PATERSON GROUP

# Phase II – Environmental Site Assessment

370 Athlone Avenue

Ottawa, Ontario

Prepared for Tony Zacconi & Mr. David Aston

**Report: PE6096-1**
**June 14, 2023**

# TABLE OF CONTENTS

**PAGE**

## List of Figures



## List of Appendices

# EXECUTIVE SUMMARY

## Assessment

Based on the findings of this assessment, PAH and metal impacted fill was identified in the northwestern portion of the Phase II Property. Given the low solubility of PAH and metal parameters, in combination with visual observations made during the field program and analytical testing, the impacts are expected to be confined to the fill layer. There is no risk to the current use of the Phase II Property since the fill layer is below concrete slab.

It is our understanding that the Phase II Property may be redeveloped in the future. As such, the contaminated soil could be fully delineated and remediated in conjunction with site redevelopment. This contaminated soil will require disposal at a licensed waste disposal facility. Prior to off-site disposal of impacted soil at a licensed waste disposal facility, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater impacted by VOCs (cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene) was identified in all well locations at the Phase II ESA. The VOC exceedances are suspected to be a result of a former off-site dry cleaners 70m south of the Phase II Property.

It is our opinion that the contaminated groundwater and soil do not pose a risk to the current use of the subject building, although further assessment would be required to confirm this opinion. However, the presence of contaminated groundwater and soil does pose a liability to the site.

Given that there is contaminated groundwater on-site and that the source of the cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene in all boreholes is expected to be a former off-site dry-cleaning facility, remediation of the groundwater to meet the generic MECP standards would not likely be a feasible option. In lieu of a generic remediation, a due diligence risk assessment should be completed to assess the risk to the current use of the land and any required risk mitigation measures that would be required to be implemented in any future developments. Further information can be provided upon request.

# Recommendations

## Soil and Groundwater

Based on the findings of this assessment, PAH and metal impacted fill was identified in the northwestern portion of the Phase II Property. Given the low solubility of PAH and metal parameters, in combination with visual observations made during the field program and analytical testing, the impacts are expected to be confined to the fill layer. There is no risk to the current use of the Phase II Property since the fill layer is below concrete slab.

It is our understanding that the Phase II Property may be redeveloped in the future. As such, the contaminated soil could be fully delineated and remediated in conjunction with site redevelopment. This contaminated soil will require disposal at a licensed waste disposal facility. Prior to off-site disposal of impacted soil at a licensed waste disposal facility, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater impacted by VOCs (cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene) was identified in all well locations at the Phase II ESA. The VOC exceedances are suspected to be a result of a former off-site dry cleaners 70m south of the Phase II Property.

It is our opinion that the contaminated groundwater and soil do not pose a risk to the current use of the subject building, although further assessment would be required to confirm this opinion. However, the presence of contaminated groundwater and soil does pose a liability to the site.

Given that there is contaminated groundwater on-site and that the source of the cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene in all boreholes is expected to be a former off-site dry-cleaning facility, remediation of the groundwater to meet the generic MECP standards would not likely be a feasible option. In lieu of a generic remediation, a due diligence risk assessment should be completed to assess the risk to the current use of the land and any required risk mitigation measures that would be required to be implemented in any future developments. Further information can be provided upon request.

## Monitoring Wells

It is recommended that the monitoring wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under Ontario Regulation 903 (Ontario Water Resources Act). At such a time that the monitoring wells are no longer required, they must be decommissioned in accordance with O.Reg. 903.

# 1.0 INTRODUCTION

At the request of Mr. Tony Zacconi and Mr. David Aston, Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment (Phase II-ESA) for the property addressed 370 Athlone Avenue, in the City of Ottawa, Ontario (the Phase II Property).

The purpose of this Phase II-ESA has been to address the areas of potential environmental concern (APECs) identified on the Phase II Property as a result of the findings of the Phase I-ESA.

## 1.1 Site Description

| | |
|---|---|
| Address: | 370 Athlone Avenue, Ottawa, Ontario. |
| Location: | The Phase I Property is located on the west side of Athlone Avenue, approximately 45m north of the Richmond Road and Athlone Avenue intersection, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan in the Figures section following the text. |
| Latitude and Longitude: | 45° 23' 37.932" N, 75° 45' 5.292" W |

**Site Description:**

| | |
|---|---|
| Configuration: | Rectangular. |
| Area: | 0.05 ha (approximately). |
| Zoning: | R4UB – Fourth Density Residential Zone. |
| Current Use: | The Phase I ESA Property is currently occupied with a residential dwelling with associated storage shed and garage. |
| Services: | The Phase I ESA Property is situated in a municipally serviced area. |

## 1.2 Property Ownership

The Phase II Property is currently owned by Mr. Tony Zacconi. Paterson was retained to complete this Phase II-ESA by Mr. Tony Zacconi.

## 1.3 Applicable Site Condition Standard

The site condition standards for the subject 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), and dated April 15, 2011. The selected MECP standards are based on the following considerations:

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

Coarse-grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

# 2.0 BACKGROUND INFORMATION

## 2.1 Physical Setting

A one-storey residential building with a full basement level, a storage shed and a detached 2-car garage are present on the Phase I Property. The majority of the residence is considered to be the original building constructed in 1942 and is currently heated with a natural gas fired furnace. The residential dwelling is finished on the exterior with vinyl siding and with a sloped shingled roof. The car garage is finished on the exterior with wood siding and has a sloped shingled roof. The storage shed is finished on the exterior with concrete blocks with a slanted roof.

# 3.0 SCOPE OF INVESTIGATION

## 3.1 Overview of Site Investigation

The subsurface investigation for this assessment was conducted on May 18, 2023 and consisted of drilling three boreholes (BH1-23 to BH3-23) across the Phase II Property.

The boreholes were advanced to a depth of 7.60m depth below the existing ground surface and terminated within the bedrock. All boreholes (BH1-23 – BH3-23) were completed with groundwater monitoring well installations in order to access the groundwater table.

## 3.2 Media Investigated

During the course of this subsurface investigation, soil and groundwater samples were obtained from the Phase II Property and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the contaminants of potential concern identified in the Phase I ESA.

The contaminants of potential concern for the soil and/or groundwater on the Phase II Property include the following:

- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- Petroleum Hydrocarbons (PHCs, F1-F4);
- Volatile organic compounds (VOCs);
- Metals;
- PAHs.

Fill of questionable quality was identified during the drilling program which resulted in the addition of PAHs and metal parameters to the contaminants of potential concern identified in the Phase I ESA. These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase I Property.

## 3.3 Phase I ESA Conceptual Site Model

### Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was reviewed as part of this assessment. Based on the available information, the bedrock in the area of the subject site consists of interbedded limestone and dolomite of the Gull River Formation. The surficial geology consists of glacial till plains, with an overburden thickness ranging from approximately 2 m to 3 m.

Groundwater is anticipated to be encountered within the bedrock and flow in a northerly direction towards the Ottawa River.

### Water Bodies and Areas of Natural and Scientific Interest

No water bodies or areas of natural and scientific interest were identified within the Phase I study area. The nearest named water body with respect to the subject site is the Ottawa River, located approximately 750 m to the northwest.

### Drinking Water Wells

Based on the availability of municipal services, no drinking water wells are expected to be present within the Phase I Study Area.

### Neighbouring Land Use

The neighbouring lands within the Phase I study area consist of residential and commercial properties. Current land use is shown on Drawing PE6096-2 – Surrounding Land Use Plan, in the Figures section of this report.

### Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, four potentially contaminating activities (PCAs) resulting in three areas of potential environmental concern (APECs), were identified on the Phase I Property. These APECs include:

**Table 1**
**Areas of Potential Environmental Concern**

| APEC | Location of APEC | PCA (O. Reg. 153/04 – Table 2) | Location of PCA | Contaminants of Potential Concern | Media Potentially Impacted |
|---|---|---|---|---|---|
| **APEC #1**<br>Former Auto body shop | Western Portion of Subject Site | *"Item 10: Commercial Autobody Shops"* | 0 m West | BTEX<br>PHCs ($F_1$-$F_4$)<br>VOCs | Soil and/or Groundwater |
| **APEC #2**<br>Former retail fuel outlet with one (1) UST and Former auto service garage | Eastern Portion of Subject Site | *"Item 28: Gasoline and Associated Products Storage in Fixed Tanks"*<br>*"Item 52: Storage, Maintenance, Fuelling, and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems"* | 40 m Southeast | BTEX<br>PHCs ($F_1$-$F_4$) | Soil and/or Groundwater |
| **APEC #3**<br>Former dry cleaners | Southern Portion of Subject Site | *Item 37 – Operation of Dry Cleaning Equipment (where chemicals are used)* | 70 m South | VOCs | Soil and/or Groundwater |

Other off-site PCAs were identified within the Phase I Study Area but were deemed not to be of any environmental concern to the Phase I Property based on their separation distances as well as their inferred down-gradient or cross-gradient orientation with respect to anticipated groundwater flow to the north.

Fill of questionable quality was identified during the drilling program. The fill of a questionable quality is considered to be a fourth APEC on the Phase II Property.

**Contaminants of Potential Concern**

The contaminants of potential concern (CPCs) associated with the aforementioned APECs are considered to be:

- ❒ Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons (PHCs, F1-F4);
- ❒ Volatile organic compounds (VOCs);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Metals.

These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase I Property.

**Assessment of Uncertainty and/or Absence of Information**

The information available for review as part of the preparation of the Phase I ESA is considered to be sufficient to conclude that there are PCAs that result in APECs on the subject site.

The presence of PCAs 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 the Sampling and Analysis Plan

No deviations from the Sampling and Analysis were made during the course of this Phase II-ESA.

## 3.5 Physical Impediments

Due to the location of certain aboveground/underground utility services the final placement of select boreholes were marginally adjusted during the field drilling program.

# 4.0 INVESTIGATION METHOD

## 4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted on May 18, 2023 and consisted of drilling three boreholes (BH1-23 to BH3-23) across the Phase II Property, all of the three boreholes were equipped with groundwater monitoring wells (BH1-23 – BH3-23).

The boreholes were advanced to a depth of 7.60m below the existing ground surface and terminated within the bedrock. Bedrock was encountered/confirmed at depths ranging from 4.88m to 5.28m in all boreholes at the time of the field drilling program.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a low-clearance drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The locations of the boreholes are illustrated on "Drawing PE6096-3 – Test Hole Location Plan", appended to this report.

## 4.2 Soil Sampling

Soil 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.

The samples were recovered using a stainless-steel split spoon, while wearing protective gloves (changed after each sample), and immediately placed into plastic bags. If significant contamination was encountered, the samples were instead placed into glass jars. Sampling equipment was routinely washed in soapy water and rinsed with methylhydrate after each split spoon to prevent any cross contamination of the samples. The samples were also stored in coolers to reduce analyte volatilization during transportation.

A total of 22 soil samples and 7 rock core samples were obtained from the boreholes by means of auger and split spoon sampling. The depths at which auger, split spoon and rock core samples were obtained from the boreholes are shown as "**AU**", "**SS**" and "**RC**", respectively, on the Soil Profile and Test Data Sheets, appended to this report.

## 4.3 Field Screening Measurements

All soil samples collected were subjected to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as soil vapour screening with a Photo Ionization Detector.

The recovered soil samples 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, ensuring consistency of readings between samples. To measure the soil vapours, the analyser probe was inserted into the nominal headspace above the sample. The sample was then agitated and manipulated gently by hand as the measurement was taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement. The parts per million (ppm) scale was used to measure concentrations of organic vapours.

The results of the vapour survey are presented on the Soil Profile and Test Data Sheets, appended to this report.

## 4.4 Groundwater Monitoring Well Installation

Three groundwater monitoring wells were installed on the Phase II Property as part of this assessment. These monitoring wells were constructed using 32 mm diameter Schedule 40 threaded PVC risers and screens. A sand pack consisting of silica sand was placed around the screen with a bentonite seal placed above to minimize cross-contamination.

The ground surface elevations of each borehole were surveyed with respect to a known geodetic elevation.

A summary of the monitoring well construction details are listed below in Table 2 as well as on the Soil Profile and Test Data Sheets provided in Appendix 1.

**Table 2**
**Monitoring Well Construction Details**

| Well ID | Ground Surface Elevation (m ASL) | Total Depth (m BGS) | Screened Interval (m BGS) | Sand Pack (m BGS) | Bentonite Seal (m BGS) | Casing Type |
|---|---|---|---|---|---|---|
| BH1-23 | 65.42 | 7.60 | 5.9 – 7.4 | 5.56 – 7.4 | 0.00 – 5.56 | Flush mount |
| BH2-23 | 65.31 | 7.60 | 6.0 – 7.5 | 5.43 – 7.5 | 0.00 – 5.43 | Flush mount |
| BH3-23 | 65.39 | 7.60 | 6.0 – 7.5 | 5.18 – 7.5 | 0.00 – 5.18 | Flush mount |

## 4.5 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.

Standing water was purged from each monitoring well prior to the recovery of the groundwater samples using dedicated sampling equipment. The samples were then stored in coolers to reduce possible analyte volatilization during their transportation. Further details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan, appended to this report.

## 4.6 Analytical Testing

The following soil and groundwater samples were submitted for laboratory analysis:

**Table 3**
**Testing Parameters for Submitted Soil Samples**

| Sample ID | Sample Depth & Stratigraphic Unit | Parameters Analyzed | | | | | | | | Rationale |
|---|---|---|---|---|---|---|---|---|---|---|
| | | BTEX | VOCs | PHCs ($F_1$-$F_4$) | PAHs | Metals | Hg | CrVI | pH | |
| BH1-23-AU1 | 0.3 m – 0.6 m Fill Material | | | | X | X | | | | To assess for quality of fill material. |
| BH1-23-SS5 | 3.6m – 4.2 m Glacial Till | | X | X | | | | | | To assess for potential impacts resulting from the former off-site presence of a retail fuel outlet & auto service garage. |
| BH2-23-AU1 | 0.3 m – 0.6m Fill Material | | | | X | X | | | | To assess for quality of fill material. |
| BH2-23-SS6 | 3.8 m – 4.4 m Glacial Till | | X | X | | | | | | To assess for potential impacts resulting from the former off-site presence of dry cleaners. |
| BH3-23-AU1 | 0.07 m – 0.4 m Fill Material | | | | X | X | | | | To assess for quality of fill material. |
| BH3-23-AU2 | 0.4 m – 0.7 m Fill Material | | | | X | X | | | | To assess for quality of fill material. |
| BH3-23-SS7 | 3.8 m – 4.4 m Glacial Till | | X | X | | | | | | To assess for potential impacts resulting from the former off-site presence of an autobody repair shop. |

**Table 4**
**Testing Parameters for Submitted Groundwater Samples**

| Sample ID | Screened Interval & Stratigraphic Unit | Parameters Analyzed | | Rationale |
|---|---|---|---|---|
| | | VOCs | PHCs ($F_1$-$F_4$) | |
| BH1-23-GW1 | 5.9 m – 7.4 m Bedrock | X | X | To assess for potential impacts resulting from the former off-site presence of a retail fuel outlet & auto service garage. |
| BH2-23-GW1 | 6.0 m – 7.5 m Bedrock | X | X | To assess for potential impacts resulting from the former off-site presence of dry cleaners. |
| BH3-23-GW1 | 6.0 m – 7.5 m Bedrock | X | X | To assess for potential impacts resulting from the former off-site presence of an autobody repair shop. |

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) and is accredited and certified by the SCC/CALA for specific tests registered with the association.

## 4.7 Residue Management

All soil cuttings were retained on-site from the site following the field program, while all purge water and equipment cleaning fluids were retained on-site.

## 4.8 Elevation Surveying

The ground surface elevations at each borehole location were surveyed using a GPS device by Paterson personnel and referenced to a geodetic datum.

# 5.0 REVIEW AND EVALUATION

## 5.1 Geology

In general, the subsurface soil profile encountered at the borehole locations consists of fill material (concrete slab or topsoil, crushed stone, gravel, brown silty sand and trace clay) underlain by silty sand to sandy silt and glacial till.

Bedrock was encountered/confirmed at depths ranging from 4.88m to 5.28m in all boreholes at the time of the field drilling program. Site geology details are provided in the Soil Profile and Test Data Sheets in Appendix 1.

## 5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured using an electronic water level meter at BH1-23, BH2-23 and BH3-23 on May 23, 2023. The groundwater levels are summarized below in Table 5.

**Table 5**
**Groundwater Level Measurements**

| Borehole Location | Ground Surface Elevation (m) | Water Level Depth (m below grade) | Water Level Elevation (m ASL) | Date of Measurement |
|---|---|---|---|---|
| BH1-23 | 65.42 | 4.67 | 60.75 | May 23, 2023 |
| BH2-23 | 65.31 | 4.55 | 60.76 | |
| BH3-23 | 65.39 | 4.57 | 60.82 | |

The groundwater at the Phase II Property was encountered within the overburden at depths ranging from 4.55 m to 4.67 m below the existing ground surface. No unusual visual observations were identified within the recovered groundwater samples. Using the groundwater elevations recorded during the sampling event, groundwater contour mapping was completed as part of this assessment.

According to the mapped contour data, illustrated on Drawing PE6096-3 – Test Hole Location Plan in the appendix, the groundwater flow on the subject site was calculated to be in a southern direction. A horizontal hydraulic gradient of approximately 0.006 m/m was also calculated as part of this assessment. However, the groundwater levels likely had not stabilized at the time of the field work. It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

## 5.3 Fine/Coarse Soil Texture

The coarse-grained soil standards were selected.

## 5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.3 ppm to 4.6 ppm, indicating that there is a negligible potential for the presence of volatile substances. 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

Seven soil samples were submitted for laboratory analysis of PHCs ($F_1$-$F_4$), VOCs, metals and PAHs. The results of the analytical testing are presented below in Tables 6 to 10, as well as on the laboratory Certificates of Analysis included in Appendix 1.

**Table 6**
**Analytical Test Results – Soil**
**PHCs ($F_1$-$F_4$)**

| Parameter | MDL (µg/g) | Soil Samples (ug/g) | | | MECP Table 3 Residential Soil Standards (µg/g) |
|---|---|---|---|---|---|
| | | May 18, 2023 | | | |
| | | BH1-23-SS5 | BH2-23-SS6 | BH3-23-SS7 | |
| | | Sample Depth (m bgs) | | | |
| | | 3.6 m – 4.2 m | 3.8 m – 4.4 m | 3.8 m – 4.4 m | |
| PHCs $F_1$ | 7 | nd | nd | nd | 55 |
| PHCs $F_2$ | 4 | nd | nd | nd | 98 |
| PHCs $F_3$ | 8 | nd | nd | nd | 300 |
| PHCs $F_4$ | 6 | nd | nd | nd | 2800 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

No PHCs parameter concentrations were detected above the laboratory method detection limits in the soil samples analyzed. All concentrations comply with the selected MECP Table 3 Coarse-Grained Residential Soil Standards.

**Table 7**
**Analytical Test Results – Soil**
**Volatile Organic Compounds (VOCs)**

| Parameter | MDL (µg/g) | Soil Samples (ug/g) | | | MECP Table 3 Residential Soil Standards (µg/g) |
|---|---|---|---|---|---|
| | | May 18, 2023 | | | |
| | | BH1-23-SS5 | BH2-23-SS6 | BH3-23-SS7 | |
| | | Sample Depth (m bgs) | | | |
| | | 3.6 m – 4.2 m | 3.8 m – 4.4 m | 3.8 m – 4.4 m | |
| Acetone | 0.50 | nd | nd | nd | 16 |
| Benzene | 0.02 | nd | nd | nd | 0.21 |
| Bromodichloromethane | 0.05 | nd | nd | nd | 13 |
| Bromoform | 0.05 | nd | nd | nd | 0.27 |
| Bromomethane | 0.05 | nd | nd | nd | 0.05 |
| Carbon Tetrachloride | 0.05 | nd | nd | nd | 0.05 |
| Chlorobenzene | 0.05 | nd | nd | nd | 2.4 |
| Chloroform | 0.05 | nd | nd | nd | 0.05 |
| Dibromochloromethane | 0.05 | nd | nd | nd | 9.4 |
| Dichlorodifluoromethane | 0.05 | nd | nd | nd | 16 |
| 1,2-Dichlorobenzene | 0.05 | nd | nd | nd | 3.4 |
| 1,3-Dichlorobenzene | 0.05 | nd | nd | nd | 4.8 |
| 1,4-Dichlorobenzene | 0.05 | nd | nd | nd | 0.083 |
| 1,1-Dichloroethane | 0.05 | nd | nd | nd | 3.5 |
| 1,2-Dichloroethane | 0.05 | nd | nd | nd | 0.05 |
| 1,1-Dichloroethylene | 0.05 | nd | nd | nd | 0.05 |
| cis-1,2-Dichloroethylene | 0.05 | nd | nd | nd | 3.4 |
| trans-1,2-Dichloroethylene | 0.05 | nd | nd | nd | 0.084 |
| 1,2-Dichloropropane | 0.05 | nd | nd | nd | 0.05 |
| 1,3-Dichloropropene | 0.05 | nd | nd | nd | 0.05 |
| Ethylbenzene | 0.05 | nd | nd | nd | 2 |
| Ethylene Dibromide | 0.05 | nd | nd | nd | 0.05 |
| Hexane | 0.05 | nd | nd | nd | 2.8 |
| Methyl Ethyl Ketone | 0.50 | nd | nd | nd | 16 |
| Methyl Isobutyl Ketone | 0.50 | nd | nd | nd | 1.7 |
| Methyl tert-butyl ether | 0.05 | nd | nd | nd | 0.75 |
| Methylene Chloride | 0.05 | nd | nd | nd | 0.1 |
| Styrene | 0.05 | nd | nd | nd | 0.7 |
| 1,1,1,2-Tetrachloroethane | 0.05 | nd | nd | nd | 0.058 |
| 1,1,2,2-Tetrachloroethane | 0.05 | nd | nd | nd | 0.05 |
| Tetrachloroethylene | 0.05 | nd | nd | nd | 0.28 |
| Toluene | 0.05 | nd | nd | nd | 2.3 |
| 1,1,1-Trichloroethane | 0.05 | nd | nd | nd | 0.38 |
| 1,1,2-Trichloroethane | 0.05 | nd | nd | nd | 0.05 |
| Trichloroethylene | 0.05 | nd | nd | nd | 0.061 |
| Trichlorofluoromethane | 0.05 | nd | nd | nd | 4 |
| Vinyl Chloride | 0.02 | nd | nd | nd | 0.02 |
| Xylenes | 0.05 | nd | nd | nd | 3.1 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

No VOC parameters were detected above the laboratory method detection limits in any of the soil samples analyzed. The results are in compliance with the selected MECP Table 3 Coarse-Grained Residential Soil Standards.

**Table 8**
**Analytical Test Results – Soil**
**Metals**

| Parameter | MDL (µg/g) | Soil Samples (ug/g) | | | | MECP Table 3 Residential Soil Standards (µg/g) |
|---|---|---|---|---|---|---|
| | | May 18, 2023 | | | | |
| | | BH1-23-AU1 | BH2-23-AU1 | BH3-23-AU1 | BH3-23-AU2 | |
| | | Sample Depth (m bgs) | | | | |
| | | 0.3 m – 0.6 m | 0.3 m – 0.6 m | 0.07 m – 0.4 m | 0.4 m – 0.7 m | |
| Antimony | 1.0 | nd | nd | 2.4 | nd | 7.5 |
| Arsenic | 1.0 | 4.6 | 3.2 | **80.6** | 4.6 | 18 |
| Barium | 1.0 | 138 | 100 | 350 | 122 | 390 |
| Beryllium | 0.5 | 0.5 | 0.5 | 1.6 | 0.5 | 4 |
| Boron | 5.0 | 9.6 | 9.4 | 11.8 | 13.3 | 120 |
| Cadmium | 0.5 | nd | nd | 0.6 | nd | 1.2 |
| Chromium | 5.0 | 25.0 | 22.5 | 24.8 | 31.6 | 160 |
| Cobalt | 1.0 | 7.0 | 6.4 | 18.8 | 10.7 | 22 |
| Copper | 5.0 | 18.6 | 20.8 | 89.1 | 27.2 | 140 |
| Lead | 1.0 | 47.4 | 32.2 | **139** | 10.3 | 120 |
| Molybdenum | 1.0 | nd | nd | **12.2** | 1.8 | 6.9 |
| Nickel | 5.0 | 15.1 | 12.8 | 44.6 | 17.4 | 100 |
| Selenium | 1.0 | nd | nd | 1.3 | nd | 2.4 |
| Silver | 0.3 | nd | nd | 0.5 | nd | 20 |
| Thallium | 1.0 | nd | nd | nd | nd | 1 |
| Uranium | 1.0 | nd | nd | nd | nd | 23 |
| Vanadium | 10.0 | 32.3 | 31.6 | 34.4 | 47.4 | 86 |
| Zinc | 20.0 | 78.8 | 56.7 | 138 | 41.5 | 340 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

All metal parameter concentrations identified in the soil samples analysed comply with the MECP Table 3 standards except for the following. The Arsenic, Lead and Molybdenum concentrations in Soil Sample BH3-23-AU1.

**Table 9**
**Analytical Test Results – Soil**
**PAHs**

| Parameter | MDL (µg/g) | Soil Samples (ug/g) | | | | MECP Table 3 Residential Soil Standards (µg/g) |
|---|---|---|---|---|---|---|
| | | May 18, 2023 | | | | |
| | | BH1-23-AU1 | BH2-23-AU1 | BH3-23-AU1 | BH3-23-AU2 | |
| | | Sample Depth (m bgs) | | | | |
| | | 0.3m – 0.6m | 0.3m – 0.6m | 0.07m – 0.4m | 0.4m – 0.7m | |
| Acenaphthene | 0.02 | nd | nd | 0.06 | nd | 7.9 |
| Acenaphthylene | 0.02 | nd | 0.03 | **0.31** | nd | 0.15 |
| Anthracene | 0.02 | nd | 0.05 | 0.49 | nd | 0.67 |
| Benzo[a]anthracene | 0.02 | 0.03 | 0.13 | **2.04** | 0.03 | 0.5 |
| Benzo[a]pyrene | 0.02 | 0.04 | 0.13 | **2.06** | 0.03 | 0.3 |
| Benzo[b]fluoranthene | 0.02 | 0.03 | 0.09 | **1.37** | nd | 0.78 |
| Benzo[g,h,i]perylene | 0.02 | 0.03 | 0.08 | 0.81 | nd | 6.6 |
| Benzo[k]fluoranthene | 0.02 | nd | 0.05 | 0.76 | nd | 0.78 |
| Chrysene | 0.02 | 0.05 | 0.15 | 1.84 | 0.04 | 7 |
| Dibenzo[a,h]anthracene | 0.02 | nd | nd | **0.21** | nd | 0.1 |
| Fluoranthene | 0.02 | 0.07 | 0.27 | **4.12** | 0.06 | 0.69 |
| Fluorene | 0.02 | nd | nd | 0.09 | nd | 62 |
| Indeno [1,2,3-cd] pyrene | 0.02 | nd | 0.06 | **0.73** | nd | 0.38 |
| 1-Methylnaphthalene | 0.02 | nd | nd | 0.11 | 0.03 | 0.99 |
| 2-Methylnaphthalene | 0.02 | nd | nd | 0.13 | 0.05 | 0.99 |
| Methylnaphthalene (1&2) | 0.04 | nd | nd | 0.25 | 0.08 | 0.99 |
| Naphthalene | 0.01 | nd | nd | 0.08 | 0.02 | 0.6 |
| Phenanthrene | 0.02 | 0.05 | 0.23 | 2.15 | 0.05 | 6.2 |
| Pyrene | 0.02 | 0.06 | 0.22 | 3.14 | 0.05 | 78 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

The concentrations of Acenaphthylene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Dibenzo[a,h]anthracene, Fluoranthene and Indeno [1,2,3-cd] pyrene in Soil Sample BH3-23-AU1 exceed the selected MECP Table 3 Coarse-Grained Residential Soil Standards. All other concentrations comply with the selected MECP Table 3 Coarse-Grained Residential Soil Standards.

**Table 10**
**Maximum Concentrations – Soil**

| Parameter | Maximum Concentration (µg/g) | Sample ID | Depth Interval (m BGS) |
|---|---|---|---|
| Antimony | 2.4 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Arsenic | **80.6** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Barium | 350 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Beryllium | 1.6 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Boron | 13.3 | BH3-23-AU2 | 0.4 m – 0.7 m |
| Cadmium | 0.6 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Chromium | 31.6 | BH3-23-AU2 | 0.4 m – 0.7 m |
| Cobalt | 18.8 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Copper | 89.1 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Lead | **139** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Molybdenum | **12.2** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Nickel | 44.6 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Selenium | 1.3 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Silver | 0.5 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Vanadium | 47.4 | BH3-23-AU2 | 0.4 m – 0.7 m |
| Zinc | 138 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Acenaphthene | 0.06 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Acenaphthylene | **0.31** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Anthracene | 0.49 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Benzo[a]anthracene | **2.04** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Benzo[a]pyrene | **2.06** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Benzo[b]fluoranthene | **1.37** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Benzo[g,h,i]perylene | 0.81 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Benzo[k]fluoranthene | 0.76 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Chrysene | 1.84 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Dibenzo[a,h]anthracene | **0.21** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Fluoranthene | **4.12** | BH3-23-AU1 | 0.07 m – 0.4 m |
| Fluorene | 0.09 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Indeno [1,2,3-cd] pyrene | **0.73** | BH3-23-AU1 | 0.07 m – 0.4 m |
| 1-Methylnaphthalene | 0.11 | BH3-23-AU1 | 0.07 m – 0.4 m |
| 2-Methylnaphthalene | 0.13 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Methylnaphthalene (1&2) | 0.25 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Naphthalene | 0.08 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Phenanthrene | 2.15 | BH3-23-AU1 | 0.07 m – 0.4 m |
| Pyrene | 3.14 | BH3-23-AU1 | 0.07 m – 0.4 m |

*Notes:*
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits.

## 5.6 Groundwater Quality

Three groundwater samples were submitted for laboratory analysis of PHCs ($F_1$-$F_4$) and VOCs. The results of the analytical testing are presented below in Tables 11 to 13, as well as on the laboratory Certificates of Analysis included in Appendix 1.

**Table 11**
**Analytical Test Results – Groundwater**
**PHCs ($F_1$-$F_4$)**

| Parameter | MDL (µg/L) | Groundwater Samples (ug/L) | | | MECP Table 3 Non-Potable Groundwater Standards (µg/L) |
|---|---|---|---|---|---|
| | | May 23, 2023 | | | |
| | | BH1-23-GW1 | BH2-23-GW1 | BH3-23-GW1 | |
| | | Screening Interval (m bgs) | | | |
| | | 5.9 – 7.4 | 6.0 – 7.5 | 6.0 – 7.5 | |
| PHCs $F_1$ | 25 | nd | 220 | 188 | 750 |
| PHCs $F_2$ | 100 | nd | nd | nd | 150 |
| PHCs $F_3$ | 100 | nd | nd | nd | 500 |
| PHCs $F_4$ | 100 | nd | nd | nd | 500 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

All PHC parameter concentrations are in compliance with the selected MECP Table 3 Coarse-Grained Non-Potable Groundwater Standards.

**Table 12**
**Analytical Test Results – Groundwater**
**Volatile Organic Compounds (VOCs)**

| Parameter | MDL (µg/L) | Groundwater Samples (ug/L) | | | MECP Table 3 Fine-Grained Non-Potable Groundwater Standards (µg/L) |
|---|---|---|---|---|---|
| | | May 23, 2023 | | | |
| | | BH1-23-GW1 | BH2-23-GW1 | BH3-23-GW1 | |
| | | Screening Interval (m bgs) | | | |
| | | 5.9 – 7.4 | 6.0 – 7.5 | 6.0 – 7.5 | |
| Acetone | 5.0 | nd | nd | nd | 130000 |
| Benzene | 0.5 | nd | nd | nd | 44 |
| Bromodichloromethane | 0.5 | nd | nd | nd | 85000 |
| Bromoform | 0.5 | nd | nd | nd | 380 |
| Bromomethane | 0.5 | nd | nd | nd | 5.6 |
| Carbon Tetrachloride | 0.2 | nd | nd | nd | 0.79 |
| Chlorobenzene | 0.5 | nd | nd | nd | 630 |
| Chloroform | 0.5 | nd | nd | nd | 2.4 |
| Dibromochloromethane | 0.5 | nd | nd | nd | 82000 |
| Dichlorodifluoromethane | 1.0 | nd | nd | nd | 4400 |
| 1,2-Dichlorobenzene | 0.5 | nd | nd | nd | 4600 |
| 1,3-Dichlorobenzene | 0.5 | nd | nd | nd | 9600 |
| 1,4-Dichlorobenzene | 0.5 | nd | nd | nd | 8 |
| 1,1-Dichloroethane | 0.5 | nd | nd | nd | 320 |
| 1,2-Dichloroethane | 0.5 | nd | nd | nd | 1.6 |
| 1,1-Dichloroethylene | 0.5 | nd | nd | nd | 1.6 |
| cis-1,2-Dichloroethylene | 0.5 | **5.5** | **49.8** | **21.3** | 1.6 |
| trans-1,2-Dichloroethylene | 0.5 | nd | nd | nd | 1.6 |
| 1,2-Dichloropropane | 0.5 | nd | nd | nd | 16 |
| 1,3-Dichloropropene | 0.5 | nd | nd | nd | 5.2 |
| Ethylbenzene | 0.5 | nd | nd | nd | 2300 |
| Ethylene Dibromide | 0.2 | nd | nd | nd | 0.25 |
| Hexane | 1.0 | nd | nd | nd | 51 |
| Methyl Ethyl Ketone | 5.0 | nd | nd | nd | 470000 |
| Methyl Isobutyl Ketone | 5.0 | nd | nd | nd | 140000 |
| Methyl tert-butyl ether | 2.0 | nd | nd | nd | 190 |
| Methylene Chloride | 5.0 | nd | nd | nd | 610 |
| Styrene | 0.5 | nd | nd | nd | 1300 |
| 1,1,1,2-Tetrachloroethane | 0.5 | nd | nd | nd | 3.3 |
| 1,1,2,2-Tetrachloroethane | 0.5 | nd | nd | nd | 3.2 |
| Tetrachloroethylene | 0.5 | **154** | **1550** | **591** | 1.6 |
| Toluene | 0.5 | nd | nd | nd | 18000 |
| 1,1,1-Trichloroethane | 0.5 | nd | nd | nd | 640 |
| 1,1,2-Trichloroethane | 0.5 | nd | nd | nd | 4.7 |
| Trichloroethylene | 0.5 | **11.8** | **87.0** | **50.1** | 1.6 |
| Trichlorofluoromethane | 1.0 | nd | nd | nd | 2500 |
| Vinyl Chloride | 0.5 | nd | nd | nd | 0.5 |
| Xylenes | 0.5 | nd | nd | nd | 4,200 |

*Notes:*
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – value exceeds selected MECP standards

All VOC parameter concentrations were in compliance with the selected MECP Table 3 Coarse-Grained Non-Potable Groundwater Standards with the exception of the following. The cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene in all groundwater samples.

**Table 13**
**Maximum Concentrations – Groundwater**

| Parameter | Maximum Concentration (µg/L) | Sample ID | Depth Interval (m BGS) |
|---|---|---|---|
| PHCs $F_1$ | 220 | **BH2-23-GW1** | **6.0 – 7.5** |
| cis-1,2-Dichloroethylene | **49.8** | **BH2-23-GW1** | **6.0 – 7.5** |
| Tetrachloroethylene | **1550** | **BH2-23-GW1** | **6.0 – 7.5** |
| Trichloroethylene | **87.0** | **BH2-23-GW1** | **6.0 – 7.5** |

*Notes:*
- **Bold and Underlined** – value exceeds selected MECP standards

All other parameter concentrations analyzed were below the laboratory detection limits. The laboratory certificates of analysis are provided in Appendix 1.

## 5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O. Reg. 153/04 amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

### Site Description

#### Potentially Contaminating Activity and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I ESA report, four potentially contaminating activities (PCAs) resulting in three areas of potential environmental concern (APECs), were identified on the Phase I Property. These APECs include:

**Table 1**
**Areas of Potential Environmental Concern**

| APEC | Location of APEC | PCA (O. Reg. 153/04 – Table 2) | Location of PCA | Contaminants of Potential Concern | Media Potentially Impacted |
|---|---|---|---|---|---|
| **APEC #1**<br>Former Auto body shop | Western Portion of Subject Site | *"Item 10: Commercial Autobody Shops"* | 0 m West | BTEX<br>PHCs ($F_1$-$F_4$)<br>VOCs | Soil and/or Groundwater |
| **APEC #2**<br>Former retail fuel outlet with one (1) UST and Former auto service garage | Eastern Portion of Subject Site | *"Item 28: Gasoline and Associated Products Storage in Fixed Tanks"*<br>*"Item 52: Storage, Maintenance, Fuelling, and Repair of Equipment, Vehicles, and Material Used to Maintain Transportation Systems"* | 40 m Southeast | BTEX<br>PHCs ($F_1$-$F_4$) | Soil and/or Groundwater |
| **APEC #3**<br>Former dry cleaners | Southern Portion of Subject Site | *Item 37 – Operation of Dry-Cleaning Equipment (where chemicals are used)* | 70 m South | VOCs | Soil and/or Groundwater |

## Contaminants of Potential Concern (CPCs)

The contaminants of potential concern for the soil and/or groundwater on the Phase II Property include the following:

- ❒ Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons (PHCs, F1-F4);
- ❒ Volatile organic compounds (VOCs);
- ❒ Metals;
- ❒ PAHs.

Fill of questionable quality was identified during the drilling program which resulted in the addition of PAHs and metal parameters to the contaminants of potential concern identified in the Phase I ESA. These CPCs have the potential to be present in the soil matrix and/or the groundwater situated beneath the Phase I Property.

# Physical Setting

## Site Stratigraphy

The stratigraphy of the Phase II Property generally consists of:

- Fill material (concrete slab or topsoil, crushed stone, gravel, brown silty sand, trace clay); extending to depths ranging from 1.45 m to 1.76 m below ground surface.
- Brown silty sand to sandy silt with gravel; extending to depths ranging from 2.21 m to 2.97 m below ground surface.
- Glacial till; extending to depths ranging from approximately 4.88 m to 5.38 m below ground surface.
- Bedrock consisting of limestone; extending to 7.60 m depth below ground surface.

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets in Appendix 1.

## Hydrogeological Characteristics

The groundwater at the Phase II Property was encountered at depths ranging from approximately 4.55 m to 4.67 m below the existing ground surface.

Based on the measured groundwater levels, the groundwater was calculated to flow in a southeastern direction, however, the groundwater levels likely had not stabilized at the time of the field work.

## Approximate Depth to Bedrock

Bedrock was encountered/confirmed at depths ranging from 4.88m to 5.28m in all the boreholes at the time of the field drilling program.

## Approximate Depth to Water Table

The depth to the water table is approximately 4.55 m to 4.67 m below the existing ground surface.

## Sections 41 and 43.1 of Ontario Regulation 153/04

Section 41 of the Regulation does not apply to the Phase II Property, as the Phase II Property is not within 30 m of an environmentally sensitive area and the pH of the subsurface soil is between 5 and 9.

Section 43.1 of the Regulation does not apply to the Phase II Property in that the Phase II Property is not a Shallow Soil Property and is not within 30 m of a water body.

## Environmental Condition

### Areas Where Contaminants are Present

Based on the analytical test results, PAH and metal impacted soil (fill material) was identified in BH3-23. This borehole is located in the northwestern portion of the Phase II Property.

Groundwater impacted with VOC parameters cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene was identified in all monitoring wells installed on the Phase II Property (BH1-23 - BH3-23).

### Types of Contaminants

Fill material at BH3-23 contains concentrations of PAHs and metals in excess of the selected MECP Table 3 Coarse-Grained Residential Soil Standards.

Groundwater impacted by VOCs (cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene) was identified in all monitoring wells.

### Contaminated Media

Based on the findings of this Phase II ESA, the fill (northwestern portion of the Phase II Property) has been impacted with metals and/or PAHs.

Groundwater across the Phase II Property has been impacted with VOCs.

### What Is Known About Areas Where Contaminants Are Present

The source of the PAH and Metal impacted fill material is unknown.

The VOC impacted groundwater is considered to have resulted from an off-site source, considered likely to be the former dry cleaners 70m south of the Phase II Property.

### Distribution and Migration of Contaminants

The surficial soil/fill in the vicinity of BH3-23 contains concentrations of PAHs and metals in excess of the selected MECP Table 3 Course-Grained Residential Soil Standards. Given their low mobility, these contaminants are anticipated to be limited to fill material and are not considered to extend into the underlying native soils or the groundwater.

VOC impacted groundwater was identified across the Phase II Property. Based on the results of the Phase II ESA, the VOC impacts are limited to the groundwater. It is expected to have migrated onto the subject site from on off-site source located to the south.

**Discharge of Contaminants**

The surficial soil/fill in the vicinity of BH3-23 contains elevated concentrations of PAHs and metals in excess of the selected MECP Table 3 Coarse-Grained Residential Soil Standards.

VOC impacts were identified in the groundwater across the majority of the Phase II Property. Based on the current and historical use of the Phase II Property, the discharge of contaminants is not anticipated to have resulted from on-site activities.

**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.

Based on the findings of this Phase II ESA, climatic and meteorological conditions are not considered to have affected contaminant distribution on the Phase II Property.

**Potential for Vapour Intrusion**

Given the low volatility of PAH and metal parameters, in combination with the location of the identified soil contamination outside of any building footprints, the potential for vapour intrusion resulting from soil contamination is low. However, it is considered possible that there is some potential for vapour intrusion based on the presence of VOCs in the groundwater across the majority of the Phase II Property.

# 6.0 CONCLUSIONS

## Assessment

Paterson Group was retained by Tony Zacconi and David Aston to conduct a Phase II – Environmental Site Assessment (Phase II-ESA) for the property addressed 370 Athlone Avenue, Ottawa, Ontario. The purpose of the Phase II-ESA was to address 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 subject site (Phase II Property).

The subsurface investigation for this assessment was conducted on May 18, 2023 and consisted of drilling three boreholes (BH1-23 to BH3-23) across the Phase II Property, all of the three boreholes were equipped with groundwater monitoring wells. The boreholes were advanced to a depth of 7.60 m below the existing ground surface and terminated within the bedrock layer.

In general, the subsurface soil profile encountered at the borehole locations consists of fill material (concrete slab or topsoil, crushed stone, gravel, brown silty sand, trace clay) underlain by silty sand to sandy silt and glacial till. Bedrock was encountered/confirmed at depths ranging from 4.88m to 5.28m in all boreholes at the time of the field drilling program.

Seven soil samples were submitted for laboratory analysis of PHCs ($F_1$-$F_4$), VOCs, metals and PAHs. Based on the analytical test results, the surficial soil/fill in the vicinity of BH3-23 contains concentrations of multiple PAH and metal parameters in excess of the selected MECP Table 3 Coarse-Grained Residential Soil Standards. The remaining soil results comply with selected MECP Table 3 Coarse-Grained Residential Soil Standards.

Three groundwater samples were submitted for laboratory analysis of PHCs ($F_1$-$F_4$) and VOCs. All parameter concentrations were in compliance with the selected MECP Table 3 Coarse-Grained Non-Potable Groundwater Standards except for the following. The cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene in all groundwater samples.

# Recommendations

## Soil and Groundwater

Based on the findings of this assessment, PAH and metal impacted fill was identified in the northwestern portion of the Phase II Property. Given the low solubility of PAH and metal parameters, in combination with visual observations made during the field program and analytical testing, the impacts are expected to be confined to the fill layer. There is no risk to the current use of the Phase II Property since the fill layer is below concrete slab.

It is our understanding that the Phase II Property may be redeveloped in the future. As such, the contaminated soil could be fully delineated and remediated in conjunction with site redevelopment. This contaminated soil will require disposal at a licensed waste disposal facility. Prior to off-site disposal of impacted soil at a licensed waste disposal facility, a leachate analysis of a representative sample of contaminated soil must be conducted in accordance with Ontario Regulation 347/558.

Groundwater impacted by VOCs (cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene) was identified in all well locations at the Phase II ESA. The VOC exceedances are suspected to be a result of a former off-site dry cleaners 70m south of the Phase II Property.

It is our opinion that the contaminated groundwater and soil do not pose a risk to the current use of the subject building, although further assessment would be required to confirm this opinion. However, the presence of contaminated groundwater and soil does pose a liability to the site.

Given that there is contaminated groundwater on-site and that the source of the cis-1,2-Dichloroethylene, Tetrachloroethylene and Trichloroethylene in all boreholes is expected to be a former off-site dry-cleaning facility, remediation of the groundwater to meet the generic MECP standards would not likely be a feasible option. In lieu of a generic remediation, a due diligence risk assessment should be completed to assess the risk to the current use of the land and any required risk mitigation measures that would be required to be implemented in any future developments. Further information can be provided upon request.

### Monitoring Wells

It is recommended that the monitoring wells be maintained for future sampling purposes. The monitoring wells will be registered with the MECP under Ontario Regulation 903 (Ontario Water Resources Act). At such a time that the monitoring wells are no longer required, they must be decommissioned in accordance with O.Reg. 903.

# 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 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 Mr. Tony Zacconi and Mr. David Aston. Permission and notification from the above noted parties and Paterson Group will be required prior to the release of this report to any other party.

**Paterson Group Inc.**

Mohammed Ramadan, B.Sc.


Mark D'Arcy, P.Eng., QP$_{ESA}$

**Report Distribution:**

- Mr. Tony Zacconi and Mr. David Aston.
- Paterson Group Inc.

# FIGURES

**FIGURE 1 – KEY PLAN**

**DRAWING PE6096-1 – SITE PLAN**

**DRAWING PE6096-2 – SURROUNDING LAND USE PLAN**

**DRAWING PE6096-3 – TEST HOLE LOCATION PLAN**

**DRAWING PE6096-4 – ANALYTICAL TESTING PLAN – SOIL**

**DRAWING PE6096-5 – ANALYTICAL TESTING PLAN – GROUNDWATER**

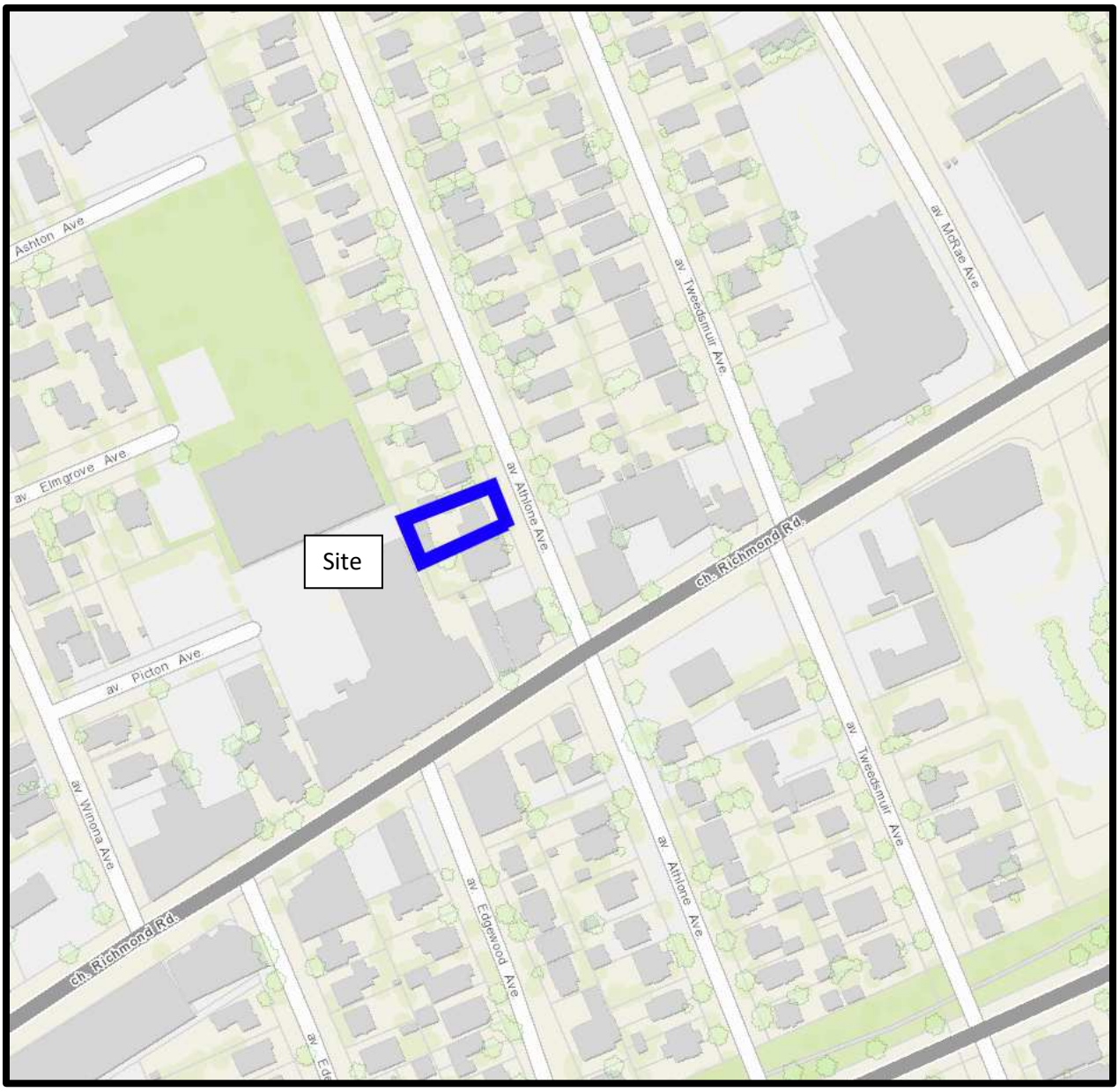



FIGURE 1

# KEY PLAN

PATERSON GROUP

294 ELMGROVE AVENUE
GYMNASTICS CENTRE

366 ATHLONE AVENUE
RESIDENTIAL DWELLING

WALL

ASPHALTIC CONCRETE
DRIVEWAY

CONCRETE
PAVEMENT

PARKING GARAGE

APEC 1

WOODEN
STEPS

SIDEWALK

ATHLONE AVENUE

361 ATHLONE AVENUE
RESIDENTIAL DWELLING

365 ATHLONE AVENUE
RESIDENTIAL DWELLING

SIDEWALK

STORAGE
SHED

GRASSED

370 ATHLONE AVENUE
RESIDENTIAL DWELLING

APEC 2

GRASSED

APEC 3

277 RICHMOND ROAD
COMMERCIAL RETAIL / OFFICE

FENCE

POLE-MOUNTED
TRANSFORMER

374 ATHLONE AVENUE
RESIDENTIAL DWELLING

AREAS OF POTENTIAL ENVIRONMENTAL CONCERN:

| ID | ADDRESS | DESCRIPTION |
|---|---|---|
| 1 | 277 RICHMOND RD. | FORMER AUTO BODY REPAIR SHOP |
| 2 | 255 RICHMOND RD. | FORMER RETAIL FUEL OUTLET & AUTO SERVICE GARAGE |
| 3 | 280-282 RICHMOND RD. | FORMER DRY CLEANERS |

SCALE: 1:150

0 1 2 3 4 5 10m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|

TONY ZACCONI AND DAVID ASTON

PHASE I - ENVIRONMENTAL SITE ASSESSMENT
370 ATHLONE AVENUE

OTTAWA, ONTARIO

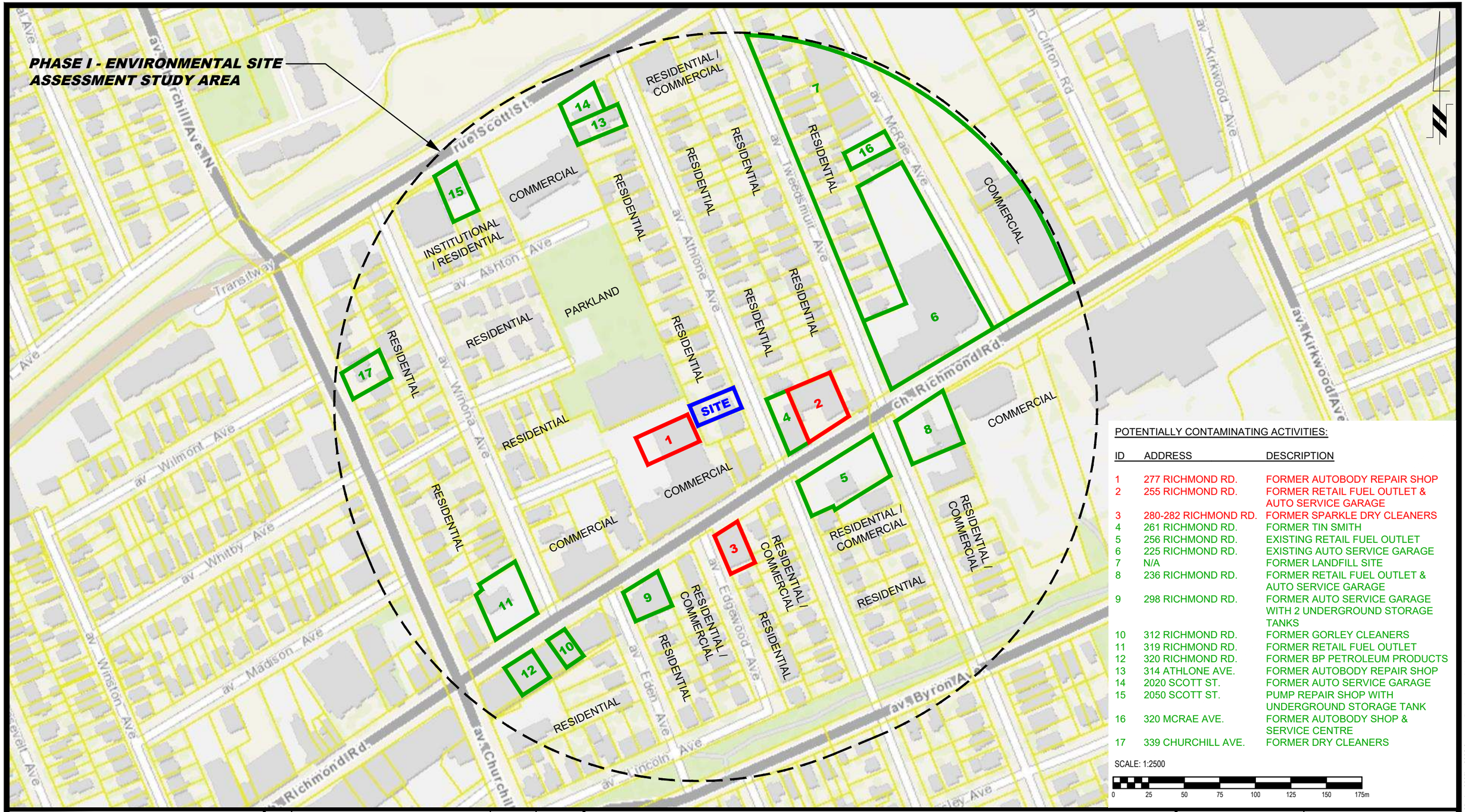
Title:

# SITE PLAN

| | |
|---|---|
| Scale: 1:150 | Date: 06/2023 |
| Drawn by: YA | Report No.: PE6096-1 |
| Checked by: MR | Dwg. No.: PE6096-1 |
| Approved by: MSD | Revision No.: |

11x17

p:\autocad drawings\environmental\pe60xx\pe6096\pe6096-1-site plan.dwg




POTENTIALLY CONTAMINATING ACTIVITIES:

| ID | ADDRESS | DESCRIPTION |
|---|---|---|
| 1 | 277 RICHMOND RD. | FORMER AUTOBODY REPAIR SHOP |
| 2 | 255 RICHMOND RD. | FORMER RETAIL FUEL OUTLET & AUTO SERVICE GARAGE |
| 3 | 280-282 RICHMOND RD. | FORMER SPARKLE DRY CLEANERS |
| 4 | 261 RICHMOND RD. | FORMER TIN SMITH |
| 5 | 256 RICHMOND RD. | EXISTING RETAIL FUEL OUTLET |
| 6 | 225 RICHMOND RD. | EXISTING AUTO SERVICE GARAGE |
| 7 | N/A | FORMER LANDFILL SITE |
| 8 | 236 RICHMOND RD. | FORMER RETAIL FUEL OUTLET & AUTO SERVICE GARAGE |
| 9 | 298 RICHMOND RD. | FORMER AUTO SERVICE GARAGE WITH 2 UNDERGROUND STORAGE TANKS |
| 10 | 312 RICHMOND RD. | FORMER GORLEY CLEANERS |
| 11 | 319 RICHMOND RD. | FORMER RETAIL FUEL OUTLET |
| 12 | 320 RICHMOND RD. | FORMER BP PETROLEUM PRODUCTS |
| 13 | 314 ATHLONE AVE. | FORMER AUTOBODY REPAIR SHOP |
| 14 | 2020 SCOTT ST. | FORMER AUTO SERVICE GARAGE |
| 15 | 2050 SCOTT ST. | PUMP REPAIR SHOP WITH UNDERGROUND STORAGE TANK |
| 16 | 320 MCRAE AVE. | FORMER AUTOBODY SHOP & SERVICE CENTRE |
| 17 | 339 CHURCHILL AVE. | FORMER DRY CLEANERS |

SCALE: 1:2500

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| | | | |

TONY ZACCONI AND DAVID ASTON

**PHASE I - ENVIRONMENTAL SITE ASSESSMENT**
**370 ATHLONE AVENUE**

OTTAWA, ONTARIO

Title:

# SURROUNDING LAND USE PLAN

| | |
|---|---|
| Scale: 1:2500 | Date: 06/2023 |
| Drawn by: YA | Report No.: PE6096-1 |
| Checked by: MR | Dwg. No.: PE6096-2 |
| Approved by: MSD | Revision No.: |

p:\autocad drawings\environmental\pe60xx\pe6096\pe6096-2-surrounding land use plan.dwg

11x17

294 ELMGROVE AVENUE
GYMNASTICS CENTRE

366 ATHLONE AVENUE
RESIDENTIAL DWELLING

WALL

PARKING GARAGE

**BH 3-23**
**65.39**
**[60.51]**
**(60.82)**

ASPHALTIC CONCRETE
DRIVEWAY

CONCRETE
PAVEMENT

WOODEN
STEPS

SIDEWALK

ATHLONE AVENUE

361 ATHLONE AVENUE
RESIDENTIAL DWELLING

365 ATHLONE AVENUE
RESIDENTIAL DWELLING

SIDEWALK

60.8

60.79

60.78

60.77

60.76

(0.006m/m)

GRASSED

**370 ATHLONE AVENUE**
**RESIDENTIAL DWELLING**

GRASSED

STORAGE
SHED

**BH 2-23**
**65.31**
**[59.93]**
**(60.76)**

**BH 1-23**
**65.42**
**[60.14]**
**(60.75)**

277 RICHMOND ROAD
COMMERCIAL RETAIL / OFFICE

FENCE

POLE-MOUNTED
TRANSFORMER

374 ATHLONE AVENUE
RESIDENTIAL DWELLING

LEGEND:

| | |
|---|---|
| ⊕ | BOREHOLE WITH MONITORING WELL LOCATION |
| 65.31 | GROUND SURFACE ELEVATION (m) |
| [59.93] | BEDROCK SURFACE ELEVATION (m) |
| (60.76) | GROUNDWATER SURFACE ELEVATION (m) |
| 60.8 | GROUNDWATER CONTOUR (m) |
| (0.006m/m) | APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT) |

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

SCALE: 1:150

0 1 2 3 4 5 10m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|

**TONY ZACCONI AND DAVID ASTON**

**PHASE II - ENVIRONMENTAL SITE ASSESSMENT**
**370 ATHLONE AVENUE**

**OTTAWA,** **ONTARIO**

**Title:**

# TEST HOLE LOCATION PLAN

| | |
|---|---|
| **Scale:** 1:150 | **Date:** 06/2023 |
| **Drawn by:** YA | **Report No.:** PE6096-1 |
| **Checked by:** MR | **Dwg. No.:** PE6096-3 |
| **Approved by:** MSD | **Revision No.:** |

p:\autocad drawings\environmental\pe60xx\pe6096\pe6096-phase ii (june 2023).dwg

11x17

| BH3-23-AU1 | 0.07-0.4m | May 18, 2023 |
|---|---|---|
| Parameter | Result(µg/g) | Standard(µg/g) |
| Arsenic | 80.6 | 18 |
| Lead | 139 | 120 |
| Molybdenum | 12.2 | 6.9 |
| Acenaphthylene | 0.31 | 0.15 |
| Benzo[a]anthracene | 2.04 | 0.5 |
| Benzo[a]pyrene | 2.06 | 0.3 |
| Benzo[b]fluoranthene | 1.37 | 0.78 |
| Dibenzo[a,h]anthracene | 0.21 | 0.1 |
| Fluoranthene | 4.12 | 0.69 |
| Indeno [1,2,3-cd] pyrene | 0.73 | 0.38 |
| Remaining Metals & PAHs comply with MECP Table 3 Standards | | |

| BH3-23-AU2 | 0.4-0.7m | May 18, 2023 |
|---|---|---|
| Metals & PAHs comply with MECP Table 3 Standards | | |

| BH3-23-SS7 | 3.8-4.4m | May 18, 2023 |
|---|---|---|
| VOCs & PHCs comply with MECP Table 3 Standards | | |

366 ATHLONE AVENUE
RESIDENTIAL DWELLING

WALL

PARKING GARAGE

**BH 3-23**
**65.39**
**[60.51]**
**(60.82)**

ASPHALTIC CONCRETE
DRIVEWAY

CONCRETE
PAVEMENT

WOODEN
STEPS

**370 ATHLONE AVENUE**
**RESIDENTIAL DWELLING**

GRASSED

STORAGE
SHED

GRASSED

**BH 1-23**
**65.42**
**[60.14]**
**(60.75)**

**BH 2-23**
**65.31**
**[59.93]**
**(60.76)**

277 RICHMOND ROAD
COMMERCIAL RETAIL / OFFICE

FENCE

POLE-MOUNTED
TRANSFORMER

374 ATHLONE AVENUE
RESIDENTIAL DWELLING

| BH2-23-AU1 | 0.3-0.6m | May 18, 2023 |
|---|---|---|
| Metals & PAHs comply with MECP Table 3 Standards | | |

| BH2-23-SS6 | 3.8-4.4m | May 18, 2023 |
|---|---|---|
| VOCs & PHCs comply with MECP Table 3 Standards | | |

| BH1-23-AU1 | 0.3-0.6m | May 18, 2023 |
|---|---|---|
| Metals & PAHs comply with MECP Table 3 Standards | | |

| BH1-23-SS5 | 3.6-4.2m | May 18, 2023 |
|---|---|---|
| VOCs & PHCs comply with MECP Table 3 Standards | | |

ATHLONE AVENUE

SIDEWALK

SIDEWALK

361 ATHLONE AVENUE
RESIDENTIAL DWELLING

365 ATHLONE AVENUE
RESIDENTIAL DWELLING

LEGEND:

**SOIL RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS**

**SOIL RESULT EXCEEDS THE MECP TABLE 3 STANDARDS**

| | |
|---|---|
| ⊕ | BOREHOLE WITH MONITORING WELL LOCATION |
| 65.31 | GROUND SURFACE ELEVATION (m) |
| [59.93] | BEDROCK SURFACE ELEVATION (m) |
| (60.76) | GROUNDWATER SURFACE ELEVATION (m) |

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

SCALE: 1:150

0 1 2 3 4 5 10m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|

TONY ZACCONI AND DAVID ASTON

**PHASE II - ENVIRONMENTAL SITE ASSESSMENT**
**370 ATHLONE AVENUE**

OTTAWA, ONTARIO

Title:

# ANALYTICAL TESTING PLAN - SOIL

| | |
|---|---|
| Scale: 1:150 | Date: 06/2023 |
| Drawn by: YA | Report No.: PE6096-1 |
| Checked by: MR | Dwg. No.: PE6096-4 |
| Approved by: MSD | Revision No.: |

11x17

p:\autocad drawings\environmental\pe60xx\pe6096\pe6096-phase ii (june 2023).dwg

294 ELMGROVE AVENUE
GYMNASTICS CENTRE

366 ATHLONE AVENUE
RESIDENTIAL DWELLING

| BH3-23-GW1 | 6.0-7.5m | May 23, 2023 |
|---|---|---|
| Parameter | Result(µg/L) | Standard(µg/L) |
| cis-1,2-Dichloroethylene | 21.3 | 1.6 |
| Tetrachloroethylene | 591 | 1.6 |
| Trichloroethylene | 50.1 | 1.6 |
| Remaining VOCs & PHCs comply with MECP Table 3 Standards | | |

WALL

PARKING GARAGE

**BH 3-23**
**65.39**
**[60.51]**
**(60.82)**

ASPHALTIC CONCRETE
DRIVEWAY

CONCRETE
PAVEMENT

| BH1-23-GW1 | 5.9-7.4m | May 23, 2023 |
|---|---|---|
| Parameter | Result(µg/L) | Standard(µg/L) |
| cis-1,2-Dichloroethylene | 5.5 | 1.6 |
| Tetrachloroethylene | 154 | 1.6 |
| Trichloroethylene | 11.8 | 1.6 |
| Remaining VOCs & PHCs comply with MECP Table 3 Standards | | |

WOODEN
STEPS

**370 ATHLONE AVENUE**
**RESIDENTIAL DWELLING**

GRASSED

GRASSED

STORAGE
SHED

**BH 2-23**
**65.31**
**[59.93]**
**(60.76)**

**BH 1-23**
**65.42**
**[60.14]**
**(60.75)**

277 RICHMOND ROAD
COMMERCIAL RETAIL / OFFICE

FENCE

POLE-MOUNTED
TRANSFORMER

| BH2-23-GW1 | 6.0-7.5m | May 23, 2023 |
|---|---|---|
| Parameter | Result(µg/L) | Standard(µg/L) |
| cis-1,2-Dichloroethylene | 49.8 | 1.6 |
| Tetrachloroethylene | 1550 | 1.6 |
| Trichloroethylene | 87 | 1.6 |
| Remaining VOCs & PHCs comply with MECP Table 3 Standards | | |

374 ATHLONE AVENUE
RESIDENTIAL DWELLING

SIDEWALK

ATHLONE AVENUE

SIDEWALK

361 ATHLONE AVENUE
RESIDENTIAL DWELLING

365 ATHLONE AVENUE
RESIDENTIAL DWELLING

LEGEND:

**GROUNDWATER RESULT COMPLIES WITH THE MECP TABLE 3 STANDARDS**

**GROUNDWATER RESULT EXCEEDS THE MECP TABLE 3 STANDARDS**

⊕ BOREHOLE WITH MONITORING WELL LOCATION

65.31 GROUND SURFACE ELEVATION (m)

[59.93] BEDROCK SURFACE ELEVATION (m)

(60.76) GROUNDWATER SURFACE ELEVATION (m)

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

SCALE: 1:150

0 1 2 3 4 5 10m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|

TONY ZACCONI AND DAVID ASTON

**PHASE II - ENVIRONMENTAL SITE ASSESSMENT**
**370 ATHLONE AVENUE**

**OTTAWA, ONTARIO**

Title:

# ANALYTICAL TESTING PLAN - GROUNDWATER

| | |
|---|---|
| Scale: 1:150 | Date: 06/2023 |
| Drawn by: YA | Report No.: PE6096-1 |
| Checked by: MR | Dwg. No.: PE6096-5 |
| Approved by: MSD | Revision No.: |

11x17

p:\autocad drawings\environmental\pe60xx\pe6096\pe6096-phase ii (june 2023).dwg

# APPENDIX 1

**SAMPLING AND ANALYSIS PLAN**

**SOIL PROFILE AND TEST DATA SHEETS**

**SYMBOLS AND TERMS**

**LABORATORY CERTIFICATES OF ANALYSIS**

PATERSON GROUP

# Sampling & Analysis Plan

370 Athlone Avenue

Ottawa, Ontario

Prepared for Mr. Tony Zacconi & Mr. David Aston

**Report: PE6096-SAP**
**May 8, 2023**

# TABLE OF CONTENTS

**PAGE**

# 1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Tony Zacconi & Mr. David Aston, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the property addressed 370 Athlone Avenue, in the City of Ottawa, Ontario.

Based on the findings of the Phase I ESA, the following subsurface investigation program was developed.

| Borehole | Location & Rationale | Proposed Depth & Rationale |
|---|---|---|
| BH1-23 | Southeastern portion of the Phase I Property to assess for potential impacts resulting from the former off-site presence of retail fuel outlet and auto service garage. | 6-8 m; to intercept the groundwater table for the purpose of installing a monitoring well. |
| BH2-23 | Southwestern portion of the Phase I Property to assess for potential impacts resulting from the former off-site presence of a dry-cleaning facility. | 6-8 m; to intercept the groundwater table for the purpose of installing a monitoring well. |
| BH3-23 | Northwestern portion of the Phase I Property to assess for potential impacts resulting from the former off-site presence of an autobody repair shop. | 6-8 m; to intercept the groundwater table for the purpose of installing a monitoring well. |

Borehole locations are shown on Drawing PE6096-3 – Test Hole Location Plan, appended to the main report.

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

Following the borehole drilling, groundwater monitoring wells will be installed in three boreholes to allow for the collection of groundwater samples.

# 2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the Phase I Property 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 soil at the Phase I Property is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).

- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.

- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

# 3.0 STANDARD OPERATING PROCEDURES

## 3.1 Environmental Drilling Procedure

### Purpose

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

### Equipment

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

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

**Determining Borehole Locations**

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

After drilling is completed a plan with the borehole locations must be provided. Distances and orientations of boreholes with respect to site features (buildings, roadways, etc.) must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Ground surface elevations at each borehole should be surveyed relative to a geodetic benchmark, if one is available, or a temporary site benchmark which can be tied in at a later date if necessary.

**Drilling Procedure**

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs $F_1$, a soil core from each soil sample, which may be analyzed, must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.

- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

**Spoon Washing Procedure**

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

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

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

**Screening Procedure**

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

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

- ❒ Samples should be brought to room temperature; this is specifically important in colder weather. Soil must not be frozen.
- ❒ Turn instrument on and allow to come to zero - calibrate if necessary
- ❒ If using RKI Eagle, ensure instrument is in methane elimination mode unless otherwise directed.

- ❒ Ensure measurement units are ppm (parts per million) initially. RKI Eagle will automatically switch to %LEL (lower explosive limit) if higher concentrations are encountered.
- ❒ Break up large lumps of soil in the sample bag, taking care not to puncture bag.
- ❒ Insert probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in bag while observing instrument readings.
- ❒ Record the highest value obtained in the first 15 to 25 seconds
- ❒ Make sure to indicate scale (ppm or LEL); also note which instrument was used (RKI Eagle 1 or 2, or MiniRae).
- ❒ Jar samples and refrigerate as per Sampling and Analysis Plan.

## 3.2 Monitoring Well Installation Procedure

### Equipment

- ❒ 5' x 2" threaded sections of Schedule 40 PVC slotted well screen (5' x 1 ¼" if installing in cored hole in bedrock)
- ❒ 5' x 2" threaded sections of Schedule 40 PVC riser pipe (5' x 1 ¼" if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

### Procedure

- ❒ Drill borehole to required depth, using drilling and sampling procedures described above.
- ❒ If borehole is deeper than required monitoring well, backfill with bentonite chips to required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- ❒ Only one monitoring well should be installed per borehole.
- ❒ Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- ❒ Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.

- ❒ Thread the end cap onto a section of screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering well.
- ❒ As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- ❒ Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.
- ❒ Backfill remainder of borehole with holeplug or with auger cuttings (if contamination is not suspected).
- ❒ Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

## 3.3 Monitoring Well Sampling Procedure

### Equipment

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

### Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.

- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

# 4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

# 5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)

- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

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

# patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

## SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment**
**370 Athlone Avenue**
**Ottawa, Ontario**

**DATUM** Elevations are referenced to a geodetic datum

**FILE NO.** PE6096

**REMARKS**

**HOLE NO.** BH 1-23

**BORINGS BY** CME 55 Power Auger **DATE** May 18, 2023

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | | |
| **TOPSOIL** 0.30 | | AU | 1 | | | 0 | 65.42 |
| **FILL**: Crushed stone with gravel, topsoil and brown silty sand | | SS | 2 | 50 | 19 | 1 | 64.42 |
| 1.72 | | SS | 3 | 29 | 7 | 2 | 63.42 |
| | | RC | 1 | 31 | 53 | | |
| **GLACIAL TILL**: Dense to compact brown silty sand with gravel and cobbles | | SS | 4 | 58 | 30 | 3 | 62.42 |
| | | SS | 5 | 63 | 19 | 4 | 61.42 |
| | | SS | 6 | 0 | 43 | | |
| 5.28 | | SS | 7 | 13 | 50+ | 5 | 60.42 |
| | | RC | 2 | 94 | 94 | | |
| **BEDROCK:** Excellent to fair quality, grey limestone | | | | | | 6 | 59.42 |
| | | RC | 3 | 90 | 68 | 7 | 58.42 |
| 7.60 | | | | | | | |
| End of Borehole | | | | | | | |
| (GWL @ 4.67m - May 23, 2023) | | | | | | | |

**Photo Ionization Detector**
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

**RKI Eagle Rdg. (ppm)**

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

# patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

## SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment**
**370 Athlone Avenue**
**Ottawa, Ontario**

**DATUM** Elevations are referenced to a geodetic datum

**FILE NO.** PE6096

**REMARKS**

**HOLE NO.** BH 2-23

**BORINGS BY** CME 55 Power Auger **DATE** May 18, 2023

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | 0 | 65.31 |
| **TOPSOIL** 0.30 | | AU | 1 | | | | |
| **FILL**: Brown silty sand with gravel, cobbles and some topsoil | | SS | 2 | 13 | 50+ | 1 | 64.31 |
| 1.45 | | | | | | | |
| Very dense, light brown **SILTY SAND** to **SANDY SILT** with gravel and cobbles | | SS | 3 | 67 | 50+ | 2 | 63.31 |
| 2.21 | | | | | | | |
| | | SS | 4 | 58 | 50+ | 3 | 62.31 |
| | | SS | 5 | 33 | 30 | | |
| **GLACIAL TILL**: Very dense to dense brown silty sand with gravel and cobbles | | SS | 6 | 54 | 21 | 4 | 61.31 |
| | | SS | 7 | 100 | 42 | 5 | 60.31 |
| 5.38 | | | | | | | |
| | | RC | 1 | 89 | 86 | 6 | 59.31 |
| **BEDROCK:** Good to fair quality, grey limestone | | | | | | | |
| | | RC | 2 | 100 | 71 | 7 | 58.31 |
| 7.60 | | | | | | | |
| End of Borehole | | | | | | | |
| (GWL @ 4.55m - May 23, 2023) | | | | | | | |

**Photo Ionization Detector**
● Volatile Organic Rdg. (ppm)

○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500

**RKI Eagle Rdg. (ppm)**

▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

# patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

## SOIL PROFILE AND TEST DATA

**Phase II - Environmental Site Assessment**
**370 Athlone Avenue**
**Ottawa, Ontario**

**DATUM** Elevations are referenced to a geodetic datum

**FILE NO.** PE6096

**REMARKS**

**HOLE NO.** BH 3-23

**BORINGS BY** CME 55 Power Auger **DATE** May 18, 2023

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | SAMPLE % RECOVERY | SAMPLE N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | | | |
| Concrete Slab 0.08 | | | | | | 0 | 65.39 |
| **FILL**: Brown silty sand with topsoil, crushed stone, cobbles trace gravel and asphalt 0.38 | | AU | 1 | | | | |
| | | AU | 2 | | | | |
| **FILL**: Brown silty sand with crushed stone, gravel, occasional cobbles | | SS | 3 | 17 | 50+ | 1 | 64.39 |
| 1.67 | | SS | 4 | 75 | 50+ | 2 | 63.39 |
| Compact to dense, brown **SILTY SAND** with gravel | | SS | 5 | | 50+ | | |
| 2.97 | | SS | 6 | 100 | 24 | 3 | 62.39 |
| **GLACIAL TILL**: Compact to dense, brown sandy silt with gravel and cobbles | | SS | 7 | 100 | 48 | 4 | 61.39 |
| 4.88 | | SS | 8 | 8 | 50+ | 5 | 60.39 |
| **BEDROCK:** Excellent to fair quality, grey limestone | | RC | 1 | 97 | 97 | 6 | 59.39 |
| | | RC | 2 | 97 | 71 | 7 | 58.39 |
| 7.60 | | | | | | | |
| End of Borehole | | | | | | | |
| (GWL @ 4.57m - May 23, 2023) | | | | | | | |

**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<br>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

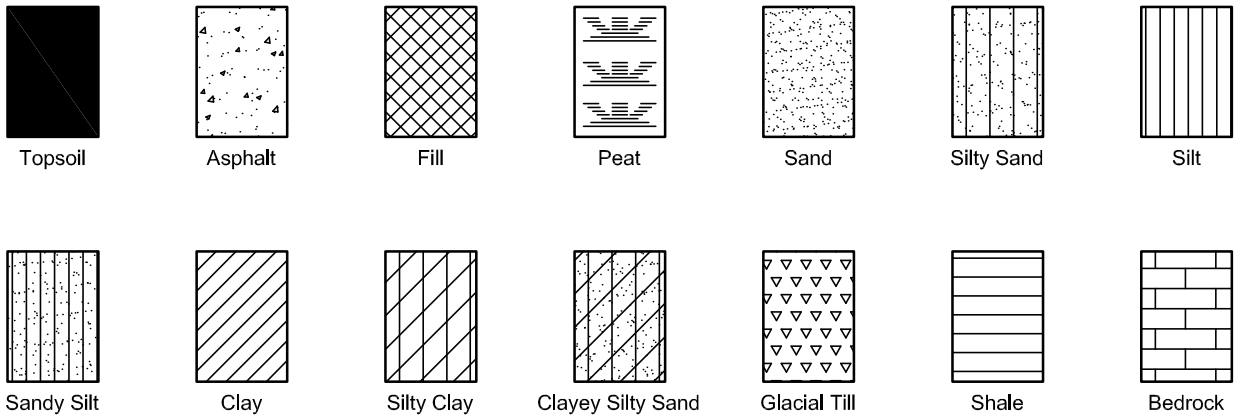
| | | |
|---|---|---|
| $p'_o$ | - | Present effective overburden pressure at sample depth |
| $p'_c$ | - | Preconsolidation pressure of (maximum past pressure on) sample |
| Ccr | - | Recompression index (in effect at pressures below $p'_c$) |
| Cc | - | Compression index (in effect at pressures above $p'_c$) |
| 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. |

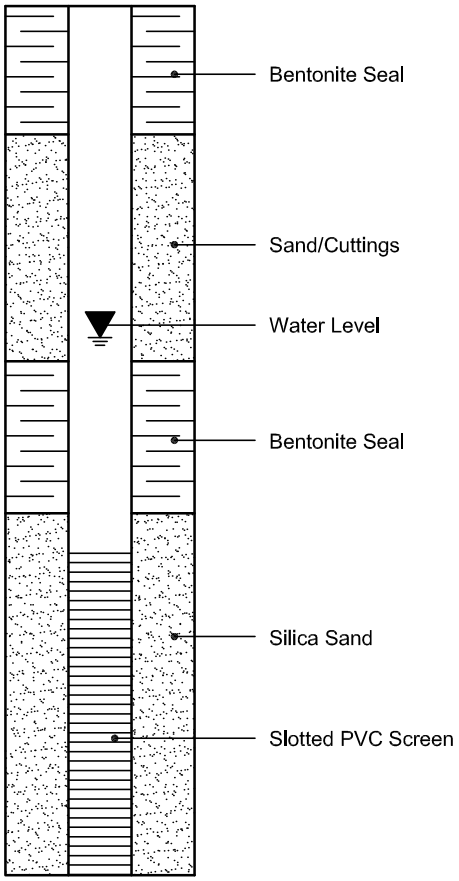
## SYMBOLS AND TERMS (continued)

### STRATA PLOT

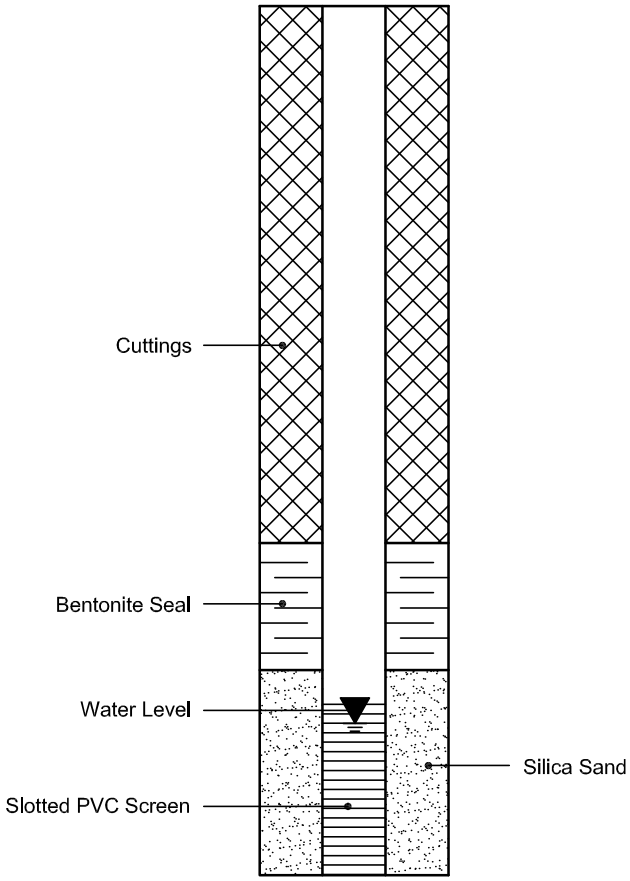



### MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION




PIEZOMETER CONSTRUCTION



PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

# Certificate of Analysis

**Paterson Group Consulting Engineers**

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Mark D'Arcy

Client PO: 57557
Project: PE6096
Custody:

Report Date: 2-Jun-2023
Order Date: 23-May-2023

Revised Report

**Order #: 2321086**

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

| Paracel ID | Client ID |
|---|---|
| 2321086-01 | BH1-23-AU1 |
| 2321086-03 | BH1-23-SS5 |
| 2321086-04 | BH2-23-AU1 |
| 2321086-05 | BH2-23-SS6 |
| 2321086-06 | BH3-23-AU1 |
| 2321086-07 | BH3-23-AU2 |
| 2321086-08 | BH3-23-SS7 |

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
**Client:** **Paterson Group Consulting Engineers**
**Client PO:** **57557**

Report Date: 02-Jun-2023
Order Date: 23-May-2023
**Project Description: PE6096**

## Analysis Summary Table

| Analysis | Method Reference/Description | Extraction Date | Analysis Date |
|---|---|---|---|
| PHC F1 | CWS Tier 1 - P&T GC-FID | 24-May-23 | 24-May-23 |
| PHCs F2 to F4 | CWS Tier 1 - GC-FID, extraction | 24-May-23 | 27-May-23 |
| REG 153: Metals by ICP/MS, soil | EPA 6020 - Digestion - ICP-MS | 29-May-23 | 29-May-23 |
| REG 153: PAHs by GC-MS | EPA 8270 - GC-MS, extraction | 25-May-23 | 26-May-23 |
| REG 153: VOCs by P&T GC/MS | EPA 8260 - P&T GC-MS | 24-May-23 | 24-May-23 |
| Solids, % | CWS Tier 1 - Gravimetric | 25-May-23 | 26-May-23 |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH1-23-AU1 | BH1-23-SS5 | BH2-23-AU1 | BH2-23-SS6 |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 |
| | Sample ID: | 2321086-01 | 2321086-03 | 2321086-04 | 2321086-05 |
| | MDL/Units | Soil | Soil | Soil | Soil |
| **Physical Characteristics** | | | | | |
| % Solids | 0.1 % by Wt. | 86.8 | 90.1 | 92.0 | 88.5 |
| **Metals** | | | | | |
| Antimony | 1.0 ug/g dry | <1.0 | - | <1.0 | - |
| Arsenic | 1.0 ug/g dry | 4.6 | - | 3.2 | - |
| Barium | 1.0 ug/g dry | 138 | - | 100 | - |
| Beryllium | 0.5 ug/g dry | 0.5 | - | 0.5 | - |
| Boron | 5.0 ug/g dry | 9.6 | - | 9.4 | - |
| Cadmium | 0.5 ug/g dry | <0.5 | - | <0.5 | - |
| Chromium | 5.0 ug/g dry | 25.0 | - | 22.5 | - |
| Cobalt | 1.0 ug/g dry | 7.0 | - | 6.4 | - |
| Copper | 5.0 ug/g dry | 18.6 | - | 20.8 | - |
| Lead | 1.0 ug/g dry | 47.4 | - | 32.2 | - |
| Molybdenum | 1.0 ug/g dry | <1.0 | - | <1.0 | - |
| Nickel | 5.0 ug/g dry | 15.1 | - | 12.8 | - |
| 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 | 32.3 | - | 31.6 | - |
| Zinc | 20.0 ug/g dry | 78.8 | - | 56.7 | - |
| **Volatiles** | | | | | |
| Acetone | 0.50 ug/g dry | - | <0.50 | - | <0.50 |
| Benzene | 0.02 ug/g dry | - | <0.02 | - | <0.02 |
| Bromodichloromethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Bromoform | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Bromomethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Carbon Tetrachloride | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Chlorobenzene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Chloroform | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Dibromochloromethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Dichlorodifluoromethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,2-Dichlorobenzene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,3-Dichlorobenzene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,4-Dichlorobenzene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1-Dichloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH1-23-AU1 | BH1-23-SS5 | BH2-23-AU1 | BH2-23-SS6 |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 |
| | Sample ID: | 2321086-01 | 2321086-03 | 2321086-04 | 2321086-05 |
| | MDL/Units | Soil | Soil | Soil | Soil |
| 1,2-Dichloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1-Dichloroethylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| cis-1,2-Dichloroethylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| trans-1,2-Dichloroethylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,2-Dichloropropane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| cis-1,3-Dichloropropylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| trans-1,3-Dichloropropylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,3-Dichloropropene, total | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Ethylbenzene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Ethylene dibromide (dibromoethane, 1,2-) | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Hexane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Methyl Ethyl Ketone (2-Butanone) | 0.50 ug/g dry | - | <0.50 | - | <0.50 |
| Methyl Isobutyl Ketone | 0.50 ug/g dry | - | <0.50 | - | <0.50 |
| Methyl tert-butyl ether | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Methylene Chloride | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Styrene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1,1,2-Tetrachloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1,2,2-Tetrachloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Tetrachloroethylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Toluene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1,1-Trichloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 1,1,2-Trichloroethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Trichloroethylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Trichlorofluoromethane | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Vinyl chloride | 0.02 ug/g dry | - | <0.02 | - | <0.02 |
| m,p-Xylenes | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| o-Xylene | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| Xylenes, total | 0.05 ug/g dry | - | <0.05 | - | <0.05 |
| 4-Bromofluorobenzene | Surrogate | - | 111% | - | 102% |
| Dibromofluoromethane | Surrogate | - | 85.1% | - | 82.2% |
| Toluene-d8 | Surrogate | - | 106% | - | 101% |
| **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 | - | <8 |
| F4 PHCs (C34-C50) | 6 ug/g dry | - | <6 | - | <6 |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH1-23-AU1 | BH1-23-SS5 | BH2-23-AU1 | BH2-23-SS6 |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 |
| | Sample ID: | 2321086-01 | 2321086-03 | 2321086-04 | 2321086-05 |
| | MDL/Units | Soil | Soil | Soil | Soil |
| **Semi-Volatiles** | | | | | |
| Acenaphthene | 0.02 ug/g dry | <0.02 | - | <0.02 | - |
| Acenaphthylene | 0.02 ug/g dry | <0.02 | - | 0.03 | - |
| Anthracene | 0.02 ug/g dry | <0.02 | - | 0.05 | - |
| Benzo [a] anthracene | 0.02 ug/g dry | 0.03 | - | 0.13 | - |
| Benzo [a] pyrene | 0.02 ug/g dry | 0.04 | - | 0.13 | - |
| Benzo [b] fluoranthene | 0.02 ug/g dry | 0.03 | - | 0.09 | - |
| Benzo [g,h,i] perylene | 0.02 ug/g dry | 0.03 | - | 0.08 | - |
| Benzo [k] fluoranthene | 0.02 ug/g dry | <0.02 | - | 0.05 | - |
| Chrysene | 0.02 ug/g dry | 0.05 | - | 0.15 | - |
| Dibenzo [a,h] anthracene | 0.02 ug/g dry | <0.02 | - | <0.02 | - |
| Fluoranthene | 0.02 ug/g dry | 0.07 | - | 0.27 | - |
| Fluorene | 0.02 ug/g dry | <0.02 | - | <0.02 | - |
| Indeno [1,2,3-cd] pyrene | 0.02 ug/g dry | <0.02 | - | 0.06 | - |
| 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 | 0.05 | - | 0.23 | - |
| Pyrene | 0.02 ug/g dry | 0.06 | - | 0.22 | - |
| 2-Fluorobiphenyl | Surrogate | 76.5% | - | 81.5% | - |
| Terphenyl-d14 | Surrogate | 76.4% | - | 74.4% | - |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH3-23-AU1 | BH3-23-AU2 | BH3-23-SS7 | - |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | - |
| | Sample ID: | 2321086-06 | 2321086-07 | 2321086-08 | - |
| | MDL/Units | Soil | Soil | Soil | - |
| **Physical Characteristics** | | | | | |
| % Solids | 0.1 % by Wt. | 88.4 | 95.8 | 92.7 | - |
| **Metals** | | | | | |
| Antimony | 1.0 ug/g dry | 2.4 | <1.0 | - | - |
| Arsenic | 1.0 ug/g dry | 80.6 | 4.6 | - | - |
| Barium | 1.0 ug/g dry | 350 | 122 | - | - |
| Beryllium | 0.5 ug/g dry | 1.6 | 0.5 | - | - |
| Boron | 5.0 ug/g dry | 11.8 | 13.3 | - | - |
| Cadmium | 0.5 ug/g dry | 0.6 | <0.5 | - | - |
| Chromium | 5.0 ug/g dry | 24.8 | 31.6 | - | - |
| Cobalt | 1.0 ug/g dry | 18.8 | 10.7 | - | - |
| Copper | 5.0 ug/g dry | 89.1 | 27.2 | - | - |
| Lead | 1.0 ug/g dry | 139 | 10.3 | - | - |
| Molybdenum | 1.0 ug/g dry | 12.2 | 1.8 | - | - |
| Nickel | 5.0 ug/g dry | 44.6 | 17.4 | - | - |
| Selenium | 1.0 ug/g dry | 1.3 | <1.0 | - | - |
| Silver | 0.3 ug/g dry | 0.5 | <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 | 34.4 | 47.4 | - | - |
| Zinc | 20.0 ug/g dry | 138 | 41.5 | - | - |
| **Volatiles** | | | | | |
| Acetone | 0.50 ug/g dry | - | - | <0.50 | - |
| Benzene | 0.02 ug/g dry | - | - | <0.02 | - |
| Bromodichloromethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Bromoform | 0.05 ug/g dry | - | - | <0.05 | - |
| Bromomethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Carbon Tetrachloride | 0.05 ug/g dry | - | - | <0.05 | - |
| Chlorobenzene | 0.05 ug/g dry | - | - | <0.05 | - |
| Chloroform | 0.05 ug/g dry | - | - | <0.05 | - |
| Dibromochloromethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Dichlorodifluoromethane | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,2-Dichlorobenzene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,3-Dichlorobenzene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,4-Dichlorobenzene | 0.05 ug/g dry | - | - | <0.05 | - |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH3-23-AU1 | BH3-23-AU2 | BH3-23-SS7 | - |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | - |
| | Sample ID: | 2321086-06 | 2321086-07 | 2321086-08 | - |
| | MDL/Units | Soil | Soil | Soil | - |
| 1,1-Dichloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,2-Dichloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,1-Dichloroethylene | 0.05 ug/g dry | - | - | <0.05 | - |
| cis-1,2-Dichloroethylene | 0.05 ug/g dry | - | - | <0.05 | - |
| trans-1,2-Dichloroethylene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,2-Dichloropropane | 0.05 ug/g dry | - | - | <0.05 | - |
| cis-1,3-Dichloropropylene | 0.05 ug/g dry | - | - | <0.05 | - |
| trans-1,3-Dichloropropylene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,3-Dichloropropene, total | 0.05 ug/g dry | - | - | <0.05 | - |
| Ethylbenzene | 0.05 ug/g dry | - | - | <0.05 | - |
| Ethylene dibromide (dibromoethane, 1 | 0.05 ug/g dry | - | - | <0.05 | - |
| Hexane | 0.05 ug/g dry | - | - | <0.05 | - |
| Methyl Ethyl Ketone (2-Butanone) | 0.50 ug/g dry | - | - | <0.50 | - |
| Methyl Isobutyl Ketone | 0.50 ug/g dry | - | - | <0.50 | - |
| Methyl tert-butyl ether | 0.05 ug/g dry | - | - | <0.05 | - |
| Methylene Chloride | 0.05 ug/g dry | - | - | <0.05 | - |
| Styrene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,1,1,2-Tetrachloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,1,2,2-Tetrachloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Tetrachloroethylene | 0.05 ug/g dry | - | - | <0.05 | - |
| Toluene | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,1,1-Trichloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| 1,1,2-Trichloroethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Trichloroethylene | 0.05 ug/g dry | - | - | <0.05 | - |
| Trichlorofluoromethane | 0.05 ug/g dry | - | - | <0.05 | - |
| Vinyl chloride | 0.02 ug/g dry | - | - | <0.02 | - |
| m,p-Xylenes | 0.05 ug/g dry | - | - | <0.05 | - |
| o-Xylene | 0.05 ug/g dry | - | - | <0.05 | - |
| Xylenes, total | 0.05 ug/g dry | - | - | <0.05 | - |
| 4-Bromofluorobenzene | Surrogate | - | - | 109% | - |
| Dibromofluoromethane | Surrogate | - | - | 83.8% | - |
| Toluene-d8 | Surrogate | - | - | 97.5% | - |
| **Hydrocarbons** | | | | | |
| F1 PHCs (C6-C10) | 7 ug/g dry | - | - | <7 | - |
| F2 PHCs (C10-C16) | 4 ug/g dry | - | - | <4 | - |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

| | Client ID: | BH3-23-AU1 | BH3-23-AU2 | BH3-23-SS7 | - |
|---|---|---|---|---|---|
| | Sample Date: | 18-May-23 09:00 | 18-May-23 09:00 | 18-May-23 09:00 | - |
| | Sample ID: | 2321086-06 | 2321086-07 | 2321086-08 | - |
| | MDL/Units | Soil | Soil | Soil | - |
| F3 PHCs (C16-C34) | 8 ug/g dry | - | - | <8 | - |
| F4 PHCs (C34-C50) | 6 ug/g dry | - | - | <6 | - |
| **Semi-Volatiles** | | | | | |
| Acenaphthene | 0.02 ug/g dry | 0.06 | <0.02 | - | - |
| Acenaphthylene | 0.02 ug/g dry | 0.31 | <0.02 | - | - |
| Anthracene | 0.02 ug/g dry | 0.49 | <0.02 | - | - |
| Benzo [a] anthracene | 0.02 ug/g dry | 2.04 | 0.03 | - | - |
| Benzo [a] pyrene | 0.02 ug/g dry | 2.06 | 0.03 | - | - |
| Benzo [b] fluoranthene | 0.02 ug/g dry | 1.37 | <0.02 | - | - |
| Benzo [g,h,i] perylene | 0.02 ug/g dry | 0.81 | <0.02 | - | - |
| Benzo [k] fluoranthene | 0.02 ug/g dry | 0.76 | <0.02 | - | - |
| Chrysene | 0.02 ug/g dry | 1.84 | 0.04 | - | - |
| Dibenzo [a,h] anthracene | 0.02 ug/g dry | 0.21 | <0.02 | - | - |
| Fluoranthene | 0.02 ug/g dry | 4.12 | 0.06 | - | - |
| Fluorene | 0.02 ug/g dry | 0.09 | <0.02 | - | - |
| Indeno [1,2,3-cd] pyrene | 0.02 ug/g dry | 0.73 | <0.02 | - | - |
| 1-Methylnaphthalene | 0.02 ug/g dry | 0.11 | 0.03 | - | - |
| 2-Methylnaphthalene | 0.02 ug/g dry | 0.13 | 0.05 | - | - |
| Methylnaphthalene (1&2) | 0.04 ug/g dry | 0.25 | 0.08 | - | - |
| Naphthalene | 0.01 ug/g dry | 0.08 | 0.02 | - | - |
| Phenanthrene | 0.02 ug/g dry | 2.15 | 0.05 | - | - |
| Pyrene | 0.02 ug/g dry | 3.14 | 0.05 | - | - |
| 2-Fluorobiphenyl | Surrogate | 74.1% | 99.5% | - | - |
| Terphenyl-d14 | Surrogate | 67.3% | 91.1% | - | - |

## 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* | *1.14* | | *ug/g* | | *85.3* | *50-140* | | | |
| *Surrogate: Terphenyl-d14* | *1.08* | | *ug/g* | | *81.1* | *50-140* | | | |
| **Volatiles** | | | | | | | | | |
| Acetone | ND | 0.50 | ug/g | | | | | | |
| Benzene | ND | 0.02 | ug/g | | | | | | |
| Bromodichloromethane | ND | 0.05 | ug/g | | | | | | |
| Bromoform | ND | 0.05 | ug/g | | | | | | |
| Bromomethane | ND | 0.05 | ug/g | | | | | | |
| Carbon Tetrachloride | ND | 0.05 | ug/g | | | | | | |
| Chlorobenzene | ND | 0.05 | ug/g | | | | | | |
| Chloroform | ND | 0.05 | ug/g | | | | | | |
| Dibromochloromethane | ND | 0.05 | ug/g | | | | | | |
| Dichlorodifluoromethane | ND | 0.05 | ug/g | | | | | | |
| 1,2-Dichlorobenzene | ND | 0.05 | ug/g | | | | | | |
| 1,3-Dichlorobenzene | ND | 0.05 | ug/g | | | | | | |

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO:** **57557**

Report Date: 02-Jun-2023

Order Date: 23-May-2023

**Project Description: PE6096**

## Method Quality Control: Blank

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| 1,4-Dichlorobenzene | ND | 0.05 | ug/g | | | | | | |
| 1,1-Dichloroethane | ND | 0.05 | ug/g | | | | | | |
| 1,2-Dichloroethane | ND | 0.05 | ug/g | | | | | | |
| 1,1-Dichloroethylene | ND | 0.05 | ug/g | | | | | | |
| cis-1,2-Dichloroethylene | ND | 0.05 | ug/g | | | | | | |
| trans-1,2-Dichloroethylene | ND | 0.05 | ug/g | | | | | | |
| 1,2-Dichloropropane | ND | 0.05 | ug/g | | | | | | |
| cis-1,3-Dichloropropylene | ND | 0.05 | ug/g | | | | | | |
| trans-1,3-Dichloropropylene | ND | 0.05 | ug/g | | | | | | |
| 1,3-Dichloropropene, total | ND | 0.05 | ug/g | | | | | | |
| Ethylbenzene | ND | 0.05 | ug/g | | | | | | |
| Ethylene dibromide (dibromoethane, 1,2 | ND | 0.05 | ug/g | | | | | | |
| Hexane | ND | 0.05 | ug/g | | | | | | |
| Methyl Ethyl Ketone (2-Butanone) | ND | 0.50 | ug/g | | | | | | |
| Methyl Isobutyl Ketone | ND | 0.50 | ug/g | | | | | | |
| Methyl tert-butyl ether | ND | 0.05 | ug/g | | | | | | |
| Methylene Chloride | ND | 0.05 | ug/g | | | | | | |
| Styrene | ND | 0.05 | ug/g | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | 0.05 | ug/g | | | | | | |
| 1,1,2,2-Tetrachloroethane | ND | 0.05 | ug/g | | | | | | |
| Tetrachloroethylene | ND | 0.05 | ug/g | | | | | | |
| Toluene | ND | 0.05 | ug/g | | | | | | |
| 1,1,1-Trichloroethane | ND | 0.05 | ug/g | | | | | | |
| 1,1,2-Trichloroethane | ND | 0.05 | ug/g | | | | | | |
| Trichloroethylene | ND | 0.05 | ug/g | | | | | | |
| Trichlorofluoromethane | ND | 0.05 | ug/g | | | | | | |
| Vinyl chloride | ND | 0.02 | ug/g | | | | | | |
| m,p-Xylenes | ND | 0.05 | ug/g | | | | | | |
| o-Xylene | ND | 0.05 | ug/g | | | | | | |
| Xylenes, total | ND | 0.05 | ug/g | | | | | | |
| *Surrogate: 4-Bromofluorobenzene* | *3.76* | | *ug/g* | | *118* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *2.74* | | *ug/g* | | *85.7* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *3.08* | | *ug/g* | | *96.3* | *50-140* | | | |

Certificate of Analysis
**Client:** **Paterson Group Consulting Engineers**
**Client PO:** **57557**

Report Date: 02-Jun-2023
Order Date: 23-May-2023
**Project Description: PE6096**

## 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 | ND | 1.0 | ug/g | ND | | | NC | 30 | |
| Arsenic | 5.7 | 1.0 | ug/g | 6.4 | | | 11.3 | 30 | |
| Barium | 83.0 | 1.0 | ug/g | 89.7 | | | 7.8 | 30 | |
| Beryllium | 0.9 | 0.5 | ug/g | 1.0 | | | 10.4 | 30 | |
| Boron | 6.4 | 5.0 | ug/g | 7.7 | | | 18.5 | 30 | |
| Cadmium | 0.7 | 0.5 | ug/g | 0.6 | | | 19.2 | 30 | |
| Chromium | 21.4 | 5.0 | ug/g | 24.5 | | | 13.5 | 30 | |
| Cobalt | 8.5 | 1.0 | ug/g | 9.1 | | | 6.2 | 30 | |
| Copper | 17.3 | 5.0 | ug/g | 18.8 | | | 8.2 | 30 | |
| Lead | 17.1 | 1.0 | ug/g | 18.0 | | | 5.1 | 30 | |
| Molybdenum | 1.1 | 1.0 | ug/g | 3.4 | | | NC | 30 | |
| Nickel | 16.6 | 5.0 | ug/g | 18.0 | | | 8.0 | 30 | |
| Selenium | ND | 1.0 | ug/g | ND | | | NC | 30 | |
| Silver | 0.4 | 0.3 | ug/g | ND | | | NC | 30 | |
| Thallium | ND | 1.0 | ug/g | ND | | | NC | 30 | |
| Uranium | 1.1 | 1.0 | ug/g | 1.1 | | | 4.3 | 30 | |
| Vanadium | 35.2 | 10.0 | ug/g | 41.5 | | | 16.3 | 30 | |
| Zinc | 74.8 | 20.0 | ug/g | 83.1 | | | 10.5 | 30 | |
| **Physical Characteristics** | | | | | | | | | |
| % Solids | 89.9 | 0.1 | % by Wt. | 89.4 | | | 0.6 | 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* | *1.06* | | *ug/g* | | *71.2* | *50-140* | | | |
| *Surrogate: Terphenyl-d14* | *1.05* | | *ug/g* | | *70.2* | *50-140* | | | |
| **Volatiles** | | | | | | | | | |
| Acetone | ND | 0.50 | ug/g | ND | | | NC | 50 | |
| Benzene | ND | 0.02 | ug/g | ND | | | NC | 50 | |
| Bromodichloromethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Bromoform | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Bromomethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Carbon Tetrachloride | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Chlorobenzene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Chloroform | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Dibromochloromethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |

Certificate of Analysis
**Client:** **Paterson Group Consulting Engineers**
**Client PO:** **57557**

Report Date: 02-Jun-2023
Order Date: 23-May-2023
**Project Description: PE6096**

## Method Quality Control: Duplicate

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Dichlorodifluoromethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,2-Dichlorobenzene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,3-Dichlorobenzene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,4-Dichlorobenzene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1-Dichloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,2-Dichloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1-Dichloroethylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| cis-1,2-Dichloroethylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| trans-1,2-Dichloroethylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,2-Dichloropropane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| cis-1,3-Dichloropropylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| trans-1,3-Dichloropropylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Ethylbenzene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Ethylene dibromide (dibromoethane, 1,2- | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Hexane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Methyl Ethyl Ketone (2-Butanone) | ND | 0.50 | ug/g | ND | | | NC | 50 | |
| Methyl Isobutyl Ketone | ND | 0.50 | ug/g | ND | | | NC | 50 | |
| Methyl tert-butyl ether | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Methylene Chloride | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Styrene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1,1,2-Tetrachloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1,2,2-Tetrachloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Tetrachloroethylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Toluene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1,1-Trichloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| 1,1,2-Trichloroethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Trichloroethylene | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Trichlorofluoromethane | ND | 0.05 | ug/g | ND | | | NC | 50 | |
| Vinyl chloride | ND | 0.02 | 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: 4-Bromofluorobenzene* | *3.78* | | *ug/g* | | *109* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *2.88* | | *ug/g* | | *83.1* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *3.20* | | *ug/g* | | *92.3* | *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) | 182 | 7 | ug/g | ND | 91.2 | 80-120 | | | |
| F2 PHCs (C10-C16) | 110 | 4 | ug/g | ND | 114 | 60-140 | | | |
| F3 PHCs (C16-C34) | 284 | 8 | ug/g | ND | 120 | 60-140 | | | |
| F4 PHCs (C34-C50) | 187 | 6 | ug/g | ND | 125 | 60-140 | | | |
| **Metals** | | | | | | | | | |
| Antimony | 45.4 | 1.0 | ug/g | ND | 90.2 | 70-130 | | | |
| Arsenic | 60.7 | 1.0 | ug/g | 2.6 | 116 | 70-130 | | | |
| Barium | 95.6 | 1.0 | ug/g | 35.9 | 119 | 70-130 | | | |
| Beryllium | 63.9 | 0.5 | ug/g | ND | 127 | 70-130 | | | |
| Boron | 59.9 | 5.0 | ug/g | ND | 114 | 70-130 | | | |
| Cadmium | 59.4 | 0.5 | ug/g | ND | 118 | 70-130 | | | |
| Chromium | 72.8 | 5.0 | ug/g | 9.8 | 126 | 70-130 | | | |
| Cobalt | 64.4 | 1.0 | ug/g | 3.6 | 122 | 70-130 | | | |
| Copper | 66.8 | 5.0 | ug/g | 7.5 | 119 | 70-130 | | | |
| Lead | 64.5 | 1.0 | ug/g | 7.2 | 114 | 70-130 | | | |
| Molybdenum | 60.5 | 1.0 | ug/g | 1.4 | 118 | 70-130 | | | |
| Nickel | 68.4 | 5.0 | ug/g | 7.2 | 122 | 70-130 | | | |
| Selenium | 53.2 | 1.0 | ug/g | ND | 106 | 70-130 | | | |
| Silver | 48.2 | 0.3 | ug/g | ND | 96.1 | 70-130 | | | |
| Thallium | 54.1 | 1.0 | ug/g | ND | 108 | 70-130 | | | |
| Uranium | 57.6 | 1.0 | ug/g | ND | 114 | 70-130 | | | |
| Vanadium | 80.1 | 10.0 | ug/g | 16.6 | 127 | 70-130 | | | |
| Zinc | 94.7 | 20.0 | ug/g | 33.2 | 123 | 70-130 | | | |
| **Semi-Volatiles** | | | | | | | | | |
| Acenaphthene | 0.132 | 0.02 | ug/g | ND | 71.1 | 50-140 | | | |
| Acenaphthylene | 0.126 | 0.02 | ug/g | ND | 67.7 | 50-140 | | | |
| Anthracene | 0.124 | 0.02 | ug/g | ND | 66.4 | 50-140 | | | |
| Benzo [a] anthracene | 0.133 | 0.02 | ug/g | ND | 71.3 | 50-140 | | | |
| Benzo [a] pyrene | 0.131 | 0.02 | ug/g | ND | 70.5 | 50-140 | | | |
| Benzo [b] fluoranthene | 0.127 | 0.02 | ug/g | ND | 68.3 | 50-140 | | | |
| Benzo [g,h,i] perylene | 0.111 | 0.02 | ug/g | ND | 59.8 | 50-140 | | | |
| Benzo [k] fluoranthene | 0.110 | 0.02 | ug/g | ND | 59.1 | 50-140 | | | |
| Chrysene | 0.162 | 0.02 | ug/g | ND | 87.1 | 50-140 | | | |
| Dibenzo [a,h] anthracene | 0.117 | 0.02 | ug/g | ND | 62.7 | 50-140 | | | |
| Fluoranthene | 0.123 | 0.02 | ug/g | ND | 65.9 | 50-140 | | | |
| Fluorene | 0.139 | 0.02 | ug/g | ND | 74.8 | 50-140 | | | |
| Indeno [1,2,3-cd] pyrene | 0.112 | 0.02 | ug/g | ND | 60.3 | 50-140 | | | |
| 1-Methylnaphthalene | 0.170 | 0.02 | ug/g | ND | 91.2 | 50-140 | | | |
| 2-Methylnaphthalene | 0.183 | 0.02 | ug/g | ND | 98.3 | 50-140 | | | |
| Naphthalene | 0.146 | 0.01 | ug/g | ND | 78.3 | 50-140 | | | |
| Phenanthrene | 0.177 | 0.02 | ug/g | ND | 95.2 | 50-140 | | | |
| Pyrene | 0.120 | 0.02 | ug/g | ND | 64.2 | 50-140 | | | |
| *Surrogate: 2-Fluorobiphenyl* | *1.04* | | *ug/g* | | *69.5* | *50-140* | | | |
| *Surrogate: Terphenyl-d14* | *1.33* | | *ug/g* | | *89.1* | *50-140* | | | |
| **Volatiles** | | | | | | | | | |
| Acetone | 8.00 | 0.50 | ug/g | ND | 80.0 | 50-140 | | | |
| Benzene | 2.79 | 0.02 | ug/g | ND | 69.7 | 60-130 | | | |
| Bromodichloromethane | 3.60 | 0.05 | ug/g | ND | 90.1 | 60-130 | | | |

## Method Quality Control: Spike

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Bromoform | 4.08 | 0.05 | ug/g | ND | 102 | 60-130 | | | |
| Bromomethane | 3.26 | 0.05 | ug/g | ND | 81.5 | 50-140 | | | |
| Carbon Tetrachloride | 4.09 | 0.05 | ug/g | ND | 102 | 60-130 | | | |
| Chlorobenzene | 3.28 | 0.05 | ug/g | ND | 81.9 | 60-130 | | | |
| Chloroform | 3.26 | 0.05 | ug/g | ND | 81.6 | 60-130 | | | |
| Dibromochloromethane | 3.95 | 0.05 | ug/g | ND | 98.8 | 60-130 | | | |
| Dichlorodifluoromethane | 4.52 | 0.05 | ug/g | ND | 113 | 50-140 | | | |
| 1,2-Dichlorobenzene | 4.23 | 0.05 | ug/g | ND | 106 | 60-130 | | | |
| 1,3-Dichlorobenzene | 4.00 | 0.05 | ug/g | ND | 100 | 60-130 | | | |
| 1,4-Dichlorobenzene | 3.84 | 0.05 | ug/g | ND | 95.9 | 60-130 | | | |
| 1,1-Dichloroethane | 3.50 | 0.05 | ug/g | ND | 87.6 | 60-130 | | | |
| 1,2-Dichloroethane | 4.37 | 0.05 | ug/g | ND | 109 | 60-130 | | | |
| 1,1-Dichloroethylene | 3.38 | 0.05 | ug/g | ND | 84.6 | 60-130 | | | |
| cis-1,2-Dichloroethylene | 3.25 | 0.05 | ug/g | ND | 81.2 | 60-130 | | | |
| trans-1,2-Dichloroethylene | 3.29 | 0.05 | ug/g | ND | 82.3 | 60-130 | | | |
| 1,2-Dichloropropane | 2.61 | 0.05 | ug/g | ND | 65.3 | 60-130 | | | |
| cis-1,3-Dichloropropylene | 3.95 | 0.05 | ug/g | ND | 98.9 | 60-130 | | | |
| trans-1,3-Dichloropropylene | 3.09 | 0.05 | ug/g | ND | 77.2 | 60-130 | | | |
| Ethylbenzene | 3.51 | 0.05 | ug/g | ND | 87.6 | 60-130 | | | |
| Ethylene dibromide (dibromoethane, 1,2- | 3.42 | 0.05 | ug/g | ND | 85.5 | 60-130 | | | |
| Hexane | 2.71 | 0.05 | ug/g | ND | 67.7 | 60-130 | | | |
| Methyl Ethyl Ketone (2-Butanone) | 9.47 | 0.50 | ug/g | ND | 94.7 | 50-140 | | | |
| Methyl Isobutyl Ketone | 8.46 | 0.50 | ug/g | ND | 84.6 | 50-140 | | | |
| Methyl tert-butyl ether | 11.9 | 0.05 | ug/g | ND | 119 | 50-140 | | | |
| Methylene Chloride | 2.97 | 0.05 | ug/g | ND | 74.1 | 60-130 | | | |
| Styrene | 3.59 | 0.05 | ug/g | ND | 89.7 | 60-130 | | | |
| 1,1,1,2-Tetrachloroethane | 3.68 | 0.05 | ug/g | ND | 91.9 | 60-130 | | | |
| 1,1,2,2-Tetrachloroethane | 3.74 | 0.05 | ug/g | ND | 93.5 | 60-130 | | | |
| Tetrachloroethylene | 3.14 | 0.05 | ug/g | ND | 78.6 | 60-130 | | | |
| Toluene | 3.41 | 0.05 | ug/g | ND | 85.3 | 60-130 | | | |
| 1,1,1-Trichloroethane | 3.86 | 0.05 | ug/g | ND | 96.6 | 60-130 | | | |
| 1,1,2-Trichloroethane | 2.94 | 0.05 | ug/g | ND | 73.5 | 60-130 | | | |
| Trichloroethylene | 2.98 | 0.05 | ug/g | ND | 74.5 | 60-130 | | | |
| Trichlorofluoromethane | 2.99 | 0.05 | ug/g | ND | 74.8 | 50-140 | | | |
| Vinyl chloride | 2.73 | 0.02 | ug/g | ND | 68.4 | 50-140 | | | |
| m,p-Xylenes | 7.48 | 0.05 | ug/g | ND | 93.5 | 60-130 | | | |
| o-Xylene | 4.03 | 0.05 | ug/g | ND | 101 | 60-130 | | | |
| *Surrogate: 4-Bromofluorobenzene* | *2.16* | | *ug/g* | | *67.5* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *2.66* | | *ug/g* | | *83.0* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *2.87* | | *ug/g* | | *89.7* | *50-140* | | | |

**Qualifier Notes:**

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

Revision 1: Revised report includes additional PAH and ICP data.

**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 crite
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 2321086

ent Blvd.
C1G 4J8
llabs.com
com

| Paracel Order Number (Lab Use Only) | Chain Of Custody (Lab Use Only) |
|---|---|
| 2321086 | |

Client Name: Paterson Group
Contact Name: Mark D'Arcy
Address: 9 Auriga Dr, Ottawa ON, K2E 7T9
Telephone: 613-226-7381

Project Ref: PE6096
Quote #:
PO #: 57557
E-mail: mdarcy@patersongroup.ca

Page 1 of 1

**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 | VOCs | PAHs | Metals by ICP | Hg | CrVI | B (HWS) | HOLD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BH1-23-AU1 | S | | 2 | May 18/23 | | | | X | X | | | | |
| 2 | BH1-23-SS2 | ↓ | | ↓ | ↓ | | | | | | | | | X |
| 3 | BH1-23-SS5 | | | | | | X | X | | | | | | |
| 4 | BH2-23-AU1 | | | | | | | | | | | | | X |
| 5 | BH2-23-SS6 | | | | | | X | X | | | | | | |
| 6 | BH3-23-AU1 | | | | | | | | X | X | | | | |
| 7 | BH3-23-AU2 | | | | | | | | | | | | | X |
| 8 | BH3-23-SS7 | ↓ | | ↓ | ↓ | | X | X | | | | | | |
| 9 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |

Comments:

Method of Delivery: Paracel Courier

| | | | |
|---|---|---|---|
| Relinquished By (Sign): Trudy Blair | Received By Driver/Depot: | Received at Lab: SD | Verified By: SD |
| Relinquished By (Print): Trudy Blair | Date/Time: | Date/Time: May 23 3:50 | Date/Time: May 23, 4:00 |
| Date/Time: May 23 2023 | Temperature: °C | Temperature: 24.7 | pH Verified: ☐ By: |

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

# Certificate of Analysis

**Paterson Group Consulting Engineers**

9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Mark D'Arcy

Client PO: 57563
Project: PE6096
Custody:

Report Date: 30-May-2023
Order Date: 24-May-2023

**Order #: 2321242**

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

| Paracel ID | Client ID |
|---|---|
| 2321242-01 | BH1-23-GW1 |
| 2321242-02 | BH2-23-GW1 |
| 2321242-03 | BH3-23-GW1 |

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

**Client: Paterson Group Consulting Engineers**

**Client PO: 57563**

Report Date: 30-May-2023

Order Date: 24-May-2023

**Project Description: PE6096**

## Analysis Summary Table

| Analysis | Method Reference/Description | Extraction Date | Analysis Date |
|---|---|---|---|
| PHC F1 | CWS Tier 1 - P&T GC-FID | 26-May-23 | 26-May-23 |
| PHCs F2 to F4 | CWS Tier 1 - GC-FID, extraction | 29-May-23 | 30-May-23 |
| REG 153: VOCs by P&T GC/MS | EPA 624 - P&T GC-MS | 26-May-23 | 26-May-23 |

Certificate of Analysis

**Client: Paterson Group Consulting Engineers**

**Client PO: 57563**

Report Date: 30-May-2023

Order Date: 24-May-2023

**Project Description: PE6096**

| | Client ID: | BH1-23-GW1 | BH2-23-GW1 | BH3-23-GW1 | - |
|---|---|---|---|---|---|
| | Sample Date: | 23-May-23 09:00 | 23-May-23 09:00 | 23-May-23 09:00 | - |
| | Sample ID: | 2321242-01 | 2321242-02 | 2321242-03 | - |
| | MDL/Units | Ground Water | Ground Water | Ground Water | - |
| **Volatiles** | | | | | |
| Acetone | 5.0 ug/L | <5.0 | <5.0 | <5.0 | - |
| Benzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Bromodichloromethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Bromoform | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Bromomethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Carbon Tetrachloride | 0.2 ug/L | <0.2 | <0.2 | <0.2 | - |
| Chlorobenzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Chloroform | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Dibromochloromethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Dichlorodifluoromethane | 1.0 ug/L | <1.0 | <1.0 | <1.0 | - |
| 1,2-Dichlorobenzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,3-Dichlorobenzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,4-Dichlorobenzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,1-Dichloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,2-Dichloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,1-Dichloroethylene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| cis-1,2-Dichloroethylene | 0.5 ug/L | 5.5 | 49.8 | 21.3 | - |
| trans-1,2-Dichloroethylene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,2-Dichloropropane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| cis-1,3-Dichloropropylene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| trans-1,3-Dichloropropylene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,3-Dichloropropene, total | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Ethylbenzene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Ethylene dibromide (dibromoethane, 1,2-) | 0.2 ug/L | <0.2 | <0.2 | <0.2 | - |
| Hexane | 1.0 ug/L | <1.0 | <1.0 | <1.0 | - |
| Methyl Ethyl Ketone (2-Butanone) | 5.0 ug/L | <5.0 | <5.0 | <5.0 | - |
| Methyl Isobutyl Ketone | 5.0 ug/L | <5.0 | <5.0 | <5.0 | - |
| Methyl tert-butyl ether | 2.0 ug/L | <2.0 | <2.0 | <2.0 | - |
| Methylene Chloride | 5.0 ug/L | <5.0 | <5.0 | <5.0 | - |
| Styrene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,1,1,2-Tetrachloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,1,2,2-Tetrachloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Tetrachloroethylene | 0.5 ug/L | 154 | 1550 | 591 | - |
| Toluene | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| 1,1,1-Trichloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |

Certificate of Analysis

Report Date: 30-May-2023

**Client: Paterson Group Consulting Engineers**

Order Date: 24-May-2023

**Client PO: 57563**

**Project Description: PE6096**

| | **Client ID:** | BH1-23-GW1 | BH2-23-GW1 | BH3-23-GW1 | - |
|---|---|---|---|---|---|
| | **Sample Date:** | 23-May-23 09:00 | 23-May-23 09:00 | 23-May-23 09:00 | - |
| | **Sample ID:** | 2321242-01 | 2321242-02 | 2321242-03 | - |
| | **MDL/Units** | Ground Water | Ground Water | Ground Water | - |
| 1,1,2-Trichloroethane | 0.5 ug/L | <0.5 | <0.5 | <0.5 | - |
| Trichloroethylene | 0.5 ug/L | 11.8 | 87.0 | 50.1 | - |
| 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 | 117% | 120% | 119% | - |
| Dibromofluoromethane | Surrogate | 121% | 123% | 122% | - |
| Toluene-d8 | Surrogate | 99.4% | 98.2% | 98.7% | - |
| **Hydrocarbons** | | | | | |
| F1 PHCs (C6-C10) | 25 ug/L | <25 | 220 | 188 | - |
| 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* | *96.2* | | *ug/L* | | *120* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *106* | | *ug/L* | | *132* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *81.3* | | *ug/L* | | *102* | *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 | 6.50 | 0.5 | ug/L | 6.48 | | | 0.3 | 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 | 1.83 | 0.5 | ug/L | 1.79 | | | 2.2 | 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 | 16.3 | 0.5 | ug/L | 16.4 | | | 0.9 | 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* | *93.6* | | *ug/L* | | *117* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *97.0* | | *ug/L* | | *121* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *79.8* | | *ug/L* | | *99.7* | *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) | 1870 | 25 | ug/L | ND | 93.5 | 68-117 | | | |
| F2 PHCs (C10-C16) | 1620 | 100 | ug/L | ND | 101 | 60-140 | | | |
| F3 PHCs (C16-C34) | 4020 | 100 | ug/L | ND | 102 | 60-140 | | | |
| F4 PHCs (C34-C50) | 2800 | 100 | ug/L | ND | 113 | 60-140 | | | |
| **Volatiles** | | | | | | | | | |
| Acetone | 113 | 5.0 | ug/L | ND | 113 | 50-140 | | | |
| Benzene | 35.8 | 0.5 | ug/L | ND | 89.5 | 60-130 | | | |
| Bromodichloromethane | 49.9 | 0.5 | ug/L | ND | 125 | 60-130 | | | |
| Bromoform | 44.5 | 0.5 | ug/L | ND | 111 | 60-130 | | | |
| Bromomethane | 27.5 | 0.5 | ug/L | ND | 68.8 | 50-140 | | | |
| Carbon Tetrachloride | 40.2 | 0.2 | ug/L | ND | 100 | 60-130 | | | |
| Chlorobenzene | 40.5 | 0.5 | ug/L | ND | 101 | 60-130 | | | |
| Chloroform | 42.0 | 0.5 | ug/L | ND | 105 | 60-130 | | | |
| Dibromochloromethane | 42.3 | 0.5 | ug/L | ND | 106 | 60-130 | | | |
| Dichlorodifluoromethane | 24.2 | 1.0 | ug/L | ND | 60.4 | 50-140 | | | |
| 1,2-Dichlorobenzene | 42.5 | 0.5 | ug/L | ND | 106 | 60-130 | | | |
| 1,3-Dichlorobenzene | 43.7 | 0.5 | ug/L | ND | 109 | 60-130 | | | |
| 1,4-Dichlorobenzene | 39.3 | 0.5 | ug/L | ND | 98.3 | 60-130 | | | |
| 1,1-Dichloroethane | 42.8 | 0.5 | ug/L | ND | 107 | 60-130 | | | |
| 1,2-Dichloroethane | 36.5 | 0.5 | ug/L | ND | 91.2 | 60-130 | | | |
| 1,1-Dichloroethylene | 42.5 | 0.5 | ug/L | ND | 106 | 60-130 | | | |
| cis-1,2-Dichloroethylene | 43.6 | 0.5 | ug/L | ND | 109 | 60-130 | | | |
| trans-1,2-Dichloroethylene | 42.0 | 0.5 | ug/L | ND | 105 | 60-130 | | | |
| 1,2-Dichloropropane | 36.7 | 0.5 | ug/L | ND | 91.7 | 60-130 | | | |
| cis-1,3-Dichloropropylene | 42.5 | 0.5 | ug/L | ND | 106 | 60-130 | | | |
| trans-1,3-Dichloropropylene | 44.7 | 0.5 | ug/L | ND | 112 | 60-130 | | | |
| Ethylbenzene | 37.4 | 0.5 | ug/L | ND | 93.4 | 60-130 | | | |
| Ethylene dibromide (dibromoethane, 1,2- | 48.9 | 0.2 | ug/L | ND | 122 | 60-130 | | | |
| Hexane | 32.6 | 1.0 | ug/L | ND | 81.4 | 60-130 | | | |
| Methyl Ethyl Ketone (2-Butanone) | 82.3 | 5.0 | ug/L | ND | 82.3 | 50-140 | | | |
| Methyl Isobutyl Ketone | 121 | 5.0 | ug/L | ND | 121 | 50-140 | | | |
| Methyl tert-butyl ether | 103 | 2.0 | ug/L | ND | 103 | 50-140 | | | |
| Methylene Chloride | 39.8 | 5.0 | ug/L | ND | 99.4 | 60-130 | | | |
| Styrene | 45.1 | 0.5 | ug/L | ND | 113 | 60-130 | | | |
| 1,1,1,2-Tetrachloroethane | 45.8 | 0.5 | ug/L | ND | 115 | 60-130 | | | |
| 1,1,2,2-Tetrachloroethane | 46.3 | 0.5 | ug/L | ND | 116 | 60-130 | | | |
| Tetrachloroethylene | 43.8 | 0.5 | ug/L | ND | 109 | 60-130 | | | |
| Toluene | 38.8 | 0.5 | ug/L | ND | 97.0 | 60-130 | | | |
| 1,1,1-Trichloroethane | 45.4 | 0.5 | ug/L | ND | 113 | 60-130 | | | |
| 1,1,2-Trichloroethane | 40.9 | 0.5 | ug/L | ND | 102 | 60-130 | | | |
| Trichloroethylene | 40.5 | 0.5 | ug/L | ND | 101 | 60-130 | | | |
| Trichlorofluoromethane | 40.2 | 1.0 | ug/L | ND | 100 | 60-130 | | | |
| Vinyl chloride | 31.4 | 0.5 | ug/L | ND | 78.4 | 50-140 | | | |
| m,p-Xylenes | 77.3 | 0.5 | ug/L | ND | 96.7 | 60-130 | | | |
| o-Xylene | 38.6 | 0.5 | ug/L | ND | 96.4 | 60-130 | | | |
| *Surrogate: 4-Bromofluorobenzene* | *94.0* | | *ug/L* | | *117* | *50-140* | | | |
| *Surrogate: Dibromofluoromethane* | *110* | | *ug/L* | | *138* | *50-140* | | | |
| *Surrogate: Toluene-d8* | *76.3* | | *ug/L* | | *95.4* | *50-140* | | | |

**Qualifier Notes:**

**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: 2321242

Laurent Blvd.
ario K1G 4J8
-1947
aracellabs.com
llabs.com

| Paracel Order Number (Lab Use Only) | Chain Of Custody (Lab Use Only) |
|---|---|
| 2321242 | |

Client Name: Paterson Group
Contact Name: Mark D'Arcy
Address: 9 Auriga Dr, Ottawa ON, K2E 7T9
Telephone: 613 226-7381

Project Ref: PE 6096
Quote #:
PO #: 57563
E-mail: mdarcy@patersongroup.ca

Page 1 of 1

**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 | VOCs | PAHs | Metals by ICP | Hg | CrVI | B (HWS) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BH1-23-GW1 | GW | | 3 | May 23/23 | | X | X | | | | | | | | | | |
| 2 | BH2-23-GW1 | GW | | 3 | ↓ | | X | X | | | | | | | | | | |
| 3 | BH3-23-GW1 | GW | | 3 | ↓ | | X | X | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

Comments:

Method of Delivery: Paracel Courier

| Relinquished By (Sign): | Received By Driver/Depot: | Received at Lab: |
|---|---|---|
| Relinquished By (Print): Trudy Blair | Date/Time: | Date/Time: May 24 6:12pm |
| Date/Time: May 24, 2023 | Temperature: °C | Temperature: 8.2 |

Verified By:
Date/Time: May 25 2023 08:33
pH Verified: ☐ By: NA