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Phase II Environmental Site Assessment

3252 Navan Road
Ottawa, Ontario

Prepared For

Claridge Homes (Gladstone) Inc.

February 21, 2020

Report: PE4588-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for 3252 Navan Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling thirteen boreholes all of which were instrumented with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Soil samples from each borehole were submitted for analysis of BTEX, VOC, PHC, Metals, and/or PAHs. All BTEX, PHC, and PAH samples are in compliance with the applicable MECP Standards. Marginal exceedances of the MECP Standards for Bromomethane and Chloroform were identified in BH7. All other VOC samples were in compliance with the applicable Standards. Naturally occurring metals (Cobalt, Vanadium) concentrations exceeding the applicable standards were identified in BH7, BH8, and BH9. These metals concentrations are considered to be naturally occurring and are not considered to be a concern.

Groundwater samples analysed are in compliance with the applicable standards for BTEX, PHC, Metals and/or PAHs in all boreholes. Exceedances of the appliable standard for Tetrachloroethylene was identified in BH1. All other VOC groundwater samples are in compliance with the applicable standard.

Conclusion

Impacted groundwater was identified in BH1, however with the additional investigative work, the groundwater appears to have been horizontally and vertically delineated. The impacted soil in BH7 requires further delineation. Following the closure of the existing site operations additional testing will be required to sufficiently investigate the fill remaining on site.

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It is recommended that the integrity of the monitoring wells be maintained, prior to future construction, for possible further groundwater monitoring purposes.

1.0 INTRODUCTION

At the request of Claridge Homes (Gladstone) Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for 3252 Navan Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in April and December, 2019.

1.1 Site Description

Address:	3252 Navan Road, Ottawa, Ontario.
Property Identification Number:	04352-0307
Location:	The subject site is located on the south side of Navan Road, east of Spring Valley Drive. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 25' 34" N, 75° 30' 31" W
Configuration:	Trapezoidal.
Site Area:	78,500 m^2 (approximate).

1.2 Property Ownership

The property is currently occupied by André Taillefer Ltd. topsoil and landscaping. Paterson was engaged to conduct this Phase I-ESA by Mr. Vincent Denomme of Claridge Homes. Mr. Denomme can be contacted by telephone at Claridge Homes' office on 613-233-6030.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by André Taillefer Ltd., a landscaping materials contractor. Near Navan Road, adjacent to an office building the site is used for stockpiling landscaping materials. Further south, large imported fill piles are present. The southern half of the site is vacant treed land. It is our understanding that the subject site will be redeveloped for residential purposes.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 3 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011. The MECP selected Table 3 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Full depth generic site conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

The Residential standards were selected based on the proposed future use of the subject site. Coarse-grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Study Area is residential to the north and west, with a landfill to the east and Mer Bleue conservation area to the south. The regional topography generally slopes down towards the south towards Mer Bleue conservation area. Site drainage consists primarily of infiltration and runoff to a ditch along the eastern boundary of the site.

2.2 Past Investigations

Paterson completed a Phase I ESA in December 2019 for the subject site. The presence of 1 historical and 2 current ASTs, together with the importation and stockpiling of materials, were considered on-site PCAs resulting in APECs. Within the Phase I Study Area, the Navan Road landfill was considered to be a PCA resulting in an APEC. The PCAs that represent APECs on the Phase I Property as well as Contaminants of Potential Concern (CPCs) are presented in Table 1.

Table 1; Areas of Potential Environmental Concern					
Area of Potential Environmental Concern	**Location of Area of Potential Environmental Concern with respect to Phase I Property**	**Potentially Contaminating Activity**	**Location of PCA (on-site or off-site)**	**Contaminants of Potential Concern**	**Media Potentially Impacted (Groundwater, Soil, and/or Sediment)**
APEC 1 (resulting from the grading, excavation and stockpiling of materials)	The northern half of the Phase I property	PCA 30 – Importation of Fill Material of Unknown Quality	On-site	PHCs (F1-F4), Metals, PAH	Soil and groundwater
APEC 2 (resulting from the historical presence of an AST)	The northern portion of the Phase I property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	BTEX PHCs (F1-F4)	Soil and groundwater
APEC 3 (resulting from the presence of two ASTs)	The northern portion of the Phase I property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	On-site	BTEX PHCs (F1-F4)	Soil and groundwater
APEC 4 (resulting from the presence of Navan landfill)	Eastern portion of the Phase I property	PCA 58 – Waste Disposal and Waste Management, including landfilling	Off-site	BTEX PHCs (F1-F4), VOC, metals	Soil and groundwater

A Phase II ESA was recommended to address the aforementioned APECs.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted in two phases. The first phase was completed on May 16, 17 and 22, 2019 in conjunction with a Geotechnical Investigation. The field program consisted of drilling nine (9) boreholes, all of which were completed as groundwater monitoring wells. Boreholes were drilled to depths ranging from 1.83 to 10.67 m below the existing grade.

The second phase was completed on September 5, 2019 and consisted of drilling four (4) additional boreholes, all of which were completed as groundwater monitoring wells. Boreholes were drilled to depths ranging from 5.18 to 11.28 m below the existing grade.

3.2 Media Investigated

During the subsurface investigation, soil and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these samples is based on the Contaminants of Potential Concern identified in the Phase I ESA.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on the information from NRCAN, bedrock in the area of the site consists of shale, limestone, dolostone and siltstone of the Billings Formation, overlain by deposits of various composition and depth. Site soils are anticipated to comprise granular glaciomarine sediments, colluvial deposits and fine-grained glaciomarine sediments between 30 and 50 m thick.

Groundwater flow is considered to be in a southerly direction, toward the Mer Bleue conservation area.

Buildings and Structures

The Phase I Property is occupied by a 2-storey office/reception building (formerly a single-family dwelling). The building was likely constructed around 1950-1960. Other structures include two semi-permanent trailers used for storage.

Water Bodies

The topographic map shows a ditch running from Navan Road at the northern boundary of the site, along the eastern boundary to the southern portion of the site before turning to the west and leading to the Mer Bleue conservation area.

Areas of Natural Significance

The Mer Bleue conservation area lies 30m south of the Phase I ESA Study Area.

Drinking Water Wells

A search of the MECP's well records identified two (2) records in the subject area, dating from 1977 to 2015. One record details a domestic water supply well drilled in 1977 to a depth of 45.7 m. The other record details the abandonment of a 4-inch diameter well located at 3225 Navan Road in 2015.

Given the municipally supplied area and age of the domestic supply well record, all private water wells are assumed to be obsolete.

Monitoring Well Records

No monitoring wells were identified for the Phase I Property or for any properties within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area is primarily residential to the north and west, with a landfill to the east and Mer Bleue conservation area to the south.

Potentially Contaminating Activities (PCAs) and Areas of Potential Environmental Concern (APECs)

As presented in Table 1 in the previous section, on-site PCAs resulting in APECs on the Phase I Property include the storage of fuel (3 ASTs), as well as the importation of fill material of unknown quality and the neighbouring landfill.

PCAs resulting in APECs are presented on Drawing PE4588-1 – Site Plan.

Contaminants of Potential Concern (CPCs)

CPCs identified with the aforementioned APECs include benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), volatile organic compounds (VOCs), metals and polycyclic aromatic hydrocarbons (PAH) in the soil and groundwater.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I-ESA is considered to be sufficient to conclude that there are PCAs on the Phase I Property which may have impacted the subject land. The presence of PCAs was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report.

3.5 Impediments

Fill piles and dense brush/vegetation represent physical impediments encountered during the Phase II ESA program on the southern portion of the site.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted in two phases. The first phase was completed on May 16, 17 and 22, 2019 in conjunction with a Geotechnical Investigation. The field program consisted of drilling nine (9) boreholes, all of which were completed as groundwater monitoring wells. Boreholes were drilled to depths ranging from 1.83 to 10.67 m below the existing grade.

The second phase was completed on September 5, 2019 and consisted of drilling four (4) additional boreholes, all of which were completed as groundwater monitoring wells. Boreholes were drilled to depths ranging from 5.18 to 11.28 m below the existing grade.

The boreholes were placed to address the aforementioned areas of potential environmental concern (APECs). The boreholes were drilled with a track-mounted power auger drill rig. The track-mounted drill rig was provided by George Downing Estate Drilling of Hawkesbury, Ontario. Borehole locations are shown on Drawing PE4588-3 – Test Hole Location Plan appended to this report.

4.2 Soil Sampling

A total of 99 soil samples were obtained from the boreholes by means of sampling from shallow auger flights and split spoon sampling. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Large stockpiles of fill material are present on the northern portion of the site, underlain by native silty clay. The southern portion of the site consists of topsoil underlain by native silty clay.

4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, followed by soils vapour screening with a MiniRAE 2000 Portable VOC Monitor.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The vapour readings were found to range from 0 to 10 ppm in all locations except for BH5. These readings are not considered to be indicative of concentrations of volatile compounds. The vapour readings were found in BH5 to range from 1.8 to 113.8 ppm.

Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Thirteen (13) groundwater monitoring wells were installed on the Phase II Property as part of the current subsurface investigation. The monitoring wells consisted of 50 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

TABLE 2: Monitoring Well Construction Details

Well ID	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack up to (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	6.10	6.10-3.05	2.84	0.10	Flushmount
BH2	6.10	6.10-3.05	2.92	0.13	Flushmount
BH3	4.57	4.57-1.52	1.27	0.10	Stick-up
BH4	8.38	8.38-5.33	5.08	0.13	Flushmount
BH5	10.67	10.67-7.62	7.26	0.00	Stick-up
BH6	10.67	10.67-7.62	7.11	0.13	Stick-up
BH7	3.05	3.05-1.53	0.91	0.00	Stick-up
BH8	1.83	1.83-0.31	2.44	0.00	Stick-up
BH9	3.05	3.05-1.53	2.44	0.00	Stick-up
BH10	5.18	5.18-2.13	1.12	0.00	Stick-up
BH11	11.28	11.28-9.76	8.53	7.92	Stick-up
BH12	5.18	5.18-2.13	0.91	0.00	Stick-up
BH13	5.18	5.18-2.13	0.91	0.00	Stick-up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1 to BH6 on 30 and 31 of May, 2019, at BH7 to BH9 on June 3, 2019 and at BH10 to BH13 on September 9, 2019. No water quality parameters were measured in the field at that time.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged

from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan, appended to this report, the following soil and groundwater samples were submitted for analysis:

TABLE 3: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed						Rationale
		PHCs (F_1-F_4)	PHCs (F_2-F_4)	BTEX	VOC	PAHs	Metals	
BH1-SS4	2.29 - 2.90 m Fill/Silty Clay	X		X				Assess any potential impacts from the two ASTs.
BH2-SS3	1.52 - 2.13 m Fill	X		X				Assess any potential impacts from the historical AST.
BH3-AU1	0.00 - 0.61 m Fill					X	X	Assess any potential impacts from the fill piles and Navan landfill.
BH4-SS2	0.76 - 1.37 m Fill						X	Assess any potential impacts from the fill piles.
BH5-SS2	0.76 - 1.37 m Fill				X	X		Assess any potential impacts from the fill piles and Navan landfill.
BH5-SS6	3.81 - 4.42 m Fill	X		X			X	Assess any potential impacts from the fill piles and Navan landfill.
BH6-SS8	5.33 - 5.94 m Fill					X	X	Assess any potential impacts from the fill piles.
BH7-SS5	2.44 - 3.05 m Silty Clay	X			X		X	Assess any potential impacts from the Navan landfill.
BH8-SS3	1.22 - 1.83 m Silty Clay	X			X		X	Assess any potential impacts from the Navan landfill.
BH9-SS3	1.22 - 1.83 m Silty Clay	X			X		X	Assess any potential impacts from the Navan landfill.
BH10-SS2	1.52 - 2.13 m Silty Sand				X			Assess any potential impacts from the two ASTs and the historical AST.
BH11-SS1	6.10 - 6.71 m Silty Clay				X			Assess any potential impacts from the two ASTs and the historical AST.
BH12-SS2	1.52 - 2.13 m Silty Sand				X			Assess any potential impacts from the two ASTs and the historical AST.
BH13-SS1	0.76 - 1.37 m Fill		X			X		Assess any potential impacts from the two ASTs and the historical AST.
BH13-SS2	1.52 - 2.13 m Silty Sand				X			Assess any potential impacts from the two ASTs and the historical AST.

TABLE 4: Groundwater Samples Submitted

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		PHCs (F_1-F_4)	VOC	SVOC	Metals	
BH1-GW1	3.00 - 6.10 m Silty Clay	X	X		X	Assess any potential impacts from the two ASTs.
BH1-GW2	3.00 - 6.10 m Silty Clay		X			Assess any potential impacts from the two ASTs.
BH2-GW1	3.00 - 6.10 m Silty Clay	X	X			Assess any potential impacts from the historical AST.
BH4-GW1	5.40 – 8.38 m Silty Clay			X	X	Assess any potential impacts from the fill piles.
BH5-GW1	7.60 – 10.67 m Silty Clay	X	X	X	X	Assess any potential impacts from the fill piles and Navan landfill.
BH6-GW1	7.60 – 10.67 m Silty Clay			X	X	Assess any potential impacts from the fill piles.
BH7-GW1	1.20 – 2.80 m Silty Clay		X			Assess any potential impacts from the Navan landfill.
BH8-GW1	0.30 – 1.83 m Silty Sand/ Silty Clay	X	X		X	Assess any potential impacts from the Navan landfill.
BH9-GW1	1.50 – 3.05 m Silty Clay		X			Assess any potential impacts from the Navan landfill.
BH10-GW1	1.92 – 5.18 m Silty Sand/ Silty Clay		X			Delineate impacted groundwater identified in BH1.
BH11-GW1	9.00 – 10.50 m Silty Clay		X			Delineate impacted groundwater identified in BH1.
BH12-GW1	3.66 – 4.60 m Silty Sand/ Silty Clay		X			Delineate impacted groundwater identified in BH1.
BH13-GW1	2.28 – 4.60 m Silty Sand/ Silty Clay		X			Delineate impacted groundwater identified in BH1.

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing. Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

4.8 Residue Management

All purge water and fluids from equipment cleaning were retained on-site.

4.9 Elevation Surveying

An elevation survey of all borehole locations was completed by Annis, O'Sullivan, Vollebekk Ltd. on 23 January 2020. The borehole elevations are presented on Drawing PE4588-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile consists of fill material, followed by native silty sand on the northern portion of the site overlying silty clay. The site stratigraphy is shown on Drawing PE4588-4A– Cross-Section A-A'.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling events, using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	85.78	1.60	84.18	May 31, 2019
BH2	85.67	1.70	81.48	May 30, 2019
BH3	Well destroyed – no sample was possible			
BH4	79.10	3.40	75.70	May 30, 2019
BH5	82.34	5.95	76.39	May 30, 2019
BH6	75.47	5.20	70.27	May 30, 2019
BH7	72.90	0.60	72.30	June 3, 2019
BH8	70.50	0.05	70.45	June 3, 2019
BH9	69.49	0.49	69.00	June 3, 2019
BH10	86.03	1.92	84.11	September 9, 2019
BH11	85.53	2.84	82.69	September 9, 2019
BH12	85.14	3.66	81.48	September 9, 2019
BH13	85.37	2.28	83.09	September 9, 2019

Based on the groundwater elevations, the groundwater is expected to flow in a southerly direction, towards the Mer Bleue Bog.

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the subject site. Coarse-grained standards were chosen as a conservative approach.

5.4 Soil: Field Screening

The vapour readings were found to range from 0 to 10 ppm in all locations except for BH5. The vapour readings were found in BH5 to range from 1.8 to 113.8 ppm. No visual or olfactory indications of potential contamination were identified in the soil samples at the time of the field program. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Fifteen (15) soil samples were submitted for analysis of PHCs (F1-F4), BTEX, VOCs, PAHs and/or metals. The results of the analytical testing are presented below in Tables 6-9. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 6: Analytical Test Results – Soil – BTEX and PHCs (F1-F4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)							MECP Table 3 Residential Standards (µg/g)
		May 16, 2019			May 22, 2019			Sept 5, '19	
		BH1-SS4	BH2-SS3	BH5-SS6	BH7-SS5	BH8-SS3	BH9-SS3	BH13-SS1	
Benzene	0.02	nd	nd	nd	nd	nd	nd	na	0.21
Ethylbenzene	0.05	nd	nd	nd	nd	nd	nd	na	2.0
Toluene	0.05	nd	nd	nd	nd	nd	nd	na	2.3
Xylenes (Total)	0.05	nd	nd	nd	nd	nd	nd	na	3.1
PHC F1	7	nd	nd	nd	nd	nd	nd	na	55
PHC F2	4	nd	nd	nd	nd	nd	nd	nd	98
PHC F3	8	nd	nd	19	nd	nd	nd	33	300
PHC F4	6	nd	nd	21	nd	nd	nd	nd	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- na – Not Analyzed

The BTEX and PHC concentrations identified in the soil samples are in compliance with MECP Table 3 Standards. Analytical results of soil sampled with respect to borehole locations is shown on Drawing PE4588-4.

TABLE 7: Analytical Test Results – Soil – VOCs

Parameter	MDL (ug/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		May 17, 2019	May 22, 2019			
		BH5-SS2	BH7-SS5	BH8-SS3	BH9-SS3	
Acetone	0.50	nd	nd	nd	nd	16
Benzene	0.02	nd	nd	nd	nd	0.21
Bromodichloromethane	0.05	nd	0.12	nd	nd	13
Bromoform	0.05	nd	nd	nd	nd	0.27
Bromomethane	0.05	nd	**0.06**	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	nd	nd	2.4
Chloroform	0.05	nd	**0.06**	nd	nd	0.05
Dibromochloromethane	0.05	nd	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	nd	0.05
1,3-Dichloropropene, total	0.05	nd	nd	nd	nd	0.05
Ethylbenzene	0.05	nd	nd	nd	nd	2
Ethylene dibromide	0.05	nd	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	nd	2.8
Methyl Ethyl Ketone	0.50	nd	nd	nd	nd	16
Methyl Isobutyl Ketone	0.50	nd	nd	nd	nd	1.7
Methyl tert-butyl ether	0.05	nd	nd	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	nd	nd	0.1
Styrene	0.05	nd	nd	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	nd	0.28
Toluene	0.05	nd	nd	nd	nd	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	nd	4
Vinyl Chloride	0.02	nd	nd	nd	nd	0.02
Xylenes, total	0.05	nd	nd	nd	nd	3.1

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- **Bold and underlined** – Exceeds MECP Table 3 Standard

TABLE 7 continued: Analytical Test Results – Soil – VOCs

Parameter	MDL (ug/g)	Soil Samples (µg/g) September 5, 2019				MECP Table 3 Residential Standards (µg/g)
		BH10-SS2	BH11-SS1	BH12-SS2	BH13-SS2	
Acetone	0.5	nd	nd	nd	nd	16
Benzene	0.02	nd	nd	nd	nd	0.32
Bromodichloromethane	0.05	nd	nd	nd	nd	18
Bromoform	0.05	nd	nd	nd	nd	0.61
Bromomethane	0.05	nd	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	nd	0.21
Chlorobenzene	0.05	nd	nd	nd	nd	2.4
Chloroform	0.05	nd	nd	nd	nd	0.47
Dibromochloromethane	0.05	nd	nd	nd	nd	13
Dichlorodifluoromethane	0.05	nd	nd	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	nd	6.8
1,3-Dichlorobenzene	0.05	nd	nd	nd	nd	9.6
1,4-Dichlorobenzene	0.05	nd	nd	nd	nd	0.2
1,1-Dichloroethane	0.05	nd	nd	nd	nd	17
1,2-Dichloroethane	0.05	nd	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	nd	0.064
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	55
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	nd	1.3
1,2-Dichloropropane	0.05	nd	nd	nd	nd	0.16
1,3-Dichloropropene	0.05	nd	nd	nd	nd	0.18
Ethyl benzene	0.05	nd	nd	nd	nd	9.5
Ethylene dibromide	0.05	nd	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	nd	46
Methyl Ethyl Ketone	0.5	nd	nd	nd	nd	70
Methyl Isobutyl Ketone	0.5	nd	nd	nd	nd	31
Methyl tert-butyl ether	0.05	nd	nd	nd	nd	11
Methylene Chloride	0.05	nd	nd	nd	nd	1.6
Styrene	0.05	nd	nd	nd	nd	34
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.087
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	nd	4.5
Toluene	0.05	nd	nd	nd	nd	68
1,1,1-Trichloroethane	0.05	nd	nd	nd	nd	6.1
1,1,2-Trichloroethane	0.05	nd	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	nd	0.91
Trichlorofluoromethane	0.05	nd	nd	nd	nd	4
Vinyl Chloride	0.02	nd	nd	nd	nd	0.032
Xylenes	0.05	nd	nd	nd	nd	26

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)

The VOC concentrations identified in the soil samples are all in compliance with MECP Table 3 Standards apart from Bromomethane and Chloroform which marginally exceed the MECP standard in BH7-SS5. Analytical results of soil sampled with respect to borehole locations is shown on Drawing PE4588-4.

TABLE 8: Analytical Test Results – Soil – PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)				MECP Table 3 Residential Standards (µg/g)
		May 16-17, 2019			Sept 5, 2019	
		BH3-AU1	BH5-SS2	BH6-SS8	BH13-SS1	
Acenaphthene	0.02	nd	nd	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	nd	nd	0.15
Anthracene	0.02	nd	0.04	nd	nd	0.67
Benzo[a]anthracene	0.02	nd	0.10	0.04	nd	0.5
Benzo[a]pyrene	0.02	nd	0.08	0.03	nd	0.3
Benzo[b]fluoranthene	0.02	0.03	0.12	0.05	nd	0.78
Benzo[g,h,i]perylene	0.02	nd	0.05	0.04	nd	6.6
Benzo[k]fluoranthene	0.02	nd	0.06	0.05	nd	0.78
Chrysene	0.02	nd	0.12	0.04	nd	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	0.1
Fluoranthene	0.02	0.04	0.23	0.08	nd	0.69
Fluorene	0.02	nd	nd	nd	nd	62
Indeno[1,2,3-cd]pyrene	0.02	nd	0.06	0.04	nd	0.38
1-Methylnaphthalene	0.02	nd	nd	nd	nd	0.99
2-Methylnaphthalene	0.02	0.02	nd	nd	nd	0.99
Methylnaphthalene (1&2)	0.04	nd	nd	nd	nd	0.99
Naphthalene	0.01	nd	nd	nd	nd	0.6
Phenanthrene	0.02	0.03	0.14	0.04	nd	6.2
Pyrene	0.02	0.04	0.19	0.06	0.02	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

The PAH concentrations identified in the soil samples are all in compliance with MECP Table 3 Standards. Analytical results of soil sampled with respect to borehole locations is shown on Drawing PE4588-4.

TABLE 9: Analytical Test Results – Soil – Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)							MECP Table 3 Residential Standards (µg/g)
		May 16, 2019				May 22, 2019			
		BH3-AU1	BH4-SS2	BH5-SS6	BH6-SS8	BH7-SS5	BH8-SS3	BH9-SS3	
Chromium (VI)	0.2	nd	nd	nd	nd	nd	nd	nd	10
Mercury	0.1	nd	nd	nd	nd	nd	nd	nd	1.8
Antimony	1.0	nd	nd	nd	nd	nd	nd	nd	7.5
Arsenic	1.0	5.3	2.9	3.1	2.9	2.6	2.9	3.1	18
Barium	1.0	99.9	98.7	78.9	136	260	311	315	390
Beryllium	0.5	0.9	nd	nd	nd	0.8	0.8	0.9	5
Boron	5.0	9.7	7.5	6.5	6.0	9.1	9.7	8.9	120
Cadmium	0.5	nd	nd	nd	nd	nd	nd	nd	1.2
Chromium	5.0	38.9	27.5	31.1	55.3	109	117	112	160
Cobalt	1.0	12.2	6.4	6.3	11.5	20.5	**22.7**	**22.6**	22
Copper	5.0	27.1	19.5	16.0	25.7	59.6	45.2	55.4	180
Lead	1.0	10.5	13.2	31.3	11.5	6.5	7.1	6.9	120
Molybdenum	1.0	nd	nd	nd	nd	nd	nd	nd	6.9
Nickel	5.0	30.3	17.2	16.3	28.5	59.2	61.9	62.6	130

TABLE 9: Analytical Test Results – Soil – Metals									
Parameter	MDL (µg/g)	Soil Samples (µg/g)							MECP Table 3 Residential Standards (µg/g)
		May 16, 2019				May 22, 2019			
		BH3-AU1	BH4-SS2	BH5-SS6	BH6-SS8	BH7-SS5	BH8-SS3	BH9-SS3	
Selenium	1.0	nd	nd	nd	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	nd	nd	nd	25
Thallium	1.0	nd	nd	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	1.7	nd	1.0	nd	23
Vanadium	10.0	44.1	28.3	32.0	53.8	**91.5**	**103**	**105**	86
Zinc	20.0	67.8	65.3	62.9	68.0	124	133	137	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Exceeds MECP Table 3 Standard

The metals concentrations identified in the soil samples are in compliance with MECP Table 3 Standards except for cobalt in two samples (BH8-SS3 and BH9-SS3) and vanadium in three samples (BH7-SS5, BH8-SS3 and BH9-SS3). Cobalt and vanadium are both considered to occur naturally at concentrations in excess of the Table 3 standards and do not represent impacted soil. Analytical results of soil sampled with respect to borehole locations is shown on Drawing PE4588-4.

5.6 Groundwater Quality

Fifteen (15) groundwater samples collected from monitoring wells, were submitted for analysis of PHCs (F1-F4), BTEX, VOCs, PAHs and/or metals. The results of the analytical testing are presented below in Tables 10-13. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 10: Analytical Test Results – Groundwater – BTEX and PHCs (F1-F4)						
Parameter	MDL (µg/l)	Groundwater Samples (µg/l)				MECP Table 3 Non-Potable Groundwater (µg/l)
		May 31, 2019	May 30, 2019		June 3, 2019	
		BH1-GW1	BH2-GW1	BH5-GW1	BH8-GW1	
Benzene	0.5	nd	nd	nd	nd	44
Ethylbenzene	0.5	nd	nd	nd	nd	2300
Toluene	0.5	nd	nd	nd	nd	18000
Xylenes (Total)	0.5	nd	nd	nd	nd	4200
PHC F1	25	nd	nd	nd	nd	750
PHC F2	100	nd	nd	nd	nd	150
PHC F3	100	nd	nd	nd	nd	500
PHC F4	100	nd	nd	nd	nd	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

The BTEX and PHC concentrations identified in the groundwater samples are in compliance with MECP Table 3 Standards. Analytical results with respect to borehole locations are shown on Drawing PE4588-5.

TABLE 11: Analytical Test Results – Groundwater – VOCs

Parameter	MDL (ug/l)	Groundwater Samples (µg/l)						MECP Table 3 Non-Potable Groundwater (µg/l)
		May 31, '19	July 15, '19	May 30, 2019		June 3, 2019		
		BH1-GW1	BH1-GW2	BH2-GW1	BH5-GW1	BH7-GW1	BH8-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	nd	130000
Benzene	0.5	nd	nd	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	nd	85000
Bromoform	0.5	nd	nd	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	nd	82000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	nd	4400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	nd	16
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	2300
Ethylene dibromide	0.2	nd	nd	nd	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	nd	470000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	nd	140000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	**286**	**43.1**	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	nd	nd	18000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	nd	2500
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	nd	nd	nd	4200

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)
- **Bold and underlined** – Exceeds MECP Table 3 Standard

TABLE 11 continued: Analytical Test Results – Groundwater – VOCs							
Parameter	MDL (ug/l)	Groundwater Samples (µg/l)					MECP Table 3 Non-Potable Groundwater (µg/l)
		June 3, 2019	September 9, 2019				
		BH9-GW1	BH10-GW1	BH11-GW1	BH12-GW1	BH13-GW1	
Acetone	5.0	nd	nd	nd	nd	nd	130000
Benzene	0.5	nd	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	85000
Bromoform	0.5	nd	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	15	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	82000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	4400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	4600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	9600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	16
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	nd	nd	2300
Ethylene dibromide	0.2	nd	nd	nd	nd	nd	0.25
Hexane	1.0	nd	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	470000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	140000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	nd	1300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	nd	18000
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	2500
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	nd	nd	4200

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (< MDL)

The VOC concentrations identified in the groundwater samples are all in compliance with MECP Table 3 Standards apart from Tetrachloroethylene which exceed the MECP standard in two samples from BH1. Analytical results with respect to borehole locations are shown on Drawing PE4588-5.

TABLE 12: Analytical Test Results – Groundwater – PAHs

Parameter	MDL (µg/l)	Groundwater Samples (µg/l) May 30, 2019			MECP Table 3 Non-Potable Groundwater (µg/l)
		BH4-GW1	BH5-GW1	BH6-GW1	
Acenaphthene	0.05	nd	nd	nd	600
Acenaphthylene	0.05	nd	nd	nd	1.8
Anthracene	0.01	nd	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	4.7
Benzo[a]pyrene	0.01	nd	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.4
Chrysene	0.05	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.52
Fluoranthene	0.01	nd	nd	nd	130
Fluorene	0.05	nd	nd	nd	400
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	nd	1800
2-Methylnaphthalene	0.05	nd	nd	nd	1800
Methylnaphthalene (1&2)	0.10	nd	nd	nd	1800
Naphthalene	0.05	nd	nd	nd	1400
Phenanthrene	0.05	nd	nd	nd	580
Pyrene	0.01	nd	nd	nd	68

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL

The PAH concentrations identified in the groundwater samples are all in compliance with MECP Table 3 Standards. Analytical results with respect to borehole locations are shown on Drawing PE4588-5.

TABLE 13: Analytical Test Results – Groundwater – Metals

Parameter	MDL (µg/l)	Groundwater Samples (µg/l)					MECP Table 3 Non-Potable Groundwater (µg/l)
		May 31, 2019	May 30, 2019			June 3, 2019	
		BH1-GW1	BH4-GW1	BH5-GW1	BH6-GW1	BH8-GW1	
Mercury	0.1	nd	na	nd	nd	nd	0.29
Antimony	0.5	nd	nd	0.6	nd	nd	20000
Arsenic	1	1	1	2	2	nd	1900
Barium	1	145	122	145	201	90	29000
Beryllium	0.5	nd	nd	nd	nd	nd	67
Boron	10	52	97	186	382	645	45000
Cadmium	0.1	nd	nd	0.1	nd	nd	2.7
Chromium	1	nd	nd	12	nd	nd	810
Chromium (VI)	10	nd	na	nd	nd	nd	140
Cobalt	0.5	0.9	nd	4.5	0.7	1.1	66
Copper	0.5	3.3	6.3	5.5	6.1	2.8	87
Lead	0.1	nd	0.2	0.3	0.3	0.2	25
Molybdenum	0.5	4.3	6.7	5.4	4.8	2.7	9200
Nickel	1	2	2	13	3	2	490
Selenium	1	nd	nd	1	nd	nd	63
Silver	0.1	nd	nd	nd	nd	nd	1.5
Sodium	200	91400	149000	793000	722000	307000	2300000
Thallium	0.1	nd	nd	nd	nd	nd	510
Uranium	0.1	3.2	3.2	14.5	3.6	3.3	420
Vanadium	0.5	1.6	1.9	4.2	4.1	1.0	250
Zinc	5	nd	8	7	6	5	1100

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- na – Not Analyzed

The metals concentrations identified in the groundwater samples are in compliance with MECP Table 3 Standards. Analytical results with respect to borehole locations are shown on Drawing PE4588-5.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04 as amended by the Environmental Protection Act, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

Overall, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 269/11 amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report and Section 2.2 of this report, the following PCAs are considered to result in APECs on the Phase I/Phase II Property:

- Importation of fill material of unknown quality resulting from the grading, excavation and stockpiling of materials in the northern half of the phase I property;
- Gasoline and associated products storage in fixed tanks resulting from the historical presence of an AST in the northern portion of the phase I property;
- Gasoline and associated products storage in fixed tanks resulting from the presence of two ASTs, in the northern portion of the phase I property;
- Waste disposal and waste management, including landfilling resulting from the presence of Navan landfill in the eastern portion of the phase I property.

Contaminants of potential concern associated with the aforementioned PCAs include benzene, toluene, ethylbenzene and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), volatile organic compounds (VOCs), metals and polycyclic aromatic hydrocarbons (PAH) in the groundwater and/or soil.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the Phase II Property include electrical, and sewerage services.

Two records were found regarding water supply well drilling, dating from 1977 and 2015. One record details a domestic water supply well drilled in 1977 to a depth of 45.7 m located around 220 m east of the subject site. The other record details the abandonment of a 4-inch diameter well located at 3225 Navan Road in 2015, located 30 m north of the subject site.

Given the municipally supplied area and age of the domestic supply well record, any private water wells are assumed to be obsolete.

Physical Setting

Site Stratigraphy

The site stratigraphy, from the ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE4588-4A. The stratigraphy consists of:

- In BH1 to BH6 and BH10 to BH13, fill was encountered. This generally consisted of brown silty sand with gravel, some clay, trace brick and topsoil and extended to depths ranging between 1.27 m and 6.86 m below the existing grade.
- In BH7 to BH9 topsoil was encountered to a maximum depth of 0.3 m below the existing grade.
- Native silty sand was identified on the north portion of the site in several boreholes, beneath the fill and above the silty clay material.
- Silty clay was identified beneath the fill material and extending to the maximum depth investigated.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered within the overburden soil. This unit is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site at depths ranging from 0.05 m to 3.66 m below grade. Based on groundwater elevations, the groundwater flow is considered to be in a southerly direction, toward the Mer Bleue conservation area.

Approximate Depth to Bedrock

Bedrock was not encountered during the investigation. Bedrock is expected to be present between 30 and 50 m below the existing ground surface.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 0.05 and 3.66 m below the existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the subject site.

Section 43.1 of the Regulation does not apply to the subject site in that the subject site is not a Shallow Soil Property.

Fill Placement

Fill material was identified across the northern portion of the Phase II Property and extending to depths between 1.27 m and 6.86 m below grade.

Proposed Buildings and Other Structures

It is our understanding that the subject site will be redeveloped for housing.

Areas of Natural Significance and Water Bodies

The Mer Bleue conservation area lies 30m south of the Phase I ESA Study Area.

The topographic map shows a ditch running from Navan Road at the northern boundary of the site, along the eastern boundary to the southern portion of the site before turning to the west and leading to the Mer Bleue conservation area.

During the site visit, a ditch was noted running from a stormwater pond located to the east of the subject site, along the eastern boundary of the site.

Environmental Condition

Areas Where Contaminants are Present

Based on the results of the Phase II ESA, no contaminant concentrations were found in excess of the MECP Table 3 standards with the exception of chloroform, bromomethane and tetrachloroethylene.

Both chloroform and bromomethane were recorded in a single soil sample and minimally exceeded the MECP Table 3 standard.

Tetrachloroethylene (PCE) was recorded in groundwater samples from BH1, collected on May 31, and July 15, 2019. Though the concentration of PCE was lower in the second sampling event, the concentration remained in excess of the MECP Table 3 standard.

Cobalt and vanadium were both encountered in multiple samples in excess of the MECP Table 3 standard however both cobalt and vanadium occur naturally at concentrations in excess of the Table 3 standards and are not considered to represent contamination.

Types of Contaminants

Based on the findings of the Phase II ESA, chloroform, bromomethane and tetrachloroethylene (PCE) are contaminants on the Phase II Property.

Contaminated Media

Based on the Phase II ESA, soil surrounding BH7 is marginally impacted by chloroform and bromomethane while groundwater in the area of BH1 is impacted by Tetrachloroethylene (PCE).

What is Known About Areas where Contaminants are Present

The impacted soil was identified near the eastern property line, adjacent to the nearby landfill. The impacted groundwater was identified near storage areas and ASTs.

Distribution and Migration of Contaminants

Based on the results of the analytical testing the migration and distribution of the contaminants present above the applicable site standards appears to the limited to the immediate areas of the impacts.

Discharge of Contaminants

The source of the contaminants is not known and no discharge locations which are considered to be associated with the impacted soil and groundwater were identified.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Based on the findings of the Phase II ESA, climatic and meteorological conditions are not considered to have affected contaminant transport.

Potential for Vapour Intrusion

Based on the findings of the Phase II ESA, there is no potential for chloroform, bromomethane and tetrachloroethylene (PCE) vapour intrusion on the Phase II Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for 3252 Navan Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling thirteen boreholes all of which were instrumented with groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Soil samples from each borehole were submitted for analysis of BTEX, VOC, PHC, Metals, and/or PAHs. All BTEX, PHC, and PAH samples are in compliance with the applicable MECP Standards. Marginal exceedances of the MECP Standards for Bromomethane and Chloroform were identified in BH7. All other VOC samples were in compliance with the applicable Standards. Naturally occurring metals (Cobalt, Vanadium) concentrations exceeding the applicable standards were identified in BH7, BH8, and BH9. These metals concentrations are considered to be naturally occurring and are not considered to be a concern.

Groundwater samples analysed are in compliance with the applicable standards for BTEX, PHC, Metals and/or PAHs in all boreholes. Exceedances of the appliable standard for Tetrachloroethylene was identified in BH1. All other VOC groundwater samples are in compliance with the applicable standard.

Conclusion

Impacted groundwater was identified in BH1, however with the additional investigative work, the groundwater appears to have been horizontally and vertically delineated. The impacted soil in BH7 requires further delineation. Following the closure of the existing site operations additional testing will be required to sufficiently investigate the fill remaining on site.

It is expected that groundwater monitoring wells will be abandoned in accordance with O.Reg.903, at the time of construction excavation. It is recommended that the integrity of the monitoring wells be maintained, prior to future construction, for possible further groundwater monitoring purposes.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Claridge Homes (Gladstone) Inc. Notification from Claridge Homes (Gladstone) Inc and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng., QP_{ESA}

Mark S. D'Arcy, P.Eng., QP_{ESA}

Report Distribution:

- Claridge Homes (Gladstone) Inc
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4588-3 – TEST HOLE LOCATION PLAN

DRAWING PE4588-4 – ANALYTICAL TESTING PLAN - SOIL

DRAWING PE4588-4A – CROSS-SECTION A-A' - SOIL

DRAWING PE4588-4B – CROSS-SECTION B-B' - SOIL

DRAWING PE4588-5 – ANALYTICAL TESTING PLAN - GROUNDWATER

DRAWING PE4588-5A – CROSS-SECTION A-A'- GROUNDWATER

DRAWING PE4588-5B – CROSS-SECTION B-B'- GROUNDWATER

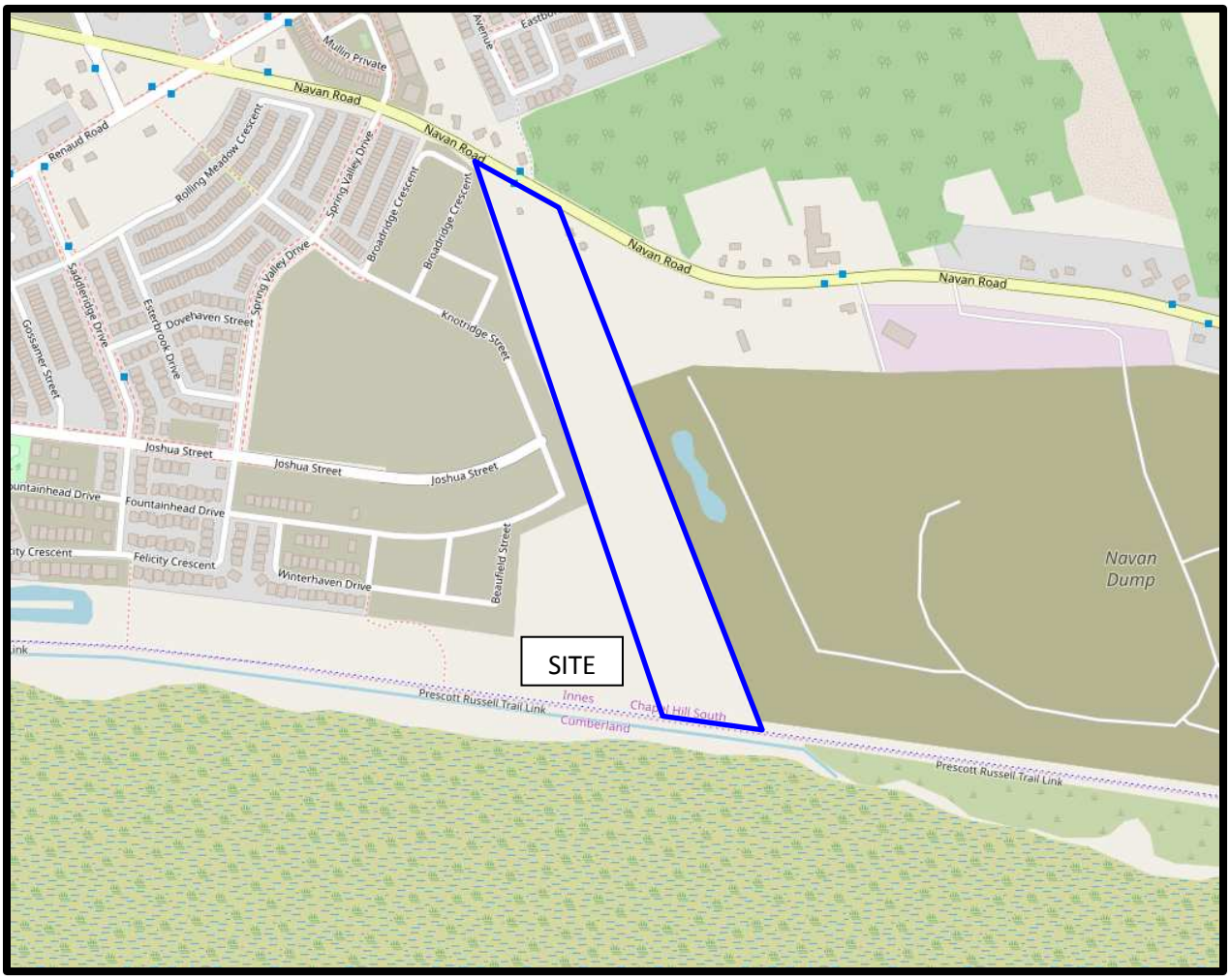
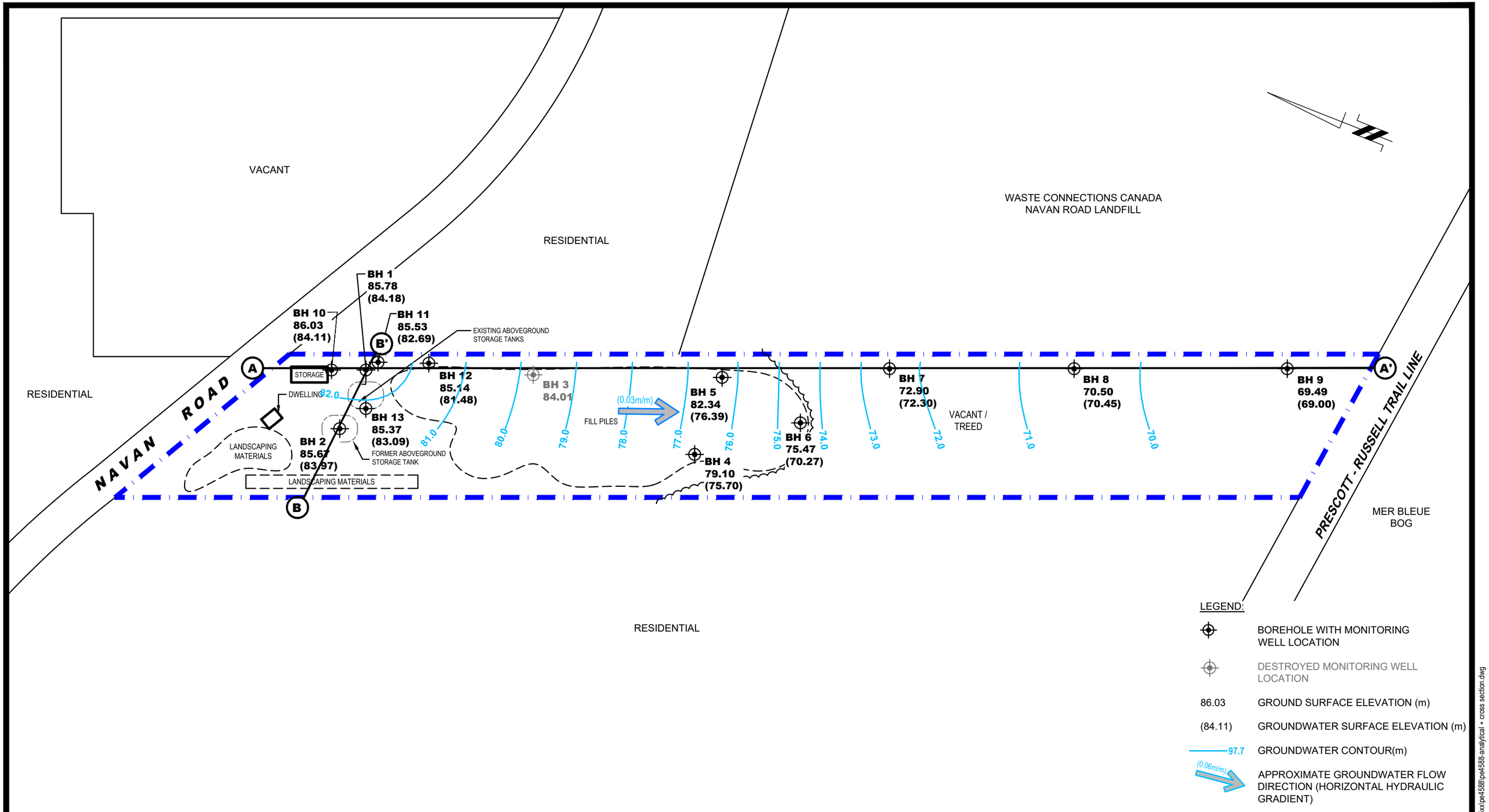


FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL

CLARIDGE HOMES (GLADSTONE) INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3252 NAVAN ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:2500	Date: 02/2020
Drawn by: YA	Report No.: PE4588-2
Checked by: MB	Dwg. No.: PE4588-3
Approved by: MSD	Revision No.:

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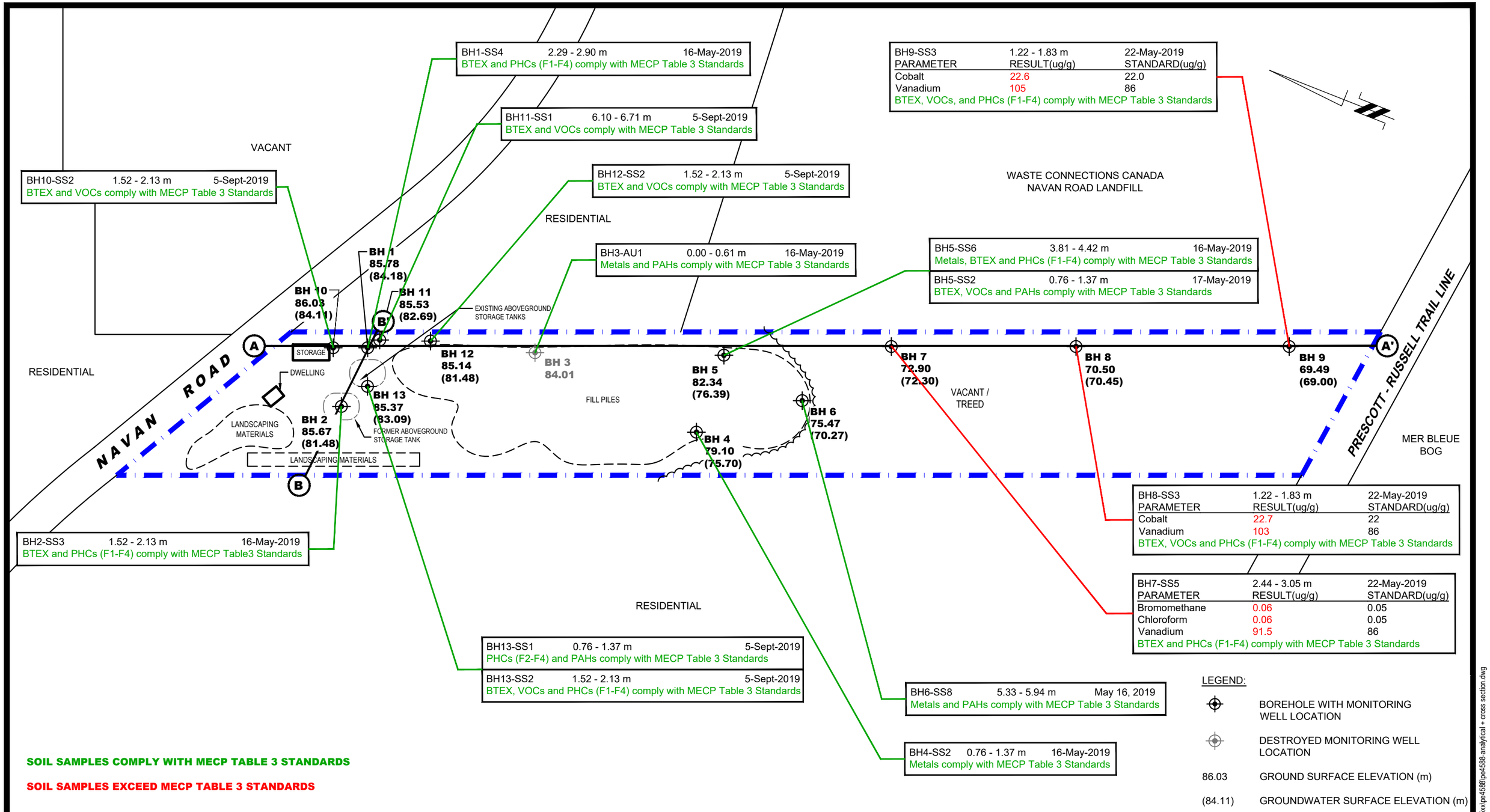

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3252 NAVAN ROAD
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN-SOIL(METALS,BTEX,PHCs,PAHs AND VOCs)

Scale: 1:2500	Date: 02/2020
Drawn by: YA	Report No.: PE4588-2
Checked by: MB	Dwg. No.: PE4588-4
Approved by: MSD	Revision No.:

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BH10-SS2 1.52 - 2.13 m 5-Sept-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH1-SS4 2.29 - 2.90 m 16-May-2019
BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH11-SS1 6.10 - 6.71 m 5-Sept-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH12-SS2 1.52 - 2.13 m 5-Sept-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH3-AU1 0.00 - 0.61 m 16-May-2019
Metals and PAHs comply with MECP Table 3 Standards

BH7-SS5 2.44 - 3.05 m 22-May-2019

PARAMETER	RESULT(ug/g)	STANDARD(ug/g)
Bromomethane	0.06	0.06
Chloroform	0.06	0.06
Vanadium	91.5	86

BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH8-SS3 1.22 - 1.83 m 22-May-2019

PARAMETER	RESULT(ug/g)	STANDARD(ug/g)
Cobalt	22.7	22
Vanadium	103	86

VOCs, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

STORAGE UNIT

EXTENT OF FILL PILE

A

A'

BH 10 BH 1 BH 11 BH 12 BH 3 BH 5 BH 7 BH 8 BH 9

TOP SOIL
FILL
SILTY SAND
SILTY CLAY
SILTY SAND
SILTY CLAY

ELEVATION (m)

87 86 85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63

0 25 50 75 100 125 150 175 200 225 250 375 300 325 350 375 400 425 450 475 500 525 550 575 600 625 650 675 700 725 750 775

DISTANCE (m)

BH5-SS2 0.76 - 1.37 m 17-May-2019
BTEX and VOCs and PAHs comply with MECP Table 3 Standards

BH5-SS6 3.81 - 4.42 m 16-May-2019
Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH9-SS3 1.22 - 1.83 m 22-May-2019

PARAMETER	RESULT(ug/g)	STANDARD(ug/g)
Cobalt	22.6	22.0
Vanadium	105	86

VOCs, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

DECOMMISSIONED MONITORING WELL

SOIL SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

SOIL SAMPLES EXCEED MECP TABLE 3 STANDARDS

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3252 NAVAN ROAD

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A'-SOIL(METALS,BTEX,PHCs,PAHs AND VOCs)

Scale: AS SHOWN	Date: 02/2020
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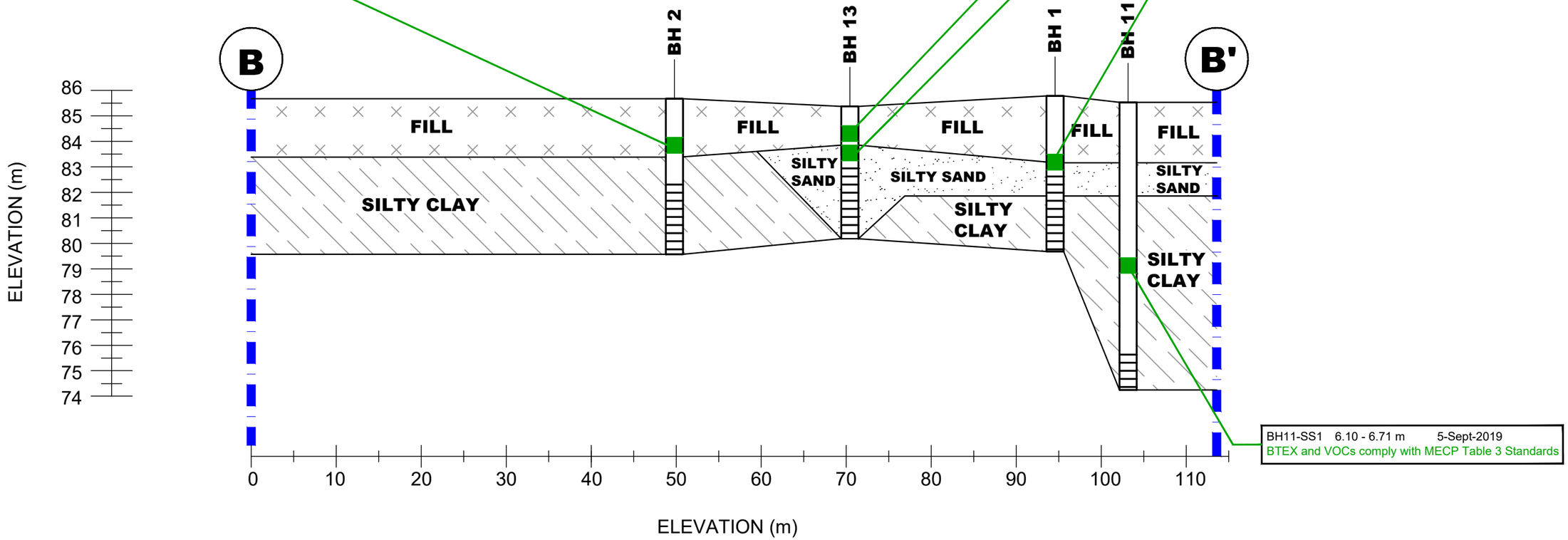
BH13-SS1 0.76 - 1.37 m 5-Sept-2019
BTEX, VOCs and PAHs comply with MECP Table 3 Standards

BH13-SS2 1.52 - 2.13 m 5-Sept-2019
BTEX,VOCs and PHCs (F1-F4) comply with MECP Table 3 Standards

BH2-SS3 1.52 - 2.13 m 16-May-2019
BTEX and PHCs (F1-F4) comply with MECP Table3 Standards

BH1-SS4 2.29 - 2.90 m 16-May-2019
BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards



BH11-SS1 6.10 - 6.71 m 5-Sept-2019
BTEX and VOCs comply with MECP Table 3 Standards

SOIL SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

SOIL SAMPLES EXCEED MECP TABLE 3 STANDARDS

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3252 NAVAN ROAD

OTTAWA, ONTARIO

Title:
CROSS SECTION B-B'-SOIL(METALS,BTEX,PHCs,PAHs AND VOCs)

Scale: AS SHOWN	Date: 02/2020
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Checked by: MB	Dwg. No.: PE4588-4B
Approved by: MSD	Revision No.:

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BH1-GW1 3.00 - 6.10 m 31-May-2019
PARAMETER RESULT(ug/L) STANDARD(ug/L)
Tetrachloroethylene 286 1.6
Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH1-GW2 3.00 - 6.10 m 15-Jul-2019
PARAMETER RESULT(ug/L) STANDARD(ug/L)
Tetrachloroethylene 43.1 1.6
Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH11-GW1 9.00 – 10.50 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH5-GW1 7.60 – 10.67 m 30-May-2019
Metals, BTEX, VOCs, PAHs and PHCs (F1-F4) comply with MECP Table 3 Standards

BH7-GW1 1.20 – 2.80 m 03-Jun-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH10-GW1 1.92 – 5.18 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH12-GW1 3.66 – 4.60 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH8-GW1 0.30 – 1.83 m 03-Jun-2019
Metals,BTEX,VOCs and PHCs (F1-F4) comply with MECP Table 3 Standards

VACANT

RESIDENTIAL

WASTE CONNECTIONS CANADA
NAVAN ROAD LANDFILL

RESIDENTIAL

NAVAN ROAD

A

A'

B

B'

STORAGE

DWELLING

LANDSCAPING MATERIALS

LANDSCAPING MATERIALS

EXISTING ABOVEGROUND STORAGE TANKS

FORMER ABOVEGROUND STORAGE TANK

FILL PILES

VACANT / TREED

PRESCOTT - RUSSELL TRAIL LINE

MER BLEUE BOG

BH 1
85.78
(84.18)

BH 10
86.03
(84.11)

BH 11
85.53
(82.69)

BH 12
85.14
(81.48)

BH 3
84.01

BH 13
85.37
(83.09)

BH 2
85.67
(81.48)

BH 5
82.34
(76.39)

BH 6
75.47
(70.27)

BH 4
79.10
(75.70)

BH 7
72.90
(72.30)

BH 8
70.50
(70.45)

BH 9
69.49
(69.00)

BH2-GW1 3.00 - 6.10 m 30-May-2019
BTEX,VOCs and PHCs (F1-F4) comply with MECP Table 3 Standards

BH13-GW1 2.28 – 5.18 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH9-GW1 1.50 – 3.05 m 03-Jun-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH6-GW1 7.60 – 10.67 m 30-May-2019
Metals PAHs comply with MECP Table 3 Standards

RESIDENTIAL

BH4-GW1 5.40 – 8.38 m 30-May-2019
Metals, PAHs comply with MECP Table 3 Standards

GROUNDWATER SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

GROUNDWATER SAMPLES EXCEED MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- DESTROYED MONITORING WELL LOCATION
- 86.03 GROUND SURFACE ELEVATION (m)
- (84.11) GROUNDWATER SURFACE ELEVATION (m)

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
3252 NAVAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN-GROUNDWATER(METALS,BTEX,PHCs,PAHs AND VOCs)

Scale: 1:2500	Date: 02/2020
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Approved by: MSD	Revision No.:

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BH10-GW1 1.92 – 5.18 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH1-GW1 3.00 - 6.10 m 31-May-2019

PARAMETER	RESULT(ug/L)	STANDARD(ug/L)
Tetrachloroethylene	286	1.6

Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH1-GW2 3.00 - 6.10 m 15-Jul-2019

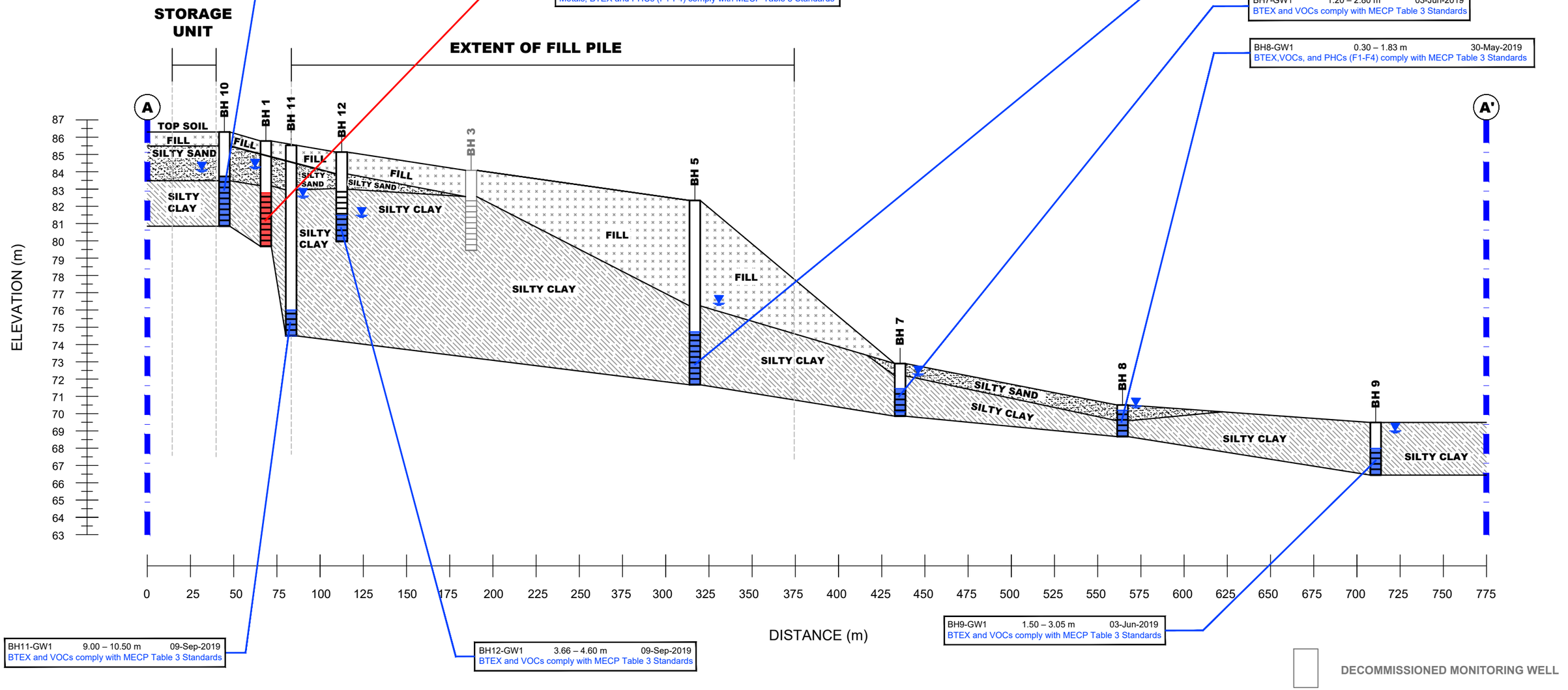
PARAMETER	RESULT(ug/L)	STANDARD(ug/L)
Tetrachloroethylene	43.1	1.6

Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH5-GW1 7.60 – 10.67 m 30-May-2019
Metals, PAHs, VOCs, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards

BH7-GW1 1.20 – 2.80 m 03-Jun-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH8-GW1 0.30 – 1.83 m 30-May-2019
BTEX,VOCs, and PHCs (F1-F4) comply with MECP Table 3 Standards



BH11-GW1 9.00 – 10.50 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH12-GW1 3.66 – 4.60 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH9-GW1 1.50 – 3.05 m 03-Jun-2019
BTEX and VOCs comply with MECP Table 3 Standards

DECOMMISSIONED MONITORING WELL

GROUNDWATER SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

GROUNDWATER SAMPLES EXCEED MECP TABLE 3 STANDARDS

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OTTAWA, ONTARIO

Title:
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BH13-GW1 2.28 – 5.18 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

BH2-GW1 3.00 - 6.10 m 30-May-2019
BTEX,VOCs and PHCs (F1-F4) comply with MECP Table 3 Standards

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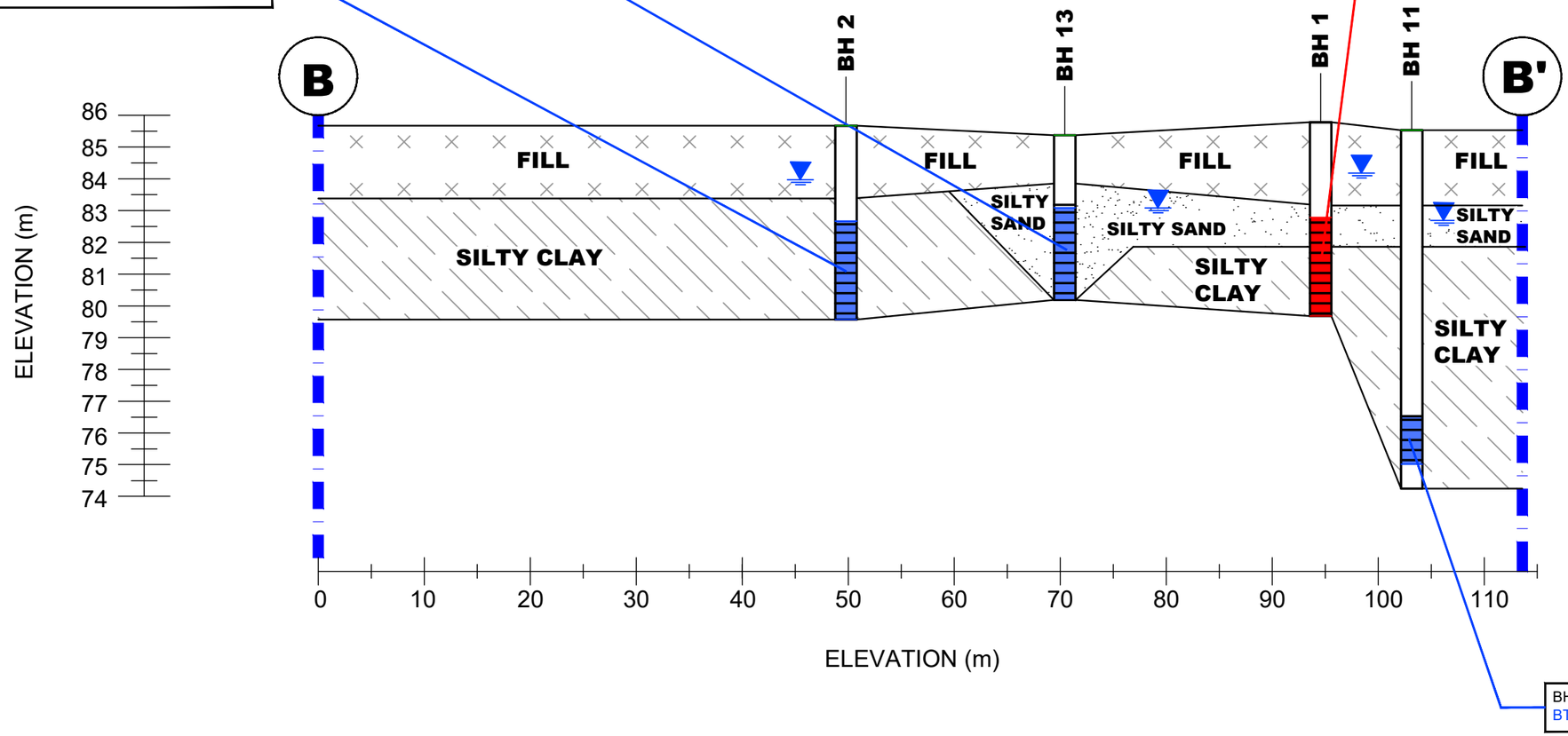
BH1-GW2 3.00 - 6.10 m 15-Jul-2019

PARAMETER	RESULT(ug/L)	STANDARD(ug/L)
Tetrachloroethylene	43.1	1.6

Metals, BTEX and PHCs (F1-F4) comply with MECP Table 3 Standards



BH11-GW1 9.00 – 10.50 m 09-Sep-2019
BTEX and VOCs comply with MECP Table 3 Standards

GROUNDWATER SAMPLES COMPLY WITH MECP TABLE 3 STANDARDS

GROUNDWATER SAMPLES EXCEED MECP TABLE 3 STANDARDS

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Title:
CROSS SECTION B-B'-GROUNDWATER (METALS,BTEX,PHCs,PAHs AND VOCs)

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment

3252 Navan Road
Ottawa, Ontario

Prepared For

Claridge Homes (Gladstone) Inc.

April, 2019

Report: PE4588-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Claridge Homes (Gladstone) Inc. to conduct a Phase II Environmental Site Assessment (ESA) of 3252 Navan Road, Ottawa, Ontario. Based on our Phase I ESA completed for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place borehole on the northern portion of the subject site, to assess any potential impacts from APEC 3; Two existing ASTs.	Borehole to be advanced to approximately 2 m below the expected long-term groundwater table and install a monitoring well.
BH2	Place borehole on the northern portion of the subject site, to assess any potential impacts from APEC 2; Historical AST.	Borehole to be advanced to approximately 2 m below the expected long-term groundwater table and install a monitoring well.
BH3 - 6	Place boreholes towards the central portion of the subject site, to assess any potential impacts from APEC 1; Fill piles.	Borehole to be advanced to approximately 2 m below the expected long-term groundwater table and install a monitoring well.
BH3, BH5, BH7 to BH9	Place boreholes towards the eastern boundary of the subject site, to assess any potential impacts from APEC 4; Navan landfill.	Borehole to be advanced to approximately 2 m below the expected long-term groundwater table and install a monitoring well.
BH10, BH12, BH13	Near BH1 for horizontal delineation purposes	Near BH1 for horizontal delineation purposes
BH11	Near BH1 for vertical delineation purposes	Near BH1 for vertical delineation purposes

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

Upon refusal, rock coring shall be undertaken to the required depth. Approximately every metre the well shall be purged by inertial pumping and the water level recorded to determine if groundwater water is entering the borehole.

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the subject site is based on the following general considerations:

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MECP Site Condition Standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

The analytical testing program for groundwater at the subject site is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).
- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.
- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to identify and/or delineate contamination within the soil and/or to install groundwater monitoring wells in order to identify contamination within the groundwater.

Equipment

The following is a list of equipment that is in addition to regular drilling equipment stated in the geotechnical drilling SOP:

- ❒ glass soil sample jars
- ❒ two buckets
- ❒ cleaning brush (toilet brush works well)
- ❒ dish detergent
- ❒ methyl hydrate
- ❒ water (if not available on-site - water jugs available in the trailer)
- ❒ latex or nitrile gloves (depending on suspected contaminant)
- ❒ RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole Locations

If conditions on-site are not as suspected, and planned borehole locations cannot be drilled, **call the office to discuss**. Alternative borehole locations will be determined in conversation with the field technician and supervising engineer.

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a catch basin of known geodetic elevation.

Drilling Procedure

The actual drilling procedure for environmental boreholes is the same as geotechnical boreholes (see SOP for drilling and sampling) with a few exceptions as follows:

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until the vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on-site, either using an RKI Eagle, PID, etc. depending on the type of suspected contamination.

Spoon Washing Procedure

All sampling equipment (spilt spoons, etc.) must be washed between samples in order to prevent cross-contamination of soil samples.

- ❒ Obtain two buckets of water (preferably hot if available)
- ❒ Add a small amount of dish soap to one bucket
- ❒ Scrub spoons with a brush in soapy water, inside and out, including the tip
- ❒ Rinse in clean water
- ❒ Apply a small amount of methyl hydrate to the inside of the spoon. (A spray bottle or water bottle with a small hole in the cap works well)
- ❒ Allow to dry (takes seconds)
- ❒ Rinse with distilled water, a spray bottle works well.

The methyl hydrate eliminates any soap residue that may be on the spoon and is especially important when dealing with suspected VOCs.

Screening Procedure

The RKI Eagle is used to screen most soil samples, particularly where petroleum hydrocarbon contamination is suspected. The MiniRae is used when VOCs are suspected, however it also can be useful for detecting petroleum. These tools are for screening purposes only and cannot be used in place of laboratory testing. Vapour results obtained from the RKI Eagle and the PID are relative and must be interpreted.

Screening equipment should be calibrated on an approximately monthly basis, more frequently if heavily used.

- ❒ Samples should be brought to room temperature; this is specifically important in colder weather. The soil must not be frozen.
- ❒ Turn the instrument on and allow to come to zero - calibrate if necessary
- ❒ If using RKI Eagle, ensure the instrument is in methane elimination mode unless otherwise directed.
- ❒ Ensure measurement units are ppm (parts per million) initially. RKI Eagle will automatically switch to %LEL (lower explosive limit) if higher concentrations are encountered.
- ❒ Break up large lumps of soil in the sample bag, taking care not to puncture the bag.
- ❒ Insert the probe into the soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in the bag while observing instrument readings.
- ❒ Record the highest value obtained in the first 15 to 25 seconds
- ❒ Make sure to indicate scale (ppm or LEL); also note which instrument was used (RKI Eagle 1 or 2, or MiniRae).
- ❒ Jar samples and refrigerate as per the Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in a cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in a cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

- ❒ Drill borehole to the required depth, using drilling and sampling procedures described above.
- ❒ If the borehole is deeper than required monitoring well, backfill with bentonite chips to the required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- ❒ Only one monitoring well should be installed per borehole.
- ❒ Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- ❒ Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.
- ❒ Thread the end cap onto a section of the screen. Thread the second section of the screen if required. Thread risers onto the screen. Lower into the borehole to the required depth. Ensure a slip-cap or J-plug is inserted to prevent backfill materials from entering the well.
- ❒ As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- ❒ Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.
- ❒ Backfill remainder of the borehole with holeplug or with auger cuttings (if contamination is not suspected).

- ❒ Install a flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match the surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

- ❒ Water level metre or interface probe on hydrocarbon/LNAPL sites
- ❒ Spray bottles containing water and methanol to clean water level tape or interface probe
- ❒ Peristaltic pump
- ❒ Polyethylene tubing for peristaltic pump
- ❒ Flexible tubing for peristaltic pump
- ❒ Latex or nitrile gloves (depending on suspected contaminant)
- ❒ Allen keys and/or 9/16" socket wrench to remove well caps
- ❒ Graduated bucket with volume measurements
- ❒ pH/Temperature/Conductivity combo pen
- ❒ Laboratory-supplied sample bottles

Sampling Procedure

- ❒ Locate well and use a socket wrench or Allan key to open metal flushmount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to the existing ground surface, using water level meter or interface probe. If using an interface probe on suspected NAPL site, measure the thickness of the free product.
- ❒ Measure the total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate the volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach it to the peristaltic pump. Turn on the peristaltic pump and purge into the graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume until appearance or field chemistry stabilizes.
- ❒ Note the appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).

- ❒ Fill the required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use a low flow rate to ensure a continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The QA/QC program for this Phase II ESA is as follows:

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples.
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to the frequency of use.

5.0 DATA QUALITY OBJECTIVES

The purpose of setting data quality objectives (DQOs) is to ensure that the level of uncertainty in data collected during the Phase II ESA is low enough that decision-making is not affected, and that the overall objectives of the investigation are met.

The quality of data is assessed by comparing field duplicates with original samples. If the relative percent difference (RPD) between the duplicate and the sample is within 20%, the data are considered to be of sufficient quality so as not to affect decision-making. The RPD is calculated as follows:

$$RPD = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100\%$$

Where x_1 is the concentration of a given parameter in an original sample and x_2 is the concentration of that same parameter in the field duplicate sample.

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) of the laboratory detection limit.

It is also important to consider data quality in the overall context of the project. For example, if the DQOs are not met for a given sample, yet the concentrations of contaminants in both the sample and the duplicate exceed the MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples that meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in the laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

Site-specific impediments to the Sampling and Analysis Plan are discussed in the body of the Phase II ESA report.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3252 Navan Road
Ottawa, Ontario

DATUM Geodetic, provided by Annis O'Sullivan Vollebekk

FILE NO. PE4588

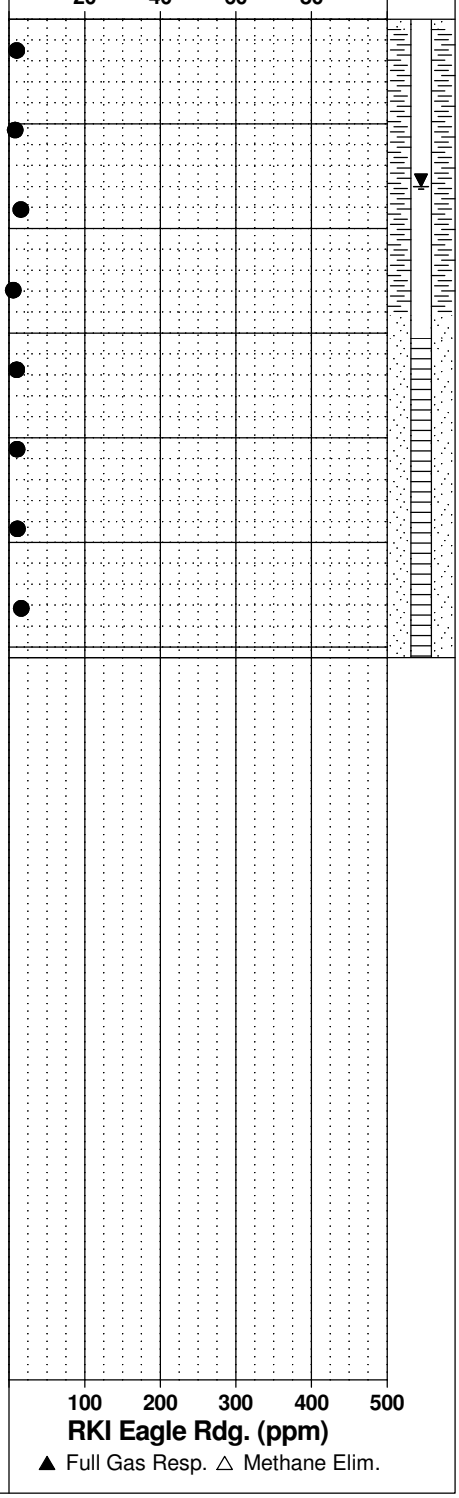
REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 2019 May 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING							
FILL: Brown silty sand with crushed stone and gravel		AU	1			0	85.78
0.51							
Brown **SILTY SAND**		SS	2	33	14	1	84.78
		SS	3	75	6	2	83.78
2.59		SS	4	100	6		
Brown **SILTY CLAY**		SS	5	100	4	3	82.78
- grey by 3.8m depth		SS	6	100	4	4	81.78
		SS	7	100	1	5	80.78
		SS	8	100	W		
6.10						6	79.78
End of Borehole							
(GWL @ 1.60m - May 31, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**



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SOIL PROFILE AND TEST DATA

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FILE NO. PE4588

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 May 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	85.67
FILL: Brown silty sand, some gravel, trace clay		AU	1				
		SS	2	21	15	1	84.67
		SS	3	79	13	2	83.67
2.29							
		SS	4	46	7		
Brown **SILTY CLAY**		SS	5	100	5	3	82.67
- grey by 3.8m depth		SS	6	100	4	4	81.67
		SS	7	100	W	5	80.67
		SS	8	100	W		
6.10						6	79.67
End of Borehole							
(GWL @ 1.70m - May 30, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 May 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	84.01
FILL: Brown silty sand with gravel		AU	1				
		SS	2	71	18	1	83.01
1.52							
Brown **SILTY CLAY**		SS	3	83	7	2	82.01
		SS	4	100	3		
- grey by 2.3m depth		SS	5	100	3	3	81.01
		SS	6	100	1	4	80.01
4.57							
End of Borehole							
(MW damaged - May 30, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** 2019 May 16

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	79.10
FILL: Brown silty sand with gravel		AU	1				
0.60							
FILL: Brow nsilty sand with clay, gravel and sandstone, trace organics		SS	2	33	27	1	78.10
1.37		SS	3	58	9	2	77.10
		SS	4	88	7		
		SS	5	100	7	3	76.10
Brown **SILTY CLAY**		SS	6	100	9	4	75.10
		SS	7	100	7	5	74.10
		SS	8	100	4		
- grey by 6.1m depth		SS	9	100	2	6	73.10
		SS	10	100	2	7	72.10
		SS	11	100		8	71.10
8.38							
End of Borehole							
(GWL @ 3.40m - May 30, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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REMARKS

HOLE NO. BH 5

BORINGS BY CME 55 Power Auger **DATE** 2019 May 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
UNDERSIDE OF FOOTING						0	82.34		
		AU	1						
		SS	2	33	8	1	81.34	113.8	
		SS	3	54	9	2	80.34		
FILL: Brown silty sand, some gravel and brick		SS	4	29	14	3	79.34		
		SS	5	58	5				
		SS	6	42	15	4	78.34		
		SS	7	38	6	5	77.34		
		SS	8	12	5				
6.10						6	76.34		
		SS	9	79	21				
		SS	10	100	15	7	75.34		
Brown **SILTY CLAY**		SS	11	100	8	8	74.34		
- grey by 8.4m depth		SS	12	88	4	9	73.34		
		SS	13	100	2				
		SS	14	100	1	10	72.34		
10.67									
End of Borehole									
(GWL @ 5.95m - May 30, 2019)									

Lower Explosive Limit % scale: 20, 40, 60, 80

RKI Eagle Rdg. (ppm): 100, 200, 300, 400, 500

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. BH 6

BORINGS BY CME 55 Power Auger **DATE** 2019 May 17

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	75.47
		AU	1				
		SS	2	58	16	1	74.47
		SS	3	33	7	2	73.47
		SS	4	71	7		
FILL: Brown silty sand with gravel, some clay, trace brick and topsoil		SS	5	62	8	3	72.47
		SS	6	75	22	4	71.47
		SS	7	71	8	5	70.47
		SS	8	67	20	6	69.47
		SS	9	46	8		
6.86							
		SS	10	88	15	7	68.47
Brown **SILTY CLAY**		SS	11	100	7	8	67.47
- grey by 8.4m depth		SS	12	100	5	9	66.47
		SS	13	100	2		
		SS	14	100	W	10	65.47
10.67							
End of Borehole							
(GWL @ 5.20m - May 30, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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FILE NO. PE4588

REMARKS

HOLE NO. BH 7

BORINGS BY Portable Drill **DATE** 2019 May 22

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING								
TOPSOIL	0.30		SS	1	100		0	72.90
Brown **SILTY CLAY**	0.71		SS	2	100		1	71.90
Brown **SILTY CLAY**			SS	3	100		2	70.90
- grey by 1.8m depth			SS	4	100			
	3.05		SS	5	100		3	69.90
End of Borehole								
(GWL @ 0.60m - June 3, 2019)								

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. BH 8

BORINGS BY Portable Drill **DATE** 2019 May 22

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING								
TOPSOIL	0.28		SS	1	12		0	70.50
Grey **SILTY SAND**	0.91		SS	2	58		1	69.50
Brown **SILTY CLAY** - grey by 1.5m depth	1.83		SS	3	100			
End of Borehole								
(GWL @ 0.05m - June 3, 2019)								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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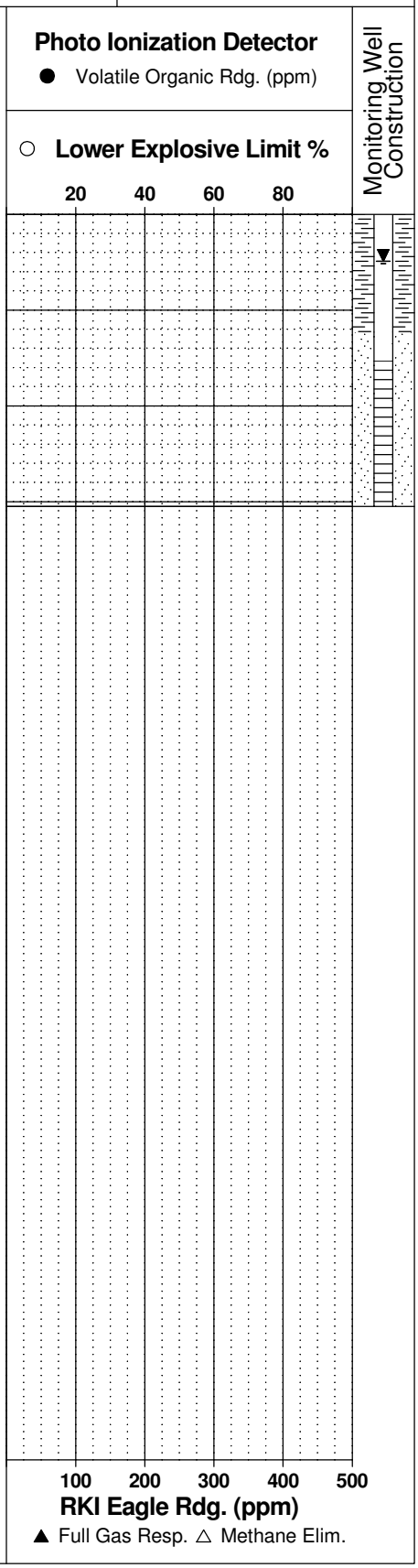
REMARKS

HOLE NO. BH 9

BORINGS BY Portable Drill **DATE** 2019 May 22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING							
TOPSOIL 0.15		SS	1	62		0	69.49
		SS	2	71		1	68.49
Brown **SILTY CLAY**		SS	3	100		2	67.49
		SS	4	100			
3.05		SS	5	100		3	66.49
End of Borehole							
(GWL @ 0.49m - June 3, 2019)							



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SOIL PROFILE AND TEST DATA

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3252 Navan Road
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FILE NO. PE4588

REMARKS

HOLE NO. BH10

BORINGS BY CME 55 Power Auger **DATE** 2019 September 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
UNDERSIDE OF FOOTING									
FILL: Brown silty clay, trace sand and gravel						0	86.03		
0.81									
		SS	1	75	10	1	85.03		
Compact to loose, brown **SILTY SAND**		SS	2	88	24	2	84.03		
2.82		SS	3	88	9				
Brown **SILTY CLAY**		SS	4	100	2	3	83.03		
- grey by 3.3m depth		SS	5	100	W	4	82.03		
5.18		SS	6	100	W	5	81.03		
End of Borehole									
(GWL @ 1.92m - Sept. 9, 2019)									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm)

○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM Geodetic, provided by Annis O'Sullivan Vollebekk

FILE NO. PE4588

REMARKS

HOLE NO. BH11

BORINGS BY CME 55 Power Auger **DATE** 2019 September 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	85.53
						1	84.53
						2	83.53
OVERBURDEN						3	82.53
						4	81.53
						5	80.53
6.10						6	79.53
		SS	1	100	1		
		SS	2	100		7	78.53
		SS	3	100		8	77.53
		SS	4	100			
						9	76.53
Grey **SILTY CLAY**		SS	5	100			
		SS	6	100		10	75.53
11.28		SS	7	100		11	74.53
End of Borehole							
(GWL @ 2.84m - Sept. 9, 2019)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
3252 Navan Road
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DATUM Geodetic, provided by Annis O'Sullivan Vollebekk

FILE NO. PE4588

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** 2019 September 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	85.14
FILL: Brown silty sand with gravel		SS	1	79	30	1	84.14
1.27							
Compact, grey **SILTY SAND**		SS	2	75	12	2	83.14
2.11							
		SS	3	100	1		
		SS	4	100	W	3	82.14
Brown to grey **SILTY CLAY**		SS	5	100	W	4	81.14
		SS	6	100	W	5	80.14
5.18							
End of Borehole							
(GWL @ 3.66m - Sept. 9, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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FILE NO. PE4588

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** 2019 September 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
UNDERSIDE OF FOOTING						0	85.37
FILL: Brown silty sand with gravel, trace cobbles and boulders		SS	1	58	24	1	84.37
1.52							
		SS	2	58	18	2	83.37
Compact, brown **SILTY SAND**		SS	3	17	42		
3.05						3	82.37
		SS	4	100	4		
Brown **SILTY SAND**		SS	5	100	3	4	81.37
- grey by 3.8m depth							
5.18		SS	6	100	W	5	80.37
End of Borehole							
(GWL @ 2.28m - Sept. 9, 2019)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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

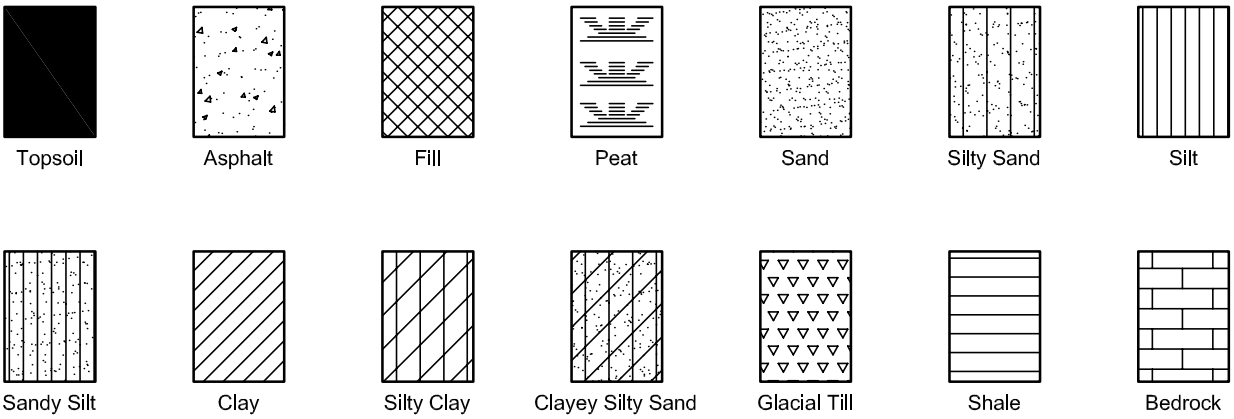
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

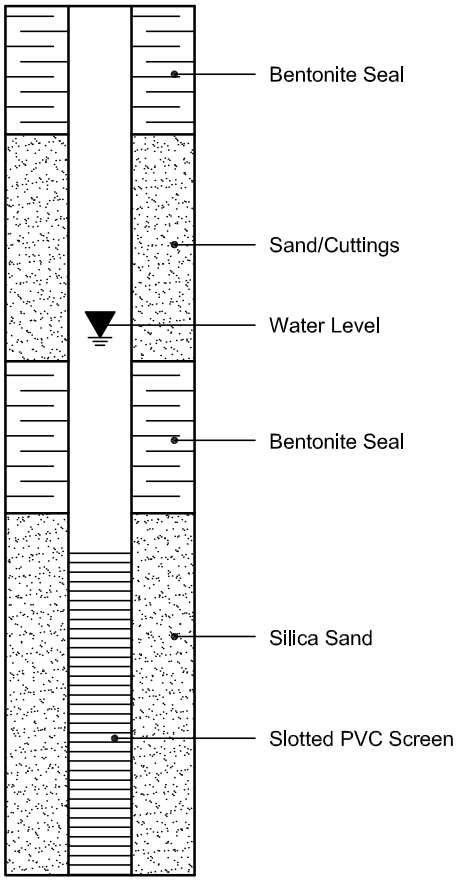
SYMBOLS AND TERMS (continued)

STRATA PLOT

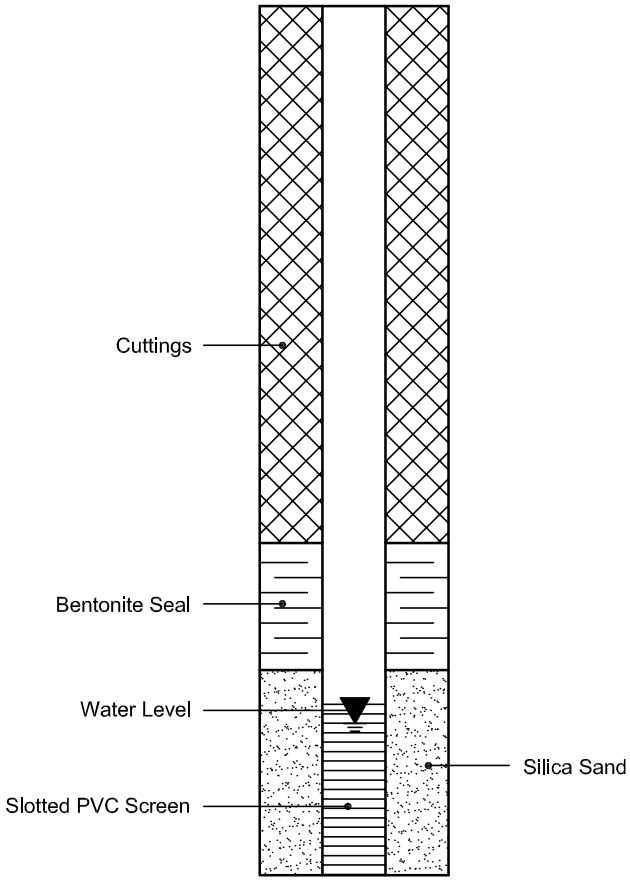


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 26839
Project: PE4588
Custody: 122169

Report Date: 7-Jun-2019
Order Date: 31-May-2019

Order #: 1923072

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1923072-01	BH1-GW1
1923072-02	BH2-GW1
1923072-03	BH4-GW1
1923072-04	BH5-GW1
1923072-05	BH6-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26839

Report Date: 07-Jun-2019
Order Date: 31-May-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	6-Jun-19	7-Jun-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	4-Jun-19	4-Jun-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	4-Jun-19	4-Jun-19
PHC F1	CWS Tier 1 - P&T GC-FID	4-Jun-19	5-Jun-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Jun-19	6-Jun-19
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	7-Jun-19	7-Jun-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	4-Jun-19	5-Jun-19

Certificate of Analysis

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Report Date: 07-Jun-2019

Order Date: 31-May-2019

Project Description: PE4588

	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	BH5-GW1
	Sample Date:	31-May-19 09:00	30-May-19 12:00	30-May-19 12:00	30-May-19 09:00
	Sample ID:	1923072-01	1923072-02	1923072-03	1923072-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	<0.1	-	-	<0.1
Antimony	0.5 ug/L	<0.5	-	<0.5	0.6
Arsenic	1 ug/L	1	-	1	2
Barium	1 ug/L	145	-	122	145
Beryllium	0.5 ug/L	<0.5	-	<0.5	<0.5
Boron	10 ug/L	52	-	97	186
Cadmium	0.1 ug/L	<0.1	-	<0.1	0.1
Chromium	1 ug/L	<1	-	<1	12
Chromium (VI)	10 ug/L	<10	-	-	<10
Cobalt	0.5 ug/L	0.9	-	<0.5	4.5
Copper	0.5 ug/L	3.3	-	6.3	5.5
Lead	0.1 ug/L	<0.1	-	0.2	0.3
Molybdenum	0.5 ug/L	4.3	-	6.7	5.4
Nickel	1 ug/L	2	-	2	13
Selenium	1 ug/L	<1	-	<1	1
Silver	0.1 ug/L	<0.1	-	<0.1	<0.1
Sodium	200 ug/L	91400	-	149000	793000
Thallium	0.1 ug/L	<0.1	-	<0.1	<0.1
Uranium	0.1 ug/L	3.2	-	3.2	14.5
Vanadium	0.5 ug/L	1.6	-	1.9	4.2
Zinc	5 ug/L	<5	-	8	7
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	-	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	-	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	-	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	-	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	<0.5

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	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	BH5-GW1
	Sample Date:	31-May-19 09:00	30-May-19 12:00	30-May-19 12:00	30-May-19 09:00
	Sample ID:	1923072-01	1923072-02	1923072-03	1923072-04
	MDL/Units	Water	Water	Water	Water
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	<0.5
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	-	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	-	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
Tetrachloroethylene	0.5 ug/L	286	<0.5	-	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	-	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	-	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	<0.5
4-Bromofluorobenzene	Surrogate	89.2%	91.5%	-	87.9%
Dibromofluoromethane	Surrogate	112%	110%	-	113%
Toluene-d8	Surrogate	92.0%	88.2%	-	101%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	<100

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	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	BH5-GW1
	Sample Date:	31-May-19 09:00	30-May-19 12:00	30-May-19 12:00	30-May-19 09:00
	Sample ID:	1923072-01	1923072-02	1923072-03	1923072-04
	MDL/Units	Water	Water	Water	Water
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	<100
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	-	<0.05	<0.05
Acenaphthylene	0.05 ug/L	-	-	<0.05	<0.05
Anthracene	0.01 ug/L	-	-	<0.01	<0.01
Benzo [a] anthracene	0.01 ug/L	-	-	<0.01	<0.01
Benzo [a] pyrene	0.01 ug/L	-	-	<0.01	<0.01
Benzo [b] fluoranthene	0.05 ug/L	-	-	<0.05	<0.05
Benzo [g,h,i] perylene	0.05 ug/L	-	-	<0.05	<0.05
Benzo [k] fluoranthene	0.05 ug/L	-	-	<0.05	<0.05
Chrysene	0.05 ug/L	-	-	<0.05	<0.05
Dibenzo [a,h] anthracene	0.05 ug/L	-	-	<0.05	<0.05
Fluoranthene	0.01 ug/L	-	-	<0.01	<0.01
Fluorene	0.05 ug/L	-	-	<0.05	<0.05
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	-	<0.05	<0.05
1-Methylnaphthalene	0.05 ug/L	-	-	<0.05	<0.05
2-Methylnaphthalene	0.05 ug/L	-	-	<0.05	<0.05
Methylnaphthalene (1&2)	0.10 ug/L	-	-	<0.10	<0.10
Naphthalene	0.05 ug/L	-	-	<0.05	<0.05
Phenanthrene	0.05 ug/L	-	-	<0.05	<0.05
Pyrene	0.01 ug/L	-	-	<0.01	<0.01
2-Fluorobiphenyl	Surrogate	-	-	103%	79.7%
Terphenyl-d14	Surrogate	-	-	118%	110%

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Order Date: 31-May-2019
Project Description: PE4588

	Client ID:	BH6-GW1	-	-	-
	Sample Date:	30-May-19 09:00	-	-	-
	Sample ID:	1923072-05	-	-	-
	MDL/Units	Water	-	-	-
Metals					
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	<0.5	-	-	-
Arsenic	1 ug/L	2	-	-	-
Barium	1 ug/L	201	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10 ug/L	382	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-
Chromium	1 ug/L	<1	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	0.7	-	-	-
Copper	0.5 ug/L	6.1	-	-	-
Lead	0.1 ug/L	0.3	-	-	-
Molybdenum	0.5 ug/L	4.8	-	-	-
Nickel	1 ug/L	3	-	-	-
Selenium	1 ug/L	<1	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-
Sodium	200 ug/L	722000	-	-	-
Thallium	0.1 ug/L	<0.1	-	-	-
Uranium	0.1 ug/L	3.6	-	-	-
Vanadium	0.5 ug/L	4.1	-	-	-
Zinc	5 ug/L	6	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-

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	Client ID:	BH6-GW1	-	-	-
	Sample Date:	30-May-19 09:00	-	-	-
	Sample ID:	1923072-05	-	-	-
	MDL/Units	Water	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-
Naphthalene	0.05 ug/L	<0.05	-	-	-
Phenanthrene	0.05 ug/L	<0.05	-	-	-
Pyrene	0.01 ug/L	<0.01	-	-	-
2-Fluorobiphenyl	Surrogate	106%	-	-	-
Terphenyl-d14	Surrogate	119%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*19.3*		*ug/L*		*96.3*	*50-140*			
Surrogate: Terphenyl-d14	*24.1*		*ug/L*		*120*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*27.3*		*ug/L*		*85.4*	*50-140*			
Surrogate: Dibromofluoromethane	*43.0*		*ug/L*		*134*	*50-140*			
Surrogate: Toluene-d8	*38.3*		*ug/L*		*120*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	0.62	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	23.1	1	ug/L	24.4			5.4	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	19	10	ug/L	19			0.3	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	0.94	0.5	ug/L	1.14			19.2	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	1.02	0.5	ug/L	0.98			3.9	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	15900	200	ug/L	16500			3.5	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	8	5	ug/L	9			8.6	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND			0.0	30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			0.0	30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND			0.0	30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			0.0	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			0.0	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			0.0	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			0.0	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			0.0	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			0.0	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			0.0	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND			0.0	30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND			0.0	30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			0.0	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			0.0	30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			0.0	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND			0.0	30	

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26839

Report Date: 07-Jun-2019
Order Date: 31-May-2019
Project Description: PE4588

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND			0.0	30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND			0.0	30	
Surrogate: 4-Bromofluorobenzene	*31.6*		*ug/L*		*98.7*	*50-140*			
Surrogate: Dibromofluoromethane	*36.0*		*ug/L*		*112*	*50-140*			
Surrogate: Toluene-d8	*38.3*		*ug/L*		*120*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1700	25	ug/L		84.9	68-117			
F2 PHCs (C10-C16)	1290	100	ug/L		80.4	60-140			
F3 PHCs (C16-C34)	3210	100	ug/L		81.8	60-140			
F4 PHCs (C34-C50)	2200	100	ug/L		88.9	60-140			
Metals									
Mercury	3.19	0.1	ug/L	ND	106	70-130			
Antimony	50.8		ug/L	ND	101	80-120			
Arsenic	51.3		ug/L	ND	102	80-120			
Barium	69.8		ug/L	24.4	90.7	80-120			
Beryllium	50.8		ug/L	ND	102	80-120			
Boron	57		ug/L	19	75.3	80-120			QM-07
Cadmium	48.4		ug/L	ND	96.8	80-120			
Chromium (VI)	198	10	ug/L	ND	99.0	70-130			
Chromium	51.6		ug/L	ND	103	80-120			
Cobalt	48.7		ug/L	ND	97.3	80-120			
Copper	49.9		ug/L	1.14	97.5	80-120			
Lead	45.7		ug/L	ND	91.3	80-120			
Molybdenum	48.7		ug/L	0.98	95.5	80-120			
Nickel	49.4		ug/L	ND	97.8	80-120			
Selenium	48.6		ug/L	ND	96.9	80-120			
Silver	48.7		ug/L	ND	97.3	80-120			
Sodium	24800		ug/L	16500	83.3	80-120			
Thallium	49.2		ug/L	ND	98.3	80-120			
Uranium	48.7		ug/L	ND	97.4	80-120			
Vanadium	51.1		ug/L	ND	102	80-120			
Zinc	53		ug/L	9	88.7	80-120			
Semi-Volatiles									
Acenaphthene	4.47	0.05	ug/L		89.5	50-140			
Acenaphthylene	4.22	0.05	ug/L		84.4	50-140			
Anthracene	4.70	0.01	ug/L		93.9	50-140			
Benzo [a] anthracene	4.61	0.01	ug/L		92.1	50-140			
Benzo [a] pyrene	3.85	0.01	ug/L		76.9	50-140			
Benzo [b] fluoranthene	6.18	0.05	ug/L		124	50-140			
Benzo [g,h,i] perylene	3.77	0.05	ug/L		75.4	50-140			
Benzo [k] fluoranthene	5.83	0.05	ug/L		117	50-140			
Chrysene	5.12	0.05	ug/L		102	50-140			
Dibenzo [a,h] anthracene	4.01	0.05	ug/L		80.2	50-140			
Fluoranthene	4.53	0.01	ug/L		90.7	50-140			
Fluorene	4.36	0.05	ug/L		87.1	50-140			
Indeno [1,2,3-cd] pyrene	4.08	0.05	ug/L		81.6	50-140			
1-Methylnaphthalene	4.71	0.05	ug/L		94.1	50-140			
2-Methylnaphthalene	5.17	0.05	ug/L		103	50-140			
Naphthalene	4.73	0.05	ug/L		94.6	50-140			
Phenanthrene	4.33	0.05	ug/L		86.5	50-140			
Pyrene	4.56	0.01	ug/L		91.2	50-140			
Surrogate: 2-Fluorobiphenyl	*21.5*		*ug/L*		*107*	*50-140*			
Volatiles									
Acetone	124	5.0	ug/L		124	50-140			
Benzene	45.6	0.5	ug/L		114	60-130			
Bromodichloromethane	49.6	0.5	ug/L		124	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	47.1	0.5	ug/L		118	60-130			
Bromomethane	38.4	0.5	ug/L		96.0	50-140			
Carbon Tetrachloride	48.1	0.2	ug/L		120	60-130			
Chlorobenzene	40.8	0.5	ug/L		102	60-130			
Chloroform	49.4	0.5	ug/L		123	60-130			
Dibromochloromethane	45.8	0.5	ug/L		115	60-130			
Dichlorodifluoromethane	47.1	1.0	ug/L		118	50-140			
1,2-Dichlorobenzene	34.9	0.5	ug/L		87.2	60-130			
1,3-Dichlorobenzene	33.7	0.5	ug/L		84.3	60-130			
1,4-Dichlorobenzene	32.4	0.5	ug/L		81.0	60-130			
1,1-Dichloroethane	46.0	0.5	ug/L		115	60-130			
1,2-Dichloroethane	44.9	0.5	ug/L		112	60-130			
1,1-Dichloroethylene	49.8	0.5	ug/L		124	60-130			
cis-1,2-Dichloroethylene	41.2	0.5	ug/L		103	60-130			
trans-1,2-Dichloroethylene	39.2	0.5	ug/L		98.0	60-130			
1,2-Dichloropropane	44.8	0.5	ug/L		112	60-130			
cis-1,3-Dichloropropylene	31.9	0.5	ug/L		79.8	60-130			
trans-1,3-Dichloropropylene	40.5	0.5	ug/L		101	60-130			
Ethylbenzene	30.8	0.5	ug/L		77.1	60-130			
Ethylene dibromide (dibromoethane	48.7	0.2	ug/L		122	60-130			
Hexane	37.3	1.0	ug/L		93.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	115	5.0	ug/L		115	50-140			
Methyl Isobutyl Ketone	124	5.0	ug/L		124	50-140			
Methyl tert-butyl ether	128	2.0	ug/L		128	50-140			
Methylene Chloride	43.4	5.0	ug/L		109	60-130			
Styrene	30.1	0.5	ug/L		75.2	60-130			
1,1,1,2-Tetrachloroethane	40.4	0.5	ug/L		101	60-130			
1,1,2,2-Tetrachloroethane	48.2	0.5	ug/L		120	60-130			
Tetrachloroethylene	46.2	0.5	ug/L		115	60-130			
Toluene	42.7	0.5	ug/L		107	60-130			
1,1,1-Trichloroethane	48.2	0.5	ug/L		121	60-130			
1,1,2-Trichloroethane	42.7	0.5	ug/L		107	60-130			
Trichloroethylene	41.9	0.5	ug/L		105	60-130			
Trichlorofluoromethane	44.5	1.0	ug/L		111	60-130			
Vinyl chloride	40.7	0.5	ug/L		102	50-140			
m,p-Xylenes	85.6	0.5	ug/L		107	60-130			
o-Xylene	37.1	0.5	ug/L		92.8	60-130			

Qualifier Notes:

Login Qualifiers :

Sample - Not preserved - Metals
Applies to samples: BH5-GW1

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

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PARACEL WO: 1923072

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Chain of Custody (Lab Use Only)
No 122169

Page __ of __

Client Name: Paterson
Contact Name: Mark D'Arcy
Address: 154 Colonnade St. S
Telephone: (613) 226-7381

Project Reference: PE4588
Quote #:
PO #: 26839
Email Address: mdarcy@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ____ ☐ Other

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1923072

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH1-GW1	GW		6	May31/19	AM	✓	✓		✓	✓	✓							
2	BH2-GW1	↓		3	May30/19	PM	✓	✓											
3	BH4-GW1	↓		2	↓	PM			✓	✓									
4	BH5-GW1	↓		7	↓	AM	✓	✓	✓	✓	✓	✓							
5	BH6-GW1	↓		4	↓	AM			✓	✓	✓	✓							
6																			
7																			
8																			
9																			
10																			

Comments: COC rec'd June 3/19. 8C

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: Sumeeparm Dohmai	Verified By: D-Gomer
Relinquished By (Print):	Date/Time:	Date/Time: May 31, 2019 04.10	Date/Time: 3 Jun 17 1406
Date/Time:	Temperature: °C	Temperature: 15.6 °C	pH Verified [ ] By: DG

Chain of Custody (Env) - Rev 0.7 Feb. 2016

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 26803
Project: PE4588
Custody: 122360

Report Date: 12-Jun-2019
Order Date: 6-Jun-2019

Order #: 1923526

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1923526-01	BH7-GW1
1923526-02	BH8-GW1
1923526-03	BH9-GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26803

Report Date: 12-Jun-2019
Order Date: 6-Jun-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - water	MOE E3056 - colourimetric	6-Jun-19	7-Jun-19
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Jun-19	7-Jun-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	7-Jun-19	7-Jun-19
PHC F1	CWS Tier 1 - P&T GC-FID	7-Jun-19	8-Jun-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Jun-19	11-Jun-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Jun-19	8-Jun-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26803

Report Date: 12-Jun-2019
Order Date: 6-Jun-2019
Project Description: PE4588

	Client ID:	BH7-GW1	BH8-GW1	BH9-GW1	-
	Sample Date:	03-Jun-19 00:00	03-Jun-19 00:00	03-Jun-19 09:00	-
	Sample ID:	1923526-01	1923526-02	1923526-03	-
	MDL/Units	Water	Water	Water	-
Metals					
Mercury	0.1 ug/L	-	<0.1	-	-
Antimony	0.5 ug/L	-	<0.5	-	-
Arsenic	1 ug/L	-	<1	-	-
Barium	1 ug/L	-	90	-	-
Beryllium	0.5 ug/L	-	<0.5	-	-
Boron	10 ug/L	-	645	-	-
Cadmium	0.1 ug/L	-	<0.1	-	-
Chromium	1 ug/L	-	<1	-	-
Chromium (VI)	10 ug/L	-	<10	-	-
Cobalt	0.5 ug/L	-	1.1	-	-
Copper	0.5 ug/L	-	2.8	-	-
Lead	0.1 ug/L	-	0.2	-	-
Molybdenum	0.5 ug/L	-	2.7	-	-
Nickel	1 ug/L	-	2	-	-
Selenium	1 ug/L	-	<1	-	-
Silver	0.1 ug/L	-	<0.1	-	-
Sodium	200 ug/L	-	307000	-	-
Thallium	0.1 ug/L	-	<0.1	-	-
Uranium	0.1 ug/L	-	3.3	-	-
Vanadium	0.5 ug/L	-	1.0	-	-
Zinc	5 ug/L	-	5	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26803

Report Date: 12-Jun-2019

Order Date: 6-Jun-2019

Project Description: PE4588

	Client ID:	BH7-GW1	BH8-GW1	BH9-GW1	-
	Sample Date:	03-Jun-19 00:00	03-Jun-19 00:00	03-Jun-19 09:00	-
	Sample ID:	1923526-01	1923526-02	1923526-03	-
	MDL/Units	Water	Water	Water	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	117%	117%	116%	-
Dibromofluoromethane	Surrogate	101%	100%	101%	-
Toluene-d8	Surrogate	112%	111%	111%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	-	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	-	<100	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26803

Report Date: 12-Jun-2019

Order Date: 6-Jun-2019

Project Description: PE4588

	Client ID:	BH7-GW1	BH8-GW1	BH9-GW1	-
	Sample Date:	03-Jun-19 00:00	03-Jun-19 00:00	03-Jun-19 09:00	-
	Sample ID:	1923526-01	1923526-02	1923526-03	-
	MDL/Units	Water	Water	Water	-
F4 PHCs (C34-C50)	100 ug/L	-	<100	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*99.8*		*ug/L*		*125*	*50-140*			
Surrogate: Dibromofluoromethane	*72.3*		*ug/L*		*90.4*	*50-140*			
Surrogate: Toluene-d8	*84.5*		*ug/L*		*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	ND	1	ug/L	ND			0.0	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	ND	10	ug/L	ND			0.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	ND	0.5	ug/L	ND			0.0	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	ND	0.5	ug/L	ND			0.0	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	ND	200	ug/L	ND			0.0	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	ND	5	ug/L	ND			0.0	20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*96.3*		*ug/L*		*120*	*50-140*			
Surrogate: Dibromofluoromethane	*84.8*		*ug/L*		*106*	*50-140*			
Surrogate: Toluene-d8	*84.5*		*ug/L*		*106*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1960	25	ug/L		98.1	68-117			
F2 PHCs (C10-C16)	1520	100	ug/L		95.0	60-140			
F3 PHCs (C16-C34)	3580	100	ug/L		91.3	60-140			
F4 PHCs (C34-C50)	2660	100	ug/L		107	60-140			
Metals									
Mercury	2.97	0.1	ug/L	ND	99.1	70-130			
Antimony	38.6		ug/L	ND	76.9	80-120			QM-07
Arsenic	44.7		ug/L	ND	89.3	80-120			
Barium	48.6		ug/L	ND	96.0	80-120			
Beryllium	46.0		ug/L	ND	92.0	80-120			
Boron	42		ug/L	ND	82.2	80-120			
Cadmium	44.5		ug/L	ND	88.9	80-120			
Chromium (VI)	198	10	ug/L	ND	99.0	70-130			
Chromium	46.6		ug/L	ND	93.2	80-120			
Cobalt	45.0		ug/L	ND	89.9	80-120			
Copper	43.9		ug/L	ND	87.7	80-120			
Lead	44.3		ug/L	ND	88.5	80-120			
Molybdenum	41.9		ug/L	ND	83.7	80-120			
Nickel	44.8		ug/L	ND	89.6	80-120			
Selenium	46.4		ug/L	ND	92.6	80-120			
Silver	47.1		ug/L	ND	94.1	80-120			
Sodium	9340		ug/L	ND	92.0	80-120			
Thallium	42.0		ug/L	ND	84.0	80-120			
Uranium	42.8		ug/L	ND	85.5	80-120			
Vanadium	46.1		ug/L	ND	92.1	80-120			
Zinc	48		ug/L		96.1	80-120			
Volatiles									
Acetone	75.7	5.0	ug/L		75.7	50-140			
Benzene	43.5	0.5	ug/L		109	60-130			
Bromodichloromethane	41.1	0.5	ug/L		103	60-130			
Bromoform	51.8	0.5	ug/L		130	60-130			
Bromomethane	45.6	0.5	ug/L		114	50-140			
Carbon Tetrachloride	44.5	0.2	ug/L		111	60-130			
Chlorobenzene	42.2	0.5	ug/L		105	60-130			
Chloroform	41.6	0.5	ug/L		104	60-130			
Dibromochloromethane	44.5	0.5	ug/L		111	60-130			
Dichlorodifluoromethane	40.8	1.0	ug/L		102	50-140			
1,2-Dichlorobenzene	47.1	0.5	ug/L		118	60-130			
1,3-Dichlorobenzene	42.6	0.5	ug/L		107	60-130			
1,4-Dichlorobenzene	42.6	0.5	ug/L		106	60-130			
1,1-Dichloroethane	37.0	0.5	ug/L		92.6	60-130			
1,2-Dichloroethane	37.4	0.5	ug/L		93.4	60-130			
1,1-Dichloroethylene	39.6	0.5	ug/L		99.1	60-130			
cis-1,2-Dichloroethylene	41.7	0.5	ug/L		104	60-130			
trans-1,2-Dichloroethylene	40.3	0.5	ug/L		101	60-130			
1,2-Dichloropropane	39.0	0.5	ug/L		97.4	60-130			
cis-1,3-Dichloropropylene	33.4	0.5	ug/L		83.6	60-130			
trans-1,3-Dichloropropylene	30.8	0.5	ug/L		76.9	60-130			
Ethylbenzene	43.2	0.5	ug/L		108	60-130			
Ethylene dibromide (dibromoethane	44.5	0.2	ug/L		111	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hexane	41.7	1.0	ug/L		104	60-130			
Methyl Ethyl Ketone (2-Butanone)	95.1	5.0	ug/L		95.1	50-140			
Methyl Isobutyl Ketone	60.8	5.0	ug/L		60.8	50-140			
Methyl tert-butyl ether	113	2.0	ug/L		113	50-140			
Methylene Chloride	36.5	5.0	ug/L		91.3	60-130			
Styrene	44.3	0.5	ug/L		111	60-130			
1,1,1,2-Tetrachloroethane	41.2	0.5	ug/L		103	60-130			
1,1,2,2-Tetrachloroethane	34.5	0.5	ug/L		86.2	60-130			
Tetrachloroethylene	50.8	0.5	ug/L		127	60-130			
Toluene	43.3	0.5	ug/L		108	60-130			
1,1,1-Trichloroethane	43.6	0.5	ug/L		109	60-130			
1,1,2-Trichloroethane	38.8	0.5	ug/L		96.9	60-130			
Trichloroethylene	43.6	0.5	ug/L		109	60-130			
Trichlorofluoromethane	37.6	1.0	ug/L		93.9	60-130			
Vinyl chloride	39.0	0.5	ug/L		97.6	50-140			
m,p-Xylenes	86.4	0.5	ug/L		108	60-130			
o-Xylene	41.4	0.5	ug/L		103	60-130			
Surrogate: 4-Bromofluorobenzene	*81.5*		*ug/L*		*102*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Sample - Not preserved - Mercury
Applies to samples: BH8-GW1

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

PARACEL WO: 1923526

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Ottawa, Ontario K1G 4J8
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e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 122360

Page 1 of 1

Client Name: ~~MIKE BEAUDOIN~~ PATERSON
Contact Name: ~~154 COLONNADE RD~~ MIKE BEAUDOIN
Address: 154 COLONNADE RD S.
Telephone: 613-226-7381

Project Reference: PE4588
Quote #
PO # 26803
Email Address: mbeaudoin@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required:

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ______ ☐ Other: ______

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1923526

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH7-GW1	GW		2	June 3/19			X												
2	BH6-GW1	GW		8	June 3/19		X	X		X	X	X								
3	BH9-GW1	GW		2	June 3/19			X												
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: * Extra two VOC vials on Hold Shelf

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received by Driver/Depot: A. Krouse	Received at Lab: Sumeeporn Rohmoi	Verified By: [signature]
Relinquished By (Print): Nick Sullivan	Date/Time: 06/06/19 4:10 PM	Date/Time: JUN 06, 2019 05.40	Date/Time: 06-06-19 18:44
Date/Time: June 6/19	Temperature: °C	Temperature: 15.7 °C	pH Verified ☒ By: [signature]

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 26975
Project: PE4588
Custody: 48725

Report Date: 16-Jul-2019
Order Date: 15-Jul-2019

Order #: 1929208

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1929208-01	BH1-GW2

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26975

Report Date: 16-Jul-2019
Order Date: 15-Jul-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	16-Jul-19	16-Jul-19

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26975

Report Date: 16-Jul-2019
Order Date: 15-Jul-2019
Project Description: PE4588

	Client ID:	BH1-GW2	-	-	-
	Sample Date:	15-Jul-19 09:00	-	-	-
	Sample ID:	1929208-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	43.1	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26975

Report Date: 16-Jul-2019

Order Date: 15-Jul-2019

Project Description: PE4588

	Client ID:	BH1-GW2	-	-	-
	Sample Date:	15-Jul-19 09:00	-	-	-
	Sample ID:	1929208-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	120%	-	-	-
Dibromofluoromethane	Surrogate	94.2%	-	-	-
Toluene-d8	Surrogate	104%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*92.2*		*ug/L*		*115*	*50-140*			
Surrogate: Dibromofluoromethane	*74.1*		*ug/L*		*92.6*	*50-140*			
Surrogate: Toluene-d8	*81.4*		*ug/L*		*102*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*93.0*		*ug/L*		*116*	*50-140*			
Surrogate: Dibromofluoromethane	*78.0*		*ug/L*		*97.5*	*50-140*			
Surrogate: Toluene-d8	*81.6*		*ug/L*		*102*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	89.1	5.0	ug/L		89.1	50-140			
Benzene	31.9	0.5	ug/L		79.7	60-130			
Bromodichloromethane	33.3	0.5	ug/L		83.2	60-130			
Bromoform	48.4	0.5	ug/L		121	60-130			
Bromomethane	32.6	0.5	ug/L		81.6	50-140			
Carbon Tetrachloride	33.5	0.2	ug/L		83.8	60-130			
Chlorobenzene	41.6	0.5	ug/L		104	60-130			
Chloroform	30.2	0.5	ug/L		75.4	60-130			
Dibromochloromethane	45.6	0.5	ug/L		114	60-130			
Dichlorodifluoromethane	27.1	1.0	ug/L		67.6	50-140			
1,2-Dichlorobenzene	43.4	0.5	ug/L		109	60-130			
1,3-Dichlorobenzene	49.2	0.5	ug/L		123	60-130			
1,4-Dichlorobenzene	38.4	0.5	ug/L		96.0	60-130			
1,1-Dichloroethane	31.1	0.5	ug/L		77.8	60-130			
1,2-Dichloroethane	32.6	0.5	ug/L		81.5	60-130			
1,1-Dichloroethylene	31.3	0.5	ug/L		78.3	60-130			
cis-1,2-Dichloroethylene	38.2	0.5	ug/L		95.4	60-130			
trans-1,2-Dichloroethylene	31.8	0.5	ug/L		79.6	60-130			
1,2-Dichloropropane	31.3	0.5	ug/L		78.2	60-130			
cis-1,3-Dichloropropylene	35.3	0.5	ug/L		88.2	60-130			
trans-1,3-Dichloropropylene	37.3	0.5	ug/L		93.4	60-130			
Ethylbenzene	47.8	0.5	ug/L		120	60-130			
Ethylene dibromide (dibromoethane	44.5	0.2	ug/L		111	60-130			
Hexane	37.0	1.0	ug/L		92.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	89.4	5.0	ug/L		89.4	50-140			
Methyl Isobutyl Ketone	90.2	5.0	ug/L		90.2	50-140			
Methyl tert-butyl ether	90.2	2.0	ug/L		90.2	50-140			
Methylene Chloride	33.4	5.0	ug/L		83.6	60-130			
Styrene	42.6	0.5	ug/L		107	60-130			
1,1,1,2-Tetrachloroethane	42.6	0.5	ug/L		106	60-130			
1,1,2,2-Tetrachloroethane	49.6	0.5	ug/L		124	60-130			
Tetrachloroethylene	40.1	0.5	ug/L		100	60-130			
Toluene	38.8	0.5	ug/L		96.9	60-130			
1,1,1-Trichloroethane	32.2	0.5	ug/L		80.6	60-130			
1,1,2-Trichloroethane	30.3	0.5	ug/L		75.7	60-130			
Trichloroethylene	31.4	0.5	ug/L		78.6	60-130			
Trichlorofluoromethane	32.5	1.0	ug/L		81.2	60-130			
Vinyl chloride	50.0	0.5	ug/L		125	50-140			
m,p-Xylenes	91.6	0.5	ug/L		114	60-130			
o-Xylene	49.8	0.5	ug/L		124	60-130			
Surrogate: 4-Bromofluorobenzene	*55.7*		*ug/L*		*69.6*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

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: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 48725

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4588	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☑ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd. S.	PO # 26975	☐ 2 Day ☐ Regular
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca	Date Required:

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1929208

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOCs
1	BH1-GW2	GW		2	July 15/19		X
2							
3							
4							
5							
6							
7							
8							
9							
10							

Comments:

Method of Delivery: Walk in

Relinquished By (Sign): DClatt	Received by Driver/Depot:	Received at Lab: Kym Stewart	Verified By:
Relinquished By (Print): Derek Latta	Date/Time:	Date/Time: 15 July 19 15:25	Date/Time: 7-16-19 13
Date/Time: July 15 2019 3:30pm	Temperature: °C	Temperature: 20.5	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27691
Project: PE4588
Custody: 123156

Report Date: 10-Sep-2019
Order Date: 9-Sep-2019

Order #: 1937092

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1937092-01	BH10-GW1
1937092-02	BH12-GW1
1937092-03	BH13-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27691

Report Date: 10-Sep-2019
Order Date: 9-Sep-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	9-Sep-19	9-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27691

Report Date: 10-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4588

	Client ID:	BH10-GW1	BH12-GW1	BH13-GW1	-
	Sample Date:	09-Sep-19 09:00	09-Sep-19 09:00	09-Sep-19 09:00	-
	Sample ID:	1937092-01	1937092-02	1937092-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27691

Report Date: 10-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4588

	Client ID:	BH10-GW1	BH12-GW1	BH13-GW1	-
	Sample Date:	09-Sep-19 09:00	09-Sep-19 09:00	09-Sep-19 09:00	-
	Sample ID:	1937092-01	1937092-02	1937092-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	89.8%	90.1%	88.8%	-
Dibromofluoromethane	Surrogate	110%	106%	109%	-
Toluene-d8	Surrogate	102%	103%	102%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*82.8*		*ug/L*		*104*	*50-140*			
Surrogate: Dibromofluoromethane	*80.9*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*92.6*		*ug/L*		*116*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.0*		*ug/L*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*87.9*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*78.4*		*ug/L*		*98.1*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	66.8	5.0	ug/L		66.8	50-140			
Benzene	33.5	0.5	ug/L		83.8	60-130			
Bromodichloromethane	34.5	0.5	ug/L		86.2	60-130			
Bromoform	36.6	0.5	ug/L		91.4	60-130			
Bromomethane	33.9	0.5	ug/L		84.7	50-140			
Carbon Tetrachloride	35.3	0.2	ug/L		88.3	60-130			
Chlorobenzene	33.5	0.5	ug/L		83.7	60-130			
Chloroform	34.4	0.5	ug/L		85.9	60-130			
Dibromochloromethane	35.0	0.5	ug/L		87.5	60-130			
Dichlorodifluoromethane	34.4	1.0	ug/L		86.0	50-140			
1,2-Dichlorobenzene	33.0	0.5	ug/L		82.5	60-130			
1,3-Dichlorobenzene	33.4	0.5	ug/L		83.4	60-130			
1,4-Dichlorobenzene	33.3	0.5	ug/L		83.3	60-130			
1,1-Dichloroethane	34.2	0.5	ug/L		85.6	60-130			
1,2-Dichloroethane	35.4	0.5	ug/L		88.4	60-130			
1,1-Dichloroethylene	36.3	0.5	ug/L		90.8	60-130			
cis-1,2-Dichloroethylene	35.0	0.5	ug/L		87.6	60-130			
trans-1,2-Dichloroethylene	35.8	0.5	ug/L		89.6	60-130			
1,2-Dichloropropane	33.6	0.5	ug/L		84.0	60-130			
cis-1,3-Dichloropropylene	36.0	0.5	ug/L		89.9	60-130			
trans-1,3-Dichloropropylene	37.3	0.5	ug/L		93.2	60-130			
Ethylbenzene	33.7	0.5	ug/L		84.2	60-130			
Ethylene dibromide (dibromoethane	35.1	0.2	ug/L		87.8	60-130			
Hexane	40.5	1.0	ug/L		101	60-130			
Methyl Ethyl Ketone (2-Butanone)	90.6	5.0	ug/L		90.6	50-140			
Methyl Isobutyl Ketone	83.4	5.0	ug/L		83.4	50-140			
Methyl tert-butyl ether	85.9	2.0	ug/L		85.9	50-140			
Methylene Chloride	32.7	5.0	ug/L		81.7	60-130			
Styrene	34.7	0.5	ug/L		86.8	60-130			
1,1,1,2-Tetrachloroethane	34.7	0.5	ug/L		86.8	60-130			
1,1,2,2-Tetrachloroethane	37.5	0.5	ug/L		93.8	60-130			
Tetrachloroethylene	35.0	0.5	ug/L		87.5	60-130			
Toluene	32.4	0.5	ug/L		81.0	60-130			
1,1,1-Trichloroethane	34.4	0.5	ug/L		86.1	60-130			
1,1,2-Trichloroethane	34.9	0.5	ug/L		87.3	60-130			
Trichloroethylene	33.5	0.5	ug/L		83.8	60-130			
Trichlorofluoromethane	29.8	1.0	ug/L		74.4	60-130			
Vinyl chloride	35.4	0.5	ug/L		88.4	50-140			
m,p-Xylenes	67.3	0.5	ug/L		84.1	60-130			
o-Xylene	33.8	0.5	ug/L		84.4	60-130			
Surrogate: 4-Bromofluorobenzene	*82.3*		*ug/L*		*103*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

PARACEL LABORATORIES LTD.

Paracel ID: 1937092

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Chain of Custody
(Lab Use Only)
№ 123156

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE4588
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd. S.	PO # 27691
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca

Turnaround Time:
☒ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1937092

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH10-GW1	GW		2	Sept 9 2019			X												
~~2~~	~~BH11-GW1~~							X												
3	BH12-GW1							X												
4	BH13-GW1							X												
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Teare	Received at Lab:	Verified By:
Relinquished By (Print): Nicholas Doucette	Date/Time: 09/09/19 4:30 PM	Date/Time: 9-9-19 17:15	Date/Time: 9-9-19 17:15
Date/Time:	Temperature: °C	Temperature: 14.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27694
Project: PE4588
Custody: 123209

Report Date: 12-Sep-2019
Order Date: 11-Sep-2019

Revised Report **Order #: 1937355**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1937355-01	BH11-GW1

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27694

Report Date: 12-Sep-2019
Order Date: 11-Sep-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	12-Sep-19	12-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27694

Report Date: 12-Sep-2019

Order Date: 11-Sep-2019

Project Description: PE4588

	Client ID:	BH11-GW1	-	-	-
	Sample Date:	09-Sep-19 09:00	-	-	-
	Sample ID:	1937355-01	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	15.0	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27694

Report Date: 12-Sep-2019

Order Date: 11-Sep-2019

Project Description: PE4588

	Client ID:	BH11-GW1	-	-	-
	Sample Date:	09-Sep-19 09:00	-	-	-
	Sample ID:	1937355-01	-	-	-
	MDL/Units	Water	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	99.2%	-	-	-
Dibromofluoromethane	Surrogate	109%	-	-	-
Toluene-d8	Surrogate	98.6%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*81.2*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*73.4*		*ug/L*		*91.7*	*50-140*			
Surrogate: Toluene-d8	*75.9*		*ug/L*		*94.9*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	6.69	5.0	ug/L	8.16			19.8	30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*80.8*		*ug/L*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*80.1*		*ug/L*		*100*	*50-140*			
Surrogate: Toluene-d8	*77.5*		*ug/L*		*96.9*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	87.3	5.0	ug/L		87.3	50-140			
Benzene	29.5	0.5	ug/L		73.7	60-130			
Bromodichloromethane	28.7	0.5	ug/L		71.8	60-130			
Bromoform	37.1	0.5	ug/L		92.8	60-130			
Bromomethane	34.1	0.5	ug/L		85.4	50-140			
Carbon Tetrachloride	27.6	0.2	ug/L		68.9	60-130			
Chlorobenzene	35.1	0.5	ug/L		87.7	60-130			
Chloroform	43.6	0.5	ug/L		109	60-130			
Dibromochloromethane	34.6	0.5	ug/L		86.6	60-130			
Dichlorodifluoromethane	43.8	1.0	ug/L		110	50-140			
1,2-Dichlorobenzene	31.2	0.5	ug/L		78.1	60-130			
1,3-Dichlorobenzene	30.4	0.5	ug/L		76.0	60-130			
1,4-Dichlorobenzene	31.1	0.5	ug/L		77.8	60-130			
1,1-Dichloroethane	48.7	0.5	ug/L		122	60-130			
1,2-Dichloroethane	40.3	0.5	ug/L		101	60-130			
1,1-Dichloroethylene	45.0	0.5	ug/L		113	60-130			
cis-1,2-Dichloroethylene	39.3	0.5	ug/L		98.2	60-130			
trans-1,2-Dichloroethylene	44.2	0.5	ug/L		110	60-130			
1,2-Dichloropropane	38.2	0.5	ug/L		95.4	60-130			
cis-1,3-Dichloropropylene	48.8	0.5	ug/L		122	60-130			
trans-1,3-Dichloropropylene	30.5	0.5	ug/L		76.3	60-130			
Ethylbenzene	35.4	0.5	ug/L		88.6	60-130			
Ethylene dibromide (dibromoethane	36.0	0.2	ug/L		90.0	60-130			
Hexane	42.9	1.0	ug/L		107	60-130			
Methyl Ethyl Ketone (2-Butanone)	130	5.0	ug/L		130	50-140			
Methyl Isobutyl Ketone	67.2	5.0	ug/L		67.2	50-140			
Methyl tert-butyl ether	97.4	2.0	ug/L		97.4	50-140			
Methylene Chloride	44.1	5.0	ug/L		110	60-130			
Styrene	36.1	0.5	ug/L		90.4	60-130			
1,1,1,2-Tetrachloroethane	35.7	0.5	ug/L		89.2	60-130			
1,1,2,2-Tetrachloroethane	48.6	0.5	ug/L		121	60-130			
Tetrachloroethylene	34.2	0.5	ug/L		85.4	60-130			
Toluene	34.7	0.5	ug/L		86.7	60-130			
1,1,1-Trichloroethane	26.3	0.5	ug/L		65.7	60-130			
1,1,2-Trichloroethane	27.6	0.5	ug/L		69.1	60-130			
Trichloroethylene	33.8	0.5	ug/L		84.5	60-130			
Trichlorofluoromethane	40.7	1.0	ug/L		102	60-130			
Vinyl chloride	40.3	0.5	ug/L		101	50-140			
m,p-Xylenes	71.7	0.5	ug/L		89.6	60-130			
o-Xylene	37.6	0.5	ug/L		94.0	60-130			
Surrogate: 4-Bromofluorobenzene	*71.4*		*ug/L*		*89.2*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

only one VOC received

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

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Paracel ID: 1937355

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Chain of Custody (Lab Use Only)

Nº 123209

Page ___ of ___

Client Name: Paterson Group	Project Reference: PE 4588
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd, Nepean, Ontario	PO # 27694
Telephone: 613-226-7381	Email Address: mdarcy@patersongroup.ca

Turnaround Time:
☑ 1 Day ☐ 3 Day
☐ 2 Day ☐ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ______ ☐ Other: ______

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1937355

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH11-GW1	GW		1	Sept 9/19			✓												
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Only one VOC received

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: T. Frouse	Received at Lab: Suneeporn Dokmai	Verified By: [signature]
Relinquished By (Print): Nicholas Doucette	Date/Time: 11/09/19 4:00 PM	Date/Time: SEP 11, 2019 09.50	Date/Time: 09/11/19 17:45
Date/Time:	Temperature: °C	Temperature: 12.6 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 26440
Project: PE4588
Custody: 122132

Report Date: 28-May-2019
Order Date: 22-May-2019

Order #: 1921256

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1921256-01	BH1-SS4
1921256-02	BH2-SS3
1921256-03	BH3-AU1
1921256-04	BH4-SS2
1921256-05	BH5-SS2
1921256-06	BH5-SS6
1921256-07	BH6-SS8

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26440

Report Date: 28-May-2019
Order Date: 22-May-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	27-May-19	28-May-19
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	23-May-19	27-May-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	27-May-19	27-May-19
PHC F1	CWS Tier 1 - P&T GC-FID	27-May-19	28-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	23-May-19	24-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	27-May-19	27-May-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	23-May-19	24-May-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	27-May-19	28-May-19
Solids, %	Gravimetric, calculation	24-May-19	24-May-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26440

Report Date: 28-May-2019

Order Date: 22-May-2019

Project Description: PE4588

	Client ID:	BH1-SS4	BH2-SS3	BH3-AU1	BH4-SS2
	Sample Date:	16-May-19 09:00	16-May-19 09:00	16-May-19 09:00	16-May-19 09:00
	Sample ID:	1921256-01	1921256-02	1921256-03	1921256-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	79.9	80.8	86.8	78.9
Metals					
Antimony	1.0 ug/g dry	-	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	-	-	5.3	2.9
Barium	1.0 ug/g dry	-	-	99.9	98.7
Beryllium	0.5 ug/g dry	-	-	0.9	<0.5
Boron	5.0 ug/g dry	-	-	9.7	7.5
Cadmium	0.5 ug/g dry	-	-	<0.5	<0.5
Chromium	5.0 ug/g dry	-	-	38.9	27.5
Chromium (VI)	0.2 ug/g dry	-	-	<0.2	<0.2
Cobalt	1.0 ug/g dry	-	-	12.2	6.4
Copper	5.0 ug/g dry	-	-	27.1	19.5
Lead	1.0 ug/g dry	-	-	10.5	13.2
Mercury	0.1 ug/g dry	-	-	<0.1	<0.1
Molybdenum	1.0 ug/g dry	-	-	<1.0	<1.0
Nickel	5.0 ug/g dry	-	-	30.3	17.2
Selenium	1.0 ug/g dry	-	-	<1.0	<1.0
Silver	0.3 ug/g dry	-	-	<0.3	<0.3
Thallium	1.0 ug/g dry	-	-	<1.0	<1.0
Uranium	1.0 ug/g dry	-	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	-	-	44.1	28.3
Zinc	20.0 ug/g dry	-	-	67.8	65.3
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	94.6%	101%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26440

Report Date: 28-May-2019

Order Date: 22-May-2019

Project Description: PE4588

	Client ID:	BH1-SS4	BH2-SS3	BH3-AU1	BH4-SS2
	Sample Date:	16-May-19 09:00	16-May-19 09:00	16-May-19 09:00	16-May-19 09:00
	Sample ID:	1921256-01	1921256-02	1921256-03	1921256-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	-	<0.02	-
Anthracene	0.02 ug/g dry	-	-	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	-	-	<0.02	-
Benzo [a] pyrene	0.02 ug/g dry	-	-	<0.02	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	0.03	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	<0.02	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	<0.02	-
Chrysene	0.02 ug/g dry	-	-	<0.02	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	<0.02	-
Fluoranthene	0.02 ug/g dry	-	-	0.04	-
Fluorene	0.02 ug/g dry	-	-	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	<0.02	-
1-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	-	0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	<0.04	-
Naphthalene	0.01 ug/g dry	-	-	<0.01	-
Phenanthrene	0.02 ug/g dry	-	-	0.03	-
Pyrene	0.02 ug/g dry	-	-	0.04	-
2-Fluorobiphenyl	Surrogate	-	-	75.8%	-
Terphenyl-d14	Surrogate	-	-	92.0%	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26440

Report Date: 28-May-2019

Order Date: 22-May-2019

Project Description: PE4588

	Client ID:	BH5-SS2	BH5-SS6	BH6-SS8	-
	Sample Date:	17-May-19 09:00	17-May-19 09:00	17-May-19 09:00	-
	Sample ID:	1921256-05	1921256-06	1921256-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	78.2	78.3	80.6	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	-	3.1	2.9	-
Barium	1.0 ug/g dry	-	78.9	136	-
Beryllium	0.5 ug/g dry	-	<0.5	<0.5	-
Boron	5.0 ug/g dry	-	6.5	6.0	-
Cadmium	0.5 ug/g dry	-	<0.5	<0.5	-
Chromium	5.0 ug/g dry	-	31.1	55.3	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	-	6.3	11.5	-
Copper	5.0 ug/g dry	-	16.0	25.7	-
Lead	1.0 ug/g dry	-	31.3	11.5	-
Mercury	0.1 ug/g dry	-	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	-	<1.0	<1.0	-
Nickel	5.0 ug/g dry	-	16.3	28.5	-
Selenium	1.0 ug/g dry	-	<1.0	<1.0	-
Silver	0.3 ug/g dry	-	<0.3	<0.3	-
Thallium	1.0 ug/g dry	-	<1.0	<1.0	-
Uranium	1.0 ug/g dry	-	<1.0	1.7	-
Vanadium	10.0 ug/g dry	-	32.0	53.8	-
Zinc	20.0 ug/g dry	-	62.9	68.0	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26440

Report Date: 28-May-2019
Order Date: 22-May-2019
Project Description: PE4588

	Client ID:	BH5-SS2	BH5-SS6	BH6-SS8	-
	Sample Date:	17-May-19 09:00	17-May-19 09:00	17-May-19 09:00	-
	Sample ID:	1921256-05	1921256-06	1921256-07	-
	MDL/Units	Soil	Soil	Soil	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Ethylene dibromide (dibromoethar	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	102%	-	-	-
Dibromofluoromethane	Surrogate	96.8%	-	-	-
Toluene-d8	Surrogate	101%	-	-	-
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26440

Report Date: 28-May-2019
Order Date: 22-May-2019
Project Description: PE4588

	Client ID:	BH5-SS2	BH5-SS6	BH6-SS8	-
	Sample Date:	17-May-19 09:00	17-May-19 09:00	17-May-19 09:00	-
	Sample ID:	1921256-05	1921256-06	1921256-07	-
	MDL/Units	Soil	Soil	Soil	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	93.4%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	19	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	21	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	<0.02	-
Anthracene	0.02 ug/g dry	0.04	-	<0.02	-
Benzo [a] anthracene	0.02 ug/g dry	0.10	-	0.04	-
Benzo [a] pyrene	0.02 ug/g dry	0.08	-	0.03	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.12	-	0.05	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.05	-	0.04	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.06	-	0.05	-
Chrysene	0.02 ug/g dry	0.12	-	0.04	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	<0.02	-
Fluoranthene	0.02 ug/g dry	0.23	-	0.08	-
Fluorene	0.02 ug/g dry	<0.02	-	<0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.06	-	0.04	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	<0.04	-
Naphthalene	0.01 ug/g dry	<0.01	-	<0.01	-
Phenanthrene	0.02 ug/g dry	0.14	-	0.04	-
Pyrene	0.02 ug/g dry	0.19	-	0.06	-
2-Fluorobiphenyl	Surrogate	80.2%	-	79.4%	-
Terphenyl-d14	Surrogate	100%	-	103%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.942*		*ug/g*		*70.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.23*		*ug/g*		*92.6*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*8.64*		*ug/g*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*8.25*		*ug/g*		*103*	*50-140*			
Surrogate: Toluene-d8	*7.94*		*ug/g*		*99.2*	*50-140*			
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.94*		*ug/g*		*99.2*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	65	4	ug/g dry	111			51.9	30	QR-04
F3 PHCs (C16-C34)	50	8	ug/g dry	56			10.2	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	1.9	1.0	ug/g dry	1.9			1.5	30	
Barium	79.1	1.0	ug/g dry	85.9			8.3	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	6.6	5.0	ug/g dry	5.9			11.8	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	19.7	5.0	ug/g dry	20.4			3.7	30	
Cobalt	8.3	1.0	ug/g dry	8.1			2.7	30	
Copper	11.9	5.0	ug/g dry	11.9			0.1	30	
Lead	17.7	1.0	ug/g dry	14.7			18.3	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	18.1	5.0	ug/g dry	18.1			0.1	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	30.4	10.0	ug/g dry	31.6			4.2	30	
Zinc	35.4	20.0	ug/g dry	36.1			1.9	30	
Physical Characteristics									
% Solids	88.2	0.1	% by Wt.	88.7			0.5	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	0.057	0.02	ug/g dry	0.060			5.3	40	
Anthracene	0.050	0.02	ug/g dry	0.051			2.7	40	
Benzo [a] anthracene	0.126	0.02	ug/g dry	0.121			4.2	40	
Benzo [a] pyrene	0.116	0.02	ug/g dry	0.115			1.1	40	
Benzo [b] fluoranthene	0.159	0.02	ug/g dry	0.156			1.8	40	
Benzo [g,h,i] perylene	0.077	0.02	ug/g dry	0.075			2.6	40	
Benzo [k] fluoranthene	0.084	0.02	ug/g dry	0.084			0.2	40	
Chrysene	0.143	0.02	ug/g dry	0.139			2.4	40	
Dibenzo [a,h] anthracene	0.022	0.02	ug/g dry	0.022			0.4	40	
Fluoranthene	0.268	0.02	ug/g dry	0.264			1.6	40	
Fluorene	ND	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.072	0.02	ug/g dry	0.073			1.0	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			0.0	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND			0.0	40	
Phenanthrene	0.132	0.02	ug/g dry	0.135			2.6	40	
Pyrene	0.222	0.02	ug/g dry	0.219			1.0	40	
Surrogate: 2-Fluorobiphenyl	*1.36*		*ug/g dry*		*84.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.68*		*ug/g dry*		*104*	*50-140*			
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*12.9*		*ug/g dry*		*122*	*50-140*			
Surrogate: Dibromofluoromethane	*10.6*		*ug/g dry*		*100*	*50-140*			
Surrogate: Toluene-d8	*10.0*		*ug/g dry*		*95.1*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*10.0*		*ug/g dry*		*95.1*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	201	7	ug/g		100	80-120			
F2 PHCs (C10-C16)	141	4	ug/g	111	28.6	60-140			QM-06
F3 PHCs (C16-C34)	283	8	ug/g	56	90.0	60-140			
F4 PHCs (C34-C50)	177	6	ug/g	ND	111	60-140			
Metals									
Antimony	42.2		ug/L		84.4	70-130			
Arsenic	47.4		ug/L		94.8	70-130			
Barium	45.2		ug/L		90.5	70-130			
Beryllium	46.9		ug/L		93.8	70-130			
Boron	41.2		ug/L		82.4	70-130			
Cadmium	44.6		ug/L		89.2	70-130			
Chromium (VI)	0.1		mg/L	ND	48.5	70-130			QM-01
Chromium	49.1		ug/L		98.2	70-130			
Cobalt	47.9		ug/L		95.8	70-130			
Copper	48.0		ug/L		96.1	70-130			
Lead	45.7		ug/L		91.4	70-130			
Mercury	1.56	0.1	ug/g	ND	104	70-130			
Molybdenum	46.0		ug/L		92.1	70-130			
Nickel	47.8		ug/L		95.6	70-130			
Selenium	47.0		ug/L		93.9	70-130			
Silver	47.9		ug/L		95.8	70-130			
Thallium	48.0		ug/L		96.0	70-130			
Uranium	49.2		ug/L		98.3	70-130			
Vanadium	48.1		ug/L		96.2	70-130			
Zinc	46.8		ug/L		93.5	70-130			
Semi-Volatiles									
Acenaphthene	0.174	0.02	ug/g	ND	86.4	50-140			
Acenaphthylene	0.242	0.02	ug/g	0.060	90.6	50-140			
Anthracene	0.233	0.02	ug/g	0.051	90.2	50-140			
Benzo [a] anthracene	0.332	0.02	ug/g	0.121	105	50-140			
Benzo [a] pyrene	0.303	0.02	ug/g	0.115	93.1	50-140			
Benzo [b] fluoranthene	0.433	0.02	ug/g	0.156	137	50-140			
Benzo [g,h,i] perylene	0.246	0.02	ug/g	0.075	84.9	50-140			
Benzo [k] fluoranthene	0.323	0.02	ug/g	0.084	119	50-140			
Chrysene	0.419	0.02	ug/g	0.139	139	50-140			
Dibenzo [a,h] anthracene	0.174	0.02	ug/g	0.022	75.6	50-140			
Fluoranthene	0.509	0.02	ug/g	0.264	122	50-140			
Fluorene	0.185	0.02	ug/g	ND	91.9	50-140			
Indeno [1,2,3-cd] pyrene	0.245	0.02	ug/g	0.073	85.4	50-140			
1-Methylnaphthalene	0.181	0.02	ug/g	ND	90.1	50-140			
2-Methylnaphthalene	0.196	0.02	ug/g	ND	97.5	50-140			
Naphthalene	0.185	0.01	ug/g	ND	91.9	50-140			
Phenanthrene	0.344	0.02	ug/g	0.135	104	50-140			
Pyrene	0.452	0.02	ug/g	0.219	115	50-140			
Surrogate: 2-Fluorobiphenyl	*1.36*		*ug/g*		*84.6*	*50-140*			
Volatiles									
Acetone	10.4	0.50	ug/g		104	50-140			
Benzene	2.91	0.02	ug/g		72.7	60-130			
Bromodichloromethane	2.63	0.05	ug/g		65.8	60-130			
Bromoform	4.90	0.05	ug/g		122	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromomethane	4.40	0.05	ug/g		110	50-140			
Carbon Tetrachloride	3.43	0.05	ug/g		85.7	60-130			
Chlorobenzene	3.80	0.05	ug/g		94.9	60-130			
Chloroform	2.91	0.05	ug/g		72.8	60-130			
Dibromochloromethane	4.24	0.05	ug/g		106	60-130			
Dichlorodifluoromethane	3.38	0.05	ug/g		84.4	50-140			
1,2-Dichlorobenzene	4.30	0.05	ug/g		107	60-130			
1,3-Dichlorobenzene	3.84	0.05	ug/g		96.1	60-130			
1,4-Dichlorobenzene	3.87	0.05	ug/g		96.7	60-130			
1,1-Dichloroethane	3.12	0.05	ug/g		78.1	60-130			
1,2-Dichloroethane	2.99	0.05	ug/g		74.6	60-130			
1,1-Dichloroethylene	2.72	0.05	ug/g		68.0	60-130			
cis-1,2-Dichloroethylene	3.15	0.05	ug/g		78.6	60-130			
trans-1,2-Dichloroethylene	2.98	0.05	ug/g		74.5	60-130			
1,2-Dichloropropane	3.39	0.05	ug/g		84.8	60-130			
cis-1,3-Dichloropropylene	2.70	0.05	ug/g		67.6	60-130			
trans-1,3-Dichloropropylene	4.57	0.05	ug/g		114	60-130			
Ethylbenzene	3.73	0.05	ug/g		93.4	60-130			
Ethylene dibromide (dibromoethane	4.15	0.05	ug/g		104	60-130			
Hexane	2.43	0.05	ug/g		60.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	6.82	0.50	ug/g		68.2	50-140			
Methyl Isobutyl Ketone	7.95	0.50	ug/g		79.5	50-140			
Methyl tert-butyl ether	7.38	0.05	ug/g		73.8	50-140			
Methylene Chloride	3.60	0.05	ug/g		90.1	60-130			
Styrene	3.96	0.05	ug/g		98.9	60-130			
1,1,1,2-Tetrachloroethane	4.11	0.05	ug/g		103	60-130			
1,1,2,2-Tetrachloroethane	3.44	0.05	ug/g		86.0	60-130			
Tetrachloroethylene	5.13	0.05	ug/g		128	60-130			
Toluene	3.70	0.05	ug/g		92.6	60-130			
1,1,1-Trichloroethane	3.11	0.05	ug/g		77.6	60-130			
1,1,2-Trichloroethane	2.61	0.05	ug/g		65.3	60-130			
Trichloroethylene	3.54	0.05	ug/g		88.5	60-130			
Trichlorofluoromethane	2.76	0.05	ug/g		68.9	50-140			
Vinyl chloride	5.16	0.02	ug/g		129	50-140			
m,p-Xylenes	7.83	0.05	ug/g		97.8	60-130			
o-Xylene	3.64	0.05	ug/g		91.0	60-130			
Benzene	2.91	0.02	ug/g		72.7	60-130			
Ethylbenzene	3.73	0.05	ug/g		93.4	60-130			
Toluene	3.70	0.05	ug/g		92.6	60-130			
m,p-Xylenes	7.83	0.05	ug/g		97.8	60-130			
o-Xylene	3.64	0.05	ug/g		91.0	60-130			

Qualifier Notes:

QC Qualifiers :

QM-01 : The spike recovery for this QC sample is outside of established control limits due to sample matrix interference.

QM-06 : Due to noted non-homogeneity of the QC sample matrix, the spike recoveries were out side the accepted range. Batch data accepted based on other QC.

QR-04 : Duplicate results exceeds RPD limits due to non-homogeneous matrix.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

Paracel ID: 1921256

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Chain of Custody
(Lab Use Only)
No 122132

Page 1 of 1

Client Name: Paterson	Project Reference: PE4588	**Turnaround Time:**
Contact Name: MIKE BEAUDOIN	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 COLONNADE RD S.	PO # 26440	☐ 2 Day ~~☐~~ Regular
Telephone: 613-226-7381	Email Address: mbeaudoin@patersongroup.ca	Date Required:

Criteria: ☐ O. Reg. 153/04 (As Amended) Table ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1921256

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-SS4	S		2	May 16/19		X						
2	BH2-SS3	S		2	↓		X						
3	BH3-AU1	S		1	↓				X	X	X	X	
4	BH4-SS2	S		1	↓					X	X	X	
5	BH5-SS2	S		2	May 17/19			X	X				
6	BH5-SS6	S		2	↓		X			X	X	X	
7	BH6-SS6	S		1	↓				X	X	X	X	
8													
9													
10													

Required Analyses

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: Sweetam Rokmail	Verified By:
Relinquished By (Print):	Date/Time:	Date/Time: May 23, 2019 04:50	Date/Time:
Date/Time:	Temperature: °C	Temperature: 17.4°	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 26441
Project: PE4588
Custody: 122140

Report Date: 29-May-2019
Order Date: 23-May-2019

Order #: 1921390

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1921390-01	BH7-SS5
1921390-02	BH8-SS3
1921390-03	BH9-SS3

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26441

Report Date: 29-May-2019
Order Date: 23-May-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	24-May-19	28-May-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	28-May-19	28-May-19
PHC F1	CWS Tier 1 - P&T GC-FID	28-May-19	29-May-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-May-19	27-May-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	28-May-19	28-May-19
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	28-May-19	29-May-19
Solids, %	Gravimetric, calculation	28-May-19	28-May-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26441

Report Date: 29-May-2019

Order Date: 23-May-2019

Project Description: PE4588

	Client ID:	BH7-SS5	BH8-SS3	BH9-SS3	-
	Sample Date:	22-May-19 09:00	22-May-19 09:00	22-May-19 09:00	-
	Sample ID:	1921390-01	1921390-02	1921390-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	66.1	72.8	60.9	-
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Arsenic	1.0 ug/g dry	2.6	2.9	3.1	-
Barium	1.0 ug/g dry	260	311	315	-
Beryllium	0.5 ug/g dry	0.8	0.8	0.9	-
Boron	5.0 ug/g dry	9.1	9.7	8.9	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5.0 ug/g dry	109	117	112	-
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	-
Cobalt	1.0 ug/g dry	20.5	22.7	22.6	-
Copper	5.0 ug/g dry	59.6	45.2	55.4	-
Lead	1.0 ug/g dry	6.5	7.1	6.9	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Nickel	5.0 ug/g dry	59.2	61.9	62.6	-
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	-
Uranium	1.0 ug/g dry	<1.0	1.0	<1.0	-
Vanadium	10.0 ug/g dry	91.5	103	105	-
Zinc	20.0 ug/g dry	124	133	137	-
Volatiles					
Acetone	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Bromodichloromethane	0.05 ug/g dry	0.12	<0.05	<0.05	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Bromomethane	0.05 ug/g dry	0.06	<0.05	<0.05	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Chloroform	0.05 ug/g dry	0.06	<0.05	<0.05	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26441

Report Date: 29-May-2019

Order Date: 23-May-2019

Project Description: PE4588

	Client ID:	BH7-SS5	BH8-SS3	BH9-SS3	-
	Sample Date:	22-May-19 09:00	22-May-19 09:00	22-May-19 09:00	-
	Sample ID:	1921390-01	1921390-02	1921390-03	-
	MDL/Units	Soil	Soil	Soil	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	<0.50	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
4-Bromofluorobenzene	Surrogate	114%	74.1%	85.2%	-
Dibromofluoromethane	Surrogate	67.7%	120%	112%	-
Toluene-d8	Surrogate	79.0%	94.2%	107%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26441

Report Date: 29-May-2019

Order Date: 23-May-2019

Project Description: PE4588

	Client ID:	BH7-SS5	BH8-SS3	BH9-SS3	-
	Sample Date:	22-May-19 09:00	22-May-19 09:00	22-May-19 09:00	-
	Sample ID:	1921390-01	1921390-02	1921390-03	-
	MDL/Units	Soil	Soil	Soil	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.50*		*ug/g*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*2.65*		*ug/g*		*82.9*	*50-140*			
Surrogate: Toluene-d8	*3.61*		*ug/g*		*113*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	4.2	1.0	ug/g dry	4.1			1.8	30	
Barium	70.3	1.0	ug/g dry	67.1			4.6	30	
Beryllium	0.7	0.5	ug/g dry	0.7			5.8	30	
Boron	6.8	5.0	ug/g dry	6.0			11.4	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	26.4	5.0	ug/g dry	24.8			6.1	30	
Cobalt	7.3	1.0	ug/g dry	6.7			8.0	30	
Copper	14.5	5.0	ug/g dry	13.6			6.7	30	
Lead	12.9	1.0	ug/g dry	11.7			10.2	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	15.8	5.0	ug/g dry	14.5			8.6	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	32.8	10.0	ug/g dry	31.0			5.9	30	
Zinc	79.6	20.0	ug/g dry	75.3			5.6	30	
Physical Characteristics									
% Solids	97.4	0.1	% by Wt.	97.2			0.3	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*3.04*		*ug/g dry*		*92.2*	*50-140*			
Surrogate: Dibromofluoromethane	*3.10*		*ug/g dry*		*94.2*	*50-140*			
Surrogate: Toluene-d8	*3.03*		*ug/g dry*		*92.0*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	207	7	ug/g		103	80-120			
F2 PHCs (C10-C16)	95	4	ug/g	ND	78.8	60-140			
F3 PHCs (C16-C34)	259	8	ug/g	ND	87.3	60-140			
F4 PHCs (C34-C50)	153	6	ug/g	ND	81.4	60-140			
Metals									
Antimony	44.8		ug/L	ND	89.3	70-130			
Arsenic	52.2		ug/L	1.6	101	70-130			
Barium	72.2		ug/L	26.8	90.8	70-130			
Beryllium	50.7		ug/L	ND	101	70-130			
Boron	46.2		ug/L	ND	87.6	70-130			
Cadmium	46.1		ug/L	ND	92.0	70-130			
Chromium (VI)	4.3	0.2	ug/g	ND	74.0	70-130			
Chromium	60.0		ug/L	9.9	100	70-130			
Cobalt	52.7		ug/L	2.7	100	70-130			
Copper	55.8		ug/L	5.4	101	70-130			
Lead	53.8		ug/L	4.7	98.3	70-130			
Mercury	1.61	0.1	ug/g	ND	107	70-130			
Molybdenum	48.9		ug/L	ND	97.4	70-130			
Nickel	54.2		ug/L	5.8	96.9	70-130			
Selenium	53.3		ug/L	ND	106	70-130			
Silver	44.9		ug/L	ND	89.7	70-130			
Thallium	48.9		ug/L	ND	97.6	70-130			
Uranium	53.7		ug/L	ND	107	70-130			
Vanadium	61.2		ug/L	12.4	97.6	70-130			
Zinc	77.7		ug/L	30.1	95.1	70-130			
Volatiles									
Acetone	10.1	0.50	ug/g		101	50-140			
Benzene	3.65	0.02	ug/g		91.3	60-130			
Bromodichloromethane	3.73	0.05	ug/g		93.3	60-130			
Bromoform	3.60	0.05	ug/g		90.1	60-130			
Bromomethane	2.74	0.05	ug/g		68.5	50-140			
Carbon Tetrachloride	3.55	0.05	ug/g		88.7	60-130			
Chlorobenzene	2.74	0.05	ug/g		68.6	60-130			
Chloroform	3.66	0.05	ug/g		91.6	60-130			
Dibromochloromethane	3.96	0.05	ug/g		99.1	60-130			
Dichlorodifluoromethane	2.88	0.05	ug/g		71.9	50-140			
1,2-Dichlorobenzene	4.09	0.05	ug/g		102	60-130			
1,3-Dichlorobenzene	4.13	0.05	ug/g		103	60-130			
1,4-Dichlorobenzene	3.35	0.05	ug/g		83.7	60-130			
1,1-Dichloroethane	3.58	0.05	ug/g		89.5	60-130			
1,2-Dichloroethane	3.37	0.05	ug/g		84.2	60-130			
1,1-Dichloroethylene	3.76	0.05	ug/g		94.1	60-130			
cis-1,2-Dichloroethylene	3.67	0.05	ug/g		91.7	60-130			
trans-1,2-Dichloroethylene	3.41	0.05	ug/g		85.3	60-130			
1,2-Dichloropropane	3.86	0.05	ug/g		96.4	60-130			
cis-1,3-Dichloropropylene	3.53	0.05	ug/g		88.4	60-130			
trans-1,3-Dichloropropylene	3.96	0.05	ug/g		98.9	60-130			
Ethylbenzene	2.63	0.05	ug/g		65.7	60-130			
Ethylene dibromide (dibromoethane	3.66	0.05	ug/g		91.6	60-130			
Hexane	3.90	0.05	ug/g		97.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	9.51	0.50	ug/g		95.1	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Methyl Isobutyl Ketone	10.5	0.50	ug/g		105	50-140			
Methyl tert-butyl ether	8.48	0.05	ug/g		84.8	50-140			
Methylene Chloride	3.63	0.05	ug/g		90.6	60-130			
Styrene	2.97	0.05	ug/g		74.4	60-130			
1,1,1,2-Tetrachloroethane	3.58	0.05	ug/g		89.5	60-130			
1,1,2,2-Tetrachloroethane	4.16	0.05	ug/g		104	60-130			
Tetrachloroethylene	3.18	0.05	ug/g		79.6	60-130			
Toluene	3.09	0.05	ug/g		77.3	60-130			
1,1,1-Trichloroethane	3.55	0.05	ug/g		88.9	60-130			
1,1,2-Trichloroethane	4.32	0.05	ug/g		108	60-130			
Trichloroethylene	4.39	0.05	ug/g		110	60-130			
Trichlorofluoromethane	2.73	0.05	ug/g		68.2	50-140			
Vinyl chloride	2.59	0.02	ug/g		64.7	50-140			
m,p-Xylenes	8.02	0.05	ug/g		100	60-130			
o-Xylene	3.32	0.05	ug/g		83.0	60-130			
Surrogate: 4-Bromofluorobenzene	*3.21*		*ug/g*		*100*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH9-SS3

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

TRUST RESPO RELIAL

PARACEL WO: 1921390

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
N° 122140

Page 1 of 1

Client Name: PATERSON	Project Reference: PE4588
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd S.	PO # 26441
Telephone: 613-226-7381	Email Address: Mbeaudoin@patersongroup.ca.

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table _ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

	Paracel Order Number: 1921390 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH7-SS5	S		2	May 22/19		X	X		X	X	X							120 mL + 1 vial	✓
2	~~BH8~~-SS3	S		2	↓		X	X		X	X	X							↓	✓
3	BH9-SS5 ✓	S		2	↓		X	X		X	X	X							↓	✓
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: ~ NO.3 Sample ID on Soil Jar read = BH9-SS3. Lm for Mike. SC

Method of Delivery: Swift

Relinquished By (Sign): MIKE B.	Received by Driver/Depot: -	Received at Lab: Sivaneeporn Polmai	Verified By:
Relinquished By (Print):	Date/Time:	Date/Time: May 23, 2019 04:05	Date/Time: 05-24-19 10:26
Date/Time:	Temperature: °C	Temperature: 19.8 °C	pH Verified ☒ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27622
Project: PE4588
Custody: 123188

Report Date: 10-Sep-2019
Order Date: 6-Sep-2019

Order #: 1936482

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1936482-01	BH10-SS2
1936482-02	BH11-SS1
1936482-03	BH12-SS2
1936482-04	BH13-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27622

Report Date: 10-Sep-2019
Order Date: 6-Sep-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 8260 - P&T GC-MS	6-Sep-19	9-Sep-19
Solids, %	Gravimetric, calculation	9-Sep-19	9-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27622

Report Date: 10-Sep-2019

Order Date: 6-Sep-2019

Project Description: PE4588

	Client ID:	BH10-SS2	BH11-SS1	BH12-SS2	BH13-SS2
	Sample Date:	05-Sep-19 10:00	05-Sep-19 10:00	05-Sep-19 13:00	05-Sep-19 15:00
	Sample ID:	1936482-01	1936482-02	1936482-03	1936482-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	81.7	59.1	81.7	83.7
Volatiles					
Acetone	0.50 ug/g dry	<0.50	<0.50	<0.50	<0.50
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromoform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Ethylene dibromide (dibromoethan	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	<0.50	<0.50
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	<0.50	<0.50
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27622

Report Date: 10-Sep-2019

Order Date: 6-Sep-2019

Project Description: PE4588

	Client ID:	BH10-SS2	BH11-SS1	BH12-SS2	BH13-SS2
	Sample Date:	05-Sep-19 10:00	05-Sep-19 10:00	05-Sep-19 13:00	05-Sep-19 15:00
	Sample ID:	1936482-01	1936482-02	1936482-03	1936482-04
	MDL/Units	Soil	Soil	Soil	Soil
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
4-Bromofluorobenzene	Surrogate	101%	101%	101%	100%
Dibromofluoromethane	Surrogate	113%	135%	129%	128%
Toluene-d8	Surrogate	63.9%	63.7%	64.3%	63.7%

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27622

Report Date: 10-Sep-2019
Order Date: 6-Sep-2019
Project Description: PE4588

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	0.50	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Ethylene dibromide (dibromoethane	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Isobutyl Ketone	ND	0.50	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.34*		*ug/g*		*104*	*50-140*			
Surrogate: Dibromofluoromethane	*3.02*		*ug/g*		*94.4*	*50-140*			
Surrogate: Toluene-d8	*2.59*		*ug/g*		*80.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	92.7	0.1	% by Wt.	93.2			0.6	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Ethylene dibromide (dibromoethane	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.50	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*4.36*		*ug/g dry*		*119*	*50-140*			
Surrogate: Dibromofluoromethane	*2.68*		*ug/g dry*		*73.3*	*50-140*			
Surrogate: Toluene-d8	*3.04*		*ug/g dry*		*83.2*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	12.4	0.50	ug/g		124	50-140			
Benzene	4.47	0.02	ug/g		112	60-130			
Bromodichloromethane	5.15	0.05	ug/g		129	60-130			
Bromoform	4.14	0.05	ug/g		104	60-130			
Bromomethane	3.91	0.05	ug/g		97.8	50-140			
Carbon Tetrachloride	4.66	0.05	ug/g		116	60-130			
Chlorobenzene	4.32	0.05	ug/g		108	60-130			
Chloroform	5.13	0.05	ug/g		128	60-130			
Dibromochloromethane	4.21	0.05	ug/g		105	60-130			
Dichlorodifluoromethane	3.02	0.05	ug/g		75.5	50-140			
1,2-Dichlorobenzene	3.83	0.05	ug/g		95.7	60-130			
1,3-Dichlorobenzene	3.86	0.05	ug/g		96.4	60-130			
1,4-Dichlorobenzene	3.88	0.05	ug/g		96.9	60-130			
1,1-Dichloroethane	4.77	0.05	ug/g		119	60-130			
1,2-Dichloroethane	4.98	0.05	ug/g		124	60-130			
1,1-Dichloroethylene	4.11	0.05	ug/g		103	60-130			
cis-1,2-Dichloroethylene	4.57	0.05	ug/g		114	60-130			
trans-1,2-Dichloroethylene	4.33	0.05	ug/g		108	60-130			
1,2-Dichloropropane	4.55	0.05	ug/g		114	60-130			
cis-1,3-Dichloropropylene	4.45	0.05	ug/g		111	60-130			
trans-1,3-Dichloropropylene	4.25	0.05	ug/g		106	60-130			
Ethylbenzene	4.32	0.05	ug/g		108	60-130			
Ethylene dibromide (dibromoethane	4.20	0.05	ug/g		105	60-130			
Hexane	3.48	0.05	ug/g		87.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	12.1	0.50	ug/g		121	50-140			
Methyl Isobutyl Ketone	12.0	0.50	ug/g		120	50-140			
Methyl tert-butyl ether	11.9	0.05	ug/g		119	50-140			
Methylene Chloride	3.55	0.05	ug/g		88.7	60-130			
Styrene	4.17	0.05	ug/g		104	60-130			
1,1,1,2-Tetrachloroethane	4.46	0.05	ug/g		112	60-130			
1,1,2,2-Tetrachloroethane	4.15	0.05	ug/g		104	60-130			
Tetrachloroethylene	4.09	0.05	ug/g		102	60-130			
Toluene	4.21	0.05	ug/g		105	60-130			
1,1,1-Trichloroethane	4.64	0.05	ug/g		116	60-130			
1,1,2-Trichloroethane	4.77	0.05	ug/g		119	60-130			
Trichloroethylene	4.77	0.05	ug/g		119	60-130			
Trichlorofluoromethane	3.89	0.05	ug/g		97.2	50-140			
Vinyl chloride	3.05	0.02	ug/g		76.3	50-140			
m,p-Xylenes	8.60	0.05	ug/g		107	60-130			
o-Xylene	4.35	0.05	ug/g		109	60-130			
Surrogate: 4-Bromofluorobenzene	*2.77*		*ug/g*		*86.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL
LABORATORIES LTD.

Paracel ID: 1936482

Head Office
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e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 123188

Page 1 of 1

Client Name: Patersen Group	Project Reference: PE 4588	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd, Nepean, Ontario	PO # 27622	☑ 2 Day ☐ Regular
	Email Address: mdarcy@patersongroup.ca	
Telephone: (613) 226-7381		Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ______ ☐ Other: ______

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1936482

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH10-SS2	S		2	Sep5/19	10am		✓							250ml + 1 vial				✓
2	BH11-SS1	S		2	Sep5/19	11:30		✓							↓				✓
3	BH12-SS2	S		2	Sep5/19	1pm		✓							↓				✓
4	BH13-SS2	S		2	Sep5/19	3pm		✓							↓				✓
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Doucette	Received by Driver/Depot: [signature]	Received at Lab: Somenpurm Dohmai	Verified By: [signature]
Relinquished By (Print): Nicholas Doucette	Date/Time: 06/09/19 4:00 PM	Date/Time: SEP 06, 2019 04.50	Date/Time: 9-6-19 17:15
Date/Time:	Temperature: °C	Temperature: 18.4 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mark D'Arcy

Client PO: 27622
Project: PE4588
Custody: 123205

Report Date: 10-Sep-2019
Order Date: 9-Sep-2019

Order #: 1937091

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1937091-01	BH13-SS1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27622

Report Date: 10-Sep-2019
Order Date: 9-Sep-2019
Project Description: PE4588

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	10-Sep-19	10-Sep-19
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	6-Sep-19	10-Sep-19
Solids, %	Gravimetric, calculation	9-Sep-19	10-Sep-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27622

Report Date: 10-Sep-2019

Order Date: 9-Sep-2019

Project Description: PE4588

	Client ID:	BH13-SS1	-	-	-
	Sample Date:	05-Sep-19 14:30	-	-	-
	Sample ID:	1937091-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	85.8	-	-	-
Hydrocarbons					
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	33	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	-	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	-	-	-
Anthracene	0.02 ug/g dry	<0.02	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	-	-	-
Chrysene	0.02 ug/g dry	<0.02	-	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	-	-	-
Fluoranthene	0.02 ug/g dry	<0.02	-	-	-
Fluorene	0.02 ug/g dry	<0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	-	-	-
Naphthalene	0.01 ug/g dry	<0.01	-	-	-
Phenanthrene	0.02 ug/g dry	<0.02	-	-	-
Pyrene	0.02 ug/g dry	0.02	-	-	-
2-Fluorobiphenyl	Surrogate	85.0%	-	-	-
Terphenyl-d14	Surrogate	104%	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27622

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Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.769*		*ug/g*		*57.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.58*		*ug/g*		*119*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	93.1	0.1	% by Wt.	92.3			0.9	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F2 PHCs (C10-C16)	74	4	ug/g		92.7	80-120			
F3 PHCs (C16-C34)	192	8	ug/g		98.2	80-120			
F4 PHCs (C34-C50)	111	6	ug/g		89.6	80-120			
Semi-Volatiles									
Acenaphthene	0.176	0.02	ug/g		106	50-140			
Acenaphthylene	0.151	0.02	ug/g		90.8	50-140			
Anthracene	0.164	0.02	ug/g		98.2	50-140			
Benzo [a] anthracene	0.179	0.02	ug/g		107	50-140			
Benzo [a] pyrene	0.143	0.02	ug/g		85.7	50-140			
Benzo [b] fluoranthene	0.208	0.02	ug/g		125	50-140			
Benzo [g,h,i] perylene	0.171	0.02	ug/g		102	50-140			
Benzo [k] fluoranthene	0.214	0.02	ug/g		129	50-140			
Chrysene	0.185	0.02	ug/g		111	50-140			
Dibenzo [a,h] anthracene	0.183	0.02	ug/g		110	50-140			
Fluoranthene	0.181	0.02	ug/g		108	50-140			
Fluorene	0.166	0.02	ug/g		99.6	50-140			
Indeno [1,2,3-cd] pyrene	0.160	0.02	ug/g		96.0	50-140			
1-Methylnaphthalene	0.118	0.02	ug/g		70.7	50-140			
2-Methylnaphthalene	0.134	0.02	ug/g		80.3	50-140			
Naphthalene	0.142	0.01	ug/g		85.2	50-140			
Phenanthrene	0.146	0.02	ug/g		87.7	50-140			
Pyrene	0.178	0.02	ug/g		107	50-140			
Surrogate: 2-Fluorobiphenyl	*1.31*		*ug/g*		*98.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 1937091

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Chain of Custody
(Lab Use Only)
№ 123205

Page 1 of 1

Client Name: Paterson	Project Reference: PE4588
Contact Name: Mark D'Arcy	Quote #
Address:	PO # 27622
Telephone: 226-7381	Email Address:

Turnaround Time:
☑ 1 Day ☐ 3 Day
☐ 2 Day ☐ Regular
Date Required:

Criteria: ☑ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1937091

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	F2 - F4
1	BH13-SS1	S	-	1	Sept 5/19	2:30			✓					✓
2														
3														
4														
5														
6														
7														
8														
9														
10														

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Scrase	Received at Lab:	Verified By:
Relinquished By (Print): Nicholas Ouellette	Date/Time: 09/09/19 4:30 PM	Date/Time: 9-9-19 17:15	Date/Time: 9-9-19 17:50
Date/Time:	Temperature: °C	Temperature: 14.7 °C	pH Verified [ ] By: