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June 4, 2021
File: PH4282-LET.01

Omar Alnader
314 Maxwell Bridge Road
Kanata, Ontario
K2W 0A5

Attention: **Omar Alnader**

Subject: **Permeameter Testing and Geotechnical Assessment**
Proposed Commercial Development
2742 Dunrobin Road - Ottawa

Dear Sir,

Further to your request, Paterson Group (Paterson) was commissioned to conduct a permeameter test investigation and geotechnical assessment for the proposed development to be located at 2742 Dunrobin Road in the City of Ottawa. The purpose of the current investigation is to provide design infiltration rates for the subsoils below the proposed infiltration system in support of the site servicing and water management brief completed by others. A geotechnical review and recommendations for the proposed gravel parking lot have been provided.

1.0 Proposed Development

Based on the available drawings, it is understood that the proposed commercial development will consist of a gravel-surfaced parking lot with a temporary structure and drainage ditch located within the southwest portion of the subject site. The proposed development will also include landscaped areas.

2.0 Field Investigation

Field Program

The field program conducted by Paterson for the current investigation was completed on May 21, 2021. At that time, 3 hand auger holes (HA 1 to HA 3) were excavated to an approximate depth of 0.2 m below ground surface (bgs) followed by permeameter testing over a depth of 0.3 to 0.7 m below the base of the excavation. Upon completion of the permeameter testing, HA 1 to HA 3 were extended to approximate depths of 0.9 m bgs for geotechnical purposes. Two (2) additional test holes (HA 4 and HA 5) were excavated to an approximate depth of 0.9 m bgs geotechnical purposes.

The test hole locations were selected by Paterson and distributed in a manner to provide general coverage of the proposed development. The test holes which received permeameter testing were selected to provide general coverage of the proposed drainage ditch, which is anticipated to be located within the central portion of the subject site. The test hole locations are presented on Drawing PH4282-1 - Test Hole Location Plan, attached to this report.

In-Situ Testing

Permeameter testing was conducted using a Pask (Constant Head Well) Permeameter. Test holes HA 1 through HA 3 were excavated to an approximate depth of 0.2 m bgs and an 83 mm diameter hole was excavated using a Riverside/Bucket auger to a depth of 0.1 and 0.5 m below the base of the excavation at each test hole location. All soil 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 it was relatively vertical and rests on the bottom of the hole. The water level of the reservoir was monitored at various intervals 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.

3.0 Field Observations

Surface Conditions

The ground surface across the majority of the subject site is relatively level. However, the ground surface at the southwestern limit of the subject site slopes gently upwards toward Dunrobin Road. The majority of the site is currently vacant and grass covered with a temporary structure located within the central portion of the site. An asphalt-paved access lane links the subject site to Dunrobin Road.

Subsurface Profile

Generally, the subsurface profile encountered at the test hole locations consists of a thin topsoil layer overlying either fill material or silty sand. The fill material was observed underlying the topsoil in hand auger holes HA 1 and HA 2 and consists of a brown silty sand with crushed stone.

A brown silty clay deposit was observed underlying the fill or the silty sand layer at approximate depths ranging from 0.2 to 0.5 m below the existing ground surface, at all hand auger locations with the exception of HA 4. Permeameter testing for HA 1 to HA 3 was carried out in the silty clay deposit. Reference should be made to the Soil Profile and Test Data sheets and Test Hole Location Plans 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. The overburden drift thickness is estimated to range from 1 to 10 m within the subject site.

Groundwater

All hand auger holes were dry upon completion. Based on our field observations, the long-term groundwater table was not encountered at the test hole locations. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

4.0 Discussion

4.1 Permeameter Results

A total of 6 constant head Pask permeameter tests were conducted at 3 locations within the proposed drainage ditch to determine the design infiltration rates of the underlying soils. Based on Site Grading Plan - Drawing SG-1 prepared by NorthTown Engineering Inc., it is understood the invert of the drainage ditch has been proposed to be approximately 0.3 m below existing ground surface. The permeameter test locations were selected by Paterson in a manner to provide general coverage of the proposed drainage ditch, taking into consideration site features. 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 field saturated hydraulic conductivity values were used to determine the design infiltration rates using the approximate relationship between infiltration rate and hydraulic conductivity, as described in the Draft LID Guidance Document, dated December 2019. It should be noted that a safety correction factor was applied for calculating design infiltration rates at each test hole location.

Table 1 - Field Saturated Hydraulic Conductivity and Infiltration Results

Test Hole ID	Invert of Permeameter Testing (m bgs)	Material	K_{fs} (m/sec)	Infiltration Rate (mm/hr)	Design Infiltration Rate (mm/hr)
HA 1	0.4	Brown Silty Clay	1.6×10^{-7}	28	<8.0
	0.7	Brown Silty Clay	$<5.3 \times 10^{-8}$	<22	
HA 2	0.3	Brown Silty Clay	$<5.3 \times 10^{-8}$	<22	<8.8
	0.6	Brown Silty Clay	1.1×10^{-7}	27	
HA 3	0.4	Brown Silty Clay	1.1×10^{-7}	27	10.8
	0.7	Brown Silty Clay	1.1×10^{-7}	27	

Based on Paterson's field investigation, the field saturated hydraulic conductivity values and design infiltration rates measured at the test hole locations are consistent with similar material Paterson has encountered on other sites with similar subsoil structures and typical values for brown silty clay material. Field saturated hydraulic conductivity values for the brown silty clay ranged from $<5.3 \times 10^{-8}$ to 1.6×10^{-7} m/sec. The design infiltration rate at the approximate invert of the proposed drainage ditch location ranges from <8.0 to 10.8 mm/hr. It is recommended that the proposed invert of the proposed drainage ditch is constructed a minimum 1 m above the long-term groundwater table and sound bedrock surface to promote infiltration.

4.2 Geotechnical Review

From a geotechnical perspective, the subject site is suitable for the proposed gravel parking lot. Topsoil and fill containing organic or deleterious materials should be stripped within the footprint of the proposed parking lot. It is anticipated that the existing fill, free of deleterious and significant amounts of organics can be left in place. With the removal of all topsoil and deleterious fill, the existing undisturbed fill, silty sand and silty clay will be considered an acceptable subgrade on which to construct the gravel parking lot. The gravel fill material should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of the materials standard Proctor maximum dry density.

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 field 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 contractors 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 Omar Alnader or their agents are not authorized without review by Paterson.

We trust that his information satisfies your requirements.

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

Scott S. Dennis, P.Eng.

Attachments

- ❑ PH4282-1 - Soil Profile and Test Data
- ❑ Drawing PH4282-1 - Test Hole Location Plan

Report Distribution

- ❑ Omar Alnader (1 copy)
- ❑ Paterson Group (1 copy)

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 1

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.05									
FILL: Brown silty sand, trace crushed stone 0.20		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.90 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.09									
FILL: Brown silty sand trace crushed stone 0.19		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.92 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
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DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 3

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.18									
Stiff, brown **SILTY CLAY**		G	1						
		G	2						
0.93 End of Hand Auger Hole									

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

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL		G	1						
0.22									
Loose, brown **SILTY SAND**		G	2						
		G	3						
0.93									
End of Hand Auger Hole									

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

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL		G	1				
0.19							
Compact, brown **SILTY SAND** - trace clay by 0.45m depth		G	2				
0.50							
Stiff, brown **SILTY CLAY,** trace sand		G	3				
		G	4				
0.96							
End of Hand Auger Hole							

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

Piezometer Construction

DUNROBIN ROAD

PROPERTY LINE

EXISTING WELL

EXISTING SWALE

GRASS YARD

LANDSCAPED BUFFER & MOUND

EXISTING DITCH

EXISTING CULVERT

TRAILER

WR

99.00
98.70

99.15
98.85

1

2

3

4

PARKING

1.9%

99.13
98.83

99.05
98.75

SNOW PILE

98.78
98.48

98.74
98.44

2.4%

2.9%

98.69
98.39

CAR SALES (112 STALLS)

PROPOSED GRAVEL LOT

99.07
98.77

2.5%

98.87
98.57

98.80
98.57

98.69
98.69

1.9%

98.92
98.92

VEHICLAR ACCESS

98.77
98.77

HA 1

HA 2

HA 3

HA 4

HA 5

0.5%

30m

5.0m

PROPOSED RIP-RAP WEIR

PROPOSED DRAINAGE DITCH SEE DETAILS

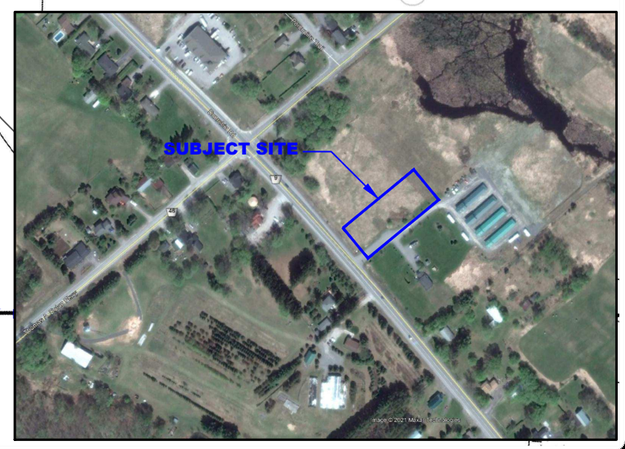
98.844

SIB BENCHMARK

3.5m X 3m SIGN

EXISTING ASPHALT PAVED ACCESS

PROPERTY LINE



LEGEND:

- HAND AUGER HOLE LOCATION
- HAND AUGER HOLE WITH PERMEAMETER TESTING LOCATION

DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

OMAR ALNADER

Project:

PROPOSED COMMERCIAL DEVELOPMENT

2742 DUNROBIN ROAD
OTTAWA, ONTARIO

Drawing:

PERMEAMETER TESTING LOCATION PLAN

Scale:	Reviewed by:
1:200	KP
Date:	Checked by:
06/2021	NZ

Drawing No.:

PH4282-1

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