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File: PE4046-LET.01

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Geotechnical Engineering
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Geological Engineering
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Attention: **Mr. David Renfroe**

Subject: **Phase II Environmental Site Assessment
398, 402 and 406 Roosevelt Avenue
Ottawa, Ontario**

Dear Sir,

Further to your request and authorization, Paterson Group (Paterson) carried out a Phase II Environmental Site Assessment at the aforementioned site. The purpose of this environmental assessment was to assess any potential environmental impacts resulting from former retail fuel outlet located to the south, at 415 Richmond Road, prior to a potential purchase of the site.

1.0 Background Information

The subject site is located on the west side of Roosevelt Avenue and approximately 25 m north of Richmond Road, in the City of Ottawa, Ontario. The subject properties are occupied by three (3) residential dwellings. Grassed landscaped areas are present to the east of the buildings, along Roosevelt Avenue, and to the west, at the rear of the buildings.

Regional topography slopes downward towards the northwest. The site topography is relatively flat. Site drainage is considered to be primarily sheet flow to catch basins along Roosevelt Avenue with some infiltration in landscaped areas.

Based on information contained in our data, a retail fuel outlet with underground storage tanks was previously present on the adjacent property to the south (415 Richmond Road). Based on the former presence of USTs and the use of the neighbouring property as an automotive service garage, a subsurface investigation was recommended and conducted

for the subject site. The results of the Phase II-ESA are contained herein.

2.0 Subsurface Investigation

Two (2) boreholes (BH1 and BH2) were placed on the subject property on June 28, 2017. BH1 was placed near the southern boundary of 406 Roosevelt Avenue, adjacent to the former retail fuel outlet, and BH2 was placed further north for site coverage. The boreholes were extended to a maximum depth of 7.6 m below ground surface. Both boreholes were instrumented with a groundwater monitoring well. The boreholes were drilled using a track-mounted drill rig under the full time supervision of Paterson personnel.

The borehole locations were determined by Paterson personnel taking into consideration property boundaries, site features and underground services. The locations of the boreholes are illustrated on the enclosed Test Hole Location Plan. The depths at which the auger and split spoon samples were obtained from the test holes are shown as “**AU**” and “**SS**” on the Soil Profile and Test Data sheets, attached to this report.

Subsurface Profile

The subsurface profile at the locations of BH1 and BH2 consists of interbedded and limestone and shale bedrock, overlain by silty sand with topsoil and trace gravel in BH1 and silty sand fill under asphalt in BH2. The subsurface material was not considered to be impacted or contain any deleterious substances. The specific details of the soil profile at the test hole locations are presented on the attached Soil Profile and Test Data sheets.

Monitoring Well Installation

Groundwater monitoring wells were installed in BH1 and BH2, the locations of which can be seen on the attached Test Hole Location Plan. Typical monitoring well construction details are described below:

- Slotted 32 mm diameter PVC screen at base of borehole.
- 32 mm diameter PVC riser pipe from the top of the screen to ground surface.
- No.3 silica sand backfill within annular space around screen.
- Bentonite above sand pack to just below ground surface.
- Clean backfill from top of bentonite plug to the ground surface.

Refer to the Soil Profile and Test Data sheets attached for the actual well construction in BH1 and BH2.

Soil Sampling Protocol

A total of six (6) soil samples and nine (9) rock core samples were recovered from the test holes by means of stainless steel split spoon sampling and diamond coring equipment. Upon recovery, all samples were immediately sealed in appropriate containers to facilitate a preliminary screening procedure. No unusual visual or olfactory observations were made regarding the soil samples obtained.

All samples recovered as part of this investigation will be stored in the laboratory for a period of one (1) month after issuance of this report. All samples will then be discarded unless this firm is otherwise directed.

Soil Sample Headspace Analysis

An RKI Eagle (gastech) calibrated to hexane was used to measure the combustible vapour concentrations in the headspace of all soil samples recovered from the boreholes. The technical protocol was obtained from Appendix C of the MOECC document titled "Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario", dated March 1992.

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey. Allowing the samples to stabilize to room temperature ensures consistency of readings between samples.

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement. The parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale.

The combustible vapour readings were found to range from 0 to 10 ppm in the soil samples obtained. These vapour readings do not indicate the presence of volatile contaminants such as gasoline related parameters. It should be noted that the vapour results can not be used to identify the presence of heavier petroleum hydrocarbons (PHCs) or weathered PHCs. The results of the vapour survey are presented on the Soil Profile and Test Data sheets.

Groundwater

A site visit was conducted on July 5, 2017 to measure groundwater levels and to sample the groundwater from the monitoring wells. The groundwater levels were found to range

from 4.77 to 5.18 m below the existing ground surface. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations. No unusual visual or olfactory observations were noted regarding the groundwater obtained from any of the boreholes.

Elevation Surveying

An elevation and location survey of all borehole locations was completed by Paterson Personnel. All borehole elevations are referenced to a temporary benchmark. The site benchmark is the top spindle of a fire hydrant located across the street from 402 Roosevelt Avenue, which was assigned an arbitrary elevation of 100 m.

3.0 Analytical Test Results

Soil and Groundwater Standards

The soil and groundwater standards for the subject site were obtained from Table 7 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*", dated April 15, 2011. The MOECC Standards are based on the following considerations:

- Coarse grained soil conditions.
- Shallow soil site conditions.
- Non-potable groundwater situation.
- Residential land use.

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

Soil

Based on our visual, vapour survey and olfactory observations, two (2) soil samples were submitted to Paracel Laboratories for the following parameters: petroleum hydrocarbons (PHCs Fractions 1 to 4) and benzene, toluene, ethylbenzene and xylenes (BTEX). The results of the analytical testing and the selected soil standards are presented in Table 1. A copy of the laboratory certificate of analysis is attached to this report.

Table 1 Analytical Test Results - Soil BTEX and PHCs (Fractions 1 to 4)				
Parameter	MDL (µg/g)	Soil Samples (µg/g)		MOECC Table 7 Standards Residential Land Use (µg/g)
		BH1-AU1	BH2-SS3	
Benzene	0.02	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	2
Toluene	0.05	nd	nd	2.3
Xylenes (Total)	0.05	nd	nd	3.1
F ₁ PHCs (C ₆ -C ₁₀)	7	nd	nd	55
F ₂ PHCs (C ₁₀ -C ₁₆)	4	4	nd	98
F ₃ PHCs (C ₁₆ -C ₃₄)	8	38	nd	300
F ₄ PHCs (C ₃₄ -C ₅₀)	6	39	nd	2,800
Notes: <input type="checkbox"/> MDL - Method Detection Limit <input type="checkbox"/> nd - Not Detected (< MDL)				

No detectable BTEX or PHC parameter concentrations were identified in the soil sample BH2-SS3. No detectable BTEX parameter concentrations were identified in the soil sample BH1-AU1. The concentrations of PHC parameters in sample BH1-AU1 comply with the MOECC Table 7 standards.

Groundwater

Groundwater samples were collected from the monitoring wells installed in BH1 and BH2 on July 5, 2017, and a third sample was collected from BH1 on July 12, 2017. The water samples were submitted for PHCs (Fractions F1 to F4) and volatile organic compounds (VOCs) analysis. The results of the analytical testing and the selected MOECC standards are presented in Tables 2 and 3. A copy of the laboratory certificate of analysis is attached to this report.

Table 2 Analytical Test Results - Groundwater PHCs (Fractions 1 to 4)					
Parameter	MDL (ug/L)	Groundwater Samples (ug/L)			MOECC Table 7 Standards Residential Land Use (µg/g)
		July 5, 2017		July 12, 2017	
		BH1-GW1	BH2-GW1	BH1-GW2	
F1 PHCs (C ₆ -C ₁₀)	25	nd	nd	nd	420
F2 PHCs (C ₁₀ -C ₁₆)	100	nd	nd	nd	150
F3 PHCs (C ₁₆ -C ₃₄)	100	nd	nd	nd	500
F4 PHCs (C ₃₄ -C ₅₀)	100	nd	nd	nd	500

Notes: MDL - Method Detection Limit
 nd - Not Detected (< MDL)
 Bold and underlined - results exceed the selected MOECC standards.

No detectable PHC concentrations were identified in the groundwater samples analysed. The test results comply with the MOECC Table 7 standards.

Table 3
Analytical Test Results - Groundwater
VOCs

Parameter	MDL (ug/L)	Groundwater Samples (ug/L)			MOECC Table 7 Standards Residential Land Use (µg/g)
		July 5, 2017		July 12, 2017	
		BH1-GW1	BH2-GW1	BH1-GW2	
Acetone	5	nd	nd	nd	100,000
Benzene	0.5	nd	nd	nd	0.5
Bromodichloromethane	0.5	nd	nd	nd	67,000
Bromoform	0.5	nd	nd	nd	5
Bromomethane	0.5	nd	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	nd	0.2
Chlorobenzene	0.5	nd	nd	nd	140
Chloroform	0.5	<u>4.6</u>	nd	<u>2.3</u>	2
Dibromochloromethane	0.5	nd	nd	nd	65,000
Dichlorodifluoromethane	1	nd	nd	nd	3,500
1,2-Dichlorobenzene	0.5	nd	nd	nd	150
1,3-Dichlorobenzene	0.5	nd	nd	nd	7,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	0.5
1,1-Dichloroethane	0.5	nd	nd	nd	11
1,2-Dichloroethane	0.5	nd	nd	nd	0.5
1,1-Dichloroethylene	0.5	nd	nd	nd	0.5
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	0.58
1,3-Dichloropropene	0.5	nd	nd	nd	0.5
Ethylbenzene	0.5	nd	nd	nd	54
Ethylene dibromide	0.5	nd	nd	nd	0.2
Hexane	0.5	nd	nd	nd	5
Methyl Ethyl Ketone	5.0	nd	nd	nd	21,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	5,200

Notes: MDL - Method Detection Limit
 nd - Not Detected (< MDL)
 Bold & Underlined - Value exceeds selected MOECC Standard

Table 3 - continued					
Analytical Test Results - Groundwater					
VOCs					
Parameter	MDL (ug/L)	Groundwater Samples (ug/L)			MOECC Table 7 Standards Residential Land Use (µg/g)
		July 5, 2017		July 12, 2017	
		BH1-GW1	BH2-GW1	BH1-GW2	
Methyl tert-butyl ether	0.5	nd	nd	nd	15
Methylene Chloride	5.0	nd	nd	nd	26
Styrene	0.5	nd	nd	nd	43
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	0.5
Tetrachloroethylene	0.5	nd	nd	nd	0.5
Toluene	0.5	nd	nd	nd	320
1,1,1-Trichloroethane	0.5	nd	nd	nd	23
1,1,2-Trichloroethane	0.5	nd	nd	nd	0.5
Trichloroethylene	0.5	nd	nd	nd	0.5
Trichlorofluoromethane	1.0	nd	nd	nd	2,000
Vinyl chloride	0.5	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	72
Notes: <input type="checkbox"/> MDL - Method Detection Limit <input type="checkbox"/> nd - Not Detected (< MDL) <input type="checkbox"/> <u>Value</u> - Value exceeds selected MOECC Standard					

With the exception of chloroform in the limited water sample from BH1 (BH1-GW1), no VOC parameter concentrations were detected in the groundwater samples. The chloroform in BH1-GW1 was in excess of the selected MOECC Standard; however, it is suspected that the concentration is a result of the use of chlorine to treat City drinking water. The retest of BH1 identified a reduced chloroform concentration, and this concentration is expected to dissipate readily in the near future.

4.0 Assessment and Recommendations

Assessment

A Phase II-ESA was conducted on the subject property to investigate potential impacts from a former retail fuel outlet and automotive service garage located immediately to the south.

Two (2) boreholes were placed on the subject property on June 28, 2017. The boreholes were distributed in a manner as to provide coverage of the southern property boundary near the location of the former RFO and general coverage of the subject site. The locations were determined in the field by Paterson personnel taking into consideration site features and underground services. The boreholes were instrumented with groundwater monitoring wells.

Soil

No unusual visual or olfactory observations were made regarding the soil samples obtained from any of the boreholes. No significant combustible vapour concentrations were detected in the soil samples obtained. Two (2) soil samples were submitted to Paracel Laboratories for PHC and BTEX analysis. The majority of the parameters were not detected, while several PHC parameters concentration were identified in soil sample BH1-AU1. However, all soil test results comply with the MOECC Table 7 standards.

Groundwater

Groundwater samples were collected from the monitoring wells installed in BH1 and BH2 on July 5, 2017. No visual or olfactory observations of potential fuel impact were noted during the field sampling program. The water samples were submitted for PHC and VOC analysis. No detectable PHC or VOC concentrations were identified in the groundwater samples analysed, with the exception of chloroform in BH1. The chloroform was suspected to be the result of the use of municipal water during the drilling program. BH1 was retested and found to have reduced chloroform concentration.

Conclusion

Based on the results of the Phase II-ESA, it is our opinion that the historical potentially contaminating activities along Richmond Road have not affected the subsurface of the subject site. No further investigation is recommended at this time.

Monitoring Wells

If the monitoring wells installed in BH1 and BH2 are not going to be used in the future, they should be abandoned according to Ontario Regulation 903. The monitoring wells will be registered with the MOECC under this regulation. Further information can be provided upon request in this regard.

5.0 Statement of Limitations

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 described by the test holes themselves.

Should any conditions be encountered at the subject property 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 Domicile Developments Inc. Permission from Paterson and Domicile will be required to release this report to any other party.

We trust that this report satisfies your requirements.

Paterson Group Inc.



Anna Graham, M.E.S.



Mark D'Arcy, P.Eng

Report Distribution

- Domicile Developments Inc. (2 copies)
- Paterson Group (1 copy)

Attachments

- Soil Profile and Test Data Sheets
- Symbols and Terms
- Laboratory Certificates of Analysis
- Drawing No. PE4046-1 - Test Hole Location Plan

DATUM TBM - Top spindle of fire hydrant located in front of 402 Roosevelt Avenue.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 28, 2017

FILE NO. PE4046

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %				
GROUND SURFACE								20	40	60	80		
FILL: Brown silty sand with topsoil, trace organics and gravel		AU	1			0	98.68						
	0.69												
		SS	2	53	50+	1	97.68						
		RC	1	100	0								
		RC	2	100	10	2	96.68						
		RC	3	100	0								
BEDROCK: Grey limestone		RC	4	100	98	5	93.68						
		RC	5	100	82	7	91.68						
	7.57												
End of Borehole (GWL @ 5.18m - July 5, 2017)													

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

DATUM TBM - Top spindle of fire hydrant located in front of 402 Roosevelt Avenue.
Assumed elevation = 100.00m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 28, 2017

FILE NO. PE4046

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Photo Ionization Detector				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			● Volatile Organic Rdg. (ppm)	○ Lower Explosive Limit %			
GROUND SURFACE							20	40	60	80		
Asphaltic concrete	0.10	AU	1			0	99.11					
FILL: Crushed stone with silty sand	0.30	AU	2									
FILL: Brown silty clay, some sand, trace gravel	0.69											
FILL: Brown silty sand, some cobbles, trace gravel	1.35	SS	3	62	50+	1	98.11					
		SS	4	50	50+							
		RC	1	100	30	2	97.11					
						3	96.11					
		RC	2	100	23	4	95.11					
BEDROCK: Grey limestone						5	94.11					
		RC	3	100	51	6	93.11					
						7	92.11					
		RC	4	100	80							
End of Borehole	7.70											
(GWL @ 4.77m - July 5, 2017)												

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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 = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = D_{60} / D_{10}

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		Overconsolidation 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.
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SYMBOLS AND TERMS (continued)

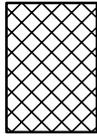
STRATA PLOT



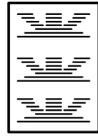
Topsoil



Asphalt



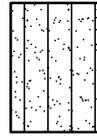
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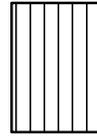
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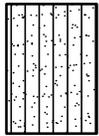
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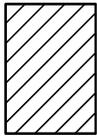
Silty Sand



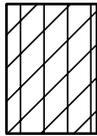
Silt



Sandy Silt



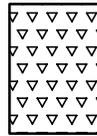
Clay



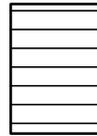
Silty Clay



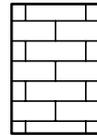
Clayey Silty Sand



Glacial Till



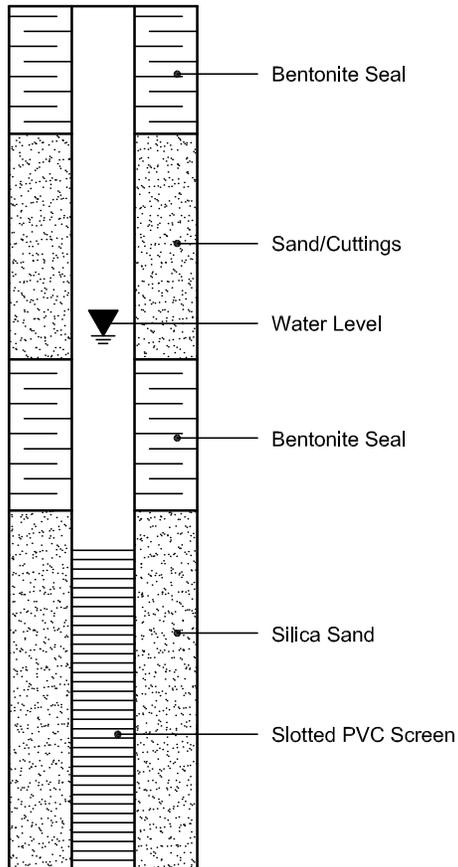
Shale



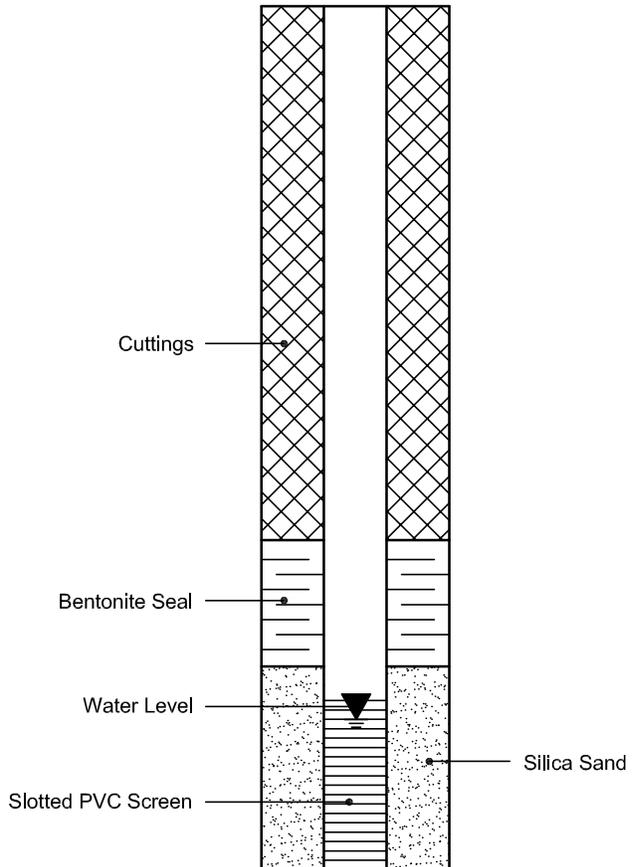
Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Client PO: 20647
Project: PE4046
Custody: 113547

Report Date: 5-Jul-2017
Order Date: 29-Jun-2017

Order #: 1726389

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

Parcel ID	Client ID
1726389-01	BH1-AU1
1726389-02	BH2-SS3

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-Jul-17	5-Jul-17
PHC F1	CWS Tier 1 - P&T GC-FID	3-Jul-17	5-Jul-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Jun-17	4-Jul-17
Solids, %	Gravimetric, calculation	30-Jun-17	30-Jun-17

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

Client ID:	BH1-AU1	BH2-SS3	-	-
Sample Date:	28-Jun-17	28-Jun-17	-	-
Sample ID:	1726389-01	1726389-02	-	-
MDL/Units	Soil	Soil	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	84.4	93.4	-	-
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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	91.5%	93.1%	-	-

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	38	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	39	<6	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

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						
Volatiles									
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	3.44		ug/g		108	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

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)	10	4	ug/g dry	ND			0.0	30	
F3 PHCs (C16-C34)	193	8	ug/g dry	ND			0.0	30	
F4 PHCs (C34-C50)	28	6	ug/g dry	ND			0.0	30	
Physical Characteristics									
% Solids	91.2	0.1	% by Wt.	91.3			0.1	25	
Volatiles									
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	1.72		ug/g dry		97.1	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	191	7	ug/g		95.5	80-120			
F2 PHCs (C10-C16)	111	4	ug/g	ND	111	60-140			
F3 PHCs (C16-C34)	195	8	ug/g		105	80-120			
F4 PHCs (C34-C50)	185	6	ug/g	ND	133	60-140			
Volatiles									
Benzene	3.22	0.02	ug/g		80.6	60-130			
Ethylbenzene	3.98	0.05	ug/g		99.4	60-130			
Toluene	3.78	0.05	ug/g		94.4	60-130			
m,p-Xylenes	7.85	0.05	ug/g		98.2	60-130			
o-Xylene	3.92	0.05	ug/g		98.0	60-130			
Surrogate: Toluene-d8	3.23		ug/g		101	50-140			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 20647

Report Date: 05-Jul-2017

Order Date: 29-Jun-2017

Project Description: PE4046

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.



Client Name: <u>Patersan Group</u>	Project Reference: <u>PE4046</u>	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <u>Eric Leveque</u>	Quote #	
Address: <u>154 Comrade Rd S.</u>	PO # <u>20647</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>e.leveque@patersangroup.ca</u>	

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)

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	P.A.
				Date	Time								
1 <u>BH1-AU</u>	<u>S</u>		<u>2</u>	<u>June 28, 2017</u>		<input checked="" type="checkbox"/>							
2 <u>BH2-SS3</u>	<u>S</u>		<u>2</u>	<u>↓</u>									<u>- 120ml + 1 uid -</u>
3													
4													
5													
6													
7													
8													
9													
10													

Comments: _____ Method of Delivery: Paracel

Relinquished By (Sign): <u>[Signature]</u>	Received by Driver/Depot: <u>[Signature]</u>	Received at Lab: <u>[Signature]</u>	Verified By: <u>[Signature]</u>
Relinquished By (Print): <u>Erik Ardley</u>	Date/Time: <u>29/06/17 3:20</u>	Date/Time: <u>JUN 29, 2017 05:10</u>	Date/Time: <u>06/29/17 5:16</u>
Date/Time: <u>June 28, 2017</u>	Temperature: <u>17.1</u> °C	Temperature: <u>17.6</u> °C	pH Verified [] By: _____

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Client PO: 20650
Project: PE4046
Custody: 36169

Report Date: 10-Jul-2017
Order Date: 6-Jul-2017

Order #: 1727374

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

Parcel ID	Client ID
1727374-01	BH1-GW1
1727374-02	BH2-GW1

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	7-Jul-17	9-Jul-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Jul-17	8-Jul-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	7-Jul-17	9-Jul-17

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

Client ID:	BH1-GW1	BH2-GW1	-	-
Sample Date:	05-Jul-17	05-Jul-17	-	-
Sample ID:	1727374-01	1727374-02	-	-
MDL/Units	Water	Water	-	-

Volatiles

	MDL/Units	BH1-GW1	BH2-GW1		
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	4.6	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

	Client ID:	BH1-GW1	BH2-GW1	-	-
	Sample Date:	05-Jul-17	05-Jul-17	-	-
	Sample ID:	1727374-01	1727374-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	101%	101%	-	-
Dibromofluoromethane	Surrogate	94.7%	95.1%	-	-
Toluene-d8	Surrogate	115%	113%	-	-

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: **PE4046**

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						
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	80.9		ug/L		101	50-140			
Surrogate: Dibromofluoromethane	74.9		ug/L		93.6	50-140			
Surrogate: Toluene-d8	89.1		ug/L		111	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

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	
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	79.1		ug/L		98.8	50-140			
Surrogate: Dibromofluoromethane	75.3		ug/L		94.1	50-140			
Surrogate: Toluene-d8	91.9		ug/L		115	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1930	25	ug/L		96.5	68-117			
F2 PHCs (C10-C16)	1660	100	ug/L		92.1	60-140			
F3 PHCs (C16-C34)	3130	100	ug/L		84.0	60-140			
F4 PHCs (C34-C50)	2740	100	ug/L		110	60-140			
Volatiles									
Acetone	116	5.0	ug/L		116	50-140			
Benzene	39.0	0.5	ug/L		97.6	60-130			
Bromodichloromethane	39.6	0.5	ug/L		99.0	60-130			
Bromoform	43.4	0.5	ug/L		109	60-130			
Bromomethane	30.8	0.5	ug/L		77.1	50-140			
Carbon Tetrachloride	38.7	0.2	ug/L		96.8	60-130			
Chlorobenzene	41.5	0.5	ug/L		104	60-130			
Chloroform	38.3	0.5	ug/L		95.6	60-130			
Dibromochloromethane	41.5	0.5	ug/L		104	60-130			
Dichlorodifluoromethane	42.9	1.0	ug/L		107	50-140			
1,2-Dichlorobenzene	47.5	0.5	ug/L		119	60-130			
1,3-Dichlorobenzene	46.2	0.5	ug/L		116	60-130			
1,4-Dichlorobenzene	45.4	0.5	ug/L		113	60-130			
1,1-Dichloroethane	39.8	0.5	ug/L		99.4	60-130			
1,2-Dichloroethane	38.5	0.5	ug/L		96.4	60-130			
1,1-Dichloroethylene	38.8	0.5	ug/L		97.0	60-130			
cis-1,2-Dichloroethylene	38.2	0.5	ug/L		95.6	60-130			
trans-1,2-Dichloroethylene	39.0	0.5	ug/L		97.4	60-130			
1,2-Dichloropropane	40.6	0.5	ug/L		101	60-130			
cis-1,3-Dichloropropylene	41.1	0.5	ug/L		103	60-130			
trans-1,3-Dichloropropylene	42.5	0.5	ug/L		106	60-130			
Ethylbenzene	45.7	0.5	ug/L		114	60-130			
Ethylene dibromide (dibromoethane)	41.5	0.2	ug/L		104	60-130			
Hexane	38.0	1.0	ug/L		95.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	105	5.0	ug/L		105	50-140			
Methyl Isobutyl Ketone	116	5.0	ug/L		116	50-140			
Methyl tert-butyl ether	100	2.0	ug/L		100	50-140			
Methylene Chloride	47.9	5.0	ug/L		120	60-130			
Styrene	47.4	0.5	ug/L		119	60-130			
1,1,1,2-Tetrachloroethane	43.5	0.5	ug/L		109	60-130			
1,1,2,2-Tetrachloroethane	49.5	0.5	ug/L		124	60-130			
Tetrachloroethylene	38.9	0.5	ug/L		97.2	60-130			
Toluene	41.6	0.5	ug/L		104	60-130			
1,1,1-Trichloroethane	38.4	0.5	ug/L		96.1	60-130			
1,1,2-Trichloroethane	39.6	0.5	ug/L		99.0	60-130			
Trichloroethylene	38.1	0.5	ug/L		95.2	60-130			
Trichlorofluoromethane	39.5	1.0	ug/L		98.8	60-130			
Vinyl chloride	37.6	0.5	ug/L		94.1	50-140			
m,p-Xylenes	87.5	0.5	ug/L		109	60-130			
o-Xylene	44.4	0.5	ug/L		111	60-130			
Surrogate: 4-Bromofluorobenzene	80.8		ug/L		101	50-140			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: 20650

Report Date: 10-Jul-2017

Order Date: 6-Jul-2017

Project Description: PE4046

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.

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.

Parcel ID: 1727374



TRUSTED .
RESPONSIVE
RELIABLE .



Chain of Custody
(Lab Use Only)
No. 36169

Page 1 of 1

Client Name: Paterson Group	Project Reference: PE 4046	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: ERIC Leveque	Quote #	
Address: 154 Colonnade Rd S.	PO # 20650	
Telephone: 613-226-7381	Email Address: eleveque@patersongroup.ca	

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: 1727374				Required Analyses			
Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHC(FI-Fu)	VOC
				Date	Time		
1 BH1-GW1	GW		3	July 5, 2017		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2 BH2-GW1	GW		3	↓		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3							
4							
5							
6							
7							
8							
9							
10							

Comments: _____ Method of Delivery: **Paracel**

Relinquished By (Sign):	Received by Driver/Depot: A. Frouse	Received at Lab:	Verified By:
Relinquished By (Print): ERIN AROLEY	Date/Time: 06/07/17 3:40	Date/Time: 07/05/17 5:30pm	Date/Time: 07/07/17 11:29am
Date/Time: July 5, 2017	Temperature: 7.1	Temperature: 15.5	pH Verified By:

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Eric Leveque

Client PO: 22043
Project: PE4046
Custody: 37374

Report Date: 18-Jul-2017
Order Date: 12-Jul-2017

Order #: 1728358

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

Parcel ID	Client ID
1728358-01	BH1-GW2

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 22043

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	14-Jul-17	16-Jul-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	14-Jul-17	15-Jul-17
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	14-Jul-17	16-Jul-17

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 22043

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

Client ID:	BH1-GW2	-	-	-
Sample Date:	12-Jul-17	-	-	-
Sample ID:	1728358-01	-	-	-
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	2.3	-	-	-
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 (dibromoethane)	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: 22043

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

	Client ID:	BH1-GW2	-	-	-
	Sample Date:	12-Jul-17	-	-	-
	Sample ID:	1728358-01	-	-	-
	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	96.8%	-	-	-
Dibromofluoromethane	Surrogate	118%	-	-	-
Toluene-d8	Surrogate	109%	-	-	-

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	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: **22043**

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: **PE4046**

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						
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	78.0		ug/L		97.4	50-140			
Surrogate: Dibromofluoromethane	92.6		ug/L		116	50-140			
Surrogate: Toluene-d8	88.7		ug/L		111	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 22043

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

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	
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	77.3		ug/L		96.6	50-140			
Surrogate: Dibromofluoromethane	95.1		ug/L		119	50-140			
Surrogate: Toluene-d8	88.3		ug/L		110	50-140			

Certificate of Analysis
 Client: Paterson Group Consulting Engineers
 Client PO: 22043

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2030	25	ug/L		101	68-117			
F2 PHCs (C10-C16)	2150	100	ug/L		120	60-140			
F3 PHCs (C16-C34)	4120	100	ug/L		111	60-140			
F4 PHCs (C34-C50)	2790	100	ug/L		112	60-140			
Volatiles									
Acetone	105	5.0	ug/L		105	50-140			
Benzene	44.0	0.5	ug/L		110	60-130			
Bromodichloromethane	47.4	0.5	ug/L		118	60-130			
Bromoform	44.6	0.5	ug/L		111	60-130			
Bromomethane	38.4	0.5	ug/L		96.0	50-140			
Carbon Tetrachloride	44.5	0.2	ug/L		111	60-130			
Chlorobenzene	41.5	0.5	ug/L		104	60-130			
Chloroform	43.9	0.5	ug/L		110	60-130			
Dibromochloromethane	44.7	0.5	ug/L		112	60-130			
Dichlorodifluoromethane	42.8	1.0	ug/L		107	50-140			
1,2-Dichlorobenzene	41.0	0.5	ug/L		103	60-130			
1,3-Dichlorobenzene	40.3	0.5	ug/L		101	60-130			
1,4-Dichlorobenzene	40.0	0.5	ug/L		100	60-130			
1,1-Dichloroethane	44.4	0.5	ug/L		111	60-130			
1,2-Dichloroethane	42.4	0.5	ug/L		106	60-130			
1,1-Dichloroethylene	39.2	0.5	ug/L		98.0	60-130			
cis-1,2-Dichloroethylene	45.3	0.5	ug/L		113	60-130			
trans-1,2-Dichloroethylene	39.3	0.5	ug/L		98.4	60-130			
1,2-Dichloropropane	41.6	0.5	ug/L		104	60-130			
cis-1,3-Dichloropropylene	50.2	0.5	ug/L		126	60-130			
trans-1,3-Dichloropropylene	48.1	0.5	ug/L		120	60-130			
Ethylbenzene	47.4	0.5	ug/L		119	60-130			
Ethylene dibromide (dibromoethane)	41.8	0.2	ug/L		104	60-130			
Hexane	43.4	1.0	ug/L		109	60-130			
Methyl Ethyl Ketone (2-Butanone)	113	5.0	ug/L		113	50-140			
Methyl Isobutyl Ketone	111	5.0	ug/L		111	50-140			
Methyl tert-butyl ether	108	2.0	ug/L		108	50-140			
Methylene Chloride	27.1	5.0	ug/L		67.6	60-130			
Styrene	48.5	0.5	ug/L		121	60-130			
1,1,1,2-Tetrachloroethane	44.1	0.5	ug/L		110	60-130			
1,1,2,2-Tetrachloroethane	45.0	0.5	ug/L		112	60-130			
Tetrachloroethylene	39.8	0.5	ug/L		99.4	60-130			
Toluene	42.5	0.5	ug/L		106	60-130			
1,1,1-Trichloroethane	45.0	0.5	ug/L		112	60-130			
1,1,2-Trichloroethane	43.8	0.5	ug/L		109	60-130			
Trichloroethylene	40.7	0.5	ug/L		102	60-130			
Trichlorofluoromethane	41.9	1.0	ug/L		105	60-130			
Vinyl chloride	44.7	0.5	ug/L		112	50-140			
m,p-Xylenes	89.2	0.5	ug/L		112	60-130			
o-Xylene	43.9	0.5	ug/L		110	60-130			
Surrogate: 4-Bromofluorobenzene	70.3		ug/L		87.9	50-140			

Certificate of Analysis
Client: **Paterson Group Consulting Engineers**
Client PO: **22043**

Report Date: 18-Jul-2017

Order Date: 12-Jul-2017

Project Description: PE4046

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.

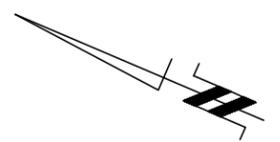
CCME PHC additional information:

- 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.

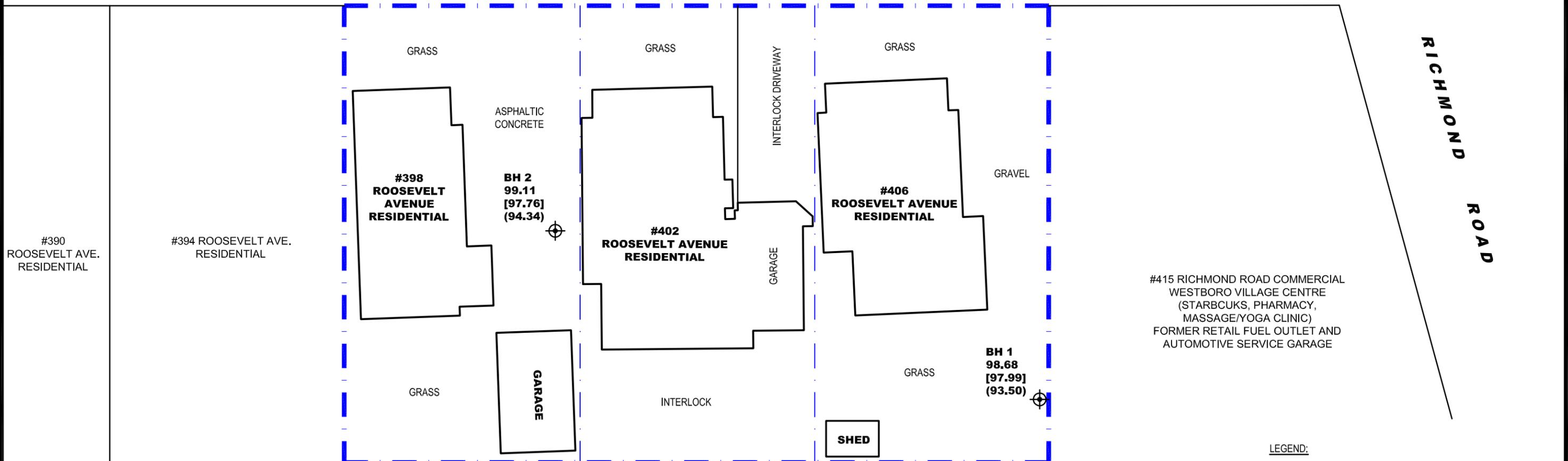
#389
ROOSEVELT AVE.
RESIDENTIAL

#403 RICHMOND ROAD
WESTBORO CHAPEL /
TUBMAN FUNERAL HOME

FH - TBM



R O O S E V E L T A V E N U E



- LEGEND:**
- BOREHOLE WITH MONITORING WELL LOCATION
 - 98.68 GROUND SURFACE ELEVATION (m)
 - [97.99] BEDROCK SURFACE ELEVATION (m)
 - (93.46) GROUNDWATER SURFACE ELEVATION (m)
 - TBM - TOP SPINDLE OF FIRE HYDRANT. ASSUMED ELEVATION = 100.00m.

#389 BERKLEY AVE. RESIDENTIAL	#391 BERKLEY AVE. RESIDENTIAL	#395 BERKLEY AVENUE RESIDENTIAL	#397 BERKLEY AVE. RESIDENTIAL	#399 BERKLEY AVE. RESIDENTIAL	#401 BERKLEY AVENUE RESIDENTIAL
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<p>patersongroup consulting engineers</p> <p>154 Colonnade Road South Ottawa, Ontario K2E 7J5 Tel: (613) 226-7381 Fax: (613) 226-6344</p>					<p>DOMICILE DEVELOPMENTS PHASE II - ENVIRONMENTAL SITE ASSESSMENT 398, 402 AND 406 ROOSEVELT AVENUE</p>		Scale: 1:250	Date: 10/2017
					<p>OTTAWA, ONTARIO</p>		Drawn by: MPG	Report No.: PE4046-1
				<p>Title: TEST HOLE LOCATION PLAN</p>		Checked by: AG	Dwg. No.: PE4046-1	
						Approved by: MSD	Revision No.: 0	
NO.	REVISIONS	DATE	INITIAL					

p:\autocad drawings\environmental\pe4046\pe4046-1.dwg