Geotechnical Investigation

Proposed Residential Development

40 Beechcliffe Street
Ottawa, Ontario

Prepared for Habitat for Humanity

Report PG7521-1 dated May 27, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Habitat for Humanity to undertake a geotechnical investigation for the proposed residential development to be located at 40 Beechcliffe Street in the City of Ottawa, Ontario (reference should be made 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 for the design of the proposed development including construction considerations which may affect its design.

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

Investigating the presence or potential presence of contamination on the subject site was not part of the scope of work of the present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of several low-rise townhouse-style residential dwellings, each provided with one basement level. The proposed structures are anticipated to be surrounded by landscaped areas, associated driveways, and a 2 m high soil berm along the eastern portion of the subject site. It is expected that the proposed residential development will be municipally serviced and provided with rear-yard stormwater management systems.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on May 7 to May 8, 2025, and consisted of advancing a total of four (4) boreholes and four (4) test pits to a maximum depth of 6.7 and 3.0 m, respectively, below the existing ground surface. A previous investigation was conducted by others in which seventeen (17) boreholes and eight (8) test pits were advanced to a maximum depth of 7.6 and 2.2 m, respectively, below the existing ground surface.

The test hole locations were determined in the field by Paterson personnel and distributed in a manner to provide general coverage of the proposed residential development taking into consideration site features and underground utilities. The test hole locations are presented on Drawing PG7521-1 - Test Hole Location Plan included in Appendix 2.

Boreholes were advanced using a track-mounted auger drill rig operated by a two-person crew. The test pits were completed using a backhoe at the selected locations and backfilled with the excavated soil upon completion. The test hole procedure consisted of augering or excavating to the required depths at the selected locations and sampling the overburden soils. All fieldwork was conducted under the full-time supervision of our personnel under the direction of a senior engineer from Paterson's Geotechnical Division.

Sampling and In Situ Testing

Soil samples collected from the boreholes were either recovered directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. Soil samples collected from the test pits were recovered from the side walls of the open excavation as grab (G) samples. All soil samples were visually inspected and initially classified on site.

The auger, split-spoon, and grab samples were placed in sealed plastic bags and transported to our laboratory for further examination and classification. 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 presented in Appendix 1.

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

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

The overburden thickness was evaluated by a dynamic cone penetration test (DCPT) completed at borehole BH 4-25 for the current field program. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1.

Groundwater Level Readings

A flexible polyethylene standpipe was installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the current sampling program.

Monitoring wells were previously installed by others at MW101, MW103, MW105D, MW109D, MW110D and MW111D as part of the previous investigations. The groundwater observations are discussed in Subsection 4.3 of this report and presented on the Soil Profile and Test Data Sheets in Appendix 1.

3.2 Field Survey

The test hole locations and the ground surface elevation at each test hole location were surveyed by Paterson using a handheld GPS unit and referenced to a geodetic datum. The test pit locations are presented on Drawing PG7521-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

The soil samples recovered from the test holes were examined in our laboratory to review the results of the field logging. A total of two (2) Atterberg limits tests and one (1) grain-size distribution test were completed on selected soil samples recovered during the current investigation. The results of the testing are discussed in Subsection 4.2 and presented in Appendix 1 of this report.

Sample Storage

All samples recovered during the current investigation 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.

3.4 Analytical Testing

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

3.5 In-Situ Infiltration Testing

In-situ infiltration testing was conducted using a Pask (Constant Head Well) Permeameter to estimate infiltration rates of the unsaturated surficial soils at the subject site. The tests were conducted at four (4) test pit locations. The test pits were excavated in approximately 0.5 m increments to allow for safe entry into the pits, as well as infiltration testing to be conducted at different elevations.

At each location, two (2) to four (4) infiltration tests were conducted. At approximately 0.3 to 0.5 m above each testing elevation, an 83 mm auger hole was excavated to the desired testing elevation using a Riverside/Bucket. Soils from the auger flights were visually inspected and initially classified on-site. The tests were conducted by filling the permeameter reservoir with water and inverting it into the hole, ensuring it was relatively vertical and rested at the bottom of the hole.

The water level of the reservoir was monitored at 0.5-to-1-minute intervals until the rate of fall out of the permeameter reached equilibrium, known as quasi “steady state” flow rate. Quasi steady state flow can be considered to have been obtained after measuring 3 to 5 consecutive rate of fall readings with identical values. The values for the steady state rate of fall were recorded for each location.

The steady state rate of fall was converted to a field saturated hydraulic conductivity value (K_{fs}) using the Engineering Technology Canada Ltd. conversion tables. Unfactored infiltration rates were estimated based on the methodology outlined in the Ontario Ministry of Municipal Affairs and Housing – Supplementary Guidelines to the Ontario Building Code, 1997 – SG-6 – Percolation Time and Soil Descriptions. The testing results are further discussed in Subsection 4.4.

4.0 Observations

4.1 Surface Conditions

The subject site currently consists of vacant grassed land. The site is bordered to the north by an existing railway corridor, to the east by undeveloped land and further by Woodroffe Avenue, to the south by undeveloped land and further by Knoxdale Road and to the west by Beechcliffe Street. The site is relatively flat and approximately at grade with the adjacent roadway (Beechcliffe Street).

An existing slope was observed between Woodroffe Avenue and the eastern boundary of the neighboring parcel along the eastern portion of the subject site. The slope ranges in approximate height between 0.3 to 4 m high, with steepness ranging between 6.6H:1V to 2.8H:1V. Due to the presence of this neighbouring slope, a slope stability assessment was completed. The results of the slope stability assessment are discussed further in Subsection 6.9 of this report.

Due to the potential for a future Ottawa Light Rail Transit (LRT) station on the neighbouring property to the east, a proximity assessment was completed for the subject site. Reference should be made to Subsection 6.10 of this report for further discussion.

It should be noted that there is an existing sanitary sewer alignment throughout the southern portion of the subject site between Beechcliffe Street and Woodroffe Avenue. Additionally, there is a sewer easement containing storm and sanitary sewer alignments that bisect the subject site.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consisted of fill underlain by a layer of sandy silt, further underlain by a layer of silty clay or silty sand, underlain by a sand deposit.

The fill layer was noted to consist of brown silty sand or brown silty clay with various amounts of gravel, cobbles and construction debris. The fill layer was observed to extend to approximate depths ranging between 0.8 to 2.1 m below the existing ground surface. At several test hole locations, the fill layer was observed to be underlain by a layer of compact sandy silt which extended to approximate depths ranging between 1.9 to 4.3 m below the existing ground surface.

At other test hole locations, the fill layer was observed to be underlain by a deposit of stiff to firm brown silty clay, followed by a layer of firm grey silty clay, which extended to approximate depths ranging between 2 to 5.3 m below the existing ground surface. A deposit of loose to compact brown sand to silty sand was encountered below the aforementioned soil layers at all test hole locations and was observed to extend to approximate depths ranging between 1.6 to 6.7 m below the existing ground surface. The silty clay deposit was observed to be discontinuous along the eastern portion of the subject.

DCPT testing was conducted in BH 4-25 and practical refusal to the DCPT was encountered at 15.5 m below the 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.

It should be noted that there is an existing sanitary line that crosses through the southern portion of the subject site between Beechcliffe Street and Woodroffe Avenue. Additionally, there is one sanitary and one storm line that intersects Phase 1 (southern portion) and Phase 2 (northern portion) of the subject site, both lines connect from Beechcliffe Street to Woodroffe Avenue.

Atterberg Limits Testing

Atterberg limits testing, as well as associated moisture content testing, was completed on the recovered silty clay samples at selected locations throughout the subject site. The results are summarized in Table 1 and presented on the Grain Size Distribution sheet in Appendix 1.

Table 1 – Summary of Atterberg Limits Tests

Sample	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Classification
BH 1-25 – SS4	31	35	19	16	CL
BH 2-25 – SS4	44	44	22	22	CL

Notes: CL: Inorganic Clay of Low Plasticity

Grain Size Distribution Testing

Grain size distribution testing was completed on one (1) selected soil sample. The results of the grain size analysis are summarized in Table 2 and presented on the Grain-size Distribution Testing Results sheets in Appendix 1.

Table 2 – Grain Size Distribution Testing

Sample	Gravel %	Sand %	Silt %	Clay %
BH 1-25 – SS8	3.9	92.4	3.7	

Bedrock

Based on available geological mapping, bedrock in the area of the subject site consists of dolostone of the Oxford formation with overburden drift thicknesses between 15 to 25 m.

4.3 Groundwater

Groundwater levels were measured at the installed standpipe piezometers and at the existing monitoring wells installed by others on May 14, 2025. The measured groundwater levels are summarized below in Table 3 and presented on the Soil Profile and Test Data sheets in Appendix 1.

It should be noted that surface water can become trapped within a backfilled borehole column, which can lead to higher-than-normal groundwater level readings. Additionally, groundwater levels are subject to seasonal fluctuations. Therefore, groundwater levels could vary at the time of construction.

Table 3 – Summary of Groundwater Levels

Test Hole Number	Method	Ground Surface Elevation (m)	Measured Groundwater Level		Date
			Depth (m)	Elevation (m)	
Current Investigation					
BH 1-25	Piezometer	88.54	4.94	83.60	May 14, 2025
BH 2-25	Piezometer	88.57	4.92	83.65	May 14, 2025
BH 3-25	Piezometer	88.00	4.29	83.71	May 14, 2025
BH 4-25	Piezometer	88.33	4.48	83.85	May 14, 2025
Previous Investigation					
MW 101	Monitoring Well	88.64	2.03	86.61	May 14, 2025
MW 103	Monitoring Well	88.61	2.41	86.20	May 14, 2025
MW 105D	Monitoring Well	88.62	4.66	83.96	May 14, 2025
MW 109D	Monitoring Well	88.32	4.25	84.07	May 14, 2025
MW 110D	Monitoring Well	88.48	4.38	84.10	May 14, 2025
MW 111	Monitoring Well	88.69	4.28	84.41	May 14, 2025

Notes: The ground surface elevation at each test hole location was referenced to a geodetic datum.

4.4 In-Situ Infiltration Testing Results

In-situ infiltration tests were conducted at four (4) test pit locations to provide general coverage of the subject site on May 8, 2025. Field saturated hydraulic conductivity (K_{fs}) values and estimated unfactored infiltration rates are presented in Table 4 below.

Field saturated hydraulic conductivity values were determined using the Engineering Technologies Canada Ltd. (ETC) reference tables provided in the most recent ETC Pask Permeameter User Guide dated July 2018. Unfactored infiltration rates were estimated based on the methodology outlined in the Ontario Ministry of Municipal Affairs and Housing – Supplementary Guidelines to the Ontario Building Code, 1997 – SG-6 – Percolation Time and Soil Descriptions.

Table 4 – Field Saturated Hydraulic Conductivity Results and Estimated Unfactored Infiltration Rates

Test Pit ID	Ground Surface Elevation (m)	Infiltration Testing Depth (m)	Infiltration Testing Elevation (m)	K_{fs} (m/sec)	Infiltration Rate (mm/hr)*	Soil Type
TP 1-25	88.58	1.62	86.96	5.3×10^{-7}	39	Sandy Silt
		2.10	86.48	2.1×10^{-5}	104	Silty Sand
TP 2-25	88.35	1.60	86.75	1.3×10^{-5}	92	Sandy Silt
		2.10	86.25	5.3×10^{-6}	72	Sandy Silt
TP3-25	88.41	0.90	87.51	1.1×10^{-6}	47	Fill
		1.80	86.61	1.1×10^{-6}	47	Sandy Silt
TP4-25	88.71	0.50	88.21	5.3×10^{-7}	39	Fill
		1.80	86.91	5.3×10^{-7}	39	Sandy Silt
		2.60	86.11	5.5×10^{-7}	39	Clayey Silt / Silty Clay
		3.00	85.71	2.7×10^{-7}	33	Clayey Silt / Silty Clay

*The estimated infiltration rates are unfactored. A safety correction factor must be applied to the infiltration rates prior to the use for design purposes.

The observed K_{fs} values and unfactored infiltration rates of the shallow unsaturated soils at the subject site ranged between 2.7×10^{-7} to 2.5×10^{-5} m/sec and 33 to 104 mm/hr, respectively.

The large range of observed K_{fs} values and unfactored infiltration rates are due to the variability in composition and consistency of the material encountered across the subject site but are generally consistent with similar material Paterson has encountered on other sites and typical published values.

It is important to note that the estimated infiltration rates derived from the K_{fs} values are unfactored. Prior to use for design purposes, a safety correction factor will need to be applied to the above infiltration rates. It should also be noted that for most Low Impact Development (LID) measures, the invert of the system should be planned to be in accordance with the latest and pertinent City of Ottawa design guidelines. Additional testing may be required depending on the depth and size of the proposed LID system.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential development. Based on the results of the field investigation, the proposed buildings may be founded on conventional shallow foundations placed on the in-situ, undisturbed, compact sandy silt, stiff silty clay or an engineered fill pad placed upon an approved in-situ fill bearing surface.

Due to the presence of the silty clay deposit, the subject site is subjected to a permissible grade raise restriction. Our permissible grade raise restriction recommendations are discussed further in Subsection 5.3.

Paterson conducted a review of the conditions of the slope on the neighbouring property to the east. The results and associated Limit of Hazard Lands designation line are presented on the associated plans in Appendix 2 and are discussed further in Subsection 6.9.

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 material containing a high content of organic materials, should be stripped from under the proposed building footprints and other settlement sensitive structures such as roadways and service pipes.

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

Where fill is encountered at the founding depth of the proposed buildings it is recommended to sub-excavate the fill by a minimum of 500 mm. The fill would be recommended to be proof-rolled as described in the following sections. Provided proof-rolling demonstrates adequate conditions, the in-situ fill may be left in place below the building footprint. Inadeqaute and poor-performing fill should be removed and reinstated with engineered fill (described in the following section) at the discretion of Paterson field personnel. If native in-situ soils are encountered above the 500 mm sub-excavation depth, the sub-excavation may terminate at the fill-native soil interface and reviewed and approved by Paterson field personnel.

Fill Placement – Buildings, Services, Berm and Other Uses

Fill used for grading beneath the proposed buildings should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building and paved areas should be compacted to at least 98% of the material's standard Proctor maximum dry density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. This material should be spread in thin lifts and compacted by the tracks of the spreading equipment to minimize voids.

If this material is to be used to build up the subgrade level for areas to be paved or the proposed eastern 2m high soil berm, it should be compacted in maximum 300 mm thick loose lifts and by several passes of a suitably-sized sheepsfoot roller. The site-generated fill should consist of workable soil fill free of organic debris (topsoil, logs, stumps, etc.), inorganic material and/or stones/cobbles larger than 100 mm in their longest dimension. Fill meeting the aforementioned conditions are considered suitable for re-use throughout the subject site. Wet site-generated fill, such as the grey silty clay or grey sandy soils, will be saturated and are expected to be difficult to re-use as the high-water contents make compacting impractical without an extensive drying period. Therefore, those soils are not anticipated to be suitable for this purpose.

Soils intended for re-use which become frozen and/or which have excessive moisture contents will not be considered suitable for re-use at the subject site. Placement of this material during winter months increases the risk of placing frozen material which is expected to result in future poor performing areas that will require future repair due to long-term thawing and higher than tolerable amounts of settlement from placing frozen material. This process should be reviewed and approved by Paterson field personnel upon completion of each lift and who are experienced in reviewing the placement of soil fill in this manner.

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 CCW MiraDRAIN 2000 or Delta-Teraxx.

Proof Rolling Below Building Footprints

Based on the results of the field investigations, fill may be encountered at the founding depth of the proposed structures. The fill is expected to consist of workable silty sand to silty clay fill in a loose to compact state of compactness. As indicated in the preceding section, where the fill is encountered at the founding depth of the proposed structures, the fill surface should be sub-excavated a minimum depth of 500 mm below the founding depth of the proposed structures.

The sub-excavated fill surface would be proof-rolled thereafter using a suitably sized vibratory sheepsfoot roller making several passes over the fill surface under dry and above-freezing conditions and the supervision of Paterson field personnel. Proof-rolling will be undertaken to re-compact the fill layer and to identify areas of poor performing fill and/or soft-spots that may be present. All soft spots or inadequately performing fill would be advised to be removed by Paterson field personnel and reinstate with engineered fill upon completion of additional proof-rolling.

Provided all soft spots are removed and the fill surface adequately supports the earthworks equipment throughout the building excavation and proof-rolling process, the fill layer may be reinstated upon by the use of engineered fill as described in the preceding paragraphs. In summary, engineered fill, consisting of OPSS Granular A and/or OPSS Granular B Type II crushed stone may be placed in 300 mm maximum thick loose lifts and each lift compacted to a minimum of 98% of the materials SPMDD. All proof-rolling and compaction efforts should be verified by Paterson personnel at the time of construction.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 2 m wide, and pad footings, up to 4 m wide, placed in an undisturbed, compact silty sand, very stiff to firm silty clay or engineered fill over an approved fill or native soil bearing surface can be designed using a bearing resistance value at SLS of **100 kPa** and a factored bearing resistance value at ULS of **150 kPa** incorporating a geotechnical factor of 0.5 at ULS.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, have been removed prior to the placement of concrete for footings. The bearing resistance value at SLS given for footings will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

Proof Rolling and Subgrade Improvement for Loose Sand Below Footings

Where the sandy silt or sand bearing surface for footings is considered loose by Paterson field personnel at the time of construction, it would be recommended to proof-roll the bearing surface prior to forming for footings. Proof-rolling is recommended to be undertaken in dry conditions and above freezing temperatures by an adequately sized vibratory roller making several passes to achieve optimal compaction levels.

Depending on the looseness and degree of saturation of loose sandy soils at the time of construction, other measures (additional compaction, sub-excavation and reinstatement of crushed stone fill, mud slab) may be recommended to accommodate site conditions at the time of construction. However, these considerations would be evaluated at the time of construction by Paterson on a building-specific basis and based on observed field conditions.

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 overburden 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 Recommendations

Based on in-situ undrained shear strength testing results within the silty clay deposit, a permissible grade raise restriction of **1 m** above the existing ground surface is recommended for areas where building foundations are founded over the silty clay deposit and considered loading from the proposed eastern soil berm.

Further, the proposed eastern soil berm is anticipated to be approximately 2 m higher than the exiting ground surface. This is considered acceptable from a geotechnical perspective due to the lack of clay soils encountered below the berm footprint and appropriate setback between the proposed building and berm footprints. Therefore, based on the current site plan layout, the proposed grade raise restriction is not considered applicable to the proposed berm, and the proposed berm may be considered up to 2 m higher than the existing grades.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures may be advised by Paterson during the preliminary and detailed design stages to mitigate the risks of unacceptable long-term post construction total and differential settlements amongst settlement sensitive structures.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Site Class X_E** for foundations constructed at the subject site, according to Table 4.1.8.4.A of the 2024 Ontario Building Code (OBC 2024). The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Basement Slab Construction

With the removal of all topsoil and deleterious fill containing significant amounts of organic matter and preparation of the slab subgrade as described in Section 5.2 of this report, the native soil or approved fill, reviewed by Paterson personnel at the time of construction, will be considered acceptable subgrade on which to commence backfilling for floor slab construction.

For structures with basement slabs supported by strip and pad footings, the upper 200 mm of sub-floor fill may consist of 19 mm clear crushed stone.

All backfill material within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of its SPMDD. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II are recommended for backfilling below the floor slab.

5.6 Pavement Design

For design purposes, the pavement structure presented in the following tables could be used for the design of driveways and local residential streets. It should be noted that for local roadways (i.e., Beechcliffe Street) an Ontario Traffic Category B should be used for design purposes.

Table 5 - 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
Notes: **1 - SUBGRADE** - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil	

Table 6 - Recommended Pavement Structure – Local Residential Roadways

Thickness (mm)	Material Description
40	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
450	**SUBBASE** – OPSS Granular B Type II

Notes:
1 - SUBGRADE - Either in situ soils or OPSS Granular B Type I or II material placed over in situ soil.
2 – PAVEMENT STRUCTURE DESIGN – This pavement structure is intended to be used for service trench reinstatement areas along Beechcliffe Street. If City of Ottawa standards exceed these requirements, those pavement structures should be considered for this purpose. All fill placed above the bedding layer of of sewer pipes should be placed in 300 mm thick maximum thick loose lifts and compacted to a minimum of 95% of the materials SPMDD and as described in Section 5.2 of this report for providing a suitable subgrade for roadways.

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

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

Pavement Joint Tie-in for Road Cuts

Where the proposed pavement structure meets an existing pavement structure or a road cut is undertaken to tie-in to existing services, the following recommendations should be followed:

- ❑ A 300 mm wide section of the existing asphalt roadway should be saw cut from the existing pavement edge to provide a sound surface to abut the proposed pavement structure.
- ❑ It is recommended to mill a 300 mm wide and 40 mm deep section of the existing asphalt at the saw cut edge.
- ❑ The proposed pavement structure subbase materials should be tapered no greater than 3H:1V to meet the existing subbase materials.
- ❑ Clean existing granular road subbase materials can be reused upon assessment by Paterson at the time of construction as to its suitability.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone which is 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.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non-frost susceptible granular materials such as clean sand, OPSS Granular B Type I or Type II granular material. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless used in conjunction with a geocomposite drainage membrane, such as CCW MiraDRAIN 2000 or Delta-Teraxx.

All fill placed against the structures should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 98% of the materials SPMDD to support settlement-sensitive surfaces (i.e., hardscaping such as sidewalks) and as described in Section 5.2 of this 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 of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

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

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is expected that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be excavated at 1H:1V or shallower. The shallower slope is required for excavation below groundwater level. The subsurface soils are considered to be mainly a Type 2 and Type 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by Paterson in order to detect if the slopes are exhibiting signs of distress.

Excavation side slopes around the building excavation should be protected from erosion by surface water and rainfall events by the use of secured tarpaulins spanning the length of the side slopes, or other means of erosion protection along their footprint. Efforts should also be made to maintain dry surfaces at the bottom of the excavation footprints and along the bottom of side slopes. Additional measures may be recommended at the time of construction by Paterson.

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

6.4 Pipe Bedding and Backfill

New Site Services

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

The pipe bedding for sewer and water pipes should consist of a minimum of 150 mm of OPSS Granular A material. Where the bedding is located upon a grey silty clay subgrade, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in a maximum 225 mm thick loose lifts and compacted to a minimum of 99% 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 a maximum 225 mm thick loose lifts and compacted to a minimum of 99% of its SPMDD.

It should generally be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay 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 a maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

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.

New Soil Berm and Existing Site Services

Based on our review of proposed grading and servicing concepts, the proposed development will consider the implementation of a soil berm along the eastern property boundary of the subject site. The berm is anticipated to consist of soil fill generated from building and other site-excavations and would generally consist of workable silty clay and sand soils with variable amounts of gravel.

Based on our review, the soil berm will approximately 2 m high and may be constructed within 6.4 m of the existing sanitary alignment along the southern portion of the subject site. Based on our review, the existing 375 mm diameter sanitary pipe alignment invert elevation ranges between 82.61 and 82.44 m between Beechcliffe Street and Woodroffe Avenue.

Based on this information, the approximately 2 m high berm will result in an increase of soil pressure resisted by existing pipes corresponding to less than 5% of the unit weight of the soil berm since the existing pipe is mostly beyond the zone of influence associated with the berm. This is anticipated be an approximate increase of up to 3 kPa resisted by the existing sanitary alignment located up to 6.4 m beyond the proposed berm. This pressure would become negligible (i.e., less than 1 kPa) within several meters along either direction of the alignment.

The existing storm and sanitary pipes located within the servicing easement bisecting the subject site are located more than 11 m from the proposed berms and would result in a significantly lower increase in pressure resulting from the berm and associated development.

The proposed buildings are anticipated to be provided with conventional strip footings with zones of influence that would not impact or be encroach within the footprint of the existing pipes based on the proposed grading concepts.

Based on this assessment, the soil stress increase resulting from the proposed 2 m high berms and associated proposed structures has been evaluated and is anticipated to be of a negligible magnitude to negatively impact the existing site services from a geotechnical perspective.

6.5 Groundwater Control

Groundwater Control for Building Construction

Due to the relatively impervious nature of the silty clay and existing groundwater table depth, it is anticipated that groundwater infiltration into building excavations should be low and controllable using open sumps.

Deeper excavations extending into the sandier overburden and below the groundwater table should be assessed by a specialized dewatering contractor during the design phase. Excavations for site services that extend below the groundwater table and within the more permeable sandy soils are expected to encounter significant influxes of water that are not expected to be able to be readily controlled with conventional open sumps.

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.

Permit to Take Water

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) is not anticipated but may be required <u>if more than 400,000 L/day</u> of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Persons as stipulated under O.Reg. 63/16.

If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application. This requirement may be assessed by the project hydrogeologist (or Paterson) once site servicing drawings are available to assess the depth of excavations against the in-situ overburden and potential groundwater depth that may be encountered during the construction period.

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.

6.6 Winter Construction

Precautions should be provided if winter construction is considered for this project. The subsurface soil conditions 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.

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 carried out in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. 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 analytical testing results show that the sulphate content is less than 0.1%. The results are indicative that Type 10 Portland 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 in indicative of a non-aggressive corrosive environment.

6.8 Landscaping Considerations

Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks for trees planted within a public right-of-way (ROW). Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. The above-noted test results were completed on samples taken at depths between the anticipated underside of footing elevation and a 3.5 m depth below finished grade. The results of our testing are presented in Table 1 in Subsection 4.2.

Low to Medium Potential for Soil Volume Change

A low to medium potential for soil volume change was encountered between the anticipated design underside of footing elevations and 3.5 m below finished grade as per City Guidelines. Based on our Atterberg limits test results, the modified plasticity index does not exceed 40% in these areas. The following tree planting setbacks are recommended for the low to medium potential for soil volume change where trees are located near buildings founded on cohesive soils.

Large trees (mature height over 14 m) can be planted within these areas provided that a tree to foundation setback equal to the full mature height of the tree can be provided (i.e., in a park or other green space).

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 conditions noted below are met:

- ❒ The foundations are founded upon or are underlain by clayey soils. If they are not, as is anticipated for a portion of the subject site, there is no applicable setback.

- ❒ A small tree must be provided with a minimum of 25 m^3 of available soils 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 for sidewalls of structure facing the tree 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), as noted on the Grading Plan.

It is well documented in the literature, and is our experience, that fast-growing trees located near buildings founded on cohesive soils that shrink on drying can result in long-term differential settlements of the structures. Tree varieties that have the most pronounced effect on foundations are seen to consist of poplars, willows and some maples (i.e., Manitoba Maples) and, as such, they should not be considered in the landscaping design.

Aboveground Swimming Pools, Hot Tubs, Decks and Additions

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 neighboring foundations. Pool construction should be assessed against the presence of sewer infrastructure constructed throughout the rear-yards during the permitting review stage. 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 raise restrictions. 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 raise restrictions and should be verified against the footprint of rear-yard sewer infrastructure. Otherwise, standard construction practices are considered acceptable.

6.9 Slope Stability Assessment

The existing slope located beyond the eastern property boundary of the subject site along Woodroffe Avenue ranges between approximate heights of 0.3 to 4 m high, and ranges in approximate steepness between 6.6H:1V to 2.8H:1V. Due to the presence of this neighboring slope and the proposed 2 m high soil berm along the subject sites eastern property boundary, a slope stability assessment was completed.

The slope conditions were reviewed by Paterson field personnel as part of the geotechnical investigation on May 2, 2025. The slope was noted to be covered with vegetation and terminating into a concrete curb and further by concrete sidewalks at the base of the slope. The slope was noted to be in stable condition with no signs of active erosion or movement. No ponding water or watercourses were observed at the top or bottom of the slope at the time of our visit.

A slope stability analysis was carried out to determine the required geotechnical setback from the top of slope. One (1) slope cross-sections was studied as the worst-case scenario with regards to potential loading conditions. The cross-section locations are presented on Drawing PG7521- 1 – Test Hole Location Plan in Appendix 2.

Slope Stability Analysis

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 simplified 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 favoring failure.
Theoretically, a factor of safety of 1.0 represents a condition where the slope is marginally 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 that 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. The cross-section was analyzed based on the proposed conditions taking into consideration the site's features observed during our site visit, our review of the available geotechnical information, and our experience in the general area.

Subsoil conditions at the cross-section were inferred based on the subsoil information recovered during the geotechnical investigation and general knowledge of the geology of the area. The effective strength soil parameters used for static analysis are presented in Table 7 in the following page.

Table 7 – Effective Soil and Material Parameters (Static Analysis)			
Soil Layer	**Unit Weight (kN/m^3)**	**Friction Angle (degrees)**	**Cohesion (kPa)**
Existing and Future Fill	19	30	1
Silty Sand/Sand	19	30	0
Brown Silty Clay	18	33	5
Grey Silty Clay	17	33	10

The total strength parameters for seismic analysis were chosen based on the in situ undrained shear strengths recovered within the boreholes completed at the time of the geotechnical investigation and based on our general knowledge of the geology of the area. The strength parameters used for the seismic analysis are presented in Table 8 below.

Table 8 – Total Soil and Material Parameters (Seismic Analysis)			
Soil Layer	**Unit Weight (kN/m^3)**	**Friction Angle (degrees)**	**Cohesion (kPa)**
Existing and Future Fill	19	30	1
Silty Sand/Sand	19	30	0
Brown Silty Clay	18	-	80
Stiff Grey Silty Clay	17	-	60

Static Loading Analysis

The results of the static analysis for the proposed conditions are shown on Figure 1A in Appendix 2. The factor of safety for existing conditions at Section A was estimated as approximately 2.1 and exceeds 1.5.

Seismic Loading Analysis

An analysis considering seismic loading for the existing site conditions was also completed. A horizontal ground acceleration of 0.197 g (half of the subject sites published current National Building Code of Canada's peak ground acceleration values) was considered for the slope. A factor of safety of 1.1 is considered to be satisfactory for stability analyses including seismic loading.

The results of the seismic analysis for proposed conditions are shown on Figure 1B in Appendix 2. The factor of safety for existing conditions at Section A was estimated as approximately 1.3 and exceeds 1.1.

Stable Slope Allowance

Based on the results of our analysis, the subject slopes are considered stable based on the estimated factors of safety. Therefore, there is no applicable stable slope setback for the subject slope that would be considered throughout the subject site.

Toe Erosion Allowance

A Toe Erosion Setback is not considered applicable to the subject site since the toe of the slope is not subject to erosion by active watercourses due to the presence of hardscaping and cast-in-place concrete curbs at the bottom of the slope.

Erosion Access Allowance

Given that toe erosion is not anticipated, an Erosion Access Allowance setback for future slope maintenance is not deemed necessary for the subject site.

Total Geotechnical Setback – Limit of Hazard Lands

Based on our review, a Limit of Hazard Lands designation line is not considered applicable to the subject site since the subject slopes are considered stable and acceptable to support the proposed development from a geotechnical perspective. This analysis considers the stability of the proposed 2 m high berms that will be constructed throughout the rear-yards and eastern property boundary for the subject site.

6.10 O-Train Proximity Assessment – Knoxdale Station

Proposed O-Train Station Background

Based on the publicly available drawings and renderings published by the City of Ottawa, the O-Train will host a transit corridor along Woodroffe Avenue and the Knoxdale Stations throughout the parcel bound between the subject site and Woodroffe Avenue.

The Knoxdale Station is anticipated to consist of a raised-concrete rail structure for conveying the future trains and an at- and above-ground station located throughout the southern half of the subject parcel. Based on our understanding of the soils encountered throughout the subject site and knowledge of the area's geology, Paterson anticipates the foundations for the Knoxdale Station would consist of conventional spread footing foundations. Paterson also anticipates that the raised-rail portion of the O-Train alignment connecting to the Knoxdale Station would be supported upon large spread footing foundations, similar to raft or mat foundations, or, consist of drilled shaft caissons extending to glacial till or bedrock.

Paterson anticipates that the proposed residential development will exist prior to the initiation of construction in support of the future Knoxdale Station.

Influence of Proposed Development on Knoxdale Station

Based on existing soils information and project design details, the footings for the proposed residential buildings will be supported by conventional spread footing foundations founded upon compact silty sand, stiff silty clay or engineered fill underlain by existing fill bearing mediums. Lateral loads imposed by the proposed buildings will be transferred at a 1.5H:1V zone of influence from the outside face of footings.

It is further anticipated that a vertical separation of approximately 18 m will be present between the founding depth of the proposed buildings and the property boundary associated with the O-Train. Considering this horizontal separation between the two developments, the zone of influence created by the proposed buildings footings is not anticipated to impact or extend into the zone of influence or footprints of the proposed O-Train infrastructure.

However, the type of foundations and depth of infrastructure and structures that will be constructed throughout the Knoxdale Station parcel are currently unknown. Therefore, it will be considered a requirement that excavations planned throughout the Knoxdale Station parcel consider the as-built information of the proposed buildings when assessing excavation depths and potential requirements to install temporary shoring systems to appropriately retain soils supporting the future residential dwellings.

It is anticipated that above-grade station structures throughout the Knoxdale Station parcel would not require temporary shoring systems, however, this should be assessed by the City of Ottawa during the design phase of the Knoxdale Station once excavation and design details are developed to assess this appropriately.

Dewatering systems in support of deeper excavations throughout the Knoxdale Station parcel would likely be required for excavations extending below the groundwater table and sand deposit. These systems would be implemented to undertake deeper excavations in the dry and where conventional sumps would be insufficient to maintain dewatered conditions.

Due to the presence of loose sands throughout the overburden, a dewatering system that lowers the groundwater table prior to undertaking excavations would be appropriate for the Knoxdale Station parcel. This, in conjunction with appropriately chosen soil retention systems, would mitigate the potential for excavation sidewalls below the groundwater table to collapse or become susceptible to running-sand conditions if handled with conventional open sumps.

The requirement for these systems should be evaluated by the City of Ottawa and their contractors specialized dewatering contractor during the design stage of the Knoxdale Station to mitigate the potential for a running sand condition to occur within deeper excavations undertaken throughout the Knoxdale Station parcel. This condition should be assessed to mitigate potential impacts to soil support rendered to the future residential dwellings by the in-situ overburden.

Temporary dewatering for construction of the Knoxdale Station is not anticipated to be undertaken for a sufficient period to result in dewatering of the clay deposit encountered throughout the subject site. It is generally not anticipated that dewatering in support of construction for the Knoxdale Station would impact the clay deposit supporting a portion of the future residential dwellings, however, this would be assessed by a geotechnical consultant and hydrogeologist during the Knoxdale Station design stage and once foundation and excavation types are known.

All temporary shoring systems considered throughout the subject site should be chosen to consider the presence of loose non-cohesive soils that are anticipated to be present east of the boundary of the subject site.

Based on the available timelines, the proposed residential development should not be evaluated as new construction when considering its impact on the O-Train since the residential dwellings and associated infrastructure will exist prior to construction of the Knoxdale Station. Therefore, it is recommended that pre-construction surveys anticipated for the construction of the Knoxdale Station account for the future residential buildings and associated rear-yard sewer infrastructure to be located at the subject site. Consideration should be given to performing vibration monitoring programs should a deep-foundation solution be proposed that would introduce significant vibrations to the surrounding area (i.e. drilled and rock-socketed caisson piles, driven piles, etc.)

Further, as-built information should be captured during the construction phases of the future sewer and foundation structures that will be considered throughout the proposed residential development for planning future O-Train design and construction assessments.

Proximity Study Requirements

It is understood that a Level 1 O-Train Proximity Study is required where the proposed development is located within the City of Ottawa's Development Zone of Influence. However, from a geotechnical perspective, the subject site will not negatively impact or affect the area of or the future infrastructure associated with the future Knoxdale Station.

Based on our understanding of the proposed development and the future Confederation Line West Extension, a Level 1 O-Train Proximity Study is not considered to be required for the proposed development, from a geotechnical perspective.

7.0 Recommendations

It is recommended that the following be carried out by Paterson once design details of the proposed development have been prepared:

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

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

- Review and inspection of the installation of the foundation drainage systems.
- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials.
- 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 and follow-up field density tests to determine the level of compaction achieved.
- 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 provided in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the drawings and specifications are completed.

A geotechnical investigation of this nature is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

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

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

Paterson Group Inc.

Nicholas F. R. Versolato, CPI, B.Eng.

Drew Petahtegoose, P.Eng.

LICENSED PROFESSIONAL ENGINEER
May 27, 2025
D. J. PETAHTEGOOSE
100568013
PROVINCE OF ONTARIO

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SOIL PROFILE AND TEST DATA SHEETS BY OTHERS

SYMBOLS AND TERMS

ATTERBERG TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING RESULTS

ANALYTICAL TESTING RESULTS

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 363234.09 **NORTHING:** 5022088.34 **ELEVATION:** 88.54

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: May 7, 2025

FILE NO. : PG7521

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	Shear strength (kPa)
GROUND SURFACE					
TOPSOIL 0.18m [88.36m]					
FILL: Very stiff, brown silty clay, some gravel and concrete 1.45m [87.09m]	AU 1				
	SS 2	62	2-4-3-4 7		
Very stiff to firm, brown **SILTY CLAY** to **CLAYEY SILT**, trace sand	SS 3	75	2-5-5-4 10		
	SS 4	4	1-1-1-1 2		
- Grey by 3.7 m depth	SS 5	100	1-1-0-0 1		
	SS 6	83	P		▲31
5.26m [83.28m]	SS 7	100	P		△14, ▲34
Compact, brown **SAND**, trace gravel 5.94m [82.60m]	SS 8	46	2-4-4-5 8		
End of Borehole					
(GWL at 4.94 m depth - May 14, 2025)					

Legend: ■ PEN. RESIST. (BLOWS/0.3m); DCPT (50mm DIA. CONE); △ REMOULDED SHEAR STRENGTH (kPa); ▲ UNDRAINED SHEAR STRENGTH (kPa); PL (%) WATER CONTENT (%) LL (%)

Columns: STRATA PLOT; DEPTH (m) 0–10; PIEZOMETER CONSTRUCTION; ELEVATION (m) 88–79

Piezometer: 4.94 m 2025-05-14

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SOIL PROFILE AND TEST DATA
Geotechnical Investigation
40 Beechcliffe Street, Ottawa, Ontario

PATERSON GROUP

COORD. SYS.: MTM ZONE 9 **EASTING:** 363262.59 **NORTHING:** 5022010.35 **ELEVATION:** 88.57

PROJECT: Proposed Residential Development
ADVANCED BY: CME-55 Low Clearance Drill
REMARKS:
DATE: May 7, 2025

FILE NO. : PG7521
HOLE NO. : BH 2-25

SAMPLE DESCRIPTION	Depth (m) to base [Elev.]	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
GROUND SURFACE					
TOPSOIL	0.25m [88.32m]				
FILL: brown silty clay, some gravel, trace rootlets	0.69m [87.88m]	AU 1			
FILL: Compact, brown silty sand, with gravel, rock fragments and cobbles	1.45m [87.12m]	SS 2	21	11-11-4-2 15	
Compact, reddish brown **SANDY SILT**	2.21m [86.36m]	SS 3	100	3-4-6-6 10	
Stiff to firm, brown **SILTY CLAY** to **CLAYEY SILT**	3.73m [84.84m]	SS 4	100	1-1-1-1 2	
		SS 5	75	P	
Compact, brown **SAND**, trace gravel	6.71m [81.86m]	SS 6	46	2-7-9-7 16	
		SS 7	67	6-8-9-5 17	
		SS 8	67	3-5-8-7 13	
		SS 9	67	2-2-4-5 6	
End of Borehole (GWL at 4.92 m depth - May 14, 2025)					

■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

Shear strength at approx. 3.4 m depth: △ 10, ▲ 34

PIEZOMETER CONSTRUCTION: water level 4.92 m 2025-05-14

ELEVATION (m): 88, 87, 86, 85, 84, 83, 82, 81, 80, 79

DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 363290.69 **NORTHING:** 5021942.63 **ELEVATION:** 88.00

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: May 7, 2025

FILE NO. : PG7521

HOLE NO. : BH 3-25

■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

SAMPLE DESCRIPTION (GROUND SURFACE)	Depth / Elevation
TOPSOIL	0.23m [87.77m]
FILL: Very stiff, brown silty clay, some sand and gravel	1.45m [86.55m]
FILL: Compact, brown silty sand, some clay, trace gravel	1.83m [86.17m]
Compact, brown **SANDY SILT**, trace gravel	2.21m [85.79m]
Stiff to firm, brown **SILTY CLAY** - Grey by 3.0 m depth	3.73m [84.27m]
Compact, brown **SAND**, trace gravel	5.94m [82.06m]
End of Borehole (GWL at 4.29 m depth - May 14, 2025)	

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	67	3-5-5-4 10	
SS 3	58	3-4-5-2 9	
SS 4	100	1-1-1-1 2	
SS 5	100	P	
SS 6	58	3-4-4-4 8	
SS 7	58	2-2-3-3 5	
SS 8	50	2-2-3-4 5	

Shear strength at SS 5: △14 ▲34

Piezometer: 4.29 m 2025-05-14

DEPTH (m): 0 1 2 3 4 5 6 7 8 9 10

ELEVATION (m): 87 86 85 84 83 82 81 80 79 78

STRATA PLOT | PIEZOMETER CONSTRUCTION

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SOIL PROFILE AND TEST DATA

PATERSON GROUP

Geotechnical Investigation
40 Beechcliffe Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 363310.64 **NORTHING:** 5021892.91 **ELEVATION:** 88.33

PROJECT: Proposed Residential Development
ADVANCED BY: CME-55 Low Clearance Drill
REMARKS:
DATE: May 7, 2025

FILE NO. : PG7521
HOLE NO. : BH 4-25

SAMPLE DESCRIPTION (GROUND SURFACE)	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	ELEVATION (m)
TOPSOIL — 0.18m [88.15m]					
FILL: Compact, brown silty sand, some gravel, trace clay, topsoil and rootlets — 1.45m [86.88m]		AU 1			88
	1	SS 2	17	3-7-6-4 13	87
Compact, brown **SANDY SILT**, trace clay — 2.21m [86.12m]	2	SS 3	71	3-4-6-5 10	86
Stiff to firm, brown **SILTY CLAY** — 2.97m [85.36m]		SS 4	100	1-1-1-1 2	
Compact, brown **SAND**, trace gravel	3	SS 5	58	1-1-4-3 5	85
	4	SS 6	67	3-4-3-2 7	84
	5	SS 7	8	3-3-4-5 7	83
		SS 8	46	3-4-5-5 9	
— 6.71m [81.62m]	6	SS 9	58	1-2-3-5 5	82
Dynamic cone penetration test commenced at 6.71 m depth	7–10				81–79

PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE): 13, 21, 24, 24, 26, 34, 36, 34, 36, 31

△ REMOULDED SHEAR STRENGTH (kPa)
▲ UNDRAINED SHEAR STRENGTH (kPa)
PL (%) WATER CONTENT (%) LL (%)

PIEZOMETER CONSTRUCTION: 4.48 m 2025-05-14

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

PATERSON GROUP

COORD. SYS.: MTM ZONE 9 **EASTING:** 363310.64 **NORTHING:** 5021892.91 **ELEVATION:** 88.33

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

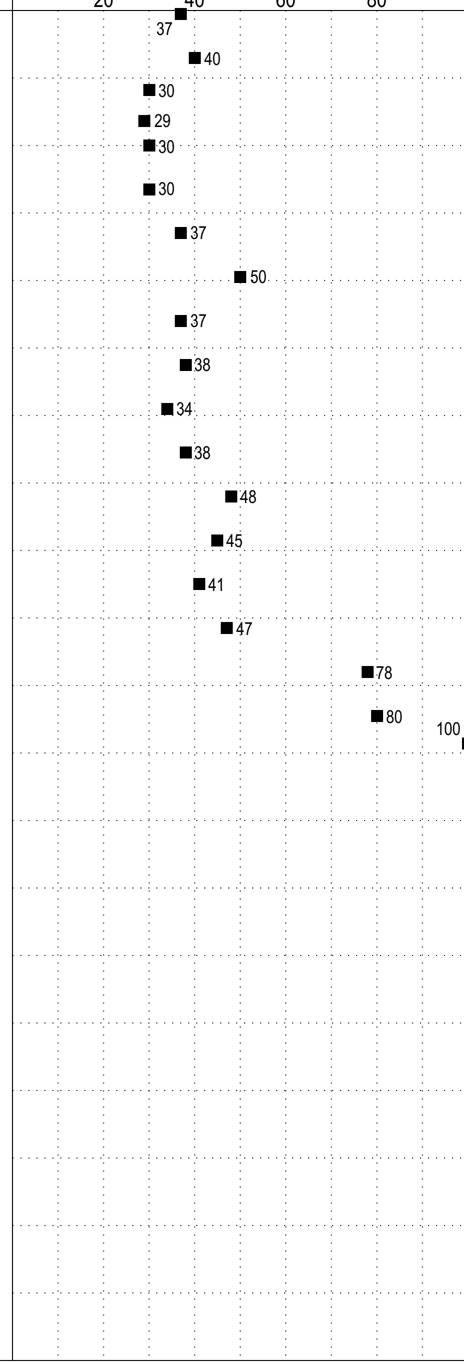
REMARKS:

DATE: May 7, 2025

FILE NO. : PG7521

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) / △ REMOULDED SHEAR STRENGTH (kPa) / ▲ UNDRAINED SHEAR STRENGTH (kPa) / PL (%) WATER CONTENT (%) LL (%)	PIEZOMETER CONSTRUCTION	ELEVATION (m)
Dynamic cone penetration test 15.47m [72.86m]		10 – 15.47							78 – 73
End of Borehole Practical refusal to DCPT at 15.47 m depth (GWL at 4.48 m depth - May 14, 2025)		15.47 – 20							73 – 69



SOIL PROFILE AND TEST DATA

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

PATERSON GROUP

COORD. SYS.: MTM ZONE 9 **EASTING:** 363329.53 **NORTHING:** 5021867.26 **ELEVATION:** 88.58

PROJECT: Proposed Residential Development

ADVANCED BY: Back Hoe

REMARKS:

DATE: May 8, 2025

FILE NO. : PG7521

HOLE NO. : TP 1-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / △ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL 0.30m [88.28m]			G 1						
FILL: Compact, brown silty sand, with gravel, cobbles and crushed stone - Trace asphalt and clay at 0.8 m depth - Organics at 1.2 m depth 1.30m [87.28m]		1	G 2						88
Compact, brown **SANDY SILT**, trace gravel and clay 1.90m [86.68m]			G 3 G 4						87
Compact, brown **SILTY SAND** 2.10m [86.48m]		2	G 5						
End of Test Pit Test pit dry upon completion of excavation		3 4 5							86 85 84

DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

PATERSON GROUP

COORD. SYS.: MTM ZONE 9 **EASTING:** 363309.21 **NORTHING:** 5021921.27 **ELEVATION:** 88.35

PROJECT: Proposed Residential Development

ADVANCED BY: Back Hoe

REMARKS:

DATE: May 8, 2025

FILE NO. : PG7521

HOLE NO. : TP 2-25

SAMPLE DESCRIPTION (GROUND SURFACE)	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	ELEVATION (m)
TOPSOIL — 0.20m [88.15m]						
FILL: Compact, brown sandy silt, some gravel and cobbles — 0.70m [87.65m]		G 1				88
FILL: Compact, brown sandy silt, trace gravel, cobbles, brick and clay — 1.30m [87.05m]	1	G 2				
Compact, brown **SANDY SILT** , trace clay - Clay content decreasing with depth — 2.10m [86.25m]	2	G 3, G 4, G 5, G 6				87
End of Test Pit Test pit dry upon completion of excavation	3, 4, 5					86, 85, 84

■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80

△ REMOULDED SHEAR STRENGTH (kPa)
▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80

PL (%) WATER CONTENT (%) LL (%) 20 40 60 80

STRATA PLOT | PIEZOMETER CONSTRUCTION

SOIL PROFILE AND TEST DATA

PATERSON GROUP

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 363280.12 **NORTHING:** 5021993.29 **ELEVATION:** 88.41

PROJECT: Proposed Residential Development

ADVANCED BY: Back Hoe

REMARKS:

DATE: May 8, 2025

FILE NO. : PG7521

HOLE NO. : TP 3-25

SAMPLE DESCRIPTION	DEPTH (m)	SAMPLE TYPE AND NO.	ELEVATION (m)
GROUND SURFACE	0		88.41
TOPSOIL			
0.20m [88.21m]			
FILL: Compact, brown sandy silt, with gravel, crushed stone, concrete and asphalt, trace clay		G 1	88
		G 2	
	1		
1.40m [87.01m]			87
Compact, brown **SANDY SILT**		G 3	
	2		
2.20m [86.21m]			
Firm, brown to grey **SILTY CLAY**		G 4	
2.30m [86.11m]			
End of Test Pit			86
Test pit dry upon completion of excavation			
	3		
			85
	4		
			84
	5		

Column headings: SAMPLE DESCRIPTION; STRATA PLOT; DEPTH (m); SAMPLE: TYPE AND NO., RECOVERY (%), N OR RQD, WATER CONTENT (%); ■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80; △ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80; PL (%) WATER CONTENT (%) LL (%) 20 40 60 80; PIEZOMETER CONSTRUCTION; ELEVATION (m)

P:/AutoCAD Drawings/Test Hole Data Files/PG75xx/PG7521/data.sqlite 2025-05-23, 11:24 Paterson_Template MR

SOIL PROFILE AND TEST DATA

PATERSON GROUP

Geotechnical Investigation

40 Beechcliffe Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 363249.11 **NORTHING:** 5022074.94 **ELEVATION:** 88.71

PROJECT: Proposed Residential Development

ADVANCED BY: Back Hoe

REMARKS:

DATE: May 8, 2025

FILE NO. : PG7521

HOLE NO. : TP 4-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) / REMOULDED SHEAR STRENGTH (kPa) / UNDRAINED SHEAR STRENGTH (kPa) / PL (%) WATER CONTENT (%) LL (%)	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL 0.20m [88.51m]									
FILL: Compact, brown sandy silt, some gravel, crushed stone, brick and concrete, trace clay 1.50m [87.21m]		1	G 1						88
Compact, brown **SANDY SILT**, trace clay - Clay content increasing with depth 2.20m [86.51m]		2	G 2 G 3						87
Stiff, brown **CLAYEY SILT** to **SILTY CLAY**, trace sand 3.00m [85.71m]		3	G 4 G 5 G 6						86
End of Test Pit Test pit dry upon completion of excavation		4 5							85 84

Chart scales: 20 40 60 80

CLIENT: CITY OF OTTAWA	PROJECT NO.: CO986.00	RECORD OF:
ADDRESS: 40 BEECHCLIFFE STREET	STATION:	BH104

CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 5020569.381	EASTING (m): 440886.262	ELEV. (m) 88.552

CONTRACTOR: STRATA DRILLING GROUP	METHOD: DIRECT PUSH

BOREHOLE DIAMETER (cm):	WELL DIAMETER (cm): -	SCREEN SLOT #: -	SAND TYPE: -	SEALANT TYPE: -

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON, GRAB

Column headings: GWL (m); SOIL SYMBOL; SOIL DESCRIPTION; DEPTH (m); ELEVATION (m); SHEAR STRENGTH (kPa) 40 80 120 160; N-VALUE (Blows/300mm) 20 40 60 80; WATER CONTENT (%) PL W.C. LL 20 40 60 80; SAMPLE NO.; SAMPLE TYPE; RECOVERY (%); CSV/TOV (ppm or %LEL); LABORATORY TESTING; WELL INSTALLATION; REMARKS

Depth (m)	Elevation (m)	Soil Description	Sample No.	Recovery (%)	CSV/TOV (ppm or %LEL)	Laboratory Testing
0 – 0.6	88.5	FILL moist, dark brown SILTY CLAY some sand, gravel, trace gravel	1A		<5	
0.6 – 2.3	88 – 86.5	FILL moist, brown/grey sand and gravel some asphalt	1B	35	<5	METALS, PAHs, BTEX, PHCs
			2A		<5	
2.3 – 4.0	86 – 85	moist to wet, brown-olive SILTY CLAY	2B	45	<5	METALS, PAHs
			3A		<5	BTEX, PHCs, VOCs
4.0 – 7.6	84.5 – 81	moist, brown/grey SAND	3B	55	<5	
			4	35	<5	
			5			
		END OF BOREHOLE				

Depth scale (m): 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5
Elevation scale (m): 88.5, 88, 87.5, 87, 86.5, 86, 85.5, 85, 84.5, 84, 83.5, 83, 82.5, 82, 81.5, 81

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 21-NOV-2024
INPUT BY: JS	MONITORING DATE: -
REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA		PROJECT NO.: CO986.00	RECORD OF: **MW105**
ADDRESS: 40 BEECHCLIFFE STREET		STATION:	
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 5020550.284	EASTING (m): 440893.676	ELEV. (m) 88.618
CONTRACTOR: STRATA DRILLING GROUP		METHOD: DIRECT PUSH	
BOREHOLE DIAMETER (cm):	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10	SAND TYPE: #2 / SEALANT TYPE: BENTONITE

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON, GRAB

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		moist, dark brown SILTY CLAY some sand, trace organics	0 – 0.5	88.5 – 88			1A		80	<5			
		moist, light brown SILTY SAND	1	87.5			1B			<5	METALS, PAHs, BTEX, PHCs,		
			1.5 – 2	87 – 86.5			2A		100	<5			
		--- wet	2.5	86			2B			<5			
			3	85.5			3A			<5	METALS PAHS, BTEX, PHCs, VOCs		
		wet to saturated SAND	3.5 – 4.5	85 – 84.5			3B			<5			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 21-NOV-2024
INPUT BY: JS	MONITORING DATE: 11-DEC-2024
REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA		PROJECT NO.: CO986.00	RECORD OF: BH106
ADDRESS: 40 BEECHCLIFFE STREET		STATION:	
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 5020576.359	EASTING (m): 440910.042	ELEV. (m) 88.791
CONTRACTOR: STRATA DRILLING GROUP		METHOD: DIRECT PUSH	
BOREHOLE DIAMETER (cm):	WELL DIAMETER (cm): -	SCREEN SLOT #: -	SAND TYPE: - / SEALANT TYPE: -

SAMPLE TYPE: AUGER, DRIVEN, CORING, DYNAMIC CONE, SHELBY, SPLIT SPOON, GRAB

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, dark brown/grey silty clay	0 – 0.9	88.5 – 88			1A		60	<5			
		FILL moist, brown sand some gravel, asphalt	0.9 – 1.8	87.5 – 87			1B			<5	METALS, PAHs, BTEX, PHCs		
							2A			<5			
		moist, brown SILTY SAND trace clay	1.8 – 4.5	87 – 84.5			2B		55	<5			
							3		5	<5			
		END OF BOREHOLE											

TERRAPEX	LOGGED BY: JM	DRILLING DATE: 21-NOV-2024
	INPUT BY: JS	MONITORING DATE: -
	REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA	PROJECT NO.: CO986.00	RECORD OF: BH107
ADDRESS: 40 BEECHCLIFFE STREET	STATION:	
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 5020506.783 / EASTING (m): 440930.761	ELEV. (m) 88.52
CONTRACTOR: STRATA DRILLING GROUP	METHOD: DIRECT PUSH	
BOREHOLE DIAMETER (cm): / WELL DIAMETER (cm): -	SCREEN SLOT #: - / SAND TYPE: -	SEALANT TYPE: -

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

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SVTOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, dark brown silty clay some gravel, organics	0	88.5			1A		66	<5 ppm			
		FILL moist, light brown silty sand trace gravel	0.5 – 1	88 – 87.5			1B		66	<5 ppm	METALS PAHs, BTEX, PHCs		
			1.5 – 2	87 – 86.5			2A		80	<5 ppm			
		wet, brown/olive SILTY CLAY	2.5	86			2B		-	<5 ppm			
			3 – 3.5	85.5 – 85			3A		-	130 ppm	BTEX, PHCs, VOCs		
		light brown SAND	4 – 4.5	84.5 – 84			3B		100	<5 ppm			

END OF BOREHOLE

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 21-NOV-2024
INPUT BY: SAF	MONITORING DATE: -
REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA	PROJECT NO.: CO986.00		RECORD OF: BH108
ADDRESS: 40 BEECHCLIFFE STREET	STATION:		
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 5020474.732	EASTING (m): 440942.768	ELEV. (m) 87.80
CONTRACTOR: STRATA DRILLING GROUP	METHOD: DIRECT PUSH		
BOREHOLE DIAMETER (cm):	WELL DIAMETER (cm): -	SCREEN SLOT #: -	SAND TYPE: - SEALANT TYPE: -

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

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, dark brown silty sand some gravel, trace organics	0 – 1.1	87.5			1A	DRIVEN	66	<5 ppm	METALS, PAHs, BTEX, PHCs		
		moist, brown SILTY CLAY trace gravel, sand	1.1 – 2.5	86.5			1B	DRIVEN	-	<5 ppm			
				86			2A	DRIVEN	-	<5 ppm			
		moist, brown SILTY SAND	2.5 – 3.0	85			3A	DRIVEN	-	<5 ppm			
		wet, brown SAND	3.0 – 4.5	84			3B	DRIVEN	-	<5 ppm			
		END OF BOREHOLE	4.5	83.5									

Depth scale (m): 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5

Elevation scale (m): 87.5, 87, 86.5, 86, 85.5, 85, 84.5, 84, 83.5

TERRAPEX

LOGGED BY: JM	DRILLING DATE: 21-NOV-2024
INPUT BY: SAF	MONITORING DATE: -
REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA	PROJECT NO.: CO986.00		RECORD OF: **MW109**
ADDRESS: 40 BEECHCLIFFE STREET	STATION:		
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 440968.17	EASTING (m): 5020432.67	ELEV. (m) 88.32
CONTRACTOR: STRATA DRILLING GROUP	METHOD: DIRECT PUSH		
BOREHOLE DIAMETER (cm): 9.53	WELL DIAMETER (cm): 5	SCREEN SLOT #: 10	SAND TYPE: #2 / SEALANT TYPE: BENTONITE

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

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SVTOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, dark brown silty clay some gravel, trace sand, trace organics	0 – 0.5 – 1	88 – 87.5 – 87			1A			<5 ppm	METALS PAHs		GW ELEVATION: DRY
		FILL moist, light brown silty sand	1.5	86.5			1B 2A			<5 ppm <5 ppm	BTEX, PHCs		
		FILL moist, dark brown silty clay some gravel, trace sand, trace organics, trace brick wet	2 – 2.5	86			2B			<5 ppm			
		moist to wet SANDY SILT saturated	3 – 3.5 – 4	85.5 – 85 – 84.5			3A			<5 ppm	BTEX, PHCs, VOCs		
		saturated, brown SAND	4.5	84			3B			<5 ppm			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: MK	DRILLING DATE: 22-NOV-2024
INPUT BY: SW	MONITORING DATE: 02-DEC-2024
REVIEWED BY: GS	PAGE 1 OF 1

CLIENT: CITY OF OTTAWA	PROJECT NO.: CO986.00	RECORD OF:
ADDRESS: 40 BEECHCLIFFE STREET	STATION:	MW110
CITY/PROVINCE: OTTAWA, ONTARIO	NORTHING (m): 440959.686	EASTING (m): 5020373.795 ELEV. (m) 88.475
CONTRACTOR: STRATA DRILLING GROUP	METHOD: DIRECT PUSH	
BOREHOLE DIAMETER (cm): 9.53 WELL DIAMETER (cm): 5	SCREEN SLOT #: 10 SAND TYPE: #2	SEALANT TYPE: BENTONITE

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

SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SAMPLE NO.	RECOVERY (%)	SVT/OV (ppm or %LEL)	LABORATORY TESTING	REMARKS
FILL moist, brown silty clay trace concrete, trace asphalt, trace organics	0 – 1.4	88.475	1A	73	<5 ppm	METALS PAHs, BTEX PHCs	GW ELEVATION: DRY
FILL light brown silty sand	1.4 – 1.9		1B				
FILL moist, brown sandy silt trace clay, trace gravel	1.9 – 2.7		2A	47	<5 ppm		
FILL wet, grey silty clay some gravel, trace sand	2.7 – 3.3		2B	47	<5 ppm		
wet, brown SAND	3.3 – 4.5		3	47	<5 ppm		
END OF BOREHOLE							

Other column headings: GWL (m); SOIL SYMBOL; SHEAR STRENGTH (kPa) 40 80 120 160; N-VALUE (Blows/300mm) 20 40 60 80; WATER CONTENT (%) PL W.C. LL 20 40 60 80; SAMPLE TYPE; WELL INSTALLATION

Depth scale (m): 0, 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5
Elevation scale (m): 88, 87.5, 87, 86.5, 86, 85.5, 85, 84.5, 84

TERRAPEX

LOGGED BY: MK	DRILLING DATE: 22-NOV-2024
INPUT BY: BW	MONITORING DATE: 02-DEC-2024
REVIEWED BY: GS	PAGE 1 OF 1

TP101 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0.0 – 0.5	**SILTY SAND, TRACE CLAY AND GRAVEL (FILL)** Brown	None	<5 ppm	TP101-1	0.5	
0.5 – 1.8	**SILTY CLAY AND GRAVEL, TRACE SAND (FILL)**	None	<5 ppm	TP101-2	1.0	
		None	<5 ppm	TP101-3	1.3	
		None	<5 ppm	TP101-4	1.6	
1.8 – 2.0	**SILTY CLAY, TRACE SAND (NATIVE)**	None	<5 ppm	TP101-5	1.9	

TP102 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0 – 0.5	**SILTY SAND, TRACE CLAY AND GRAVEL, METAL (FILL)** Brown	None	<5 ppm	TP102-1	0.5	
0.5 – 1.4	**SILTY CLAY, TRACE SAND, ASPHALT (FILL)** Brown	None	<5 ppm	TP102-2	1.0	
		None	<5 ppm	TP102-3	1.4	
1.4 – 1.7	**SILTY CLAY, TRACE ORGANICS AND ASPHALT (FILL)** Red/Yellow, Brown	None	<5 ppm	TP102-4	1.7	
1.7 – 1.8	**SILTY SAND (NATIVE)** Brown, wet	None	<5 ppm	TP102-5	1.8	

TP103 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0 – 0.5	**SILTY SAND AND GRAVEL (FILL)** Brown	None	<5 ppm	TP103-1	0.5	
0.5 – 1.0	**SILTY SAND, TRACE CLAY AND GRAVEL, METAL (FILL)** Brown	None	<5 ppm	TP103-2	1.0	PAH
1.0 – 1.5	**SILTY CLAY, TRACE SAND AND PLASTIC, GRAVEL (FILL)** Brown	None	<5 ppm	TP103-3	1.5	
1.5 – 1.6	**SILTY SAND (Native)** Grey, wet	None	<5 ppm	TP103-4	1.6	

TP104 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0 – 0.5	**SILTY SAND AND GRAVEL, TRACE CLAY (Fill)** Brown. Large concrete blocks in Test pit	None	<5 ppm	TP104-1	0.5	
0.5 – 1.8	**SILTY SAND AND GRAVEL (Fill)** Brown, wet	None	<5 ppm	TP104-2	1.0	PAH (DUP sample ID: 104-12)
		None	<5 ppm	TP104-3	1.6	
1.8 – 2.1	**SILTY CLAY (Native)** Grey, wet	None	<5 ppm	TP104-4	2.1	

TP105 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0 – 0.5	**SILTY SAND AND GRAVEL (Fill)** Brown	None	<5 ppm	TP105-1	0.5	
0.5 – 1.2	**SILTY CLAY AND GRAVEL, TRACE SAND (Fill)** Brown	None	<5 ppm	TP105-2	1.2	
1.2 – 1.5	**SANDY SILT, TRACE CLAY AND GRAVEL (Fill)** Brown	None	<5 ppm	TP105-3	1.5	
1.5 – 1.7	**SILTY SAND (Native)** Brown, moist	None	<5 ppm	TP105-4	1.7	

TP112 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	Soil Description	Odours	CSV	I.D.	Depth (m)	Lab Analysis/ Comments
0 – 0.5	**SAND AND GRAVEL, TRACE CLAY (Fill)** Brown	None	<5 ppm	TP112-1	0.5	
0.5 – 1.2	**SILTY CLAY AND TRACE GRAVEL (Fill)** Brown	None	<5 ppm	TP112-2	1.0	
1.2 – 1.65	**SILTY SAND (Native)** Brown, moist	None	<5 ppm	TP112-3	1.65	

TP113 Date: January 15, 2025

Stratigraphy		Sample Data				
Depth (m)	**Soil Description**	**Odours**	**CSV**	**I.D.**	**Depth (m)**	**Lab Analysis/ Comments**
0 – 0.5	**SILTY CLAY AND GRAVEL with WOOD DEBRIS (Fill)** Brown	None	<5 ppm	TP113-1	0.5	
0.5 – 1.0	**SILTY CLAY AND GRAVEL with WOOD DEBRIS AND METAL (Fill)** Brown	None	<5 ppm	TP113-2	1.0	
						Refusal at 1.0 m

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

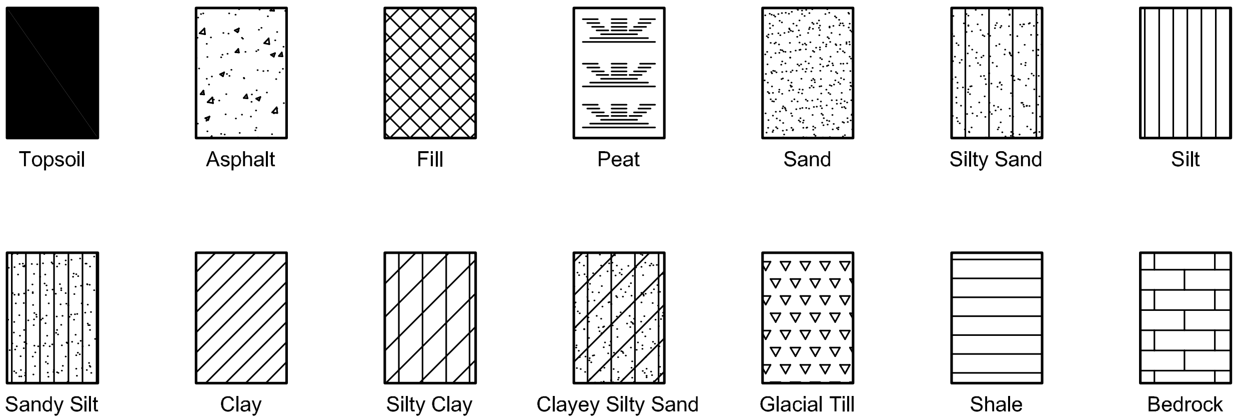
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

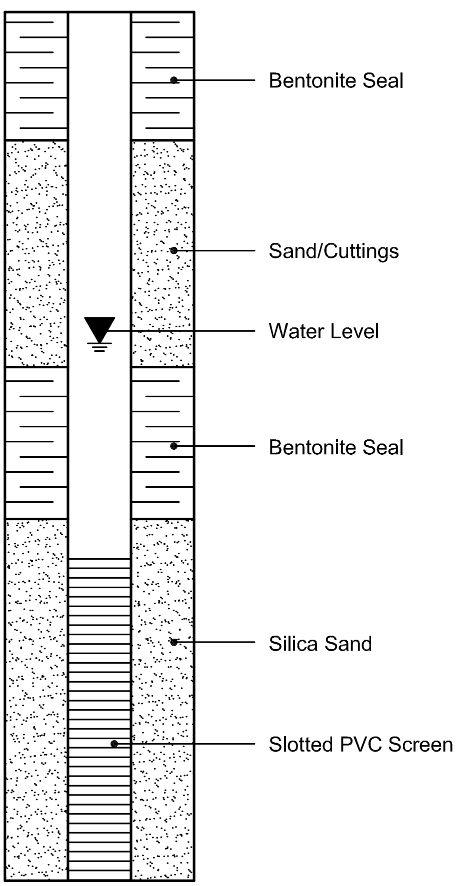
SYMBOLS AND TERMS (continued)

STRATA PLOT

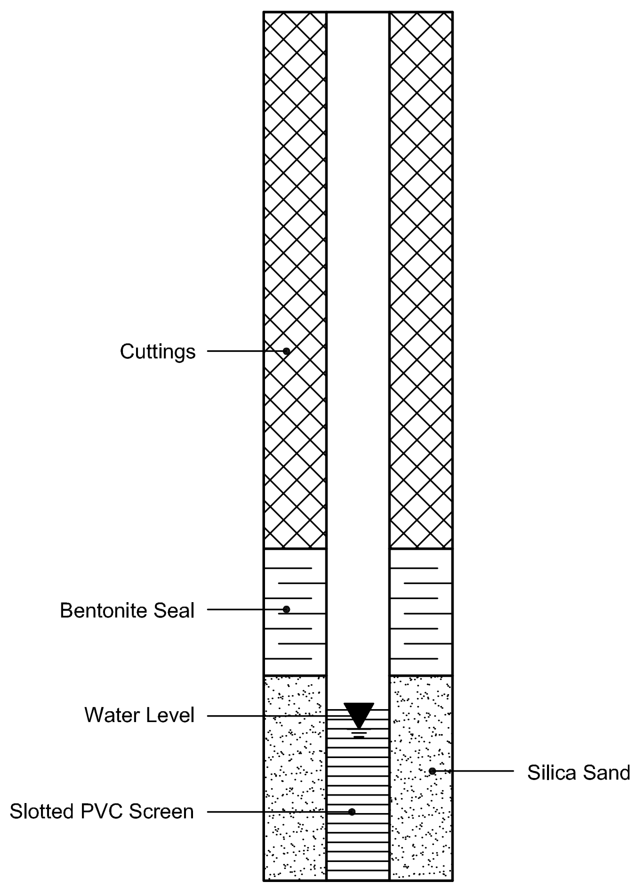


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



PATERSON GROUP

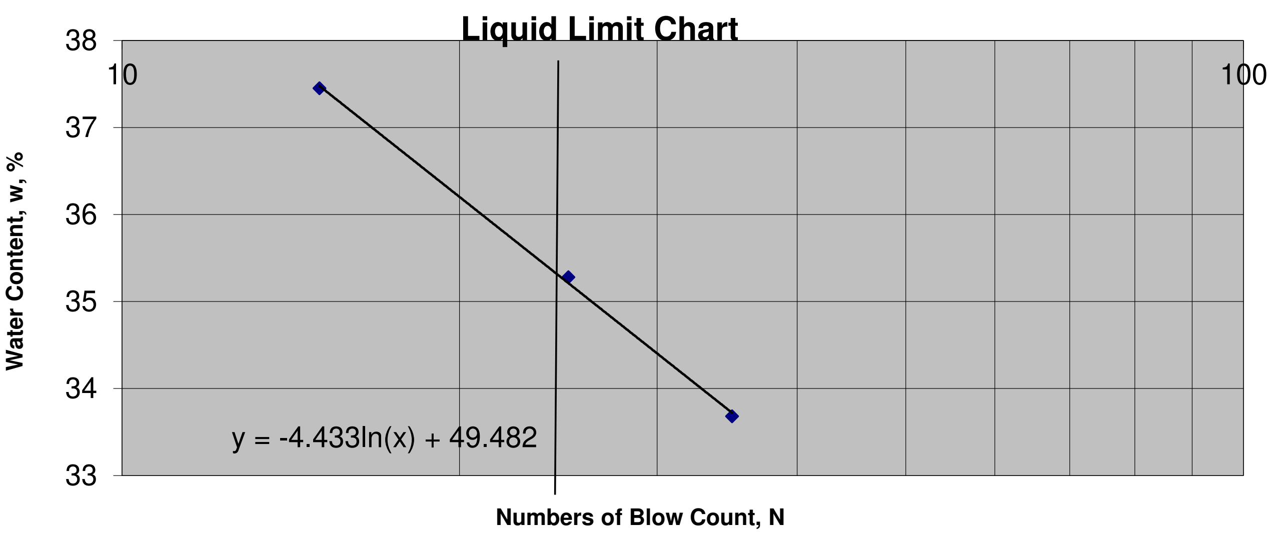
ATTERBERG LIMITS
LS-703/704

CLIENT:	Habitat for Humanity	FILE NO.:	PG7521
PROJECT:	40 Beechcliff Street, Ottawa, Ontario	DATE SAMPLED:	7-May
LOCATION:	BH1-25 SS3 @ 5' - 7'	DATE REPORTED:	16-May

CAN NO.	**11**	**67**	**87**				
WT. OF CAN	8.64	7.19	7.21				
WT. OF SOIL & CAN	15.76	13.44	13.56				
WT. OF DRY SOIL & CAN	13.82	11.81	11.96				
WT. OF MOISTURE	1.94	1.63	1.60				
WT. OF DRY SOIL & CAN	5.18	4.62	4.75				
WATER CONTENT, w, %	**37.45**	**35.28**	**33.68**				
NO. OF BLOWS, N	15	25	35				

CAN NO.	**12**	**18**
WT. OF CAN	16.7	18.99
WT. OF SOIL & CAN	24.45	27.95
WT. OF DRY SOIL & CAN	23.19	26.50
WT. OF MOISTURE	1.26	1.45
WT. OF DRY SOIL & CAN	6.49	7.51
WATER CONTENT, w, %	**19.41**	**19.31**

RESULTS	
LIQUID LIMIT	**35**
PLASTIC LIMIT	**19**
PLASTICITY INDEX	**16**



TECHNICIAN: CP	**REVIEWED BY:**	**C. Beadow**	**J. Forsyth, P. Eng.**

PATERSON GROUP

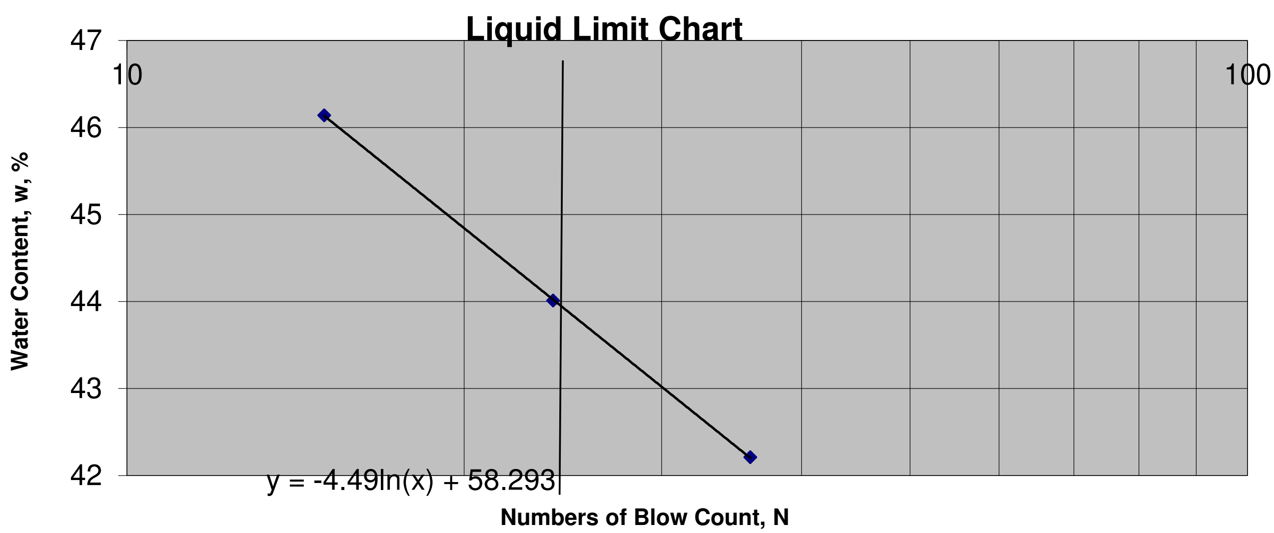
ATTERBERG LIMITS
LS-703/704

CLIENT:	Habitat for Humanity	FILE NO.:	PG7521
PROJECT:	40 Beechcliff Street, Ottawa, Ontario	DATE SAMPLED:	7-May
LOCATION:	BH2-25 SS4-BOT @ 8'6" - 9'6"	DATE REPORTED:	16-May

CAN NO.	**32**	**33**	**35**				
WT. OF CAN	4.35	4.30	4.35				
WT. OF SOIL & CAN	10.97	10.55	10.28				
WT. OF DRY SOIL & CAN	8.88	8.64	8.52				
WT. OF MOISTURE	2.09	1.91	1.76				
WT. OF DRY SOIL & CAN	4.53	4.34	4.17				
WATER CONTENT, w, %	**46.14**	**44.01**	**42.21**				
NO. OF BLOWS, N	15	24	36				

CAN NO.	**1**	**2**
WT. OF CAN	19.84	19.89
WT. OF SOIL & CAN	28.35	28.29
WT. OF DRY SOIL & CAN	26.76	26.81
WT. OF MOISTURE	1.59	1.48
WT. OF DRY SOIL & CAN	6.92	6.92
WATER CONTENT, w, %	**22.98**	**21.39**

RESULTS	
LIQUID LIMIT	**44**
PLASTIC LIMIT	**22**
PLASTICITY INDEX	**22**

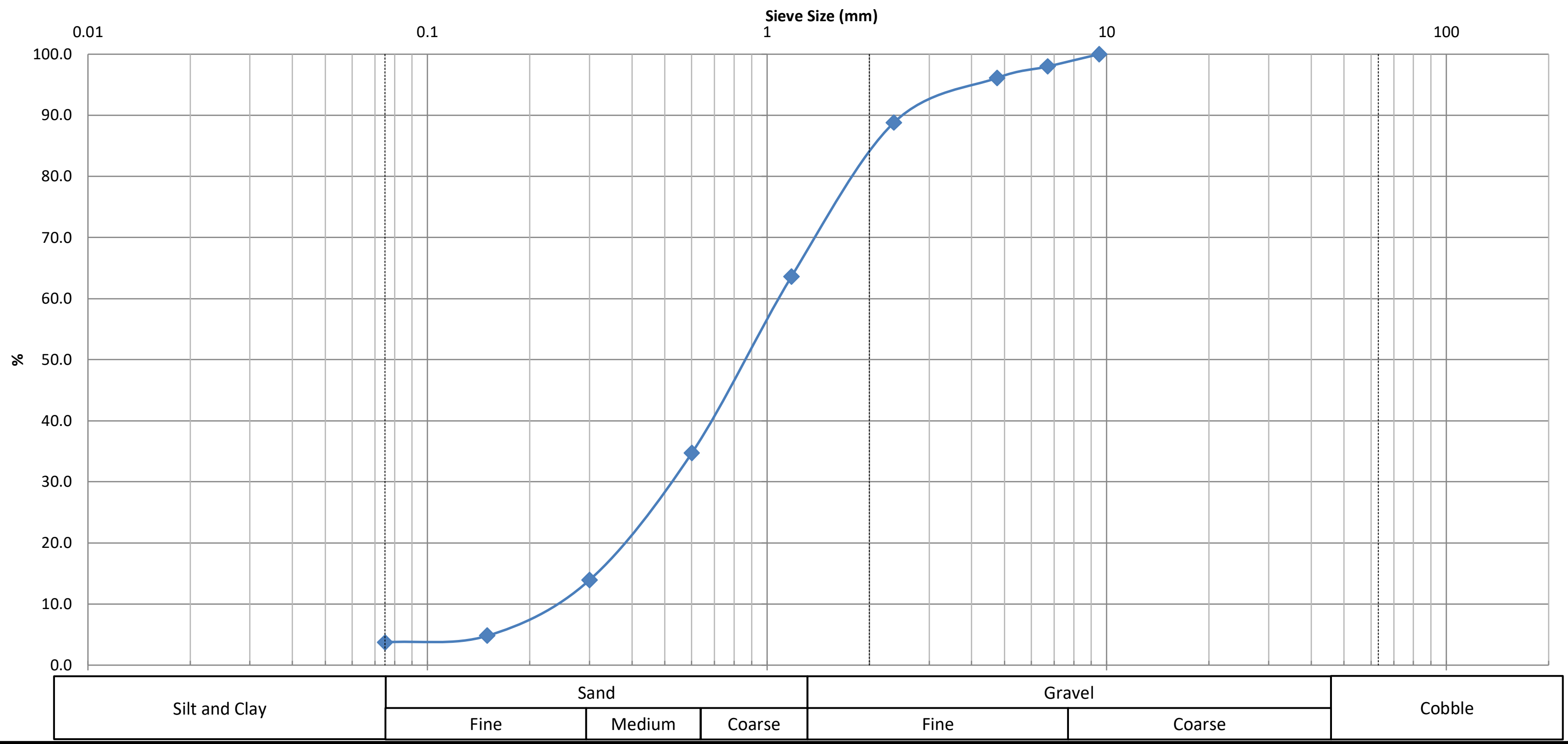


TECHNICIAN: CP	**REVIEWED BY:**	**C. Beadow**	**J. Forsyth, P. Eng.**

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Habitat for Humanity	DESCRIPTION:	Soil	FILE NO:	PG7521
CONTRACT NO.:	-	SPECIFICATION:	**Soil**	LAB NO:	59481
PROJECT:	40 Beechcliff St, Ottawa ON	INTENDED USE:	-	DATE RECEIVED:	-
		PIT OR QUARRY:	-	DATE TESTED:	12-May-25
DATE SAMPLED:	7-May-25	SOURCE LOCATION:	BH1-25 SS8	DATE REPORTED:	16-May-25
SAMPLED BY:	M.R.	SAMPLE LOCATION:	17'6" - 19'6"	TESTED BY:	CP



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
										0.94	4.6
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
	9.5	1.15	0.52	0.25	3.9	92.4		3.7			

Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

	Client ID:	BH3-25-SS4	-	-	-		
	Sample Date:	07-May-25 09:00	-	-	-	-	-
	Sample ID:	2520117-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	70.2	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.41	-	-	-	-	-
Resistivity	0.1 Ohm.m	55.5	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	43	-	-	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

FIGURE 1A & FIGURE 1B – SLOPE STABILTY ANALYSIS SECITONS

DRAWING PG7521-1 – TEST HOLE LOCATION PLAN

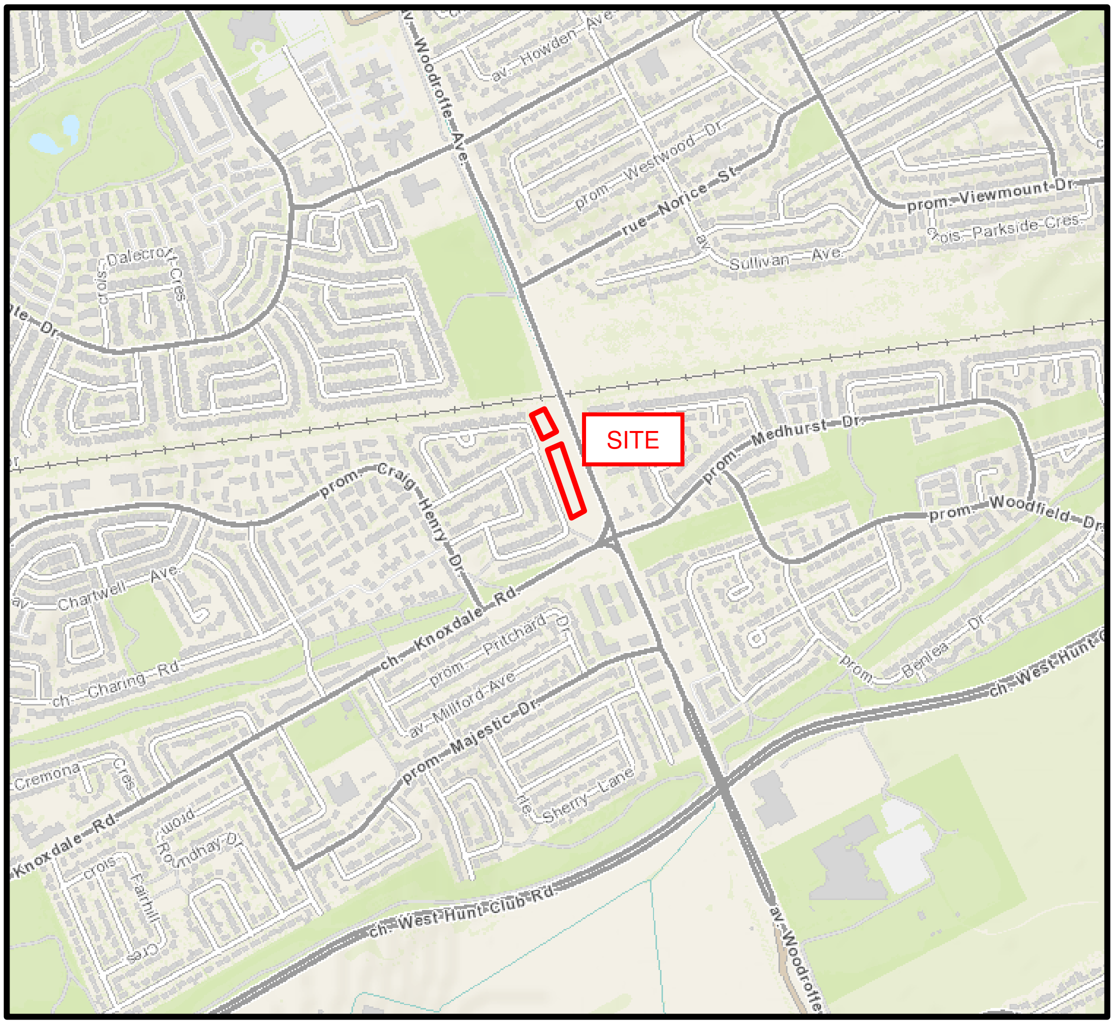
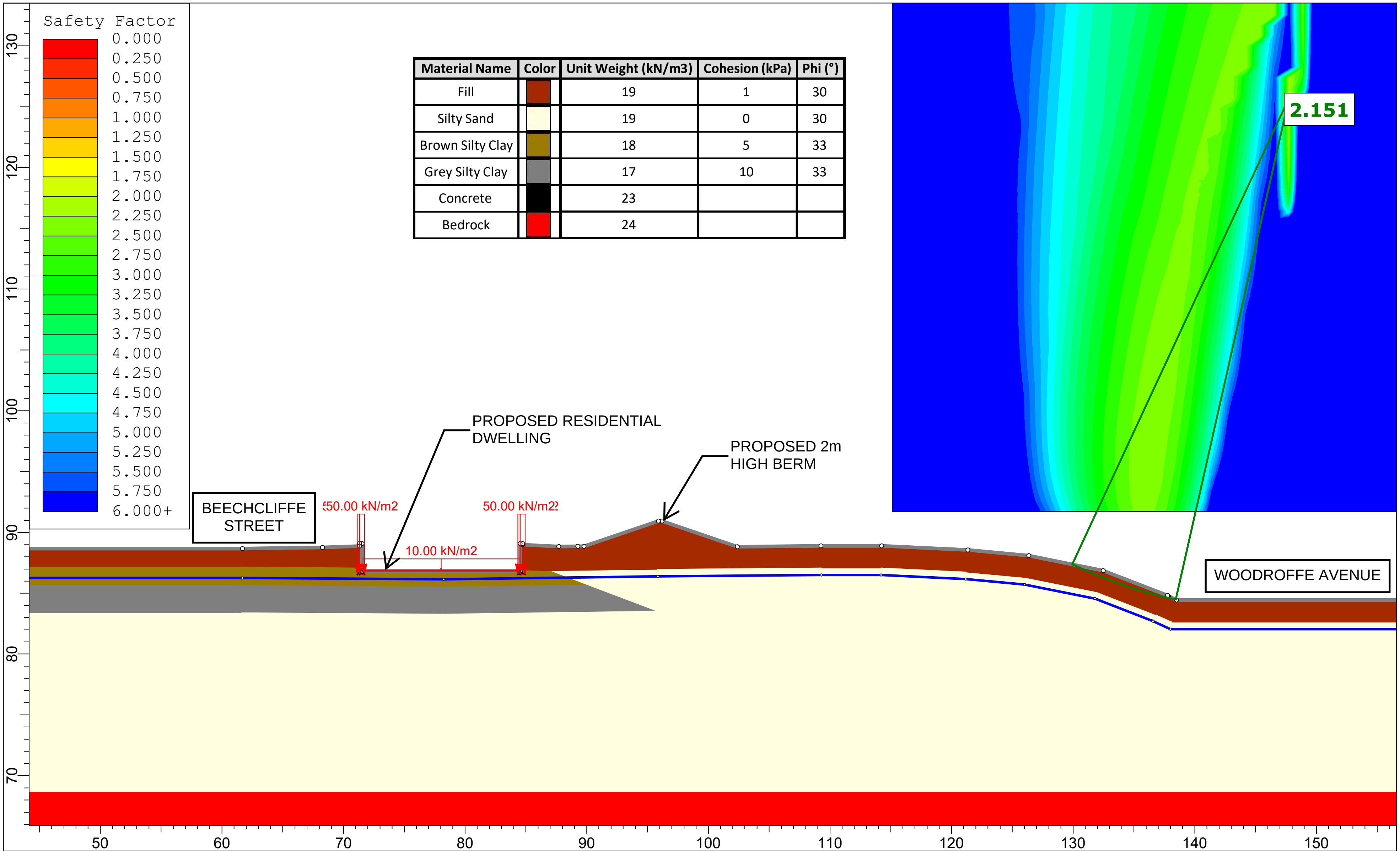


FIGURE 1

KEY PLAN

PATERSON GROUP

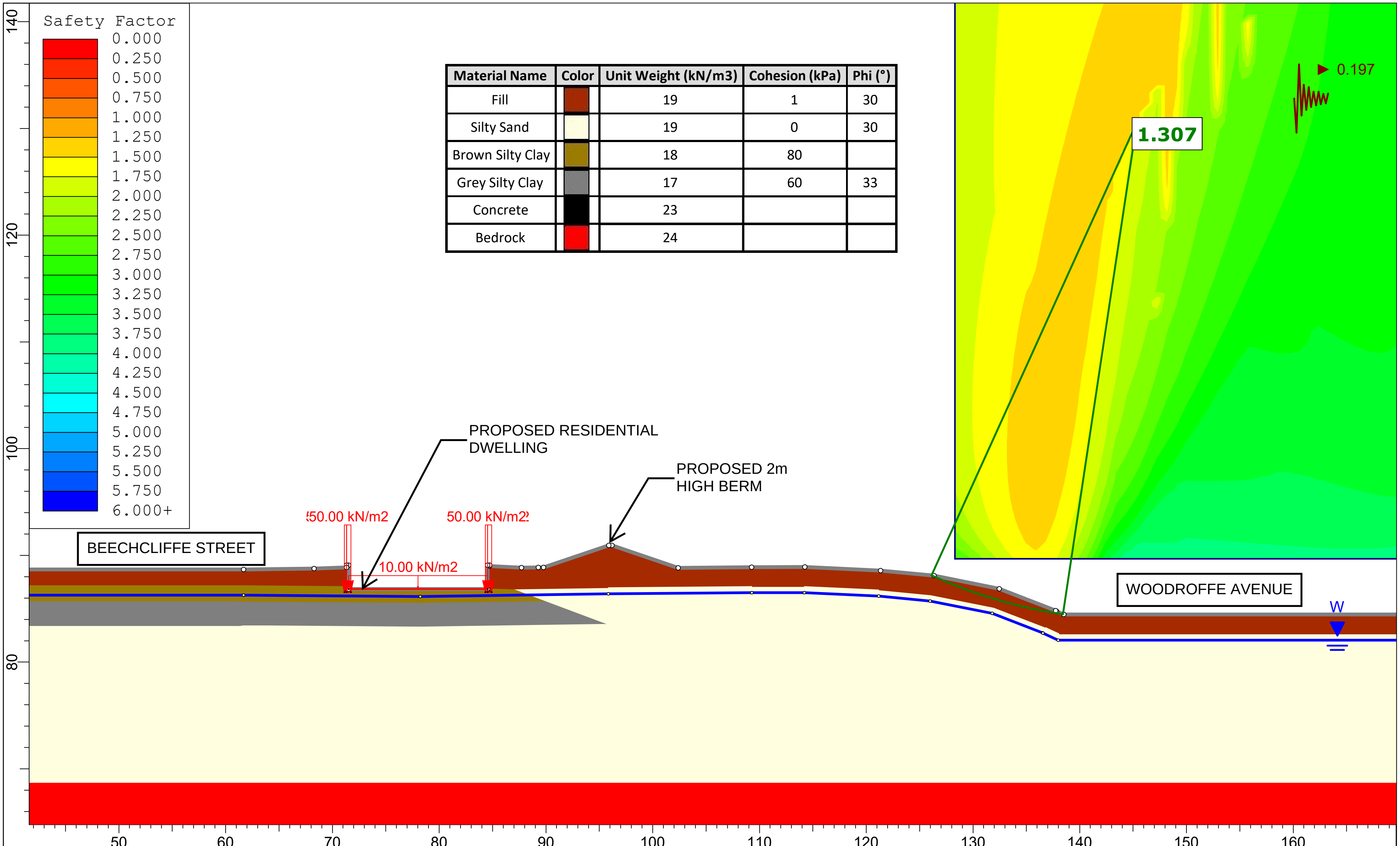


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)
Fill		19	1	30
Silty Sand		19	0	30
Brown Silty Clay		18	5	33
Grey Silty Clay		17	10	33
Concrete		23		
Bedrock		24		

PATERSON GROUP

SLIDEINTERPRET 9.031

Project	**Habitat for Humanity** **Slope Stability Analysis** **40 Beechcliff Street, Ottawa, Ontario**
Figure No.	**Figure 1A - Section A - Proposed Conditions - Static Loading**
Drawn by: NFRV	*Company:* Paterson Group
Date: 2025-05-20	*File No.* PG7521

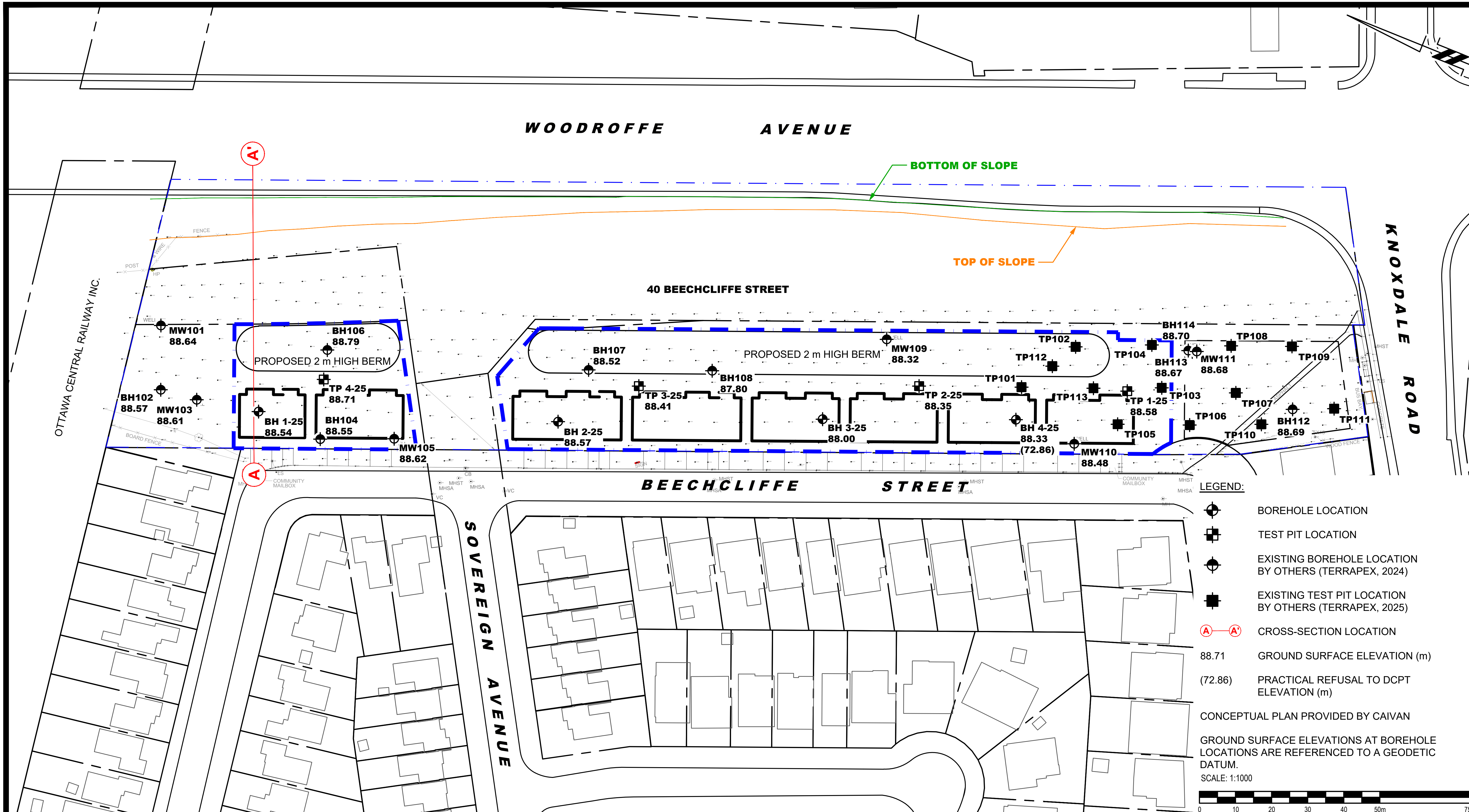


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)
Fill		19	1	30
Silty Sand		19	0	30
Brown Silty Clay		18	80	
Grey Silty Clay		17	60	33
Concrete		23		
Bedrock		24		

PATERSON GROUP

SLIDEINTERPRET 9.031

Project	Habitat for Humanity Slope Stability Analysis 40 Beechcliff Street, Ottawa, Ontario		
Figure No.	**Figure 1B - Section A - Proposed Conditions - Seismic Loading**		
Drawn by:	NFRV	***Company:***	Paterson Group
Date:	2025-05-20	***File No.***	PG7521



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NO.	REVISIONS	DATE	INITIAL

HABITAT FOR HUMANITY
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
40 BEECHCLIFFE STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 05/2025
Drawn by: ZS	Report No.: PG7521-1
Checked by: NFRV	Dwg. No.: PG7521-1
Approved by: DP	Revision No.:

p:\autocad drawings\geotechnical\pg75xx\pg7521\pg7521-1-test hole location plan.dwg

11x17