PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

Arcadia – Stage 6

Campeau Drive - Ottawa

Minto Communities

Report PG5648-1 Revision 8 dated August 1, 2023

Table of Contents

PAGE

1.0 Introduction 1
2.0 Proposed Development 1
3.0 Method of Investigation 2
3.1 Field Investigation 2
3.2 Field Survey 3
3.3 Laboratory Testing 3
3.4 Analytical Testing 4
4.0 Observations 5
4.1 Surface Conditions 5
4.2 Subsurface Profile 5
4.3 Groundwater 7
5.0 Discussion 8
5.1 Geotechnical Assessment 8
5.2 Site Grading and Preparation 8
5.3 Foundation Design 11
5.4 Design for Earthquakes 14
5.5 Basement Floor Slab 14
5.6 Pavement Design 15
6.0 Design and Construction Precautions 20
6.1 Foundation Drainage and Backfill 20
6.2 Protection of Footings Against Frost Action 21
6.3 Excavation Side Slopes 21
6.4 Pipe Bedding and Backfill 23
6.5 Groundwater Control 25
6.6 Winter Construction 25
6.7 Corrosion Potential and Sulphate 26
6.8 Landscaping Considerations 26
6.9 Slope Stability Analysis 29
7.0 Recommendations 32
8.0 Statement of Limitations 33

Appendices

Appendix 1 Soil Profile and Test Data Sheets
Symbols and Terms
Atterberg Limits Testing Results
Grain Size Distribution Sheets
Analytical Testing Results

Appendix 2 Figure 1 - Key Plan
Figures 2 to 11 - Slope Stability Analysis Sections
Figures 12 to 14 - Historical Aerial Photographs
Figure 15 – Temporary Excavation Side Slope Review
Figure 16 – Groundwater Suppression System
Figure 17 – Podium Deck to Foundation Wall Drainage System Tie-In Detail
Drawing PG5648-1 - Test Hole Location Plan
Drawing PG5648-2 - Permissible Grade Raise Plan
Drawing PG5648-3 - Limit of Hazard Lands Setbacks (Includes 4 sub-drawings 3A through 3D)

Appendix 3 Relevant Memorandums

1.0 Introduction

Paterson Group (Paterson) was commissioned by Minto Communities to conduct a geotechnical investigation for Stage 6 of the Arcadia Development on Campeau Drive, in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objectives of the geotechnical investigation were to:

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

It is understood that Stage 6 of the proposed development will consist of townhouses, condominiums, residential dwellings with attached garages, underground parking, associated driveways, garage access ramps, local roadways and landscaping areas.

It is further understood that blocks which consist of one-level basement for underground parking are located at the north portion and the northeast portion of the site. In accordance with what is known, the proposed development will be serviced by future municipal water, sanitary and storm services.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on December 17, 2020 and consisted of advancing a total of eight (8) boreholes to a maximum depth of 6.7 m below existing ground surface. A supplemental test pit program was undertaken on March 3, 2023 and consisted of a total of 21 test pits advanced to a maximum depth of 5.5 m below ground surface. The test hole locations were distributed in a manner to provide general coverage of the subject site and taking into consideration underground utilities and site features. Multiple historical geotechnical investigations were completed within the subject site by this firm between 2005 and 2013. The current test hole locations along with the relevant historical test hole locations are shown on Drawing PG5648-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were completed using a low clearance drill rig operated by a two-person crew. The test pits were advanced using a hydraulic excavator. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The drilling and test pit procedures consisted of drilling and excavating, respectively, to the required depths at the selected locations, and sampling the overburden.

Sampling and In Situ Testing

The soil samples were recovered from the auger flights or collected using a 50 mm diameter split-spoon sampler. Grab samples were collected from the test pits at selected intervals. All samples were inspected and classified on site, placed in sealed plastic bags and transported to our laboratory. The depths at which the auger, split-spoon and grab samples were recovered from the test holes are shown as AU, SS and G, 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 conducted in cohesive soils using a field vane apparatus.

The thickness of the sensitive silty clay deposit was evaluated by a dynamic cone penetration testing (DCPT) completed at BH 4-20. 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.

The subsurface conditions observed in the test holes 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.

Sample Storage

All samples will be stored in the laboratory for a period of one (1) month after the issuance of this report. They will then be discarded unless we are otherwise directed.

Groundwater

Flexible polyethylene standpipes were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

3.2 Field Survey

The test hole locations were selected by Paterson to provide general coverage of the proposed development, taking into consideration the existing site features and underground utilities. The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson personnel using a high precision handheld GPS and referenced to a geodetic datum. The location of the test holes and ground surface elevation at each test hole location are presented on Drawing PG5648-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the subject site were examined in our laboratory to review the results of the field logging.

A total of three (3) soil samples collected during our investigations were submitted for grain size distribution analysis and hydrometer testing. The grain size distribution and hydrometer testing results are presented in Table 1 - Grain Size Distribution and in Appendix 1 and are further discussed in Section 4.

A total of five (5) representative silty clay samples were submitted for Atterberg limit testing during our investigations. The results of the Atterberg limit testing are presented in Table 2 - Summary of Atterberg Limits and in Appendix 1 and are further discussed in Sections 4 and 6.

A total of two (2) representative soil samples were submitted for shrinkage limit testing during our investigations. The results of the shrinkage limit testing are discussed in Section 4.

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

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 samples. The results are presented in Appendix 1 and are discussed further in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The majority of the subject site is currently undeveloped. Generally, the ground surface across the subject site slopes down towards the east and north with an elevation difference of 2 to 2.5 m.

Based on historical information gathered between 2005 and the present time, and the attached aerial photographs (Figure 12 to 14), it has been determined that the subject site has been in-filled with site excavated material from the previous stages (1 through 4). The fill thickness ranges from 0.3 m to 4.4 m placed and compacted above the original ground surface. Further discussion on the fill is summarized in Subsection 4.2.

The subject site is bordered to the north by the future extension of Campeau Drive followed by Arcadia Stage 5, to the east by an agricultural land which is the future location of a storm water management pond, to the south by Feedmill creek and to the west by a future development stage.

4.2 Subsurface Profile

Overburden

It is understood that the topsoil layer has been stripped from the majority of Stage 6 of the subject site. The subsurface profile encountered at the test hole locations generally consisted of fill layer and/or a stiff brown silty clay layer underlain by a stiff to firm grey silty clay deposit. The silty clay deposit was observed to be underlain by a glacial till deposit at boreholes BH13, BH19 and BH22.

Where encountered, the fill generally consisted of silty sand and/or silty clay with sand, gravel, cobbles, debris and organic matter. The fill thickness was observed to range from 0.3 m and up to 4.4 m below existing grade.

Practical refusal to DCPT was encountered in BH 4-20 on inferred bedrock at a depth of 20.9 m below existing ground surface.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Bedrock

Based on available geological mapping, the underlying bedrock consists of interbedded limestone and shale of the Verulam formation with an anticipated overburden thickness of 10 to 25 m.

Grain Size Distribution and Hydrometer Testing Results

The results of the three (3) soil samples submitted for grain size analysis and hydrometer testing are summarized in Table 1.

Table 1 - Grain Size Distribution

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-20	SS2	1.2	13.8	49.5	35.5
BH 1-20	SS6	0	1.9	45.6	52.5
BH 8-20	SS2	0	5.1	38.9	56.0

Atterberg Limit Testing Results

Five (5) silty clay samples were submitted for Atterberg Limits testing during the course of the investigation. The results are summarized in Table 2 below and on the Atterberg Limits results sheets in Appendix 1.

Table 2 - Summary of Atterberg Limits Tests

Test Hole	Sample No.	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
BH 1-20	SS6	49	22	28
BH 2-20	SS5	45	21	23
BH 4-20	SS4	42	17	25
BH 6-20	SS3	52	22	31
BH 8-20	SS4	69	33	36

Shrinkage Limit Testing Results

The results of the shrinkage testing of BH2-20 SS5 resulted in a shrinkage limit of 19.6% with a shrinkage ratio of 1.86. The results of the shrinkage testing of BH4-20 SS4 resulted in a shrinkage limit of 17.3% with a shrinkage ratio of 1.87.

4.3 Groundwater

Based on field observations, groundwater levels were recorded during the field program. The measured ground water levels are presented on the Soil Profile and Test Data sheets in Appendix 1.

Long-term groundwater levels can also be estimated based on the observed color and consistency of the recovered soil samples. Based on these observations, the long-term groundwater table can be expected at approximately 3 to 4 m below existing ground surface.

It should be noted that groundwater levels are subject to seasonal fluctuations and therefore could vary during the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is expected that the proposed buildings will be founded over conventional shallow footings placed over an undisturbed stiff to firm brown silty clay, firm grey silty clay bearing surface or engineered fill placed over an undisturbed, grey silty clay bearing surface.

Due to the presence of the sensitive silty clay layer, the proposed development will be subjected to grade raise restrictions. 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.

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 organic materials, or construction debris/remnants should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures. Under paved areas, existing construction remnants, such as foundation walls, pipe ducts, etc., should be excavated to a minimum depth of 1 m below final grade.

It is important to note that due to the presence of a 1 to 4.4 m thick layer of fill overlying the native soils, it is expected that sub-excavation of the existing fill will be required within the footprint of the proposed residential dwellings. Where the fill is free of organic matter, the fill may be left in place provided the fill is reviewed and approved by Paterson at the time of construction.

Where the fill is deemed acceptable, sub-excavation of the existing fill down to the native subgrade will only be required to be completed below the proposed footings including the lateral support zone of each footing. Any fill left in place will be required to be proof-rolled using suitable compaction equipment in dry conditions and above freezing temperatures. The compaction efforts should also be reviewed and approved by Paterson personnel at the time of construction.

Fill Placement

Fill placed for grading beneath the building areas 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 building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil could be placed as general landscaping fill where settlement of the ground surface is of minor concern. 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. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls, unless used in conjunction with a geocomposite drainage membrane, such as Miradrain G100N or Delta Drain 6000.

Temporary Excavation Backfilling

Where the foundations will be backfilled to the existing ground surface, areas depicted on *Figure 15 – Temporary Excavation Side Slope Review* included in Appendix 2 of the current geotechnical report, the following is recommended to be carried out for backfilling the subject structures.

Suitable site-generated existing fill material, approved on-site by Paterson prior to being segregated and expected to consist of relatively workable brown silty clay, can be used for backfilling.

It is expected existing fill consisting of grey clay and/or fill with high organic and deleterious material content would not be suitable for re-use. However, the fill may be assessed for this purpose by Paterson personnel at the time of construction and as coordinated with the site's earthworks contractor.

Cobbles and stones larger than 200 mm in diameter should be segregated from the fill prior to re-use. Other deleterious materials not considered suitable for re-use will be determined and be requested to be removed at the time of construction by Paterson personnel.

Site-generated fill, approved by Paterson personnel, should be placed in maximum 300 mm thick loose lifts and compacted using a suitably sized sheepsfoot roller to backfill the proposed structures back to the existing ground surface. The re-use fill material should be compacted by several passes of a suitably sized vibratory sheepsfoot roller (i.e.- 5 to 6 passes and as deemed appropriate by Paterson personnel at the time of construction).

All material should be placed in **dry and above-freezing conditions**. Frozen material may not be considered for this purpose. This process should be reviewed and approved daily by Paterson field personnel during the placement of the fill layers.

It is recommended to place a minimum 300 mm thick layer of OPSS Granular A crushed stone at the founding elevation and within the western and eastern units of MT-08 at the time of foundation construction for that structure. The additional crushed stone layer is recommended to be compacted to a minimum of 98% of the materials SPMDD.

The use of excessive thicknesses of engineered granular fill may impact the permissible grade raise restrictions for the subject site. Therefore, it is highly recommended that the client finds a source for workable brown silty clay, to be reviewed and approved by Paterson.

Carrying out the above-noted works, and provided the works are reviewed in the field by Paterson personnel, is anticipated to provide suitable subgrade surfaces for the future service alignments and building footprints that would be affected by the excavation for the proposed structures. It is recommended that Paterson and the clients earthworks contractor attend a meeting to confirm the proposed backfilling plan and associated inspection schedule for this portion of this project.

Exterior Foundation Wall and Top of Podium Deck Backfill

Site-generated fill, approved by Paterson personnel, may be spread in maximum 300 mm thick loose lifts and compacted using suitably sized equipment to build up the ground surface surrounding the building footprint and over the podium deck structure once the structure is permitted to be backfilled. It is anticipated that the material will generally consist of a silty clay fill with variable amounts of sand, gravel and inorganic debris.

Once the material has been reviewed on-site and approved for re-use for this purpose on site by Paterson personnel, the material be compacted by several passes of a suitably sized vibratory sheepsfoot roller (i.e.- 5 to 6 passes and as deemed appropriate by Paterson personnel at the time of construction). Should the material consist of non-cohesive fill (i.e., sand, gravel, crushed stone, etc.), the material could be compacted using a suitably sized smooth drum vibratory roller when considered for placement.

Cobbles and stones larger than 200 mm in diameter should be segregated from the fill prior to re-use. All material should be placed in **dry and above-freezing conditions**. Frozen material may not be considered for this purpose. This process should be reviewed and approved on a daily basis by Paterson field personnel during the placement of the fill layer.

Protection of Subgrade and Bearing Surfaces

It is expected that site grading and preparation will consist of stripping of the soils containing significant amounts of organic materials and existing topsoil piles above design underside of footing elevation. The contractor should take appropriate precautions to avoid disturbing the subgrade and bearing surfaces from construction and worker traffic. Disturbance of the subgrade may result in having to sub-excavate the disturbed material and the placement of additional fill.

Further, since the subgrade material for the proposed townhouse structures with parking garages will mostly likely consist of a firm grey silty clay deposit, it is recommended that a minimum 100 mm layer of 20 MPa lean-concrete (28-day strength) mud slab be placed on the undisturbed subgrade shortly after the completion of the excavation. The main purpose of the mud slab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment. For winter construction, an insulation layer will be required and can be specified, if required.

5.3 Foundation Design

Conventional Single and Townhouse Residential Dwellings

Using continuously applied loads, footings for the proposed buildings placed over an undisturbed stiff silty clay crust, firm grey silty clay or engineered fill placed over an undisturbed silty clay crust bearing surface can be designed using the bearing resistance values presented in Table 3.

Table 3 - Bearing Resistance Values		
Bearing Surface	**Bearing Resistance Value at SLS (kPa)**	**Factored Bearing Resistance Value at ULS (kPa)**
Very Stiff to Stiff Silty Clay Crust	150	225
Firm Grey Silty Clay	75	110
Engineered Fill Over Silty Clay Crust	150	225
Note: Strip footings, up to 2 m wide, and pad footings, up to 5 m wide, placed over a silty clay bearing surface can be designed using the above noted bearing resistance values.		

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

The bearing resistance values are provided on the assumption that the footings will be placed on undisturbed soil bearing surfaces. An undisturbed soil bearing surface consists of a surface 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.

Townhouse Structures with Parking Garages (MT-04 to MT-07 and MT-11 to MT-14)

Strip footings, up to 2 m wide, and pad footings, up to 6 m wide, placed on a minimum 100 mm thick lean-concrete mud slab placed upon an undisturbed, firm grey silty bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **130 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **195 kPa** incorporating a geotechnical resistance factor of 0.5 at ULS.

The bearing resistance value 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 a surface 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.

Lateral Support

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 the in-situ bearing medium soils 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 of the same or higher capacity as the bearing medium soil.

Permissible Grade Raise and Settlements

Due to the presence of the silty clay deposit, a permissible grade raise restriction is recommended. The recommended grade raise restrictions are shown on Drawing PG5648-2 - Permissible Grade Raise Plan included in Appendix 2. A post-development groundwater lowering of 0.5 m was considered in our permissible grade raise calculations.

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.

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.

The potential post construction total and differential settlements are dependent on the position of the long-term groundwater level when buildings are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long-term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

To reduce potential long-term liabilities, consideration should be given to accounting for a larger groundwater lowering and to provide means to reduce long term groundwater lowering (e.g., clay dykes, restriction on planting around the dwellings, etc.). Buildings on silty clay deposits increases the likelihood of movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking compared to unreinforced foundations.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class D** for foundations constructed at the subject site. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Basement Floor Slab

With the removal of all topsoil and deleterious fill, containing organic matter, within the footprints of the proposed buildings, undisturbed native soil surface will be considered acceptable subgrade on which to commence backfilling for floor slab construction. Any soft areas should be removed and backfilled with appropriate backfill material.

For structures with slab-on-grade construction, OPSS Granular B Type II, with a maximum particle size of 50 mm is recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of 19 mm of clear crushed stone.

For the areas within the western and eastern units of MT-08, where the foundations will be backfilled back to the existing ground surface, it is recommended to place a minimum 300 mm thick layer of OPSS Granular A crushed stone at the founding elevation at the time of foundation construction. The additional crushed stone layer is recommended to be compacted to a minimum of 98% of the materials SPMDD.

The recommended pavement structures noted in Subsection 5.6 will be applicable for the founding level of the proposed parking garage structure.

5.6 Pavement Design

Pavement Structure for Car Only Parking Areas

For car only parking areas, local and collector roadways are anticipated at this site. The proposed pavement structures are shown in Tables 4, 5 and 6.

Table 4 - 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 soil or OPSS Granular B Type I or II material placed over in situ soil.	

Table 5 - Recommended Pavement Structure - Local Residential Roadways

Thickness (mm)	Material Description
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** 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	

Table 6 - Recommended Pavement Structure - Roadways with Bus Traffic

Thickness (mm)	Material Description
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil or OPSS Granular B Type II material placed over in situ soil	

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. Weak subgrade conditions may be experienced over service trench fill materials, which will require the use of a woven geotextile liner, such as Terrafix 200W or equivalent, as well as an additional 300 to 600 mm thick granular layer, consisting of a 150 mm minus, well-graded granular fill or crushed concrete, to provide adequate construction access.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD using suitable vibratory equipment. Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

Pavement Structure and Subgrade Preparation for Parking Garage

The rigid pavement structure for the below-grade parking area may be considered as indicated in Table 7 below.

Table 7 – Recommended Rigid Pavement Structure – Below-Grade Parking Garage and Ramp

Thickness (mm)	Material Description
Specified by Others	**Concrete Slab** – Minimum 32 MPa Concrete – C2 Exposure Class
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
50*	**RIGID INSULATION** – HI-40 or Foamular 400 XPS (*Only for Ramp)
Separation Layer	**WOVEN GEOTEXTILE** – Terrafix 200W
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil.	

Site-generated fill, approved by Paterson personnel, may be spread in maximum 300 mm thick loose lifts and compacted using suitably sized equipment to build up the subgrade below the above-noted pavement structure. It is anticipated that the material will generally consist of a silty clay fill with variable amounts of sand, gravel and inorganic debris. Cobbles and stones larger than 200 mm in diameter should be segregated from the fill prior to re-use.

Once the material has been reviewed on-site and approved for re-use for this purpose on site by Paterson personnel, the material be compacted by several passes of a suitably sized vibratory sheepsfoot roller (i.e.- 5 to 6 passes and as deemed appropriate by Paterson personnel at the time of construction). Should the material consist of non-cohesive fill (i.e., sand, gravel, crushed stone, etc.), the material could be compacted using a suitably sized smooth drum vibratory roller when considered for placement.

All material should be placed in **dry and above-freezing conditions**. Frozen material may not be considered for this purpose. This process should be reviewed and approved daily by Paterson field personnel during the placement of the fill layer.

Alternatively, fill placed to bring up the subgrade level may consist 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 building should be compacted to a minimum of 98% of the standard Proctor maximum dry density (SPMDD). 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 vibratory equipment.

Podium Deck Hardscaping Surface Structures

The pavement structures provided in Tables 8 and 9 in the following page are recommended where the proposed pavement structure is to be located overlying the concrete podium deck.

Table 8 – Recommended Pavement Structure – Light-Duty Asphalt Pathways	
Thickness (mm)	**Material Description**
50	**Wear Course** – Superpave 12.5 Asphaltic Concrete
300	**BASE** – OPSS Granular A Crushed Stone
Separation Layer	**WOVEN GEOTEXTILE –** Terrafix 200W
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. **NOTE –** A bi-axial geogrid layer may be advised to be provided at the time of subgrade preparation by Paterson personnel as based on the quality and performance of the subgrade material placed throughout the pathway.	

Table 9 – Recommended Pavement Structure – Brick/Stone Pathways	
Thickness (mm)	**Material Description**
Specified by Others	**Wear Course** – Interlocking Stones/Brick Pavers
25 - 40	**Leveling Course** – Stone Dust or Sand
300	**SUBBASE** – OPSS Granular A
Separation Layer	**WOVEN GEOTEXTILE –** Terrafix 200W
SUBGRADE – Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill. **NOTE –** A bi-axial geogrid layer may be advised to be provided at the time of subgrade preparation by Paterson personnel as based on the quality and performance of the subgrade material placed throughout the pathway.	

Due to the low permeability of the subgrade materials consideration should be given to installing subdrains during at the subgrade level of the above-noted pavement structures. The subdrain inverts should be approximately 300 mm below subgrade level and consist of a minimum 100 mm diameter perforate drainage pipe fitted with a geosock and surrounded by a minimum of 100 mm of clear crushed stone on all of its sides.

The pipe should discharge to either a catch-basins, connected to the drainage pipe, and/or become in contact with the geotextile face of the foundation drainage board that would be provided to the buried portions of the townhouse structures.

All remaining sidewalks and pathways provided throughout the subject site should be provided with a minimum 300 mm thick layer of OPSS Granular A and provided with a subdrain at the subgrade level as noted herein.

Ramp Slab Backfill

It is understood the ramp slab backfill layer for the Arcadian building will consist of a minimum 1.8 m thick layer of well-graded crushed stone, such as OPSS Granular A or OPSS Granular B Type II crushed stone. This material is recommended to be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 99% of the materials SPMDD.

Alternatively, if the pavement structure noted in Table 7 is considered in lieu of the 1.8 m thick layer of engineered fill, it is recommended to install an in-slab heating system to mitigate frost action within the underlying fill layers. Further, a minimum 50 mm thick layer of extruded polystyrene boards, such as DOW Chemical High-Load 40 (HI-40) or Owens Corning Canada Foamular 400 XPS-type rigid insulation, or equivalent other approved by Paterson, should be placed directly below the subbase layer. Expanded polystyrene and other types of foam insulation board products are not recommended to be used for the above-noted purposes.

It is recommended to cow-path the proposed ramp footprint with a minimum 600 mm thick layer of sacrificial soil material if consideration would be given to using the future ramp footprint as the temporary access ramp into the excavation during the construction phase of the parking garage structure. This would mitigate extensive over-excavation of subgrade material disturbed from construction worker traffic.

Pavement Structure Drainage

Satisfactory performance of the pavement structure 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 low permeability of the subgrade materials consideration should be given to installing subdrains 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

Foundation Drainage System

A perimeter foundation drainage system is recommended for the proposed residential structures which will be provided with an occupied basement level. The system should consist of a 150 mm diameter, geotextile-wrapped, 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 storm sewer or sump pit.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless placed in conjunction with a composite drainage system (such as system Platon or Miradrain G100N) connected to a drainage system.

Groundwater Suppression System

It is expected the townhouse structures supported by a level of underground parking will be founded below the long-term groundwater table. To mitigate long-term dewatering below the groundwater table, it is recommended that a groundwater suppression system be implemented for the subject structures. This would consist of a waterproofing membrane placed upon a composite foundation drainage board which is further placed upon the foundation wall.

It is anticipated that foundation walls will be cast using a double-sided method (i.e., temporary formwork on both sides of the foundation wall). Reference should be made to Figure 16 – Groundwater Suppression System and Figure 17 – Podium Deck to Foundation Wall Drainage System Tie-In Detail, for specific details of the groundwater suppression system included in Appendix 2 of the current geotechnical report.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

Based on our review, consideration may be given to completing the excavations using a combination of temporary excavation side slopes and temporary shoring, or solely using temporary shoring systems. The design and construction considerations associated with each of these methodologies are discussed in the following paragraphs.

Temporary Excavation Side Slopes – Excavation

The excavations for the proposed buildings are anticipated to be throughout an existing layer of silty clay fill (with variable amounts of silt, sand, gravel, cobbles, boulders and inorganic material) underlain by stiff brown silty clay, which is further underlain by a layer of firm, grey silty clay. The excavation is expected to extend into the firm, grey silty clay layer and below the groundwater table (anticipated to be at an approximate geodetic elevation of 92.5 and 91.5 m for west and eastern structures, respectively).

Based on our review, the soils that are expected to be encountered throughout the excavation and at the founding level of the proposed buildings may be considered as Type 3 soil in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects. Based on this, the excavation is recommended to be sloped no steeper than 3H:1V.

Prior to completing the excavation for the western structure supporting MT-04, MT-05, MT-06 and MT-07, an existing stockpile of fill should be reduced in height to a maximum top of ground surface elevation of 97.5 m. Excavated soil should not be stockpiled directly at the top of the building 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.

Temporary Shoring Systems

Based on our review, a temporary shoring system will be required to complete a portion of the excavations considering the recommended temporary excavation side slope angles for both proposed buildings. The portions of the building excavations that are anticipated to require support by the use of a temporary shoring system are indicated on *Figure 15 – Temporary Excavation Side Slope Review*. Consideration may also be given to installing temporary shoring systems across the remainder of the building perimeters.

Where a temporary shoring system is considered, the design and implementation of these temporary systems will be the responsibility of the excavation contractor and their design team. The shoring requirements, designed by Paterson or a structural engineer specializing in those works, will depend on the depth of the excavation, the proximity of the adjacent structures and the elevation of the adjacent building foundations and underground services. Inspections and approval of the temporary system will also be the responsibility of the designer.

It is the responsibility of the shoring contractor to ensure that the temporary shoring system is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures. In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes.

The temporary shoring system could consist of a soldier pile and lagging system or interlocking steel sheet piling. Any additional loading due to street traffic, neighbouring buildings, construction equipment, adjacent structures, and facilities, etc., should be included to the earth pressures described below.

Tiebacks considered for the system should be installed at elevations that would avoid conflicting with future infrastructure that will be installed throughout the subject site. It is also recommended that tiebacks be de-stressed prior to backfilling above tiebacks, and as deemed appropriate by the design engineer.

Furthermore, the design of the temporary shoring systems should take into consideration a full hydrostatic condition that can occur during significant precipitation events. These systems could be cantilevered, anchored, or braced. The shoring system is recommended to be adequately supported to resist toe failure if required by means of extending the piles into the bedrock through pre-augered holes if a soldier pile and lagging system is the preferred method.

The earth pressures acting on the temporary shoring system may be calculated with the parameters indicated in Table 10 below.

Table 10 – Soil Parameters

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Dry Unit Weight (γ), kN/m^3	20
Effective Unit Weight (γ'), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight is calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

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 City of Ottawa.

It is expected that the invert level of the municipal services will be installed at or below the long-term groundwater level within the native silty clay deposit. Due to the low permeability of the silty clay deposit, it is expected that minimal groundwater infiltration will occur during installation work. It is expected that groundwater infiltration will be handled by suitably sized submersible pumps. Groundwater infiltration is not expected provided that best construction practices are followed for the sewer pipe installation work and that the sewers are installed as per design requirements.

The pipe bedding for sewer and water pipes placed on a relatively dry, undisturbed subgrade surface should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within the firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extend at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD.

Generally, it should be possible to re-use the moist (not wet) brown silty clay and silty clay with sand above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay and silty clay with sand materials will be difficult to re-use, as the high-water contents make compacting impractical without an extensive drying period.

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.

Clay Seals

To reduce long-term lowering of the groundwater at this site, clay seals should be provided within the service trenches excavated through the silty clay deposit. The seals should be at least 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 and compactable brown silty clay placed in maximum 225 mm thick loose layers 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 no more than 60 m intervals in the service trenches excavated through the silty clay deposit.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. 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.

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 of 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

The subsurface conditions at this site mostly 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. Precautions should be taken if winter construction is considered for this project.

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, 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 constructed in a manner that will avoid the introduction of frozen materials into the trenches. Pavement construction is also difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place.

In addition, 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. Additional information could be provided, if required.

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 very aggressive corrosive environment.

6.8 Landscaping Considerations

Tree Planting Setbacks

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. Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. Grain size distribution and Sieve analysis testing was also completed on selected soil samples. The above noted test results were completed between design underside of footing elevation and a 3.5 m depth below finished grade. The results of our testing are presented in Tables 1 and 2 in Subsection 4.1 and in Appendix 1.

Townhouses West of Arcadian (Block 15 to Block 28, MT-01 to MT-03)

Since the modified plasticity limit (PI) does not exceed 40%, large trees (mature height over 14 m) can be planted at the subject site 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).

According to the City of Ottawa Tree Planting Guidelines, tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the following conditions are met:

- The underside of footing (USF) extends to 2.1 m or greater below the lowest finished grade within 10 m from the tree, as measured from the center of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below. **However, due to the thickness of the fill material within the subject site, this condition is not required as the native silty clay material is well below the proposed underside of footing elevations (at least 1 m below proposed USF levels).**

- A small tree must be provided with a minimum of 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 tree height up to 7.5 m) to medium size (mature tree 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).

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

Private Townhouses East of Arcadian (MT-04 to MT-14)

Based on our review, two conditions exist throughout the private portion of the subject site and east of the proposed Arcadian right-of-way.

One condition is that the separation between the design underside of footing (USF) elevation and the in-situ clay deposit is greater than 1 m for MT-08, MT-09 and MT-10. Since the underlying clay deposit throughout the area of these buildings will be at lower depth than USF, tree root systems for low to medium sized trees are not expected to extend within the underlying clay deposit. Further, given the high gravel, cobble and boulder content of the in-situ fill layer that would be below USF, roots are not expected to extend into and beyond the overlying fill layer.

The second condition is that the basement level for MT-04 to MT-07 and MT-11 to MT-14 will consist of a level of underground parking. The founding depth for these parking structures will be over 5.5 m below finished grade. It is expected the trees will be planted within the surficial layer of fill as noted for MT-08, MT-09 and MT-10.

Since it is not expected that the root systems will extend beyond the overlying fill layer, it is also not expected the root systems will extend below the founding depth of the structure given the separation between USF and finished grade.

Since the modified plasticity limit (PI) does not exceed 40%, large trees (mature height over 14 m) can be planted throughout this portion of the subject site 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). However, given the above-noted rationale, tree planting setback limits may be reduced to 3 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) throughout this portion of the subject site from a geotechnical perspective.

The following conditions should be met for trees planted in proximity to structures throughout this portion of the subject site:

- A small tree must be provided with a minimum of 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 tree height up to 7.5 m) to medium size (mature tree 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). This recommendation is not considered applicable to the design of the foundation walls for the underground parking structures as it is expected the reinforcement details for those structures will exceed this recommendation.

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

In-Ground Swimming Pools

The in-situ soils are considered to be acceptable for the installation of in-ground swimming pools. The soil removed to accommodate an in-ground swimming pool weighs more than the water filled in-ground pool. Therefore, no additional load is being applied to the underlying sensitive clays.

Aboveground Swimming Pools, Hot Tubs and Exterior Decks

If consideration is given to construction of an above ground swimming pool, a hot tub or an exterior deck, a geotechnical consultant should be retained by the homeowner to review the site conditions. No additional grading should be placed around the exterior structure. The swimming pool should be located at least 3 m away from the existing foundation to avoid adding localized loading to the foundation and the hot tub should be located at least 2 m away from the existing foundation. Otherwise, construction is considered routine, and can be constructed in accordance with the manufacturer's specifications.

6.9 Slope Stability Analysis

Field Observations

The subject section of Feedmill Creek is located with a 4 to 45 m wide valley corridor with a 1.5 to 3 m high valley wall. The valley corridor is less defined within the east portion of the site, where the walls are close to 2 m or less. It was noted that the majority of the slope face was densely covered with mature trees, saplings, bushes and grass along the southwest portion.

An area of bouldery fill was noted along the north bank at approximately 80 to 100 m northeast of Huntmar Drive. Also, a beaver dam was noted within the watercourse approximately 180 m northeast of Huntmar Drive. The northeast section of the valley corridor is mainly grass covered along top of slope with bushes and trees sparsely populated along the bank face. Tree and plant roots were noted to be protruding from the exposed bank face along the majority of the watercourse. Some sloughing and minor undercutting along the lower portion of the bank face was noted where the watercourse meandered in close contact with the valley wall.

Slope Stability Analysis

A slope stability analysis was completed by Paterson for the subject slope. Five (5) slope sections were analysed based on information obtained by Paterson field personnel and topographical mapping from the City of Ottawa.

The analysis of the stability of the slope was carried out using SLIDE, a computer program which permits a two-dimensional slope stability analysis using several methods including the Bishop's method, which is a widely used and accepted analysis method. The program calculates a factor of safety, which represents the ratio of the forces resisting failure to those favouring failure. Theoretically, a factor of safety of 1.0 represents a condition where the slope is stable.

However, due to intrinsic limitations of the calculation methods and the variability of the subsoil and groundwater conditions, a factor of safety greater than one is usually required to ascertain the risks of failure are acceptable. A minimum factor of safety of 1.5 is generally recommended for conditions where the failure of the slope would endanger permanent structures. Under seismic loading, a minimum factor of safety of 1.1 is considered to be satisfactory.

The sections were analyzed considering the groundwater level at ground surface. Subsoil conditions at the cross-sections were inferred based on the findings at nearby borehole locations and general knowledge of the area's geology.

Static Conditions Analysis

The results for the existing slope conditions in Sections A to E are shown in Figures 2, 4, 6, 8 and 10, respectively, and are attached to the present letter. The results of the slope stability analysis indicate that all sections, except Section E, are considered stable from a geotechnical perspective. Therefore, Section E requires a 2.9 m stable slope allowance. The stable slope allowance is included in the limit of hazard lands setback line.

Seismic Loading Analysis

An analysis considering seismic loading was also completed. A horizontal seismic acceleration, K_h, of 0.16g was considered for the analyzed sections. A factor of safety of 1.1 is considered to be satisfactory for stability analysis including seismic loading.

The results of the analysis including seismic loading are shown in Figures 3, 5, 7, 9 and 11 for the slope sections. The overall slope stability factors of safety for the subject sections when considering seismic loading were found to be greater than 1.1. Based on these results, the slopes are considered to be stable under seismic loading.

Limit of Hazard Lands

Typically, the limit of hazard lands setback is comprised of a stable slope allowance, toe erosion, and 6 m erosion access allowance. It should be noted that based on our analysis results, the majority of the slope is considered stable.

The limit of hazard lands designation line for the subject site is indicated on Drawing PG5648-3 – Limit of Hazard Lands Setback Plan in Appendix 2.

The toe erosion allowance for the valley corridor wall slopes was based on the cohesive nature of the soils, the observed current erosional activities and the width and location of the current watercourse.

Signs of erosion were noted along the existing watercourse, especially where the watercourse has meandered in close proximity to the toe of the corridor wall. It is considered that a toe erosion allowance of 6 m is appropriate for the corridor walls confining the existing watercourse.

The toe erosion allowance should be applied from the top of stable slope, where the watercourse has meandered to within 10 m of the slope toe. The toe erosion allowance should be taken from the bank full water's edge in areas where the watercourse is greater than 10 m from the toe of the existing slope. The toe erosion allowance should be applied from the top of stable slope.

The existing vegetation on the slope face should not be removed as it contributes to the stability of the slope and reduces erosion. If the existing vegetation needs to be removed, it is recommended that a 100 to 150 mm of topsoil mixed with a hardy seed, or an erosional control blanket be placed across the exposed slope face.

It should also be noted that a meander belt allowance was not considered in our analysis. Meander belt allowances normally only apply to unconfined water systems and terrain-dependent water systems consisting of cohesionless materials, such as sands.

7.0 Recommendations

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

- ❑ Review of the fill at the time of the excavation, segregation and stockpiling for future re-use as backfill material by Paterson personnel.
- ❑ Review placement of approved site-generated soil for re-use and backfilling proposed structures.
- ❑ Review of the grading plan(s) from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ 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 the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per *Ontario Regulation 406/19: On-Site and Excess Soil Management*.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and the test hole log are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

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 to be notified immediately in order to permit reassessment of the recommendations.

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 Minto Communities 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.

Drew Petahtegoose, B.Eng. Faisal I. Abou-Seido, P.Eng.

Report Distribution:

- ❑ Minto Communities (E-mail copy)
- ❑ Paterson Group (Digital copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMITS TESTING RESULTS

GRAIN SIZE DISTRIBUTION SHEETS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5648

REMARKS

HOLE NO. BH 1-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	95.61
FILL: Brown silty sand to silty clay with sand, gravel, organics and roots		AU	1				
-Decreasing in sand content with depth		SS	2	38	14	1	94.61
		SS	3	67	19	2	93.61
2.29							
Stiff brown **SILTY CLAY**		SS	4	13	4		
- Some silt seams encoutered throughout		SS	5	42	3	3	92.61
						4	91.61
4.57							
Firm grey **SILTY CLAY** with silt seams						5	90.61
						6	89.61
6.55							
End of Borehole							
(GWL based on site observations at 5.33 m depth - Dec 17, 2020)							

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

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

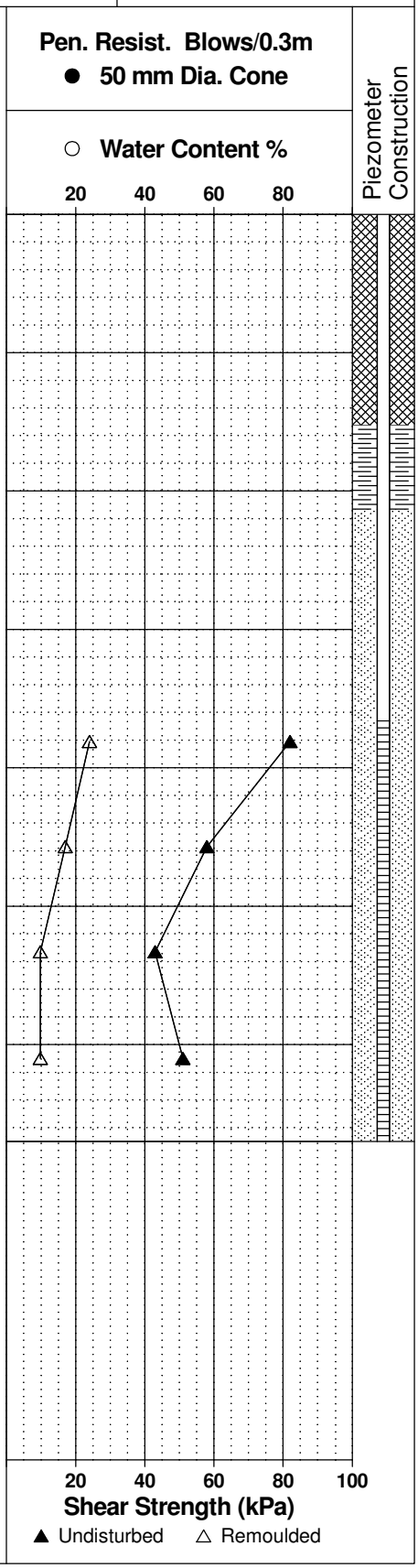
FILE NO. PG5648

REMARKS

HOLE NO. BH 2-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.80
		AU	1				
FILL: Brown silty sand to silty clay with sand, crushed stone, cobbles and trace roots		SS	2	46	24	1	95.80
		SS	3	4	9	2	94.80
2.59		SS	4	25	5		
		SS	5	100	6	3	93.80
Stiff to firm grey **SILTY CLAY**						4	92.80
						5	91.80
						6	90.80
6.70							
End of Borehole							
(GWL based on site observations at 3.81 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

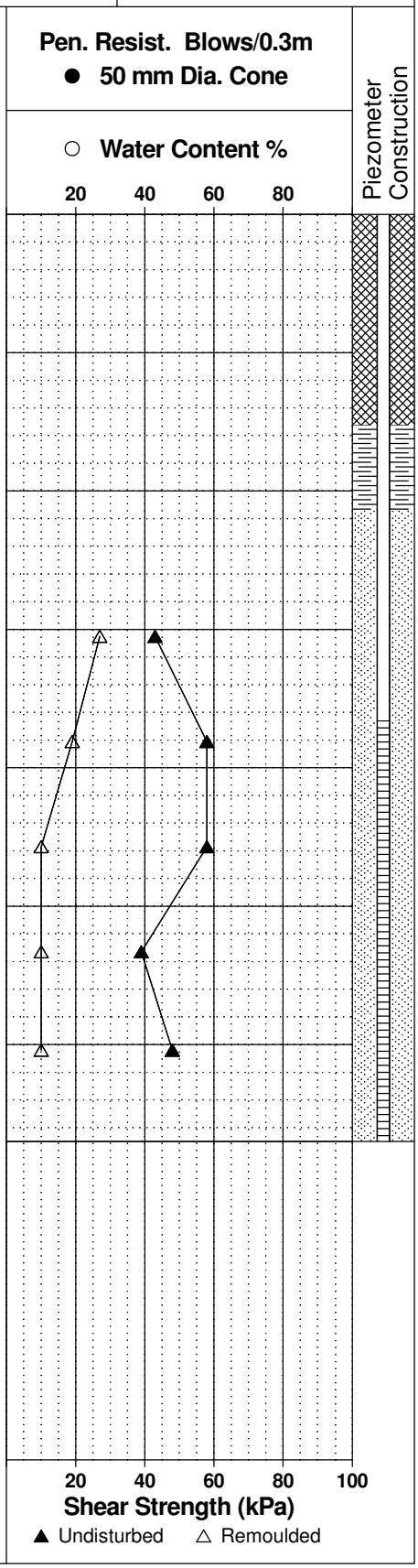
FILE NO. PG5648

REMARKS

HOLE NO. BH 3-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.58
FILL: Brown silty clay with trace with sand, trace gravel, cobbles and organics		AU	1				
		SS	2	58	13	1	95.58
1.40							
		SS	3	0	7	2	94.58
Stiff to firm brown **SILTY CLAY** trace sand		SS	4	42	3	3	93.58
						4	92.58
4.57							
Firm grey **SILTY CLAY**						5	91.58
						6	90.58
6.70							
End of Borehole							
(GWL based on site observations at 4.57 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

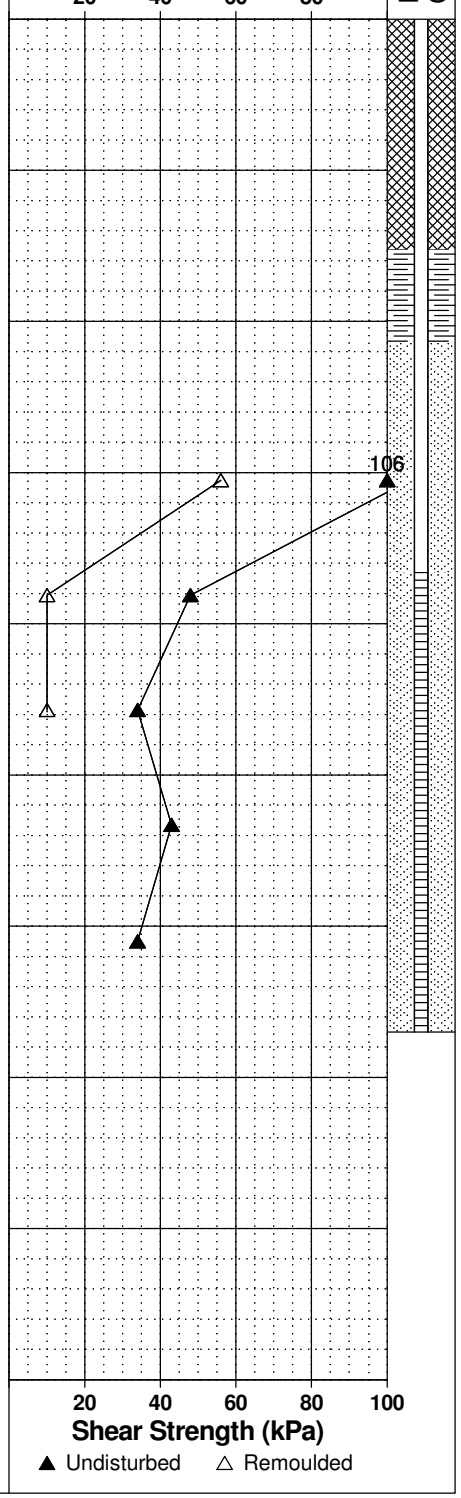
FILE NO. PG5648

REMARKS

HOLE NO. BH 4-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.79
FILL: Brown silty sand some gravel, trace cobbles, boulders, organics and roots		AU	1				
		SS	2	16	8	1	95.79
		SS	3	9	5	2	94.79
2.10							
Stiff to firm stiff brown **SILTY CLAY**		SS	4	30	4	3	93.79
- Grey by 3.81 m depth						4	92.79
						5	91.79
						6	90.79
6.70							
Dynamic Cone Penetration Test Commenced at 6.70 m depth. Pushed cone through inferred **SILTY CLAY**						7	89.79
						8	88.79
						9	87.79



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

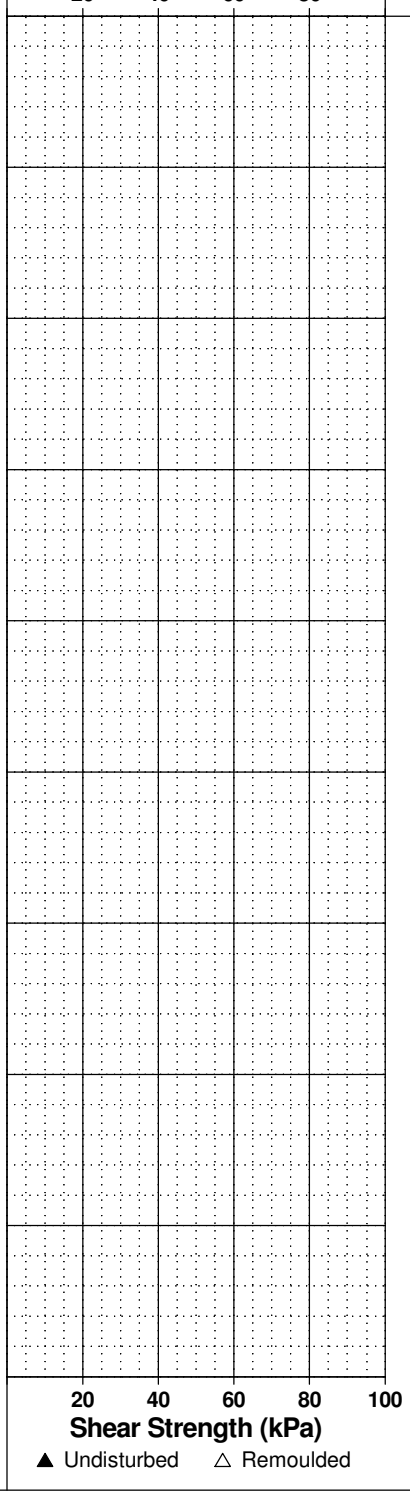
FILE NO. PG5648

REMARKS

HOLE NO. BH 4-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

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									
						9	87.79		
						10	86.79		
						11	85.79		
Inferred **SILTY CLAY**						12	84.79		
						13	83.79		
						14	82.79		
						15	81.79		
						16	80.79		
						17	79.79		
						18	78.79		



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

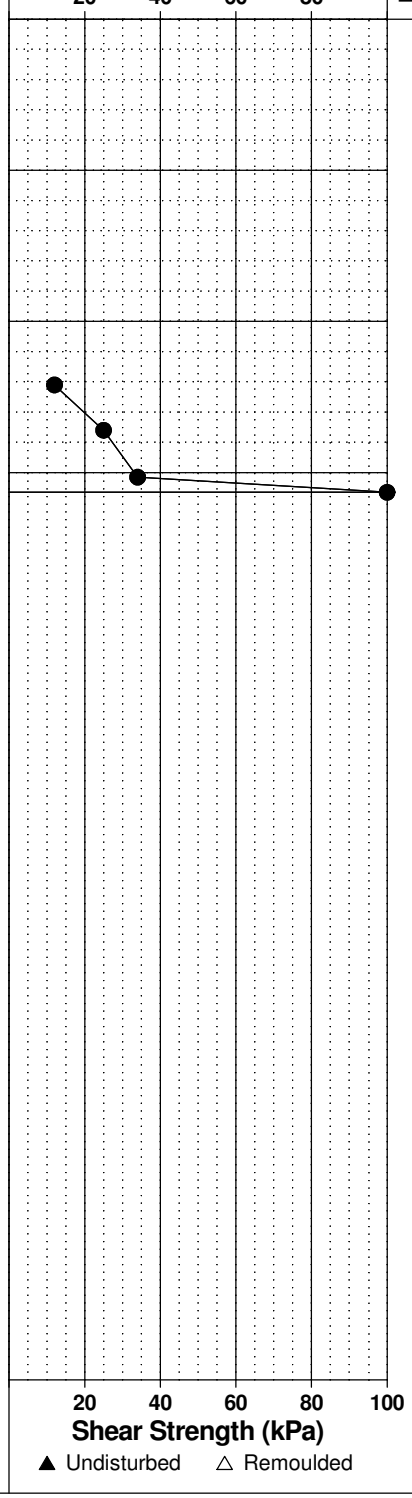
FILE NO. PG5648

REMARKS

HOLE NO. BH 4-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

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**						18	78.79		
						19	77.79		
						20	76.79		
20.93						21	75.79		
End of Borehole									
Practical refusal to DCPT at 20.93 m depth									
(GWL based on site observations at 4.57 m depth - Dec 17, 2020)									



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

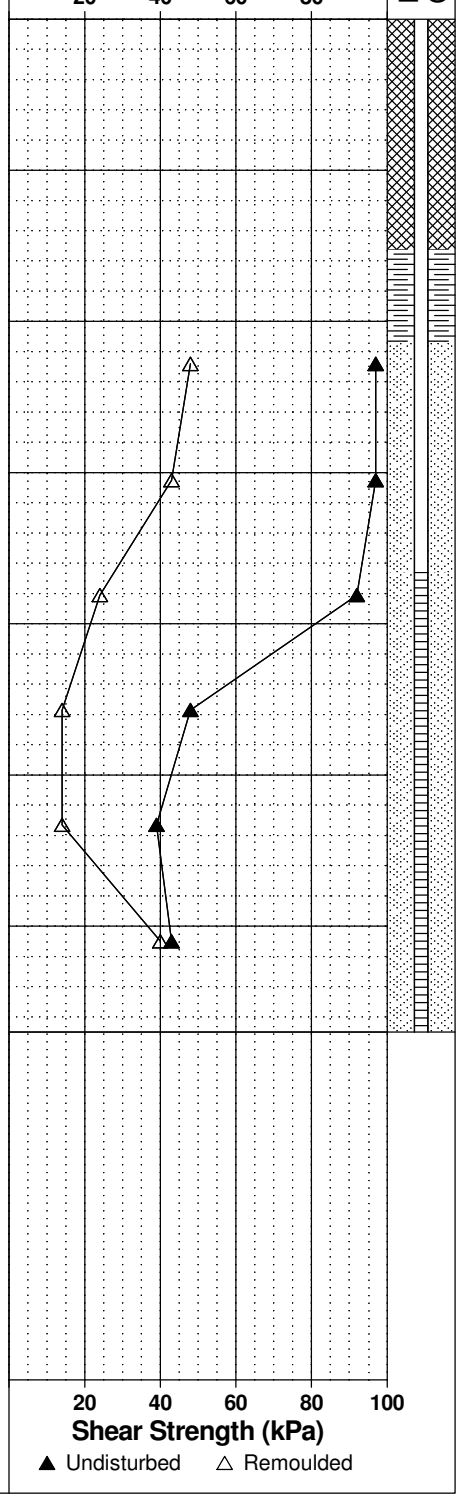
FILE NO. PG5648

REMARKS

HOLE NO. BH 5-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	96.80
FILL: Brown silty clay with sand, gravel, cobbles trace organics 0.33		AU	1				
Stiff to firm brown **SILTY CLAY**		SS	2	42	6	1	95.80
		SS	3	46	5	2	94.80
						3	93.80
						4	92.80
4.57							
Firm grey **SILTY CLAY**						5	91.80
						6	90.80
6.70							
End of Borehole							
(GWL based on site observations at 4.57 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

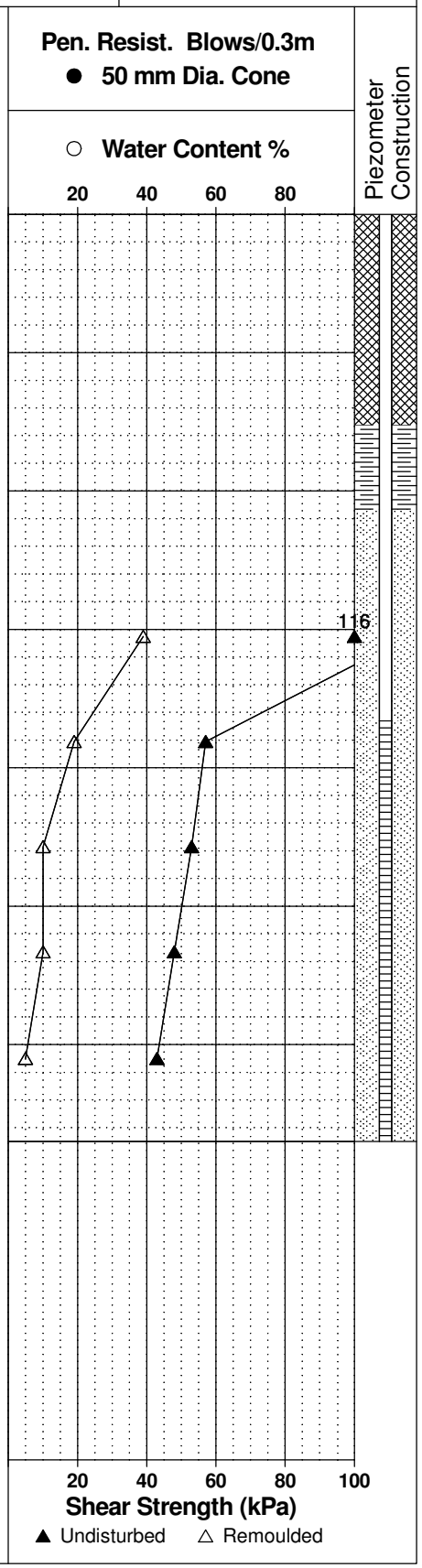
FILE NO. PG5648

REMARKS

HOLE NO. BH 6-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.77
FILL: Brown silty clay with sand, some gravel, trace organics		AU	1				
		SS	2	16	5	1	96.77
1.37							
Very stiff to stiff brown **SILTY CLAY**		SS	3	63	10	2	95.77
		SS	4	16	7	3	94.77
- Firm and grey by 3.81 m depth						4	93.77
						5	92.77
6.70						6	91.77
End of Borehole							
(GWL based on site observations at 4.57 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

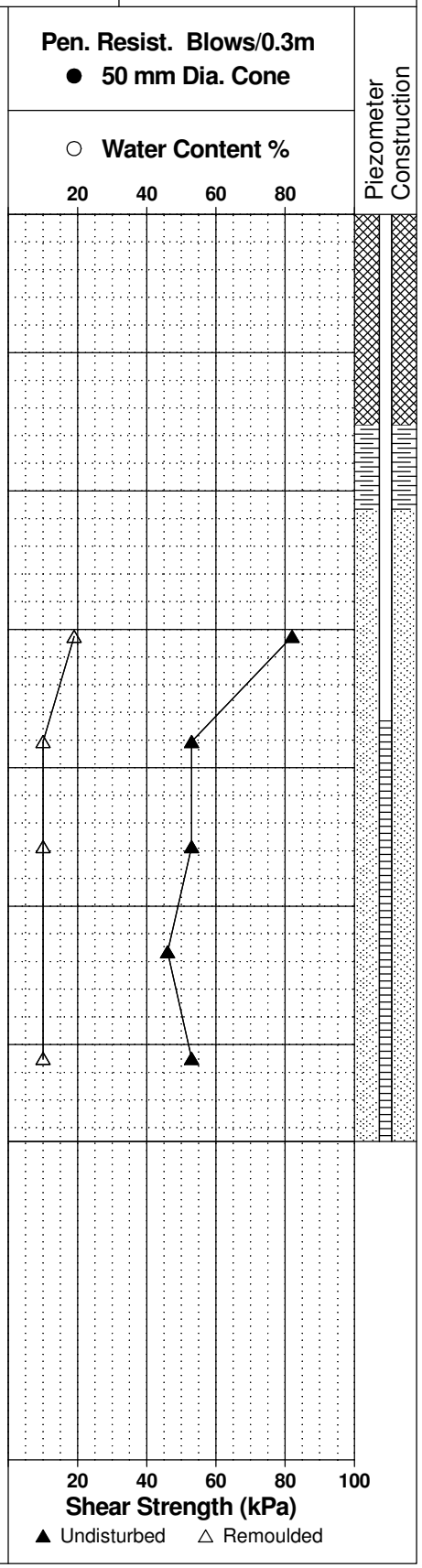
FILE NO. PG5648

REMARKS

HOLE NO. BH 7-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.63
FILL: Brown silty sand with gravel, cobbles, trace clay and roots		AU	1				
0.40							
FILL: Brown silty clay some sand		SS	2	50	13	1	96.63
1.37							
Stiff to firm brown **SILTY CLAY**		SS	3	100	8	2	95.63
		SS	4	100	6	3	94.63
3.81							
Stiff to firm grey **SILTY CLAY**						4	93.63
						5	92.63
						6	91.63
6.70							
End of Borehole							
(GWL based on site observations at 3.81 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development
Arcadia Stage 6 - Campeau Dr - Ottawa, Ontario

DATUM Geodetic

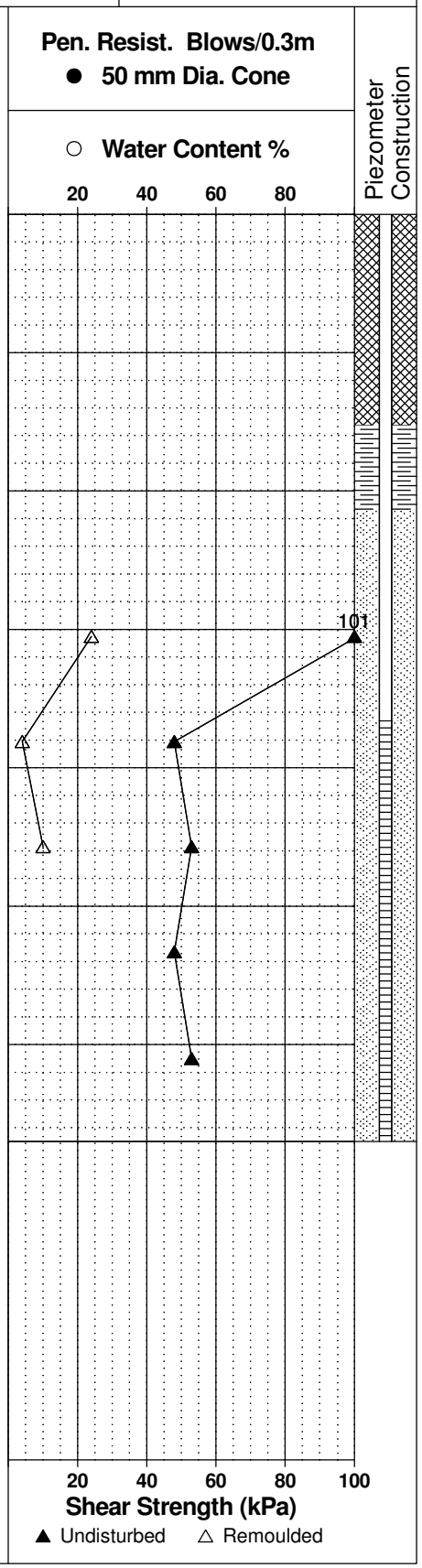
FILE NO. PG5648

REMARKS

HOLE NO. BH 8-20

BORINGS BY CME-55 Low Clearance Drill **DATE** 2020 December 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.07
FILL: Brown silty clay with sand, crushed stone, gravel, cobbles, and boulders		AU	1				
0.66							
FILL: Brown silty clay trace gravel and sand 0.85		SS	2	54	16	1	97.07
Very stiff to stiff brown **SILTY CLAY**		SS	3	92	12	2	96.07
		SS	4	96	5	3	95.07
3.81							
Stiff to firm grey **SILTY CLAY**						4	94.07
						5	93.07
						6	92.07
6.70							
End of Borehole							
(GWL based on site observations at 3.81 m depth - Dec 17, 2020)							



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 1-23

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	97.12		
Stiff, brown **SILTY CLAY**		G	1						
		G	2			1	96.12		
1.00									
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 2-23

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	97.18		
Stiff, brown **SILTY CLAY**		G	1						
		G	2			1	96.18		
1.00									
End of Test Pit									

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

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 3-23

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	97.05		
Stiff, brown **SILTY CLAY**		G	1			1	96.05		
End of Test Pit		G	2			1.90			

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 4-23

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	97.70		
Stiff, brown **SILTY CLAY**		G	1			1	96.70		
		G	2			2	95.70		
2.20									
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 5-23

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	98.35		
Stiff, brown **SILTY CLAY,** trace organics to 0.3m depth		G	1			1	97.35		
		G	2			2	96.35		
End of Test Pit						2.30			

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 7-23

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	97.28		
Stiff, brown **SILTY CLAY**		G	1			1	96.28		
		G	2			1.80			
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

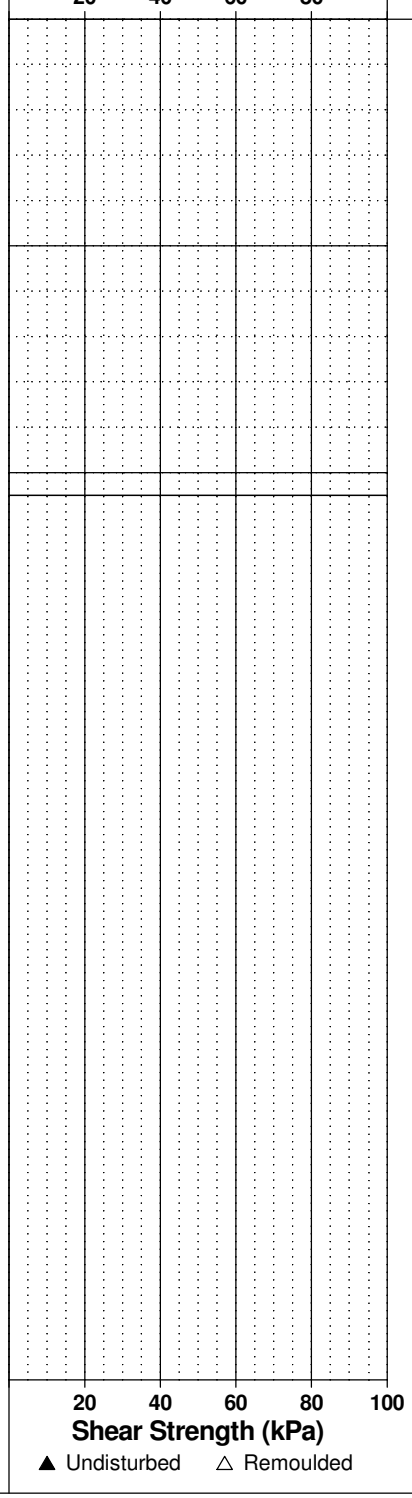
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 8-23

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	97.86		
FILL: Brown silty sand, some gravel, trace debris		G	1						
0.40									
		G	2			1	96.86		
Stiff, brown **SILTY CLAY**									
2.10						2	95.86		
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP 9-23

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	97.30		
Stiff, brown **SILTY CLAY**		G	1			1	96.30		
		G	2						
1.90 End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

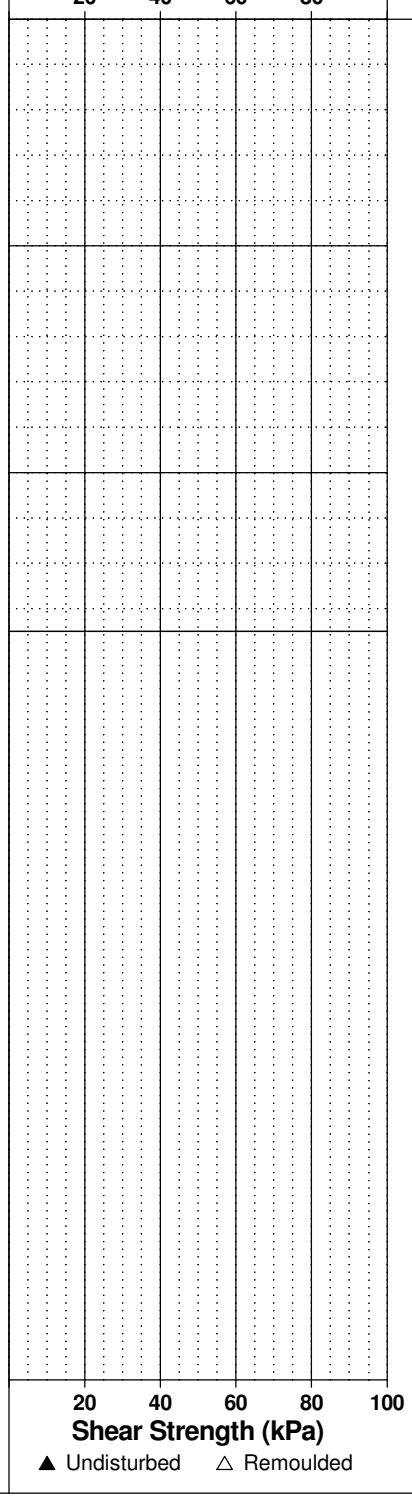
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP10-23

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	96.88		
		G	1			1	95.88		
Stiff, brown **SILTY CLAY**						2	94.88		
		G	2						
2.70									
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP11-23

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	97.04		
Stiff, brown **SILTY CLAY**		G	1						
						1	96.04		
		G	2						
1.50									
End of Test Pit									

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

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

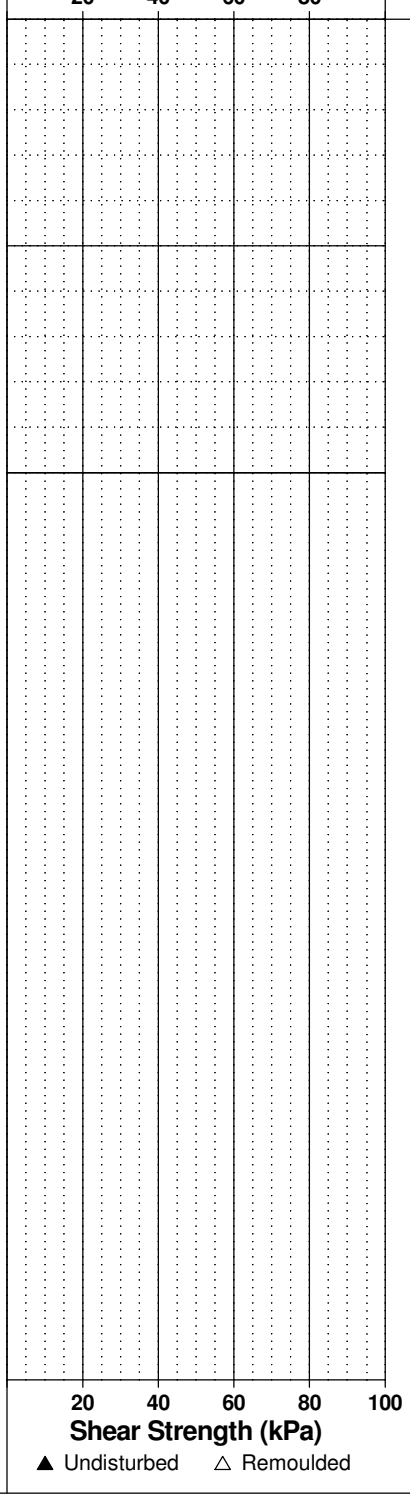
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP12-23

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	97.74		
FILL: Brown silty sand, some gravel, trace clay		G	1			1	96.74		
1.40									
Stiff, brown **SILTY CLAY**		G	2			2	95.74		
2.00									
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

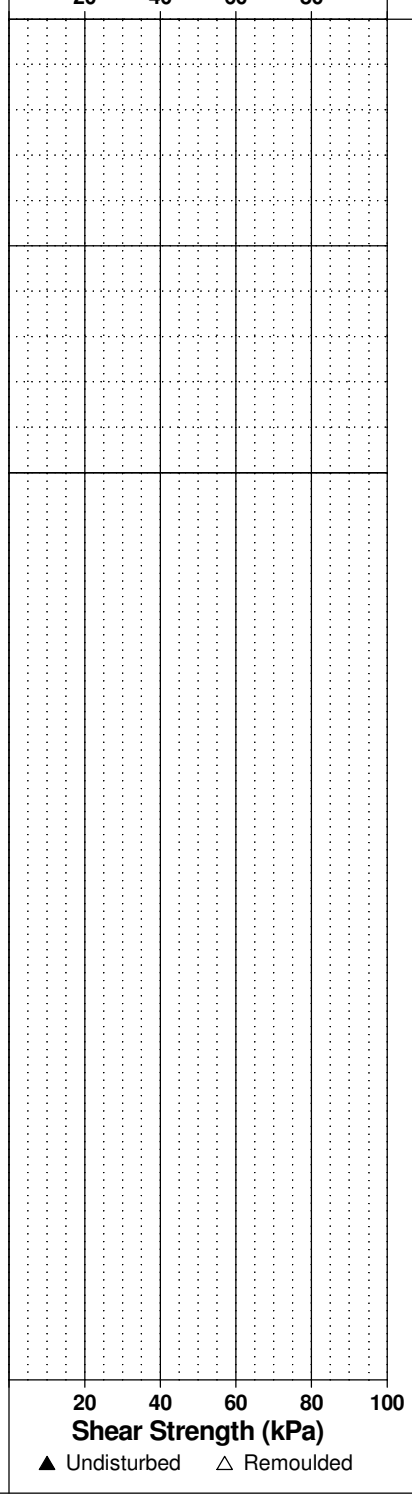
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP13-23

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	97.46		
FILL: Brown silty sand, some gravel, trace clay		G	1			1	96.46		
1.50									
Stiff, brown **SILTY CLAY**		G	2			2	95.46		
2.00									
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

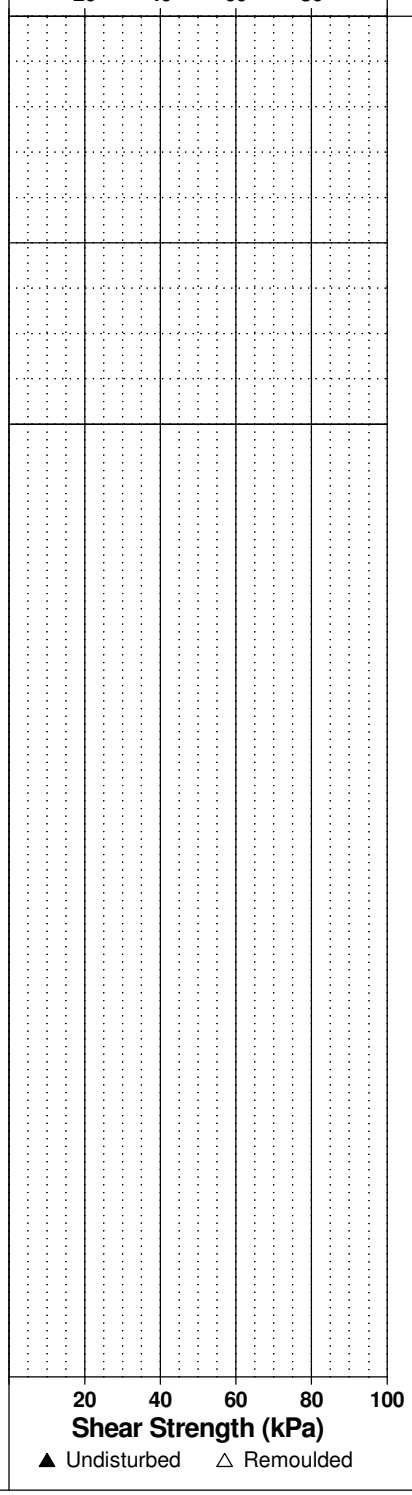
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP14-23

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	98.19		
FILL: Brown silty clay, trace gravel		G	1			1	97.19		
1.30									
Stiff, brown **SILTY CLAY**		G	2						
1.80									
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP15-23

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	96.66		
FILL: Brown silty sand, some gravel, trace clay and debris		G	1						
1.00						1	95.66		
Stiff, brown **SILTY CLAY**		G	2						
1.80									
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

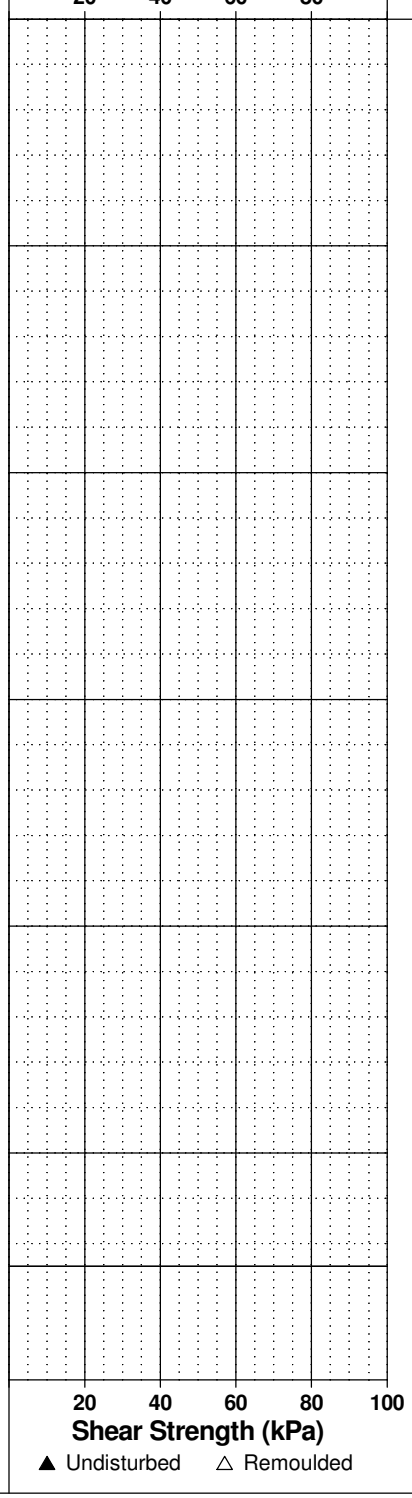
REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP16-23

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	96.76		
		G	1			1	95.76		
		G	2			2	94.76		
Stiff, brown **SILTY CLAY**						3	93.76		
						4	92.76		
		G	3			5	91.76		
5.50									
End of Test Pit									



patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP17-23

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	96.30		
		G	1			1	95.30		
		G	2			2	94.30		
Stiff, brown **SILTY CLAY**						3	93.30		
		G	3			4	92.30		
		G	4			5	91.30		
5.00									
End of Test Pit									

Water Content % scale: 20, 40, 60, 80

Shear Strength (kPa) scale: 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP18-23

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	95.72		
Stiff, brown **SILTY CLAY,** trace organics		G	1						
		G	2			1	94.72		
1.10 End of Test Pit									

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

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP19-23

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	97.03		
		G	1			1	96.03		
FILL: Brown silty sand, some gravel, trace debris						2	95.03		
		G	2						
2.80									
Stiff, brown **SILTY CLAY** 2.90		G	3						
End of Test Pit									

Pen. Resist. Blows/0.3m: ○ Water Content % — 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP20-23

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	96.11		
FILL: Brown silty sand, some clay and gravel		G	1			1	95.11		
1.40									
		G	2			2	94.11		
Stiff, brown **SILTY CLAY**		G	3			3	93.11		
						4	92.11		
		G	4			5	91.11		
5.20									
End of Test Pit									

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

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP21-23

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	96.45		
TOPSOIL 0.30		G	1						
		G	2			1	95.45		
FILL: Brown silty sand, some gravel, trace debris		G	3			2	94.45		
4.40						3	93.45		
Stiff, brown **SILTY CLAY**		G	4			4	92.45		
5.50						5	91.45		
End of Test Pit									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
450 Huntmar Drive
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Excavator **DATE** March 3, 2023

FILE NO. PG5648

HOLE NO. TP22-23

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	95.57		
FILL: Brown silty sand, some clay and gravel		G	1			1	94.57		
1.60									
Stiff, brown **SILTY CLAY**		G	2			2	93.57		
		G	3			3	92.57		
		G	4			4	91.57		
4.70									
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.

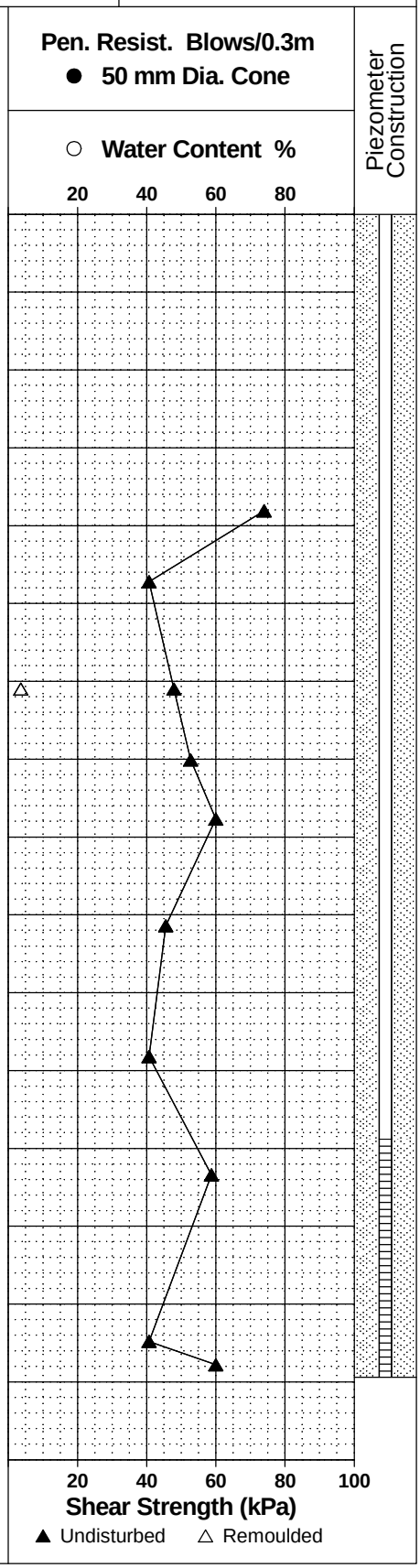
FILE NO. PG0538

REMARKS

HOLE NO. BH10

BORINGS BY CME 75 Power Auger **DATE** Feb 11, 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.20
FILL: Topsoil, silty clay, sand and gravel		AU	1			1	96.20
		SS	2	25	10	2	95.20
		SS	3	12	7		
2.95						3	94.20
Stiff, brown **SILTY CLAY**		SS	4	100	4	4	93.20
- firm and grey by 4.9m depth		SS	5	0	1	5	92.20
- stiff by 6.4m depth						6	91.20
						7	90.20
						8	89.20
- firm by 9.0m depth		SS	6	100	P	9	88.20
						10	87.20
						11	86.20
						12	85.20
						13	84.20
		SS	7	71	1	14	83.20
14.94						15	82.20
Dynamic Cone Penetration Test commenced @ 14.94m depth. Cone pushed to 19.9m						16	81.20



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.

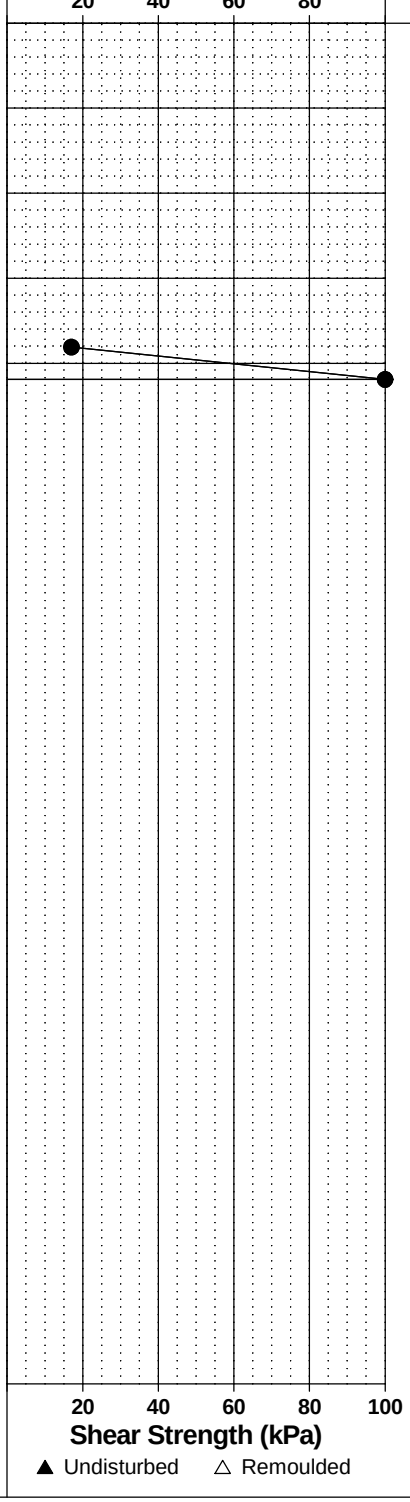
FILE NO. PG0538

REMARKS

HOLE NO. BH10

BORINGS BY CME 75 Power Auger **DATE** Feb 11, 05

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
depth						16	81.20		
						17	80.20		
Inferred **SILTY CLAY**						18	79.20		
						19	78.20		
19.90						20	77.20		
Inferred **GLACIAL TILL** 20.19									
End of Borehole									
DCPT refusal @ 20.19m depth									
(Piezometer damaged - Feb. 21/05)									



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.

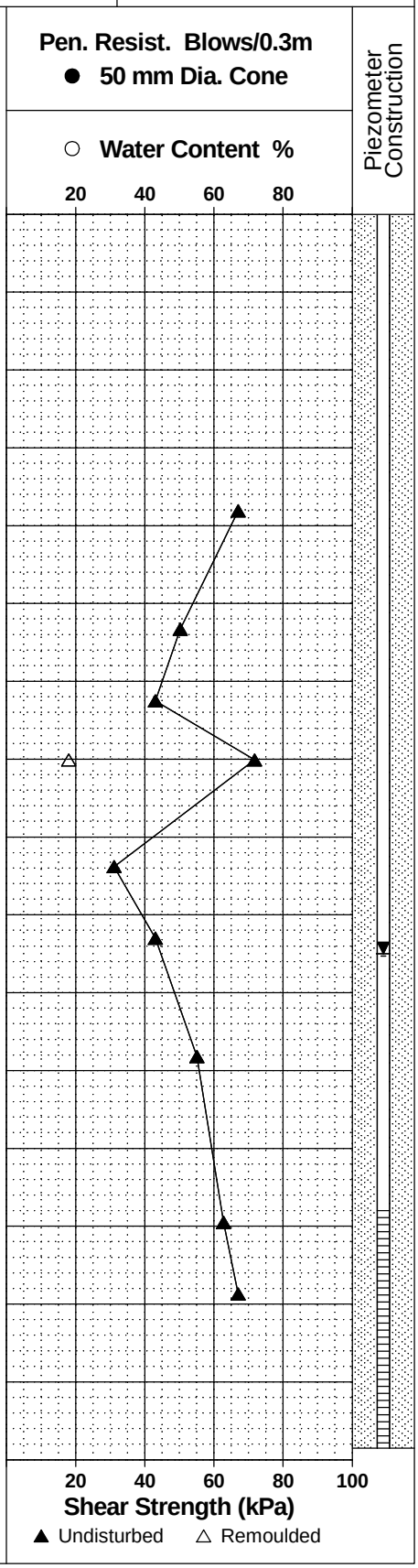
FILE NO. PG0538

REMARKS

HOLE NO. BH11

BORINGS BY CME 75 Power Auger **DATE** Feb 10, 05

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	94.09
FILL: Topsoil, silty clay, sand and gravel		AU	1			1	93.09
1.68		SS	2	62	3	2	92.09
Stiff, brown **SILTY CLAY**, some fine sand seams		SS	3	100	1	3	91.09
- grey by 2.9 depth		SS	4	17	1	4	90.09
		SS	5	100	P	5	89.09
						6	88.09
						7	87.09
- firm by 8.0m depth		SS	6	100	3	8	86.09
						9	85.09
- stiff by 10.0m depth						10	84.09
						11	83.09
						12	82.09
		SS	7	100	P	13	81.09
						14	80.09
						15	79.09
15.85		SS	8		2	16	78.09



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.

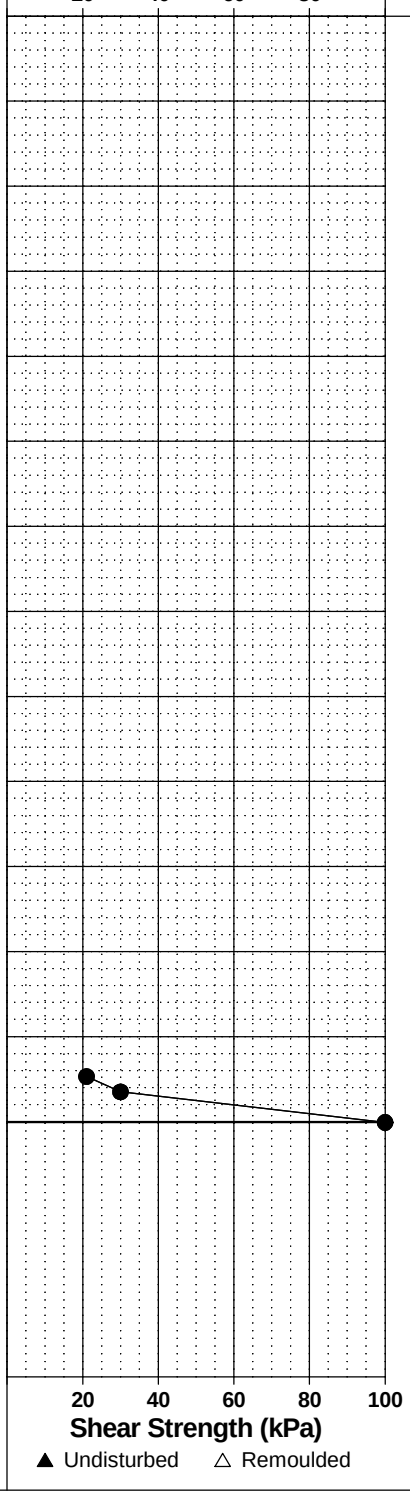
FILE NO. PG0538

REMARKS

HOLE NO. BH11

BORINGS BY CME 75 Power Auger **DATE** Feb 10, 05

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
Dynamic Cone Penetration Test commenced @ 15.85m depth. Cone pushed to 28.5m depth						16	78.09		
						17	77.09		
						18	76.09		
						19	75.09		
						20	74.09		
						21	73.09		
Inferred **SILTY CLAY**						22	72.09		
						23	71.09		
						24	70.09		
						25	69.09		
						26	68.09		
						27	67.09		
						28	66.09		
28.50									
Inferred **GLACIAL TILL**						29	65.09		
29.01									
End of Borehole									
DCPT refusal @ 29.01m depth									
(GWL @ 9.50m-Feb. 21/05)									



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

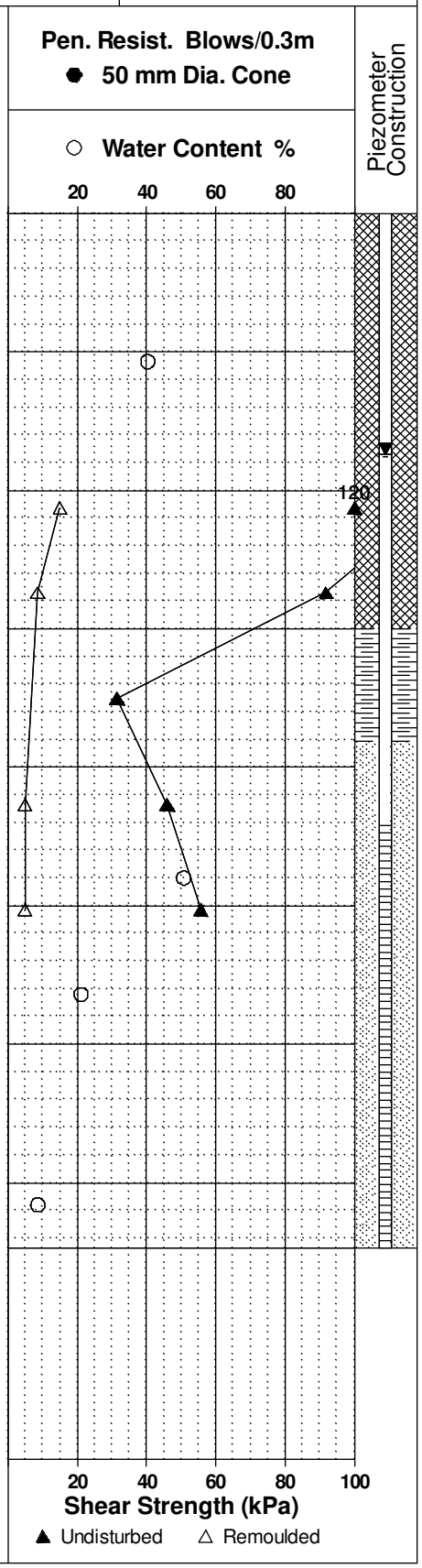
FILE NO. PG3045

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** October 10, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.19
		AU	1				
Very stiff to stiff, brown **SILTY CLAY**		SS	2	100	4	1	96.19
- rootlets extending to 0.3m depth noted						2	95.19
- firm to stiff and grey by 3.3m depth						3	94.19
						4	93.19
5.18						5	92.19
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	3	83	3	6	91.19
		SS	4	83	11		
		SS	5	83	31	7	90.19
7.47							
End of Borehole							
(GWL @ 1.74m-Oct. 21, 2013)							



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

FILE NO. PG3045

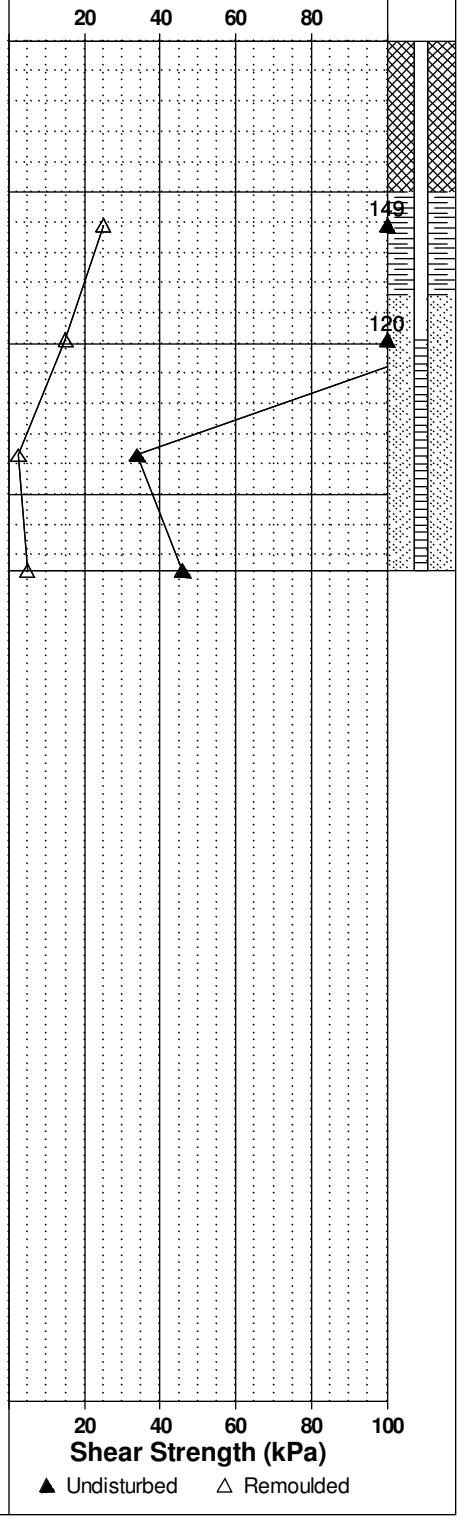
REMARKS

HOLE NO. BH14

BORINGS BY CME 55 Power Auger **DATE** October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.41
Very stiff to stiff, brown **SILTY CLAY**						1	96.41
- firm and grey by 2.6m depth						2	95.41
						3	94.41
3.50							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

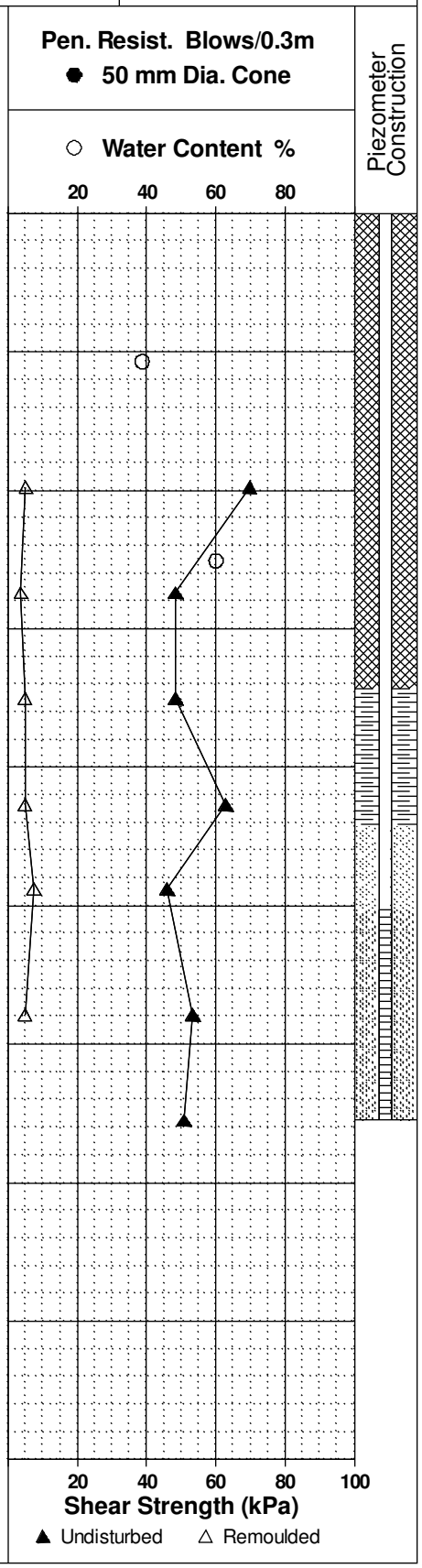
FILE NO. PG3045

REMARKS

HOLE NO. BH18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.12
		SS	1	100	4	1	97.12
Stiff to firm, brown **SILTY CLAY**						2	96.12
- grey by 2.7m depth						3	95.12
						4	94.12
						5	93.12
						6	92.12
6.55							
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 11.5m depth.						7	91.12
						8	90.12
						9	89.12



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

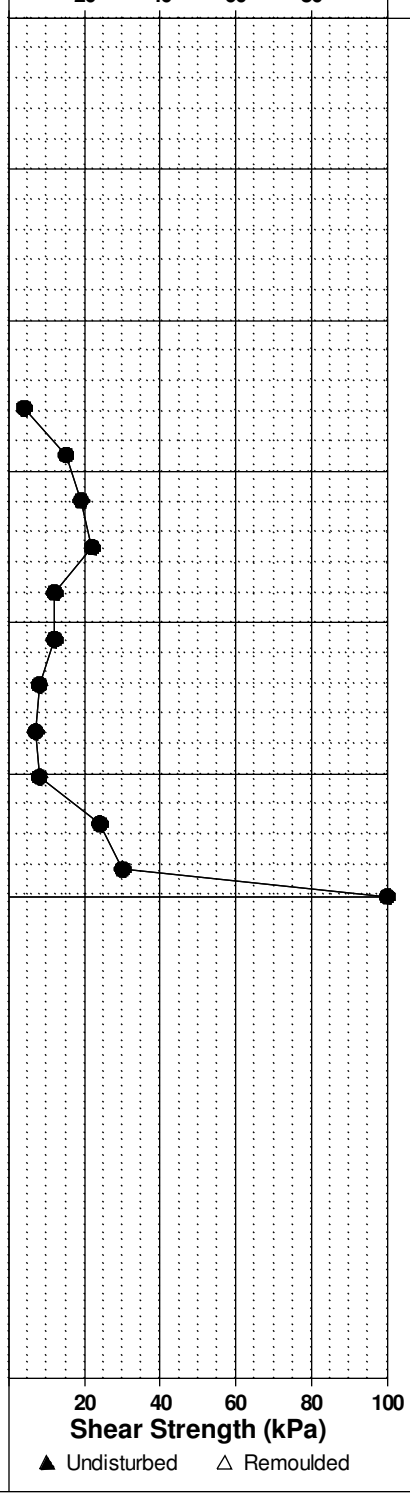
FILE NO. PG3045

REMARKS

HOLE NO. BH18

BORINGS BY CME 55 Power Auger **DATE** October 11, 2013

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						9	89.12		
						10	88.12		
						11	87.12		
						12	86.12		
						13	85.12		
						14	84.12		
14.81									
End of Borehole Practical DCPT refusal at 14.81m depth (Piezometer damaged - Oct. 21, 2013)									



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

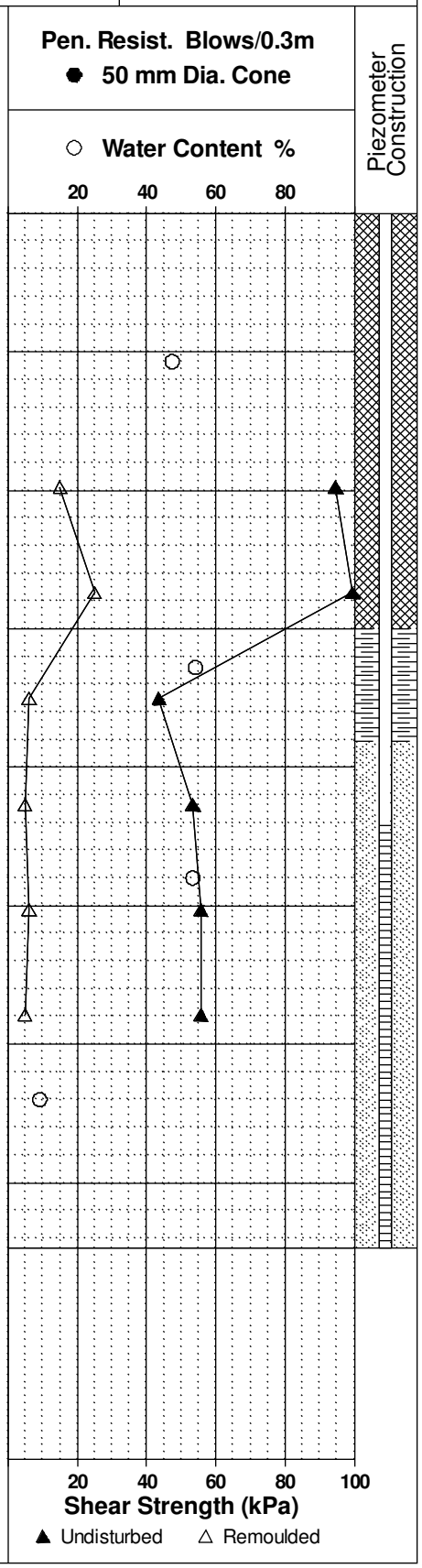
FILE NO. PG3045

REMARKS

HOLE NO. BH19

BORINGS BY CME 55 Power Auger **DATE** October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.43
		AU	1				
Stiff, brown **SILTY CLAY**		SS	2	100	5	1	96.43
- rootlets extending to 0.2m depth noted						2	95.43
						3	94.43
-firm to stiff and grey by 3.4m depth						4	93.43
						5	92.43
5.90							
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders		SS	3	100	9	6	91.43
		SS	4	67	15	7	90.43
7.47							
End of Borehole							
(Piezometer damaged - Oct. 21, 2013)							



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

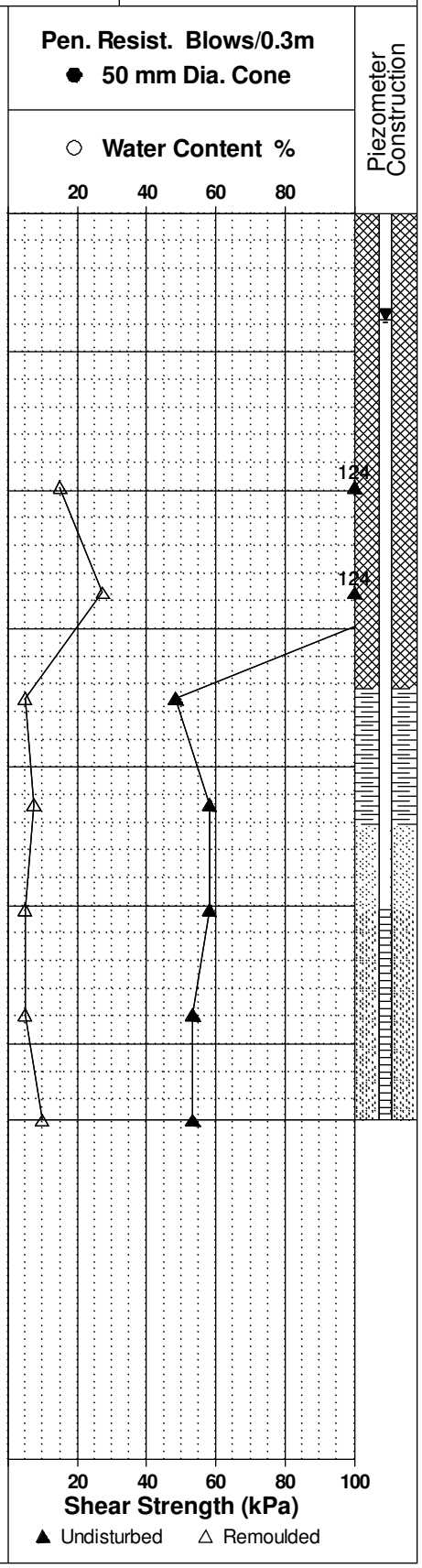
FILE NO. PG3045

REMARKS

HOLE NO. BH20

BORINGS BY CME 55 Power Auger **DATE** October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.08
Very stiff to stiff, brown **SILTY CLAY**		SS	1	100	5	1	96.08
- rootlets extending to 0.2m depth noted						2	95.08
						3	94.08
- firm to stiff and grey by 3.5m depth						4	93.08
						5	92.08
						6	91.08
6.55							
End of Borehole							
(GWL @ 0.77m-Oct. 21, 2013)							



patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

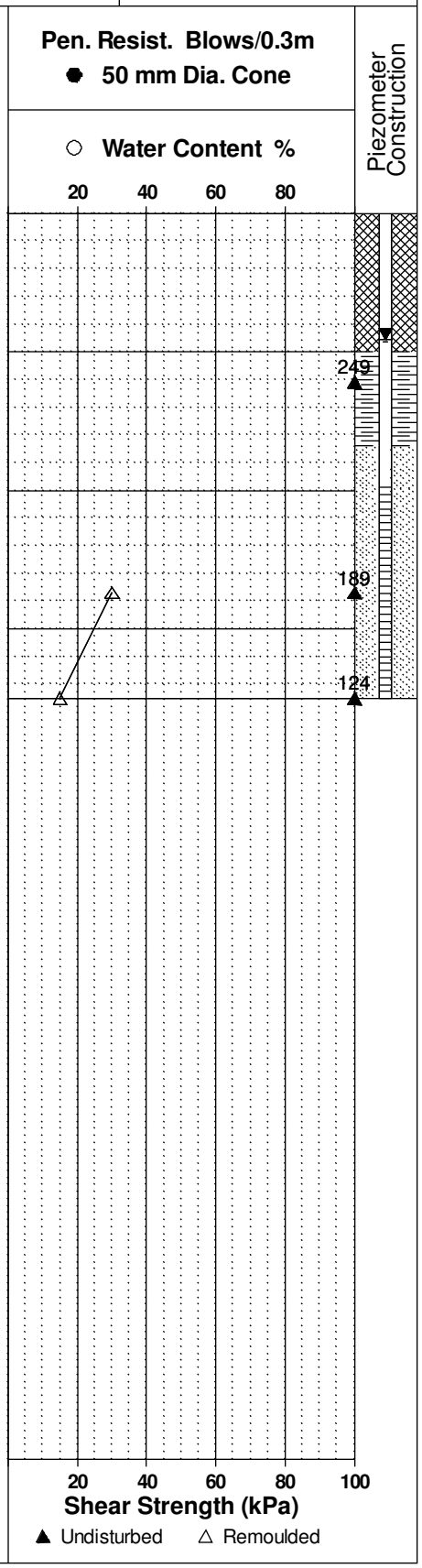
FILE NO. PG3045

REMARKS

HOLE NO. BH21

BORINGS BY CME 55 Power Auger **DATE** October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.55
Hard to very stiff, brown **SILTY CLAY**		SS	1	100	9	1	97.55
						2	96.55
						3	95.55
3.50							
End of Borehole							
(GWL @ 0.91m-Oct. 21, 2013)							



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

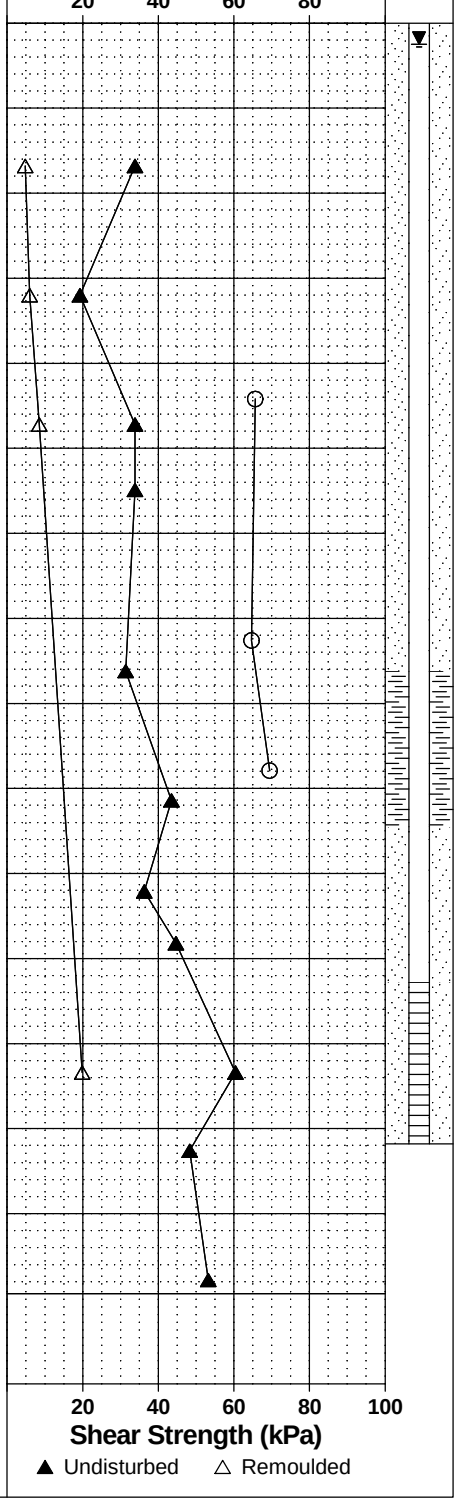
DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.
REMARKS Wash boring methods used.

FILE NO. PG0538

HOLE NO. BH20

BORINGS BY CME 75 Power Auger **DATE** Jun 1, 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	93.92
TOPSOIL 0.33							
Compact, brown **SILTY SAND**, some clay 0.60		SS	1	75	4	1	92.92
Firm, brown **SILTY CLAY**, some sand seams		SS	2	100	1	2	91.92
- grey by 2.6m depth						3	90.92
- soft at 3.2m depth		TW	3	100		4	89.92
						5	88.92
						6	87.92
		TW	4	100		7	86.92
		TW	5	100		8	85.92
						9	84.92
						10	83.92
						11	82.92
		TW	6	100		12	81.92
						13	80.92
14.94						14	79.92
End of Borehole							
(GWL @ 0.25m-June 18/06)							



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

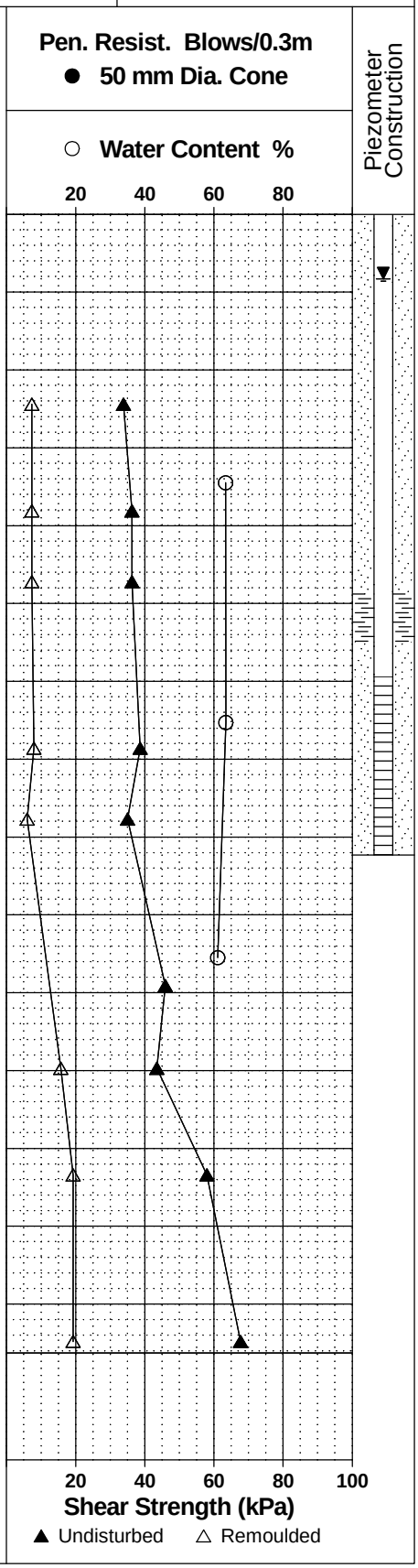
DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.
REMARKS Wash boring methods used.

FILE NO. PG0538

HOLE NO. BH21

BORINGS BY CME 75 Power Auger **DATE** May 31, 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	94.40
FILL: Brown silty clay 0.38							
Firm, brown **SILTY CLAY**, some sand seams		SS	1	8	4	1	93.40
		SS	2	100	3	2	92.40
- grey by 2.8m depth		TW	3	98		3	91.40
						4	90.40
						5	89.40
		TW	4	100		6	88.40
						7	87.40
						8	86.40
		TW	5	100		9	85.40
						10	84.40
						11	83.40
						12	82.40
						13	81.40
		TW	6	100		14	80.40
14.63 End of Borehole							
(GWL @ 0.83m-June 18/06)							



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

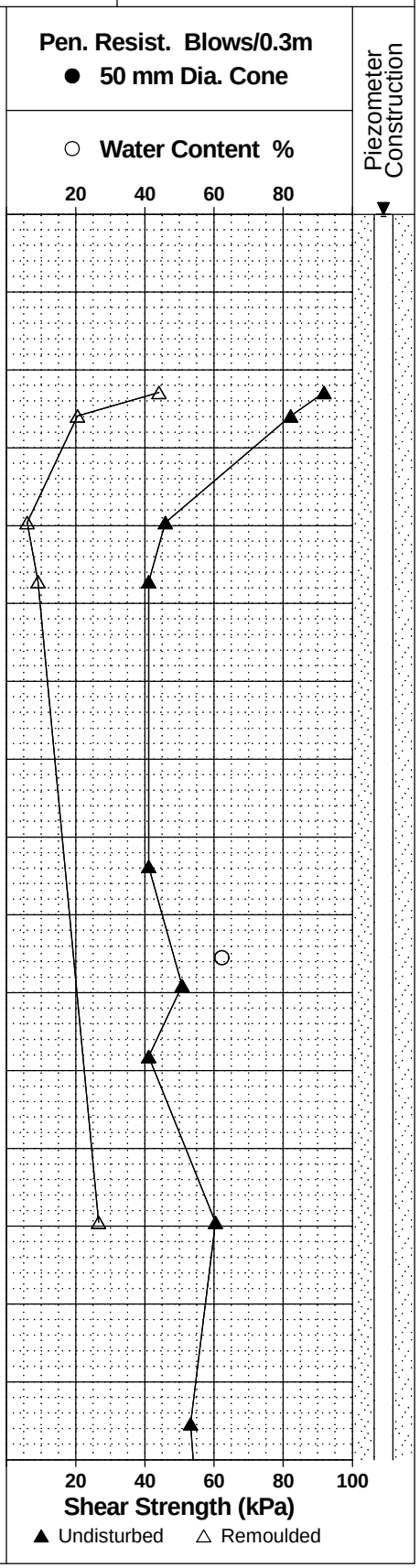
DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.
REMARKS Wash boring methods used.

FILE NO. PG0538

HOLE NO. BH22

BORINGS BY CME 75 Power Auger **DATE** May 30, 06

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	95.28
FILL: Brown silty clay, some cobbles 0.30							
Stiff, brown **SILTY CLAY**		SS	1	75	7	1	94.28
		SS	2	100	4	2	93.28
- firm and grey by 3.0m depth						3	92.28
						4	91.28
						5	90.28
		TW	3	0		6	89.28
						7	88.28
		TW	4	79		8	87.28
						9	86.28
		TW	5	100		10	85.28
						11	84.28
						12	83.28
		TW	6	100		13	82.28
						14	81.28
						15	80.28
						16	79.28



patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Arcadia Development-Huntmar Road, Kanata
Ottawa, Ontario

DATUM Ground surface elevation provided by Webster and Simmonds Surveying Limited.
REMARKS Wash boring methods used.

FILE NO. PG0538

HOLE NO. BH22

BORINGS BY CME 75 Power Auger **DATE** May 30, 06

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
Firm, grey **SILTY CLAY**						16	79.28		
						17	78.28		
						18	77.28		
						19	76.28		
						20	75.28		
20.60						21	74.28		
GLACIAL TILL: Grey silty sand with gravel, cobbles and boulders									
21.79									
End of Borehole Practical refusal to advancement of NW casing by wash boring @ 21.79m depth (GWL @ 1.29m above ground surface - June 18/06. Standpipe installed in till)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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.

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 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

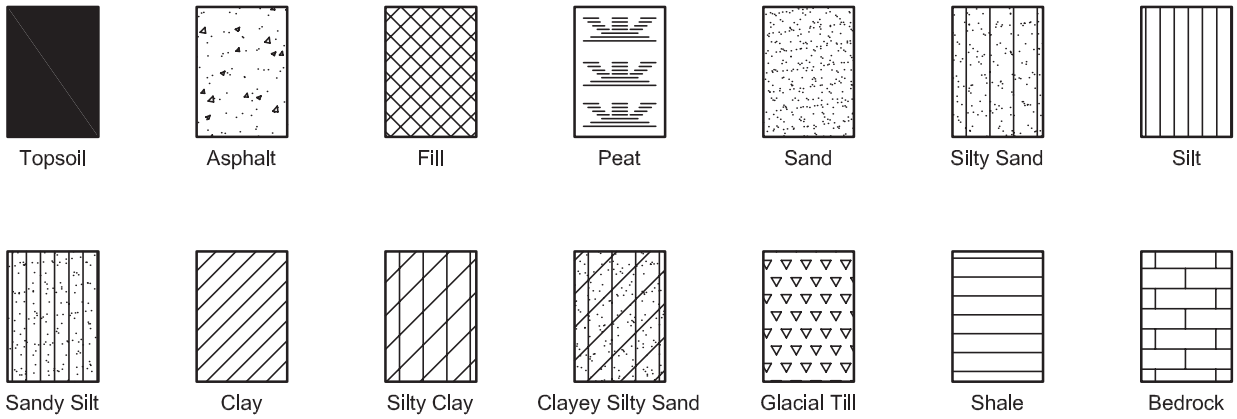
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

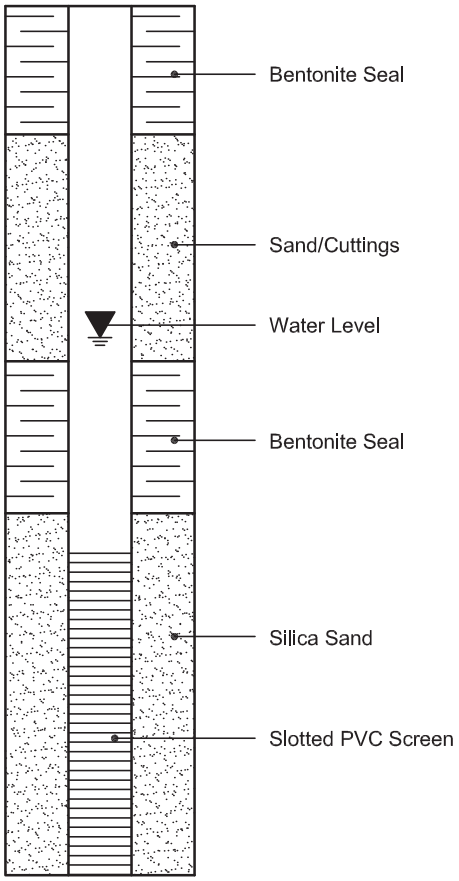
SYMBOLS AND TERMS (continued)

STRATA PLOT

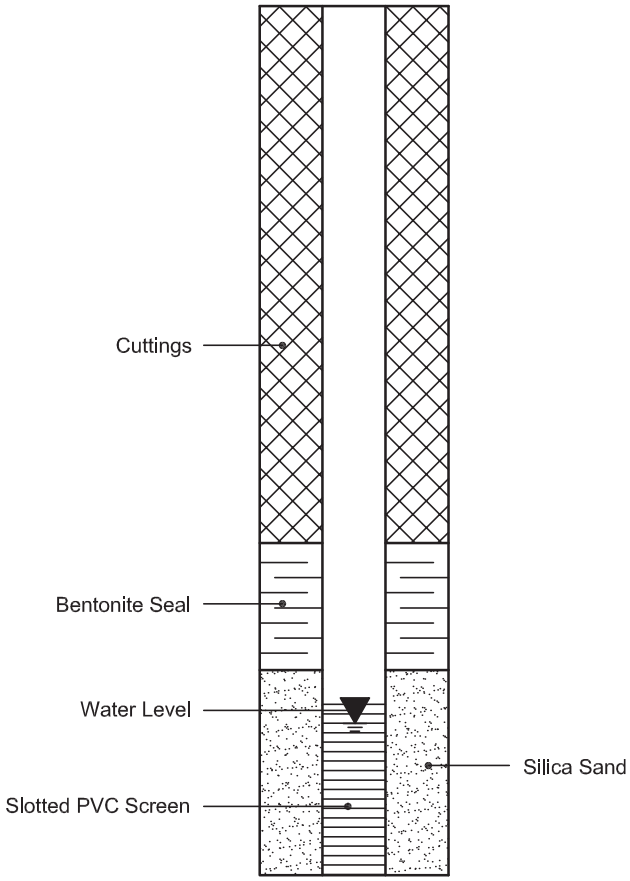


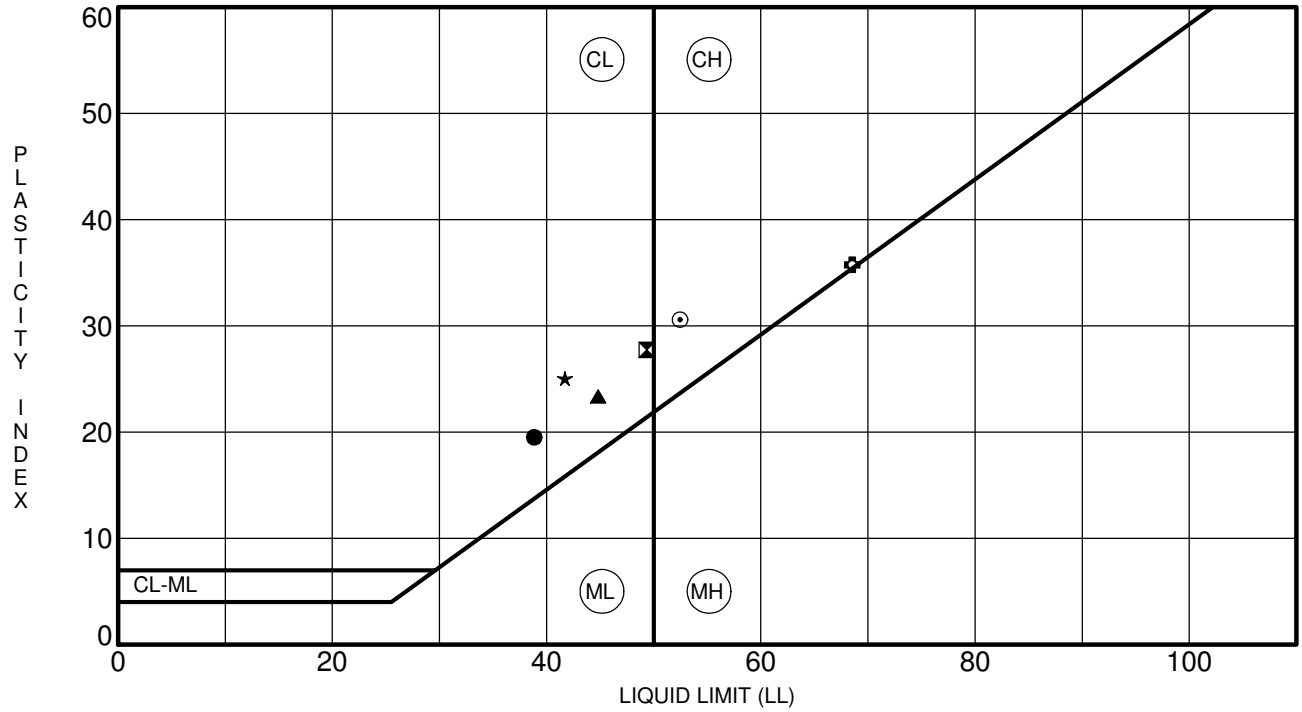
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





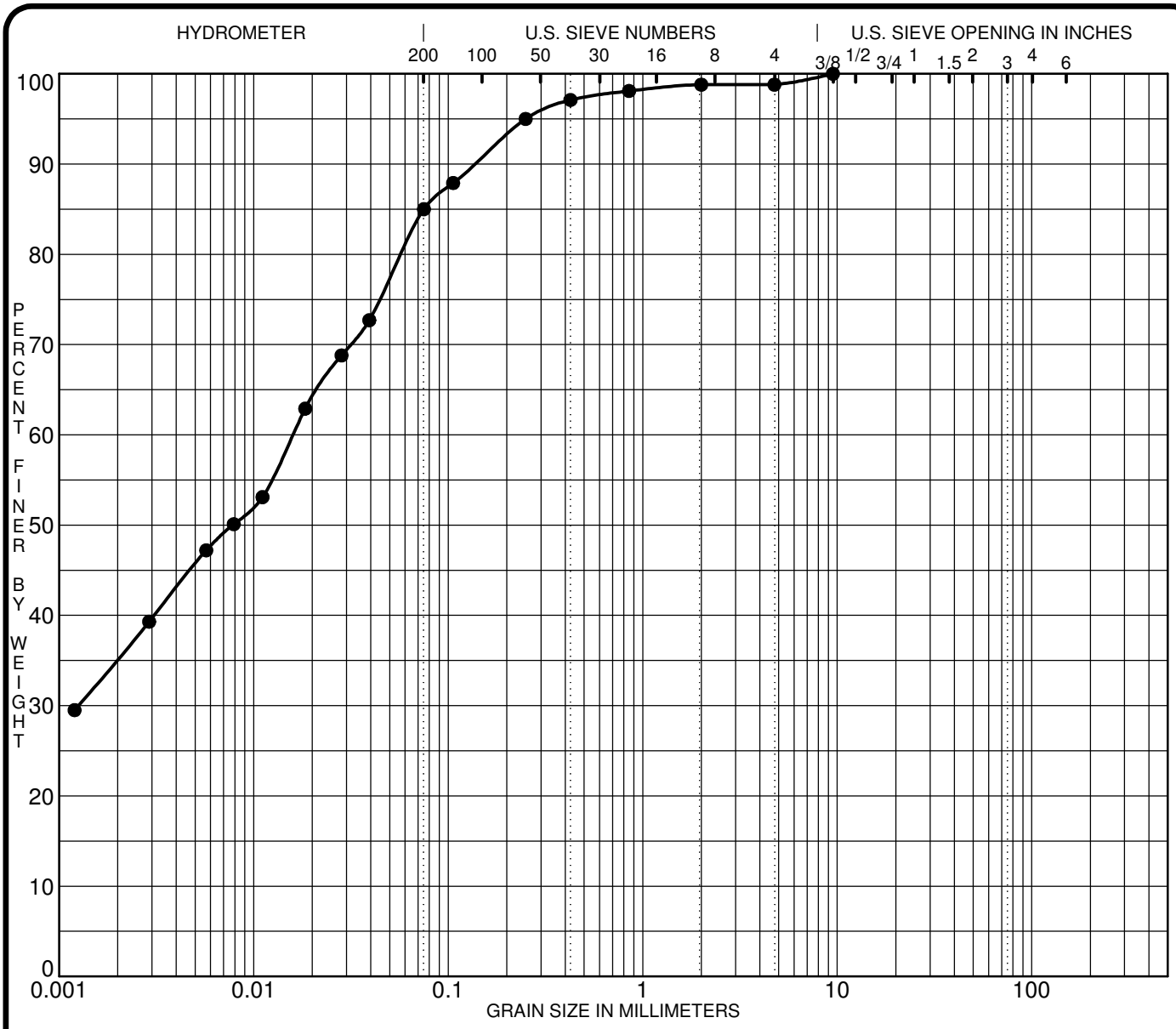
	Specimen Identification	LL	PL	PI	Fines	Classification
●	**BH 1-20 SS2**	**39**	**19**	**20**	**85.0**	**CL - Inorganic clays of low plasticity**
⧓	**BH 1-20 SS6**	**49**	**22**	**28**	**98.1**	**CL - Inorganic clays of low plasticity**
▲	**BH 2-20 SS5**	**45**	**21**	**23**		**CL - Inorganic clays of low plasticity**
★	**BH 4-20 SS4**	**42**	**17**	**25**		**CL - Inorganic clays of low plasticity**
⊙	**BH 6-20 SS3**	**52**	**22**	**31**		**CL - Inorganic clays of low plasticity**
✿	**BH 8-20 SS4**	**69**	**33**	**36**		**CL - Inorganic clays of low plasticity**

CLIENT **Minto Communities Inc.** FILE NO. **PG5648**

PROJECT **Geotechnical Investigation - Proposed Residential Development - Arcadia Stg 6 -** DATE **17 Dec 20**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● **BH 1-20 SS2**	**CL - Inorganic clays of low plasticity**		**39**	**19**	**20**		

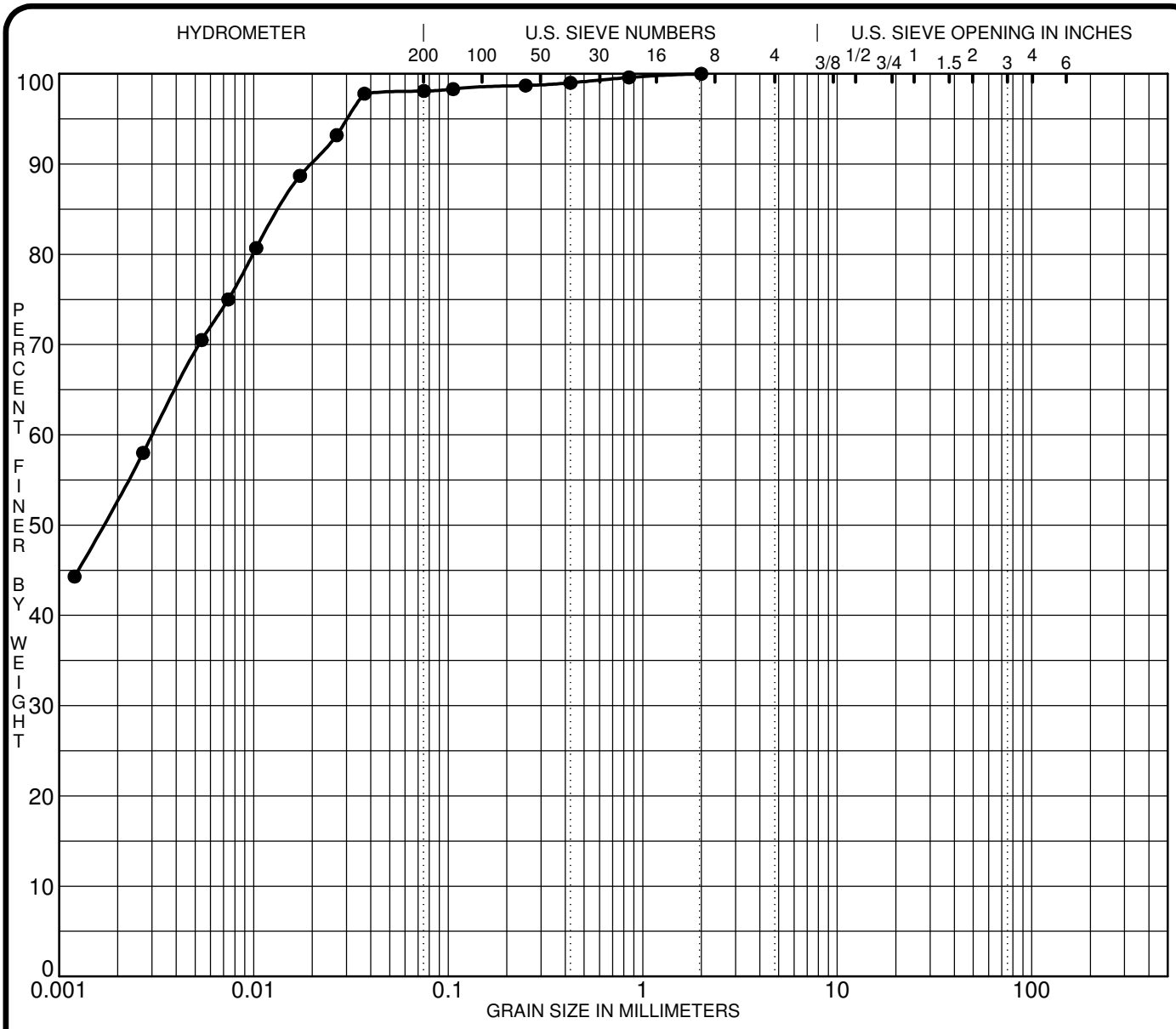
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH 1-20 SS2**	**9.50**	**0.02**	**0.001**		**1.2**	**13.8**	**85.0**	

CLIENT **Minto Communities Inc.** FILE NO. **PG5648**

PROJECT **Geotechnical Investigation - Proposed Residential Development - Arcadia Stg 6** DATE **17 Dec 20**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● **BH 1-20 SS6**	**CL - Inorganic clays of low plasticity**		**49**	**22**	**28**		

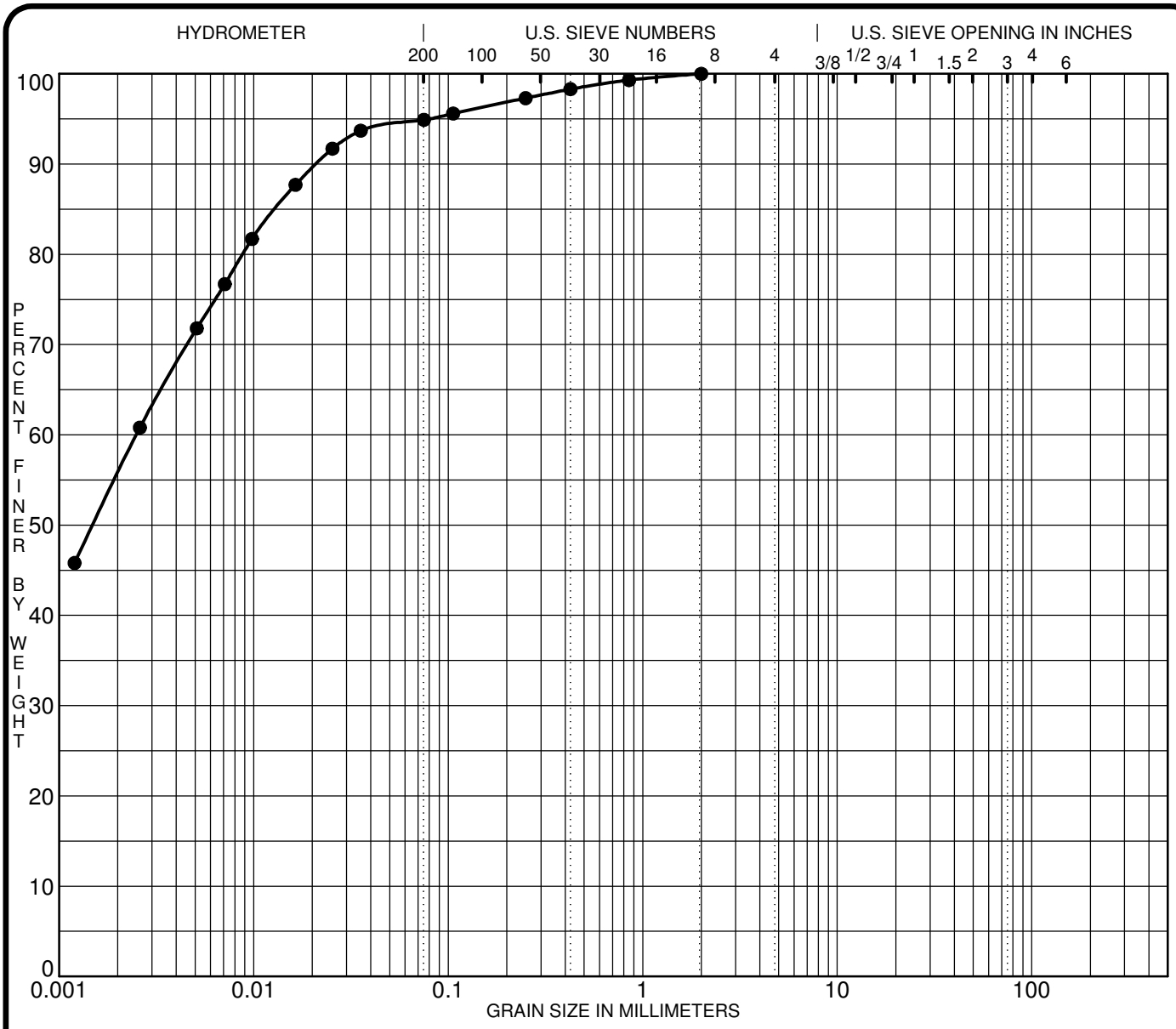
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH 1-20 SS6**	**2.00**	**0.00**			**0.0**	**1.9**	**98.1**	

CLIENT **Minto Communities Inc.** FILE NO. **PG5648**

PROJECT **Geotechnical Investigation - Proposed Residential Development - Arcadia Stg 6** DATE **17 Dec 20**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

Specimen Identification	Classification	MC%	LL	PL	PI	Cc	Cu
● **BH 8-20 SS2**	**CL - Inorganic clays of low plasticity**						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH 8-20 SS2**	**2.00**	**0.00**			**0.0**	**5.1**	**94.9**	

CLIENT **Minto Communities Inc.** FILE NO. **PG5648**

PROJECT **Geotechnical Investigation - Proposed Residential Development - Arcadia Stg 6** DATE **17 Dec 20**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION

Certificate of Analysis

Report Date: 13-Jan-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 8-Jan-2021

Client PO:

Project Description: PG5648

	Client ID:	BH7-SS2	-	-	-
	Sample Date:	18-Dec-20 09:00	-	-	-
	Sample ID:	2102475-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	80.1	-	-	-
General Inorganics					
pH	0.05 pH Units	7.59	-	-	-
Resistivity	0.10 Ohm.m	28.1	-	-	-
Anions					
Chloride	5 ug/g dry	33	-	-	-
Sulphate	5 ug/g dry	154	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 to 11 - SLOPE STABILITY ANALYSIS SECTIONS

FIGURES 12 to 14 - HISTORICAL AERIAL PHOTOGRAPHS

FIGURE 15 – TEMPORARY EXCAVATION SIDE SLOPE REVIEW

FIGURE 16 – GROUNDWATER SUPPRESSION SYSTEM

FIGURE 17 – PODIUM DECK TO FOUNDATION WALL DRAINAGE SYSTEM TIE-IN DETAIL

DRAWING PG5648-1 - TEST HOLE LOCATION PLAN

DRAWING PG5648-2 - PERMISSIBLE GRADE RAISE PLAN

DRAWING PG5648-3 - LIMIT OF HAZARD LANDS SETBACKS (INCLUDES 4 SUB-DRAWINGS 3A THROUGH 3D)

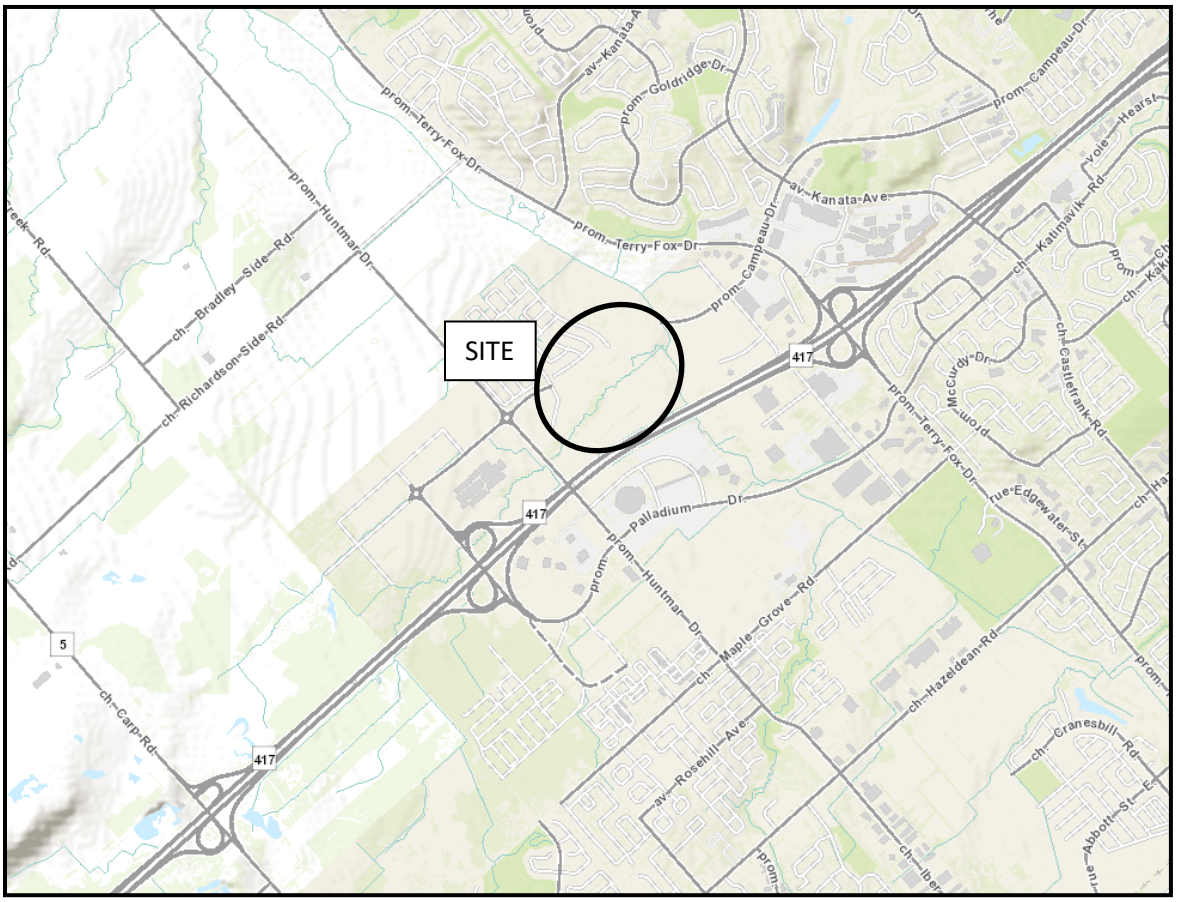


FIGURE 1

KEY PLAN

PATERSON GROUP

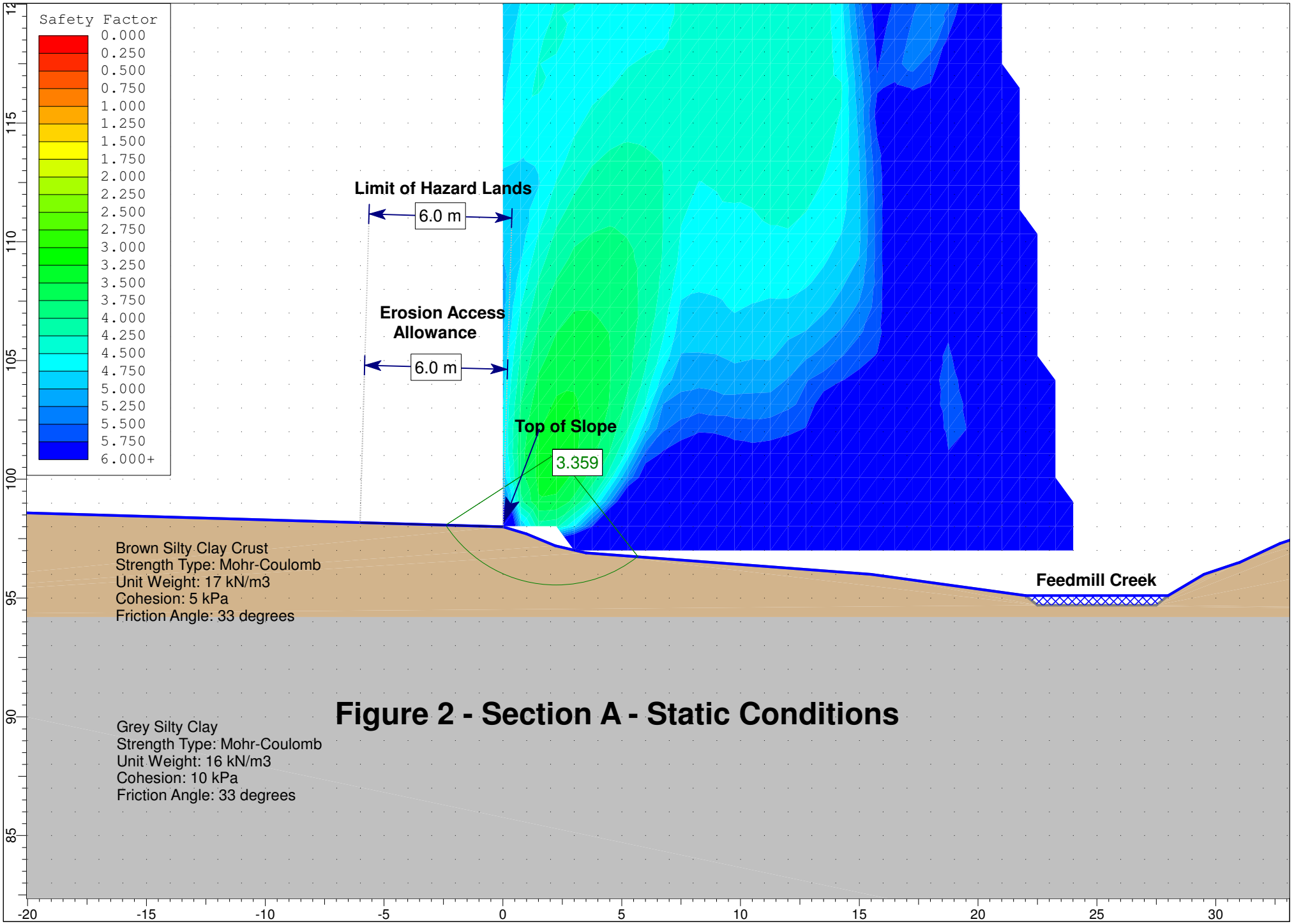


Figure 2 - Section A - Static Conditions

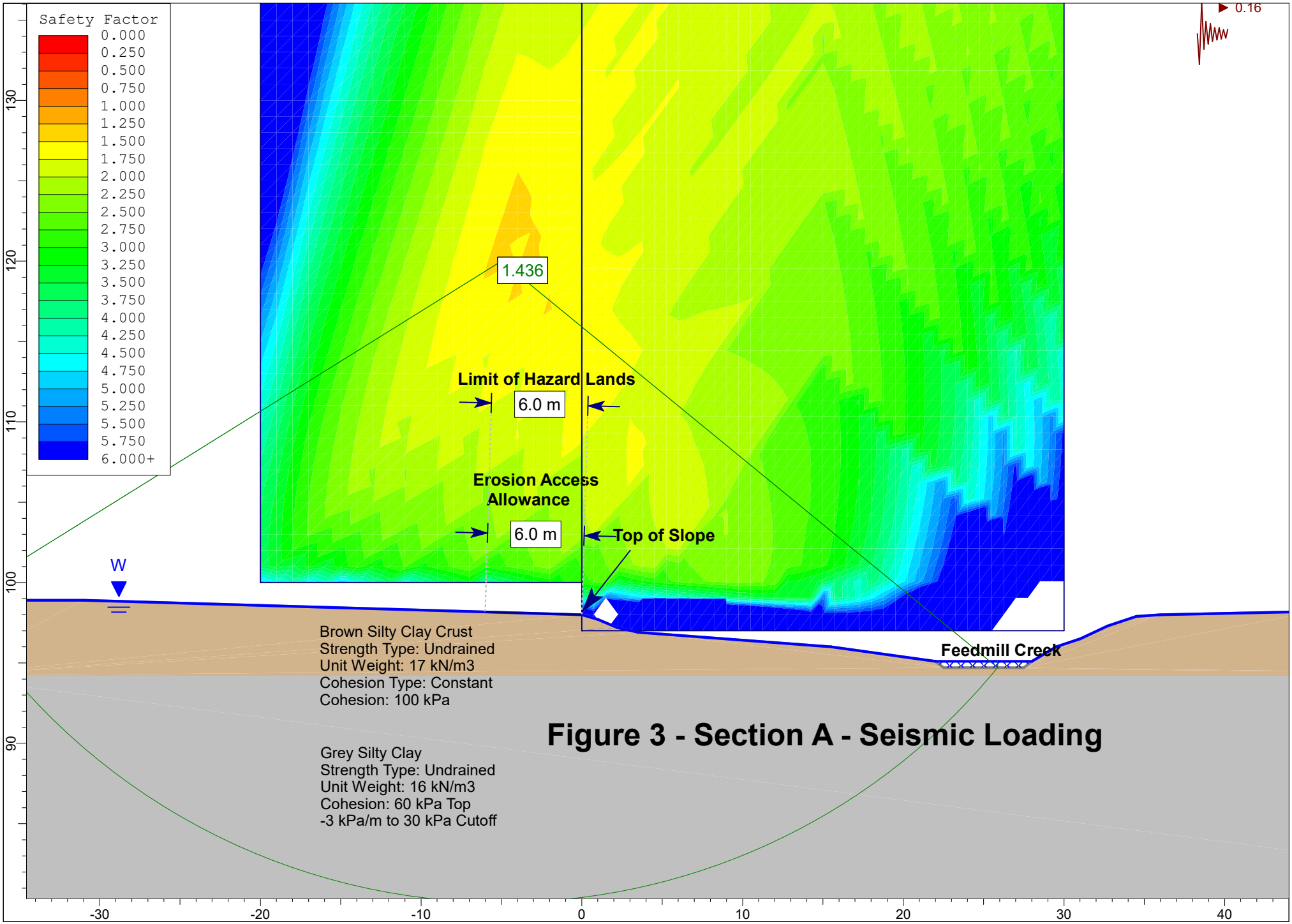


Figure 3 - Section A - Seismic Loading

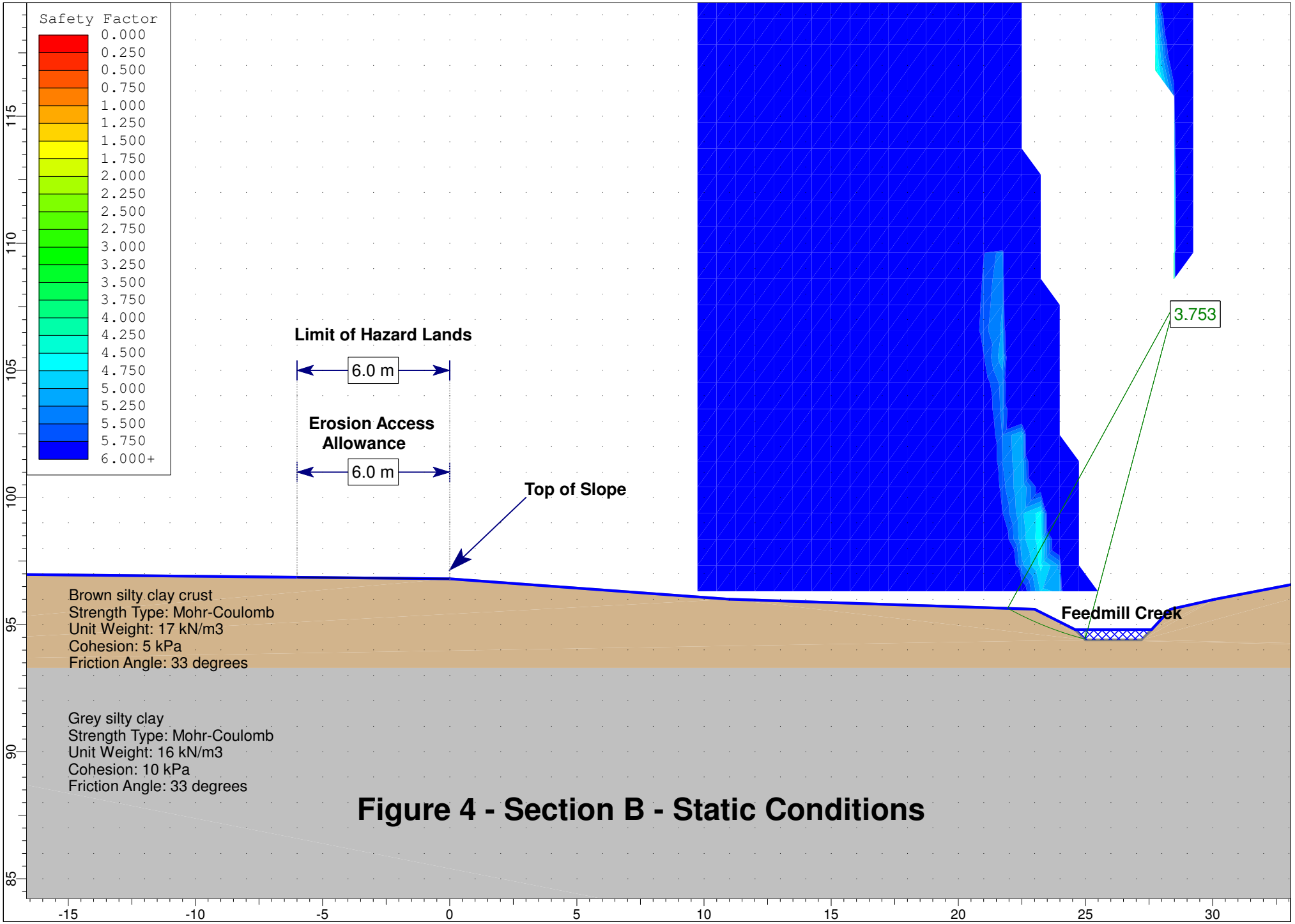


Figure 4 - Section B - Static Conditions

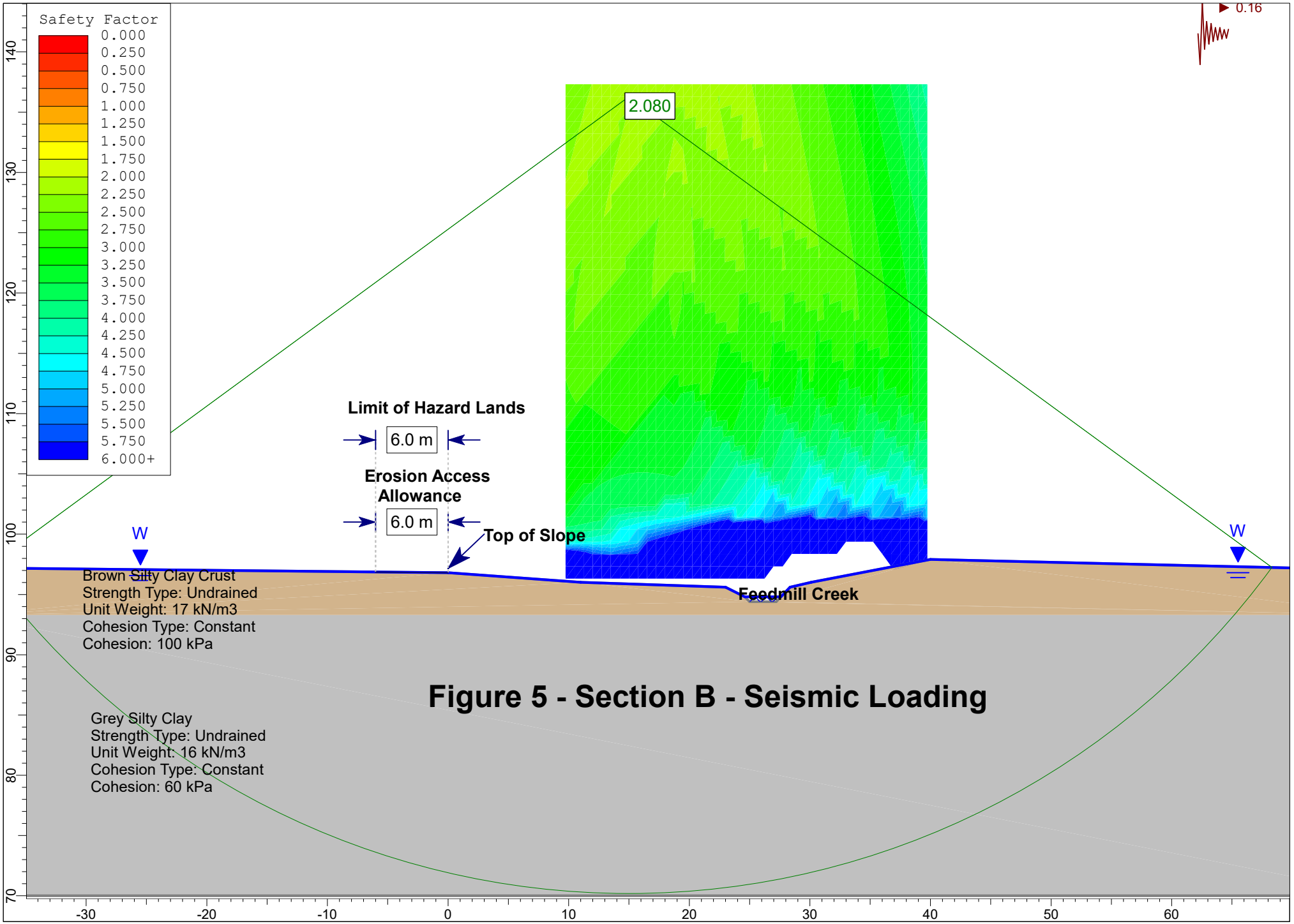


Figure 5 - Section B - Seismic Loading

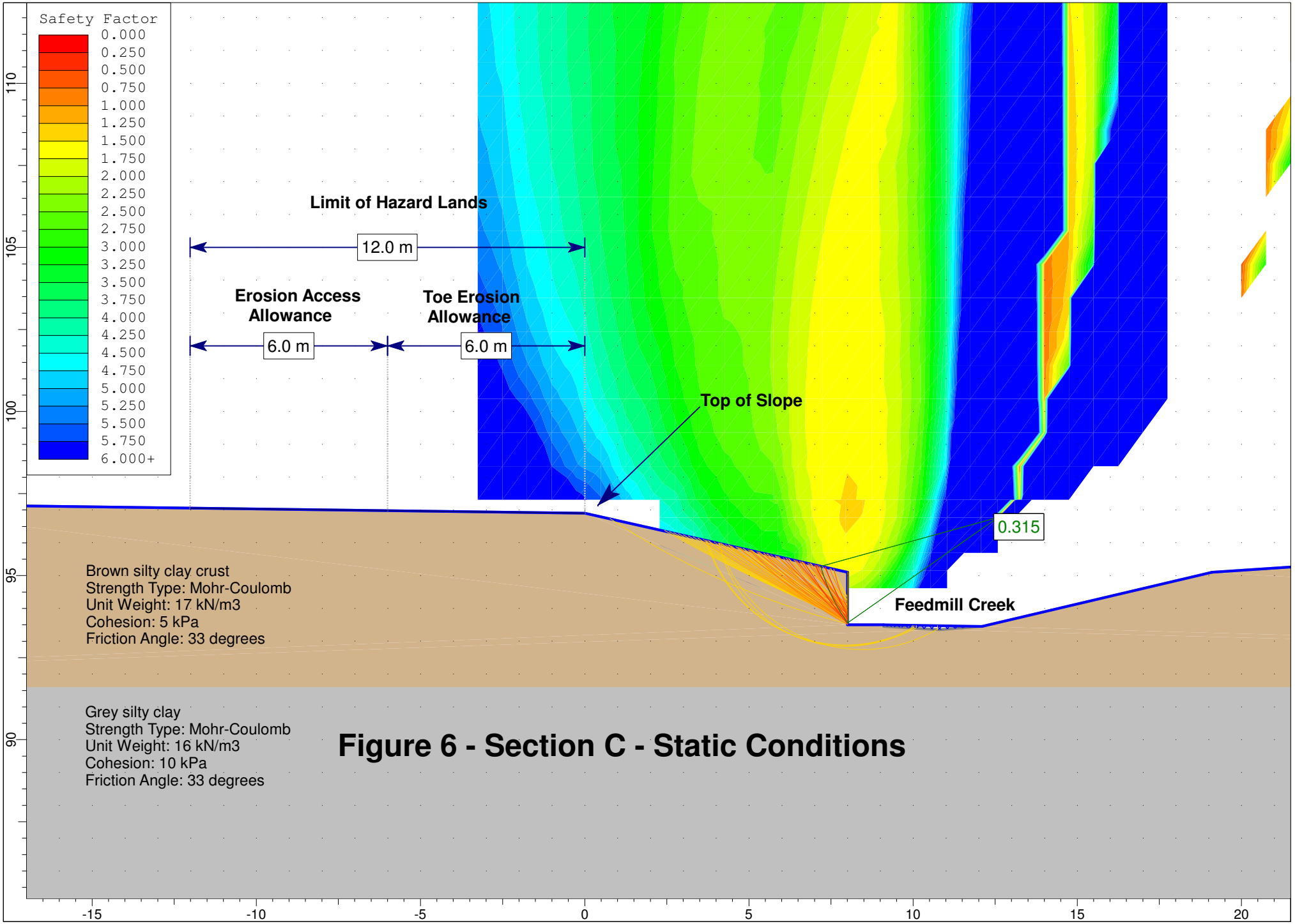


Figure 6 - Section C - Static Conditions

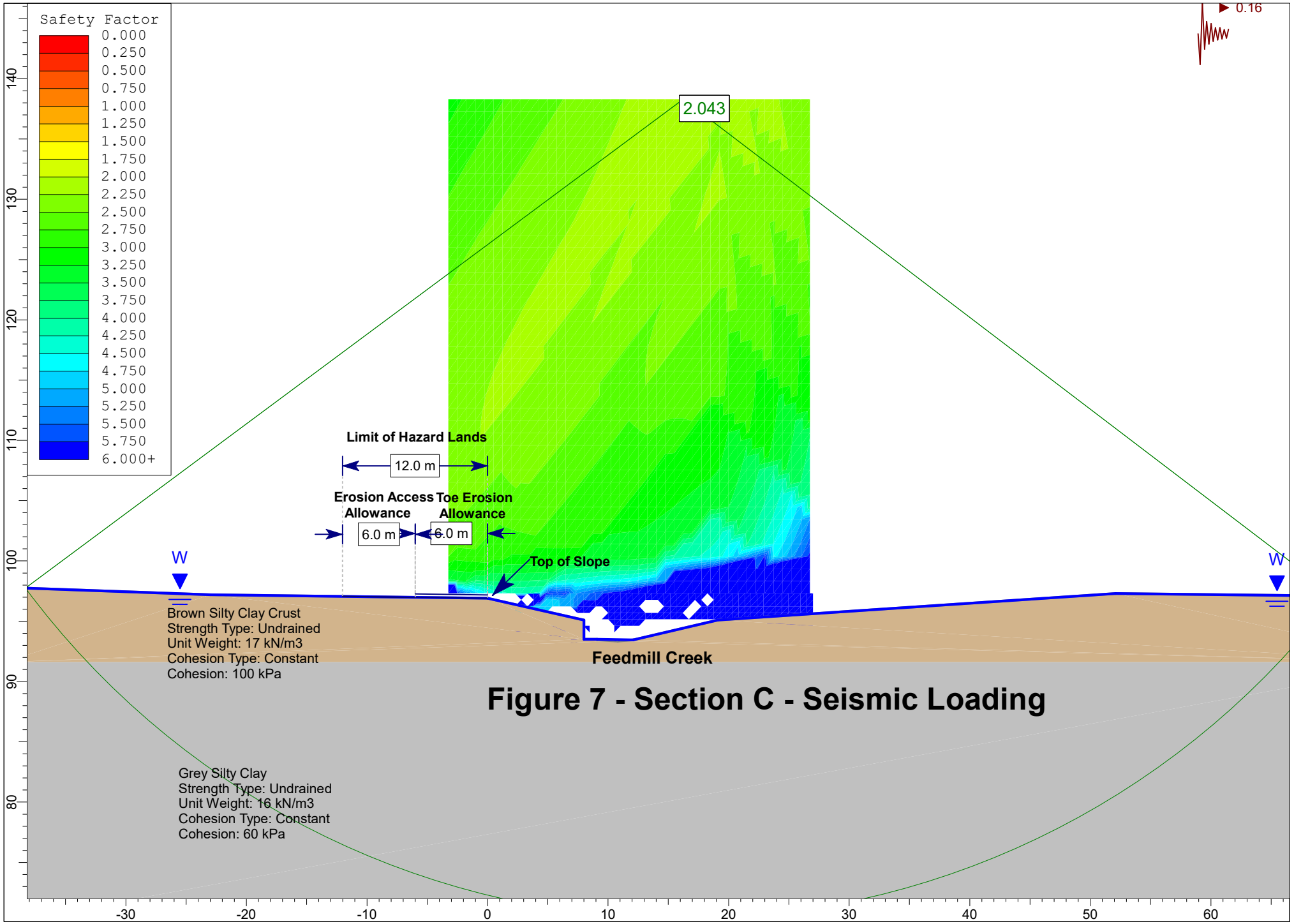


Figure 7 - Section C - Seismic Loading

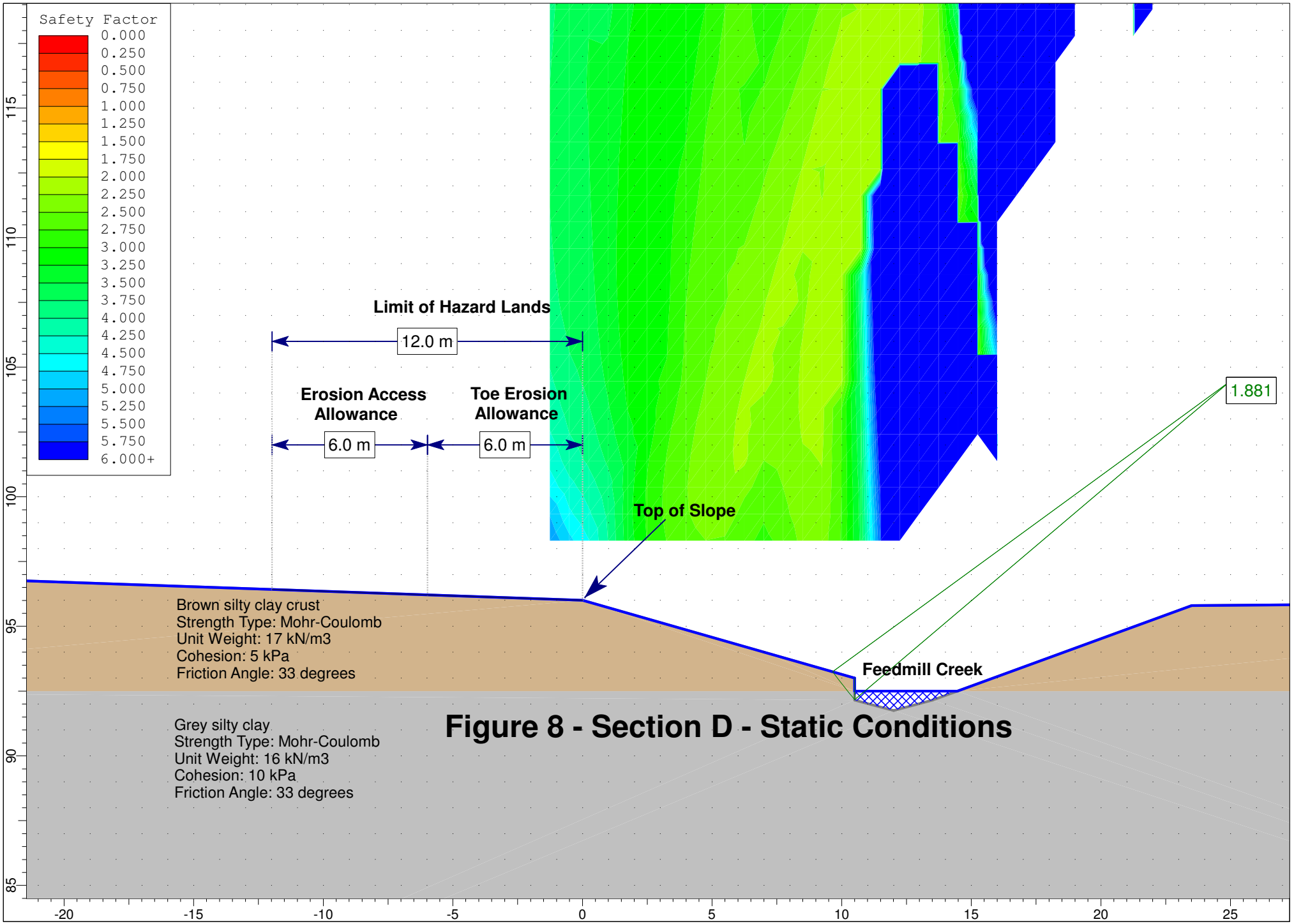


Figure 8 - Section D - Static Conditions

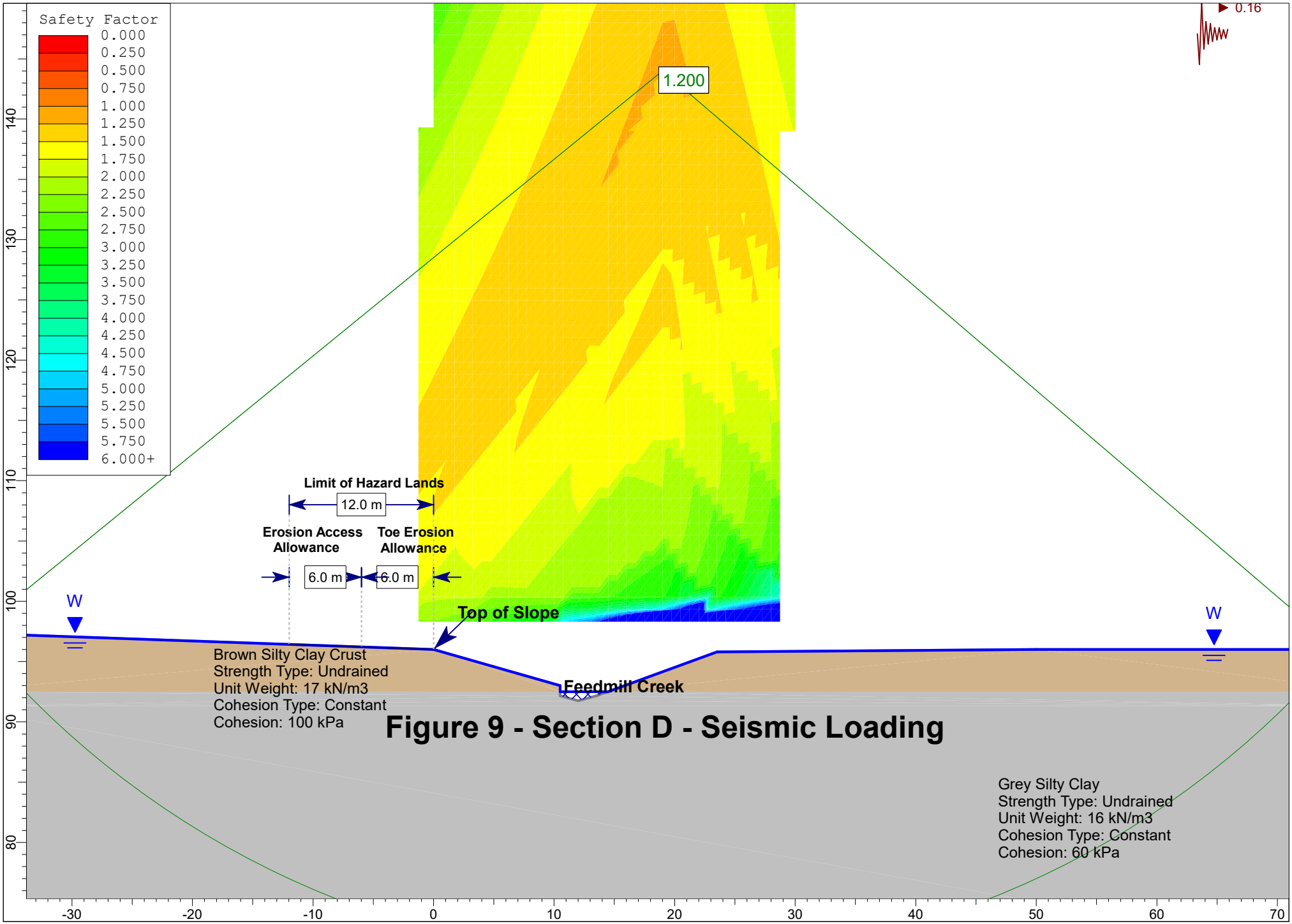


Figure 9 - Section D - Seismic Loading

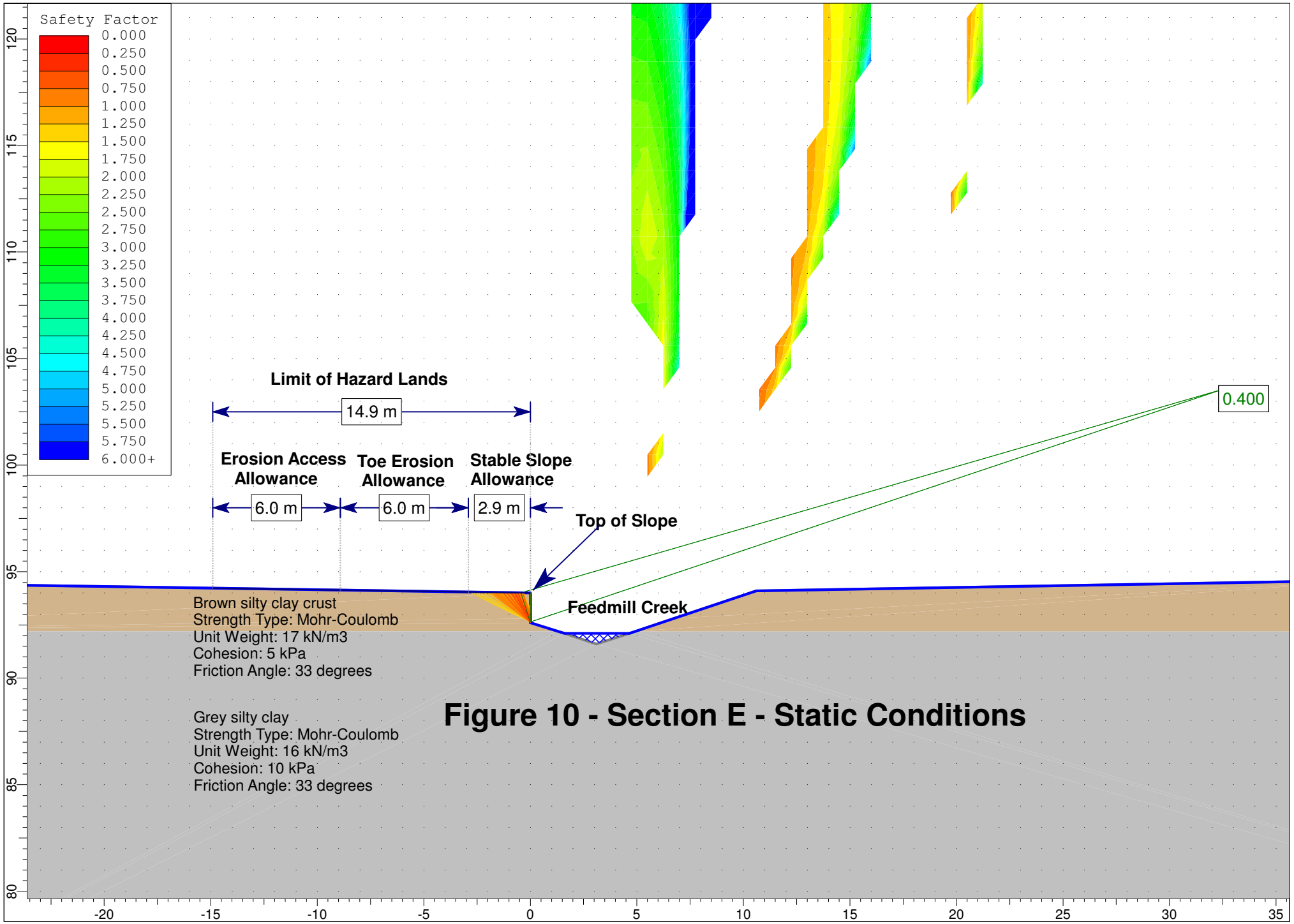


Figure 10 - Section E - Static Conditions

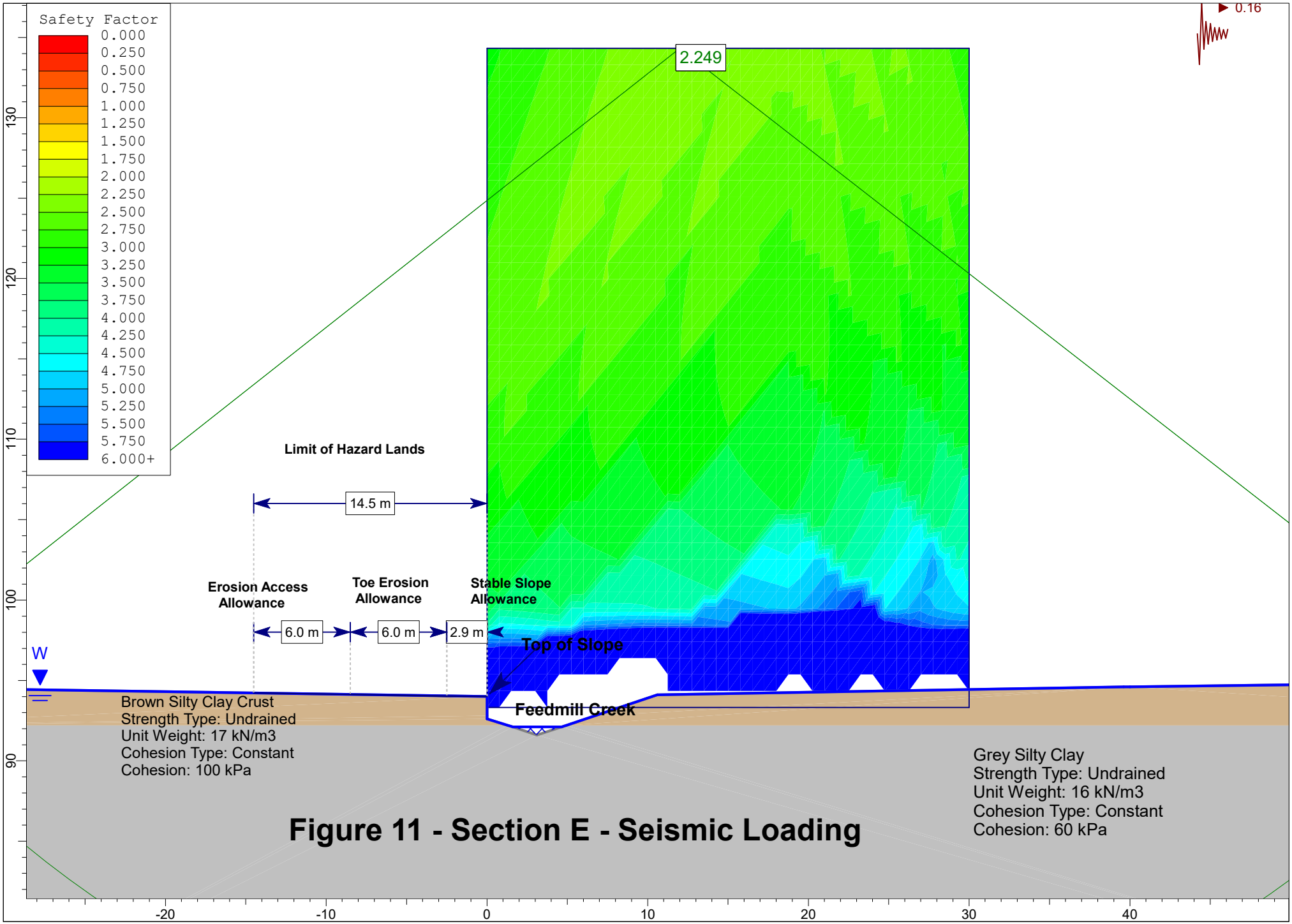


Figure 11 - Section E - Seismic Loading

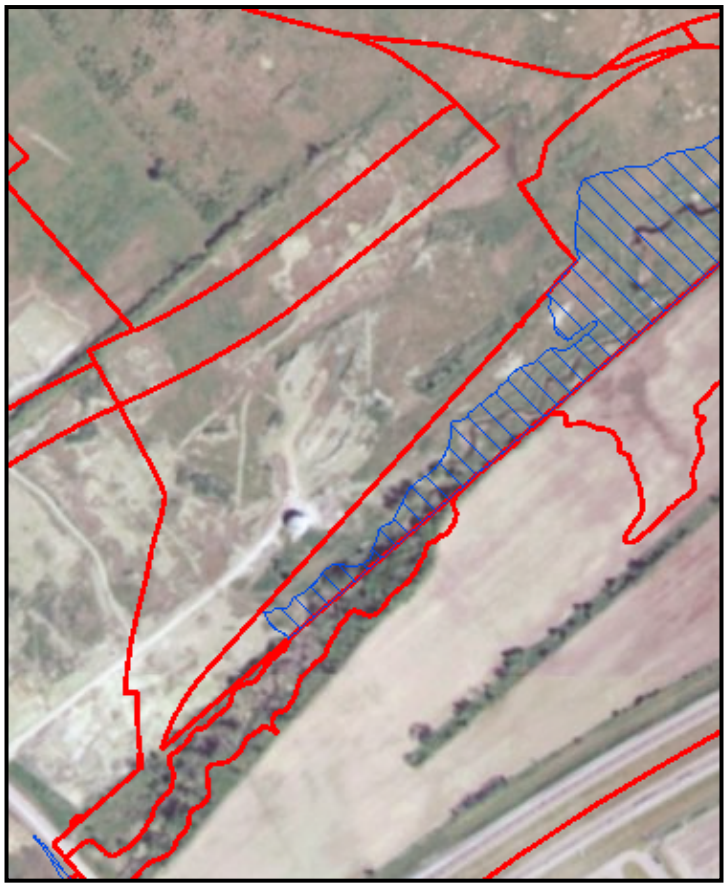


FIGURE 12

AERIAL PHOTO – 1999

PATERSON GROUP

FIGURE 13

AERIAL PHOTO – 2008

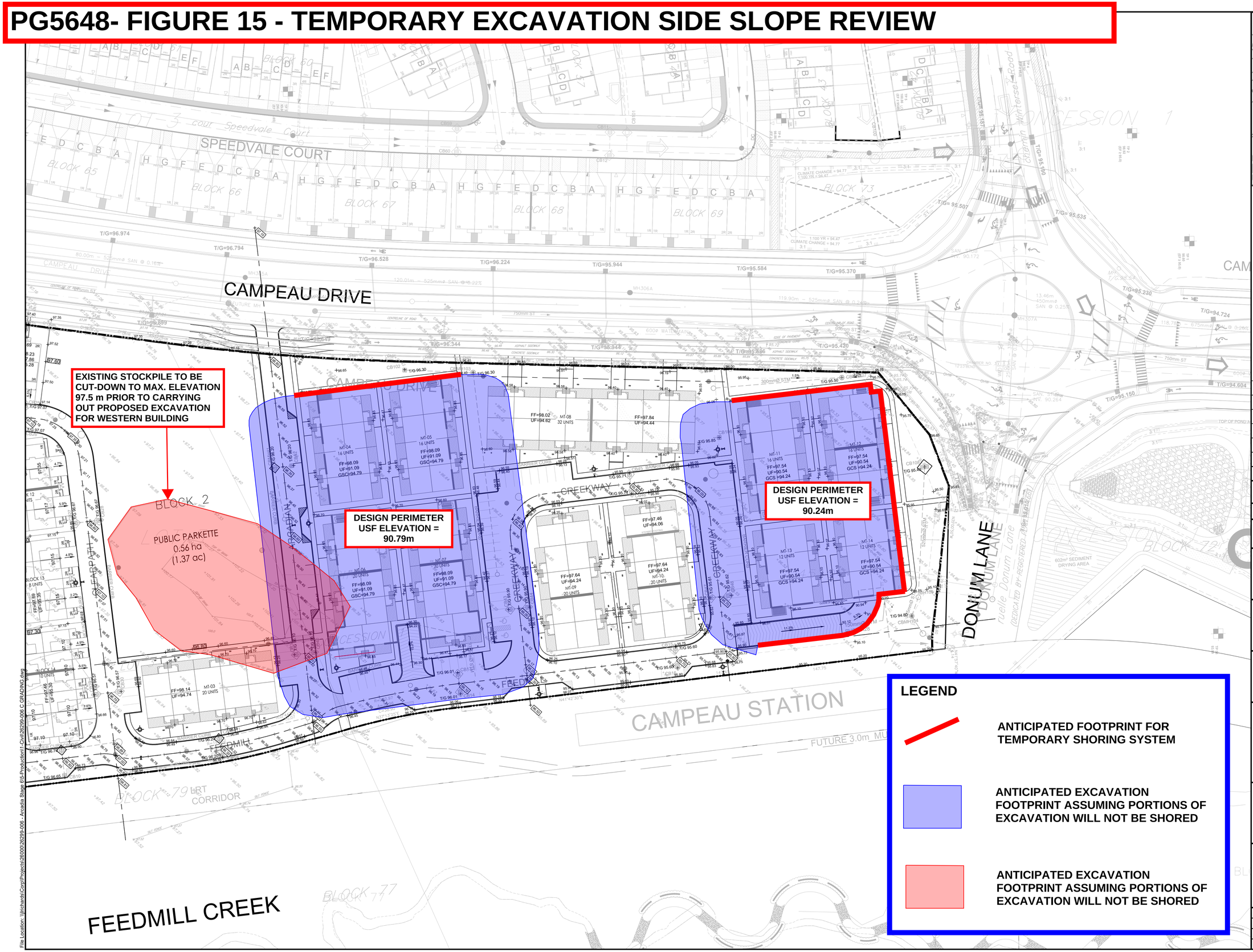
PATERSON GROUP

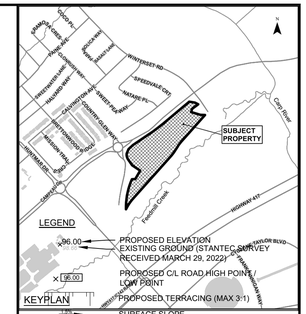
FIGURE 14

AERIAL PHOTO – 2019

PATERSON GROUP

PG5648- FIGURE 15 - TEMPORARY EXCAVATION SIDE SLOPE REVIEW





LEGEND

- 96.00 — PROPOSED ELEVATION
- EXISTING GROUND (STANTEC SURVEY RECEIVED MARCH 29, 2022)
- 96.00 — PROPOSED C/L ROAD HIGH POINT / LOW POINT
- PROPOSED TERRACING (MAX 3:1)
- SURFACE SLOPE
- FLOW DIRECTION
- MAJOR OVERLAND FLOW DIRECTION
- FF = 97.64 — FINISHED FLOOR ELEVATION
- UF = 94.24 — UNDERSIDE OF FOOTING ELEVATION
- GCS = 94.34 — GARAGE CEILING SLAB ELEVATION
- ASPHALT WALKWAY
- CONCRETE SURFACE (EXISTING)
- CONCRETE RISERS
- CONCRETE MOUNTABLE CURB
- DEPRESSED CURB
- BICYCLE RACK
- BH##-# — BOREHOLE NUMBER
- TP##-# — TEST PIT

No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED TO CITY FOR REVIEW FIRST ENGINEERING SUBMISSION	19/07/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:500

CLIENT: minto Communities

CONSULTANT: www.jlrichards.ca

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT: ARCADIA STAGE 6

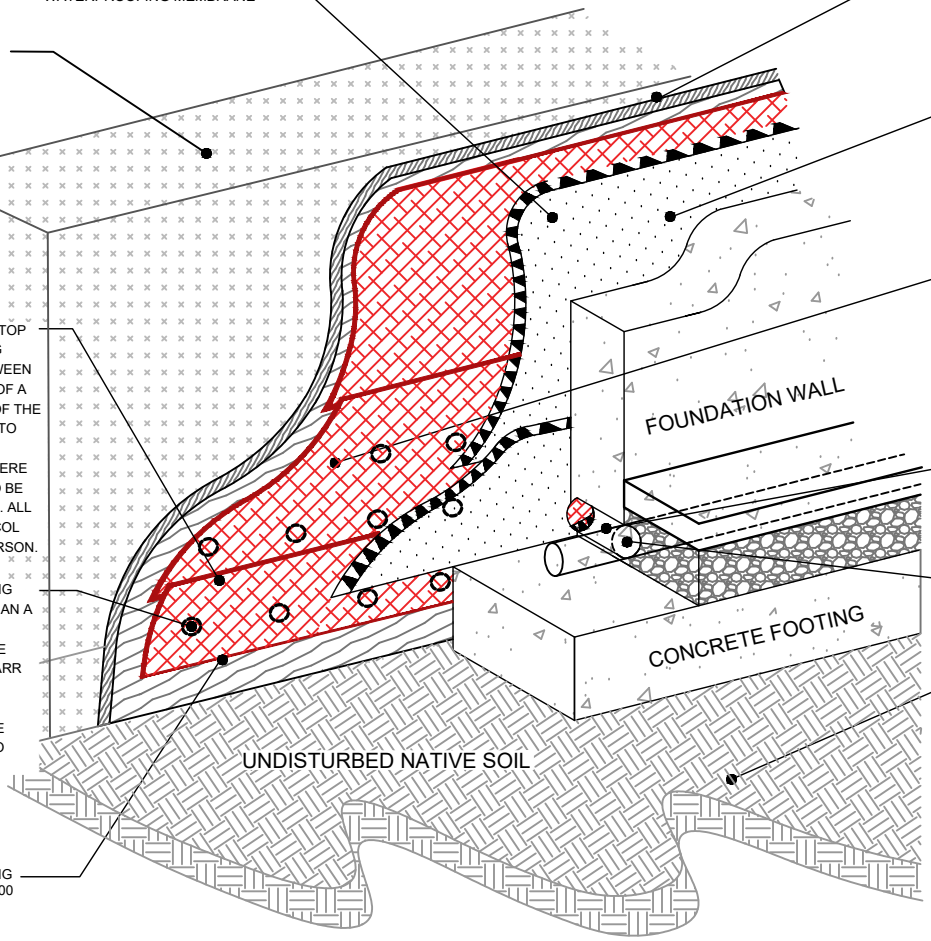
450 HUNTMAR DRIVE

DRAWING: GRADING PLAN

DESIGN:	MM
DRAWN:	KC
CHECKED:	LD
JLR #:	26299-006
DRAWING #:	G2

PLOT DATE: January 27, 2023 11:53:37 AM

File Location: \\jlrichards\Corp\Projects\26000\26299-006 - Arcadia Stage 6\5-Production\1-Civil\26299-006 G GRADING.dwg



INSPECTIONS BE COMPLETED BY THE GEOTECHNICAL CONSULTANT AT THE TIME OF CONSTRUCTION DURING THE INSTALLATION ALL OF THE ABOVE-NOTED COMPONENTS AND ITEMS PERTAINING TO THE GROUNDWATER SUPPRESSION SYSTEM.

PATERSON GROUP

MINTO COMMUNITIES

PROPOSED RESIDENTIAL DEVELOPMENT

ARCADIA - STAGE 6

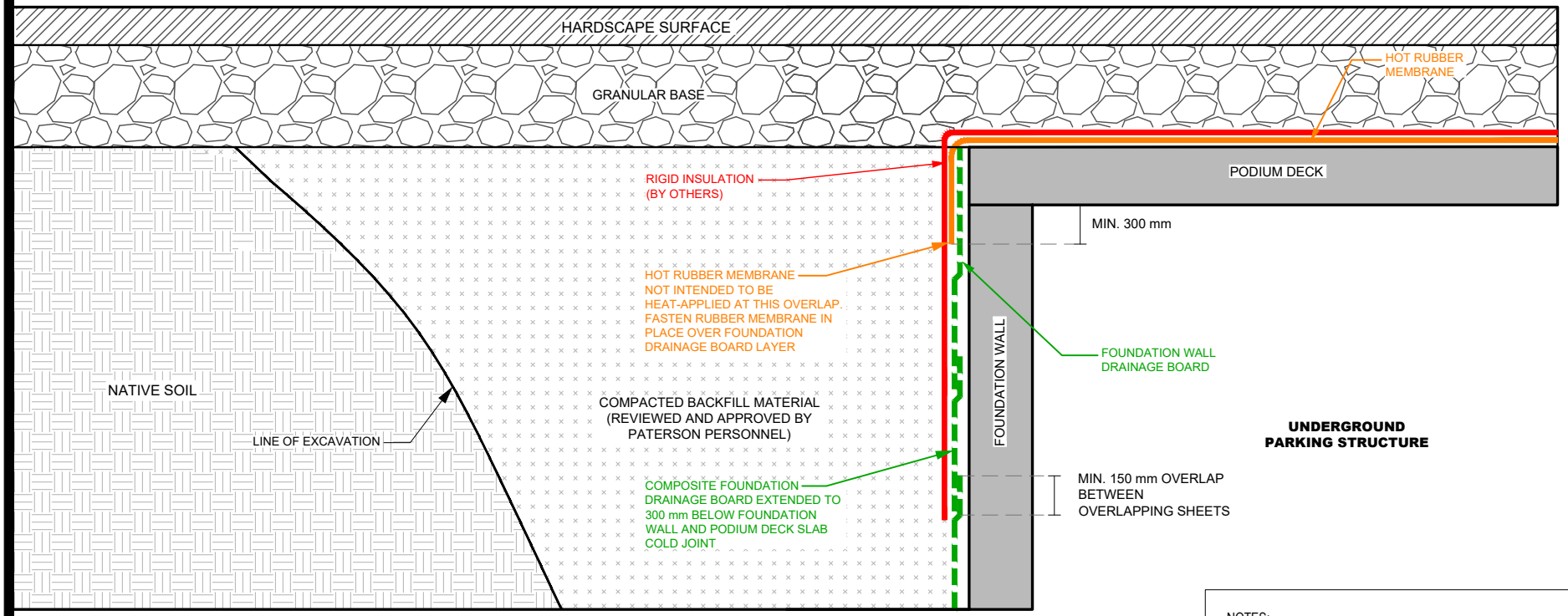
OTTAWA, ONTARIO

Title:

GROUNDWATER SUPPRESSION SYSTEM

Scale: NTS	**Date:** 03/2023
Drawn by: NFRV	**Report No.:** PG5648-1
Checked by: DP	**Drawing No.:** FIGURE 16
Approved by: FA	**Revision No.:**

c:\users\nicholasv\appdata\local\microsoft\windows\inetcache\content.outlook\3ce1z9zx\pg5648\pg5648 figure 1 - water suppresion rev.dwg



ALL PORTIONS OF THE ABOVE-NOTED DETAIL (INSULATION OF FOUNDATION DRAINAGE BOARD, HOT-RUBBER MEMBRANE OVER SLAB AND FOUNDATION WALL CONSTRUCTION JOINT AND OVERLAPPING/SHINGLING OF DRAINAGE BOARD SHOULD BE REVIEWED AT THE TIME OF CONSTRUCTION BY PATERSON PERSONNEL.

NOTES:

THE ABOVE DETAIL FOR HOT RUBBER, AND DRAINAGE BOARD OVERLAP IS APPLICABLE TO ALL EDGE-PORTIONS OF THE PODIUM DECK AND/OR SUSPENDED GROUND FLOOR SLAB STRUCTURE.

APPLICABILITY THICKNESS AND EXTENSIONS OF RIGID INSULATION ARE SPECIFIED BY OTHERS

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

MINTO COMMUNITIES

PROPOSED RESIDENTIAL DEVELOPMENT

ARCADIA - STAGE 6

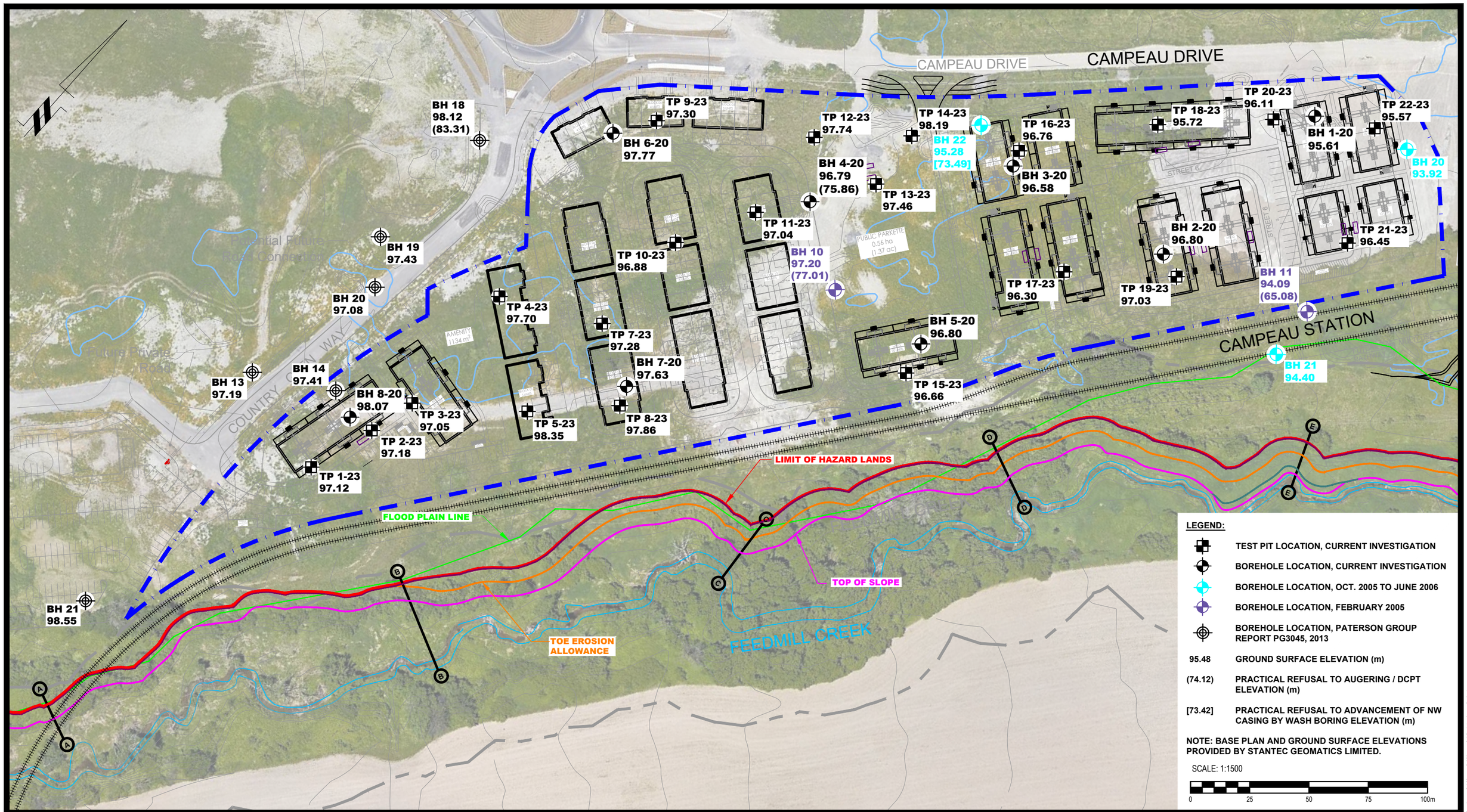
OTTAWA, ONTARIO

Title:

PODIUM DECK TO FOUNDATION WALL DRAINAGE SYSTEM TIE-IN DETAIL

Scale: NTS	Date: 03/2023
Drawn by: YA	Report No.: PG5648-1
Checked by: DP	Drawing No.: FIGURE 17
Approved by: FA	Revision No.:

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-fig 02- podium deck to foundation wall tie-in detail.dwg



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

NO.	REVISIONS	DATE	INITIAL
5	ADEED 2023 TEST PIT LOCATION TO THE PLAN	17/04/2023	DP
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
ARCADIA STAGE 6 - CAMPEAU DRIVE

OTTAWA, ONTARIO

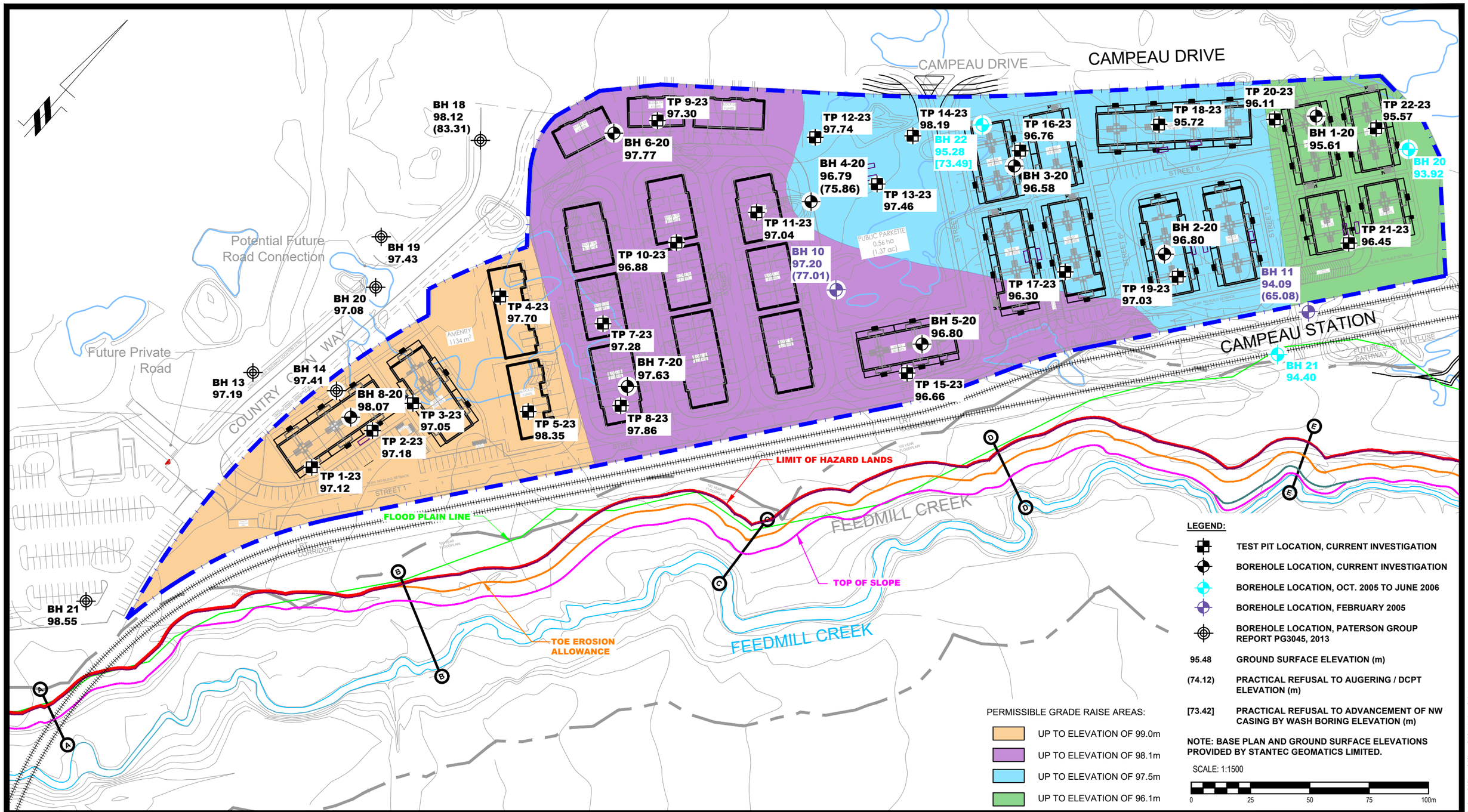
Title:

TEST HOLE LOCATION PLAN

Scale: 1:1500	Date: 07/2023
Drawn by: MPG	Report No.: PG5648
Checked by: DP	Dwg. No.: PG5648-1
Approved by: FA	Revision No.: 5

11x17

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648.thlp (rev.05).dwg



PERMISSIBLE GRADE RAISE AREAS:

- UP TO ELEVATION OF 99.0m
- UP TO ELEVATION OF 98.1m
- UP TO ELEVATION OF 97.5m
- UP TO ELEVATION OF 96.1m

LEGEND:

- TEST PIT LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, OCT. 2005 TO JUNE 2006
- BOREHOLE LOCATION, FEBRUARY 2005
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG3045, 2013
- 95.48 — GROUND SURFACE ELEVATION (m)
- (74.12) — PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)
- [73.42] — PRACTICAL REFUSAL TO ADVANCEMENT OF NW CASING BY WASH BORING ELEVATION (m)

NOTE: BASE PLAN AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:1500

0 25 50 75 100m

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

NO.	REVISIONS	DATE	INITIAL
5	ADEED 2023 TEST PIT LOCATION TO THE PLAN	17/04/2023	DP
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
ARCADIA STAGE 6 - CAMPEAU DRIVE

OTTAWA, ONTARIO

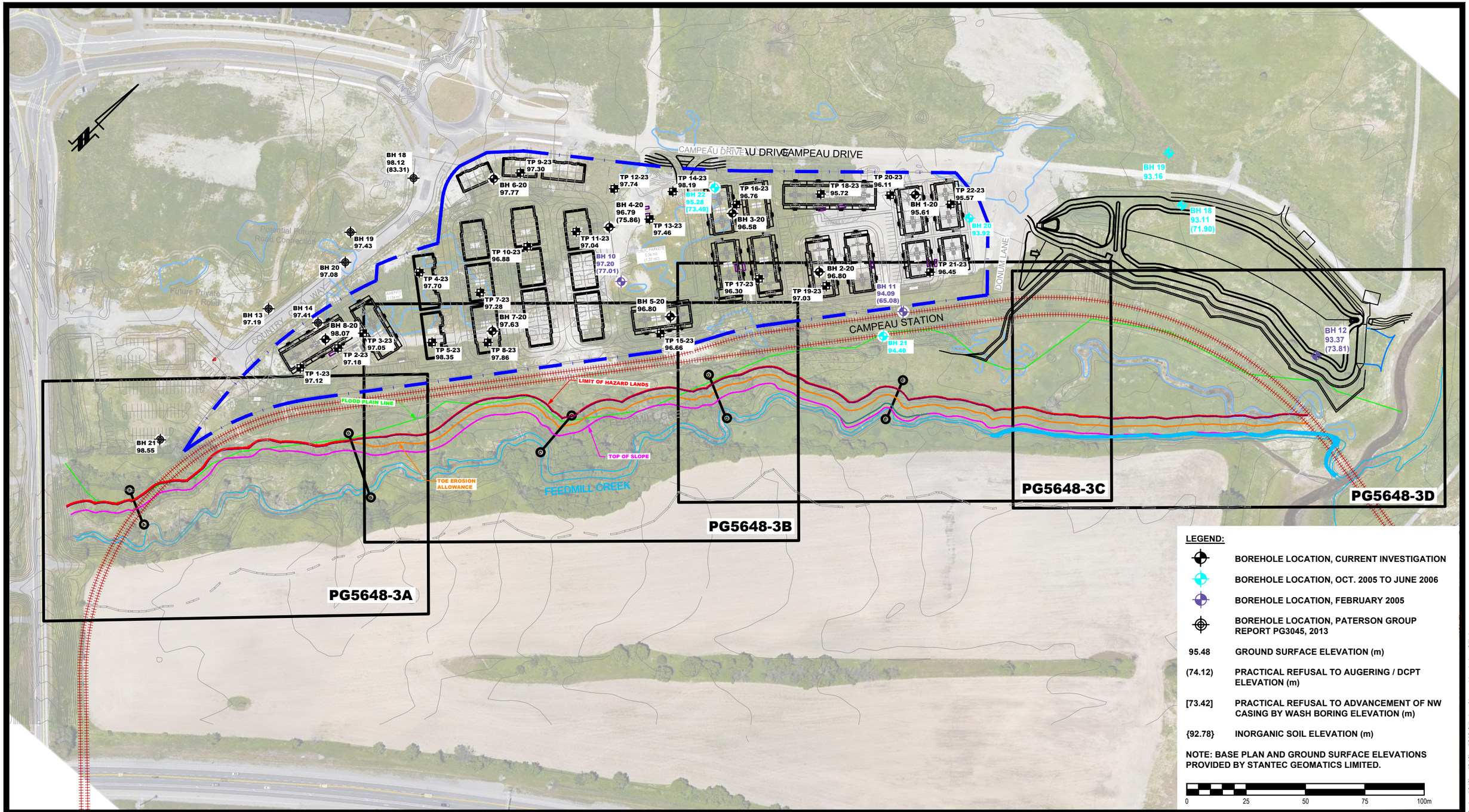
Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:1500	Date: 07/2023
Drawn by: MPG	Report No.: PG5648
Checked by: DP	Dwg. No.: PG5648-1
Approved by: FA	Revision No.: 5

11x17

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-thlp (rev.05).dwg



LEGEND:

	BOREHOLE LOCATION, CURRENT INVESTIGATION
	BOREHOLE LOCATION, OCT. 2005 TO JUNE 2006
	BOREHOLE LOCATION, FEBRUARY 2005
	BOREHOLE LOCATION, PATERSON GROUP REPORT PG3045, 2013
95.48	GROUND SURFACE ELEVATION (m)
(74.12)	PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)
[73.42]	PRACTICAL REFUSAL TO ADVANCEMENT OF NW CASING BY WASH BORING ELEVATION (m)
{92.78}	INORGANIC SOIL ELEVATION (m)

NOTE: BASE PLAN AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

0 25 50 75 100m

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

NO.	REVISIONS	DATE	INITIAL
5	ADEED 2023 TEST PIT LOCATION TO THE PLAN	17/04/2023	DP
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

MINTO COMMUNITIES

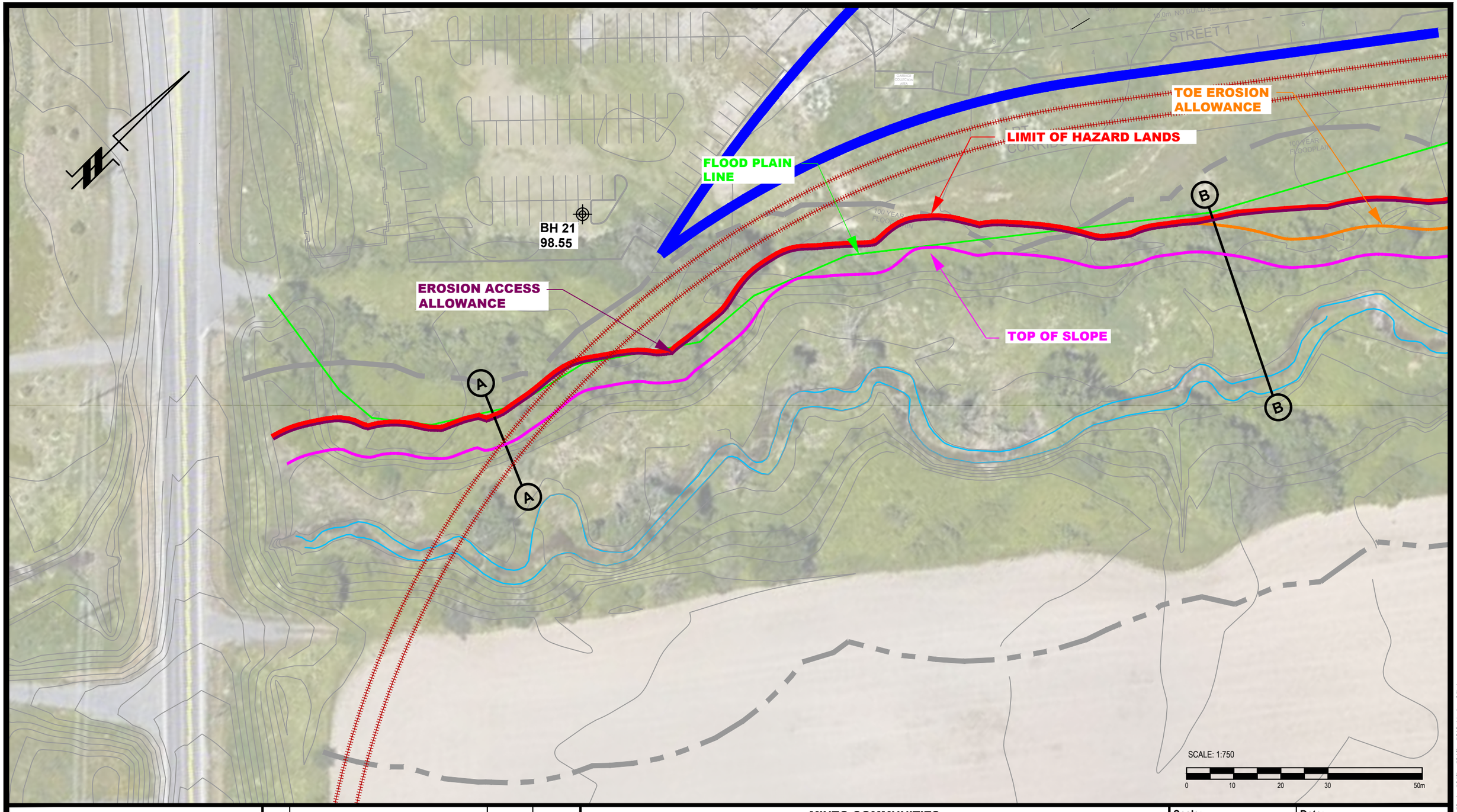
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - ARCADIA - STAGE 6
OTTAWA, ONTARIO

Title:

LIMIT OF HAZARD LANDS - KEY PLAN

Scale: 1:1500	Date: 01/2021
Drawn by: RCG	Report No.: PG5648
Checked by: MS	Dwg. No.: PG5648-3
Approved by: FA	Revision No.: 5

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-3 limits of hazard lands (rev.05).dwg



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

NO.	REVISIONS	DATE	INITIAL
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - ARCADIA - STAGE 6

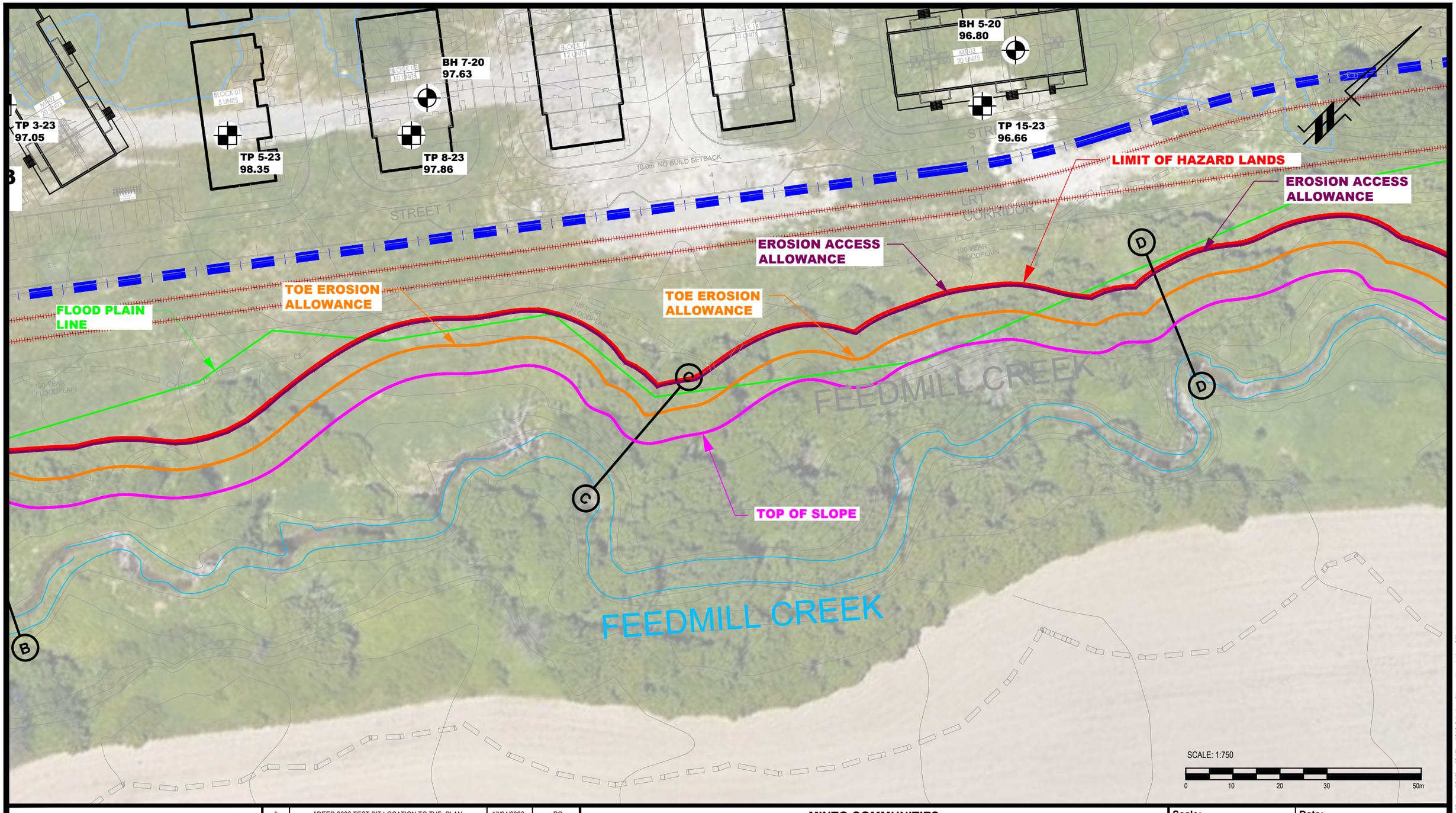
OTTAWA, ONTARIO

Title:

LIMIT OF HAZARD LANDS - A

Scale: 1:750	Date: 01/2021
Drawn by: RCG	Report No.: PG5648
Checked by: MS	Dwg. No.: PG5648-3A
Approved by: FA	Revision No.: 4

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-thlp (rev. 04).dwg



PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7Z9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
5	ADEED 2023 TEST PIT LOCATION TO THE PLAN	17/04/2023	DP
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

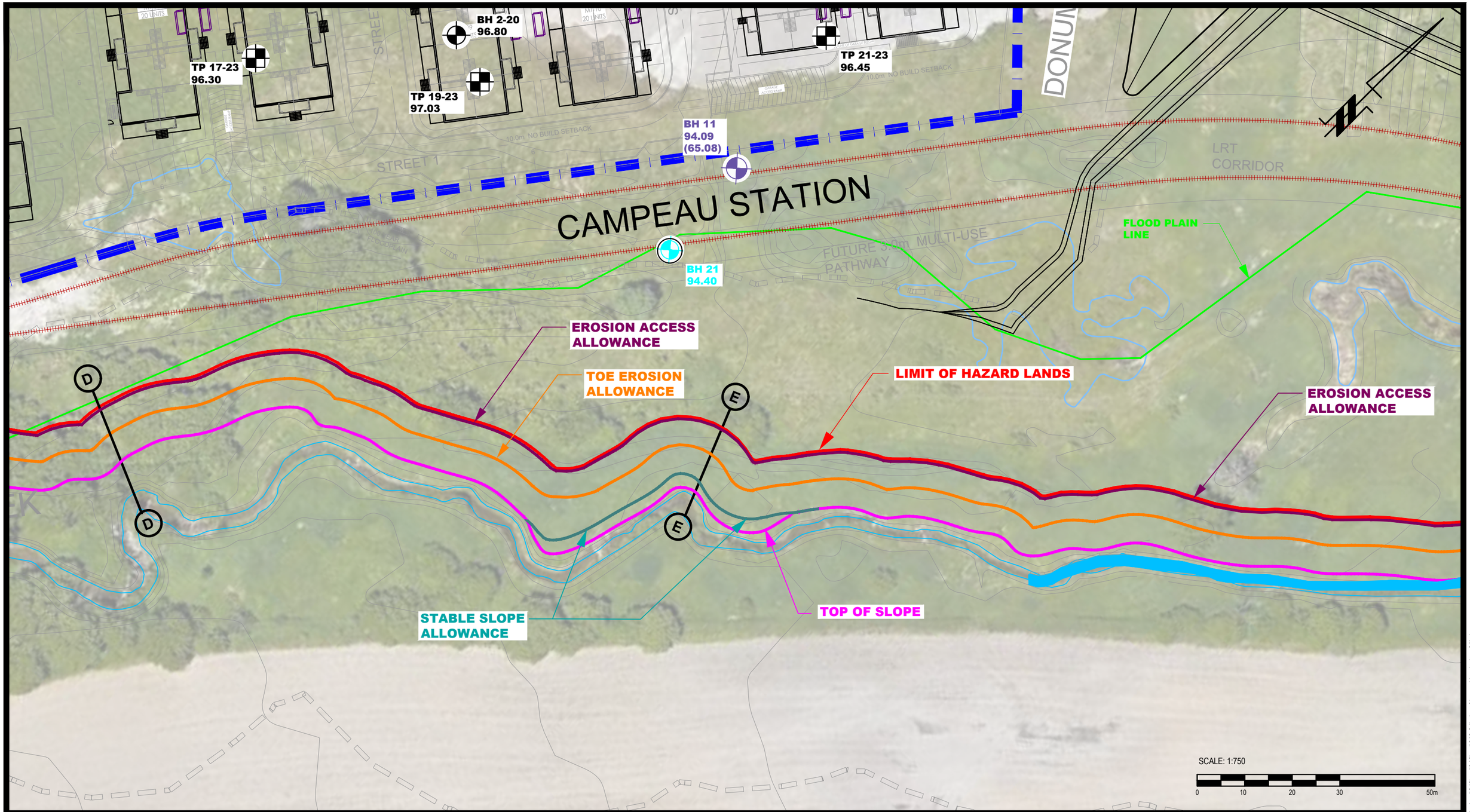
MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - ARCADIA - STAGE 6
OTTAWA, ONTARIO

Title:
LIMIT OF HAZARD LANDS - B

Scale: 1:750	Date: 01/2021
Drawn by: RCG	Report No.: PG5648
Checked by: MS	Dwg. No.: PG5648-3B
Approved by: FA	Revision No.: 5

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-3 limits of hazard lands (rev 05).dwg



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

NO.	REVISIONS	DATE	INITIAL
5	ADEED 2023 TEST PIT LOCATION TO THE PLAN	17/04/2023	DP
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

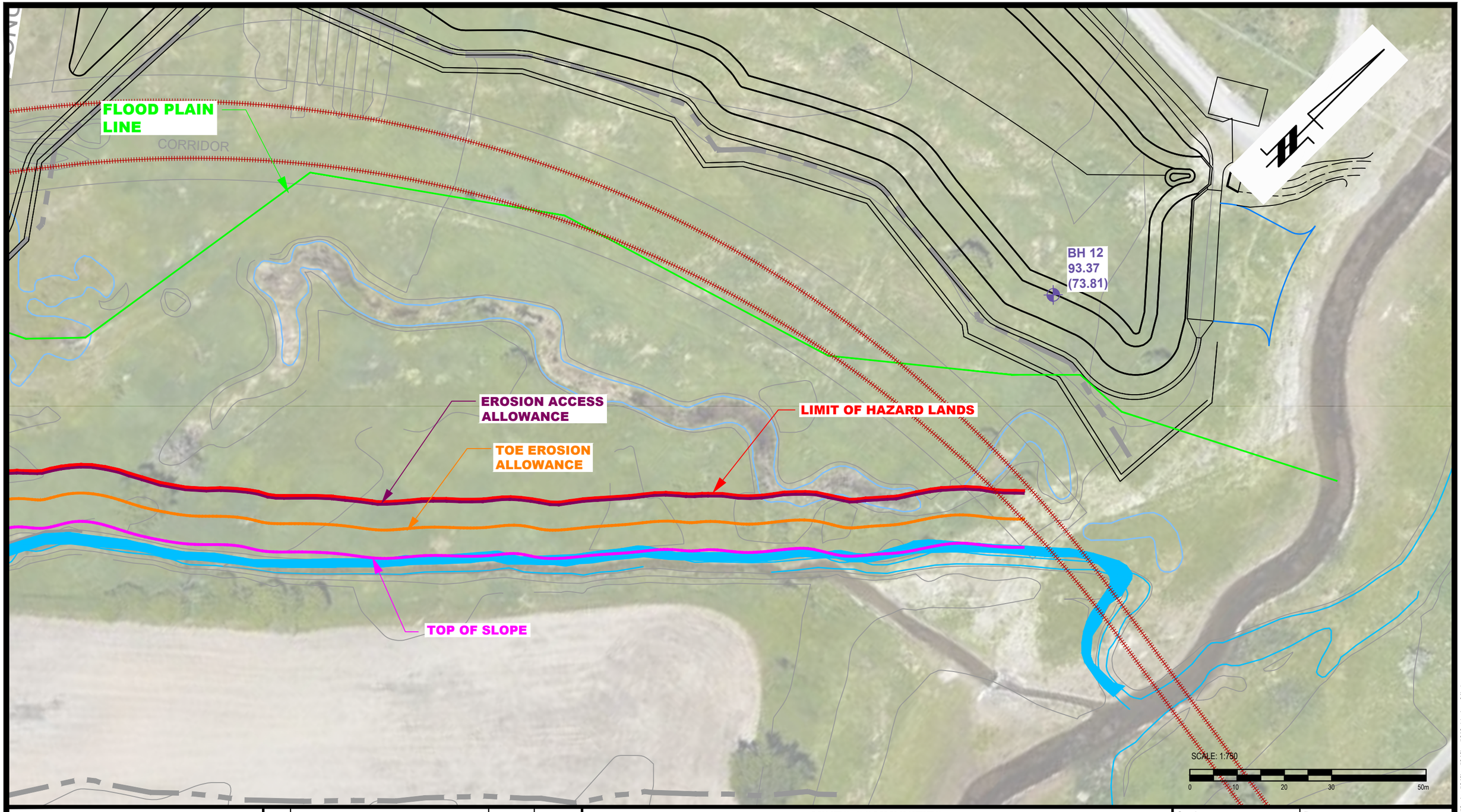
MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - ARCADIA - STAGE 6
OTTAWA, ONTARIO

Title:
LIMIT OF HAZARD LANDS - C

Scale: 1:750	Date: 01/2021
Drawn by: RCG	Report No.: PG5648
Checked by: MS	Dwg. No.: PG5648-3C
Approved by: FA	Revision No.: 5

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-3 limits of hazard lands (rev.05).dwg



PATERSON GROUP

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

NO.	REVISIONS	DATE	INITIAL
4	UPDATED TO LATEST CONCEPTUAL PLAN	27/06/2022	NP
3	UPDATED TO LATEST CONCEPTUAL PLAN	01/02/2022	FA
2	UPDATED NEW LIMIT OF HAZARD LANDS	20/01/2022	FA
1	UPDATED TO LATEST CONCEPTUAL PLAN	16/09/2021	FA

MINTO COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT - ARCADIA - STAGE 6

OTTAWA, ONTARIO

Title:

LIMIT OF HAZARD LANDS - D

Scale: 1:750	Date: 01/2021
Drawn by: RCG	Report No.: PG5648
Checked by: MS	Dwg. No.: PG5648-3D
Approved by: FA	Revision No.: 4

p:\autocad drawings\geotechnical\pg56xx\pg5648\pg5648-thlp (rev. 04).dwg

APPENDIX 3

RELEVANT MEMORANDUMS

patersongroup

consulting engineers

memorandum

re: **Geotechnical Response to City Comments**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive - Ottawa

to: Minto Communities – **Mr. Curtiss Scarlet -** CScarlett@minto.com

date: February 1, 2022

file: PG5648-MEMO.01 Revision 1

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to city comments regarding the proposed residential development at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5648-1 Revision 3 dated February 1, 2022.

Comment 57

Please provide and delineate the proposed 6 m toe erosion allowance at the west portion, section A-A to section B-B (Drawing PG5648-3A).

Response: Based on the topographic survey and on our field survey, the width of the valley floor along the slope between sections A-A and B-B is greater than 15 m. Therefore, based on the *MNR's Technical Guide – River and Stream Systems: Erosion Hazard Limit,* no toe erosion allowance is required for this section of the slope.

Comment 58

Please address the variable 6 m erosion access allowance vary along section A-A to section C-C (Drawing PG5648-3B).

Response: The erosion access allowance along the whole alignment shall be 6m minimum. Paterson revised the limit of hazard lands drawings to show the required 6 m erosion access allowance. Reference should be made to our revised drawings PG5648-3, PG5648-3A, PG5648-3B, PG5648-3C, and PG5648-3D enclosed in Appendix 2 of our geotechnical report PG5648-1 Revision 3 dated February 1, 2022.

Comment 59

Why did the proposed 2.9 m stable slope allowance vary at section E-E (Drawing PG5648-3C)?

Response: The stable slope allowance at section E-E is constant and equal to 2.9 m. Please refer to our revised drawing PG5648-3D enclosed in Appendix 2 of our geotechnical report PG5648-1 Revision 3 dated February 1, 2022, for the correct stable slope allowance limit.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Maha Saleh, P.Eng (Prov.)

Faisal Abou-Seido, P.Eng.

PATERSON GROUP

memorandum

re: **Geotechnical Response to City Comments**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive - Ottawa

to: Minto Communities – **Mr. Curtiss Scarlet -** CScarlett@minto.com

date: November 29, 2022

file: PG5648-MEMO.02

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to city comments regarding the proposed residential development at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5648-1 Revision 3 dated February 1, 2022 and memorandum PG5648-MEMO.03 dated November 29, 2022.

Comment 2.42

Provide signed and sealed memo confirming that the most recent grading, servicing, and landscape plans have been reviewed and they conform to geotechnical recommendations.

Response: Reference should be made to our grading plan review memo PG5648-MEMO.03 dated November 29, 2022.

Comment 2.43

Section 6.3 recommends potential shoring. Is shoring anticipated to be contained within private site or will it extend into public ROW or LRT corridor? If so, provide recommendation to ensure protection of City or adjacent properties as well as potential ROW/LRT infrastructure. Note that a Municipal Consent circulation will be needed for shoring extending into public ROW.

Response: Based on our review of the site's grading and servicing plans, the extent of the proposed ramp and underground level excavations range between 4.5 to 13.7 m, respectively. Considering a 3 m deep excavation for the proposed buildings, it is expected that the proposed excavation will have sufficient for opencut excavation method. Therefore, no shoring system is required for the proposed buildings.

Comment 2.4

Section 6.7 indicates that the SMCS policy requirement of minimum 2.1m of cover to USF does not need to be followed due to the thickness of fill that exists above the clay and that no building USFs will extend into the clay deposit. Confirm that this recommendation is appropriate for all units proposed as lain out in the most recent plans. What is the typical nature of fill across the site? Section 6.3 states that excavation will be through a silty clay fill. Will this fill behave as a clay soil and still require the 2.1m of cover above USF?

Response: The fill within the subject site has a mixture of varying amounts of silty clay, sand, gravel and crushed stone. The fill was found to be mostly dry with minimal to no water content. Therefore, the tree planting restrictions should not apply to the proposed building across the entirety of the proposed phase for the following reasons:

- A number of buildings will include a full underground garage that will be founded over shallow footings placed between 3 to 3.5 m below existing grade. Generally, buildings with full underground parking levels do not fall under the tree planting restrictions due to the depth of footings.
- For the proposed residential dwellings, several lots will be founded over varying thicknesses of engineered fill placed over the native silty clay layer. The extent of the engineered fill will act as a barrier to the growth of the tree roots which eliminates the impact of trees on the proposed buildings. Furthermore, the clay soil within the subject phase has a high shear strength and low moisture content. These properties are indicative of low-sensitivity soil. Therefore, it is recommended the vertical extent of 2.1 m should be reduced to 1.8 m for the proposed buildings. In addition, the requirements to set the trees back to 4.5 m can be reduced to 3 m based on our experience with the tree planting impacts on buildings founded over engineered fill.
- Due to the nature of the existing fill, proof rolling is expected where the fill will be left surrounding the proposed buildings. The compaction levels will be reviewed and approved by Paterson at the time of construction. Due to the dryness of the existing fill, the tree roots are expected to have minimal to no impact on landscaped areas surrounding the proposed dwellings.

Based on the above and the existing thickness of fill, tree planting restrictions can be reduced as per our recommendations provided above. Paterson can revise the geotechnical report accordingly upon receiving the City's approval to this recommendation.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Puneet Bandi, B.Eng.

Faisal I. Abou-Seido, P.Eng.

PATERSON GROUP

memorandum

re: **Geotechnical Design Summary Details**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive - Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett -** CScarlett@minto.com

date: August 1, 2023

file: PG5648-MEMO.03 Revision 4

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to provide the geotechnical design summary details for Stage 6 at the Arcadia residential development. The following memorandum should be read in conjunction with the current Geotechnical Investigation Report (Paterson Group Report PG5648-1 Revision 8 dated August 1, 2023).

Relevant design information is presented in Table 1 - Summary of Grading Design Details – Arcadia – Stage 6 – 450 Huntmar Drive, Ottawa for the subject blocks. The relevant design and inspection information includes the following:

- ❑ Legal lot/block number and street name
- ❑ Original ground surface elevation
- ❑ Proposed finished grade elevation
- ❑ Permissible grade raise elevation
- ❑ Bearing resistance values
- ❑ Proposed USF elevation
- ❑ Lightweight fill (LWF) recommendations
- ❑ Seismic site class

Grading Plan Review

Paterson reviewed the following grading plan prepared by J.L. Richards for Stage 6 of the aforementioned residential development:

- ❑ Grading Plan– Arcadia Stage 6 – 450 Huntmar Drive – Drawing # G1– JLR#: 26299-006, Revision 6 dated June 30, 2023
- ❑ Grading Plan– Arcadia Stage 6 – 450 Huntmar Drive – Drawing # G2– JLR#: 26299-006, Revision 6 dated June 30, 2022

Based on the grading plans provided, no exceedances to the recommended permissible grade raise elevations were noted. Based on that, no lightweight fill is required throughout the subject site from a geotechnical perspective.

Frost Protection Requirements

Based on the proposed grades, the foundation for all townhouse blocks located throughout the subject site have been provided sufficient soil cover above the design underside of footing (USF) elevation for protection against frost action.

Tree Planting Setbacks

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. Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. Grain size distribution and Sieve analysis testing was also completed on selected soil samples. The above noted test results were completed between design underside of footing elevation and a 3.5 m depth below finished grade. The results of our testing are presented in Tables 1 and 2 in Subsection 4.1 and in Appendix 1 of the aforementioned geotechnical report.

Townhouses West of Arcadian (Block 15 to Block 28, MT-01 to MT-03)

Since the modified plasticity limit (PI) does not exceed 40%, large trees (mature height over 14 m) can be planted at the subject site 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).

According to the City of Ottawa Tree Planting Guidelines, tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the following conditions are met:

- The underside of footing (USF) extends to 2.1 m or greater below the lowest finished grade within 10 m from the tree, as measured from the center of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below. **However, due to the thickness of the fill material within the subject site, this condition is not required as the native silty clay material is well below the proposed underside of footing elevations (at least 1 m below proposed USF levels).**

- A small tree must be provided with a minimum of 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 tree height up to 7.5 m) to medium size (mature tree 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).
- Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree).

Private Townhouses East of Arcadian (MT-04 to MT-14)

Based on our review, two conditions exist throughout the private portion of the subject site and east of the proposed Arcadian right-of-way.

One condition is that the separation between the design underside of footing (USF) elevation and the in-situ clay deposit is greater than 1 m for MT-08, MT-09, and MT-10. Since the underlying clay deposit throughout the area of these buildings will be at a lower depth than USF, the tree root systems for low to medium sized trees are not expected to extend within the underlying clay deposit. Further, given the high gravel, cobble and boulder content of the in-situ fill layer that would be below USF, roots are not expected to extend into and beyond the overlying fill layer.

The second condition is that the basement level for MT-04 to MT-07 and MT-11 to MT-14 will consist of a level of underground parking. The founding depth for these parking structures will be over 5.5 m below finished grade. It is expected the trees will be planted within the surficial layer of fill as noted for MT-08, MT-09 and MT-10. Since it is not expected that the root systems will extend beyond the overlying fill layer, it is also not expected the root systems will extend below the founding depth of the structure given the separation between USF and finished grade.

Since the modified plasticity limit (PI) does not exceed 40%, large trees (mature height over 14 m) can be planted throughout this portion of the subject site 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).

However, given the above-noted rationale, tree planting setback limits may be reduced to 3 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) throughout this portion of the subject site from a geotechnical perspective.

The following conditions should be met for trees planted in proximity to structures throughout this portion of the subject site:

- A small tree must be provided with a minimum of 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 tree height up to 7.5 m) to medium size (mature tree 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). This recommendation is not considered applicable to the design of the foundation walls for the underground parking structures as it is expected the reinforcement details for those structures will exceed this recommendation.

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

Exterior Structure Considerations

Aboveground Swimming Pools, Hot Tubs and Exterior Decks

The in-situ soils are considered to be acceptable for in-ground swimming pools. Above ground swimming pools must be placed at least 5 m away from the residence foundation and neighbouring foundations. Otherwise, pool construction is considered routine and can be constructed in accordance with the manufacturer's requirements.

Additional grading around hot tubs should not exceed permissible grade raises. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer's specifications. Additional grading around proposed decks or additions should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, B.Eng.

Faisal Abou-Seido, P.Eng.

Table 1 - Summary of Grading Design Details - Arcadia - Stage 6 - 450 Huntmar Drive, Ottawa

Lot/Block Number	Unit *	Unit Type	Street Name	Underside of Footing Elevation / Bottom of Garage Floor Slab	Bearing Resistance Value (SLS)	Original GS Front	Proposed GS Front	Original GS Rear	Proposed GS Rear	Frost Cover OK	Estimated Engineered Fill Below USF for Frost cover	Estimated Engineered Fill Below Front USF for Tree Planting (front)	Estimated Engineered Fill Below USF Front and front half of sides	Estimated Engineered Fill Below USF Rear and rear half of sides	Permissible Grade Raise Elevation	Above Permissible Grade Raise - Front	Above Permissible Grade Raise - Rear	Minimum Thickness of LWF in Garage and Front Porch	Minimum Lightweight Fill Requirement	Seismic Site Class
				(m)	(kPa)	(m)	(m)	(m)	(m)		(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
Block 15	A	END	Clearpath	95.52	150	97.49	97.42	97.41	97.91	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	B	MID	Clearpath	95.52	150	97.66	97.39	97.47	97.91	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	C	MID	Clearpath	95.52	150	97.66	97.39	97.55	97.91	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	D	MID	Clearpath	95.52	150	97.10	97.39	97.43	97.91	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	E	END	Clearpath	95.52	150	97.10	97.39	97.11	97.91	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
Block 16	A	END	Clearpath	95.43	150	97.11	97.48	96.99	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	B	MID	Clearpath	95.43	150	97.11	97.48	97.02	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	C	MID	Clearpath	95.43	150	97.42	97.48	97.22	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	D	MID	Clearpath	95.43	150	97.42	97.48	97.46	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	E	MID	Clearpath	95.43	150	97.58	97.48	97.50	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
	F	END	Clearpath	95.43	150	97.58	97.48	97.40	97.82	YES	-	-	0.00	0.00	99.00	n/a	n/a	n/a	n/a	D
Block 17	A	BTB	Clearpath	95.47	150	97.74	97.73	97.87	97.88	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.47	150	97.74	97.73	97.87	97.88	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.47	150	97.80	97.73	97.91	97.88	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.47	150	97.80	97.73	97.91	97.88	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
Block 18	A	BTB	Clearpath	95.36	150	96.80	97.62	97.23	97.77	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.36	150	96.80	97.62	97.23	97.77	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.36	150	96.58	97.62	97.19	97.77	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.36	150	96.58	97.62	97.19	97.77	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
Block 19	A	BTB	Clearpath	95.28	150	96.51	97.72	96.99	97.69	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.28	150	96.45	97.72	96.99	97.69	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.28	150	96.45	97.72	96.82	97.69	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.28	150	96.55	97.54	96.82	97.69	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Clearpath	95.28	150	96.55	97.54	96.80	97.69	YES	-	-	0.00	0.00	98.10	n/a	n/a	n/a	n/a	D
Block 20	A	BTB	Clearpath	95.55	150	97.68	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.55	150	97.68	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.55	150	97.85	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.55	150	97.85	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Silverberry	95.55	150	98.00	97.35	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Silverberry	95.55	150	98.00	97.35	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Silverberry	95.55	150	97.84	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Silverberry	95.55	150	97.84	97.53	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 21	A	BTB	Clearpath	95.66	150	96.97	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.66	150	96.97	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.66	150	96.90	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.66	150	96.90	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Silverberry	95.66	150	97.41	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Silverberry	95.66	150	97.41	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Silverberry	95.66	150	96.96	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Silverberry	95.66	150	96.96	97.46	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 22	A	BTB	Clearpath	95.35	150	97.06	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Clearpath	95.35	150	97.00	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Clearpath	95.35	150	97.00	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Clearpath	95.35	150	97.16	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Clearpath	95.35	150	97.16	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Silverberry	95.35	150	97.75	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Silverberry	95.35	150	97.75	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Silverberry	95.35	150	97.66	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	I	BTB	Silverberry	95.35	150	97.66	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	J	BTB	Silverberry	95.35	150	97.50	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.00	n/a	n/a	n/a	n/a	D
Block 23	A	BTB	Silverberry	95.70	150	96.79	97.50	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Silverberry	95.70	150	96.79	97.50	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Silverberry	95.52	150	96.84	97.32	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Silverberry	95.52	150	96.84	97.32	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Woodily	95.52	150	96.95	97.32	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Woodily	95.52	150	96.95	97.32	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Woodily	95.70	150	96.63	97.50	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Woodily	95.70	150	96.63	97.50	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 24	A	BTB	Silverberry	95.45	150	96.93	97.43	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Silverberry	95.45	150	96.93	97.43	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Silverberry	95.45	150	97.72	97.43	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Silverberry	95.45	150	97.72	97.43	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Woodily	95.45	150	97.67	97.25	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Woodily	95.45	150	97.67	97.25	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Woodily	95.45	150	96.98	97.25	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Woodily	95.45	150	96.98	97.25	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	A	BTB	Silverberry	95.30	150	97.79	97.28	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Silverberry	95.30	150	97.79	97.28	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Silverberry	95.30	150	97.99	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D

Table 1 - Summary of Grading Design Details - Arcadia - Stage 6 - 450 Huntmar Drive, Ottawa

Lot/Block Number	Unit *	Unit Type	Street Name	Underside of Footing Elevation / Bottom of Garage Floor Slab	Bearing Resistance Value (SLS)	Original GS Front	Proposed GS Front	Original GS Rear	Proposed GS Rear	Frost Cover OK	Estimated Engineered Fill Below USF for Frost cover	Estimated Engineered Fill Below Front USF for Tree Planting (front)	Estimated Engineered Fill Below USF Front and front half of sides	Estimated Engineered Fill Below USF Rear and rear half of sides	Permissible Grade Raise Elevation	Above Permissible Grade Raise - Front	Above Permissible Grade Raise - Rear	Minimum Thickness of LWF in Garage and Front Porch	Minimum Lightweight Fill Requirement	Seismic Site Class
				(m)	(kPa)	(m)	(m)	(m)	(m)		(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
Block 25	D	BTB	Silverberry	95.30	150	97.99	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Silverberry	95.30	150	99.98	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Silverberry	95.30	150	99.98	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Woodily	95.30	150	100.44	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Woodily	95.30	150	100.44	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	I	BTB	Woodily	95.30	150	97.74	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	J	BTB	Woodily	95.30	150	97.74	97.10	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	K	BTB	Woodily	95.30	150	98.95	97.28	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	L	BTB	Woodily	95.30	150	98.95	97.28	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 26	A	BTB	Woodily	95.42	150	95.95	97.37	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Woodily	95.42	150	96.87	97.37	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Woodily	95.42	150	97.13	97.22	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Woodily	95.42	150	97.13	97.22	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Clearpath	95.42	150	96.95	97.22	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Clearpath	95.42	150	96.95	97.22	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Clearpath	95.42	150	98.25	97.37	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Clearpath	95.42	150	98.25	97.37	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 27	A	BTB	Woodily	95.35	150	97.22	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Woodily	95.35	150	97.22	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Woodily	95.35	150	99.90	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Woodily	95.35	150	99.90	97.33	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Clearpath	95.35	150	97.47	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Clearpath	95.35	150	97.47	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Clearpath	95.35	150	97.25	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Clearpath	95.35	150	97.25	97.15	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
Block 28	A	BTB	Woodily	95.15	150	97.47	97.13	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Woodily	95.15	150	97.47	97.13	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Woodily	95.15	150	99.53	97.13	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Woodily	95.15	150	99.53	97.13	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Woodily	95.15	150	98.47	97.13	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Clearpath	95.15	150	98.47	96.95	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Clearpath	95.15	150	97.19	96.95	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Clearpath	95.15	150	97.19	96.95	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	I	BTB	Clearpath	95.15	150	99.35	96.95	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	J	BTB	Clearpath	95.15	150	99.35	96.95	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
MT-1	A	BTB	Feedmill	96.04	150	96.72	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	96.04	150	96.90	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	96.04	150	96.90	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	96.04	150	97.03	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	96.04	150	97.03	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	96.04	150	97.03	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	96.04	150	97.03	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	96.04	150	97.01	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	I	BTB	Feedmill	96.04	150	97.01	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	J	BTB	Feedmill	96.04	150	96.98	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	K	BTB	Feedmill	96.04	150	96.98	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	L	BTB	Feedmill	96.04	150	96.98	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
MT-2	A	BTB	Feedmill	96.04	150	96.95	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	96.04	150	96.95	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	96.04	150	97.02	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	I	BTB	Feedmill	96.04	150	97.01	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D
	J	BTB	Feedmill	96.04	150	97.01	98.00	n/a	n/a	YES	-	-	0.00	n/a	99.00	n/a	n/a	n/a	n/a	D

Table 1 - Summary of Grading Design Details - Arcadia - Stage 6 - 450 Huntmar Drive, Ottawa

Lot/Block Number	Unit *	Unit Type	Street Name	Underside of Footing Elevation / Bottom of Garage Floor Slab	Bearing Resistance Value (SLS)	Original GS Front	Proposed GS Front	Original GS Rear	Proposed GS Rear	Frost Cover OK	Estimated Engineered Fill Below USF for Frost cover	Estimated Engineered Fill Below Front USF for Tree Planting (front)	Estimated Engineered Fill Below USF Front and front half of sides	Estimated Engineered Fill Below USF Rear and rear half of sides	Permissible Grade Raise Elevation	Above Permissible Grade Raise - Front	Above Permissible Grade Raise - Rear	Minimum Thickness of LWF in Garage and Front Porch	Minimum Lightweight Fill Requirement	Seismic Site Class
				(m)	(kPa)	(m)	(m)	(m)	(m)		(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
MT-3	A	BTB	Feedmill	94.89	150	96.94	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	94.89	150	96.94	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	94.89	150	96.12	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	94.89	150	96.12	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	94.89	150	96.47	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	94.89	150	96.81	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	94.89	150	96.81	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	94.89	150	96.91	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	I	BTB	Feedmill	94.89	150	97.05	96.85	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	J	BTB	Feedmill	94.89	150	97.05	96.70	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
MT-4*	A	BTB	Arcadian	91.27	130	97.18	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Arcadian	91.27	130	96.88	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Arcadian	91.27	130	96.91	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Arcadian	91.27	130	97.22	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Arcadian	91.27	130	96.55	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Arcadian	91.27	130	96.55	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Arcadian	91.27	130	96.53	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Arcadian	91.27	130	96.74	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-5*	A	BTB	Arcadian	91.27	130	95.95	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Arcadian	91.27	130	95.95	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Arcadian	91.27	130	96.55	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Arcadian	91.27	130	96.55	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Arcadian	91.27	130	96.64	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Arcadian	91.27	130	96.44	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Arcadian	91.27	130	96.44	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Arcadian	91.27	130	95.50	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-6*	A	BTB	Arcadian	91.27	130	96.79	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Arcadian	91.27	130	96.79	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Arcadian	91.27	130	96.67	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Arcadian	91.27	130	96.67	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Arcadian	91.27	130	96.21	96.65	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	F	BTB	Arcadian	91.27	130	96.21	96.65	n/a	n/a	YES	-	-	0.00	n/a	98.10	n/a	n/a	n/a	n/a	D
	G	BTB	Arcadian	91.27	130	96.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Arcadian	91.27	130	96.58	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	I	BTB	Arcadian	91.27	130	96.58	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	J	BTB	Arcadian	91.27	130	96.58	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-7*	A	BTB	Creekway	91.27	130	95.30	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Creekway	91.27	130	95.30	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Creekway	91.27	130	95.30	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Creekway	91.27	130	95.30	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Creekway	91.27	130	95.30	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Creekway	91.27	130	95.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Creekway	91.27	130	95.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Creekway	91.27	130	95.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	I	BTB	Creekway	91.27	130	95.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	J	BTB	Creekway	91.27	130	95.25	96.65	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-8	A	BTB	Creekway	94.72	150	95.35	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Creekway	94.72	150	95.35	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Creekway	94.72	150	95.96	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Creekway	94.72	150	95.96	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Creekway	94.72	150	95.57	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Creekway	94.72	150	95.92	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Creekway	94.72	150	95.92	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Creekway	94.72	150	95.92	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	I	BTB	Campeau Drive	94.72	150	95.72	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	J	BTB	Campeau Drive	94.72	150	95.72	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	K	BTB	Campeau Drive	94.72	150	95.72	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	L	BTB	Campeau Drive	94.72	150	95.53	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	M	BTB	Campeau Drive	94.72	150	95.53	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	N	BTB	Campeau Drive	94.72	150	95.56	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	O	BTB	Campeau Drive	94.72	150	95.56	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	P	BTB	Campeau Drive	94.72	150	96.25	96.68	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-9	A	BTB	Creekway	94.24	150	96.40	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Creekway	94.24	150	96.85	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	C	BTB	Creekway	94.24	150	96.85	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Creekway	94.24	150	96.71	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Creekway	94.24	150	96.71	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	94.24	150	96.40	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	94.24	150	96.40	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	94.24	150	95.05	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	I	BTB	Feedmill	94.24	150	95.05	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	J	BTB	Feedmill	94.24	150	95.05	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	A	BTB	Creekway	94.24	150	96.88	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	B	BTB	Creekway	94.24	150	96.88	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D

Table 1 - Summary of Grading Design Details - Arcadia - Stage 6 - 450 Huntmar Drive, Ottawa

Lot/Block Number	Unit *	Unit Type	Street Name	Underside of Footing Elevation / Bottom of Garage Floor Slab	Bearing Resistance Value (SLS)	Original GS Front	Proposed GS Front	Original GS Rear	Proposed GS Rear	Frost Cover OK	Estimated Engineered Fill Below USF for Frost cover	Estimated Engineered Fill Below Front USF for Tree Planting (front)	Estimated Engineered Fill Below USF Front and front half of sides	Estimated Engineered Fill Below USF Rear and rear half of sides	Permissible Grade Raise Elevation	Above Permissible Grade Raise - Front	Above Permissible Grade Raise - Rear	Minimum Thickness of LWF in Garage and Front Porch	Minimum Lightweight Fill Requirement	Seismic Site Class
				(m)	(kPa)	(m)	(m)	(m)	(m)		(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
MT-10	C	BTB	Creekway	94.24	150	96.95	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	D	BTB	Creekway	94.24	150	96.95	96.02	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	E	BTB	Creekway	94.24	150	96.76	96.02	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	94.24	150	96.76	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	94.24	150	96.95	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	94.24	150	96.95	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	I	BTB	Feedmill	94.24	150	96.83	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
	J	BTB	Feedmill	94.24	150	96.83	96.20	n/a	n/a	YES	-	-	0.00	n/a	97.50	n/a	n/a	n/a	n/a	D
MT-11*	A	BTB	Feedmill	90.72	130	95.67	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	90.72	130	95.67	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	90.72	130	95.71	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	90.72	130	95.71	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	90.72	130	95.80	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	90.72	130	95.80	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	90.72	130	96.31	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	90.72	130	96.31	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
MT-12*	A	BTB	Feedmill	90.72	130	96.16	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	90.72	130	96.16	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	90.72	130	95.80	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	90.72	130	95.80	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	90.72	130	96.01	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	90.72	130	96.01	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	G	BTB	Feedmill	90.72	130	95.14	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	H	BTB	Feedmill	90.72	130	95.14	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
MT-13*	A	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	90.72	130	96.52	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
MT-14*	A	BTB	Feedmill	90.72	130	95.93	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	B	BTB	Feedmill	90.72	130	96.26	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	C	BTB	Feedmill	90.72	130	96.26	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	D	BTB	Feedmill	90.72	130	95.10	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	E	BTB	Feedmill	90.72	130	95.80	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D
	F	BTB	Feedmill	90.72	130	95.58	96.10	n/a	n/a	YES	-	-	0.00	n/a	96.10	n/a	n/a	n/a	n/a	D

Notes:

- Grading reviewed from Drawing: Grading Plan– Arcadia Stage 6 – 450 Huntmar Drive – Drawing # G1 and # G2 – JLR#: 26299-006, Revision 6 dated June 30, 2023
- Units numbered from left to right from a street view perspective. Back to back units numbered from south to north in a conter-clockwise fashion.
- SU-Single Unit; END-End Unit; MID-Middle UNIT; BTB-Back to Back Unit.
- Bearing resistance provided assuming that the bearing surface is undisturbed stiff silty clay, if another bearing surface is encountered during construction, the bearing surface should be inspected by Paterson to provide additionnal bearing resistance values.

* - Indicates blocks with underground parking level.

PATERSON GROUP

memorandum

re: **Site Servicing Plan Review**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive - Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett -** CScarlett@minto.com

date: February 10, 2023

file: PG5648-MEMO.04

Further to your request and authorization, Paterson Group (Paterson) prepared the current memorandum to document our review of the site servicing plans, and to provide associated recommendations from a geotechnical perspective for the aforementioned project. The following memorandum should be read in conjunction with the current Geotechnical Investigation Report PG5648-1 Revision 5, dated February 8, 2023.

Site Servicing Plan Review

Paterson reviewed the following servicing plans prepared by J.L.Richards for the aforementioned development:

- ❒ Site Servicing Plan – JLR No. 26299-006 – Drawing No. S1 and S2, Revision 1, dated July 19, 2022.
- ❒ Plan and Profile – JLR No. 26299-006 – Drawing No. 1 to 8, Revision 1, dated July 19, 2022.

Based on our review of the above noted site service plans, the majority of the design details are considered to be acceptable from a geotechnical perspective. The services were found to be outside of the lateral support zone of the proposed footings. However, due to the close proximity of the service laterals, considerations should be given to installing the service laterals prior to the installation of the proposed front porches to ensure that the no excessive excavation is performed in close proximity to the lateral support zones of the adjacent front porches.

Pipe Bedding

It is recommended that the above-noted drawings clearly indicate that where the subgrade for pipe bedding consists of firm, grey silty clay, that the bedding layer thickness be increased from 150 to 300 mm.

The bedding material is recommended to consist of OPSS Granular A crushed stone and compacted to a minimum of 99% of the materials SPMDD. The placement of this material is recommended to be reviewed and approved by Paterson personnel at the time of construction.

Clay Seals

To reduce the long-term lowering of the groundwater at this site, clay seals should be provided within the service trenches excavated through the silty clay deposit. Paterson has provided proposed locations for the clay seals within the service trenches as based on our review of the subsurface profile encountered throughout the subject site and current servicing drawings.

Reference should be made to Figure 1 and Figure 2 – Proposed Clay Seal Location Plan for the location of additional clay seals to be considered within the service trenches. It should be noted that the current clay seals proposed by J.L. Richards/others are considered acceptable from a geotechnical perspective.

The placement of clay seals at the subject site should be reviewed and approved by Paterson personnel at the time of construction. The clay seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the subgrade for the overlying pavement structure and fully penetrate the bedding, subbedding and cover material.

The clay seals should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. Alternatively, the placement of clay seals may be evaluated by Paterson field personnel experienced in assessing levels of compaction effort of soils given the difficulty to measure the SPMDD of clay soil fill using a nuclear density gauge. Wet, saturated grey silty clay is not considered suitable for this purpose.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, B.Eng.

Faisal I. Abou-Seido, P.Eng.

Attachments:

❒ Figure 1 and Figure 2 – Proposed Clay Seal Location Plan

Figure 1 - Proposed Clay Seals Location Plan

LEGEND

PROPOSED CLAY SEAL LOCATION

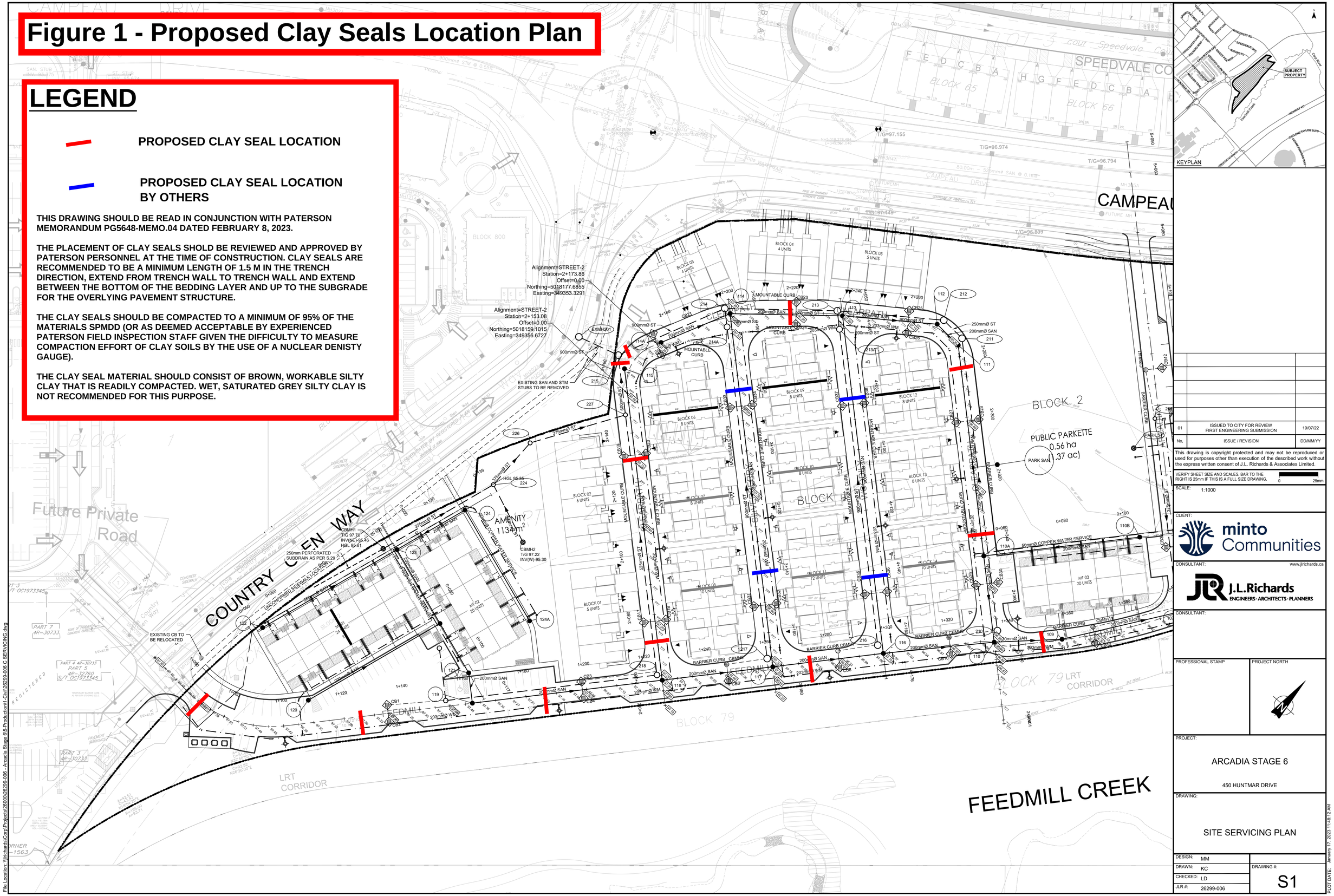
PROPOSED CLAY SEAL LOCATION BY OTHERS

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH PATERSON MEMORANDUM PG5648-MEMO.04 DATED FEBRUARY 8, 2023.

THE PLACEMENT OF CLAY SEALS SHOLD BE REVIEWED AND APPROVED BY PATERSON PERSONNEL AT THE TIME OF CONSTRUCTION. CLAY SEALS ARE RECOMMENDED TO BE A MINIMUM LENGTH OF 1.5 M IN THE TRENCH DIRECTION, EXTEND FROM TRENCH WALL TO TRENCH WALL AND EXTEND BETWEEN THE BOTTOM OF THE BEDDING LAYER AND UP TO THE SUBGRADE FOR THE OVERLYING PAVEMENT STRUCTURE.

THE CLAY SEALS SHOULD BE COMPACTED TO A MINIMUM OF 95% OF THE MATERIALS SPMDD (OR AS DEEMED ACCEPTABLE BY EXPERIENCED PATERSON FIELD INSPECTION STAFF GIVEN THE DIFFICULTY TO MEASURE COMPACTION EFFORT OF CLAY SOILS BY THE USE OF A NUCLEAR DENISTY GAUGE).

THE CLAY SEAL MATERIAL SHOULD CONSIST OF BROWN, WORKABLE SILTY CLAY THAT IS READILY COMPACTED. WET, SATURATED GREY SILTY CLAY IS NOT RECOMMENDED FOR THIS PURPOSE.



No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED TO CITY FOR REVIEW FIRST ENGINEERING SUBMISSION	19/07/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:1000

CLIENT: minto Communities

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

ARCADIA STAGE 6

450 HUNTMAR DRIVE

DRAWING:

SITE SERVICING PLAN

DESIGN: MM	
DRAWN: KC	DRAWING #:
CHECKED: LD	S1
JLR #: 26299-006	

PLOT DATE: January 17, 2023 11:48:12 AM

File Location: \\jlrichards\Corp\Projects\26000\26299-006 - Arcadia Stage 6\5-Production\1-Civil\26299-006 C SERVICING.dwg

Figure 2 - Proposed Clay Seals Location Plan

LEGEND

PROPOSED CLAY SEAL LOCATION

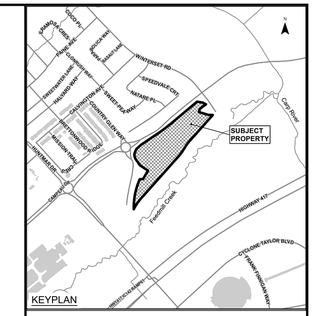
PROPOSED CLAY SEAL LOCATION BY OTHERS

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH PATERSON MEMORANDUM PG5648-MEMO.04 DATED FEBRUARY 8, 2023.

THE PLACEMENT OF CLAY SEALS SHOLD BE REVIEWED AND APPROVED BY PATERSON PERSONNEL AT THE TIME OF CONSTRUCTION. CLAY SEALS ARE RECOMMENDED TO BE A MINIMUM LENGTH OF 1.5 M IN THE TRENCH DIRECTION, EXTEND FROM TRENCH WALL TO TRENCH WALL AND EXTEND BETWEEN THE BOTTOM OF THE BEDDING LAYER AND UP TO THE SUBGRADE FOR THE OVERLYING PAVEMENT STRUCTURE.

THE CLAY SEALS SHOULD BE COMPACTED TO A MINIMUM OF 95% OF THE MATERIALS SPMDD (OR AS DEEMED ACCEPTABLE BY EXPERIENCED PATERSON FIELD INSPECTION STAFF GIVEN THE DIFFICULTY TO MEASURE COMPACTION EFFORT OF CLAY SOILS BY THE USE OF A NUCLEAR DENISTY GAUGE).

THE CLAY SEAL MATERIAL SHOULD CONSIST OF BROWN, WORKABLE SILTY CLAY THAT IS READILY COMPACTED. WET, SATURATED GREY SILTY CLAY IS NOT RECOMMENDED FOR THIS PURPOSE.



No.	ISSUE / REVISION	DD/MM/YY
01	ISSUED TO CITY FOR REVIEW FIRST ENGINEERING SUBMISSION	19/07/22

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:1000

CLIENT: minto Communities

CONSULTANT: J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS www.jlrichards.ca

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

ARCADIA STAGE 6

450 HUNTMAR DRIVE

DRAWING:

SITE SERVICING PLAN

DESIGN: MM	
DRAWN: KC	DRAWING #: S2
CHECKED: LD	
JLR #: 26299-006	

PLOT DATE: January 17, 2023 11:48:31 AM

File Location: \\jlrichards\Corp\Projects\26000\26299-006 - Arcadia Stage 6\5-Production\1-Civil\26299-006 C SERVICING.dwg

PATERSON GROUP

memorandum

re: **Geotechnical Responses to City Comments**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive - Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett -** CScarlett@minto.com

date: February 10, 2023

file: PG5648-MEMO.05

Further to your request, Paterson Group (Paterson) prepared the current memorandum to address the geotechnical-related review comments provided by the City of Ottawa. The following memorandum should be read in conjunction with the current Geotechnical Investigation Report (Paterson Group Report PG5648-1 Revision 5 dated February 8, 2023.

Geotechnical Investigation

Comment 2.42: *Provide signed and sealed memo confirming that the most recent grading, servicing, and landscape plans have been reviewed and they conform to geotechnical recommendations.*

Response: Reference should be made to our Grading Plan and Servicing Plan Review memos (Paterson Group Mems PG5648-MEMO.03 Revision 1 and PG5648-MEMO.04 date February 8, 2023, respectively), which documents our review of the latest site servicing and grading plans for the subject site.

In summary, the grading is considered acceptable, from a geotechnical perspective. Some exceedances were observed in lot gradings at several blocks. Based on this, lightweight fill has been recommended to for use around the subject portions of those blocks to accommodate proposed grading. Grading considered throughout the remainder of the subject site is considered acceptable from a geotechnical perspective.

In addition, the proposed services have sufficient soil cover to provide suitable frost protection without the need for insulation. Additional clay seal locations have been recommended and provided on marked-up service plan drawings appended to our service plan review memo. The proposed site servicing drawings are otherwise considered acceptable from a geotechnical perspective.

The landscape plans were not finalized at the time of writing this report, however, detailed discussions and direction regarding the tree planting restriction were provided to the landscape architect as shown on the grading plan review memo and updated geotechnical report for all the lots within the subject site.

We trust that this information is satisfactory for your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, B.Eng.

Faisal I. Abou-Seido, P.Eng.

PATERSON GROUP

memorandum

re: **Subsoil Infiltration Review**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive – Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett -** CScarlett@minto.com

date: March 7, 2023

file: PG5648-MEMO.06

Further to your request, Paterson Group (Paterson) has prepared the current memorandum report to provide anticipated soil infiltration rates of the backfill material to be used for the proposed development. The following memorandum should be read in conjunction with the current Geotechnical Investigation Report (Paterson Group Report PG5648-1 Revision 5 dated February 8, 2023.

1.0 Proposed Development

It is understood that Stage 6 of the proposed development will consist of townhouses, condominiums, residential dwellings and underground parking structures. Driveways, local roadways and landscaping areas are also anticipated for the proposed development.

2.0 Background Information

A geotechnical field investigation was completed on December 17, 2020. A that time, a total of eight (8) boreholes were extended to a maximum depth of 6.7 m below existing ground surface. The test hole locations were distributed in a manner to provide general coverage of the subject site. Historical geotechnical investigations were also completed within the subject site between 2005 and 2013.

The subsurface profile encountered at the test hole locations generally consists of a fill layer overlying a very stiff to stiff brown silty clay crust followed by a stiff to firm grey silty clay deposit.

Based on field observation during the geotechnical investigation, the long-term groundwater table can be expected at approximately 3 to 4 m below existing ground surface. However, it should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

3.0 Subsoil Infiltration Values

Based on our understanding of the proposed development, subsurface conditions and correspondence with Minto Communities, the foundation drainage system of the underground parking structures located at MT-04 to MT-07 and MT-11 to MT-14 will be backfilled with crushed stone followed by on-site silty clay material.

Based upon previous experience at similar sites in the area with similar stratigraphy, hydraulic conductivity values for the silty clay backfill material are expected to range between **1 x 10^{-8} to 1 x 10^{-6} m/sec**, while estimated infiltration rates are anticipated to vary between **15 and 45 mm/hr**. Variability of these values will be dependent on the compactness and composition/ratio of the silty clay backfill material.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

PATERSON GROUP

memorandum

re: **Geotechnical Response to City Comments**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive – Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett** – CScarlett@minto.com

date: April 14, 2023

file: PG5648-MEMO.08

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to city comments regarding the proposed residential development at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5648-1 Revision 6 dated March 29, 2023 and memorandum PG5648-MEMO.03 dated March 9, 2023.

Comment 2.42

Provide signed and sealed memo confirming that the most recent grading, servicing, and landscape plans have been reviewed and they conform to geotechnical recommendations.

Paterson (Feb 2023): Noted. Signed and sealed memo from geotechnical engineer will be included within the coming days.

City (March 2023):

- *MEMO.03 noted that memo includes grade raise/lightweight fill recommendations, frost protection recommendations. Please ensure final grading plan is reviewed to ensure conformance with recommended modifications.*
- *MEMO.03 mentions surcharge program completion. This is not mentioned in the report. Please add discussion related to surcharge program. Error in surcharge program in Memo.03 first round*
- *Please ensure all memos and report are merged to form one single document prior to final submission.*

Response: revised in our latest grading plan review memorandum PG5648-MEMO.03 Revision 2 dated March 8, 2023.

Comment 2.44

Section 6.7 indicates that the SMCS policy requirement of minimum 2.1m of cover to USF does not need to be followed due to the thickness of fill that exists above the clay and that no building USFs will extend into the clay deposit. Confirm that this recommendation is appropriate for all units proposed as lain out in the most recent plans. What is the typical nature of fill across the site? Section 6.3 states that excavation will be through a silty clay fill. Will this fill behave as a clay soil and still require the 2.1m of cover above USF?

Paterson (Feb 2023): The fill within the subject site has a mixture of varying amounts of silty clay, sand, gravel and crushed stone. The fill was found to be mostly dry with minimal to no water content. Therefore, the tree planting restrictions should not apply to the proposed building across the entirety of the proposed phase for the following reasons:

- *A number of buildings will include a full underground garage that will be founded over shallow footings placed between 3 to 3.5 m below existing grade. Generally, buildings with full underground parking levels do not fall under the tree planting restrictions due to the depth of footings.*

- *For the proposed residential dwellings, several lots will be founded over varying thicknesses of engineered fill placed over the native silty clay layer. The extent of the engineered fill will act as a barrier to the growth of the tree roots which eliminates the impact of trees on the proposed buildings. Furthermore, the clay soil within the subject phase has a high shear strength and low moisture content. These properties are indicative of low-sensitivity soil. Therefore, it is recommended the vertical extent of 2.1 m should be reduced to 1.8 m for the proposed buildings. In addition, the requirements to set the trees back to 4.5 m can be reduced to 3 m based on our experience with the tree planting impacts on buildings founded over engineered fill.*

- *Due to the nature of the existing fill, proof rolling is expected where the fill will be left surrounding the proposed buildings. The compaction levels will be reviewed and approved by Paterson at the time of construction. Due to the dryness of the existing fill, the tree roots are expected to have minimal to no impact on landscaped areas surrounding the proposed dwellings.*

City (March 2023): Noted. In past situations where 2.1m of cover cannot be provided, the city has allowed engineered fill beneath the footings to make up the difference. In this case, where 1.8m of cover is provided over footings in place of 2.1m, 0.3m of engineered fill would be provided beneath the footing to make up the difference. Is this what is meant above when stating engineered fill will act as a barrier? Ensure other City of Ottawa Tree Planting in Clay Soils requirements outlined in section 6.7 of report are followed and coordinated with civil and landscaping.

Response:

To summarize the recommendations provided in Subsection 6.7, due to the amount of fill material that will be present between underside of footing and the in-situ, undisturbed, native clay deposit, it is our opinion that this existing fill material will act similarly to crushed stone fill material as a barrier to tree root migration into the underlying clay deposit. Therefore, despite the footings for the proposed residential dwellings being located shallower than 2.1 m below finished grade (and not in accordance with the City of Ottawa's SMCS), the existing fill material between USF and the clay deposit will provide sufficient vertical separation between finished grade and the underlying clay deposit. Based on this, it would be considered appropriate to consider reducing the minimum vertical separation finished grade and USF from 2.1 to 1.8 m for residential dwellings located throughout the subject site from a geotechnical perspective.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Puneet Bandi, B.Eng.

Faisal I. Abou-Seido, P.Eng.

PATERSON GROUP

memorandum

re: **Geotechnical Response to City Comments**
Proposed Residential Development
Arcadia – Stage 6
Campeau Drive – Ottawa

to: Minto Communities – **Mr. Curtiss Scarlett** – CScarlett@minto.com

date: August 1, 2023

file: PG5648-MEMO.10 Revision 1

Further to your request and authorization, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical responses to city comments regarding the proposed residential development at the aforementioned site. This memorandum should be read in conjunction with Paterson Geotechnical Report PG5648-1 Revision 8 dated August 1, 2023 and memorandum PG5648-MEMO.03 Revision 4 dated August 1, 2023.

Comment 1.4

Understood, revised MEMO.03, revision 2, dated March 13, 2023, from Paterson noted. Please ensure MEMO.03 is updated to indicate the most recent version of the civil plans have been reviewed following the slight reconfiguration of the west side of the site. Note that MEMO.05 dated February 10, 2023, is included in the consolidated Geotechnical Report and still indicates the requirement for lightweight fill in some locations. Should this be removed or is LWF necessary? Unclear. Also, ensure review of landscape plans and coordination with landscape architect as it relates to tree planting setbacks recommendations in MEMO.03.

Response: Reference should be made to our Grading Plan Review memo PG5648-MEMO.03 Revision 4 dated August 1, 2023. In summary, no exceedances have been noted to the permissible grade raises. Therefore, the proposed grades are considered acceptable from a geotechnical perspective. Based on the above, no lightweight fill is required throughout the subject site from a geotechnical perspective.

Please, note that recommendations associated with MEMO.05 are no longer applicable to the subject site since lightweight fill will not be required throughout the subject site. Reference should be made to our Geotechnical Report PG5648-1 Revision 8 dated August 1, 2023.

Paterson reviewed the following landscape plans and details prepared by NAK for Stage 6 of the aforementioned residential development:

- Landscape Plan – Minto Communities Arcadia Stage 6 – Job No. 21-089 – Sheets L01 to L03 Revision 4 dated April 14, 2023.
- Landscape Plan – Minto Communities Arcadia Stage 6 – Job No. 21-089 – Sheets D01 and D02 Revision 4 dated April 14, 2023.

Based on our review, the landscape plans meet our requirements and are considered acceptable from a geotechnical perspective.

Comment 1.8

As noted in the comment please provide confirmation from the Geotechnical Engineer that no weeping tiles and hence no connection to the storm sewer are an acceptable design.

The metro townhouse units (MT units) should include the symbol on the grading plan showing no basement. The freeboard is not to be from the HGL to the lowest liveable unit (0.4m higher than the USF shown in the drawings). It is from the underside of footing. OSDG do not say anything about a "liveable" unit. You can have a basement and it is not classified as liveable. Please provide confirmation from the Geotechnical Engineer that no weeping tiles are acceptable for the MT units.

Response: Since the proposed Block 20 to Block 28 are not expected to be provided with basement levels, the perimeter foundation drainage system is considered optional at the aforementioned buildings. However, in areas where hardscaping or pavement structures will abut the building footprints, a perimeter foundation drainage system is recommended to promote proper drainage of the area to decrease the chances of differential settlements along the hardscaping areas.

If provided, the system should consist of a 150 mm diameter perforated corrugated plastic pipe wrapped in a geosock and surrounded by 150 mm of 10 mm clear crushed stone. The clear stone should be wrapped in a non-woven geotextile. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

The civil engineer consultant is expected to address the remaining comments regarding the grading plan.

We trust that the current submission meets your immediate requirements.

Best Regards,

Paterson Group Inc.

Drew Petahtegoose, B.Eng.

Faisal I. Abou-Seido, P.Eng.