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Phase II - Environmental Site Assessment

Vacant Residential Property
107-109 Armstrong Street and 71-73 Merton Street
Ottawa, Ontario

Prepared For

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Table of Contents

EXECUTIVE SUMMARY	iii
1.0 INTRODUCTION	1
1.1 Site Description	1
1.2 Property Ownership	1
1.3 Current and Proposed Future Uses	2
1.4 Applicable Site Condition Standard	2
2.0 BACKGROUND INFORMATION	2
2.1 Physical Setting	2
2.2 Past Investigations	2
3.0 SCOPE OF INVESTIGATION	3
3.1 Overview of Site Investigation	3
3.2 Media Investigated	3
3.3 Phase I Conceptual Site Model	3
3.4 Deviations from Sampling and Analysis Plan	5
3.5 Impediments	5
4.0 INVESTIGATION METHOD	5
4.1 Subsurface Investigation	5
4.2 Soil Sampling	5
4.3 Field Screening Measurements	6
4.4 Groundwater Monitoring Well Installation	6
4.5 Groundwater Sampling	7
4.6 Analytical Testing	7
4.7 Residue Management	8
4.8 Elevation Surveying	8
4.9 Quality Assurance and Quality Control Measures	9
5.0 REVIEW AND EVALUATION	9
5.1 Geology	9
5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient	9
5.3 Fine-Medium Soil Texture	10
5.4 Soil: Field Screening	10
5.5 Soil Quality	10
5.6 Groundwater Quality	12
5.7 Phase II Conceptual Site Model	14
6.0 CONCLUSIONS	18
7.0 STATEMENT OF LIMITATIONS	19

List of Figures

Figure 1 - Key Plan

Drawing PE3703-1– Test Hole Location Plan

Drawing PE3703-2 – Analytical Testing Plan

Drawing PE3703-3 – Groundwater Contour Plan

Drawing PE3703-4 – Cross-Section A-A`

List of Appendices

Appendix 1 Sampling and Analysis Plan

Soil Profile and Test Data Sheets

Symbols and Terms

Laboratory Certificates of Analysis

EXECUTIVE SUMMARY

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted for the property at 107-109 Armstrong Street and 71-73 Merton Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the area of potential environmental concern on the subject site, posed by the former use of the neighbouring property to the south as a dry cleaning facility. The Phase II-ESA consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells to assess soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Site soils consist of a layer of fill material, which is underlain by a compact to dense glacial till. Based on the field observations and screening results, various samples were selected for analysis of volatile organic compounds (VOCs). Based on the analytical results, the site soil is in compliance with the Ontario Ministry of the Environment and Climate Change (MOECC) Table 3 Standards for VOC parameters.

Groundwater samples were collected from the monitoring wells installed in each borehole, and analysed for VOCs. One (1) groundwater sample was also analysed for petroleum hydrocarbon fractions 1-4 (PHCs F1-F4). All groundwater samples are in compliance with the MOECC Table 3 Standards for the analysed parameters.

Based on the above results, the soil and groundwater at the subject has not been impacted by the former use of the neighbouring property as a dry cleaning facility. No further investigative work is recommended at this time.

Recommendations

If the monitoring wells 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.

1.0 INTRODUCTION

At the request of Mr. Stanley Levine of Sherbrooke Urban Developments Ltd., Paterson Group (Paterson) conducted a Phase II-Environmental Site Assessment (ESA) of the property addressed 107-109 Armstrong Street and 71-73 Merton Street, in the City of Ottawa, Ontario. The purpose of this Phase II-ESA was to address concerns posed to the subject site from the former operation of a dry cleaning business located on a neighbouring property in the area of the subject site.

1.1 Site Description

Address: 107-109 Armstrong Street and 71-73 Merton Street, Ottawa, Ontario.

Legal Description: Part of Lot 37, Concession 1, Nepean Township, Ottawa Front.

Property Identification

Number: 04095-0234.

Location: The subject site is located at the northeast corner of the intersection of Armstrong Street and Merton Street, in the City of Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan following the body of this report.

Latitude and Longitude: 45° 24' 17" N, 75° 43' 31" W.

Configuration: Quasi-triangular.

Site Area: 3,600 square meters (approximate).

1.2 Property Ownership

The property is currently owned by Mr. Paul Bauchamp. Paterson was engaged to complete the Phase II-ESA at the subject site by Mr. Stanley Levine with Sherbrooke Urban Developments Ltd. Mr. Levine can be reached by telephone at (613) 820-1040.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by a vacant two (2) storey residential building. Historical research indicates that the site has always been used for residential purposes. A private garage structure was formerly present along the northern property line of the subject site, in the area of BH1. It is our understanding that Sherbrooke Urban Developments Ltd. intends to demolish the building and redevelop the property with townhomes.

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 Ontario Ministry of the Environment and Climate Change (MOECC), April 2011. The MOECC Table 3 Standards are based on the following considerations:

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

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The vacant residential structure is present on the west property edge, extending north from the southern property corner. Two asphalt parking areas are present to the east and north of the subject building. An overgrown garden/yard area is present between the parking areas.

2.2 Past Investigations

Paterson has not performed any previous environmental investigations at the subject site.

Paterson has previously conducted Phase I ESAs and Phase II ESAs on several neighbouring properties, which identified a former dry cleaning facility (106 Merton Street) to the south of the subject site as a potentially contaminating activity (PCA) which is considered to generate an area of potential environmental concern on the subject site. Several other historical PCAs were identified within

the study area, however, none of the remaining PCAs were considered to be close enough to the subject site to result in an APEC. Based on the former dry cleaners representing an APEC on site, this Phase II-ESA was carried out.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II-ESA consisted of drilling four (4) boreholes. Boreholes were drilled through overburden soils to a maximum depth of 7.47 m below ground surface (bgs). Groundwater monitoring wells were installed in three (3) of the boreholes.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. Contaminants of concern for soil and groundwater is limited to volatile organic compounds (VOCs).

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Phase I property is located in an area of glacial till deposits. Groundwater flow is expected to reflect the regional topography and flow in a northerly direction.

Contaminants of Potential Concern

Based on the presence of the former dry cleaners, the following Contaminants of Potential Concern (CPCs) were identified:

- Volatile Organic Compounds (VOCs) – this suite of parameters includes chlorinated solvents (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) associated with dry cleaning operations. These parameters were selected as CPCs for the subject site due to the historical use of a nearby property to the south as a dry cleaning facility. VOCs may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

Petroleum hydrocarbons (PHCs) were not identified as CPCs, however, one groundwater sample was unintentionally analysed for PHCs (fractions 1-4).

Existing Buildings and Structures

A vacant two (2) storey residential building occupies the south-western portion of the subject property. No other structures are present on the subject site.

Water Bodies

No water bodies are present within a 250 m radius of the subject site. The Ottawa River, located 775 m to the north of the subject site, is the closest body of water to the subject site.

Areas of Natural Significance

There are no identified areas of natural provincial significance within the Phase II study area.

Drinking Water Wells

No drinking water wells were identified on the subject site or within a 250 m radius of the subject site. A review of the MOECC database identified the presence of several records for monitoring wells installed between 50 and 250 m from the subject site, several of which have corresponding abandonment records.

Neighbouring Land Use

Neighbouring land use in the Phase II study area is predominantly residential, with commercial properties along Wellington Street West, further to the south of the subject site and an office located across Merton Street, to the west of the subject site.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

No Potential Contaminating Activities (PCAs) were identified on the subject site. Based on a review of previous reports carried out in the area of the subject site, the former dry cleaning facility to the south of the subject site is considered to be a PCA which generates an Area of Potential Environmental Concern (APEC) on the subject site. No other PCAs in the study area are considered to generate APECs on the subject site.

Assessment of Uncertainty and/or Absence of Information

The presence of potentially contaminating activities was confirmed by a variety of independent sources, identified during multiple Phase I and Phase II ESAs

conducted by Paterson on several neighbouring lands in the immediate vicinity of the subject site.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. Duplicate soil and groundwater samples were not submitted for analytical testing. However, two (2) separate groundwater samples acquired on different dates from BH1 were analysed for VOCs, providing verification of the groundwater data. Field chemistry measurements of groundwater were not made at the time of the sampling, however, a sufficient volume of water was removed from each well prior to sampling.

3.5 Impediments

Overhead and underground services restricted drillings locations. The drill rig encountered mechanical issues during the initial drilling date. No further impediments were encountered during the drilling program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on December 8 and 16, 2015, and consisted of the placement of three (3) boreholes (BH1 to BH3), each of which was instrumented with a groundwater monitoring well. The boreholes were placed for site coverage, to investigate groundwater flow and to address the potential impacts from the former dry cleaning facility to the south. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Boreholes were advanced using a truck mounted CME 55 drill rig, under the full-time supervision of Paterson personnel. The borehole locations are identified on the attached Drawing PE3703-1 - Test Hole Location Plan.

4.2 Soil Sampling

A total of 24 soil samples were obtained from the boreholes by means of split spoon and auger grab sampling. Split spoon samples were taken semi-continuously at approximate 0.76 m intervals. The depths at which split spoon and auger grab samples were obtained from the boreholes and are shown as “**SS**” and “**AU**” respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of sand and gravel fill over native glacial till. Fill was observed in all boreholes to a depth of 1.40 to 1.83 m bgs. The fill material consisted of sand and gravel, with brick fragments identified in BH1. The fill was obviously imported to raise the parking area and was not considered to be impacted or of poor quality. The only brick fragment observed in BH1 was likely some residual demolition debris from the former private garage building that was present in this area.

4.3 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour and evidence of staining or metals, as well as screening with a MiniRae photoionization detector (PID). The detection limit of the PID is 0.1 ppm, with a precision of +/- 0.1 ppm.

The soil vapours were measured by inserting the analyser probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The PID vapour readings were found to range from 0.4 ppm to 5.3 ppm. The readings are not considered to be indicative of the presence of VOC contamination. Volatile vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Soil samples were selected for analytical testing based on visual appearance, location, and vapour readings.

4.4 Groundwater Monitoring Well Installation

Three groundwater monitoring wells were installed by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen, and a bentonite seal was placed above the screen to minimize cross-contamination. Monitoring well construction details are provided on the Soil Profile and Test Data Sheets in Appendix 1. A summary of monitoring well construction details is provided below in Table 1.

Table 1: Monitoring Well Construction Details						
Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	99.88	6.40	3.35-6.40	2.95-6.40	0-2.95	Flushmount
BH2	99.83	6.17	3.12-6.17	2.62-6.17	0-2.62	Flushmount
BH3	99.83	7.44	4.39-7.44	3.94-7.44	0-3.94	Flushmount

4.5 Groundwater Sampling

Groundwater sampling protocols were followed using the MOECC document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996, with the exception of the initial water sample obtained from BH1. The sample acquired from BH1 on December 9, 2015 was obtained directly from the open hole and tested for VOCs at the request of the client. Although the sample was obtained directly from the open borehole, the results have been included in this report. 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.

4.6 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 2: Soil Samples Submitted			
Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analysed	Rationale
		VOCs	
December, 2015			
BH1-SS6	4.57-5.18 m bgs; glacial till	X	Sample to assess the potential impacts from the former dry cleaning facility to the south of the subject site.
BH2-SS7	5.33-5.94 m bgs; glacial till	X	
BH3-SS9	6.10-6.53 m bgs; glacial till	X	

Table 3: Groundwater Samples Submitted				
Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analysed		Rationale
		VOCs	BTEX/ PHC (F ₁ -F ₄)	
December 9, 2015				
BH1-GW1	3.35-6.40 m bgs; glacial till	X		Sampled from open hole at request of Client. Sampled to assess the potential impacts from the former dry cleaning facility to the south of the subject site.
December 21, 2015				
BH1-GW1	3.35-6.40 m bgs; glacial till	X		Sampled to assess the potential impacts from the former dry cleaning facility to the south of the subject site.
BH2-GW1	3.12-6.17 m bgs; glacial till	X	X	
BH3-GW1	4.39-7.44 m bgs; glacial till	X		

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.

4.7 Residue Management

Soil cuttings, purge water and fluids from equipment cleaning were retained on-site.

4.8 Elevation Surveying

Borehole elevations were surveyed using a laser level. Elevations were surveyed relative to a fire hydrant at the south corner of the subject site. The elevation of a nut on the lower flange of the fire hydrant was arbitrarily selected as 100.00 metres above sea level (m ASL). The location of the site benchmark is shown on Drawing PE3703-1 – Test Hole Location Plan.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1. Site soils generally consist of fill (sand and gravel), underlain by glacial till. Bedrock was not encountered in any of the boreholes. Fill material was encountered in all of the boreholes. Fill consisted of sand and gravel used for pavement structure, with brick fragments identified in one sample from BH1. The brick fragments are likely remnant from the former private garage in this area.

Groundwater was encountered in the glacial till layer, at depths ranging from 3.97-4.27 m below existing grade.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter. Groundwater levels are summarized below in Table 4. All elevations are relative to the assumed elevation of the fire hydrant to the south of the subject site. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

Table 4: Groundwater Level Measurements				
Borehole Location	Ground Surface Elevation (m ASL)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	99.88	4.27	95.61	December 21, 2015
BH2	99.83	3.97	95.86	December 21, 2015
BH3	99.83	4.27	95.56	December 21, 2015

Based on the groundwater elevations recorded during the monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE3703-3 - Groundwater Contour Plan.

Based on the contour mapping, groundwater flow at the subject site appears to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.027 m/m was calculated.

5.3 Fine-Medium Soil Texture

Native soil at the subject site consists of a dense glacial till. Based on observed soil conditions, it is our opinion that fine- to medium-grained soil standards are not applicable at the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in soil vapour readings of 0.4 to 5.3 ppm. 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

Three (3) soil samples were submitted to Paracel Laboratories for analysis of VOC parameters. A copy of the analytical test results is attached to this report. The results of the soil analytical testing are presented in Tables 5. The laboratory certificates of analysis are provided in Appendix 1.

Table 5: Analytical Test Results – Soil – VOCs					
Parameter	MDL (µg/g)	Soil Samples (µg/g) December, 2015			MOECC Table 3 Standards Residential (µg/g)
		BH1- SS6	BH2- SS7	BH3- SS9	
Acetone	0.50	nd	nd	nd	16
Benzene	0.02	nd	nd	nd	0.21
Bromodichloromethane	0.05	nd	nd	nd	13
Bromoform	0.05	nd	nd	nd	0.27
Bromomethane	0.05	nd	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	nd	0.05
Chlorobenzene	0.05	nd	nd	nd	2.4
Chloroform	0.05	nd	nd	nd	0.05
Dibromochloromethane	0.05	nd	nd	nd	9.4
Dichlorodifluoromethane	0.05	nd	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	nd	3.4
1,3-Dichlorobenzene	0.05	nd	nd	nd	4.8
1,4-Dichlorobenzene	0.05	nd	nd	nd	0.083
1,1-Dichloroethane	0.05	nd	nd	nd	3.5
1,2-Dichloroethane	0.05	nd	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	nd	0.05
cis-1,2-Dichloroethylene	0.05	nd	nd	nd	3.4
trans-1,2-Dichloroethylene	0.05	nd	nd	nd	0.084
1,2-Dichloropropane	0.05	nd	nd	nd	0.05
1,3-Dichloropropene	0.05	nd	nd	nd	0.05
Ethylbenzene	0.05	nd	nd	nd	2
Ethylene Dibromide	0.05	nd	nd	nd	0.05
Hexane	0.05	nd	nd	nd	2.8
Methyl Ethyl Ketone	0.05	nd	nd	nd	16
Methyl Isobutyl Ketone	0.50	nd	nd	nd	1.7
Methyl tert-butyl Ether	0.05	nd	nd	nd	0.75
Methylene Chloride	0.05	nd	nd	nd	0.1
Styrene	0.05	nd	nd	nd	0.7
1,1,1,2-Tetrachloroethane	0.05	nd	nd	nd	0.058
1,1,2,2-Tetrachloroethane	0.05	nd	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	nd	0.28
Toluene	0.05	nd	nd	nd	2.3
1,1,1-Trichloroethane	0.05	nd	nd	nd	0.38
1,1,2-Trichloroethane	0.05	nd	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	nd	0.061
Trichlorofluoromethane	0.05	nd	nd	nd	4
Vinyl Chloride	0.02	nd	nd	nd	0.02
Xylenes	0.05	nd	nd	nd	3.1
Notes:					
<ul style="list-style-type: none"> MDL – Method Detection Limit nd – not detected above the MDL <u>Value exceeds MOECC Table 3 Standard</u> 					

No VOC parameters were detected above the method detection limits in the soil samples. All VOC parameters are in compliance with the MOECC Table 3 Standards for the soil samples.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells installed in each borehole, were submitted for laboratory analysis of VOC parameters. The groundwater sample from BH2 was also submitted for analysis of PHC(F1-F4) parameters. The groundwater samples were obtained from the screened intervals noted on Table 1, above. The results of the analytical testing are presented below in Tables 6 and 7. The laboratory certificates of analysis are provided in Appendix 1.

Table 6: Analytical Test Results – Groundwater PHC (F₁ – F₄)			
Parameter	MDL (µg/L)	Groundwater Samples (µg/L) December 21, 2015	MOECC Table 3 Standards
		BH2-GW1	(µg/L)
PHC F ₁	25	nd	750
PHC F ₂	100	nd	150
PHC F ₃	100	nd	500
PHC F ₄	100	nd	500
Notes: <ul style="list-style-type: none"> MDL – Method Detection Limit nd – not detected above the MDL <u>Value exceeds MOECC Table 3 Standard</u> 			

No PHC parameters were detected in the groundwater sample collected from BH2. As a result, all PHC parameters were in compliance with the MOECC Table 3 Standards.

Table 7: Analytical Test Results – Groundwater – VOCs						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MOECC Table 3 Standard d (µg/L)
		09/12/15	December 21, 2015			
		BH1- GW1	BH1- GW1	BH2- GW1	BH3- GW1	
Acetone	5.0	nd	64.0	35.0	nd	130,000
Benzene	0.5	nd	nd	nd	nd	44
Bromodichloromethane	0.5	nd	nd	nd	nd	85,000
Bromoform	0.5	nd	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	nd	630
Chloroform	0.5	nd	nd	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	nd	nd	5.2
1,2-Dibromoethane	0.2	nd	nd	nd	nd	0.25
Ethylbenzene	0.5	nd	nd	nd	nd	2,300
Hexane	1.0	nd	nd	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	140,000
Methyl tert-butyl Ether	2.0	nd	nd	nd	nd	190
Methylene Chloride	5.0	nd	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	nd	18,000
1,2,4-Trichlorobenzene	0.5	nd	nd	nd	nd	850
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	nd	0.5
Xylenes	0.5	nd	nd	nd	nd	4,200
Notes:						
▪ MDL – Method Detection Limit						
▪ nd – not detected above the MDL						
▪ <u>Value exceeds MOECC Table 3 Standard</u>						

Trace concentrations of acetone were detected in Samples BH1-GW1 and BH2-GW1, no other VOC parameters were detected in the groundwater samples above the method detection limits. All VOC parameters are in compliance with the MOECC Table 3 Standards.

The maximum final concentrations of all parameters analysed in groundwater are summarized below.

Table 8: Maximum Concentrations – Groundwater			
Parameter	Maximum Concentration (µg/L)	Borehole/Sample Location	Depth Interval (m BGS)
Acetone	64.0	BH1-GW1	3.35-6.40 m bgs
Notes:			
▪ <u>Bold and underlined</u> – Value exceeds selected MOECC Standard			

The concentrations of all other parameters were below laboratory detection limits.

5.7 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04 as amended by O.Reg. 269/11 - Record of Site Condition regulation, made under the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activities

No PCAs were identified on the subject site. The former dry cleaning facility located on the property to the south of the subject site, across Merton Street and Armstrong Street, is considered to represent an APEC on the subject site. No other PCAs were considered to represent an APEC for the subject property.

Areas of Potential Environmental Concern

As discussed above, the former dry cleaning facility located to the south of the subject site, is considered to be the only APEC affecting the subject site.

Contaminants of Potential Concern

Contaminants of Potential Concern (CPCs) for the aforementioned APEC are limited to the chlorinated solvent suite of the VOCs parameters. PHCs were also analysed in one groundwater sample unintentionally.

Based on analytical test results, PHC and VOC concentrations within the soil and groundwater on the subject site, comply with the MOECC Table 3 Standards.

Subsurface Structures and Utilities

The site is occupied by a vacant two (2) storey residential dwelling. Underground utility locates were acquired prior to commencing the drilling program at the subject site. Underground utility locations are illustrated on Drawing PE3073-1 Test Hole Location Plan.

Physical Setting

Site Stratigraphy

Site stratigraphy is provided in the Soil Profile and Test Data Sheets provided in Appendix 1 and illustrated on Drawing PE3703-4 - Cross-Section A-A'. Stratigraphy consists of:

- Asphaltic concrete was encountered at each borehole, underlain by granular crushed stone.
- Fill material was encountered in all boreholes. Fill extended to depths ranging from 1.40 - 1.83 m bgs. The fill consisted of compact sand and gravel with brick fragments identified in one (1) sample from BH1.
- Glacial till material was identified at 1.40 to 1.83 m bgs and extends beyond the depth of any borehole carried out on-site.
- Bedrock was not encountered during the Phase II drilling program.

Hydrogeological Characteristics

The water table was encountered in the glacial till at the subject site. Groundwater levels were measured at the subject site on December 21, 2015. Groundwater was encountered at depths between 3.97 and 4.27 m below existing grade. It should be noted that water levels may fluctuate with seasonal variations.

Based on the groundwater elevations from the December 2015 monitoring event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE3703-3 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a northerly direction. A horizontal hydraulic gradient of approximately 0.027 m/m was calculated.

Approximate Depth to Bedrock

Bedrock was not encountered during the Phase II-ESA. Based on our drilling program, the bedrock is at least, 6.25 m bgs.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 3.97 and 4.27 m below 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 and is not within 30 m of a water body.

Fill Placement

Fill was identified in each of the boreholes to a maximum depth of 2.13 m bgs. Fill consisted of granular crushed stone for the asphalt parking area, on top of sand and gravel. Brick fragments were identified in one of the samples from BH1 (remnant from the former private garage building). No signs of deleterious fill or contamination were identified in any of the samples from the fill layer.

The thickness and location of the fill is illustrated in the Soil Profile and Data Sheets, as well as, Drawing PE3703-4 Cross Section A-A', appended to this report.

Proposed Buildings and Other Structures

It is our understanding that the subject site will be redeveloped as a residential property.

Existing Buildings and Structures

The subject site is currently occupied by a vacant two (2) storey residential structure. No other buildings or structures are present on the subject site.

Water Bodies

The Ottawa River is located approximately 775 m to the north of the subject site.

Areas of Natural Significance

No areas of natural significance were observed on the site or in the Phase II study area.

Environmental Condition

Areas Where Contaminants are Present

Based on analytical results, none of the CPCs were identified in excess of the MOECC Table 3 Standards. Analytical test results are depicted on Drawing PE3703-2 – Analytical Testing Plan, appended to this report.

6.0 CONCLUSIONS

Assessment

A Phase II-Environmental Site Assessment (ESA) was conducted for the property at 107-109 Armstrong Street and 71-73 Merton Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the area of potential environmental concern on the subject site, posed by the former use of the neighbouring property to the south as a dry cleaning facility. The Phase II-ESA consisted of the drilling of three (3) boreholes and the installation of three (3) groundwater monitoring wells to assess soil and groundwater quality at the subject site.

Soil samples obtained from the boreholes were screened using visual observations and vapour measurements. Site soils consist of a layer of fill material, which is underlain by a compact to dense glacial till. Based on the field observations and screening results, various samples were selected for analysis of volatile organic compounds (VOCs). Based on the analytical results, the site soil is in compliance with the Ontario Ministry of the Environment and Climate Change (MOECC) Table 3 Standards for VOC parameters.

Groundwater samples were collected from the monitoring wells installed in each borehole, and analysed for VOCs. One (1) groundwater sample was also analysed for petroleum hydrocarbon fractions 1-4 (PHCs F1-F4). All groundwater samples are in compliance with the MOECC Table 3 Standards for the analysed parameters.

Based on the above results, the soil and groundwater at the subject has not been impacted by the former use of the neighbouring property as a dry cleaning facility. No further investigative work is recommended at this time.

Recommendations

If the monitoring wells 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.

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 by O.Reg. 269/11, 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 Sherbrooke Urban Developments Ltd. Permission and notification from Sherbrooke Urban Developments Ltd. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Sean Moggridge, B.Eng.

Mark S. D'Arcy, P.Eng.



Report Distribution:

- Sherbrooke Urban Developments Ltd.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3703-1 – TEST HOLE LOCATION PLAN

DRAWING PE3703-2– ANALYTICAL TESTING PLAN

DRAWING PE3703-3 - GROUNDWATER CONTOUR PLAN

DRAWING PE3703-4 – CROSS-SECTION A-A`

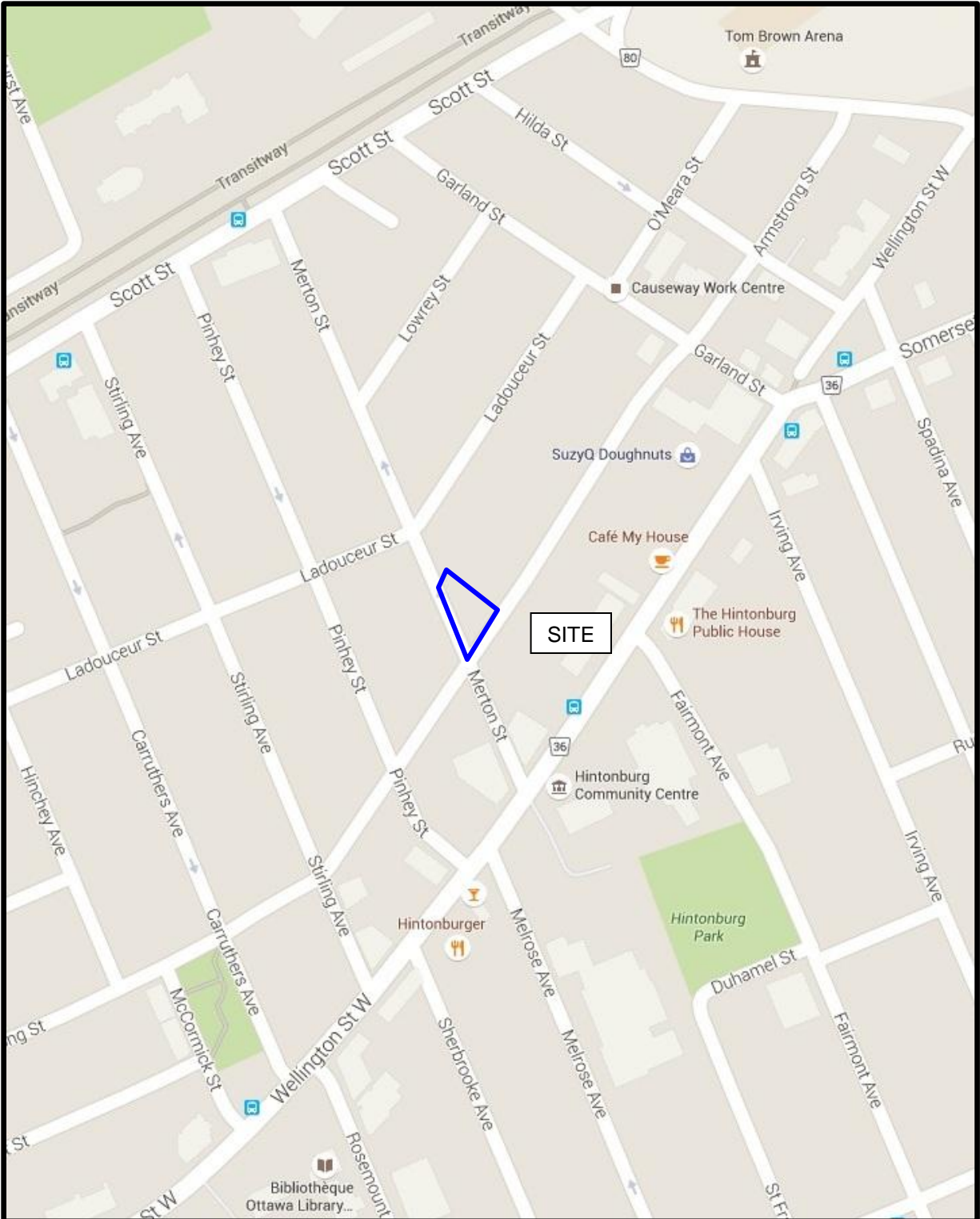
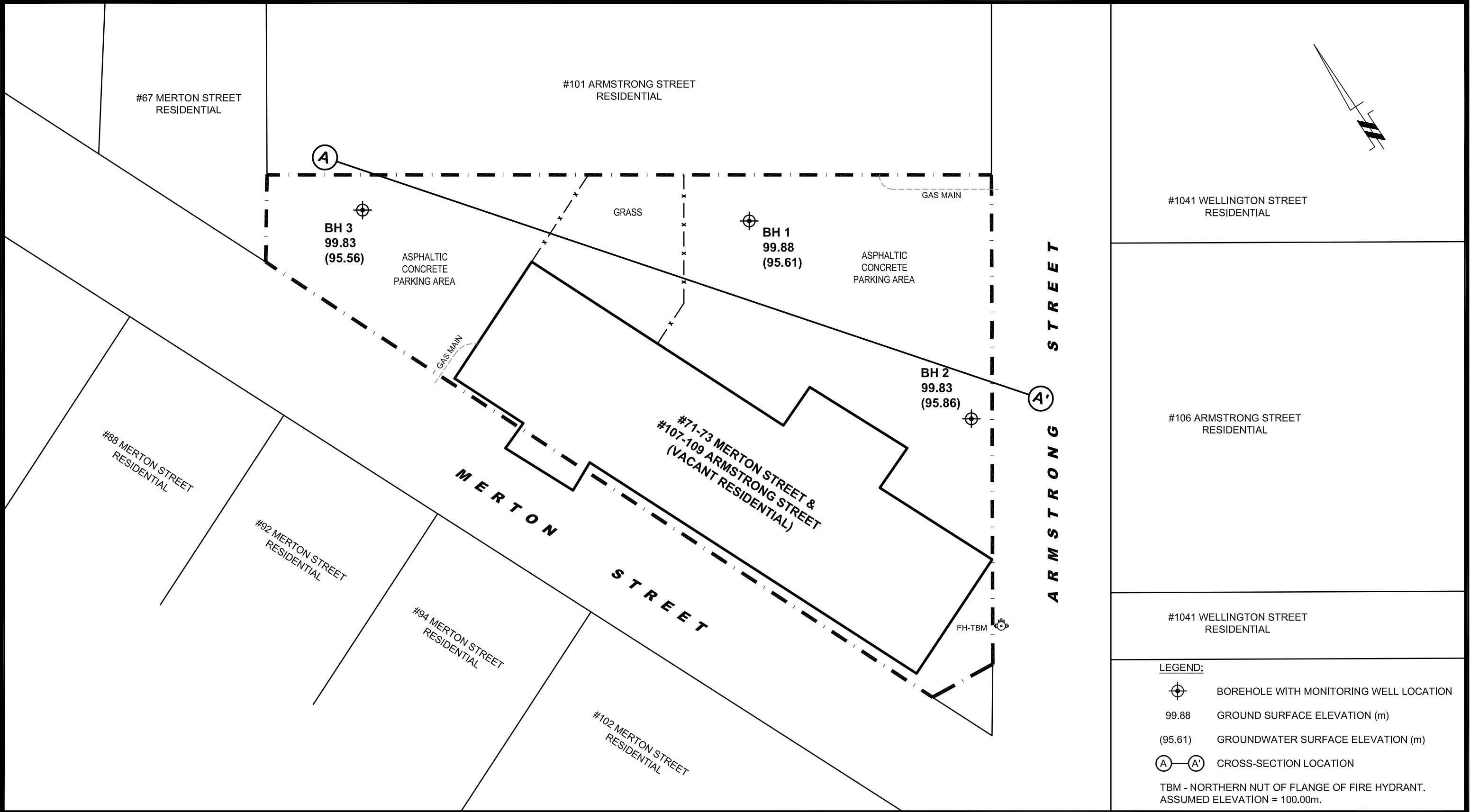


FIGURE 1
KEY PLAN



LEGEND:

BOREHOLE WITH MONITORING WELL LOCATION

99.88 GROUND SURFACE ELEVATION (m)

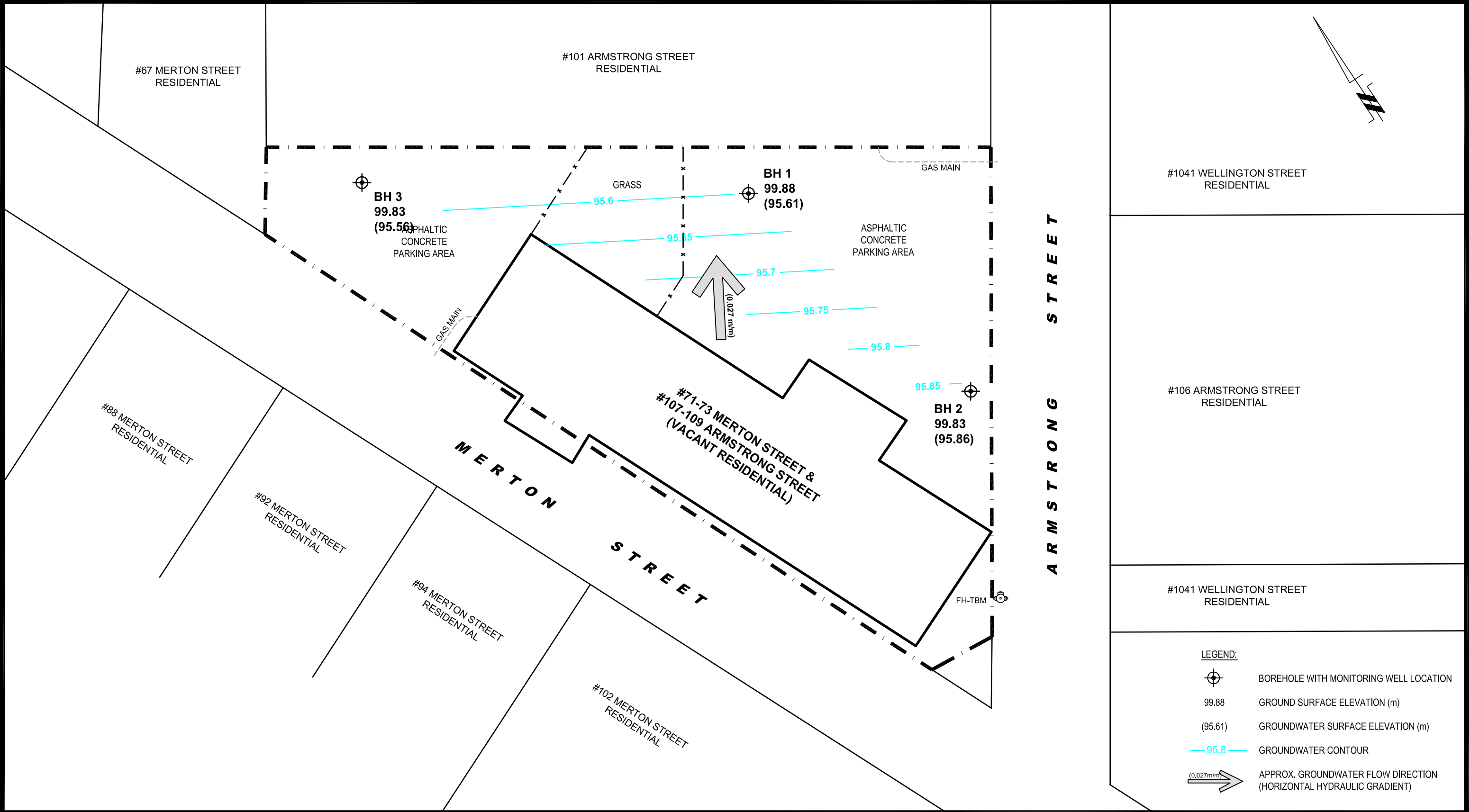
(95.61) GROUNDWATER SURFACE ELEVATION (m)

CROSS-SECTION LOCATION

TBM - NORTHERN NUT OF FLANGE OF FIRE HYDRANT.
ASSUMED ELEVATION = 100.00m.

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						Drawn by: CPB	Report No.: PE3703
						Checked by: SM	Dwg. No.: PE3703-1
						Approved by: MSD	Revision No.:
	NO.	REVISIONS	DATE	INITIAL			

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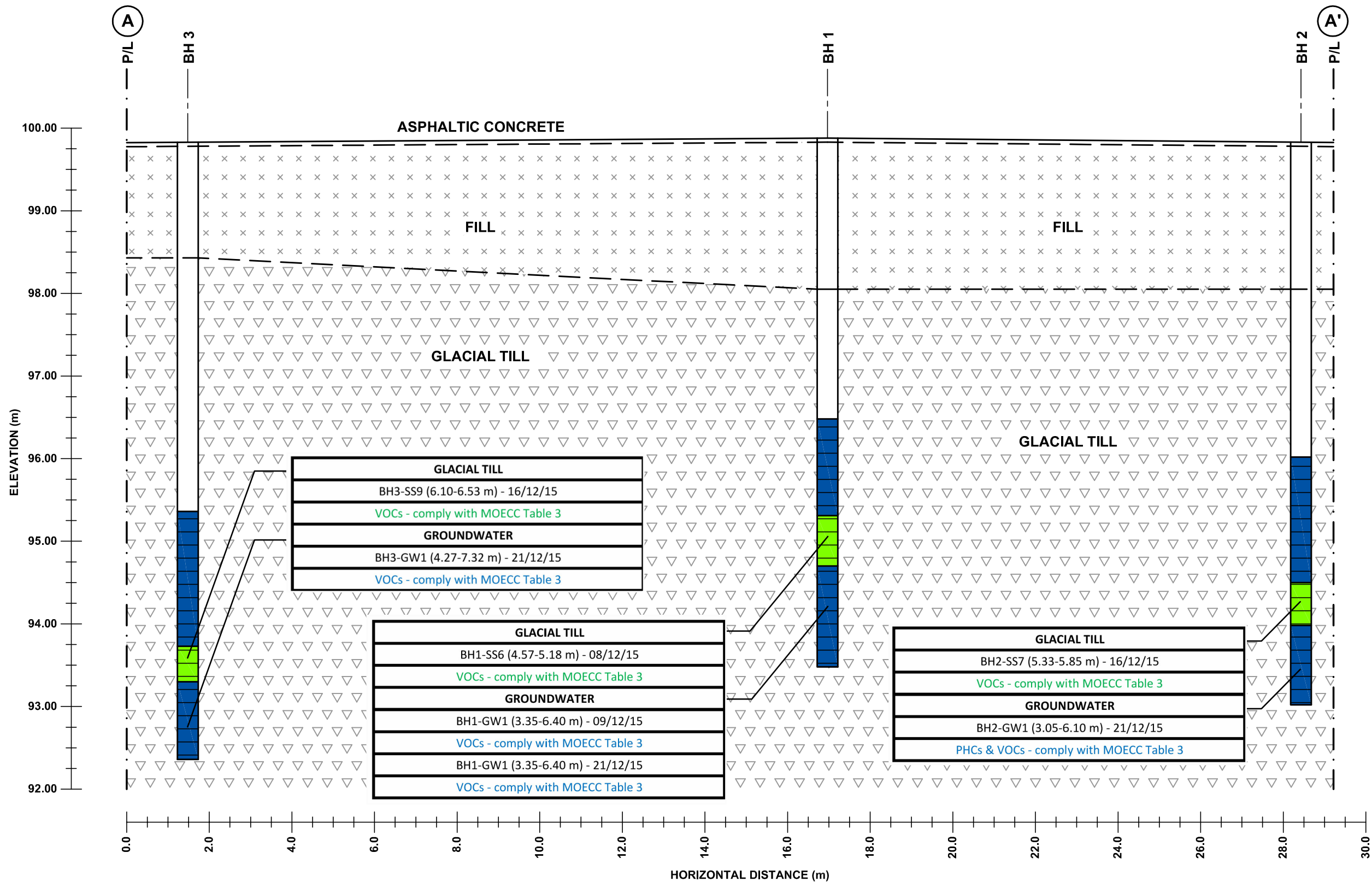


LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 99.88 GROUND SURFACE ELEVATION (m)
- (95.61) GROUNDWATER SURFACE ELEVATION (m)
- 95.8 GROUNDWATER CONTOUR
- (0.027m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

<div><div>patersongroup</div><div>consulting engineers</div><div>154 Colonnade Road South Ottawa, Ontario K2E 7J5 Tel: (613) 226-7381 Fax: (613) 226-6344</div></div>					<div>SHERBROOKE URBAN DEVELOPMENTS LTD.</div> <div>PHASE II - ENVIRONMENTAL SITE ASSESSMENT</div> <div>107 - 109 ARMSTRONG STREET & 71 - 73 MERTON STREET</div> <div>OTTAWA, ONTARIO</div> <div>Title: GROUNDWATER CONTOUR PLAN</div>	Scale: 1:150	Date: 01/2016
						Drawn by: MPG	Report No.: PE3703-1
						Checked by: SM	Dwg. No.: PE3703-3
						Approved by: MSD	Revision No.:
	NO.	REVISIONS	DATE	INITIAL			

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NO.	REVISIONS	DATE	INITIAL

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OTTAWA, ONTARIO
Title: CROSS-SECTION A-A'

Scale: AS SHOWN	Date: 01/2016
Drawn by: MPG	Report No.: PE3703-1
Checked by: SM	Dwg. No.: PE3703-4
Approved by: MSD	Revision No.:

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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
Studies

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Sampling and Analysis Plan

Vacant Residential Property
107-109 Armstrong Street and 71-73 Merton Street
Ottawa, Ontario

Prepared For

Sherbrooke Urban Developments Ltd.

December 1, 2015

Report: PE3703-SAP.01

Table of Contents

1.0	Sampling Program.....	1
2.0	Analytical Testing Program.....	2
3.0	Standard Operating Procedures.....	3
3.1	Environmental Drilling Procedure	3
3.2	Monitoring Well Installation Procedure	5
3.3	Monitoring Well Sampling Procedure	6
4.0	Quality Assurance/Quality Control (QA/QC).....	9
5.0	Physical Impediments to Sampling and Analysis Plan	9

1.0 Sampling Program

Paterson Group (Paterson) was commissioned by Sherbrooke Urban Developments Ltd. to conduct a Phase II ESA for the vacant property, located at 107-109 Armstrong Street and 71-73 Merton Street, in the City of Ottawa, Ontario.

Based on the historical use of a property to the south of the subject site as a dry cleaning facility, potential contamination by volatile organic compounds (VOCs) may be present in the soil or groundwater on the subject site. The following subsurface investigation program was developed to identify and delineate the suspected contamination:

Test Pit	Location and Rationale	Proposed Depth and Rationale
BH1	Boreholes to be placed apart for general site coverage and model groundwater flow across the subject site.	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells.
BH2		
BH3		

Borehole locations are shown on the Test Hole Location Plan appended to the main report.

At each borehole, split spoon of overburden soils will be obtained at 0.76 m (2'6") intervals until spoon refusal is encountered. Grab samples will be obtained from each stratigraphic unit encountered in the test pits. All soil samples will be retained, and samples will be selected for submission following a preliminary screening analysis.

If it is considered necessary to drill into bedrock to intercept the groundwater table, boreholes will be advanced into bedrock as required using diamond coring equipment. Rock core samples will be retained for review.

Following borehole drilling, monitoring wells will be installed in selected boreholes for the measurement of water levels and the collection of groundwater samples.

2.0 Analytical Testing Program

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

- In borehole where there is visual or olfactory evidence of contamination, or where photoionization detector (PID) readings indicate the presence of contamination, the 'worst-case' sample from each test pit should be submitted for comparison with MOECC 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 vertically downward.
- At least one sample from each borehole should be submitted to delineate the horizontal extent of contamination across the site.
- Parameters analyzed should be consistent with the contaminants of potential concern identified in the Phase II-ESA.
- Samples will be submitted for analysis of VOC parameters.

3.0 Standard Operating Procedures

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to delineate assess the soil condition and facilitate the installation of groundwater monitoring wells to assess the potential volatile organic compound (VOC) impacts within the groundwater.

Equipment

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

- Glass soil sample jars
- Plastic sample bags two buckets
- Cleaning brush (toilet brush works well)
- Dish detergent
- Methyl hydrate
- Water (if not available on site - water jugs available in trailer)
- Latex or nitrile gloves (depending on suspected contaminant)
- RKL Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole and Test pit Locations

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

After drilling/excavation is completed a plan with the borehole/test pit locations must be provided. Distances and orientations of test pits 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 geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

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. Sleeve samples are to be collected when utilizing GeoProbe direct push drill.
- 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. Sleeves are disposable and will not require washing.
- If obvious contamination is encountered, continue sampling until 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 a RKL Eagle, PID, visual observations, etc. depending on 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 brush in soapy water, inside and out, including 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.

The spoon-washing procedure may be bypassed if a GeoProbe direct-push drill rig with disposable plastic sampling tubes is used.

3.2 Monitoring Well Installation Procedure

Equipment

- 1.5 m x 5 cm threaded sections of Schedule 40 PVC slotted well screen (1.5 m x 3.2 cm if installing in cored hole in bedrock)
- 1.5 m x 5 cm threaded sections of Schedule 40 PVC riser pipe (1.5 m x 3.2 cm if installing in 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 required depth, using drilling and sampling procedures described above.
- If borehole is deeper than required monitoring well, backfill with bentonite chips to 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 screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering 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 borehole with holeplug or with auger cuttings (if contamination is not suspected).
- Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match 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
- Portable pH/Temperature/Conductivity analyzer
- Laboratory-supplied sample bottles

Sampling Procedure

- Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- Measure total depth of well.
- Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- Calculate volume of standing water within well and record.
- Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into 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 purged, until appearance or field chemistry stabilizes.

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

Instrument Washing Procedure

All sampling equipment (shovels, trowels, spatulas, 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 instrument with brush in soapy water, inside and out, including tip
- Rinse in clean water
- Apply a small amount of methyl hydrate to the exposed faces of the instrument. (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 equipment, 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. Soil must not be frozen.
- Turn instrument on and allow to come to zero - calibrate if necessary
- If using RKI Eagle, ensure 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 bag.
- Insert probe into soil bag, creating a seal with your hand around the opening.
- Gently manipulate soil in 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 Sampling and Analysis Plan.

4.0 Quality Assurance/Quality Control (QA/QC)

The QA/QC program for this subsurface investigation is as follows:

- All non-dedicated sampling equipment (shovels, split spoons, etc.) will be decontaminated according to the SOPs listed above.
- Approximately one field duplicate will be submitted for every ten samples submitted for laboratory analysis. A minimum of one field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples where possible.
- Where multi-parameter analyzers are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 Physical Impediments to Sampling and Analysis Plan

Physical impediments to the Sampling and Analysis plan may include:

- The location of underground utilities
- Shallow bedrock or limited presence of fill
- Insufficient groundwater volume for groundwater samples (if encountered)
- 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 laboratory
- Mechanical Equipment breakdowns
- Winter conditions
- Other site-specific impediments

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
107-109 Armstrong Street & 71-73 Merton St.
Ottawa, Ontario

DATUM TBM - Northern nut of flange of fire hydrant located on the west side of Armstrong Road, near the southeast corner of subject site. Assumed elevation = 100.00m.
REMARKS

FILE NO.
PE3703

HOLE NO.
BH 1

BORINGS BY CME 55 Power Auger

DATE December 16, 2015

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	0.05					0	99.88					
FILL: Brown silty sand with gravel, some brick and asphalt		SS	1	33	10	1	98.88					
		SS	2	50	16	2	97.88	●				
	1.83	SS	3	89	50+	3	96.88	●				
		SS	4	50	31	4	95.88	●				
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders		SS	5	61	22	5	94.88	●				
		SS	6	58	33	6	93.88	●				
	6.40											
End of Borehole (GWL @ 4.27m-Dec. 21, 2015)												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
107-109 Armstrong Street & 71-73 Merton St.
Ottawa, Ontario

DATUM TBM - Northern nut of flange of fire hydrant located on the west side of Armstrong Road, near the southeast corner of subject site. Assumed elevation = 100.00m.
REMARKS

FILE NO.
PE3703

HOLE NO.
BH 2

BORINGS BY CME 55 Power Auger

DATE December 16, 2015

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	0.05					0	99.83					
FILL: Brown silty sand with clay and gravel		SS	1	0	14	1	98.83					
	1.78	SS	2	68	65	2	97.83	●				
		SS	3	40	50+			●				
		SS	4	92	67	3	96.83	●				
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders		SS	5	67	50+	4	95.83	●				
		SS	6	83	74	5	94.83	●				
		SS	7	58	67			●				
		SS	8	67	50+	6	93.83	●				
End of Borehole	6.81											
(GWL @ 3.97m-Dec. 21, 2015)												
								100	200	300	400	500
								RKI Eagle Rdg. (ppm)				
								▲ Full Gas Resp. △ Methane Elim.				

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
107-109 Armstrong Street & 71-73 Merton St.
Ottawa, Ontario

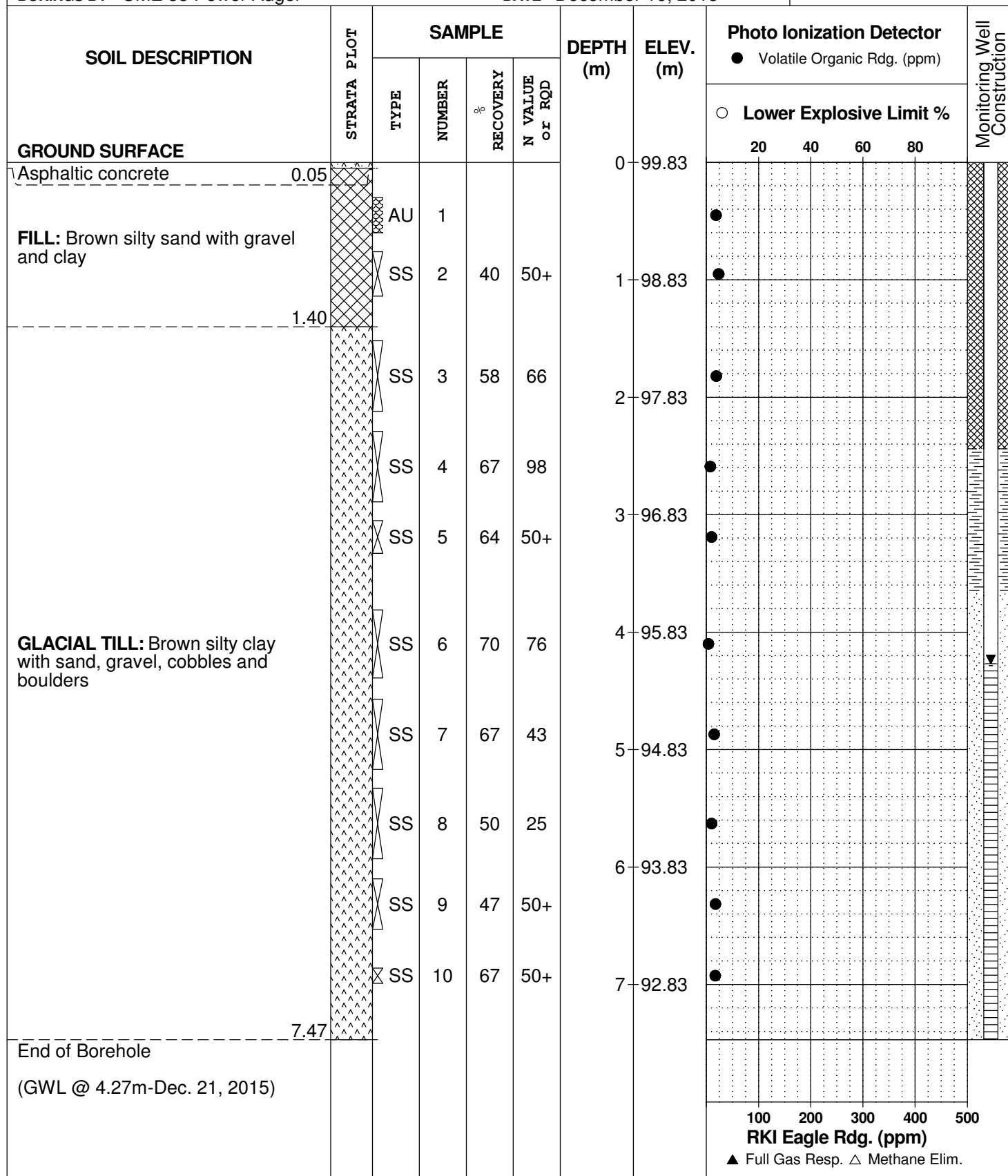
DATUM TBM - Northern nut of flange of fire hydrant located on the west side of Armstrong Road, near the southeast corner of subject site. Assumed elevation = 100.00m.
REMARKS

FILE NO.
PE3703

HOLE NO.
BH 3

BORINGS BY CME 55 Power Auger

DATE December 16, 2015



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)

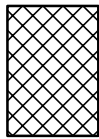
STRATA PLOT



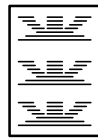
Topsoil



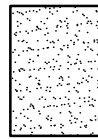
Asphalt



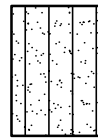
Fill



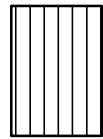
Peat



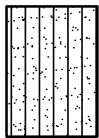
Sand



Silty Sand



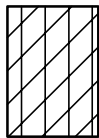
Silt



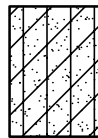
Sandy Silt



Clay



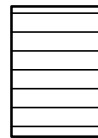
Silty Clay



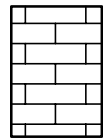
Clayey Silty Sand



Glacial Till



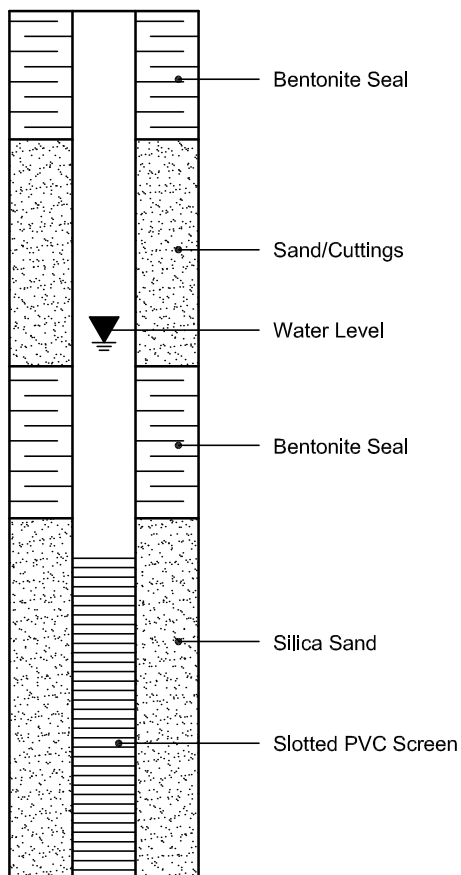
Shale



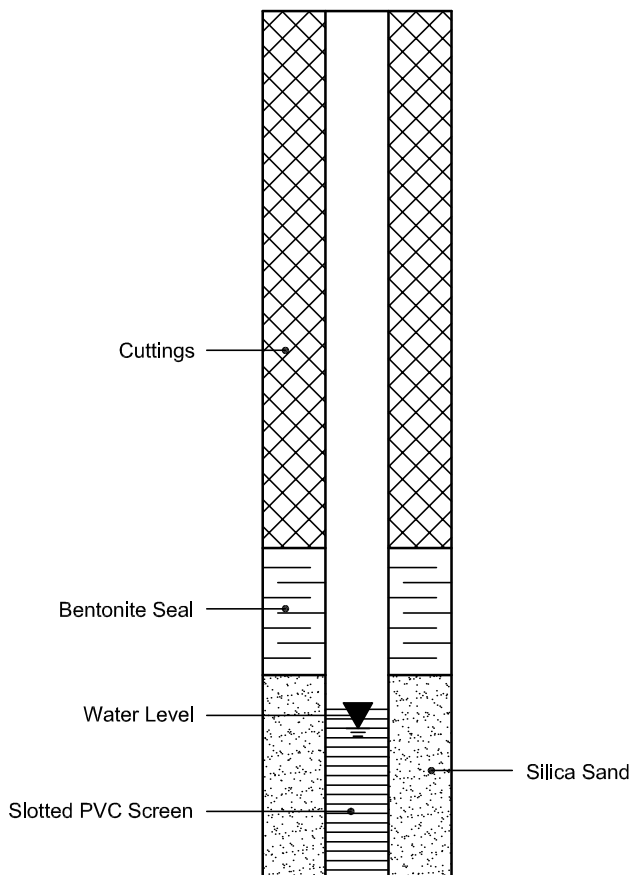
Bedrock

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: Mark D'Arcy

Client PO: 18888
Project: PE3703
Custody: 26215

Report Date: 15-Dec-2015
Order Date: 9-Dec-2015

Order #: 1550233

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

Paracel ID
1550233-01

Client ID
BH1-SS6

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18888

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703

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	10-Dec-15	12-Dec-15
Solids, %	Gravimetric, calculation	10-Dec-15	10-Dec-15

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18888**

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703

Client ID:	BH1-SS6	-	-	-
Sample Date:	08-Dec-15	-	-	-
Sample ID:	1550233-01	-	-	-
MDL/Units	Soil	-	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	89.9	-	-	-
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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	-	-	-
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 (dibromoethane)	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	-	-	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18888**

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703

	Client ID:	BH1-SS6	-	-	-
	Sample Date:	08-Dec-15	-	-	-
	Sample ID:	1550233-01	-	-	-
	MDL/Units	Soil	-	-	-
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	99.7%	-	-	-
Dibromofluoromethane	Surrogate	82.9%	-	-	-
Toluene-d8	Surrogate	88.5%	-	-	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **18888**

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703
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	3.39		ug/g		106	50-140			
Surrogate: Dibromofluoromethane	2.82		ug/g		88.1	50-140			
Surrogate: Toluene-d8	2.93		ug/g		91.5	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **18888**

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703
Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	88.7	0.1	% by Wt.	88.6			0.1	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	2.85		ug/g dry	ND	102	50-140			
Surrogate: Dibromofluoromethane	2.37		ug/g dry	ND	84.5	50-140			
Surrogate: Toluene-d8	2.50		ug/g dry	ND	89.2	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18888**

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: **PE3703**

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	11.8	0.50	ug/g	ND	118	50-140			
Benzene	3.31	0.02	ug/g	ND	82.7	60-130			
Bromodichloromethane	3.39	0.05	ug/g	ND	84.8	60-130			
Bromoform	2.70	0.05	ug/g	ND	67.5	60-130			
Bromomethane	3.08	0.05	ug/g	ND	77.1	50-140			
Carbon Tetrachloride	2.48	0.05	ug/g	ND	62.1	60-130			
Chlorobenzene	4.17	0.05	ug/g	ND	104	60-130			
Chloroform	3.18	0.05	ug/g	ND	79.5	60-130			
Dibromochloromethane	2.75	0.05	ug/g	ND	68.8	60-130			
Dichlorodifluoromethane	2.93	0.05	ug/g	ND	73.3	50-140			
1,2-Dichlorobenzene	3.60	0.05	ug/g	ND	90.0	60-130			
1,3-Dichlorobenzene	3.57	0.05	ug/g	ND	89.3	60-130			
1,4-Dichlorobenzene	3.56	0.05	ug/g	ND	89.0	60-130			
1,1-Dichloroethane	3.45	0.05	ug/g	ND	86.3	60-130			
1,2-Dichloroethane	3.61	0.05	ug/g	ND	90.1	60-130			
1,1-Dichloroethylene	2.74	0.05	ug/g	ND	68.5	60-130			
cis-1,2-Dichloroethylene	2.83	0.05	ug/g	ND	70.8	60-130			
trans-1,2-Dichloroethylene	2.74	0.05	ug/g	ND	68.5	60-130			
1,2-Dichloropropane	3.15	0.05	ug/g	ND	78.8	60-130			
cis-1,3-Dichloropropylene	2.68	0.05	ug/g	ND	66.9	60-130			
trans-1,3-Dichloropropylene	2.47	0.05	ug/g	ND	61.6	60-130			
Ethylbenzene	4.87	0.05	ug/g	ND	122	60-130			
Ethylene dibromide (dibromoethane)	4.10	0.05	ug/g	ND	103	60-130			
Hexane	3.10	0.05	ug/g	ND	77.5	60-130			
Methyl Ethyl Ketone (2-Butanone)	10.7	0.50	ug/g	ND	107	50-140			
Methyl Isobutyl Ketone	9.65	0.50	ug/g	ND	96.5	50-140			
Methyl tert-butyl ether	7.11	0.05	ug/g	ND	71.1	50-140			
Methylene Chloride	3.00	0.05	ug/g	ND	75.1	60-130			
Styrene	4.29	0.05	ug/g	ND	107	60-130			
1,1,1,2-Tetrachloroethane	3.49	0.05	ug/g	ND	87.3	60-130			
1,1,2,2-Tetrachloroethane	5.33	0.05	ug/g	ND	133	60-130			
Tetrachloroethylene	4.03	0.05	ug/g	ND	101	60-130			
Toluene	4.21	0.05	ug/g	ND	105	60-130			
1,1,1-Trichloroethane	2.77	0.05	ug/g	ND	69.3	60-130			
1,1,2-Trichloroethane	3.39	0.05	ug/g	ND	84.8	60-130			
Trichloroethylene	3.02	0.05	ug/g	ND	75.6	60-130			
Trichlorofluoromethane	3.14	0.05	ug/g	ND	78.6	50-140			
Vinyl chloride	3.36	0.02	ug/g	ND	83.9	50-140			
m,p-Xylenes	9.00	0.05	ug/g	ND	112	60-130			
o-Xylene	4.54	0.05	ug/g	ND	113	60-130			
Surrogate: 4-Bromofluorobenzene	2.66		ug/g		83.0	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18888

Report Date: 15-Dec-2015

Order Date: 9-Dec-2015

Project Description: PE3703

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.

Client Name: PATERSON GROUP	Project Reference: PE3703	TAT: <input checked="" type="checkbox"/> Regular <input type="checkbox"/> 3 Day
Contact Name: MARK D'ARCY	Quote #	<input type="checkbox"/> 2 Day <input type="checkbox"/> 1 Day
Address: 154 COLONNADE RD S OTTAWA, ON	PO # 18888	Date Required:
Telephone: 613-226-7391	Email Address: mdarcy@patersongroup.ca	

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ 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

Parcel Order Number:

1550233

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		VOC												
					Date	Time													
1	BH1-SS6	S		2	DEC 8/15	9:30 AM	✓												
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery:

Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Drouse	Received at Lab: SUMMIT PORN DUMMI	Verified By: [Signature]
Relinquished By (Print):	Date/Time: 09/12/15 4:00 PM	Date/Time: DEC 09, 2015 05:28	Date/Time: DEC 9/15 5:56
Date/Time:	Temperature: 14.5 °C	Temperature: 14.5 °C	pH Verified <input checked="" type="checkbox"/> By: BS.

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 18646
Project: PE3703
Custody: 105760

Report Date: 23-Dec-2015
Order Date: 17-Dec-2015

Order #: 1551249

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

Paracel ID	Client ID
1551249-01	BH2-SS7
1551249-02	BH3-SS9

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18646

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703

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	17-Dec-15	18-Dec-15
Solids, %	Gravimetric, calculation	17-Dec-15	17-Dec-15

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18646**

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703

Client ID:	BH2-SS7	BH3-SS9	-	-
Sample Date:	16-Dec-15	16-Dec-15	-	-
Sample ID:	1551249-01	1551249-02	-	-
MDL/Units	Soil	Soil	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	93.4	92.8	-	-
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Volatiles

Acetone	0.50 ug/g dry	<0.50	<0.50	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylene dibromide (dibromoethane)	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	<0.50	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18646**

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703

	MDL/Units	Client ID:	BH2-SS7	BH3-SS9		
		Sample Date:	16-Dec-15	16-Dec-15		
		Sample ID:	1551249-01	1551249-02		
			Soil	Soil		
Toluene	0.05 ug/g dry		<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry		<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry		<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry		<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry		<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry		<0.02	<0.02	-	-
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	-	-
4-Bromofluorobenzene	Surrogate		92.7%	93.8%	-	-
Dibromofluoromethane	Surrogate		97.6%	98.3%	-	-
Toluene-d8	Surrogate		110%	111%	-	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **18646**

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703
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	8.00		ug/g		100	50-140			
Surrogate: Dibromofluoromethane	7.72		ug/g		96.5	50-140			
Surrogate: Toluene-d8	8.78		ug/g		110	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **18646**

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703
Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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Physical Characteristics

% Solids	90.1	0.1	% by Wt.	90.1			0.1	25	
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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	4.18		ug/g dry	ND	95.2	50-140			
Surrogate: Dibromofluoromethane	4.51		ug/g dry	ND	103	50-140			
Surrogate: Toluene-d8	4.79		ug/g dry	ND	109	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18646

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	12.0	0.50	ug/g	ND	120	50-140			
Benzene	4.44	0.02	ug/g	ND	111	60-130			
Bromodichloromethane	4.03	0.05	ug/g	ND	101	60-130			
Bromoform	4.96	0.05	ug/g	ND	124	60-130			
Bromomethane	2.99	0.05	ug/g	ND	74.7	50-140			
Carbon Tetrachloride	4.50	0.05	ug/g	ND	112	60-130			
Chlorobenzene	3.70	0.05	ug/g	ND	92.6	60-130			
Chloroform	3.76	0.05	ug/g	ND	94.1	60-130			
Dibromochloromethane	4.10	0.05	ug/g	ND	103	60-130			
Dichlorodifluoromethane	3.27	0.05	ug/g	ND	81.7	50-140			
1,2-Dichlorobenzene	4.47	0.05	ug/g	ND	112	60-130			
1,3-Dichlorobenzene	4.41	0.05	ug/g	ND	110	60-130			
1,4-Dichlorobenzene	4.38	0.05	ug/g	ND	109	60-130			
1,1-Dichloroethane	3.90	0.05	ug/g	ND	97.6	60-130			
1,2-Dichloroethane	4.16	0.05	ug/g	ND	104	60-130			
1,1-Dichloroethylene	3.64	0.05	ug/g	ND	91.1	60-130			
cis-1,2-Dichloroethylene	4.34	0.05	ug/g	ND	108	60-130			
trans-1,2-Dichloroethylene	4.02	0.05	ug/g	ND	100	60-130			
1,2-Dichloropropane	3.76	0.05	ug/g	ND	94.1	60-130			
cis-1,3-Dichloropropylene	4.08	0.05	ug/g	ND	102	60-130			
trans-1,3-Dichloropropylene	4.18	0.05	ug/g	ND	104	60-130			
Ethylbenzene	3.64	0.05	ug/g	ND	90.9	60-130			
Ethylene dibromide (dibromoethane)	4.11	0.05	ug/g	ND	103	60-130			
Hexane	3.62	0.05	ug/g	ND	90.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	10.0	0.50	ug/g	ND	100	50-140			
Methyl Isobutyl Ketone	10.1	0.50	ug/g	ND	101	50-140			
Methyl tert-butyl ether	10.8	0.05	ug/g	ND	108	50-140			
Methylene Chloride	4.18	0.05	ug/g	ND	104	60-130			
Styrene	4.49	0.05	ug/g	ND	112	60-130			
1,1,1,2-Tetrachloroethane	3.83	0.05	ug/g	ND	95.8	60-130			
1,1,2,2-Tetrachloroethane	3.88	0.05	ug/g	ND	97.0	60-130			
Tetrachloroethylene	4.38	0.05	ug/g	ND	109	60-130			
Toluene	3.56	0.05	ug/g	ND	88.9	60-130			
1,1,1-Trichloroethane	4.35	0.05	ug/g	ND	109	60-130			
1,1,2-Trichloroethane	3.53	0.05	ug/g	ND	88.3	60-130			
Trichloroethylene	4.15	0.05	ug/g	ND	104	60-130			
Trichlorofluoromethane	4.27	0.05	ug/g	ND	107	50-140			
Vinyl chloride	3.13	0.02	ug/g	ND	78.1	50-140			
m,p-Xylenes	7.42	0.05	ug/g	ND	92.8	60-130			
o-Xylene	3.66	0.05	ug/g	ND	91.5	60-130			
Surrogate: 4-Bromofluorobenzene	8.14		ug/g		102	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18646

Report Date: 23-Dec-2015

Order Date: 17-Dec-2015

Project Description: PE3703

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.

Client Name: PATERSON Group Inc.	Project Reference: PE 3703	TAT: <input checked="" type="checkbox"/> Regular <input type="checkbox"/> 3 Day
Contact Name: MARK D'ARCY	Quote #	<input type="checkbox"/> 2 Day <input type="checkbox"/> 1 Day
Address: 154 COLONNADE ROAD SOUTH	PO # 18646	Date Required: _____
Telephone: (413) 226-7381	Email Address: MDARCY@PATERSONGROUP.CA	
Criteria: <input checked="" type="checkbox"/> O. Reg. 153/04 (As Amended) Table 3 <input type="checkbox"/> RSC Filing <input type="checkbox"/> O. Reg. 558/00 <input type="checkbox"/> PWQO <input type="checkbox"/> CCME <input type="checkbox"/> SUB (Storm) <input type="checkbox"/> SUB (Sanitary) Municipality: _____ <input type="checkbox"/> Other: _____		


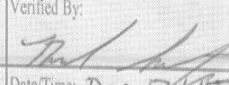
Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Parcel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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Comments:

Method of Delivery:

Relinquished By (Sign): 	Received by Driver/Depot: M. FROUSE	Received at Lab: SUNBORN DONMIL	Verified By: 
Relinquished By (Print): SEAN MACRIDGE	Date/Time: 17/12/15 12:05	Date/Time: DEC 17, 2015 12:30	Date/Time: DEC 17/15 12:39
Date/Time: Dec 17, 2015 - 10am	Temperature: _____ °C	Temperature: 16.1 °C	pH Verified By: RS

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 18891
Project: PE3703
Custody: 26223

Report Date: 16-Dec-2015
Order Date: 10-Dec-2015

Order #: 1550328

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

Paracel ID
1550328-01

Client ID
BH1-GW1

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18891

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

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	10-Dec-15	12-Dec-15

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **18891**

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

Client ID:	BH1-GW1	-	-	-
Sample Date:	09-Dec-15	-	-	-
Sample ID:	1550328-01	-	-	-
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 (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: **18891**

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

	Client ID:	BH1-GW1	-	-	-
	Sample Date:	09-Dec-15	-	-	-
	Sample ID:	1550328-01	-	-	-
	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	112%	-	-	-
Toluene-d8	Surrogate	91.6%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18891

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

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	80.4		ug/L		101	50-140			
Surrogate: Dibromofluoromethane	92.0		ug/L		115	50-140			
Surrogate: Toluene-d8	75.5		ug/L		94.4	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **18891**

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703
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	3.39	0.5	ug/L	4.43			26.6	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	6.84	0.5	ug/L	8.23			18.4	30	
Dibromochloromethane	2.35	0.5	ug/L	2.83			18.5	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	80.0		ug/L	ND	100	50-140			
Surrogate: Dibromofluoromethane	89.2		ug/L	ND	111	50-140			
Surrogate: Toluene-d8	76.9		ug/L	ND	96.2	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18891

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	57.6	5.0	ug/L	ND	57.6	50-140			
Benzene	33.2	0.5	ug/L	ND	82.9	50-140			
Bromodichloromethane	43.6	0.5	ug/L	4.43	97.9	50-140			
Bromoform	32.8	0.5	ug/L	ND	82.0	50-140			
Bromomethane	39.1	0.5	ug/L	ND	97.8	50-140			
Carbon Tetrachloride	30.9	0.2	ug/L	ND	77.3	50-140			
Chlorobenzene	35.3	0.5	ug/L	ND	88.2	50-140			
Chloroform	39.0	0.5	ug/L	8.23	77.0	50-140			
Dibromochloromethane	35.1	0.5	ug/L	2.83	80.8	50-140			
Dichlorodifluoromethane	41.8	1.0	ug/L	ND	104	50-140			
1,2-Dichlorobenzene	33.3	0.5	ug/L	ND	83.2	50-140			
1,3-Dichlorobenzene	36.9	0.5	ug/L	ND	92.2	50-140			
1,4-Dichlorobenzene	32.0	0.5	ug/L	ND	80.0	50-140			
1,1-Dichloroethane	32.0	0.5	ug/L	ND	80.0	50-140			
1,2-Dichloroethane	28.9	0.5	ug/L	ND	72.2	50-140			
1,1-Dichloroethylene	33.4	0.5	ug/L	ND	83.4	50-140			
cis-1,2-Dichloroethylene	38.9	0.5	ug/L	ND	97.3	50-140			
trans-1,2-Dichloroethylene	32.1	0.5	ug/L	ND	80.2	50-140			
1,2-Dichloropropane	34.2	0.5	ug/L	ND	85.6	50-140			
cis-1,3-Dichloropropylene	30.4	0.5	ug/L	ND	75.9	50-140			
trans-1,3-Dichloropropylene	23.5	0.5	ug/L	ND	58.7	50-140			
Ethylbenzene	38.0	0.5	ug/L	ND	95.1	50-140			
Ethylene dibromide (dibromoethane)	34.5	0.2	ug/L	ND	86.3	50-140			
Hexane	24.9	1.0	ug/L	ND	62.3	50-140			
Methyl Ethyl Ketone (2-Butanone)	58.6	5.0	ug/L	ND	58.6	50-140			
Methyl Isobutyl Ketone	70.4	5.0	ug/L	ND	70.4	50-140			
Methyl tert-butyl ether	89.9	2.0	ug/L	ND	89.9	50-140			
Methylene Chloride	31.7	5.0	ug/L	ND	79.2	50-140			
Styrene	37.8	0.5	ug/L	ND	94.5	50-140			
1,1,1,2-Tetrachloroethane	33.0	0.5	ug/L	ND	82.4	50-140			
1,1,1,2,2-Tetrachloroethane	35.9	0.5	ug/L	ND	89.8	50-140			
Tetrachloroethylene	31.7	0.5	ug/L	ND	79.3	50-140			
Toluene	33.5	0.5	ug/L	ND	83.8	50-140			
1,1,1-Trichloroethane	32.6	0.5	ug/L	ND	81.6	50-140			
1,1,2-Trichloroethane	39.5	0.5	ug/L	ND	98.8	50-140			
Trichloroethylene	35.3	0.5	ug/L	ND	88.2	50-140			
Trichlorofluoromethane	28.8	1.0	ug/L	ND	72.0	50-140			
Vinyl chloride	42.8	0.5	ug/L	ND	107	50-140			
m,p-Xylenes	77.9	0.5	ug/L	ND	97.4	50-140			
o-Xylene	35.6	0.5	ug/L	ND	88.9	50-140			
Surrogate: 4-Bromofluorobenzene	72.0		ug/L		90.0	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 18891

Report Date: 16-Dec-2015

Order Date: 10-Dec-2015

Project Description: PE3703

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.

Client Name: PATERSON GROUP	Project Reference: PE3703	TAT: <input checked="" type="checkbox"/> Regular <input type="checkbox"/> [] 3 Day
Contact Name: MARK D'ARCY	Quote #	<input type="checkbox"/> [] 2 Day <input type="checkbox"/> [] 1 Day
Address: 154 COLONNADE RD. S OTTAWA, ON	PO # 18891	Date Required: _____
Telephone: 613-226-7381	Email Address: mdarcy@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)

Required Analyses

Paracel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		VOC's												
Sample ID/Location Name					Date	Time													
1	BH1-GW1	GW		2	DEC 9/15	8:15 AM	✓												
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:	Method of Delivery: Paracel
-----------	------------------------------------

Relinquished By (Sign):	Received by Driver/Depot: A. DELOUSE	Received at Lab: STURTEVANT	Verified By: DKM
Relinquished By (Print):	Date/Time: 10/12/15 4:30 PM	Date/Time: DEC 10, 2015 05:11	Date/Time: Dec. 11, 2015 8:58
Date/Time:	Temperature: 11.2 °C	Temperature: 11.2 °C	pH Verified [] By:

Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 19085
Project: PE3703
Custody: 26359

Report Date: 23-Dec-2015
Order Date: 21-Dec-2015

Order #: 1552071

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

Paracel ID	Client ID
1552071-01	BH1-GW1
1552071-02	BH2-GW1
1552071-03	BH3-GW1

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 19085

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: PE3703

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	22-Dec-15	22-Dec-15
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	22-Dec-15	22-Dec-15
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	22-Dec-15	22-Dec-15

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **19085**

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: PE3703

Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
Sample Date:	21-Dec-15	21-Dec-15	21-Dec-15	-
Sample ID:	1552071-01	1552071-02	1552071-03	-
MDL/Units	Water	Water	Water	-

Volatiles

Acetone	5.0 ug/L	64.0	35.0	<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 (dibromoethane)	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: **19085**

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: PE3703

	Client ID: Sample Date: Sample ID:	BH1-GW1 21-Dec-15 1552071-01 Water	BH2-GW1 21-Dec-15 1552071-02 Water	BH3-GW1 21-Dec-15 1552071-03 Water	- - - -
	MDL/Units				
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	111%	114%	109%	-
Dibromofluoromethane	Surrogate	102%	110%	103%	-
Toluene-d8	Surrogate	119%	119%	116%	-

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	-	-
F1 + F2 PHCs	125 ug/L	-	<125	-	-
F3 + F4 PHCs	200 ug/L	-	<200	-	-

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
 Client PO: **19085**

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: PE3703
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	87.3		ug/L		109	50-140			
Surrogate: Dibromofluoromethane	77.4		ug/L		96.8	50-140			
Surrogate: Toluene-d8	90.7		ug/L		113	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 19085

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: **PE3703**

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	88.9		ug/L	ND	111	50-140			
Surrogate: Dibromofluoromethane	77.7		ug/L	ND	97.1	50-140			
Surrogate: Toluene-d8	93.0		ug/L	ND	116	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **19085**

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: PE3703

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2080	25	ug/L	ND	104	68-117			
F2 PHCs (C10-C16)	2000	100	ug/L	ND	111	60-140			
F3 PHCs (C16-C34)	3960	100	ug/L	ND	107	60-140			
F4 PHCs (C34-C50)	3220	100	ug/L	ND	130	60-140			
Volatiles									
Acetone	105	5.0	ug/L	ND	105	50-140			
Benzene	32.0	0.5	ug/L	ND	80.1	50-140			
Bromodichloromethane	34.0	0.5	ug/L	ND	85.1	50-140			
Bromoform	42.5	0.5	ug/L	ND	106	50-140			
Bromomethane	25.9	0.5	ug/L	ND	64.7	50-140			
Carbon Tetrachloride	32.4	0.2	ug/L	ND	80.9	50-140			
Chlorobenzene	34.0	0.5	ug/L	ND	85.0	50-140			
Chloroform	33.0	0.5	ug/L	ND	82.6	50-140			
Dibromochloromethane	40.9	0.5	ug/L	ND	102	50-140			
Dichlorodifluoromethane	27.0	1.0	ug/L	ND	67.5	50-140			
1,2-Dichlorobenzene	34.8	0.5	ug/L	ND	87.1	50-140			
1,3-Dichlorobenzene	31.2	0.5	ug/L	ND	78.0	50-140			
1,4-Dichlorobenzene	31.2	0.5	ug/L	ND	78.0	50-140			
1,1-Dichloroethane	33.7	0.5	ug/L	ND	84.2	50-140			
1,2-Dichloroethane	34.1	0.5	ug/L	ND	85.3	50-140			
1,1-Dichloroethylene	32.6	0.5	ug/L	ND	81.5	50-140			
cis-1,2-Dichloroethylene	34.3	0.5	ug/L	ND	85.8	50-140			
trans-1,2-Dichloroethylene	33.0	0.5	ug/L	ND	82.4	50-140			
1,2-Dichloropropane	33.1	0.5	ug/L	ND	82.8	50-140			
cis-1,3-Dichloropropylene	27.9	0.5	ug/L	ND	69.8	50-140			
trans-1,3-Dichloropropylene	27.9	0.5	ug/L	ND	69.7	50-140			
Ethylbenzene	35.7	0.5	ug/L	ND	89.2	50-140			
Ethylene dibromide (dibromoethane)	37.9	0.2	ug/L	ND	94.8	50-140			
Hexane	32.2	1.0	ug/L	ND	80.6	50-140			
Methyl Ethyl Ketone (2-Butanone)	97.5	5.0	ug/L	ND	97.5	50-140			
Methyl Isobutyl Ketone	97.4	5.0	ug/L	ND	97.4	50-140			
Methyl tert-butyl ether	98.2	2.0	ug/L	ND	98.2	50-140			
Methylene Chloride	35.0	5.0	ug/L	ND	87.4	50-140			
Styrene	36.3	0.5	ug/L	ND	90.8	50-140			
1,1,1,2-Tetrachloroethane	37.6	0.5	ug/L	ND	94.1	50-140			
1,1,2,2-Tetrachloroethane	38.6	0.5	ug/L	ND	96.6	50-140			
Tetrachloroethylene	32.2	0.5	ug/L	ND	80.4	50-140			
Toluene	34.8	0.5	ug/L	ND	87.1	50-140			
1,1,1-Trichloroethane	33.2	0.5	ug/L	ND	82.9	50-140			
1,1,2-Trichloroethane	31.5	0.5	ug/L	ND	78.7	50-140			
Trichloroethylene	29.1	0.5	ug/L	ND	72.8	50-140			
Trichlorofluoromethane	29.6	1.0	ug/L	ND	74.1	50-140			
Vinyl chloride	29.0	0.5	ug/L	ND	72.6	50-140			
m,p-Xylenes	74.1	0.5	ug/L	ND	92.6	50-140			
o-Xylene	38.6	0.5	ug/L	ND	96.6	50-140			
Surrogate: 4-Bromofluorobenzene	79.1		ug/L		98.8	50-140			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: **19085**

Report Date: 23-Dec-2015

Order Date: 21-Dec-2015

Project Description: **PE3703**

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.

Client Name: PATERSON GROUP	Project Reference: PE3703	TAT: <input type="checkbox"/> Regular <input type="checkbox"/> 3 Day
Contact Name: Mark D'Arcy	Quote #	<input checked="" type="checkbox"/> 2 Day <input type="checkbox"/> 1 Day
Address: 154 Colonnade Rd S	PO # 19065	Date Required:
Telephone: 613-226-7361	Email Address: mdarcy@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)

Required Analyses

Parcel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		VOC	PHC	F-E										
Sample ID/Location Name					Date	Time													
1	BH1-GW1	GW		32	Dec 21/15	AM	X												
2	BH2-GW1	GW		3	Dec 21/15	AM	X	X											
3	BH3-GW1	GW		32	Dec 21/15	AM	X												
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: **PHC on BH2-GW1 ONLY** Method of Delivery: **Paracel**

Relinquished By (Sign): [Signature]	Received by Driver/Depot: IT HOUSE	Received at Lab: SURETORN DOMIN	Verified By: [Signature]
Relinquished By (Print):	Date/Time: 21/12/15 4:00 PM	Date/Time: DEC 21 2015 05:34	Date/Time: Dec 21/15 5:36
Date/Time:	Temperature: 12.0 °C	Temperature: 12.0 °C	pH Verified <input checked="" type="checkbox"/> By: NA