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Phase II Environmental Site Assessment

Existing Commercial Property
2012 Ogilvie Road
Ottawa, Ontario

Prepared For

Trinity Development Group Inc.

October 17, 2013

Report: PE3116-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property at 2012 Ogilvie Road, Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern identified during the Phase I ESA, in particular a former automotive service garage, former retail fuel outlet, and former dry cleaner at the subject site. The subsurface investigation at the subject site was conducted concurrently with a geotechnical investigation and consisted of the drilling of 28 boreholes and the installation of four (4) monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. A total of 12 soil samples were submitted for laboratory analysis of BTEX, PHCs, and VOCs. Two (2) samples from the vicinity of the former automotive service garage (BH20-13-SS4 and duplicate) and three (3) samples from the vicinity of the former retail fuel outlet (BH24-13-SS2 and SS4, BH25-13-SS5) exceeded the MOE Table 3 standards for various BTEX and PHC parameters. All other samples were in compliance with MOE Table 3 standards for BTEX, PHC, and VOC parameters.

Groundwater samples were obtained from the monitoring wells at BH20-13, BH23-13, BH24-13, and BH27-13 and submitted for analysis of BTEX, PHCs, VOCs, and PAHs. Concentration of PHCs at BH20-13, BH23-13, BH24-13, and BH27-13 exceeded the MOE standards for PHC F2 and/or F3 parameters. The concentration of cis-1,2-Dichloroethylene at BH23-13 also exceeded Table 3 standards. Sediment was noted in groundwater samples.

Recommendations

Based on the above results, soil exists at the subject property with BTEX and PHC which exceed the applicable MOE Table 3 soil standards. Groundwater exists at the subject site with VOC and PHC concentrations which exceed the applicable MOE Table 3 soil standards. It is our understanding that the subject site is to be redeveloped with several commercial/residential buildings. It is our recommendation that an environmental site remediation program, involving the removal of all contaminated soil and groundwater, be completed concurrently with site redevelopment.

It is our interpretation that the sediment in the groundwater samples may result in increased reported PHC concentrations. It is our recommendation that all wells be re-tested for PHCs to confirm concentrations.

1.0 INTRODUCTION

At the request of Trinity Development Group Inc. (Trinity), Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of the property addressed as 2012 Ogilvie Road, in the City of Ottawa, Ontario. The purpose of this Phase II ESA was to address concerns identified in the Phase I ESA prepared by Paterson, dated October 15, 2013.

1.1 Site Description

Address:	2012 Ogilvie Road (locally addressed as 2012, 2014, 2016, 2018 Ogilvie Road and 1401 Blair Place), Ottawa, Ontario.
Legal Description:	Part of Lot 20, Concession 2, former Township of Gloucester, currently the City of Ottawa, Ontario.
Property Identification Number:	04363-0103.
Location:	The subject site is located on the south side of Ogilvie Road, to the east of Blair Place, 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° 26' 10" N, 75° 36' 12" W.
Configuration:	Rectangular.
Site Area:	7.9 hectares (approximate).

1.2 Property Ownership

The subject property is currently owned by Trinity Development Group Inc. Paterson was retained to complete this Phase II ESA by Mr. Brad Caco of Trinity. The offices of Broccolini are located at 3250 Bloor Street West, Suite 100, Toronto, Ontario. Mr. Caco can be reached by telephone at (416) 255-8800.

1.3 Current and Proposed Future Uses

The subject site is currently occupied by several commercial buildings and associated paved asphalt parking areas. It is our understanding that the subject site will be redeveloped as a commercial / residential development consisting of several buildings. No further details are currently available.

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 (MOE), April 2011. The MOE Table 3 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Non-potable groundwater conditions
- Commercial land use

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject site is located on the south side of Ogilvie Road, east of Blair Place, in the City of Ottawa, Ontario. The subject site is currently occupied by three (3) multi-unit commercial buildings, one vacant car wash building, and one vacant fast food restaurant building. The remainder of the site consists of paved asphalt parking areas. Site topography slopes gently to the south. Site drainage consists of sheet flow to catch basins in the parking lot.

No drinking water wells or private sewage systems were observed on the subject property, nor are any expected to be present, as the site is located in a municipally-serviced area. No evidence of current or former railway or spur lines on the subject property were observed at the time of the site inspection. There were no unidentified substances observed on the subject site.

2.2 Past Investigations

Paterson has completed a Phase I ESA for the subject site, provided under separate cover, as well as previous subsurface investigations in 2004 and 2008. The findings of the Phase I ESA are discussed below.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation conducted as a component of this Phase II ESA was completed concurrently with a geotechnical investigation at the subject site, and consisted of the drilling of 28 boreholes at the subject property. Monitoring wells were installed in four (4) boreholes. Boreholes were advanced to a maximum depth of 6.1 m.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I ESA. Contaminants of concern for soil and groundwater are BTEX, PHCs, VOCs, and/or PAHs.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada mapping and the 2004, 2008, and 2013 subsurface investigations, drift thickness in the area of the subject site is on the order of 2 to 6.1 m. Overburden soils consist of fill over glacial till with an intermittent layer of silty clay, and bedrock consists of Billings Formation shale. Groundwater was encountered within the glacial till unit at depths ranging from 1.7 to 2.6 m below existing grade.

Contaminants of Potential Concern

The following CPCs were identified with respect to the subject site:

- Volatile Organic Compounds (VOCs) – this suite of parameters includes Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), associated with gasoline, as well as chlorinated solvents (Tetrachloroethylene, Trichloroethylene, Dichloroethylenes, and Vinyl Chloride) associated with de-greasing, dry cleaning, and printing operations. These parameters were selected as CPCs for the Phase I study area due to the historical presence of the dry cleaning business on-site. VOCs may be present in the soil matrix as well as in the dissolved phase in the groundwater system.

- Petroleum Hydrocarbons Fractions 1 through 4 (PHCs F1-F4) – this suite of parameters encompasses gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F1-F4 were selected as CPCs for the Phase I property based on the presence of the historical retail fuel outlet and automotive service garage on the subject site. Gasoline and diesel are commonly used motor vehicle fuels, and heavy oils may be present in the form of lubricants. PHCs may be present in the soil matrix, sorbed to soil particles, as well as in free or dissolved phase in the groundwater system. PHCs are generally considered to be LNAPLs – light non-aqueous phase liquids, indicating that when present in sufficient concentrations above the solubility limit, they will partition into a separate phase above the water table, due to their lower density.

- Polycyclic Aromatic Hydrocarbons (PAHs) – this suite of parameters encompasses various complex hydrocarbons, commonly associated with coal and/or combustion or heavy-fraction hydrocarbons such as hydraulic or crankcase oil. PAHs were selected as a CPC for the site based on the historical presence of the automotive service garage on the subject site. PAHs may be present in the soil matrix or dissolved in site groundwater.

The mechanisms of contaminant transport within the site soils include physical transportation and leaching. Physical transport is not anticipated to be an issue at the subject site, given the developed nature of the site, particularly the parking lot covering much of the site. Leaching is anticipated to be limited by the low permeability of the asphalt pavement and roofs over most of the site. As such, contaminants identified in the soil are considered to have a low potential to migrate to the groundwater below the site.

The mechanisms of contaminant transport within the groundwater system include advection, dispersion, and diffusion. Advection and dispersion will be the dominant mechanisms of contaminant transport in soils with higher hydraulic conductivities, such as sands, gravels, silts, and some glacial till soils, whereas diffusion will dominate in soils with lower hydraulic conductivity, such as clays.

Existing Buildings and Structures

The following buildings and structures were observed on the subject property:

- 2012 Ogilvie Road: Vacant slab-on-grade car wash building.
- 2014 Ogilvie Road: Vacant single-storey slab-on-grade fast food restaurant building, heated with natural gas fired HVAC units.

- 2016 Ogilvie Road: Single storey slab-on-grade multi-unit shopping centre building, steel frame construction with concrete block exterior and flat tar-and-gravel roof, heated with natural gas fired HVAC units.
- 2018 Ogilvie Road: Single storey slab-on-grade multi-unit retail plaza, finished with brick, metal, and concrete block, heated with natural gas fired HVAC units.
- 1401 Blair Place: Single storey multi-unit commercial building with partial basement, finished with brick, metal, and concrete block, heated with natural gas fired HVAC units.

No ASTs or evidence of USTs or fuels or chemical storage were observed on the exterior of the subject site.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is Green's Creek, located approximately 1 km to the east of the site.

Areas of Natural Significance

No areas of natural significance were identified on the site or in the Phase I study area.

Drinking Water Wells

A search of the MOE water well database returned six (6) water well records within the Phase I study area, of which two (2) are drinking water wells and four (4) are monitoring wells. One drinking water well is reported as decommissioned, and the other drinking water well was not located. Based on the availability of municipal water within the Phase I ESA study area, these drinking water wells are no longer considered to be in use.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is commercial and residential.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report. No deviations from the sampling and analysis plan were noted.

3.5 Impediments

No physical impediments or denial of access were encountered during the Phase II Environmental Site Assessment.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on October 1, 2, 4, 7, and 9, 2013, and consisted of the drilling of 28 boreholes on the subject site. The boreholes were placed to provide general coverage of the property for geotechnical purposes and to address the aforementioned areas of potential environmental concern. The boreholes were advanced using a truck-mounted CME 55 power auger drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Borehole locations are shown on Drawing No. PE3116-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 141 soil samples were obtained from the boreholes by means of split spoon sampling and the sampling of shallow soils directly from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes and test pits are shown as "**SS**" and "**AU**" respectively on the Soil Profile and Test Data Sheets, appended to this report.

Site soils consist of fill over an intermittent layer of silty clay, underlain by glacial till and black shale bedrock. The fill material consists of silty sand with gravel and varies in thickness from 0.3 to 2.7 m. No deleterious fill material, or visual or olfactory evidence of contamination in the fill material, was encountered. The silty clay material varies in thickness from 0.8 to 2.5 m. The glacial till material consists of silty clay with sand and gravel and varies in thickness from 0.4 to 4.0 m. Practical refusal to augering was encountered at depths varying from 1.7 to 6.1 m below existing grade. BH27-13 was augered into shale to facilitate monitoring well installation.

4.3 Field Screening Measurements

All soil samples collected underwent a preliminary screening procedure, which included visual screening for colour and evidence of deleterious fill, as well as screening with a RKI Eagle combustible detector. The detection limit is 5 ppm, with a precision of +/- 5 ppm.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated and the peak readings recorded. The vapour readings ranged from 0 ppm to 820 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

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

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed during the 2013 drilling program by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision by Paterson personnel. The monitoring wells consisted of 51 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 2.

The groundwater monitoring wells were developed upon completion using a dedicated inertial lift pump. A minimum of three (3) well volumes were removed from the wells.

Table 2: 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
BH20-13	75.51	6.10	3.05-6.10	2.74-6.10	0.60-2.74	Flushmount
BH23-13	75.81	3.84	2.31-3.84	1.70-3.84	0.60-1.70	Flushmount
BH24-13	76.14	3.76	2.24-3.76	1.63-3.76	0.60-1.63	Flushmount
BH27-13	75.68	4.57	3.05-4.57	2.44-4.57	0.60-2.44	Flushmount

4.5 Field Measurement of Water Quality Parameters

Prior to sampling, water quality parameters were measured in the field using a multi-parameter analyzer. Parameters measured in the field included temperature, electrical conductivity, and total dissolved solids. Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized below in Table 3.

Table 3: Field Measurement of Water Quality Parameters, October 10, 2013

Parameter	BH20-13-GW1	BH23-13-GW1	BH24-13-GW1	BH27-13-GW1
Temperature (°C)	13.0	18.0	18.9	20.0
Electrical Conductivity (µS/cm)	2,690	4,820	4,990	5,670
Total Dissolved Solids (ppm)	670	3,210	3,300	3,790

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MOE document entitled "Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario", dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

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

Table 4: Soil Samples Submitted

Sample ID	Sample Depth/ Stratigraphic Unit	Parameters Analyzed		Rationale
		BTEX, PHCs F_1-F_4	VOCs	
BH20-13-SS4	2.29-2.90; silty clay	X		Check for contamination in vicinity of former automotive service garage
BH20-13-SS6	3.81-4.42; till	X		Delineate vertical extent of contamination observed in BH20.
BH21-13-SS6	3.81-4.42; till	X		Delineate lateral extent of contamination observed in vicinity of former automotive service garage.
BH22-13-SS5	3.05-3.66; till	X		
BH23-13-SS3	1.52-2.13; fill	X	X	Address visual / olfactory evidence of PHC contamination observed in borehole; check for VOC contamination in vicinity of former dry cleaner.
BH24-13-SS2	0.76-1.37; fill	X		Check for contamination in vicinity of former retail fuel outlet.
BH24-13-SS4	2.29-2.90; till	X		Delineate vertical extent of contamination observed in BH24.
BH25-13-SS5	3.05-3.66; till	X		Delineate lateral extent of contamination observed in vicinity of former retail fuel outlet.
BH26-13-SS6	3.81-4.42; till	X		
BH27-13-SS4	2.29-2.90; till	X	X	Check for VOC contamination in vicinity of former dry cleaner.
BH28-13-SS2	0.76-1.37; till	X		Delineate lateral extent of contamination observed in vicinity of former retail fuel outlet.
Dup. 1 (BH20-13-SS4)	2.29-2.90; silty clay	X		QA/QC

Table 5: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX/ PHCs F_1-F_4	VOCs	PAHs	
BH20-13-GW1	2.74-6.10; till	X		X	Assessment of groundwater quality in vicinity of former automotive service garage.
BH23-13-GW1	1.70-3.84; till	X	X		Delineation of VOC impacts identified by previous subsurface investigation.
BH24-13-GW1	1.63-3.76; till	X		X	Assessment of groundwater quality in vicinity of former retail fuel outlet
BH27-13-GW1	2.44-4.57; shale	X	X		Delineation of VOC impacts identified by previous subsurface investigation.
Dup. 1 (BH24-13-GW1)	1.63-3.76	X			QA/QC

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

4.8 Residue Management

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

4.9 Elevation Surveying

An elevation survey of all borehole locations was completed by Stantec Geomatics. All borehole elevations are geodetic.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils consist of fill over an intermittent layer of silty clay, underlain by glacial till and black shale bedrock. The fill material consists of silty sand with gravel and varies in thickness from 0.3 to 2.7 m. The silty clay material varies in thickness from 0.8 to 2.5 m. The glacial till material consists of silty clay with sand and gravel and varies in thickness from 0.4 to 4.0 m. Practical refusal to augering was encountered at depths varying from 1.7 to 6.1 m below existing grade. BH27-13 was augered into shale to facilitate monitoring well installation.

Groundwater monitoring wells were installed at BH20-13, BH23-13, BH24-13, and BH27-13. Site stratigraphy is shown on Drawing PE3116-5 - Cross-Sections.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on October 10, 2013, using an electronic water level meter. Groundwater levels are summarized below in Table 6. All measurements are geodetic based on the topographic plan of the subject site.

Table 6: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH20-13	75.03	2.62	72.41	October 10, 2013
BH23-13	75.60	1.66	73.94	October 10, 2013
BH24-13	76.06	1.92	74.14	October 10, 2013
BH27-13	75.66	1.99	73.67	October 10, 2013

Based on the groundwater elevations from the October 10, 2013 monitoring event, groundwater contour mapping was completed for the upper aquifer. Groundwater contours are shown on Drawing PE3116-4 - Groundwater Contour Plan. Based on the contour mapping, groundwater flow at the subject site appears to be in a southeasterly direction. A horizontal hydraulic gradient of approximately 0.006 m/m was calculated.

No free product was observed in the monitoring wells sampled at the subject site.

5.3 Fine-Medium Soil Texture

Based on field soil observations, fine-grained soil standards are not applicable to the subject site.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in organic vapour readings of 0 ppm to 820 ppm. Field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

The organic vapour readings obtained from field screening of soil samples indicates that there is the potential for significant PHC contamination in site soils. It is noted that higher-fraction hydrocarbons may not be as readily detectable by combustible gas or PID detectors.

5.5 Soil Quality

A total of 12 soil samples (including one duplicate) were submitted for analysis of BTEX and PHCs. Two (2) soil samples were submitted for analysis of VOCs. The results of the analytical testing are presented below. The laboratory certificates of analysis are provided in Appendix 1.

Table 7:
Analytical Test Results – Soil
BTEX and PHCs F1-F4

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 2-4, 2013				MOE Table 3 Commercial Coarse Standards
		BH20-13-SS4	Dup. 1 (BH20-13-SS4)	BH20-13-SS6	BH21-13-SS6	
Benzene	0.02	nd	nd	nd	nd	0.32
Ethylbenzene	0.05	nd	nd	nd	nd	9.5
Toluene	0.05	0.07	0.08	nd	nd	68
Xylenes	0.05	0.18	0.17	nd	nd	26
PHC F1	7	31	**64**	nd	nd	55
PHC F2	4	**457**	**804**	nd	nd	230
PHC F3	8	436	682	nd	nd	1,700
PHC F4	6	nd	nd	nd	nd	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MOE standards

Table 7 Continued:
Analytical Test Results – Soil
BTEX and PHCs F1-F4

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 2-4, 2013				MOE Table 3 Commercial Coarse Standards
		BH22-13-SS5	BH23-13-SS3	BH24-13-SS2	BH24-13-SS4	
Benzene	0.02	nd	-	nd	**1.49**	0.32
Ethylbenzene	0.05	nd	-	5.07	1.77	9.5
Toluene	0.05	nd	-	nd	0.13	68
Xylenes	0.05	nd	-	12.3	3.29	26
PHC F1	7	nd	nd	**662**	42	55
PHC F2	4	nd	12	195	27	230
PHC F3	8	nd	62	56	27	1,700
PHC F4	6	nd	36	40	nd	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MOE standards

Table 7 Continued:
Analytical Test Results – Soil
BTEX and PHCs F1-F4

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 2-4, 2013				MOE Table 3 Commercial Coarse Standards
		BH25-13-SS5	BH26-13-SS6	BH27-13-SS4	BH28-13-SS2	
Benzene	0.02	**0.76**	nd	-	nd	0.32
Ethylbenzene	0.05	5.71	0.08	-	0.19	9.5
Toluene	0.05	0.32	nd	-	nd	68
Xylenes	0.05	9.49	0.15	-	0.57	26
PHC F1	7	**316**	nd	19	nd	55
PHC F2	4	**250**	24	57	57	230
PHC F3	8	47	42	37	51	1,700
PHC F4	6	nd	20	12	32	3,300

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MOE standards

Concentrations in the upper sample at BH20 (and duplicate), both samples at BH24, and BH25 exceed MOE Table 3 standards for various BTEX and PHC parameters. All other PHC concentrations were in compliance with the selected MOE Table 3 standards.

Table 8:
Analytical Test Results – Soil
VOCs

Parameter	MDL (µg/g)	Soil Samples (µg/g) October 2-4, 2013		MOE Table 3 Commercial Coarse Standards
		BH23-13-SS3	BH27-13-SS4	
Acetone	0.50	nd	nd	16
Benzene	0.02	nd	0.07	0.32
Bromodichloromethane	0.05	nd	nd	18
Bromoform	0.05	nd	nd	0.61
Bromomethane	0.05	nd	nd	0.05
Carbon Tetrachloride	0.05	nd	nd	0.21
Chlorobenzene	0.05	nd	nd	2.4
Chloroform	0.05	nd	nd	0.47
Dibromochloromethane	0.05	nd	nd	13
Dichlorodifluoromethane	0.05	nd	nd	16
1,2-Dichlorobenzene	0.05	nd	nd	6.8
1,3-Dichlorobenzene	0.05	nd	nd	9.6
1,4-Dichlorobenzene	0.05	nd	nd	0.2
1,1-Dichloroethane	0.05	nd	nd	17
1,2-Dichloroethane	0.05	nd	nd	0.05
1,1-Dichloroethylene	0.05	nd	nd	0.064
cis-1,2-Dichloroethylene	0.05	nd	0.23	55
trans-1,2-Dichloroethylene	0.05	nd	nd	1.3
1,2-Dichloropropane	0.05	nd	nd	0.16
1,3-Dichloropropene	0.05	nd	nd	0.18
Ethylbenzene	0.05	nd	0.23	9.5
Hexane	0.05	nd	0.20	46
Methyl Ethyl Ketone	0.50	nd	nd	70
Methyl Isobutyl Ketone	0.50	nd	nd	31
Methyl tert-butyl ether	0.05	nd	nd	11
Methylene Chloride	0.05	nd	nd	1.6
Styrene	0.05	nd	nd	34
1,1,1,2-Tetrachloroethane	0.05	nd	nd	0.087
1,1,2,2-Tetrachloroethane	0.05	nd	nd	0.05
Tetrachloroethylene	0.05	nd	nd	4.5
Toluene	0.05	nd	0.15	68
1,2,4-Trichlorobenzene	0.05	nd	nd	3.2
1,1,1-Trichloroethane	0.05	nd	nd	6.1
1,1,2-Trichloroethane	0.05	nd	nd	0.05
Trichloroethylene	0.05	nd	nd	0.091
Trichlorofluoromethane	0.05	nd	nd	4
Vinyl chloride	0.02	nd	nd	0.032
Xylenes	0.05	0.07	0.51	26

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds selected MOE standards

All VOC concentrations were in compliance with MOE Table 3 standards.

Based on the analytical results, no contaminants were identified as being by-products of chemical or biological transformations which have or may have occurred.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 9.

Table 9: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Benzene	**1.49**	BH24-13-SS2	0.76-1.37; fill
cis-1,2-Dichloroethylene	0.23	BH27-13-SS4	2.29-2.90; till
Ethylbenzene	5.71	BH25-13-SS5	3.05-3.66; till
Hexane	0.20	BH27-13-SS4	2.29-2.90; till
Toluene	0.32	BH25-13-SS5	3.05-3.66; till
Xylenes	**12.3**	BH24-13-SS2	0.76-1.37; fill
PHC F1	**662**	BH24-13-SS2	0.76-1.37; fill
PHC F2	**804**	Dup. 1 (BH20-13-SS4)	2.29-2.90; silty clay
PHC F3	682	Dup. 1 (BH20-13-SS4)	2.29-2.90; silty clay
PHC F4	40	BH24-13-SS2	0.76-1.37; fill

Notes:
- **Bold** – Value exceeds MOE Table 3 standards

All other parameter concentrations were below laboratory detection limits.

5.6 Groundwater Quality

Groundwater samples from the monitoring wells at BH20-13, BH23-13, BH24-13, and BH27-13 were submitted for laboratory analysis of BTEX, PHCs, VOCs, and PAHs. A duplicate sample taken from BH24-13 was submitted for analysis of PHCs. The groundwater samples were obtained from the screened intervals noted on Table 1. The results of the analytical testing are presented below in Tables 10, 11, and 12. The laboratory certificates of analysis are provided in Appendix 1.

Table 10:
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Sample (µg/L) October 10, 2013		MOE Table 3 Commercial Coarse Standards
		BH23-13-GW1	BH27-13-GW1	
Acetone	5.0	nd	nd	130,000
Benzene	0.5	nd	nd	44
Bromodichloromethane	0.5	nd	nd	85,000
Bromoform	0.5	nd	nd	380
Bromomethane	0.5	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	630
Chloroform	0.5	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	82,000
Dichlorodifluoromethane	1.0	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	**17.1**	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	16
1,3-Dichloropropene	0.5	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	2,300
Hexane	1.0	nd	nd	51
Methyl Ethyl Ketone	5.0	nd	nd	470,000
Methyl Isobutyl Ketone	5.0	nd	nd	140,000
Methyl tert-butyl Ether	2.0	nd	nd	190
Methylene Chloride	5.0	nd	nd	610
Styrene	0.5	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	18,000
1,2,4-Trichlorobenzene	0.5	nd	nd	180
1,1,1-Trichloroethane	0.5	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1.0	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes	0.5	nd	nd	4,200

Notes:
- MDL – Method Detection Limit nd – not detected above the MDL
- N/V – no value provided by the MOE
- **Bold** – Value exceeds applicable MOE Standard

The concentration of cis-1,2-Dichloroethylene exceeded the Table 3 standard at BH27. All remaining VOC concentrations are in compliance with the selected MOE standards.

Table 11:
Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MOE Table 3 Commercial Coarse Standards
		October 10, 2013			
		BH20-13-GW1	BH24-13-GW1	Dup. 1 (BH24-13-GW1)	
Acenaphthene	0.05	0.21	nd	nd	600
Acenaphthylene	0.05	nd	nd	nd	1.8
Anthracene	0.01	nd	0.07	0.05	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	4.7
Benzo[a]pyrene	0.01	nd	nd	nd	0.81
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.75
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.4
Biphenyl	0.05	0.14	0.06	nd	1,000
Chrysene	0.05	nd	nd	nd	1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.52
Fluoranthene	0.01	nd	nd	nd	130
Fluorene	0.05	0.28	nd	nd	400
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	0.08	0.2
Methylnaphthalene (1&2)	0.10	0.22	0.66	0.31	1,800
Naphthalene	0.05	nd	0.25	0.24	1,400
Phenanthrene	0.05	0.30	0.19	0.16	580
Pyrene	0.01	0.04	0.06	0.05	68

Notes:
- MDL – Method Detection Limit nd – not detected above the MDL
- N/V – no value provided by the MOE
- **Bold** – Value exceeds applicable MOE Standard

All PAH concentrations were in compliance with the selected MOE Table 3 standards.

Table 12:
Analytical Test Results – Groundwater
BTEX/PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)					MOE Table 3 Comm. Coarse Standards
		October 10, 2013					
		BH20-13-GW1	BH23-13-GW1	BH24-13-GW1	Dup. 1 (BH24-13-GW1)	BH27-13-GW1	
Benzene	0.5	nd	-	nd	nd	-	44
Ethylbenzene	0.5	nd	-	nd	nd	-	2,300
Toluene	0.5	nd	-	nd	nd	-	18,000
Xylenes	0.5	nd	-	nd	nd	-	4,200
PHCs F1	25	nd	nd	179	nd	nd	750
PHCs F2	100	**155**	117	**476**	**287**	**389**	150
PHCs F3	100	368	**525**	313	**587**	**606**	500
PHCs F4	100	248	413	179	359	316	500

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold** – Value exceeds MOE Table 7 Standard

The concentrations of PHC F2 at BH20-13, BH24-13, and BH27-13, and the concentrations of PHC F3 at BH23-13, BH24-13 (duplicate), and BH27-13 exceed the MOE Table 3 standards. As per the laboratory certificate of analysis, sediment was noted in all samples. Based on the presence of sediment in these samples, reported PHC concentrations may be higher than actual concentrations. It is our recommendation that all wells be further developed to remove sediment and re-sampled to confirm PHC concentrations.

It is our interpretation that the analyzed parameter concentrations do not indicate the potential presence of light non-aqueous phase liquids (LNAPLs) or dense non-aqueous phase liquids (DNAPLs). No free phase hydrocarbons were noted in the wells sampled at the time of sampling.

The maximum final concentrations of analyzed parameters in the groundwater at the site are summarized below in Table 13.

Table 13: Maximum Concentrations – Groundwater			
Parameter	**Maximum Concentration (µg/L)**	**Borehole**	**Depth Interval (m BGS)**
cis-1,2-Dichloroethylene	**17.1**	BH27-13-GW1	2.44-4.57; shale
Acenaphthene	0.21	BH20-13-GW1	2.74-6.10; till
Anthracene	0.07	BH24-13-GW1	1.63-3.76; till
Biphenyl	0.14	BH20-13-GW1	2.74-6.10; till
Fluorene	0.28	BH20-13-GW1	2.74-6.10; till
Indeno[1,2,3-cd]pyrene	0.08	Dup. 1 (BH24-13-GW1)	1.63-3.76; till
Methylnaphthalene (1&2)	0.66	BH24-13-GW1	1.63-3.76; till
Naphthalene	0.25	BH24-13-GW1	1.63-3.76; till
Phenanthrene	0.30	BH20-13-GW1	2.74-6.10; till
Pyrene	0.06	BH24-13-GW1	1.63-3.76; till
PHC F1	179	BH24-13-GW1	1.63-3.76; till
PHC F2	**476**	BH24-13-GW1	1.63-3.76; till
PHC F3	**606**	BH27-13-GW1	2.44-4.57; shale
PHC F4	413	BH23-13-GW1	1.70-3.84; till
Notes: ▪ **Bold** – Value exceeds MOE Table 3 standards			

All other parameter concentrations were below laboratory detection limits.

5.7 Quality Assurance and Quality Control Results

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained at BH20 and analyzed for BTEX and PHCs, with the intent of calculating the relative percent difference (RPD) between duplicate sample values as a way of assessing the quality of the analytical results. The RPD calculations for the original and duplicate sample are provided below in Table 14.

Table 14: QA/QC Calculations – Soil					
Parameter	**MDL (µg/g)**	**BH20-13-SS4**	**Dup. 1**	**RPD (%)**	**QA/QC Result**
Toluene	0.05	0.07	0.08	13.3	Meets Target
Xylenes	0.05	0.18	0.17	5.7	Meets Target
PHC F1	7	31	**64**	69.5	Exceeds Target
PHC F2	4	**457**	**804**	55.0	Exceeds Target
PHC F3	8	**436**	**682**	44.0	Exceeds Target
Notes: * All other parameter concentrations were below laboratory detection limits for original and duplicate samples, and as such, are within acceptable QA/QC parameters.					

The RPD values for PHC F1, F2, and F3 exceeded the 20% target. This is considered to be a result of the inherent heterogeneity of the soil sample and is not considered to materially affect the conclusions of the report, since both original and duplicate samples exceed MOE Table 3 standards for PHC F2 and F3.

A duplicate groundwater sample was also submitted for analysis of BTEX, PHCs, and PAHs. The RPD calculations for the original and duplicate sample are provided below in Table 15.

Table 15: QA/QC Calculations – Groundwater

Parameter	MDL (µg/L)	BH24-13-GW1	Dup. 1	RPD (%)	QA/QC Result
Anthracene	0.01	0.07	0.05	33.3	Exceeds Target
Biphenyl	0.05	0.06	nd	18.2**	Meets Target
Indeno[1,2,3-cd]pyrene	0.05	nd	0.08	46.4**	Exceeds Target
Methylnaphthalene (1&2)	0.10	0.66	0.34	64.0	Exceeds Target
Naphthalene	0.05	0.25	0.24	4.1	Meets Target
Phenanthrene	0.05	0.19	0.16	17.1	Meets Target
Pyrene	0.01	0.06	0.05	18.2	Meets Target
PHCs F1	25	179	nd	151**	Exceeds Target
PHCs F2	100	**476**	**287**	49.5	Exceeds Target
PHCs F3	100	313	**587**	60.9	Exceeds Target
PHCs F4	100	179	359	66.9	Exceeds Target

Notes:
* All other parameter concentrations were below laboratory detection limits for original and duplicate samples, and as such, are within acceptable QA/QC parameters.
** Where one parameter concentration is below the laboratory detection limit, the value of the detection limit is used for RPD calculations.

The RPD values for anthracene, indeno[1,2,3-cd]pyrene, methylnaphthalene, and PHC parameters exceed the 20% target. The conclusions of the report are not considered to be materially affected, considering that groundwater impacts are observed in both the original and the duplicate sample, and PHC F2 exceeds the Table 3 standards in both the original and the duplicate sample.

All samples submitted as part of the 2013 sampling event were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

As per Subsection 47(3) of O.Reg. 153/04 as amended by O.Reg. 269/11, a Certificate of Analysis has been received for each sample submitted for analysis during the 2013 sampling event, and all Certificates of Analysis are appended to this report. As noted on the laboratory certificate of analysis for groundwater samples, sediment was observed in all submitted groundwater samples.

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

5.8 Phase II Conceptual Site Model

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

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Areas of Potential Environmental Concern (APECs) identified include the historical presence of an automotive service garage, retail fuel outlet, and dry cleaner on the subject site. Additional Potentially Contaminating Activities were identified within the Phase I study area but were not considered to represent Areas of Potential Environmental Concern.

BTEX, PHCs, and VOCs in soil and BTEX, PHCs, VOCs, and PAHs in groundwater are identified as the Contaminants of Concern with respect to the subject site potentially resulting from these APECs.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Sewer and water services extend from Ogilvie Road and Blair Place to the subject site, and private site stormwater services are present on-site.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE3116-5 - Cross-Sections. Stratigraphy consists of:

- Fill, consisting of silty sand with gravel, varying in thickness from 0.3 to 2.7 m. Groundwater was not observed in this stratigraphic unit.
- An intermittent layer of silty clay, varying in thickness from 0.8 to 2.5 m, where encountered. Groundwater was not observed in this stratigraphic unit.
- Glacial till, consisting of silty clay with sand and gravel, varying in thickness from 0.4 to 4.0 m. Groundwater was observed in this stratigraphic unit, and all monitoring wells with the exception of BH27-13 were installed in the glacial till unit. The glacial till is interpreted to function as a shallow aquifer at the subject site.
- Shale bedrock - this unit is inferred due to practical refusal to augering at depths ranging from 1.7 to 6.1 m below existing grade, and due to weathered shale encountered in the tip of split spoon samplers upon spoon refusal. BH27-13 was augered into shale to facilitate monitoring well installation, given that groundwater was not encountered in the glacial till unit at this location. The shale, together with the glacial till is considered to function as an aquifer at the subject site. This is the deepest unit investigated.

Hydrogeological Characteristics

Groundwater was encountered in the glacial till and shale at the subject site. These units are interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on October 10, 2013. Water levels are summarized above in Section 6.2 of this report and are shown on Drawing PE3116-4 and PE3116-5.

Based on the groundwater elevations from the October 2013 monitoring event, groundwater contour mapping was completed and the horizontal hydraulic gradient for the subject site was calculated. Groundwater flow at the subject site was in a southeasterly direction. A hydraulic gradient of approximately 0.006 m/m was calculated.

Approximate Depth to Bedrock

Bedrock surface or practical refusal to augering (potential bedrock surface) were encountered at depths ranging from 1.7 to 6.1 m below ground surface.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 1.7 and 2.6 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 applt 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 material was identified at the subject site. This fill material was likely placed at the time of site development or concurrently with the decommissioning of the former retail fuel outlet or the remediation of the former automotive service garage. The majority of the fill material did not exhibit any visual or olfactory evidence of contamination. Selected fill samples in areas of potential environmental concern were analyzed for suspected contaminants of concern, as detailed in preceding sections.

Proposed Buildings and Other Structures

It is our understanding that the site is to be redeveloped with several structures as part of a mixed used residential and commercial development. No further information is available regarding the proposed redevelopment.

Existing Buildings and Structures

The subject site is currently occupied with several commercial buildings as noted in preceding sections.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is Green's Creek, located approximately 1 km to the southeast of the site.

Areas of Natural Significance

No areas of natural significance are present on the subject site.

Environmental Condition

Areas Where Contaminants are Present

Based on screening and analytical results, the area where contaminants are present in concentrations greater than the MOE Table 3 standards are shown on Drawing PE3116-3 and PE3116-5.

Types of Contaminants

Based on the Areas of Potential Environmental Concern identified as part of the Phase I ESA and analytical testing, contaminants found at concentrations greater than the MOE Table 3 standards at the subject site consist of BTEX and PHCs in soil and PHCs and cis-1,2-Dichloroethylene in groundwater.

Contaminated Media

Based on the results of the Phase II ESA, the contaminants of concern are present in the soil and groundwater at the subject site.

What Is Known About Areas Where Contaminants Are Present

Contaminants were identified in the approximate locations of the aforementioned Areas of Potential Environmental Concern at the subject site (automotive service garage, retail fuel outlet, dry cleaner) and are interpreted to be associated with historical activities at those locations.

Distribution of Contaminants

The horizontal distribution of contaminants is shown on Drawing PE3116-3. Vertically, the contaminants were observed in the fill and glacial till stratigraphic units.

Discharge of Contaminants

The discharge of contaminants at the subject site is considered to have been associated with the historical presence of the automotive service garage, retail fuel outlet, and dry cleaner on the subject site. No further information concerning the discharge of contaminants is available.

Migration of Contaminants

The migration of contaminants within the soil, or from the soil to groundwater, is interpreted to be limited by the presence of the paved asphalt layer over much of the site, and by the lack of any observed soil disturbance by which impacted soil may be physically transported.

Migration of contaminants within site groundwater is interpreted to be controlled primarily by groundwater flow at the subject site as well as seasonal fluctuations.

Climatic and Meteorological Conditions

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

Given the presence of asphalt over much of the site, leaching is not considered to affect contaminant transport at the subject site. Groundwater levels were observed between 1.7 and 2.6 m below existing grade, and as such, in areas where contaminants are present, it is possible that groundwater flow and/or fluctuation may affect contaminant movement at the subject site.

Potential for Vapour Intrusion

Although concentrations of cis-1,2-Dichloroethylene exceeding Table 3 standards were observed in site groundwater adjacent to the subject building, the concentrations were relatively low and do not indicate the presence of free-phase product at the borehole locations. Furthermore, given the slab-on-grade construction of the building at 2016 Ogilvie Road, the potential for vapour intrusion is considered to be limited. Buildings are not currently present in the areas of PHC contamination, and vapour intrusion at those locations is considered to be negligible.

It is our understanding that any VOC or PHC concentrations will be addressed concurrently with the redevelopment of the site.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property at 2012 Ogilvie Road, Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of potential environmental concern identified during the Phase I ESA, in particular a former automotive service garage, former retail fuel outlet, and former dry cleaner at the subject site. The subsurface investigation at the subject site was conducted concurrently with a geotechnical investigation and consisted of the drilling of 28 boreholes and the installation of four (4) monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. A total of 12 soil samples were submitted for laboratory analysis of BTEX, PHCs, and VOCs. Two (2) samples from the vicinity of the former automotive service garage (BH20-13-SS4 and duplicate) and three (3) samples from the vicinity of the former retail fuel outlet (BH24-13-SS2 and SS4, BH25-13-SS5) exceeded the MOE Table 3 standards for various BTEX and PHC parameters. All other samples were in compliance with MOE Table 3 standards for BTEX, PHC, and VOC parameters.

Groundwater samples were obtained from the monitoring wells at BH20-13, BH23-13, BH24-13, and BH27-13 and submitted for analysis of BTEX, PHCs, VOCs, and PAHs. Concentration of PHCs at BH20-13, BH23-13, BH24-13, and BH27-13 exceeded the MOE standards for PHC F2 and/or F3 parameters. The concentration of cis-1,2-Dichloroethylene at BH23-13 also exceeded Table 3 standards. Sediment was noted in groundwater samples.

Recommendations

Based on the above results, soil exists at the subject property with BTEX and PHC which exceed the applicable MOE Table 3 soil standards. Groundwater exists at the subject site with VOC and PHC concentrations which exceed the applicable MOE Table 3 soil standards. It is our understanding that the subject site is to be redeveloped with several commercial/residential buildings. It is our recommendation that an environmental site remediation program, involving the removal of all contaminated soil and groundwater, be completed concurrently with site redevelopment.

It is our interpretation that the sediment in the groundwater samples may result in increased reported PHC concentrations. It is our recommendation that all wells be re-tested for PHCs to confirm concentrations.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with the agreed scope-of-work, in compliance 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 Trinity Development Group Inc. Permission and notification from Trinity and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Daniel J. Arnott, P.Eng.

Mark S. D'Arcy, P.Eng.

Report Distribution:

- Trinity Development Group Inc. (6 copies)
- Paterson Group (1 copy)

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE3116-3 – TEST HOLE LOCATION PLAN

DRAWING PE3116-4 - GROUNDWATER CONTOUR PLAN

DRAWING PE3116-5 - CROSS-SECTIONS

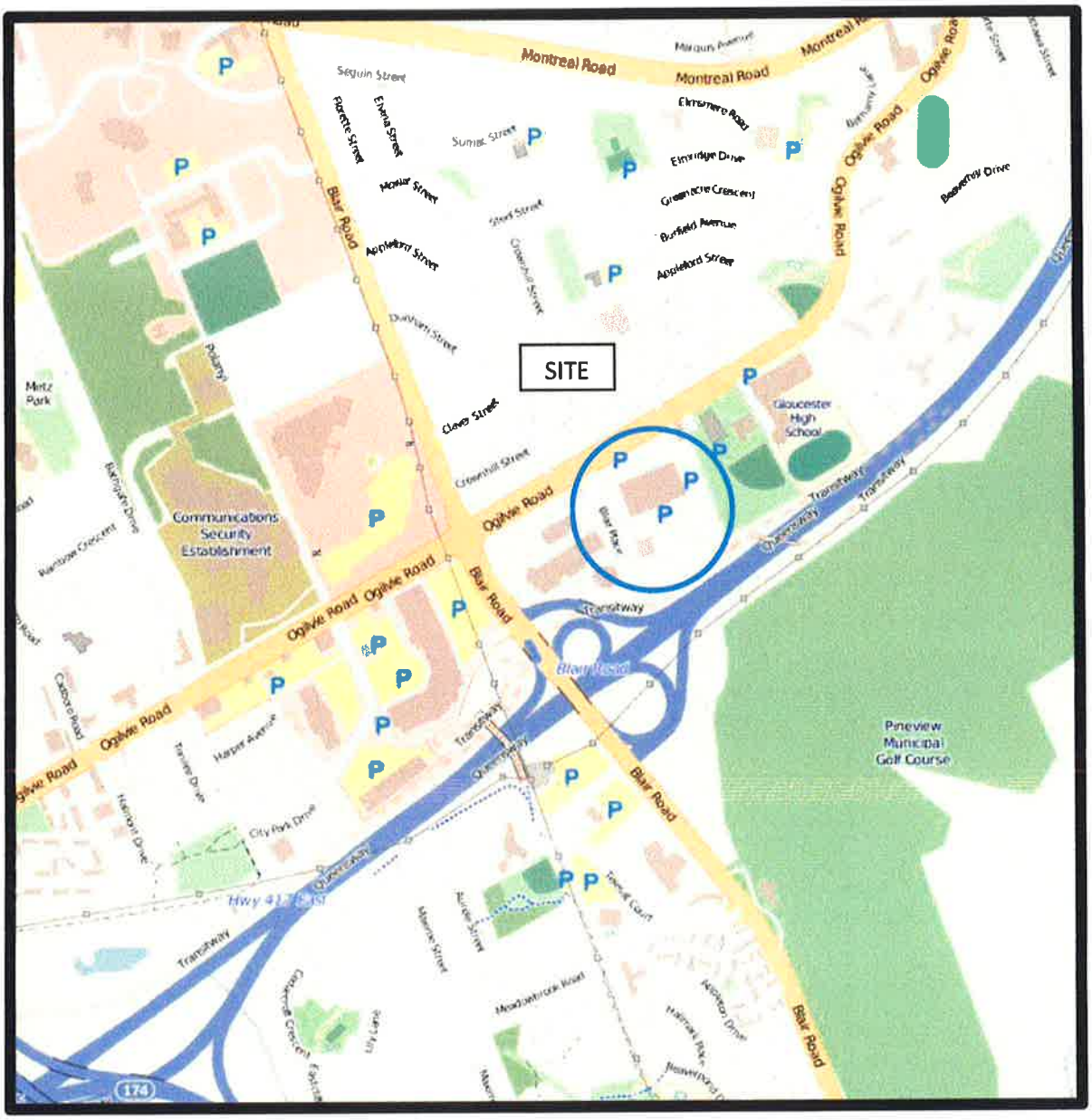
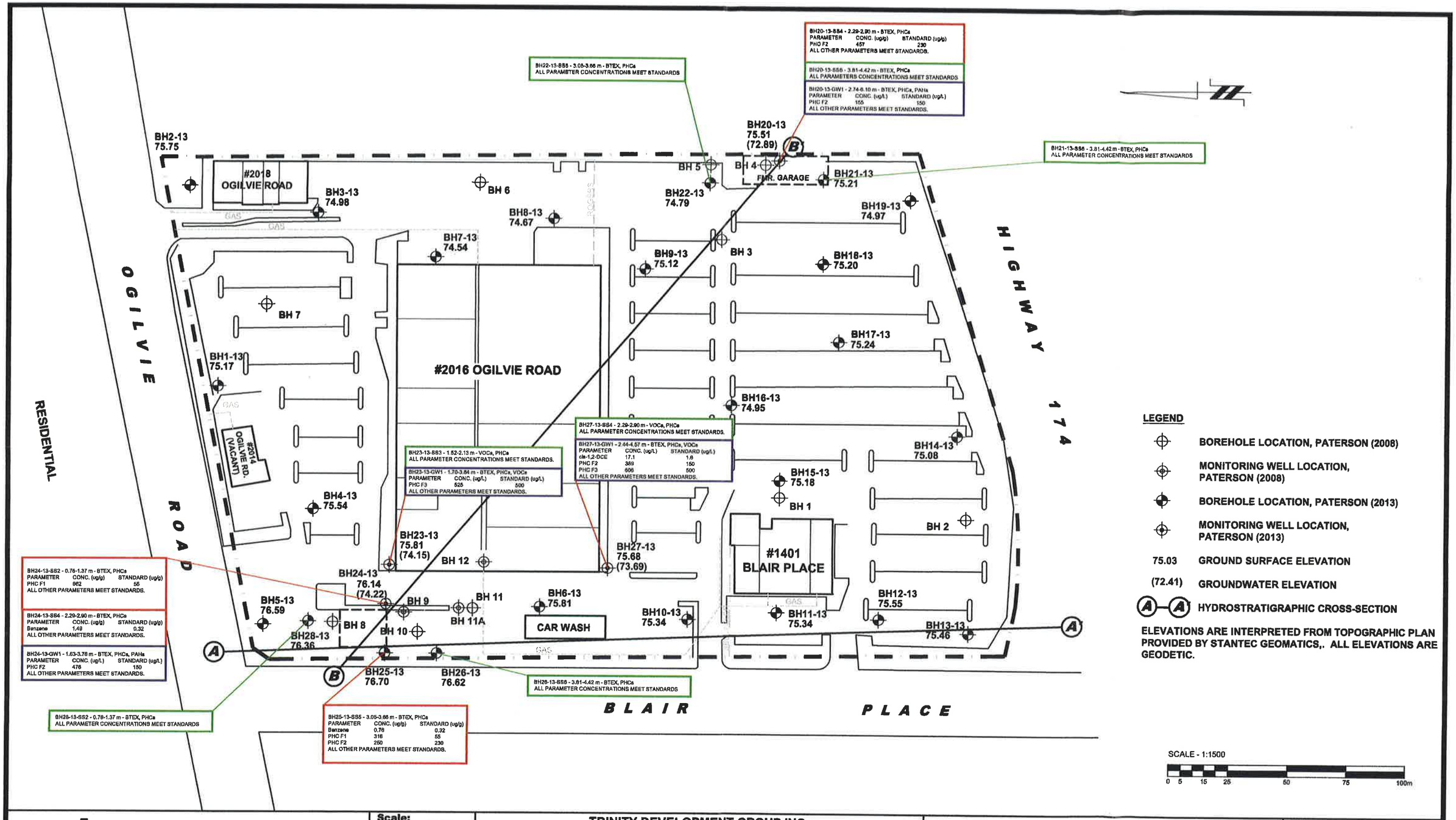


FIGURE 1

KEY PLAN



paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Scale:	1:1500
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

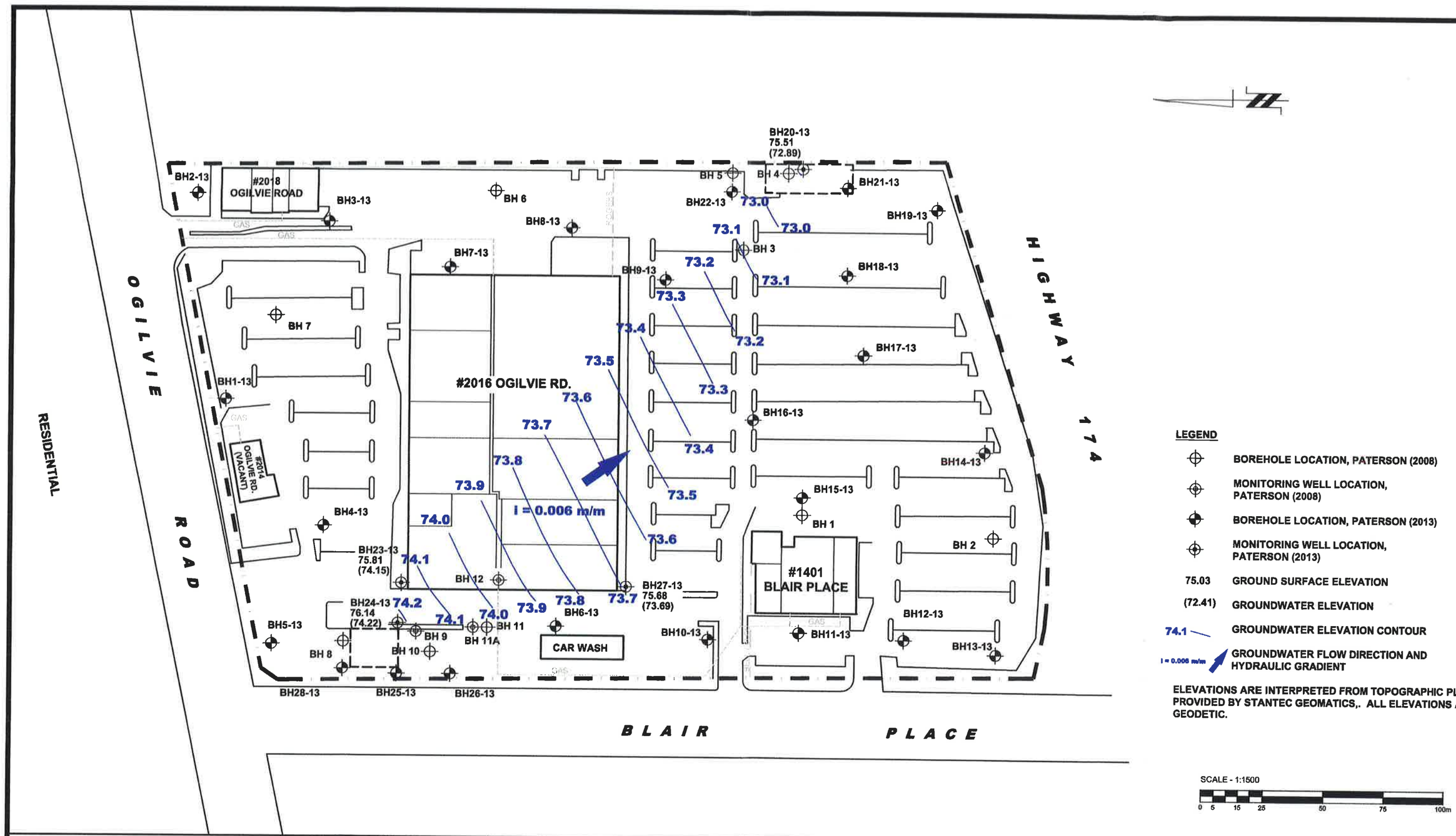
TRINITY DEVELOPMENT GROUP INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD
OTTAWA, ONTARIO

TEST HOLE LOCATION PLAN

Dwg. No. PE3116-3
Report No.: PE3116-2
Date: 10/2013

11x17



LEGEND

- BOREHOLE LOCATION, PATERSON (2008)
- MONITORING WELL LOCATION, PATERSON (2008)
- BOREHOLE LOCATION, PATERSON (2013)
- MONITORING WELL LOCATION, PATERSON (2013)
- 75.03 GROUND SURFACE ELEVATION
- (72.41) GROUNDWATER ELEVATION
- 74.1 GROUNDWATER ELEVATION CONTOUR
- I = 0.006 m/m GROUNDWATER FLOW DIRECTION AND HYDRAULIC GRADIENT

ELEVATIONS ARE INTERPRETED FROM TOPOGRAPHIC PLAN PROVIDED BY STANTEC GEOMATICS,. ALL ELEVATIONS ARE GEODETIC.

SCALE - 1:1500

0 5 15 25 50 75 100m

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

Scale:	1:1500
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

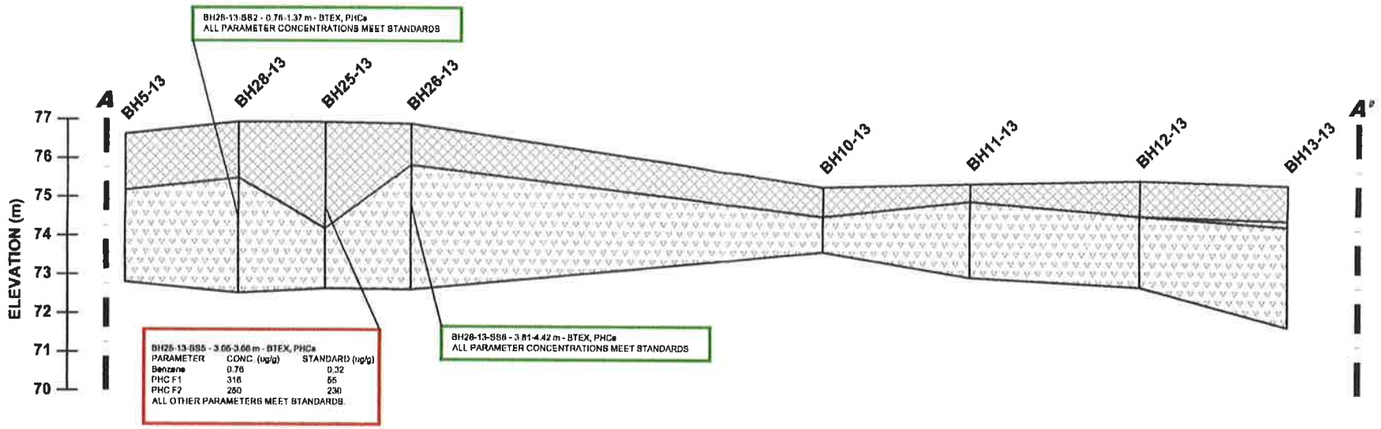
TRINITY DEVELOPMENT GROUP INC.

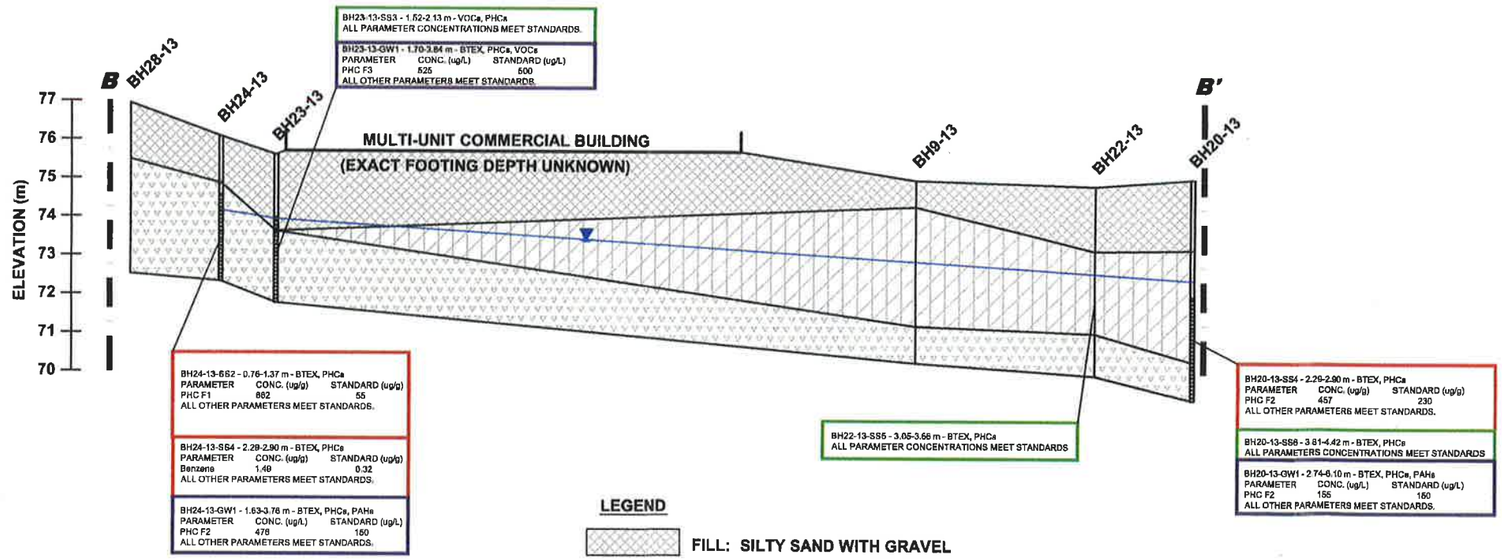
PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD
OTTAWA, ONTARIO

GROUNDWATER CONTOUR PLAN

Dwg. No. PE3116-4
Report No.: PE3116-2
Date: 10/2013

11x17





LEGEND

- FILL: SILTY SAND WITH GRAVEL
- SILTY CLAY, TRACE SAND
- GLACIAL TILL: SILTY SAND MATRIX WITH GRAVEL, COBBLES
- WATER TABLE ELEVATION

SCALE - 1:1500

0 5 15 25 50 75 100m

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Scale:	1:1500 H; 1:150 V
Des.:	DJA
Dwn:	DJA
Chkd:	MSD

TRINITY DEVELOPMENT GROUP INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
2012 OGILVIE ROAD
OTTAWA, ONTARIO

CROSS-SECTIONS

Dwg. No. PE3116-5
Report No.: PE3116-2
Date: 10/2013

11x17

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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Sampling & Analysis Plan

Phase II ESA, Existing Commercial Property
2012 Ogilvie Road
Ottawa, Ontario

Prepared For

Trinity Development Group Ltd.

October 2013

Report: PE3116-SAP

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1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Trinity Development Group Ltd. to conduct a Phase II Environmental Site Assessment (ESA) for the property located at 2012 Ogilvie Road, Ottawa, Ontario. Based on a Phase I ESA and subsurface investigations previously completed by Paterson for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-13 to BH19-13	Geotechnical boreholes	Geotechnical borehole
BH20-13	Adjacent to property boundary in vicinity of former automotive service garage, to assess on-site conditions and potential off-site impacts	Drilled to intercept water table for monitoring well installation.
BH21-13	Drilled to delineate contamination encountered in former automotive service garage area	Drilled to intercept water table
BH22-13		
BH23-13	Drilled to install monitoring well for delineation of groundwater impacts associated with former dry cleaner.	Drilled to intercept water table for monitoring well installation.
BH24-13	Drilled to assess former retail fuel outlet area	Drilled to intercept water table for monitoring well installation.
BH25-13	Drilled to delineate impacts in former retail fuel outlet area	Drilled to intercept water table
BH26-13		
BH27-13	Drilled to install monitoring well for delineation of groundwater impacts associated with former dry cleaner.	Drilled to intercept water table for monitoring well installation.
BH28-13	Drilled to delineate impacts in former retail fuel outlet area	Drilled to intercept water table

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

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. 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.

Soil quality at geotechnical boreholes will be screened using visual and olfactory screening methods. If contamination is suspected, soil samples will be submitted to vapour screening and soil samples may be analyzed.

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a 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.
- Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- Note all and any odours or discolouration of samples.
- Split spoon samplers must be washed between samples.
- If obvious contamination is encountered, continue sampling until 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 RKI Eagle, PID, 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.

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.

3.2 Monitoring Well Installation Procedure

Equipment

- 5' x 2" threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" if installing in cored hole in bedrock)
- 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" 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
- pH/Temperature/Conductivity combo pen
- 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.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH20-13**

BORINGS BY CME 55 Power Auger DATE October 2, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	75.51
FILL: Topsoil 0.15		AU	1				
FILL: Brown silty sand with crushed stone		SS	2	75	78	1	74.51
		SS	3	75	27	2	73.51
2.21							
Stiff, grey **SILTY CLAY**		SS	4	100	5	3	72.51
		SS	5	100	3		
3.96							
Compact, grey **SANDY SILT**		SS	6	100	13	4	71.51
4.72							
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders		SS	7	75	17	5	70.51
		SS	8	67	50+		
5.72							
BEDROCK: Black shale						6	69.51
6.10							
End of Borehole							
(GWL @ 2.62m-Oct. 10, 2013)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. PE3116

REMARKS

HOLE NO. BH21-13

BORINGS BY CME 55 Power Auger **DATE** October 2, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	75.21		
Asphaltic concrete 0.08									
FILL: Crushed stone 0.38		AU	1						
FILL: Brown silty sand, trace clay and crushed stone		SS	2	75	18	1	74.21		
1.68		SS	3	75	9	2	73.21		
Stiff, brown **SILTY CLAY**		SS	4	100	5				
		SS	5	100	4	3	72.21		
4.04		SS	6	100	6	4	71.21		
Loose, brown **SANDY SILT**		SS	7	75	7				
5.11						5	70.21		
GLACIAL TILL: Grey silty sand with gravel, cobbles, boulders		SS	8		11				
5.82									
BEDROCK: Black shale									
6.10						6	69.21		
End of Borehole									

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

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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Consulting Engineers

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH22-13**

BORINGS BY CME 55 Power Auger

DATE October 2, 2013

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
Asphaltic concrete	0.08						0	74.79
FILL: Crushed stone	0.38		AU	1				
FILL: Brown silty sand with crushed stone			SS	2	67	14	1	73.79
	1.68		SS	3	83	7	2	72.79
Stiff, brown **SILTY CLAY**			SS	4	100	4		
	3.20		SS	5	75	10	3	71.79
Loose, brown **SANDY SILT**	3.81							
GLACIAL TILL: Grey sandy silt with gravel, cobbles, boulders	4.34		SS	6	33	6	4	70.79
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders	4.90		SS	7	92	50+		
End of Borehole								
BH terminated on inferred bedrock surface at 4.90m depth								

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH23-13**

BORINGS BY CME 55 Power Auger DATE October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	75.81
Asphaltic concrete 0.08		AU	1				
FILL: Brown silty sand with crushed stone		SS	2	67	18	1	74.81
		SS	3	93	50+		
1.83 Concrete 1.98						2	73.81
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles, boulders		SS	4	75	12		
		SS	5	67	23	3	72.81
3.50 **BEDROCK:** Black shale							
3.83 End of Borehole		SS	6		50+		
(GWL @ 1.66m-Oct. 10, 2013)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

Monitoring Well Construction

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

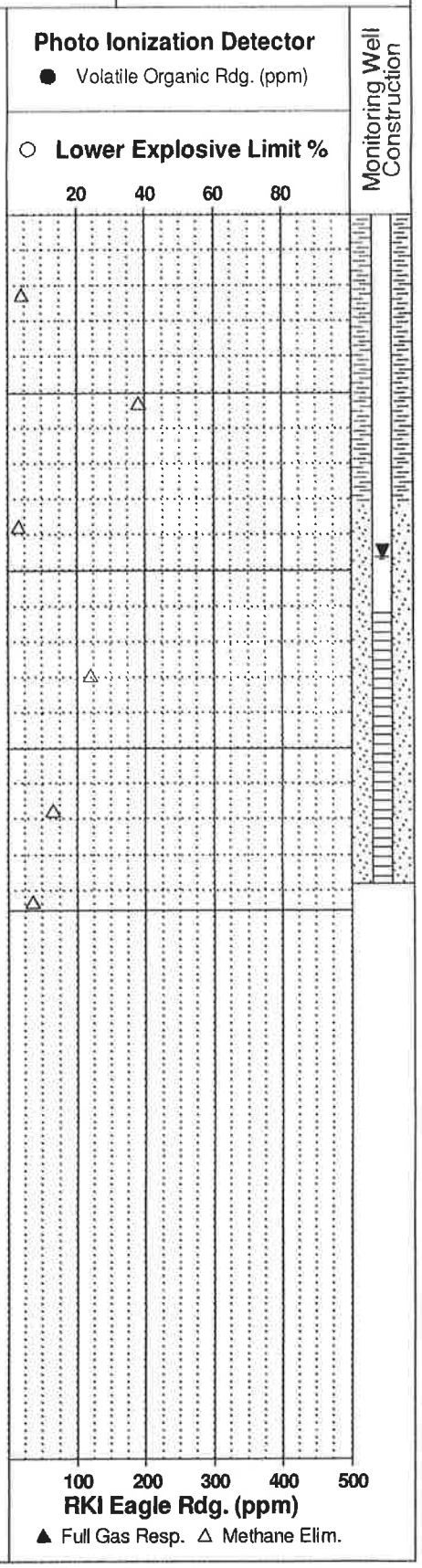
FILE NO. PE3116

REMARKS

HOLE NO. BH24-13

BORINGS BY CME 55 Power Auger **DATE** October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.08						0	76.14
FILL: Brown silty sand with crushed stone		AU	1				
1.22		SS	2	75	18	1	75.14
		SS	3	78	50+	2	74.14
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders		SS	4	75	20		
		SS	5	75	17	3	73.14
3.91		SS	6		50+		
End of Borehole							
Practical refusal to augering at 3.91m depth							
(GWL @ 1.92m-Oct. 10, 2013)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH25-13**

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.70
Asphaltic concrete 0.08		AU	1				
		SS	2	33	10	1	75.70
FILL: Brown silty sand with crushed stone		SS	3	50	5	2	74.70
2.74		SS	4	50	4		
GLACIAL TILL: Grey silty sand wity clay, gravel, cobbles, boulders		SS	5	33	6	3	73.70
4.29		SS	6	33	13	4	72.70
End of Borehole							
BH terminated on inferred bedrock surface at 4.29m depth							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

820

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH26-13**

BORINGS BY CME 55 Power Auger DATE October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
Asphaltic concrete 0.08						0	76.62		
FILL; Brown silty sand with crushed stone		AU	1						
1.07		SS	2	75	12	1	75.62		
		SS	3	75	30	2	74.62		
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders		SS	4	75	10				
		SS	5	50	18	3	73.62		
		SS	6		50+	4	72.62		
4.27									
End of Borehole									
Practical refusal to augering at 4.27m depth									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Shoppers City East - Ogilvie Road at Blair Place
Ottawa, Ontario

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FILE NO. PE3116

REMARKS

HOLE NO. BH27-13

BORINGS BY CME 55 Power Auger **DATE** October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	75.68
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone		AU	1				
1.14		SS	2	67	9	1	74.68
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles, boulders		SS	3	67	30	2	73.68
2.21		SS	4	100	50+		
BEDROCK: Black shale						3	72.68
						4	71.68
4.57							
End of Borehole							
(GWL @ 1.99m-Oct. 10, 2013)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

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DATUM Ground surface elevations provided by Stantec Geomatics Limited.

FILE NO. **PE3116**

REMARKS

HOLE NO. **BH28-13**

BORINGS BY CME 55 Power Auger

DATE October 4, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	76.36
Asphaltic concrete 0.08							
FILL: Brown silty sand with crushed stone 0.76							
		SS	1	83	24	1	75.36
		SS	2	67	36	2	74.36
GLACIAL TILL: Brown to grey silty sand with gravel, cobbles and boulders		SS	3	67	28	3	73.36
		SS	4	75	28		
4.05		SS	5	0	50+	4	72.36
End of Borehole							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

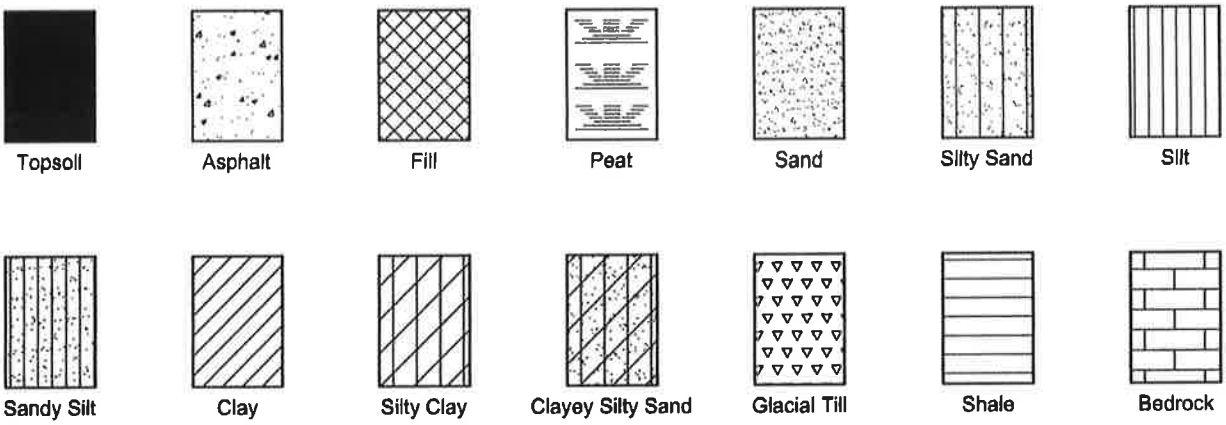
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

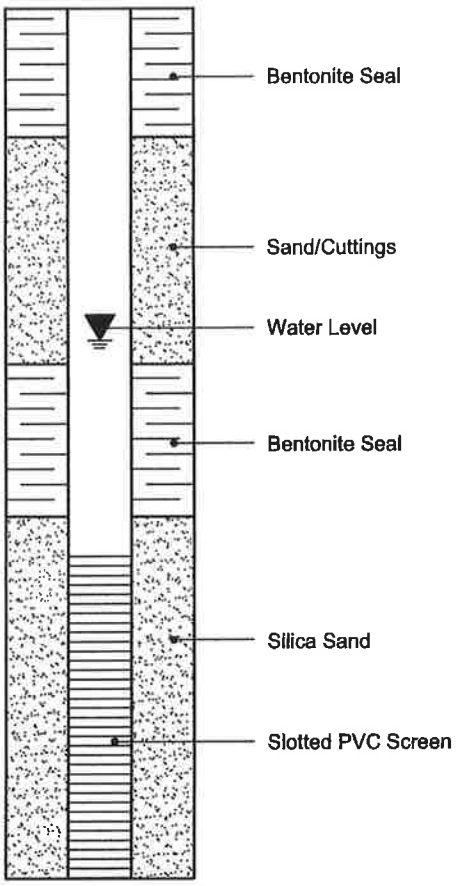
SYMBOLS AND TERMS (continued)

STRATA PLOT

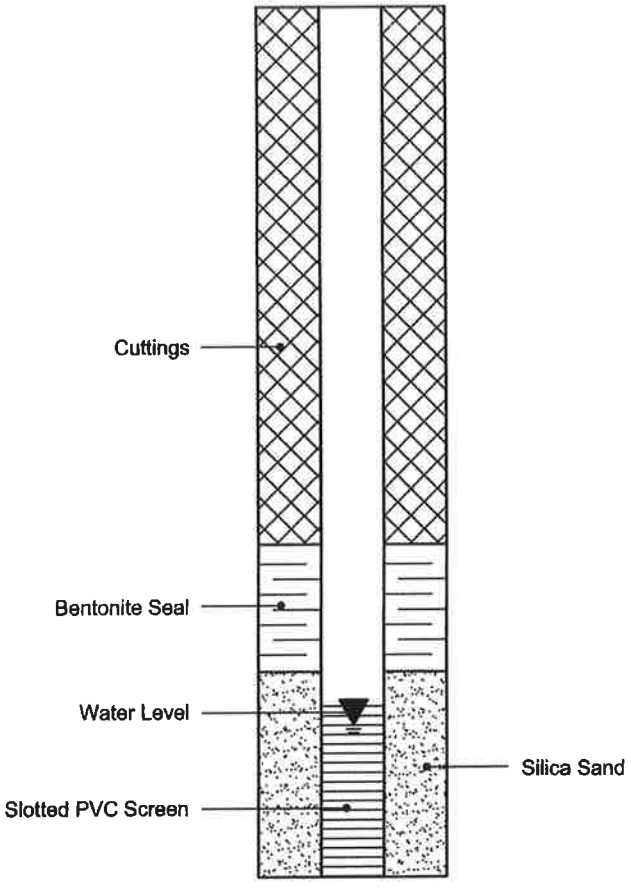


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 14704
Project: PE3116
Custody: 98292

Report Date: 9-Oct-2013
Order Date: 4-Oct-2013
Order #: 1340262

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

Paracel ID	Client ID
1340262-01	BH22-13-SS5
1340262-02	BH20-13-SS4
1340262-03	BH20-13-SS6
1340262-04	BH21-13-SS6
1340262-05	Dup-1

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704 Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-Oct-13	5-Oct-13
PHC F1	CWS Tier 1 - P&T GC-FID	3-Oct-13	5-Oct-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	4-Oct-13	7-Oct-13
Solids, %	Gravimetric, calculation	7-Oct-13	7-Oct-13

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704

Project Description: PE3116

	Client ID:	BH22-13-SS5	BH20-13-SS4	BH20-13-SS6	BH21-13-SS6
	Sample Date:	02-Oct-13	02-Oct-13	02-Oct-13	02-Oct-13
	Sample ID:	1340262-01	1340262-02	1340262-03	1340262-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	72.0	68.7	79.3	79.8
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	0.07	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	0.13	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	0.18	<0.05	<0.05
Toluene-d8	Surrogate	90.4%	103%	90.1%	91.8%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	31	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	457	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	436	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

	Client ID:	Dup-1	-	-	-
	Sample Date:	02-Oct-13	-	-	-
	Sample ID:	1340262-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	70.3	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	0.08	-	-	-
m,p-Xylenes	0.05 ug/g dry	0.12	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	0.17	-	-	-
Toluene-d8	Surrogate	102%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	64	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	804	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	682	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704 Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.38*		*ug/g*		*105*	*50-140*			

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704 Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	645	4	ug/g dry	1160			56.7	30	QR-04
F3 PHCs (C16-C34)	452	8	ug/g dry	793			54.8	30	QR-04
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Physical Characteristics									
% Solids	67.8	0.1	% by Wt.	65.5			3.4	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*9.72*		*ug/g dry*	*ND*	*91.2*	*50-140*			

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	198	7	ug/g	ND	98.9	80-120			
F2 PHCs (C10-C16)	1310	4	ug/g	1160	136	60-140			
F3 PHCs (C16-C34)	1060	8	ug/g	793	117	60-140			
F4 PHCs (C34-C50)	129	6	ug/g	ND	83.9	60-140			
Volatiles									
Benzene	4.02	0.02	ug/g	ND	101	60-130			
Ethylbenzene	4.13	0.05	ug/g	ND	103	60-130			
Toluene	3.79	0.05	ug/g	ND	94.7	60-130			
m,p-Xylenes	7.91	0.05	ug/g	ND	98.9	60-130			
o-Xylene	3.65	0.05	ug/g	ND	91.3	60-130			
Surrogate: Toluene-d8	*7.98*		*ug/g*		*99.8*	*50-140*			

Certificate of Analysis

Report Date: 09-Oct-2013
Order Date:4-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14704 Project Description: PE3116

Qualifier Notes:

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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№ 98292

Page 1 of 1

Client Name: Paterson Group Inc.	Project Reference: PE 3116	TAT: [X] Regular [ ] 3 Day	
Contact Name: Dan Arnott	Quote #:	[ ] 2 Day [ ] 1 Day	
Address: 154 Colonnade Rd Ottawa, ON K2E 7J5	PO #: 14704	Date Required:	
Telephone: 613. 226. 7381	Email Address: darnott@patersongroup.ca		

Criteria: [X] 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

Paracel Order Number: 1340262

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4 + BTEX	VOC's	PAHs	Metals by ICP	Hg	CrVI	B (HWS)								
1	BH-F-SS5	S		2	2-Oct-13		X												130	Metals	Nickel
2	BH-G-SS4	S		2	↓		X												↓	↓	
3	BH-G-SS6	S		2			X														
4	BH-H-SS6	S		2			X														
5	Dup-1	S		2	↓		X													↓	
6																					
7																					
8																					
9																					
10																					

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: SUNEEPORN
Relinquished By (Print): Dan Arnott	Date/Time: 04/10/13 10:05	Date/Time: Oct 04 2013 11:05
Date/Time: 3-Oct-2013 4:30p.m.	Temperature: ____ °C	Temperature: 12.5 °C
Verified By: MC		
Date/Time: Oct 4/13 11:19		
pH Verified [ ] By: N/A		

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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 14724
Project: PE3116
Custody: 98296

Report Date: 11-Oct-2013
Order Date: 7-Oct-2013
Order #: 1341076

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

Paracel ID	Client ID
1341076-01	BH23-13-SS3
1341076-02	BH24-13-SS2
1341076-03	BH24-13-SS4
1341076-04	BH25-13-SS5
1341076-05	BH26-13-SS6
1341076-06	BH27-13-SS4
1341076-07	BH28-13-SS2

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Oct-13	9-Oct-13
PHC F1	CWS Tier 1 - P&T GC-FID	8-Oct-13	9-Oct-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	9-Oct-13	10-Oct-13
Solids, %	Gravimetric, calculation	8-Oct-13	8-Oct-13
VOCs by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Oct-13	9-Oct-13

PARACEL LABORATORIES LTD.

Order #: 1341076

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

	Client ID:	BH23-13-SS3	BH24-13-SS2	BH24-13-SS4	BH25-13-SS5
	Sample Date:	04-Oct-13	04-Oct-13	04-Oct-13	04-Oct-13
	Sample ID:	1341076-01	1341076-02	1341076-03	1341076-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.8	89.3	89.8	90.3
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	-	-	-
Chloroethane	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Chloromethane	0.20 ug/g dry	<0.20	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dibromoethane	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-Dichloroethylene, total	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	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	<0.50	-	-	-
Methyl Butyl Ketone (2-Hexanone)	2.00 ug/g dry	<2.00	-	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	<0.50	-	-	-

PARACEL LABORATORIES LTD

Order #: 1341076

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

	Client ID:	BH23-13-SS3	BH24-13-SS2	BH24-13-SS4	BH25-13-SS5
	Sample Date:	04-Oct-13	04-Oct-13	04-Oct-13	04-Oct-13
	Sample ID:	1341076-01	1341076-02	1341076-03	1341076-04
	MDL/Units	Soil	Soil	Soil	Soil
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,2,4-Trichlorobenzene	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	-	-	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	0.06	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	0.07	-	-	-
4-Bromofluorobenzene	Surrogate	92.4%	-	-	-
Dibromofluoromethane	Surrogate	92.4%	-	-	-
Toluene-d8	Surrogate	89.2%	-	-	-
Benzene	0.02 ug/g dry	-	<0.02	1.49	0.76
Ethylbenzene	0.05 ug/g dry	-	5.07	1.77	5.71
Toluene	0.05 ug/g dry	-	<0.05	0.13	0.32
m,p-Xylenes	0.05 ug/g dry	-	11.6	2.97	8.95
o-Xylene	0.05 ug/g dry	-	0.73	0.32	0.55
Xylenes, total	0.05 ug/g dry	-	12.3	3.29	9.49
Toluene-d8	Surrogate	-	110%	102%	86.6%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	662	42	316
F2 PHCs (C10-C16)	4 ug/g dry	12	195	27	250
F3 PHCs (C16-C34)	8 ug/g dry	62	56	27	47
F4 PHCs (C34-C50)	6 ug/g dry	36	40	<6	<6

PARACEL LABORATORIES LTD.

Order #: 1341076

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

	Client ID:	BH26-13-SS6	BH27-13-SS4	BH28-13-SS2	-
	Sample Date:	04-Oct-13	04-Oct-13	04-Oct-13	-
	Sample ID:	1341076-05	1341076-06	1341076-07	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	90.9	91.3	93.3	-
Volatiles					
Acetone	0.50 ug/g dry	-	<0.50	-	-
Benzene	0.02 ug/g dry	-	0.07	-	-
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	-	-
Chloroethane	0.05 ug/g dry	-	<0.05	-	-
Chloroform	0.05 ug/g dry	-	<0.05	-	-
Chloromethane	0.20 ug/g dry	-	<0.20	-	-
Dibromochloromethane	0.05 ug/g dry	-	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	-	<0.05	-	-
1,2-Dibromoethane	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	-	0.23	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	-	<0.05	-	-
1,2-Dichloroethylene, total	0.05 ug/g dry	-	0.23	-	-
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	-	0.23	-	-
Hexane	0.05 ug/g dry	-	0.20	-	-
Methyl Ethyl Ketone (2-Butanone)	0.50 ug/g dry	-	<0.50	-	-
Methyl Butyl Ketone (2-Hexanone)	2.00 ug/g dry	-	<2.00	-	-
Methyl Isobutyl Ketone	0.50 ug/g dry	-	<0.50	-	-

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

	Client ID:	BH26-13-SS6	BH27-13-SS4	BH28-13-SS2	-
	Sample Date:	04-Oct-13	04-Oct-13	04-Oct-13	-
	Sample ID:	1341076-05	1341076-06	1341076-07	-
	MDL/Units	Soil	Soil	Soil	-
Methyl tert-butyl ether	0.05 ug/g dry	-	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	-	<0.05	-	-
Styrene	0.05 ug/g dry	-	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	-	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	0.15	-	-
1,2,4-Trichlorobenzene	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	-	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	-	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	-	0.45	-	-
o-Xylene	0.05 ug/g dry	-	0.06	-	-
Xylenes, total	0.05 ug/g dry	-	0.51	-	-
4-Bromofluorobenzene	Surrogate	-	93.6%	-	-
Dibromofluoromethane	Surrogate	-	90.8%	-	-
Toluene-d8	Surrogate	-	102%	-	-
Benzene	0.02 ug/g dry	<0.02	-	<0.02	-
Ethylbenzene	0.05 ug/g dry	0.08	-	0.19	-
Toluene	0.05 ug/g dry	<0.05	-	<0.05	-
m,p-Xylenes	0.05 ug/g dry	0.13	-	0.51	-
o-Xylene	0.05 ug/g dry	<0.05	-	0.07	-
Xylenes, total	0.05 ug/g dry	0.15	-	0.57	-
Toluene-d8	Surrogate	88.3%	-	101%	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	19	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	24	57	57	-
F3 PHCs (C16-C34)	8 ug/g dry	42	37	51	-
F4 PHCs (C34-C50)	6 ug/g dry	20	12	32	-

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724 Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
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						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.20	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	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-Dichloroethylene, total	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						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	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	*7.33*		*ug/g*		*91.6*	*50-140*			
Surrogate: Dibromofluoromethane	*6.74*		*ug/g*		*84.2*	*50-140*			
Surrogate: Toluene-d8	*8.38*		*ug/g*		*105*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.38*		*ug/g*		*105*	*50-140*			

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	111	8	ug/g dry	152			31.2	30	QR-04
F4 PHCs (C34-C50)	317	6	ug/g dry	387			20.0	30	
Physical Characteristics									
% Solids	93.4	0.1	% by Wt.	93.9			0.6	25	
Volatiles									
Acetone	ND	0.50	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.20	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-Dibromoethane	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	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.50	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.00	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	
1,2,4-Trichlorobenzene	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	
1,3,5-Trimethylbenzene	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	*9.89*		*ug/g dry*	*ND*	*92.8*	*50-140*			
Surrogate: Dibromofluoromethane	*9.99*		*ug/g dry*	*ND*	*93.7*	*50-140*			

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Toluene-d8	*9.72*		*ug/g dry*	*ND*	*91.2*	*50-140*			
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*9.72*		*ug/g dry*	*ND*	*91.2*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	198	7	ug/g	ND	98.9	80-120			
F2 PHCs (C10-C16)	115	4	ug/g	ND	116	60-140			
F3 PHCs (C16-C34)	299	8	ug/g	152	71.1	60-140			
F4 PHCs (C34-C50)	388	6	ug/g	387	0.137	60-140			QM-06
Volatiles									
Acetone	10.0	0.50	ug/g	ND	100	50-140			
Benzene	4.02	0.02	ug/g	ND	101	60-130			
Bromodichloromethane	3.28	0.05	ug/g	ND	81.9	60-130			
Bromoform	3.39	0.05	ug/g	ND	84.7	60-130			
Bromomethane	4.56	0.05	ug/g	ND	114	50-140			
Carbon Tetrachloride	3.43	0.05	ug/g	ND	85.6	60-130			
Chlorobenzene	3.81	0.05	ug/g	ND	95.3	60-130			
Chloroethane	4.59	0.05	ug/g	ND	115	50-140			
Chloroform	3.53	0.05	ug/g	ND	88.3	60-130			
Chloromethane	3.43	0.20	ug/g	ND	85.7	50-140			
Dibromochloromethane	3.70	0.05	ug/g	ND	92.4	60-130			
Dichlorodifluoromethane	3.34	0.05	ug/g	ND	83.6	50-140			
1,2-Dibromoethane	3.49	0.05	ug/g	ND	87.3	60-130			
1,2-Dichlorobenzene	3.49	0.05	ug/g	ND	87.2	60-130			
1,3-Dichlorobenzene	3.68	0.05	ug/g	ND	92.0	60-130			
1,4-Dichlorobenzene	3.87	0.05	ug/g	ND	96.8	60-130			
1,1-Dichloroethane	3.98	0.05	ug/g	ND	99.6	60-130			
1,2-Dichloroethane	3.10	0.05	ug/g	ND	77.5	60-130			
1,1-Dichloroethylene	3.35	0.05	ug/g	ND	83.7	60-130			
cis-1,2-Dichloroethylene	3.71	0.05	ug/g	ND	92.6	60-130			
trans-1,2-Dichloroethylene	3.63	0.05	ug/g	ND	90.8	60-130			
1,2-Dichloropropane	3.71	0.05	ug/g	ND	92.7	60-130			
cis-1,3-Dichloropropylene	3.21	0.05	ug/g	ND	80.4	60-130			
trans-1,3-Dichloropropylene	3.27	0.05	ug/g	ND	81.7	60-130			
Ethylbenzene	4.13	0.05	ug/g	ND	103	60-130			
Hexane	6.15	0.05	ug/g	ND	154	60-130			
Methyl Ethyl Ketone (2-Butanone)	8.44	0.50	ug/g	ND	84.4	50-140			
Methyl Butyl Ketone (2-Hexanone)	9.62	2.00	ug/g	ND	96.2	50-140			
Methyl Isobutyl Ketone	8.49	0.50	ug/g	ND	84.9	50-140			
Methyl tert-butyl ether	8.96	0.05	ug/g	ND	89.6	50-140			
Methylene Chloride	4.90	0.05	ug/g	ND	123	60-130			
Styrene	4.18	0.05	ug/g	ND	105	60-130			
1,1,1,2-Tetrachloroethane	3.81	0.05	ug/g	ND	95.3	60-130			
1,1,2,2-Tetrachloroethane	3.43	0.05	ug/g	ND	85.8	60-130			
Tetrachloroethylene	3.44	0.05	ug/g	ND	86.1	60-130			
Toluene	3.79	0.05	ug/g	ND	94.7	60-130			
1,2,4-Trichlorobenzene	3.48	0.05	ug/g	ND	86.9	60-130			
1,1,1-Trichloroethane	3.50	0.05	ug/g	ND	87.6	60-130			
1,1,2-Trichloroethane	3.15	0.05	ug/g	ND	78.7	60-130			
Trichloroethylene	3.32	0.05	ug/g	ND	82.9	60-130			
Trichlorofluoromethane	3.81	0.05	ug/g	ND	95.3	50-140			
1,3,5-Trimethylbenzene	3.87	0.05	ug/g	ND	96.8	60-130			
Vinyl chloride	3.62	0.02	ug/g	ND	90.6	50-140			
m,p-Xylenes	7.91	0.05	ug/g	ND	98.9	60-130			

Certificate of Analysis

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	3.65	0.05	ug/g	ND	91.3	60-130			
Surrogate: 4-Bromofluorobenzene	*7.28*		*ug/g*		*91.0*	*50-140*			
Benzene	4.02	0.02	ug/g	ND	101	60-130			
Ethylbenzene	4.13	0.05	ug/g	ND	103	60-130			
Toluene	3.79	0.05	ug/g	ND	94.7	60-130			
m,p-Xylenes	7.91	0.05	ug/g	ND	98.9	60-130			
o-Xylene	3.65	0.05	ug/g	ND	91.3	60-130			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14724

Report Date: 11-Oct-2013
Order Date:7-Oct-2013

Project Description: PE3116

Qualifier Notes:

QC Qualifiers :

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

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Chain of Custody
(Lab Use Only)
№ 98296

Page 1 of 1

Client Name: Paterson Group Inc	Project Reference: PE 3116	TAT: [X] Regular [ ] 3 Day
Contact Name: Dan Arnott	Quote #:	[ ] 2 Day [ ] 1 Day
Address: 154 Colonade Rd Ottawa, ON	PO #: 47124	Date Required:
Telephone: 613 226 7381	Email Address: darnott@patersongroup.ca	

Criteria: [X] 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)

Paracel Order Number: 1341076

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4 + BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH 23-13-SS3	S		2	4-Oct-13		X	X									Regular			
2	BH 24-13-SS2			2			X													
3	BH 24-13-SS4			2			X													
4	BH 25-13-SS5			2			X													
5	BH 26-13-SS6			2			X													
6	BH 26-13-SS4			2			X	X												
7	BH 26-13-SS2	S		2	↓		X										↓			
8																				
9																				
10																				

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: MC	Verified By: MC
Relinquished By (Print): Dan Arnott	Date/Time:	Date/Time: Oct 7/13 5:43	Date/Time: Oct 7/13 6:18
Date/Time: Oct 7/13 5:18pm	Temperature: ____ °C	Temperature: 15.6 °C	pH Verified: [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers
154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Dan Arnott

Phone: (613) 226-7381
Fax: (613) 226-6344

Client PO: 14748
Project: PE3116
Custody: 98299

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013
Order #: 1341394

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

Paracel ID	Client ID
1341394-01	BH20-13-GW1
1341394-02	BH23-13-GW1
1341394-03	BH24-13-GW1
1341394-04	BH27-13-GW1
1341394-05	Dup1

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748 Project Description: PE3116

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	15-Oct-13	16-Oct-13
PAHs by GC-MS	EPA 625 - GC-MS, extraction	15-Oct-13	16-Oct-13
PHC F1	CWS Tier 1 - P&T GC-FID	15-Oct-13	16-Oct-13
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	15-Oct-13	16-Oct-13
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	15-Oct-13	16-Oct-13

PARACEL LABORATORIES LTD

Order #: 1341394

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013

Project Description: PE3116

	Client ID:	BH20-13-GW1	BH23-13-GW1	BH24-13-GW1	BH27-13-GW1
	Sample Date:	10-Oct-13	10-Oct-13	10-Oct-13	10-Oct-13
	Sample ID:	1341394-01	1341394-02	1341394-03	1341394-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	-	<5.0	-	<5.0
Benzene	0.5 ug/L	-	<0.5	-	<0.5
Bromodichloromethane	0.5 ug/L	-	<0.5	-	<0.5
Bromoform	0.5 ug/L	-	<0.5	-	<0.5
Bromomethane	0.5 ug/L	-	<0.5	-	<0.5
Carbon Tetrachloride	0.2 ug/L	-	<0.2	-	<0.2
Chlorobenzene	0.5 ug/L	-	<0.5	-	<0.5
Chloroethane	1.0 ug/L	-	<1.0	-	<1.0
Chloroform	0.5 ug/L	-	<0.5	-	<0.5
Chloromethane	3.0 ug/L	-	<3.0	-	<3.0
Dibromochloromethane	0.5 ug/L	-	<0.5	-	<0.5
Dichlorodifluoromethane	1.0 ug/L	-	<1.0	-	<1.0
1,2-Dibromoethane	0.2 ug/L	-	<0.2	-	<0.2
1,2-Dichlorobenzene	0.5 ug/L	-	<0.5	-	<0.5
1,3-Dichlorobenzene	0.5 ug/L	-	<0.5	-	<0.5
1,4-Dichlorobenzene	0.5 ug/L	-	<0.5	-	<0.5
1,1-Dichloroethane	0.5 ug/L	-	<0.5	-	<0.5
1,2-Dichloroethane	0.5 ug/L	-	<0.5	-	<0.5
1,1-Dichloroethylene	0.5 ug/L	-	<0.5	-	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	17.1
trans-1,2-Dichloroethylene	0.5 ug/L	-	<0.5	-	<0.5
1,2-Dichloroethylene, total	0.5 ug/L	-	<0.5	-	17.2
1,2-Dichloropropane	0.5 ug/L	-	<0.5	-	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	-	<0.5	-	<0.5
1,3-Dichloropropene, total	0.5 ug/L	-	<0.5	-	<0.5
Ethylbenzene	0.5 ug/L	-	<0.5	-	<0.5
Hexane	1.0 ug/L	-	<1.0	-	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	-	<5.0	-	<5.0
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	-	<10.0	-	<10.0
Methyl Isobutyl Ketone	5.0 ug/L	-	<5.0	-	<5.0
Methyl tert-butyl ether	2.0 ug/L	-	<2.0	-	<2.0
Methylene Chloride	5.0 ug/L	-	<5.0	-	<5.0

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

	Client ID:	BH20-13-GW1	BH23-13-GW1	BH24-13-GW1	BH27-13-GW1
	Sample Date:	10-Oct-13	10-Oct-13	10-Oct-13	10-Oct-13
	Sample ID:	1341394-01	1341394-02	1341394-03	1341394-04
	MDL/Units	Water	Water	Water	Water
Styrene	0.5 ug/L	-	<0.5	-	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	-	<0.5	-	<0.5
Tetrachloroethylene	0.5 ug/L	-	<0.5	-	<0.5
Toluene	0.5 ug/L	-	<0.5	-	<0.5
1,2,4-Trichlorobenzene	0.5 ug/L	-	<0.5	-	<0.5
1,1,1-Trichloroethane	0.5 ug/L	-	<0.5	-	<0.5
1,1,2-Trichloroethane	0.5 ug/L	-	<0.5	-	<0.5
Trichloroethylene	0.5 ug/L	-	<0.5	-	<0.5
Trichlorofluoromethane	1.0 ug/L	-	<1.0	-	<1.0
1,3,5-Trimethylbenzene	0.5 ug/L	-	<0.5	-	<0.5
Vinyl chloride	0.5 ug/L	-	<0.5	-	<0.5
m,p-Xylenes	0.5 ug/L	-	<0.5	-	<0.5
o-Xylene	0.5 ug/L	-	<0.5	-	<0.5
Xylenes, total	0.5 ug/L	-	<0.5	-	<0.5
4-Bromofluorobenzene	Surrogate	-	115%	-	115%
Dibromofluoromethane	Surrogate	-	94.6%	-	124%
Toluene-d8	Surrogate	-	90.2%	-	91.1%
Benzene	0.5 ug/L	<0.5	-	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	-
Toluene	0.5 ug/L	<0.5	-	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	-
o-Xylene	0.5 ug/L	<0.5	-	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	-
Toluene-d8	Surrogate	90.7%	-	93.5%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	155 [1]	117 [1]	179 [1]	389 [1]
F3 PHCs (C16-C34)	100 ug/L	368 [1]	525 [1]	476 [1]	606 [1]
F4 PHCs (C34-C50)	100 ug/L	248 [1]	413 [1]	313 [1]	316 [1]
F1 + F2 PHCs	125 ug/L	155	-	179	-
F1 + F2 PHCs	125 ug/L	-	<125	-	389
F3 + F4 PHCs	200 ug/L	616	-	789	-
F3 + F4 PHCs	200 ug/L	-	939	-	921
Semi-Volatiles					

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

	Client ID:	BH20-13-GW1	BH23-13-GW1	BH24-13-GW1	BH27-13-GW1
	Sample Date:	10-Oct-13	10-Oct-13	10-Oct-13	10-Oct-13
	Sample ID:	1341394-01	1341394-02	1341394-03	1341394-04
	MDL/Units	Water	Water	Water	Water
Acenaphthene	0.05 ug/L	0.21	-	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	-	<0.05	-
Anthracene	0.01 ug/L	<0.01	-	0.07	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	<0.01	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	<0.05	-
Biphenyl	0.05 ug/L	0.14	-	0.06	-
Chrysene	0.05 ug/L	<0.05	-	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	<0.05	-
Fluoranthene	0.01 ug/L	<0.01	-	<0.01	-
Fluorene	0.05 ug/L	0.28	-	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	<0.05	-
1-Methylnaphthalene	0.05 ug/L	0.22	-	0.44	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	0.22	-
Methylnaphthalene (1&2)	0.10 ug/L	0.22	-	0.66	-
Naphthalene	0.05 ug/L	<0.05	-	0.25	-
Phenanthrene	0.05 ug/L	0.30	-	0.19	-
Pyrene	0.01 ug/L	0.04	-	0.06	-
2-Fluorobiphenyl	Surrogate	80.2%	-	79.1%	-
Terphenyl-d14	Surrogate	92.3%	-	84.7%	-

PARACEL LABORATORIES LTD

Order #: 1341394

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

	Client ID:	Dup1	-	-	-
	Sample Date:	10-Oct-13	-	-	-
	Sample ID:	1341394-05	-	-	-
	MDL/Units	Water	-	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	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	-	-	-
Toluene-d8	Surrogate	92.6%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	287 [1]	-	-	-
F3 PHCs (C16-C34)	100 ug/L	587 [1]	-	-	-
F4 PHCs (C34-C50)	100 ug/L	359 [1]	-	-	-
F1 + F2 PHCs	125 ug/L	287	-	-	-
F3 + F4 PHCs	200 ug/L	946	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Anthracene	0.01 ug/L	0.05	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-
Biphenyl	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	0.08	-	-	-
1-Methylnaphthalene	0.05 ug/L	0.34	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	0.34	-	-	-
Naphthalene	0.05 ug/L	0.24	-	-	-

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

	Client ID:	Dup1	-	-	-
	Sample Date:	10-Oct-13	-	-	-
	Sample ID:	1341394-05	-	-	-
	MDL/Units	Water	-	-	-
Phenanthrene	0.05 ug/L	0.16	-	-	-
Pyrene	0.01 ug/L	0.05	-	-	-
2-Fluorobiphenyl	Surrogate	67.3%	-	-	-
Terphenyl-d14	Surrogate	70.3%	-	-	-

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

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						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	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-Dichloroethylene, total	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						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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						
1,2,4-Trichlorobenzene	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						
1,3,5-Trimethylbenzene	ND	0.5	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	*35.8*		*ug/L*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*38.3*		*ug/L*		*120*	*50-140*			
Surrogate: Toluene-d8	*30.6*		*ug/L*		*95.5*	*50-140*			

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	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: Toluene-d8	*30.6*		*ug/L*		*95.5*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Project Description: PE3116

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	
F2 PHCs (C10-C16)	4300	100	ug/L	4540			5.4	30	
F3 PHCs (C16-C34)	2720	100	ug/L	2860			5.0	30	
F4 PHCs (C34-C50)	ND	100	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	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	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	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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	
1,2,4-Trichlorobenzene	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	
1,3,5-Trimethylbenzene	ND	0.5	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	*36.1*		*ug/L*	*ND*	*113*	*50-140*			
Surrogate: Dibromofluoromethane	*30.3*		*ug/L*	*ND*	*94.7*	*50-140*			
Surrogate: Toluene-d8	*29.3*		*ug/L*	*ND*	*91.5*	*50-140*			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2010	25	ug/L	ND	101	68-117			
F2 PHCs (C10-C16)	1760	100	ug/L	ND	97.5	60-140			
F3 PHCs (C16-C34)	3610	100	ug/L	ND	97.0	60-140			
F4 PHCs (C34-C50)	2580	100	ug/L	ND	104	60-140			
Volatiles									
Acetone	63.1	5.0	ug/L	ND	63.1	50-140			
Benzene	41.8	0.5	ug/L	ND	105	50-140			
Bromodichloromethane	34.0	0.5	ug/L	ND	85.0	50-140			
Bromoform	41.8	0.5	ug/L	ND	105	50-140			
Bromomethane	28.3	0.5	ug/L	ND	70.8	50-140			
Carbon Tetrachloride	35.5	0.2	ug/L	ND	88.8	50-140			
Chlorobenzene	28.0	0.5	ug/L	ND	70.1	50-140			
Chloroethane	40.7	1.0	ug/L	ND	102	50-140			
Chloroform	37.8	0.5	ug/L	ND	94.6	50-140			
Chloromethane	55.8	3.0	ug/L	ND	139	50-140			
Dibromochloromethane	40.5	0.5	ug/L	ND	101	50-140			
Dichlorodifluoromethane	41.1	1.0	ug/L	ND	103	50-140			
1,2-Dibromoethane	24.3	0.2	ug/L	ND	60.7	50-140			
1,2-Dichlorobenzene	26.1	0.5	ug/L	ND	65.2	50-140			
1,3-Dichlorobenzene	24.0	0.5	ug/L	ND	60.1	50-140			
1,4-Dichlorobenzene	24.4	0.5	ug/L	ND	61.0	50-140			
1,1-Dichloroethane	41.3	0.5	ug/L	ND	103	50-140			
1,2-Dichloroethane	38.6	0.5	ug/L	ND	96.6	50-140			
1,1-Dichloroethylene	37.6	0.5	ug/L	ND	94.0	50-140			
cis-1,2-Dichloroethylene	38.0	0.5	ug/L	ND	95.0	50-140			
trans-1,2-Dichloroethylene	39.1	0.5	ug/L	ND	97.7	50-140			
1,2-Dichloropropane	37.4	0.5	ug/L	ND	93.6	50-140			
cis-1,3-Dichloropropylene	26.7	0.5	ug/L	ND	66.8	50-140			
trans-1,3-Dichloropropylene	22.0	0.5	ug/L	ND	55.1	50-140			
Ethylbenzene	24.9	0.5	ug/L	ND	62.3	50-140			
Hexane	25.1	1.0	ug/L	ND	62.8	50-140			
Methyl Ethyl Ketone (2-Butanone)	72.7	5.0	ug/L	ND	72.7	50-140			
Methyl Butyl Ketone (2-Hexanone)	65.3	10.0	ug/L	ND	65.3	50-140			
Methyl Isobutyl Ketone	108	5.0	ug/L	ND	108	50-140			
Methyl tert-butyl ether	58.7	2.0	ug/L	ND	58.7	50-140			
Methylene Chloride	36.4	5.0	ug/L	ND	91.1	50-140			
Styrene	27.0	0.5	ug/L	ND	67.6	50-140			
1,1,1,2-Tetrachloroethane	21.4	0.5	ug/L	ND	53.4	50-140			
1,1,2,2-Tetrachloroethane	35.1	0.5	ug/L	ND	87.7	50-140			
Tetrachloroethylene	22.9	0.5	ug/L	ND	57.2	50-140			
Toluene	28.5	0.5	ug/L	ND	71.2	50-140			
1,2,4-Trichlorobenzene	27.4	0.5	ug/L	ND	68.6	50-140			
1,1,1-Trichloroethane	32.2	0.5	ug/L	ND	80.4	50-140			
1,1,2-Trichloroethane	36.1	0.5	ug/L	ND	90.4	50-140			
Trichloroethylene	33.8	0.5	ug/L	ND	84.4	50-140			
Trichlorofluoromethane	37.2	1.0	ug/L	ND	93.0	50-140			
1,3,5-Trimethylbenzene	21.8	0.5	ug/L	ND	54.4	50-140			
Vinyl chloride	42.5	0.5	ug/L	ND	106	50-140			
m,p-Xylenes	57.4	0.5	ug/L	ND	71.7	50-140			

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date: 11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748

Project Description: PE3116

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	29.0	0.5	ug/L	ND	72.4	50-140			
Surrogate: 4-Bromofluorobenzene	*32.7*		*ug/L*		*102*	*50-140*			
Benzene	41.8	0.5	ug/L	ND	105	50-140			
Ethylbenzene	24.9	0.5	ug/L	ND	62.3	50-140			
Toluene	28.5	0.5	ug/L	ND	71.2	50-140			
m,p-Xylenes	57.4	0.5	ug/L	ND	71.7	50-140			
o-Xylene	29.0	0.5	ug/L	ND	72.4	50-140			

Certificate of Analysis

Report Date: 16-Oct-2013
Order Date:11-Oct-2013

Client: **Paterson Group Consulting Engineers**
Client PO: 14748 Project Description: PE3116

Qualifier Notes:

Sample Qualifiers :

1 : Water sample included significant sediment amount that was included in extraction process. This is expected to result in reduced accuracy of the reported result.

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.

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Page 1 of 1

Client Name: Paterson Group Inc.
Contact Name: Dan Arnott
Address: 154 Colonnade Ottawa K2E 7J5
Telephone: 613. 226. 7381

Project Reference: PE3116
Quote #:
PO #: W-11 Cal 14748 (per Dan)
Email Address: darnott@patersongrp.ca &c

TAT: [ ] Regular [ ] 3 Day
N2 Day [ ] 1 Day
Date Required: _____

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

Paracel Order Number: 1341394

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4 + BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH20-13-GW1	GW		4	10-Oct-13		X		X											
2	BH23-13-GW1			3			X	X												
3	BH24-13-GW1			4			X		X											
4	BH27-13-GW1			5			X	X	X											
5	Dup 1			4			X		X											
6																				
7																				
8																				
9																				
10																				

Comments: No PAHs on BH27-13-GW1.

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received by Driver/Depot: T. Sauve	Received at Lab: SUMEERAH	Verified By: MC
Relinquished By (Print): Dan Arnott	Date/Time: 11/10/13 2:48 PM	Date/Time: Oct 11, 2013 04:50	Date/Time: Oct 11/13 5:54
Date/Time: 2:45 pm 11-Oct-13	Temperature: ___ °C	Temperature: 13.3 °C	pH Verified [ ] By: N/A