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Phase II Environmental Site Assessment

1987 Robertson Road
Ottawa, Ontario

Prepared For

Stillwater Station Ltd. c/o The Properties Group

June 9, 2022

Report: PE4378-4

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for 1987 Robertson Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address three potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the Phase II - Property. The subsurface investigation consisted of drilling five boreholes, two of which were completed as groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Five soil samples including one duplicate, were submitted for laboratory analysis of petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), metals and/or VOCs.

Eight additional soil samples were submitted as part of previously completed Phase II – ESAs by Paterson Group in 2012, 2018 and 2019. All of the analyzed PHC, PAH, metals and VOC parameters were in compliance with the applicable MECP Table 3 standards with two exceptions. The zinc concentration within soil sample BH5-22-AU1 as well as multiple PAH parameters identified in BH2-SS1 (2012 assessment) exceeded the applicable MECP Table 3 standards.

Five groundwater samples, including two duplicate samples, were obtained from the monitoring wells installed in BH1-22, BH2-22 and MW3 and were analyzed for PHCs and BTEX. The majority of the analyzed parameter concentrations in the groundwater samples were identified as being non-detect, with the identified concentrations being in compliance with the MECP 3 Table 3 standards.

Nine additional groundwater samples were submitted as part of previously completed Phase II – ESAs by Paterson Group in 2012, 2018 and 2019. The majority of the analyzed parameter concentrations in the groundwater samples were identified as being non-detect, with the identified concentrations being in compliance with the MECP Table 3 standards.

Based on the findings of the Phase II ESA, the fill material identified in BH2 and BH5-22 located in the northeastern portion of the Phase II – Property is impacted with metals and PAHs. The groundwater on the Phase II Property is in compliance with the applicable MECP Table 3 standards.

Recommendations

Soil

Based on the findings of the Phase II ESA, impacted fill material was identified in the northeastern portion of the Phase II Property, in the location of a former railway spur line that had intersected the northeastern corner of the property. The impacted fill material can be removed from the Phase II Property as part of redevelopment activities. It is recommended that the excavation of soil be monitored and confirmed by Paterson. Impacted material will require disposal at a licensed waste disposal facility. Following removal of impacted material, the underlying native material will require testing to confirm compliance with site standards

Monitoring Wells

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

1.0 INTRODUCTION

At the request of Stillwater Station Ltd., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment for 1987 Robertson Road in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address three areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in February of 2022.

1.1 Site Description

Address:	1987 Robertson Road, Ottawa, Ontario.
Legal Description:	Part of Lot 11, Concession 2, Nepean (Ottawa Front), in the City of Ottawa, Ontario.
Location:	The Phase II Property is located on the north side of Robertson Road, approximately 485 m northeast of the Roberston Road and Moodie Drive intersection, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan for the site location.
Latitude and Longitude:	45° 19’ 30.31” N, 75° 47’ 33.21” W

Site Description:

Configuration:	Irregular
Site Area:	7 ha (approximate)

1.2 Property Ownership

Paterson was engaged to conduct this Phase I – ESA by Mr. Andrew Glass of The Properties Group. Mr. Glass can be contacted via his mailing address at 276 Metcalfe Street, Ottawa, Ontario, K2P 1R3.

1.3 Current and Proposed Future Uses

The Phase II Property is occupied by large storage/warehouse style building. The remainder of the site is vacant, and grass covered. The study area consists of a mixture of commercial and residential properties. It is our understanding that the Phase II Property is to be developed for residential purposes.

1.4 Applicable Site Condition Standard

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

- ❒ Coarse-grained soil conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use.

The residential standards were selected based on the proposed future use of the Phase II Property. Coarse-grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II - Property is located in a mixed residential, commercial and light industrial area and is located on the north side of Robertson Road, approximately 485 m northeast of the Roberston Road and Moodie Drive intersection, in the City of Ottawa, Ontario. The properties south of the Phase II Property are occupied by a trailer park, and General Dynamics and commercial buildings are located to the east of the Phase II Property. The trailer park also extends immediately west of the Phase II Property and is followed by retail and office buildings. The property immediately north of the Phase II Property is occupied by a existing railway running in a east-west direction.

The Phase II - Property and regional topography slope gradually down towards the north in the direction of the Ottawa River. Water drainage on the Phase II Property consists primarily of surface infiltration in the vegetated areas across the site. No ponded water was observed on the Phase I – Property.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The most recent subsurface investigation was conducted on April 22, 2022. Results from previously completed assessments in 2012, 2018 and 2019 were included in the current report.

The most recent field program consisted of drilling five boreholes, two of which were instrumented with groundwater monitoring wells. The boreholes were drilled to a maximum depth of 5.1 m below the existing grade.

3.2 Media Investigated

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

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on the information from NRCAN, the majority of the site is underlain by sandstone of the Nepean Formation while the northern part of the Phase I - Property is underlain by dolomite of the Oxford Formation. Based on the maps, the surficial geology consists of offshore marine sediments with an overburden thickness ranging from 2 to 10 m.

Contaminants of Potential Concern

The contaminants of potential concern resulting from the identified APECs are as follows:

- Petroleum Hydrocarbons (PHCs (F_1-F_4))
- Polycyclic aromatic hydrocarbons (PAHs)
- Metals
- Volatile organic compounds (VOCs)

Existing Buildings and Structures

The Phase I Property consists of a slab-on-grade commercial warehouse located in the southern portion of the property. One large canopy tent is located further northeast of the subject building and is used for outdoor seating.

The concrete slabs from the historical buildings on the property are located to the north and northwest of the subject building.

Water Bodies

Stillwater Creek runs in a north-south direction along the western property boundary of the Phase I Property.

Areas of Natural Significance

No areas of natural significance were identified on the Phase I Property or within the Phase I study area.

Water Well Records

A search of the MECPs website for all drilled well records within 250 m of the Phase I - Property was conducted as part of this assessment. The search identified three domestics well records on the Phase I – Property from 1963 to 2019. The soil profile on the Phase I – Property consists of silty clay extending to a maximum depth of 3 m followed by sandstone bedrock.

Paterson installed two wells as part of the subsurface investigation that was completed in 2012. Based on the well records, the site stratigraphy consists primarily of a shallow fill layer followed by native brown silty clay and glacial till.

The groundwater table was intercepted at an average depth of 2.2 m and sandstone bedrock was encountered at a maximum depth of 3.56 m below the existing grade.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists primarily of residential and commercial properties with the General Dynamics Mission Systems-Canada building located approximately 101 m east of the Phase I – Property.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

Ten (10) PCAs were identified within the Phase I study area. Based on their separation distances and cross or down gradient orientation with respect to the Phase I Property, the above noted PCAs, except for the on-site aboveground storage tanks (ASTs) and mechanical maintenance work, as well as the historical railway are not considered to result in APECs on 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 three PCAs that result in APECs on the Phase I Property.

The presence of three APECs was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

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

3.5 Impediments

The central portion of the Phase II Property was occupied by a large sanitary sewer easement that traversed from the southern property boundary to the northeastern corner of the property. Additional services located near the warehouse building also minorly impeded the field program. The rental service company (Ontario Rental Services) occupied the Phase II Property at the time of the field investigation and the monitoring well locations were determined as to not impede their operations.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on April 22, 2022. The field program consisted of the drilling of five boreholes on the Phase II Property, two of which were completed with monitoring well installations.

The boreholes were placed to address the aforementioned areas of potential environmental concern (APECs).

The boreholes were drilled with a low clearance track-mounted drill rig, operated by George Downing Estate Drilling of Hawkesbury, Ontario, under the full-time supervision of Paterson personnel. Borehole locations are shown on Drawing PE4378-7 – Test Hole Location Plan appended to this report.

4.2 Soil Sampling

A total of 15 soil samples were obtained from the boreholes by means of sampling from shallow auger flights and split spoon sampling.

The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

Site soils generally consist of between 0.30 and 2.13 m of fill, consisting of brown silty sand crushed stone and gravel. Native brown silty clay followed by glacial till extending to a depth of 1.90m was encountered in BH1-22 and brown clayey and sandy silt was encountered in the other four boreholes. Grey sandstone was encountered in BH1-22 and BH2-22 at depths ranging from 1.90 to 2.34m.

In addition to the subsurface investigation completed as part of the current assessment, soil samples submitted during previous assessments were included in the report.

4.3 Field Screening Measurements

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

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. A photo ionization detector (PID) was used to measure the volatile organic vapour concentrations. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement.

The PID readings were found to range from 0.1 to 0.5 ppm in the soil samples obtained. These results do not indicate the potential for significant contamination from volatile contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

4.4 Groundwater Monitoring Well Installation

Two groundwater monitoring wells were installed on the Phase II Property as part of the most recent subsurface investigation. The monitoring wells consisted of 25 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 1 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Table 1: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1-22	89.17	4.57	1.90-4.57	1.22-4.57	0-1.22	Stick-up
BH2-22	89.17	5.10	3.58-5.10	3.27-5.10	0-3.27	Stick-up

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted on May 3, 2022, and water quality parameters were collected at that time. The averaged water quality parameters collected during the sampling program are provided below.

Table 2: Groundwater Quality Parameters

Well ID	Temperature (ºC)	Conductivity (µs)	pH
BH1-22	11.01	1144.1	9.15
BH2-22	9.97	741.5	9.28

4.6 Groundwater Sampling

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

Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation.

Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

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

Table 3: Soil Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameter Analyzed				Rationale
		PHCs	Metals	PAHs	BTEX	
BH2-SS1 (2012 Assessment)	0-0.18 Brown silty sand and gravel fill			X		Assess APEC 3 (Historical railway line)
BH6-SS6 (2012 Assessment)	3.0-3.6 Brown silty clay/sand fill		X			Assess potential impacts from previous use of Phase II Property during 2012 assessment
BH1-18-AU1 (2018 Assessment)	0-0.18 Brown silty sand and gravel fill	X	X			Assess baseline conditions of Phase II Property
BH3-18-AU1 (2018 Assessment)	0-0.48 Brown silty sand and gravel fill	X				Assess baseline conditions of Phase II Property
BH4-18-AU1 (2018 Assessment)	0-0.48 Brown silty sand and gravel fill	X	X			Assess baseline conditions of Phase II Property
BH5-18-AU1 (2018 Assessment)	0-0.52 Brown silty sand and gravel fill	X	X			Assess baseline conditions of Phase II Property
BH6-18-AU1 (2018 Assessment)	0-0.52 Brown silty sand and gravel fill	X				Assess baseline conditions of Phase II Property
BH8-18-AU1 (2018 Assessment)	0-0.40 Brown silty sand and gravel fill	X	X			Assess baseline conditions of Phase II Property
BH1-22-SS3	1.5- 2.1m Native glacial till	X			X	Assess APEC 2 (Mechanical maintenance work)
BH2-22-SS3	1.5- 2.1m Native glacial till	X			X	Assess APEC 1 and APEC 2 (Mechanical maintenance work and three ASTs and one metal diesel exhaust fluid container)
BH4-22-AU1	0.15-0.30 m Crushed stone and trace clay fill		X	X		Assess APEC 3 (Historical railway line)
BH5-22-AU1	0.15-0.30 m Topsoil and crushed stone fil		X	X		Assess APEC 3 (Historical railway line)
***BH5-22-SS10**	0.15-0.30 m Topsoil and crushed stone fil			X		Assess APEC 3 (Historical railway line)

- * - Duplicate of BH5-22-AU1

Based on the guidelines outlined in the Sampling and Analysis Plan, appended to this report, the following groundwater samples were submitted for analysis: Groundwater samples submitted as part of previous assessments were also included in the current assessment.

Table 4: Groundwater Samples Submitted

Sample ID	Screened Interval/ Stratigraphic Unit	Parameters Analyzed		Rationale
		PHCs ($F_1 – F_4$)	VOCs	
MW1-GW1	Installation details unavailable (installed by another firm)		X	Assess potential impacts from previous use of Phase II Property during 2012 assessment
MW2-GW1	Installation details unavailable (installed by another firm)		X	Assess potential impacts from previous use of Phase II Property during 2012 assessment
MW3-GW1	Installation details unavailable (installed by another firm)	X	X	Assess potential impacts from previous use of Phase II Property during 2012 assessment
MW5-GW1	Installation details unavailable (installed by another firm)	X	X	Assess potential impacts from previous use of Phase II Property during 2012 assessment
MW3-GW	Installation details unavailable (installed by another firm)	X	X	Assess baseline conditions of Phase II Property
MW5-GW1 (BH5)	4.14-7.14 Bedrock (grey sandstone)	X	X	Assess baseline conditions of Phase II Property
MW6-GW1 (BH6)	3.27-6.27 Bedrock (grey sandstone)	X	X	Assess baseline conditions of Phase II Property
MW1-GW1	Installation details unavailable (installed by another firm)	X	X	General coverage
MW3-GW2	Installation details unavailable (installed by another firm)	X	X	General coverage
BH5-GW2	4.14-7.14 Bedrock (grey sandstone)	X	X	General coverage
MW3-GW3	Installation details unavailable (installed by another firm)	X	X	General coverage
BH12-GW1 (Duplicate of MW3-GW3)	Installation details unavailable (installed by another firm)		X	General coverage
BH1-22-GW1	1.88-4.57 Bedrock (grey sandstone)	X	X	Assess APEC 1 and APEC 2 (Mechanical maintenance work and three ASTs and one metal diesel exhaust fluid container)
BH2-22–GW1	3.60-5.11 Bedrock (grey sandstone)	X	X	Assess APEC 1 and APEC 2 (Mechanical maintenance work and three ASTs and one metal diesel exhaust fluid container)
DUP1-GW1*	1.88-4.57 Bedrock (grey sandstone)	X		Assess APEC 1 and APEC 2 (Mechanical maintenance work and three ASTs and one metal diesel exhaust fluid container)

- * - Duplicate of BH1-22-GW1

Paracel Laboratories (Paracel) of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing.

Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

4.8 Residue Management

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

4.9 Elevation Surveying

The most recent boreholes were surveyed to geodetic elevations by Paterson personnel.

4.10 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

The soil profile generally consists of between 0.30 and 2.13 m of fill, consisting of brown silty sand crushed stone and gravel. Native brown silty clay followed by glacial till extending to a depth of 1.90m was encountered in BH1-22 and brown clayey and sandy silt was encountered in the other four boreholes. Grey sandstone was encountered in Boreholes 1-22 and 2-22 at depths ranging from 1.90 to 2.34m. BH1-22 and BH2-22 were terminated in grey sandstone bedrock that extended to depths ranging from 4.57 to 5.10 m. The remaining boreholes were terminated in the native overburden layer consisting of clayey/sandy silt at a depth of 2.13m.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on May 3, 2022, using an electronic water level meter.

Groundwater levels are summarized below in Table 5. All elevations were acquired through a GPS survey completed at the time of the subsurface investigation.

Table 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (Asl)	Date of Measurement
BH1-22	89.17	1.17	88.0	May 3, 2022
BH2-22	89.17	1.74	87.43	

Based on the groundwater levels recorded, the groundwater appears to flow to the north.

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the Phase II Property. Coarse-grained standards were selected based on the observed stratigraphy.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0.1 to 0.5 ppm.

No visual or olfactory indications of potential contamination were identified in the soil samples at the time of the field program. The field screening results of each individual soil sample are provided on the Soil Profile, and Test Data Sheets appended to this report.

5.5 Soil Quality

Four soil samples including one duplicate were submitted for analysis of metals, PAHs, PHCs (F_1-F_4) and BTEX as part of the current assessment. Additionally, nine soil samples from previous assessments (2012, 2018 and 2019) were included as part of the current Phase II – ESA. The results of the analytical testing have been appended and are presented in Table 6: Soil Analytical Test Results. The laboratory certificates of analysis are provided in Appendix 1. Analytical test results are shown on Drawings PE4378- 9 to PE4378-11.

PAHs

All identified PAH parameters were compliance with the MECP Table 3 standards with the exception of multiple exceedances identified in BH2-SS1 during the 2012 subsurface investigation.

Metals

All of the identified metal parameters were in compliance with the applicable MECP Table 3 standards, with one exception. The zinc concentration within soil sample BH5-22-AU1 exceeded the applicable MECP Table 3 standard.

BTEX

All BTEX parameters were identified as being non-detect and therefore in compliance with the MECP Table 3 standards.

PHCs (F_1-F_4)

All of the analyzed PHC parameters were non-detect with the exception of PHC fractions F_3 and F_4 in soil samples BH1-AU1-18, BH5-AU1-18, BH8-AU1-18, BH1-22-SS3 and BH2-22-SS3, which were in compliance with the applicable Table 3 standards.

TABLE 7: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Soil Sample	Depth Interval (m BGS)
Antimony	1.1	BH5-22-AU1	0.15-0.30m, Fill
Arsenic	15.3	BH5-22-AU1	0.15-0.30m, Fill
Barium	156	BH6-SS6	3.1-3.7m, Native
Boron	5.7	BH5-22-AU1	0.15-0.30m, Fill
Chromium	43.2	BH5-22-AU1	0.15-0.30m, Fill
Cobalt	9.0	BH5-22-AU1	0.15-0.30m, Fill
Copper	37.6	BH5-22-AU1	0.15-0.30m, Fill
Lead	98.3	BH5-22-AU1	0.15-0.30m, Fill
Nickel	20.3	BH5-22-AU1	0.15-0.30m, Fill
Vanadium	44	BH6-SS6	3.1-3.7m, Native
Zinc	**437**	BH5-22-AU1	0.15-0.30m, Fill
F3 PHCs (C16-C34)	25	BH1-22-SS3	1.5- 2.1m, Native
F4 PHCs (C34-C50)	49	BH1-22-SS3	1.5- 2.1m, Native
Acenaphthene	7.42	BH2-SS1	0-0.60, Fill
Acenaphthylene	**1.3**	BH2-SS1	0-0.60, Fill
Anthracene	**16.9**	BH2-SS1	0-0.60, Fill
Benzo[a]anthracene	**11.2**	BH2-SS1	0-0.60, Fill
Benzo[a]pyrene	**3.64**	BH2-SS1	0-0.60, Fill
Benzo[b]fluoranthene	**7.72**	BH2-SS1	0-0.60, Fill

TABLE 7 Continued: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g)**	**Soil Sample**	**Depth Interval (m BGS)**
Benzo[g,h,i]perylene	0.77	BH2-SS1	0-0.60, Fill
Benzo[k]fluoranthene	**4.43**	BH2-SS1	0-0.60, Fill
Chrysene	10.5	BH2-SS1	0-0.60, Fill
Fluoranthene	44.3	BH2-SS1	0-0.60, Fill
Fluorene	7.93	BH2-SS1	0-0.60, Fill
Indeno [1,2,3-cd] pyrene	**0.81**	BH2-SS1	0-0.60, Fill
1-Methylnaphthalene	**1.26**	BH2-SS1	0-0.60, Fill
2-Methylnaphthalene	**1.28**	BH2-SS1	0-0.60, Fill
Methylnaphthalene (1&2)	1.54	BH2-SS1	0-0.60, Fill
Naphthalene	0.35	BH2-SS1	0-0.60, Fill
Phenanthrene	**43.5**	BH2-SS1	0-0.60, Fill
Pyrene	33.6	BH2-SS1	0-0.60, Fill

Notes:
- **Bold and Underlined** – Results exceed the selected MECP standards

All other analyzed parameters were non-detect.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1-22 and BH2-22 were submitted for laboratory analysis of PHCs (F_1-F_4) and VOCs.

The groundwater samples were obtained from the screened intervals noted in Table 4.

The results of the analytical testing are presented in Table 8: Groundwater Analytical Test Results, which has been appended to the report. The laboratory certificate of analysis is provided in Appendix 1. Analytical test results are shown on Drawing PE4378- 12 – Analytical Testing Plan – Groundwater.

PHCs (F_1-F_4)

All of the analyzed PHC parameters were non-detect and therefore in compliance with the applicable Table 3 standards.

VOCs

The majority of the analyzed VOC parameters were non-detect and are therefore in compliance with the applicable MECP Table 3 standards.

5.7 Quality Assurance and Quality Control Results

All soil and groundwater samples were handled in accordance with the Analytical Protocol with respect to holding time, preservation method, storage requirement, and container type.

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

As per the Sampling and Analysis Plan, a duplicate soil sample was obtained from sample BH5-22-AU1 and submitted for laboratory analysis of PAH parameters. All of the analyzed PAH parameters were identified as being non-detect in both samples. No PAH concentrations were detected in the original or duplicate samples.

Duplicate groundwater samples were obtained from the monitoring wells installed in BH1-22 and MW3 and were submitted for laboratory analysis of PHC and/or VOC parameters. No PHC (F_1-F_4) or VOC concentrations were detected in the original or duplicate samples.

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

5.8 Phase II Conceptual Site Model

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

Site Description

The Phase I Property consists of a slab-on-grade commercial warehouse located in the southern portion of the property. One large canopy tent is located further northeast of the subject building and is used for outdoor seating. The concrete slabs from the historical buildings on the property are located to the north and northwest of the subject building.

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report, the following PCAs were considered to result in APECs on the Phase I/Phase II Property:

- Three ASTs and one metal diesel exhaust fluid container
- Mechanical maintenance work.
- Historical railway line

Contaminants of Potential Concern and Impacted Media

Contaminants of potential concern associated with the PCAs include metals, PAHs, PHCs and VOCs in the soil and/or groundwater.

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation. Underground utilities on the Phase II Property include private electrical and sewer services as well as hydro and gas lines. One large sanitary sewer easement was located in the central portion of the Phase II Property, running from the southern property boundary to the northeastern portion of the property.

Physical Setting

Site Stratigraphy

The site stratigraphy, from the ground surface to the deepest aquifer or aquitard investigated consists of:

- Fill material consisting of brown silty sand and gravel extending to depths ranging from 0.30 and 4.50m. Crushed stone was identified in the fill material within all of the most recently completed Boreholes (BH1-22 to BH5-22) extending to a maximum depth of 0.69m. Brick fragments were identified in the fill material within BH5-18.
- Native brown silty clay followed extending to depths ranging from 1.22 to 6.70m. Native brown silty fine sand was encountered in BH3-18 extending to a depth of 2.36m.
- Glacial till extending to depths ranging 1.90 to 3.66m.

- Grey sandstone bedrock extending to depths of 1.90 and 2.34m was encountered in BH1-22 and BH2-22, respectively.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered primarily within the native silty clay layer and within the silty sand fill layer in BH2-22.

Water levels were measured at the Phase I - Property on May 3, 2022, at depths ranging from 1.17 to 1.74m below grade in BH1-22 and BH2-22.

Based on the groundwater levels recorded, the groundwater appears to flow in a northerly direction.

Approximate Depth to Bedrock

Bedrock was encountered at an average depth of 2.44m below the existing grade.

Approximate Depth to Water Table

Depth to the water table at the Phase I Property varies between approximately 1.20 to 2.40m below the existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation (Site Condition Standards, Environmentally Sensitive Areas) does not apply to the Phase II Property.

Section 43.1 of the Regulation does not apply to the Phase II Property in that it is not a Shallow Soil Property.

Fill Placement

Fill material ranging from 0.30 to 2.13m and consisting of brown silty sand with gravel was identified in all of the boreholes. Crushed stone was identified in the fill material within all of the most recently completed Boreholes (BH1-22 to BH5-22) extending to a maximum depth of 0.69m. Brick fragments were observed in BH5-18.

Proposed Buildings and Other Structures

It is our understanding that the Phase II Property is to be redeveloped for residential purposes.

Areas of Natural Significance and Water Bodies

No areas of natural significance are present on or within the vicinity of the Phase II Property.

Stillwater creek intersects the western portion of the Phase I Property and runs in a north to south direction.

Environmental Condition

Areas Where Contaminants are Present

Fill material impacted with PAHs was identified in BH2 which is located in the northeastern portion of the Phase II Property in the location of a former railway spur line.

The zinc concentration identified within the fill material in BH5-22, also located in the northeastern portion of the property, was in excess of the applicable MECP Table 3 standard,

Types of Contaminants

Fill material impacted with PAHs and zinc was identified in the northeastern portion of the Phase II Property.

Contaminated Media

Fill material impacted with PAHs and zinc was identified in BH2 and BH5-22, located in the northeastern portion of the Phase II Property. No groundwater impacts were identified.

What Is Known About Areas Where Contaminants Are Present

The impacted fill material was identified in the location of a previously existing railway spur line that is no longer in use. The contaminated fill material is considered to be a result of the former spur line that had intersected the northeastern corner of the Phase II Property.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, no significant distribution and/or migration of contaminants is considered to have occurred.

Discharge of Contaminants

Based on the analytical testing results, PAH impacts were identified within the fill material in BH2 and zinc within the fill material in BH5-22. The metals and PAH parameters in excess of the selected standards are expected to be a result of a former spur line that had previously intersected the northeastern portion of the Phase II Property.

Climatic and Meteorological Conditions

In general, climatic, and meteorological conditions have the potential to affect contaminant distribution. Two ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally. It is our opinion that climatic and meteorological conditions have not influenced contaminant transport in the past.

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 1987 Robertson Road, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address three potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the Phase II - Property. The subsurface investigation consisted of drilling five boreholes, two of which were completed as groundwater monitoring wells.

Soil samples were obtained from the boreholes and screened using visual observations and organic vapour measurements. Five soil samples including one duplicate, were submitted for laboratory analysis of petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), metals and/or VOCs.

Eight additional soil samples were submitted as part of previously completed Phase II – ESAs by Paterson Group in 2012, 2018 and 2019. All of the analyzed PHC, PAH, metals and VOC parameters were in compliance with the applicable MECP Table 3 standards with two exceptions. The zinc concentration within soil sample BH5-22-AU1 as well as multiple PAH parameters identified in BH2-SS1 (2012 assessment) exceeded the applicable MECP Table 3 standards.

Five groundwater samples, including two duplicate samples, were obtained from the monitoring wells installed in BH1-22, BH2-22 and MW3 and were analyzed for PHCs and BTEX. The majority of the analyzed parameter concentrations in the groundwater samples were identified as being non-detect, with the identified concentrations being in compliance with the MECP 3 Table 3 standards.

Nine additional groundwater samples were submitted as part of previously completed Phase II – ESAs by Paterson Group in 2012, 2018 and 2019. The majority of the analyzed parameter concentrations in the groundwater samples were identified as being non-detect, with the identified concentrations being in compliance with the MECP Table 3 standards.

Based on the findings of the Phase II ESA, the fill material identified in BH2 and BH5-22 located in the northeastern portion of the Phase II – Property is impacted with metals and PAHs. The groundwater on the Phase II Property is in compliance with the applicable MECP Table 3 standards.

Recommendations

Soil

Based on the findings of the Phase II ESA, impacted fill material was identified in the northeastern portion of the Phase II Property, in the location of a former railway spur line that had intersected the northeastern corner of the property. The impacted fill material can be removed from the Phase II Property as part of redevelopment activities. It is recommended that the excavation of soil be monitored and confirmed by Paterson. Impacted material will require disposal at a licensed waste disposal facility. Following removal of impacted material, the underlying native material will require testing to confirm compliance with site standards

Monitoring Wells

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

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended and meets 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 Phase II Property 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 Stillwater Station Ltd. c/o The Properties Group. Notification from Stillwater Station Ltd. c/o The Properties Group and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Samuel Berube, B.Eng.

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

Report Distribution:

- Stillwater Station Ltd.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4378-7 – TEST HOLE LOCATION PLAN

DRAWING PE4378-9 ANALYTICAL TESTING PLAN - SOIL (PAHs)

DRAWING PE4378-9A – CROSS SECTION A-A' SOIL (PAHs)

DRAWING PE4378-10 ANALYTICAL TESTING PLAN - SOIL (METALs)

DRAWING PE4378-10A – CROSS SECTION A-A' SOIL (METALS)

DRAWING PE4378-11 ANALYTICAL TESTING PLAN - SOIL (BTEX, PHCs, VOCs)

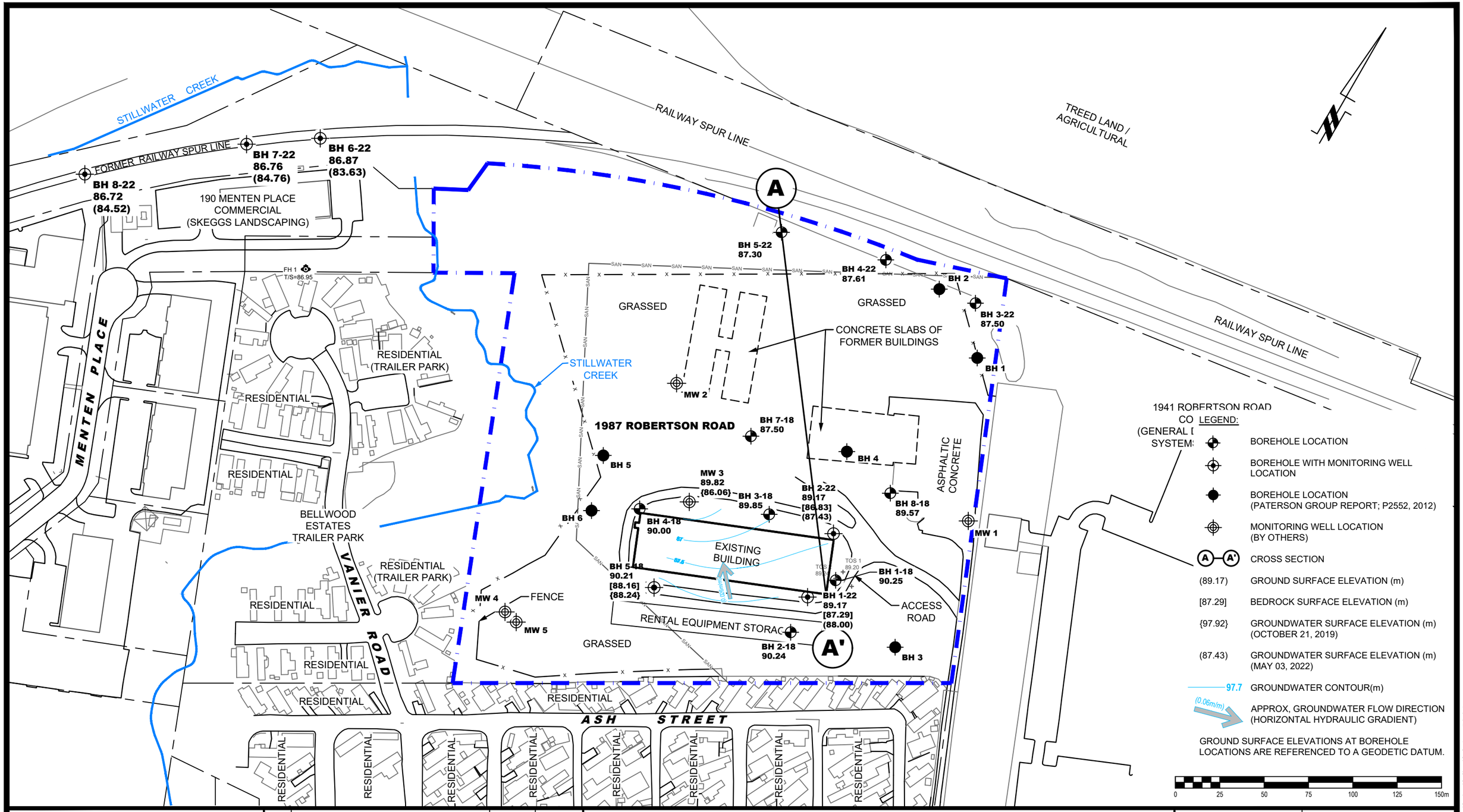
DRAWING PE4378-11A ANALYTICAL TESTING PLAN - SOIL (BTEX, PHCs, VOCs))

DRAWING PE4378-12 – ANALYTICAL TESTING PLAN - GROUNDWATER (PHCs VOCs)

DRAWING PE4378-12A – CROSS SECTION A-A' GROUNDWATER (PHCs VOCs)

FIGURE 1

KEY PLAN



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NO.	REVISIONS	DATE	INITIAL

STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:2000	Date: 05/2022
Drawn by: YA	Report No.: PE4378-3
Checked by: SB	Dwg. No.: PE4378-7
Approved by: MSD	Revision No.:

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BH5-22-AU1 0.15-0.30 m 22-APR-2022
PAHs comply with the MECP Table 3 Standards

BH5-22-SS10-DUP 0.15-0.30 m 22-APR-2022
PAHs comply with the MECP Table 3 Standards

BH4-22-AU1 0.15-0.30 m 22-APR-2022
PAHs comply with MECP Table 3 Standards

BH2-SS1	0.0-0.60 m	08-MAR-2012
Parameter	Result(µg/g)	Standard(µg/g)
Acenapthylene	1.3	0.15
Antracene	16.9	0.67
Benzo[a]anthracene	11.2	0.5
Benzo[a]pyrene	3.64	0.3
Benzo[b]fluoranthene	7.72	0.78
Benzo[k]fluoranthene	4.43	0.78
Chrysene	10.5	7
Fluoranthene	44.3	0.69
Indeno[1,2,3-cd] pyrene	0.81	0.38
1-Methylnapthalene	1.26	0.99
2-Methylnapthalene	1.28	0.99
Methlynapthalene(1&2)	2.54	0.99
Phenanthrene	43.5	6.2
Remaining PAHs comply with MECP Table 3 Standards		

STILLWATER CREEK
FORMER RAILWAY SPUR LINE
RAILWAY SPUR LINE
190 MENTEN PLACE COMMERCIAL (SKEGGS LANDSCAPING)
MENTEN PLACE
RESIDENTIAL (TRAILER PARK)
RESIDENTIAL
BELLWOOD ESTATES TRAILER PARK
VANIER ROAD
GRASSED
CONCRETE SLABS OF FORMER BUILDINGS
1987 ROBERTSON ROAD
EXISTING BUILDING
RENTAL EQUIPMENT STORAC
ASPHALTIC CONCRETE
ACCESS ROAD
FENCE
ASH STREET

BH 8-22 86.72 (84.52)
BH 7-22 86.76 (84.76)
BH 6-22 86.87 (83.63)
BH 5-22 87.30
BH 4-22 87.61
BH 2
BH 3-22 87.50
BH 1
MW 1
MW 2
MW 3 89.82 {86.06}
MW 4
MW 5
BH 5
BH 6
BH 7-18
BH 4
BH 8-18
BH 3-18
BH 4-18
BH 2-22 89.17 [86.83] (87.43)
BH 5-18
BH 6-18
BH 1-22 89.17 [87.29] (88.00)
BH 1-18
BH 2-18
BH 3
A
A'
FH 1 T/S=86.95
TOS 1 89.20
TOS 2 89.20

SOIL RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

SOIL RESULTS EXCEED MECP TABLE 3 STANDARDS

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- DESTROYED BOREHOLE
- BOREHOLE LOCATION (PATERSON GROUP REPORT; PE2552, 2012)
- MONITORING WELL LOCATION (BY OTHERS)
- (A)—(A') CROSS SECTION
- (89.17) GROUND SURFACE ELEVATION (m)
- [87.29] BEDROCK SURFACE ELEVATION (m)
- {97.92} GROUNDWATER SURFACE ELEVATION (m) (OCTOBER 21, 2019)
- (87.43) GROUNDWATER SURFACE ELEVATION (m) (MAY 03, 2022)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

0 25 50 75 100 125 150m

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STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (PAHs)

Scale: 1:2000	Date: 05/2022
Drawn by: YA	Report No.: PE4378-3
Checked by: SB	Dwg. No.: PE4378-9
Approved by: MSD	Revision No.:

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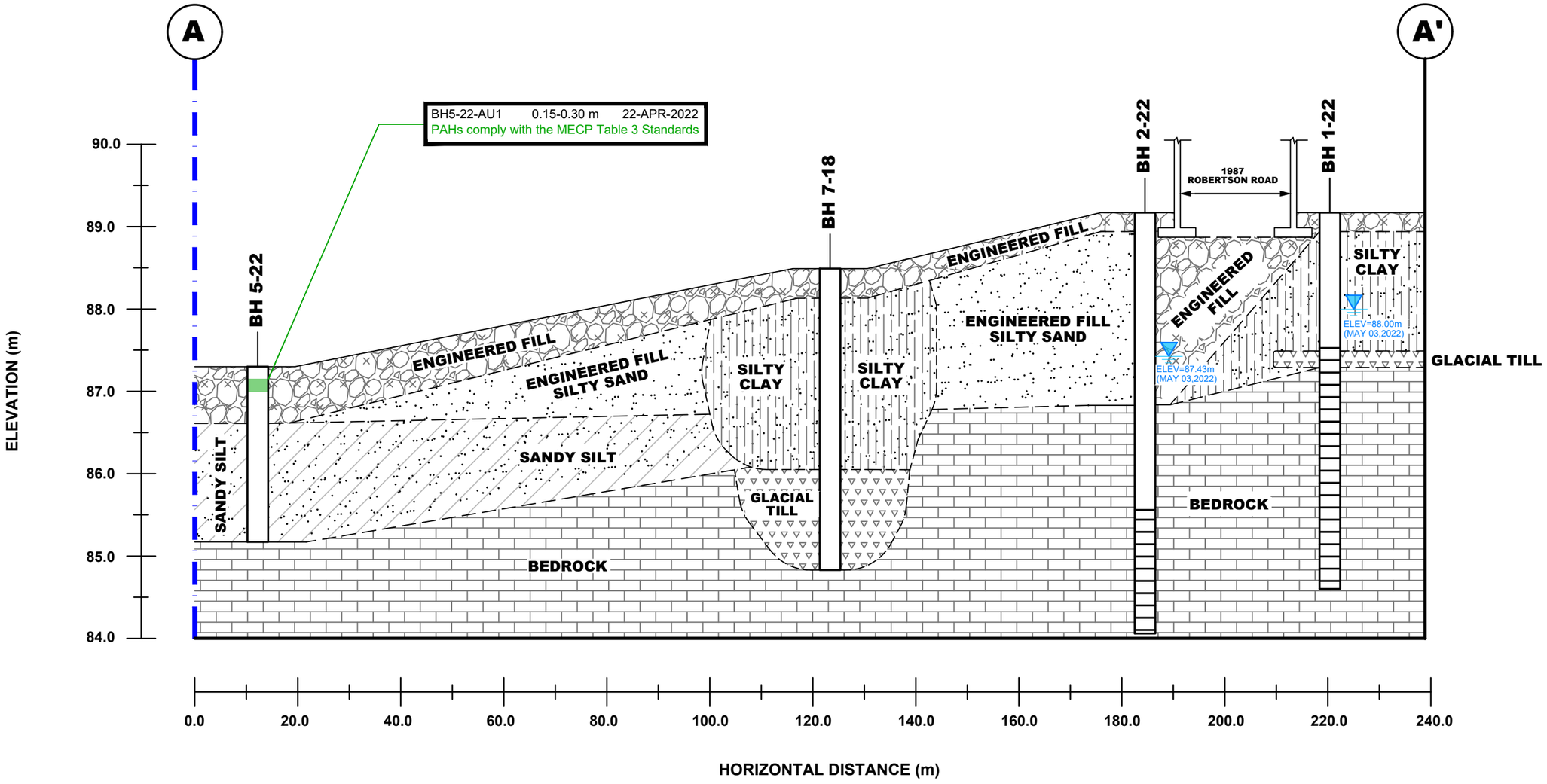

SOIL RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (PAHs)

Scale: AS SHOWN	Date: 05/2022
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Approved by: MSD	Revision No.:

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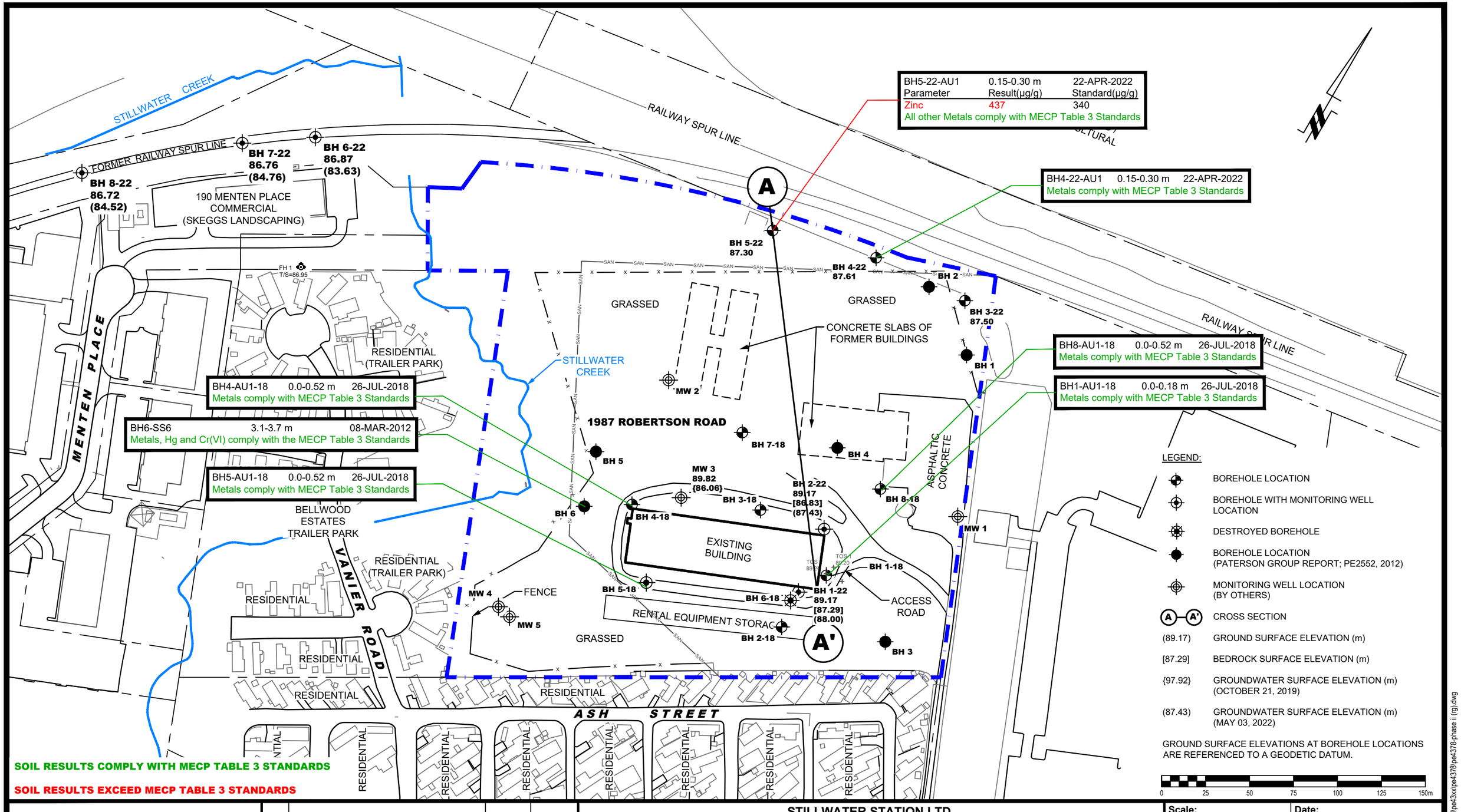

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STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:2000	Date: 05/2022
Drawn by: YA	Report No.: PE4378-3
Checked by: SB	Dwg. No.: PE4378-10
Approved by: MSD	Revision No.:

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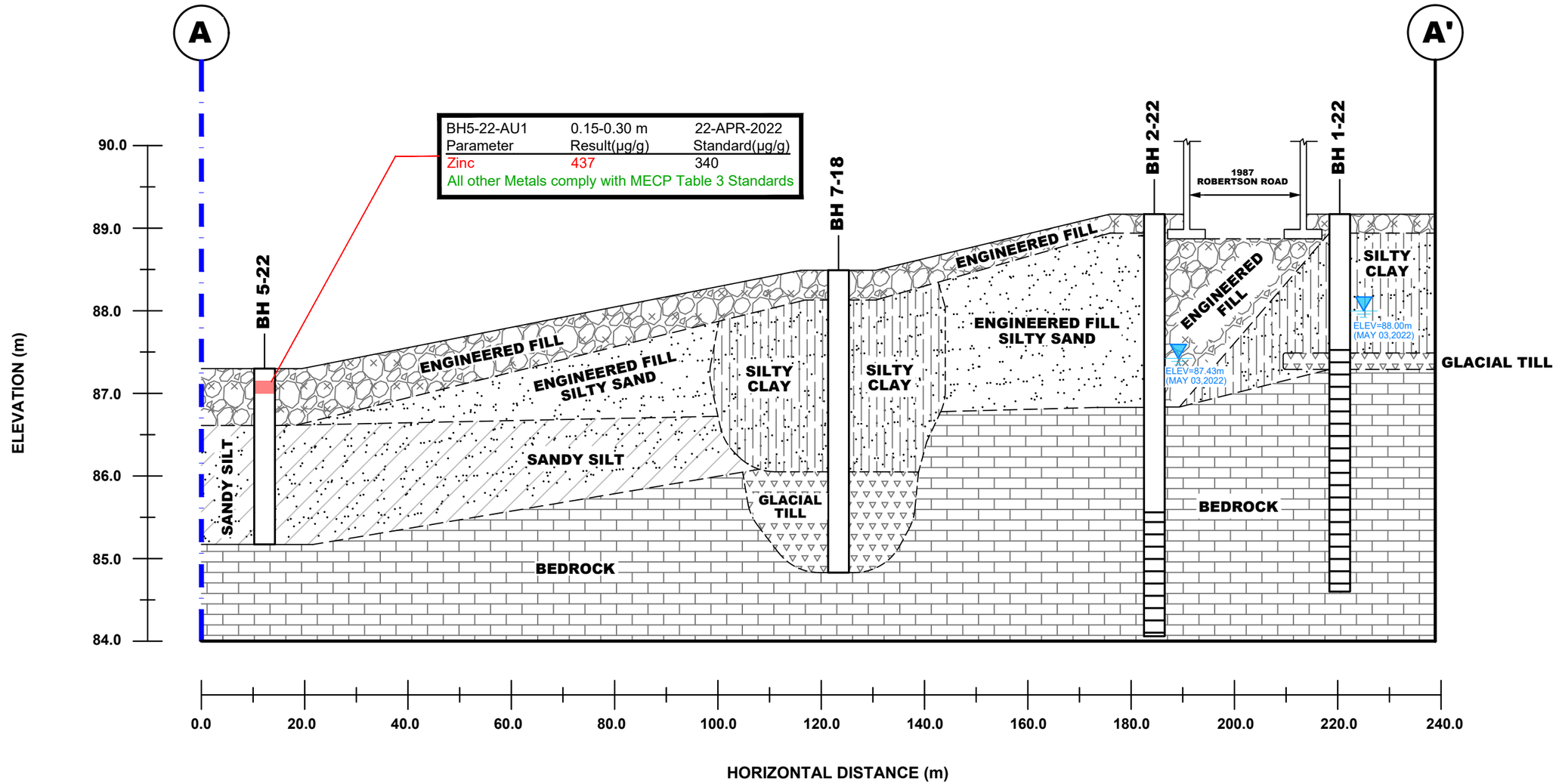

SOIL RESULTS EXCEED MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (METALS)

Scale: AS SHOWN	Date: 05/2022
Drawn by: JM	Report No.: PE4378-3
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Approved by: MSD	Revision No.:

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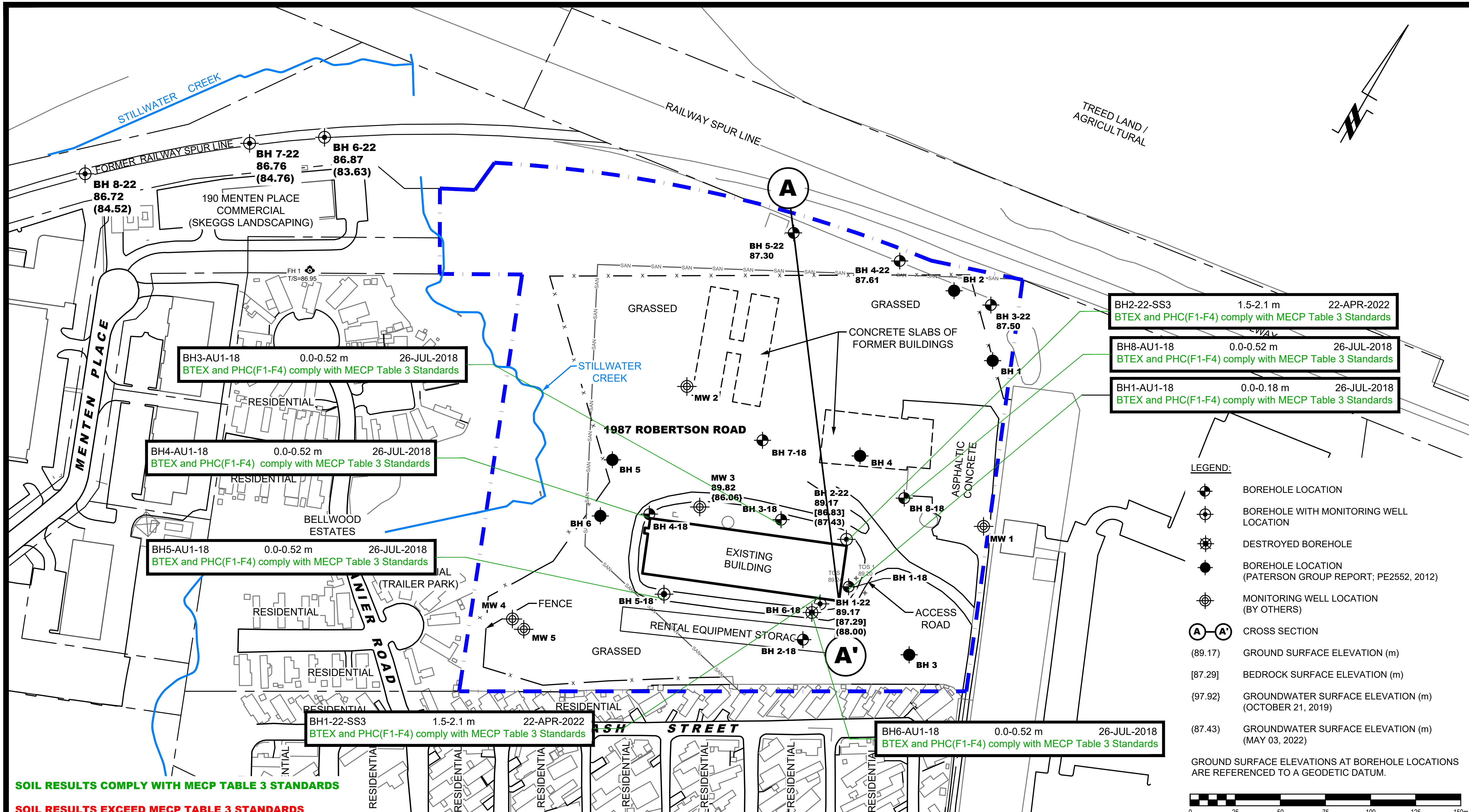

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NO.	REVISIONS	DATE	INITIAL

STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX & PHCs)

Scale: 1:2000	Date: 05/2022
Drawn by: YA	Report No.: PE4378-3
Checked by: SB	Dwg. No.: PE4378-11
Approved by: MSD	Revision No.:

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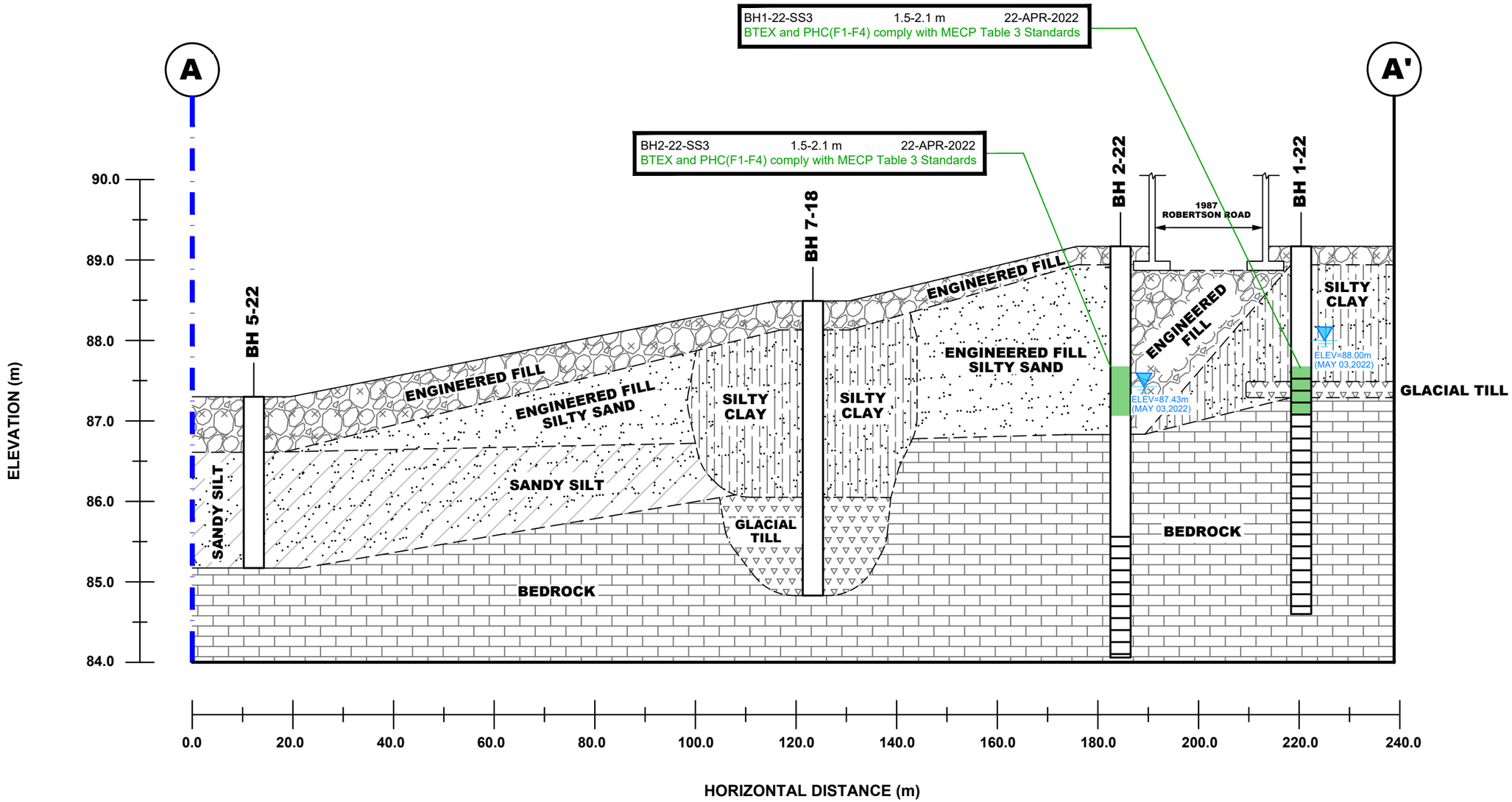

SOIL RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

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Title:

CROSS SECTION A-A' - SOIL (BTEX & PHCs)

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Checked by: SB	Dwg. No.: PE4378-11A
Approved by: MSD	Revision No.:

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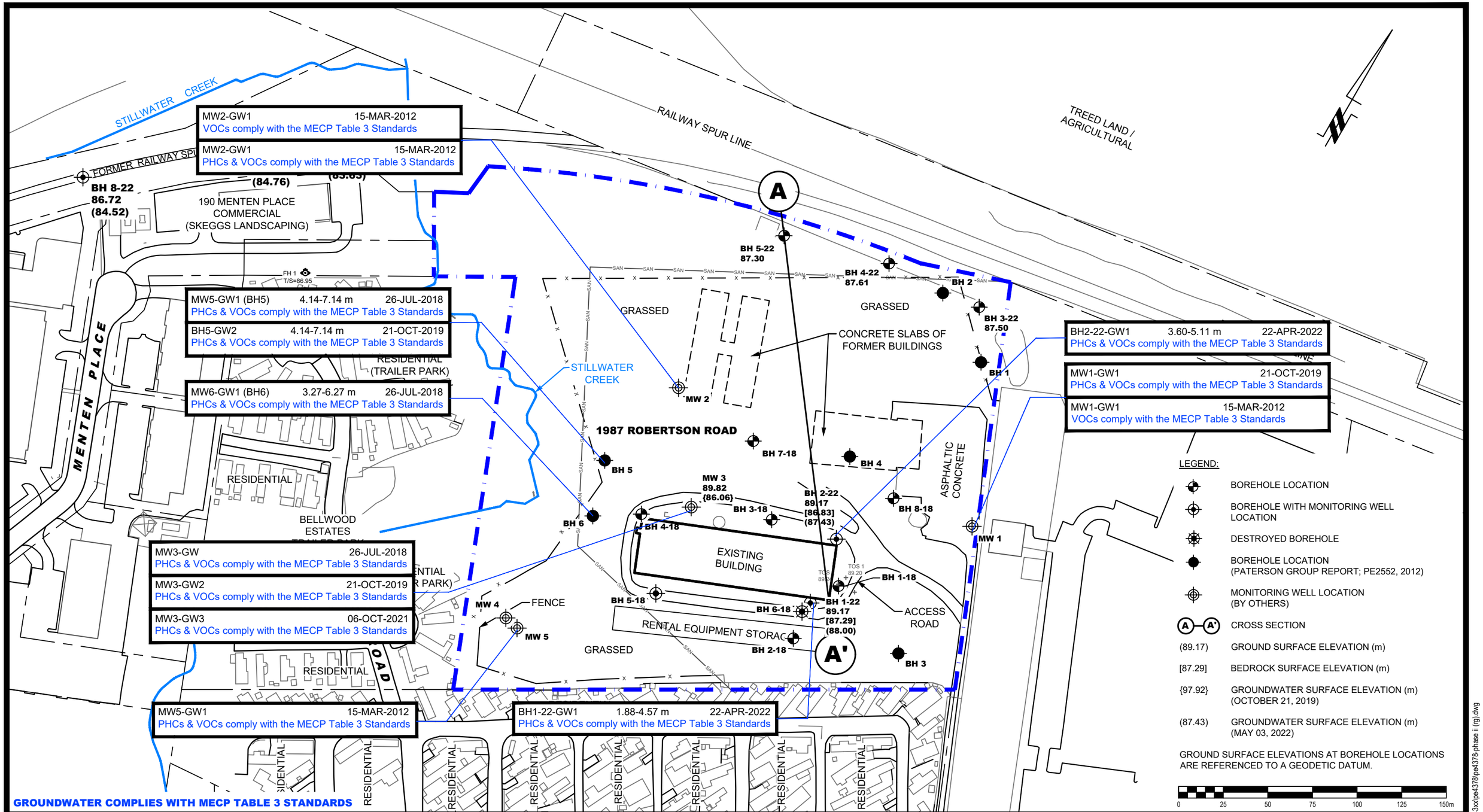

GROUNDWATER COMPLIES WITH MECP TABLE 3 STANDARDS

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STILLWATER STATION LTD.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD
OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - GROUNDWATER**

Scale: 1:2000	Date: 05/2022
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Checked by: SB	Dwg. No.: PE4378-12
Approved by: MSD	Revision No.:

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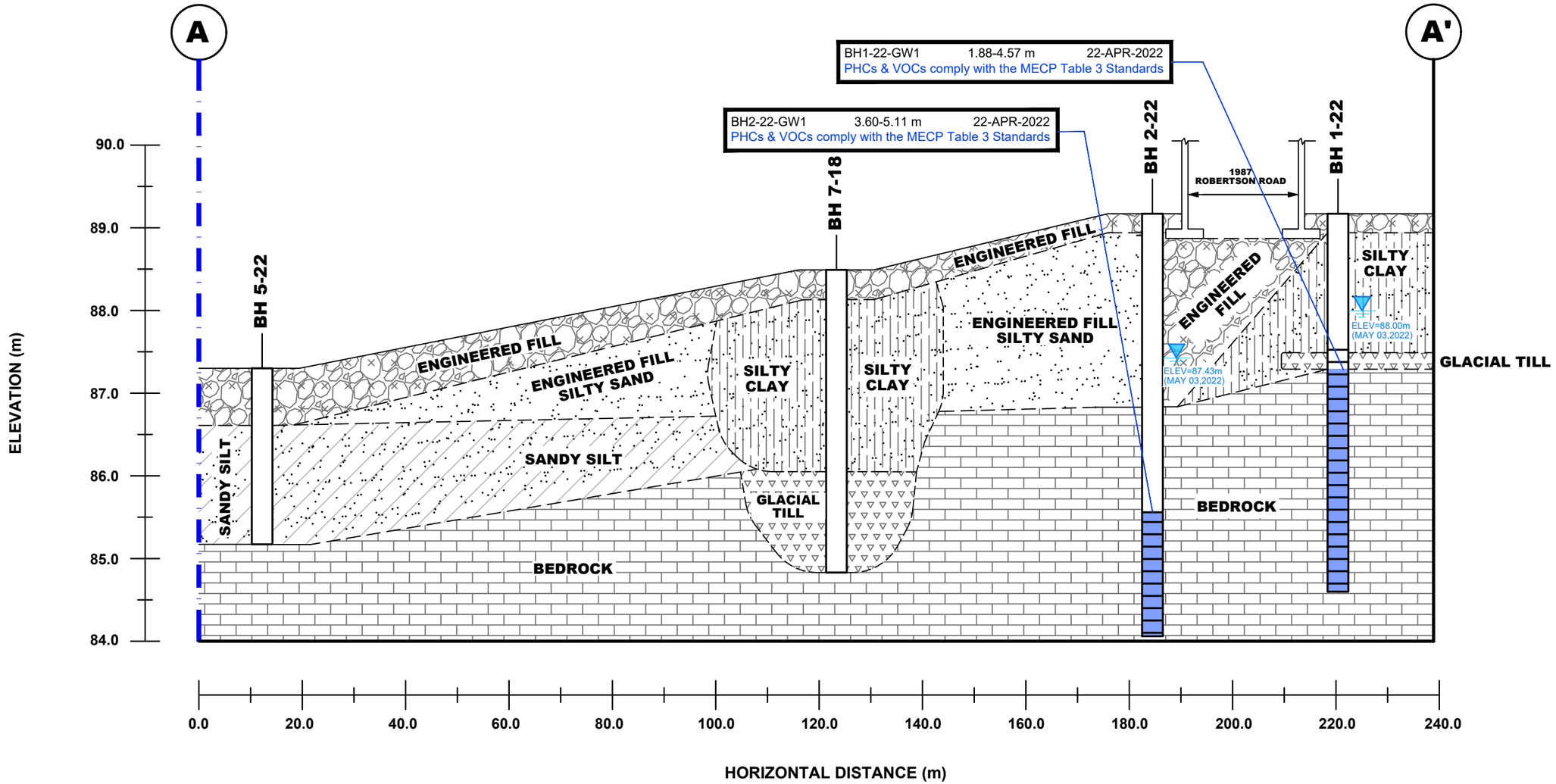

GROUNDWATER COMPLIES WITH MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1987 ROBERTSON ROAD

OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

ANALYTICAL TEST RESULTS

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATE OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

patersongroup

Sampling & Analysis Plan

Phase II Environmental Site Assessment
1987 Robertson Road
Ottawa, Ontario

Prepared For
Stillwater Station c/o The Properties Group

April 2022
Report: PE4378-SAP

Paterson Group Inc.

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TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Stillwater Station Ltd. to conduct a Phase II Environmental Site Assessment (ESA) of 1987 Robertson Road, Ottawa, Ontario. Based on our 2021 Phase I ESA completed for the subject property, a subsurface investigation program, consisting of borehole drilling, was developed.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH2-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH3-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH4-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH5-18	Assess baseline conditions of Phase II Property	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH6-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH7-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH8-18	Assess baseline conditions of Phase II Property	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH1-22	Assess APEC 2 (Mechanical maintenance work)	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH2-22	Assess APEC 1 and APEC 2 (Mechanical maintenance work and three ASTs and one metal diesel exhaust fluid container)	Borehole to be advanced to approximately 2m below the expected long-term groundwater table and install a monitoring well.
BH3-22	Assess APEC 3 (Historical railway line)	Through the fill material into the native soil, and intercept the groundwater table, as applicable

Borehole	Location & Rationale	Proposed Depth & Rationale
BH4-22	Assess APEC 3 (Historical railway line)	Through the fill material into the native soil, and intercept the groundwater table, as applicable
BH5-22	Assess APEC 3 (Historical railway line)	Through the fill material into the native soil, and intercept the groundwater table, as applicable

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

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

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

- ❒ RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole Locations

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

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

Drilling Procedure

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

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

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

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

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

Table 6: Soil MECP Table 3 RPI

Soil Analytical Test Results

1987 Robertson Road, Ottawa, Ontario

Parameter	Units	MDL	Regulation	Sample												
				BH2-SS1	BH6-SS6	BH1-18-AU1	BH3-18-AU1	BH4-18-AU1	BH5-18-AU1	BH6-18-AU1	BH8-18-AU1	BH1-22-SS3	BH2-22-SS3	BH4-22-AU1	BH5-22-AU1	BH5-22-SS10
Sample Depth (m)			**Reg 153/04 (2011) - Table 3 Residential, coarse**	**0-0.60**	**3.1-3.7**	**0-0.18**	**0-0.52**	**0-0.52**	**0-0.52**	**0-0.52**	**0-0.52**	**1.5-2.1**	**1.5-2.1**	**0.15-0.30**	**0.15-0.30**	**0.15-0.30**
Sample Date (m/d/y)				**08-Mar-12**	**08-Mar-12**	**26-Jul-18**	**26-Jul-18**	**26-Jul-18**	**26-Jul-18**	**26-Jul-18**	**26-Jul-18**	**22-Apr-22**	**22-Apr-22**	**22-Apr-22**	**22-Apr-22**	**22-Apr-22**
Metals																
Antimony	ug/g dry	1	7.5 ug/g dry	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	N/A	N/A	ND (1.0)	1.1	N/A
Arsenic	ug/g dry	1	18 ug/g dry	N/A	1	ND (1.0)	N/A	ND (1.0)	1.3	N/A	ND (1.0)	N/A	N/A	3.0	15.3	N/A
Barium	ug/g dry	1	390 ug/g dry	N/A	156	61.1	N/A	31.3	113	N/A	77.3	N/A	N/A	122	134	N/A
Beryllium	ug/g dry	0.5	4 ug/g dry	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	N/A	N/A	ND (0.5)	ND (0.5)	N/A
Boron	ug/g dry	5	120 ug/g dry	N/A	ND (5.0)	ND (5.0)	N/A	ND (5.0)	6.9	N/A	ND (5.0)	N/A	N/A	ND (5.0)	5.7	N/A
Cadmium	ug/g dry	0.5	1.2 ug/g dry	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	ND (0.5)	N/A	ND (0.5)	N/A	N/A	ND (0.5)	ND (0.5)	N/A
Chromium (IV)	ug/g dry	0.2	8 ug/g dry	N/A	ND (0.2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	ug/g dry	5	160 ug/g dry	N/A	32	12.8	N/A	8.6	16.4	N/A	15.9	N/A	N/A	32.1	43.2	N/A
Cobalt	ug/g dry	1	22 ug/g dry	N/A	9	4.5	N/A	3.4	6	N/A	5.4	N/A	N/A	8.7	9.0	N/A
Copper	ug/g dry	5	140 ug/g dry	N/A	18	9.9	N/A	8.6	13.7	N/A	12.8	N/A	N/A	25.2	37.6	N/A
Lead	ug/g dry	1	120 ug/g dry	N/A	10	14.9	N/A	3.4	15.7	N/A	11.4	N/A	N/A	6.2	98.3	N/A
Mercury	ug/g dry	0.1	0.27 ug/g dry	N/A	ND (0.1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molybdenum	ug/g dry	1	6.9 ug/g dry	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	N/A	N/A	ND (1.0)	ND (1.0)	N/A
Nickel	ug/g dry	5	100 ug/g dry	N/A	18	10.3	N/A	5.8	14.8	N/A	11.2	N/A	N/A	19.2	20.3	N/A
Selenium	ug/g dry	1	2.4 ug/g dry	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	N/A	N/A	ND (1.0)	ND (1.0)	N/A
Silver	ug/g dry	0.3	20 ug/g dry	N/A	ND (0.3)	ND (0.3)	N/A	ND (0.3)	ND (0.3)	N/A	ND (0.3)	N/A	N/A	ND (0.3)	ND (0.3)	N/A
Thallium	ug/g dry	1	1 ug/g dry	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	N/A	N/A	ND (1.0)	ND (1.0)	N/A
Uranium	ug/g dry	1	23 ug/g dry	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	ND (1.0)	N/A	ND (1.0)	N/A	N/A	ND (1.0)	ND (1.0)	N/A
Vanadium	ug/g dry	10	86 ug/g dry	N/A	44	21.2	N/A	21.8	19.5	N/A	24.4	N/A	N/A	39.6	40.5	N/A
Zinc	ug/g dry	20	340 ug/g dry	N/A	56	43.7	N/A	21	73.7	N/A	40	N/A	N/A	49.8	437	N/A
Volatiles																
Benzene	ug/g dry	0.02	0.21 ug/g dry	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	N/A	N/A	N/A
Ethylbenzene	ug/g dry	0.05	2 ug/g dry	N/A	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A	N/A	N/A
Toluene	ug/g dry	0.05	2.3 ug/g dry	N/A	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A	N/A	N/A
m/p-Xylene	ug/g dry	0.05		N/A	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A	N/A	N/A
o-Xylene	ug/g dry	0.05		N/A	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A	N/A	N/A
Xylenes, total	ug/g dry	0.05	3.1 ug/g dry	N/A	N/A	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	N/A	N/A	N/A
Hydrocarbons																
F1 PHCs (C6-C10)	ug/g dry	7	55 ug/g dry	N/A	N/A	ND (7)	ND (7)	ND (7)	ND (7)	ND (7)	ND (7)	ND (7)	ND (7)	N/A	N/A	N/A
F2 PHCs (C10-C16)	ug/g dry	4	98 ug/g dry	N/A	N/A	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	ND (4)	N/A	N/A	N/A
F3 PHCs (C16-C34)	ug/g dry	8	300 ug/g dry	N/A	N/A	27	ND (8)	ND (8)	40	ND (8)	21	25	24	N/A	N/A	N/A
F4 PHCs (C34-C50)	ug/g dry	6	2800 ug/g dry	N/A	N/A	13	ND (6)	ND (6)	26	ND (6)	20	49	45	N/A	N/A	N/A
Semi-Volatiles																
Acenaphthene	ug/g dry	0.02	7.9 ug/g dry	7.42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Acenaphthylene	ug/g dry	0.02	0.15 ug/g dry	1.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Anthracene	ug/g dry	0.02	0.67 ug/g dry	16.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[a]anthracene	ug/g dry	0.02	0.5 ug/g dry	11.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[a]pyrene	ug/g dry	0.02	0.3 ug/g dry	3.64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[b]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	7.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[g,h,i]perylene	ug/g dry	0.02	6.6 ug/g dry	0.77	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[k]fluoranthene	ug/g dry	0.02	0.78 ug/g dry	4.43	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Chrysene	ug/g dry	0.02	7 ug/g dry	10.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Dibenzo[a,h]anthracene	ug/g dry	0.02	0.1 ug/g dry	ND (0.02)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Fluoranthene	ug/g dry	0.02	0.69 ug/g dry	44.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Fluorene	ug/g dry	0.02	62 ug/g dry	7.93	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Indeno [1,2,3-cd] pyrene	ug/g dry	0.02	0.38 ug/g dry	0.81	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
1-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	1.26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
2-Methylnaphthalene	ug/g dry	0.02	0.99 ug/g dry	1.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Methylnaphthalene (1&2)	ug/g dry	0.04	0.99 ug/g dry	2.55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.04)	ND (0.04)	ND (0.04)
Naphthalene	ug/g dry	0.01	0.6 ug/g dry	0.35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.01)	ND (0.01)	ND (0.01)
Phenanthrene	ug/g dry	0.02	6.2 ug/g dry	43.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)
Pyrene	ug/g dry	0.02	78 ug/g dry	33.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND (0.02)	ND (0.02)	ND (0.02)

Notes	
	Result exceeds applicable site condition standard
MDL	Method Detection Limit
NA	Not Reported
ND	Not Detected

Table 8 :Groundwater MECP Table 3 RPI

Groundwater Analytical Test Results

1987 Robertson Road, Ottawa, Ontario

Parameter	Units	MDL	Regulation	Sample														
				MW1-GW1	MW2-GW1	MW3-GW1	MW5-GW1	MW3-GW	MW5-GW1 (BH5)	MW6-GW1 (BH6)	MW1-GW1	MW3-GW2	BH5-GW2	MW3-GW3	BH12-GW1	BH1-22-GW1	BH2-22-GW1	DUP1-GW1
Sample Depth (m)			Reg 153/04 (2011) - Table 3 Residential, coarse	N/A	N/A	N/A	N/A	N/A	4.14-7.14	3.27-6.27	N/A	N/A	4.14-7.14	N/A	1.5-2.1	1.88-4.57	3.60-5.11	0.15-0.30
Sample Date (m/d/y)				15-Mar-12	15-Mar-12	15-Mar-12	15-Mar-12	26-Jul-18	26-Jul-18	26-Jul-18	21-Oct-19	21-Oct-19	21-Oct-19	26-Jul-18	22-Apr-22	03-May-22	03-May-22	03-May-22
Volatiles																		
Acetone	ug/L	5.0	130000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	34.7	ND (5.0)	N/A
Benzene	ug/L	0.5	44 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Bromodichloromethane	ug/L	0.5	85000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Bromoform	ug/L	0.5	380 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Bromomethane	ug/L	0.5	5.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Carbon Tetrachloride	ug/L	0.2	0.79 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	N/A
Chlorobenzene	ug/L	0.5	630 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Chloroform	ug/L	0.5	2.4 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Dibromochloromethane	ug/L	0.5	82000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Dichlorodifluoromethane	ug/L	1.0	4400 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	N/A
1,2-Dichlorobenzene	ug/L	0.5	4600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,3-Dichlorobenzene	ug/L	0.5	9600 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,4-Dichlorobenzene	ug/L	0.5	8 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1-Dichloroethane	ug/L	0.5	320 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,2-Dichloroethane	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
cis-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
trans-1,2-Dichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,2-Dichloropropane	ug/L	0.5	16 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
cis-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
trans-1,3-Dichloropropylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,3-Dichloropropene, total	ug/L	0.5	5.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Ethylbenzene	ug/L	0.5	2300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Ethylene dibromide (dibromoethane, 1,2-)	ug/L	0.2	0.25 ug/L	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	N/A
Hexane	ug/L	1.0	51 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	N/A
Methyl Ethyl Ketone (2-Butanone)	ug/L	5.0	470000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	N/A
Methyl Isobutyl Ketone	ug/L	5.0	140000 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	N/A
Methyl tert-butyl ether	ug/L	2.0	190 ug/L	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	N/A
Methylene Chloride	ug/L	5.0	610 ug/L	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)	N/A
Styrene	ug/L	0.5	1300 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1,1,2-Tetrachloroethane	ug/L	0.5	3.3 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1,2,2-Tetrachloroethane	ug/L	0.5	3.2 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Tetrachloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Toluene	ug/L	0.5	18000 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1,1-Trichloroethane	ug/L	0.5	640 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
1,1,2-Trichloroethane	ug/L	0.5	4.7 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Trichloroethylene	ug/L	0.5	1.6 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Trichlorofluoromethane	ug/L	1.0	2500 ug/L	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	N/A
Vinyl Chloride	ug/L	0.5	0.5 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
m/p-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
o-Xylene	ug/L	0.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Xylenes, total	ug/L	0.5	4200 ug/L	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	N/A
Semi-Volatiles																		
F1 PHCs (C6-C10)	ug/L	25	750 ug/L	N/A	N/A	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (0.02)	ND (0.02)
F2 PHCs (C10-C16)	ug/L	100	150 ug/L	N/A	N/A	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (25)	ND (25)	ND (25)	ND (100)	ND (100)	ND (100)	ND (0.02)	ND (0.02)
F3 PHCs (C16-C34)	ug/L	100	500 ug/L	N/A	N/A	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (25)	ND (25)	ND (25)	ND (100)	ND (100)	ND (100)	ND (0.02)	ND (0.02)
F4 PHCs (C34-C50)	ug/L	100	500 ug/L	N/A	N/A	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (25)	ND (25)	ND (25)	ND (100)	ND (100)	ND (100)	ND (0.02)	ND (0.02)

Notes

	Result exceeds applicable site condition standard
MDL	Method Detection Limit
NA	Not Reported
ND	Not Detected

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Timm Road Extension & 295 Moodie Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4378

REMARKS

HOLE NO. BH 1-22

BORINGS BY CME-55 Low Clearance Drill **DATE** April 22, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.17
FILL: Crushed stone and gravel 0.23		AU	1				
Hard to very stiff, brown **SILTY CLAY**		SS	2	58	18	1	88.17
1.68		SS	3	29	50+		
GLACIAL TILL: Dense, brown silty clay with gravel, some sand, cobbles and boulders 1.88		RC	1	91	91	2	87.17
BEDROCK: Excellent quality, grey sandstone		RC	2	100	100	3	86.17
						4	85.17
4.57							
End of Borehole							
(GWL @ 1.17m - May 3, 2022)							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Timm Road Extension & 295 Moodie Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4378

REMARKS

HOLE NO. BH 2-22

BORINGS BY CME-55 Low Clearance Drill **DATE** April 22, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	89.17
FILL: Crushed stone with sand 0.23		AU	1				
FILL: Brown silty sand		SS	2	42	4	1	88.17
		SS	3	17	5	2	87.17
2.34							
BEDROCK: Excellent quality, grey sandstone		RC	1	100	93	3	86.17
- fair quality from 3.1 to 4.6m depth		RC	2	97	59	4	85.17
- vertical fracture from 3.2 to 3.4m depth		RC	3	100	90	5	84.17
5.11							
End of Borehole							
(GWL @ 1.74m - May 3, 2022)							

Photo Ionization Detector

● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Timm Road Extension & 295 Moodie Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4378

REMARKS

HOLE NO. BH 3-22

BORINGS BY CME-55 Low Clearance Drill **DATE** April 22, 2022

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: Crushed stone with sand		AU	1			0	87.50		
0.69									
Very stiff to stiff, brown **CLAYEY SILT** with sand		SS	2	50	10	1	86.50		
		SS	3	67	6				
2.13						2	85.50		
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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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Timm Road Extension & 295 Moodie Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4378

REMARKS

HOLE NO. BH 4-22

BORINGS BY CME-55 Low Clearance Drill **DATE** April 22, 2022

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: Crushed stone with sand and organics, trace clay		AU	1			0	87.61		
0.69									
Loose, brown **SANDY SILT**		SS	2	58	9	1	86.61		
		SS	3	100	9				
2.13						2	85.61		
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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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Proposed Timm Road Extension & 295 Moodie Drive
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE4378

REMARKS

HOLE NO. BH 5-22

BORINGS BY CME-55 Low Clearance Drill **DATE** April 22, 2022

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.30
FILL: Topsoil with crushed stone		AU	1				
0.69							
Loose, brown **SANDY SILT**		SS	2	92	8	1	86.30
		SS	3	100	7		
2.13						2	85.30
End of Borehole							

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the 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

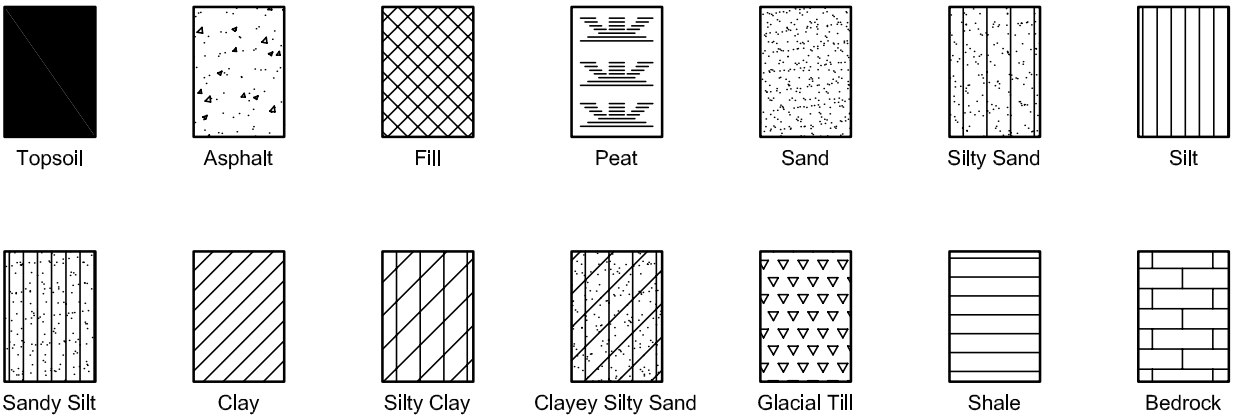
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

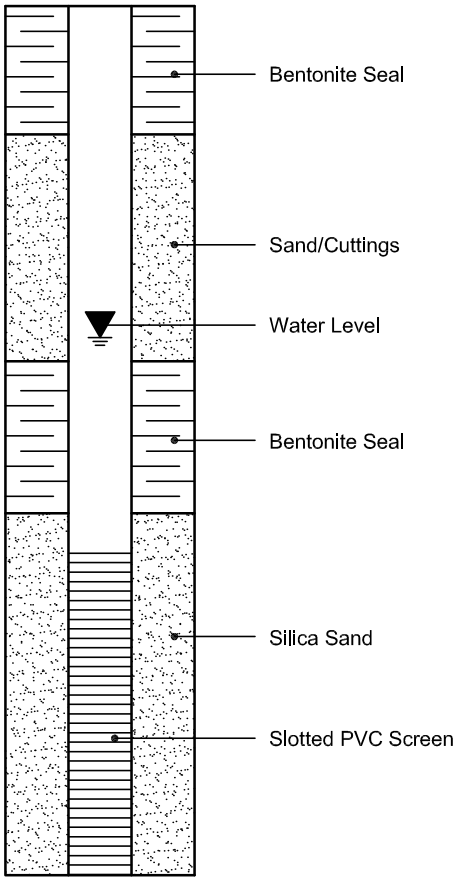
SYMBOLS AND TERMS (continued)

STRATA PLOT

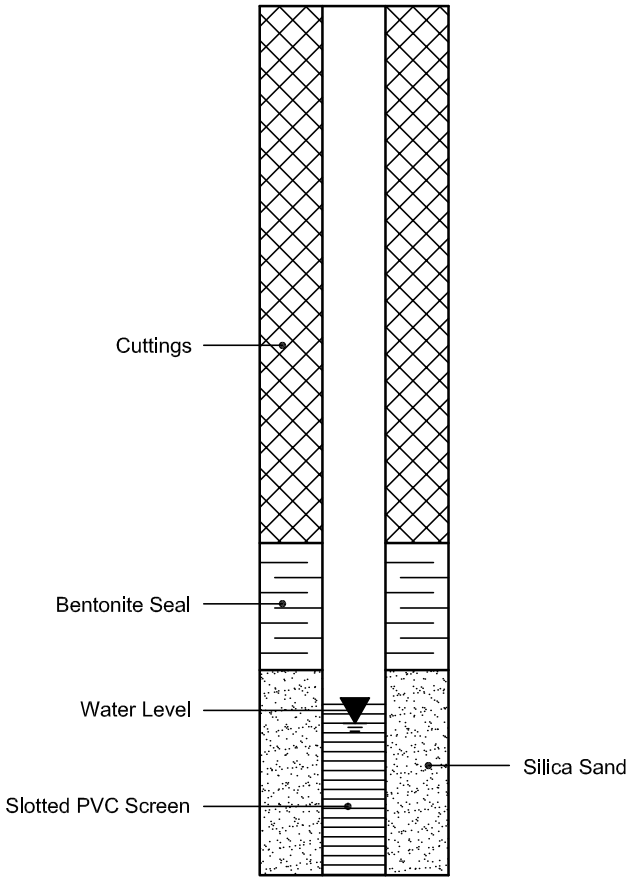


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: Eric Leveque

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

Client PO: 12046
Project: PE2552
Custody: 92088

Report Date: 14-Mar-2012
Order Date: 9-Mar-2012
Order #: 1210234

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

Paracel ID	Client ID
1210234-01	BH2-SS1
1210234-02	BH6-SS6

Approved By:

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

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046 Project Description: PE2552

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	13-Mar-12	13-Mar-12
Mercury	EPA 7471A - CVAA, digestion	13-Mar-12	13-Mar-12
Metals	EPA 6020 - Digestion - ICP-MS	13-Mar-12	13-Mar-12
PAHs by GC-MS, standard scan	EPA 8270 - GC-MS, extraction	12-Mar-12	13-Mar-12
Solids, %	Gravimetric, calculation	12-Mar-12	12-Mar-12

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046

Project Description: PE2552

	Client ID:	BH2-SS1	BH6-SS6	-	-
	Sample Date:	08-Mar-12	08-Mar-12	-	-
	Sample ID:	1210234-01	1210234-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	84.6	76.8	-	-
Metals					
Antimony	1 ug/g dry	-	<1	-	-
Arsenic	1 ug/g dry	-	1	-	-
Barium	1 ug/g dry	-	156	-	-
Beryllium	0.5 ug/g dry	-	<0.5	-	-
Boron	5.0 ug/g dry	-	<5.0	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5 ug/g dry	-	32	-	-
Chromium (VI)	0.2 ug/g dry	-	<0.2	-	-
Cobalt	1 ug/g dry	-	9	-	-
Copper	5 ug/g dry	-	18	-	-
Lead	1 ug/g dry	-	10	-	-
Mercury	0.1 ug/g dry	-	<0.1	-	-
Molybdenum	1 ug/g dry	-	<1	-	-
Nickel	5 ug/g dry	-	18	-	-
Selenium	1 ug/g dry	-	<1	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1 ug/g dry	-	<1	-	-
Uranium	1 ug/g dry	-	<1	-	-
Vanadium	10 ug/g dry	-	44	-	-
Zinc	20 ug/g dry	-	56	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	7.42	-	-	-
Acenaphthylene	0.02 ug/g dry	1.30	-	-	-
Anthracene	0.02 ug/g dry	16.9	-	-	-
Benzo [a] anthracene	0.02 ug/g dry	11.2	-	-	-
Benzo [a] pyrene	0.02 ug/g dry	3.64	-	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	7.72	-	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.77	-	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	4.43	-	-	-
Biphenyl	0.02 ug/g dry	0.54	-	-	-
Chrysene	0.02 ug/g dry	10.5	-	-	-

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046

Project Description: PE2552

	Client ID:	BH2-SS1	BH6-SS6	-	-
	Sample Date:	08-Mar-12	08-Mar-12	-	-
	Sample ID:	1210234-01	1210234-02	-	-
	MDL/Units	Soil	Soil	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.40 [1]	-	-	-
Fluoranthene	0.02 ug/g dry	44.3	-	-	-
Fluorene	0.02 ug/g dry	7.93	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.81	-	-	-
1-Methylnaphthalene	0.02 ug/g dry	1.26	-	-	-
2-Methylnaphthalene	0.02 ug/g dry	1.28	-	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	2.55	-	-	-
Naphthalene	0.01 ug/g dry	0.35	-	-	-
Phenanthrene	0.02 ug/g dry	43.5	-	-	-
Pyrene	0.02 ug/g dry	33.6	-	-	-
2-Fluorobiphenyl	Surrogate	78.2%	-	-	-
Terphenyl-d14	Surrogate	74.4%	-	-	-

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046 Project Description: PE2552

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	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	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	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						
Biphenyl	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	*0.944*		*ug/g*		*70.8*	*50-140*			
Surrogate: Terphenyl-d14	*0.846*		*ug/g*		*63.5*	*50-140*			

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046

Project Description: PE2552

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	1.0	1	ug/g dry	1.2			16.7	30	
Arsenic	ND	1	ug/g dry	3.7			0.0	30	
Barium	226	1	ug/g dry	195			14.6	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	12.6	5.0	ug/g dry	15.3			19.3	30	
Cadmium	ND	0.5	ug/g dry	3.06			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	20.8	5	ug/g dry	19.5			6.2	30	
Cobalt	3.7	1	ug/g dry	3.3			10.4	30	
Copper	448	5	ug/g dry	440			1.8	30	
Lead	270	1	ug/g dry	239			12.2	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	35	
Molybdenum	ND	1	ug/g dry	1.7			0.0	30	
Nickel	15.8	5	ug/g dry	17.6			10.8	30	
Selenium	ND	1	ug/g dry	1.1			0.0	30	
Silver	ND	0.3	ug/g dry	0.35			0.0	30	
Thallium	ND	1	ug/g dry	ND			0.0	30	
Uranium	ND	1	ug/g dry	ND			0.0	30	
Vanadium	10.4	10	ug/g dry	ND			0.0	30	
Zinc	615	20	ug/g dry	602			2.2	30	
Physical Characteristics									
% Solids	83.3	0.1	% by Wt.	83.5			0.2	25	
Semi-Volatiles									
Acenaphthene	0.021	0.02	ug/g dry	ND			0.0	40	
Acenaphthylene	0.022	0.02	ug/g dry	ND			0.0	40	
Anthracene	0.075	0.02	ug/g dry	0.034			76.2	40	QR-04
Benzo [a] anthracene	0.628	0.02	ug/g dry	0.367			52.6	40	QR-04
Benzo [a] pyrene	0.793	0.02	ug/g dry	0.457			53.8	40	QR-04
Benzo [b] fluoranthene	1.78	0.02	ug/g dry	1.01			55.5	40	QR-04
Benzo [g,h,i] perylene	0.548	0.02	ug/g dry	0.348			44.7	40	QR-04
Benzo [k] fluoranthene	0.784	0.02	ug/g dry	0.419			60.7	40	QR-04
Biphenyl	ND	0.02	ug/g dry	ND				40	
Chrysene	1.05	0.02	ug/g dry	0.620			51.7	40	QR-04
Dibenzo [a,h] anthracene	0.102	0.02	ug/g dry	ND			0.0	40	
Fluoranthene	1.77	0.02	ug/g dry	0.962			59.0	40	QR-04
Fluorene	0.023	0.02	ug/g dry	ND			0.0	40	
Indeno [1,2,3-cd] pyrene	0.458	0.02	ug/g dry	0.284			46.8	40	QR-04
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	0.021			0.0	40	
Phenanthrene	0.406	0.02	ug/g dry	0.236			53.3	40	QR-04
Pyrene	1.66	0.02	ug/g dry	0.875			62.1	40	QR-04
Surrogate: 2-Fluorobiphenyl	*1.69*		*ug/g dry*	*ND*	*57.0*	*50-140*			
Surrogate: Terphenyl-d14	*1.46*		*ug/g dry*	*ND*	*49.5*	*50-140*			*ORG05*

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046 Project Description: PE2552

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	40.0		ug/L	0.5	79.0	70-130			
Arsenic	38.8		ug/L	1.5	74.7	70-130			
Barium	109		ug/L	78.0	61.7	70-130			QS-02
Beryllium	46.2		ug/L	0.08	92.2	70-130			
Boron	53.5		ug/L	6.1	94.7	70-130			
Cadmium	38.5		ug/L	1.23	74.5	70-130			
Chromium (VI)	1.0	0.2	ug/g	ND	18.5	89-123			QM-05
Chromium	59.8		ug/L	7.8	104	70-130			
Cobalt	48.9		ug/L	1.3	95.2	70-130			
Copper	46.4		ug/L	ND	92.8	70-130			
Lead	45.7		ug/L	ND	91.5	70-130			
Mercury	1.31	0.1	ug/g	ND	87.4	72-128			
Molybdenum	38.3		ug/L	0.7	75.3	70-130			
Nickel	52.7		ug/L	7.0	91.4	70-130			
Selenium	39.1		ug/L	0.4	77.3	70-130			
Silver	34.7		ug/L	0.14	69.2	70-130			QS-02
Thallium	51.8		ug/L	0.05	103	70-130			
Uranium	50.8		ug/L	0.1	101	70-130			
Vanadium	61.4		ug/L	3.8	115	70-130			
Zinc	43.4		ug/L	ND	86.8	70-130			
Semi-Volatiles									
Acenaphthene	0.283	0.02	ug/g	ND	54.0	50-140			
Acenaphthylene	0.268	0.02	ug/g	ND	51.2	50-140			
Anthracene	0.291	0.02	ug/g	ND	55.5	50-140			
Benzo [a] anthracene	0.604	0.02	ug/g	0.201	77.0	50-140			
Benzo [a] pyrene	0.631	0.02	ug/g	0.251	72.5	50-140			
Benzo [b] fluoranthene	1.05	0.02	ug/g	0.489	106	50-140			
Benzo [g,h,i] perylene	0.496	0.02	ug/g	0.186	59.2	50-140			
Benzo [k] fluoranthene	0.682	0.02	ug/g	0.325	68.2	50-140			
Biphenyl	0.285	0.02	ug/g	ND	54.4	50-140			
Chrysene	0.825	0.02	ug/g	0.366	87.6	50-140			
Dibenzo [a,h] anthracene	0.290	0.02	ug/g	ND	55.3	50-140			
Fluoranthene	1.22	0.02	ug/g	0.630	113	50-140			
Fluorene	0.285	0.02	ug/g	ND	54.4	50-140			
Indeno [1,2,3-cd] pyrene	0.440	0.02	ug/g	0.146	56.1	50-140			
1-Methylnaphthalene	0.271	0.02	ug/g	ND	51.7	50-140			
2-Methylnaphthalene	0.288	0.02	ug/g	ND	55.1	50-140			
Naphthalene	0.320	0.01	ug/g	ND	61.0	50-140			
Phenanthrene	0.540	0.02	ug/g	0.211	62.8	50-140			
Pyrene	1.14	0.02	ug/g	0.597	104	50-140			
Surrogate: 2-Fluorobiphenyl	*2.23*		*ug/g*		*53.3*	*50-140*			

Certificate of Analysis

Report Date: 14-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:9-Mar-2012

Client PO: 12046 Project Description: PE2552

Sample and QC Qualifiers Notes

1- GEN07 :	Elevated detection limit because of dilution required due to high target analyte concentration.
2- ORG05 :	PAH surrogate recovery lower than normal - possible matrix interference - surrogate recoveries for in-run QC and other samples were acceptable.
3- QM-05 :	The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.
4- QR-04 :	Duplicate results exceeds RPD limits due to non-homogeneous matrix.
5- QS-02 :	Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

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Chain of Custody
(Lab Use Only)
No. 92088

Page __ of __

Client Name: PATERSON GROUP	Project Reference: PE 2552	TAT: [✓] Regular [ ] 3 Day
Contact Name: ERIC LEVEQUE	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 COLONNADE ROAD SOUTH	PO # 12046	Date Required:
Telephone: 226-7381	Email Address: elevequee@patersongroup.ca	

Criteria: [ ] O. Reg. 153/04 Table __ [✓] O. Reg. 153/11 (Current) Table 3 [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [ ] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

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

Required Analyses

Paracel Order Number: 1210234

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP/MS	Hg	CrVI	B (HWS)	Metals (ICP/MS)						
1	BH2-SS1	S		1	Mar 8/12				✓					✓			250	ml		
2	BH6-SS6	S		1	"	"								✓			"			
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Subsurface samples per Eric. -MC

Method of Delivery: Swift

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Mar 9/12 Eric Leveque	BC	MC	MC
Date/Time:	Date/Time:	Date/Time: Mar 9/12 1:10	Date/Time: Mar 9/12 2:14
Date/Time:	Temperature: ____ °C	Temperature: 13.7 °C	pH Verified [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 23572
Project: PE4378
Custody: 118689

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018

Order #: 1829080

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

Paracel ID	Client ID
1829080-01	BH1-18-AU1
1829080-02	BH3-18-AU1
1829080-03	BH4-18-AU1
1829080-04	BH5-18-AU1
1829080-05	BH6-18-AU1
1829080-06	BH8-18-AU1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	19-Jul-18	20-Jul-18
PHC F1	CWS Tier 1 - P&T GC-FID	19-Jul-18	20-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Jul-18	19-Jul-18
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	18-Jul-18	19-Jul-18
Solids, %	Gravimetric, calculation	20-Jul-18	20-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

	Client ID:	BH1-18-AU1	BH3-18-AU1	BH4-18-AU1	BH5-18-AU1
	Sample Date:	07/12/2018 09:00	07/12/2018 09:00	07/12/2018 09:00	07/12/2018 09:00
	Sample ID:	1829080-01	1829080-02	1829080-03	1829080-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	99.0	99.7	99.8	99.8
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	-	<1.0	1.3
Barium	1.0 ug/g dry	61.1	-	31.3	113
Beryllium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Boron	5.0 ug/g dry	<5.0	-	<5.0	6.9
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	<0.5
Chromium	5.0 ug/g dry	12.8	-	8.6	16.4
Cobalt	1.0 ug/g dry	4.5	-	3.4	6.0
Copper	5.0 ug/g dry	9.9	-	8.6	13.7
Lead	1.0 ug/g dry	14.9	-	3.4	15.7
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Nickel	5.0 ug/g dry	10.3	-	5.8	14.8
Selenium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	-	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	21.2	-	21.8	19.5
Zinc	20.0 ug/g dry	43.7	-	21.0	73.7
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	84.3%	93.5%	88.1%	86.7%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	27	<8	<8	40
F4 PHCs (C34-C50)	6 ug/g dry	13	<6	<6	26

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

	Client ID:	BH6-18-AU1	BH8-18-AU1	-	-
	Sample Date:	07/12/2018 09:00	07/12/2018 09:00	-	-
	Sample ID:	1829080-05	1829080-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	97.0	99.2	-	-
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	<1.0	-	-
Barium	1.0 ug/g dry	-	77.3	-	-
Beryllium	0.5 ug/g dry	-	<0.5	-	-
Boron	5.0 ug/g dry	-	<5.0	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	15.9	-	-
Cobalt	1.0 ug/g dry	-	5.4	-	-
Copper	5.0 ug/g dry	-	12.8	-	-
Lead	1.0 ug/g dry	-	11.4	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	11.2	-	-
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	-	24.4	-	-
Zinc	20.0 ug/g dry	-	40.0	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	84.4%	86.6%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	21	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	20	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 23572

Report Date: 20-Jul-2018
Order Date: 16-Jul-2018
Project Description: PE4378

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Volatiles									
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	*2.80*		*ug/g*		*87.5*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	ND	1.0	ug/g dry	ND			0.0	30	
Barium	58.0	1.0	ug/g dry	61.1			5.3	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	ND	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	11.7	5.0	ug/g dry	12.8			9.0	30	
Cobalt	4.2	1.0	ug/g dry	4.5			7.4	30	
Copper	10.3	5.0	ug/g dry	9.9			4.6	30	
Lead	14.1	1.0	ug/g dry	14.9			5.6	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	9.2	5.0	ug/g dry	10.3			11.1	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	20.0	10.0	ug/g dry	21.2			6.1	30	
Zinc	42.0	20.0	ug/g dry	43.7			4.0	30	
Physical Characteristics									
% Solids	95.1	0.1	% by Wt.	95.1			0.0	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.83*		*ug/g dry*		*99.4*	*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)	211	7	ug/g		106	80-120			
F2 PHCs (C10-C16)	84	4	ug/g	ND	87.0	60-140			
F3 PHCs (C16-C34)	197	8	ug/g	ND	83.5	60-140			
F4 PHCs (C34-C50)	112	6	ug/g	ND	74.7	60-140			
Metals									
Antimony	35.8		ug/L	ND	71.7	70-130			
Arsenic	37.4		ug/L	ND	74.4	70-130			
Barium	67.1		ug/L	24.4	85.3	70-130			
Beryllium	39.8		ug/L	ND	79.7	70-130			
Boron	46.0		ug/L	ND	91.3	70-130			
Cadmium	36.2		ug/L	ND	72.3	70-130			
Chromium	45.1		ug/L	5.1	80.0	70-130			
Cobalt	42.6		ug/L	1.8	81.6	70-130			
Copper	43.2		ug/L	ND	78.5	70-130			
Lead	48.4		ug/L	6.0	84.9	70-130			
Molybdenum	36.6		ug/L	ND	72.9	70-130			
Nickel	43.7		ug/L	ND	79.2	70-130			
Selenium	40.6		ug/L	ND	81.0	70-130			
Silver	36.2		ug/L	ND	72.4	70-130			
Thallium	43.9		ug/L	ND	87.7	70-130			
Uranium	45.8		ug/L	ND	91.2	70-130			
Vanadium	49.4		ug/L	ND	81.8	70-130			
Zinc	55.0		ug/L	ND	75.0	70-130			
Volatiles									
Benzene	2.67	0.02	ug/g		66.8	60-130			
Ethylbenzene	3.95	0.05	ug/g		98.7	60-130			
Toluene	3.72	0.05	ug/g		92.9	60-130			
m,p-Xylenes	7.28	0.05	ug/g		91.0	60-130			
o-Xylene	3.78	0.05	ug/g		94.5	60-130			
Surrogate: Toluene-d8	*2.89*		*ug/g*		*90.4*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

Paracel ID: 1829080

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Chain of Custody (Lab Use Only)
№ 118689

Page 1 of 1

Client Name: Paterson Group		Project Reference: PE4378	
Contact Name: Mark D'Arcy		Quote #	
Address:		PO # 23572	
Telephone: 226-7381		Email Address:	

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

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

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

Paracel Order Number: 1829080

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)						
1	BH1-18-AU1	S	-	2	July 12/18	see	✓			✓						250ml + 1 vial			
2	BH3-18-AU1	S	-	2	"	jars	✓									↓			
3	BH4-18-AU1	S	-	2	"		✓			✓						↓			
4	BH5-18-AU1	S	-	2	"		✓			✓						↓			
5	BH6-18-AU1	S	-	2	"		✓									↓			
6	BH8-18-AU1	S	-	2	"		✓			✓						↓			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Trouve	Received at Lab: Sumporn Dohmai	Verified By: [signature]
Relinquished By (Print): Admin M	Date/Time: 16/07/18 3:10	Date/Time: Jul 16, 2018 03.45	Date/Time: 071618 4:21p
Date/Time: July 16 2018	Temperature: °C PH	Temperature: 17.5 °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: 31834
Project: PE4378
Custody: 137029

Report Date: 5-May-2022
Order Date: 28-Apr-2022

Order #: 2218586

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

Paracel ID	Client ID
2218586-01	BH1-22-SS3
2218586-02	BH2-22-SS3
2218586-03	BH4-22-AU1
2218586-04	BH5-22-AU1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31834

Report Date: 05-May-2022

Order Date: 28-Apr-2022

Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	3-May-22	3-May-22
PHC F1	CWS Tier 1 - P&T GC-FID	3-May-22	3-May-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	2-May-22	4-May-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	3-May-22	3-May-22
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	2-May-22	4-May-22
Solids, %	Gravimetric, calculation	3-May-22	3-May-22

Certificate of Analysis

Report Date: 05-May-2022

Client: **Paterson Group Consulting Engineers**

Order Date: 28-Apr-2022

Client PO: **31834**

Project Description: PE4378

	Client ID:	BH1-22-SS3	BH2-22-SS3	BH4-22-AU1	BH5-22-AU1
	Sample Date:	22-Apr-22 09:00	22-Apr-22 09:00	22-Apr-22 09:00	22-Apr-22 09:00
	Sample ID:	2218586-01	2218586-02	2218586-03	2218586-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	82.6	85.6	88.1	80.7
Metals					
Antimony	1.0 ug/g dry	-	-	<1.0	1.1
Arsenic	1.0 ug/g dry	-	-	3.0	15.3
Barium	1.0 ug/g dry	-	-	122	134
Beryllium	0.5 ug/g dry	-	-	<0.5	<0.5
Boron	5.0 ug/g dry	-	-	<5.0	5.7
Cadmium	0.5 ug/g dry	-	-	<0.5	<0.5
Chromium	5.0 ug/g dry	-	-	32.1	43.2
Cobalt	1.0 ug/g dry	-	-	8.7	9.0
Copper	5.0 ug/g dry	-	-	25.2	37.6
Lead	1.0 ug/g dry	-	-	6.2	98.3
Molybdenum	1.0 ug/g dry	-	-	<1.0	<1.0
Nickel	5.0 ug/g dry	-	-	19.2	20.3
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	-	-	39.6	40.5
Zinc	20.0 ug/g dry	-	-	49.8	437
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene-d8	Surrogate	121%	117%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	25	24	-	-
F4 PHCs (C34-C50)	6 ug/g dry	49	45	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	-	-	<0.02	<0.02

Certificate of Analysis

Report Date: 05-May-2022

Client: **Paterson Group Consulting Engineers**

Order Date: 28-Apr-2022

Client PO: **31834**

Project Description: PE4378

	Client ID:	BH1-22-SS3	BH2-22-SS3	BH4-22-AU1	BH5-22-AU1
	Sample Date:	22-Apr-22 09:00	22-Apr-22 09:00	22-Apr-22 09:00	22-Apr-22 09:00
	Sample ID:	2218586-01	2218586-02	2218586-03	2218586-04
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthylene	0.02 ug/g dry	-	-	<0.02	<0.02
Anthracene	0.02 ug/g dry	-	-	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	-	-	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	-	-	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	-	-	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	-	-	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	-	-	<0.02	<0.02
Chrysene	0.02 ug/g dry	-	-	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	-	-	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	-	-	<0.02	<0.02
Fluorene	0.02 ug/g dry	-	-	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	-	-	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	-	-	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	-	-	<0.04	<0.04
Naphthalene	0.01 ug/g dry	-	-	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	-	-	<0.02	<0.02
Pyrene	0.02 ug/g dry	-	-	<0.02	<0.02
2-Fluorobiphenyl	Surrogate	-	-	109%	124%
Terphenyl-d14	Surrogate	-	-	127%	131%

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	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	*1.54*		*ug/g*		*116*	*50-140*			
Surrogate: Terphenyl-d14	*1.78*		*ug/g*		*134*	*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	*8.39*		*ug/g*		*105*	*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	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	ug/g	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	ug/g	ND			NC	30	
Metals									
Antimony	1.6	1.0	ug/g	ND			NC	30	
Arsenic	3.0	1.0	ug/g	2.9			4.8	30	
Barium	316	1.0	ug/g	309			2.2	30	
Beryllium	0.7	0.5	ug/g	0.7			2.0	30	
Boron	5.8	5.0	ug/g	5.3			8.2	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium	104	5.0	ug/g	98.6			5.4	30	
Cobalt	18.7	1.0	ug/g	17.8			5.0	30	
Copper	46.2	5.0	ug/g	44.3			4.3	30	
Lead	10.4	1.0	ug/g	10.1			2.7	30	
Molybdenum	ND	1.0	ug/g	ND			NC	30	
Nickel	57.0	5.0	ug/g	55.1			3.4	30	
Selenium	ND	1.0	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1.0	ug/g	ND			NC	30	
Uranium	ND	1.0	ug/g	ND			NC	30	
Vanadium	85.5	10.0	ug/g	81.8			4.5	30	
Zinc	107	20.0	ug/g	104			2.6	30	
Physical Characteristics									
% Solids	85.0	0.1	% by Wt.	85.3			0.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g	ND			NC	40	
Anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g	ND			NC	40	
Chrysene	ND	0.02	ug/g	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g	ND			NC	40	
Fluoranthene	ND	0.02	ug/g	ND			NC	40	
Fluorene	ND	0.02	ug/g	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g	ND			NC	40	
Naphthalene	ND	0.01	ug/g	ND			NC	40	
Phenanthrene	ND	0.02	ug/g	ND			NC	40	
Pyrene	ND	0.02	ug/g	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.58*		*ug/g*		*105*	*50-140*			
Surrogate: Terphenyl-d14	*1.80*		*ug/g*		*119*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
Surrogate: Toluene-d8	*10.8*		*ug/g*		*115*	*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)	204	7	ug/g	ND	102	80-120			
F2 PHCs (C10-C16)	108	4	ug/g	ND	99.5	60-140			
F3 PHCs (C16-C34)	273	8	ug/g	ND	103	60-140			
F4 PHCs (C34-C50)	203	6	ug/g	ND	120	60-140			
Metals									
Antimony	35.2	1.0	ug/g	ND	70.1	70-130			
Arsenic	49.6	1.0	ug/g	1.2	97.0	70-130			
Barium	188	1.0	ug/g	124	128	70-130			
Beryllium	48.3	0.5	ug/g	ND	96.0	70-130			
Boron	46.5	5.0	ug/g	ND	88.7	70-130			
Cadmium	44.0	0.5	ug/g	ND	87.9	70-130			
Chromium	95.3	5.0	ug/g	39.4	112	70-130			
Cobalt	56.5	1.0	ug/g	7.1	98.8	70-130			
Copper	65.6	5.0	ug/g	17.7	95.8	70-130			
Lead	47.4	1.0	ug/g	4.0	86.8	70-130			
Molybdenum	47.6	1.0	ug/g	ND	94.8	70-130			
Nickel	71.7	5.0	ug/g	22.0	99.4	70-130			
Selenium	45.9	1.0	ug/g	ND	91.4	70-130			
Silver	37.5	0.3	ug/g	ND	75.0	70-130			
Thallium	46.4	1.0	ug/g	ND	92.5	70-130			
Uranium	48.0	1.0	ug/g	ND	95.6	70-130			
Vanadium	88.9	10.0	ug/g	32.7	112	70-130			
Zinc	90.1	20.0	ug/g	41.7	96.8	70-130			
Semi-Volatiles									
Acenaphthene	0.247	0.02	ug/g	ND	131	50-140			
Acenaphthylene	0.212	0.02	ug/g	ND	112	50-140			
Anthracene	0.192	0.02	ug/g	ND	101	50-140			
Benzo [a] anthracene	0.200	0.02	ug/g	ND	105	50-140			
Benzo [a] pyrene	0.211	0.02	ug/g	ND	111	50-140			
Benzo [b] fluoranthene	0.244	0.02	ug/g	ND	129	50-140			
Benzo [g,h,i] perylene	0.218	0.02	ug/g	ND	115	50-140			
Benzo [k] fluoranthene	0.259	0.02	ug/g	ND	137	50-140			
Chrysene	0.228	0.02	ug/g	ND	120	50-140			
Dibenzo [a,h] anthracene	0.242	0.02	ug/g	ND	128	50-140			
Fluoranthene	0.211	0.02	ug/g	ND	112	50-140			
Fluorene	0.213	0.02	ug/g	ND	113	50-140			
Indeno [1,2,3-cd] pyrene	0.235	0.02	ug/g	ND	124	50-140			
1-Methylnaphthalene	0.246	0.02	ug/g	ND	130	50-140			
2-Methylnaphthalene	0.265	0.02	ug/g	ND	140	50-140			
Naphthalene	0.251	0.01	ug/g	ND	133	50-140			
Phenanthrene	0.208	0.02	ug/g	ND	110	50-140			
Pyrene	0.206	0.02	ug/g	ND	109	50-140			
Surrogate: 2-Fluorobiphenyl	*2.03*		*ug/g*		*134*	*50-140*			
Surrogate: Terphenyl-d14	*2.08*		*ug/g*		*137*	*50-140*			
Volatiles									
Benzene	3.18	0.02	ug/g	ND	79.6	60-130			
Ethylbenzene	4.05	0.05	ug/g	ND	101	60-130			
Toluene	4.27	0.05	ug/g	ND	107	60-130			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 31834

Report Date: 05-May-2022

Order Date: 28-Apr-2022

Project Description: PE4378

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	7.93	0.05	ug/g	ND	99.1	60-130			
o-Xylene	3.94	0.05	ug/g	ND	98.5	60-130			
Surrogate: Toluene-d8	*8.23*		*ug/g*		*103*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2218586

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2218586	№ 137029

Page 1 of 1

Client Name: Paterson	Project Ref: PE4378
Contact Name: Mark D'Arcy	Quote #:
Address: 154 Colonnade	PO #: 31834
Telephone: 613 226 7381	E-mail: sberube@patersongroup.ca MDarcy@patersongroup.ca

Turnaround Time

☐ 1 day ☐ 3 day

☐ 2 day ☑ Regular

Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ 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)					
1	BH1-22-SS3	S		2	Apr 22		✓											
2	BH2-22-SS3	↓		2	↓		✓											
3	BH4-22-AU1	↓		1	↓				✓	✓								
4	BH5-22-AU1	↓		1	↓				✓	✓								
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): [signature]	Received By Driver/Depot: [signature]	Received at Lab: Sonequam Dhamai	Verified By: [signature]
Relinquished By (Print):	Date/Time: 28/04/22 4:00	Date/Time: APR 28, 2022 04.54	Date/Time: April 29, 22 10:57
Date/Time:	Temperature: °C PH.	Temperature: 13.3 °C	pH Verified: ☐ By:

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Certificate of Analysis

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

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

Client PO: 12049
Project: PE2552
Custody: 1686

Report Date: 20-Mar-2012
Order Date: 16-Mar-2012
Order #: 1211246

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

Paracel ID	Client ID
1211246-01	MW1-GW1
1211246-02	MW2-GW1
1211246-03	MW3-GW1
1211246-04	MW5-GW1

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049 Project Description: PE2552

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	16-Mar-12	19-Mar-12
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	19-Mar-12	20-Mar-12
VOCs	EPA 624 - P&T GC-MS	16-Mar-12	19-Mar-12

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049

Project Description: PE2552

	Client ID:	MW1-GW1	MW2-GW1	MW3-GW1	MW5-GW1
	Sample Date:	15-Mar-12	15-Mar-12	15-Mar-12	15-Mar-12
	Sample ID:	1211246-01	1211246-02	1211246-03	1211246-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	<3.0
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	<10.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049

Project Description: PE2552

	Client ID:	MW1-GW1	MW2-GW1	MW3-GW1	MW5-GW1
	Sample Date:	15-Mar-12	15-Mar-12	15-Mar-12	15-Mar-12
	Sample ID:	1211246-01	1211246-02	1211246-03	1211246-04
	MDL/Units	Water	Water	Water	Water
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	100%	98.7%	100%	98.8%
Dibromofluoromethane	Surrogate	110%	105%	104%	105%
Toluene-d8	Surrogate	106%	106%	106%	104%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	<25	<25
F2 PHCs (C10-C16)	100 ug/L	-	-	<100	<100
F3 PHCs (C16-C34)	100 ug/L	-	-	<100	<100
F4 PHCs (C34-C50)	100 ug/L	-	-	<100	<100
F1 + F2 PHCs	125 ug/L	-	-	<125	<125
F3 + F4 PHCs	200 ug/L	-	-	<200	<200

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049 Project Description: PE2552

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*31.4*		*ug/L*		*98.3*	*50-140*			
Surrogate: Dibromofluoromethane	*29.9*		*ug/L*		*93.4*	*50-140*			
Surrogate: Toluene-d8	*36.0*		*ug/L*		*112*	*50-140*			

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049 Project Description: PE2552

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*31.8*		*ug/L*	*ND*	*99.4*	*50-140*			
Surrogate: Dibromofluoromethane	*30.0*		*ug/L*	*ND*	*93.9*	*50-140*			
Surrogate: Toluene-d8	*34.9*		*ug/L*	*ND*	*109*	*50-140*			

Certificate of Analysis

Client: **Paterson Group Consulting Engineers**

Client PO: 12049 Project Description: PE2552

Report Date: 20-Mar-2012

Order Date:16-Mar-2012

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1710	25	ug/L	ND	85.7	68-117			
F2 PHCs (C10-C16)	1350	100	ug/L	ND	84.3	60-140			
F3 PHCs (C16-C34)	3420	100	ug/L	ND	85.5	60-140			
F4 PHCs (C34-C50)	2310	100	ug/L	ND	96.2	60-140			
Volatiles									
Acetone	72.6	5.0	ug/L	ND	72.6	50-140			
Benzene	38.4	0.5	ug/L	ND	96.1	50-140			
Bromodichloromethane	38.6	0.5	ug/L	ND	96.4	50-140			
Bromoform	31.9	0.5	ug/L	ND	79.7	50-140			
Bromomethane	49.3	0.5	ug/L	ND	123	50-140			
Carbon Tetrachloride	30.6	0.2	ug/L	ND	76.5	50-140			
Chlorobenzene	39.9	0.5	ug/L	ND	99.6	50-140			
Chloroethane	34.4	1.0	ug/L	ND	86.0	50-140			
Chloroform	41.7	0.5	ug/L	ND	104	50-140			
Chloromethane	43.9	3.0	ug/L	ND	110	50-140			
Dibromochloromethane	33.5	0.5	ug/L	ND	83.8	50-140			
Dichlorodifluoromethane	52.5	1.0	ug/L	ND	131	50-140			
1,2-Dibromoethane	39.7	0.2	ug/L	ND	99.4	50-140			
1,2-Dichlorobenzene	37.6	0.5	ug/L	ND	94.1	50-140			
1,3-Dichlorobenzene	38.0	0.5	ug/L	ND	94.9	50-140			
1,4-Dichlorobenzene	37.6	0.5	ug/L	ND	94.0	50-140			
1,1-Dichloroethane	29.4	0.5	ug/L	ND	73.6	50-140			
1,2-Dichloroethane	40.0	0.5	ug/L	ND	100	50-140			
1,1-Dichloroethylene	42.3	0.5	ug/L	ND	106	50-140			
cis-1,2-Dichloroethylene	40.1	0.5	ug/L	ND	100	50-140			
trans-1,2-Dichloroethylene	44.1	0.5	ug/L	ND	110	50-140			
1,2-Dichloropropane	35.8	0.5	ug/L	ND	89.6	50-140			
cis-1,3-Dichloropropylene	39.2	0.5	ug/L	ND	98.0	50-140			
trans-1,3-Dichloropropylene	35.6	0.5	ug/L	ND	89.0	50-140			
Ethylbenzene	38.5	0.5	ug/L	ND	96.2	50-140			
Hexane	35.5	1.0	ug/L	ND	88.6	50-140			
Methyl Ethyl Ketone (2-Butanone)	73.2	5.0	ug/L	ND	73.2	50-140			
Methyl Butyl Ketone (2-Hexanone)	77.8	10.0	ug/L	ND	77.8	50-140			
Methyl Isobutyl Ketone	78.8	5.0	ug/L	ND	78.8	50-140			
Methyl tert-butyl ether	112	2.0	ug/L	ND	112	50-140			
Methylene Chloride	36.6	5.0	ug/L	ND	91.5	50-140			
Styrene	37.5	0.5	ug/L	ND	93.8	50-140			
1,1,1,2-Tetrachloroethane	38.4	0.5	ug/L	ND	95.9	50-140			
1,1,2,2-Tetrachloroethane	36.0	0.5	ug/L	ND	90.0	50-140			
Tetrachloroethylene	42.9	0.5	ug/L	ND	107	50-140			
Toluene	38.7	0.5	ug/L	ND	96.8	50-140			
1,2,4-Trichlorobenzene	36.4	0.5	ug/L	ND	91.0	50-140			
1,1,1-Trichloroethane	38.7	0.5	ug/L	ND	96.7	50-140			
1,1,2-Trichloroethane	38.4	0.5	ug/L	ND	96.0	50-140			
Trichloroethylene	40.9	0.5	ug/L	ND	102	50-140			
Trichlorofluoromethane	43.4	1.0	ug/L	ND	109	50-140			
1,3,5-Trimethylbenzene	41.8	0.5	ug/L	ND	104	50-140			
Vinyl chloride	46.8	0.5	ug/L	ND	117	50-140			
m,p-Xylenes	76.9	0.5	ug/L	ND	96.1	50-140			

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049 Project Description: PE2552

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
o-Xylene	39.1	0.5	ug/L	ND	97.6	50-140			
Surrogate: 4-Bromofluorobenzene	*31.0*		*ug/L*		*97.0*	*50-140*			

Certificate of Analysis

Report Date: 20-Mar-2012

Client: **Paterson Group Consulting Engineers**

Order Date:16-Mar-2012

Client PO: 12049 Project Description: PE2552

Sample and QC Qualifiers Notes

None

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

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

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www.paracellabs.com

Chain of Custody
(Lab Use Only)
Nº 1686

Page ___ of ___

Client Name: PATERSON GROUP	Project Reference: PE2552	TAT: [✓] Regular [ ] 3 Day
Contact Name: ERIC LEVEQUE	Quote #	[ ] 2 Day [ ] 1 Day
Address: 154 COLONNADE ROAD SOUTH	PO # 12049	Date Required:
Telephone: 226-7381	Email Address: elevequee@patersongroup.ca	

Criteria: [ ] O. Reg. 153/04 Table __ [✓] O. Reg. 153/11 (Current) Table 3 [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [ ] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality:_____ [ ] Other: _____

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

Required Analyses

Paracel Order Number: 1211246

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOC's	PHC's (F1-F4)
1	MW1-GW1	W		2	March 15/12		✓	
2	MW2-GW1	W		2	↓	↓	✓	
3	MW3-GW1	W		3			✓	✓
4	MW5-GW1	W		3	↓	↓	✓	✓
5								
6								
7								
8								
9								
10								

Comments:

Method of Delivery: Paracel.

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
ERIC LEVEQUE	M. Dcouse		MC
March 16/12	Date/Time: 16/03/12 1:06pm	Date/Time: Mar 16/12	Date/Time: Mar 16/12 1:55
Date/Time:	Temperature: ___ °C	Temperature: 13.1 °C 1:43p	pH Verified [ ] By: N/A

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 24809
Project: PE4378
Custody: 44338

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018

Order #: 1830513

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

Paracel ID	Client ID
1830513-01	MW3-GW
1830513-02	MW5-GW1
1830513-03	MW6-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	27-Jul-18	28-Jul-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	27-Jul-18	28-Jul-18
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	27-Jul-18	28-Jul-18

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

	Client ID:	MW3-GW	MW5-GW1	MW6-GW1	-
	Sample Date:	07/26/2018 09:00	07/26/2018 09:00	07/26/2018 09:00	-
	Sample ID:	1830513-01	1830513-02	1830513-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 24809

Report Date: 31-Jul-2018
Order Date: 26-Jul-2018
Project Description: PE4378

	Client ID:	MW3-GW	MW5-GW1	MW6-GW1	-
	Sample Date:	07/26/2018 09:00	07/26/2018 09:00	07/26/2018 09:00	-
	Sample ID:	1830513-01	1830513-02	1830513-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	101%	100%	105%	-
Dibromofluoromethane	Surrogate	105%	105%	104%	-
Toluene-d8	Surrogate	103%	99.8%	103%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*88.0*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*87.8*		*ug/L*		*110*	*50-140*			
Surrogate: Toluene-d8	*81.1*		*ug/L*		*101*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.6*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*84.5*		*ug/L*		*106*	*50-140*			
Surrogate: Toluene-d8	*81.1*		*ug/L*		*101*	*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)	1780	25	ug/L		88.8	68-117			
F2 PHCs (C10-C16)	1650	100	ug/L		103	60-140			
F3 PHCs (C16-C34)	4130	100	ug/L		105	60-140			
F4 PHCs (C34-C50)	2730	100	ug/L		110	60-140			
Volatiles									
Acetone	94.1	5.0	ug/L		94.1	50-140			
Benzene	27.2	0.5	ug/L		67.9	60-130			
Bromodichloromethane	32.1	0.5	ug/L		80.2	60-130			
Bromoform	42.8	0.5	ug/L		107	60-130			
Bromomethane	25.2	0.5	ug/L		62.9	50-140			
Carbon Tetrachloride	32.8	0.2	ug/L		82.0	60-130			
Chlorobenzene	30.0	0.5	ug/L		74.9	60-130			
Chloroform	29.5	0.5	ug/L		73.6	60-130			
Dibromochloromethane	37.9	0.5	ug/L		94.8	60-130			
Dichlorodifluoromethane	26.7	1.0	ug/L		66.8	50-140			
1,2-Dichlorobenzene	29.3	0.5	ug/L		73.2	60-130			
1,3-Dichlorobenzene	28.4	0.5	ug/L		71.0	60-130			
1,4-Dichlorobenzene	28.7	0.5	ug/L		71.7	60-130			
1,1-Dichloroethane	26.7	0.5	ug/L		66.8	60-130			
1,2-Dichloroethane	28.2	0.5	ug/L		70.6	60-130			
1,1-Dichloroethylene	28.8	0.5	ug/L		71.9	60-130			
cis-1,2-Dichloroethylene	28.8	0.5	ug/L		72.0	60-130			
trans-1,2-Dichloroethylene	29.6	0.5	ug/L		73.9	60-130			
1,2-Dichloropropane	27.3	0.5	ug/L		68.2	60-130			
cis-1,3-Dichloropropylene	28.1	0.5	ug/L		70.3	60-130			
trans-1,3-Dichloropropylene	27.7	0.5	ug/L		69.3	60-130			
Ethylbenzene	28.5	0.5	ug/L		71.2	60-130			
Ethylene dibromide (dibromoethane	29.8	0.2	ug/L		74.5	60-130			
Hexane	32.5	1.0	ug/L		81.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	71.7	5.0	ug/L		71.7	50-140			
Methyl Isobutyl Ketone	88.2	5.0	ug/L		88.2	50-140			
Methyl tert-butyl ether	61.4	2.0	ug/L		61.4	50-140			
Methylene Chloride	30.2	5.0	ug/L		75.6	60-130			
Styrene	27.4	0.5	ug/L		68.5	60-130			
1,1,1,2-Tetrachloroethane	33.9	0.5	ug/L		84.8	60-130			
1,1,2,2-Tetrachloroethane	32.7	0.5	ug/L		81.6	60-130			
Tetrachloroethylene	28.5	0.5	ug/L		71.4	60-130			
Toluene	28.5	0.5	ug/L		71.4	60-130			
1,1,1-Trichloroethane	29.3	0.5	ug/L		73.2	60-130			
1,1,2-Trichloroethane	28.5	0.5	ug/L		71.3	60-130			
Trichloroethylene	26.4	0.5	ug/L		66.1	60-130			
Trichlorofluoromethane	29.0	1.0	ug/L		72.4	60-130			
Vinyl chloride	30.2	0.5	ug/L		75.5	50-140			
m,p-Xylenes	61.6	0.5	ug/L		77.0	60-130			
o-Xylene	30.2	0.5	ug/L		75.4	60-130			
Surrogate: 4-Bromofluorobenzene	*77.8*		*ug/L*		*97.3*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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№ 44338

Page 1 of 1

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

Client Name: Mark D'Arcy	Project Reference: PE4378
Contact Name: Paterson Group	Quote #
Address: 154 Colonnade Rd	PO # 24809
	Email Address: mdarcy@patersongroup.ca
Telephone: 613 226 7381	

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

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

Paracel Order Number: 1830513

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC F1-F4	VOCs									
1	MW3-GW	W		3	26 July '18	AM	✓	✓									
2	MW5-GW1	W		3	↓	AM	✓	✓									
3	MW6-GW1	W		3	↓	AM	✓	✓									
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): [signature]	Received by Driver/Depot: T. Rouse	Received at Lab: Sunateporn Dom Mai	Verified By: [signature]
Relinquished By (Print): PHILIP PRICE	Date/Time: 26/07/18 4:05	Date/Time: Jul 26, 2018 05.05	Date/Time: July 26/18 6:45
Date/Time: 26 July 2018	Temperature: °C	Temperature: 21.7 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Sam Berube

Client PO: 30426
Project: PE4378
Custody: 128484

Report Date: 12-Oct-2021
Order Date: 6-Oct-2021

Order #: 2141403

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

Paracel ID	Client ID
2141403-01	MW3-GW3
2141403-02	BH12-GW1

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 12-Oct-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Oct-2021

Client PO: 30426

Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	8-Oct-21	8-Oct-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Oct-21	10-Oct-21
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	8-Oct-21	8-Oct-21

Certificate of Analysis

Report Date: 12-Oct-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 6-Oct-2021

Client PO: **30426**

Project Description: PE4378

	Client ID:	MW3-GW3	BH12-GW1	-	-
	Sample Date:	06-Oct-21 09:00	06-Oct-21 09:00	-	-
	Sample ID:	2141403-01	2141403-02	-	-
	MDL/Units	Water	Water	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Report Date: 12-Oct-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Oct-2021

Client PO: 30426

Project Description: PE4378

	Client ID:	MW3-GW3	BH12-GW1	-	-
	Sample Date:	06-Oct-21 09:00	06-Oct-21 09:00	-	-
	Sample ID:	2141403-01	2141403-02	-	-
	MDL/Units	Water	Water	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	91.0%	92.8%	-	-
Dibromofluoromethane	Surrogate	100%	101%	-	-
Toluene-d8	Surrogate	81.2%	81.7%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane, 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						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*81.6*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*80.7*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*66.5*		*ug/L*		*83.1*	*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	12.7	5.0	ug/L	37.5			98.9	30	QR-07
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)	14.1	5.0	ug/L	51.4			114.0	30	QR-07
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	*68.7*		*ug/L*		*85.9*	*50-140*			
Surrogate: Dibromofluoromethane	*79.5*		*ug/L*		*99.4*	*50-140*			
Surrogate: Toluene-d8	*65.2*		*ug/L*		*81.6*	*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)	2090	25	ug/L	ND	104	68-117			
F2 PHCs (C10-C16)	1500	100	ug/L	ND	94.0	60-140			
F3 PHCs (C16-C34)	4440	100	ug/L	ND	113	60-140			
F4 PHCs (C34-C50)	2900	100	ug/L	ND	117	60-140			
Volatiles									
Acetone	75.6	5.0	ug/L	ND	75.6	50-140			
Benzene	30.8	0.5	ug/L	ND	77.0	60-130			
Bromodichloromethane	41.4	0.5	ug/L	ND	103	60-130			
Bromoform	25.8	0.5	ug/L	ND	64.5	60-130			
Bromomethane	31.4	0.5	ug/L	ND	78.5	50-140			
Carbon Tetrachloride	33.3	0.2	ug/L	ND	83.2	60-130			
Chlorobenzene	38.2	0.5	ug/L	ND	95.4	60-130			
Chloroform	30.0	0.5	ug/L	ND	75.0	60-130			
Dibromochloromethane	29.4	0.5	ug/L	ND	73.4	60-130			
Dichlorodifluoromethane	36.1	1.0	ug/L	ND	90.2	50-140			
1,2-Dichlorobenzene	29.5	0.5	ug/L	ND	73.6	60-130			
1,3-Dichlorobenzene	29.1	0.5	ug/L	ND	72.8	60-130			
1,4-Dichlorobenzene	29.0	0.5	ug/L	ND	72.4	60-130			
1,1-Dichloroethane	29.2	0.5	ug/L	ND	73.0	60-130			
1,2-Dichloroethane	28.1	0.5	ug/L	ND	70.3	60-130			
1,1-Dichloroethylene	34.5	0.5	ug/L	ND	86.2	60-130			
cis-1,2-Dichloroethylene	29.5	0.5	ug/L	ND	73.8	60-130			
trans-1,2-Dichloroethylene	30.9	0.5	ug/L	ND	77.3	60-130			
1,2-Dichloropropane	28.7	0.5	ug/L	ND	71.8	60-130			
cis-1,3-Dichloropropylene	30.7	0.5	ug/L	ND	76.8	60-130			
trans-1,3-Dichloropropylene	29.9	0.5	ug/L	ND	74.6	60-130			
Ethylbenzene	32.3	0.5	ug/L	ND	80.7	60-130			
Ethylene dibromide (dibromoethane, 1,2-	35.6	0.2	ug/L	ND	89.1	60-130			
Hexane	37.1	1.0	ug/L	ND	92.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	71.6	5.0	ug/L	ND	71.6	50-140			
Methyl Isobutyl Ketone	62.7	5.0	ug/L	ND	62.7	50-140			
Methyl tert-butyl ether	62.3	2.0	ug/L	ND	62.3	50-140			
Methylene Chloride	33.0	5.0	ug/L	ND	82.4	60-130			
Styrene	34.6	0.5	ug/L	ND	86.6	60-130			
1,1,1,2-Tetrachloroethane	29.5	0.5	ug/L	ND	73.8	60-130			
1,1,2,2-Tetrachloroethane	31.5	0.5	ug/L	ND	78.7	60-130			
Tetrachloroethylene	38.6	0.5	ug/L	ND	96.4	60-130			
Toluene	37.2	0.5	ug/L	ND	92.9	60-130			
1,1,1-Trichloroethane	37.2	0.5	ug/L	ND	93.0	60-130			
1,1,2-Trichloroethane	30.6	0.5	ug/L	ND	76.4	60-130			
Trichloroethylene	31.5	0.5	ug/L	ND	78.8	60-130			
Trichlorofluoromethane	32.5	1.0	ug/L	ND	81.3	60-130			
Vinyl chloride	36.2	0.5	ug/L	ND	90.6	50-140			
m,p-Xylenes	57.4	0.5	ug/L	ND	71.8	60-130			
o-Xylene	36.0	0.5	ug/L	ND	90.0	60-130			
Surrogate: 4-Bromofluorobenzene	*63.8*		*ug/L*		*79.8*	*50-140*			
Surrogate: Dibromofluoromethane	*76.5*		*ug/L*		*95.6*	*50-140*			
Surrogate: Toluene-d8	*58.5*		*ug/L*		*73.1*	*50-140*			

Qualifier Notes:

QC Qualifiers :

QR-07 : Duplicate result exceeds RPD limits due to non-homogeneity between multiple sample vials. Remainder of QA/QC is acceptable.

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

CCME PHC additional information:

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

PARACEL LABORATORIES LTD.

Paracel ID: 2141403

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
603	Nº 128484

Client Name: Paterson	Project Ref: PE4378	Page 1 of 1
Contact Name: Samuel Berube	Quote #:	Turnaround Time
Address: 154 Colonnade Rd South	PO #: 30426	☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular
Telephone:	E-mail: sberube@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)
1	MW3-GW3	GW		2	Oct. 6/21		✓	✓	✓				
2	~~DUP-GW1~~	↓			↓			✓					
3	BH12-GW1	↓		2	↓			✓					
4													
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign):	Received By Driver/Depot: M. DeLouse	Received at Lab: C	Verified By: C
Relinquished By (Print): Samuel Berube	Date/Time: 06/10/21 3:02	Date/Time: Oct 6 2021 5:00	Date/Time: Oct 6 2021 6:10
Date/Time:	Temperature: °C FH.	Temperature: 6.9 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 27628
Project: PE4378
Custody: 123200

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

Order #: 1943316

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

Paracel ID	Client ID
1943316-01	MW1-GW1
1943316-02	MW3-GW2
1943316-03	BH5-GW2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27628

Report Date: 28-Oct-2019
Order Date: 22-Oct-2019
Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	25-Oct-19	26-Oct-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	22-Oct-19	24-Oct-19
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	25-Oct-19	26-Oct-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27628

Report Date: 28-Oct-2019

Order Date: 22-Oct-2019

Project Description: PE4378

	Client ID:	MW1-GW1	MW3-GW2	BH5-GW2	-
	Sample Date:	21-Oct-19 12:00	21-Oct-19 12:00	21-Oct-19 12:00	-
	Sample ID:	1943316-01	1943316-02	1943316-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27628

Report Date: 28-Oct-2019

Order Date: 22-Oct-2019

Project Description: PE4378

	Client ID:	MW1-GW1	MW3-GW2	BH5-GW2	-
	Sample Date:	21-Oct-19 12:00	21-Oct-19 12:00	21-Oct-19 12:00	-
	Sample ID:	1943316-01	1943316-02	1943316-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	106%	108%	106%	-
Dibromofluoromethane	Surrogate	109%	62.9%	109%	-
Toluene-d8	Surrogate	97.0%	99.6%	97.1%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*82.8*		*ug/L*		*104*	*50-140*			
Surrogate: Dibromofluoromethane	*80.7*		*ug/L*		*101*	*50-140*			
Surrogate: Toluene-d8	*79.8*		*ug/L*		*99.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*84.7*		*ug/L*		*106*	*50-140*			
Surrogate: Dibromofluoromethane	*79.5*		*ug/L*		*99.4*	*50-140*			
Surrogate: Toluene-d8	*79.7*		*ug/L*		*99.6*	*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)	1950	25	ug/L		97.3	68-117			
F2 PHCs (C10-C16)	1120	100	ug/L		70.0	60-140			
F3 PHCs (C16-C34)	2860	100	ug/L		73.0	60-140			
F4 PHCs (C34-C50)	2700	100	ug/L		109	60-140			
Volatiles									
Acetone	67.3	5.0	ug/L		67.3	50-140			
Benzene	49.8	0.5	ug/L		125	60-130			
Bromodichloromethane	37.3	0.5	ug/L		93.2	60-130			
Bromoform	40.7	0.5	ug/L		102	60-130			
Bromomethane	33.7	0.5	ug/L		84.2	50-140			
Carbon Tetrachloride	34.0	0.2	ug/L		84.9	60-130			
Chlorobenzene	35.8	0.5	ug/L		89.5	60-130			
Chloroform	35.5	0.5	ug/L		88.7	60-130			
Dibromochloromethane	38.4	0.5	ug/L		96.0	60-130			
Dichlorodifluoromethane	32.6	1.0	ug/L		81.5	50-140			
1,2-Dichlorobenzene	40.2	0.5	ug/L		101	60-130			
1,3-Dichlorobenzene	41.1	0.5	ug/L		103	60-130			
1,4-Dichlorobenzene	38.8	0.5	ug/L		97.0	60-130			
1,1-Dichloroethane	36.0	0.5	ug/L		89.9	60-130			
1,2-Dichloroethane	29.1	0.5	ug/L		72.8	60-130			
1,1-Dichloroethylene	41.2	0.5	ug/L		103	60-130			
cis-1,2-Dichloroethylene	43.3	0.5	ug/L		108	60-130			
trans-1,2-Dichloroethylene	43.3	0.5	ug/L		108	60-130			
1,2-Dichloropropane	38.9	0.5	ug/L		97.3	60-130			
cis-1,3-Dichloropropylene	37.0	0.5	ug/L		92.4	60-130			
trans-1,3-Dichloropropylene	32.5	0.5	ug/L		81.2	60-130			
Ethylbenzene	32.2	0.5	ug/L		80.6	60-130			
Ethylene dibromide (dibromoethane	43.4	0.2	ug/L		108	60-130			
Hexane	31.7	1.0	ug/L		79.2	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.1	5.0	ug/L		75.1	50-140			
Methyl Isobutyl Ketone	92.2	5.0	ug/L		92.2	50-140			
Methyl tert-butyl ether	84.2	2.0	ug/L		84.2	50-140			
Methylene Chloride	34.6	5.0	ug/L		86.4	60-130			
Styrene	44.2	0.5	ug/L		110	60-130			
1,1,1,2-Tetrachloroethane	37.1	0.5	ug/L		92.7	60-130			
1,1,2,2-Tetrachloroethane	29.3	0.5	ug/L		73.2	60-130			
Tetrachloroethylene	38.3	0.5	ug/L		95.8	60-130			
Toluene	34.7	0.5	ug/L		86.6	60-130			
1,1,1-Trichloroethane	33.0	0.5	ug/L		82.4	60-130			
1,1,2-Trichloroethane	41.7	0.5	ug/L		104	60-130			
Trichloroethylene	49.1	0.5	ug/L		123	60-130			
Trichlorofluoromethane	30.5	1.0	ug/L		76.2	60-130			
Vinyl chloride	32.2	0.5	ug/L		80.6	50-140			
m,p-Xylenes	70.1	0.5	ug/L		87.6	60-130			
o-Xylene	34.8	0.5	ug/L		87.0	60-130			
Surrogate: 4-Bromofluorobenzene	*89.7*		*ug/L*		*112*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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 ID: 1943316

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Chain of Custody
(Lab Use Only)
№ 123200

Page 1 of 1

Client Name: Paterson	Project Reference: PE4378
Contact Name: Mark D'Arcy	Quote #
Address: 154 Colonnade Rd	PO # 27628
Telephone: 613 226 7381	Email Address: MDarcy@Patersongroup.ca

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

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

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

Required Analyses

Paracel Order Number: 1943316

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	MW1-GW1	W		3	21 Oct	PM	✓	✓												
2	MW3-GW2	W		3	↓	↓	✓	✓												
3	BH5-GW2	W		3	↓	↓	✓	✓												
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): PHILIP PRICE	Date/Time:	Date/Time: 10-22-19 15:05	Date/Time: 10/22/19 17:39
Date/Time: 21 Oct 2019	Temperature: °C	Temperature: 9.8 °C	pH Verified [ ] By: NA

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 54497
Project: PE4378
Custody: 44437

Report Date: 10-May-2022
Order Date: 4-May-2022

Order #: 2219425

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

Paracel ID	Client ID
2219425-01	BH1-22-GW1
2219425-02	BH2-22-GW1
2219425-03	BH6-22-GW1
2219425-04	BH7-22-GW1
2219425-05	BH8-22-GW1
2219425-06	DUP1-GW1
2219425-07	DUP2-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 54497

Report Date: 10-May-2022

Order Date: 4-May-2022

Project Description: PE4378

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PHC F1	CWS Tier 1 - P&T GC-FID	6-May-22	6-May-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-May-22	9-May-22
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	6-May-22	6-May-22

Certificate of Analysis

Report Date: 10-May-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-May-2022

Client PO: 54497

Project Description: PE4378

	Client ID:	BH1-22-GW1	BH2-22-GW1	BH6-22-GW1	BH7-22-GW1
	Sample Date:	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00
	Sample ID:	2219425-01	2219425-02	2219425-03	2219425-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	34.7	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	0.8
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylene dibromide (dibromoethane, 1,2-)	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Report Date: 10-May-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-May-2022

Client PO: 54497

Project Description: PE4378

	Client ID:	BH1-22-GW1	BH2-22-GW1	BH6-22-GW1	BH7-22-GW1
	Sample Date:	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00
	Sample ID:	2219425-01	2219425-02	2219425-03	2219425-04
	MDL/Units	Water	Water	Water	Water
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	116%	114%	138%	118%
Dibromofluoromethane	Surrogate	83.0%	98.8%	82.2%	81.2%
Toluene-d8	Surrogate	105%	105%	105%	104%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
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

Certificate of Analysis

Report Date: 10-May-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-May-2022

Client PO: 54497

Project Description: PE4378

	Client ID:	BH8-22-GW1	DUP1-GW1	DUP2-GW1	-
	Sample Date:	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00	-
	Sample ID:	2219425-05	2219425-06	2219425-07	-
	MDL/Units	Water	Water	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: 10-May-2022

Client: Paterson Group Consulting Engineers

Order Date: 4-May-2022

Client PO: 54497

Project Description: PE4378

	Client ID:	BH8-22-GW1	DUP1-GW1	DUP2-GW1	-
	Sample Date:	03-May-22 09:00	03-May-22 09:00	03-May-22 09:00	-
	Sample ID:	2219425-05	2219425-06	2219425-07	-
	MDL/Units	Water	Water	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	115%	-	-	-
Dibromofluoromethane	Surrogate	82.3%	-	-	-
Toluene-d8	Surrogate	105%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
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						
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	*93.5*		*ug/L*		*117*	*50-140*			
Surrogate: Dibromofluoromethane	*66.0*		*ug/L*		*82.5*	*50-140*			
Surrogate: Toluene-d8	*87.8*		*ug/L*		*110*	*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	*92.3*		*ug/L*		*115*	*50-140*			
Surrogate: Dibromofluoromethane	*65.6*		*ug/L*		*82.0*	*50-140*			
Surrogate: Toluene-d8	*83.7*		*ug/L*		*105*	*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)	1910	25	ug/L	ND	111	68-117			
F2 PHCs (C10-C16)	1360	100	ug/L	ND	84.8	60-140			
F3 PHCs (C16-C34)	4250	100	ug/L	ND	109	60-140			
F4 PHCs (C34-C50)	3340	100	ug/L	ND	135	60-140			
Volatiles									
Acetone	75.0	5.0	ug/L	ND	75.0	50-140			
Benzene	30.5	0.5	ug/L	ND	76.3	60-130			
Bromodichloromethane	41.5	0.5	ug/L	ND	104	60-130			
Bromoform	42.8	0.5	ug/L	ND	107	60-130			
Bromomethane	44.3	0.5	ug/L	ND	111	50-140			
Carbon Tetrachloride	35.4	0.2	ug/L	ND	88.4	60-130			
Chlorobenzene	40.3	0.5	ug/L	ND	101	60-130			
Chloroform	32.3	0.5	ug/L	ND	80.6	60-130			
Dibromochloromethane	39.2	0.5	ug/L	ND	98.0	60-130			
Dichlorodifluoromethane	38.8	1.0	ug/L	ND	97.1	50-140			
1,2-Dichlorobenzene	38.8	0.5	ug/L	ND	96.9	60-130			
1,3-Dichlorobenzene	40.6	0.5	ug/L	ND	101	60-130			
1,4-Dichlorobenzene	39.7	0.5	ug/L	ND	99.3	60-130			
1,1-Dichloroethane	34.0	0.5	ug/L	ND	85.1	60-130			
1,2-Dichloroethane	30.7	0.5	ug/L	ND	76.7	60-130			
1,1-Dichloroethylene	44.5	0.5	ug/L	ND	111	60-130			
cis-1,2-Dichloroethylene	30.5	0.5	ug/L	ND	76.4	60-130			
trans-1,2-Dichloroethylene	40.7	0.5	ug/L	ND	102	60-130			
1,2-Dichloropropane	30.6	0.5	ug/L	ND	76.6	60-130			
cis-1,3-Dichloropropylene	39.5	0.5	ug/L	ND	98.7	60-130			
trans-1,3-Dichloropropylene	31.7	0.5	ug/L	ND	79.2	60-130			
Ethylbenzene	39.9	0.5	ug/L	ND	99.8	60-130			
Ethylene dibromide (dibromoethane, 1,2-	40.0	0.2	ug/L	ND	99.9	60-130			
Hexane	39.0	1.0	ug/L	ND	97.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	86.4	5.0	ug/L	ND	86.4	50-140			
Methyl Isobutyl Ketone	79.9	5.0	ug/L	ND	79.9	50-140			
Methyl tert-butyl ether	86.2	2.0	ug/L	ND	86.2	50-140			
Methylene Chloride	36.6	5.0	ug/L	ND	91.6	60-130			
Styrene	44.1	0.5	ug/L	ND	110	60-130			
1,1,1,2-Tetrachloroethane	44.5	0.5	ug/L	ND	111	60-130			
1,1,2,2-Tetrachloroethane	31.8	0.5	ug/L	ND	79.4	60-130			
Tetrachloroethylene	40.5	0.5	ug/L	ND	101	60-130			
Toluene	41.4	0.5	ug/L	ND	103	60-130			
1,1,1-Trichloroethane	31.0	0.5	ug/L	ND	77.4	60-130			
1,1,2-Trichloroethane	44.0	0.5	ug/L	ND	110	60-130			
Trichloroethylene	40.8	0.5	ug/L	ND	102	60-130			
Trichlorofluoromethane	39.8	1.0	ug/L	ND	99.4	60-130			
Vinyl chloride	36.7	0.5	ug/L	ND	91.8	50-140			
m,p-Xylenes	75.0	0.5	ug/L	ND	93.7	60-130			
o-Xylene	36.8	0.5	ug/L	ND	91.9	60-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD. | T R R

Paracel ID: 2219425

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Chain of Custody
(Lab Use Only)
№ 44437

Page 1 of 1

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

Client Name: Paterson Group Inc.	Project Reference: PE4378
Contact Name: Samuel Berube, Mark D'Arcy	Quote #
Address: 154 Colonnade Rd	PO # 54497
Telephone: 613-226-7381	Email Address: Sberube@patersongroup.ca

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

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

Paracel Order Number: 2219425

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs (F1-F4)	VOC									
1	BH1-22-GW1	GW		3	May 3/22		✓	✓									
2	BH2-22-GW1	↓		↓			↓	↓									
3	BH6-22-GW1																
4	BH7-22-GW1																
5	BH8-22-GW1																
6	DUP1-GW1						✓										
7	DUP2-GW1						✓										
8																	
9																	
10																	

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): [signature]	Received by Driver/Depot: M. Touse	Received at Lab: Sivrajporn Dhmai	Verified By: [signature]
Relinquished By (Print): Samuel Bérubé	Date/Time: 04/05/22 4:23	Date/Time: May 04, 2022 05.10	Date/Time: May 5/22 10:27a
Date/Time:	Temperature: ___ °C	Temperature: 16.6 °C	pH Verified [ ] By: N/A

Chain of Custody (Blank) - Rev 0.4 Feb 2016