PATERSON GROUP

Geotechnical Investigation

Proposed Commercial Development

5505 & 5545 Albion Road
Ottawa, Ontario

Prepared for W.O. Stinson and Son Ltd.

Report PG5485-1 Revision 2 dated January 30, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by W.O. Stinson and Son Ltd. to conduct a geotechnical investigation for the proposed commercial development to be located at 5505 & 5545 Albion Road in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 for the general site location).

The objectives of the geotechnical investigation were to:

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

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

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of this investigation. A report addressing environmental issues for the subject site was prepared under separate cover.

2.0 Proposed Development

Based on the site plan provided, the proposed commercial development will consist of a 1-storey building of slab-on-grade to be located within the southern portion of the subject site. Structures such as a gas bar, cardlock fueling station and underground fuel storage are also anticipated.

Associated landscaped areas, asphalt paved access lanes and parking areas are also proposed. The proposed development is expected to be privately serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

A supplemental field investigation was carried out at the subject site on April 11 and 12, 2024, and consisted of advancing a total of 5 boreholes to a maximum depth of 9.8 m below the existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the proposed development, taking into consideration existing site features and underground services. The approximate locations of the boreholes are shown on Drawing PG5485-1 - Test Hole Location Plan included in Appendix 2.

Previous investigations were conducted by Paterson between September 1 and 3, 2020 and on October 13, 2023. A total of 10 boreholes and 4 test pits were advanced to maximum depths of 5.2 and 1.8 m below the existing surface, respectively, during the previous investigations.

The boreholes were put down using a track-mounted auger drill rig operated by a two-person crew. The test pits were excavated using a hydraulic excavator and backfilled using the site-excavated soil upon completion. The borehole procedures consisted of augering or excavating to the required depths at the selected locations and sampling the overburden. All fieldwork was conducted under the full-time supervision of our personnel under the direction of a senior engineer from our geotechnical department.

Sampling and In-Situ Testing

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

Standard Penetration Testing (SPT) was conducted and 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 sample 300 mm into the soil after a 150 mm initial penetration with a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was conducted at regular intervals in cohesive soils and completed using a shear vane apparatus.

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 of this report.

Groundwater

Monitoring wells were installed in boreholes BH 1-20, BH 2-20, BH 6-20 and BH 9-20 during the original field investigation to permit monitoring of the groundwater levels. Flexible polyethylene standpipes were installed within all boreholes during the supplemental investigation as well as all boreholes which did not receive a monitoring well at the time of the original investigation.

Submersible dataloggers (Van Essen Instrument TD-Diver Water Level Datalogger) were installed at BH 1-20, BH 2-20, BH 6-20 and BH 9-20 in advance of the supplemental investigation to record seasonal-high groundwater level fluctuation by measuring hydrostatic pressure of the water above the sensor.

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

Sample Storage

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

3.2 Field Survey

The test hole locations, and the ground surface elevations at each test hole were surveyed by Paterson using a handheld GPS unit, and referenced to a geodetic datum. The borehole locations and elevations are presented on Drawing PG5485-1 – Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples were recovered and visually examined in our laboratory to review the results of the field logging. A total of 4 soil samples were submitted for Atterberg Limits testing and 9 soil samples for were submitted for grain size distribution testing. Additionally, 1 soil sample was submitted for shrinkage testing. All results are shown within the Soil Profile and Test Data Sheets in Appendix 1.

3.4 Analytical Testing

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

3.5 Permeameter Testing

In-situ permeameter testing was conducted using a Pask (Constant Head Well) Permeameter to confirm infiltration rates of the surficial soils at the footprint of the proposed stormwater management facility. At each location, an 83 mm in diameter hole, was excavated using a Riverside/Bucket auger to approximate depths ranging from 0.3 to 1.0 m below the existing ground surface. All soils from the auger flights were visually inspected and initially classified on-site. The permeameter reservoir was filled with water and inverted into the hole, ensuring that it was relatively vertical and rested on the bottom of the hole. As the water infiltrated into the soil, the water level of the reservoir was monitored at various time intervals until the rate of fall 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 results of testing are further discussed in Section 4.2.

4.0 Observations

4.1 Surface Conditions

The subject site is generally used as a storage parking lot and has been cleared of all previously existing above-ground structures. Based on our observations, foundations, utilities and services from the previously existing gas station and associated structures remain below the ground surface. The ground surface across the subject site is relatively flat and at-grade with the surrounding properties and roads. A nearly 1 m deep ditch and tree line was noted along the properties west border.

The subject site is bordered to the north by an automobile dealership, to the east by agricultural land, to the south by Mitch Owens Road, and to the west by Albion Road.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the test hole locations consists of topsoil and/or fill underlain by layers of silty sand, silty clay to clayey silt, and sandy silt. A glacial till deposit was observed underlying the above-mentioned layers, where penetrated.

An approximate 0.1 to 2.3 m thickness of fill material was generally encountered at the existing ground surface across the subject site. The fill material was observed to extend to a depth of 3.1 m at borehole BH 9. The fill was generally observed to consist of brown silty sand with crushed stone, gravel, cobbles, and some organics. Concrete was observed within the fill material borehole BH 3-24.

A layer of compact to very loose, brown silty sand was generally observed underlying the fill material across the site and was observed to transition from brown to grey in colour at approximate depths of 1.2 to 2.3 m. The silty sand layer extended to maximum depths ranging from 2.2 to 3.2 m below the existing ground surface.

A stiff to firm grey, silty clay to clayey silt was encountered below the silty sand and/or fill material at all borehole locations with the exception of boreholes BH 4-24, BH 8 and BH 10. The silty clay to clayey silt layer was observed to extend to depths ranging from 4.1 to 5.5 m, where penetrated.

A loose to compact, grey sandy silt layer was observed underlying the aforementioned silty sand and/or silty clay to clayey silt layers. Where encountered, the sandy silt layer extended to depths of 4.1 to 7.3 m below the existing ground surface.

A glacial till deposit was encountered below the above-noted soil layers at boreholes BH 1-24 through BH 5-24, and was observed to consist of compact to dense, grey silty sand to sandy silt with gravel, cobbles and boulders.

Running sand was encountered at borehole BH 4-24. Practical refusal to augering was encountered in boreholes BH 3-24 and BH 4A-24 at depths of 7.5 and 4.5 m, respectively.

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

Bedrock

Based on available geological mapping, the subject site is underlain by a dolomite bedrock of the Oxford Formation with an overburden drift thickness of 10 to 25 m.

Grain Size Distribution Testing

Nine (9) grain size distribution tests were completed to further classify selected soil samples. The results are summarized in Table 1 below and presented in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis Results

Borehole Number	Sample	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-24	SS7	4.6-5.2	0.0	10.8	58.2	31.0
BH 2-24	SS6	3.8-4.4	0.0	6.6	63.4	30.0
BH 2-24	SS7	4.6-5.2	3.0	33.3	59.4	4.3
BH 3-24	SS4	2.6-2.9	0.0	2.1	50.9	47.0
BH 3-24	SS7	4.6-4.9	0.0	39.9	56.2	4.0
BH 4-24	SS5	3.4-3.7	0.0	36.1	60.8	3.1
BH 4B-24	SS1	4.6 -5.2	28.3	35.0	29.7	7.0
BH 5-24	SS6	3.1-3.7	0.0	3.6	49.4	47.0
BH 5-24	SS8	4.6-5.2	0.0	11.2	79.3	9.5

Atterberg Limits Testing

A total of 4 silty clay samples were submitted for Atterberg Limits testing. The test results indicate that the silty clay is generally classified as an Inorganic Clay of High Plasticity (CH). These classifications are in accordance with the Unified Soil Classification System. The results are summarized in Table 2 below and presented in Appendix 1.

Table 2 – Summary of Atterberg Limits Results

Test Hole	Sample	Depth (m)	LL (%)	PL (%)	PI (%)	Classification
BH1-24	SS6	3.8 – 4.4	54	23	31	CH
BH2-24	SS4	2.3 – 2.9	54	23	31	CH
BH3-24	SS4	2.6 – 2.9	63	26	37	CH
BH5-24	SS6	3.1 – 3.7	56	23	33	CH

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; CH: Inorganic Clay of High Plasticity

Shrinkage Limit Testing

Linear shrinkage testing was completed on 1 soil sample recovered from borehole BH 1-24 at an approximate depth of 4.9 m. The shrinkage limit and shrinkage ratio of the tested silty clay sample were found to be 15.4% and 1.89, respectively.

Permeameter Testing Results

In-situ infiltration tests were conducted at 4 locations on October 13, 2023 to provide general coverage of the proposed stormwater management facility. Field saturated hydraulic conductivity (K_{fs}) values and estimated infiltration values are presented in Table 3, on the next page. Due to the observed groundwater levels within the open excavation, infiltration testing could not be completed at the proposed invert of the system.

Field saturated hydraulic conductivity values were determined using the Engineering Technologies Canada (ETC) Ltd. reference tables provided in the most recent ETC Pask Permeameter User Guide. Unfactored infiltration rates were estimated based on the methodology outlined in Appendix C of the Credit Valley Conservation's Low Impact Development Stormwater Management Planning and Design Guide.

Table 3 – Field Saturated Hydraulic Conductivity and Estimated Infiltration Results

Test Hole Number	Ground Surface Elevation (m)	Infiltration Testing Depth (m)	Infiltration Testing Elevation (m)	K_{fs} (m/sec)	Soil Type	Estimated Infiltration Rate (mm/hr)
TP1-23	103.75	0.98	102.77	$8x10^{-7}$	Silty sand	43
TP2-23	103.74	0.54	103.20	$2.7x10^{-7}$	Fill material	32
TP3-23	103.60	0.35	103.25	$1.3x10^{-5}$	Fill material	92
TP4-23	103.50	0.30	103.20	$3.2x10^{-5}$	Fill material	117

Based on the test results, K_{fs} values of the fill material ranged from $2.7x10^{-7}$ to $3.2x10^{-5}$ m/s, while estimated infiltration rates varied between 32 and 117 mm/hr. The silty sand layer underlying fill material yielded a field saturated hydraulic conductivity value of $8x10^{-7}$ m/s, with an estimated infiltration rate of 43 mm/hr. The above-noted hydraulic conductivity values and estimated infiltration rates are generally consistent with similar materials Paterson has encountered on other sites as well as published values.

It is important to note that the estimated infiltration rates derived from the K_{fs} values in Table 3 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 LID measures, the invert of the system should be planned to be in accordance with the latest and pertinent City of Ottawa design guidelines, which are anticipated to require a minimum separation of 1 m above the seasonally high groundwater table and bedrock surface.

4.3 Groundwater

Groundwater levels were measured in the piezometers on June 4, 2024 and measured periodically in the monitoring well installed at borehole BH 1-24. The observed groundwater levels are summarized in Table 4 on the following page and presented on the Soil Profile and Test Data sheets in Appendix 1.

Table 4 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
*BH1	103.53	n/a	-	Sept. 11, 2020
		0.54	102.99	March 7, 2024
		0.85	102.68	June 4, 2024
*BH2	103.45	1.17	102.28-	Sept. 11, 2020
		0.86	102.59	March 7, 2024
		1.08	102.37	June 4, 2024
BH3	103.46	1.05	102.41	Sept. 11, 2020
BH4	103.68	0.95	102.73	Sept. 11, 2020
BH5	103.34	0.74	102.60	Sept. 11, 2020
*BH6	103.80	1.94	101.86	Sept. 11, 2020
		0.75	103.05	March 7, 2024
		1.13	102.67	June 4, 2024
BH7	103.62	0.61	103.01	Sept. 11, 2020
BH8	103.74	1.01	102.73	Sept. 11, 2020
*BH9	103.85	1.52	102.33	Sept. 11, 2020
		0.44	103.41	March 2, 2024
		0.82	103.03	June 4, 2024
BH10	103.89	Dry	-	Sept. 11, 2020
TP1-23	103.75	0.86	102.89	Oct.13, 2023
TP2-23	103.74	1.03	102.71	Oct.13, 2023
TP3-23	103.60	0.64	102.96	Oct.13, 2023
TP4-23	103.50	0.42	103.08	Oct.13, 2023
BH1-24	103.82	1.39	102.43	June 4, 2024
BH2-24	103.65	0.86	102.79	June 4, 2024
BH3-24	103.33	Blocked	-	June 4, 2024
BH4-24	103.51	0.86	102.65	June 4, 2024
BH5-24	103.42	Blocked	-	June 4, 2024

Note: - Ground surface elevations at borehole location are referenced to a geodetic datum.
-"*" indicates monitoring well installed within borehole

It should be noted that groundwater levels could be influenced by surface water infiltrating the backfilled boreholes. The long-term groundwater levels can also be estimated based on the observed colour, moisture content and consistency of the recovered samples.

In addition to manual water level measurements, a groundwater monitoring program was carried out at the subject site. The groundwater monitoring program provides an overview of the variations in the monitoring well water levels based upon seasonal fluctuations. The monitoring wells were equipped with a submersible datalogger (TD-Diver, VanEssen Instruments) to accurately monitor fluctuations in the water levels. The datalogger was programmed to continuously measure and record water levels at a fixed rate of one (1) reading every 24 hours for approximately 3 months.

The monitoring program was undertaken from March to June 2024. The monitoring data was compared with Environment and Natural Resources Canada precipitation data from the Ottawa International Airport over the same timeframe as part of the monitoring program. The monitoring data is presented in Figures 2 to 5 in Appendix 2.

Upon review of the datalogger readings and manual measurements, the groundwater readings measured within the monitoring wells across the subject site varied from an elevation of 102.35 m asl to a maximum elevation of 103.58 m asl.

Based on our analysis of the data logger groundwater readings, seasonal groundwater fluctuations can be observed at each monitoring well location with a difference in elevation between the low and high readings ranging from 0.40 to 0.72 m. The low groundwater level across the site was noted at an average elevation of 102.61 m asl throughout the monitoring period. The high groundwater table across the site during this monitoring period was found to be at an average elevation of 103.15 m asl.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is satisfactory for the proposed development. The proposed structures are recommended to be founded on conventional shallow footings placed on an undisturbed, silty sand, sandy silt, or silty clay bearing surface.

Due to the presence of a silty clay layer, a permissible grade raise restriction is required for the subject site.

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

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and fill, such as those containing organic or deleterious materials, should be stripped from under any buildings and other settlement sensitive structures. It is anticipated that the existing fill, free of deleterious material and significant amounts of organics, can be left in place below the proposed building footprints, outside of lateral support zones for the footings, and below the proposed parking area and access lanes. It is recommended that the existing fill layer be proof-rolled by a vibratory roller and approved by the geotechnical consultant at the time of construction. Any poor performing areas noted during the proof-rolling operation should be removed and replaced with an approved fill.

Existing foundation walls and other construction debris should be entirely removed from within the proposed building footprints. Under paved areas, existing construction remnants, such as foundation walls should be excavated to a minimum depth of 1 m below final grade.

Fill Placement

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

Non-specified existing fill along with site-excavated soil can be placed as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts compacted by the tracks of the spreading equipment to minimize voids. If the material is to be placed to increase the level for areas to be paved, the fill should be compacted in maximum 300 mm lifts and compacted to 95% of the material's SPMDD. Non-specified existing fill and site-excavated soils are not suitable for placement as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Bearing Resistance Values

Footings founded on an undisturbed, compact silty sand and/or compact sandy silt bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **180 kPa**.

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, stiff grey silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **180 kPa**.

A geotechnical resistance factor of 0.5 was applied to the above noted bearing resistance value at ULS.

Where the sandy silt or silty sand bearing surface is found to be in a loose state of compactness, the area should be proof-rolled using a vibratory compactor and approved by the geotechnical consultant prior to placing footings.

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

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the above-noted overburden soils and engineered fill bearing media when a plane extending down and out from the

bottom edges of the footing, at a minimum of 1.5H:1V, passes only through in situ soil or engineered fill of the same or higher capacity as that of the bearing medium.

Permissible Grade Raise

Due to the presence of the silty clay deposit, a permissible grade raise restriction of **2.0 m** is recommended. A post-development groundwater lowering of 0.5 m was considered in our permissible grade raise calculations.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

5.4 Design for Earthquakes

The subject site can be taken as seismic site response **Class D** as defined in the Ontario Building Code 2012 (OBC 2012; Table 4.1.8.4.A) for foundations considered at this site. The soils underlying the site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Slab-on-Grade Construction

With the removal of all topsoil and deleterious fill, such as those containing significant amounts of organic matter, within the footprint of the proposed buildings, undisturbed native soil surface or existing fill approved by the geotechnical consultant at the time of construction will be considered acceptable subgrade on which to commence backfilling for floor slab construction. It is recommended that the existing fill layer, free of deleterious and organic materials, be proof-rolled by a suitably-sized vibratory roller making several passes and approved by the geotechnical consultant at the time of construction.

It is recommended that the upper 200 mm of sub-slab fill consist of Granular A crushed stone. The sub-slab fill should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the material's SPMDD.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II with a maximum particle size of 50 mm, compacted to a minimum of 98% of the material's SPMDD are recommended for backfilling below the floor slab.

5.6 Pavement Structure

Flexible Pavement structure

For design purposes, the following pavement structures presented below could be used for the design of car parking areas and access lanes. It is anticipated that both pavement structures provided would be adequate for use as a fire route.

Table 5 – Recommended Flexible Pavement Structure – Car Only Parking Areas

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

Table 6 – Recommended Flexible Pavement Structure – Access Lanes and Heavy Loading Parking Area

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil and/or fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. Weak subgrade conditions may be experienced throughout the existing fill layer within the northern portion of the subject site and over service trenches.

The subgrade should be proof-rolled using suitably sized compaction equipment, and reviewed by Paterson personnel at the time of construction. It is further recommended that proof-rolling of clayey fill should be carried out using a sheepsfoot roller. Should subgrade conditions be deemed inadequate upon completion of proof-rolling, the fill subgrade may require the use of a woven geotextile such as Terrafix 200W, thicker subbase, or other measures that can be recommended at the time of construction as part of the field observation program.

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

Where the proposed pavement structure meets Albion Road, 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 the geotechnical consultant at the time of excavation (construction) as to its suitability.

Rigid Pavement structure

It is understood that a rigid pavement structure may be considered for the vehicle service bay. The rigid pavement structure presented in Table 7 is recommended for areas where a concrete pad is required. It should be noted that the reinforced concrete will be susceptible to frost heave if frost protection is not provided. Therefore, control and isolation joints are required for the subject concrete slabs.

Table 7 – Recommended Rigid Pavement Structure

Thickness (mm)	Material Description
150	**Reinforced Concrete** – Minimum 32 MPa Class C1 Concrete
100	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil and/or fill.	
NOTE: It is recommended that the concrete slab be reinforced with 152 X 152 MW 25.8/25.8 gauge welded wire mesh. The reinforcement would be adequately supported by 50 mm thick masonry blocking with a wire mesh overlap of a minimum 150 mm.	

To minimize the potential differential frost heave at the interface between the rigid pavement structure and adjacent asphalt pavement structures, a frost taper should be over-excavated below the asphalt pavement structure. It is recommended that a minimum 500 mm thick frost taper, consisting of a Granular B Type II placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the SPMDD using suitable vibratory equipment, extend horizontally at least 1.5 m beyond the

outside edge of the concrete pad. The frost taper beyond the horizontal section should slope up to match the pavement structure subgrade level at a 3H:1V slope.

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 granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum 98% of the SPMDD using suitable vibratory equipment.

Full depth isolation joints consisting of approximately 12 mm thick compressible material are recommended to any existing rigid structure such as curbs, poles, sidewalks and buildings to allow minor movement to occur independently from each other.

Control joints, also known as contraction joints provide a location where drying shrinkage cracks or cracking attributed to frost heave can occur without affecting the appearance of the concrete pad. The saw cut control joints should be placed at a minimum 2.4 m grid with a depth of 50 mm and a maximum width of 5 mm.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

A perimeter foundation drainage system is recommended to be provided for the proposed structures. The system should consist of a 100 to 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structures. The pipe should have a positive outlet, such as a gravity connection to the storm sewer or ditches.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage blanket, such as Miradrain G100N or Delta Drain 6000.

Concrete Sidewalks Adjacent to Buildings

To avoid differential settlements within the proposed sidewalks adjacent to the proposed buildings, it is recommended that the upper 600 mm of backfill placed below the concrete sidewalks adjacent to the building footprint consist of non-frost susceptible material such as OPSS Granular A or Granular B Type II. The granular material should be placed in maximum 300 mm loose lifts and compacted to 98% of the material's SPMDD using suitable compaction equipment. The subgrade material should be shaped to promote positive drainage towards the building's perimeter drainage pipe. Consideration should be given to placing a rigid insulation layer below the granular fill layer to prevent frost heave issues at the building entrances.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided in this regard. Exterior unheated footings, such as those for isolated exterior piers or access ramp, are more prone to deleterious movement associated with frost action than the exterior walls of the proper 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 excavations for the proposed development will be through fill followed by native silty sand material. The subsurface soil is considered to be mainly a Type 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects. Above the groundwater level, for excavations to depths of approximately 1.0 m, the excavation side slopes should be stable in the short term at 1H:1V. Shallower slopes should be provided for deeper excavations or for excavation below the groundwater level.

The slope cross-sections recommended above are for temporary slopes. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain safe working distance from the excavation sides.

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

A trench box is recommended to be installed 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 should not remain open for extended periods of time.

6.4 Pipe Bedding and Backfill

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

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. The material should be placed in a maximum 300 mm thick lifts and compacted to a minimum of 99% of its SPMDD. The bedding should extend to the spring line of the pipe.

Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A and be placed in maximum size of 25 mm. The cover material should be placed in maximum 300 mm thick lifts and compacted to 99% of the material’s SPMDD.

Where hard surfaces areas are expected, the backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce differential frost heaving. The backfill should be placed in maximum

300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

The groundwater infiltration into the excavation is anticipated to be moderate and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding mediums.

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

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

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

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

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a moderate to slightly aggressive corrosive environment.

6.8 Landscaping Consideration

Tree Planting Setbacks

In general accordance with the City of Ottawa's "Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines)", Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg Limits testing and grain size analysis were completed for recovered silty clay samples at select locations throughout the subject site. The soils samples were recovered from elevations below the anticipated design underside of footing (USF) elevations and 3.5 m depth below anticipated finished grade. The results of our testing are presented in Table 1 and 2 in Section 4.2 and in Appendix 1.

Based on the Atterberg Limits testing results, the plasticity limit for the encountered silty clay samples does not exceed 40 % across the subject site. In addition, based on the moisture levels and consistency of the soil, the silty clay encountered at the subject site is considered to be low to medium sensitive clay. Therefore, the following tree planting setbacks are recommended for the low to medium sensitivity areas.

Large trees (mature height over 14 m) can be planted within the site provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). A tree planting setback limit of **4.5 m** is applicable for small (mature tree height up to 7.5 m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the following conditions are met:

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

- ❑ A small tree must be provided with a minimum of 25 m3 of available soil volume while a medium tree must be provided with a minimum of 30 m3 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 to 14 m) as confirmed by the Landscape Architect.

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

- ❑ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), be noted in a drawing as part of 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.

Plants such as shrubs and bushes in which root growth is typically limited to the upper 1 m of overburden soils, may be planted within the 4.5 m setback limit.

7.0 Recommendations

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

- ❑ Review detailed grading plan(s), from a geotechnical perspective once available.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to determine that the specified level of compaction has been achieved.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ 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 are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

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

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

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

Paterson Group Inc.

Kevin A. Pickard, P.Eng.

Scott S, Dennis, P.Eng.

Report Distribution:

- ❑ W.O. Stinson and Son Limited (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMITS TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING RESULTS

ANALYTICAL TESTING RESULTS

PATERSON GROUP

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

SOIL PROFILE AND TEST DATA

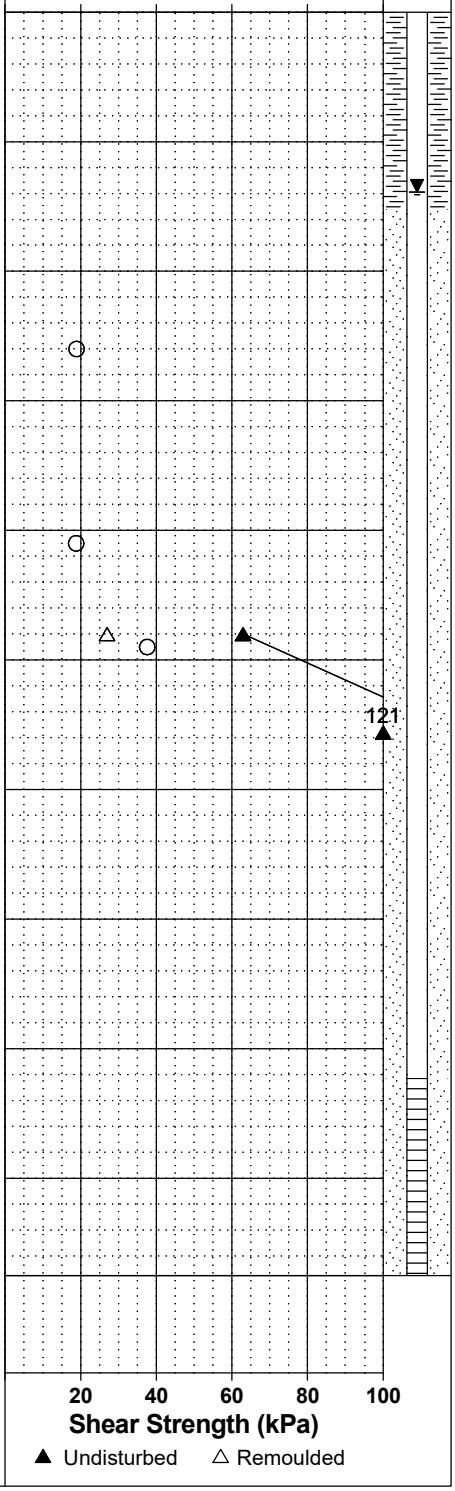
Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375872 **NORTHING:** 5014967 **ELEVATION:** 103.82
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 1-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	103.82
FILL: Brown silty sand with crushed stone and gravel		AU	1				
0.56							
TOPSOIL , trace organics							
0.94							
Compact brown **SILTY SAND**		SS	2	79	16	1	102.82
		SS	3	83	11	2	101.82
- Grey by 2.3 m depth		SS	4	67	11		
2.97						3	100.82
Stiff grey **SILTY CLAY** to **CLAYEY SILT** , trace sand		SS	5	0	1		
		SS	6	100	2	4	99.82
		SS	7	100	P	5	98.82
5.49							
Compact to dense grey **SANDY SILT** , trace clay		SS	8	75		6	97.82
		SS	9	83	48		
7.32		SS	10	83	33	7	96.82
GLACIAL TILL: Compact to very dense, grey silty sand to sandy silt, trace clay, gravel and cobbles, occasional boulders		SS	11	42	19	8	95.82
		SS	12	46	+50		
- Gravel content increasing with depth		SS	13	75	24	9	94.82
9.75							
End of Borehole							
(GWL at 1.39 m - June 4, 2024)							

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



PIEZOMETER CONSTRUCTION

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

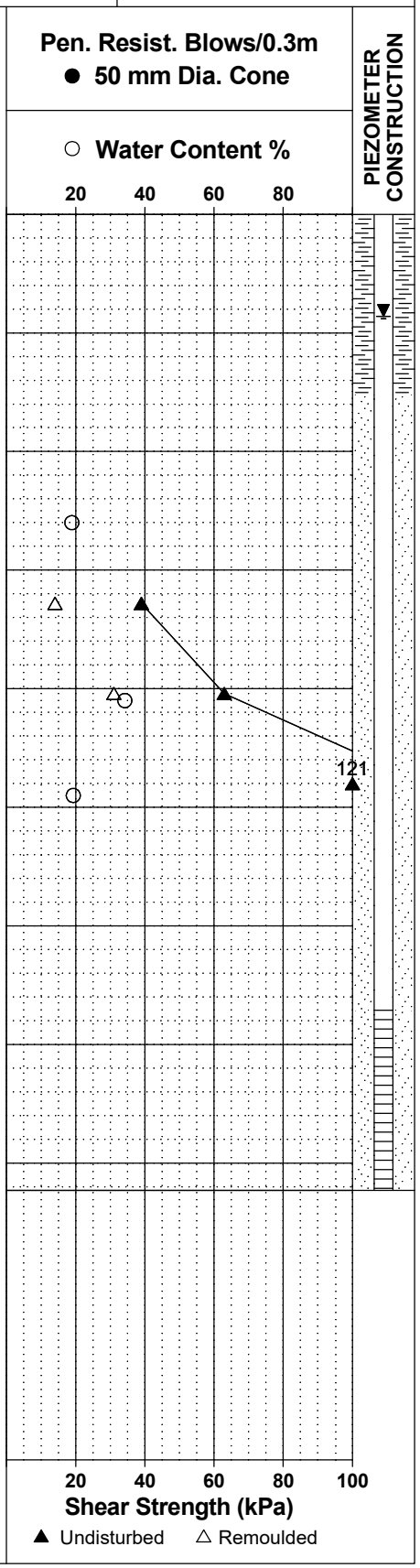
SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375916 **NORTHING:** 5015024 **ELEVATION:** 103.65
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 2-24

SAMPLE DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface							0	103.65
TOPSOIL with gravel and cobbles	0.15							
FILL: Brown silty sand with crushed stone and gravel, trace organics	0.61		AU	1				
Compact brown **SILTY SAND**			SS	2	63	13	1	102.65
- Grey by 1.8m depth			SS	3	25	13	2	101.65
Firm to stiff grey **SILTY CLAY** to **CLAYEY SILT**	2.21		SS	4	75	1		
			SS	5	0	P	3	100.65
	4.27		SS	6	67	P	4	99.65
Compact grey **SANDY SILT**								
	5.03		SS	7	75	23	5	98.65
GLACIAL TILL: Compact to very dense, grey silty sand with clay and gravel, occasional cobbles and boulders			SS	8	42	11		
			SS	9	38	9	6	97.65
- Boulder content increases with depth			SS	10	33	33	7	96.65
			SS	11	20	+50		
	8.23						8	95.65
End of Borehole								
(GWL at 0.86 m - June 4, 2024)								



PATERSON GROUP

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375937 **NORTHING:** 5014973 **ELEVATION:** 103.33
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 11

FILE NO. PG5485
HOLE NO. BH 3-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.33		
FILL: Brown silty sand with crushed stone and gravel		AU	1						
- Some concrete from 0.9 to 1.1 m depth		SS	2	54	38	1	102.33		
		SS	3	38	31	2	101.33		
2.13									
Firm grey **SILTY CLAY** to **CLAYEY SILT**		SS	4	67	1	3	100.33		
		SS	5	0	P				
4.11		SS	6	67	P	4	99.33		
Loose grey **SANDY SILT**									
4.88		SS	7	63	7	5	98.33		
GLACIAL TILL: Loose to compact, grey silty sand to sandy silt, some gravel, trace to some clay		SS	8	33	13				
- Occasional cobbles and boulders by 5.5 m depth		SS	9	54	14	6	97.33		
		SS	10	58	9	7	96.33		
7.52									
End of Borehole									
Practical refusal to augering at 7.52 m depth									
Piezometer Blocked									

Pen. Resist. Blows/0.3m: 20 40 60 80
Shear Strength (kPa): 20 40 60 80 100
▲ Undisturbed △ Remoulded

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375978 **NORTHING:** 5014904 **ELEVATION:** 103.51
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.51	
FILL: Brown silty sand with crushed stone, gravel and cobbles		AU	1					
0.91								
Compact to loose brown **SILTY SAND**		SS	2	88	11	1	102.51	
- Grey by 1.7 m depth		SS	3	75	6			
		SS	4	46	8	2	101.51	
3.20								
Compact grey **SANDY SILT**		SS	5	83	26	3	100.51	
4.11								
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay		SS	6	50	8	4	99.51	
4.42								
End of Borehole								
Hole terminated due to sand ingress into augers								
(GWL at 0.86 m - June 4, 2024)								

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

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

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375976 **NORTHING:** 5014903 **ELEVATION:** 103.51
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4A-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.51		
FILL: Brown silty sand with crushed stone, gravel and cobbles									
0.91						1	102.51		
Compact to loose brown **SILTY SAND**									
- Grey by 1.7 m depth						2	101.51		
3.20						3	100.51		
Compact grey **SANDY SILT**									
4.11						4	99.51		
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay		SS	1		+50				
4.52									
End of Borehole									
Practical refusal to augering at 4.52 m depth									

Pen. Resist. Blows/0.3m: 20, 40, 60, 80
Shear Strength (kPa): 20, 40, 60, 80, 100
▲ Undisturbed △ Remoulded

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

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375983 **NORTHING:** 5014906 **ELEVATION:** 103.48
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 4B-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	PIEZOMETER CONSTRUCTION
Ground Surface						0	103.48		
FILL: Brown silty sand with crushed stone, gravel and cobbles									
0.91						1	102.48		
Compact to loose brown **SILTY SAND**									
- Grey by 1.7 m depth						2	101.48		
3.20						3	100.48		
Compact grey **SANDY SILT**									
4.11						4	99.48		
GLACIAL TILL: Loose, grey silty sand to sandy silt, some gravel and clay									
4.57						5	98.48	○	
GLACIAL TILL: Compact, grey silty sand to sandy silt with gravel, trace clay, occasional cobbles and boulders		SS	1	33	11				
		SS	2	46	10	6	97.48		
		SS	3	50	22				
6.71									
End of Borehole									

Pen. Resist. Blows/0.3m: 20 40 60 80
Shear Strength (kPa): 20 40 60 80 100
▲ Undisturbed △ Remoulded

PATERSON GROUP

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

SOIL PROFILE AND TEST DATA

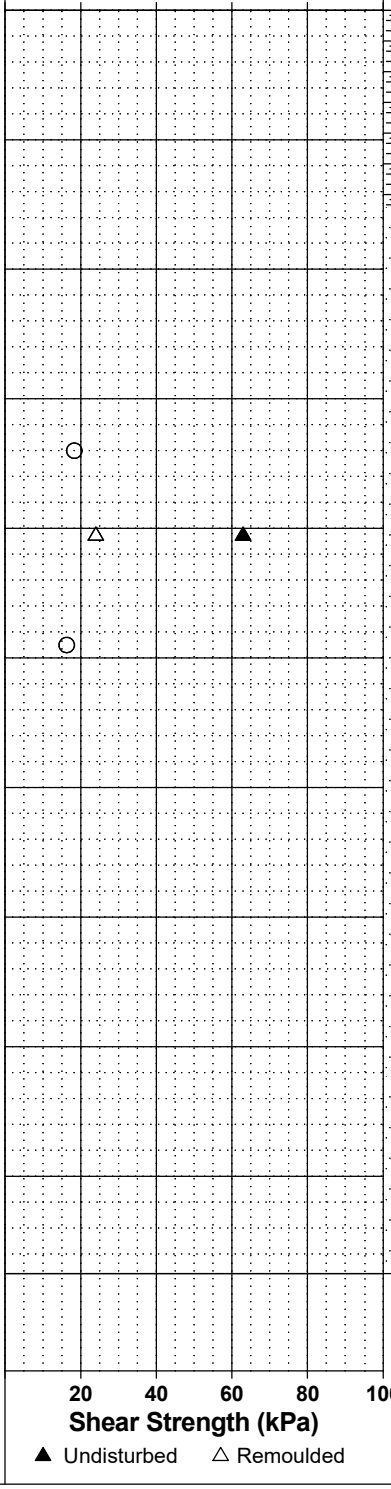
Geotechnical Investigation
5505 & 5545 Albion Road
Ottawa, Ontario

EASTING: 375915 **NORTHING:** 5014904 **ELEVATION:** 103.42
DATUM: Geodetic
REMARKS:
BORINGS BY: CME 55 Low Clearance Power Auger **DATE:** 2024 April 12

FILE NO. PG5485
HOLE NO. BH 5-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Ground Surface						0	103.42
TOPSOIL , some crushed stone and gravel, trace organics	0.20	AU	1				
FILL: Brown silty sand with crushed stone and gravel	0.61	AU	2				
Compact to loose brown **SILTY SAND** - Grey by 1.2 m depth		SS	3	79	10	1	102.42
		SS	4	75	7	2	101.42
		SS	5	83	3		
Stiff grey **SILTY CLAY** to **CLAYEY SILT**	2.97	SS	6	100	1	3	100.42
		SS	7	0	P	4	99.42
Dense to compact grey **SILT** , trace clay and sand	4.50	SS	8	75	34	5	98.42
		SS	9	92	22		
	6.55	SS	10	71	19	6	97.42
GLACIAL TILL: Compact to dense, grey silty sand to sandy silt with gravel, some clay, occasional cobbles and boulders		SS	11	83	13	7	96.42
		SS	12	25	19	8	95.42
		SS	13	33	12		
		SS	14	38	32	9	94.42
	9.75						
End of Borehole							
Piezometer blocked							

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



PIEZOMETER CONSTRUCTION

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 1

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.53
FILL: Brown silty sand, some crushed stone, trace organics		AU	1				
0.56							
Compact, light brown **SILTY SAND**		SS	2	46	12	1	102.53
1.37							
Loose, grey **SANDY SILT**		SS	3	42	4	2	101.53
2.13							
Loose, grey **SILTY SAND**		SS	4	96	6		
2.74						3	100.53
Firm, grey **SILTY CLAY**		SS	5	33	2		
3.81							
End of Borehole							

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 2

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.45
FILL: Dark brown silty sand with crushed stone		AU	1				
0.60							
FILL: Brown silty sand, trace asphalt		SS	2	33	8	1	102.45
		SS	3	29	5	2	101.45
2.29							
Very loose, grey **SILTY SAND**		SS	4	54	2	3	100.45
3.05							
Stiff, grey **SILTY CLAY**		SS	5	58	2		
4.11						4	99.45
Loose, grey **SILTY SAND**		SS	6	54	P		
4.42							
End of Borehole							
(GWL @ 1.17m - Sept. 11, 2020)							

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

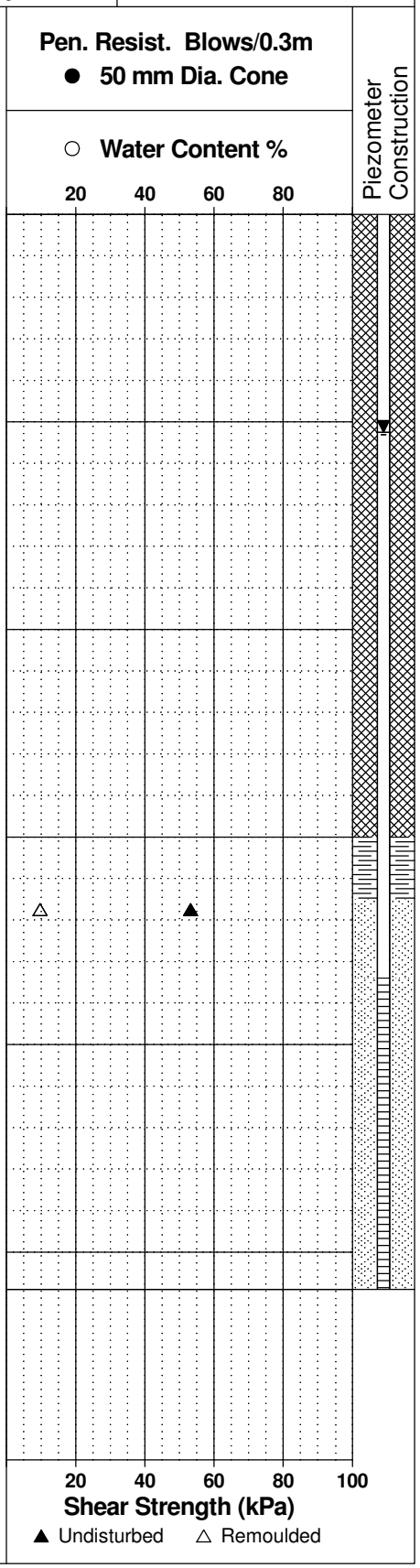
FILE NO. PG5485

REMARKS

HOLE NO. BH 3

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.46
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone		AU	1				
0.63							
		SS	2	58	14	1	102.46
Loose, grey **SILTY SAND**		SS	3	54	8		
		SS	4	38	5	2	101.46
3.05							
		SS	5	79	3	3	100.46
Stiff to very stiff, grey **SILTY CLAY**							
- silt content increasing with depth		SS	6	62	30	4	99.46
4.65							
Loose, grey **SANDY SILT**		SS	7	83	7	5	98.46
5.18							
End of Borehole							
(GWL @ 1.05m - Sept. 11, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

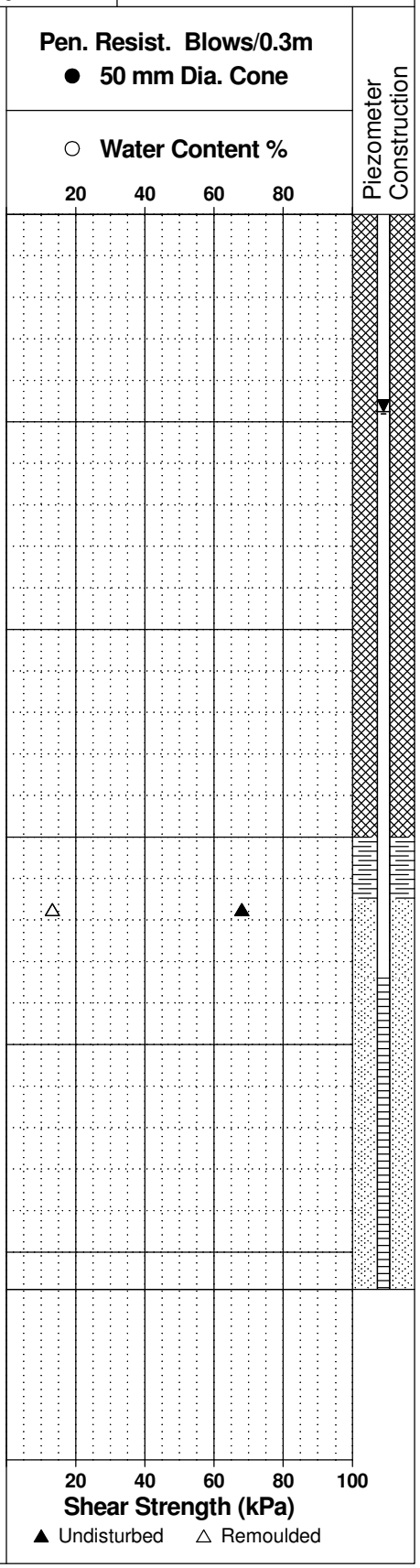
FILE NO. PG5485

REMARKS

HOLE NO. BH 4

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.68
FILL: Brown silty sand with crushed stone, trace organics		AU	1				
0.43							
		SS	2	38	9	1	102.68
Loose, brown **SILTY SAND**, trace gravel and shells		SS	3	29	10	2	101.68
2.59		SS	4	100	6		
Stiff to very stiff, grey **SILTY CLAY**		SS	5	100	P	3	100.68
		SS	6	79	3	4	99.68
4.57							
Dense, grey **SANDY SILT**		SS	7	33	31	5	98.68
5.18							
End of Borehole							
(GWL @ 0.95m - Sept. 11, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

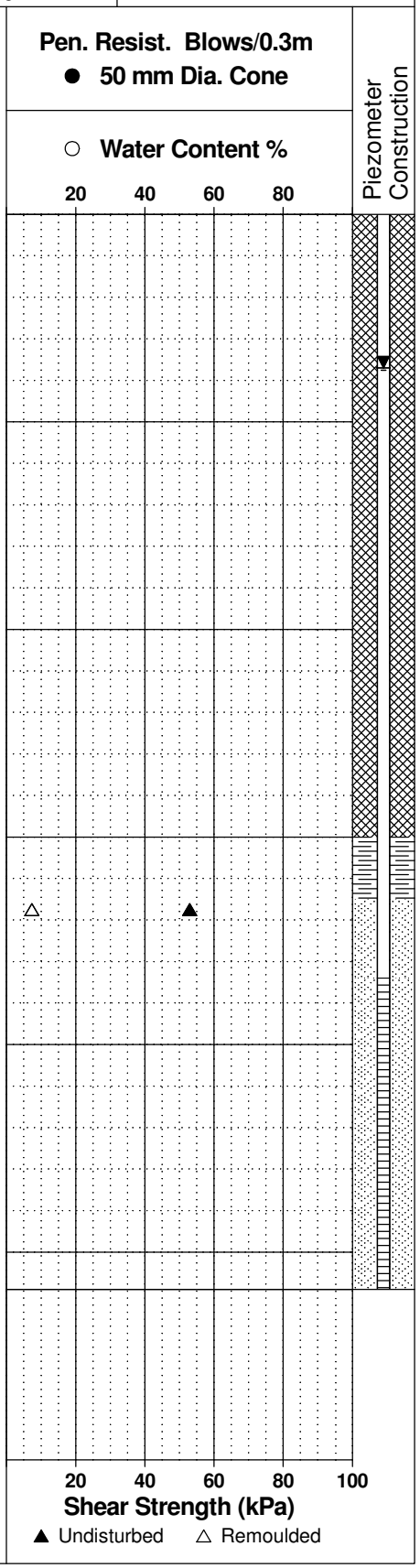
FILE NO. PG5485

REMARKS

HOLE NO. BH 5

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.34
FILL: Dark brown silty sand with gravel, some crushed stone		AU	1				
0.43							
		SS	2	54	16	1	102.34
Compact to very loose, grey **SILTY SAND,** trace shells		SS	3	21	14		
		SS	4	100	2	2	101.34
2.74							
Stiff, grey **SILTY CLAY**						3	100.34
4.11		SS	5	79	10	4	99.34
Compact, grey **SANDY SILT,** trace gravel		SS	6	38	17		
						5	98.34
5.18							
End of Borehole							
(GWL @ 0.74m - Sept. 11, 2020)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 6

BORINGS BY CME-55 Low Clearance Drill **DATE** September 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.80
FILL: Brown silty sand with crushed stone		AU	1				
0.51							
FILL: Brown/black silty sand, trace crushed stone		SS	2	62	21	1	102.80
1.52							
		SS	3	71	15	2	101.80
Compact, grey **SILTY SAND,** trace shells		SS	4	33	13	3	100.80
		SS	5	100	12	4	99.80
4.57							
Soft, grey **SILTY CLAY**		SS	6	92	2	5	98.80
5.18							
End of Borehole							
(GWL @ 1.94m - Sept. 11, 2020)							

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

20 40 60 80

Piezometer Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 7

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.62
FILL: Brown silty sand with gravel and organics		AU	1				
0.38							
Loose, brown **SILTY SAND**, with brown clay		SS	2	79	7	1	102.62
1.52							
		SS	3	29	8	2	101.62
Soft, grey **SILTY CLAY**		SS	4	96	2		
3.05						3	100.62
		SS	5	12	9		
Loose, grey **SILTY SAND** with clay		SS	6	79	W	4	99.62
		SS	7	12	9		
5.18						5	98.62
End of Borehole							
(GWL @ 0.61m - Sept. 11, 2020)							

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

20 40 60 80

Piezometer Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 8

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.74
FILL: Brown/black silty sand with crushed stone, some organics		AU	1				
0.36							
		SS	2	58	9	1	102.74
Loose, red-brown **SILTY SAND**							
- brown with clay by 1.5m depth.		SS	3	54	4	2	101.74
2.29							
		SS	4	42	7	3	100.74
		SS	5	79	6		
Loose, grey **SAND,** trace shells		SS	6	100	7	4	99.74
		SS	7	100	5	5	98.74
5.18							
End of Borehole							
(GWL @ 1.01m - Sept. 11, 2020)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**
20 40 60 80

Piezometer Construction

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5485

REMARKS

HOLE NO. BH 9

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	103.85
FILL: Black silty sand with crushed stone, some boulders		AU	1				
0.66							
FILL: Brown/black silty sand with grey clay, trace gravel		SS	2	46	6	1	102.85
1.52							
		SS	3	42	6	2	101.85
FILL: Grey/black silty clay with grey sand		SS	4	46	2		
3.05						3	100.85
		SS	5	83	2		
Stiff, grey **SILTY CLAY**		SS	6	100	P	4	99.85
4.57							
End of Borehole							
(GWL @ 1.52m - Sept. 11, 2020)							

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

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Dev. - Albion Rd. at Mitch Owens Rd.
Ottawa, Ontario

DATUM Geodetic

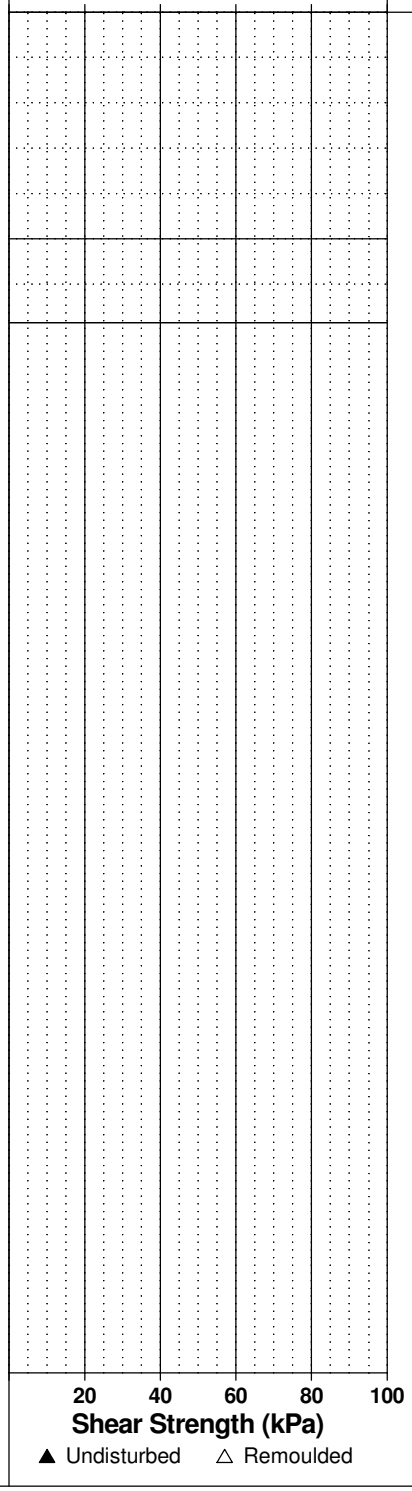
FILE NO. PG5485

REMARKS

HOLE NO. BH10

BORINGS BY CME-55 Low Clearance Drill **DATE** September 3, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
FILL: Brown silty sand with crushed stone, gravel and cobbles, trace clay		AU	1			0	103.89		
0.10									
Compact, brown **SILTY SAND**		SS	2	38	25	1	102.89		
1.37									
End of Borehole									
(BH dry upon completion)									



SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.75 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 1-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.75 m						0				
FILL: Crushed stone with silty sand and gravel, occasional cobbles		G1								
0.86 m EL 102.89 m										▼
Brown SILTY SAND		G2				1				
1.29 m EL 102.46 m		G3								
Grey SILT, trace sand										
1.75 m EL 102 m						2				
End of Test Pit										
(GWL @ 0.86m depth)						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.74 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 2-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.74 m						0				
FILL: Crushed stone with silty sand, trace asphalt and organics		G1								
0.3 m EL 103.44 m										
FILL: Brown sand, trace silt, gravel and organics		G2								
0.95 m EL 102.79 m		G3				1				▼
Brown SANDY SILT, trace gravel										
1.75 m EL 101.99 m										
End of Test Pit						2				
(GWL @ 1.03m depth)										
						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.6 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS: **DATE:** October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 3-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.6 m						0				
FILL: Crushed stone with silty sand, trace gravel and organics		G1								▼
		G2				1				
1.27 m EL 102.33 m Grey SILT, trace sand		G3								
1.56 m EL 102.04 m End of Test Pit (GWL @ 0.64m depth)						2				
						3				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

5545 Albion Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 103.5 m

PROJECT: Hydrogeological Assessment

BORINGS BY: Excavator

REMARKS:

DATE: October 13, 2023

FILE NO. **PH3645**

HOLE NO. TP 4-23

SAMPLE DESCRIPTION	STRATA PLOT	Sample No.	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 50 100	Peak Shear Strength (kPa) 0 50 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 50 100	Piezometer Construction
Ground Surface EL 103.5 m						0				
FILL: Crushed stone with silty sand, trace organics		G1								▼
1.12 m EL 102.38 m						1				
Brown SILT, trace sand		G2								
1.4 m EL 102.1 m						2				
End of Test Pit (GWL @ 0.42m depth)						3				

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

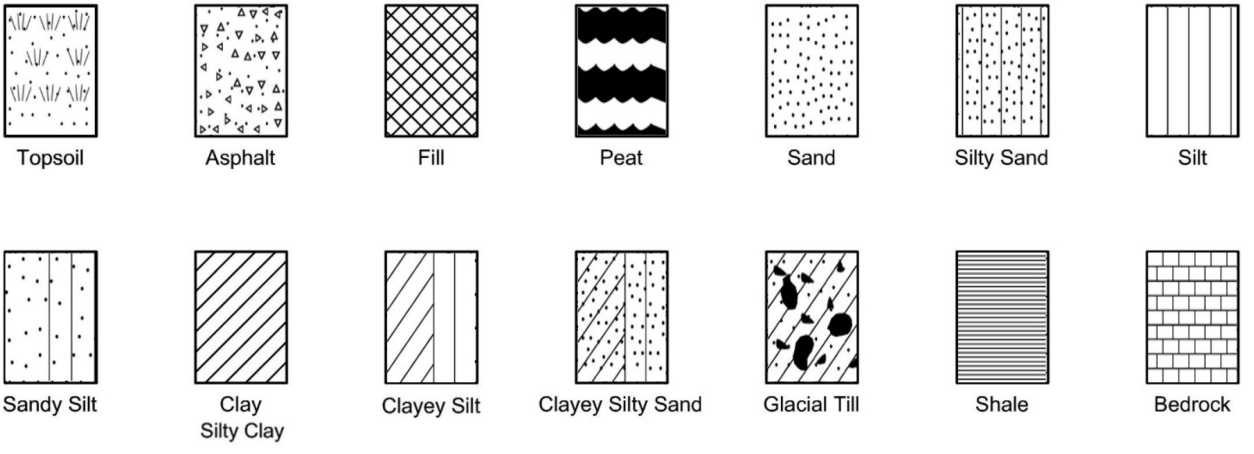
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

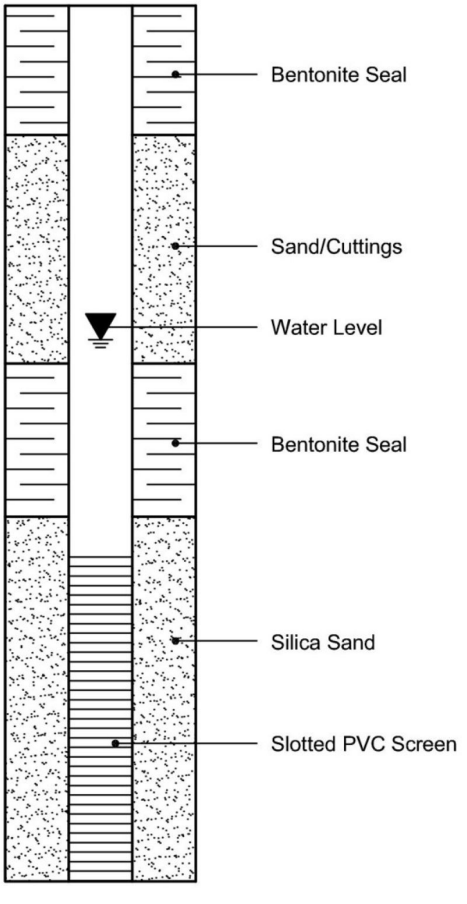
SYMBOLS AND TERMS (continued)

STRATA PLOT

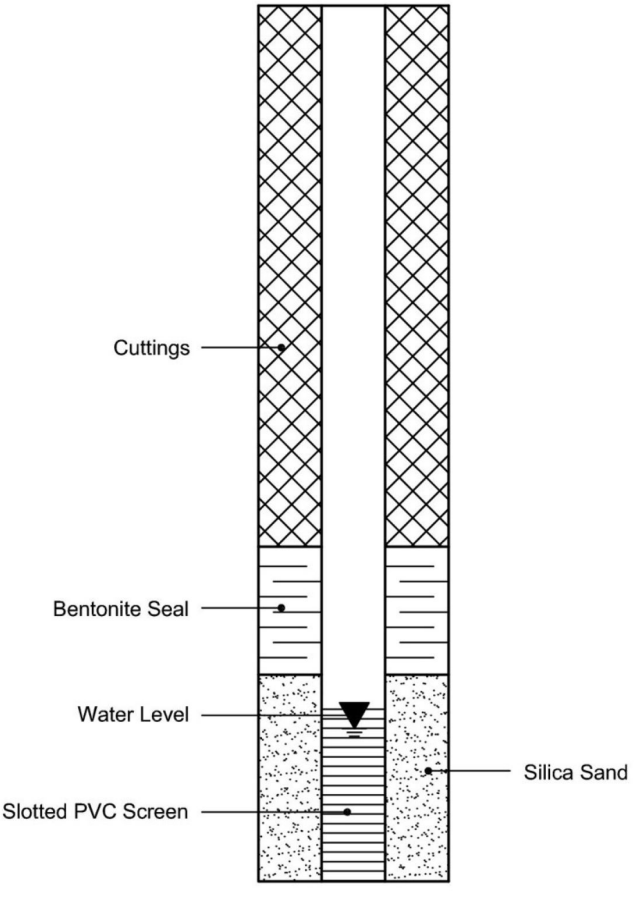


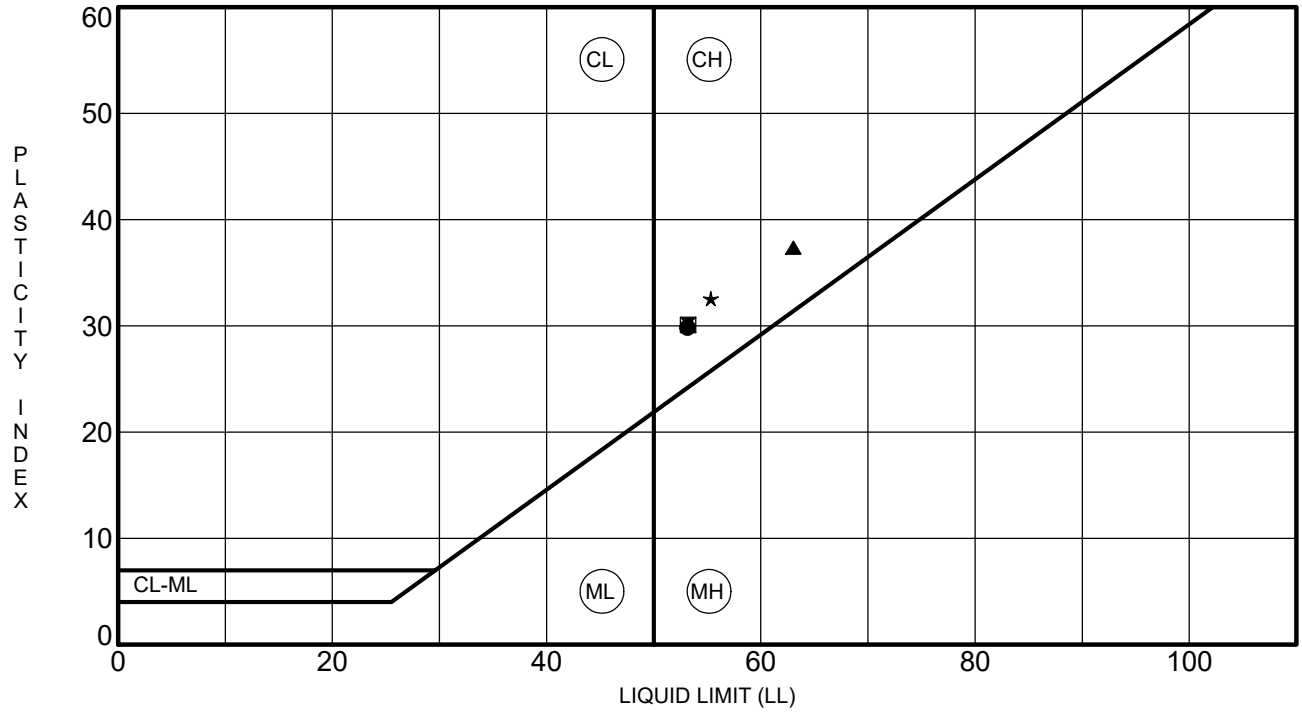
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 1-24**	**SS6**	**54**	**23**	**31**		**CH - Inorganic clays of high plasticity**
⧓	**BH 2-24**	**SS4**	**54**	**23**	**31**		**CH - Inorganic clays of high plasticity**
▲	**BH 3-24**	**SS4**	**63**	**26**	**37**		**CH - Inorganic clays of high plasticity**
★	**BH 5-24**	**SS6**	**56**	**23**	**33**		**CH - Inorganic clays of high plasticity**

CLIENT **W.O. Stinson & Son Ltd** FILE NO. **PG5485 & PH3645**

PROJECT **Geotechnical Investigation - 5505 & 5545 Albion Road** DATE **12 Apr 24**

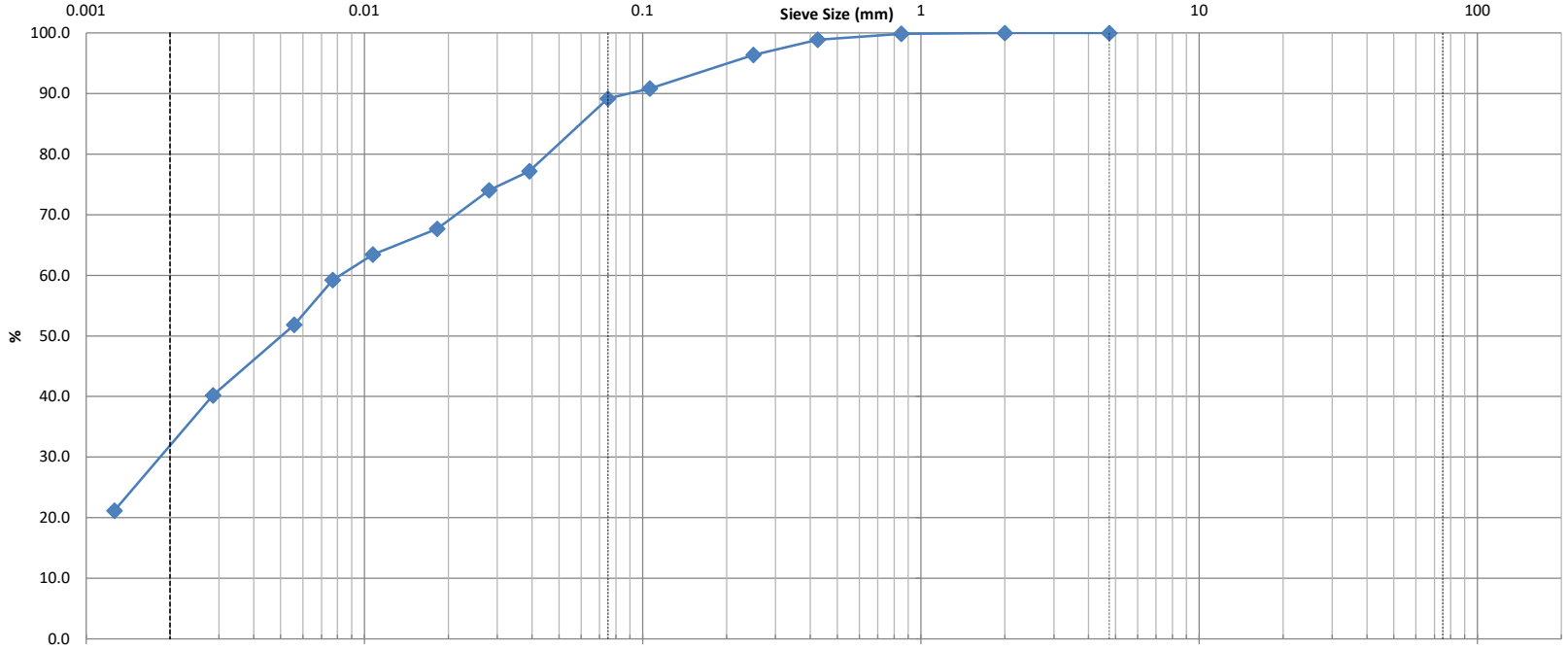
patersongroup Consulting Engineers
9 Auriga Drive, Ottawa, Ontario K2E 7T9

ATTERBERG LIMITS' RESULTS

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH1-24 SS7	LAB NO:	51670
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					37.6%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
					0.0	10.8	58.2		31.0	

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH1-24 SS7	DATE SAMPLED:	April 11-12
LAB No. :	51670	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
95.0	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	46.75	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	5.48	AIR DRY	101.60	101.60
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	95.00	95.00
		CORRECTED	0.935	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**95.0**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.55**	1.1	**98.9**
0.250	**1.81**	3.6	**96.4**
0.106	**4.57**	9.1	**90.9**
0.075	**5.41**	10.8	**89.2**
Pan	**5.48**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:49	42.5	6.0	23.0	0.0391	77.2	**77.2**
2	8:50	41.0	6.0	23.0	0.0281	74.0	**74.0**
5	8:53	38.0	6.0	23.0	0.0182	67.7	**67.7**
15	9:03	36.0	6.0	23.0	0.0107	63.4	**63.4**
30	9:18	34.0	6.0	23.0	0.0077	59.2	**59.2**
60	9:48	30.5	6.0	23.0	0.0056	51.8	**51.8**
250	12:58	25.0	6.0	23.0	0.0029	40.2	**40.2**
1440	8:48	16.0	6.0	23.0	0.0013	21.1	**21.1**

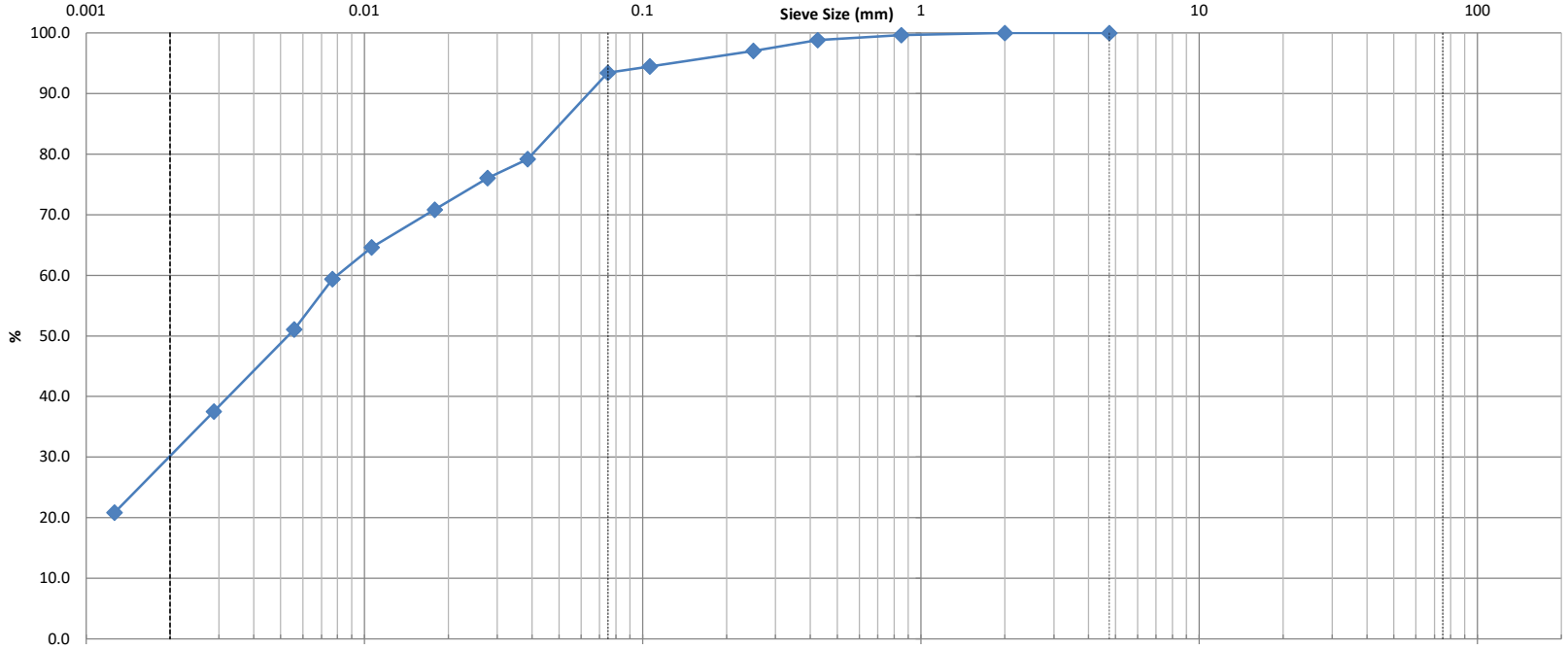
Moisture = 37.6%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	12'6" - 14'6"	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH2-24 SS6	LAB NO:	51672
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						34.2%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	6.6		63.4		30.0	

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	12'6" - 14'6"	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH2-24 SS6	DATE SAMPLED:	April 11-12
LAB No. :	51672	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
104.1	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	47.45	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	3.36	AIR DRY	109.70	109.70
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	104.10	104.10
		CORRECTED	0.949	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**104.1**		
0.850	**0.17**	0.3	**99.7**
0.425	**0.58**	1.2	**98.8**
0.250	**1.47**	2.9	**97.1**
0.106	**2.75**	5.5	**94.5**
0.075	**3.29**	6.6	**93.4**
Pan	**3.36**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:54	44.0	6.0	23.0	0.0386	79.2	**79.2**
2	8:55	42.5	6.0	23.0	0.0277	76.1	**76.1**
5	8:58	40.0	6.0	23.0	0.0179	70.9	**70.9**
15	9:08	37.0	6.0	23.0	0.0106	64.6	**64.6**
30	9:23	34.5	6.0	23.0	0.0077	59.4	**59.4**
60	9:53	30.5	6.0	23.0	0.0056	51.1	**51.1**
250	13:03	24.0	6.0	23.0	0.0029	37.5	**37.5**
1440	8:53	16.0	6.0	23.0	0.0013	20.8	**20.8**

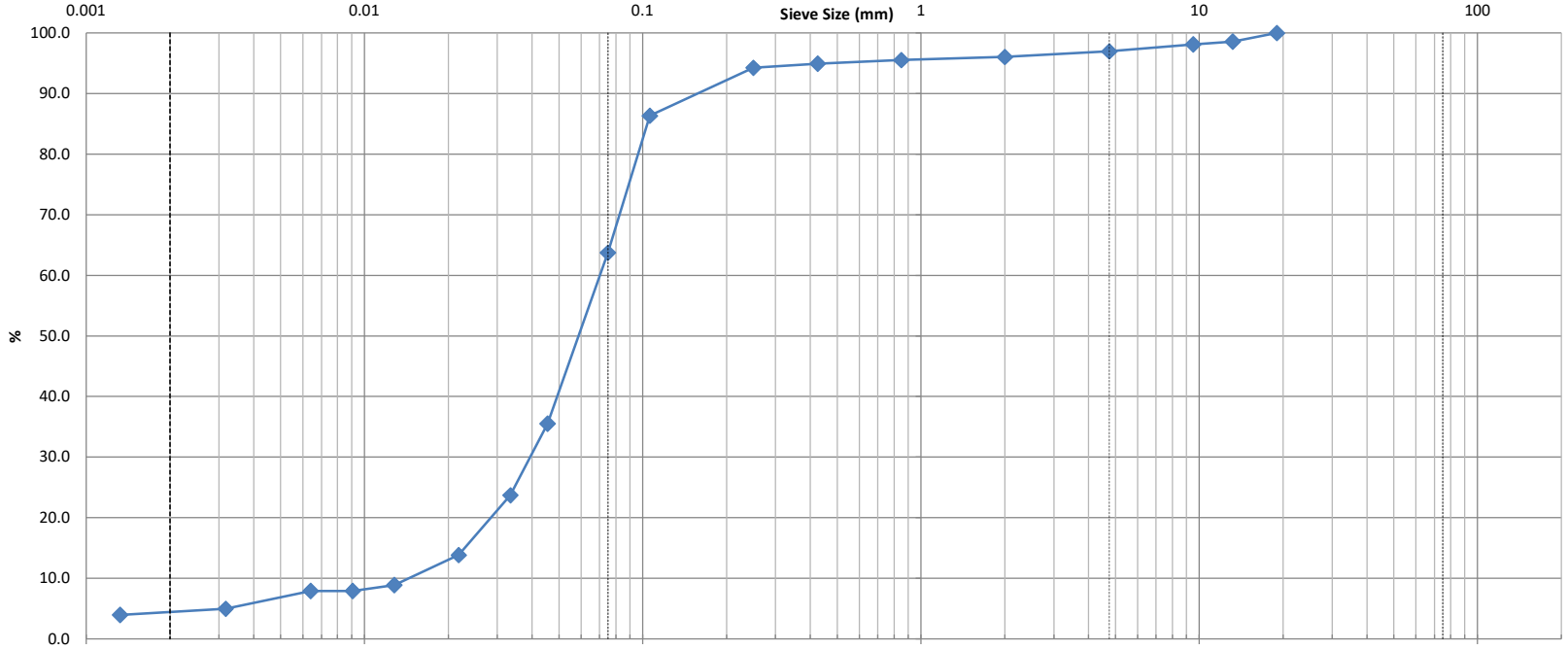
Moisture = 34.2%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH2-24 SS7	LAB NO:	51678
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					19.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					3.0	33.3		59.4		4.3

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH2-24 SS7	DATE SAMPLED:	April 11-12
LAB No. :	51678	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
596.2	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	48.14	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	22.60	AIR DRY	619.20	619.20
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	596.20	596.20
		CORRECTED	0.963	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19	**0.0**	0.0	**100.0**
13.2	**8.4**	1.4	**98.6**
9.5	**11.1**	1.9	**98.1**
4.75	**18.0**	3.0	**97.0**
2.0	**23.5**	3.9	**96.1**
Pan	**572.7**		
0.850	**0.28**	4.5	**95.5**
0.425	**0.58**	5.1	**94.9**
0.250	**0.94**	5.7	**94.3**
0.106	**5.06**	13.7	**86.3**
0.075	**16.83**	36.3	**63.7**
Pan	**22.60**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:01	24.0	6.0	23.0	0.0454	37.0	**35.5**
2	9:02	18.0	6.0	23.0	0.0334	24.6	**23.7**
5	9:05	13.0	6.0	23.0	0.0218	14.4	**13.8**
15	9:15	10.5	6.0	23.0	0.0128	9.2	**8.9**
30	9:30	10.0	6.0	23.0	0.0091	8.2	**7.9**
60	10:00	10.0	6.0	23.0	0.0064	8.2	**7.9**
250	13:10	8.5	6.0	23.0	0.0032	5.1	**4.9**
1440	9:00	8.0	6.0	23.0	0.0013	4.1	**3.9**

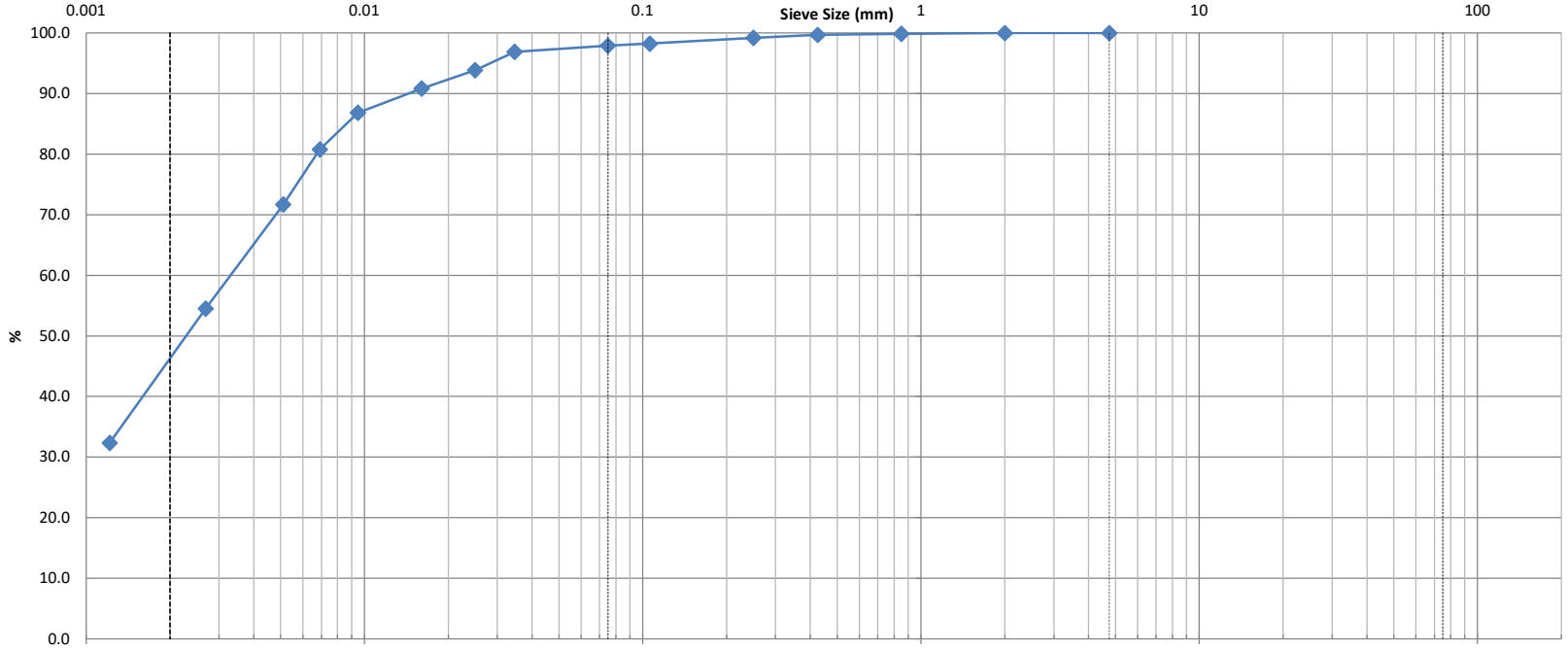
Moisture = 19.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	8'6" - 9'6"	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH3-24 SS4 BTM	LAB NO:	51673
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						55.7%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	2.1		50.9		47.0	

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	8'6" - 9'6"	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH3-24 SS4 BTM	DATE SAMPLED:	April 11-12
LAB No. :	51673	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
77.6	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	42.22	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	1.08	AIR DRY	91.90	91.90
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	77.60	77.60
		CORRECTED	0.844	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**77.6**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.16**	0.3	**99.7**
0.250	**0.40**	0.8	**99.2**
0.106	**0.87**	1.7	**98.3**
0.075	**1.04**	2.1	**97.9**
Pan	**1.08**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:20	54.0	6.0	23.0	0.0346	96.9	**96.9**
2	9:21	52.5	6.0	23.0	0.0249	93.9	**93.9**
5	9:24	51.0	6.0	23.0	0.0160	90.9	**90.9**
15	9:34	49.0	6.0	23.0	0.0095	86.8	**86.8**
30	9:49	46.0	6.0	23.0	0.0069	80.8	**80.8**
60	10:19	41.5	6.0	23.0	0.0051	71.7	**71.7**
250	13:29	33.0	6.0	23.0	0.0027	54.5	**54.5**
1440	9:19	22.0	6.0	23.0	0.0012	32.3	**32.3**

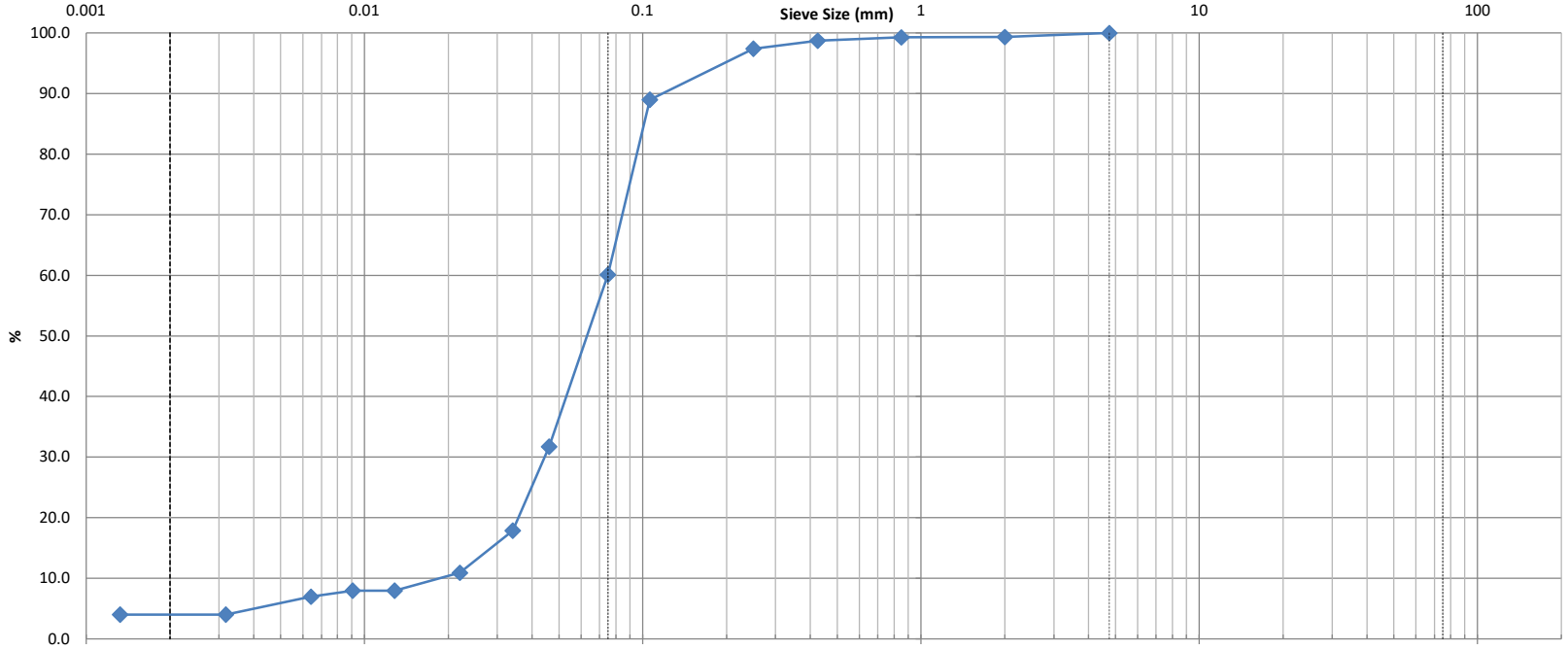
Moisture = 55.7%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 16'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH3-24 SS7 TOP	LAB NO:	51668
PROJECT:	5505 & 5545 Albion Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					20.9%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					0.0	39.9		56.2		4.0

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 16'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albion Road	BH OR TP No.:	BH3-24 SS7 TOP	DATE SAMPLED:	April 11-12
LAB No. :	51668	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
135.8	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.56	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	24.26	AIR DRY	137.00	137.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	135.80	135.80
		CORRECTED	0.991	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.9**	0.7	**99.3**
Pan	**134.9**		
0.850	**0.03**	0.7	**99.3**
0.425	**0.31**	1.3	**98.7**
0.250	**0.96**	2.6	**97.4**
0.106	**5.20**	11.0	**89.0**
0.075	**19.74**	39.9	**60.1**
Pan	**24.26**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:25	22.0	6.0	23.0	0.0461	31.9	**31.7**
2	8:26	15.0	6.0	23.0	0.0341	18.0	**17.8**
5	8:29	11.5	6.0	23.0	0.0220	11.0	**10.9**
15	8:39	10.0	6.0	23.0	0.0128	8.0	**7.9**
30	8:54	10.0	6.0	23.0	0.0091	8.0	**7.9**
60	9:24	9.5	6.0	23.0	0.0064	7.0	**6.9**
250	12:34	8.0	6.0	23.0	0.0032	4.0	**4.0**
1440	8:24	8.0	6.0	23.0	0.0013	4.0	**4.0**

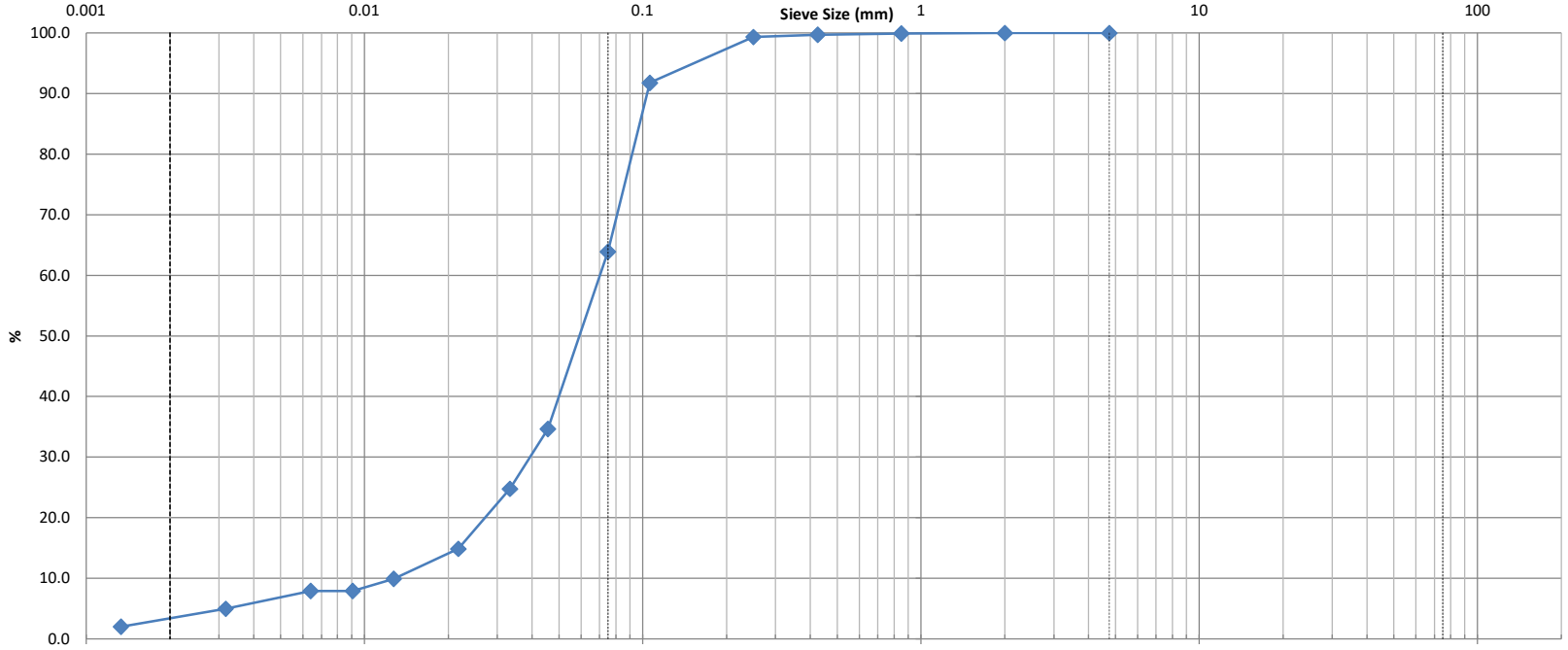
Moisture = 20.9%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH4-24 SS5 BTM	LAB NO:	51674
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					21.1%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)		Clay (%)	
					0.0	36.1	60.8		3.1	

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH4-24 SS5 BTM	DATE SAMPLED:	April 11-12
LAB No. :	51674	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
135.2	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.96	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	23.18	AIR DRY	135.30	135.30
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	135.20	135.20
		CORRECTED	0.999	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**135.2**		
0.850	**0.04**	0.1	**99.9**
0.425	**0.13**	0.3	**99.7**
0.250	**0.33**	0.7	**99.3**
0.106	**4.10**	8.2	**91.8**
0.075	**18.05**	36.1	**63.9**
Pan	**23.18**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:24	23.5	6.0	23.0	0.0456	34.6	**34.6**
2	9:25	18.5	6.0	23.0	0.0333	24.7	**24.7**
5	9:28	13.5	6.0	23.0	0.0217	14.8	**14.8**
15	9:38	11.0	6.0	23.0	0.0127	9.9	**9.9**
30	9:53	10.0	6.0	23.0	0.0091	7.9	**7.9**
60	10:23	10.0	6.0	23.0	0.0064	7.9	**7.9**
250	13:33	8.5	6.0	23.0	0.0032	4.9	**4.9**
1440	9:23	7.0	6.0	23.0	0.0013	2.0	**2.0**

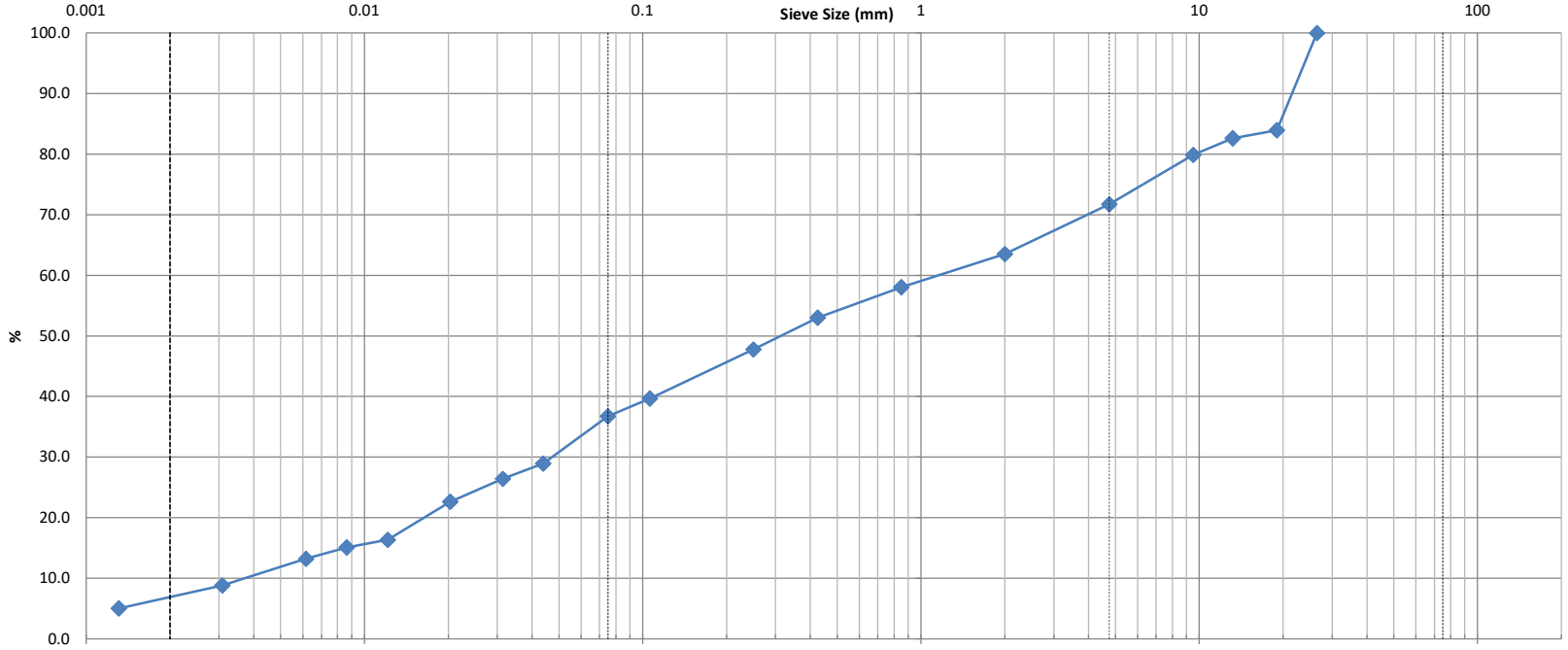
Moisture = 21.1%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH4B-24 SS1	LAB NO:	51675
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					8.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					28.3	35.0		29.7		7.0

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH4B-24 SS1	DATE SAMPLED:	April 11-12
LAB No. :	51675	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
387.7	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.97	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	21.50	AIR DRY	387.90	387.90
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	387.70	387.70
		CORRECTED	0.999	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5	**0.0**	0.0	**100.0**
19	**62.1**	16.0	**84.0**
13.2	**67.3**	17.4	**82.6**
9.5	**78.0**	20.1	**79.9**
4.75	**109.5**	28.3	**71.7**
2.0	**141.4**	36.5	**63.5**
Pan	**246.3**		
0.850	**4.31**	41.9	**58.1**
0.425	**8.27**	47.0	**53.0**
0.250	**12.42**	52.3	**47.7**
0.106	**18.76**	60.3	**39.7**
0.075	**21.10**	63.3	**36.7**
Pan	**21.50**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:11	29.0	6.0	23.0	0.0438	45.5	**28.9**
2	9:12	27.0	6.0	23.0	0.0314	41.6	**26.4**
5	9:15	24.0	6.0	23.0	0.0203	35.6	**22.6**
15	9:25	19.0	6.0	23.0	0.0121	25.7	**16.3**
30	9:40	18.0	6.0	23.0	0.0086	23.7	**15.1**
60	10:10	16.5	6.0	23.0	0.0062	20.8	**13.2**
250	13:20	13.0	6.0	23.0	0.0031	13.9	**8.8**
1440	9:10	10.0	6.0	23.0	0.0013	7.9	**5.0**

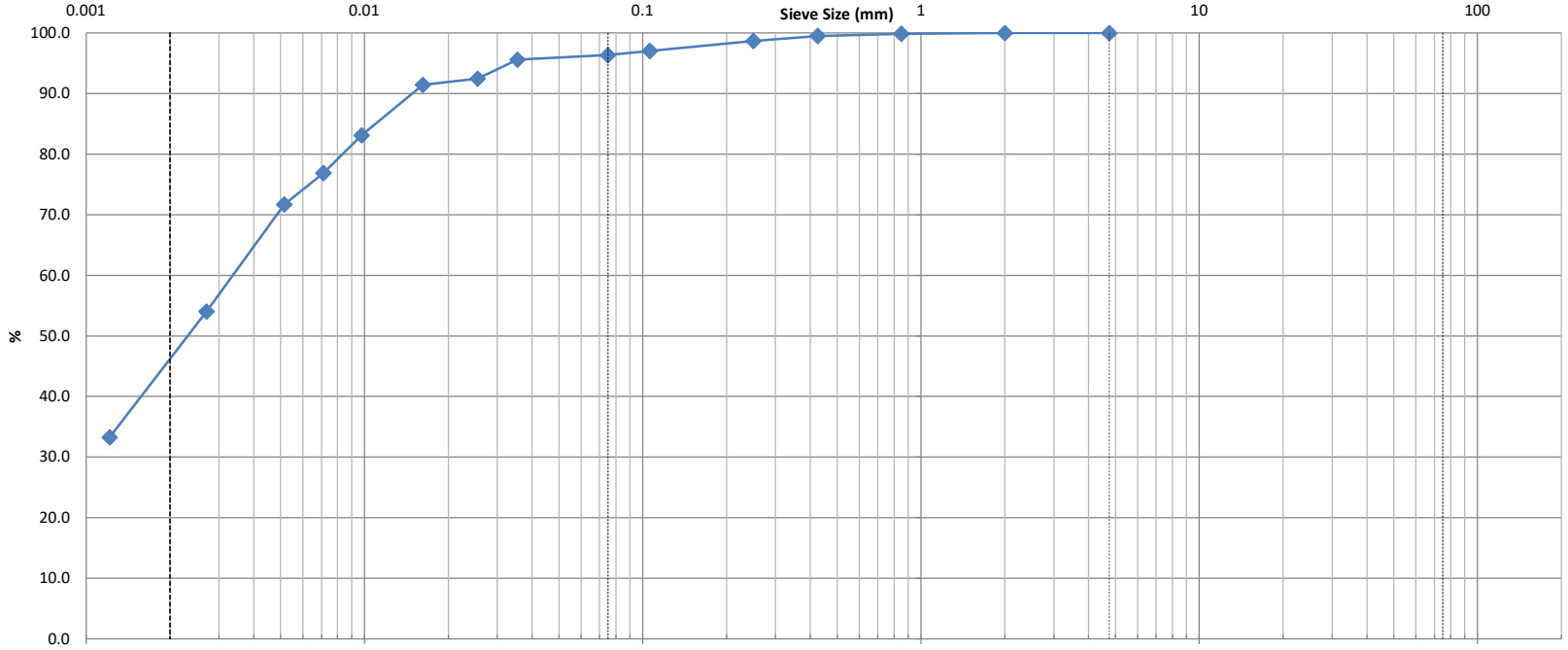
Moisture = 8.0%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH5-24 SS6	LAB NO:	51676
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						50.3%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	3.6		49.4		47.0	

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	10' - 12'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH5-24 SS6	DATE SAMPLED:	April 11-12
LAB No. :	51676	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
88.8	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	41.38	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	1.85	AIR DRY	107.30	107.30
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	88.80	88.80
		CORRECTED	0.828	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**88.8**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.24**	0.5	**99.5**
0.250	**0.66**	1.3	**98.7**
0.106	**1.47**	2.9	**97.1**
0.075	**1.82**	3.6	**96.4**
Pan	**1.85**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:43	52.0	6.0	23.0	0.0355	95.6	**95.6**
2	9:44	50.5	6.0	23.0	0.0255	92.5	**92.5**
5	9:47	50.0	6.0	23.0	0.0162	91.4	**91.4**
15	9:57	46.0	6.0	23.0	0.0098	83.1	**83.1**
30	10:12	43.0	6.0	23.0	0.0071	76.9	**76.9**
60	10:42	40.5	6.0	23.0	0.0051	71.7	**71.7**
250	13:52	32.0	6.0	23.0	0.0027	54.0	**54.0**
1440	9:42	22.0	6.0	23.0	0.0012	33.3	**33.3**

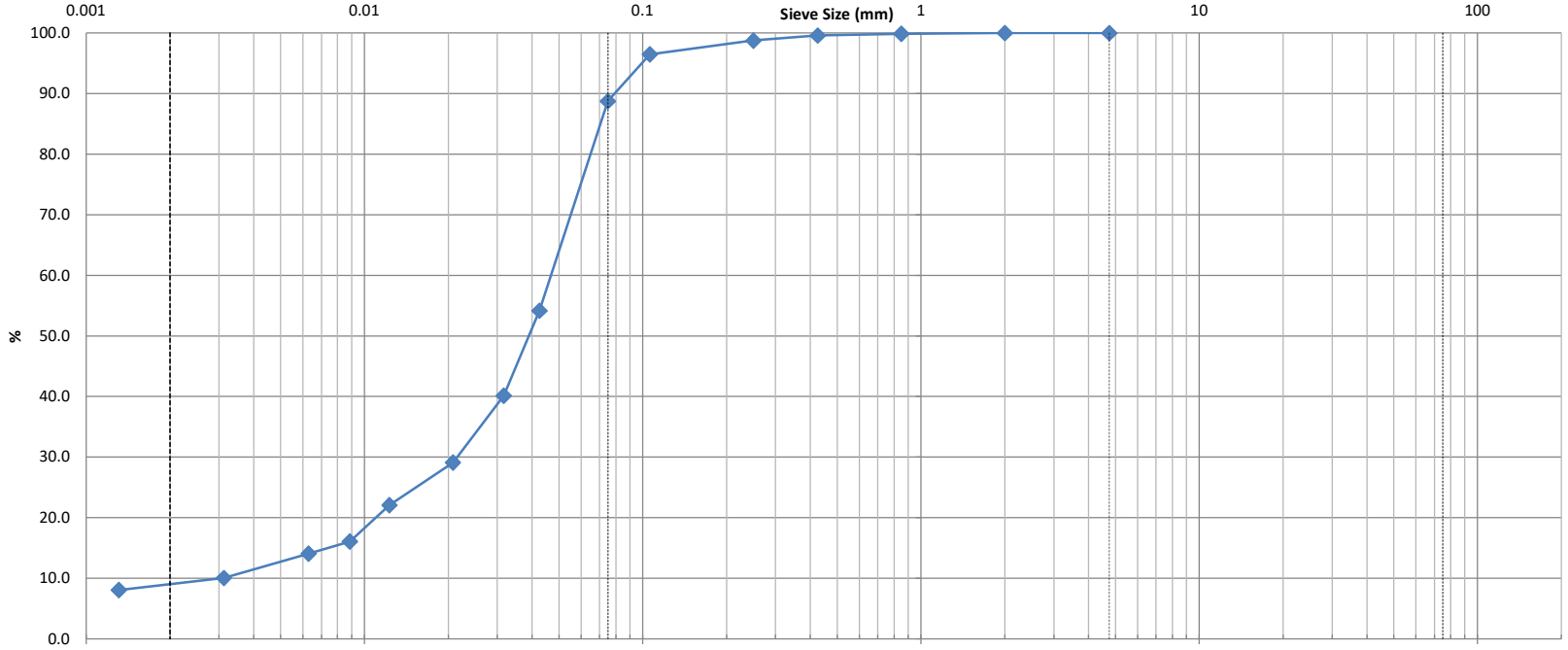
Moisture = 50.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO:	PG5485/PH3645
CONTRACT NO.:		BH OR TP No.:	BH5-24 SS8	LAB NO:	51677
PROJECT:	5505 & 5545 Albian Road			DATE RECEIVED:	25-Apr-24
				DATE TESTED:	26-Apr-24
DATE SAMPLED:	April 11-12			DATE REPORTED:	30-Apr-24
SAMPLED BY:	J.P			TESTED BY:	D.K



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					16.3%					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	11.2	79.3	9.5

Comments:

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

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	W.O Stinson & Son Ltd.	DEPTH:	15' - 17'	FILE NO.:	PG5485/PH3645
PROJECT:	5505 & 5545 Albian Road	BH OR TP No.:	BH5-24 SS8	DATE SAMPLED:	April 11-12
LAB No. :	51677	TESTED BY:	D.K	DATE RECEIVED:	25-Apr-24
SAMPLED BY:	J.P	DATE REPT'D:	30-Apr-24	DATE TESTED:	26-Apr-24

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
180.5	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	49.29	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	8.64	AIR DRY	183.10	183.10
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	180.50	180.50
		CORRECTED	0.986	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**180.5**		
0.850	**0.07**	0.1	**99.9**
0.425	**0.20**	0.4	**99.6**
0.250	**0.61**	1.2	**98.8**
0.106	**1.75**	3.5	**96.5**
0.075	**5.62**	11.2	**88.8**
Pan	**8.64**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:20	33.0	6.0	23.0	0.0425	54.2	**54.2**
2	8:21	26.0	6.0	23.0	0.0317	40.1	**40.1**
5	8:24	20.5	6.0	23.0	0.0208	29.1	**29.1**
15	8:34	17.0	6.0	23.0	0.0123	22.1	**22.1**
30	8:49	14.0	6.0	23.0	0.0089	16.0	**16.0**
60	9:19	13.0	6.0	23.0	0.0063	14.0	**14.0**
250	12:29	11.0	6.0	23.0	0.0031	10.0	**10.0**
1440	8:19	10.0	6.0	23.0	0.0013	8.0	**8.0**

Moisture = 16.3%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

Certificate of Analysis

Report Date: 10-Sep-2020

Client: Paterson Group Consulting Engineers

Order Date: 4-Sep-2020

Client PO: 30729

Project Description: PG5485

	Client ID:	BH4-SS3	-	-	-
	Sample Date:	02-Sep-20 12:00	-	-	-
	Sample ID:	2036652-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	87.5	-	-	-
General Inorganics					
pH	0.05 pH Units	7.73	-	-	-
Resistivity	0.10 Ohm.m	60.8	-	-	-
Anions					
Chloride	5 ug/g dry	<5	-	-	-
Sulphate	5 ug/g dry	74	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURES 2 TO 5 – GROUNDWATER MONITORING CHARTS

DRAWING PG5485-1 – TEST HOLE LOCATION PLAN

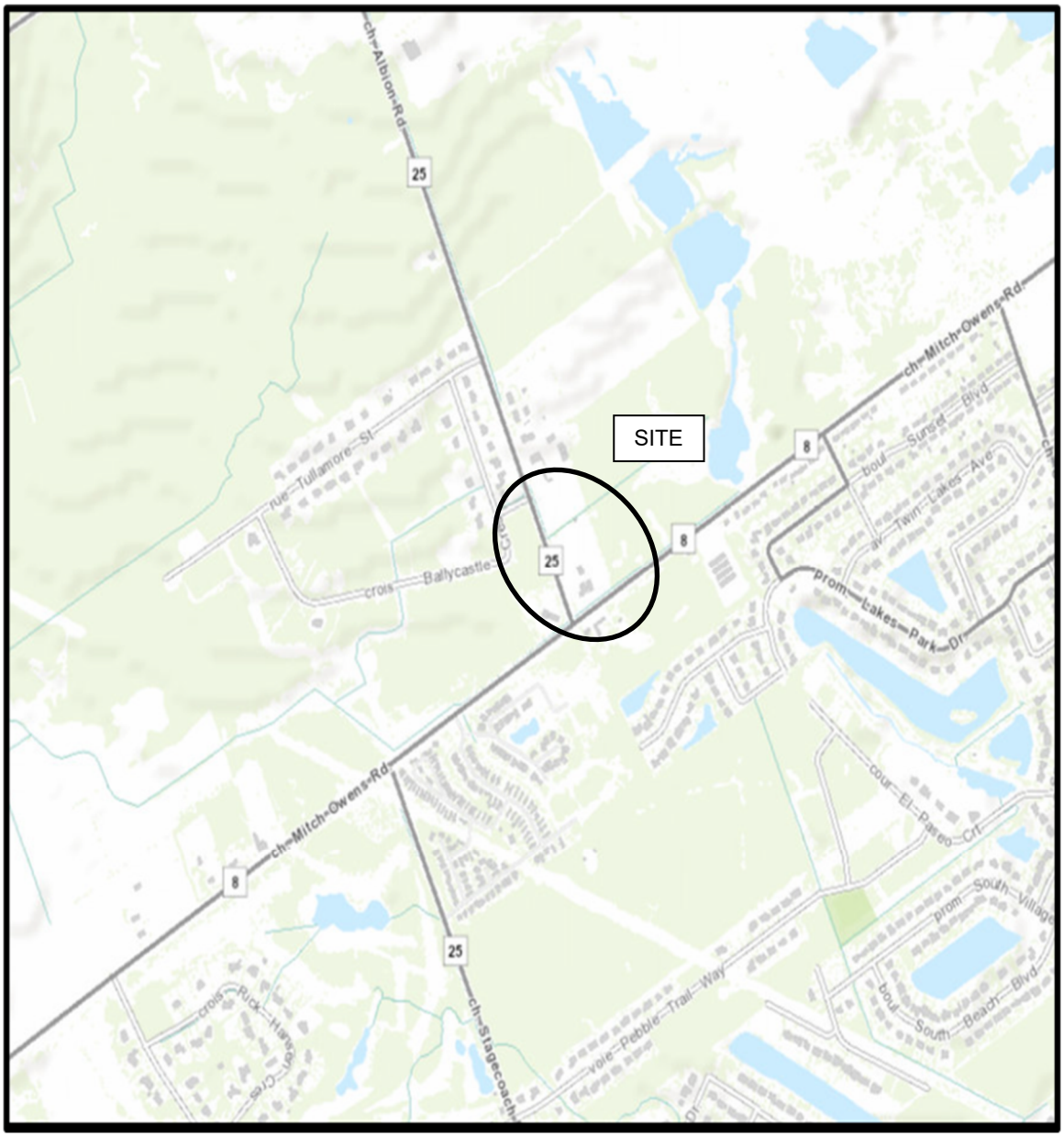


FIGURE 1

KEY PLAN

PATERSON GROUP

Figure 2: BH 1 - Monitoring Well Water Elevations

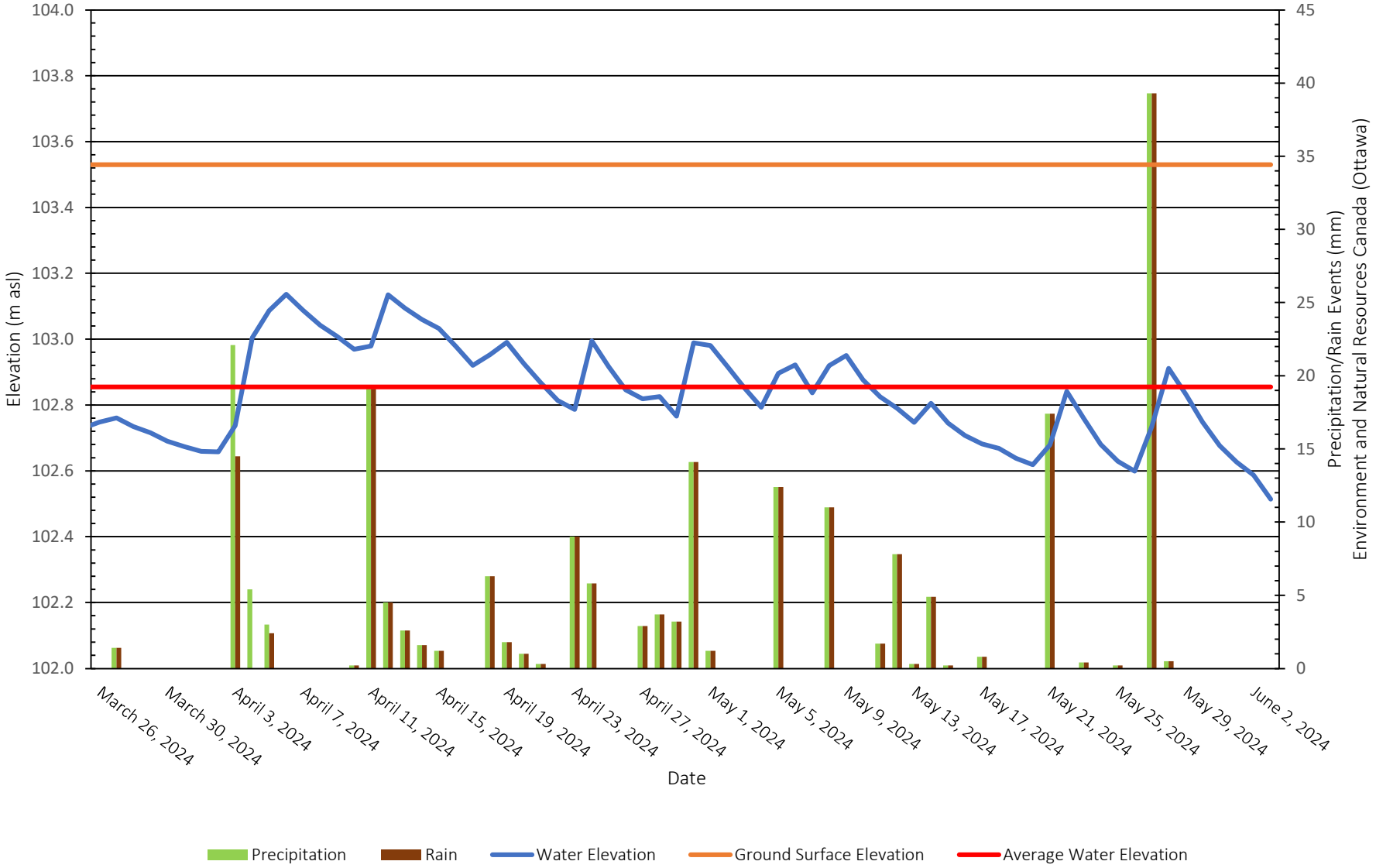


Figure 3: BH 2 - Monitoring Well Water Elevations

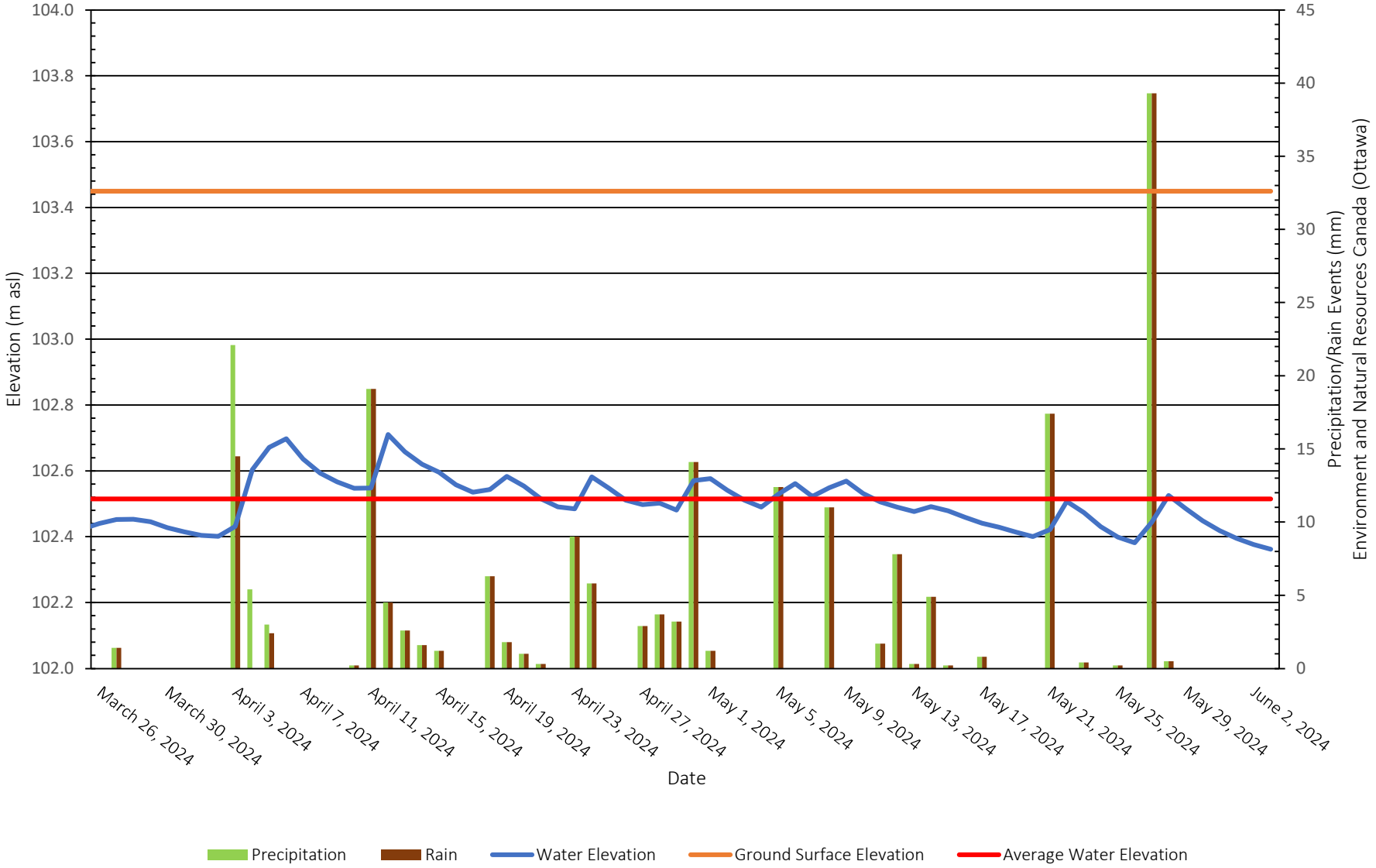


Figure 4: BH 6 - Monitoring Well Water Elevations

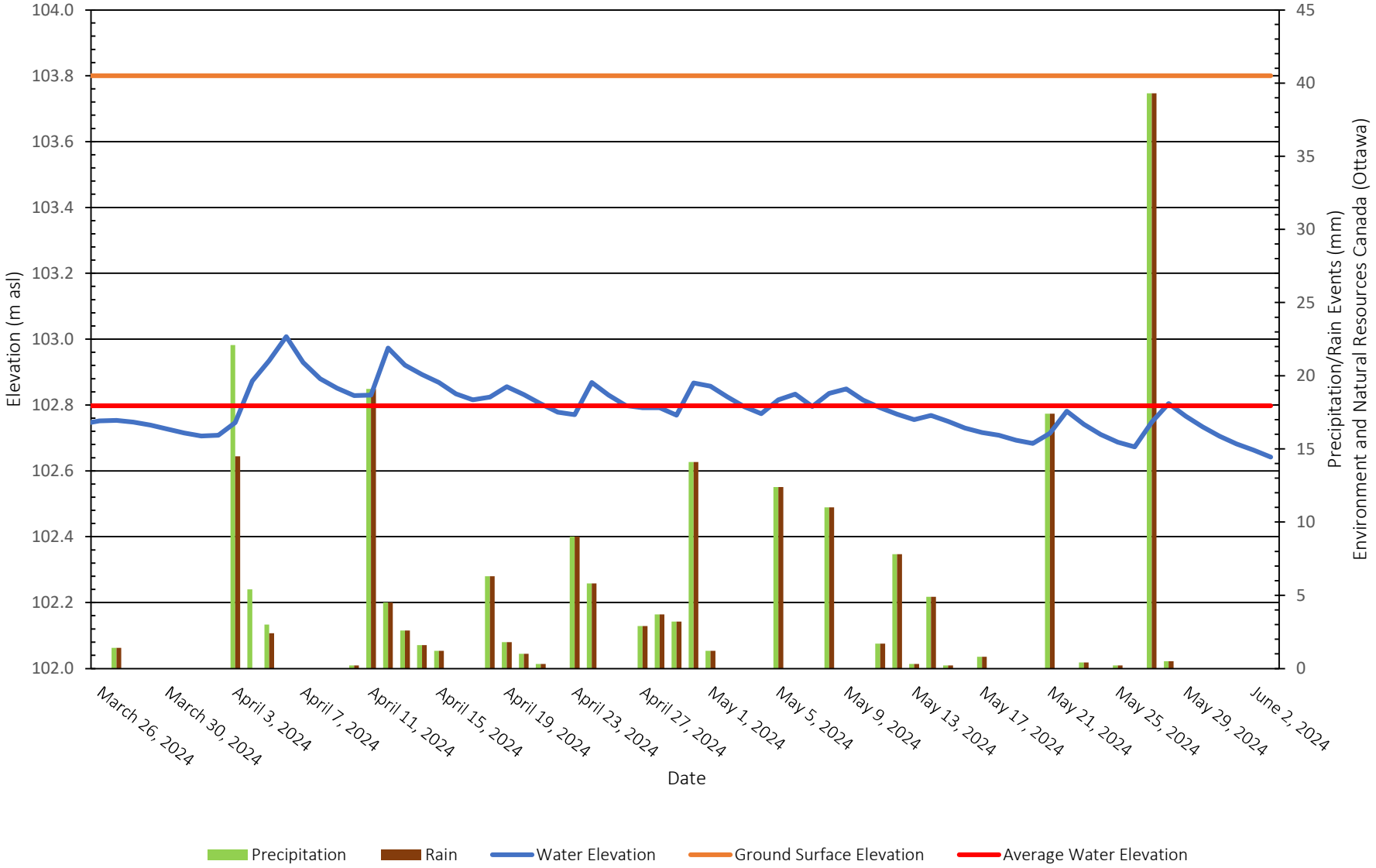
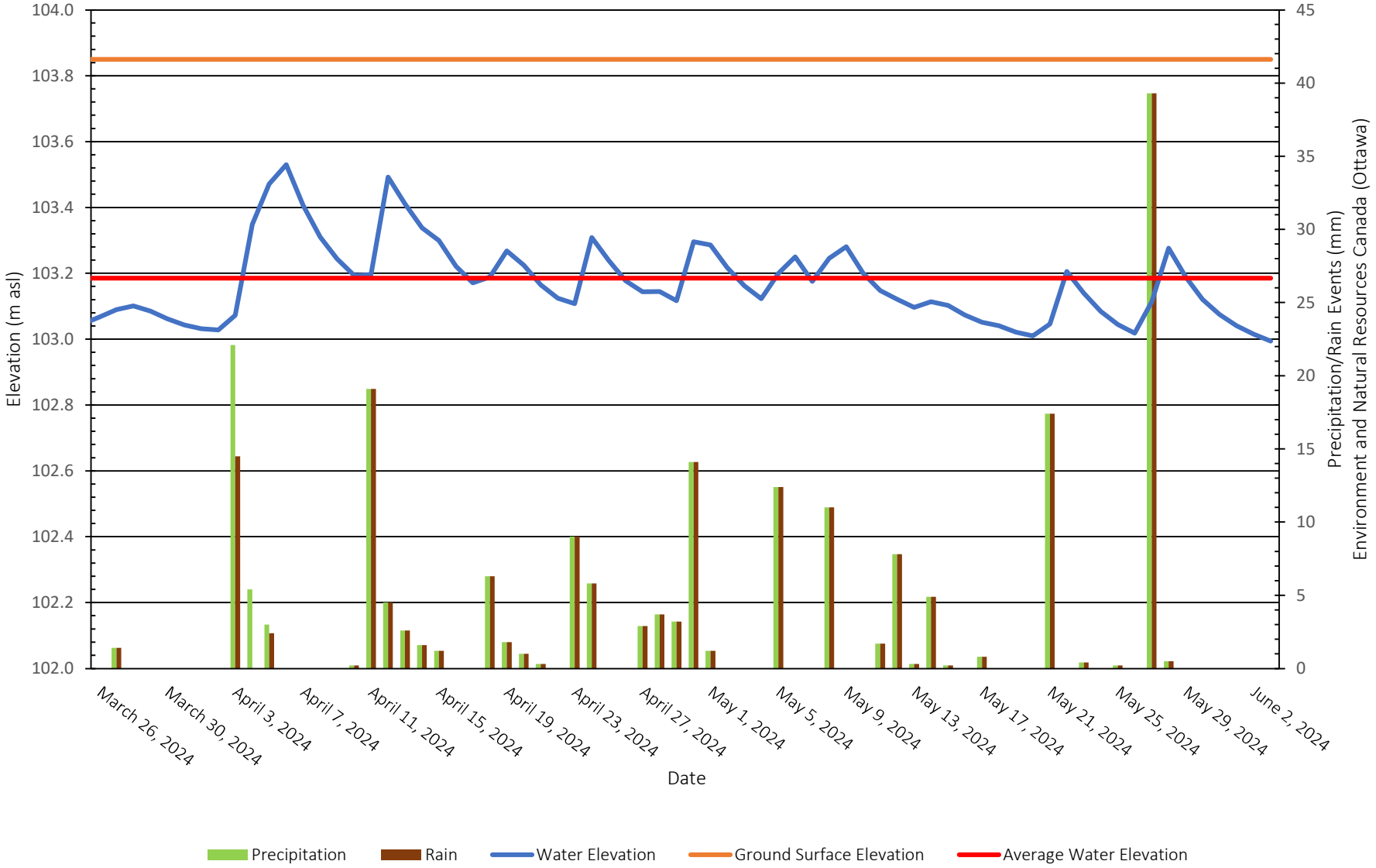
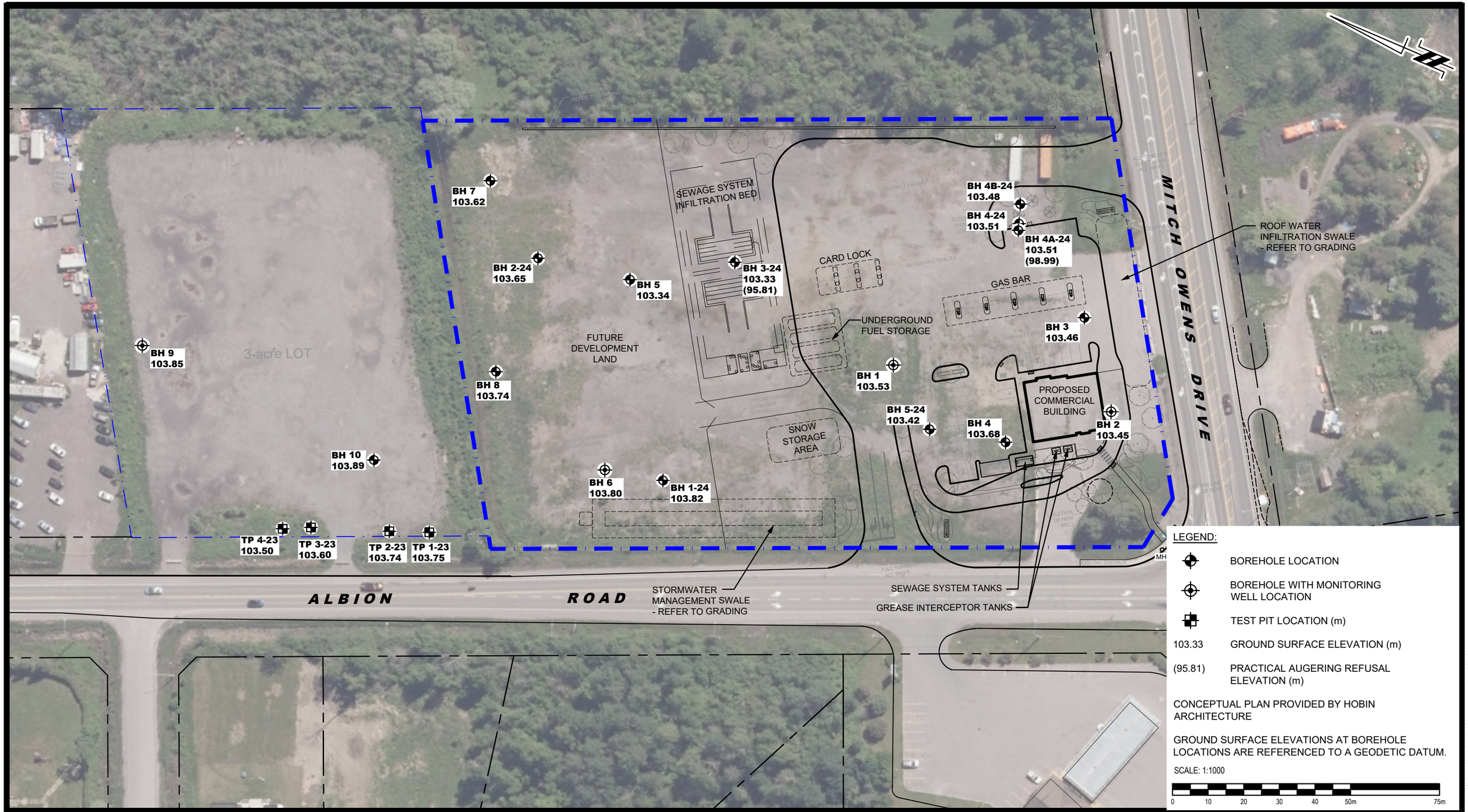


Figure 5: BH 9 - Monitoring Well Water Elevations





LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- TEST PIT LOCATION (m)
- 103.33 GROUND SURFACE ELEVATION (m)
- (95.81) PRACTICAL AUGERING REFUSAL ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY HOBIN ARCHITECTURE

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1000

0 10 20 30 40 50m 75m

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

NO.	REVISIONS	DATE	INITIAL
2	UPDATED TO NEW CONCEPTUAL PLAN	27/01/2025	KP
1	UPDATED TO NEW CONCEPTUAL PLAN ADDED 2023 TEST PITS / 2024 BOREHOLES	26/07/2024	KP

W.O. STINSON AND SON LIMITED
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
5545 ALBION ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 09/2020
Drawn by: RCG	Report No.: PG5485-1
Checked by: KP	Dwg. No.: PG5485-1
Approved by: DJG	Revision No.: 2

11x17

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