



re: Long-Term Groundwater Monitoring Program Proposed Lansdowne Rink – Lansdowne Park Marche Way – Ottawa to: Trinity Development Group - Ahmed Zayed - azayed@trinity-group.com

date: December 2, 2022

file: PH4424-MEMO.01

Further to your request, Paterson Group (Paterson) completed a long term groundwater monitoring program at Lansdowne Park along Marche Way. A summary of the field program and results have been provided below.

Background Information

Paterson completed a Geotechnical Investigation (PG5792-1 dated December 14, 2021) and a Hydrogeological Assessment Report (PH4423-1 dated November 19, 2021).

The long-term groundwater monitoring program commenced on September 15, 2022. At that time, the five existing monitoring wells previously installed by Amec Foster Wheeler (AFW) were available onsite for groundwater monitoring. The 5 available monitoring wells were outfitted with data loggers between September 15 and October 27, 2021. As part of the Paterson Geotechnical Investigation, 4 monitoring wells were installed onsite from November 9 to 18, 2021. Manual groundwater measurements were collected from the 5 monitoring wells installed by AFW, as well as the 4 monitoring wells installed by Paterson, on a monthly basis.

Groundwater level readings for the first five-week period were provided in the Hydrogeological Assessment Report (PH4423-1).

Field Survey

The borehole locations were selected by Paterson to provide general coverage of the proposed development, taking into consideration the existing site features and underground utilities. The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The locations of the existing monitoring wells, as well as geodetic elevations of the ground surface elevation for those wells, were taken from the AFW stratigraphic and instrumentation logs. The geodetic elevations of the ground surface at the AFW wells was confirmed by Paterson. It was noted that the ground surface elevation at AFW's monitoring well MW15-10 was erroneously recorded on the borehole log provided in their reports. The updated ground surface elevation is 64.91, which is used in this report. The locations are presented on Drawing PG5792-1 Test Hole Location Plan attached to the current memorandum.





Subsurface Profile

According to available borehole logs, the subsurface profile at the site generally consists of varying amounts of fill material followed by a sandy silt to silty sand with varying amounts of gravel, overlying a till comprised of a silty sand with gravel, cobbles and boulders extending to the bedrock surface.

Based on coring results completed by Paterson, limestone bedrock with occasional shale partings was encountered between 21.3 and 31.6 m below ground surface (bgs). Based on available geological mapping, the subject site is located in an area where the bedrock consists of limestone, dolostone, shale, arkose, and sandstone of the Ottawa Group, Simcoe Group, and Shadow Lake Formation.

Monitoring Well Installation

Typical monitoring well construction details are described below:

- 3.0 m of slotted 51 mm diameter PVC screen at the base of the AFM boreholes. Paterson attempted to intercept the long-term groundwater table with 3.0 m of slotted 51 mm diameter PVC screen in their boreholes based on site conditions observed during borehole drilling.
- **51** mm diameter PVC riser pipe from the top of the screen to ground surface.
- □ No.3 silica sand backfill within annular space around screen.
- **300** mm thick bentonite hole plug directly above PVC slotted screen.
- □ The 51 mm diameter PVC riser extending to the ground surface was covered with a protective steel cap (flush mount).

Specific details of the installation of each monitoring well can be found in the Soil Profile and Test Data Sheets attached to this memorandum.

Monitoring Well Installation

Between September 15, 2021 and October 27, 2021, the five monitoring wells installed by AMF (MW15-06, MW15-07, MW15-09, MW15-10 and MW15-11) were equipped with data loggers to continuously monitor fluctuations in the groundwater levels. The data loggers were programmed to continuously measure and record groundwater levels throughout the subject site at a fixed rate of 1 reading every hour. Manual water level measurements were taken monthly using an electronic water level meter along with the logger measurements. All equipment which was used in onsite wells was cleaned and disinfected prior to use.

Although continuous monitoring for a one-year period was completed, occasionally site conditions and equipment failures resulted in infrequent missed datapoints during the groundwater monitoring period. All significant missed datapoints occurred during periods of low groundwater levels. However, it should be noted the missing data was predominantly during winter months and did not impact seasonal groundwater high measurements.



The recorded groundwater elevations at each monitoring well location and correlated precipitation events between September 15, 2021 and November 9, 2022 are presented in Figure 1: Long-Term Groundwater Monitoring Program attached to the current memorandum.

Discussion

The recorded high and low groundwater elevations at each well location have been summarized in Table 3 below.

Table 2 – Groundwater Elevation Summary											
Groundwater Elevation (m asl)											
Monitoring Well ID	Ground Surface Elevation (m asl)	Maximum	Date	Minimum	Date	Difference Between Maximum and Minimum Groundwater Elevation (m)					
MW15-06	64.90	60.74	16-08-22	*59.72	09-03-22 20-04-22 10-05-22	*1.02					
MW15-07	64.51	60.42	18-08-22	59.18	20-04-22	1.24					
MW15-09	65.25	60.60	16-08-22	*59.19	09-03-22	*1.41					
MW15-10	64.91	60.57	17-08-22	*59.08	09-03-22	*1.49					
MW15-11	64.57	60.67	09-22-22	59.12	10-11-21	1.54					
BH5-21	65.14	60.58	16-08-22	59.20	08-02-22	1.39					
BH6-21	66.62	60.55	26-09-22	59.13	09-03-22	1.42					
BH8-21	65.45	60.60	26-09-22	59.30	09-03-22	1.31					
BH9-21	67.07	60.78	26-09-22	59.41	09-03-22	1.37					

*Dry well - the minimum groundwater elevation is noted to be at the elevation of the well invert

The groundwater aquifer accessed by the onsite monitoring well was noted to be hydraulically connected to the Rideau Canal. As such the draining and filling of the Rideau Canal directly influences the onsite groundwater levels. Groundwater levels are observed to decrease after the canal is drained and increase once the canal is filled. In March 2022, MW15-06, MW15-09 and MW5-10 were dry and MW15-06 remained dry until the canal was filled in May 2022.

Conclusion

Based on the results from the one year long groundwater monitoring program, the long-term groundwater table ranges between <59.08 to 60.78 m asl and is within the overburden materials. Depending on the depth of well installation, a low water elevation was not able to be recorded at all locations. Maximum and minimum groundwater elevations were observed at the end of summer/early fall and the end of winter/early spring, respectively, at all groundwater monitoring locations. Groundwater levels were observed to be hydraulically connected to the Rideau Canal.



Reference should be made to the individual monitoring locations for design specifications at that borehole location. Design specifications should be based on a high water table elevation of **60.78 m asl**, the maximum groundwater elevation observed during the long-term groundwater monitoring period. It should be noted that groundwater levels can fluctuate seasonally and with precipitation events. Therefore, groundwater levels could vary.

The long-term groundwater investigation is a limited investigation 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.

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

Best Regards,

Paterson Group Inc.

Oliver Blume, M.Sc., G.I.T.

Erik Ardley, P.Geo.



Michael S. Killam, P.Eng.

Attachments

- Soil Profile and Test Data Sheets
- Amec Foster Wheeler Stratigraphic and Instrumentation Log
- Drawing PG5792-1 Test Hole Location Plan
- General Figure 1: Long-Term Groundwater Monitoring Program

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Ottawa Laboratory 28 Concourse Gate Ottawa – Ontario – K2E 7T7 Tel: (613) 226-7381 Northern Office and Laboratory 63 Gibson Street North Bay – Ontario – P1B 8Z4 Tel: (705) 472-5331



SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic

REMARKS

FILE NO.	PG5792

	D			_		Ostabar	0001		HOLE	e no.	BH ·	1-21	
BORINGS BY CIVIE-55 LOW Clearance I				D	DATE		25, 2021						
SOIL DESCRIPTION	LOT		SAN	IPLE		DEPTH	ELEV.	Pen. R	esist. 0 mm	Blov	ws/0.3 Cone	m	
	A P		R	RΥ	Ba	(m)	(m)	• 3					leter uctio
	TRAT	туре	UMBE	COVE	VAL F RQ			• •	Vater (Cont	ent %		szom
GROUND SURFACE	S		N	RE	z ^o	0	64.02	20	40	60	80)	i∰ S
Asphaltic concrete 0.10		<u> </u>	_				-04.93						
FILL: Crushed stone, trace sand 0.41		¥ AU ₩	1										
FILL: Brown silty sand to sandy silt,		ss	2	50	64	1-	63.93						
some clay, trace topsoil													
2 10		∬ ss	3	58	28	2-	62.93		·····	÷			
<i>_</i>													
		§ SS	4	42	13								
		0	5	25	1/	3-	-61.93						
Compact, brown SILTY SAND		A SS	5	25	14								
- trace clay from 3.0 to 4.3m depth		ss	6	50	15	4-	60.93						
- trace gravel by 4.3m depth			7	33	20								
		Δ	1	00	20	5-	-59.93			÷			
5.49		Viaa	_										
		SS A	8	50	53								
		∬ ss	9	42	32	6-	-58.93						
		∬ss	10	33	31	7-	-57.93						
		∦ ss	11	25	26	8-	-56.93						
GLACIAL TILL: Very dense to compact, brown silty sand with gravel,													
cobbles and boulders		∦ ss	12	42	21								
		ss	13	42	29	9-	-55.93						
		¥1											
		ss	14	33	39	10-	-54.93						
11.10		∦ ss	15		65	11-	-53.93						
End of Borehole													
(GWL @ 5.09m - Nov. 12, 2021)													
								20	40	60	8() //-D-) 1(00
								Snea ▲ Undist	ar Stre turbed	ngtr: ∆∣	i (KPa Remoul) ded	
	1	1	1	1	1	1	1	1					

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic

FILE NO.	PG5792

REMARKS										1 00752	•
BORINGS BY CME-55 Low Clearance [Drill			D	ATE (October 2	25, 2021		HOLE N	^{o.} BH 2-21	
SOIL DESCRIPTION	LOT		SAN	IPLE	1	DEPTH	ELEV.	Pen. R ● 5	lesist. B 50 mm Di	lows/0.3m a. Cone	L L
	TRATA F	гурЕ	UMBER	°° COVERY	VALUE r RQD	(m)	(m)	0 V	Vater Co	ntent %	zometer
GROUND SURFACE	δ.	. .	IN	REC	zö	0-	-66.04	20	40	60 80	Co Co
Asphaltic concrete0.10 FILL: Brown silty sand with crushed0.36 \stone and gravel		∦ ≩ AU	1			0	00.04				
FILL: Brown silty sand, trace gravel		ss	2	33	32	1-	-65.04				
2.21		ss	3	50	7	2-	-64.04				· · ·
		ss	4	50	14	0	62.04				
Compact, brown SILTY SAND		ss	5	33	10	5	-03.04				
		ss	6	33	11	4-	-62.04				
- trace gravel by 4.4m depth		ss	7	42	24	5-	-61 04				· · · · · · · · · · · · · · · · · · ·
5.74		∬ss	8	25	59		•• .				
		ss	9	63	50+	6-	-60.04				
CLACIAL THE Very dense to dense		ss	10	50	77	7-	-59.04				· · ·
brown silty sand with gravel, cobbles and boulders		ss	11	42	46	8-	-58.04				
		ss	12	0	63	0.	57.04			· · · · · · · · · · · · · · · · · · ·	
- some shale fragments from 10.5 to		ss	13	8	61	5-	57.04				
10.74m depth		∑ss	14		50+	10-	-56.04				· · · · · · · · · · · · · · · · · · ·
10.74 End of Borehole	<u>\^^^</u> ^										
								20 Shea ▲ Undis	40 ar Streng turbed 2	60 80 1]th (kPa) ∆ Remoulded	⊣ 00

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic	
REMARKS	
BORINGS BY CME-55 Low Clearance I	Drill
SOIL DESCRIPTION	STRATA PLOT
TOPSOIL0.36	

FILE NO. PG5792

BORINGS BY CME-55 Low Clearance Drill DATE October 27, 2021 HOLE NO. BH 3-21							BH 3-21				
SOIL DESCRIPTION	PLOT		SAN	IPLE	1	DEPTH	ELEV.	Pen. Re • 5	esist. Blow 0 mm Dia. C	s/0.3m Cone	2
	TRATA 1	ТҮРЕ	UMBER	% COVERY	VALUE r rod	(m)	(m)	• N	/ater Conte	nt %	szomete
GROUND SURFACE	ß		N	RE	z ^o		70.10	20	40 60	80	¦≞ S
TOPSOIL 0.36		R				0-	-73.10				
	\bigotimes	<u>B</u> AU	1						• • • • • • • • • • • • • • • • • • • •		
		ss	2	33	16	1-	72.10				
			0	00	50						
		8 22	3	22	50+	2-	71 10				
FILL: Brown silty sand, some gravel,						2	/1.10				
clay and topsoil		∦ ss	4	17	11						
		n X ss	5	44	50+	3-	70.10				
- cored through boulder from 3.28 to		RC	1	95							
3.81m depth	\bigotimes					Δ-	-69 10				
		ss	6	33	6	, T	00.10				
			7	33	17						
		A 33	1	55	4/	5-	68.10				
- trace ash from 5.3 to 5.9m depth		ss	8	25	50+						
						6-	67 10				
		ss	9	25	59		07.10				
	\bigotimes	Å	Ū								
- trace asphaltic concrete from 7.0 to	\bigotimes		10	05	00	7-	-66.10				
7.6m depth		1 55	10	25	38						
		- 33	11		50+	8-	-65 10				
		<					00.10				
		ss	12	33	34						
						9-	-64.10				
9.45		∦-ss	13	50	14						
		Ľ				10-	-63 10				
Compact, brown SILTY SAND to		ss	14	58	22				· · · · · · · · · · · · · · · · · · ·		
SANDI SILI		\square									
		∦ ss	15	50	28	11-	62.10				
Compact, brown SILTY SAND, some		E-									
gravel	바바	∦ ss	16	33	17	12-	-61 10				
								20	40 60	80 10 (kBc)	00
								▲ Undist	urbed $\triangle \operatorname{Re}$	(rra) emoulded	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

FILE NO.

DATUM Geodetic

BOBINGS BY CME-55 Low Clearance Drill

HOLE NO. BH 3-21

PG5792

BORINGS BY CME-55 Low Clearance Drill DATE October 27, 2021 BH 3-21								БП 3-21	
SOIL DESCRIPTION	РІОТ		SAN	IPLE	1	DEPTH	ELEV.	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone	uc
	RATA	ЭДУ	MBER	% OVERY	VALUE	(m)	(ጠ)	• Water Content %	Istructio
GROUND SURFACE	LS IS	E E	NN	REC	N N			20 40 60 80 🗖	S
		ss	17	33	19	12-	-61.10		
Compact, brown SILTY SAND, some gravel		ss	18	25	18	13-	-60.10		
		ss	19	4	12	14-	-59.10		
		ss	20	4	21	15-	-58.10		
<u>15.54</u>		÷∦-ss ∱∕∏	21	50	36	16-	-57.10		
		∬ SS ∕≊ SS	22 23	67 33 70	60 50+	17-	-56 10		
		× SS	24	4	50+		50.10		
GLACIAL TILL: Dense to very dense, brown silty sand with gravel, cobbles and boulders						18-	-55.10		
			3	64		19-	-54.10		
- grey by 20.2m depth			4	50		20-	-53.10		
			4	52		21-	-52.10		
- compact by 21.3m depth		RC	5	30		22-	-51.10		
						23-	-50.10		
		RC	6	13		24-	-49.10		
								Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Colonnade Road South, Ottawa, Ontario K2E 7J5 Colonnade Road South, Ottawa, Ontario K2E 7J5

Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM	Geodetic
DATUM	Geodelic

FILE NO.	
	PG5792

REMARKS HOLE NO. BH 3-21 BORINGS BY CME-55 Low Clearance Drill DATE October 27, 2021 SAMPLE Pen. Resist. Blows/0.3m PLOT DEPTH ELEV. Piezometer Construction SOIL DESCRIPTION • 50 mm Dia. Cone (m) (m) RECOVERY N VALUE or RQD STRATA NUMBER TYPE o/0 \bigcirc Water Content % **GROUND SURFACE** 80 20 40 60 24+49.10 25+48.10 RC 7 8 26+47.10 RC 8 0 27+46.10 GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders 28+45.10 RC 9 0 - cobbles and boulders content decreasing with depth 29+44.10 RC 10 0 30+43.10 31+42.10 RC 11 100 71 31.57 32+41.10 BEDROCK: Good to excellent quality, grey limestone RC 12 100 98 with occasional shale partings 33+40.10 <u>33.45</u> End of Borehole (GWL @ 13.46m - Nov. 16, 2021) 20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Geotechnical Investigation Lansdowne Park Redevelop Bron Multi Storay Puilding

Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

FILE NO.

DATUM	Geodetic
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PG5792

REMARKS													
BORINGS BY CME-55 Low Clearance I	Drill			D	ATE	Novembe	er 5, 2021			NO.	BH	4-21	
SOIL DESCRIPTION	PLOT		SAN	IPLE	1	DEPTH ELEV.		Pen. Resist. Blows/0.3m • 50 mm Dia. Cone					- <u>-</u>
	ATA 1	E	BER	ÆRY	SOD LUE	(m)	(m)						mete
	STR2	ТХТ	NUME	ECO *	I VA or F			0 1	Vater C	Cont	ent %	6	iezol onst
GROUND SURFACE				Ř	4	0-	-72.75	20	40	60	3	30 	
10PSOIL0.30	$\times\!\!\times\!\!\times$		1										
			•									· · · · · · · · · · · · · · · · · · ·	
	\bigotimes	∦ ss	2	33	5	1-	-71.75						
	\bigotimes		-										
	\bigotimes	\mathbb{X} ss	3	58	49	2-	-70.75						-88
			л	50	10								
		833	4	50		2	60.75						
FILL: Brown silty sand iwth gravel		ss	5	50	8	3-	-09.75						
trace clay		A 00	0										
	\bigotimes	ss	6	50	8	4-	-68.75						
		Ľ											
		ss	7	42	46	5-	67 75						
- some topsoil from 5.3 to 5.9m depth	\bigotimes					5	07.75						
	\bigotimes	🛛 ss	8	33	28								
						6-	-66.75						
		∦ ss	9	50	19								
						7-	-65 75						
- some asphaltic concrete from 7.6 to 8 2m depth	\bigotimes	∦ ss	10	18	9	/	00.70						
cop		v Ss	11		50+								
					001	8-	-64.75						
8.53	XX	₩	10	50	10								
		85	12	58	13	9-	-63 75						
		0	12		14	Ū	00.70						
Compact, brown SILTY SAND to		A 22	15		14								
SANDISILI			11	10	10	10-	-62.75						
		\mathbb{A}^{33}	14	42	19								₩₩
		∦ ss	15	50	18	11-	61.75						
GLACIAL TILL: Very dense to dense.		₩- 	16	33	50								
silty sand with gravel, cobbles and		Δ 33	10		33								
						12-	-60.75	20	40	60	<u></u> 8	<u> </u>	_pxx1 kxx1 00
								She	ar Stre	ngth	ו (kPa	a)	
								Undis	urbed	\triangle	Remol	lided	

SOIL PROFILE AND TEST DATA

Geotechnical Investigation Lansdowne Park Redevelopment

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic

REMARKS

HOLE NO. PH 4-21

PG5792

FILE NO.

BORINGS BY CME-55 Low Clearance I	Drill			D	ATE	Novembe	r 5, 2021		D	П 4-21	
SOIL DESCRIPTION	PLOT		SAM	IPLE		DEPTH	ELEV.	Pen. Re ● 50	esist. Blows) mm Dia. Co	/0.3m one	er on
	ATA	ЪE	BER	VERY	ALUE ROD		(11)		latar Cantan	• 0/	omete
	STR	ΤΥ	MUN	ο Ο Ξ	or VJ				ater Conten	[%	iezo ons
GROUND SURFACE			-	8	Z V	12-	-60 75	20	40 60	80	ĒΟ
						12	00.75				
		≍ SS -	17	60	50+	13-	-59.75				
		RC	1	33		14-	-58.75				
GLACIAL TILL: Very dense to dense, silty sand with gravel, cobbles and boulders						15-	-57.75				
		RC	2	41		16-56.75 + 17-55.75	-56.75				
		⊠ SS	18	75	50+						
		RC	3	34		18-	-54.75				
		- RC	4	24		19-	-53.75				
		≖ SS _	19	0	50+		50.75				
		RC	5	7		20-	-52.75				
- grey by 20.8m depth		ss	20	42	15	21-	-51.75			· · · · · · · · · · · · · · · · · · ·	
		RC ≖ SS	6 21	0 0	50+	22-	-50.75				
		- BC	7	20		23-	-49.75				
			1	20		24-	-48.75	20	40 60	80 10	₩ ₩ 00
								Shea ▲ Undistu	ar Strength (I urbed △ Rer	(Pa) noulded	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

Geotechnical Investigation

DATUM	Geodetic
DATUM	Geodetic

FILE NO. PG5792

REMARKS											
BORINGS BY CME-55 Low Clearance	Drill			D	ATE I	Novembe	r 5, 2021		BH 4-21		
SOIL DESCRIPTION	PLOT	SAMPLE			DEPTH	ELEV.	Pen. Re ● 5	<u>+ 5</u>			
	STRATA	ТҮРЕ	NUMBER	* SCOVERY	I VALUE or ROD	(m)	(m)	0 1	/ater Cor	ezomete onstructio	
GROUND SURFACE			I	8	ZŬ	24-	-48.75	20	40 6	60 80	Ū Ē
		- RC	8	5		25-	-47.75		· · · · · · · · · · · · · · · · · · ·		
GLACIAL TILL: Very dense to dense, silty sand with gravel, cobbles and boulders		∑ ss -	22	0	50+	26-	-46.75				
						27-	-45.75				
		RC	9	10		28-	-44.75				
						29-	-43.75		· · · · · · · · · · · · · · · · · · ·		
20.69		_				30-	-42.75				
<u>30.00</u>		 RC _	10	100	100	31-	-41.75				
BEDROCK: Excellent quality, grey limestone with occasional shale partings		RC	11	100	100	32-	-40.75				
<u>32.89</u> 32.89									<u> </u>		
(GWL @ 10.5111 - NOV. 10, 2021)								20 Shea ▲ Undist	40 € ar Streng urbed △	50 80 1 th (kPa) . Remoulded	00

SOIL PROFILE AND TEST DATA

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geodetic

Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

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DATUM

FILE NO. PG5792

BORINGS BY CME 55 Power Auger				D	ATE	Novembe	er 9, 2021		HOLI	e no.	BH 5	-21	
SOIL DESCRIPTION	PLOT		SAN	IPLE		DEPTH	ELEV.	Pen. Re	esist. Blows/0.3m 0 mm Dia. Cone				Well
	STRATA	ТҮРЕ	NUMBER	°° SCOVERY	VALUE Dr RQD	(m)	(m)	• v	Nater Content %				onitoring onstructio
GROUND SURFACE	01	~	I	R	zv	0-	-71.14	20	40	60	80		≥ŏ
TOPSOIL 0.36	$\overline{\mathbf{x}}$	B AU	1									· · · · · · · · · · · · · · · · · · ·	
		x ss	2	63	50+	-	70.14					· · · · · · · · · · · · · · · · · · ·	
		« «				1-	-70.14						
		ss	3	50	19	0	00.14						
FILL: Brown silty sand with gravel, occasional cobbles		4 <u>1</u> •∏				2-	-69.14						
		ss	4	50	15	0	00.14						
 trace topsoil and concrete from 2.3 to 2.9m depth 		ss	5	0	14	3-	-08.14						
		ss	6	25	13	4-	-67.14						
		≍ SS	7	0	50+								
						5-	-66.14						
with compolitic concrete by C.1m		ss	8	58	43								
depth		- 	٥	67	15	6-	-65.14						
<u>6.70</u>			5	07									
		ss	10	50	14	7-	-64.14						
			4.4	40	17								
Compact to dense, brown SILTY		800	11	42		8-	-63.14						
		ss	12	50	34								
- some gravel by 8.5m depth		ss	13	42	47	9-	-62.14						
		ss	14	50	48	10-	-61.14						
		ss	15	88	50+								
						11-	-60.14						IIII IIII IIII
		ss	16	50	35		E0 11						
						12-	-59.14	20 Shea	40 or Stra	60 Athone	80 (kPa)	10	00
								▲ Undist	urbed		Remould	ed	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

FILE NO.

DATUM Geodetic

REMARKS

HOLE NO. **BH 5-21**

PG5792

BORINGS BY CME 55 Power Auger	DATE November 9, 202						1 BH 5-21					
SOIL DESCRIPTION	PLOT		SAN	IPLE	1	DEPTH	ELEV.	Pen. Resist. Blows/0.3m • 50 mm Dia. Cone				Well on
	STRATA	ТҮРЕ	NUMBER	» ECOVERY	N VALUE or ROD	(m)	(m)	• v	Vater Co	ntent %		10nitoring
GROUND SURFACE	 			<u></u>	4	12-	-59.14	20	40	60 80 +		20
Compact to dense, brown SILTV		ss	17	21	9	10	50.14					
SAND, some gravel		ss	18	50	23	13-	-58.14					
14.20		ss	19	50	28	14-	-57.14			· · · · · · · · · · · · · · · · · · ·		
		≍ SS	20	55	50+	15-	-56.14					
		RC	1	60		16-	-55.14					
		ss	21	42	71	17-	-54.14					
GLACIAL TILL: Very dense to dense, brown silty sand with gravel, cobbles and boulders		RC	2	22		18-	-53.14					
		∦ ss	22	64	38	10	50 14					
- grey by 18.2m depth		BC	3	15		19-	-52.14					
						20-	-51.14					
		× ss	23	100	50+	21-	-50.14			· · · · · · · · · · · · · · · · · · ·		
		RC	4	15		22-	-49.14			· · · · · · · · · · · · · · · · · · ·		
		SS SS	24	0	50+	23-	-48.14					
		RC	5	19		24 -	-47 14					
							17.17	20 Shea ▲ Undist	40 ar Streng urbed 2	60 80 jth (kPa) ∆ Remould	10 ed	0

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Bi

Prop. Multi-Storey Buildings & Rink Structure, Ontario

PG5792

BH 5-21

BORINGS BY CME 55 Power Auger

REMARKS

		FILE NO.
		HOLE NO.
DATE	November 9, 2021	

SOIL DESCRIPTION	LOT		SAN	IPLE		DEPTH	ELEV.	Pen. Resist. Blows/0.3m = ■ 50 mm Dia Cone
	RATA P	TPE	MBER	% OVERY	VALUE ROD	(m)	(m)	• Water Content %
GROUND SURFACE	ะ ถึง		NC	REC	Z O	04	47 4 4	20 40 60 80 ≥Ö
		∑ss	25	80	50+	24-	-47.14	
		RC	6	0		25-	-46.14	
		– ≊ SS	26	0	50+			
GLACIAL TILL: Very dense to		RC	7	0		26-	-45.14	
dense, brown silty sand with gravel, cobbles and boulders		-	27	86	50+	27-	-44.14	
		BC	8	37	50+			
		Π	Ū			28-	-43.14	
		ss	28	0	10	29-	-42.14	
29.95		RC	9	100	100			
						30-	-41.14	
BEDROCK: Excellent quality, grey limestone with occasional shale partings		RC	10	100	93	31-	-40.14	
31.55								
(GWL @ 11.30m - Nov. 16, 2021)								
								20 40 60 80 100
								Snear Strengtn (KPa) ▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic

REMARKS	
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FILE NO. PG5792

BOBINGS BY CME-55 Low Clearance	Drill			D		Novembe	er 11 202	91	HOLI	e no.	BH	6-21		
	ТОЛ		SAN	IPLE		DEPTH	ELEV.	Pen. Re	esist.	Blov	ws/0.	3m	Vell	
SOIL DESCRIPTION	LATA PI	ЪЕ	BER	VERY	ALUE ROD	(m)	(m)		0 mm	Dia.		e 	toring V	tructior
GROUND SUBFACE	STR	Τ	NUM	RECO	N OL			20	40	60	ent %	o 30	Moni	Cons
Asphaltic concrete 0.08						0-	-65.14							
FILL: Brown silty sand with crushed stone and gravel 0.91		ss	1	67	47									<u>, լլլլլլլ</u>
		∦ ss	2	42	26	1-	-64.14		· · · · · · · · ·		· · · · · · ·			ներեր
		ss	3	50	17	2-	-63.14		· · · · · · · · · · · · · · · · · · ·					Որիկիկիկ
		ss	4	58	13				· · · · · · · · · · · · · · · · · · ·					նկկկկ
Compact to dense, brown SILTY SAND, trace to some gravel		ss	5	50	43	3-	-62.14							կկկկկկ
		ss	6	50	13	4-	-61.14							իկկկկ
		ss	7	50	50+									կկկկկ
5.41		ss	8	50	50+	5-	-60.14							
		ss	9	42	34	6-	-59.14							
		A V oo	10	10	05	7-	-58 14		· · · · · · · · · · · · · · · · · · ·					
CLACIAL TILL Donso brown silty			10	42	35		00.11							
sand with gravel, cobbles and boulders		85	11	50	34	8-	-57.14							
- silty sand to sandy silt layer from		ss	12	43	78									
8.9 to 9.3m depth		ss	13	50	43	9-	-56.14						Ē	
		ss	14	42	38	10-	-55.14							
		ss	15	43	50+									
		RC I SS	1 16	61 40	50+	11-	-54.14							
- grey by 12.2m depth		RC	2	75		12-	-53.14							
								20 Shea ▲ Undist	40 ar Stre urbed	60 ength ∆ F	8 (kPa Remou	30 1 a) ulded	00	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment Prop. Multi-Storay Buildings * Pit

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geodetic

REMARKS

FILE NO. PG5792

	5			_					HOLE N	^{0.} BH 6-2	1
BORINGS BY CME-55 Low Clearance I	Jrill			D	ATE	Novembe	er 11, 202	21		BIIUE	
SOIL DESCRIPTION	PLOT	SAM		SAMPLE			DEPTH ELEV.		Pen. Resist. Blows/0.3m • 50 mm Dia. Cone		
	RATA	ХРЕ	MBER	% OVERY	/ALUE ROD			• v	Vater Co	ntent %	nitoring structi
	E S	H	ĺΩΝ	U U	N OF			20	40	60 80	Von
GROUND SURFACE	_^_^^	Vee	17		50.	12-	-53.14		40		~~~~
		A 22	17		50+						· · · · · · · · · · · · · · · · · · ·
						13-	-52.14				
		– BC	3	34							
			U			14-	-51 14				
		ss	18	52	41						
		BC	4	19		15	50.14				
		=	•			15-	50.14				
		ss	19	86	50+						
						16-	49 14				
GLACIAL TILL: Dense, grey silty		RC	5	0			-0.1-				
boulders		_									
						17-	48 14			· · · · · · · · · · · · · · · · · · ·	
- some clay by 16.8m depth		∇	~~	50			-0.1-				
		$\int SS$	20	50	28						
						18-	47 14				
		БС	<u> </u>	44							
		RU	0			19-	46.14				
						20-	45.14				
		- SS	21	0	50+						
		BC	7	14							
			-			21-	44.14				
		_									
			00	0	50.						
		∆	22	0	50+	22-	43.14				
		RC	8	35							
22 88		-									
		-				23-	42.14				
BEDROCK: Good to excellent		RC	9	100	85						
quality, grey limestone with occasional			-								
shale partings	· · · ·					24-	41.14		40	60 90	100
								Shea	ar Strend	ith (kPa)	100
								▲ Undist	urbed 2	Remoulded	

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation Lansdowne Park Redevelopment Bron Multi Storay Buildings & Bi

DATUM	Geodetic	

Prop. Multi-Storey Buildings & Rink Structure, Ontario FILE NO.

Ю.	
	PG5792

REMARKS BORINGS BY CME-55 Low Clearance D	Drill			D	ATE	Novembe	er 11, 202	21	HOL	BH (6-21	
SOIL DESCRIPTION	LOT		SAN	IPLE		DEPTH	ELEV.	Pen. R	esist 0 mn	. Blows/0.3 n Dia. Cone	ßm	Well
	TRATA F	ТҮРЕ	UMBER	% COVERY	VALUE r RQD	(m)	(m)	• •	Vater	Content %	,	onitoring
GROUND SURFACE	ß		z	RE	z ^o	24-	41 14	20	40	60 8	0	ž
BEDROCK: Good to excellent quality, grey limestone with occasional shale partings		RC	10	100	98	24-	-40.14					
25.73 End of Borehole		-										
(GWL @ 5.25m - Nov. 16, 2021)												

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment Pron. Multi-Storay Buildings & Pir

Prop. Multi-Storey Buildings & Rink Structure, Ontario FILE NO.

DATUM Geodetic

PG5792

BORINGS BY CME-55 Low Clearance I	Drill			D	ATE	Novembe	er 15, 202	21	HOLE NO.	BH 7-21	
SOIL DESCRIPTION	PLOT		SAN			DEPTH (m)	ELEV.	Pen. Re • 50	sist. Blow mm Dia. (vs/0.3m Cone	er ion
	STRATA	ТҮРЕ	NUMBER	° % ECOVER3	N VALUE or RQD			• W	ater Conte	ent %	iezomet. onstruct
GROUND SURFACE				<u></u>	4	0-	66.62	20	40 60	80	
							05.00				
FILL: Brown silty sand, some gravel						1-	-65.62				
<u>1.93</u>						2-	-64.62				
Compact to dense, brown SILTY SAND, trace gravel						3-	-63.62				
4.42		ss	1	50	27	4-	-62.62				
		ss	2	0	48	5-	-61.62				
		ss	3	50	50+						
		ss	4	50	50+	6-	-60.62				
		RC	1	45		7-	-59.62				
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		ss	5	53	50+	8-	-58.62				
		∝ SS RC	6 2	0 56	50+	9-	-57.62				
		BC	3	33		10-	-56.62				
- some shale fragments from 11.0 to			7	40	E0	11-	-55.62				
11.5m depth		800	1	42	53	12-	-54.62				
								20 Shear	40 60 r Strength irbed △ R	80 1 (kPa) emoulded	UU

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

FILE NO. PG5792

REMARKS	Drill					Novembe	or 15 202	1 HOLE NO. BH 7-	21			
	год		SAMPLE			DEPTH	ELEV.	Pen. Resist. Blows/0.3m				
SOIL DESCRIPTION	LATA PI	PE	IBER	% VERY	ALUE ROD	(m)	(m)	Su mm Dia. Cone Water Content %	ometer			
GROUND SURFACE	STF	7T	NUN	RECO	N OF			20 40 60 80	Piezo			
		RC	4	48		12-	-54.62					
		ss	8	33	48							
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		RC	5	47		13-	-53.62					
- grey by 13.7m depth		ss	9	33	50+	14-	-52.62					
		RC	6	0		15-	-51.62					
		X SS	10 7	0	50+	16-	-50.62					
		x ss	, 11	73	50+	17-	-49.62					
						10	19 62					
		RC	8	12		10	40.02					
						19-	-47.62					
		ss	12	77	50+	20-	-46.62					
		~				21-	-45.62					
		RC	9	18		22-	-44.62					
		× SS	13	0	50+	23-	-43.62					
23.80		RC	10	100	100							
						24-	-42.62	20 40 60 80 Shear Strength (kPa) ▲ Undisturbed △ Remoulde	100			

SOIL PROFILE AND TEST DATA

Geotechnical Investigation Lansdowne Park Redevelopment

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM Geo	detic
DATUM Geo	detic

FILE NO.	
	PG5792

REMARKO										PG5792	
BOBINGS BY CME-55 Low Clearance	Drill			D		Novembe	er 15 202	21	HOLE NO	^{o.} BH 7-21	
	E		SAN	- IPLE				Pen. R	esist. Bl	ows/0.3m	
SOIL DESCRIPTION	PLO			к	ы	DEPTH (m)	ELEV. (m)	• 5	0 mm Dia	a. Cone	tion
	RATA	ХРE	MBER	° over	ROD			• v	Vater Cor	ntent %	tomet
GROUND SURFACE	S T	H	л И И	REC	N N OF			20	40	60 80	Piez
		_				24-	-42.62			······································	
		RC	11	100	100	25-	41.62				
BEDROCK: Excellent quality, grey											
limestone with occasional shale partings						26-	40.62				
		RC	12	100	94						
07.00						27-	39.62				
End of Borehole										· · · · · · · · · · · · · · · · · · ·	<u>-80-180</u>
(BH dry - November 16, 2021)											
								20	40	60 80 1	⊣ 00
								Shea ▲ Undist	ur Streng urbed ∠	jth (kPa) ∆ Remoulded	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario

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FILE NO. PG5792

REMARKS	Drill			r		Novembe	or 17 202	21	HOLE NO. BH	8-21	
	LOI		SAN	IPLE		DEPTH	ELEV.	Pen. R	esist. Blows/0.	3m :	Vell
JUL DESCRIPTION	TRATA P	гүре	UMBER	°° COVERY	VALUE c RQD	(m)	(m)	• 5 • V	/ater Content %	; 	nitoring \ nstructio
GROUND SURFACE	ι. Γ	L.	IN	RE(z Ö	0-	65 45	20	40 60 8	0	ŠΩ
Concrete patio stone 0.15 FILL: Crushed stone 0.46		₿ AU	1			0	05.45				
FILL: Brown silty sand with gravel,		ss	2	42	20	1-	-64.45				
		ss	3	0	15	2-	-63 45				
		ss	4	0	8		00.40				
Compact to dense, brown silty sand, some gravel		ss	5	17	37	3-	-62.45				
		ss	6	42	41	4-	-61.45				
5.13		ss	7	50	57	5-	-60.45				
		ss	8	42	36						
Dense, brown SILTY SAND		ss	9	50	40	6-	-59.45				
		ss	10	50	36	7-	-58.45				
 some gravel, occasional cobbles and boudlers by 7.4m depth 		ss	11	58	47	8-	-57 45			· · · · · · · · · · · · · · · · · · ·	
8 80		ss	12	50	41		•••••				
0.03		ss	13	67	36	9-	-56.45				
Dense, brown SILTY SAND to SANDY SILT, some gravel		ss	14		45	10-	-55.45				
		ss	15	67	69	11.	-54 45				
<u>11.18</u>		- 	16	67	43		54.40				
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		ss	17	50	14	12-	-53.45				
						13-	-52.45				_
								20 Shea ▲ Undist	40 60 8 a r Strength (kPa urbed △ Remou	u 100 I) Ided	J

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment

Prop. Multi-Storey Buildings & Rink Structure, Ontario FILE NO.

DATUM Geodetic

REMARKS

PG5792

POPINICS BY CME 55 Low Closeropool	٦rill				ATE	Novombo	vr 17 202	01	HOI	LE NO.	BH	8-21	
BORINGS BY CIVIE-55 LOW Clearance						lovembe	117,202						
SOIL DESCRIPTION	PLOT		SAN			DEPTH (m)	ELEV.	Pen. R ● 5	esist 0 mn	: Blov n Dia.	ws/0.3 Cone	Bm	g Well ion
	RATA	КРЕ	MBER	overy	'ALUE RQD	(,	(,	- • •	Vater	Cont	ent %		itorinę struct
GROUND SUBFACE	ST	Ĥ	ION I	REC	N OF			20	40	60	8	n	Mon
		RC	1	55		13-	-52.45						
		RC	2	30		14-	-51.45						
						15-	-50.45						
		ss	18	58	28							•••••••••••••••••••••••••••••••••••••••	
GLACIAL TILL: Very dense, brown		RC	3	0		16-	-49.45						
silty sand with gravel, cobbles and		= 55	19	0	50+								
boulders			15		50+	17	10 15						
		BC	4	36		17-	40.45						
		-				18-	47.45						
		⊠ SS	20	25	50+								
		RC	5	50		19-	46.45						
			01	0									
		- 33	21	0									
						20-	45.45						
		RC	6	35									
							44.45						
21.28		⊠ SS	22		50+	21-	44.45						
											· · · · · · · · ·		
		RC	7	100	90	22-	43 45						
							-10.40						
limestone with occasional shale partings		<u> </u>											
						23-	42.45						
		RC	8	100	95								
24.10						24-	-41.45						
								20 Shea	40 ar Sti	60 rength	80 n (kPa	0 10)	00
									bearu		hemoul	uea	

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Geotechnical Investigation Lansdowne Park Redevelopment Bron Multi Storay Buildings & Bin

Prop. Multi-Storey Buildings & Rink Structure, Ontario

DATUM	Geodetic

REMARKS

FILE NO. PG5792

BORINGS BY CME-55 Low Clearance	Drill			D	ATE	Novembe	er 18, 202	21	HOL	E NO	BH	9-21	
SOIL DESCRIPTION	РГОТ		SAMPLE			DEPTH	ELEV.	Pen. R • 5	esist. 0 mm	. Blo n Dia	ows/0. . Cone	3m Ə	Well
	TRATA	ТҮРЕ	IUMBER	% COVERY	VALUE Pr RQD	(11)		• V	Vater	Con	tent %	, 0	onitoring
GROUND SURFACE	01		4	RE	z	0-	67.07	20	40	6(0 E	0	Ξŏ
Concrete 0.15 FILL: Brown silty sand with crushed0.46 Istone		838838888					66.07						<u>तितितितिः</u> तित्ततितिः
						1-	-66.07						
FILL: Brown silty sand with gravel, occasional cobbles		AU	1			2-	-65.07						
						3-	-64.07						
4 34	, XXX	ss	2	17	18	4-	-63.07						
Concrete (inferred footing)4.75		SS	3 1	8 63	17	5-	-62.07						
		ss ss	4 5	42	6 50+	6-	-61.07						<u>तितितितितिति</u> जनसम्बद्धाः
		RC	2	16		7-	-60.07						
		SS RC ≈ SS	6 3 7	45 46 0	50+ 50+	8-	-59.07						
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		x SS	8	50	58	9-	-58.07						
		RC	4	42		10-	-57.07						
		ss	9	25	43	11-	-56.07						
		x ss	10	0	50+								
		⊻ ss	11	60	50+	12-	+55.07						-
		RC	5	13		13-	-54.07	20 Shea ▲ Undist	40 ar Stro turbed	60 engt △	0 8 h (kPa Remou	30 1 3) JIded	
				1	I	1	L						

SOIL PROFILE AND TEST DATA

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Geotechnical Investigation Lansdowne Park Redevelop Prop. Multi-Storey Building

Lansdowne Park Redevelopment Prop. Multi-Storey Buildings & Rink Structure, Ontario

FILE NO.

DATUM Geodetic

PG5792

REMARKS									HOLE NO		
BORINGS BY CME-55 Low Clearance	Drill			D	ATE	Novembe	er 18, 202	21		BH 9-21	
SOIL DESCRIPTION		SAMPLE DEPTH ELEV. Per					Pen. R • 5	esist. Blo 0 mm Dia	ows/0.3m . Cone	Nell D	
	RATA 1	ХРЕ	MBER	° overy	/ALUE RQD	(m)	(m)		Vater Con	tent %	itoring structio
GROUND SURFACE	ST	H	ŊŊ	REC	N OF			20	40 60	0 80	Mon Con
						13-	-54.07			·····	
		₹ ss	12	22	50+						
						14-	-53.07				
		RC	6	70							
						15-	-52 07				-
				37			02.07				
GLACIAL TILL: Very dense, brown silty sand with gravel, cobbles and boulders		RC	7								-
						16-	-51.07				
		_									
						17-50.	-50.07				
		RC	8	25							
		_				18-	-49.07				
		= SS	13	0	50+	10	43.07				
			0	40							
		RC	9	48		19-	-48.07				
		_									-
						20-	-47.07				
		RC	10	11							
						01 40	40.07				
21.36		_				21-	-46.07				
		RC	11	100	90	22-	-45.07				
BEDROCK: Excellent quality, grey											
limestone with occasional shale partings		_				23-	-44.07				
		RC	12	100	100						
04.00											-
End of Borehole	<u> </u>					24-	-43.07				
								20 Shee	40 60 ar Strengt) 80 1(h (kPa)	00
								▲ Undist	turbed \triangle	Remoulded	

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the 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								
Сс	-	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 > 4Well-graded sands have: 1 < Cc < 3 and Cu > 4Well-graded sands have: 1 < Cc < 3 and Cu > 6Sands 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)					
Сс	-	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 Topsoil Asphalt Peat Sand Silty Sand Fill Δ Sandy Silt Clay Silty Clay Clayey Silty Sand Glacial Till Shale Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION









Project No: TZ10100106 Location: 945 Bank Street, Ottawa Logged By: JFT Drill Date: October 21, 2015 Hole Size: 127 mm Project Name: CPU Ground Water Monitoring Program Client: City of Ottawa Entered By: KYLT Drill Method: Direct Push Drilled By: Strata Drilling Group

SUBSURFACE PROFILE				SAMPLE DATA				Combustible Vapour			WE	LLS		
Depth	Symbol	Description	Elevation (m)	Type	Number	Sample	N or RQD	Recovery (%)	° 20 Total ● 20	(ppn 40 Organi (ppn 40	n) ○ 60 80 ic Vapour n) ● 60 80	GP	MW	Remarks
o ft m		Ground Surface	64.9											
		TOPSOIL	0.0 64.5	SS										
2		FILL Fine grained loamy sand, trace gravel, dark brown	0.4											
				SS	1			45						
5									-					
				SS	2			65						
8 		Very fine grained sandy loam, dark brown, moist										_*:*:		
		Brownish grey, wet										-		
12-		Fine to medium grained sand, grey										-		
13 <u>4</u> 14 <u>4</u>		Trace gravel		SS	3			43				_		
15		Fine to medium grained sandy loam and gravel	60.2 4.7	-										
16 		Fine to coarse grained sand, trace gravel	59.7 5.2									-		
18		END OF BOREHOLE										_		
19 6 20												-		
21														
22 												-		
Elevation: 64.924 maslCasing Elevation: 64.615 maslFilter Pack Size: MW 6.7 mm/GP 9.5 mmDatum: GeodeticEasting: 368843.807Well Casing Size: MW 50.8 mm/GP 12.7 mmWell Material: Schedule 40 PVCChecked by: KDHNorthing: 5029183.520Screen Slot Size: MW 0.25 mm/GP 6.4 mmVapour Unit: N/ASheet: 1 of 1														



Project Name: CPU Ground Water Monitoring Program Client: City of Ottawa Entered By: KYLT Drill Method: Direct Push

Drilled By: Strata Drilling Group



Amec Foster Wheeler 300-210 Colonnade Road Ottawa, Ontario K2E 7L5

SUBSURFACE PROFILE SAMPLE DATA Combustible Vapour Monitoring Well Details (ppm) 750 0 (%) Elevation (m) 250 1250 or RQD Remarks Recovery Number Sample Symbol Description **Total Organic Vapour** Depth Type (ppm) ٠ `100´140_180 20 60 z ft m Ground Surface 64.51 0.00 0 TOPSOIL 1 64.12 0.40 FILL 2 Gravel and sand, grey 3 Fine loamy sand, greyish brown 1 SS 1 68 4 5 6 2 7 Wet SS 2 70 8 9 Fine to medium grained sand, brown 3 -10 11 Fine grained sandy loam 60.80 3.71 12 SAND SS 3 65 Fine to coarse grained sand, trace 13 4 gravel, brown, wet 14 15 Trace silt 16 5 17 Slightly grey 55 SS 4 18 19 6 58.42 20 6.10 END OF BOREHOLE 21 22 7 23-Elevation: 64.513 masl Casing Elevation: 64.431 masl Filter Pack Size: 6.7 mm Datum: Geodetic Easting: 368911.901 Well Casing Size: 50.8 mm Well Material: Schedule 40 PVC Checked by: KDH Screen Slot Size: 0.25 mm Sheet: 1 of 1 Northing: 5029169.410 Vapour Unit: N/A



Project No: TZ10100106 Location: 945 Bank Street, Ottawa Logged By: JFT Drill Date: October 21, 2015 Hole Size: 127 mm Project Name: CPU Ground Water Monitoring Program Client: City of Ottawa Entered By: KYLT Drill Method: Direct Push Drilled By: Strata Drilling Group

SUBSURFACE PROFILE SAMPLE DATA Combustible Vapour Monitoring Well Details (ppm) 750 (%) Elevation (m) 250 1250 RQD Remarks Recovery Number Sample Symbol Description **Total Organic Vapour** Depth Type (ppm) P ٠ 100′140 180 20 60 z ft m Ground Surface 65.25 0.00 0 ASPHALT 1 64.86 0.40 FILL Fine to medium grained loamy sand, 2 trace gravel, brown 3 1 SS 1 68.1 4 5 Fine to medium grained sand, trace 6 coarse grained sand, brown 2 7 SS 2 70 8 Brownish grey 9 3 10 Damp/moist 11 Fine to medium grained sand 12 SS 3 65 13 4 Medium to coarse grained sand, moist/wet 14 Very fine to fine grained sand, grey 60.68 4.57 15 SAND Fine to coarse grained sand, trace V 16 gravel, grey, wet 5 60.07 5.18 17 LOAMY SAND SS 4 55 Fine to medium grained loamy sand and gravel, some pieces of rock 18 19 6 59.16 20 6.10 END OF BOREHOLE 21 22 7 23-Elevation: 65.253 masl Casing Elevation: 65.148 masl Filter Pack Size: 6.7 mm Datum: Geodetic Easting: 368798.392 Well Casing Size: 50.8 mm Well Material: Schedule 40 PVC Checked by: KDH Screen Slot Size: 0.25 mm Northing: 5029125.377 Vapour Unit: N/A Sheet: 1 of 1

Project No: TZ10100106 Location: 945 Bank Street, Ottawa Logged By: JFT Drill Date: October 22, 2015 Hole Size: 127 mm Project Name: CPU Ground Water Monitoring Program Client: City of Ottawa Entered By: KYLT Drill Method: Direct Push Drilled By: Strata Drilling Group

Amec Foster Wheeler 300-210 Colonnade Road Ottawa, Ontario K2E 7L5

SUBSURFACE PROFILE SAMPLE DATA Combustible Vapour Monitoring Well Details (ppm) 750 (%) Elevation (m) 250 1250 RQD Remarks Recovery Number Sample Symbol Description Total Organic Vapour Depth Type (ppm) P ٠ 20 60 100 140 180 z ft m Ground Surface 64.04 0.00 0 TOPSOIL 1 63.65 0.40 FILL Very fine to fine grained loamy sand, 2 brown 3 1 Very fine to fine grained sand SS 1 68 4 5 Very fine sandy loam, dark brown 6 2 7 Very fine grained loamy sand, brown SS 2 85 8 Very fine grained sandy loam Very fine grained loamy sand 9 Very fine to fine grained loamy sand 3 10 Very fine grained sandy loam, brown, moist/wet 11 Very fine to fine grained loamy sand 12 Very fine grained sandy loam SS 3 85 13 4 Very fine to fine grained sand 59.93 4.11 SAND 14 Fine to medium grained, trace coarse grained sand, some gravel, some rock 15 16 5 • 17 SS 4 43 Medium to coarse grained sand, some 18 gravel 19 6 57.95 20 6.10 END OF BOREHOLE 21 22 7 23-Elevation: 64.043 masl Casing Elevation: 64.979 masl Filter Pack Size: 6.7 mm Datum: Geodetic Easting: 368878.435 Well Casing Size: 50.8 mm Well Material: Schedule 40 PVC Checked by: KDH Screen Slot Size: 0.25 mm Northing: 5029083.949 Vapour Unit: N/A Sheet: 1 of 1

Project No: TZ10100106 Location: 945 Bank Street, Ottawa Logged By: JFT Drill Date: October 22, 2015 Hole Size: 127 mm Project Name: CPU Ground Water Monitoring Program Client: City of Ottawa Entered By: KYLT Drill Method: Direct Push Drilled By: Strata Drilling Group



Amec Foster Wheeler 300-210 Colonnade Road Ottawa, Ontario K2E 7L5

SUBSURFACE PROFILE SAMPLE DATA Combustible Vapour Monitoring Well Details (ppm) 750 (%) Elevation (m) 250 1250 or RQD Remarks Recovery Number Sample Symbol Description **Total Organic Vapour** Depth Type (ppm) ٠ 20 60 100 140 180 z ft m Ground Surface 64.57 0.00 0 TOPSOIL 1 64.17 0.40 FILL Very fine to fine grained sand, trace silt, 2 grey/brown 3 1 SS 1 66 4 5 Very fine to medium grained sand, 6 brown/grey 2 7 SS 2 58 8 9 Fine to medium grained loamy sand and 3 10 gravel, moist 11 Gravelly loamy sand, some pieces of 12 rock SS 3 52 13 4 14 Wet 60.00 4.57 15 SAND 2 Fine to medium and trace grained sand, 16 some gravel 5 17 SS 4 33 18 Coarse sand and gravel •••••••• • • 19 6 58.47 20 6.10 END OF BOREHOLE 21 22 7 23-Elevation: 64.571 masl Casing Elevation: 64.447 masl Filter Pack Size: 6.7 mm Datum: Geodetic Easting: 368858.743 Well Casing Size: 50.8 mm Well Material: Schedule 40 PVC Checked by: KDH Screen Slot Size: 0.25 mm Sheet: 1 of 1 Northing: 5028968.821 Vapour Unit: N/A



	0 5 10 15 20 25	i	50 75m
	Scale:		Date:
		1:1250	12/2021
	Drawn by:		Report No.:
		YA	PG5792-1
ONTARIO	Checked by:		Dwg. No.:
		MS	PG5792-1
	Approved by:		
		DJG	Revision No.:



