

memorandum

re: Groundwater Monitoring Program

Proposed Industrial Addition 158 Cardevco Road – Ottawa

to: Pri-Tec Construction Ltd. - Mike Watters - Mike@pritec.ca

date: November 20, 2024 file: PH4559-MEMO.02

Further to your request and authorization, Paterson Group (Paterson) conducted a groundwater monitoring program in support of a Low Impact Development (LID) design for the proposed industrial addition at the aforementioned site. This report should be read in conjunction with Paterson Report PG6233-1 Revision 3 dated November 30, 2023.

1.0 Background Information

Geotechnical field investigations were carried out between May 20, 2022, and March 24, 2023. At that time, a total of six (6) boreholes and three (3) test pits where advanced to a maximum depth of 4.7 m and 3.1 m below existing grade (bgs), respectively. The test holes were distributed in a manner to provide general coverage of the study area, taking into consideration existing site features.

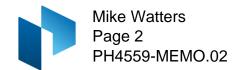
Field Survey

The borehole locations, and ground surface elevations at each borehole location, were surveyed by Paterson using a high precision, handheld GPS and referenced to a geodetic datum. The location and ground surface elevation at each borehole location is presented on Drawing PG6233-1 - Test Hole Location Plan attached to the current memorandum.

Subsurface Profile

The subsurface profile at the borehole locations generally consisted of fill material followed by a native silty sand deposit. The above noted fill layer typically consisted of dense to compact brown silty sand with varying amounts of gravel, crushed stone, and construction debris. The native silt sand with varying amounts of gravel and cobbles was encountered underlying the glacial till. Practical refusal to augering/excavation was encountered in select test holes between 2.1 to 4.3 m bgs.

Details of the subsurface profile can be found in the Soil Profile and Test Data Sheets attached to the current report.



Monitoring Well Installation

Typical monitoring well construction details are described below:

1.5 m of slotted 51 mm diameter PVC screen at the base of the aforementioned
boreholes.
51 mm diameter PVC riser pipe from the top of the screen to ground surface.
No.3 silica sand backfill within the annular space around the screen.
Bentonite hole plug placed directly above PVC slotted screen extending to the
existing ground surface.
The 51 mm diameter PVC riser was covered with a protective steel flush mount
well casing at ground surface.

Specific details of the installation of the monitoring well is further included in the Soil Profile and Test Data Sheet attached to the current report.

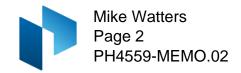
2.0 Groundwater Monitoring Program

The monitoring well installed at BH 2-23 was equipped with a Van Essen Instrument Mini-Diver Water Level Logger on November 16, 2023, to accurately monitor fluctuations in the groundwater levels. In addition, a Van Essen Instruments Baro-Diver was installed in BH 2-23 to monitor changes in atmospheric pressure. The Mini-Diver was programmed to continuously measure and record groundwater levels throughout the subject site at a rate of 1 reading every 24 hours for a period of approximately 7 months.

The results of the groundwater fluctuations and correlated precipitation events at the monitoring well location between November 2023 and June 2024, have been summarized in Figure 1 attached to the current report.

3.0 Groundwater Monitoring Results

The data presented in Figure 1 illustrates the collected groundwater elevations between November 2023 and June 2024. The groundwater readings measured within the monitoring well varied from an elevation of 114.88 m asl to a maximum elevation of 115.94 m asl. The low and high groundwater elevation are summarized in Table 1 below.



Based on our analysis of the data logger groundwater readings, seasonal groundwater fluctuations can be observed at the well location with a difference in elevation between low and high readings of 1.06 m.

Table 1: Groundwater Monitoring Summary								
Monitoring Well ID	Ground Surface Elevation (m asl)	Low Groundwater Elevation (m asl)	High Groundwater Elevation (m asl)	Difference in Groundwater Elevation (m asl)				
BH 2-23	117.47	114.88	115.94	1.06				

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

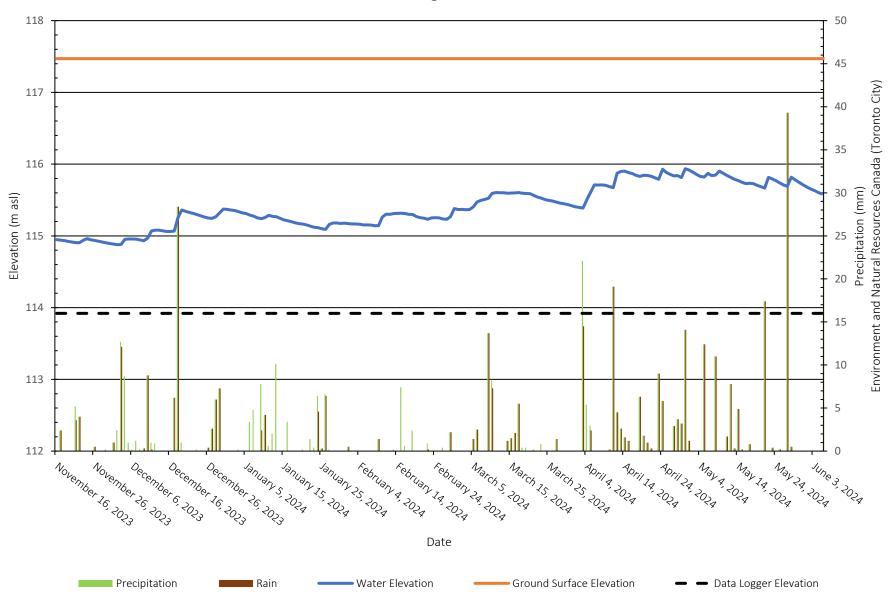


Erik Ardley, P.Geo.

Attachments

- ☐ Figure 1 Groundwater Monitoring Levels
- Soil Profile and Test Data Sheets
- ☐ Drawing PG6233-1 Test Hole Location Plan

BH2-23 - Monitoring Well Water Elevations





Elevations are referenced to a geodetic datum

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment 158 Cardevco Road

9 Auriga Drive, Ottawa, Ontario K2E 7T9

Ottawa, Ontario

DATUM REMARKS

PG5996

FILE NO.

BORINGS BY CME 55 Power Auger	,			D	ATE I	March 24	, 2023		HOLE NO. BH 1-23	
SOIL DESCRIPTION	PLOT		SAM			DEPTH (m)	ELEV. (m)		onization D	
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	()	()	O Lowe	er Explosive	Limit %
GROUND SURFACE			24	뀚	z °	0-	-117.83	20	40 60	80
Asphaltic Concrete 0.10 FILL: Compacted granular base , brown silty sand with crushed stone and gravel		AU	1			0	117.03	•		
FILL: Compact to dense brown silty sand with some gravel, crushed stone, trace clay 0.91	7	SS	2	66	37	1-	-116.83			
FILL: Dense to very dense brown silty sand with some gravel, trace clay										
Auger Refusal on Limestone cobbles,boulders Limestone Boulders		SS	3	42	50+	2-	-115.83	•		
Some cobbles and boulders by 1.80 Limestone Boulders Some cobbles and boulders by 1.80		RC	1	100	100					
3.18						3-	-114.83			
Compact, brown SILTY SAND with some gravel		SS	4		24		,	•		
4.27						4-	-113.83			
Excellent quality LIMESTONE BEDROCK 4.72 End of Borehole		RC	2	100	100					
(GWL @ 1.80m depth on March 30, 2023)								100	200 300	400 500
								RKII	Eagle Rdg. (as Resp. △ M	(ppm)

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment 158 Cardevco Road Ottawa, Ontario

DATUM Elevations are referenced to a geodetic datum FILE NO. **PG5996 REMARKS** HOLE NO. **BH 2-23** BORINGS BY CME 55 Power Auger **DATE** March 24, 2023 Monitoring Well Construction **SAMPLE Photo Ionization Detector** STRATA PLOT DEPTH ELEV. SOIL DESCRIPTION Volatile Organic Rdg. (ppm) (m) (m) RECOVERY N VALUE or RQD NUMBER TYPE **Lower Explosive Limit % GROUND SURFACE** 80 60 0+117.471 FILL: Compact to dense gravel surface, with brown silty sand, with some crushed stone, trace clay 0.91 1+116.47SS 2 67 22 FILL: Compact brown silty sand with gravel, with gravel, crushed stone, trace plastic FILL: Compact brown silty sand. SS 3 58 30 some gravel and clay, trace concrete 2+115.47SS 4 50 FILL: Compact silty sand trace asphaltic concrete 3+114.47 3.20 5 SS 67 31 Compact, brown SILTY SAND, some gravel 3.73 Compact, brown SILTY SAND SS 6 50 50 +4.04 4 + 113.47LIMESTONE BEDROCK 4.09 End of Borehole (GWL @ 1.38m depth on March 30, 2023) 100 200 300 500 RKI Eagle Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment 158 Cardevco Road Ottawa, Ontario

DATUM Elevations are referenced to a geodetic datum FILE NO. **PG5996 REMARKS** HOLE NO. **BH 3-23** BORINGS BY CME 55 Power Auger **DATE** March 24, 2023 **SAMPLE Photo Ionization Detector** STRATA PLOT DEPTH ELEV. **SOIL DESCRIPTION** Volatile Organic Rdg. (ppm) (m) (m) RECOVERY N VALUE or RQD NUMBER **Lower Explosive Limit % GROUND SURFACE** 80 0+117.30**FILL**: Compact to dense brown silty sand with gravel, crushed stone, 0.30 1 sand and clay 1+116.30FILL: Compact, redish brown silty SS 2 75 21 sand, some gravel, occasional cobbles and boulders, Some concrete fragments by 1.52m depth SS 3 42 29 2+115.30SS 4 3 + 114.30Dense, brown SAND with gravel SS 5 38 3.73 Compact, brown SILTY SAND 3.91 End of Borehole SS 6 50 (GWL @ 1.09m depth on March 30, 2023) 100 200 300 400 500 RKI Eagle Rdg. (ppm) ▲ Full Gas Resp. △ Methane Elim.

Phase II - Environmental Site Assessment

158 Cardevco Road Ottawa, Ontario

SOIL PROFILE AND TEST DATA

9 Auriga Drive, Ottawa, Ontario K2E 7T9

Elevations are referenced to a geodetic datum

REMARKS

DATUM

FILE NO. **PG5996** HOLE NO.

ORINGS BY CME 55 Power Auger				D	ATE	March 24	, 2023				LE NO 1 4-2			
SOIL DESCRIPTION	PLOT		SAN	IPLE	Т	DEPTH	ELEV.	P		loniz atile O				Mell
		TYPE	NUMBER	» RECOVERY	N VALUE or RQD	(m)	(m)	0					mit %	Monitoring Well Construction
ROUND SURFACE	STRATA		Z	RE	z °	0-	-117.76		20	40	6	0	80	_ ≥
ILL: Compact, brown silty sand ith gravel, crushed stone, trace clay 0.30		-AU	1				117.70	•						
		SS	2	42	29	1-	-116.76							
LL : Compact, brown silty sand th gravel, trace clay														
		SS	3	42	24	2-	-115.76							
		SS	4	46	22		(
3.20 ense to very dense, brown SILTY AND , some gravel, occasional		ss	5	63	40	3-	-114.76							
obbles 3.66 nd of borehole		<u></u>												
									100 RKI	200 Eagle				500

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment 158 Cardevco Road Ottawa, Ontario

9 Auriga Drive, Ottawa, Ontario K2E 7T9

Elevations are referenced to a geodetic datum

FILE NO. **PG5996**

HOLE NO

REMARKS

DATUM

BORINGS BY CME 55 Power Auger				C	ATE	March 24	, 2023		HOLE NO. BH 5-23	3	
SOIL DESCRIPTION	PLOT		SAN	/IPLE		DEPTH			onization I		Well
	STRATA	TYPE	NUMBER	RECOVERY	N VALUE or RQD	(m)	(m)	O Lowe	er Explosiv	e Limit %	Monitoring Well Construction
GROUND SURFACE	ß		Z	뀚	z º	0	117.62	20	40 60	80	ž
FILL: Compact to dense brown silty sand with gravel, crushed stone, 0.30 some clay, occasional brick fragments		AU	1				117.02	•			
FILL: Compact to dense, brown silty sand some gravel and clay		ss	2	42	7	1-	-116.62	•			
2.03 End of borehole		ss	3	4	50+	2-	-115.62	•			
						3-	-114.62				
									200 300 Eagle Rdg. as Resp. △ M		00

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation 158 Cardevco Road Ottawa. Ontario

DATUM Geodetic												NC 62				
REMARKS				_							HOL	E N	Ο.			
BORINGS BY Excavator	DATE May 20, 2022												22	—		
SOIL DESCRIPTION	PLOT			/IPLE		DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m • 50 mm Dia. Cone					Piezometer Construction			
	STRATA	TYPE	NUMBER	RECOVERY	VALUE r RQD				0	Wa	ıter	Со	nter	nt %)	iezom iezom
GROUND SURFACE	ß	F	N N	REC	N N		117 44		20)	40		60	80	0	
FILL: Dense to very dense brown silty sand with gravel and crushed stone							117.44									
0.50		X G	1													
FILL: Dense brown silty sand with gravel, crushed stone, asphalt and																
concrete						1-	116.44									
		ΧG	2													
			_													
		∑ G	3								1					
Refusal to excavation in dense fill at 1.71 m depth																
(Open hole GWL 1.6 m depth)																
										hear distur		enç	 60 g th (∆ Re)	 100

Geotechnical Investigation

158 Cardevco Road

SOIL PROFILE AND TEST DATA

Shear Strength (kPa)

△ Remoulded

▲ Undisturbed

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Ottawa, Ontario **DATUM** Geodetic FILE NO. **PG6233 REMARKS** HOLE NO. **TP 1A-22 BORINGS BY** Excavator **DATE** 2022 May 20 **SAMPLE** Pen. Resist. Blows/0.3m STRATA PLOT Piezometer Construction DEPTH ELEV. **SOIL DESCRIPTION** • 50 mm Dia. Cone (m) (m) RECOVERY N VALUE or RQD NUMBER Water Content % **GROUND SURFACE** 80 20 0+117.44FILL: Dense to very dense brown silty sand with gravel and crushed stone 0.52 FILL: Dense brown silty sand with gravel, crushed stone, asphalt and concrete 1 + 116.442.02 2+115.44Compact brown SILTY SAND with gravel, trace cobbles 1 End of Test Pit Refusal to excavation on bedrock surface at 2.31 m depth (Open hole GWL 1.6 m depth) 40 60 80 100

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation 158 Cardevco Road Ottawa, Ontario

DATUM Geodetic					'				FILE NO		
REMARKS				_	(2000 May	. 00		HOLE N	Ю.	
BORINGS BY Excavator	PLOT		CAN		AIE 4	2022 May	20	Dave D			
SOIL DESCRIPTION				MPLE	B Q	DEPTH (m)	ELEV. (m)		lows/0.3m a. Cone	Piezometer Construction	
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or RQD			o w	/ater Co	ntent %	Piezo Cons
GROUND SURFACE	0 2			22	N	0-	-117.58	20	40	60 80	
FILL: Dense brown silty sand with gravel and crushed stone		∑ G 	1			, and the second					
FILL: Compact brown silty sand with gravel, crushed stone and brick fragments						1-	-116.58				-
		∑ G	2								
		∑ G	3			2-	-115.58				
gravel, trace cobbles						3-	-114.58				
3.12 End of Test Pit											-
Refusal to excavation on bedrock surface at 3.12 m depth											
(Open hole GWL at 1.8 m depth)											
									r Strenç	60 80 1 gth (kPa)	100

158 Cardevco Road

Geotechnical Investigation

SOIL PROFILE AND TEST DATA

▲ Undisturbed

△ Remoulded

154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Ottawa, Ontario FILE NO. **DATUM** Geodetic **PG6233 REMARKS** HOLE NO. **TP 3-22 BORINGS BY** Excavator **DATE** 2022 May 20 **SAMPLE** Pen. Resist. Blows/0.3m STRATA PLOT Piezometer Construction DEPTH ELEV. **SOIL DESCRIPTION** 50 mm Dia. Cone (m) (m) N VALUE or RQD RECOVERY NUMBER Water Content % **GROUND SURFACE** 80 20 0+117.34FILL: Dense to very dense granular crushed stone, some sand G 1 FILL: Dense brown silty sand with gravel, asphalt and concrete G 2 1 + 116.34Compact brown SILTY SAND with 2.06 3 gravel, trace cobbles End of Test Pit Refusal to excavation on inferred bedrock at 2.06 m depth (Open hole GWL at 1.82 m depth) 40 60 100 Shear Strength (kPa)

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC% - Natural water content or water content of sample, %

Liquid Limit, % (water content above which soil behaves as a liquid)
 PL - Plastic Limit, % (water content above which soil behaves plastically)

PI - Plasticity Index, % (difference between LL and PL)

Dxx - Grain size at which xx% of the soil, by weight, is of finer grain sizes

These grain size descriptions are not used below 0.075 mm grain size

D10 - Grain size at which 10% of the soil is finer (effective grain size)

D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$

Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: 1 < Cc < 3 and Cu > 4 Well-graded sands have: 1 < Cc < 3 and Cu > 6

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay

(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'o - Present effective overburden pressure at sample depth

p'c - Preconsolidation pressure of (maximum past pressure on) sample

Ccr - Recompression index (in effect at pressures below p'c)
 Cc - Compression index (in effect at pressures above p'c)

OC Ratio Overconsolidaton ratio = p'c / p'o

Void Ratio Initial sample void ratio = volume of voids / volume of solids

Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

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



