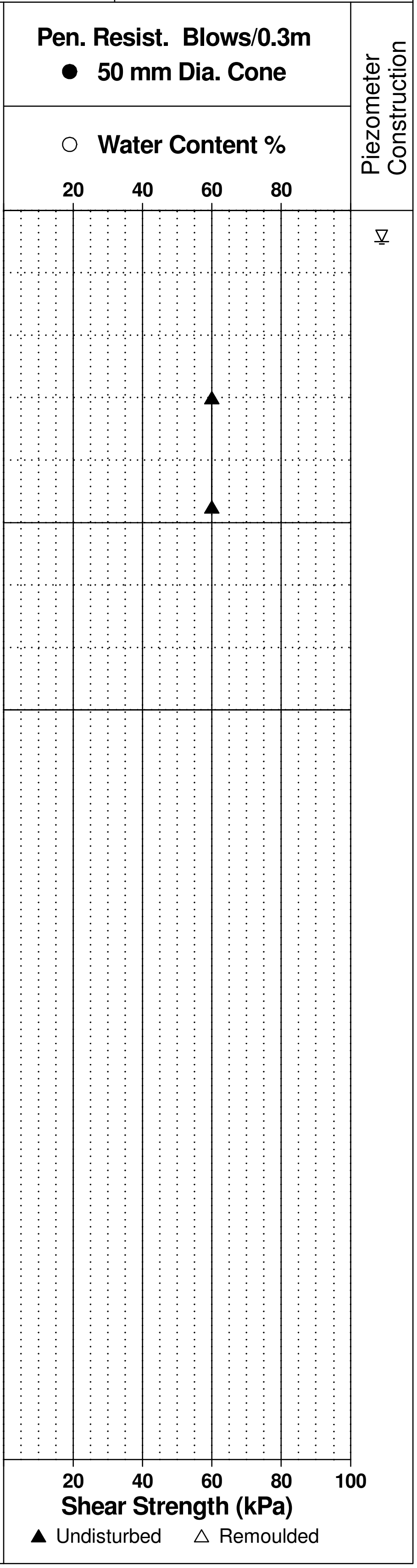
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 1-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 138.56 |
| **TOPSOIL/PEAT** | | | | | | | |
| 0.35 | | | | | | | |
| Stiff, brown **SILTY CLAY** | | | | | | 1 | 137.56 |
| 1.10 | | | | | | | |
| Stiff to hard, grey **SILTY CLAY** with sand and gravel | | | | | | | |
| 1.60 | | | | | | | |
| End of Hand Auger<br>Practical refusal to hand augering at 1.60m depth<br>(GWL @ 0.1m depth based on field observations) | | | | | | | |



**patersongroup** Consulting Engineers
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**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

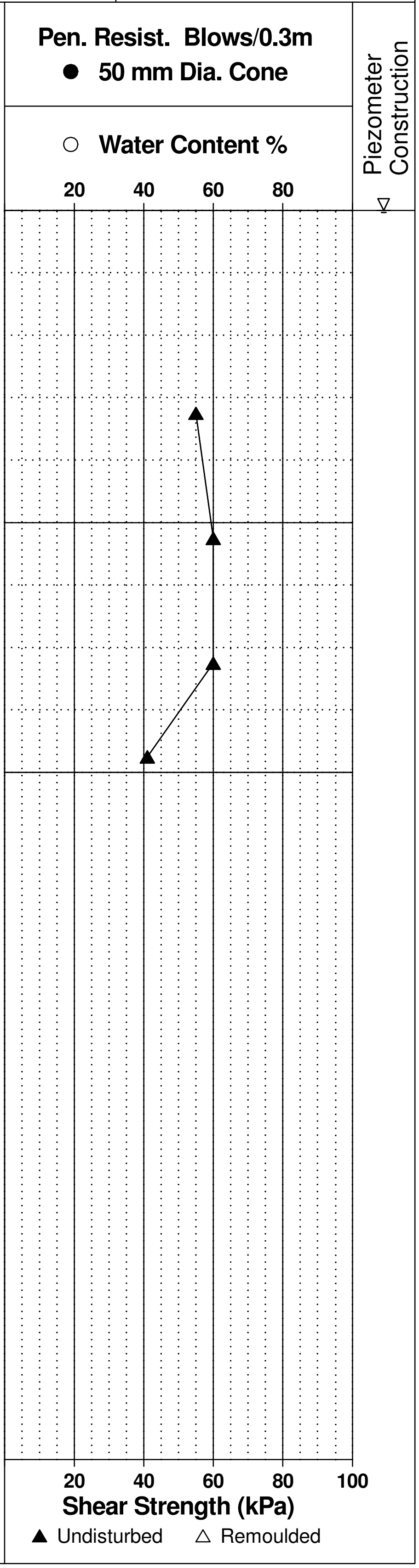
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 2-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.40 |
| **TOPSOIL/PEAT** — 0.45 | | | | | | | |
| Stiff to firm, brown **SILTY CLAY**<br>- grey by 0.9m depth — 1.80 | | | | | | 1 | 137.40 |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | |



**patersongroup** Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

## SOIL PROFILE AND TEST DATA

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**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

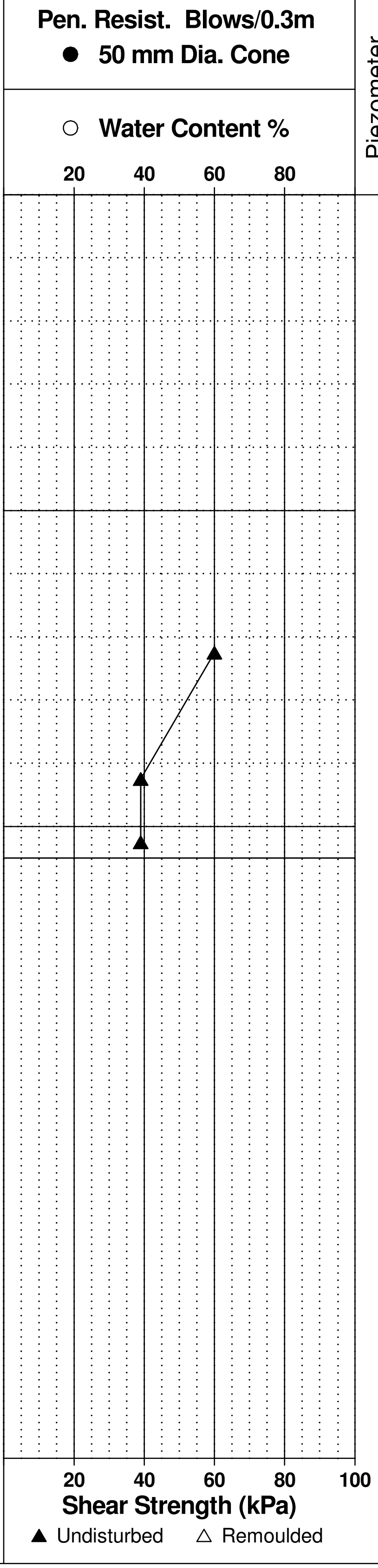
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 3-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.47 | ∇ |
| **TOPSOIL/PEAT** | | | | | | | | |
| 0.90 | | | | | | 1 | 137.47 | |
| Stiff to firm, grey **SILTY CLAY** | | | | | | | | |
| 2.10 | | | | | | 2 | 136.47 | |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | | |



**patersongroup** Consulting Engineers
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# SOIL PROFILE AND TEST DATA

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**Future Phase for Proposed Residential Development**
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**DATUM** Geodetic

**REMARKS**

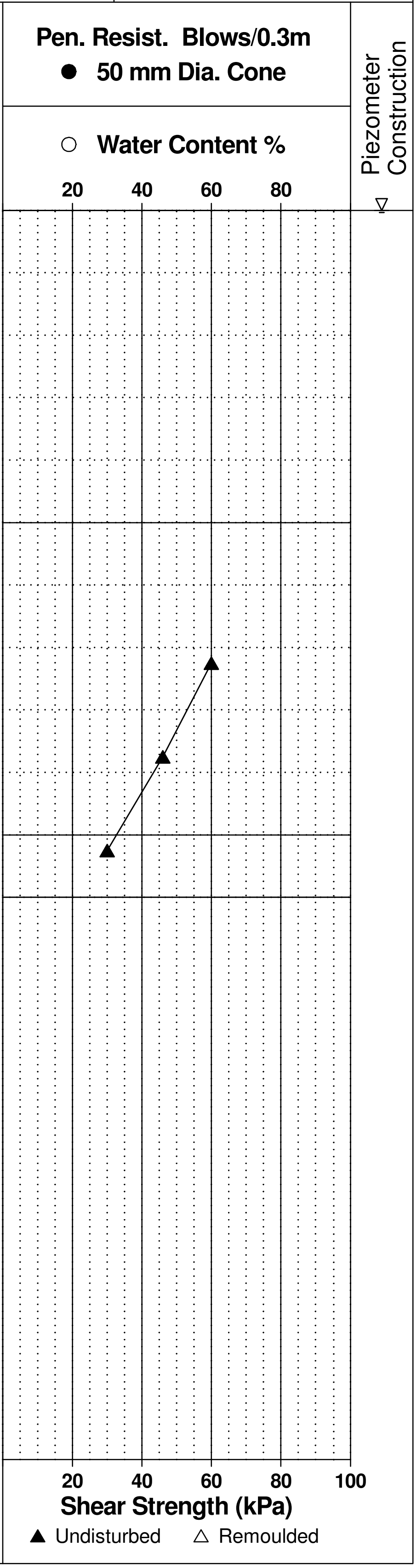
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 4-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.37 |
| **TOPSOIL/PEAT** | | | | | | 1 | 137.37 |
| 1.25 | | | | | | | |
| Stiff to firm, grey **SILTY CLAY** | | | | | | 2 | 136.37 |
| 2.20 | | | | | | | |
| End of Test Pit<br>(Water encountered at ground surface) | | | | | | | |



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**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

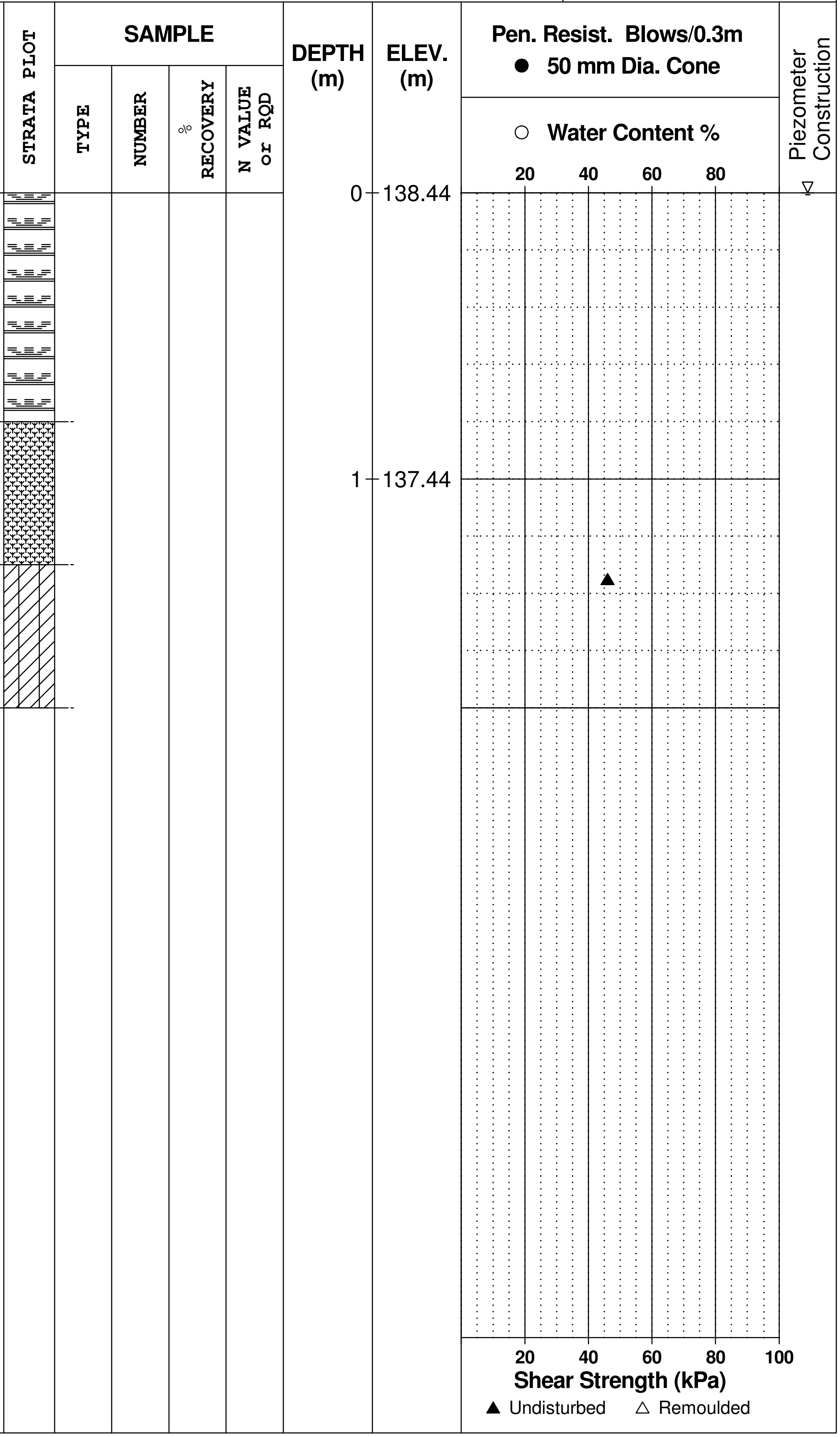
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** **PG5860**

**HOLE NO.** **HA 5-21**

| SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | 0 | 138.44 |
| **TOPSOIL/PEAT**<br>0.80 | | | | | | |
| **MARL**<br>1.30 | | | | | 1 | 137.44 |
| Firm, grey **SILTY CLAY,** trace sand and gravel<br>1.80 | | | | | | |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 6-21

| 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 % (20 40 60 80) | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 139.12 | | |
| **TOPSOIL** 0.25 | | | | | | | | | |
| **GLACIAL TILL:** Hard to very stiff, brown silty clay with sand and gravel<br>- sand content increasing with depth 0.70 | | | | | | | | | ∑ |
| End of Hand Auger Hole<br>(GWL @ 0.5m depth based on field observations) | | | | | | | | | |

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

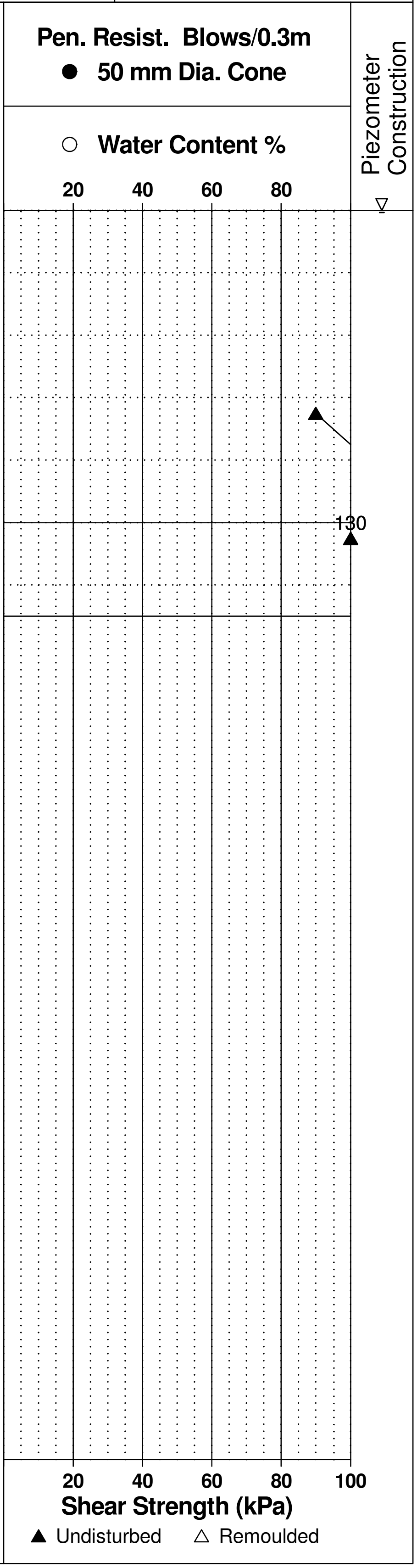
**HOLE NO.** HA 7-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.65 |
| **TOPSOIL/PEAT** 0.33 | | | | | | | |
| Stiff to very stiff, brown **SILTY CLAY**<br>- sand seam at 0.7m depth | | | | | | 1 | 137.65 |
| 1.30 | | | | | | | |

End of Hand Auger Hole

Practical refusal to hand augering at 1.30m depth

(Water encountered at ground surface)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

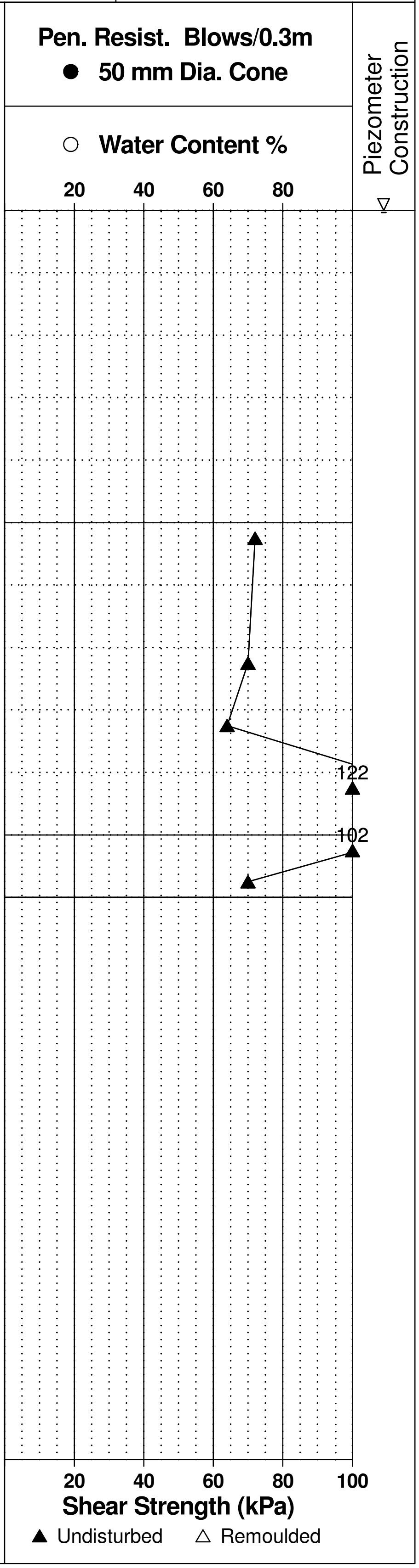
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 8-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.65 |
| **TOPSOIL/PEAT** | | | | | | | |
| 0.60 | | | | | | | |
| | | | | | | 1 | 137.65 |
| Stiff to very stiff, grey **SILTY CLAY**<br>- sand seam at 1.5m depth | | | | | | | |
| | | | | | | 2 | 136.65 |
| 2.20 | | | | | | | |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

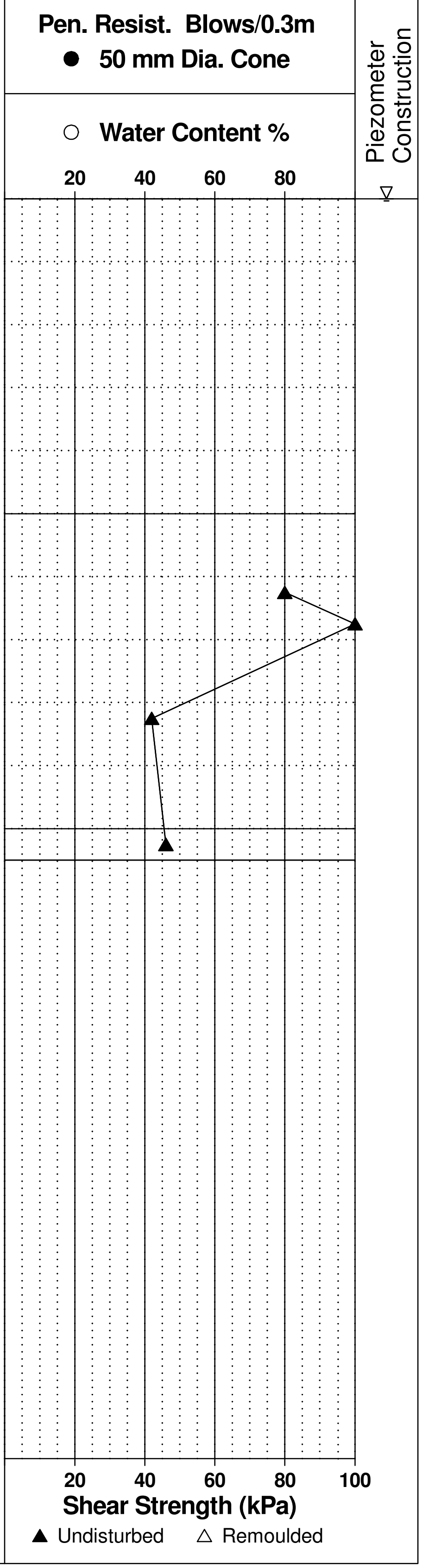
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA 9-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.59 |
| **TOPSOIL/PEAT** | | | | | | 1 | 137.59 |
| 1.10 | | | | | | | |
| Stiff to firm, grey **SILTY CLAY**<br>- sand seams at 1.2 and 1.9m depth | | | | | | 2 | 136.59 |
| 2.10 | | | | | | | |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

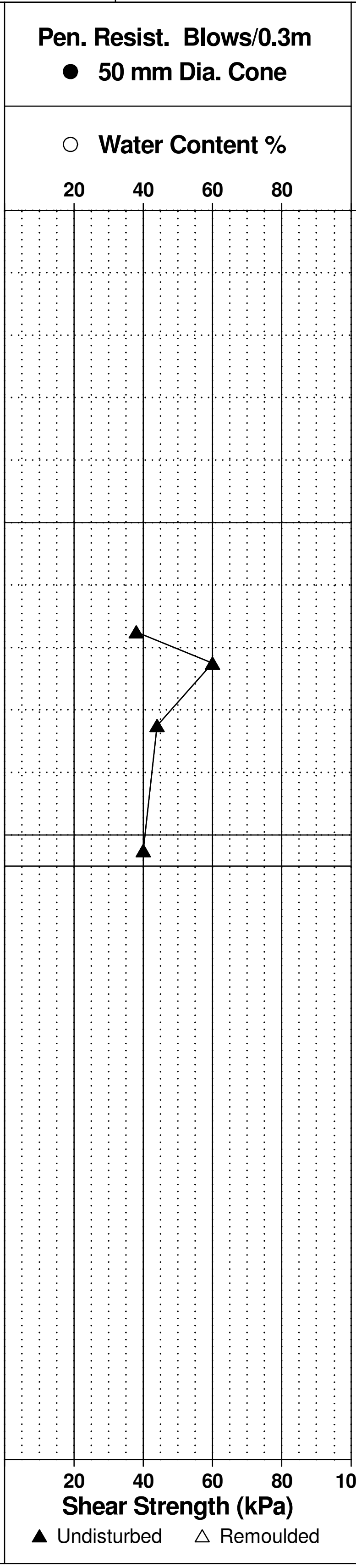
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA10-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.66 | ∇ |
| **PEAT** | | | | | | | | |
| 0.75 | | | | | | | | |
| **MARL** | | | | | | 1 | 137.66 | |
| 1.25 | | | | | | | | |
| Firm, grey **SILTY CLAY**<br>- some silt seams from 1.4 to 1.7m depth | | | | | | 2 | 136.66 | |
| 2.10 | | | | | | | | |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA11-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.56 |
| **PEAT** 0.70 | | | | | | | |
| **MARL** 1.20 | | | | | | 1 | 137.56 |
| Stiff to firm, grey **SILTY CLAY,** trace sand 1.80 | | | | | | | |

End of Hand Auger Hole

Practical refusal to hand augering at 1.80m depth

(Water encountered at ground surface)

**Pen. Resist. Blows/0.3m**
● **50 mm Dia. Cone**

○ **Water Content %**

20 40 60 80

**Piezometer Construction** ∇

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

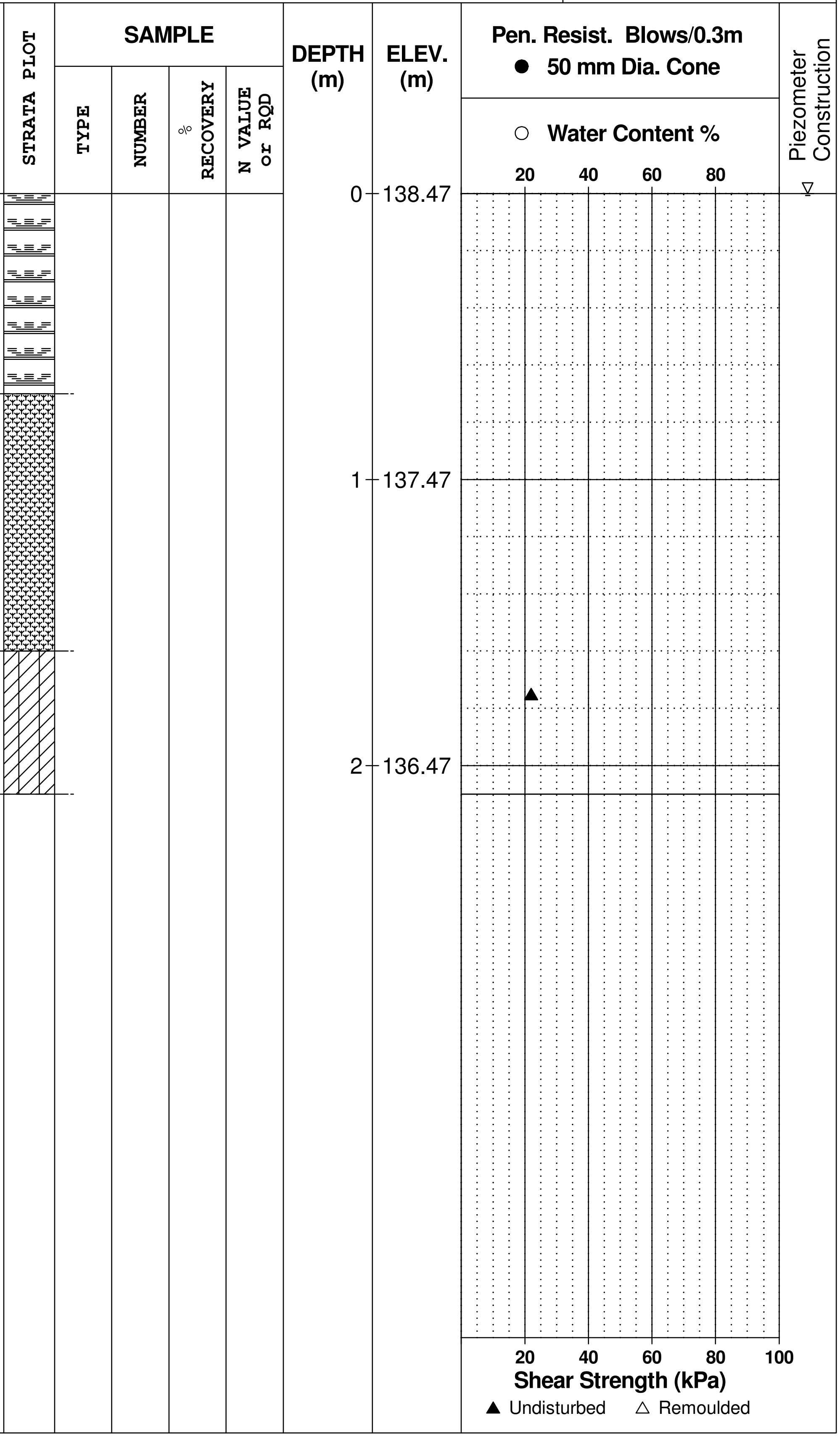
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA12-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.47 |
| **PEAT** | | | | | | | |
| 0.70 | | | | | | | |
| **MARL**<br>- trace gravel by 1.2m depth | | | | | | 1 | 137.47 |
| 1.60 | | | | | | | |
| Soft to firm, grey **SILTY CLAY**<br>- some sand, trace by 1.9m depth | | | | | | 2 | 136.47 |
| 2.10 | | | | | | | |
| End of Hand Auger<br>(Water encountered at ground surface) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

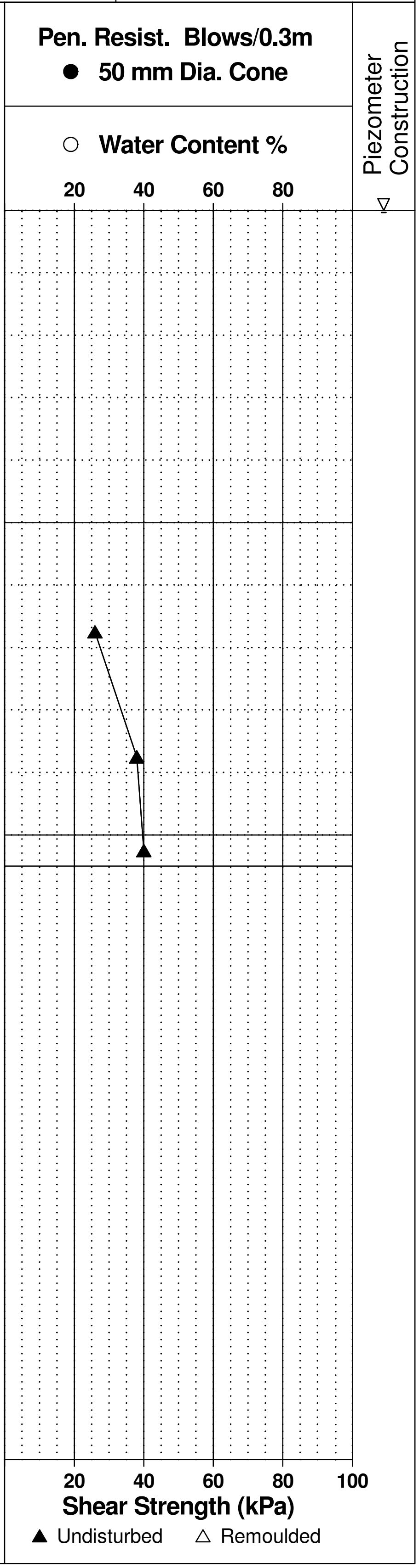
**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic
**REMARKS**
**BORINGS BY** Hand Auger
**DATE** November 24, 2021
**FILE NO.** PG5860
**HOLE NO.** HA13-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.40 |
| **PEAT** | | | | | | | |
| 0.65 | | | | | | | |
| **MARL** | | | | | | 1 | 137.40 |
| 1.30 | | | | | | | |
| Soft to firm, grey **SILTY CLAY** | | | | | | | |
| 2.10 | | | | | | 2 | 136.40 |

End of Hand Auger Hole

(Water encountered at ground surface)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

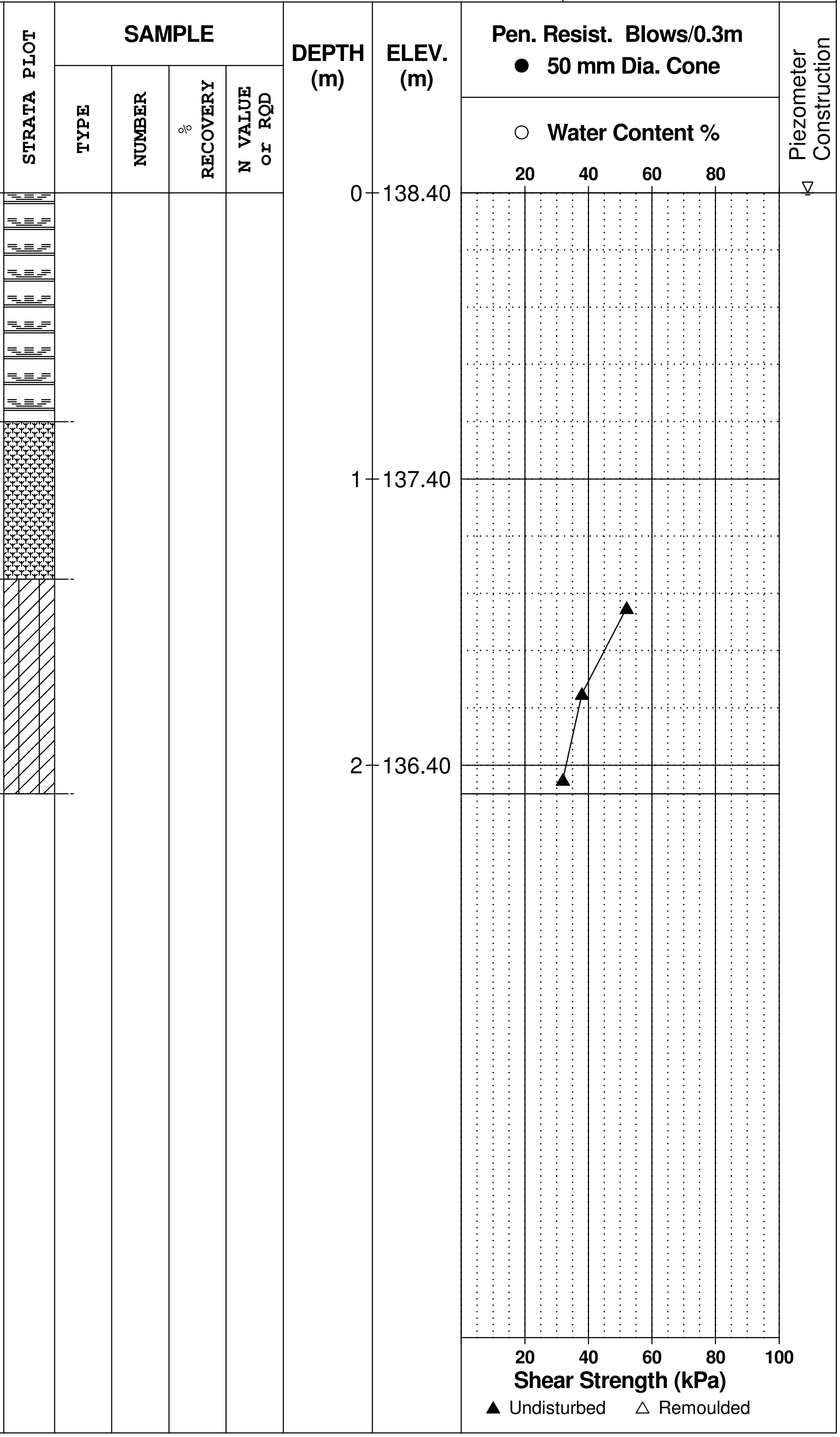
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA14-21

| SOIL DESCRIPTION | Depth to base (m) |
|---|---|
| GROUND SURFACE | |
| **PEAT** | 0.80 |
| **MARL** | 1.35 |
| Stiff to firm, grey **SILTY CLAY**<br>- sand seam at 1.4m depth | 2.10 |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

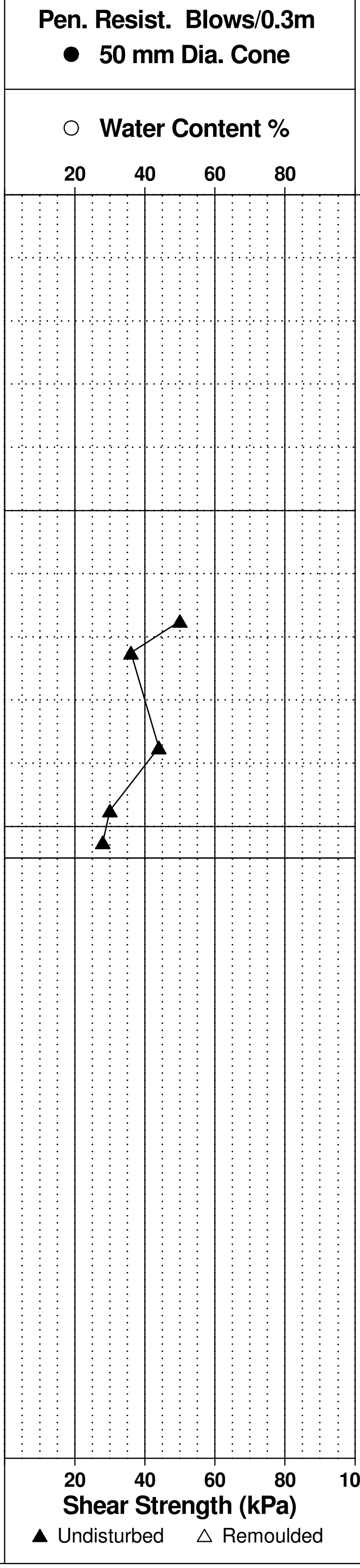
**BORINGS BY** Hand Auger

**DATE** November 24, 2021

**FILE NO.** PG5860

**HOLE NO.** HA15-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 138.37 |
| **PEAT** 0.55 | | | | | | | |
| **MARL** 1.30 | | | | | | 1 | 137.37 |
| Stiff to firm, grey **SILTY CLAY** 2.10 | | | | | | 2 | 136.37 |
| End of Hand Auger Hole<br>(Water encountered at ground surface) | | | | | | | |



Piezometer Construction

∇

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** PG5860

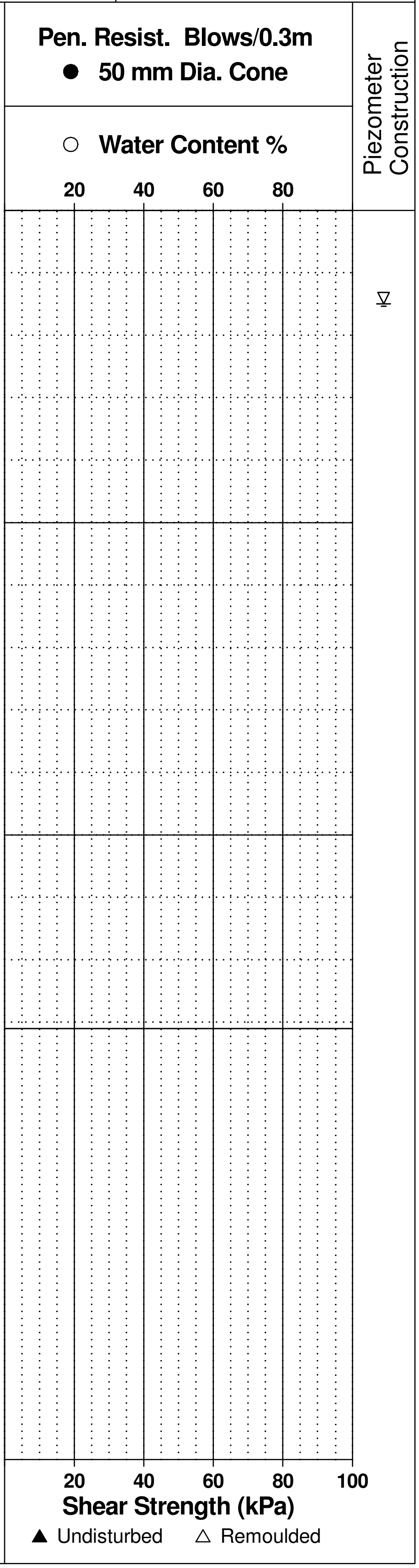
**HOLE NO.** TP 1-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| | | TYPE | NUMBER | % RECOVERY | N VALUE or RQD | | |
| GROUND SURFACE | | | | | | 0 | 138.54 |
| **PEAT** 0.42 | | G | 1 | | | | |
| **MARL** 0.75 | | G | 2 | | | | |
| Firm, grey **SILTY CLAY** | | | | | | 1 | 137.54 |
| | | G | 3 | | | | |
| | | | | | | 2 | 136.54 |
| 2.62 | | | | | | | |

End of Test Pit

TP terminated on bedrock surface at 2.62m depth.

(GWL @ 0.3m depth based on field observations)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** PG5860

**HOLE NO.** TP 2-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 138.61 | |
| **PEAT** 0.25 | | G | 1 | | | | | |
| **GLACIAL TILL:** Very stiff, brown silty clay with sand, gravel, cobbles and boulders<br>- grey by 0.8m depth | | | | | | 1 | 137.61 | ∇ |
| 2.15 | | G | 2 | | | 2 | 136.61 | |

End of Test Pit

TP terminated on bedrock surface at 2.15m depth.

(GWL @ 1.0m depth based on field observations)

**Pen. Resist. Blows/0.3m**
● **50 mm Dia. Cone**

○ **Water Content %**

20 40 60 80

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** PG5860

**HOLE NO.** TP 3-21

| 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<br>○ Water Content %<br>20 40 60 80 | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | | | | |
| **TOPSOIL** 0.17 | ■ | G | 1 | | | 0 | 138.93 | | |
| | | | | | | 1 | 137.93 | | |
| **GLACIAL TILL:** Very stiff, brown silty clay with sand, gravel, cobbles and boulders | | | | | | | | | |
| | | | | | | | | | ▽ |
| | | G | 2 | | | | | | |
| - grey by 2.0m depth | | | | | | 2 | 136.93 | | |
| | | G | 3 | | | | | | |
| 2.58 | | | | | | | | | |
| End of Test Pit<br>TP terminated on bedrock surface at 2.58m depth.<br>(GWL @ 1.7m depth based on field observations) | | | | | | | | | |

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

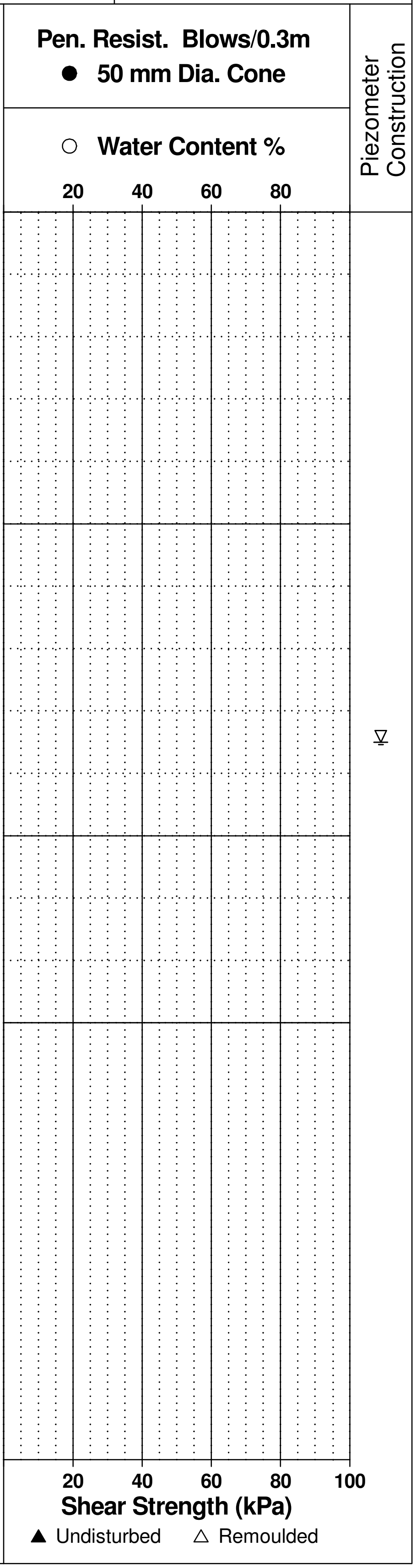
**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** PG5860

**HOLE NO.** TP 4-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.97 |
| **TOPSOIL** 0.19 | | G | 1 | | | | |
| **GLACIAL TILL:** Very stiff, brown silty clay with sand, gravel, cobbles and boulders | | | | | | 1 | 137.97 |
| | | G | 2 | | | | |
| - grey by 1.8m depth | | | | | | 2 | 136.97 |
| 2.60 | | G | 3 | | | | |
| End of Test Pit<br>TP terminated on bedrock surface at 2.60m depth.<br>(GWL @ 1.7m depth based on field observations) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** **PG5860**

**HOLE NO.** **TP 5-21**

| 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<br>○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 138.41 | | |
| **PEAT** | | G | 1 | | | | | | ▽ |
| 0.42 | | | | | | | | | |
| **MARL** | | G | 2 | | | | | | |
| 0.98 | | | | | | 1 | 137.41 | | |
| Firm to soft, grey **SILTY CLAY** | | G | 3 | | | 2 | 136.41 | | |
| 2.51 | | | | | | | | | |

End of Test Pit

TP terminated on bedrock surface at 2.51m depth.

(GWL @ 0.3m depth based on field observations)

20 40 60 80

20 40 60 80 100

**Shear Strength (kPa)**

▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

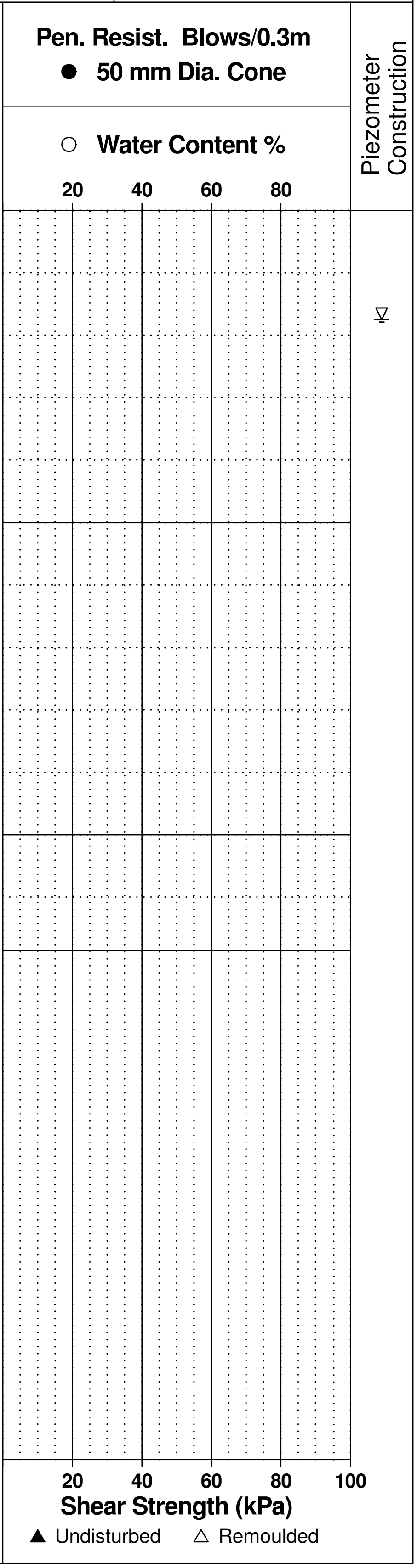
**BORINGS BY** Excavator

**DATE** June 11, 2021

**FILE NO.** PG5860

**HOLE NO.** TP 6-21

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.29 |
| **PEAT** | | G | 1 | | | | |
| 0.37 | | | | | | | |
| | | G | 2 | | | | |
| | | | | | | 1 | 137.29 |
| Stiff, grey **SILTY CLAY,** trace sand and gravel | | | | | | | |
| | | | | | | 2 | 136.29 |
| 2.37 | | | | | | | |
| End of Test Pit<br>TP terminated on bedrock surface at 2.37m depth.<br>(GWL @ 0.35m depth based on field observations) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Future Phase for Proposed Residential Development**
**1825 Ramsay Concession 11A, Mississippi Mills, Ont.**

**DATUM** Geodetic

**REMARKS**

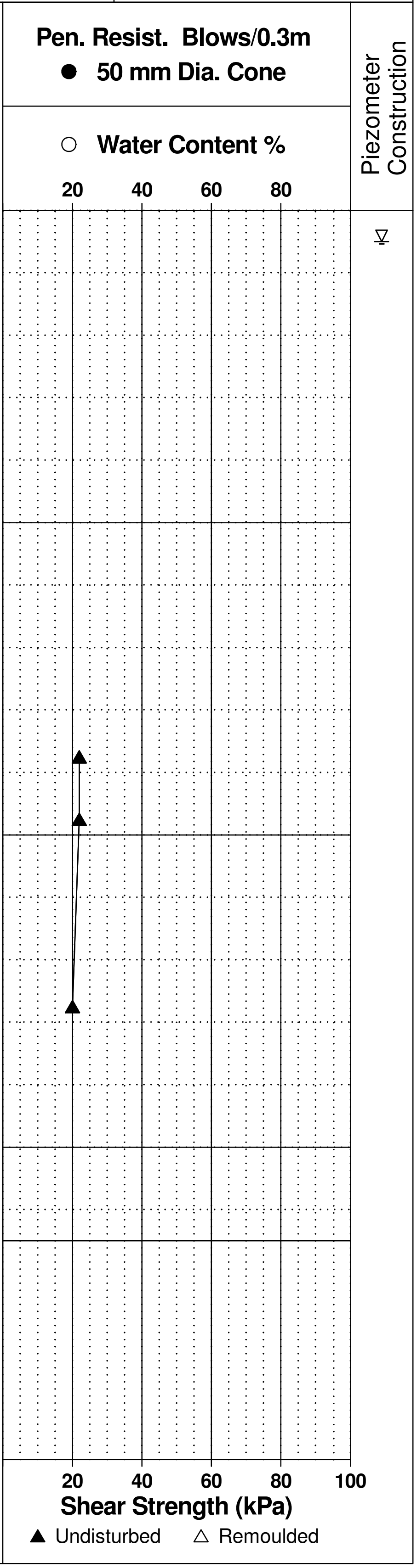
**BORINGS BY** Excavator

**DATE** November 24, 2021

**FILE NO.** **PG5860**

**HOLE NO.** **TP 7-21**

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 138.41 |
| **PEAT** | | G | 1 | | | | |
| 0.55 | | | | | | | |
| **MARL** | | G | 2 | | | 1 | 137.41 |
| 1.30 | | | | | | | |
| Soft, grey **SILTY CLAY** | | G | 3 | | | 2 | 136.41 |
| 2.90 | | | | | | | |
| **GLACIAL TILL:** Very stiff, grey silty clay with sand and gravel | | | | | | 3 | 135.41 |
| 3.30 | | | | | | | |
| End of Test Pit<br>(Groundwater infiltration at 0.1m 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 strength of cohesionless soils is the relative density, 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.

| Relative Density | ‘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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

| 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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

## 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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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 |
| PS | - | Piston sample |
| AU | - | Auger sample or bulk sample |
| WS | - | Wash sample |
| RC | - | Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits. |

# SYMBOLS AND TERMS (continued)

## GRAIN SIZE DISTRIBUTION

MC% - Natural moisture 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 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 x 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 $p'_c$)

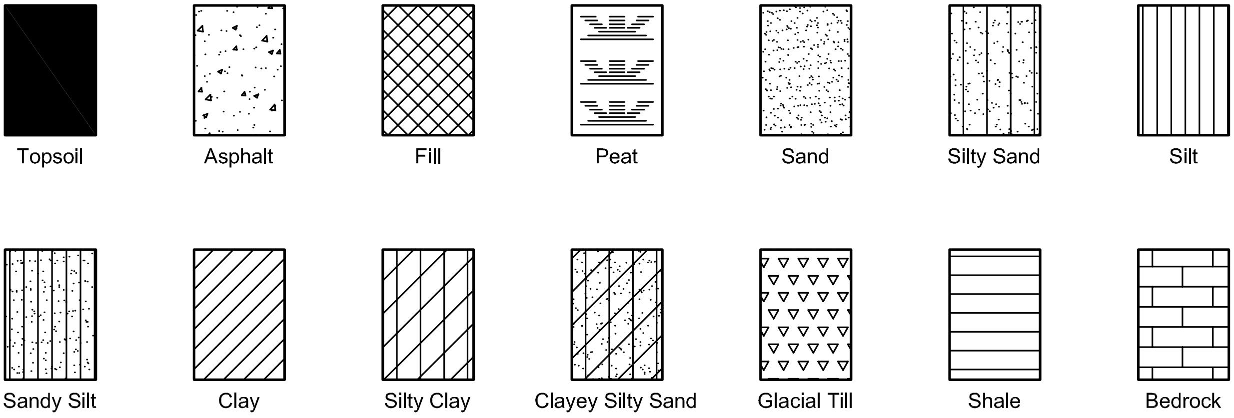
OC Ratio Overconsolidaton ratio = $p'_c / p'_o$
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

## 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.

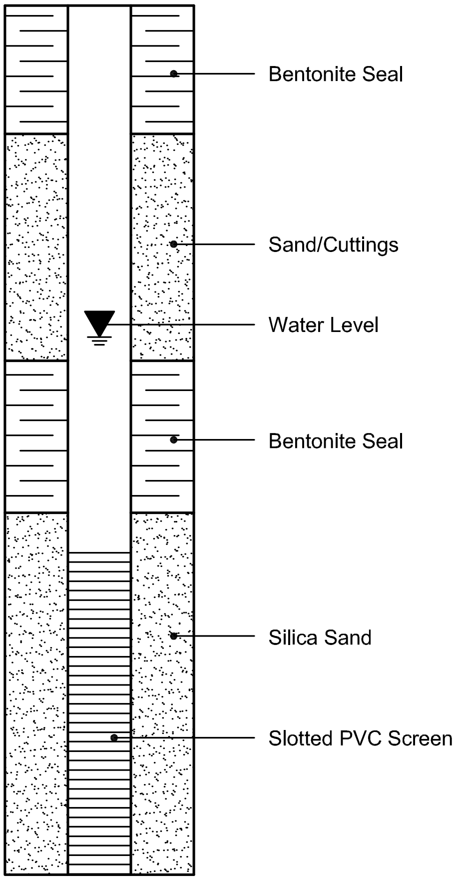
# SYMBOLS AND TERMS (continued)

## STRATA PLOT

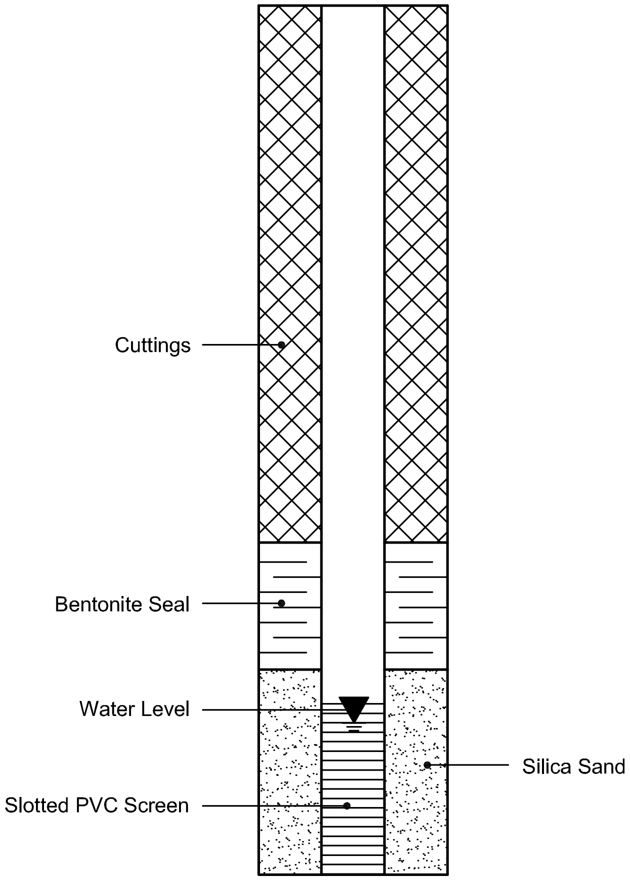


## MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

**Client: Paterson Group Consulting Engineers**

**Client PO: 32278**

Report Date: 21-Jun-2021

Order Date: 15-Jun-2021

**Project Description: PG5860**

| | **MDL/Units** | TP6-21 G2<br>11-Jun-21 09:00<br>2125235-01<br>Soil | -<br>-<br>-<br>- | -<br>-<br>-<br>- | -<br>-<br>-<br>- |
|---|---|---|---|---|---|
| **Client ID:** | | TP6-21 G2 | - | - | - |
| **Sample Date:** | | 11-Jun-21 09:00 | - | - | - |
| **Sample ID:** | | 2125235-01 | - | - | - |
| **Physical Characteristics** | | | | | |
| % Solids | 0.1 % by Wt. | 77.7 | - | - | - |
| **General Inorganics** | | | | | |
| pH | 0.05 pH Units | 7.53 | - | - | - |
| Resistivity | 0.10 Ohm.m | 57.2 | - | - | - |
| **Anions** | | | | | |
| Chloride | 5 ug/g dry | 14 | - | - | - |
| Sulphate | 5 ug/g dry | 52 | - | - | - |

# APPENDIX 2

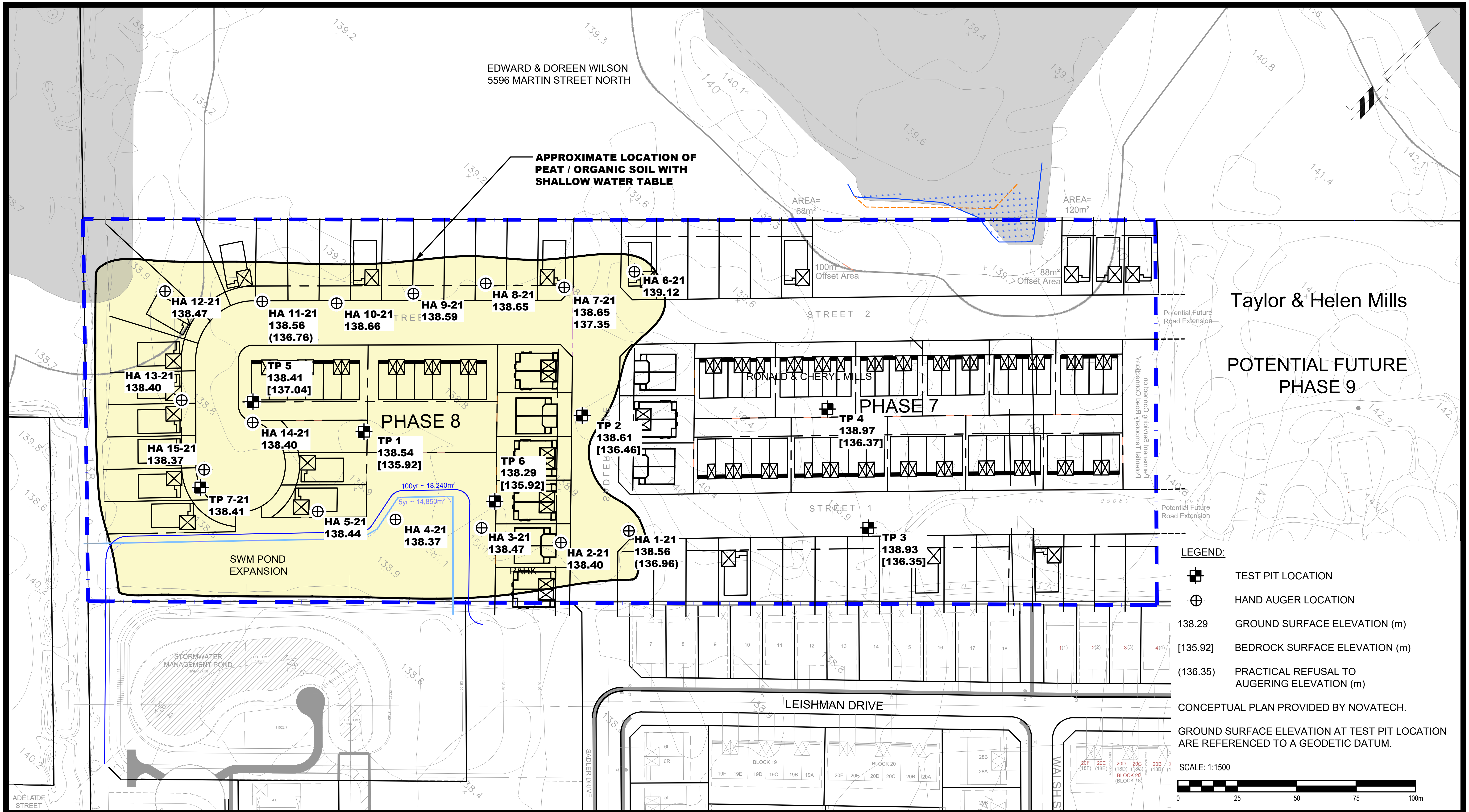
FIGURE 1 – KEY PLAN

DRAWING PG5860-1 – TEST HOLE LOCATION PLAN

DRAWING PG5860-2 – PERMISSIBLE GRADE RAISE PLAN

FIGURE 1

KEY PLAN



LEGEND:

| | |
|---|---|
| ✚ | TEST PIT LOCATION |
| ⊕ | HAND AUGER LOCATION |
| 138.29 | GROUND SURFACE ELEVATION (m) |
| [135.92] | BEDROCK SURFACE ELEVATION (m) |
| (136.35) | PRACTICAL REFUSAL TO AUGERING ELEVATION (m) |

CONCEPTUAL PLAN PROVIDED BY NOVATECH.

GROUND SURFACE ELEVATION AT TEST PIT LOCATION ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1500

**PATERSON GROUP**

9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| | | | |
| | | | |
| 3 | UPDATED TO NEW CONCEPTUAL PLAN | 07/02/2023 | GA |
| 2 | UPDATED TO NEW CONCEPTUAL PLAN | 12/01/2023 | ZM |
| 1 | HA 1-21 - HA 15-21 & TP 7-21 ADDED TO PLAN | 11/01/2021 | MS |

MENZIE ALMONTE 2 INC. c/o REGIONAL GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1825 RAMSAY CONCESSION 11A
TOWNSHIP OF MISSISSIPPI MILLS, ONTARIO

Title:

**TEST HOLE LOCATION PLAN**

Scale: 1:1500
Date: 06/2021
Drawn by: YA
Report No.: PG5860-REP.01
Checked by: MS
Dwg. No.: PG5860-1
Approved by: DJG
Revision No.: 3

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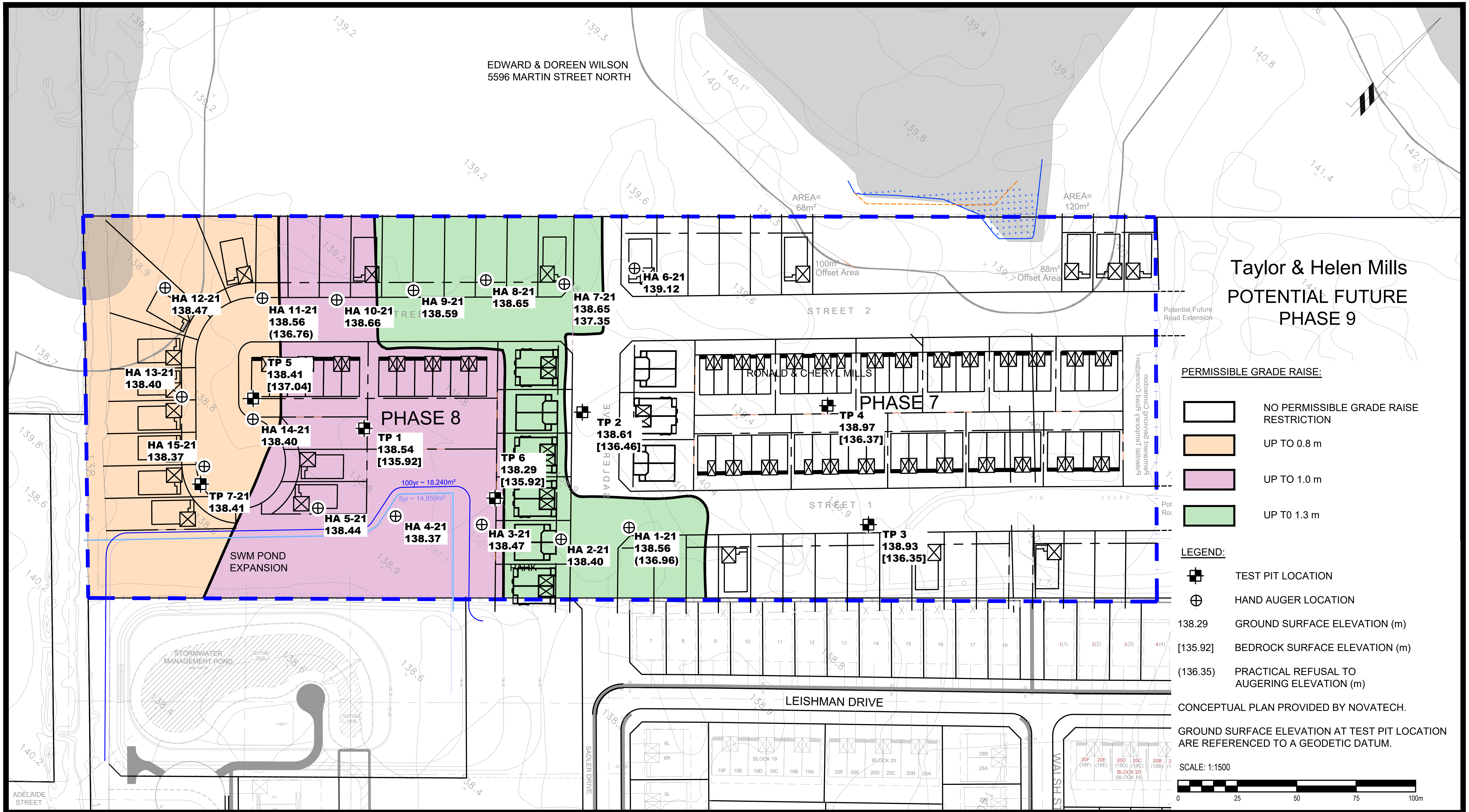

PERMISSIBLE GRADE RAISE:

| | |
|---|---|
| ☐ | NO PERMISSIBLE GRADE RAISE RESTRICTION |
| 🟧 | UP TO 0.8 m |
| 🟪 | UP TO 1.0 m |
| 🟩 | UP T0 1.3 m |

LEGEND:

| | |
|---|---|
| ✚ | TEST PIT LOCATION |
| ⊕ | HAND AUGER LOCATION |
| 138.29 | GROUND SURFACE ELEVATION (m) |
| [135.92] | BEDROCK SURFACE ELEVATION (m) |
| (136.35) | PRACTICAL REFUSAL TO AUGERING ELEVATION (m) |

CONCEPTUAL PLAN PROVIDED BY NOVATECH.

GROUND SURFACE ELEVATION AT TEST PIT LOCATION ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1500

0 25 50 75 100m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 2 | UPDATED TO NEW CONCEPTUAL PLAN | 07/02/2023 | GA |
| 1 | UPDATED TO NEW CONCEPTUAL PLAN | 21/09/2022 | ZM |

MENZIE ALMONTE 2 INC. c/o REGIONAL GROUP
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
1825 RAMSAY CONCESSION 11A
TOWNSHIP OF MISSISSIPPI MILLS, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN

| | |
|---|---|
| Scale: 1:1500 | Date: 01/2022 |
| Drawn by: YA | Report No.: PG5860-REP.01 |
| Checked by: MS | Dwg. No.: PG5860-2 |
| Approved by: DJG | Revision No.: 2 |

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