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Phase II Environmental Site Assessment

2980, 3054, 3060 and 3080 Navan Road, and
6101 Renaud Road
Ottawa, Ontario

Prepared For
Caivan Communities

July 13, 2020

Report: PE4937-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA was carried out in conjunction with a Geotechnical Investigation and consisted of drilling seven (7) boreholes on the Phase II Property as well as thirteen (13) test pits. Four (4) of the seven (7) boreholes were constructed with groundwater monitoring well installations.

The soil profile generally consisted of topsoil or fill material, followed by some silty sand, underlain by silty clay. The boreholes and test pits were terminated in either fill, silty sand or silty clay at depths ranging from 1.1 to 6.10 m below the ground surface. Soil samples were obtained from the boreholes and test pits and screened using vapour measurements along with visual and olfactory observations. A hydrocarbon odour was noted in some of the soil samples during the subsurface investigation.

Based on the screening results in combination with sample depth and location, fourteen (14) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and metals (including mercury and hexavalent chromium). No detectable BTEX was identified in any of the soil samples. PHCs, PAHs and metal concentrations were identified in the soil; PHCs (F2), Metals (Cobalt and Vanadium), and PAHs (Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene and Indeno[1,2,3-cd]pyrene) were in excess of the selected MECP Table 2 Residential Standards. The impacted soil was isolated in the fill material on the western portion of the Phase II Property at TP9, TP12, TP13 and BH2.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 standards are considered to be indicative of typical Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes. Given that eleven (11) out of sixteen (16) soil samples exceeded Table 1 standards PHCs, PAHs and/or metals impacted soil/fill material will need to be disposed of at an approved waste disposal facility.

PHC contaminated soil and groundwater were identified in the former AST/UST areas and beneath the former garage during the work conducted by LRL.

Groundwater samples were recovered and analyzed for BTEX, PHCs, PAHs and/or VOCs. No free-phase product was observed on the groundwater at any of the monitoring well locations during the groundwater sampling events. No BTEX, PHC, PAHs and VOC parameter concentrations were detected in the groundwater samples analyzed. All groundwater results are in compliance with the MECP Table 2 Standards; however, significant concentrations were identified in the area of the garage by LRL.

Based on the findings of the Phase II ESA and the previous one conducted by LRL, petroleum hydrocarbon contaminated soil and groundwater are present in the former AST, UST and garage area, both situated in the eastern portion of the Phase II Property as well as impacted fill material on the western portion of the Phase II Property. The volume of contaminated soil in the eastern portion of the site is estimated to be on the order of 2,300m^3. Contaminated groundwater is also expected to be present in these areas.

Recommendations

As noted in the report, the Phase II Property will be redeveloped for intended residential land use and as such, the commercial portion of the property will require a Record of Site Condition (RSC). This will require that PHC impacted soil and groundwater and the fill material that does not comply with Table 2 Residential Standards, be remediated.

Soil

Fill material on the western side of the Phase II Property identified PHC (F2), metals and PAHs concentrations in excess of the Table 1 Standards, which are used to classify the fill for off-site disposal. It is our recommendation that the impacted fill/soil material be removed from the subject site during the redevelopment process. The excavation of the soil from the property should be monitored and confirmed by Paterson. Soil/ fill in excess of Table 1, will need to be removed and disposed of at an approved waste disposal facility. It is expected that approximately 80,000m^3 to 100,000m^3 of impacted fill material will require off-site disposal.

Testing of the fill and underlying native soil will be required in conjunction with the excavation program to segregate clean soil from impacted spoil and for final confirmatory purposes.

Groundwater

Remediation of the groundwater using a licenced hauling company pumping from the excavation may be a viable option, depending upon the groundwater level at the time of the remediation, however, if significant volume of water are anticipated, a pump and treat system would likely be more economical. Depending upon the methodology selected, post remediation groundwater monitoring will be required up to 12 months prior to filing an RSC.

Monitoring Wells

It is our recommendation that the monitoring wells installed on the subject site should remain viable for future monitoring. If they are not going to be used in the future, or will be entirely removed, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of Caivan Communities, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for the properties addressed 2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road, in the City of Ottawa, Ontario, herein referred to as the Phase II Property. The purpose of this Phase II ESA was to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson.

1.1 Site Description

Address:	2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road, Ottawa, Ontario
Legal Description:	Part of lot 6, Concession 3 of Ottawa River, in the Township of Gloucester, now in the City of Ottawa, Ontario.
Location:	The Phase II Property is located on the west side of Page Road with the northern and southern property line bounded by 2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road, respectively, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan in the Figures section following the text.
Latitude and Longitude:	45° 25' 46.6" N, 75° 31' 13.6" W
Zoning:	DR – Development Reserve Zone
Configuration:	Irregular
Area:	6.2 hectares (approximately)

1.2 Property Ownership

Paterson was retained to complete this Phase II ESA by Mr. Hugo Lalonde of Caivan Communities. The head office of Caivan Communities is located at 2934 Baseline Road, Suite 302, Ottawa, Ontario. Mr. Lalonde can be reached by telephone at 613-295-5082.

1.3 Current and Proposed Future Uses

The Phase II Property is occupied by two (2) single-storey residential dwellings addressed 3054 Navan Road and 3080 Navan Road; a slab-on-grade commercial building used as an office and garage at 3060 Navan Road; and commercial land addressed 6101 Renaud Road and 2980 Navan Road.

It is our understanding that the proposed site redevelopment for the Phase II Property consists of a residential development. The footprint of the development will cover the majority of the site and it will be municipally serviced with water and sewer.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 2 of the document entitled “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act”, prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011. The selected MECP Table 3 Standards are based on the following considerations:

- Coarse-grained soil conditions
- Full depth generic site condition
- Potable groundwater conditions
- Residential land use

These standards were selected based on the future land use of the subject site. Coarse-grained soil standards, which are considered conservative, were chosen to represent the current site conditions of the Phase II Property.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 standards are considered to be indicative of typical Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is situated in an area consisting of mixed-use commercial and residential land use. Adjacent and neighbouring properties consist of residential to the east, west and south with commercial land to the north, followed by residences.

The Phase II Property consists of two (2) one-storey residential dwellings with unfinished basements located on the most northern portion (3054 Navan Road) and eastern portion (3080 Navan Road) of the subject land. A single-storey commercial building previously used as a garage and office building is situated on the eastern side of 6101 Renaud Road, addressed 3060 Navan Road.

Stockpiles of debris and fill material and the storage of old equipment are present throughout the site. Access roads run east to west across the central portion of the subject site as well as north to south along the western border. A berm is present along the western property line and two large stockpiles of fill material are centrally located on the subject land. Topsoil is stockpiled in the northwestern portion of the subject site.

Site drainage on the Phase II Property consists primarily of surface infiltration throughout the property, in addition to surface run-off towards manholes located along Navan and Renaud Road.

The Phase II Property is relatively at the grade of the surrounding residential developments to the south, west and east, while below the grade of the properties to the north with the regional topography sloping downwards in a southerly direction. Groundwater in the area is anticipated to flow in a southerly direction as well.

A depiction of the Phase II Property is shown on Drawing PE4937-1 – Site Plan, in the Phase I ESA report.

2.2 Past Investigations

The Phase II ESA Report, entitled *"Phase II Environmental Site Assessment, Marcel Brazeau Ltd, 3060 Navan Road, Ottawa, Ontario,"* prepared by Levac Robichaud Leclerc Associates Ltd. (LRL), dated April 2008 was reviewed as part of this assessment. The Phase II – ESA was completed to assess the environmental impacts of the ASTs used in conjunction with a private fuel outlet

as well as the existing vehicle maintenance garage on the commercial portion of the subject site. The drilling program consisted of twenty-two (22) boreholes that were placed in the areas of the above ground storage tanks (ASTs), maintenance garage. BH9 was placed by the oil water separator outside the maintenance garage. Concentrations of PHCs (F_2 and F_3) were identified. Impacted groundwater was also identified during the assessment.

Based on their investigation, LRL estimated that there was approximately 700 metric tonnes of contaminated soil around and beneath the garage building, with another roughly 200 metric tonnes expected around the ASTs. LRL estimated the cost to remediate the contaminated soil to be on the order of $250,000.

It should be noted that LRL compared their results to the 2004 MECP Standards for non-potable groundwater conditions, which are outdated and not reflective of today's site conditions.

A Phase I-ESA was conducted by Paterson in June of 2020 in general accordance with the Ontario Regulation (O.Reg.) 153/04, as amended. The Phase I ESA identified five (5) on-site and off-site PCAs that resulted in areas of potential environmental concern (APECs) on the Phase I Property:

- APEC 1: Resulting from the former ASTs situated on the eastern portion of the Phase I property at 3060 Navan Road (PCA 28).
- APEC 2: Resulting from the former repair garage located on the eastern portion of the Phase I Property (PCA 52).
- APEC 3: Resulting from the former UST nest located on the eastern portion of the Phase I Property (PCA 28).
- APEC 4: Resulting from fill material of unknown quality, associated with the handling and placement of fill material of unknown quality on the commercial portion and western portions of the Phase I Property (PCA 30).
- APEC 5: Resulting from the former presence of 3 ASTs located at 3000 Navan Road (PCA 28).

These PCAs were verified through the historical review, an ERIS search, site visit and personal interview.

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

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on May 28, 2020 and June 2, 2020 in conjunction with a Geotechnical Investigation. The field program consisted of drilling seven (7) boreholes, four (4) of which were instrumented with groundwater monitoring wells for environmental purposes. Boreholes were drilled to depths ranging from 5.9 to 6.1 m below the ground surface (mbgs).

Additionally, thirteen (13) test pits were placed across the site to assess the quality of the fill material.

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 this media is based on the Contaminants of Potential Concern (CPCs) identified in the Phase I ESA. These CPCs include benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbons (PHC, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and metals (including mercury and hexavalent chromium) in soil and/or groundwater.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

According to the Geological Survey of Canada website, the bedrock in the area of the Phase I Property is reported to consist of shale of the Billings Formation. The overburden is reported to consist of reworked marine sediments with a thickness of 25 to 50 m across the site. The groundwater is expected to flow in a southerly direction.

Based on the well records, the Phase I Property is situated in an area where the overburden consists of sandy clay and clay, underlain by shale and limestone bedrock more than 28 mbgs.

Drinking Water Wells

One potable water well is present and currently in-use at 3054 Navan Road. The remainder of the site is serviced by municipal water.

Fill Placement

Based on the historical review in combination with the site visit, the central and western portions of the subject land have been used for fill handling with additional stockpiles of fill material imported onto the central west and west sides of the property. The unknown quality of the stockpiles and fill material imported on-site represent APECs on the Phase I Property.

Existing Buildings and Structures

The Phase I Property is currently occupied by two (2) single- storey residential dwellings with unfinished basements located at 3054 and 3080 Navan Road. A slab on grade commercial building formerly used as a repair garage is located at 3060 Navan Road.

Subsurface Structures and Utilities

The Phase I Property is situated in a partially municipally serviced area. Underground utility services on the property include natural gas and municipal water, which enter the Phase I Property from Page Road. The residential dwelling at 3054 Navan Road still relies on a domestic well located on the south side of the residence.

Private septic systems are located on the southwest side of the residence of 3054 Navan Road; south side of 3080 Navan Road; and two (2) septic tanks on the north and west sides of the commercial building at 3060 Navan Road.

Areas of Natural Significance and Water Bodies

No areas of natural significance or water bodies were identified on the Phase I Property or within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area consists primarily of residential properties with the occasional commercial land use.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, five (5) PCAs are considered to result APECs on the Phase I Property. These APECs are summarized in Table 1, along with their respective locations and contaminants of potential concern (CPCs) on the Phase I Property.

Table 1: Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from the former ASTs	Eastern portion of the Phase I Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	On-site	BTEX PHCs (F_1-F_4)	Soil and/or Groundwater
APEC 2: Resulting from the former repair garage located	Eastern portion of the Phase I Property	PCA 52 – *"Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems."*	On-site	BTEX PHCs (F_1-F_4) VOCs	Soil and/or Groundwater
APEC 3: Resulting from the former UST nest	Eastern portion of the Phase I Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	On-site	BTEX PHCs (F_1-F_4)	Soil and/or Groundwater
APEC 4: Resulting from fill material of unknown quality	Central and central west portions of the Phase I Property	PCA 30 – "*Importation of Fill Material of Unknown Quality.*"	On-site	PAHs Metals (including Hg, CrVI)	Soil and/or Groundwater
APEC 5: Resulting from the presence of a former and existing 3 ASTs	Central north side of the Phase I Property	PCA 28 – "*Gasoline and Associated Products Storage in Fixed Tanks.*"	Off-site	BTEX PHCs (F_1-F_4)	Soil and/or Groundwater

As previously discussed in Section 7.1, the remaining off-site PCAs were determined not to represent APECs on the Phase I Property.

Contaminants of Potential Concern

As per the APECs identified in Section 7.1, the contaminants of potential concern (CPCs) in soil and/or groundwater include:

- ❒ Benzene, ethylbenzene, toluene and xylenes (BTEX);
- ❒ Petroleum hydrocarbons (PHCs, Fractions F_1-F_4);
- ❒ Polycyclic aromatic hydrocarbons (PAHs);
- ❒ Volatile organic compounds (VOCs); and
- ❒ Metals plus Mercury (Hg), and Hexavalent Chromium (CrVI).

The CPCs are expected to be present in the soil and/or groundwater of the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I-ESA is considered to be sufficient to conclude that there are on-site and off-site PCAs that have resulted in APECs on the Phase I Property.

A variety of independent sources were consulted as part of this assessment, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

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

3.5 Impediments

No physical impediments were encountered during the Phase II ESA program, aside from existing buildings and utility structures.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation, completed in conjunction with a Geotechnical Investigation, was conducted during the interim of May 28 to June 2, 2020. The field program consisted of drilling seven (7) boreholes (BHs) and thirteen (13) test pits (TPs) on the Phase II Property.

The boreholes were drilled to a maximum depth of 6.1 mbgs. Four (4) of the seven (7) boreholes were completed as groundwater monitoring wells to access the groundwater table.

BH1 through BH7 and TP1 through TP13 were placed to address the aforementioned APECs as presented in Table 1, as well as completed for geotechnical purposes. All boreholes were completed using a track mounted drill rig provided by Downing Drilling Ltd. of Ottawa, Ontario, under the full-time supervision of Paterson personnel. The borehole and test pit locations are indicated on the attached Drawing PE4937-3 – Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of forty-five (45) soil samples were obtained from the boreholes by means of grab sampling from auger flights and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**G**" and "**SS**" on the Soil Profile and Test Data Sheets appended to this report.

The soil stratigraphy at the borehole locations consisted of topsoil and/or fill material, followed by silty sand, underlain by silty clay. Practical refusal to auguring was completed in BH2 and BH7 to depths ranging from 5.94 to 6.10 m below the existing grade. The remaining boreholes were to 6.10 m below the ground surface.

4.3 Field Screening Measurements

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

The technical protocol was obtained from Appendix C of the MECP document entitled “Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario”, dated March 1992.

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

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

The vapour readings were found to range from 10 ppm to 1,500 ppm. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

Hydrocarbon odours were noted in the soil samples BH1-SS2, BH1-SS3, BH4-SS2 and BH5-SS2. Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location.

4.4 Groundwater Monitoring Well Installation

Four (4) groundwater monitoring wells were installed on the Phase II Property as part of the subsurface investigation. The monitoring wells consisted of 50 mm diameter, Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1. A summary of the monitoring well construction details is provided below in Table 2.

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
BH1	80.19	6.10	3.10-6.10	2.56-6.10	0.15-2.56	Flushmount
BH2	76.94	5.94	2.94-5.94	2.74-5.94	0.15-2.74	Flushmount
BH4	77.68	6.10	3.10-6.10	2.74-6.10	0.15-2.74	Flushmount
BH7	80.29	6.10	3.10-6.10	2.56-6.10	0.15-2.56	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater samples were collected on June 10, 2020. The water levels were the only parameter measured in the field during the sampling event.

4.6 Groundwater Sampling

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

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

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan in Appendix 1, the soil and groundwater samples submitted for analytical testing are presented in Tables 3, 4 and 5.

TABLE 3: Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth (m) and Stratigraphic Unit	Parameters Analyzed				Rationale
		BTEX	PHCs (F1-F4)	PAHs	Metals	
May 28, 2020						
TP1-G3	0.7-1.0m Top soil				X	Assess the quality of fill material on-site.
TP2-G1	0-0.3m Fill	X	X			Assess the quality of fill material on-site and potential impact of the historical presence of 3 ASTs.
TP4-G2*	0.5-0.8m Fill		X	X		Assess the quality of fill material on-site.
TP6-G3	1.5-1.8m Fill				X	Assess the quality of fill material on-site.
TP7-G2*	0.3-0.6m Fill		X			Assess the quality of fill material on-site.
TP8-G1	0.6-0.9m Fill	X	X			Assess the quality of fill material on-site.
TP8-G2	0.6-0.9m Fill			X		
TP9-G5	0.8-1.1m Fill				X	Assess the quality of fill material on-site.
TP11-G1	0.1-0.3m Fill				X	Assess the quality of fill material on-site.
TP12-G2	0.4-0.7m Fill	X	X	X	X	Assess the quality of fill material on-site.
TP13-G2*	0.6-1.0m Fill		X	X	X	Assess the quality of fill material on-site.
SPG-G2	0.6-0.8m Fill			X	X	Assess the quality of fill material on-site.

Note:
* only F2-F4 fractions were analyzed

TABLE 4: Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth (m) and Stratigraphic Unit	Parameters Analyzed			Rationale
		BTEX	PHCs (F1-F4)	PAHs	
June 2, 2020					
BH1-SS3	1.52-2.13m Fill	X	X		Assess the potential soil impact due to the presence of a former repair garage and USTs.
BH2-SS3	1.52-2.13m Fill			X	Assess quality of fill material.
BH4-SS2	0.76-1.37m Fill	X	X		Assess the potential impact due to the former ASTs on the neighbouring property to the north.
BH7-SS2B	1.52-2.13m Silty Sand	X	X		Assess the potential impact due to the former 3 ASTs.

TABLE 5: Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Interval (m) and Stratigraphy Unit	Parameters Analyzed				Rationale
		BTEX	PHCs (F1-F4)	PAHs	VOCs	
June 10, 2020						
BH1-GW1	3.10-6.10M Silty Clay	X	X		X	Assess potential impact in the groundwater due to the automotive repair garage and former USTs on-site.
BH2-GW1*	3.10-6.10m Silty Clay	X	X	X		Assess potential impact in the groundwater.
BH4-GW1	3.10-6.10m Silty Clay	X	X	X	X	Assess potential impact in the groundwater due to the automotive repair garage located on the adjacent property to the north.
BH7-GW1	3.10-6.10m Silty Clay	X	X	X	X	Assess potential impact in the groundwater due to former USTs on-site.

Note:
* only F2-F4 fractions were analyzed

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

4.8 Residue Management

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

4.9 Elevation Surveying

The borehole locations were selected by Paterson for both environmental and geotechnical purposes. Boreholes were located and surveyed in the field by Paterson. All borehole and test pit locations were measured at geodetic elevations.

The locations and elevations of the boreholes are presented on Drawing PE4937-3 – Test Hole Location Plan, appended to this report.

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 generally consist of topsoil, followed by fill material, underlain by some silty sand or silty clay. The boreholes were terminated at depths ranging from 5.94 to 6.10 mbgs.

Groundwater was encountered within the fill at depths ranging from approximately 0.34 to 1.04 mbgs. Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on June 10, 2020, using an electronic water level meter. Groundwater levels are summarized below in Table 6.

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**
BH1	80.19	0.76	79.43	June 10, 2020
BH2	76.94	0.34	76.66	June 10, 2020
BH4	77.68	0.77	76.91	June 10, 2020
BH7	80.29	1.08	79.21	June 10, 2020

Based on the groundwater elevations measured during the sampling event, a groundwater contour plan was completed. The groundwater contour mapping is shown on Drawing PE4937-3 – Groundwater Contour Plan. Based on the contour mapping, groundwater flow beneath the Phase II Property is in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.06 m/m was calculated.

5.3 Fine-Course Soil Texture

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

5.4 Soil: Field Screening

Field screening of the soil samples collected resulted in vapour readings ranging from 10 to 1,500 ppm.

Hydrocarbon odours were noted in the soil samples BH1-SS2, BH1-SS3, BH4-SS2 and BH5-SS2. Soil samples were selected based on a combination of the results of the vapour screening, visual and olfactory screening, sample depth and/or sample location. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets, appended to this report.

5.5 Soil Quality

Fourteen (14) soil samples were submitted for BTEX, PHC (F_1-F_4), PAHs and/or metals analyses. The results of the analytical testing are presented in Tables 7, 8 and 9. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 7: Analytical Test Results – Soil – BTEX and PHC (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 28, 2020				MECP Table 2 Residential Standards (µg/g)
		TP2-G1	TP4-G2	TP7-G2	TP8-G1	
Benzene	0.02	nd	NA	NA	nd	0.21
Ethylbenzene	0.05	nd	NA	NA	nd	1.1
Toluene	0.05	nd	NA	NA	nd	2.3
Xylenes	0.05	nd	NA	NA	nd	3.1
PHC F_1	7	nd	NA	NA	nd	55
PHC F_2	4	(48)	(12)	(23)	8	98
PHC F_3	8	189	26	27	(205)	300
PHC F_4	6	78	9	nd	(225)	2800
PHC F_4 (gravimetric)	50	NA	NA	NA	(868)	120

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

TABLE 7 Continued: Analytical Test Results – Soil – BTEX and PHC (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 28, 2020		MECP Table 2 Residential Standards (µg/g)
		TP12-G2	TP13-G2	
Benzene	0.02	nd	NA	0.21
Ethylbenzene	0.05	nd	NA	1.1
Toluene	0.05	nd	NA	2.3
Xylenes	0.05	nd	NA	3.1
PHC F_1	7	nd	NA	55
PHC F_2	4	nd	**(105)**	98
PHC F_3	8	61	169	300
PHC F_4	6	25	94	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

TABLE 7 Continued: Analytical Test Results – Soil – BTEX and PHC (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g) June 2, 2020			MECP Table 2 Residential Standards (µg/g)
		BH1-SS3	BH4-SS2	BH7-SS2B	
Benzene	0.02	0.06	nd	nd	0.21
Ethylbenzene	0.05	0.71	nd	nd	1.1
Toluene	0.05	nd	nd	nd	2.3
Xylenes	0.05	2.82	nd	nd	3.1
PHC F_1	7	30	12	nd	55
PHC F_2	4	82	27	nd	98

TABLE 7 Continued: Analytical Test Results – Soil – BTEX and PHC (F_1-F_4)					
Parameter	**MDL (µg/g)**	**Soil Samples (µg/g)**			**MECP Table 2 Residential Standards (µg/g)**
		June 2, 2020			
		BH1-SS3	**BH4-SS2**	**BH7-SS2B**	
PHC F_3	8	36	44	nd	300
PHC F_4	6	nd	15	nd	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

BTEX and/or PHCs were identified in all of the soil samples except BH7-SS2B. All BTEX concentrations comply with the selected MECP Table 2 Residential Standards. Soil sample TP13-G2 is marginally in excess for PHC, F2 fraction. All other test results comply with the MECP Table 2 Residential Standards. Soil samples TP2-G1, TP4-G2, TP7-G2, TP8-G1 and TP13-G2 are in excess of the MECP Table 1 Standards for PHCs (F2-F4).

TABLE 8: Analytical Test Results – Soil – Metals						
Parameter	**MDL (µg/g)**	**Soil Samples (µg/g)**				**MECP Table 2 Residential Standards (µg/g)**
		May 28, 2020				
		TP1-G3	**TP6-G3**	**TP9-G5**	**TP11-G1**	
Antimony	1.0	nd	nd	nd	nd	7.5
Arsenic	1.0	1.6	2.5	4.0	2.8	18
Barium	1.0	24.7	104	(390)	117	390
Beryllium	0.5	nd	nd	0.9	nd	4
Boron	5.0	nd	nd	6.2	nd	120
Cadmium	0.5	nd	nd	nd	nd	1.2
Chromium	5.0	9.2	42.0	(146)	48.6	160
Chromium (VI)	0.2	nd	NA	NA	nd	8
Cobalt	1.0	2.8	8.8	**(27.9)**	6.9	22
Copper	5.0	6.0	20.8	64.7	19.3	140
Lead	1.0	2.0	17.0	7.2	8.3	120
Mercury	0.1	nd	NA	NA	nd	0.27
Molybdenum	1.0	nd	nd	nd	nd	6.9
Nickel	5.0	5.6	24.0	80.7	22.5	100
Selenium	1.0	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	2.0	23
Vanadium	10.0	17.8	39.0	**(125)**	37.7	86
Zinc	20.0	nd	51.3	140	62.6	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

TABLE 8 Continue: Analytical Test Results – Soil – Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 28, 2020			MECP Table 2 Residential Standards (µg/g)
		TP12-G2	TP13-G2	SPG-G2	
Antimony	1.0	nd	nd	nd	7.5
Arsenic	1.0	3.6	3.2	3.8	18
Barium	1.0	(273)	169	(298)	390
Beryllium	0.5	0.7	nd	0.7	4
Boron	5.0	6.3	nd	5.6	120
Cadmium	0.5	nd	nd	nd	1.2
Chromium	5.0	(104)	47.5	50.8	160
Chromium (VI)	0.2	nd	nd	nd	8
Cobalt	1.0	20.7	11.0	12.9	22
Copper	5.0	47.1	28.0	25.3	140
Lead	1.0	10.5	40.9	11.8	120
Mercury	0.1	nd	nd	nd	0.27
Molybdenum	1.0	nd	nd	nd	6.9
Nickel	5.0	57.6	28.8	31.1	100
Selenium	1.0	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	23
Vanadium	10.0	**(89.7)**	48.2	55.1	86
Zinc	20.0	106	79.6	88.1	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

Cobalt and vanadium concentrations in soil sample TP9-G5 and TP12-G2 are in excess of the selected MECP Standards. All other metal results comply with the MECP Table 2 Residential Standards.

Soil samples TP9-G5 and TP12-G2 are in excess of the MECP Table 1 Standards for several metal parameters.

TABLE 9: Analytical Test Results – Soil – PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 28, 2020			MECP Table 2 Residential Standards (µg/g)
		TP4-G2	TP8-G2	TP12-G2	
Acenaphthene	0.02	0.02	nd	nd	7.9
Acenaphthylene	0.02	nd	nd	nd	0.15
Anthracene	0.02	0.04	0.02	nd	0.67
Benzo[a]anthracene	0.02	0.07	0.04	nd	0.5
Benzo[a]pyrene	0.02	0.06	0.04	nd	0.3
Benzo[b]fluoranthene	0.02	0.07	0.05	nd	0.78
Benzo[g,h,i]perylene	0.02	0.04	0.03	nd	6.6
Benzo[k]fluoranthene	0.02	0.03	0.02	nd	0.78
Chrysene	0.02	0.08	0.05	nd	7
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	0.1
Fluoranthene	0.02	0.17	0.09	nd	0.69
Fluorene	0.02	0.02	0.02	nd	62
Indeno[1,2,3-cd]pyrene	0.02	0.04	0.02	nd	0.38
1-Methylnaphthalene	0.02	nd	nd	nd	0.99
2-Methylnaphthalene	0.02	nd	nd	nd	0.99
Methylnaphthalene (1&2)	0.04	nd	nd	nd	0.99
Naphthalene	0.01	nd	0.01	nd	0.6
Phenanthrene	0.02	0.14	0.07	nd	6.2
Pyrene	0.02	0.12	0.07	nd	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

TABLE 9 Continued: Analytical Test Results – Soil – PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) May 28, 2020		June 2,2020	MECP Table 2 Residential Standards (µg/g)
		TP13-G2	SPG-G2	BH2-SS3	
Acenaphthene	0.02	(0.10)	nd	(0.53)	7.9
Acenaphthylene	0.02	0.07	nd	0.04	0.15
Anthracene	0.02	(0.38)	nd	**(0.77)**	0.67
Benzo[a]anthracene	0.02	**(0.54)**	nd	**(2.35)**	0.5
Benzo[a]pyrene	0.02	**(0.47)**	nd	**(2.36)**	0.3
Benzo[b]fluoranthene	0.02	(0.56)	nd	**(2.06)**	0.78
Benzo[g,h,i]perylene	0.02	0.26	nd	(1.18)	6.6
Benzo[k]fluoranthene	0.02	0.29	nd	**(1.14)**	0.78
Chrysene	0.02	0.58	nd	2.50	7
Dibenzo[a,h]anthracene	0.02	0.07	nd	**(0.34)**	0.1
Fluoranthene	0.02	**(1.19)**	nd	**(5.97)**	0.69
Fluorene	0.02	(0.14)	nd	(0.58)	62
Indeno[1,2,3-cd]pyrene	0.02	(0.25)	nd	**(1.26)**	0.38

TABLE 9 Continued: Analytical Test Results – Soil – PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 2 Residential Standards (µg/g)
		May 28, 2020		June 2,2020	
		TP13-G2	SPG-G2	BH2-SS3	
1-Methylnaphthalene	0.02	0.04	nd	0.11	0.99
2-Methylnaphthalene	0.02	0.06	nd	0.14	0.99
Methylnaphthalene (1&2)	0.04	0.10	nd	0.25	0.99
Naphthalene	0.01	(0.12)	nd	(0.17)	0.6
Phenanthrene	0.02	(0.91)	nd	(3.64)	6.2
Pyrene	0.02	0.97	nd	(4.45)	78

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

Several PAH parameters were identified at concentrations that are in excess of the selected MECP Table 2 Residential Standards in soil samples TP13-G2 and BH2-SS3. All other soil samples comply with the MECP Table 2 Residential Standards.

Soil samples TP13-G2 and BH2-SS3 are in excess of the MECP Table 1 Standards for several PAH parameter concentrations.

The analytical results for BTEX, PHCs, PAHs and metals in soil with respect to borehole and test pit locations are shown on Drawing PE4937-4A- Analytical Testing Plan – Soil.

The maximum concentrations of analyzed parameters in the soil at the site are summarized in Table 10.

TABLE 10: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
PHC F_2	**105**	TP13-G2	0.6-1.0m, fill
PHC F_3	205	TP8-G1	0-0.15m, fill
PHC F_4	225	TP8-G1	0-0.15m, fill
Arsenic	4.0	TP9-G5	0.8-1.10m, fill
Barium	390	TP9-G5	0.8-1.10m, fill
Beryllium	0.9	TP9-G5	0.8-1.10m, fill
Boron	6.3	TP12-G2	0.4-0.7m, fill
Chromium	146	TP9-G5	0.8-1.10m, fill
Cobalt	**27.9**	TP9-G5	0.8-1.10m, fill
Copper	64.7	TP9-G5	0.8-1.10m, fill
Lead	40.9	TP13-G2	0.6-1.0m, fill

TABLE 10: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g)**	**Soil Sample**	**Depth Interval (m BGS)**
Nickel	80.7	TP9-G5	0.8-1.10m, fill
Uranium	2.0	TP11-G1	0.1-0.3m, fill
Vanadium	**89.7**	TP12-G2	0.4-0.7m, fill
Zinc	140	TP12-G2	0.4-0.7m, fill
Acenaphthene	0.53	BH2-SS2	1.52-2.13m, fill
Acenaphthylene	0.07	TP13-G2	0.6-1.0m, fill
Anthracene	**0.77**	BH2-SS2	1.52-2.13m, fill
Benzo[a]anthracene	**2.35**	BH2-SS2	1.52-2.13m, fill
Benzo[a]pyrene	**2.36**	BH2-SS2	1.52-2.13m, fill
Benzo[b]fluoranthene	**2.06**	BH2-SS2	1.52-2.13m, fill
Benzo[g,h,i]perylene	1.18	BH2-SS2	1.52-2.13m, fill
Benzo[k]fluoranthene	**1.14**	BH2-SS2	1.52-2.13m, fill
Chrysene	2.50	BH2-SS2	1.52-2.13m, fill
Dibenzo[a,h]anthracene	**0.34**	BH2-SS2	1.52-2.13m, fill
Fluoranthene	**5.97**	BH2-SS2	1.52-2.13m, fill
Fluorene	0.58	BH2-SS2	1.52-2.13m, fill
Indeno[1,2,3-cd]pyrene	**1.26**	BH2-SS2	1.52-2.13m, fill
1-Methylnaphthalene	0.11	BH2-SS2	1.52-2.13m, fill
2-Methylnaphthalene	0.14	BH2-SS2	1.52-2.13m, fill
Methylnaphthalene (1&2)	0.25	BH2-SS2	1.52-2.13m, fill
Naphthalene	0.17	BH2-SS2	1.52-2.13m, fill
Phenanthrene	3.64	BH2-SS2	1.52-2.13m, fill
Pyrene	4.45	BH2-SS2	1.52-2.13m, fill

Notes:
- **Bold and Underlined** – Value exceeds the selected MECP Standards

The maximum PHC, F2 fraction, cobalt, vanadium and PAH parameter concentrations in the soil samples analyzed exceeded the selected MECP Standards in soil samples TP13-G2, TP9-G5, TP12-G2 and/or BH2-SS3. All other test results are in compliance with the selected MECP Table 2 Residential Standards. The remaining parameters were not detected above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples were submitted for laboratory analysis of BTEX, PHC (F_1-F_4), PAHs and/or VOC parameters. The groundwater samples were obtained from the screened intervals noted in Table 2.

The results of the analytical testing are presented in Tables 11, 12 and 13. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 11: Analytical Test Results – Groundwater – PHCs and/or BTEX

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 2 Standards (µg/L)
		June 10, 2020		
		BH1-GW1	BH2-GW1	
Benzene	0.5	nd	NA	5
Ethylbenzene	0.5	nd	NA	2.4
Toluene	0.5	nd	NA	24
Xylenes (total)	0.5	nd	NA	300
PHC F_1	25	61	NA	750
PHC F_2	100	nd	nd	150
PHC F_3	100	nd	nd	500
PHC F_4	100	nd	nd	500

Notes:
- NA – Paramter not tested
- MDL – Method Detection Limit
- nd – not detected above the MDL
- BTEX parameters are included in the VOC group of parameters

TABLE 11 Continued: Analytical Test Results – Groundwater PHCs and/or BTEX

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 2 Standards (µg/L)
		June 10, 2020		
		BH4-GW1	BH7-GW1	
Benzene	0.5	nd	nd	5
Ethylbenzene	0.5	nd	nd	2.4
Toluene	0.5	nd	nd	24
Xylenes (total)	0.5	nd	nd	300
PHC F_1	25	nd	100	750
PHC F_2	100	nd	nd	150
PHC F_3	100	nd	nd	500
PHC F_4	100	nd	nd	500

Notes:
- NA – Paramter not tested
- MDL – Method Detection Limit
- nd – not detected above the MDL
- BTEX parameters are included in the VOC group of parameters

No detectable BTEX or PHC concentrations were identified in the groundwater samples analyzed, with the exception of PHC, F1. All test results comply with the selected MECP Table 2 Standards.

TABLE 12: Analytical Test Results – Groundwater – PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 2 Standards (µg/L)
		June 10, 2020			
		BH2-GW1	BH4-GW1	BH7-GW1	
Acenaphthene	0.05	nd	nd	nd	4.1
Acenaphthylene	0.05	nd	nd	nd	1
Anthracene	0.01	nd	nd	nd	2.4
Benzo[a]anthracene	0.01	nd	nd	nd	1
Benzo[a]pyrene	0.01	nd	nd	nd	0.01
Benzo[b]fluoranthene	0.05	nd	nd	nd	0.1
Benzo[g,h,i]perylene	0.05	nd	nd	nd	0.2
Benzo[k]fluoranthene	0.05	nd	nd	nd	0.1
Chrysene	0.05	nd	nd	nd	0.1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	0.2
Fluoranthene	0.01	nd	nd	nd	0.41
Fluorene	0.05	nd	nd	nd	120
Indeno[1,2,3-cd]pyrene	0.05	nd	nd	nd	0.2
1-Methylnaphthalene	0.05	nd	nd	nd	3.2
2-Methylnaphthalene	0.05	nd	nd	nd	3.2
Methylnaphthalene (1&2)	0.10	nd	nd	nd	3.2
Naphthalene	0.05	nd	nd	nd	11
Phenanthrene	0.05	nd	nd	nd	1
Pyrene	0.01	nd	nd	nd	4.1

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and underlined** – Parameter exceeds selected MECP Standards
- (-) Exceeds the MECP Table 1 Standards

No detectable PAH concentrations were identified in the groundwater samples analyzed. All test results comply with the selected MECP Table 2 Standards.

TABLE 13: Analytical Test Results – Groundwater – VOC				
Parameter	**MDL (µg/L)**	**Groundwater Samples (µg/L)**		**MECP Table 2 Standards (µg/L)**
		June 2, 2020		
		BH1-GW1	**BH4-GW1**	
Acetone	5	nd	nd	2700
Benzene	0.5	nd	nd	5
Bromodichloromethane	0.5	nd	nd	16
Bromoform	0.5	nd	nd	25
Bromomethane	0.5	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	30
Chloroform	0.5	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	25
Dichlorodifluoromethane	1	nd	nd	590
1,2-Dichlorobenzene	0.5	nd	nd	3
1,3-Dichlorobenzene	0.5	nd	nd	59
1,4-Dichlorobenzene	0.5	nd	nd	1
1,1-Dichloroethane	0.5	nd	nd	5
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	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	5
1,3-Dichloropropene, total	0.2	nd	nd	0.5
Ethylbenzene	1	nd	nd	2.4
Ethylene dibromide (dibromoethane, 1,2-)	5	nd	nd	0.2
Hexane	5	nd	nd	51
Methyl Ethyl Ketone (2-Butanone)	2	nd	nd	1800
Methyl Isobutyl Ketone	5	nd	nd	640 ug
Methyl tert-butyl ether	0.5	nd	nd	15
Methylene Chloride	0.5	nd	nd	50
Styrene	0.5	nd	nd	5.4
1,1,1,2-Tetrachloroethane	0.5	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	1
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	24
1,1,1-Trichloroethane	0.5	nd	nd	200
1,1,2-Trichloroethane	1	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	150
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes, total	0.5	nd	nd	300

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

TABLE 13 Continued: Analytical Test Results – Groundwater – VOC				
Parameter	**MDL (µg/L)**	**Groundwater Samples (µg/L)**		**MECP Table 2 Standards (µg/L)**
		June 2, 2020		
		BH7-GW1	**DUP**	
Acetone	5	nd	nd	2700
Benzene	0.5	nd	nd	5
Bromodichloromethane	0.5	nd	nd	16
Bromoform	0.5	nd	nd	25
Bromomethane	0.5	nd	nd	0.89
Carbon Tetrachloride	0.2	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	30
Chloroform	0.5	nd	nd	2.4
Dibromochloromethane	0.5	nd	nd	25
Dichlorodifluoromethane	1	nd	nd	590
1,2-Dichlorobenzene	0.5	nd	nd	3
1,3-Dichlorobenzene	0.5	nd	nd	59
1,4-Dichlorobenzene	0.5	nd	nd	1
1,1-Dichloroethane	0.5	nd	nd	5
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	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	5
1,3-Dichloropropene, total	0.2	nd	nd	0.5
Ethylbenzene	1	nd	nd	2.4
Ethylene dibromide (dibromoethane, 1,2-)	5	nd	nd	0.2
Hexane	5	nd	nd	51
Methyl Ethyl Ketone (2-Butanone)	2	nd	nd	1800
Methyl Isobutyl Ketone	5	nd	nd	640 ug
Methyl tert-butyl ether	0.5	nd	nd	15
Methylene Chloride	0.5	nd	nd	50
Styrene	0.5	nd	nd	5.4
1,1,1,2-Tetrachloroethane	0.5	nd	nd	1.1
1,1,2,2-Tetrachloroethane	0.5	nd	nd	1
Tetrachloroethylene	0.5	nd	nd	1.6
Toluene	0.5	nd	nd	24
1,1,1-Trichloroethane	0.5	nd	nd	200
1,1,2-Trichloroethane	1	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	150
Vinyl Chloride	0.5	nd	nd	0.5
Xylenes, total	0.5	nd	nd	300

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

No VOC concentrations were identified in the groundwater samples analyzed. All VOC test results comply with the selected MECP Table 2 Standards.

Analytical results of BTEX, PHC and VOCs in the groundwater with respect to borehole locations are shown on Drawing PE4937-4B- Analytical Testing Plan – Groundwater.

No parameter concentrations in groundwater were detected above the laboratory method detection limits, with the exception of PHC, F1. The maximum concentration was identified in groundwater sample BH7-GW1.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the May 28 through June 10, 2020 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

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 general accordance with the requirements of O.Reg. 153/04, as amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in Section 2.2 of this report, PCAs 28, 52 and 30 were identified on the subject land as well as PCA 28 at 3000 Navan Road, which have resulted in APECs on the Phase II Property:

- APEC 1: Resulting from the former ASTs situated on the eastern portion of the Phase I property at 3060 Navan Road (PCA 28).
- APEC 2: Resulting from the former repair garage located on the eastern portion of the Phase I Property (PCA 52).
- APEC 3: Resulting from the former UST nest located on the eastern portion of the Phase I Property (PCA 28).

- APEC 4: Resulting from fill material of unknown quality, associated with the handling and placement of fill material of unknown quality on the commercial portion and western portions of the Phase I Property (PCA 30).
- APEC 5: Resulting from the former and existing presence of 3 ASTs located at 3000 Navan Road (PCA 28).

Contaminants of Potential Concern

Based on the APECs identified on the Phase II Property, the contaminants of potential concern (CPCs) are:

- Benzene, ethylbenzene, toluene and xylenes (BTEX);
- Petroleum hydrocarbons (PHCs, Fractions F_1-F_4);
- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile organic compounds (VOCs); and
- Metals plus Mercury (Hg), and Hexavalent Chromium (CrVI).

Subsurface Structures and Utilities

The Phase II Property is situated in a partially municipally serviced area. Underground utility services on the property include natural gas and municipal water, which enter the Phase I Property from Page Road. The residential dwelling at 3054 Navan Road still relies on a domestic well located on the south side of the residence.

Private septic systems are located on the southwest side of the residence of 3054 Navan Road; south side of 3080 Navan Road; and two (2) septic tanks on the north and west sides of the commercial building at 3060 Navan Road.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawing PE4937-5–Cross-section A-A' – Soil and Groundwater. The site stratigraphy consists of:

- Topsoil with an approximate thickness of 0.15 m. Groundwater was not encountered in this layer.

- Fill material consisting of silty sand with some crushed stone and gravel was encountered in all of the boreholes (BH1 to BH7), extending to depths ranging from 0.6 to 3.66mbgs. Groundwater was encountered in this layer at BH1, BH2 and BH4.
- Silty sand with traces of gravel was encountered in BH1 and BH7, extending to depths ranging from 1.37 to 3.20 mbgs. Groundwater was encountered in this layer at BH7.

- Silty clay was encountered in all boreholes and extended to depth ranging from 5.94 to 6.10 mbgs. **Hydrogeological Characteristics**

Groundwater at the Phase II Property was generally encountered in the fill ranging at depths of approximately 0.34 to 1.08 mbgs. Groundwater flow was measured in a westerly direction with a hydraulic gradient of 0.06 m/m. Groundwater contours are shown on Drawing PE4937-3–Test Hole Location Plan.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 0.34 to 1.08 mbgs.

Approximate Depth to Bedrock

Bedrock was not confirmed during the drilling program. All boreholes were completed in the native soil and reached refusal between 5.94 and 6.10 mbgs. Bedrock was not encountered, as drift thickness is estimated to be on the order of 25 to 50 mbgs.

Well records for the immediate area of the Phase II Property did not provide any information regarding the local stratigraphy or bedrock depth.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the subject property is not within 30m of an environmentally sensitive area.

Section 43.1 of the Regulation does not apply to the Phase II Property as it is not a shallow soil property.

Fill Placement

Based on the findings of the subsurface investigation, the fill material encountered consisted of a mixture of silty sand, crushed stone and some gravel with traces of sand. Petroleum hydrocarbon odours were observed during the field program at locations BH1, BH4 and BH5, which was indicative of contaminated fill material.

Existing Buildings and Structures

The Phase II Property is currently occupied by two (2) single- storey residential dwellings with unfinished basements located at 3054 and 3080 Navan Road. A slab on grade commercial building formerly used as a repair garage is located at 3060 Navan Road.

Proposed Buildings and Other Structures

The proposed development for the Phase II Property includes a residential development as well as local roadways. The footprint of the development will cover the majority of the site and it will be municipally serviced with water and sewer.

Drinking Water Wells

One potable water well is present and currently in-use at 3045 Navan Road. The remainder of the site is serviced by municipal water.

Water Bodies and Areas of Natural Significance

No water bodies or areas of natural significance were identifed on the Phase II Property or within the 250 m search radius.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical results, PHCs, metals and PAH concentrations in soil were in excess of the selected MECP Table 2 Residential Standards, as shown on Drawing PE4937-4 – Analytical Testing Plan–Soil. It should be noted that

The PHC contaminated soil and groundwater were identified in the former AST/UST areas and beneath the former garage during the work conducted by LRL.

Types of Contaminants

Based on the analytical results for soil and groundwater, the contaminants of concern include PHCs (F2 fraction at TP13), Metals (Cobalt and Vanadium at TP9 and Vanadium at TP12), and PAHs (Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene and Indeno[1,2,3-cd]pyrene at TP13 and BH2). PHCs were identified by LRL in the area of the garage and former tanks.

Contaminated Media

Based on the findings of the Phase II ESA, the fill material is impacted with PHC, specifically F2 at TP13, Cobalt at TP9 and Vanadium at TP12, Benzo[a]anthracene, Benzo[a]pyrene and Fluoranthene at TP13, and Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene and Indeno[1,2,3-cd]pyrene at BH2.

PHCs were identified in the groundwater in the area of the garage during the previous LRL investigation.

What Is Known About Areas Where Contaminants Are Present

Based on the subsurface investigation, the western portion of the Phase II Property is impacted with PHC (F2), Metals and PAHs.

LRL identifed soil and groundwater within the immediate area of the former tanks were impacted with PHCs.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, no significant distribution or migration of contaminants is considered to have occurred. The fill impact is considered to be limited at the western side of the Phase II Property.

LRL identified impact close to the sources. Based on our investigation, there was no sign of migration expected.

Discharge of Contaminants

The PHC (F2), metals and PAH impacts on the western portion of the Phase II Property is considered to have resulted from importation of fill material on-site. The PHC contamination identified by LRL considered to be a result of the on-site garage, former AST and USTs.

Climatic and Meteorological Conditions

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

Since no contaminants were identified in the groundwater beneath the fill, climatic and meteorological conditions are not considered to have contributed to contaminant transport.

Potential for Vapour Intrusion

Based on the findings of the Phase II ESA, there is no potential for vapour intrusion on the Phase II Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the areas of environmental concern (APECs) that were identified on the Phase II Property during the Phase I ESA.

The Phase II ESA was carried out in conjunction with a Geotechnical Investigation and consisted of drilling seven (7) boreholes on the Phase II Property as well as thirteen (13) test pits. Four (4) of the seven (7) boreholes were constructed with groundwater monitoring well installations.

The soil profile generally consisted of topsoil or fill material, followed by some silty sand, underlain by silty clay. The boreholes and test pits were terminated in either fill, silty sand or silty clay at depths ranging from 1.1 to 6.10 m below the ground surface. Soil samples were obtained from the boreholes and test pits and screened using vapour measurements along with visual and olfactory observations. A hydrocarbon odour was noted in some of the soil samples during the subsurface investigation.

Based on the screening results in combination with sample depth and location, fourteen (14) soil samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F_1-F_4), polycyclic aromatic hydrocarbons (PAHs) and metals (including mercury and hexavalent chromium). No detectable BTEX was identified in any of the soil samples. PHCs, PAHs and metal concentrations were identified in the soil; PHCs (F2), Metals (Cobalt and Vanadium), and PAHs (Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene and Indeno[1,2,3-cd]pyrene) were in excess of the selected MECP Table 2 Residential Standards. The impacted soil was isolated in the fill material on the western portion of the Phase II Property at TP9, TP12, TP13 and BH2.

A comparison of the soil test data to the MECP Table 1 Standards was also conducted. The Table 1 standards are considered to be indicative of typical Ontario background concentrations and are commonly used to assess whether soil is clean for off-site disposal purposes. Given that eleven (11) out of sixteen (16) soil samples exceeded Table 1 standards PHCs, PAHs and/or metals

impacted soil/fill material will need to be disposed of at an approved waste disposal facility.

PHC contaminated soil and groundwater were identified in the former AST/UST areas and beneath the former garage during the work conducted by LRL.

Groundwater samples were recovered and analyzed for BTEX, PHCs, PAHs and/or VOCs. No free-phase product was observed on the groundwater at any of the monitoring well locations during the groundwater sampling events. No BTEX, PHC, PAHs and VOC parameter concentrations were detected in the groundwater samples analyzed. All groundwater results are in compliance with the MECP Table 2 Standards; however, significant concentrations were identified in the area of the garage by LRL.

Based on the findings of the Phase II ESA and the previous one conducted by LRL, petroleum hydrocarbon contaminated soil and groundwater are present in the former AST, UST and garage area, both situated in the eastern portion of the Phase II Property as well as impacted fill material on the western portion of the Phase II Property. The volume of contaminated soil in the eastern portion of the site is estimated to be on the order of 2,300m^3. Contaminated groundwater is also expected to be present in these areas.

Recommendations

As noted in the report, the Phase II Property will be redeveloped for intended residential land use and as such, the commercial portion of the property will require a Record of Site Condition (RSC). This will require that PHC impacted soil and groundwater and the fill material that does not comply with Table 2 Residential Standards, be remediated.

Soil

Fill material on the western side of the Phase II Property identified PHC (F2), metals and PAHs concentrations in excess of the Table 1 Standards, which are used to classify the fill for off-site disposal. It is our recommendation that the impacted fill/soil material be removed from the subject site during the redevelopment process. The excavation of the soil from the property should be monitored and confirmed by Paterson. Soil/ fill in excess of Table 1, will need to be removed and disposed of at an approved waste disposal facility. It is expected that approximately 80,000m^3 to 100,000m^3 of impacted fill material will require off-site disposal.

Testing of the fill and underlying native soil will be required in conjunction with the excavation program to segregate clean soil from impacted spoil and for final confirmatory purposes.

Groundwater

Remediation of the groundwater using a licenced hauling company pumping from the excavation may be a viable option, depending upon the groundwater level at the time of the remediation, however, if significant volume of water are anticipated, a pump and treat system would likely be more economical. Depending upon the methodology selected, post remediation groundwater monitoring will be required up to 12 months prior to filing an RSC.

Monitoring Wells

It is our recommendation that the monitoring wells installed on the subject site should remain viable for future monitoring. If they are not going to be used in the future, or will be entirely removed, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

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

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

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

This report was prepared for the sole use of Caivan Communities. Notification from Caivan Communities and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Mandy Witteman, B.Eng., M.A.Sc.

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

Report Distribution:

- Caivan Communities
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4937-3 – TEST HOLE LOCATION PLAN AND GROUNDWATER CONTOUR PLAN

DRAWING PE4937-4A – ANALYTICAL TESTING PLAN – SOIL

DRAWING PE4937-4B– ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4937-5 – CROSS-SECTION A – A' – SOIL & GROUNDWATER

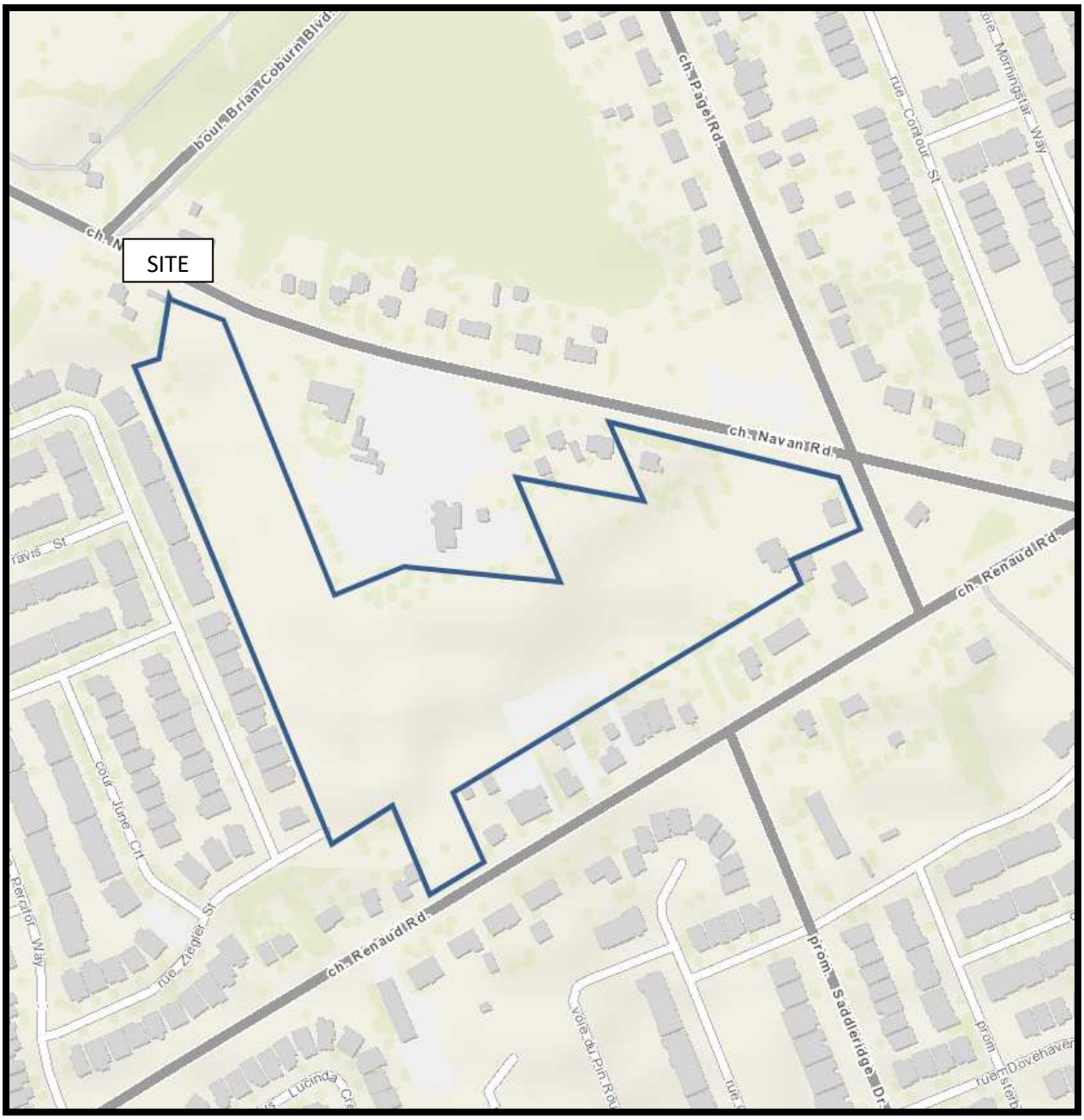
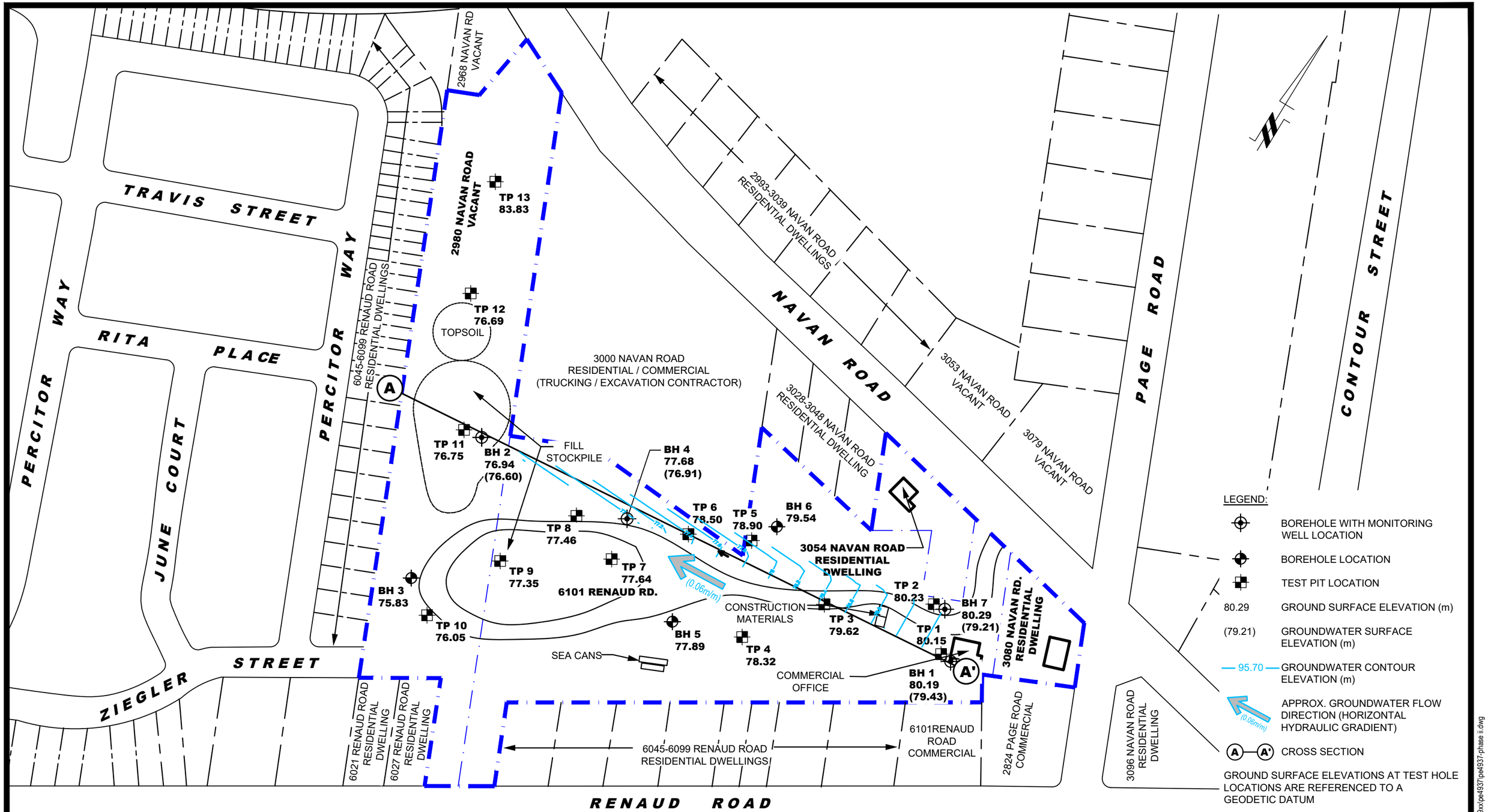


FIGURE 1

KEY PLAN



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CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RENAUD ROAD AT NAVAN ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION AND GROUNDWATER CONTOUR PLAN

Scale: 1:2000	Date: 07/2020
Drawn by: YA	Report No.: PE4937-2
Checked by: MW	Dwg. No.: PE4937-3
Approved by: MSD	Revision No.:

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TP13-G2	0.6-1.0m	28-May-20
PARAMETER	RESULT(µg/g)	STANDARD(µg/g)
PHC (F2)	105	98
Benzo[a]anthracene	0.54	0.5
Benzo[a]pyrene	0.47	0.3
Fluoranthene	1.19	0.69

Remaining PHC paramters comply with Table 2 Standards
Remaining PAH parameters comply with Table 2 Standards
Metals comply with Table 2 Standards

TP12-G2	0.4-0.7m	28-May-20
PARAMETER	RESULT(µg/g)	STANDARD(µg/g)
Vanadium	89.7	86

Remaining Metals comply with Table 2 Standards
PHCs comply with Table 2 Standards
PAHs comply with Table 2 Standards

SPG-G2 (DUP-TP12-G2) 0.4-0.7m 28-May-20
Metals comply with Table 2 Standards
PAHs comply with Table 2 Standards

TP11-G1 0.1-0.3m 28-May-20
Metals comply with Table 2 Standards

BH2-SS3	1.52-2.13m	2-Jun-20
PARAMETER	RESULT(µg/g)	STANDARD(µg/g)
Anthracene	0.77	0.67
Benzo[a]anthracene	2.35	0.5
Benzo[a]pyrene	2.36	0.3
Benzo[b]fluoranthene	2.06	0.78
Benzo[k]fluoranthene	1.14	0.78
Dibenzo[a,h]anthracene	0.34	0.1
Fluoranthene	5.97	0.69
Indeno[1,2,3-cd]pyrene	1.26	0.38

Remaining PAH parameters comply with Table 2 Standards

TP8-G1 0-0.15m 28-May-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

TP8-G2 0.6-0.9m 28-May-20
PAHs comply with Table 2 Standards

BH4-SS2 0.76-1.37m 2-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

TP9-G5	0.8-1.1m	28-May-20
PARAMETER	RESULT(µg/g)	STANDARD(µg/g)
Vanadium	125	86

Remaining Metals comply with Table 2 Standards

TP4-G2 0.5-0.8m 28-May-20
BTEX comply with Table 2 Standards
PHCs (F2-F4) comply with Table 2 Standards

TP7-G2 0.3-0.6m 28-May-20
PHCs (F2-F4) comply with Table 2 Standards

TP6-G3 1.5-1.8m 28-May-20
Metals comply with Table 2 Standards

TP2-G1 0-0.3m 28-May-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

BH7-SS2B 1.52-2.13m 2-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

TP1-G3 0.7-1.0m 28-May-20
Metals comply with Table 2 Standards

BH1-SS3 1.52-2.13m 2-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

2968 NAVAN RD VACANT
2980 NAVAN ROAD VACANT
TP 13 83.83
TP 12 76.69
TOPSOIL
PERCITOR WAY
6045-6099 RENAUD ROAD RESIDENTIAL DWELLINGS
A
TP 11 76.75
BH 2 76.94 (76.60)
FILL STOCKPILE
3000 NAVAN ROAD RESIDENTIAL / COMMERCIAL (TRUCKING / EXCAVATION CONTRACTOR)
2993-3039 NAVAN ROAD RESIDENTIAL DWELLINGS
NAVAN ROAD
3053 NAVAN ROAD VACANT
3028-3046 NAVAN ROAD RESIDENTIAL DWELLING
3079 NAVAN ROAD VACANT
PAGE ROAD
TP 8 77.46
BH 4 77.68 (76.91)
TP 6 78.50
BH 6 79.54
TP 5 78.90
3054 NAVAN ROAD RESIDENTIAL DWELLING
TP 9 77.35
TP 7 77.64
6101 RENAUD RD.
BH 3 75.83
TP 10 76.05
CONSTRUCTION MATERIALS
TP 3 79.62
TP 2 80.23
BH 7 80.29 (79.21)
TP 1 80.15
3080 NAVAN RD. RESIDENTIAL DWELLING
BH 5 77.89
TP 4 78.32
SEA CANS
COMMERCIAL OFFICE
BH 1 80.19 (79.43)
A'
STREET
6021 RENAUD ROAD RESIDENTIAL DWELLING
6027 RENAUD ROAD RESIDENTIAL DWELLING
6045-6099 RENAUD ROAD RESIDENTIAL DWELLINGS
6101RENAUD ROAD COMMERCIAL
2824 PAGE ROAD COMMERCIAL
3096 NAVAN ROAD RESIDENTIAL DWELLING
RENAUD ROAD

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- TEST PIT LOCATION
- 80.29 GROUND SURFACE ELEVATION (m)
- (79.21) GROUNDWATER SURFACE ELEVATION (m)
- A — A' CROSS SECTION

GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM

SOIL RESULT COMPLIES WITH TABLE 2 STANDARDS
SOIL RESULT EXCEEDS TABLE 2 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RENAUD ROAD AT NAVAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL

Scale: 1:2000	Date: 07/2020
Drawn by: YA	Report No.: PE4937-2
Checked by: MW	Dwg. No.: PE4937-4A
Approved by: MSD	Revision No.:

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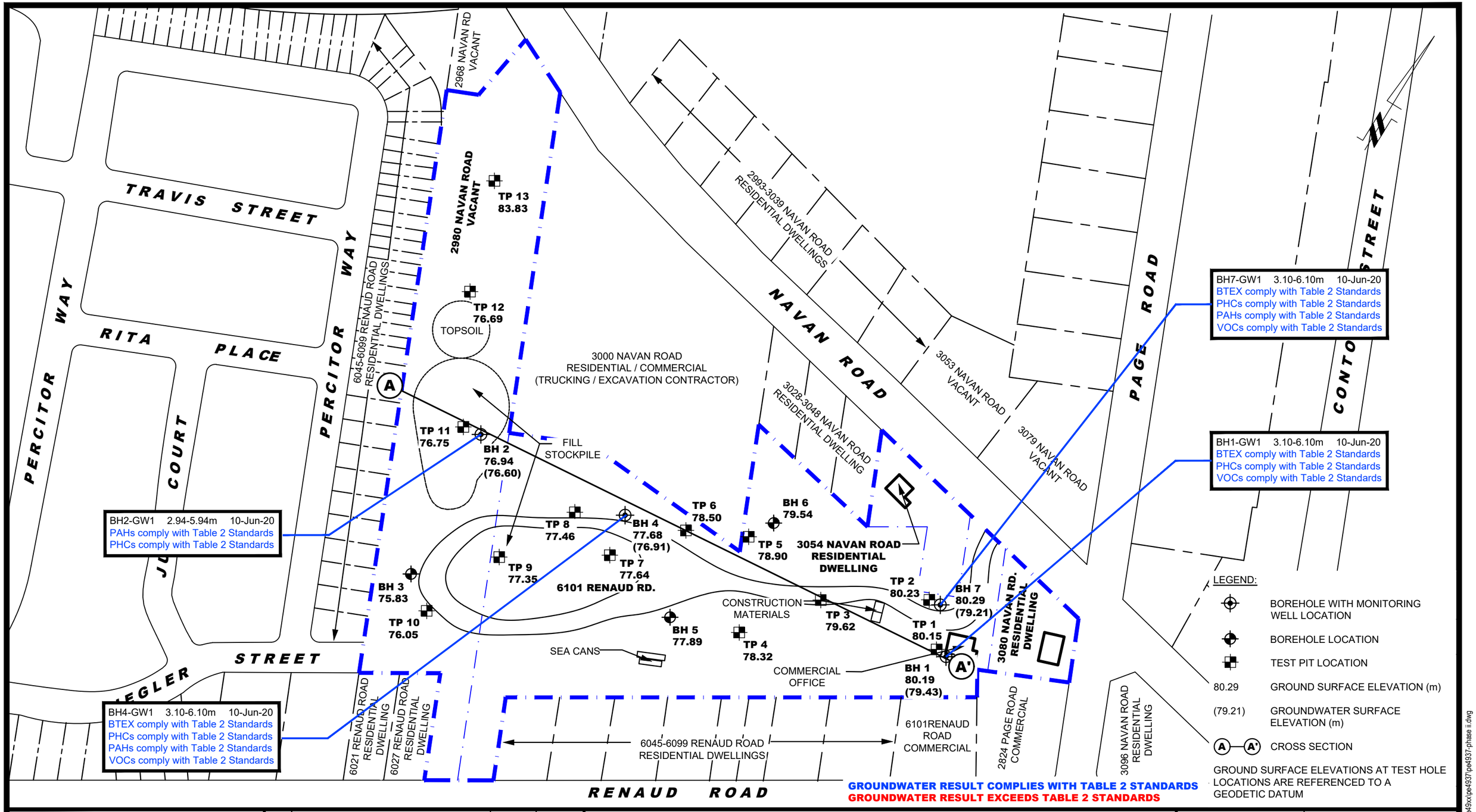

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NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RENAUD ROAD AT NAVAN ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:2000	Date: 07/2020
Drawn by: YA	Report No.: PE4937-2
Checked by: MW	Dwg. No.: PE4937-4B
Approved by: MSD	Revision No.:

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BH2-SS3	1.52-2.13m	2-Jun-20
PARAMETER	RESULT(µg/g)	STANDARD(µg/g)
Anthracene	0.77	0.67
Benzo[a]anthracene	2.35	0.5
Benzo[a]pyrene	2.36	0.3
Benzo[b]fluoranthene	2.06	0.78
Benzo[k]fluoranthene	1.14	0.78
Dibenzo[a,h]anthracene	0.34	0.1
Fluoranthene	5.97	0.69
Indeno[1,2,3-cd]pyrene	1.26	0.38

Remaining PAH parameters comply with Table 2 Standards

BH4-SS2 0.76-1.37m 2-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

TP6-G3 1.5-1.8m 28-May-20
Metals comply with Table 2 Standards

TP1-G3 0.7-1.0m 28-May-20
Metals comply with Table 2 Standards

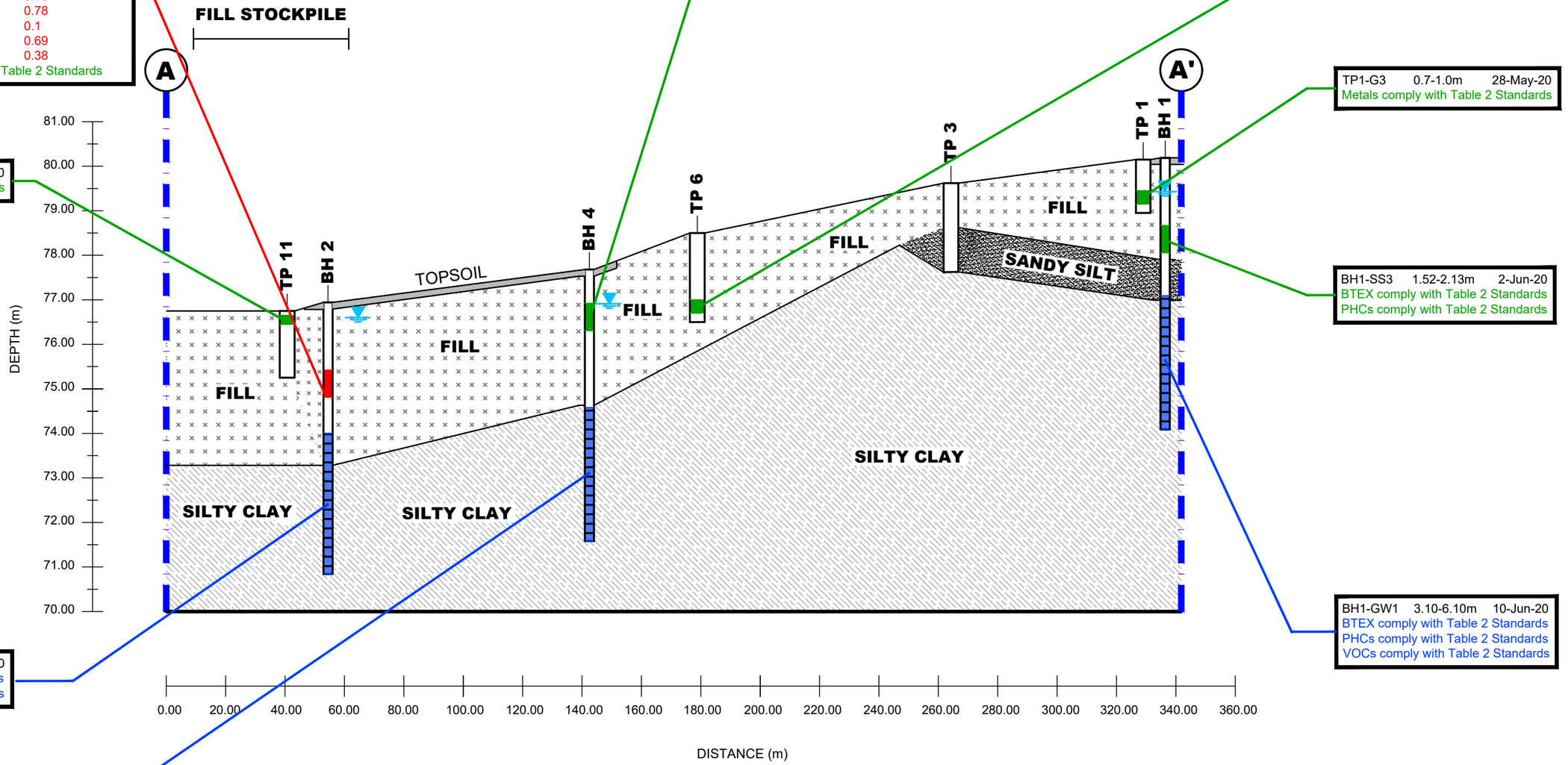
TP11-G1 0.1-0.3m 28-May-20
Metals comply with Table 2 Standards

BH1-SS3 1.52-2.13m 2-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards

BH1-GW1 3.10-6.10m 10-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards
VOCs comply with Table 2 Standards

BH2-GW1 2.94-5.94m 10-Jun-20
PAHs comply with Table 2 Standards
PHCs comply with Table 2 Standards

BH4-GW1 3.10-6.10m 10-Jun-20
BTEX comply with Table 2 Standards
PHCs comply with Table 2 Standards
PAHs comply with Table 2 Standards
VOCs comply with Table 2 Standards



SOIL RESULT COMPLIES WITH TABLE 2 STANDARDS
SOIL RESULT EXCEEDS TABLE 2 STANDARDS

GROUNDWATER RESULT COMPLIES WITH TABLE 2 STANDARDS
GROUNDWATER RESULT EXCEEDS TABLE 2 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
RENAUD ROAD AT NAVAN ROAD

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL AND GROUNDWATER

Scale: AS SHOWN	Date: 07/2020
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Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
2980, 3054, 3060 and 3080 Navan Road, and
6101 Renaud Road
Ottawa, Ontario

Prepared For

Caivan Communities

May 2020

Report: PE4937-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson was retained by Mr. Hugo Lalonde of Caivan Communities, to conduct a Phase II Environmental Site Assessment (ESA) for the properties addressed2980, 3054, 3060 and 3080 Navan Road, and 6101 Renaud Road, in the City of Ottawa, Ontario.

The Phase II ESA was carried out to address the areas of potential environmental concern on the Phase II Property. The following subsurface investigation program was developed. A Geotechnical Investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Place on the eastern side of the commercial portion of the Phase II Property to assess the potential impact due to APECs 2 and 3.	Borehole to be advanced to approximately 6 mbgs to install monitoring well.
BH2	Place on the central west side of the Phase II Property to assess the potential impact due to APEC 4.	Borehole to be advanced to approximately 6 mbgs to install monitoring well.
BH3	Place on the north west corner of the Phase II Property to assess the potential impact due to APEC 4 and for geotechnical purposes.	Borehole to be advanced to approximately 6 mbgs.
BH4	Place on the central north side of the Phase II Property to assess the potential impact due to APEC 5.	Borehole to be advanced to approximately 6 mbgs to install monitoring well.
BH5	Place on the central portion of the Phase II Property for geotechnical purposes.	Borehole to be advanced to approximately 6 mbgs.
BH6	Place on the central north side of the Phase II Property for geotechnical purposes.	Borehole to be advanced to approximately 6 mbgs.
BH7	Place on the eastern side of the commercial portion of the Phase II Property to assess the potential impact due to APEC 1.	Borehole to be advanced to approximately 6 mbgs to install monitoring well.

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

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

It should be noted, that thirteen (13) test pits are to be placed across the central and western portions of the Phase II Property to obtain broader coverage to assess the quality of the fill material (APEC 4) as well as for geotechnical purposes. The depths at which these test pits were completed range from 1.2 to 2.10 mbgs.

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 MOECC site condition standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated 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 should be measured using a measuring tape or wheel rather than paced off. Boreholes were located and surveyed in the field by Paterson. All borehole and test pit locations were measured at geodetic elevations.

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" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ 5' x 2" [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" [1.52 m x 32 mm] if installing in 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 MECP 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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SOIL PROFILE AND TEST DATA

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6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. BH 1

BORINGS BY Track-Mount Power Auger **DATE** June 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	80.19
TOPSOIL 0.15		AU	1				
FILL: Brown silty sand, some crushed stone and gravel		SS	2	42	10	1	79.19
		SS	3	67	6	2	78.19
2.29							
Compact, grey **SILTY SAND,** trace gravel		SS	4	58	12	3	77.19
3.20		SS	5	4	P		
		SS	6	71	P	4	76.19
Firm, grey **SILTY CLAY**		SS	7	92	P	5	75.19
		SS	8	100	P		
6.10						6	74.19
End of Borehole							
(GWL @ 0.76m - June 10, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

1500

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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REMARKS

HOLE NO. BH 2

BORINGS BY Track-Mount Power Auger **DATE** June 2, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	76.94
TOPSOIL	0.15							
FILL: Brown silty sand with crushed stone	0.76		AU		1			
FILL: Crushed stone	1.30		SS	2	8	25	1	75.94
FILL: Brown silty clay, some sand, trace gravel	1.52		SS	3	50	25	2	74.94
FILL: Brown silty sand, some clay			SS	4	67	7	3	73.94
FILL: Brown silty clay, trace sand and gravel	3.15		SS	5	75	4		
	3.66		SS	6		P	4	72.94
Firm, grey **SILTY CLAY**			SS	7		P	5	71.94
			SS	8		P		
	6.10						6	70.94

Dynamic Cone Penetration Test commenced at 6.10m depth. Cone pushed to 16.0m depth.

Practical DCTP refusal at 25.90m depth.

(GWL @ 0.34m - June 10, 2020)

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. BH 3

BORINGS BY Track-Mount Power Auger **DATE** June 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	75.83
TOPSOIL 0.10		AU	1				
FILL: Brown silty clay with crushed stone and shale fragments		SS	2	38	8	1	74.83
1.52		SS	3	42	9	2	73.83
Very stiff to stiff, brown **SILTY CLAY**		SS	4		P	3	72.83
- firm to stiff and grey by 3.0m depth						4	71.83
						5	70.83
5.94							
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

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REMARKS

HOLE NO. BH 4

BORINGS BY Track-Mount Power Auger **DATE** June 1, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	77.68
TOPSOIL 0.10		AU	1				
FILL: Brown silty sand with crushed stone and shale fragments		SS	2	67	13	1	76.68
		SS	3	4	64	2	75.68
2.29							
FILL: Grey-brown silty clay with sand, trace gravel		SS	4	62	5	3	74.68
3.05		SS	5		P		
Very stiff to stiff, brown **SILTY CLAY**		SS	6	0	P	4	73.68
- firm to stiff and grey by 3.8m depth		SS	7	96	P	5	72.68
		SS	8		P		
6.10						6	71.68
End of Borehole							
(GWL @ 0.77m - June 10, 2020)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**
20 40 60 80

Monitoring Well Construction

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

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REMARKS

HOLE NO. BH 5

BORINGS BY Track-Mount Power Auger **DATE** June 1, 2020

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
TOPSOIL	0.18						0	77.89
FILL: Brown silty sand with crushed stone	0.60		AU	1				
			SS	2	46	20	1	76.89
FILL: Brown silty sand, some clay and gravel			SS	3	71	20	2	75.89
			SS	4	83	2	3	74.89
			SS	5	67	4		
	3.81						4	73.89
			SS	6	92	P		
Stiff to firm, grey **SILTY CLAY**							5	72.89
	5.94							
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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REMARKS

HOLE NO. BH 6

BORINGS BY Track-Mount Power Auger **DATE** June 1, 2020

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									
TOPSOIL						0	79.54		
0.28		AU	1						
		SS	2	83	9	1	78.54		
Hard to very stiff, brown **SILTY CLAY**						2	77.54		
- stiff to firm and grey by 3.0m depth						3	76.54		
						4	75.54		
		SS	3	100	P	5	74.54		
5.94									
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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REMARKS

HOLE NO. BH 7

BORINGS BY Track-Mount Power Auger **DATE** June 2, 2020

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	80.29
TOPSOIL 0.15							
FILL: Brown silty sand, some crushed stone 0.60		AU	1				
Compact, brown **SILTY SAND** 1.37		SS	2	67	10	1	79.29
		SS	3	88	5	2	78.29
Very stiff to stiff, brown **SILTY CLAY**		SS	4		P		
- firm and grey by 2.3m depth		SS	5		P	3	77.29
		SS	6		P	4	76.29
		SS	7		P	5	75.29
		SS	8		P		
6.10						6	74.29
Dynamic Cone Penetration Test commenced at 27.13m depth. Cone pushed to 21.3m depth.							
Practical DCPT refusal at 27.13m depth							
(GWL @ 1.08m - June 10, 2020)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** May 28, 2020

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	80.15		
FILL: Brown silty sand with crushed stone and organics		G	1						
0.30									
		G	2						
FILL: Brown silty sand, some gravel		G	3						
						1	79.15		
1.20									
End of Test Pit									
TP terminated in fill at 1.20m 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.

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FILE NO. PE4937

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** May 28, 2020

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	80.23		
FILL: Brown silty sand with crushed stone		G	1						
0.30									
Asphaltic concrete 0.37									
FILL: Brown silty sand, trace clay and gravel		G	2						
		G	3			1	79.23		
1.20									
Compact, brown **SILTY SAND to SANDY SILT**		G	4						
1.60									
End of Test Pit									
TP terminated in sandy silt aty 1.60m 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.

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REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** May 28, 2020

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	79.62		
FILL: Gravel with sand		G	1						
0.40									
FILL: Brown silty sand, some shale fragments		G	2						
1.00						1	78.62		
Brown **SILTY SAND to SANDY SILT**		G	3						
2.00						2	77.62		
End of Test Pit									
TP terminated in sandy silt at 2.00m depth									

Lower Explosive Limit % scale: 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** May 28, 2020

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	78.32		
FILL: Gravel, trace crushed stone and sand		G	1						
0.30									
FILL: Brown silty sand with crushed stone and shale fragments		G	2						
1.00						1	77.32		
Hard to very stiff, reddish brown **SILTY CLAY**		G	3						
1.60									
End of Test Pit									
TP terminated in silty clay at 1.60m 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.

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SOIL PROFILE AND TEST DATA

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FILE NO. PE4937

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** May 28, 2020

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									
TOPSOIL 0.10		G	1			0	78.90		
FILL: Brown silty sand, trace clay, gravel and topsoil 0.50		G	2						
FILL: Grey-brown silty clay, trace sand and organics		G	3			1	77.90		
1.10 End of Test Pit									
TP terminated in fill at 1.10m 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.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** May 28, 2020

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	78.50		
FILL: Reddish brown to brown silty sand with topsoil, crushed stone and gravel		G	1						
		G	2			1	77.50		
1.30									
FILL: Brown to grey silty clay with sand, gravel, trace topsoil		G	3						
2.00						2	76.50		
End of Test Pit									
TP terminated in fill at 2.00m 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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** May 28, 2020

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	77.64		
FILL: Brown silty clay with sand, topsoil, crushed stone, shale fragments		G	1						
0.30									
FILL: Brown silty sand with gravel, some clay		G	2						
		G	3						
1.10						1	76.64		
End of Test Pit									
TP terminated in fill at 1.10m 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.

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** May 28, 2020

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									
FILL: Brown silty sand with organics and crushed stone		G	1			0	77.46		
0.15									
FILL: Grey-brown to dark grey silty sand with gravel, some crushed stone, blast rock, trace clay		G	2			1	76.46		
		G	3						
1.50									
End of Test Pit									
TP terminated in fill at 1.50m depth									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** May 28, 2020

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	77.35		
FILL: Dark brown silty sand with topsoil, gravel and shale fragments		G	1						
0.40									
FILL: Brown silty sand with crsuhed stone and shale fragments		G	2						
0.70									
Hard to very stiff, brown **SILTY CLAY**		G	3			1	76.35		
1.10									
End of Test Pit									
TP terminated in silty clay at 1.10m depth									

Photo Ionization Detector: ○ Lower Explosive Limit % — 20 40 60 80

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

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP10

BORINGS BY Backhoe **DATE** May 28, 2020

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	76.05		
TOPSOIL 0.10									
FILL: Brown silty sand with crushed stone and gravel 0.90		G	1						
FILL: Brown silty clay, some sand, trace topsoil 1.20		G	2			1	75.05		
FILL: Grey-brown silty clay, trace gravel 1.60		G	3						
End of Test Pit									
TP terminated in fill at 1.60m 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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP11

BORINGS BY Backhoe **DATE** May 28, 2020

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	76.75		
FILL: Brown silty sand, some gravel, trace topsoil and clay		G	1						
		G	2						
1.00						1	75.75		
FILL: Brown to grey silty clay, trace gravel		G	3						
1.50									
End of Test Pit									
TP terminated in fill at 1.50m 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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4937

REMARKS

HOLE NO. TP12

BORINGS BY Backhoe **DATE** May 28, 2020

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	76.69		
TOPSOIL 0.20		G	1						
FILL: Brown silty clay, some sand and organics, occasional cobbles		G	2			1	75.69		
1.50		G	3						
End of Test Pit Practical refusal to excavation at 1.50m 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.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
6101 Renaud Road
Ottawa, Ontario

DATUM Geodetic

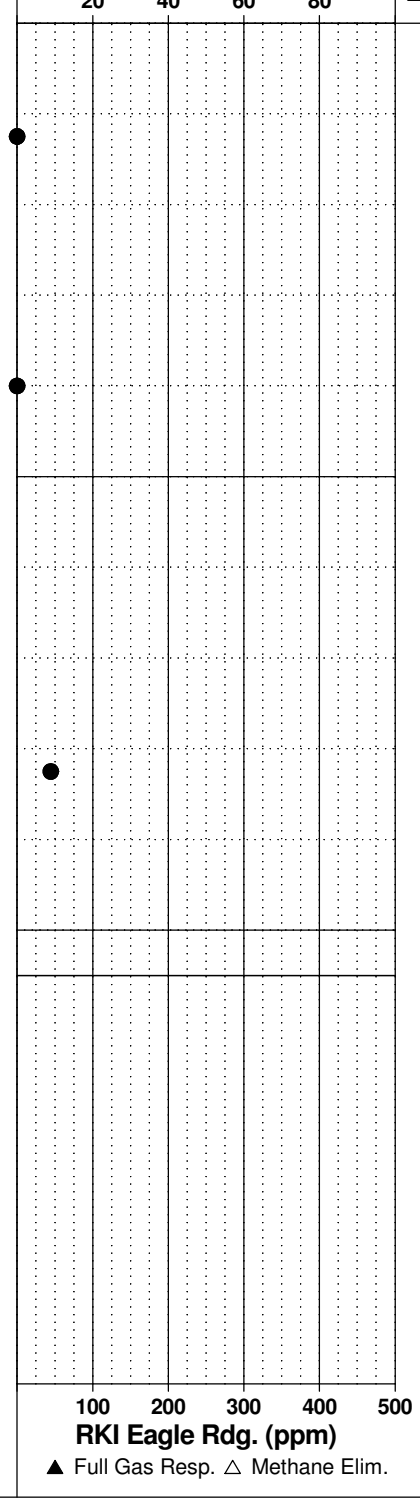
FILE NO. PE4937

REMARKS

HOLE NO. TP13

BORINGS BY Backhoe **DATE** May 28, 2020

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	83.83		
FILL: Brown silty sand with organics		G	1						
0.40									
FILL: Brown silty clay with sand, some gravel		G	2			1	82.83		
1.10									
FILL: Dark brown silty sand, some clay		G	3			2	81.83		
2.10									
End of Test Pit									
Practical refusal to excavation at 2.10m depth.									



SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
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 at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = D60 / D10

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

CONSOLIDATION TEST

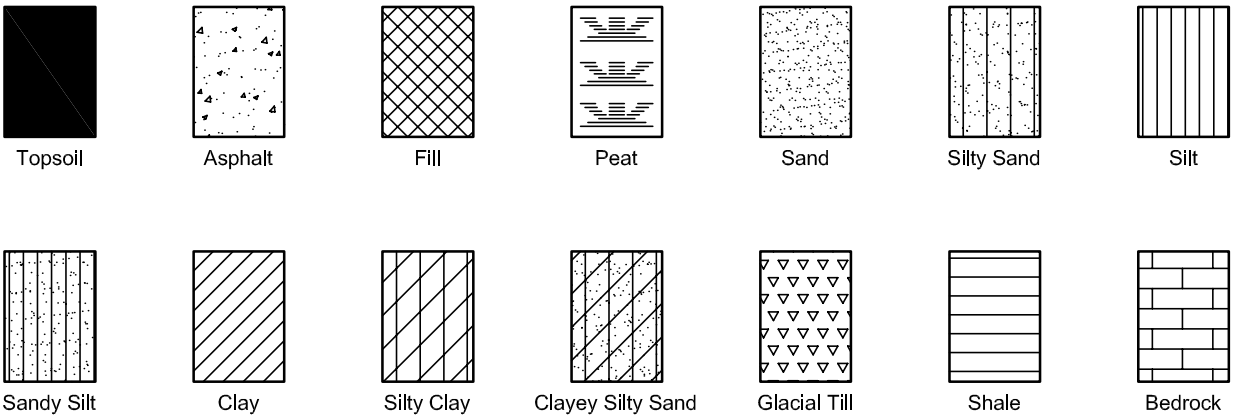
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

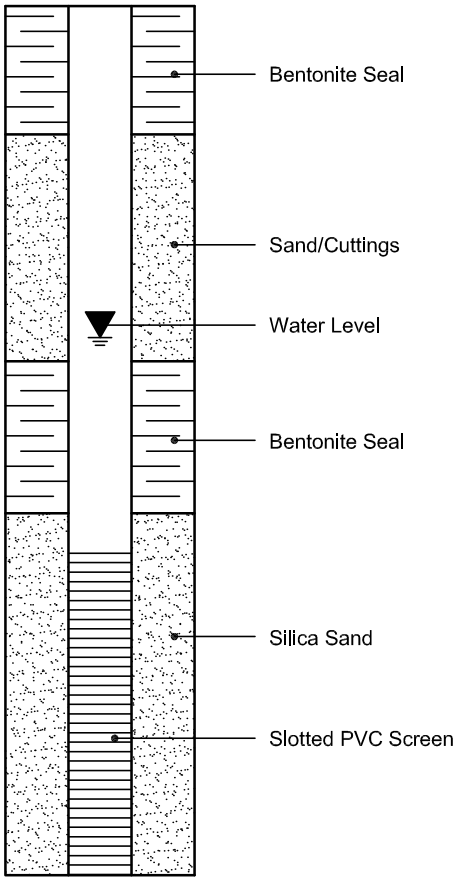
SYMBOLS AND TERMS (continued)

STRATA PLOT

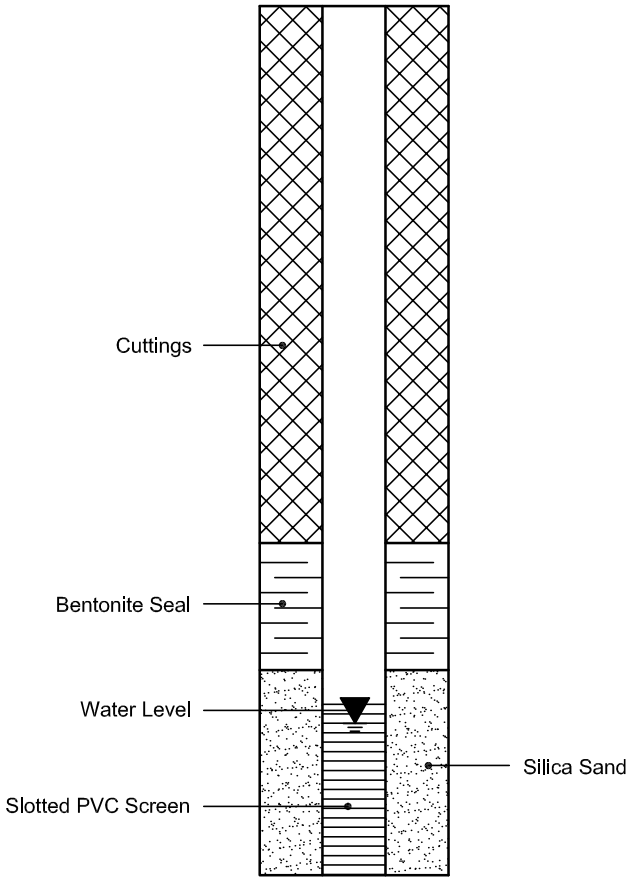


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 29964
Project: PE4937
Custody: 125724

Report Date: 10-Jun-2020
Order Date: 3-Jun-2020

Order #: 2023300

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

Paracel ID	Client ID
2023300-01	BH1-SS3
2023300-02	BH2-SS3
2023300-03	BH4-SS2
2023300-04	BH7-SS2B

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 10-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2020

Client PO: 29964

Project Description: PE4937

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	5-Jun-20	6-Jun-20
PHC F1	CWS Tier 1 - P&T GC-FID	5-Jun-20	6-Jun-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Jun-20	8-Jun-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	5-Jun-20	9-Jun-20
Solids, %	Gravimetric, calculation	9-Jun-20	6-Jun-20

Certificate of Analysis

Report Date: 10-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2020

Client PO: 29964

Project Description: PE4937

	Client ID:	BH1-SS3	BH2-SS3	BH4-SS2	BH7-SS2B
	Sample Date:	02-Jun-20 09:00	01-Jun-20 09:00	01-Jun-20 09:00	02-Jun-20 09:00
	Sample ID:	2023300-01	2023300-02	2023300-03	2023300-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	79.4	84.9	84.1	82.0
Volatiles					
Benzene	0.02 ug/g dry	0.06	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	0.71	-	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	2.82	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	2.82	-	<0.05	<0.05
Toluene-d8	Surrogate	107%	-	104%	116%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	30	-	12	<7
F2 PHCs (C10-C16)	4 ug/g dry	82	-	27	<4
F3 PHCs (C16-C34)	8 ug/g dry	36	-	44	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	15	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	0.53	-	-
Acenaphthylene	0.02 ug/g dry	-	0.04	-	-
Anthracene	0.02 ug/g dry	-	0.77	-	-
Benzo [a] anthracene	0.02 ug/g dry	-	2.35	-	-
Benzo [a] pyrene	0.02 ug/g dry	-	2.36	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	2.06	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	1.18	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	1.14	-	-
Chrysene	0.02 ug/g dry	-	2.50	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	0.34	-	-
Fluoranthene	0.02 ug/g dry	-	5.97	-	-
Fluorene	0.02 ug/g dry	-	0.58	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	1.26	-	-
1-Methylnaphthalene	0.02 ug/g dry	-	0.11	-	-
2-Methylnaphthalene	0.02 ug/g dry	-	0.14	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	0.25	-	-
Naphthalene	0.01 ug/g dry	-	0.17	-	-
Phenanthrene	0.02 ug/g dry	-	3.64	-	-
Pyrene	0.02 ug/g dry	-	4.45	-	-
2-Fluorobiphenyl	Surrogate	-	92.7%	-	-
Terphenyl-d14	Surrogate	-	57.4%	-	-

Certificate of Analysis

Report Date: 10-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 3-Jun-2020

Client PO: 29964

Project Description: PE4937

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						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.18*		*ug/g*		*88.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.31*		*ug/g*		*97.9*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.61*		*ug/g*		*113*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	40	ug/g dry	ND			NC	30	GEN07
F3 PHCs (C16-C34)	8160	80	ug/g dry	8340			2.2	30	
F4 PHCs (C34-C50)	3350	60	ug/g dry	3330			0.5	30	ORG01
Physical Characteristics									
% Solids	80.1	0.1	% by Wt.	79.4			0.9	25	
Semi-Volatiles									
Acenaphthene	1.70	0.02	ug/g dry	0.534			105.0	40	QR-04
Acenaphthylene	0.030	0.02	ug/g dry	0.044			37.0	40	
Anthracene	2.25	0.02	ug/g dry	0.767			98.3	40	QR-04
Benzo [a] anthracene	5.34	0.02	ug/g dry	2.35			77.7	40	QR-04
Benzo [a] pyrene	5.19	0.02	ug/g dry	2.36			75.0	40	QR-04
Benzo [b] fluoranthene	6.66	0.02	ug/g dry	2.06			106.0	40	QR-04
Benzo [g,h,i] perylene	2.68	0.02	ug/g dry	1.18			77.6	40	QR-04
Benzo [k] fluoranthene	4.31	0.02	ug/g dry	1.14			117.0	40	QR-04
Chrysene	5.77	0.02	ug/g dry	2.50			79.2	40	QR-04
Dibenzo [a,h] anthracene	0.405	0.02	ug/g dry	0.343			16.5	40	
Fluoranthene	15.4	0.02	ug/g dry	5.97			88.2	40	QR-04
Fluorene	1.76	0.02	ug/g dry	0.582			100.0	40	QR-04
Indeno [1,2,3-cd] pyrene	2.75	0.02	ug/g dry	1.26			74.1	40	QR-04
1-Methylnaphthalene	0.250	0.02	ug/g dry	0.108			78.9	40	QR-04
2-Methylnaphthalene	0.357	0.02	ug/g dry	0.141			86.9	40	QR-04
Naphthalene	0.605	0.01	ug/g dry	0.173			111.0	40	QR-04
Phenanthrene	10.6	0.02	ug/g dry	3.64			97.6	40	QR-04
Pyrene	10.9	0.02	ug/g dry	4.45			83.9	40	QR-04
Surrogate: 2-Fluorobiphenyl	*1.57*		*ug/g dry*		*100*	*50-140*			
Surrogate: Terphenyl-d14	*1.34*		*ug/g dry*		*85.5*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g dry	ND			NC	50	
Toluene	ND	0.05	ug/g dry	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g dry	ND			NC	50	
o-Xylene	ND	0.05	ug/g dry	ND			NC	50	
Surrogate: Toluene-d8	*4.44*		*ug/g dry*		*109*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	184	7	ug/g	ND	91.9	80-120			
F2 PHCs (C10-C16)	136	4	ug/g	27	115	60-140			
F3 PHCs (C16-C34)	303	8	ug/g	44	111	60-140			
F4 PHCs (C34-C50)	152	6	ug/g	15	93.0	60-140			
Semi-Volatiles									
Acenaphthene	0.194	0.02	ug/g	ND	116	50-140			
Acenaphthylene	0.164	0.02	ug/g	ND	98.6	50-140			
Anthracene	0.174	0.02	ug/g	ND	105	50-140			
Benzo [a] anthracene	0.156	0.02	ug/g	ND	93.4	50-140			
Benzo [a] pyrene	0.147	0.02	ug/g	ND	88.4	50-140			
Benzo [b] fluoranthene	0.195	0.02	ug/g	ND	117	50-140			
Benzo [g,h,i] perylene	0.182	0.02	ug/g	ND	109	50-140			
Benzo [k] fluoranthene	0.191	0.02	ug/g	ND	114	50-140			
Chrysene	0.183	0.02	ug/g	ND	110	50-140			
Dibenzo [a,h] anthracene	0.169	0.02	ug/g	ND	102	50-140			
Fluoranthene	0.174	0.02	ug/g	ND	104	50-140			
Fluorene	0.188	0.02	ug/g	ND	113	50-140			
Indeno [1,2,3-cd] pyrene	0.179	0.02	ug/g	ND	107	50-140			
1-Methylnaphthalene	0.196	0.02	ug/g	ND	118	50-140			
2-Methylnaphthalene	0.199	0.02	ug/g	ND	120	50-140			
Naphthalene	0.185	0.01	ug/g	ND	111	50-140			
Phenanthrene	0.182	0.02	ug/g	ND	109	50-140			
Pyrene	0.174	0.02	ug/g	ND	104	50-140			
Surrogate: 2-Fluorobiphenyl	*1.24*		*ug/g*		*93.0*	*50-140*			
Surrogate: Terphenyl-d14	*1.28*		*ug/g*		*95.9*	*50-140*			
Volatiles									
Benzene	2.54	0.02	ug/g	ND	63.5	60-130			
Ethylbenzene	2.89	0.05	ug/g	ND	72.4	60-130			
Toluene	4.66	0.05	ug/g	ND	117	60-130			
m,p-Xylenes	6.42	0.05	ug/g	ND	80.3	60-130			
o-Xylene	3.13	0.05	ug/g	ND	78.4	60-130			
Surrogate: Toluene-d8	*3.93*		*ug/g*		*123*	*50-140*			

Qualifier Notes:

QC Qualifiers :

GEN07 : Elevated detection limit due to dilution required because of high target analyte concentration.

ORG01 : GC-FID signal did not return to baseline by C50

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.
NC: Not Calculated

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

CCME PHC additional information:

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

PARACE LABORATORIES LT

Paracel ID: 2023300

vd. 18 com

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2023306	Nº 125724

Client Name: Paterson	Project Ref: PE 4937	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	Turnaround Time: ☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Address: 154 Colonnade Road South	PO #: 4 29964	
Telephone: 226-7381	E-mail: mdarcy@patersongroup.ca	Date Required:

Regulation 153/04	Other Regulation
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA
☒ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm
☐ Table ___	Mun:
For RSC: ☐ Yes ☒ No	☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	Required Analysis
1	BH2-SS3	S		1	June 1/20				✓					
2	BH4-SS2	S		2	"		✓							
3	BH7-SS2B	S		2	June 2/20		✓							
4	BH8-SS2	S		2	"		—	—	—	—	—	—	ON HOLD	
5	BH8-SS3	S		2	"		✓							
6														
7														
8														
9														
10														

Comments: *Please report these in numerical order.

Method of Delivery: Paracel

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Sneepam Dahiwal	Verified By:
Relinquished By (Print): Mark D'Arcy	Date/Time:	Date/Time: June 03, 2020 05:1	Date/Time: 06-03-2, 17:13
Date/Time: June 3/2020	Temperature: °C	Temperature: 10.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 30213
Project: PE4937
Custody: 125717,716

Report Date: 8-Jun-2020
Order Date: 2-Jun-2020

Order #: 2023210

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

Paracel ID	Client ID
2023210-01	TP1-G3
2023210-02	TP2-G1
2023210-03	TP4-G2
2023210-04	TP6-G3
2023210-05	TP7-G2
2023210-06	TP8-G1
2023210-07	TP8-G2
2023210-08	TP9-G5
2023210-09	TP11-G1
2023210-10	TP12-G2
2023210-11	TP13-G2
2023210-12	SPG-G2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 08-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 2-Jun-2020

Client PO: 30213

Project Description: PE4937

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	4-Jun-20	5-Jun-20
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	4-Jun-20	6-Jun-20
Mercury by CVAA	EPA 7471B - CVAA, digestion	8-Jun-20	8-Jun-20
PHC F1	CWS Tier 1 - P&T GC-FID	4-Jun-20	5-Jun-20
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	8-Jun-20	8-Jun-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Jun-20	8-Jun-20
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	8-Jun-20	8-Jun-20
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	4-Jun-20	7-Jun-20
Solids, %	Gravimetric, calculation	5-Jun-20	6-Jun-20

Certificate of Analysis

Report Date: 08-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 2-Jun-2020

Client PO: 30213

Project Description: PE4937

	Client ID:	TP1-G3	TP2-G1	TP4-G2	TP6-G3
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-01	2023210-02	2023210-03	2023210-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.3	93.5	88.3	89.8
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	<1.0
Arsenic	1.0 ug/g dry	1.6	-	-	2.5
Barium	1.0 ug/g dry	24.7	-	-	104
Beryllium	0.5 ug/g dry	<0.5	-	-	<0.5
Boron	5.0 ug/g dry	<5.0	-	-	<5.0
Cadmium	0.5 ug/g dry	<0.5	-	-	<0.5
Chromium	5.0 ug/g dry	9.2	-	-	42.0
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	2.8	-	-	8.8
Copper	5.0 ug/g dry	6.0	-	-	20.8
Lead	1.0 ug/g dry	2.0	-	-	17.0
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	<1.0
Nickel	5.0 ug/g dry	5.6	-	-	24.0
Selenium	1.0 ug/g dry	<1.0	-	-	<1.0
Silver	0.3 ug/g dry	<0.3	-	-	<0.3
Thallium	1.0 ug/g dry	<1.0	-	-	<1.0
Uranium	1.0 ug/g dry	<1.0	-	-	<1.0
Vanadium	10.0 ug/g dry	17.8	-	-	39.0
Zinc	20.0 ug/g dry	<20.0	-	-	51.3
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	116%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	48	12	-
F3 PHCs (C16-C34)	8 ug/g dry	-	189	26	-
F4 PHCs (C34-C50)	6 ug/g dry	-	78	9	-

Certificate of Analysis

Report Date: 08-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Jun-2020

Client PO: **30213**

Project Description: PE4937

	Client ID:	TP1-G3	TP2-G1	TP4-G2	TP6-G3
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-01	2023210-02	2023210-03	2023210-04
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	-	0.02	-
Acenaphthylene	0.02 ug/g dry	-	-	<0.02	-
Anthracene	0.02 ug/g dry	-	-	0.04	-
Benzo [a] anthracene	0.02 ug/g dry	-	-	0.07	-
Benzo [a] pyrene	0.02 ug/g dry	-	-	0.06	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	0.07	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	0.04	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	0.03	-
Chrysene	0.02 ug/g dry	-	-	0.08	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	<0.02	-
Fluoranthene	0.02 ug/g dry	-	-	0.17	-
Fluorene	0.02 ug/g dry	-	-	0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	0.04	-
1-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	<0.04	-
Naphthalene	0.01 ug/g dry	-	-	<0.01	-
Phenanthrene	0.02 ug/g dry	-	-	0.14	-
Pyrene	0.02 ug/g dry	-	-	0.12	-
2-Fluorobiphenyl	Surrogate	-	-	79.6%	-
Terphenyl-d14	Surrogate	-	-	91.1%	-

Certificate of Analysis

Report Date: 08-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Jun-2020

Client PO: **30213**

Project Description: PE4937

	Client ID:	TP7-G2	TP8-G1	TP8-G2	TP9-G5
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-05	2023210-06	2023210-07	2023210-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	91.4	95.6	84.3	71.9
Metals					
Antimony	1.0 ug/g dry	-	-	-	<1.0
Arsenic	1.0 ug/g dry	-	-	-	4.0
Barium	1.0 ug/g dry	-	-	-	390
Beryllium	0.5 ug/g dry	-	-	-	0.9
Boron	5.0 ug/g dry	-	-	-	6.2
Cadmium	0.5 ug/g dry	-	-	-	<0.5
Chromium	5.0 ug/g dry	-	-	-	146
Cobalt	1.0 ug/g dry	-	-	-	27.9
Copper	5.0 ug/g dry	-	-	-	64.7
Lead	1.0 ug/g dry	-	-	-	7.2
Molybdenum	1.0 ug/g dry	-	-	-	<1.0
Nickel	5.0 ug/g dry	-	-	-	80.7
Selenium	1.0 ug/g dry	-	-	-	<1.0
Silver	0.3 ug/g dry	-	-	-	<0.3
Thallium	1.0 ug/g dry	-	-	-	<1.0
Uranium	1.0 ug/g dry	-	-	-	<1.0
Vanadium	10.0 ug/g dry	-	-	-	125
Zinc	20.0 ug/g dry	-	-	-	140
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	122%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	23	8	-	-
F3 PHCs (C16-C34)	8 ug/g dry	27	205	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	225 [2]	-	-
F4G PHCs (gravimetric)	50 ug/g dry	-	868	-	-
Semi-Volatiles					

Certificate of Analysis

Report Date: 08-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Jun-2020

Client PO: **30213**

Project Description: PE4937

	Client ID:	TP7-G2	TP8-G1	TP8-G2	TP9-G5
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-05	2023210-06	2023210-07	2023210-08
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthene	0.02 ug/g dry	-	-	<0.02	-
Acenaphthylene	0.02 ug/g dry	-	-	<0.02	-
Anthracene	0.02 ug/g dry	-	-	0.02	-
Benzo [a] anthracene	0.02 ug/g dry	-	-	0.04	-
Benzo [a] pyrene	0.02 ug/g dry	-	-	0.04	-
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	0.05	-
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	0.03	-
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	0.02	-
Chrysene	0.02 ug/g dry	-	-	0.05	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	<0.02	-
Fluoranthene	0.02 ug/g dry	-	-	0.09	-
Fluorene	0.02 ug/g dry	-	-	0.02	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	0.02	-
1-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
2-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	-
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	<0.04	-
Naphthalene	0.01 ug/g dry	-	-	0.01	-
Phenanthrene	0.02 ug/g dry	-	-	0.07	-
Pyrene	0.02 ug/g dry	-	-	0.07	-
2-Fluorobiphenyl	Surrogate	-	-	86.5%	-
Terphenyl-d14	Surrogate	-	-	88.8%	-

Certificate of Analysis

Report Date: 08-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Jun-2020

Client PO: **30213**

Project Description: PE4937

	Client ID:	TP11-G1	TP12-G2	TP13-G2	SPG-G2
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-09	2023210-10	2023210-11	2023210-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	86.5	78.5	86.5	78.1
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	2.8	3.6	3.2	3.8
Barium	1.0 ug/g dry	117	273	169	298
Beryllium	0.5 ug/g dry	<0.5	0.7	<0.5	0.7
Boron	5.0 ug/g dry	<5.0	6.3	<5.0	5.6
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	48.6	104	47.5	50.8
Chromium (VI)	0.2 ug/g dry	<1.0 [1]	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	6.9	20.7	11.0	12.9
Copper	5.0 ug/g dry	19.3	47.1	28.0	25.3
Lead	1.0 ug/g dry	8.3	10.5	40.9	11.8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	22.5	57.6	28.8	31.1
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	2.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	37.7	89.7	48.2	55.1
Zinc	20.0 ug/g dry	62.6	106	79.6	88.1
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	-	<0.05	-	-
o-Xylene	0.05 ug/g dry	-	<0.05	-	-
Xylenes, total	0.05 ug/g dry	-	<0.05	-	-
Toluene-d8	Surrogate	-	121%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	105	-
F3 PHCs (C16-C34)	8 ug/g dry	-	61	169	-
F4 PHCs (C34-C50)	6 ug/g dry	-	25	94	-

Certificate of Analysis

Report Date: 08-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 2-Jun-2020

Client PO: **30213**

Project Description: PE4937

	Client ID:	TP11-G1	TP12-G2	TP13-G2	SPG-G2
	Sample Date:	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00	28-May-20 09:00
	Sample ID:	2023210-09	2023210-10	2023210-11	2023210-12
	MDL/Units	Soil	Soil	Soil	Soil
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	<0.02	0.10	<0.02
Acenaphthylene	0.02 ug/g dry	-	<0.02	0.07	<0.02
Anthracene	0.02 ug/g dry	-	<0.02	0.38	<0.02
Benzo [a] anthracene	0.02 ug/g dry	-	<0.02	0.54	<0.02
Benzo [a] pyrene	0.02 ug/g dry	-	<0.02	0.47	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	-	<0.02	0.56	0.03
Benzo [g,h,i] perylene	0.02 ug/g dry	-	<0.02	0.26	0.02
Benzo [k] fluoranthene	0.02 ug/g dry	-	<0.02	0.29	<0.02
Chrysene	0.02 ug/g dry	-	<0.02	0.58	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	<0.02	0.07	<0.02
Fluoranthene	0.02 ug/g dry	-	<0.02	1.19	0.03
Fluorene	0.02 ug/g dry	-	<0.02	0.14	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	<0.02	0.25	<0.02
1-Methylnaphthalene	0.02 ug/g dry	-	<0.02	0.04	<0.02
2-Methylnaphthalene	0.02 ug/g dry	-	<0.02	0.06	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	-	<0.04	0.10	<0.04
Naphthalene	0.01 ug/g dry	-	<0.01	0.12	<0.01
Phenanthrene	0.02 ug/g dry	-	<0.02	0.91	<0.02
Pyrene	0.02 ug/g dry	-	<0.02	0.97	0.03
2-Fluorobiphenyl	Surrogate	-	72.9%	79.1%	75.6%
Terphenyl-d14	Surrogate	-	84.1%	94.1%	89.3%

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						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.876*		*ug/g*		*65.7*	*50-140*			
Surrogate: Terphenyl-d14	*0.884*		*ug/g*		*66.3*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*3.59*		*ug/g*		*112*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			NC	30	
F4G PHCs (gravimetric)	7600	50	ug/g dry	6110			21.8	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	2.6	1.0	ug/g dry	2.7			3.6	30	
Barium	108	1.0	ug/g dry	130			18.6	30	
Beryllium	ND	0.5	ug/g dry	ND			NC	30	
Boron	5.9	5.0	ug/g dry	454			NC	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g dry	ND			NC	35	
Chromium	23.5	5.0	ug/g dry	ND			NC	30	
Cobalt	6.0	1.0	ug/g dry	ND			NC	30	
Copper	13.9	5.0	ug/g dry	ND			NC	30	
Lead	15.8	1.0	ug/g dry	ND			NC	30	
Mercury	ND	0.1	ug/g dry	ND			NC	30	
Molybdenum	ND	1.0	ug/g dry	3.5			NC	30	
Nickel	15.0	5.0	ug/g dry	ND			NC	30	
Selenium	ND	1.0	ug/g dry	1.2			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	1.8			NC	30	
Vanadium	29.6	10.0	ug/g dry	ND			NC	30	
Zinc	80.4	20.0	ug/g dry	ND			NC	30	
Physical Characteristics									
% Solids	75.1	0.1	% by Wt.	75.9			1.0	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	0.021			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	0.039			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	0.067			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	0.064			NC	40	
Benzo [b] fluoranthene	0.022	0.02	ug/g dry	0.074			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	0.040			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	0.032			NC	40	
Chrysene	ND	0.02	ug/g dry	0.082			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	0.034	0.02	ug/g dry	0.174			NC	40	
Fluorene	ND	0.02	ug/g dry	0.022			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	0.037			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	ND	0.01	ug/g dry	ND			NC	40	
Phenanthrene	0.021	0.02	ug/g dry	0.144			NC	40	
Pyrene	0.029	0.02	ug/g dry	0.116			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.40*		*ug/g dry*		*92.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.53*		*ug/g dry*		*101*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry				NC	50	
Ethylbenzene	ND	0.05	ug/g dry				NC	50	
Toluene	ND	0.05	ug/g dry				NC	50	
m,p-Xylenes	ND	0.05	ug/g dry				NC	50	
o-Xylene	ND	0.05	ug/g dry				NC	50	
Surrogate: Toluene-d8	*4.16*		*ug/g dry*		*117*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	176	7	ug/g	ND	88.1	80-120			
F2 PHCs (C10-C16)	126	4	ug/g	ND	135	60-140			
F3 PHCs (C16-C34)	327	8	ug/g	ND	143	60-140			
F4 PHCs (C34-C50)	165	6	ug/g	ND	114	60-140			
F4G PHCs (gravimetric)	830	50	ug/g	ND	83.0	80-120			
Metals									
Antimony	45.9	1.0	ug/g	ND	91.7	70-130			
Arsenic	53.0	1.0	ug/g	1.1	104	70-130			
Barium	91.0	1.0	ug/g	51.9	78.1	70-130			QM-07
Beryllium	49.8	0.5	ug/g	ND	99.7	70-130			
Boron	45.7	5.0	ug/g	182	-272	70-130			
Cadmium	49.0	0.5	ug/g	ND	97.9	70-130			
Chromium (VI)	4.7	0.2	ug/g	ND	80.0	70-130			
Chromium	61.0	5.0	ug/g	ND	121	70-130			
Cobalt	53.5	1.0	ug/g	ND	107	70-130			
Copper	55.3	5.0	ug/g	ND	107	70-130			
Lead	54.9	1.0	ug/g	ND	110	70-130			
Mercury	1.47	0.1	ug/g	ND	98.3	70-130			
Molybdenum	50.8	1.0	ug/g	1.4	98.8	70-130			
Nickel	56.3	5.0	ug/g	ND	109	70-130			
Selenium	51.1	1.0	ug/g	ND	101	70-130			
Silver	48.0	0.3	ug/g	ND	96.1	70-130			
Thallium	47.7	1.0	ug/g	ND	95.3	70-130			
Uranium	51.5	1.0	ug/g	ND	102	70-130			
Vanadium	63.0	10.0	ug/g	ND	126	70-130			
Zinc	79.2	20.0	ug/g	ND	154	70-130			QM-07
Semi-Volatiles									
Acenaphthene	0.233	0.02	ug/g	0.021	112	50-140			
Acenaphthylene	0.205	0.02	ug/g	ND	108	50-140			
Anthracene	0.251	0.02	ug/g	0.039	112	50-140			
Benzo [a] anthracene	0.226	0.02	ug/g	0.067	84.1	50-140			
Benzo [a] pyrene	0.211	0.02	ug/g	0.064	78.1	50-140			
Benzo [b] fluoranthene	0.281	0.02	ug/g	0.074	109	50-140			
Benzo [g,h,i] perylene	0.245	0.02	ug/g	0.040	109	50-140			
Benzo [k] fluoranthene	0.270	0.02	ug/g	0.032	126	50-140			
Chrysene	0.255	0.02	ug/g	0.082	91.8	50-140			
Dibenzo [a,h] anthracene	0.237	0.02	ug/g	ND	125	50-140			
Fluoranthene	0.244	0.02	ug/g	0.174	36.9	50-140			QM-06
Fluorene	0.250	0.02	ug/g	0.022	121	50-140			
Indeno [1,2,3-cd] pyrene	0.236	0.02	ug/g	0.037	106	50-140			
1-Methylnaphthalene	0.254	0.02	ug/g	ND	134	50-140			
2-Methylnaphthalene	0.255	0.02	ug/g	ND	135	50-140			
Naphthalene	0.217	0.01	ug/g	ND	115	50-140			
Phenanthrene	0.239	0.02	ug/g	0.144	50.7	50-140			
Pyrene	0.247	0.02	ug/g	0.116	69.3	50-140			
Surrogate: 2-Fluorobiphenyl	*1.44*		*ug/g*		*95.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.68*		*ug/g*		*112*	*50-140*			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	2.80	0.02	ug/g	ND	70.0	60-130			
Ethylbenzene	4.06	0.05	ug/g	ND	102	60-130			
Toluene	4.05	0.05	ug/g	ND	101	60-130			
m,p-Xylenes	8.24	0.05	ug/g	ND	103	60-130			
o-Xylene	4.26	0.05	ug/g	ND	106	60-130			
Surrogate: Toluene-d8	*2.92*		*ug/g*		*91.4*	*50-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Elevated detection limits due to the nature of the sample matrix.

2 : GC-FID signal did not return to baseline by C50

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.

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2023210	Nº 125717

Client Name: Paterson Group
Contact Name: Mark D'Arcy
Address: 154 Colonnade Rd. S.
Telephone: 613-226-7381

Project Ref: PE4937
Quote #:
PO #: 30213
E-mail: mdarcy@patersongroup.ca

Page 1 of 2

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

Regulation 153/04
☐ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☒ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun: _____
☐ Other:

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

Required Analysis

	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)	PHC F2-F4					
1	TP1-G3	S		1	May 28/20					X	X	X							
2	TP2-G1			2			X												
3	TP4-G2			1					X					X					
4	TP6-G3			1						X									
5	~~TP7~~ TP7-G2			1										X					
6	~~TP8~~ TP8-G1			2			X												
7	TP8-G2			1					X										
8	TP9-G5			1						X									
9	TP11-G1			1						X	X	X							
10	TP12-G2	↓		2	↓		X		X	X	X	X							

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot:	Received at Lab: Sneeppam Dhamaj	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: JUN 02, 2020 04:36	Date/Time: 06-02-20 17:39
Date/Time: June 2/2020	Temperature: °C	Temperature: 14.8 °C	pH Verified: ☐ By:

PARACEL LABORATORIES

Paracel ID: 2023210

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
202310	Nº 125716

Page 2 of 2

Client Name: Paterson Group
Contact Name: Mark D'Arcy
Address: 154 Colonnade Rd. S.
Telephone: 613-226-7381

Project #: PE4707
Quote #:
PO #: 30213
E-mail: mdarcy@patersongroup.ca

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

Regulation 153/04
☐ Table 1 ☒ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☒ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

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

Required Analysis

	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)	PHC F2-F4
1	TP13-G2	S		1	May 28/20				X	X	X	X		X
2	SPG-G2	↓		1	↓				X	X	X	X		
3														
4														
5														
6														
7														
8														
9														
10														

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot:	Received at Lab: Sneepam Rdm	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: June 02 2020 04:36	Date/Time: 06-02-20 17:09
Date/Time: June 2/2020	Temperature: °C	Temperature: 14.8°C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27417
Project: PE4937
Custody: 125792

Report Date: 17-Jun-2020
Order Date: 11-Jun-2020

Order #: 2024441

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

Paracel ID	Client ID
2024441-01	BH1-GW1
2024441-02	BH2-GW1
2024441-03	BH4-GW1
2024441-04	BH7-GW1
2024441-05	DUP1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 17-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Jun-2020

Client PO: 27417

Project Description: PE4937

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	12-Jun-20	12-Jun-20
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	16-Jun-20	16-Jun-20
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	16-Jun-20	17-Jun-20
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	12-Jun-20	12-Jun-20

Certificate of Analysis

Report Date: 17-Jun-2020

Client: **Paterson Group Consulting Engineers**

Order Date: 11-Jun-2020

Client PO: **27417**

Project Description: PE4937

	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	BH7-GW1
	Sample Date:	10-Jun-20 09:00	10-Jun-20 09:00	10-Jun-20 09:00	10-Jun-20 09:00
	Sample ID:	2024441-01	2024441-02	2024441-03	2024441-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
Volatiles					
Acetone	5.0 ug/L	<5.0	-	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	-	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	-	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	-	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	-	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	-	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	-	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	-	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	-	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	-	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5

Certificate of Analysis

Report Date: 17-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Jun-2020

Client PO: 27417

Project Description: PE4937

	Client ID:	BH1-GW1	BH2-GW1	BH4-GW1	BH7-GW1
	Sample Date:	10-Jun-20 09:00	10-Jun-20 09:00	10-Jun-20 09:00	10-Jun-20 09:00
	Sample ID:	2024441-01	2024441-02	2024441-03	2024441-04
	MDL/Units	Ground Water	Ground Water	Ground Water	Ground Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	-	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	-	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	-	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	-	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	-	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	123%	-	122%	120%
Dibromofluoromethane	Surrogate	91.6%	-	89.5%	88.4%
Toluene-d8	Surrogate	108%	-	99.8%	108%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	61	-	<25	100
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	<0.05	<0.05	<0.05
Acenaphthylene	0.05 ug/L	-	<0.05	<0.05	<0.05
Anthracene	0.01 ug/L	-	<0.01	<0.01	<0.01
Benzo [a] anthracene	0.01 ug/L	-	<0.01	<0.01	<0.01
Benzo [a] pyrene	0.01 ug/L	-	<0.01	<0.01	<0.01
Benzo [b] fluoranthene	0.05 ug/L	-	<0.05	<0.05	<0.05
Benzo [g,h,i] perylene	0.05 ug/L	-	<0.05	<0.05	<0.05
Benzo [k] fluoranthene	0.05 ug/L	-	<0.05	<0.05	<0.05
Chrysene	0.05 ug/L	-	<0.05	<0.05	<0.05
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	<0.05	<0.05
Fluoranthene	0.01 ug/L	-	<0.01	<0.01	<0.01
Fluorene	0.05 ug/L	-	<0.05	<0.05	<0.05
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	<0.05	<0.05	<0.05
1-Methylnaphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05
2-Methylnaphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	<0.10	<0.10
Naphthalene	0.05 ug/L	-	<0.05	<0.05	<0.05
Phenanthrene	0.05 ug/L	-	<0.05	<0.05	<0.05
Pyrene	0.01 ug/L	-	<0.01	<0.01	<0.01
2-Fluorobiphenyl	Surrogate	-	88.6%	98.7%	92.0%
Terphenyl-d14	Surrogate	-	101%	98.8%	105%

Certificate of Analysis

Report Date: 17-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Jun-2020

Client PO: 27417

Project Description: PE4937

	Client ID:	DUP1	-	-	-
	Sample Date:	10-Jun-20 09:00	-	-	-
	Sample ID:	2024441-05	-	-	-
	MDL/Units	Ground Water	-	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Ethylene dibromide (dibromoethane, 1	0.2 ug/L	<0.2	-	-	-
Hexane	1.0 ug/L	<1.0	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	-	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	-	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	-	-	-
Methylene Chloride	5.0 ug/L	<5.0	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Report Date: 17-Jun-2020

Client: Paterson Group Consulting Engineers

Order Date: 11-Jun-2020

Client PO: 27417

Project Description: PE4937

	Client ID:	DUP1	-	-	-
	Sample Date:	10-Jun-20 09:00	-	-	-
	Sample ID:	2024441-05	-	-	-
	MDL/Units	Ground Water	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
4-Bromofluorobenzene	Surrogate	121%	-	-	-
Dibromofluoromethane	Surrogate	90.0%	-	-	-
Toluene-d8	Surrogate	106%	-	-	-

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						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*20.3*		*ug/L*		*102*	*50-140*			
Surrogate: Terphenyl-d14	*22.4*		*ug/L*		*112*	*50-140*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*95.0*		*ug/L*		*119*	*50-140*			
Surrogate: Dibromofluoromethane	*69.1*		*ug/L*		*86.4*	*50-140*			
Surrogate: Toluene-d8	*89.6*		*ug/L*		*112*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	ND	0.5	ug/L	ND			NC	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2-	ND	0.2	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*88.0*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*73.7*		*ug/L*		*92.2*	*50-140*			
Surrogate: Toluene-d8	*83.5*		*ug/L*		*104*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2130	25	ug/L	ND	106	68-117			
F2 PHCs (C10-C16)	1460	100	ug/L	ND	91.2	60-140			
F3 PHCs (C16-C34)	4010	100	ug/L	ND	102	60-140			
F4 PHCs (C34-C50)	2640	100	ug/L	ND	106	60-140			
Semi-Volatiles									
Acenaphthene	3.93	0.05	ug/L	ND	78.6	50-140			
Acenaphthylene	3.19	0.05	ug/L	ND	63.8	50-140			
Anthracene	3.96	0.01	ug/L	ND	79.3	50-140			
Benzo [a] anthracene	3.84	0.01	ug/L	ND	76.8	50-140			
Benzo [a] pyrene	3.68	0.01	ug/L	ND	73.6	50-140			
Benzo [b] fluoranthene	4.78	0.05	ug/L	ND	95.5	50-140			
Benzo [g,h,i] perylene	4.07	0.05	ug/L	ND	81.4	50-140			
Benzo [k] fluoranthene	5.42	0.05	ug/L	ND	108	50-140			
Chrysene	4.14	0.05	ug/L	ND	82.8	50-140			
Dibenzo [a,h] anthracene	4.05	0.05	ug/L	ND	81.0	50-140			
Fluoranthene	3.75	0.01	ug/L	ND	75.1	50-140			
Fluorene	3.63	0.05	ug/L	ND	72.6	50-140			
Indeno [1,2,3-cd] pyrene	4.12	0.05	ug/L	ND	82.4	50-140			
1-Methylnaphthalene	4.28	0.05	ug/L	ND	85.6	50-140			
2-Methylnaphthalene	4.45	0.05	ug/L	ND	88.9	50-140			
Naphthalene	3.95	0.05	ug/L	ND	79.0	50-140			
Phenanthrene	3.47	0.05	ug/L	ND	69.5	50-140			
Pyrene	3.87	0.01	ug/L	ND	77.3	50-140			
Surrogate: 2-Fluorobiphenyl	*16.0*		*ug/L*		*79.8*	*50-140*			
Surrogate: Terphenyl-d14	*18.3*		*ug/L*		*91.3*	*50-140*			
Volatiles									
Acetone	65.6	5.0	ug/L	ND	65.6	50-140			
Benzene	32.1	0.5	ug/L	ND	80.3	60-130			
Bromodichloromethane	39.6	0.5	ug/L	ND	99.0	60-130			
Bromoform	47.5	0.5	ug/L	ND	119	60-130			
Bromomethane	47.8	0.5	ug/L	ND	120	50-140			
Carbon Tetrachloride	45.0	0.2	ug/L	ND	112	60-130			
Chlorobenzene	46.7	0.5	ug/L	ND	117	60-130			
Chloroform	42.3	0.5	ug/L	ND	106	60-130			
Dibromochloromethane	46.2	0.5	ug/L	ND	115	60-130			
Dichlorodifluoromethane	45.0	1.0	ug/L	ND	112	50-140			
1,2-Dichlorobenzene	46.9	0.5	ug/L	ND	117	60-130			
1,3-Dichlorobenzene	44.2	0.5	ug/L	ND	111	60-130			
1,4-Dichlorobenzene	43.5	0.5	ug/L	ND	109	60-130			
1,1-Dichloroethane	35.2	0.5	ug/L	ND	88.1	60-130			
1,2-Dichloroethane	49.0	0.5	ug/L	ND	122	60-130			
1,1-Dichloroethylene	39.2	0.5	ug/L	ND	98.1	60-130			
cis-1,2-Dichloroethylene	35.6	0.5	ug/L	ND	89.0	60-130			
trans-1,2-Dichloroethylene	38.0	0.5	ug/L	ND	95.1	60-130			
1,2-Dichloropropane	28.9	0.5	ug/L	ND	72.3	60-130			
cis-1,3-Dichloropropylene	31.0	0.5	ug/L	ND	77.4	60-130			
trans-1,3-Dichloropropylene	32.4	0.5	ug/L	ND	81.1	60-130			
Ethylbenzene	46.2	0.5	ug/L	ND	115	60-130			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27417

Report Date: 17-Jun-2020

Order Date: 11-Jun-2020

Project Description: PE4937

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylene dibromide (dibromoethane, 1,2-	49.6	0.2	ug/L	ND	124	60-130			
Hexane	36.5	1.0	ug/L	ND	91.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	62.1	5.0	ug/L	ND	62.1	50-140			
Methyl Isobutyl Ketone	60.9	5.0	ug/L	ND	60.9	50-140			
Methyl tert-butyl ether	93.2	2.0	ug/L	ND	93.2	50-140			
Methylene Chloride	34.0	5.0	ug/L	ND	85.0	60-130			
Styrene	46.0	0.5	ug/L	ND	115	60-130			
1,1,1,2-Tetrachloroethane	39.3	0.5	ug/L	ND	98.3	60-130			
1,1,2,2-Tetrachloroethane	38.1	0.5	ug/L	ND	95.3	60-130			
Tetrachloroethylene	46.0	0.5	ug/L	ND	115	60-130			
Toluene	44.9	0.5	ug/L	ND	112	60-130			
1,1,1-Trichloroethane	48.5	0.5	ug/L	ND	121	60-130			
1,1,2-Trichloroethane	32.6	0.5	ug/L	ND	81.6	60-130			
Trichloroethylene	40.9	0.5	ug/L	ND	102	60-130			
Trichlorofluoromethane	42.2	1.0	ug/L	ND	105	60-130			
Vinyl chloride	49.2	0.5	ug/L	ND	123	50-140			
m,p-Xylenes	88.3	0.5	ug/L	ND	110	60-130			
o-Xylene	45.6	0.5	ug/L	ND	114	60-130			
Surrogate: 4-Bromofluorobenzene	*96.0*		*ug/L*		*120*	*50-140*			
Surrogate: Dibromofluoromethane	*72.3*		*ug/L*		*90.4*	*50-140*			
Surrogate: Toluene-d8	*74.7*		*ug/L*		*93.4*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

Sample - F1/BTEX/VOCs (water) submitted with headspace which did not cover the bottom surface of the vial when inverted.

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.
NC: Not Calculated

CCME PHC additional information:

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

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Chain Of Custody
(Lab Use Only)
Nº 125792

Client Name: Paterson Group	Project Ref: PE4937	Page 1 of 1
Contact Name: Mark D'Arcy	Quote #:	**Turnaround Time**
Address: 154 Colonnade Rd. S.	PO #: 27417	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613-226-7381	E-mail: mdarcy@patersongroup.ca	Date Required:

Regulation 153/04: ☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☒ Ind/Comm ☒ Coarse ☒ Table 3 ☐ Agri/Other ☐ Table ___ For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm Mun: ___ ☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	Required Analysis: PHCs F1-F4					
1	BH1-GW1	GW		3	June 10/20			X						X					
2	BH2-GW1			2					X					X					
3	BH4-GW1			4				X	X					X					
4	BH7-GW1			4				X	X					X					
5	DUP1			2				X											
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): N. Sullivan	Received By Driver/Depot:	Received at Lab: Juneepoorn Dhunai	Verified By: SC
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: June 11, 2020 04:07	Date/Time: June 12/20 9:11a
Date/Time: June 11/2020	Temperature: °C	Temperature: 18.9 °C	pH Verified: ☐ By: N/A