PATERSON GROUP

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

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Materials Testing
Building Science
Rural Development Design
Retaining Wall Design
Noise and Vibration Studies

patersongroup.ca

Date: October 31, 2023
File: PH3645-LET.01

W.O. Stinson and Son Ltd.
4728 Bank Street
Ottawa, Ontario
K1T 3W7

Subject: **Infiltration Testing**
5505 & 5545 Albion Road South
Ottawa, Ontario

Further to your request, Paterson Group (Paterson) was commissioned to conduct infiltration testing for the proposed industrial development to be located 5505 and 5545 Albion Road in Ottawa, Ontario. The purpose of this investigation is to provide site specific design infiltration rates for the proposed infiltration system to be located within the southwest portion of 5505 Albion Road. The current report should be read in conjunction with Paterson Report PG5485-1, dated September 18, 2020.

1.0 Proposed Development

Based on the available drawings at the time of report preparation, it is understood that the proposed development will consist of a one-storey vehicle servicing and lubricant storage facility within the southern portion of the subject site (5545 Albion Road). The proposed development will also include paved access lanes and parking within the southern portion of the property. A subsurface infiltration system has been proposed within the northern portion of the subject site (5505 Albion Road) in order to manage surface water run-off. The approximate invert elevation of the proposed infiltration system is understood to range between 102.05 and 102.25 m asl. It is anticipated that the proposed development will be privately serviced.

2.0 Field Observations

Surface Conditions

The subject site is currently vacant of any structures. The northern portion of the site (5505 Albion Road) has historically been vacant, while the southern portion of the site (5545 Albion Road) has previously been used for industrial purposes. The existing structures have been demolished to accommodate the proposed development. The site is bordered to the north by industrial buildings, to the east by undeveloped land with mature trees, to the south by Mitch Owens Road, and to the west by Albion Road. The ground surface across the subject site gently slopes towards the south and is generally at-grade with the surrounding roadways.

Subsurface Conditions

Generally, the subsurface profile encountered at the test hole locations consists of fill material underlain by interbedded layers of silty sand and sandy silt followed by a silty clay deposit. At select test hole locations, a sandy silt layer was encountered underlying the silty clay deposit. Reference should be made to the Soil Profile and Test Data sheets and Infiltration Testing Location Plan attached to the current report for the details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the subject site is located in an area where the bedrock consists of dolostone of the Oxford formation with an overburden drift thickness of 10 to 25 m.

Groundwater

At the time of the current investigation, groundwater within the open excavations was encountered between 102.71m and 103.08 m asl. However, it should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

3.0 Field Investigation

Field Program

The field program conducted for the current investigation was completed on October 13,2023. At that time, four (4) test pits were excavated to a maximum depth of 101.99 m asl for the purpose of permeameter testing. All soil from the test pits were visually inspected and initially classified on site. A previous geotechnical investigation was carried out at the subject site by Paterson between September 1 and 3, 2020. At that time, a total of ten (10) boreholes were advanced to a maximum depth of 98.16 m asl.

The test hole locations for the current investigation were selected by Paterson and approved by Hobin Architecture as well as Arcadis to provide general coverage of the infiltration system. The approximate invert elevation of the proposed infiltration system was provided by Arcadis prior to conducting the field testing. The test hole locations are presented on Drawing PH3645-1 – Test Hole Location Plan, attached to this report.

In-Situ Testing

Permeameter testing was conducted using a Pask (Constant Head Well) Permeameter at each test hole location. Due to the groundwater levels observed within the open excavations during the current investigation, permeameter testing could not be completed at the proposed invert elevations of the proposed infiltration system. As such, testing was completed above the observed groundwater level ranging between 102.77 and 103.25 m asl in order to review the hydrogeological properties of the soils at shallower depths. The permeameter reservoir was filled with water and inverted into a 83 mm diameter auger hole within the test pit, ensuring it was relatively vertical and rests on the bottom of the hole. The water level of the reservoir was monitored until the rate of fall of water in the permeameter reservoir 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 quasi steady state rate of fall were recorded for each location.

4.0 Permeameter Results

A total of four (4) constant head Pask permeameter tests were conducted at four (4) locations within the proposed infiltration system footprint to determine the infiltration rates of the soils. Preparation and testing of this investigation are in accordance with the Canadian Standards Association (CSA) B65-12 - Annex E. The field saturated hydraulic conductivity (K_{fs}) and estimated infiltration values for each test hole location are presented in Table 1.

Field saturated hydraulic conductivity values were determined using Engineering Technologies Canada (ETC) Ltd. reference tables provided in the most recent ETC Pask Permeameter User Guide dated March 2016. The saturated hydraulic conductivity values can be converted to estimated infiltration rates using the approximate relationship described in Appendix C of the Low Impact Development Stormwater Management Planning and Design Guide (CVC, 2011).

Table 1 – Field Saturated Hydraulic Conductivity and Estimated Infiltration Results					
Test Hole ID	Infiltration Testing (m)	Infiltration Testing Elevation (m asl)	Material	K_{fs} (m/sec)	Estimated Infiltration Rate (mm/hr)
TP 1-23	0.98	102.77	Br. Silty Sand	$8x10^{-7}$	43
TP 2-23	0.54	103.20	Fill Material	$2.7x10^{-7}$	32
TP3-23	0.35	103.25	Fill Material	$1.3x10^{-5}$	92
TP4-23	0.30	103.20	Fill Material	$3.2x10^{-5}$	117

Based on Paterson's current investigation, field saturated hydraulic conductivity values of the fill material ranged from 2.7×10^{-7} to 3.2×10^{-5} m/sec, 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 8×10^{-7} m/sec, with an estimated infiltration rate of 43 mm/hr. The above noted hydraulic conductivity values and estimated infiltration rates measured in the test holes are generally consistent with similar material Paterson has encountered on other sites as well as published values.

In order to compensate for the potential reduction in soil permeability (ie: compaction during construction, variability in soil conditions below invert of system, etc.), the estimated infiltration rate used to design an infiltration system must incorporate a **minimum** safety correction factor of 2.5. Due to the observed groundwater levels within the open excavation, infiltration testing could not be completed at the proposed invert of the system or greater. As such, a safety correction factor could not be provided to calculate a design infiltration rate at the proposed invert elevations.

It is recommended that the invert of the proposed infiltration system be located a minimum 1 m above the seasonal high groundwater table and sound bedrock surface to promote infiltration.

5.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project and are preliminary in nature.

The hydrogeological investigation is a limited sampling of the 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 the recommendations.

The recommendations provided should only be used by the design professionals associated with this project. The recommendations are not intended for contractors bidding on or constructing the project. The latter should evaluate the factual information provided in the report. The contractor should also determine the suitability and completeness for the intended construction schedule and methods. Additional testing may be required for the contractor's purpose.

The present report applies only to the project described in the report. The use of the report for purposes other than those described herein or by person(s) other than W.O Stinson and Son Ltd. or their agents are not authorized without review by Paterson.

We trust that his information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

Erik Ardley, P.Geo.

Attachments

- ❑ PH3645-1 – Soil Profile and Test Data
- ❑ PG5485-1 – Soil Profile and Test Data
- ❑ Drawing PH3645-1 – Test Hole Location Plan

Report Distribution

- ❑ W.O. Stinson and Son Ltd. (e-mail copy)
- ❑ Paterson Group (1 copy)

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				

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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

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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

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SOIL PROFILE AND TEST DATA

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

DATUM Geodetic

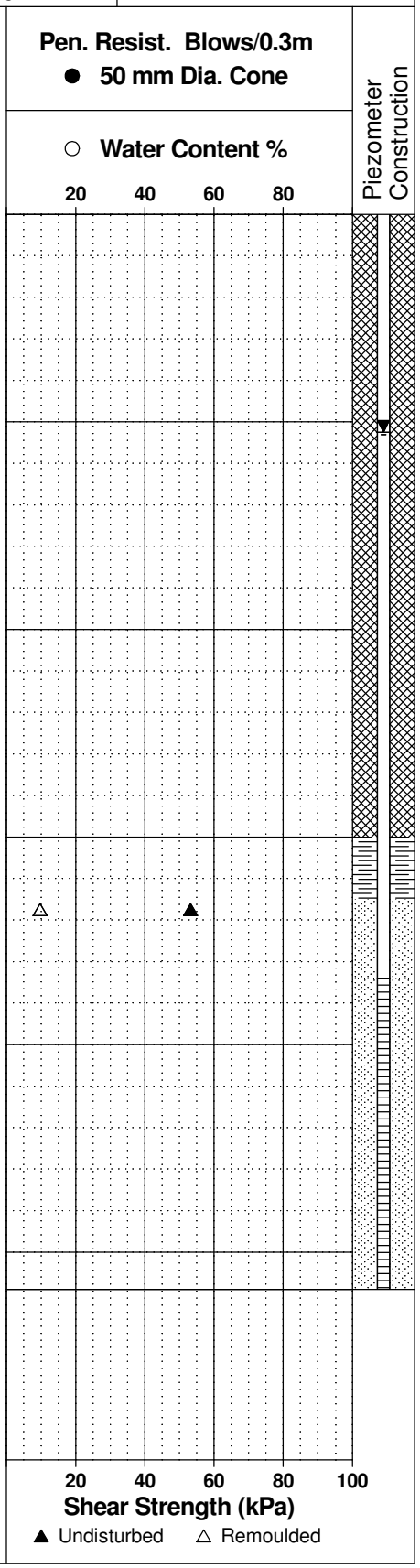
FILE NO. PG5485

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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SOIL PROFILE AND TEST DATA

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

DATUM Geodetic

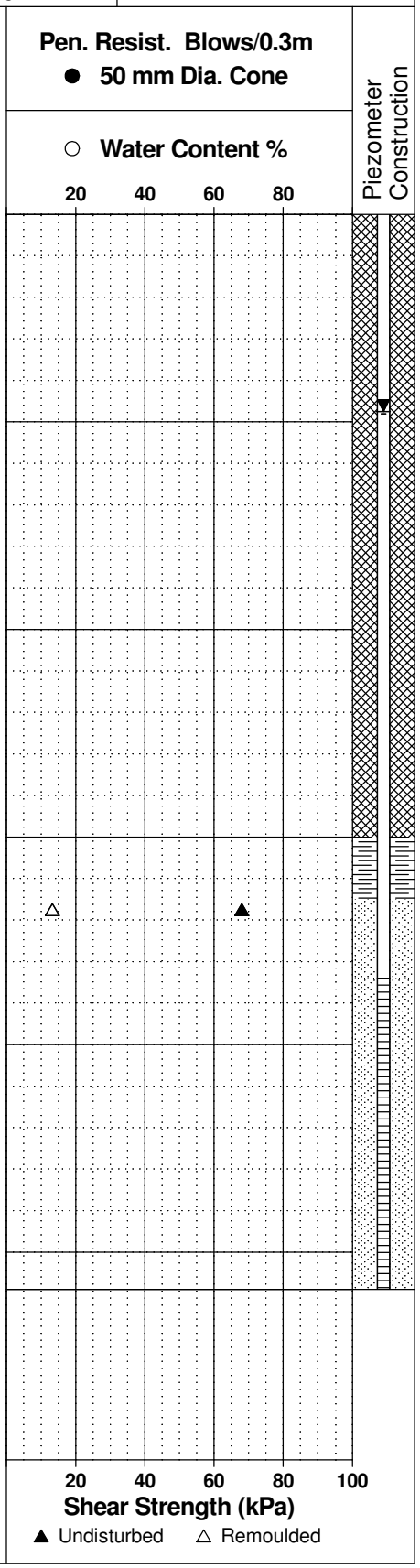
FILE NO. PG5485

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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SOIL PROFILE AND TEST DATA

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

DATUM Geodetic

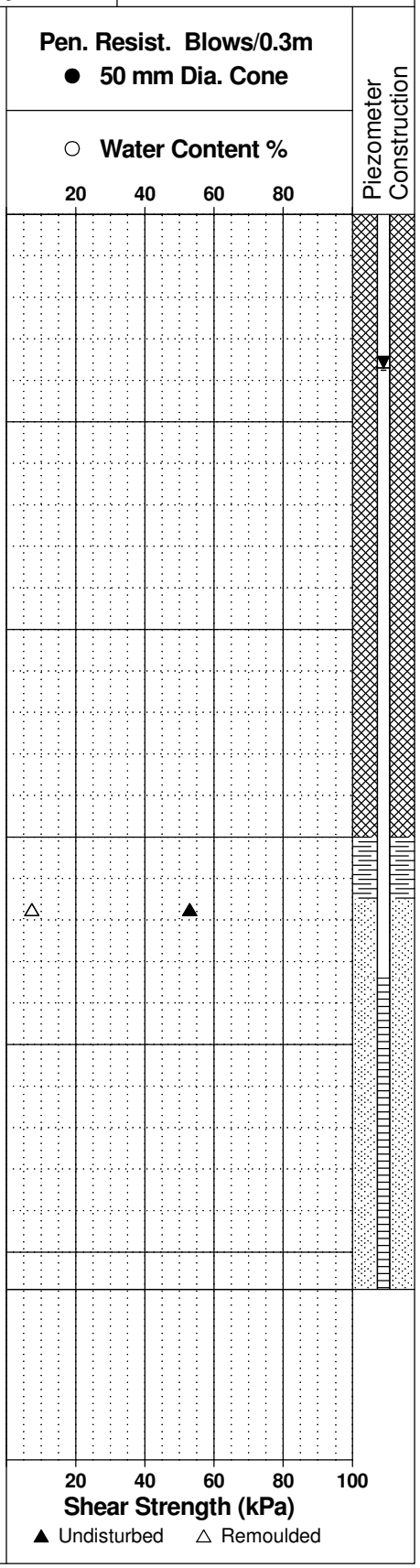
FILE NO. PG5485

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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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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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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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

patersongroup Consulting Engineers

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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

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

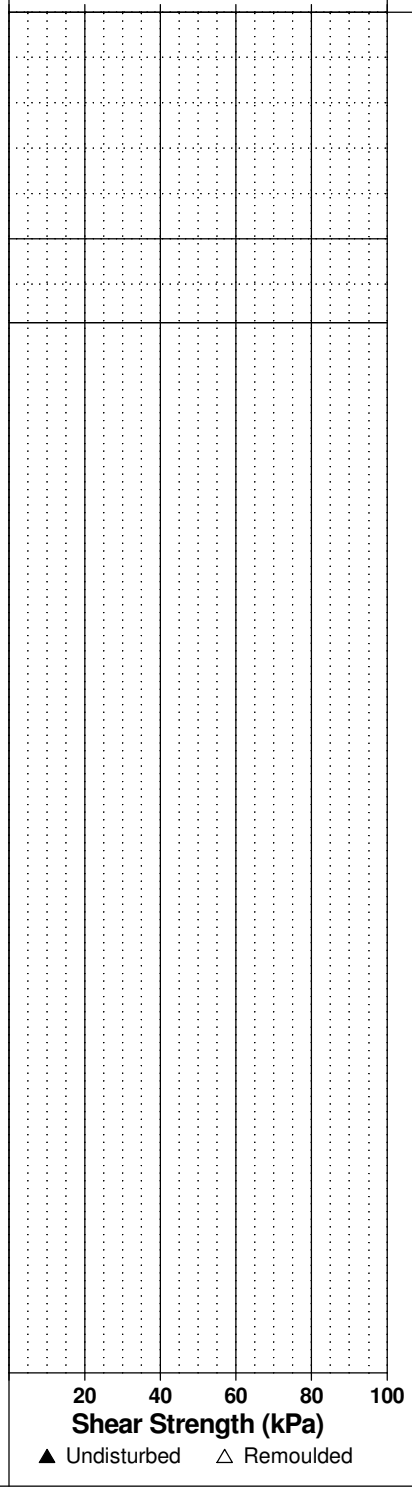
FILE NO. PG5485

REMARKS

HOLE NO. 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)									



SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

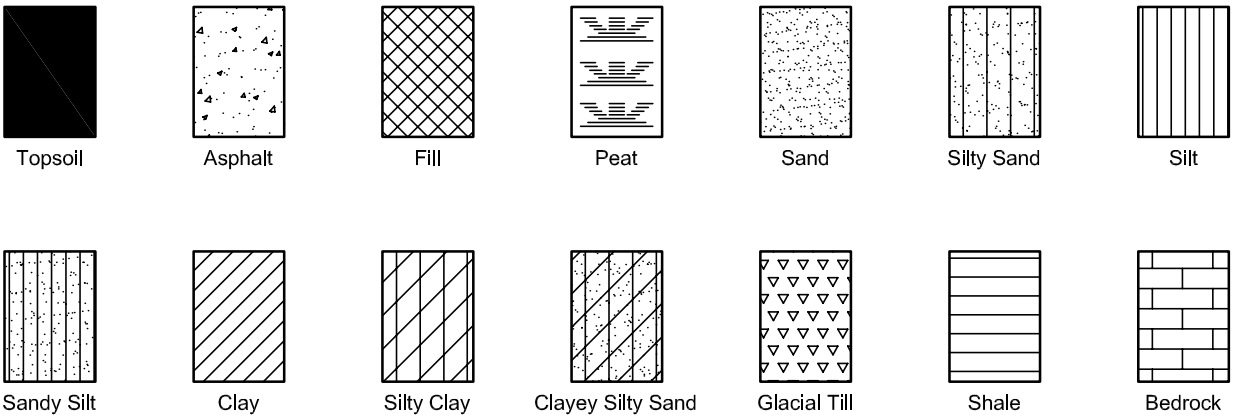
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

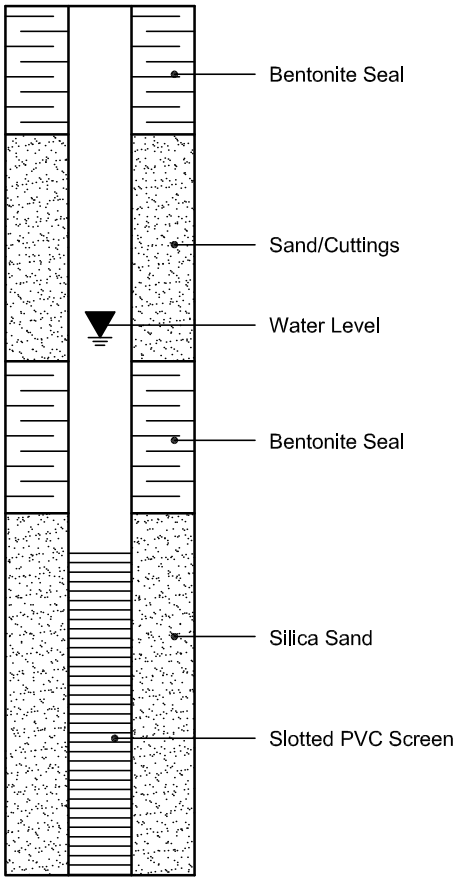
SYMBOLS AND TERMS (continued)

STRATA PLOT

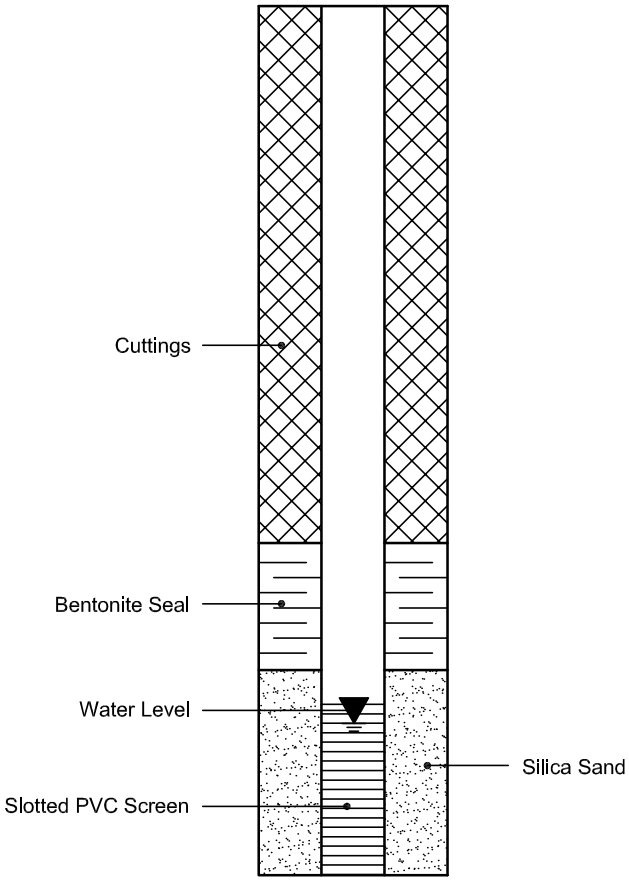


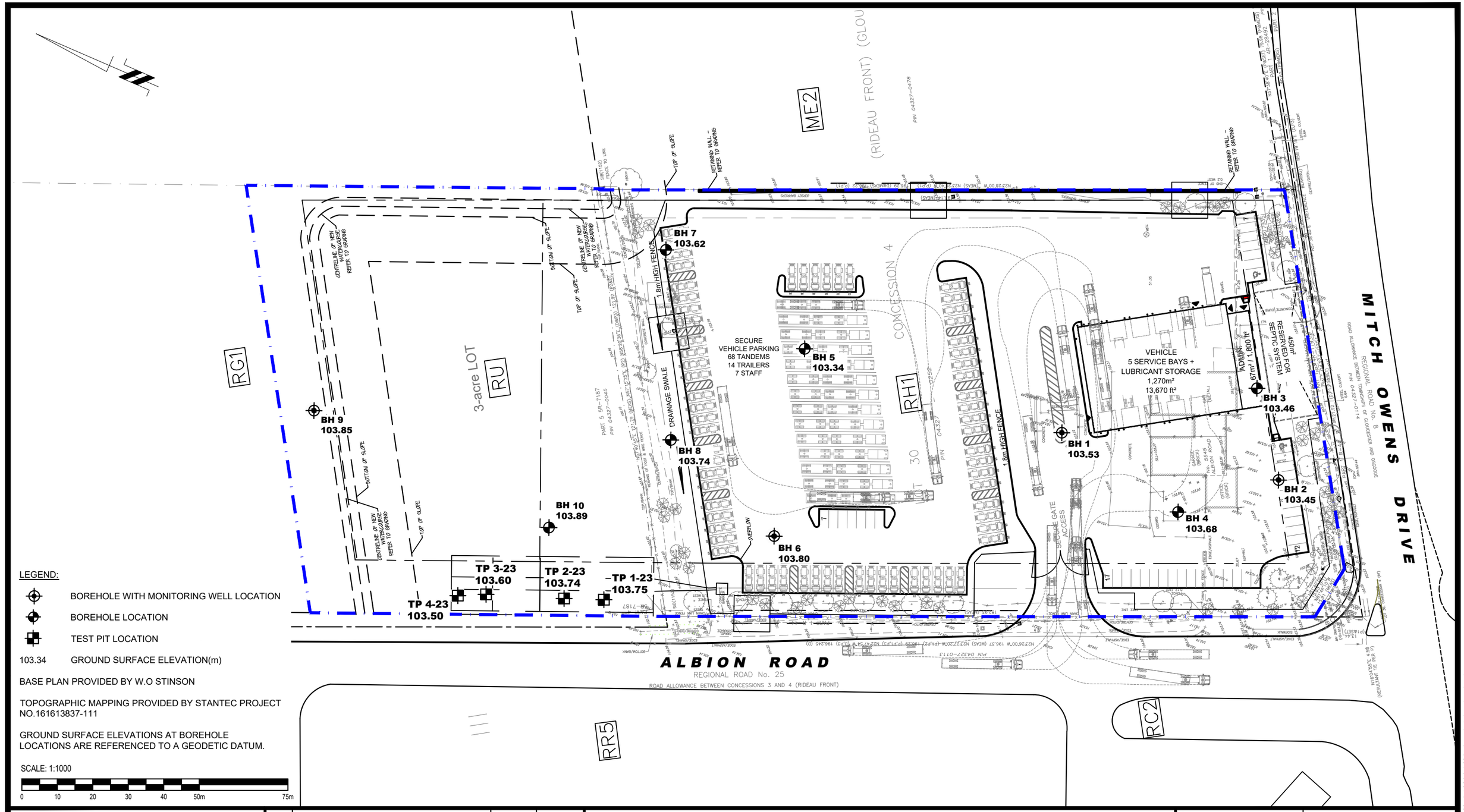
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- TEST PIT LOCATION

103.34 GROUND SURFACE ELEVATION(m)

BASE PLAN PROVIDED BY W.O STINSON

TOPOGRAPHIC MAPPING PROVIDED BY STANTEC PROJECT NO.161613837-111

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

W.O. STINSON AND SON LIMITED

PROPOSED INDUSTRIAL DEVELOPMENT
5505 AND 5545 ALBION ROAD SOUTH

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 10/2023
Drawn by: GK	Report No.: PH3645-LET.01
Checked by: ZB	Dwg. No.: PH3645-1
Approved by: NZ	Revision No.:

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