PATERSON GROUP

Phase II – Environmental Site Assessment

Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

Prepared for Arcadis IBI Group

Report: PE5791-2
May 30, 2024

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the the network of road right-of-ways of the Tunney's Pasture complex, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the Phase II Property.

The subsurface investigation for this assessment was conducted between April 2 and April 4, 2024, and consisted of drilling 18 boreholes (BH1-24 to BH18-24) throughout the Phase II Property, in conjunction with a geotechnical investigation. A select number of boreholes (BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24) were advanced to depths ranging from approximately 5.66 m to 11.86 m below the existing ground surface and terminated within the underlying bedrock unit. Upon completion, these boreholes were instrumented with groundwater monitoring wells in order to access the water table. The remaining boreholes were advanced to depths ranging from approximately 0.66 m to 3.51 m below the existing ground surface and terminated within the overburden on practical refusal to augering on the inferred bedrock surface.

In general, the subsurface soil profile encountered at the borehole locations consists of a shallow overburden comprised of a surficial pavement structure (asphaltic concrete over top of granular sub-grade fill), underlain by another layer of fill material (brown silty clay with sand, gravel, and crushed stone). Native glacial till was encountered beneath the fill layers in boreholes BH9-24 and BH11-24. Bedrock, consisting of good to excellent quality limestone, was encountered in boreholes BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24 at depths ranging from approximately 1.09 m to 4.88 m below ground surface. Practical refusal to augering on inferred bedrock was measured in the remaining boreholes at depths ranging from approximately 0.66 m to 3.51 m below ground surface. During the field sampling program, the groundwater was measured at depths ranging from approximately 2.06 m to 5.70 m below the existing ground surface.

As part of this assessment, 21 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), metals, mercury, hexavalent chromium, PAHs, EC, SAR, and/or pH parameters. With some exceptions, the majority of the soil parameters analyzed were found to comply with the selected MECP Table 7 Coarse-Grained Community Soil Standards and the CCME SQG Commercial Standards.

Based on the analytical test results, the shallow layer of soil/fill material situated underneath the pavement structure at boreholes BH4-24, BH6-24, BH13-24, and BH17-24 contains concentrations of heavier fractions of petroleum hydrocarbons (PHC $F_{4\ gravimetric}$) above the selected standards. Similarly, the same layer of soil/fill material present at BH5-24 contains an elevated concentration of barium above the selected standards. The identification of the PHC $F_{4\ gravimetric}$ concentrations are suspected to be the result of influence from asphalt fragments included in the sample matrix obtained directly beneath the road surface, while the identification of the elevated barium concentration is suspected to have been the result of the importation of poor quality fill material imported onto the site for road grading purposes.

Some elevated levels of EC and SAR were also identified within the shallow soil/fill material layer in select locations, however, these exceedances are considered to be a result of the use of a road salt for de-icing purposes during snow and ice conditions, and as such, are deemed to meet the selected site standards in accordance with Section 49.1 of O. Reg. 153/04.

It should be noted that some polycyclic aromatic hydrocarbon (PAH) parameter concentrations were identified above the CCME SQG Commercial Standards in the shallow soil/fill material at boreholes BH3-24, BH6-24, BH7-24, BH9-24, BH10-24, BH17-24, and BH18-24. These concentrations, however, do comply with the selected MECP Table 7 Coarse-Grained Community Soil Standards and thus are not considered to represent a contaminant issue to the Phase II Property.

As part of this assessment, six groundwater samples were submitted for laboratory analysis of PHCs (F_1-F_4), VOCs, metals, mercury, hexavalent chromium, and PAH parameters. Based on the analytical test results, all groundwater samples recovered from the Phase II Property were found to comply with the selected MECP Table 7 Non-Potable Groundwater Standards, with the exception of the chloroform concentration identified BH1-24. This chloroform exceedance is suspected to be the result of municipal water used during the bedrock coring process, and not as a result of a contaminant issue. The chloroform is expected to dissipate over time through natural attenuation processes, and as such, the groundwater beneath the Phase II Property is not considered to be contaminated.

It should be noted that some metal parameter concentrations were identified above the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites in the groundwater at boreholes BH1-24, BH6-24, BH16-24, and BH18-24. These parameters may potentially be naturally elevated, or may potentially be the result of interference from suspended sediment in the groundwater sample recovered. As such, these elevated parameters are not considered to pose an environmental risk to the current use of the property.

Recommendations

Soil

Based on the findings of this assessment, the shallow layer of soil/fill material found underneath the pavement structure within the vicinity of BH4-24, BH5-24, BH6-24, BH13-24, and BH17-24 is deemed to be contaminated, requiring remedial action. Given the low-mobility of these contaminants, and the non-impacted groundwater results, it is anticipated that the contamination is confined to the fill material layer above the bedrock.

Given our understanding that the Phase II Property is to be redeveloped in the near future, it is our recommendation that the contaminated soil be remediated in conjunction with site excavation activities. At such a time, the contaminated soil will be excavated from the site and transported to a licensed waste disposal facility. It is recommended that remediation be completed under the supervision of a Qualified Person to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Prior to the 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 O. Reg. 347/90 and O. Reg. 558/00.

Excess soil must be handed in accordance with O. Reg. 406/19: On-Site and Excess Soil Management. Additional excess soil testing and reporting requirements may be required prior to future site excavation activities, in accordance with O. Reg. 406/19.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future construction activities, then they must be decommissioned in accordance with O. Reg. 903/90 (Ontario Water Resources Act). Further information can be provided upon request in this regard.

It is our recommendation that the monitoring wells currently be maintained for future sampling purposes, until such a time when future site excavation activities have commenced. The monitoring wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of Arcadis IBI Group, Paterson Group (Paterson) conducted a Phase II – Environmental Site Assessment (Phase II ESA) for the network of road right-of-ways of the Tunney's Pasture complex, 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 the findings of the Phase I ESA.

1.1 Site Description

Address:	Part of 120 Parkdale Avenue, 101 Goldenrod Driveway, and 251 Sir Frederick Banting Driveway, Ottawa, Ontario.
Location:	The Phase II Property consists of the network of road right-of-ways situated within the Tunney's Pasture government office complex, located on the north side of Scott Street, between Parkdale Avenue and Northwestern Avenue, in the City of Ottawa, Ontario. These roadways include Sir Frederick Banting Driveway, Goldenrod Driveway, Sorrel Driveway, Tunney's Pasture Driveway, Yarrow Driveway, Columbine Driveway, Chardon Driveway, and Eglantine Driveway. Refer to Figure 1 – Key Plan, appended to this report.
Latitude and Longitude:	45° 24' 23" N, 75° 44' 10" W.

Site Description:

Configuration:	Irregular.
Site Area:	10.25 hectares (approximate).
Zoning:	MC – Mixed-Use Centre Zone.
Current Uses:	The Phase II Property currently consists of a network of roads and driveways. (Community Use)
Services:	Municipal sewer and water infrastructure is known to exist beneath the roadways to service the neighbouring buildings.

1.2 Property Ownership

The Phase II Property is currently owned by the Government of Canada. Paterson was retained to complete this Phase II ESA by Ms. Catriona Moggach of Arcadis IBI Group, whose offices are located at 333 Preston Street, Unit #500, Ottawa, Ontario. Ms. Moggach can be contacted via telephone at 613-225-1311.

In 2021, Public Service and Procurement Canada (PSPC) partnered with Canada Lands Company (CLC) under a collaboration project to leverage the strengths of each organization to deliver the long-term vision of Tunney's Pasture that includes the site's transition from a federal employment centre into a mixed-use, sustainable, transit-oriented community. CLC is a self-financing federal Crown corporation specializing in real estate and development with a mandate to transform former Government of Canada properties and reintegrates them into local communities while ensuring their long-term goals. Since the launch of this collaboration project, CLC has been committed to working with the community to define amendments to the TPMP and proposed upgrades to the existing roadway and servicing infrastructure that support both federal priorities and future development.

1.3 Applicable Site Condition Standard

The site condition standards for the subject property were obtained from Table 7 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:

- ❒ Shallow soil conditions;
- ❒ Coarse-grained soil conditions;
- ❒ Non-potable groundwater conditions;
- ❒ Community land use.

Grain size analysis was not conducted as part of this assessment, and as such, the coarse-grained soil standards were selected as a conservative approach.

It should be noted that in addition to the provincial MECP standards, the federal Canadian Council of Ministers of the Environment (CCME) commercial standards were also selected for additional consideration.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property currently consists of paved asphaltic concrete roads and driveways, bordered by landscaped areas and sidewalks. The site topography is relatively flat, while the regional topography appears to slope down towards the northwest, in the general direction the Ottawa River. The Phase II Property is considered to be at grade with respect to the surrounding properties.

Water drainage on the Phase II Property occurs primarily via surface run-off towards catch basins present on the roads, as well as via infiltration within the landscaped areas.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation for this assessment was conducted between April 2 and April 4, 2024, and consisted of drilling 18 boreholes (BH1-24 to BH18-24) throughout the Phase II Property in conjunction with a geotechnical investigation. A select number of boreholes (BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24) were advanced to depths ranging from approximately 5.66 m to 11.86 m below the existing ground surface and terminated within the underlying bedrock unit. Upon completion, these boreholes were instrumented with groundwater monitoring wells in order to access the water table. The remaining boreholes were advanced to depths ranging from approximately 0.66 m to 3.51 m below the existing ground surface and terminated within the overburden on practical refusal to augering on the inferred bedrock surface.

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 groundwater on the Phase II Property include the following:

- ❒ Volatile Organic Compounds (VOCs);
- ❒ Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);

- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Metals (including Arsenic [As], Antimony [Sb], and Selenium [Se])
- ❒ Mercury;
- ❒ Hexavalent Chromium;
- ❒ Electrical Conductivity (EC);
- ❒ Sodium Adsorption Ratio (SAR).

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

3.3 Phase I ESA Conceptual Site Model

Geological and Hydrogeological Setting

Based on the available mapping information, the bedrock beneath the western half of the Phase I Property generally consists of interbedded limestone and dolomite of the Gull River Formation, while the bedrock beneath the eastern half generally consists of limestone of the Bobcaygeon Formation. The surficial geology consists largely of Paleozoic bedrock, with some areas consisting of glacial till plains along the southern and eastern ends of the Phase I Property. In general, the overburden thickness across the Phase I Property ranges from approximately 0 m to 2 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 a 250 m radius of the Phase II Property.

The nearest named water body with respect to the Phase II Property is the Ottawa River, located approximately 225 m to the northwest.

Drinking Water Wells

Based on the availability of municipal services, no drinking water wells are expected to be present within a 250 m radius of the Phase II Property.

Existing Buildings and Structures

No buildings or structures are currently present on the Phase II Property.

Current and Future Property Use

The Phase II Property is currently being used for community purposes.

It is our understanding that the roadways and buried utility services throughout the Phase II Property will be reconstructed in the near future as part of a larger site redevelopment project for the Tunney's Pasture complex, and as such, no change in land use is anticipated since the Phase II Property will remain as a road network.

Neighbouring Land Use

The surrounding lands within a 250 m radius of the Phase II Property consist largely of residential and commercial properties.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

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

- Fill material of unknown quality, located throughout the Phase II Property;
- The application of road salt during snow and/or ice conditions, located throughout the Phase II Property.

Other off-site PCAs were identified within a 250 m radius of the Phase II Property, but were deemed not to be of any environmental concern based on their separation distances and/or their inferred down-gradient or cross-gradient orientation with respect to anticipated groundwater flow to the north.

Contaminants of Potential Concern

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

- ❒ Volatile Organic Compounds (VOCs);
- ❒ Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Metals (including Arsenic [As], Antimony [Sb], and Selenium [Se])
- ❒ Mercury;
- ❒ Hexavalent Chromium;
- ❒ Electrical Conductivity (EC);
- ❒ Sodium Adsorption Ratio (SAR).

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

The presence of any 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

No physical impediments were encountered during the course of the field drilling program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation for this assessment was conducted between April 2 and April 4, 2024, and consisted of drilling 18 boreholes (BH1-24 to BH18-24) throughout the Phase II Property in conjunction with a geotechnical investigation. A select number of boreholes (BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24) were advanced to depths ranging from approximately 5.66 m to 11.86 m below the existing ground surface and terminated within the underlying bedrock unit. Upon completion, these boreholes were instrumented with groundwater monitoring wells in order to access the water table. During the field sampling program, the groundwater was measured at depths ranging from approximately 2.06 m to 5.70 m below the existing ground surface. The remaining boreholes were advanced to depths ranging from approximately 0.66 m to 3.51 m below the existing ground surface and terminated within the overburden on practical refusal to augering on the inferred bedrock surface.

Under the full-time supervision of Paterson personnel, the boreholes were drilled using a truck-mounted drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario. The locations of the boreholes are illustrated on "Drawing PE5791-3 – 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 51 soil samples were obtained from boreholes BH1-24 to BH18-24 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

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

Upon completion, the groundwater monitoring wells were developed using a dedicated inertial lift pump, with a minimum of three well volumes being removed from the wells at the time of installation. The wells were developed until the appearance of the water was noted to have stabilized. In addition, the ground surface elevations of each borehole were subsequently surveyed with respect to a known geodetic elevation.

Table 1
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
BH1-24	58.00	8.53	7.03-8.53	6.81-8.53	1.07-6.81	Flushmount
BH4-24	63.38	6.86	5.36-6.86	5.03-6.86	0.76-5.03	
BH6-24	63.87	5.18	3.68-5.18	3.35-5.18	1.22-3.35	
BH9-24	62.55	5.61	4.11-5.61	3.66-5.61	1.02-3.66	
BH10-24	62.28	5.49	3.99-5.49	3.66-5.49	1.32-3.66	
BH16-24	61.81	7.09	5.59-7.09	5.33-7.09	2.24-5.33	
BH17-24	62.38	8.59	7.09-8.59	6.76-8.59	1.22-6.76	
BH18-24	60.70	11.58	10.08-11.58	9.75-11.58	4.42-9.75	

4.5 Field Measurement of Water Quality Parameters

Groundwater monitoring and sampling was conducted on-site on April 17, 2024. Following their development and stabilization during the field sampling event, select water quality parameters were measured at each monitoring well location using a multi-reader probe device. The stabilized field parameter values are summarized below in Table 2.

Table 2
Measurement of Water Quality Parameters

Well ID	Temperature (˚C)	Conductivity (µS)	pH (Units)
BH1-24	10.5	3,181	8.39
BH4-24	DRY	DRY	DRY
BH6-24	14.6	>3,999	8.14
BH9-24	DRY	DRY	DRY
BH10-24	9.9	>3,999	8.09
BH16-24	11.0	>3,999	8.14
BH17-24	11.0	3,555	8.22
BH18-24	13	>3,999	8.11

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled, *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996.

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.

4.7 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	PHCs (F_1-F_4)	Metals	Hg	CrVI	PAHs	EC	SAR	pH	
BH1-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X	X	To assess for potential soil impacts resulting from the presence of fill material of unknown quality and the application of road salt for de-icing purposes during winter conditions.
BH2-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH3-24-SS2A	0.76 – 1.09 m Fill Material	X	X	X	X	X	X	X	X		
BH4-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH5-24-SS4	1.52 – 2.13 m Fill Material	X	X	X	X	X	X	X	X	X	
BH6-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH7-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X	X	
BH8-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH9-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH10-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH11-24-SS2A	0.76 – 1.07 m Fill Material	X	X	X	X	X	X	X	X		
BH11-24-SS4	2.29 – 2.90 m Fill Material									X	
BH12-24-SS2	0.76 – 1.04 m Fill Material	X	X	X	X	X	X	X	X		
BH13-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X	X	
BH14-24-SS3	0.76 – 1.37 m Fill Material	X	X	X	X	X	X	X	X		
BH15-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		

Table 3 (Continued)
Testing Parameters for Submitted Soil Samples

Sample ID	Sample Depth & Stratigraphic Unit	Parameters Analyzed									Rationale
		BTEX	PHCs (F_1-F_4)	Metals	Hg	CrVI	PAHs	EC	SAR	pH	
BH16-24-AU2	0.20 – 0.31 m Fill Material	X	X	X	X	X	X	X	X		To assess for potential soil impacts resulting from the presence of fill material of unknown quality and the application of road salt for de-icing purposes during winter conditions.
BH16-24-SS5	1.52 – 2.13 m Fill Material									X	
BH17-24-AU1	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X	X	
BH18-24-AU2	0.36 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
BH18-24-SS6	3.61 – 4.22 m Fill Material									X	
SOIL DUP-1[1]	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		For laboratory QA/QC purposes.
SOIL DUP-2[2]	0.31 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		
SOIL DUP-3[3]	0.36 – 0.61 m Fill Material	X	X	X	X	X	X	X	X		

1 – Duplicate sample of BH1-24-AU1
2 – Duplicate sample of BH7-24-AU1
3 – Duplicate sample of BH18-24-AU2

Table 4
Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed						Rationale
		VOCs	PHCs (F_1-F_4)	PAHs	Metals	Hg	CrVI	
BH1-24-GW1	7.03 – 8.53 m Bedrock	X	X	X	X	X	X	To assess for potential groundwater impacts resulting from the presence of fill material of unknown quality.
BH6-24-GW1	3.68 – 5.18 m Bedrock	X	X	X	X	X	X	
BH10-24-GW1	3.99 – 5.49 m Bedrock	X	X	X	X	X	X	

Table 4 (Continued)
Testing Parameters for Submitted Groundwater Samples

Sample ID	Screened Interval & Stratigraphic Unit	Parameters Analyzed						Rationale
		VOCs	PHCs (F_1-F_4)	PAHs	Metals	Hg	CrVI	
BH16-24-GW1	5.59 – 7.09 m Bedrock	X	X	X	X	X	X	To assess for potential groundwater impacts resulting from the presence of fill material of unknown quality.
BH17-24-GW1	7.09 – 8.59 m Bedrock	X	X	X	X	X	X	
BH18-24-GW1	10.08 – 11.58 m Bedrock	X	X	X	X	X	X	
GW DUP-1[1]	7.09 – 8.59 m Bedrock	X	X	X	X	X	X	For laboratory QA/QC purposes.
Trip Blank	N/A	X						

1 – Duplicate sample of BH17-24-GW1

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

4.8 Residue Management

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

4.9 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.

4.10 Quality Assurance and Quality Control Measures

A summary of the quality assurance and quality control (QA/QC) measures, undertaken as part of this assessment, is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

In general, the subsurface soil profile encountered at the borehole locations consists of a shallow overburden comprised of a surficial pavement structure (asphaltic concrete over top of granular sub-grade fill), underlain by fill material (brown silty clay with sand, gravel, and crushed stone). Native glacial till was encountered beneath the fill layers in boreholes BH9-24 and BH11-24.

Bedrock, consisting of good to excellent quality limestone, was encountered in boreholes BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24 at depths ranging from approximately 1.09 m to 4.88 m below ground surface. Practical refusal to augering on inferred bedrock was measured in the remaining boreholes at depths ranging from approximately 0.66 m to 3.51 m below ground surface.

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 beneath the Phase II Property were most recently measured using an electronic water level meter on April 17, 2024. 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
BH1-24	58.00	2.74	55.26	April 17, 2024
BH4-24	63.38	2.12	61.26	
BH6-24	63.87	2.06	61.81	
BH9-24	62.55	-	-	
BH10-24	62.28	2.71	59.57	
BH16-24	61.81	5.70	56.11	
BH17-24	62.38	3.10	59.28	
BH18-24	60.70	5.52	55.18	

The groundwater at the Phase II Property was encountered within the bedrock at depths ranging from approximately 2.06 m to 5.70 m below ground surface.

No unusual visual observations were identified within the recovered groundwater samples at the time of the field sampling event.

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 PE5791-3 – Test Hole Location Plan in the appendix, the groundwater flow beneath the Phase II Property was calculated to be in a northeasterly direction. A horizontal hydraulic gradient of approximately 0.016 m/m was also calculated as part of this assessment.

It should be noted that groundwater levels are expected to fluctuate throughout the year with seasonal variations.

5.3 Fine/Coarse Soil Texture

Grain size analysis was not completed as part of this investigation. As a result, the coarse-grained soil standards were chosen as a conservative approach.

5.4 Field Screening

Field screening of the soil samples collected during the drilling program resulted in organic vapour readings ranging from 0.0 ppm to 8.6 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

As part of this assessment, 21 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), metals, mercury, hexavalent chromium, PAHs, EC, SAR, and/or pH parameters. The results of the analytical testing are presented below in Tables 6 to 9, as well as on the laboratory certificates of analysis included in Appendix 1.

Table 6.1
Analytical Test Results – Soil
BTEX & PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 2, 2024							
		BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	BH5-24-SS4	BH6-24-AU1		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.76-1.09 m	0.31-0.61 m	1.52-2.13 m	0.31-0.61 m		
Benzene	0.002	nd	nd	nd	nd	nd	nd	0.32	0.03
Ethylbenzene	0.002	nd	nd	nd	nd	nd	nd	9.5	0.082
Toluene	0.002	nd	nd	nd	nd	nd	nd	68	0.37
Xylenes	0.002	nd	nd	nd	nd	0.012	nd	26	11
PHCs F_1	7	nd	nd	nd	nd	nd	nd	55	240
PHCs F_2	4	nd	nd	nd	nd	nd	nd	230	260
PHCs F_3	8	95	nd	349	360	113	188	1,700	1,700
PHCs F_4	6	1,740	1,110	1,860	2,490	986	1,800	3,300	3,300
PHCs F_4 (gravimetric)	50	2,490	1,830	1,730	**5,290**	459	**4,200**	3,300	3,300

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

Table 6.2
Analytical Test Results – Soil
BTEX & PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 3, 2024							
		BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	BH11-24-SS2A	BH12-24-SS2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.76-1.07 m	0.76-1.04 m		
Benzene	0.02	nd	nd	nd	nd	nd	nd	0.32	0.03
Ethylbenzene	0.05	nd	nd	nd	nd	nd	0.003	9.5	0.082
Toluene	0.05	nd	nd	nd	nd	nd	nd	68	0.37
Xylenes	0.05	nd	nd	0.003	0.007	nd	0.020	26	11
PHCs F_1	7	nd	nd	nd	nd	nd	nd	55	240
PHCs F_2	4	nd	nd	nd	nd	nd	nd	230	260
PHCs F_3	8	nd	111	98	119	24	40	1,700	1,700
PHCs F_4	6	1,050	239	269	744	171	184	3,300	3,300
PHCs F_4 (gravimetric)	50	2,500	449	-	2,280	303	1,060	3,300	3,300

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

Table 6.3
Analytical Test Results – Soil
BTEX & PHCs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 4, 2024							
		BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	BH16-24-AU2	BH17-24-AU1	BH18-24-AU2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.76-1.37 m	0.31-0.61 m	0.20-0.31 m	0.31-0.61 m	0.36-0.61 m		
Benzene	0.02	0.004	nd	nd	nd	0.004	0.003	0.32	0.03
Ethylbenzene	0.05	0.002	nd	nd	nd	0.003	0.006	9.5	0.082
Toluene	0.05	0.014	nd	0.006	nd	0.019	0.018	68	0.37
Xylenes	0.05	0.016	nd	0.011	nd	0.017	0.025	26	11
PHCs F_1	7	nd	nd	nd	nd	nd	nd	55	240
PHCs F_2	4	nd	nd	nd	nd	nd	nd	230	260
PHCs F_3	8	284	12	159	18	153	465	1,700	1,700
PHCs F_4	6	1,770	65	432	180	1,900	1,600	3,300	3,300
PHCs F_4 (gravimetric)	50	**5,230**	-	2,240	335	**7,510**	2,100	3,300	3,300

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

The concentrations of PHCs F_4 gravimetric detected in Samples BH4-24-AU1, BH6-24-AU1, BH13-24-AU1, and BH17-24-AU1 are in excess of the selected MECP Table 7 Coarse-Grained Community Soil Standards as well as the CCME Coarse-Grained Commercial Soil Standards.

All remaining BTEX and PHC parameter concentrations detected in the soil samples analyzed are in compliance with both the MECP and CCME standards.

Table 7.1
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 2, 2024							
		BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	BH5-24-SS4	BH6-24-AU1		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.76-1.09 m	0.31-0.61 m	1.52-2.13 m	0.31-0.61 m		
Antimony	1.0	nd	nd	nd	nd	nd	nd	40	40
Arsenic	1.0	2	2	7	2	4	2	18	12
Barium	1.0	114	160	351	61	**762**	267	670	2,000
Beryllium	0.5	nd	nd	1.0	nd	0.8	nd	8	8
Boron	5.0	12.5	13.5	21.2	9.6	19.8	14.6	120	-
Cadmium	0.5	nd	nd	nd	nd	nd	nd	1.9	22
Chromium	5.0	7	10	50	7	21	9	160	87
Chromium (VI)	0.2	nd	nd	0.4	nd	nd	nd	8	1.4
Cobalt	1.0	4	6	13	4	9	4	80	300
Copper	5.0	8	10	22	7	64	8	230	91
Lead	1.0	8	13	12	8	26	8	120	260
Mercury	0.1	nd	nd	nd	nd	nd	nd	3.9	24
Molybdenum	1.0	nd	nd	1	1	1	nd	40	40
Nickel	5.0	10	12	34	12	18	11	270	89
Selenium	1.0	nd	nd	1	nd	nd	nd	5.5	2.9
Silver	0.3	nd	nd	nd	nd	nd	nd	40	40
Thallium	1.0	nd	nd	nd	nd	nd	nd	3.3	1
Tin	5.0	nd	nd	nd	nd	nd	nd	-	300
Uranium	1.0	nd	nd	nd	nd	nd	nd	33	33
Vanadium	10.0	23	25	52	21	24	25	86	130
Zinc	20.0	nd	nd	79	nd	41	nd	340	410

Notes:

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

Table 7.2
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 3, 2024							
		BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	BH11-24-SS2A	BH12-24-SS2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.76-1.07 m	0.76-1.04 m		
Antimony	1.0	nd	nd	nd	nd	nd	nd	40	40
Arsenic	1.0	2	3	2	2	3	4	18	12
Barium	1.0	188	69	466	108	105	549	670	2,000
Beryllium	0.5	nd	nd	nd	nd	0.6	0.8	8	8
Boron	5.0	14.6	12.2	18.0	7.1	nd	21.2	120	-
Cadmium	0.5	nd	nd	nd	nd	nd	nd	1.9	22
Chromium	5.0	10	19	15	12	29	26	160	87
Chromium (VI)	0.2	nd	nd	nd	nd	0.3	nd	8	1.4
Cobalt	1.0	5	6	5	3	9	8	80	300
Copper	5.0	8	14	9	7	20	14	230	91
Lead	1.0	8	6	9	18	6	13	120	260
Mercury	0.1	nd	nd	nd	nd	nd	nd	3.9	24
Molybdenum	1.0	nd	nd	nd	nd	nd	nd	40	40
Nickel	5.0	12	12	12	8	18	15	270	89
Selenium	1.0	nd	nd	nd	nd	nd	nd	5.5	2.9
Silver	0.3	nd	nd	nd	nd	nd	nd	40	40
Thallium	1.0	nd	nd	nd	nd	nd	nd	3.3	1
Tin	5.0	nd	nd	nd	nd	nd	nd	-	300
Uranium	1.0	nd	nd	nd	nd	nd	nd	33	33
Vanadium	10.0	28	24	17	15	43	37	86	130
Zinc	20.0	nd	nd	nd	nd	43	77	340	410

Notes:

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

Table 7.3
Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 4, 2024							
		BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	BH16-24-AU2	BH17-24-AU1	BH18-24-AU2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.76-1.37 m	0.31-0.61 m	0.20-0.31 m	0.31-0.61 m	0.36-0.61 m		
Antimony	1.0	nd	nd	nd	nd	2	nd	40	40
Arsenic	1.0	2	4	3	3	nd	2	18	12
Barium	1.0	45	241	243	174	46	69	670	2,000
Beryllium	0.5	nd	0.7	nd	0.6	nd	nd	8	8
Boron	5.0	8.9	22.9	10.8	nd	10.9	12.5	120	-
Cadmium	0.5	nd	nd	nd	nd	nd	nd	1.9	22
Chromium	5.0	9	28	19	39	nd	46	160	87
Chromium (VI)	0.2	nd	nd	nd	0.6	nd	nd	8	1.4
Cobalt	1.0	3	10	6	10	nd	4	80	300
Copper	5.0	7	14	17	20	25	9	230	91
Lead	1.0	9	10	34	7	27	7	120	260
Mercury	0.1	nd	nd	nd	nd	nd	nd	3.9	24
Molybdenum	1.0	2	nd	3	nd	2	1	40	40
Nickel	5.0	10	20	14	23	nd	10	270	89
Selenium	1.0	nd	nd	nd	nd	1	nd	5.5	2.9
Silver	0.3	nd	nd	nd	nd	nd	nd	40	40
Thallium	1.0	nd	nd	nd	nd	nd	nd	3.3	1
Tin	5.0	nd	nd	nd	nd	nd	nd	-	300
Uranium	1.0	nd	nd	nd	nd	nd	nd	33	33
Vanadium	10.0	23	35	29	55	nd	19	86	130
Zinc	20.0	nd	37	36	56	25	nd	340	410

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

The concentrations of barium detected in Sample BH5-24-SS4 is in excess of the selected MECP Table 7 Coarse-Grained Community Soil Standards as well as the CCME Coarse-Grained Commercial Soil Standards.

All remaining metal parameter concentrations detected in the soil samples analyzed are in compliance with both the MECP and CCME standards.

Table 8.1
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 2, 2024							
		BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	BH5-24-SS4	BH6-24-AU1		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.76-1.09 m	0.31-0.61 m	1.52-2.13 m	0.31-0.61 m		
1-Methylnaphthalene	0.02	nd	nd	nd	nd	nd	nd	76	0.28
2-Methylnaphthalene	0.02	nd	nd	0.03	nd	nd	nd	76	320
Methylnaphthalene (1&2)	0.04	nd	nd	0.04	nd	nd	nd	76	32
Acenaphthene	0.02	nd	nd	nd	nd	nd	nd	96	10
Acenaphthylene	0.02	nd	nd	nd	nd	nd	nd	0.15	72
Anthracene	0.02	nd	nd	nd	nd	nd	nd	0.67	10
Benzo[a]anthracene	0.02	nd	nd	nd	nd	nd	nd	0.96	-
Benzo[a]pyrene	0.02	nd	0.04	nd	nd	nd	nd	0.3	10
Benzo[b]fluoranthene	0.02	nd	0.04	nd	nd	nd	nd	0.96	-
Benzo[g,h,i]perylene	0.02	nd	nd	nd	nd	0.05	nd	9.6	-
Benzo[k]fluoranthene	0.02	nd	nd	nd	nd	nd	nd	0.96	10
1,1-Biphenyl	0.02	nd	nd	nd	nd	nd	nd	52	180
Chrysene	0.02	nd	0.04	nd	nd	nd	nd	9.6	0.25
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	nd	nd	0.1	10
Fluoranthene	0.02	nd	0.07	nd	0.03	nd	nd	9.6	-
Fluorene	0.02	nd	nd	nd	nd	nd	nd	62	-
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	nd	nd	nd	nd	0.76	-
Naphthalene	0.01	nd	nd	0.05	nd	nd	nd	9.6	0.013
Phenanthrene	0.02	nd	nd	nd	0.02	nd	0.05	12	0.046
Pyrene	0.02	nd	0.09	nd	0.03	nd	nd	96	100
Quinoline	0.10	nd	nd	nd	nd	nd	nd	-	-

Notes:

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

Table 8.2
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 3, 2024							
		BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	BH11-24-SS2A	BH12-24-SS2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.76-1.07 m	0.76-1.04 m		
1-Methylnaphthalene	0.02	0.03	0.02	nd	nd	nd	nd	76	0.28
2-Methylnaphthalene	0.02	0.05	nd	nd	nd	nd	nd	76	320
Methylnaphthalene (1&2)	0.04	0.07	nd	nd	nd	nd	nd	76	32
Acenaphthene	0.02	nd	nd	nd	nd	nd	nd	96	10
Acenaphthylene	0.02	nd	0.02	nd	nd	nd	nd	0.15	72
Anthracene	0.02	nd	nd	nd	0.03	nd	nd	0.67	10
Benzo[a]anthracene	0.02	0.02	nd	nd	0.06	nd	nd	0.96	-
Benzo[a]pyrene	0.02	nd	nd	nd	0.04	nd	nd	0.3	10
Benzo[b]fluoranthene	0.02	0.03	nd	nd	0.04	nd	nd	0.96	-
Benzo[g,h,i]perylene	0.02	0.03	0.03	0.02	0.03	nd	nd	9.6	-
Benzo[k]fluoranthene	0.02	nd	nd	nd	0.02	nd	nd	0.96	10
1,1-Biphenyl	0.02	nd	nd	nd	nd	nd	nd	52	180
Chrysene	0.02	0.02	nd	nd	0.05	nd	nd	9.6	0.25
Dibenzo[a,h]anthracene	0.02	nd	nd	nd	nd	nd	nd	0.1	10
Fluoranthene	0.02	0.05	nd	0.04	0.12	nd	0.03	9.6	-
Fluorene	0.02	nd	nd	nd	nd	nd	nd	62	-
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	nd	nd	nd	nd	0.76	-
Naphthalene	0.01	0.02	nd	0.02	nd	nd	nd	9.6	0.013
Phenanthrene	0.02	0.07	0.02	0.03	0.10	nd	nd	12	0.046
Pyrene	0.02	0.05	0.04	0.04	0.11	nd	0.02	96	100
Quinoline	0.10	nd	nd	nd	nd	nd	nd	-	-

Notes:

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

Table 8.3
Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g)						MECP Table 7 Coarse-Grained Community Soil Standards (µg/g)	CCME Coarse-Grained Commercial Standards (µg/g)
		April 4, 2024							
		BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	BH16-24-AU2	BH17-24-AU1	BH18-24-AU2		
		Sample Depth (m bgs)							
		0.31-0.61 m	0.76-1.37 m	0.31-0.61 m	0.20-0.31 m	0.31-0.61 m	0.36-0.61 m		
1-Methylnaphthalene	0.02	nd	nd	nd	nd	0.02	nd	76	0.28
2-Methylnaphthalene	0.02	nd	nd	nd	nd	0.03	nd	76	320
Methylnaphthalene (1&2)	0.04	nd	nd	nd	nd	0.05	nd	76	32
Acenaphthene	0.02	nd	nd	nd	nd	nd	nd	96	10
Acenaphthylene	0.02	(nd >0.40)	nd	(nd >0.40)	nd	nd	nd	0.15	72
Anthracene	0.02	nd	nd	nd	nd	nd	nd	0.67	10
Benzo[a]anthracene	0.02	nd	nd	nd	nd	0.03	0.05	0.96	-
Benzo[a]pyrene	0.02	(nd >0.40)	nd	(nd >0.40)	nd	0.03	0.05	0.3	10
Benzo[b]fluoranthene	0.02	nd	nd	nd	nd	0.03	0.04	0.96	-
Benzo[g,h,i]perylene	0.02	nd	nd	nd	nd	0.03	0.06	9.6	-
Benzo[k]fluoranthene	0.02	nd	nd	nd	nd	0.03	0.04	0.96	10
1,1-Biphenyl	0.02	nd	nd	nd	nd	nd	nd	52	180
Chrysene	0.02	nd	nd	nd	nd	0.03	0.07	9.6	0.25
Dibenzo[a,h]anthracene	0.02	(nd >0.40)	nd	(nd >0.40)	nd	nd	nd	0.1	10
Fluoranthene	0.02	nd	nd	nd	nd	0.05	0.09	9.6	-
Fluorene	0.02	nd	nd	nd	nd	nd	nd	62	-
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	nd	nd	nd	nd	0.76	-
Naphthalene	0.01	nd	nd	nd	nd	nd	nd	9.6	0.013
Phenanthrene	0.02	nd	nd	nd	nd	0.05	0.06	12	0.046
Pyrene	0.02	nd	nd	nd	nd	0.06	0.09	96	100
Quinoline	0.10	nd	nd	nd	nd	nd	nd	-	-

Notes:

- MDL – Method Detection Limit
- nd – not detected above the MDL
- (bracketed) – MDLs exceed selected MECP standards
- Underlined – value exceeds selected CCME standards
- **Bold and Underlined** – value exceeds selected MECP standards

All detected PAH parameter concentrations in the soil samples analyzed are in compliance with the selected MECP Table 7 Coarse-Grained Community Soil Standards. It should be noted that the concentration of naphthalene and phenanthrene in a select number of samples exceed the CCME Coarse-Grained Commercial Soil Standards.

Elevated method detection limits were identified for Samples BH13-24-AU1 and BH15-24-AU1, with a select number exceeding the MECP Standards. This discrepancy is likely the result of asphalt fragments intermixed in the soil matrix. Given that all other PAH parameters in these samples were also non-detect, these elevated MDLs are not considered to affect the quality of the laboratory data.

Table 9.1
Analytical Test Results – Soil
Inorganic Parameters

Parameter	MDL (units)	Soil Samples (µg/g)							MECP Table 7 Coarse-Grained Residential Soil Standards (units)	CCME Coarse-Grained Commercial Standards (units)
		April 2 – April 4, 2024								
		BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	BH5-24-SS4	BH6-24-AU1	BH7-24-AU1		
		Sample Depth (m bgs)								
		0.31-0.61 m	0.31-0.61 m	0.76-1.09 m	0.31-0.61 m	1.52-2.13 m	0.31-0.61 m	0.31-0.61 m		
SAR	0.01 Units	6.97	2.07	**12.5**	1.35	5.95	1.95	4.95	12	12
EC	5 µS/cm	751	328	1080	761	665	**1,830**	746	1,400	4,000
pH	0.05 Units	7.70	-	-	-	7.51	-	7.51	5.00 – 11.00	5.00 – 11.00

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

Table 9.2
Analytical Test Results – Soil
Inorganic Parameters

Parameter	MDL (units)	Soil Samples (µg/g)							MECP Table 7 Coarse-Grained Residential Soil Standards (units)	CCME Coarse-Grained Commercial Standards (units)
		April 2 – April 4, 2024								
		BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	BH11-24-SS2A	BH11-24-SS4	BH12-24-SS2	BH13-24-AU1		
		Sample Depth (m bgs)								
		0.31-0.61 m	0.31-0.61 m	0.31-0.61 m	0.76-1.07 m	2.29-2.90 m	0.76-1.04 m	0.31-0.61 m		
SAR	0.01 Units	7.89	2.05	7.89	2.66	-	7.89	1.61	12	12
EC	5 µS/cm	1170	**2,310**	1120	216	-	1,170	1,220	1,400	4,000
pH	0.05 Units	-	-	-	-	7.48	-	7.58	5.00 – 11.00	5.00 – 11.00

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

Table 9.3
Analytical Test Results – Soil
Inorganic Parameters

Parameter	MDL (units)	Soil Samples (µg/g)							MECP Table 7 Coarse-Grained Residential Soil Standards (units)	CCME Coarse-Grained Commercial Standards (units)
		April 2 – April 4, 2024								
		BH14-24-SS3	BH15-24-AU1	BH16-24-AU2	BH16-24-SS5	BH17-24-AU1	BH18-24-AU2	BH18-24-SS6		
		Sample Depth (m bgs)								
		0.76-1.37 m	0.31-0.61 m	0.20-0.31 m	1.52-2.13 m	0.31-0.61 m	0.36-0.61 m	3.61-4.22 m		
SAR	0.01 Units	8.61	9.12	4.87	-	0.11	2.77	-	12	12
EC	5 µS/cm	1,230	1,280	596	-	1,390	719	-	1,400	4,000
pH	0.05 Units	-	-	-	7.57	7.59	-	10.37	5.00 – 11.00	5.00 – 11.00

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

The SAR value measured in Sample BH3-24-SS2A, as well as the EC values measured in Samples BH6-24-AU1 and BH9-24-AU1 are in excess of the selected MECP Table 7 Coarse-Grained Community Soil Standards, though they do comply with the CCME Coarse-Grained Commercial Soil Standards. These exceedances are suspected to be the result of the use of road salt on the Phase II Property during snow and ice conditions and thus, as per Section 49.1 of O. Reg. 153/04, these do not represent a contaminant issue.

Table 10
Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Benzene	0.004	BH13-24-AU1 / BH17-24-AU1	0.31 – 0.61 m / 0.31 – 0.61 m
Ethylbenzene	0.006	BH18-24-AU2	0.36 – 0.61 m
Toluene	0.019	BH17-24-AU1	0.31 – 0.61 m
Xylenes	0.025	BH18-24-AU2	0.36 – 0.61 m
PHCs F_3	465	BH18-24-AU2	0.36 – 0.61 m
PHCs F_4	2,490	BH4-24-AU1	0.31 – 0.61 m
PHCs $F_{4\ Gravimetric}$	**7,510**	BH17-24-AU1	0.31 – 0.61 m
Antimony	2	BH17-24-AU1	0.31 – 0.61 m
Arsenic	7	BH3-24-SS2A	0.76 – 1.09 m
Barium	**762**	BH5-24-SS4	1.52 – 2.13 m
Beryllium	1.0	BH3-24-SS2A	0.76 – 1.09 m
Boron	22.9	BH14-24-SS3	0.76 – 1.37 m
Chromium	50	BH3-24-SS2A	0.76 – 1.09 m
Chromium (VI)	0.6	BH16-24-AU2	0.20 – 0.31 m
Cobalt	13	BH3-24-SS2A	0.76 – 1.09 m
Copper	64	BH5-24-SS4	1.52 – 2.13 m
Lead	34	BH15-24-AU1	0.31 – 0.61 m
Molybdenum	3	BH15-24-AU1	0.31 – 0.61 m
Nickel	34	BH3-24-SS2A	0.76 – 1.09 m
Selenium	1	BH3-24-SS2A / BH7-24-AU1	0.76 – 1.09 m / 0.31 – 0.61 m
Vanadium	55	BH16-24-AU2	0.20 – 0.31 m
Zinc	79	BH3-24-SS2A	0.76 – 1.09 m
1-Methylnaphthalene	0.03	BH7-24-AU1	0.31 – 0.61 m
2-Methylnaphthalene	0.05	BH7-24-AU1	0.31 – 0.61 m
Methylnaphthalene (1&2)	0.07	BH7-24-AU1	0.31 – 0.61 m
Acenaphthylene	0.02	BH8-24-AU1	0.31 – 0.61 m
Anthracene	0.03	BH10-24-AU1	0.31 – 0.61 m
Benzo[a]anthracene	0.06	BH10-24-AU1	0.31 – 0.61 m
Benzo[a]pyrene	0.05	BH18-24-AU2	0.36 – 0.61 m
Benzo[b]fluoranthene	0.04	BH2-24-AU1 / BH10-24-AU1 / BH18-24-AU2	0.31 – 0.61 m / 0.31 – 0.61 m / 0.36 – 0.61 m
Benzo[g,h,i]perylene	0.06	BH18-24-AU2	0.36 – 0.61 m
Benzo[k]fluoranthene	0.04	BH18-24-AU2	0.36 – 0.61 m
Chrysene	0.07	BH18-24-AU2	0.36 – 0.61 m
Fluoranthene	0.12	BH10-24-AU1	0.31 – 0.61 m
Naphthalene	0.05	BH3-24-SS2A	0.76 – 1.09 m
Phenanthrene	0.10	BH10-24-AU1	0.31 – 0.61 m
Pyrene	0.11	BH10-24-AU1	0.31 – 0.61 m
SAR	**12.5**	BH3-24-SS2A	0.76 – 1.09 m
EC	**2,310**	BH9-24-AU1	0.31 – 0.61 m
pH	10.37	BH18-24-SS6	3.61 – 4.22 m

Notes:
- Underlined – value exceeds selected CCME standards
- **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.

5.6 Groundwater Quality

As part of this assessment, six groundwater samples were submitted for laboratory analysis of PHCs (F_1-F_4), VOCs, metals, mercury, hexavalent chromium, and PAH parameters. The results of the analytical testing are presented below in Tables 11 to 14, 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 (µg/L)						MECP Table 7 Non-Potable Groundwater Standards (µg/L)	CCME Tier 1 FIGWQG Commercial Standards (µg/L)
		April 17, 2024							
		BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	BH17-24-GW1	BH18-24-GW1		
		Sample Depth (m bgs)							
		7.03 – 8.53 m	3.68 – 5.18 m	3.99 – 5.49 m	5.59 – 7.09 m	7.09 – 8.59 m	10.08 – 11.58 m		
PHCs F_1	0.025	nd	nd	nd	nd	nd	nd	420	810
PHCs F_2	0.1	nd	nd	nd	nd	nd	nd	150	1,300
PHCs F_3	0.1	nd	nd	nd	nd	nd	nd	500	N/A
PHCs F_4	0.1	nd	nd	nd	nd	nd	nd	500	N/A

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

No PHC parameter concentrations were detected above the laboratory method detection limits in any of the groundwater samples analyzed. The results are in compliance with the selected MECP Table 7 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

Table 12
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)						MECP Table 7 Non-Potable Groundwater Soil Standards (µg/L)	CCME Tier 1 FIGWQG Commercial Standards (µg/L)
		April 17, 2024							
		BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	BH17-24-GW1	BH18-24-GW1		
		Sample Depth (m bgs)							
		7.03 – 8.53 m	3.68 – 5.18 m	3.99 – 5.49 m	5.59 – 7.09 m	7.09 – 8.59 m	10.08 – 11.58 m		
Acetone	5.0	nd	nd	nd	nd	nd	nd	100,000	13,000
Benzene	0.5	nd	nd	nd	nd	nd	nd	0.5	140
Bromodichloromethane	0.5	nd	nd	nd	nd	nd	nd	67,000	8,500
Bromoform	0.5	nd	nd	nd	nd	nd	nd	5	380
Bromomethane	0.5	nd	nd	nd	nd	nd	nd	0.89	56
Carbon Tetrachloride	0.2	nd	nd	nd	nd	nd	nd	0.2	0.56
Chlorobenzene	0.5	nd	nd	nd	nd	nd	nd	140	1.3
Chloroethane	1.0	nd	nd	nd	nd	nd	nd	N/A	N/A
Chloroform	0.5	**6.3**	1.6	0.6	0.6	nd	nd	2	1.8
Chloromethane	3.0	nd	nd	nd	nd	nd	nd	N/A	N/A
Dibromochloromethane	0.5	nd	nd	nd	nd	nd	nd	65,000	1,100
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd	nd	3,500	N/A
Ethylene dibromide	0.2	nd	nd	nd	nd	nd	nd	0.2	0.25
1,2-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	150	0.7
1,3-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	7,600	42
1,4-Dichlorobenzene	0.5	nd	nd	nd	nd	nd	nd	0.5	26
1,1-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	11	320
1,2-Dichloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5	10
1,1-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	0.5	39
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	nd	nd	nd	1.6	1.6
1,2-Dichloroethylene, total	0.5	nd	nd	nd	nd	nd	nd	N/A	N/A
1,2-Dichloropropane	0.5	nd	nd	nd	nd	nd	nd	0.58	16
cis-1,3-Dichloropropylene	0.5	nd	nd	nd	nd	nd	nd	N/A	N/A
trans-1,3-Dichloropropylene	0.5	nd	nd	nd	nd	nd	nd	N/A	N/A
1,3-Dichloropropene, total	0.5	nd	nd	nd	nd	nd	nd	0.5	5.2
Ethylbenzene	0.5	nd	nd	nd	nd	nd	nd	54	11,000
Hexane	1.0	nd	nd	nd	nd	nd	nd	5	N/A
Methyl Ethyl Ketone	5.0	nd	nd	nd	nd	nd	nd	21,000	150,000
Methyl Butyl Ketone	10.0	nd	nd	nd	nd	nd	nd	N/A	N/A
Methyl Isobutyl Ketone	5.0	nd	nd	nd	nd	nd	nd	5,200	58,000
Methyl tert-butyl ether	2.0	nd	nd	nd	nd	nd	nd	15	4,300
Methylene Chloride	5.0	nd	nd	nd	nd	nd	nd	26	50
Styrene	0.5	nd	nd	nd	nd	nd	nd	43	72
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	1.1	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5	3.2

Notes:

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

Table 12 (Continued)
Analytical Test Results – Groundwater
VOCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)						MECP Table 7 Non-Potable Groundwater Soil Standards (µg/L)	CCME Tier 1 FIGWQG Commercial Standards (µg/L)
		April 17, 2024							
		BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	BH17-24-GW1	BH18-24-GW1		
		Sample Depth (m bgs)							
		7.03 – 8.53 m	3.68 – 5.18 m	3.99 – 5.49 m	5.59 – 7.09 m	7.09 – 8.59 m	10.08 – 11.58 m		
Tetrachloroethylene	0.5	nd	nd	nd	nd	nd	nd	0.5	110
Toluene	0.5	nd	nd	nd	nd	nd	nd	320	83
1,1,1-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	23	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	nd	nd	nd	0.5	4.7
Trichloroethylene	0.5	nd	nd	nd	nd	nd	nd	0.5	20
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd	nd	2,000	-
1,3,5-Trimethylbenzene	0.5	nd	nd	nd	nd	nd	nd	-	-
Vinyl Chloride	0.5	nd	nd	nd	nd	nd	nd	0.5	1.1
Xylenes	0.5	nd	nd	nd	nd	nd	nd	72	3,900

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

All detected VOC parameter concentrations in the groundwater samples analyzed are in compliance with the selected MECP Table 7 Non-Potable Groundwater Standards, as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites, with the exception of chloroform in Sample BH1-24-GW1.

This chloroform exceedance is suspected to be the result of municipal water used during the bedrock coring process, and not as a result of a contaminant issue. The chloroform concentration is expected to dissipate over time through natural attenuation processes.

Table 13
Analytical Test Results – Groundwater
Metals

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)						MECP Table 7 Non-Potable Groundwater Soil Standards (µg/L)	CCME Coarse-Grained Commercial Standards (µg/L)
		April 17, 2024							
		BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	BH17-24-GW1	BH18-24-GW1		
		Sample Depth (m bgs)							
		7.03 – 8.53 m	3.68 – 5.18 m	3.99 – 5.49 m	5.59 – 7.09 m	7.09 – 8.59 m	10.08 – 11.58 m		
Aluminum	1	13	10	3	2	4	5	-	5
Antimony	0.5	nd	nd	nd	nd	nd	nd	16,000	2000
Arsenic	1	1	nd	nd	nd	nd	2	1,500	5
Barium	1	185	246	207	176	102	199	23,000	500
Beryllium	0.5	nd	nd	nd	nd	nd	nd	53	5.3
Boron	10	66	82	46	52	82	243	36,000	500
Calcium	100	155,000	718,000	399,000	363,000	223,000	330,000	-	-
Chromium	1	nd	nd	nd	nd	nd	nd	640	8.9
Chromium (VI)	1	nd	nd	nd	nd	nd	nd	110	-
Cobalt	0.5	nd	1.7	nd	nd	nd	nd	52	-
Copper	0.5	1.0	2.9	1.6	2.3	1.8	1.8	69	50
Iron	100	nd	nd	nd	nd	nd	358	-	300
Lead	0.1	nd	nd	nd	nd	nd	nd	20	1
Magnesium	200	30,000	97,300	65,000	91,300	32,700	89,300	-	-
Manganese	5	28	29	nd	6	12	112	-	200
Molybdenum	0.5	2.6	1.9	24.2	2.4	11.7	4.0	7,300	73
Nickel	1	nd	4	3	2	3	nd	390	25
Selenium	1	1	nd	<1	2	nd	nd	50	1
Silver	0.1	nd	nd	0.1	nd	nd	nd	1.2	0.1
Thallium	0.1	nd	nd	nd	0.1	0.2	nd	400	0.8
Titanium	5	nd	nd	nd	nd	nd	nd	-	100
Uranium	0.1	2.3	3.5	2.4	4.4	2.9	1.3	330	10
Vanadium	0.5	1.3	1.2	nd	nd	nd	0.7	200	100
Zinc	5	nd	nd	nd	nd	nd	nd	890	10

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

All detected metal parameter concentrations in the groundwater samples analyzed are in compliance with the selected MECP Table 7 Non-Potable Groundwater Standards.

It should be noted that the concentrations of aluminum, iron, and selenium in Samples BH1-24-GW1, BH6-24-GW1, and BH16-24-GW1 and BH18-24-GW1 are in excess of the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

Table 14
Analytical Test Results – Groundwater
PAHs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)						MECP Table 7 Non-Potable Groundwater Soil Standards (µg/L)	CCME Tier 1 FIGWQG Commercial Standards (µg/L)
		April 17, 2024							
		BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	BH17-24-GW1	BH18-24-GW1		
		Sample Depth (m bgs)							
		7.03 – 8.53 m	3.68 – 5.18 m	3.99 – 5.49 m	5.59 – 7.09 m	7.09 – 8.59 m	10.08 – 11.58 m		
1-Methylnaphthalene	0.05	nd	nd	nd	nd	nd	nd	1,500	1,500
2-Methylnaphthalene	0.05	nd	nd	nd	nd	nd	nd	1,500	1,500
Methylnaphthalene (1&2)	0.10	nd	nd	nd	nd	nd	nd	1,500	180
Acenaphthene	0.05	nd	nd	nd	nd	nd	nd	17	5.8
Acridine	0.05	nd	nd	nd	nd	nd	nd	-	0.05
Acenaphthylene	0.05	nd	nd	nd	nd	nd	nd	1	46
Anthracene	0.01	nd	nd	nd	nd	nd	nd	1	0.012
Benzo[a]anthracene	0.01	nd	nd	nd	nd	nd	nd	1.8	0.018
Benzo[a]pyrene	0.01	nd	nd	nd	nd	nd	nd	0.81	0.015
Benzo (b&j) fluoranthene	0.10	nd	nd	nd	nd	nd	nd	-	0.48
Benzo[g,h,i]perylene	0.05	nd	nd	nd	nd	nd	nd	0.2	0.17
Benzo[k]fluoranthene	0.05	nd	nd	nd	nd	nd	nd	0.4	0.48
Chrysene	0.05	nd	nd	nd	nd	nd	nd	0.7	0.1
Dibenzo[a,h]anthracene	0.05	nd	nd	nd	nd	nd	nd	0.4	0.26
Fluoranthene	0.01	nd	nd	nd	nd	nd	nd	44	0.04
Fluorene	0.05	nd	nd	nd	nd	nd	nd	290	3
Indeno [1,2,3-cd] pyrene	0.05	nd	nd	nd	nd	nd	nd	0.2	0.21
Naphthalene	0.05	nd	nd	nd	nd	nd	nd	7	1.1
Phenanthrene	0.05	nd	nd	nd	nd	nd	nd	380	0.4
Pyrene	0.01	nd	nd	nd	nd	nd	nd	5.7	0.025
Quinoline	0.10	nd	nd	nd	nd	nd	nd	-	3.4

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

No PAH parameter concentrations were detected above the laboratory method detection limits in any of the groundwater samples analyzed. The results are in compliance with the selected MECP Table 7 Non-Potable Groundwater Standards as well as the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites.

Table 15
Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/g)	Sample ID	Depth Interval (m BGS)
Chloroform	**6.3**	BH1-24-GW1	7.03 – 8.53 m
Aluminum	13	BH1-24-GW1	7.03 – 8.53 m
Arsenic	2	BH18-24-GW1	10.08 – 11.58 m
Barium	246	BH6-24-GW1	3.68 – 5.18 m
Boron	243	BH18-24-GW1	10.08 – 11.58 m
Calcium	718,000	BH6-24-GW1	3.68 – 5.18 m
Cobalt	1.7	BH6-24-GW1	3.68 – 5.18 m
Copper	2.9	BH6-24-GW1	3.68 – 5.18 m
Iron	358	BH18-24-GW1	10.08 – 11.58 m
Magnesium	97,300	BH6-24-GW1	3.68 – 5.18 m
Manganese	112	BH18-24-GW1	10.08 – 11.58 m
Molybdenum	24.2	BH10-24-GW1	3.99 – 5.49 m
Nickel	4	BH6-24-GW1	3.68 – 5.18 m
Selenium	2	BH16-24-GW1	5.59 – 7.09 m
Silver	0.1	BH10-24-GW1	3.99 – 5.49 m
Thallium	0.2	BH17-24-GW1	7.09 – 8.59 m
Uranium	4.4	BH16-24-GW1	5.59 – 7.09 m
Vanadium	1.3	BH1-24-GW1	7.03 – 8.53 m

Notes:
- Underlined – value exceeds selected CCME standards
- **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.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of this Phase II ESA were handled in accordance with the analytical protocols with respect to holding time, preservation method, storage requirement, and container type.

As per Subsection 47(3) of O. Reg. 153/04, as amended by the Environmental Protection Act, the certificates of analysis have been received for each sample submitted for laboratory analysis and have been appended to this report.

As per the Sampling and Analysis Plan, three duplicate soil samples were obtained from Samples BH1-24-AU1, BH7-24-AU1, and BH18-24-AU2, and submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), metals, mercury, hexavalent chromium, PAHs, EC, SAR. The relative percent difference (RPD) calculations for the original and duplicate samples are provided below in Tables 16 to 18.

Table 16
QA/QC Calculations – Soil

Parameter	MDL (µg/g)	BH1-24-AU1	SOIL DUP-1	RPD (%)	QA/QC Result (Target: <20% RPD)
Benzene	0.02	nd	nd	-	Meets Target
Ethylbenzene	0.05	nd	nd	-	Meets Target
Toluene	0.05	nd	nd	-	Meets Target
Xylenes	0.05	nd	nd	-	Meets Target
PHCs F_1	7	nd	nd	-	Meets Target
PHCs F_2	4	nd	nd	-	Meets Target
PHCs F_3	8	95	149	44.3	Does Not Meet Target
PHCs F_4	6	1,740	2,610	40	Does Not Meet Target
PHCs F_4 (gravimetric)	50	2,490	3,160	23.7	Does Not Meet Target
Antimony	1.0	nd	nd	-	Meets Target
Arsenic	1.0	2	2	0	Meets Target
Barium	1.0	114	267	80.3	Does Not Meet Target
Beryllium	0.5	nd	nd	-	Meets Target
Boron	5.0	12.5	14.6	15.5	Meets Target
Cadmium	0.5	nd	nd	-	Meets Target
Chromium	5.0	7	9	25	Does Not Meet Target
Chromium (VI)	0.2	nd	nd	-	Meets Target
Cobalt	1.0	4	4	0	Meets Target
Copper	5.0	8	8	0	Meets Target
Lead	1.0	8	8	0	Meets Target
Mercury	0.1	nd	nd	-	Meets Target
Molybdenum	1.0	nd	nd	-	Meets Target
Nickel	5.0	10	11	9.5	Meets Target
Selenium	1.0	nd	nd	-	Meets Target
Silver	0.3	nd	nd	-	Meets Target
Thallium	1.0	nd	nd	-	Meets Target
Tin	5.0	nd	nd	-	Meets Target
Uranium	1.0	nd	nd	-	Meets Target
Vanadium	10.0	23	25	8.3	Meets Target
Zinc	20.0	nd	nd	-	Meets Target
1-Methylnaphthalene	0.02	nd	nd	-	Meets Target
2-Methylnaphthalene	0.02	nd	nd	-	Meets Target
Methylnaphthalene (1&2)	0.04	nd	nd	-	Meets Target
Acenaphthene	0.02	nd	nd	-	Meets Target
Acenaphthylene	0.02	nd	nd	-	Meets Target
Anthracene	0.02	nd	nd	-	Meets Target
Benzo[a]anthracene	0.02	nd	nd	-	Meets Target
Benzo[a]pyrene	0.02	nd	nd	-	Meets Target
Benzo[b]fluoranthene	0.02	nd	nd	-	Meets Target
Benzo[g,h,i]perylene	0.02	nd	nd	-	Meets Target
Benzo[k]fluoranthene	0.02	nd	nd	-	Meets Target
1,1-Biphenyl	0.02	nd	nd	-	Meets Target
Chrysene	0.02	nd	nd	-	Meets Target
Dibenzo[a,h]anthracene	0.02	nd	nd	-	Meets Target
Fluoranthene	0.02	nd	nd	-	Meets Target
Fluorene	0.02	nd	nd	-	Meets Target
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	-	Meets Target
Naphthalene	0.01	nd	nd	-	Meets Target
Phenanthrene	0.02	nd	nd	-	Meets Target
Pyrene	0.02	nd	nd	-	Meets Target
Quinoline	0.10	nd	nd	-	Meets Target
SAR	0.01 Units	6.97	6.13	12.8	Meets Target
EC	5 µS/cm	751	773	2.9	Meets Target

Notes:

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

Table 17
QA/QC Calculations – Soil

Parameter	MDL (µg/g)	BH7-24-AU1	SOIL DUP-2	RPD (%)	QA/QC Result (Target: <20% RPD)
Benzene	0.02	nd	nd	-	Meets Target
Ethylbenzene	0.05	nd	nd	-	Meets Target
Toluene	0.05	nd	nd	-	Meets Target
Xylenes	0.05	nd	nd	-	Meets Target
PHCs F_1	7	nd	nd	-	Meets Target
PHCs F_2	4	nd	nd	-	Meets Target
PHCs F_3	8	nd	85	N/A	N/A
PHCs F_4	6	1,050	875	18.2	Meets Target
PHCs F_4 (gravimetric)	50	2,500	**3,430**	31.4	Does Not Meet Target
Antimony	1.0	nd	nd	-	Meets Target
Arsenic	1.0	2	2	0	Meets Target
Barium	1.0	188	227	18.8	Meets Target
Beryllium	0.5	nd	nd	-	Meets Target
Boron	5.0	14.6	16.8	14	Meets Target
Cadmium	0.5	nd	nd	-	Meets Target
Chromium	5.0	10	13	26.1	Does Not Meet Target
Chromium (VI)	0.2	nd	nd	-	Meets Target
Cobalt	1.0	5	5	0	Meets Target
Copper	5.0	8	8	0	Meets Target
Lead	1.0	8	9	11.8	Meets Target
Mercury	0.1	nd	nd	-	Meets Target
Molybdenum	1.0	nd	nd	-	Meets Target
Nickel	5.0	12	13	8	Meets Target
Selenium	1.0	nd	nd	-	Meets Target
Silver	0.3	nd	nd	-	Meets Target
Thallium	1.0	nd	nd	-	Meets Target
Tin	5.0	nd	nd	-	Meets Target
Uranium	1.0	nd	nd	-	Meets Target
Vanadium	10.0	28	34	19.4	Meets Target
Zinc	20.0	nd	nd	-	Meets Target
1-Methylnaphthalene	0.02	0.03	nd	N/A	N/A
2-Methylnaphthalene	0.02	0.05	nd	N/A	N/A
Methylnaphthalene (1&2)	0.04	0.07	nd	N/A	N/A
Acenaphthene	0.02	nd	nd	-	Meets Target
Acenaphthylene	0.02	nd	nd	-	Meets Target
Anthracene	0.02	nd	nd	-	Meets Target
Benzo[a]anthracene	0.02	0.02	nd	N/A	N/A
Benzo[a]pyrene	0.02	nd	nd	-	Meets Target
Benzo[b]fluoranthene	0.02	0.03	nd	N/A	N/A
Benzo[g,h,i]perylene	0.02	0.03	0.02	40	Does Not Meet Target
Benzo[k]fluoranthene	0.02	nd	nd	-	Meets Target
1,1-Biphenyl	0.02	nd	nd	-	Meets Target
Chrysene	0.02	0.02	nd	N/A	N/A
Dibenzo[a,h]anthracene	0.02	nd	nd	-	Meets Target
Fluoranthene	0.02	0.05	0.02	85.7	Does Not Meet Target
Fluorene	0.02	nd	nd	-	Meets Target
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	-	Meets Target
Naphthalene	0.01	0.02	nd	N/A	N/A
Phenanthrene	0.02	0.07	0.03	111.1	Does Not Meet Target
Pyrene	0.02	0.05	0.02	85.7	Does Not Meet Target
Quinoline	0.10	nd	nd	-	Meets Target
SAR	0.01 Units	4.95	3.70	28.9	Does Not Meet Target
EC	5 µS/cm	746	756	1.3	Meets Target

Notes:

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

Table 18
QA/QC Calculations – Soil

Parameter	MDL (µg/g)	BH18-24-AU2	SOIL DUP-3	RPD (%)	QA/QC Result (Target: <20% RPD)
Benzene	0.02	0.003	0.004	28.6	Does Not Meet Target
Ethylbenzene	0.05	0.006	0.005	18.2	Meets Target
Toluene	0.05	0.018	0.019	5.5	Meets Target
Xylenes	0.05	0.025	0.024	4.1	Meets Target
PHCs F_1	7	nd	nd	-	Meets Target
PHCs F_2	4	nd	nd	-	Meets Target
PHCs F_3	8	465	574	20.1	Does Not Meet Target
PHCs F_4	6	1,600	1,920	18.2	Meets Target
PHCs F_4 (gravimetric)	50	2,100	1,750	18.2	Meets Target
Antimony	1.0	nd	nd	-	Meets Target
Arsenic	1.0	2	2	0	Meets Target
Barium	1.0	69	75	8.3	Meets Target
Beryllium	0.5	nd	nd	-	Meets Target
Boron	5.0	12.5	12.6	0.8	Meets Target
Cadmium	0.5	nd	nd	-	Meets Target
Chromium	5.0	46	51	10.3	Meets Target
Chromium (VI)	0.2	nd	nd	-	Meets Target
Cobalt	1.0	4	4	0	Meets Target
Copper	5.0	9	9	0	Meets Target
Lead	1.0	7	8	13.3	Meets Target
Mercury	0.1	nd	nd	-	Meets Target
Molybdenum	1.0	1	1	0	Meets Target
Nickel	5.0	10	10	0	Meets Target
Selenium	1.0	nd	nd	-	Meets Target
Silver	0.3	nd	nd	-	Meets Target
Thallium	1.0	nd	nd	-	Meets Target
Tin	5.0	nd	nd	-	Meets Target
Uranium	1.0	nd	nd	-	Meets Target
Vanadium	10.0	19	19	0	Meets Target
Zinc	20.0	nd	nd	-	Meets Target
1-Methylnaphthalene	0.02	nd	nd	-	Meets Target
2-Methylnaphthalene	0.02	nd	nd	-	Meets Target
Methylnaphthalene (1&2)	0.04	nd	nd	-	Meets Target
Acenaphthene	0.02	nd	nd	-	Meets Target
Acenaphthylene	0.02	nd	nd	-	Meets Target
Anthracene	0.02	nd	nd	-	Meets Target
Benzo[a]anthracene	0.02	0.05	0.03	50	Does Not Meet Target
Benzo[a]pyrene	0.02	0.05	0.04	22.2	Does Not Meet Target
Benzo[b]fluoranthene	0.02	0.04	0.03	28.6	Does Not Meet Target
Benzo[g,h,i]perylene	0.02	0.06	0.04	40	Does Not Meet Target
Benzo[k]fluoranthene	0.02	0.04	0.02	66.7	Does Not Meet Target
1,1-Biphenyl	0.02	nd	nd	-	Meets Target
Chrysene	0.02	0.07	0.05	33.3	Does Not Meet Target
Dibenzo[a,h]anthracene	0.02	nd	nd	-	Meets Target
Fluoranthene	0.02	0.09	0.07	25	Does Not Meet Target
Fluorene	0.02	nd	nd	-	Meets Target
Indeno [1,2,3-cd] pyrene	0.02	nd	nd	-	Meets Target
Naphthalene	0.01	nd	nd	-	Meets Target
Phenanthrene	0.02	0.06	0.04	40	Does Not Meet Target
Pyrene	0.02	0.09	0.07	25	Does Not Meet Target
Quinoline	0.10	nd	nd	-	Meets Target
SAR	0.01 Units	0.11	2.66	184.1	Does Not Meet Target
EC	5 µS/cm	1,390	699	66.2	Does Not Meet Target

Notes:

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

The RPD calculated for the majority of the parameters fell within of the acceptable range of 20%, with some minor exceptions. These discrepancies are likely attributed to the variability between the low concentrations of certain parameters detected in the samples, as well as the non-homogeneous nature of the fill material from where both samples were sourced. Given that there is a similarity in the list of parameters detected in both the original and duplicate samples, the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report, are considered to have been met.

Similarly, a duplicate groundwater sample was obtained from sample BH17-24-GW1 and submitted for laboratory analysis of VOC, PHC, metals, and PAH parameters. The relative percent difference (RPD) calculations for the original and duplicate samples are provided below in Table 19.

Table 19
QA/QC Calculations – Groundwater

Parameter	MDL (µg/L)	BH17-24-GW1	GW DUP-1	RPD (%)	QA/QC Result (Target: <20% RPD)
Acetone	5.0	nd	nd	-	Meets Target
Benzene	0.5	nd	nd	-	Meets Target
Bromodichloromethane	0.5	nd	nd	-	Meets Target
Bromoform	0.5	nd	nd	-	Meets Target
Bromomethane	0.5	nd	nd	-	Meets Target
Carbon Tetrachloride	0.2	nd	nd	-	Meets Target
Chlorobenzene	0.5	nd	nd	-	Meets Target
Chloroethane	1.0	nd	nd	-	Meets Target
Chloroform	0.5	nd	nd	-	Meets Target
Chloromethane	3.0	nd	nd	-	Meets Target
Dibromochloromethane	0.5	nd	nd	-	Meets Target
Dichlorodifluoromethane	1.0	nd	nd	-	Meets Target
Ethylene dibromide	0.2	nd	nd	-	Meets Target
1,2-Dichlorobenzene	0.5	nd	nd	-	Meets Target
1,3-Dichlorobenzene	0.5	nd	nd	-	Meets Target
1,4-Dichlorobenzene	0.5	nd	nd	-	Meets Target
1,1-Dichloroethane	0.5	nd	nd	-	Meets Target
1,2-Dichloroethane	0.5	nd	nd	-	Meets Target
1,1-Dichloroethylene	0.5	nd	nd	-	Meets Target
cis-1,2-Dichloroethylene	0.5	nd	nd	-	Meets Target
trans-1,2-Dichloroethylene	0.5	nd	nd	-	Meets Target
1,2-Dichloroethylene, total	0.5	nd	nd	-	Meets Target
1,2-Dichloropropane	0.5	nd	nd	-	Meets Target
cis-1,3-Dichloropropylene	0.5	nd	nd	-	Meets Target
trans-1,3-Dichloropropylene	0.5	nd	nd	-	Meets Target
1,3-Dichloropropene, total	0.5	nd	nd	-	Meets Target
Ethylbenzene	0.5	nd	nd	-	Meets Target
Hexane	1.0	nd	nd	-	Meets Target
Methyl Ethyl Ketone	5.0	nd	nd	-	Meets Target
Methyl Butyl Ketone	10.0	nd	nd	-	Meets Target
Methyl Isobutyl Ketone	5.0	nd	nd	-	Meets Target
Methyl tert-butyl ether	2.0	nd	nd	-	Meets Target
Methylene Chloride	5.0	nd	nd	-	Meets Target
Styrene	0.5	nd	nd	-	Meets Target
1,1,1,2-Tetrachloroethane	0.5	nd	nd	-	Meets Target
1,1,2,2-Tetrachloroethane	0.5	nd	nd	-	Meets Target
Tetrachloroethylene	0.5	nd	nd	-	Meets Target
Toluene	0.5	nd	nd	-	Meets Target
1,1,1-Trichloroethane	0.5	nd	nd	-	Meets Target
1,1,2-Trichloroethane	0.5	nd	nd	-	Meets Target

Table 19
QA/QC Calculations – Groundwater

Parameter	MDL (µg/L)	BH17-24-GW1	GW DUP-1	RPD (%)	QA/QC Result (Target: <20% RPD)
Trichloroethylene	0.5	nd	nd	-	Meets Target
Trichlorofluoromethane	1.0	nd	nd	-	Meets Target
1,3,5-Trimethylbenzene	0.5	nd	nd	-	Meets Target
Vinyl Chloride	0.5	nd	nd	-	Meets Target
Xylenes	0.5	nd	nd	-	Meets Target
PHCs F_1	0.025	nd	nd	-	Meets Target
PHCs F_2	0.1	nd	nd	-	Meets Target
PHCs F_3	0.1	nd	nd	-	Meets Target
PHCs F_4	0.1	nd	nd	-	Meets Target
Aluminum	1	4	5	22.2	Does Not Meet Target
Antimony	0.5	nd	nd	-	Meets Target
Arsenic	1	nd	nd	-	Meets Target
Barium	1	102	100	2.0	Meets Target
Beryllium	0.5	nd	nd	-	Meets Target
Boron	10	82	83	1.2	Meets Target
Calcium	100	223,000	238,000	6.5	Meets Target
Chromium	1	nd	nd	-	Meets Target
Chromium (VI)	1	nd	nd	-	Meets Target
Cobalt	0.5	nd	nd	-	Meets Target
Copper	0.5	1.8	2.0	10.5	Meets Target
Iron	100	nd	nd	-	Meets Target
Lead	0.1	nd	nd	-	Meets Target
Magnesium	200	32,700	33,900	3.6	Meets Target
Manganese	5	12	12	0	Meets Target
Molybdenum	0.5	11.7	11.7	0	Meets Target
Nickel	1	3	3	0	Meets Target
Selenium	1	nd	nd	-	Meets Target
Silver	0.1	nd	nd	-	Meets Target
Thallium	0.1	0.2	0.2	0	Meets Target
Titanium	5	nd	nd	-	Meets Target
Uranium	0.1	2.9	2.9	0	Meets Target
Vanadium	0.5	nd	nd	-	Meets Target
Zinc	5	nd	nd	-	Meets Target
1-Methylnaphthalene	0.05	nd	nd	-	Meets Target
2-Methylnaphthalene	0.05	nd	nd	-	Meets Target
Methylnaphthalene (1&2)	0.10	nd	nd	-	Meets Target
Acenaphthene	0.05	nd	nd	-	Meets Target
Acridine	0.05	nd	nd	-	Meets Target
Acenaphthylene	0.05	nd	nd	-	Meets Target
Anthracene	0.01	nd	nd	-	Meets Target
Benzo[a]anthracene	0.01	nd	nd	-	Meets Target
Benzo[a]pyrene	0.01	nd	nd	-	Meets Target
Benzo (b&j) fluoranthene	0.10	nd	nd	-	Meets Target
Benzo[g,h,i]perylene	0.05	nd	nd	-	Meets Target
Benzo[k]fluoranthene	0.05	nd	nd	-	Meets Target
Chrysene	0.05	nd	nd	-	Meets Target
Dibenzo[a,h]anthracene	0.05	nd	nd	-	Meets Target
Fluoranthene	0.01	nd	nd	-	Meets Target
Fluorene	0.05	nd	nd	-	Meets Target
Indeno [1,2,3-cd] pyrene	0.05	nd	nd	-	Meets Target
Naphthalene	0.05	nd	nd	-	Meets Target
Phenanthrene	0.05	nd	nd	-	Meets Target
Pyrene	0.01	nd	nd	-	Meets Target
Quinoline	0.10	nd	nd	-	Meets Target

Notes:

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

The RPD calculated for all but one of the parameters fell within of the acceptable range of 20%, and as such, the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report, are considered to have been met.

A trip blank sample was also acquired from the laboratory and transported to and from the Phase II Property along side the obtained groundwater samples. The trip blank was then submitted for analytical testing of VOC parameters to verify that the that the integrity of the shipping and handling procedures undertaken during this assessment had not been compromised and that no cross-contamination from outside sources have had the potential to influence the obtained groundwater samples. Based on the analytical test results, no VOC parameters were detected within the trip blank sample, and as such, the results are considered to meet the data quality objectives outlined in the Sampling and Analysis Plan, appended to this report.

Based on the results of the QA/QC analysis, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O. Reg. 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 described in Section 7.1 of the Phase I ESA report, as well as Section 2.2 of this report, the following PCAs, as defined by Table 2 of O. Reg. 153/04, are considered to result in APECs on the Phase II Property:

Table 20
Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of APEC on Phase I Property	Potentially Contaminating Activity (Table 2 – O. Reg. 153/04)	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC #1 Fill Material of Unknown Quality	Entirety of Phase II Property	*"Item 30: Importation of Fill Material of Unknown Quality"*	On-Site	BTEX VOCs PHCs PAHs Metals	Soil/ Groundwater
APEC #2 Application of Road Salt During Snow/Ice Conditions	Entirety of Phase II Property	*"No Item Number: Application of Road Salt During Snow and Ice Conditions"*	On-Site	EC SAR	Soil

Contaminants of Potential Concern (CPCs)

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

- ❒ Volatile Organic Compounds (VOCs);
- ❒ Benzene, Ethylbenzene, Toluene, and Xylenes (BTEX);
- ❒ Petroleum Hydrocarbons, fractions 1 – 4 (PHCs F_1-F_4);
- ❒ Polycyclic Aromatic Hydrocarbons (PAHs);
- ❒ Metals (including Arsenic [As], Antimony [Sb], and Selenium [Se])
- ❒ Mercury;
- ❒ Hexavalent Chromium;
- ❒ Electrical Conductivity (EC);
- ❒ Sodium Adsorption Ratio (SAR).

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

Subsurface Structures and Utilities

Underground service locates were completed prior to the subsurface investigation, which identified buried electrical lines, telecommunication cables, natural gas lines, sewer and water mains, as well as a network of steam pipes connecting to each building across the campus.

Physical Setting

Site Stratigraphy

The stratigraphy of the Phase II Property generally consists of:

- Pavement structure (asphaltic concrete over brown silty sand with crushed stone and gravel); encountered at ground level and extending to a maximum depth of approximately 1.65 m below ground surface.
- Fill material (brown silty clay with sand, trace gravel, and crushed stone); extending to depths ranging from approximately 1.04 m to 4.88 m below ground surface.
- Glacial till (brown silty sand with gravel, cobbles, and boulders), extending to depths ranging from approximately 1.04 m to 3.51 m below ground surface (BH9-24 and BH11-24, respectively).
- Good to excellent quality limestone bedrock, extending to a depth of at least 11.86 m below ground surface (bottom of deepest borehole).

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 beneath the Phase II Property was encountered within the bedrock unit at depths ranging from approximately 2.06 m to 5.70 m below the existing ground surface. Based on the measured groundwater levels, the groundwater was calculated to flow in a northeasterly direction.

Approximate Depth to Bedrock

Bedrock, consisting of good to excellent quality limestone, was encountered in boreholes BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24 at depths ranging from approximately 1.09 m to 4.88 m below ground surface. Practical refusal to augering on inferred bedrock was measured in the remaining boreholes at depths ranging from approximately 0.66 m to 3.51 m below ground surface.

Approximate Depth to Water Table

The depth to the water table is approximately 2.06 m to 5.70 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 there are no bodies of water or areas of natural significance located on or within 30 m of the Phase II Property. The Phase II Property is therefore not considered to be environmentally sensitive.

Section 43.1 of the Regulation is considered to apply to the Phase II Property, since the bedrock is situated at depths less than 2 m below ground surface, and thus is considered to be a shallow soil property.

Existing Buildings and Structures

The Phase II Property is currently vacant of any buildings or structures and consists of asphalt-covered roadways for private vehicles.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical test results obtained during this assessment, the shallow layer of soil/fill material situated underneath the pavement structure at boreholes BH4-24, BH6-24, BH13-24, and BH17-24 contains concentrations of heavier fractions of petroleum hydrocarbons (PHC $F_{4\ gravimetric}$) above the selected MECP Table 7 Coarse-Grained Community Soil Standards. Similarly, the same layer of soil/fill material present at BH5-24 contains an elevated concentration of barium above the selected site standards.

Elevated levels of electrical conductivity (EC) and/or sodium adsorption ratio (SAR) were also detected in the shallow soil samples recovered from BH3-24, BH6-24, and BH9-24, though these exceedances are suspected to be the result of the use of road salt during snow and ice conditions and thus, as per Section 49.1 of O. Reg 153/04, do not represent a contaminant issue to the Phase II Property.

It should be noted that some polycyclic aromatic hydrocarbon (PAH) parameter concentrations were identified above the CCME SQG Commercial Standards in the shallow soil/fill material at boreholes BH3-24, BH6-24, BH7-24, BH9-24, BH10-24, BH17-24, and BH18-24. These concentrations, however, do comply with the selected MECP Table 7 Coarse-Grained Community Soil Standards and thus are not considered to represent a contaminant issue to the Phase II Property.

Based on the analytical test results, all groundwater samples recovered from the Phase II Property were found to comply with the selected MECP Table 7 Non-Potable Groundwater Standards, with the exception of the chloroform concentration identified BH1-24. This chloroform exceedance is suspected to be the result of municipal water used during the bedrock coring process, and not as a result of a contaminant issue. The chloroform is expected to dissipate over time through natural attenuation processes. As such, the groundwater beneath the Phase II Property is not considered to be contaminated.

It should be noted that some metal parameter concentrations were identified above the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites in the groundwater at boreholes BH1-24, BH6-24, BH16-24, and BH18-24. These parameters may potentially be naturally elevated, or may potentially be the result of interference from suspended sediment in the groundwater sample recovered. As such, these elevated parameters are not considered to pose an environmental risk to the current use of the property.

Types of Contaminants

Based on the analytical test results, the following contaminants were detected on the Phase II Property at concentrations exceeding the selected MECP Table 7 Coarse-Grained Community Soil Standards:

Petroleum Hydrocarbons (PHCs)

- ❑ Fraction 4; Gravimetric (PHC $F_{4\ gravimetric}$)

Metals

- ❑ Barium

Inorganic Parameters

- ❑ Electrical Conductivity (EC)*
- ❑ Sodium Adsorption Ratio (SAR)*

These contaminants were identified solely within the shallow layer of soil/fill material found underneath the pavement structure in select locations across the Phase II Property.

(*) It should be noted that the elevated levels of EC and SAR detected across the site are considered to be a result of the use of a road salt for de-icing purposes during snow and ice conditions, and as such, are deemed to meet the selected site standards in accordance with Section 49.1 of O. Reg. 153/04.

Contaminated Media

Soil

Based on the findings of this assessment, the shallow layer of soil/fill material situated underneath the pavement structure in the vicinity of boreholes BH4-24, BH5-24, BH6-24, BH13-24, and BH17-24 is considered to be contaminated above the selected MECP Table 7 Coarse-Grained Community Soil Standards.

Groundwater

Based on the analytical test results, the groundwater beneath the Phase II Property is not considered to be contaminated.

What Is Known About Areas Where Contaminants Are Present

Based on what is known about the history of the Phase II Property, the areas where contaminants are present have been utilized solely as public roadways since at least the 1950's.

Given the shallow nature of the PHC $F_{4\ gravimetric}$ contaminants, as well as the general compliance of the standard PHC F_4 concentrations, the soil samples obtained from directly beneath the road surface have likely been influenced by the presence of asphalt fragments situated within the sample matrix. Another potential source of the contamination may have been the result of the importation of poor quality fill material onto the site for road grading purposes.

The elevated levels of EC and SAR, though not considered to pose a contaminant issue to the Phase II Property, are considered to be a result of the use of a road salt for de-icing purposes during snow and ice conditions, and as such, is deemed to meet the selected site standards in accordance with Section 49.1 of O. Reg. 153/04.

Distribution and Migration of Contaminants

The contaminants identified on the Phase II Property are considered to be limited to the shallow layer of fill material, within a narrow vicinity around boreholes BH4-24, BH5-24, BH6-24, BH13-24, and BH17-24.

Based on the low mobility of heavy petroleum hydrocarbons and metals, as well as the non-impacted groundwater results obtained across the Phase II Property, these contaminants are not suspected to have migrated downwards into the water table.

Discharge of Contaminants

The identification of PHC $F_{4\ gravimetric}$ concentrations in the shallow fill material at boreholes BH4-24, BH6-24, BH13-24, and BH17-24 are suspected to be the result of influence from asphalt fragments included in the sample matrix obtained directly beneath the road surface.

The identification of a barium concentration in the shallow fill material at borehole BH5-24 is suspected to have been the result of the importation of poor quality fill material imported onto the site for road grading purposes.

Climatic and Meteorological Conditions

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

Based on the low mobility nature of the soil contaminants identified, as well as the non-impacted groundwater results obtained across the Phase II Property, no downward migration of contaminants is suspected to have occurred.

Potential for Vapour Intrusion

Given that the Phase II Property is currently undeveloped with any buildings or structures, and is used solely as a roadway for vehicles, there is currently no risk of vapour intrusion occurring on the site.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the the network of road right-of-ways of the Tunney's Pasture complex, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address the potentially contaminating activities (PCAs) that were identified during the Phase I ESA and were considered to result in areas of potential environmental concern (APECs) on the Phase II Property.

The subsurface investigation for this assessment was conducted between April 2 and April 4, 2024, and consisted of drilling 18 boreholes (BH1-24 to BH18-24) throughout the Phase II Property, in conjunction with a geotechnical investigation. A select number of boreholes (BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24) were advanced to depths ranging from approximately 5.66 m to 11.86 m below the existing ground surface and terminated within the underlying bedrock unit. Upon completion, these boreholes were instrumented with groundwater monitoring wells in order to access the water table. The remaining boreholes were advanced to depths ranging from approximately 0.66 m to 3.51 m below the existing ground surface and terminated within the overburden on practical refusal to augering on the inferred bedrock surface.

In general, the subsurface soil profile encountered at the borehole locations consists of a shallow overburden comprised of a surficial pavement structure (asphaltic concrete over top of granular sub-grade fill), underlain by another layer of fill material (brown silty clay with sand, gravel, and crushed stone). Native glacial till was encountered beneath the fill layers in boreholes BH9-24 and BH11-24. Bedrock, consisting of good to excellent quality limestone, was encountered in boreholes BH1-24, BH4-24, BH6-24, BH9-24, BH10-24, BH16-24, BH17-24, and BH18-24 at depths ranging from approximately 1.09 m to 4.88 m below ground surface. Practical refusal to augering on inferred bedrock was measured in the remaining boreholes at depths ranging from approximately 0.66 m to 3.51 m below ground surface. During the field sampling program, the groundwater was measured at depths ranging from approximately 2.06 m to 5.70 m below the existing ground surface.

As part of this assessment, 21 soil samples were submitted for laboratory analysis of BTEX, PHCs (F_1-F_4), metals, mercury, hexavalent chromium, PAHs, EC, SAR, and/or pH parameters. With some exceptions, the majority of the soil parameters analyzed were found to comply with the selected MECP Table 7 Coarse-Grained Community Soil Standards and the CCME SQG Commercial Standards.

Based on the analytical test results, the shallow layer of soil/fill material situated underneath the pavement structure at boreholes BH4-24, BH6-24, BH13-24, and BH17-24 contains concentrations of heavier fractions of petroleum hydrocarbons (PHC $F_{4\ gravimetric}$) above the selected standards. Similarly, the same layer of soil/fill material present at BH5-24 contains an elevated concentration of barium above the selected standards. The identification of the PHC $F_{4\ gravimetric}$ concentrations are suspected to be the result of influence from asphalt fragments included in the sample matrix obtained directly beneath the road surface, while the identification of the elevated barium concentration is suspected to have been the result of the importation of poor quality fill material imported onto the site for road grading purposes.

Some elevated levels of EC and SAR were also identified within the shallow soil/fill material layer in select locations, however, these exceedances are considered to be a result of the use of a road salt for de-icing purposes during snow and ice conditions, and as such, are deemed to meet the selected site standards in accordance with Section 49.1 of O. Reg. 153/04.

It should be noted that some polycyclic aromatic hydrocarbon (PAH) parameter concentrations were identified above the CCME SQG Commercial Standards in the shallow soil/fill material at boreholes BH3-24, BH6-24, BH7-24, BH9-24, BH10-24, BH17-24, and BH18-24. These concentrations, however, do comply with the selected MECP Table 7 Coarse-Grained Community Soil Standards and thus are not considered to represent a contaminant issue to the Phase II Property.

As part of this assessment, six groundwater samples were submitted for laboratory analysis of PHCs (F_1-F_4), VOCs, metals, mercury, hexavalent chromium, and PAH parameters. Based on the analytical test results, all groundwater samples recovered from the Phase II Property were found to comply with the selected MECP Table 7 Non-Potable Groundwater Standards, with the exception of the chloroform concentration identified BH1-24. This chloroform exceedance is suspected to be the result of municipal water used during the bedrock coring process, and not as a result of a contaminant issue. The chloroform is expected to dissipate over time through natural attenuation processes, and as such, the groundwater beneath the Phase II Property is not considered to be contaminated.

It should be noted that some metal parameter concentrations were identified above the CCME Tier 1 Federal Interim Groundwater Water Quality Guidelines for Commercial Sites in the groundwater at boreholes BH1-24, BH6-24, BH16-24, and BH18-24. These parameters may potentially be naturally elevated, or may potentially be the result of interference from suspended sediment in the groundwater sample recovered.

As such, these elevated parameters are not considered to pose an environmental risk to the current use of the property.

Recommendations

Soil

Based on the findings of this assessment, the shallow layer of soil/fill material found underneath the pavement structure within the vicinity of BH4-24, BH5-24, BH6-24, BH13-24, and BH17-24 is deemed to be contaminated, requiring remedial action. Given the low-mobility of these contaminants, and the non-impacted groundwater results, it is anticipated that the contamination is confined to the fill material layer above the bedrock.

Given our understanding that the Phase II Property is to be redeveloped in the near future, it is our recommendation that the contaminated soil be remediated in conjunction with site excavation activities. At such a time, the contaminated soil will be excavated from the site and transported to a licensed waste disposal facility. It is recommended that remediation be completed under the supervision of a Qualified Person to direct the excavation and segregation of impacted soil, as well as to conduct confirmatory sampling as required.

Prior to the 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 O. Reg. 347/90 and O. Reg. 558/00.

Excess soil must be handed in accordance with O. Reg. 406/19: On-Site and Excess Soil Management. Additional excess soil testing and reporting requirements may be required prior to future site excavation activities, in accordance with O. Reg. 406/19.

Monitoring Wells

If the groundwater monitoring wells installed on-site are not going to be used in the future, or will be destroyed during future construction activities, then they must be decommissioned in accordance with O. Reg. 903/90 (Ontario Water Resources Act). Further information can be provided upon request in this regard.

It is our recommendation that the monitoring wells currently be maintained for future sampling purposes, until such a time when future site excavation activities have commenced. The monitoring wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

This Phase II – Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and 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 Arcadis IBI Group and the Government of Canada. 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.

Nick Sullivan, B.Sc.

Adrian Menyhart, P.Eng., QP$_{ESA}$

Report Distribution:

- Arcadis IBI Group
- Paterson Group Inc.

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE5791-1 – SITE PLAN

DRAWING PE5791-2 – SURROUNDING LAND USE PLAN

PE5791-3 – TEST HOLE LOCATION PLAN

PE5791-4 – ANALYTICAL TESTING PLAN – SOIL (PHCS)

PE5791-4A – CROSS SECTION A-A' – SOIL (PHCS)

PE5791-4B – CROSS SECTION B-B' – SOIL (PHCS)

PE5791-5 – ANALYTICAL TESTING PLAN – SOIL (METALS)

PE5791-5A – CROSS SECTION A-A' – SOIL (METALS)

PE5791-5B – CROSS SECTION B-B' – SOIL (METALS)

PE5791-6 – ANALYTICAL TESTING PLAN – SOIL (BTEX, PAHS, EC, SAR)

PE5791-6A – CROSS SECTION A-A' – SOIL (BTEX, PAHS, EC, SAR)

PE5791-6B – CROSS SECTION B-B' – SOIL (BTEX, PAHS, EC, SAR)

PE5791-7 – ANALYTICAL TESTING PLAN – GROUNDWATER

PE5791-7A – CROSS SECTION A-A' – GROUNDWATER

PE5791-7B – CROSS SECTION B-B' – GROUNDWATER

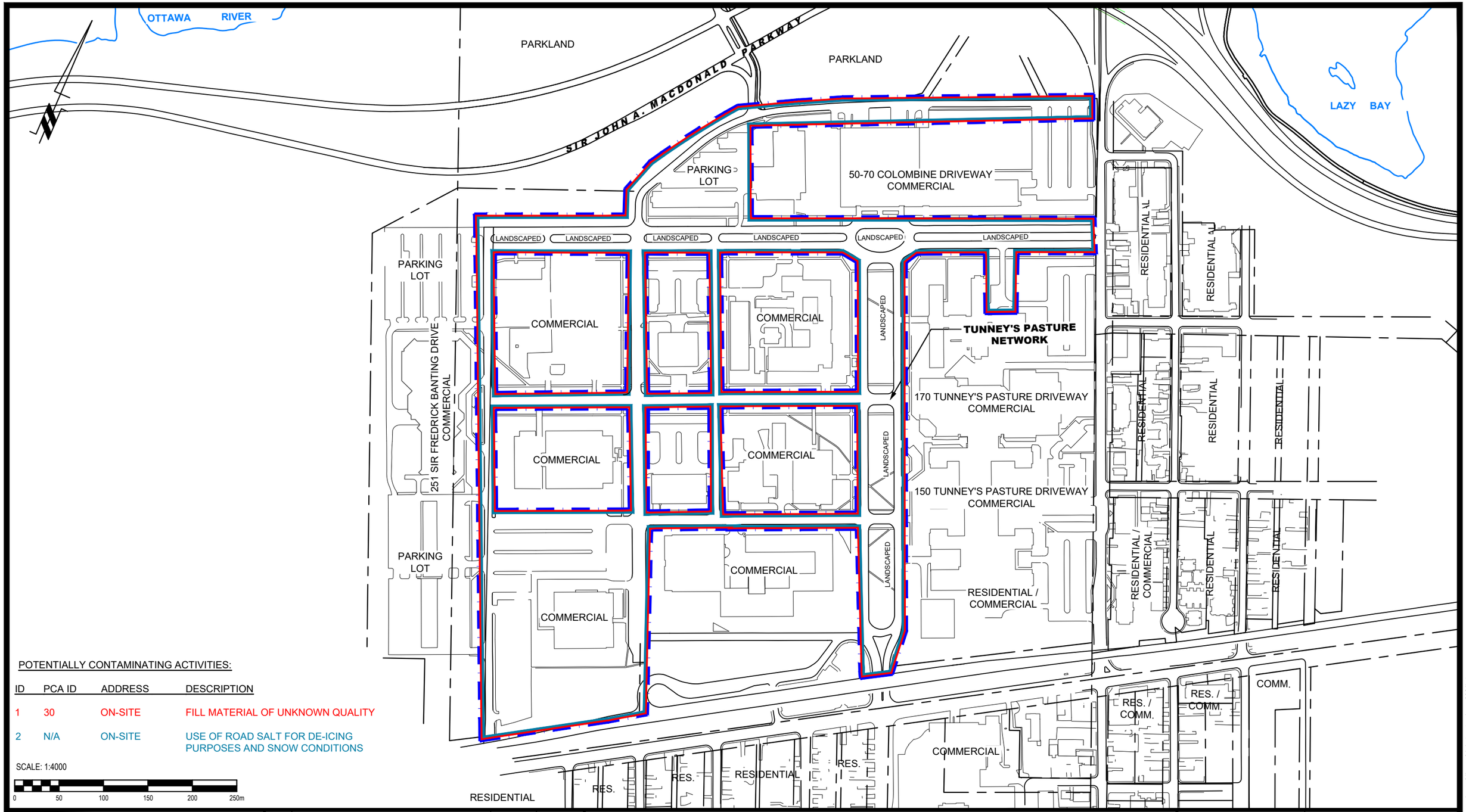
APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS



POTENTIALLY CONTAMINATING ACTIVITIES:

ID	PCA ID	ADDRESS	DESCRIPTION
1	30	ON-SITE	FILL MATERIAL OF UNKNOWN QUALITY
2	N/A	ON-SITE	USE OF ROAD SALT FOR DE-ICING PURPOSES AND SNOW CONDITIONS

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title:

SITE PLAN

Scale: 1:4000	Date: 05/2024
Drawn by: GK	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-1
Approved by: AM	Revision No.:

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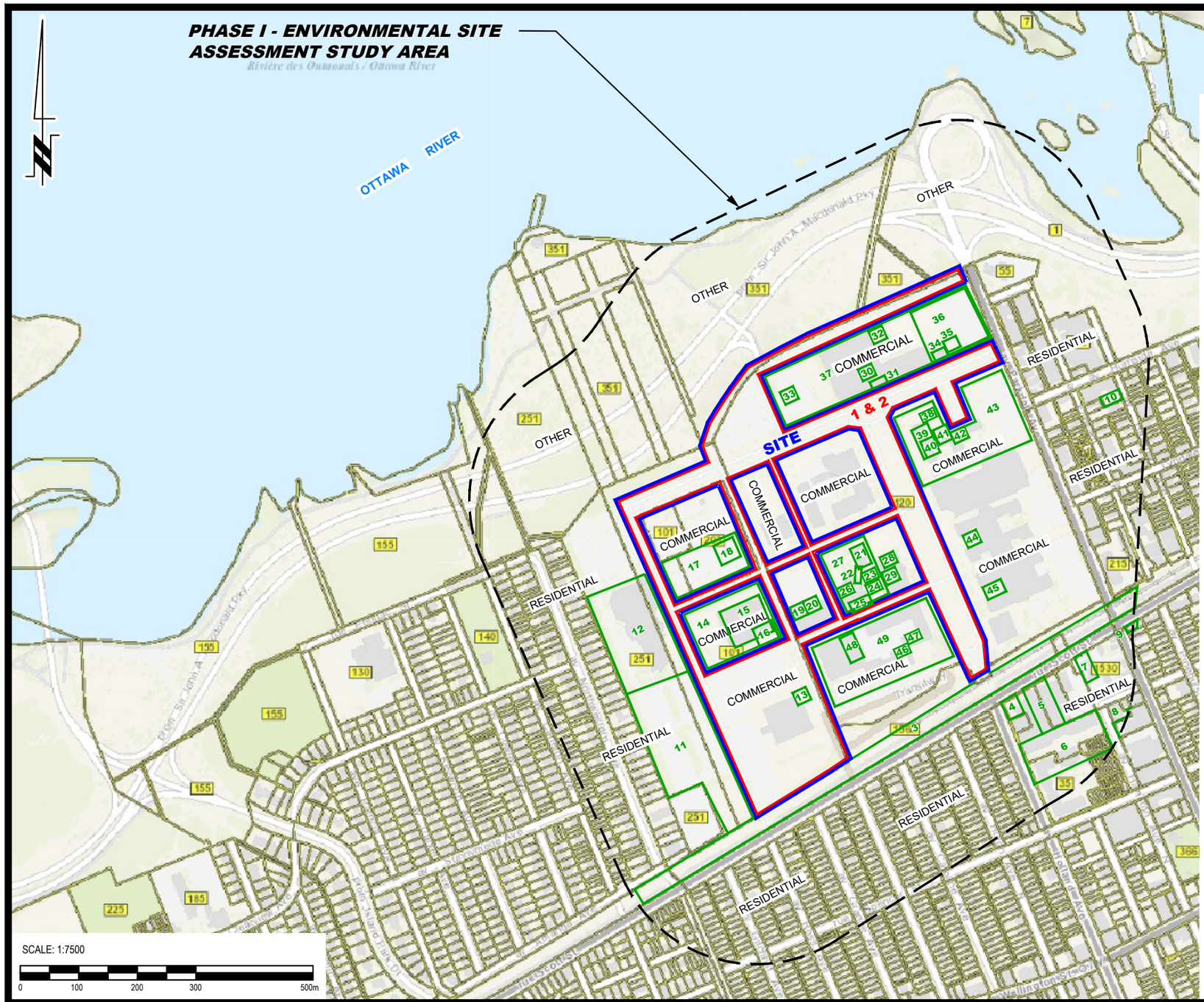

POTENTIALLY CONTAMINATING ACTIVITIES:

ID	PCA ID	ADDRESS	DESCRIPTION
1	30	ON-SITE	FILL MATERIAL OF UNKNOWN QUALITY
2	N/A	ON-SITE	USE OF ROAD SALT FOR DE-ICING PURPOSES AND SNOW CONDITIONS
3	46	NO MUNICIPAL ADDRESS	FORMER RAILWAY LINE
4	28	1560 SCOTT ST.	FORMER RETAIL FUEL OUTLET
5	N/A	1556 SCOTT ST.	FORMER CONTRACTOR'S STORAGE YARD
6	34	104 SPENCER ST.	FORMER FOUNDRY
7	52	1530 SCOTT ST.	FORMER AUTO SERVICE GARAGE
8	33	300 PARKDALE AVE.	FORMER MACHINE SHOP
9	52	255 PARKDALE AVE.	EXISTING AUTO SERVICE GARAGE
10	52	140 HINCHEY AVE.	EXISTING AUTO SERVICE GARAGE
11	30	TUNNEY'S PASTURE (BLOCK 1&2)	FILL MATERIAL OF UNKNOWN QUALITY
12	8	251 SIR FREDERICK BANTING DRIVEWAY	EXISTING CHEMICAL WASTE GENERATOR AND HAZARDOUS MATERIALS STORAGE
13	28	101 GOLDENROD DRIVEWAY	EXISTING AND FORMER UNDERGROUND FUEL STORAGE TANKS
14	30	TUNNEY'S PASTURE (BLOCK 5)	FILL MATERIAL OF UNKNOWN QUALITY
15	8	TUNNEY'S PASTURE (BLOCK 5)	FORMER GENERATION AND STORAGE OF HAZARDOUS WASTE MATERIALS
16	55	TUNNEY'S PASTURE (BLOCK 5)	EXISTING BASEMENT HYDRO VAULT
17	30	TUNNEY'S PASTURE (BLOCK 6)	FILL MATERIAL OF UNKNOWN QUALITY
18	28	TUNNEY'S PASTURE (BLOCK 6)	FORMER ABOVEGROUND FUEL STORAGE TANK
19	8	51 CHARDON DRIVEWAY	FORMER UNDERGROUND SOLVENT STORAGE TANK
20	52	51 CHARDON DRIVEWAY	FORMER MAINTENANCE GARAGE
21	28	TUNNEY'S PASTURE (BLOCK 8)	EXISTING FUEL STORAGE FACILITY
22	28	TUNNEY'S PASTURE (BLOCK 8)	EXISTING UNDERGROUND FUEL LINE
23	28	TUNNEY'S PASTURE (BLOCK 8)	FORMER UNDERGROUND BUNKER OIL STORAGE TANKS
24	28	TUNNEY'S PASTURE (BLOCK 8)	EXISTING ABOVEGROUND FUEL STORAGE TANK
25	28	TUNNEY'S PASTURE (BLOCK 8)	FORMER ABOVEGROUND OIL STORAGE TANKS
26	28	TUNNEY'S PASTURE (BLOCK 8)	FORMER ABOVEGROUND OIL STORAGE TANKS
27	30	TUNNEY'S PASTURE (BLOCK 8)	FILL MATERIAL OF UNKNOWN QUALITY
28	8	151 TUNNEY'S PASTURE DRIVEWAY	FORMER UNDERGROUND VARSOL STORAGE TANK
29	28	151 TUNNEY'S PASTURE DRIVEWAY	FORMER ABOVEGROUND DIESEL STORAGE TANK
30	55	TUNNEY'S PASTURE (BLOCK 10)	EXISTING HYDRO TRANSFORMERS
31	28	TUNNEY'S PASTURE (BLOCK 10)	EXISTING ABOVEGROUND FUEL STORAGE TANKS
32	28	TUNNEY'S PASTURE (BLOCK 10)	EXISTING ABOVEGROUND DIESEL STORAGE TANK
33	8	TUNNEY'S PASTURE (BLOCK 10)	FORMER UNDERGROUND HEATING OIL STORAGE TANK
34	28	TUNNEY'S PASTURE (BLOCK 10)	FORMER UNDERGROUND DIESEL STORAGE TANK
35	28	TUNNEY'S PASTURE (BLOCK 10)	FORMER UNDERGROUND FUEL STORAGE TANK
36	N/A	TUNNEY'S PASTURE (BLOCK 10)	EXISTING IMPACTED GROUNDWATER PLUME
37	30	TUNNEY'S PASTURE (BLOCK 10)	FILL MATERIAL OF UNKNOWN QUALITY
38	28	TUNNEY'S PASTURE (BLOCK 9)	FORMER ABOVEGROUND DIESEL FUEL TANK
39	55	TUNNEY'S PASTURE (BLOCK 9)	FORMER HYDRO TRANSFORMERS
40	28	TUNNEY'S PASTURE (BLOCK 9)	FORMER HYDRAULIC ELEVATOR
41	28	TUNNEY'S PASTURE (BLOCK 9)	FORMER ABOVEGROUND DIESEL FUEL TANKS
42	8	TUNNEY'S PASTURE (BLOCK 9)	FORMER CHEMICAL PRODUCT LOADING DOCK
43	30	TUNNEY'S PASTURE (BLOCK 9)	FILL MATERIAL OF UNKNOWN QUALITY
44	28	170 TUNNEY'S PASTURE DRIVEWAY	EXISTING ABOVEGROUND DIESEL STORAGE TANK
45	8	170 TUNNEY'S PASTURE DRIVEWAY	FORMER UNDERGROUND CHEMICAL WASTE STORAGE TANK
46	28	TUNNEY'S PASTURE (BLOCKS 3 & 4)	FORMER ABOVEGROUND HYDRAULIC OIL TANK
47	28	TUNNEY'S PASTURE (BLOCKS 3 & 4)	FORMER ABOVEGROUND HYDRAULIC OIL TANK
48	28	TUNNEY'S PASTURE (BLOCKS 3 & 4)	FORMER ABOVEGROUND FUEL TANKS
49	30	TUNNEY'S PASTURE (BLOCKS 3 & 4)	FILL MATERIAL OF UNKNOWN QUALITY

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title:

SURROUNDING LAND USE PLAN

Scale: 1:7500	Date: 05/2024
Drawn by: GK	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-2
Approved by: AM	Revision No.:

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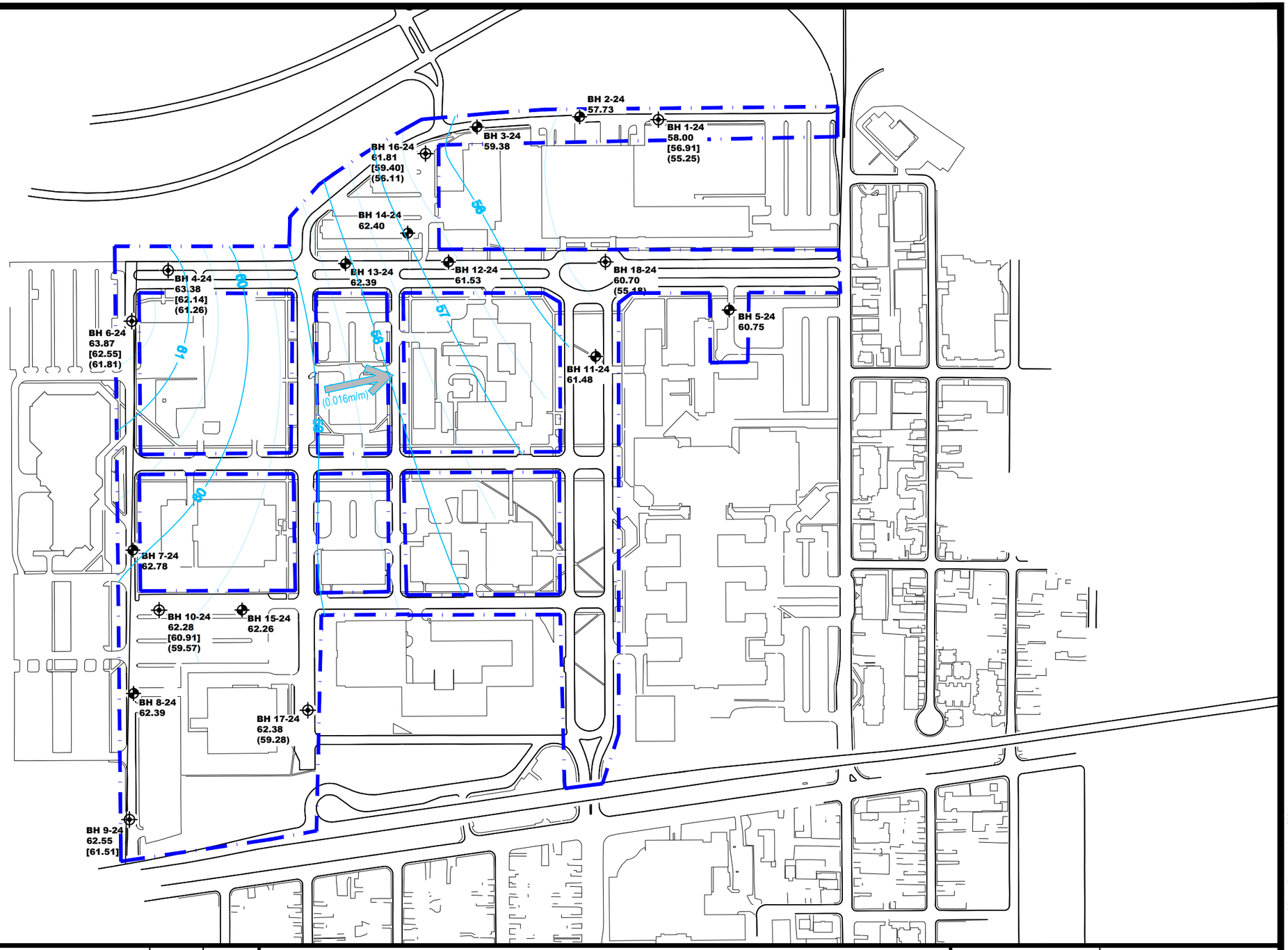

LEGEND:

- PHASE I & II PROPERTY BOUNDARY
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 62.28 GROUND SURFACE ELEVATION (m)
- [60.91] BEDROCK SURFACE ELEVATION (m)
- (56.11) GROUNDWATER SURFACE ELEVATION (m) (APRIL 17, 2024)
- 58 GROUNDWATER CONTOUR (m)
- (0.016m/m) APPROX.GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

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

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:4000	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-3
Approved by: AM	Revision No.:

11x17

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BH2-24-AU1 0.31-0.61m 02-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH3-24-SS2A 0.76-1.09m 02-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH16-24-AU2 0.20-0.31m 04-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH14-24-SS3 0.76-1.37m 04-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH1-24-AU1 0.31-0.61m 02-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH13-24-AU1 0.31-0.61m 04-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	5,230	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH4-24-AU1 0.31-0.61m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	5,290	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH5-24-SS4 1.52-2.13m 02-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH6-24-AU1 0.31-0.61m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	4,200	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH7-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH10-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH18-24-AU2 0.36-0.61m 04-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH12-24-SS2 0.76-1.04m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH11-24-SS2A 0.76-1.07m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH15-24-AU1 0.31-0.61m 04-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH17-24-AU1 0.20-0.31m 04-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	7,510	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH8-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH9-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH 2-24 57.73
BH 1-24 58.00 [56.91] (55.25)
BH 3-24 59.38
BH 16-24 61.81 [59.40] (56.11)
BH 14-24 62.40
BH 4-24 63.38 [62.14] (61.26)
BH 13-24 62.39
BH 12-24 61.53
BH 18-24 60.76 (55.48)
BH 5-24 60.75
BH 6-24 63.87 [62.55] (61.81)
BH 11-24 61.48
BH 7-24 62.78
BH 10-24 62.28 [60.91] (59.57)
BH 15-24 62.26
BH 8-24 62.39
BH 17-24 62.38 (59.28)
BH 9-24 62.55 [61.51]

A A' B B'

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

BOREHOLE LOCATION

BOREHOLE WITH MONITORING WELL LOCATION

62.28 GROUND SURFACE ELEVATION (m)

[60.91] BEDROCK SURFACE ELEVATION (m)

(56.11) GROUNDWATER SURFACE ELEVATION (m) (APRIL 17, 2024)

A—A' CROSS SECTION

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

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - SOIL (PHCs)**

Scale: 1:4000	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-4
Approved by: AM	Revision No.:

11x17

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BH4-24-AU1 0.31-0.61m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	5,290	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH6-24-AU1 0.31-0.61m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	4,200	3,300	3,300

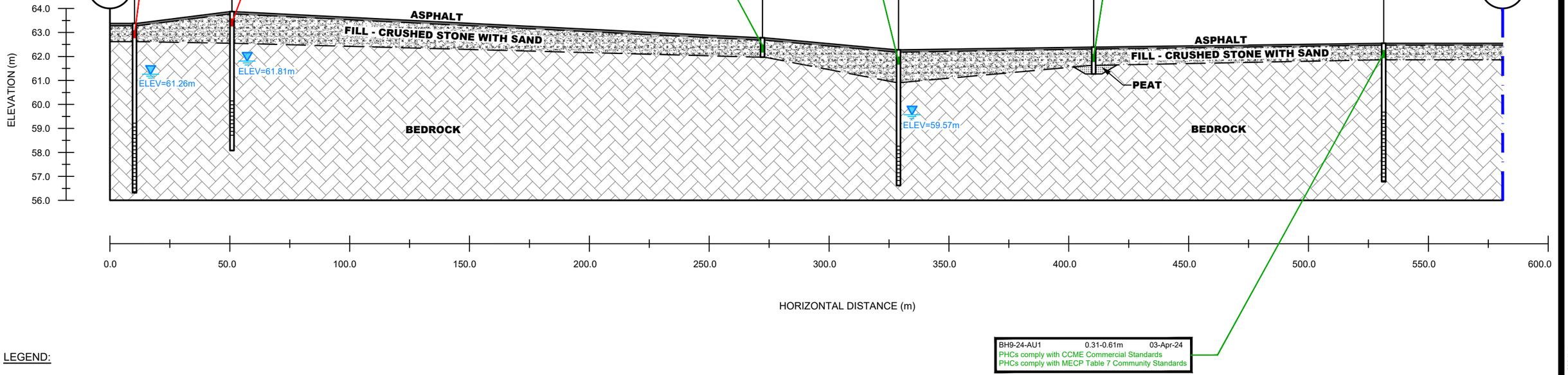
Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH7-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH10-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH8-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH9-24-AU1 0.31-0.61m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards



LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - SOIL (PHCs)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-4A
Approved by: AM	Revision No.:

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BH4-24-AU1	0.31-0.61m		02-Apr-24
Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	5,290	3,300	3,300

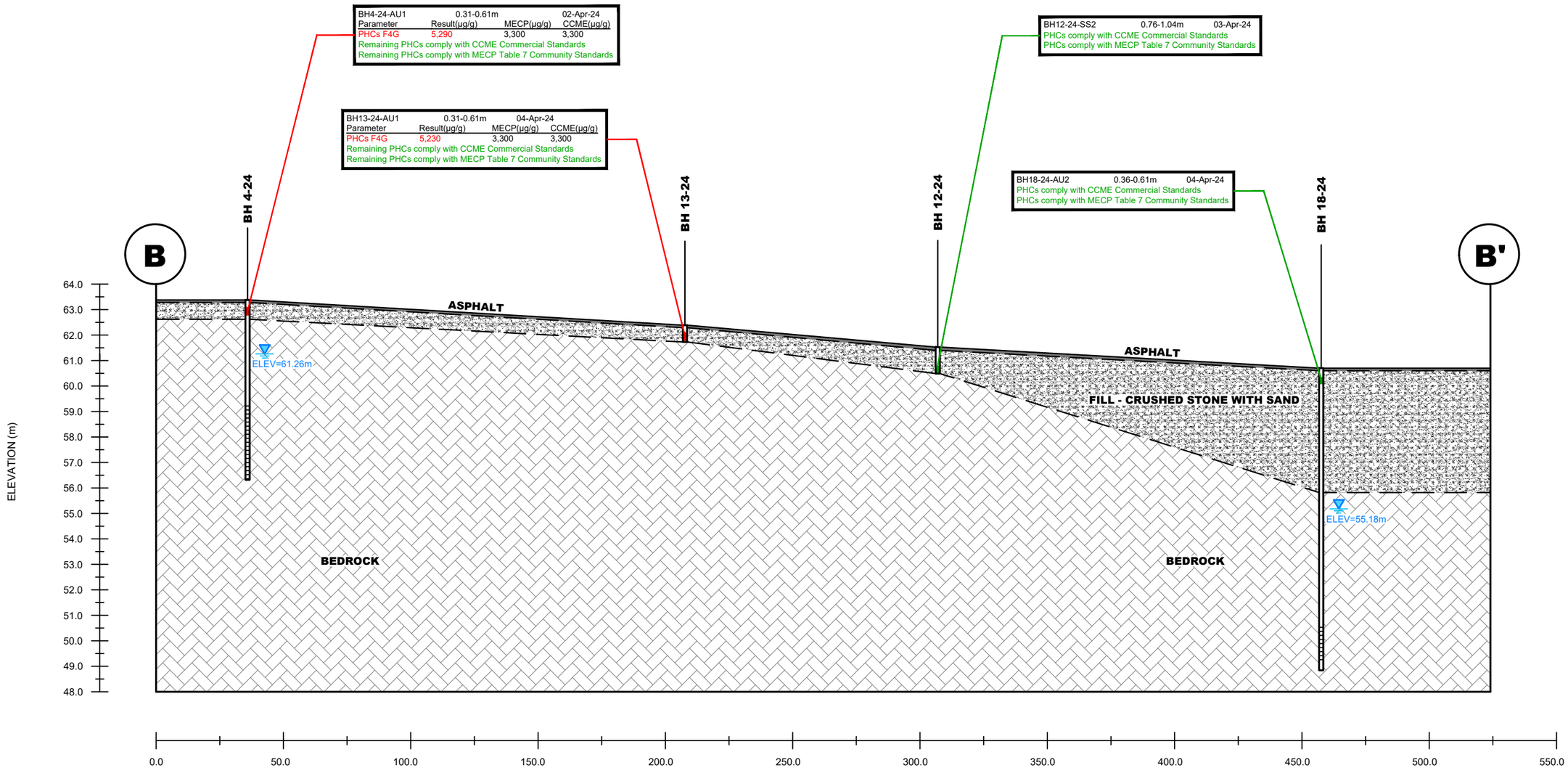
Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH13-24-AU1	0.31-0.61m	04-Apr-24	
Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
PHCs F4G	5,230	3,300	3,300

Remaining PHCs comply with CCME Commercial Standards
Remaining PHCs comply with MECP Table 7 Community Standards

BH12-24-SS2 0.76-1.04m 03-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards

BH18-24-AU2 0.36-0.61m 04-Apr-24
PHCs comply with CCME Commercial Standards
PHCs comply with MECP Table 7 Community Standards



LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

PATERSON GROUP
9 AURIGA DRIVE
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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION B-B' - SOIL (PHCs)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-4B
Approved by: AM	Revision No.:

11x17

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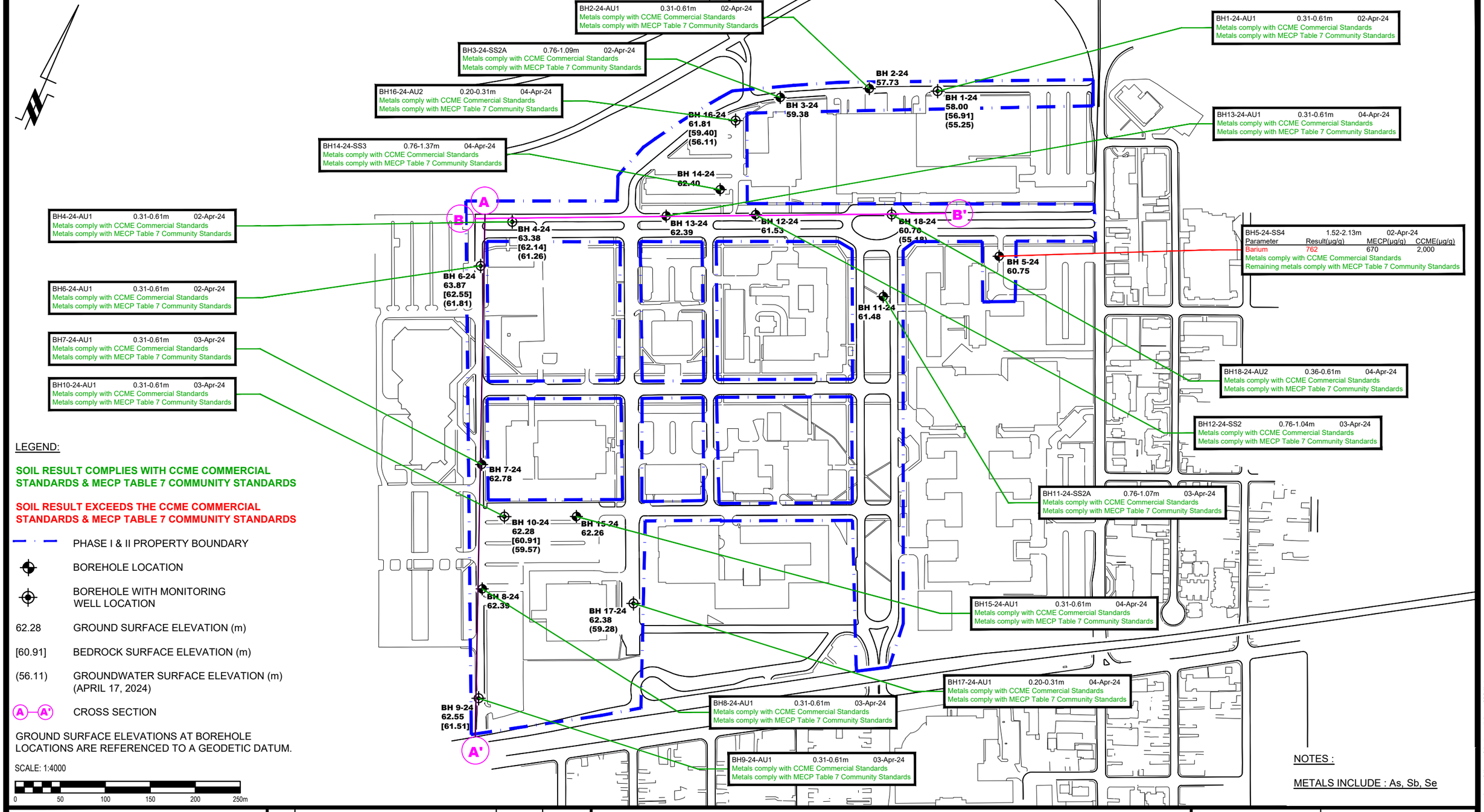

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

- PHASE I & II PROPERTY BOUNDARY
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 62.28 GROUND SURFACE ELEVATION (m)
- [60.91] BEDROCK SURFACE ELEVATION (m)
- (56.11) GROUNDWATER SURFACE ELEVATION (m) (APRIL 17, 2024)
- A—A' CROSS SECTION

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

SCALE: 1:4000

0 50 100 150 200 250m

NOTES :

METALS INCLUDE : As, Sb, Se

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - SOIL (METALS)**

Scale: 1:4000	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-5
Approved by: AM	Revision No.:

11x17

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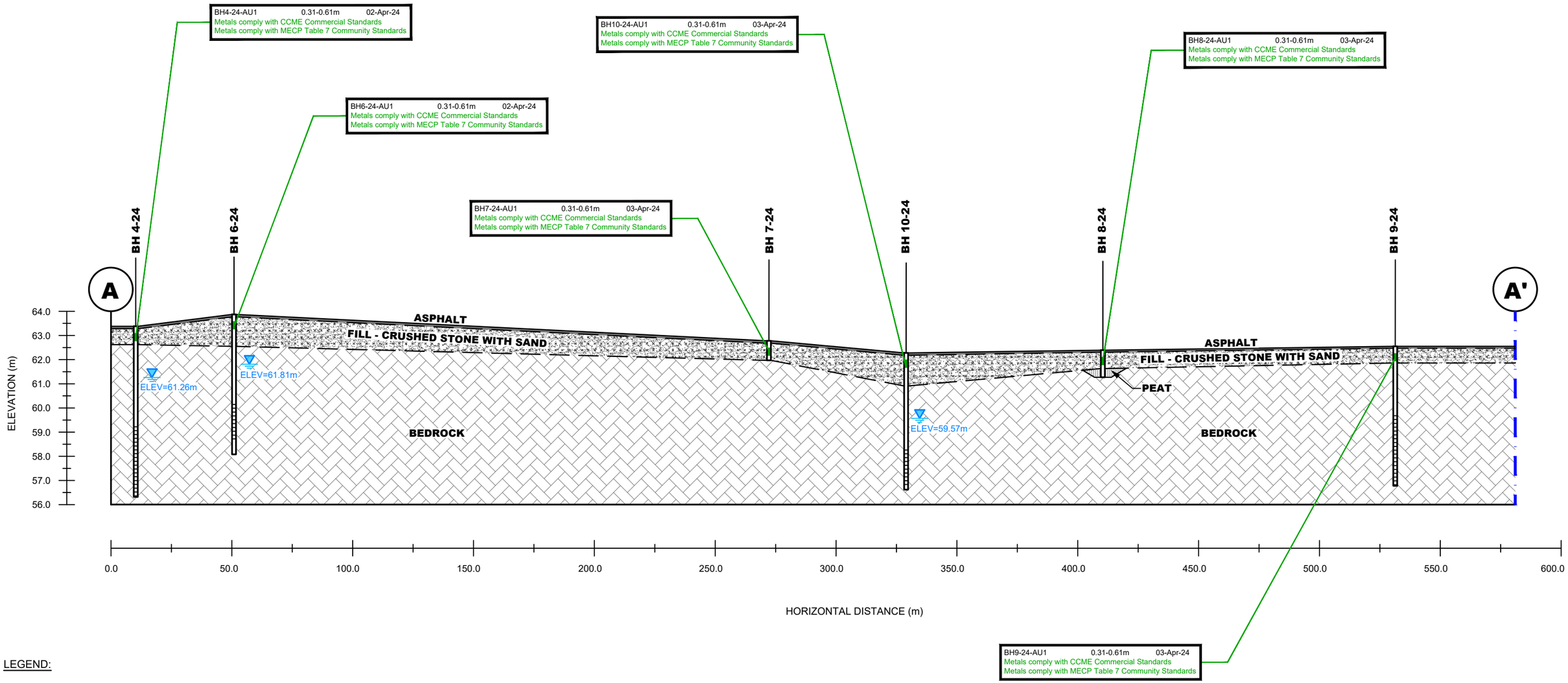

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

NOTES :

METALS INCLUDE : As, Sb, Se

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - SOIL (METALS)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-5A
Approved by: AM	Revision No.:

11x17

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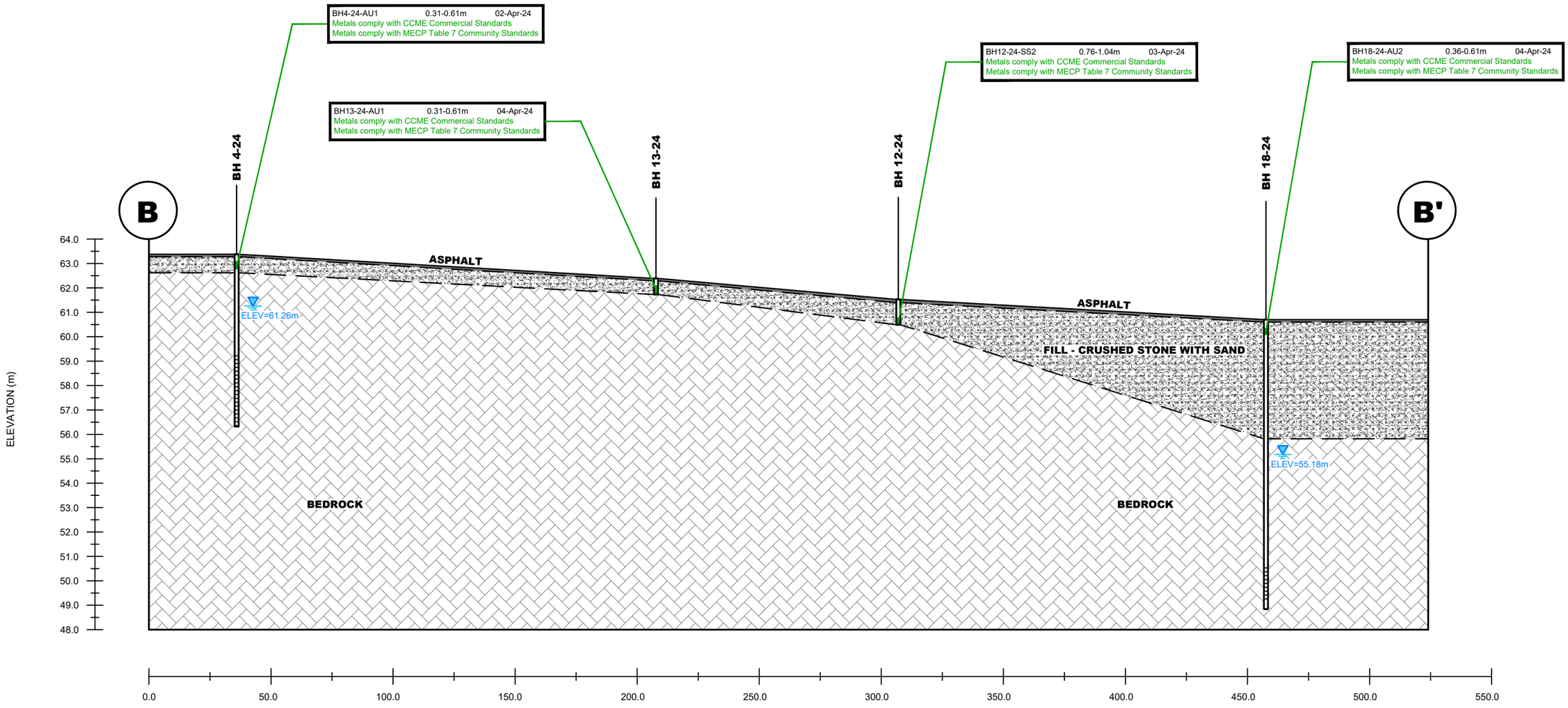

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

NOTES :

METALS INCLUDE : As, Sb, Se

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: CROSS SECTION B-B' - SOIL (METALS)

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-5B
Approved by: AM	Revision No.:

11x17

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BH3-24-SS2A 0.76-1.09m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Naphthalene	0.05	9.6	0.013

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC comply with MECP Table 7 Community Standards
SAR complies as per Section 49.1 of O.Reg. 153/04

BH16-24-AU2 0.20-0.31m 04-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH14-24-SS3 0.76-1.37m 04-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH4-24-AU1 0.31-0.61m 02-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH6-24-AU1 0.31-0.61m 02-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.05	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, SAR comply with MECP Table 7 Community Standards
EC complies as per Section 49.1 of O.Reg. 153/04

BH7-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Naphthalene	0.02	9.6	0.013
Phenanthrene	0.07	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH10-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.10	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community
and CCME Commercial Standards

BH2-24-AU1 0.31-0.61m 02-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH1-24-AU1 0.31-0.61m 02-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH13-24-AU1 0.31-0.61m 04-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH18-24-AU2 0.36-0.61m 04-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.06	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH5-24-SS4 1.52-2.13m 02-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH12-24-SS2 0.76-1.04m 03-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH11-24-SS2A 0.76-1.07m 03-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH15-24-AU1 0.31-0.61m 04-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH17-24-AU1 0.20-0.31m 04-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.05	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH8-24-AU1 0.31-0.61m 03-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH9-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Naphthalene	0.02	9.6	0.013

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, SAR comply with MECP Table 7 Community Standards
EC complies as per Section 49.1 of O.Reg. 153/04

BH 2-24 57.73
BH 1-24 58.00 [56.91] (55.25)
BH 3-24 59.38
BH 16-24 61.81 [59.40] (56.11)
BH 14-24 62.40
BH 4-24 63.38 [62.14] (61.26)
BH 13-24 62.39
BH 12-24 61.53
BH 18-24 60.70 (55.18)
BH 5-24 60.75
BH 6-24 63.87 [62.55] (61.81)
BH 11-24 61.48
BH 7-24 62.78
BH 10-24 62.28 [60.91] (59.57)
BH 15-24 62.26
BH 8-24 62.39
BH 17-24 62.38 (59.28)
BH 9-24 62.55 [61.51]
A
A'
B
B'

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

- PHASE I & II PROPERTY BOUNDARY
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 62.28 GROUND SURFACE ELEVATION (m)
- [60.91] BEDROCK SURFACE ELEVATION (m)
- (56.11) GROUNDWATER SURFACE ELEVATION (m) (APRIL 17, 2024)
- A—A' CROSS SECTION

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

SCALE: 1:4000

0 50 100 150 200 250m

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: ANALYTICAL TESTING PLAN - SOIL (BTEX, PAHs, EC, SAR)

Scale: 1:4000	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-6
Approved by: AM	Revision No.:

11x17

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BH4-24-AU1 0.31-0.61m 02-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH10-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.10	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community
and CCME Commercial Standards

BH8-24-AU1 0.31-0.61m 03-Apr-24
BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards

BH6-24-AU1 0.31-0.61m 02-Apr-24

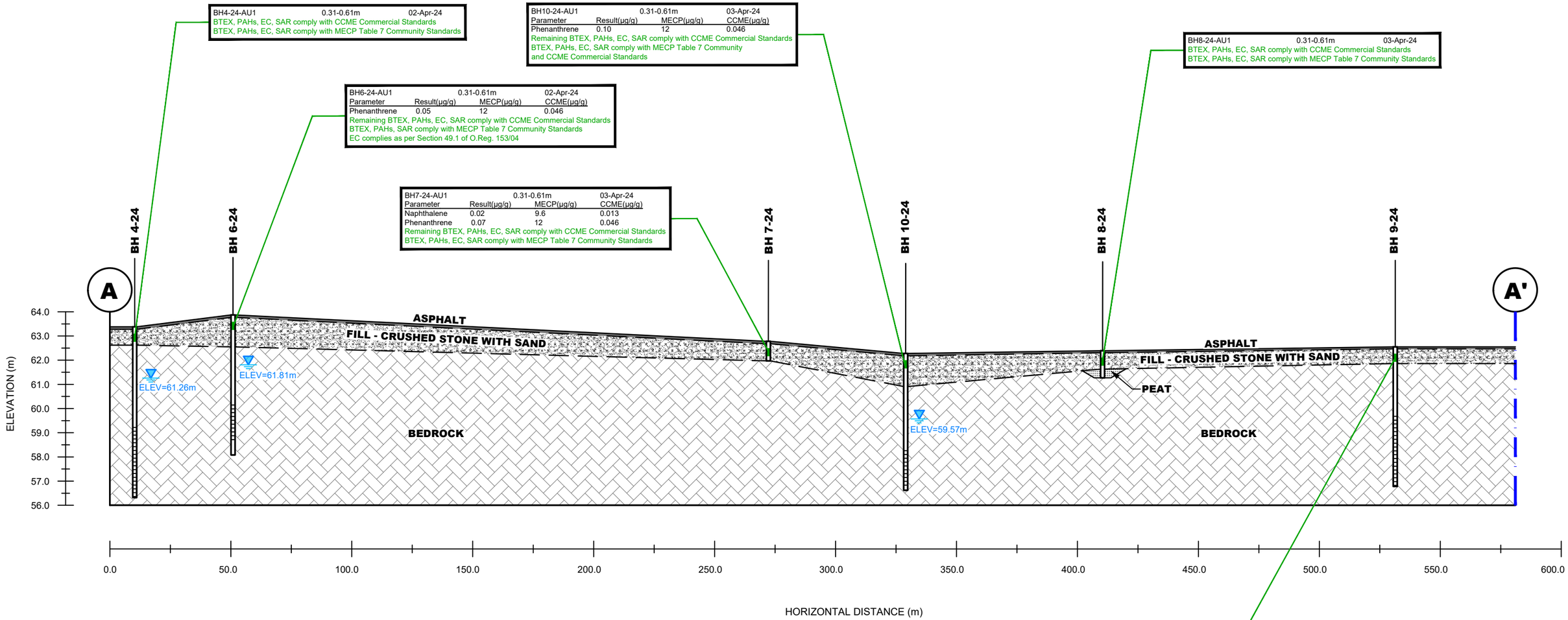
Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Phenanthrene	0.05	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, SAR comply with MECP Table 7 Community Standards
EC complies as per Section 49.1 of O.Reg. 153/04

BH7-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Naphthalene	0.02	9.6	0.013
Phenanthrene	0.07	12	0.046

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, EC, SAR comply with MECP Table 7 Community Standards



BH9-24-AU1 0.31-0.61m 03-Apr-24

Parameter	Result(µg/g)	MECP(µg/g)	CCME(µg/g)
Naphthalene	0.02	9.6	0.013

Remaining BTEX, PAHs, EC, SAR comply with CCME Commercial Standards
BTEX, PAHs, SAR comply with MECP Table 7 Community Standards
EC complies as per Section 49.1 of O.Reg. 153/04

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

PATERSON GROUP
9 AURIGA DRIVE
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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - SOIL (BTEX, PAHs, EC, SAR)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-6A
Approved by: AM	Revision No.:

11x17

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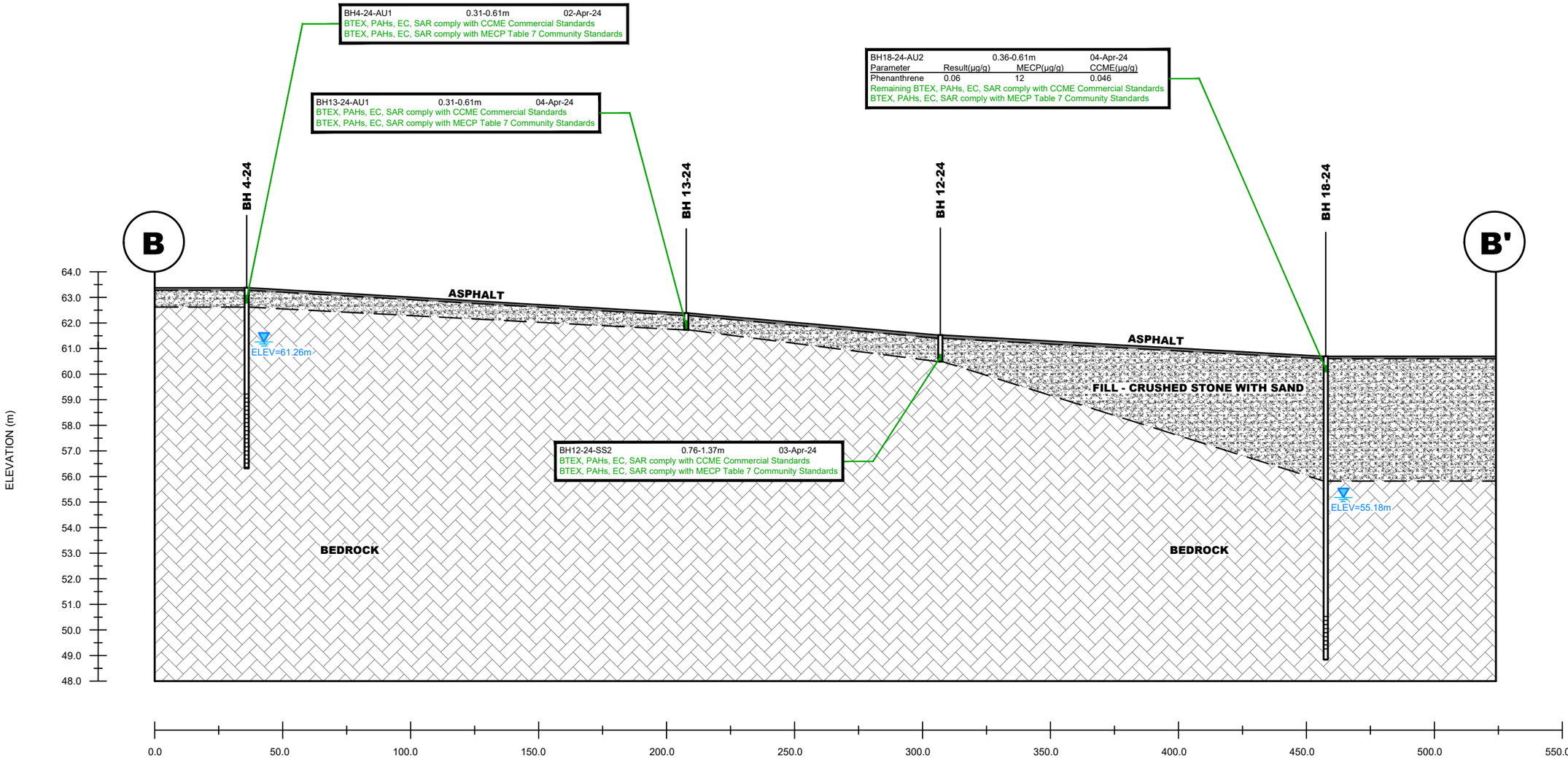

LEGEND:

SOIL RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

SOIL RESULT EXCEEDS THE CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION B-B' - SOIL (BTEX, PAHs, EC, SAR)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-6B
Approved by: AM	Revision No.:

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11x17

BH16-24-GW1 5.59-7.09m 17-Apr-24

Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
Selenium	2	N/A	1

Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH1-24-GW1 7.03-8.53m 17-Apr-24

Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
*Chloroform	6.3	2.0	1.8
Aluminum	13	N/A	5

*Choroform considered to be from municipal water source and not a contaminant issue
Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
Remaining PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH6-24-GW1 3.68-5.18m 17-Apr-24

Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
Aluminum	10	N/A	5

Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH18-24-GW1 10.08-11.58m 17-Apr-24

Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
Iron	358	N/A	300

Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH10-24-GW1 3.99-5.49m 17-Apr-24
PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH17-24-GW1 7.09-8.59m 17-Apr-24
PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH 16-24
61.81
[59.40]
(56.11)

BH 2-24
57.73

BH 3-24
59.38

BH 1-24
58.00
[56.91]
(55.25)

BH 14-24
62.40

BH 4-24
63.38
[62.14]
(61.26)

BH 13-24
62.39

BH 12-24
61.53

BH 18-24
60.70
(55.48)

BH 5-24
60.75

BH 6-24
63.87
[62.55]
(61.81)

BH 11-24
61.48

BH 7-24
62.78

BH 10-24
62.28
[60.91]
(59.57)

BH 15-24
62.26

BH 8-24
62.39

BH 17-24
62.38
(59.28)

BH 9-24
62.55
[61.51]

A

A'

B

B'

LEGEND:

GROUNDWATER RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

- PHASE I & II PROPERTY BOUNDARY
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 62.28 GROUND SURFACE ELEVATION (m)
- [60.91] BEDROCK SURFACE ELEVATION (m)
- (56.11) GROUNDWATER SURFACE ELEVATION (m) (APRIL 17, 2024)
- A—A' CROSS SECTION

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

SCALE: 1:4000

0 50 100 150 200 250m

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IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **ANALYTICAL TESTING PLAN - GROUNDWATER (PHCs, VOCs, METALS, PAHs)**

Scale: 1:4000	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-7
Approved by: AM	Revision No.:

11x17

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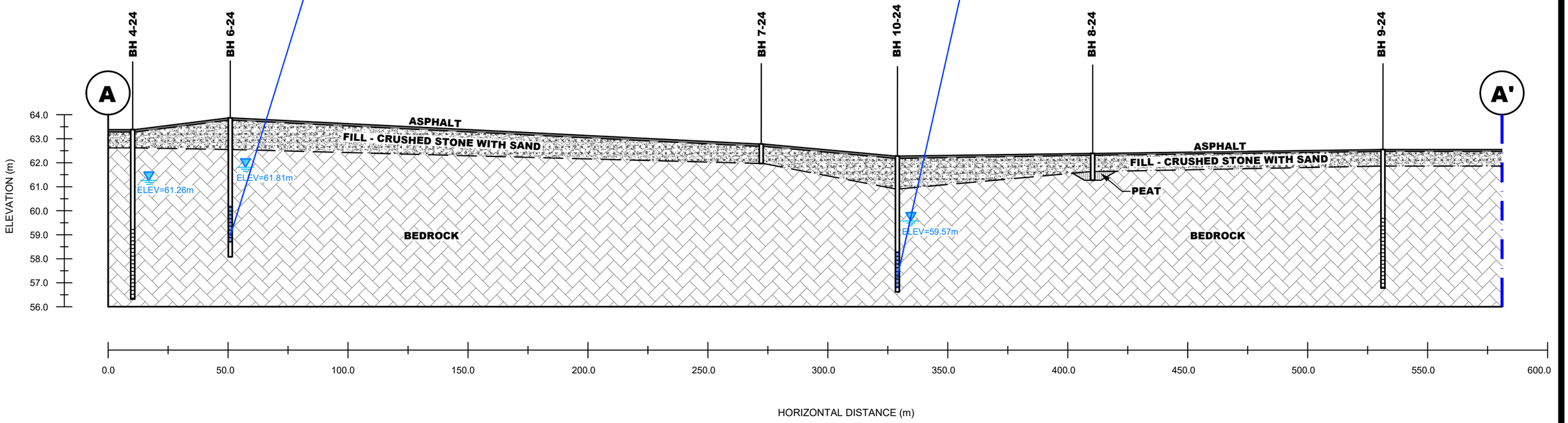
BH6-24-GW1	3.68-5.18m		17-Apr-24
Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
Aluminum	10	N/A	5

Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards

BH10-24-GW1 3.99-5.49m 17-Apr-24
PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards



LEGEND:

GROUNDWATER RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

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IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION A-A' - GROUNDWATER (PHCs, VOCs, METALS, PAHs)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-7A
Approved by: AM	Revision No.:

11x17

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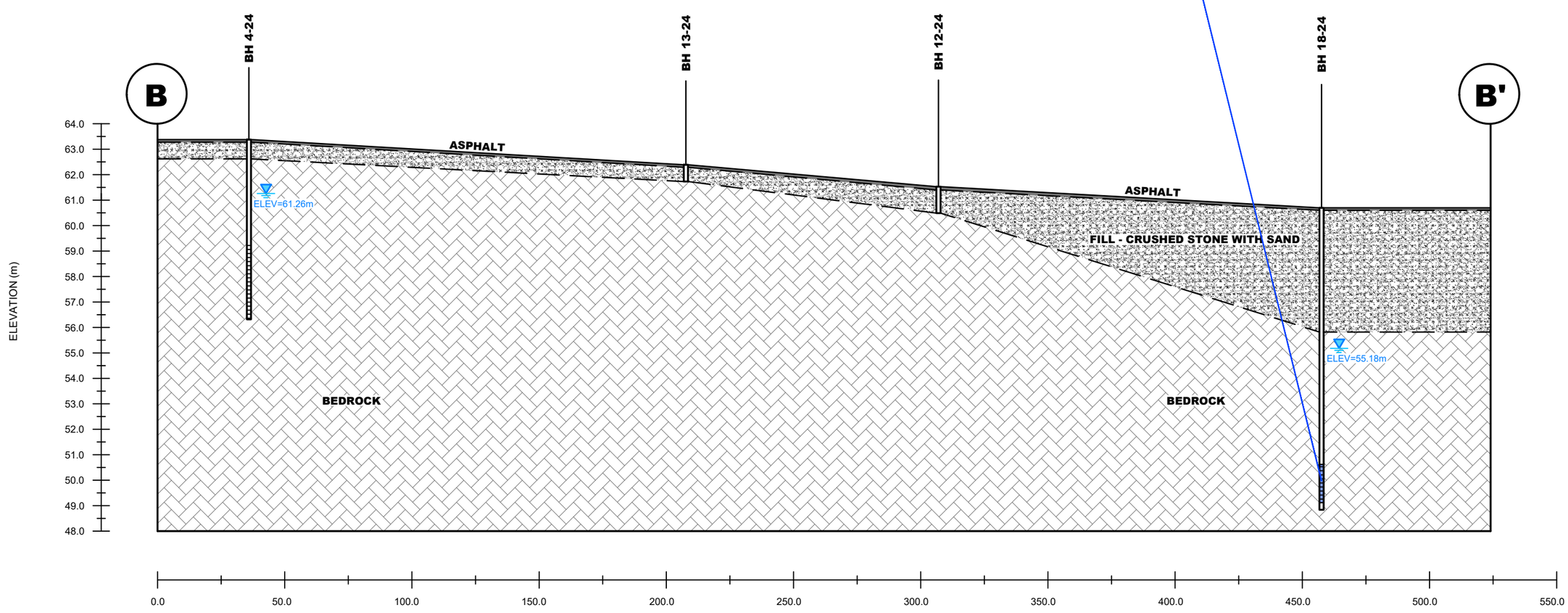
BH18-24-GW1	10.08-11.58m		17-Apr-24
Parameter	Result(µg/L)	MECP(µg/L)	CCME(µg/L)
Iron	358	N/A	300

Remaining PHCs, VOCs, Metals, PAHs comply with CCME Commercial Standards
PHCs, VOCs, Metals, PAHs comply with MECP Table 7 Community Standards



LEGEND:

GROUNDWATER RESULT COMPLIES WITH CCME COMMERCIAL STANDARDS & MECP TABLE 7 COMMUNITY STANDARDS

PHASE I & II PROPERTY BOUNDARY

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NO.	REVISIONS	DATE	INITIAL

IBI GROUP (CLC)

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
TUNNEY'S PASTURE ROAD RECONSTRUCTION

OTTAWA, ONTARIO

Title: **CROSS SECTION B-B' - GROUNDWATER (PHCs, VOCs, METALS, PAHs)**

Scale: AS SHOWN	Date: 05/2024
Drawn by: YA	Report No.: PE5791-2
Checked by: NS	Dwg. No.: PE5791-7B
Approved by: AM	Revision No.:

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11x17

APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Sampling & Analysis Plan

Public Road Redevelopment for Tunney's Pasture

Ottawa, Ontario

Prepared for Arcadis IBI Group

Report: PE5791-SAP
March 1, 2024

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1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Arcadis IBI Group, to conduct a Phase II – Environmental Site Assessment (Phase II ESA) for the road network at Tunney's Pasture, in the City of Ottawa, Ontario. Based on the findings of the Phase I ESA, the following investigation program was developed.

Borehole	Location	Rationale	Proposed Depth & Rationale
BH1-24	Northern portion of Phase II Property;	To assess for potential impacts resulting from the presence of fill material of unknown quality and the application of road salt for de-icing purposes during winter conditions.	7-9 m; for geotechnical and general coverage purposes and to intercept the groundwater table for the purpose of installing a monitoring well.
BH2-24	Northern portion of Phase II Property;		1-2 m; for geotechnical and general coverage purposes.
BH3-24	Northern portion of Phase II Property;		5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH4-24	Northwestern portion of Phase II Property		7-9 m; for geotechnical and general coverage purposes and to intercept the groundwater table for the purpose of installing a monitoring well.
BH5-24	Eastern portion of Phase II Property		1-2 m; for geotechnical and general coverage purposes.
BH6-24	Northwestern portion of Phase II Property		5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH7-24	Western portion of Phase II Property		1-2 m; for geotechnical and general coverage purposes.
BH8-24	Southwestern portion of Phase II Property		1-2 m; for geotechnical and general coverage purposes.
BH9-24	Southwestern portion of Phase II Property		5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH10-24	Western portion of Phase II Property		5-7 m; to intercept the groundwater table for the purpose of installing a monitoring well.
BH11-24	Eastern portion of Phase II Property		1-2 m; for geotechnical and general coverage purposes.
BH12-24	Northern portion of Phase II Property;		1-2 m; for geotechnical and general coverage purposes.
BH13-24	Northern portion of Phase II Property;		1-2 m; for geotechnical and general coverage purposes.
BH14-24	Northern portion of Phase II Property;		1-2 m; for geotechnical and general coverage purposes.
BH15-24	Southwestern portion of Phase II Property		1-2 m; for geotechnical and general coverage purposes.
BH16-24	Northern portion of Phase II Property;		7-9 m; for geotechnical and general coverage purposes and to intercept the groundwater table for the purpose of installing a monitoring well.
BH17-24	Southwestern portion of Phase II Property		7-9 m; for geotechnical and general coverage purposes and to intercept the groundwater table for the purpose of installing a monitoring well.
BH18-24	Northern portion of Phase II Property;		7-9 m; for geotechnical and general coverage purposes and to intercept the groundwater table for the purpose of installing a monitoring well.

Borehole locations are shown on Drawing PE5791-3 – 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 select 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

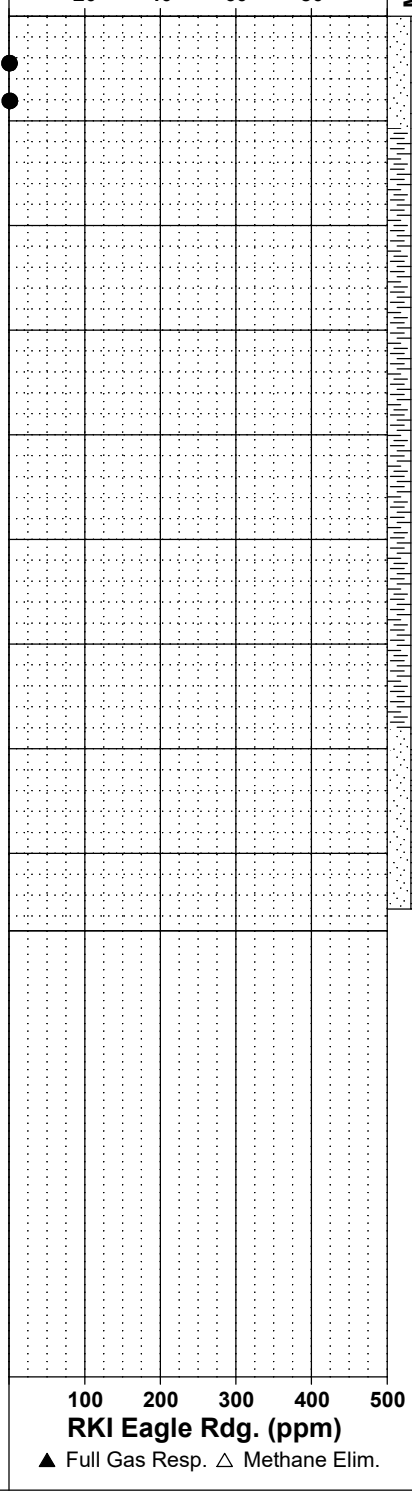
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364528.989 **NORTHING:** 5030250.644 **ELEVATION:** 58.00
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 1-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	58.00
ASPHALT 0.08							
FILL: Brown silty sand, some gravel and crushed stone 0.61		AU	1				
		SS	2	17	+50	1	57.00
FILL: Brown silty sand, some gravel and crushed stone, trace clay and asphalt 1.09							
BEDROCK: Fair quality, grey limestone bedrock - mud / gravel seam at 1.4m depth		RC	1	100	59	2	56.00
2.64							
BEDROCK: Good to excellent quality, grey limestone bedrock		RC	2	100	88	3	55.00
						4	54.00
		RC	3	100	95	5	53.00
						6	52.00
		RC	4	100	98	7	51.00
		RC	5	100	100	8	50.00
8.74							
End of Borehole							
(GWL @ 2.75m - April 17, 2024)							

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



MONITORING WELL CONSTRUCTION

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

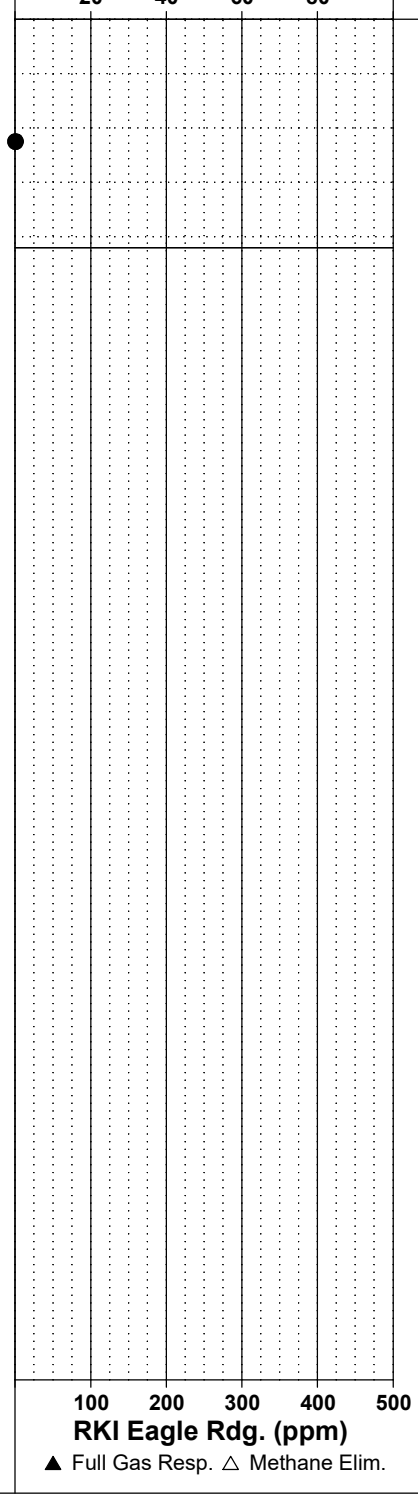
SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364458.153 **NORTHING:** 5030223.205 **ELEVATION:** 57.53
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 2-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	57.53		
ASPHALT 0.06									
FILL: Brown silty sand, some gravel and crushed stone		AU	1						
0.84		SS	2	0	+50				
End of Borehole									
Practical refusal to augering at 0.84m depth									



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SOIL PROFILE AND TEST DATA

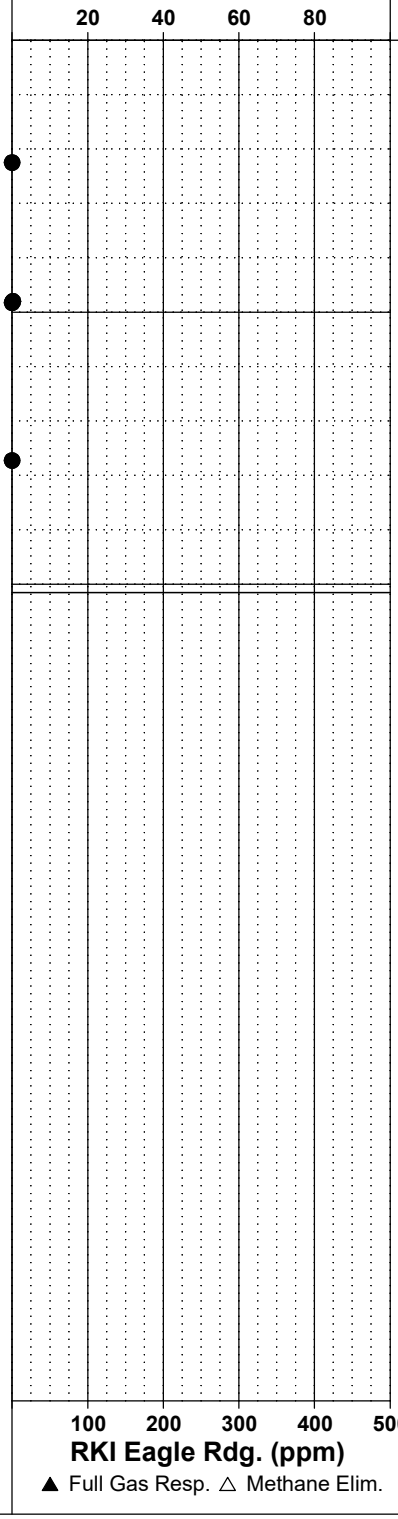
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364371.119 **NORTHING:** 5030175.195 **ELEVATION:** 59.38
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 3-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
GROUND SURFACE								
ASPHALT 0.06						0	59.38	
FILL: Brown silty sand, some gravel and crushed stone		AU	1					
0.69								
FILL: Brown silty clay, some sand, trace gravel		SS	2	69	+50	1	58.38	
1.09								
FILL: Crushed stone, trace sand		SS	3	100	+50			
2.03						2	57.38	
End of Borehole Practical refusal to augering at 2.03m depth								

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



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SOIL PROFILE AND TEST DATA

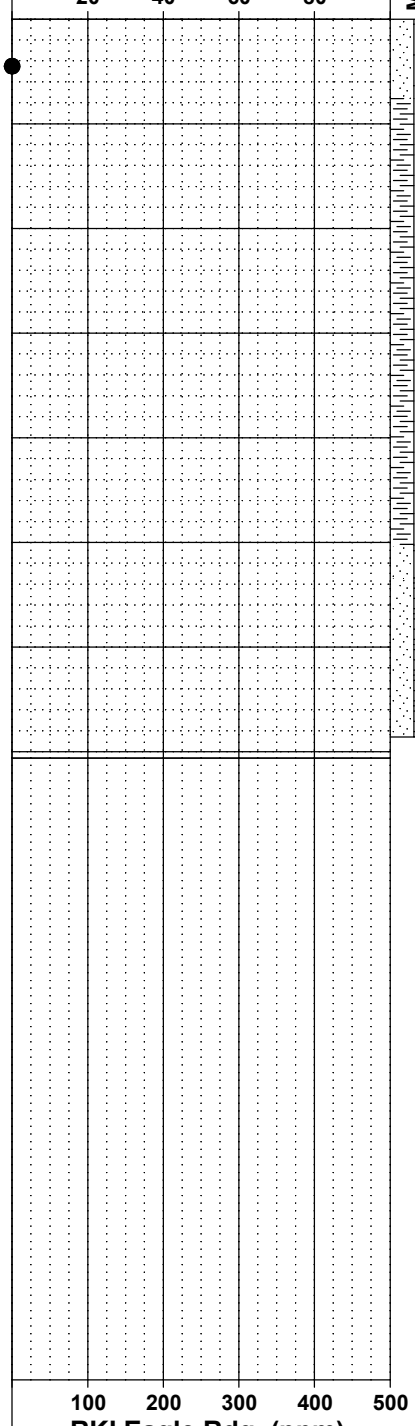
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364152.092 **NORTHING:** 5029930.624 **ELEVATION:** 63.38
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 4-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.38
ASPHALT 0.08							
FILL: Brown silty sand, some gravel and crushed stone 0.76		AU	1				
		SS	2	0	+50	1	62.38
BEDROCK: Poor quality, grey limestone bedrock 1.24							
BEDROCK: Good to excellent quality, grey limestone bedrock		RC	1	100	72	2	61.38
		RC	2	100	85	3	60.38
						4	59.38
		RC	3	100	93	5	58.38
						6	57.38
		RC	4	100	97		
7.06						7	56.38
End of Borehole							
(GWL @ 2.12m - April 17, 2024)							

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



MONITORING WELL CONSTRUCTION

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

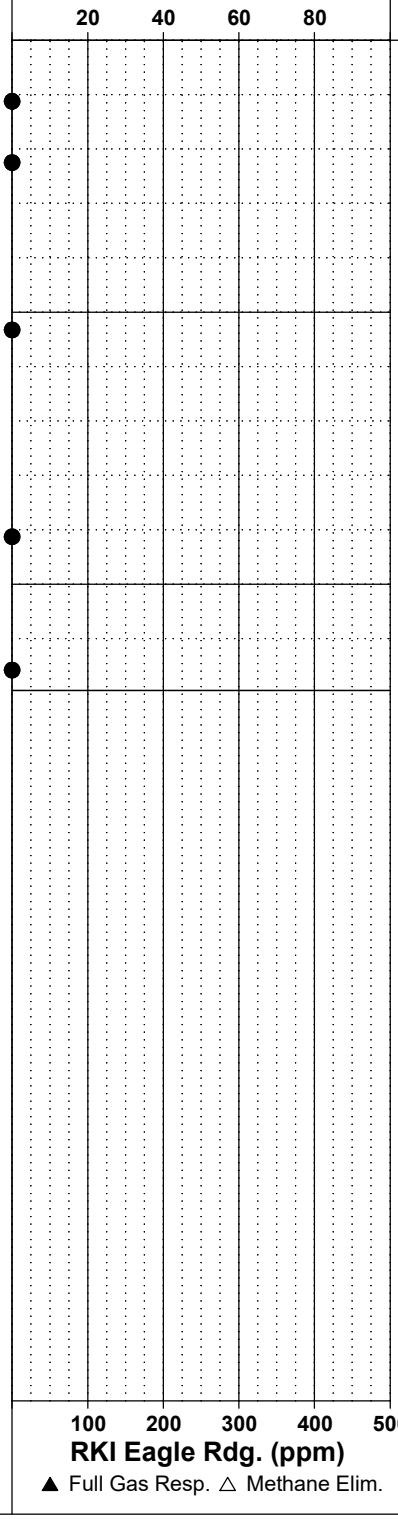
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364664.169 **NORTHING:** 5030109.055 **ELEVATION:** 60.75
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 5-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
GROUND SURFACE								
ASPHALT 0.05						0	60.75	
FILL: Brown silty sand, some gravel and crushed stone - trace clay by 0.3m depth		AU	1					
		AU	2					
		SS	3	50	9	1	59.75	
		SS	4	75	20	2	58.75	
2.39		SS	5	50	+50			
End of Borehole Practical refusal to augering at 2.39m depth								

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



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SOIL PROFILE AND TEST DATA

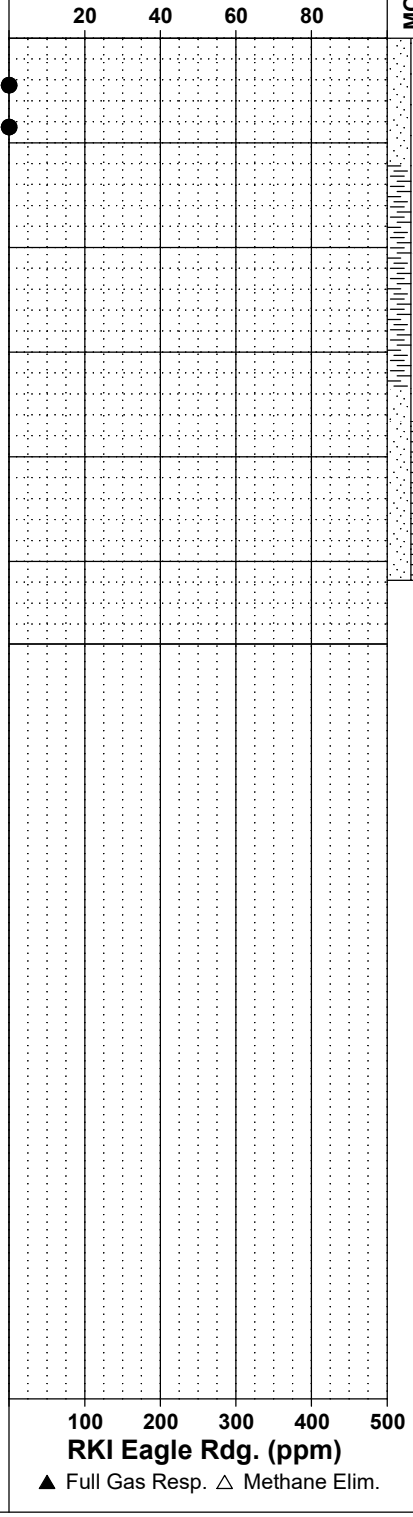
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364139.224 **NORTHING:** 5029871.797 **ELEVATION:** 63.87
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 2, 2024

FILE NO. PE5791
HOLE NO. BH 6-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	63.87
ASPHALT 0.08							
FILL: Brown silty sand with gravel, crushed stone, cobbles and boulders - trace clay by 0.8m depth		AU	1				
		SS	2	29	+50	1	62.87
1.32							
BEDROCK: Excellent quality, grey limestone bedrock		RC	1	100	91	2	61.87
						3	60.87
		RC	2	100	93	4	59.87
		RC	3	100	100	5	58.87
5.79							
End of Borehole							
(GWL @ 2.06m - April 17, 2024)							

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



MONITORING WELL CONSTRUCTION

patersongroup Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364227.31 **NORTHING:** 5029669.436 **ELEVATION:** 62.78
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 3, 2024

FILE NO. PE5791
HOLE NO. BH 7-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	62.78		
ASPHALT 0.08									
FILL: Brown silty sand, with gravel and crushed stone		AU	1						
0.81		SS	2	100	+50				
End of Borehole									
Practical refusal to augering at 0.81m depth									

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

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364282.434 **NORTHING:** 5029542.709 **ELEVATION:** 62.39
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 3, 2024

FILE NO. PE5791
HOLE NO. BH 8-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	PIEZOMETER CONSTRUCTION
GROUND SURFACE									
ASPHALT 0.06						0	62.39		
FILL: Brown silty sand, some gravel and crushed stone		AU	1						
0.76									
Loose, black **PEAT**, trace clay and gravel		SS	2	64	+50	1	61.39		
1.12									
End of Borehole									
Practical refusal to augering at 1.12m depth									

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

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SOIL PROFILE AND TEST DATA

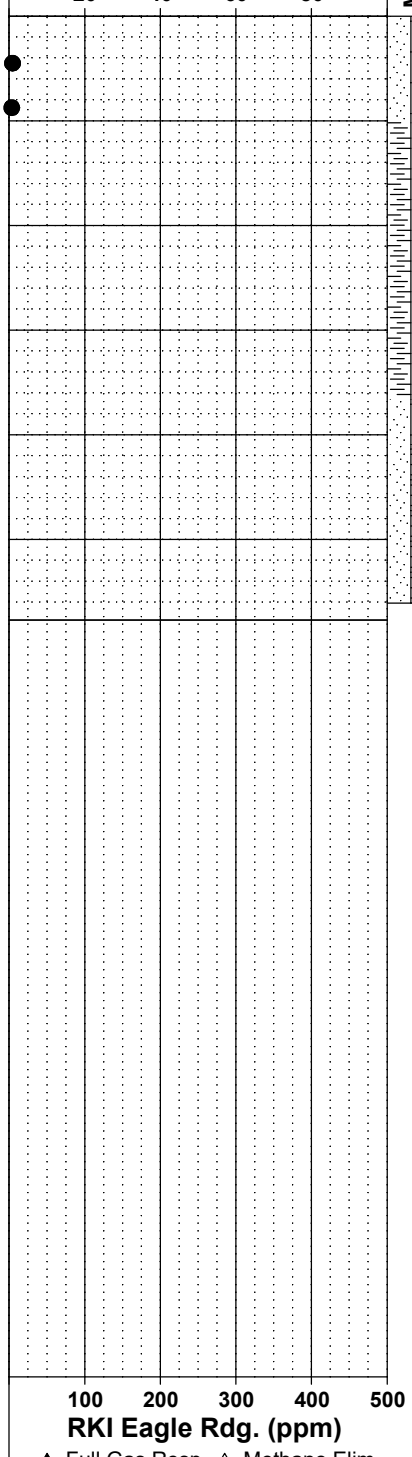
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364326.761 **NORTHING:** 5029429.399 **ELEVATION:** 62.55
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 3, 2024

FILE NO. PE5791
HOLE NO. BH 9-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
ASPHALT 0.06						0	62.55
FILL: Brown silty sand, with gravel and crushed stone 0.69		AU	1				
1.04		SS	2	78	+50	1	61.55
GLACIAL TILL: Compact, brown silty sand to sandy silt, with gravel, trace clay and cobbles							
BEDROCK: Excellent quality, grey limestone bedrock		RC	1	100	95	2	60.55
						3	59.55
		RC	2	100	94		
						4	58.55
		RC	3	100	98	5	57.55
5.77							
End of Borehole							

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



MONITORING WELL CONSTRUCTION

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SOIL PROFILE AND TEST DATA

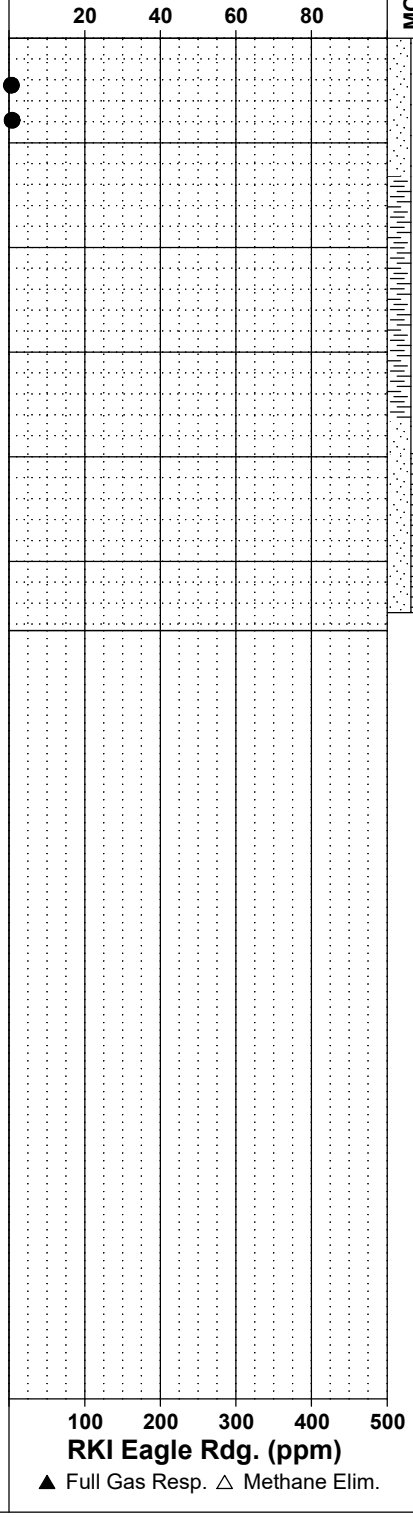
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364273.383 **NORTHING:** 5029626.197 **ELEVATION:** 62.28
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 3, 2024

FILE NO. PE5791
HOLE NO. BH10-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.28
ASPHALT 0.05							
FILL: Brown silty sand, with gravel and crushed stone, trace clay 0.81		AU	1				
		SS	2	100	+50	1	61.28
FILL: Cobbles and boulders 1.37							
BEDROCK: Excellent quality, grey limestone bedrock		RC	1	100	95	2	60.28
		RC	2	100	94	3	59.28
		RC	3	100	97	4	58.28
						5	57.28
5.66							
End of Borehole							
(GWL @ 2.71m - April 17, 2024)							

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



MONITORING WELL CONSTRUCTION

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364563.513 **NORTHING:** 5030017.067 **ELEVATION:** 61.48
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 3, 2024

FILE NO. PE5791
HOLE NO. BH11-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	61.48	
TOPSOIL with organics, trace gravel and clay								
0.30								
FILL: Brown silty sand, trace clay and gravel		SS	1	88	8			
		SS	2	71	8	1	60.48	
1.22								
FILL: Brown silty sand, with clay, gravel and crushed stone		SS	3	29	7	2	59.48	
2.21								
GLACIAL TILL: Compact, brown silty sand with gravel, cobbles and boulders, trace clay		SS	4	92	13			
		SS	5	100	+50	3	58.48	
3.51								
End of Borehole								
Practical refusal to augering at 3.51m depth								

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

20 40 60 80

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

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SOIL PROFILE AND TEST DATA

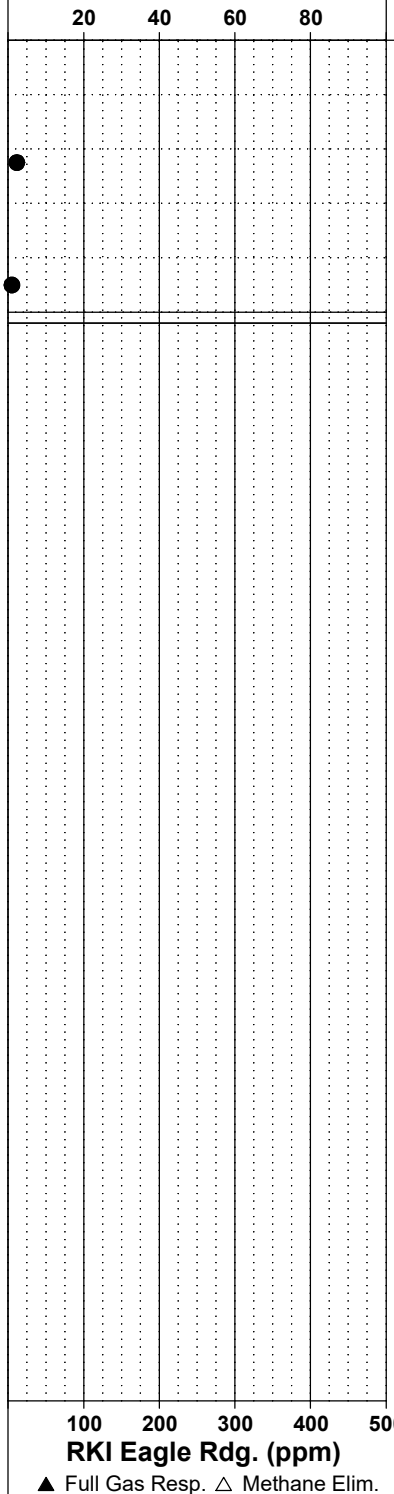
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364397.235 **NORTHING:** 5030044.77 **ELEVATION:** 61.53
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 4, 2024

FILE NO. PE5791
HOLE NO. BH12-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
GROUND SURFACE								
ASPHALT 0.13						0	61.53	
FILL: Brown silty sand, with gravel and crushed stone 0.48		AU	1					
FILL: Brown silty sand, some clay and gravel, trace topsoil and crushed stone		SS	2	91	+50			
1.04						1	60.53	
End of Borehole								
Practical refusal to augering at 1.04m depth								

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



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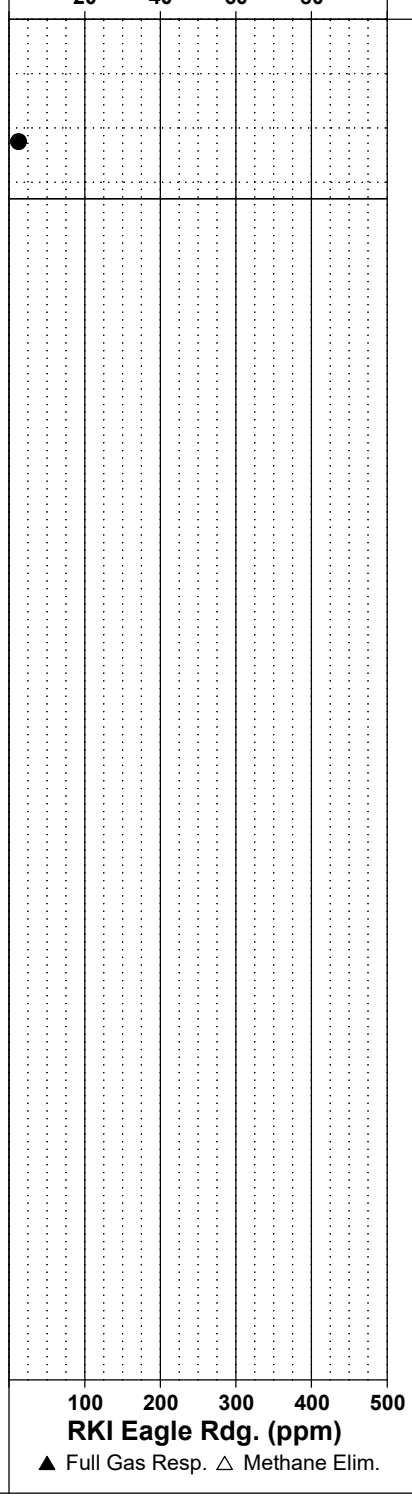
SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364306.698 **NORTHING:** 5030004.063 **ELEVATION:** 62.39
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 4, 2024

FILE NO. PE5791
HOLE NO. BH13-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	PIEZOMETER CONSTRUCTION
GROUND SURFACE						0	62.39		
ASPHALT 0.08									
FILL: Brown silty sand, with gravel and crushed stone		AU	1						
0.66									
End of Borehole									
Practical refusal to augering at 0.66m depth									



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SOIL PROFILE AND TEST DATA

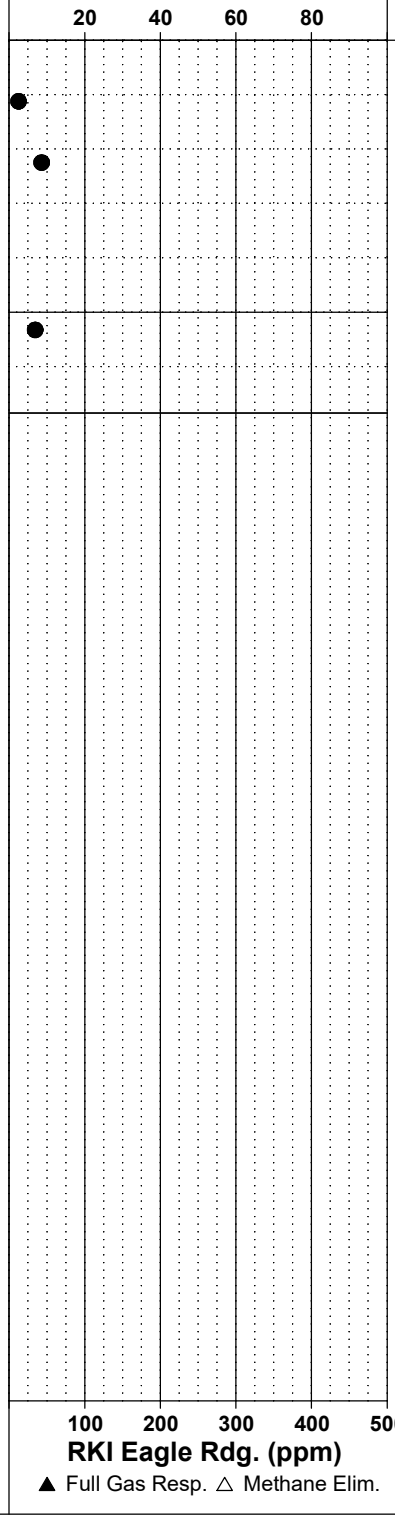
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364350.148 **NORTHING:** 5030054.744 **ELEVATION:** 62.40
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 4, 2024

FILE NO. PE5791
HOLE NO. BH14-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	PIEZOMETER CONSTRUCTION
GROUND SURFACE								
ASPHALT 0.05						0	62.40	
FILL: Brown silty sand, with gravel and crushed stone, trace clay 0.30		AU	1					
FILL: Brown silty clay, with sand, trace gravel 0.69		AU	2					
FILL: Brown silty sand, with gravel and crushed stone, trace clay and asphalt 1.37		SS	3	75	34	1	61.40	
End of Borehole								
Practical refusal to augering at 1.37m depth								

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



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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364346.835 **NORTHING:** 5029657.886 **ELEVATION:** 62.26
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 4, 2024

FILE NO. PE5791
HOLE NO. BH15-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm)	Lower Explosive Limit %	PIEZOMETER CONSTRUCTION
GROUND SURFACE										
ASPHALT 0.04						0	62.26			
FILL: Brown silty sand with gravel and crushed stone		AU	1							
- trace clay by 0.9m depth		SS	2	33	21	1	61.26			
1.65		SS	3	100	+50					
End of Borehole Practical refusal to augering at 1.65m depth										

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

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

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SOIL PROFILE AND TEST DATA

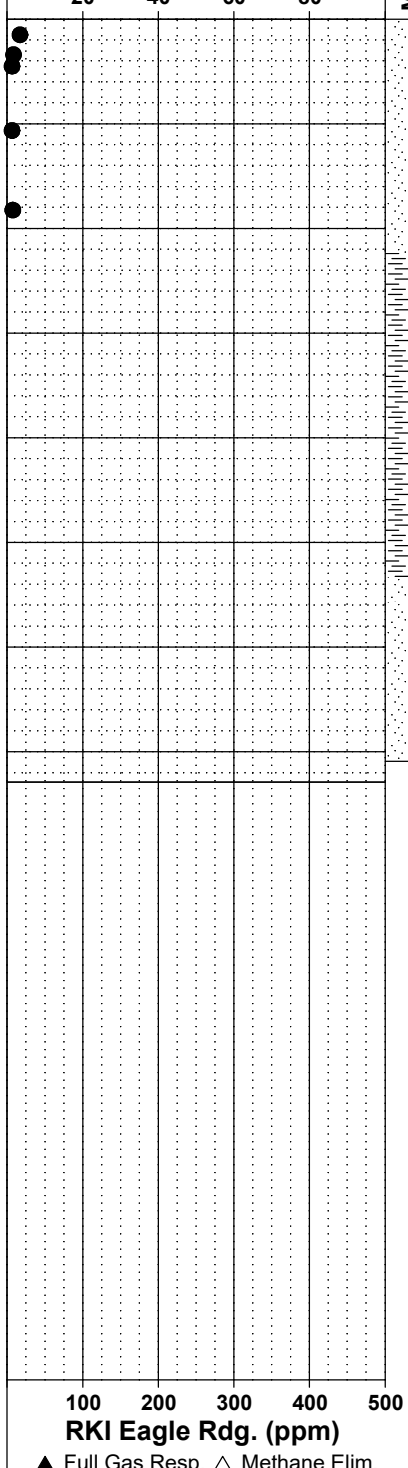
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364335.704 **NORTHING:** 5030131.964 **ELEVATION:** 61.81
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 4, 2024

FILE NO. PE5791
HOLE NO. BH16-24

SAMPLE DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE								
ASPHALT	0.10		AU	1			0	61.81
FILL: Brown silty sand with gravel and crushed stone	0.20		AU	2				
	0.30		AU	3				
FILL: Brown silty clay, some sand, trace gravel	1.07		SS	4	33	14	1	60.81
FILL: Brown silty sand, trace gravel			SS	5	29	22	2	59.81
FILL: Brown silty sand with gravel, crushed stone, cobbles and boulders, trace clay, blast rock and asphalt	2.41		RC	1	100	75		
BEDROCK: Good quality, sandstone bedrock	2.97						3	58.81
BEDROCK: Good to excellent quality, grey limestone bedrock			RC	2	100	88	4	57.81
			RC	3	100	83	5	56.81
			RC	4	100	93	6	55.81
	7.29						7	54.81
End of Borehole								
(GWL @ 5.7m - April 17, 2024)								

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



MONITORING WELL CONSTRUCTION

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

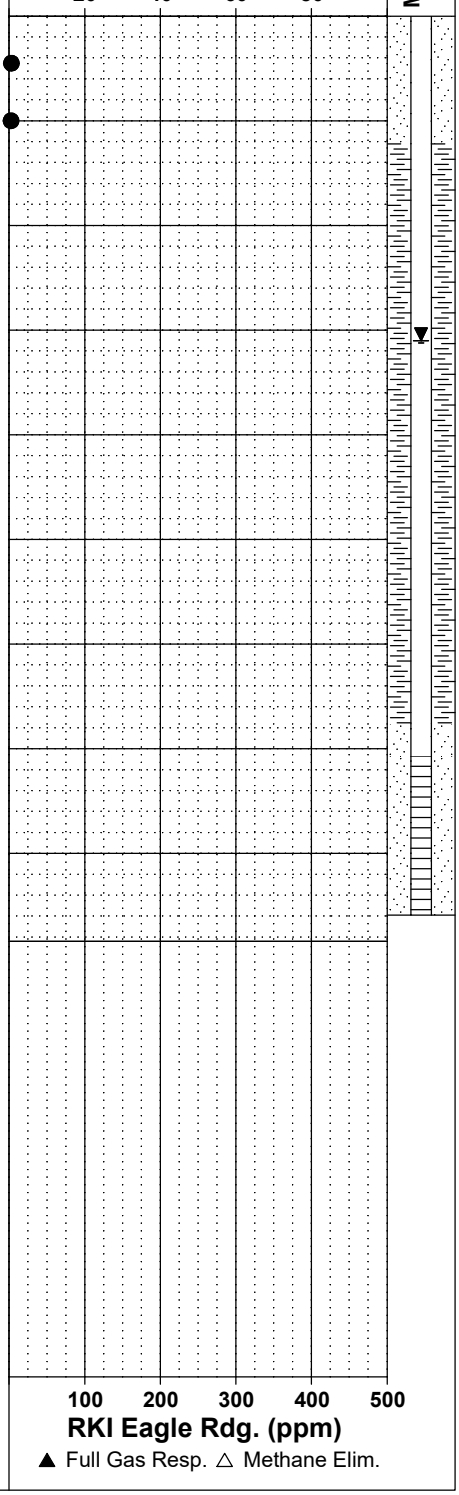
Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364443.211 **NORTHING:** 5029594.14 **ELEVATION:** 62.38
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 5, 2024

FILE NO. PE5791
HOLE NO. BH17-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
ASPHALT 0.08						0	62.38
FILL: Brown silty sand with gravel and crushed stone		AU	1				
- granular content increases with depth 1.27		SS	2	80	42	1	61.38
- cobbles by 1.1m depth							
BEDROCK: Fair quality, grey limestone bedrock		RC	1	83	62	2	60.38
- good quality by 2.7m depth						3	59.38
		RC	2	100	80		
- excellent quality by 4.3m depth						4	58.38
		RC	3	100	92	5	57.38
						6	56.38
		RC	4	100	97		
						7	55.38
		RC	5	100	98	8	54.38
8.84							
End of Borehole							
(GWL @ 3.1m - April 17, 2024)							

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



MONITORING WELL CONSTRUCTION

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

EASTING: 364536.185 **NORTHING:** 5030104.559 **ELEVATION:** 60.70
DATUM: Geodetic
REMARKS:
BORINGS BY: Truck-mounted Auger **DATE:** April 5, 2024

FILE NO. PE5791
HOLE NO. BH18-24

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
ASPHALT 0.10		AU	1			0	60.70
FILL: Brown silty sand, some gravel and crushed stone 0.69		AU	2				
- cobbles by 0.4m depth		SS	3	67	32	1	59.70
FILL: Crushed stone, some sand and gravel, trace asphalt and clay		SS	4	25	11	2	58.70
- cobbles, boulders and blast rock by 2.6m depth		SS	5	17	20	3	57.70
- trace concrete by 3.7m depth		SS	6	100	15	4	56.70
4.88						5	55.70
BEDROCK: Fair quality, grey limestone bedrock		RC	1	100	69	6	54.70
- good quality by 5.8m depth		RC	2	100	83	7	53.70
		RC	3	100	73	8	52.70
		RC	4	100	80	9	51.70
		RC	5	100	73	10	50.70
11.86						11	49.70
End of Borehole							
(GWL @ 5.52m - April 17, 2024)							

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

MONITORING WELL CONSTRUCTION

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

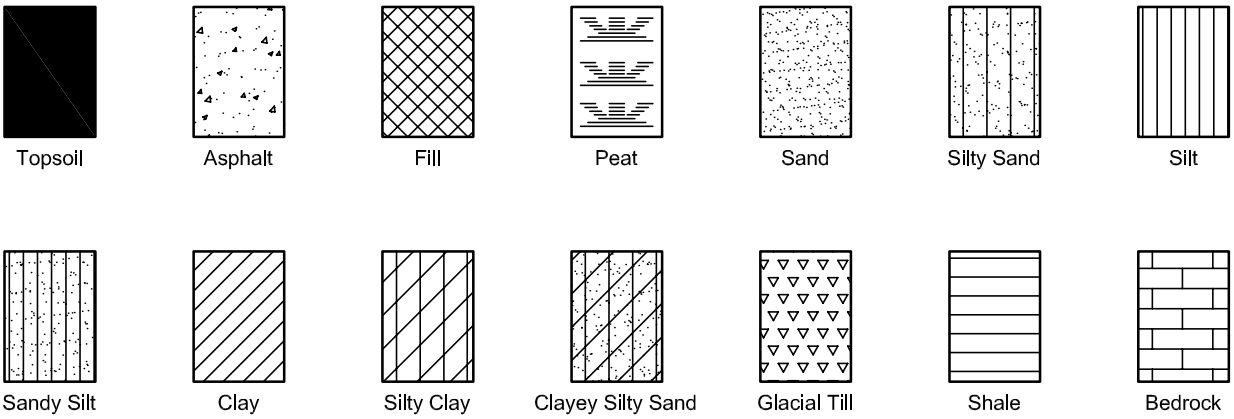
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

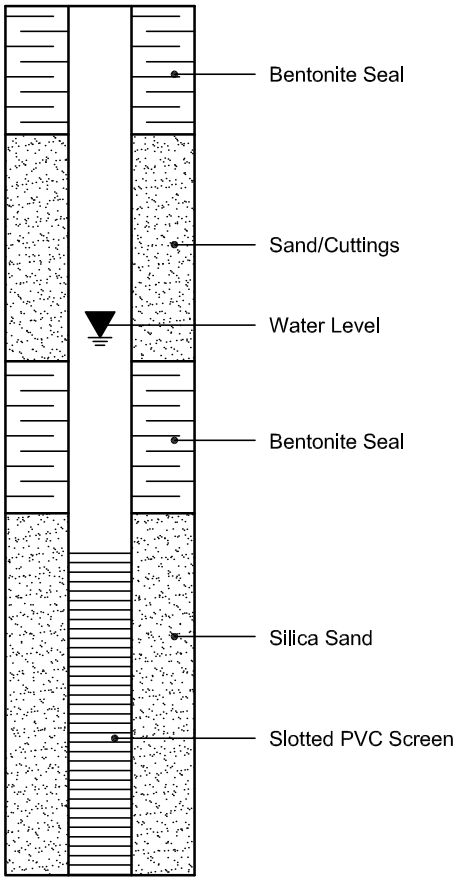
SYMBOLS AND TERMS (continued)

STRATA PLOT

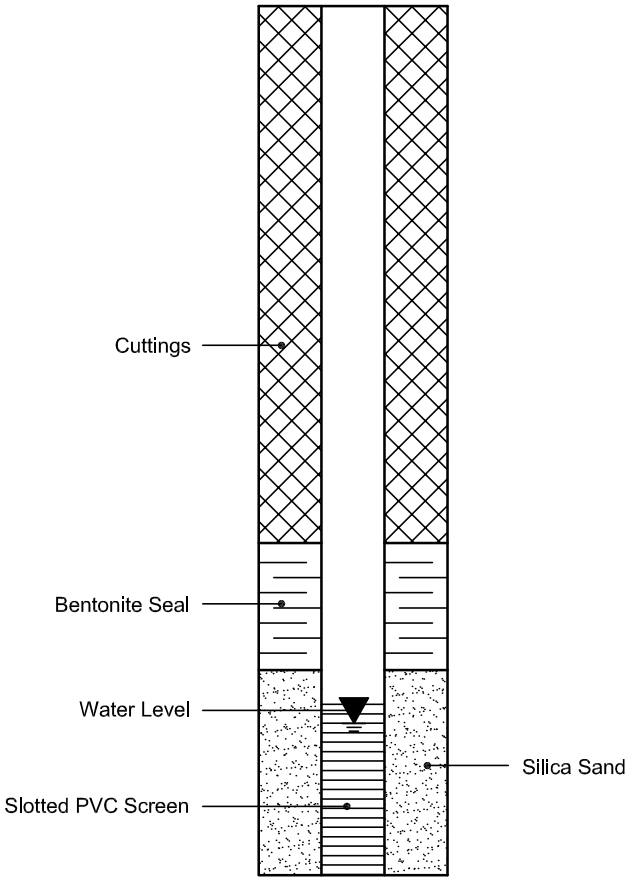


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Client PO: 59844
Project: PE5791
Custody:

Report Date: 9-Apr-2024
Order Date: 3-Apr-2024

Order #: 2414293

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

Paracel ID	Client ID
2414293-01	BH1-24-AU1
2414293-02	BH2-24-AU1
2414293-03	BH3-24-SS2A
2414293-04	BH4-24-AU1
2414293-05	BH5-24-SS4
2414293-06	BH6-24-AU1
2414293-07	SOIL DUP-1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-24	8-Apr-24
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	8-Apr-24	9-Apr-24
Conductivity	MOE E3138 - probe @25 °C, water ext	5-Apr-24	5-Apr-24
Mercury by CVAA	EPA 7471B - CVAA, digestion	5-Apr-24	5-Apr-24
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	5-Apr-24	5-Apr-24
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	5-Apr-24	8-Apr-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	8-Apr-24	8-Apr-24
PHC F1	CWS Tier 1 - P&T GC-FID	5-Apr-24	5-Apr-24
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	8-Apr-24	9-Apr-24
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	5-Apr-24	7-Apr-24
SAR	Calculated	5-Apr-24	8-Apr-24
Solids, %	CWS Tier 1 - Gravimetric	5-Apr-24	8-Apr-24

Certificate of Analysis

Report Date: 09-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 3-Apr-2024

Client PO: **59844**

Project Description: PE5791

	Client ID:	BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00		
	Sample ID:	2414293-01	2414293-02	2414293-03	2414293-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	97.3	95.9	86.2	96.9	-	-
General Inorganics							
SAR	0.01 N/A	6.97	2.07	12.5	1.35	-	-
Conductivity	5 uS/cm	751	328	1080	761	-	-
pH	0.05 pH Units	7.70	-	-	-	-	-
Metals							
Antimony	1 ug/g	<1	<1	<1	<1	-	-
Arsenic	1 ug/g	2	2	7	2	-	-
Barium	1 ug/g	114	160	351	61	-	-
Beryllium	0.5 ug/g	<0.5	<0.5	1.0	<0.5	-	-
Boron	5.0 ug/g	12.5	13.5	21.2	9.6	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	0.4	<0.2	-	-
Chromium	5 ug/g	7	10	50	7	-	-
Cobalt	1 ug/g	4	6	13	4	-	-
Copper	5 ug/g	8	10	22	7	-	-
Lead	1 ug/g	8	13	12	8	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	<1	<1	1	1	-	-
Nickel	5 ug/g	10	12	34	12	-	-
Selenium	1 ug/g	<1	<1	1	<1	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1	<1	<1	<1	-	-
Tin	5 ug/g	<5	<5	<5	<5	-	-
Uranium	1 ug/g	<1	<1	<1	<1	-	-

	Client ID:	BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00		
	Sample ID:	2414293-01	2414293-02	2414293-03	2414293-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Vanadium	10 ug/g	23	25	52	21	-	-
Zinc	20 ug/g	<20	<20	79	<20	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Ethylbenzene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Toluene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
m,p-Xylenes	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
o-Xylene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Xylenes, total	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Toluene-d8	Surrogate	105%	108%	105%	108%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 mg/kg	<40 [1]	<40 [1]	<40	<40	-	-
F3 PHCs (C16-C34)	8 mg/kg	95	<80 [1]	349	360	-	-
F4 PHCs (C34-C50)	6 mg/kg	1740 [3]	1110 [3]	1860 [3]	2490 [3]	-	-
F4G PHCs (gravimetric)	50 ug/g	2490	1830	1730	5290	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	0.03	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.08 [1]	<0.08 [1]	0.04	<0.04	-	-
Acenaphthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Acenaphthylene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.04 [1]	0.04	<0.02	<0.02	-	-

	Client ID:	BH1-24-AU1	BH2-24-AU1	BH3-24-SS2A	BH4-24-AU1	-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00		
	Sample ID:	2414293-01	2414293-02	2414293-03	2414293-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	<0.04 [1]	0.04	<0.02	<0.02	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Biphenyl	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Chrysene	0.02 mg/kg	<0.04 [1]	0.04	<0.02	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Fluoranthene	0.02 mg/kg	<0.04 [1]	0.07	<0.02	0.03	-	-
Fluorene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	<0.02	-	-
Naphthalene	0.01 mg/kg	<0.02 [1]	<0.02 [1]	0.05	<0.01	-	-
Phenanthrene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.02	0.02	-	-
Pyrene	0.02 mg/kg	<0.04 [1]	0.09	<0.02	0.03	-	-
Quinoline	0.10 mg/kg	<0.20 [1]	<0.20	<0.10	<0.10	-	-
2-Fluorobiphenyl	Surrogate	78.2%	74.1%	81.3%	69.3%	-	-
Terphenyl-d14	Surrogate	90.7%	83.3%	83.2%	76.1%	-	-

	Client ID:	BH5-24-SS4	BH6-24-AU1	SOIL DUP-1		-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00			
	Sample ID:	2414293-05	2414293-06	2414293-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	91.5	97.4	97.2	-	-	-
General Inorganics							
SAR	0.01 N/A	5.95	1.95	6.13	-	-	-
Conductivity	5 uS/cm	665	1830	773	-	-	-
pH	0.05 pH Units	7.51	-	-	-	-	-
Metals							
Antimony	1 ug/g	<1	<1	<1	-	-	-
Arsenic	1 ug/g	4	2	1	-	-	-
Barium	1 ug/g	762	267	64	-	-	-
Beryllium	0.5 ug/g	0.8	<0.5	<0.5	-	-	-
Boron	5.0 ug/g	19.8	14.6	6.3	-	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	-	-	-
Chromium	5 ug/g	21	9	<5	-	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	-	-	-
Cobalt	1 ug/g	9	4	2	-	-	-
Copper	5 ug/g	64	8	<5	-	-	-
Lead	1 ug/g	26	8	5	-	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	-	-	-
Molybdenum	1 ug/g	1	<1	<1	-	-	-
Nickel	5 ug/g	18	11	6	-	-	-
Selenium	1 ug/g	<1	<1	<1	-	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	-	-	-
Thallium	1 ug/g	<1	<1	<1	-	-	-
Tin	5 ug/g	<5	<5	<5	-	-	-
Uranium	1 ug/g	<1	<1	<1	-	-	-

	Client ID:	BH5-24-SS4	BH6-24-AU1	SOIL DUP-1		-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00			
	Sample ID:	2414293-05	2414293-06	2414293-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Metals							
Vanadium	10 ug/g	24	25	13	-	-	-
Zinc	20 ug/g	41	<20	<20	-	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	<0.002	<0.002	-	-	-
Ethylbenzene	0.002 ug/g	<0.002	<0.002	<0.002	-	-	-
Toluene	0.002 ug/g	<0.002	<0.002	<0.002	-	-	-
m,p-Xylenes	0.002 ug/g	0.008	<0.002	<0.002	-	-	-
o-Xylene	0.002 ug/g	0.003	<0.002	<0.002	-	-	-
Xylenes, total	0.002 ug/g	0.012	<0.002	<0.002	-	-	-
Toluene-d8	Surrogate	108%	108%	106%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	<7	<7	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	<40	<40	<40	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	113	188	149	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	986 [3]	1800 [3]	2610 [3]	-	-	-
F4G PHCs (gravimetric)	50 ug/g	459	4200	3160	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.08 [1]	<0.08 [1]	<0.08 [1]	-	-	-
Acenaphthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Acenaphthylene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-

	Client ID:	BH5-24-SS4	BH6-24-AU1	SOIL DUP-1		-	-
	Sample Date:	02-Apr-24 09:00	02-Apr-24 09:00	02-Apr-24 09:00			
	Sample ID:	2414293-05	2414293-06	2414293-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	0.05	<0.04 [1]	<0.04 [1]	-	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Biphenyl	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Chrysene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Fluoranthene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Fluorene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Naphthalene	0.01 mg/kg	<0.02 [1]	<0.02 [1]	<0.02 [1]	-	-	-
Phenanthrene	0.02 mg/kg	<0.04 [1]	0.05	<0.04 [1]	-	-	-
Pyrene	0.02 mg/kg	<0.04 [1]	<0.04 [1]	<0.04 [1]	-	-	-
Quinoline	0.10 mg/kg	<0.20 [1]	<0.20 [1]	<0.20 [1]	-	-	-
2-Fluorobiphenyl	Surrogate	77.3%	79.6%	70.8%	-	-	-
Terphenyl-d14	Surrogate	81.1%	85.2%	79.0%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
Conductivity	ND	5	uS/cm					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	mg/kg					
F2 PHCs (C10-C16)	ND	4	mg/kg					
F3 PHCs (C16-C34)	ND	8	mg/kg					
F4 PHCs (C34-C50)	ND	6	mg/kg					
F4G PHCs (gravimetric)	ND	50	ug/g					
Metals								
Antimony	ND	1	ug/g					
Arsenic	ND	1	ug/g					
Barium	ND	1	ug/g					
Beryllium	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5	ug/g					
Cobalt	ND	1	ug/g					
Copper	ND	5	ug/g					
Lead	ND	1	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1	ug/g					
Nickel	ND	5	ug/g					
Selenium	ND	1	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1	ug/g					
Tin	ND	5	ug/g					
Uranium	ND	1	ug/g					
Vanadium	ND	10	ug/g					
Zinc	ND	20	ug/g					
Semi-Volatiles								
1-Methylnaphthalene	ND	0.02	mg/kg					
2-Methylnaphthalene	ND	0.02	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylnaphthalene (1&2)	ND	0.04	mg/kg					
Acenaphthene	ND	0.02	mg/kg					
Acenaphthylene	ND	0.02	mg/kg					
Anthracene	ND	0.02	mg/kg					
Benzo [a] anthracene	ND	0.02	mg/kg					
Benzo [a] pyrene	ND	0.02	mg/kg					
Benzo [b] fluoranthene	ND	0.02	mg/kg					
Benzo [g,h,i] perylene	ND	0.02	mg/kg					
Benzo [k] fluoranthene	ND	0.02	mg/kg					
Biphenyl	ND	0.02	mg/kg					
Chrysene	ND	0.02	mg/kg					
Dibenzo [a,h] anthracene	ND	0.02	mg/kg					
Fluoranthene	ND	0.02	mg/kg					
Fluorene	ND	0.02	mg/kg					
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg					
Naphthalene	ND	0.01	mg/kg					
Phenanthrene	ND	0.02	mg/kg					
Pyrene	ND	0.02	mg/kg					
Quinoline	ND	0.10	mg/kg					
Surrogate: 2-Fluorobiphenyl	*0.926*		*%*	*69.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.12*		*%*	*83.8*	*50-140*			
Volatiles								
Benzene	ND	0.002	ug/g					
Ethylbenzene	ND	0.002	ug/g					
Toluene	ND	0.002	ug/g					
m,p-Xylenes	ND	0.002	ug/g					
o-Xylene	ND	0.002	ug/g					
Xylenes, total	ND	0.002	ug/g					
Surrogate: Toluene-d8	*0.423*		*%*	*106*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	2.24	0.01	N/A	2.10			6.5	30	
Conductivity	3260	5	uS/cm	3270			0.4	5	
pH	7.56	0.05	pH Units	7.51			0.7	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg	ND			NC	40	
F2 PHCs (C10-C16)	ND	40	mg/kg	ND			NC	30	
F3 PHCs (C16-C34)	135	80	mg/kg	95			35.0	30	QR-04
F4 PHCs (C34-C50)	2140	60	mg/kg	1740			20.7	30	
Metals									
Antimony	ND	1	ug/g	ND			NC	30	
Arsenic	1.2	1	ug/g	1.3			9.9	30	
Barium	117	1	ug/g	120			2.7	30	
Beryllium	ND	0.5	ug/g	ND			NC	30	
Boron	20.6	5.0	ug/g	22.0			6.5	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	0.3	0.2	ug/g	0.4			8.0	35	
Chromium	10.4	5	ug/g	11.0			5.8	30	
Cobalt	4.5	1	ug/g	4.6			3.2	30	
Copper	6.2	5	ug/g	6.4			4.0	30	
Lead	8.0	1	ug/g	8.5			6.0	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	ND	1	ug/g	ND			NC	30	
Nickel	10.0	5	ug/g	10.4			4.5	30	
Selenium	ND	1	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1	ug/g	ND			NC	30	
Tin	ND	5	ug/g	ND			NC	30	
Uranium	ND	1	ug/g	ND			NC	30	
Vanadium	ND	10	ug/g	ND			NC	30	
Zinc	ND	20	ug/g	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	89.6	0.1	% by Wt.	89.8			0.3	25	
Semi-Volatiles									
1-Methylnaphthalene	ND	0.04	mg/kg	ND			NC	40	GEN09
2-Methylnaphthalene	ND	0.04	mg/kg	ND			NC	40	GEN09
Acenaphthene	ND	0.04	mg/kg	ND			NC	40	GEN09
Acenaphthylene	ND	0.04	mg/kg	ND			NC	40	GEN09
Anthracene	ND	0.04	mg/kg	ND			NC	40	GEN09
Benzo [a] anthracene	ND	0.04	mg/kg	ND			NC	40	GEN09
Benzo [a] pyrene	ND	0.04	mg/kg	ND			NC	40	GEN09
Benzo [b] fluoranthene	ND	0.04	mg/kg	ND			NC	40	GEN09
Benzo [g,h,i] perylene	ND	0.04	mg/kg	ND			NC	40	GEN09
Benzo [k] fluoranthene	ND	0.04	mg/kg	ND			NC	40	GEN09
Biphenyl	ND	0.04	mg/kg	ND			NC	40	GEN09
Chrysene	ND	0.04	mg/kg	ND			NC	40	GEN09
Dibenzo [a,h] anthracene	ND	0.04	mg/kg	ND			NC	40	GEN09
Fluoranthene	ND	0.04	mg/kg	ND			NC	40	GEN09
Fluorene	ND	0.04	mg/kg	ND			NC	40	GEN09
Indeno [1,2,3-cd] pyrene	ND	0.04	mg/kg	ND			NC	40	GEN09
Naphthalene	ND	0.02	mg/kg	ND			NC	40	GEN09
Phenanthrene	ND	0.04	mg/kg	ND			NC	40	GEN09
Pyrene	ND	0.04	mg/kg	ND			NC	40	GEN09
Quinoline	ND	0.20	mg/kg	ND			NC	40	GEN09
Surrogate: 2-Fluorobiphenyl	*0.994*		*%*		*72.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.13*		*%*		*82.3*	*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)	177	7	mg/kg	ND	103	85-115			
F2 PHCs (C10-C16)	86	4	mg/kg	ND	108	80-120			
F3 PHCs (C16-C34)	216	8	mg/kg	ND	110	80-120			
F4 PHCs (C34-C50)	122	6	mg/kg	ND	98.4	80-120			
F4G PHCs (gravimetric)	860	50	ug/g	ND	86.0	80-120			
Metals									
Arsenic	45.0	1	ug/g	ND	89.0	70-130			
Barium	94.4	1	ug/g	48.0	92.8	70-130			
Beryllium	54.5	0.5	ug/g	ND	109	70-130			
Boron	60.1	5.0	ug/g	8.8	103	70-130			
Cadmium	45.3	0.5	ug/g	ND	90.6	70-130			
Chromium (VI)	4.5	0.2	ug/g	0.4	72.0	70-130			
Chromium	51.9	5	ug/g	ND	95.1	70-130			
Cobalt	48.1	1	ug/g	1.8	92.5	70-130			
Copper	45.0	5	ug/g	ND	84.9	70-130			
Lead	40.5	1	ug/g	3.4	74.2	70-130			
Mercury	1.35	0.1	ug/g	ND	89.8	70-130			
Molybdenum	43.9	1	ug/g	ND	87.3	70-130			
Nickel	48.7	5	ug/g	ND	89.1	70-130			
Selenium	46.6	1	ug/g	ND	92.8	70-130			
Silver	40.6	0.3	ug/g	ND	81.3	70-130			
Thallium	42.9	1	ug/g	ND	85.6	70-130			
Tin	45.6	5	ug/g	ND	91.0	70-130			
Uranium	43.7	1	ug/g	ND	87.0	70-130			
Vanadium	53.3	10	ug/g	ND	99.5	70-130			
Zinc	43.9	20	ug/g	ND	80.0	70-130			
Semi-Volatiles									
1-Methylnaphthalene	0.107	0.02	mg/kg	ND	64.5	50-140			
2-Methylnaphthalene	0.122	0.02	mg/kg	ND	73.0	50-140			
Acenaphthene	0.124	0.02	mg/kg	ND	74.2	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acenaphthylene	0.133	0.02	mg/kg	ND	79.6	50-140			
Anthracene	0.126	0.02	mg/kg	ND	75.4	50-140			
Benzo [a] anthracene	0.120	0.02	mg/kg	ND	72.1	50-140			
Benzo [a] pyrene	0.109	0.02	mg/kg	ND	65.6	50-140			
Benzo [b] fluoranthene	0.114	0.02	mg/kg	ND	68.1	50-140			
Benzo [g,h,i] perylene	0.112	0.02	mg/kg	ND	67.1	50-140			
Benzo [k] fluoranthene	0.150	0.02	mg/kg	ND	90.0	50-140			
Biphenyl	0.129	0.02	mg/kg	ND	77.5	50-140			
Chrysene	0.137	0.02	mg/kg	ND	82.1	50-140			
Dibenzo [a,h] anthracene	0.117	0.02	mg/kg	ND	70.1	50-140			
Fluoranthene	0.123	0.02	mg/kg	ND	73.7	50-140			
Fluorene	0.116	0.02	mg/kg	ND	69.8	50-140			
Indeno [1,2,3-cd] pyrene	0.128	0.02	mg/kg	ND	76.8	50-140			
Naphthalene	0.147	0.01	mg/kg	ND	88.2	50-140			
Phenanthrene	0.116	0.02	mg/kg	ND	69.5	50-140			
Pyrene	0.122	0.02	mg/kg	ND	72.9	50-140			
Quinoline	0.136	0.10	mg/kg	ND	81.8	50-140			
Surrogate: 2-Fluorobiphenyl	*0.978*		*%*		*73.4*	*50-140*			
Surrogate: Terphenyl-d14	*1.07*		*%*		*80.3*	*50-140*			
Volatiles									
Benzene	0.202	0.002	ug/g	ND	101	60-140			
Ethylbenzene	0.220	0.002	ug/g	ND	110	60-140			
Toluene	0.209	0.002	ug/g	ND	104	60-140			
m,p-Xylenes	0.455	0.002	ug/g	ND	114	60-140			
o-Xylene	0.226	0.002	ug/g	ND	113	60-140			
Surrogate: Toluene-d8	*0.413*		*%*		*103*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved. Prepared in the lab as directed by client.

Applies to Samples: BH1-24-AU1, BH2-24-AU1, BH3-24-SS2A, BH4-24-AU1, BH5-24-SS4, BH6-24-AU1, SOIL DUP-1

Sample Qualifiers :

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

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

Applies to Samples: BH1-24-AU1, BH2-24-AU1, BH3-24-SS2A, BH4-24-AU1, BH5-24-SS4, BH6-24-AU1, SOIL DUP-1

QC Qualifiers:

GEN09 Elevated reporting limits due to the nature of the sample matrix.

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

Sample Data Revisions:

None

Certificate of Analysis

Report Date: 09-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 3-Apr-2024

Client PO: 59844

Project Description: PE5791

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2414293	

Client Name: Paterson Group	Project Ref: PE5791	Page 1 of 1
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 9 Auriga Drive, Ottawa, Ontario, K2E 7T9	PO #: 59844	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca	Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☒ Ind/Comm ☒ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 7
For RSC: ☒ Yes ☐ No

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

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	BTEX	PHCs (F1-F4)	PAHs	ICP Metals	Chromium VI	Mercury	EC + SAR	pH				
1	BH1-24-AU1	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔	✔				
2	BH2-24-AU1	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔					
3	BH3-24-SS2A	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔					
4	BH4-24-AU1	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔					
5	BH5-24-SS4	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔	✔				
6	BH6-24-AU1	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔					
7	SOIL DUP-1	S		2	April 2, 2024		✔	✔	✔	✔	✔	✔	✔					
8																		
9																		
10																		

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received at Depot:	Received at Lab: SD	Verified By: SD
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: April 3, 2024 4:54pm	Date/Time: April 4, 2024 12:46pm
Date/Time: April 3, 2024	Temperature: °C	Temperature: 6.6	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Client PO: 59866
Project: PE5791
Custody:

Report Date: 10-Apr-2024
Order Date: 4-Apr-2024

Order #: 2414345

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

Paracel ID	Client ID
2414345-01	BH7-24-AU1
2414345-02	BH8-24-AU1
2414345-03	BH9-24-AU1
2414345-04	BH10-24-AU1
2414345-05	BH11-24-SS2A
2414345-06	BH11-24-SS4
2414345-07	SOIL DUP-2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-24	8-Apr-24
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	9-Apr-24	9-Apr-24
Conductivity	MOE E3138 - probe @25 °C, water ext	8-Apr-24	10-Apr-24
Mercury by CVAA	EPA 7471B - CVAA, digestion	8-Apr-24	8-Apr-24
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	8-Apr-24	8-Apr-24
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	5-Apr-24	8-Apr-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	8-Apr-24	8-Apr-24
PHC F1	CWS Tier 1 - P&T GC-FID	5-Apr-24	5-Apr-24
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	10-Apr-24	10-Apr-24
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Apr-24	10-Apr-24
SAR	Calculated	10-Apr-24	10-Apr-24
Solids, %	CWS Tier 1 - Gravimetric	5-Apr-24	8-Apr-24

Certificate of Analysis

Report Date: 10-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 4-Apr-2024

Client PO: **59866**

Project Description: PE5791

	Client ID:	BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00		
	Sample ID:	2414345-01	2414345-02	2414345-03	2414345-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	96.9	95.8	97.2	94.5	-	-
General Inorganics							
SAR	0.01 N/A	4.95	7.89	2.05	7.89	-	-
Conductivity	5 uS/cm	746	1170	2310	1120	-	-
pH	0.05 pH Units	7.51	-	-	-	-	-
Metals							
Antimony	1 ug/g	<1	<1	<1	<1	-	-
Arsenic	1 ug/g	2	3	2	2	-	-
Barium	1 ug/g	188	69	466	108	-	-
Beryllium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Boron	5.0 ug/g	14.6	12.2	18.0	7.1	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Chromium	5 ug/g	10	19	15	12	-	-
Cobalt	1 ug/g	5	6	5	3	-	-
Copper	5 ug/g	8	14	9	7	-	-
Lead	1 ug/g	8	6	9	18	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	<1	<1	<1	<1	-	-
Nickel	5 ug/g	12	12	12	8	-	-
Selenium	1 ug/g	<1	<1	<1	<1	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1	<1	<1	<1	-	-
Tin	5 ug/g	<5	<5	<5	<5	-	-
Uranium	1 ug/g	<1	<1	<1	<1	-	-

	Client ID:	BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00		
	Sample ID:	2414345-01	2414345-02	2414345-03	2414345-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Vanadium	10 ug/g	28	24	17	15	-	-
Zinc	20 ug/g	<20	<20	<20	<20	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Ethylbenzene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
Toluene	0.002 ug/g	<0.002	<0.002	<0.002	<0.002	-	-
m,p-Xylenes	0.002 ug/g	<0.002	<0.002	0.003	0.005	-	-
o-Xylene	0.002 ug/g	<0.002	<0.002	<0.002	0.002	-	-
Xylenes, total	0.002 ug/g	<0.002	<0.002	0.003	0.007	-	-
Toluene-d8	Surrogate	106%	105%	105%	107%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 mg/kg	<40 [1]	59	<4	<40 [1]	-	-
F3 PHCs (C16-C34)	8 mg/kg	<80	111	98	119	-	-
F4 PHCs (C34-C50)	6 mg/kg	1050 [3]	239 [3]	269 [3]	744 [3]	-	-
F4G PHCs (gravimetric)	50 ug/g	2500	449	-	2280	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	0.03	0.02	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg	0.05	<0.02	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	0.07	<0.04	<0.04	<0.04	-	-
Acenaphthene	0.02 mg/kg	<0.02	<0.02	<0.02	<0.02	-	-
Acenaphthylene	0.02 mg/kg	<0.02	0.02	<0.02	<0.02	-	-
Anthracene	0.02 mg/kg	<0.02	<0.02	<0.02	0.03	-	-
Benzo [a] anthracene	0.02 mg/kg	0.02	<0.02	<0.02	0.06	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.02	<0.02	<0.02	0.04	-	-

	Client ID:	BH7-24-AU1	BH8-24-AU1	BH9-24-AU1	BH10-24-AU1	-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00		
	Sample ID:	2414345-01	2414345-02	2414345-03	2414345-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	0.03	<0.02	<0.02	0.04	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	0.03	0.03	0.02	0.03	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.02	<0.02	<0.02	0.02	-	-
Biphenyl	0.02 mg/kg	<0.02	<0.02	<0.02	<0.02	-	-
Chrysene	0.02 mg/kg	0.02	<0.02	<0.02	0.05	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	<0.02	<0.02	<0.02	-	-
Fluoranthene	0.02 mg/kg	0.05	<0.02	0.04	0.12	-	-
Fluorene	0.02 mg/kg	<0.02	<0.02	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	<0.02	<0.02	<0.02	-	-
Naphthalene	0.01 mg/kg	0.02	<0.01	0.02	<0.01	-	-
Phenanthrene	0.02 mg/kg	0.07	0.02	0.03	0.10	-	-
Pyrene	0.02 mg/kg	0.05	0.04	0.04	0.11	-	-
Quinoline	0.10 mg/kg	<0.10	<0.10	<0.10	<0.10	-	-
2-Fluorobiphenyl	Surrogate	71.6%	76.4%	70.4%	77.0%	-	-
Terphenyl-d14	Surrogate	77.7%	68.5%	74.0%	83.5%	-	-

	Client ID:	BH11-24-SS2A	BH11-24-SS4	SOIL DUP-2		-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00			
	Sample ID:	2414345-05	2414345-06	2414345-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	89.1	-	96.6	-	-	-
General Inorganics							
SAR	0.01 N/A	2.66	-	3.70	-	-	-
Conductivity	5 uS/cm	216	-	756	-	-	-
pH	0.05 pH Units	-	7.48	-	-	-	-
Metals							
Antimony	1 ug/g	<1	-	<1	-	-	-
Arsenic	1 ug/g	3	-	2	-	-	-
Barium	1 ug/g	105	-	227	-	-	-
Beryllium	0.5 ug/g	0.6	-	<0.5	-	-	-
Boron	5.0 ug/g	<5.0	-	16.8	-	-	-
Cadmium	0.5 ug/g	<0.5	-	<0.5	-	-	-
Chromium	5 ug/g	29	-	13	-	-	-
Chromium (VI)	0.2 ug/g	0.3	-	<0.2	-	-	-
Cobalt	1 ug/g	9	-	5	-	-	-
Copper	5 ug/g	20	-	8	-	-	-
Lead	1 ug/g	6	-	9	-	-	-
Mercury	0.1 ug/g	<0.1	-	<0.1	-	-	-
Molybdenum	1 ug/g	<1	-	<1	-	-	-
Nickel	5 ug/g	18	-	13	-	-	-
Selenium	1 ug/g	<1	-	<1	-	-	-
Silver	0.3 ug/g	<0.3	-	<0.3	-	-	-
Thallium	1 ug/g	<1	-	<1	-	-	-
Tin	5 ug/g	<5	-	<5	-	-	-
Uranium	1 ug/g	<1	-	<1	-	-	-

	Client ID:	BH11-24-SS2A	BH11-24-SS4	SOIL DUP-2		-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00			
	Sample ID:	2414345-05	2414345-06	2414345-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Metals							
Vanadium	10 ug/g	43	-	34	-	-	-
Zinc	20 ug/g	43	-	<20	-	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	-	<0.002	-	-	-
Ethylbenzene	0.002 ug/g	<0.002	-	<0.002	-	-	-
Toluene	0.002 ug/g	<0.002	-	<0.002	-	-	-
m,p-Xylenes	0.002 ug/g	<0.002	-	<0.002	-	-	-
o-Xylene	0.002 ug/g	<0.002	-	<0.002	-	-	-
Xylenes, total	0.002 ug/g	<0.002	-	<0.002	-	-	-
Toluene-d8	Surrogate	109%	-	107%	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	-	<7	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	<4	-	<40 [1]	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	24	-	85	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	171 [3]	-	875 [3]	-	-	-
F4G PHCs (gravimetric)	50 ug/g	303	-	3430	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.04	-	<0.04	-	-	-
Acenaphthene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Acenaphthylene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Anthracene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.02	-	<0.02	-	-	-

	Client ID:	BH11-24-SS2A	BH11-24-SS4	SOIL DUP-2		-	-
	Sample Date:	03-Apr-24 09:00	03-Apr-24 09:00	03-Apr-24 09:00			
	Sample ID:	2414345-05	2414345-06	2414345-07			
	Matrix:	Soil	Soil	Soil			
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	<0.02	-	0.02	-	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Biphenyl	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Chrysene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Fluoranthene	0.02 mg/kg	<0.02	-	0.02	-	-	-
Fluorene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	-	<0.02	-	-	-
Naphthalene	0.01 mg/kg	<0.01	-	<0.01	-	-	-
Phenanthrene	0.02 mg/kg	<0.02	-	0.03	-	-	-
Pyrene	0.02 mg/kg	<0.02	-	0.02	-	-	-
Quinoline	0.10 mg/kg	<0.10	-	<0.10	-	-	-
2-Fluorobiphenyl	Surrogate	62.1%	-	74.4%	-	-	-
Terphenyl-d14	Surrogate	66.5%	-	84.5%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
Conductivity	ND	5	uS/cm					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	mg/kg					
F2 PHCs (C10-C16)	ND	4	mg/kg					
F3 PHCs (C16-C34)	ND	8	mg/kg					
F4 PHCs (C34-C50)	ND	6	mg/kg					
F4G PHCs (gravimetric)	ND	50	ug/g					
Metals								
Antimony	ND	1	ug/g					
Arsenic	ND	1	ug/g					
Barium	ND	1	ug/g					
Beryllium	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5	ug/g					
Cobalt	ND	1	ug/g					
Copper	ND	5	ug/g					
Lead	ND	1	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1	ug/g					
Nickel	ND	5	ug/g					
Selenium	ND	1	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1	ug/g					
Tin	ND	5	ug/g					
Uranium	ND	1	ug/g					
Vanadium	ND	10	ug/g					
Zinc	ND	20	ug/g					
Semi-Volatiles								
1-Methylnaphthalene	ND	0.02	mg/kg					
2-Methylnaphthalene	ND	0.02	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylnaphthalene (1&2)	ND	0.04	mg/kg					
Acenaphthene	ND	0.02	mg/kg					
Acenaphthylene	ND	0.02	mg/kg					
Anthracene	ND	0.02	mg/kg					
Benzo [a] anthracene	ND	0.02	mg/kg					
Benzo [a] pyrene	ND	0.02	mg/kg					
Benzo [b] fluoranthene	ND	0.02	mg/kg					
Benzo [g,h,i] perylene	ND	0.02	mg/kg					
Benzo [k] fluoranthene	ND	0.02	mg/kg					
Biphenyl	ND	0.02	mg/kg					
Chrysene	ND	0.02	mg/kg					
Dibenzo [a,h] anthracene	ND	0.02	mg/kg					
Fluoranthene	ND	0.02	mg/kg					
Fluorene	ND	0.02	mg/kg					
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg					
Naphthalene	ND	0.01	mg/kg					
Phenanthrene	ND	0.02	mg/kg					
Pyrene	ND	0.02	mg/kg					
Quinoline	ND	0.10	mg/kg					
Surrogate: 2-Fluorobiphenyl	*0.847*		*%*	*63.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.09*		*%*	*81.9*	*50-140*			
Volatiles								
Benzene	ND	0.002	ug/g					
Ethylbenzene	ND	0.002	ug/g					
Toluene	ND	0.002	ug/g					
m,p-Xylenes	ND	0.002	ug/g					
o-Xylene	ND	0.002	ug/g					
Xylenes, total	ND	0.002	ug/g					
Surrogate: Toluene-d8	*0.423*		*%*	*106*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.12	0.01	N/A	0.12			3.5	30	
Conductivity	103	5	uS/cm	99.8			3.0	5	
pH	7.56	0.05	pH Units	7.51			0.7	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	14	7	mg/kg	18			21.3	40	
F2 PHCs (C10-C16)	ND	4	mg/kg	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	mg/kg	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	mg/kg	ND			NC	30	
Metals									
Antimony	ND	1	ug/g	ND			NC	30	
Arsenic	2.6	1	ug/g	2.9			12.3	30	
Barium	67.3	1	ug/g	71.2			5.6	30	
Beryllium	0.50	0.5	ug/g	0.52			3.8	30	
Boron	5.5	5.0	ug/g	5.8			3.7	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	18.8	5	ug/g	19.3			2.6	30	
Cobalt	3.9	1	ug/g	4.0			4.2	30	
Copper	7.4	5	ug/g	7.8			5.6	30	
Lead	5.2	1	ug/g	5.5			4.4	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	ND	1	ug/g	ND			NC	30	
Nickel	7.7	5	ug/g	8.2			6.1	30	
Selenium	ND	1	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1	ug/g	ND			NC	30	
Tin	ND	5	ug/g	ND			NC	30	
Uranium	ND	1	ug/g	ND			NC	30	
Vanadium	33.0	10	ug/g	34.1			3.3	30	
Zinc	32.0	20	ug/g	33.3			4.0	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	89.6	0.1	% by Wt.	89.8			0.3	25	
Semi-Volatiles									
1-Methylnaphthalene	ND	0.02	mg/kg	0.023			NC	40	
2-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthylene	ND	0.02	mg/kg	0.021			NC	40	
Anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] pyrene	ND	0.02	mg/kg	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Benzo [g,h,i] perylene	0.036	0.02	mg/kg	0.030			17.2	40	
Benzo [k] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Biphenyl	ND	0.02	mg/kg	ND			NC	40	
Chrysene	ND	0.02	mg/kg	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg	ND			NC	40	
Fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Fluorene	ND	0.02	mg/kg	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg	ND			NC	40	
Naphthalene	ND	0.01	mg/kg	ND			NC	40	
Phenanthrene	ND	0.02	mg/kg	0.022			NC	40	
Pyrene	0.047	0.02	mg/kg	0.043			9.2	40	
Quinoline	ND	0.10	mg/kg	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*0.891*		*%*		*64.0*	*50-140*			
Surrogate: Terphenyl-d14	*1.04*		*%*		*74.7*	*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)	187	7	mg/kg	ND	93.6	85-115			
F2 PHCs (C10-C16)	100	4	mg/kg	ND	116	60-140			
F3 PHCs (C16-C34)	271	8	mg/kg	ND	129	60-140			
F4 PHCs (C34-C50)	181	6	mg/kg	ND	136	60-140			
F4G PHCs (gravimetric)	1180	50	ug/g	ND	118	80-120			
Metals									
Antimony	22.1	1	ug/g	ND	44.2	70-130			
Arsenic	46.5	1	ug/g	1.2	90.7	70-130			
Barium	69.7	1	ug/g	28.5	82.4	70-130			
Beryllium	46.1	0.5	ug/g	ND	91.7	70-130			
Boron	45.0	5.0	ug/g	ND	85.4	70-130			
Cadmium	44.1	0.5	ug/g	ND	88.0	70-130			
Chromium (VI)	4.7	0.2	ug/g	ND	90.5	70-130			
Chromium	53.0	5	ug/g	7.7	90.5	70-130			
Cobalt	46.5	1	ug/g	1.6	89.9	70-130			
Copper	46.5	5	ug/g	ND	86.8	70-130			
Lead	46.2	1	ug/g	2.2	88.0	70-130			
Mercury	1.33	0.1	ug/g	ND	88.4	70-130			
Molybdenum	45.0	1	ug/g	ND	89.3	70-130			
Nickel	47.4	5	ug/g	ND	88.2	70-130			
Selenium	44.5	1	ug/g	ND	88.5	70-130			
Silver	40.6	0.3	ug/g	ND	81.2	70-130			
Thallium	44.6	1	ug/g	ND	89.1	70-130			
Tin	43.5	5	ug/g	ND	86.6	70-130			
Uranium	46.9	1	ug/g	ND	93.5	70-130			
Vanadium	58.1	10	ug/g	13.6	88.9	70-130			
Zinc	56.9	20	ug/g	ND	87.1	70-130			
Semi-Volatiles									
1-Methylnaphthalene	0.163	0.02	mg/kg	0.023	80.1	50-140			
2-Methylnaphthalene	0.168	0.02	mg/kg	ND	96.3	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acenaphthene	0.173	0.02	mg/kg	ND	99.3	50-140			
Acenaphthylene	0.201	0.02	mg/kg	0.021	103	50-140			
Anthracene	0.202	0.02	mg/kg	ND	116	50-140			
Benzo [a] anthracene	0.197	0.02	mg/kg	ND	113	50-140			
Benzo [a] pyrene	0.154	0.02	mg/kg	ND	88.7	50-140			
Benzo [b] fluoranthene	0.191	0.02	mg/kg	ND	110	50-140			
Benzo [g,h,i] perylene	0.157	0.02	mg/kg	0.030	72.7	50-140			
Benzo [k] fluoranthene	0.194	0.02	mg/kg	ND	111	50-140			
Biphenyl	0.184	0.02	mg/kg	ND	106	50-140			
Chrysene	0.190	0.02	mg/kg	ND	109	50-140			
Dibenzo [a,h] anthracene	0.138	0.02	mg/kg	ND	79.3	50-140			
Fluoranthene	0.187	0.02	mg/kg	ND	108	50-140			
Fluorene	0.169	0.02	mg/kg	ND	97.2	50-140			
Indeno [1,2,3-cd] pyrene	0.149	0.02	mg/kg	ND	85.9	50-140			
Naphthalene	0.169	0.01	mg/kg	ND	96.9	50-140			
Phenanthrene	0.197	0.02	mg/kg	0.022	101	50-140			
Pyrene	0.212	0.02	mg/kg	0.043	97.3	50-140			
Quinoline	0.157	0.10	mg/kg	ND	90.3	50-140			
Surrogate: 2-Fluorobiphenyl	*1.05*		*%*		*75.2*	*50-140*			
Surrogate: Terphenyl-d14	*0.985*		*%*		*70.7*	*50-140*			
Volatiles									
Benzene	0.202	0.002	ug/g	ND	101	60-140			
Ethylbenzene	0.220	0.002	ug/g	ND	110	60-140			
Toluene	0.209	0.002	ug/g	ND	104	60-140			
m,p-Xylenes	0.455	0.002	ug/g	ND	114	60-140			
o-Xylene	0.226	0.002	ug/g	ND	113	60-140			
Surrogate: Toluene-d8	*0.413*		*%*		*103*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved. Prepared in the lab as directed by client.

Applies to Samples: BH7-24-AU1, BH8-24-AU1, BH9-24-AU1, BH10-24-AU1, BH11-24-SS2A, BH11-24-SS4, SOIL DUP-2

Sample Qualifiers :

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

Applies to Samples: BH7-24-AU1, BH10-24-AU1, SOIL DUP-2

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

Applies to Samples: BH7-24-AU1, BH8-24-AU1, BH9-24-AU1, BH10-24-AU1, BH11-24-SS2A, SOIL DUP-2

Sample Data Revisions:

None

Certificate of Analysis

Report Date: 10-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 4-Apr-2024

Client PO: 59866

Project Description: PE5791

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2414345	

Client Name: Paterson Group	Project Ref: PE5791	Page 1 of 1
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 9 Auriga Drive, Ottawa, Ontario, K2E 7T9	PO #: 59866	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca	Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☒ Ind/Comm ☒ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 7
For RSC: ☒ Yes ☐ No

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

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	BTEX	PHCs (F1-F4)	PAHs	ICP Metals	Chromium VI	Mercury	EC + SAR	pH
1	BH7-24-AU1	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	✔
2	BH8-24-AU1	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	
3	BH9-24-AU1	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	
4	BH10-24-AU1	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	
5	BH11-24-SS2A	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	
6	BH11-24-SS4	S		2	April 3, 2024									✔
7	SOIL DUP-2	S		2	April 3, 2024		✔	✔	✔	✔	✔	✔	✔	
8														
9														
10														

Comments: Please extract small volume of soil from the large sample jars for in-house CCME analysis

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received at Depot:	Received at Lab: SD	Verified By: SD
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: April 4, 2024 4:05p	Date/Time: April 4, 2024 4:25p
Date/Time: April 4, 2024	Temperature: °C	Temperature: 17.0	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Client PO: 59878
Project: PE5791
Custody:

Report Date: 11-Apr-2024
Order Date: 5-Apr-2024

Order #: 2414434

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

Paracel ID	Client ID
2414434-01	BH12-24-SS2
2414434-02	BH13-24-AU1
2414434-03	BH14-24-SS3
2414434-04	BH15-24-AU1
2414434-05	BH16-24-AU2
2414434-06	BH16-24-SS5

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-24	9-Apr-24
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	10-Apr-24	10-Apr-24
Conductivity	MOE E3138 - probe @25 °C, water ext	8-Apr-24	10-Apr-24
Mercury by CVAA	EPA 7471B - CVAA, digestion	9-Apr-24	9-Apr-24
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	9-Apr-24	9-Apr-24
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	8-Apr-24	11-Apr-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	9-Apr-24	9-Apr-24
PHC F1	CWS Tier 1 - P&T GC-FID	8-Apr-24	8-Apr-24
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	10-Apr-24	11-Apr-24
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	8-Apr-24	9-Apr-24
SAR	Calculated	10-Apr-24	10-Apr-24
Solids, %	CWS Tier 1 - Gravimetric	8-Apr-24	9-Apr-24

	Client ID:	BH12-24-SS2	BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00		
	Sample ID:	2414434-01	2414434-02	2414434-03	2414434-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	85.1	96.1	91.7	89.1	-	-
General Inorganics							
SAR	0.01 N/A	7.51	1.61	8.61	9.12	-	-
Conductivity	5 uS/cm	1170	1220	1230	1280	-	-
pH	0.05 pH Units	-	7.58	-	-	-	-
Metals							
Antimony	1 ug/g	<1	<1	<1	<1	-	-
Arsenic	1 ug/g	4	2	4	3	-	-
Barium	1 ug/g	549	45	241	243	-	-
Beryllium	0.5 ug/g	0.8	<0.5	0.7	<0.5	-	-
Boron	5.0 ug/g	21.2	8.9	22.9	10.8	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	<0.5	<0.5	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	<0.2	<0.2	-	-
Chromium	5 ug/g	26	9	28	19	-	-
Cobalt	1 ug/g	8	3	10	6	-	-
Copper	5 ug/g	14	7	14	17	-	-
Lead	1 ug/g	13	9	10	34	-	-
Mercury	0.1 ug/g	<0.1	<0.1	<0.1	<0.1	-	-
Molybdenum	1 ug/g	<1	2	<1	3	-	-
Nickel	5 ug/g	15	10	20	14	-	-
Selenium	1 ug/g	<1	<1	<1	<1	-	-
Silver	0.3 ug/g	<0.3	<0.3	<0.3	<0.3	-	-
Thallium	1 ug/g	<1	<1	<1	<1	-	-
Tin	5 ug/g	<5	<5	<5	<5	-	-
Uranium	1 ug/g	<1	<1	<1	<1	-	-

	Client ID:	BH12-24-SS2	BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00		
	Sample ID:	2414434-01	2414434-02	2414434-03	2414434-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Vanadium	10 ug/g	37	23	35	29	-	-
Zinc	20 ug/g	77	<20	37	36	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	0.004	<0.002	<0.002	-	-
Ethylbenzene	0.002 ug/g	0.003	0.002	<0.002	<0.002	-	-
Toluene	0.002 ug/g	<0.002	0.014	<0.002	0.006	-	-
m,p-Xylenes	0.002 ug/g	0.014	0.011	<0.002	0.008	-	-
o-Xylene	0.002 ug/g	0.006	0.005	<0.002	0.004	-	-
Xylenes, total	0.002 ug/g	0.020	0.016	<0.002	0.011	-	-
Toluene-d8	Surrogate	105%	106%	104%	107%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	<7	<7	<7	-	-
F2 PHCs (C10-C16)	4 mg/kg	<4	<40 [1]	<4	<4	-	-
F3 PHCs (C16-C34)	8 mg/kg	40	284	12	159	-	-
F4 PHCs (C34-C50)	6 mg/kg	184 [2]	1770 [2]	65	432 [2]	-	-
F4G PHCs (gravimetric)	50 ug/g	1060	5230	-	2240	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.04	<0.80 [1]	<0.04	<0.80 [1]	-	-
Acenaphthene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Acenaphthylene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Anthracene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-

	Client ID:	BH12-24-SS2	BH13-24-AU1	BH14-24-SS3	BH15-24-AU1	-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00	04-Apr-24 09:00		
	Sample ID:	2414434-01	2414434-02	2414434-03	2414434-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Biphenyl	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Chrysene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Fluoranthene	0.02 mg/kg	0.03	<0.40 [1]	<0.02	<0.40 [1]	-	-
Fluorene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Naphthalene	0.01 mg/kg	<0.01	<0.20 [1]	<0.01	<0.20 [1]	-	-
Phenanthrene	0.02 mg/kg	<0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Pyrene	0.02 mg/kg	0.02	<0.40 [1]	<0.02	<0.40 [1]	-	-
Quinoline	0.10 mg/kg	<0.10	<2.00 [1]	<0.10	<2.00 [1]	-	-
2-Fluorobiphenyl	Surrogate	76.9%	71.9%	82.2%	57.3%	-	-
Terphenyl-d14	Surrogate	91.0%	84.0%	88.4%	71.1%	-	-

	Client ID:	BH16-24-AU2	BH16-24-SS5			-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00				
	Sample ID:	2414434-05	2414434-06				
	Matrix:	Soil	Soil				
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	86.6	-	-	-	-	-
General Inorganics							
SAR	0.01 N/A	4.87	-	-	-	-	-
Conductivity	5 uS/cm	596	-	-	-	-	-
pH	0.05 pH Units	-	7.57	-	-	-	-
Metals							
Antimony	1 ug/g	<1	-	-	-	-	-
Arsenic	1 ug/g	3	-	-	-	-	-
Barium	1 ug/g	174	-	-	-	-	-
Beryllium	0.5 ug/g	0.6	-	-	-	-	-
Boron	5.0 ug/g	<5.0	-	-	-	-	-
Cadmium	0.5 ug/g	<0.5	-	-	-	-	-
Chromium	5 ug/g	39	-	-	-	-	-
Chromium (VI)	0.2 ug/g	0.6	-	-	-	-	-
Cobalt	1 ug/g	10	-	-	-	-	-
Copper	5 ug/g	20	-	-	-	-	-
Lead	1 ug/g	7	-	-	-	-	-
Mercury	0.1 ug/g	<0.1	-	-	-	-	-
Molybdenum	1 ug/g	<1	-	-	-	-	-
Nickel	5 ug/g	23	-	-	-	-	-
Selenium	1 ug/g	<1	-	-	-	-	-
Silver	0.3 ug/g	<0.3	-	-	-	-	-
Thallium	1 ug/g	<1	-	-	-	-	-
Tin	5 ug/g	<5	-	-	-	-	-
Uranium	1 ug/g	<1	-	-	-	-	-

	Client ID:	BH16-24-AU2	BH16-24-SS5			-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00				
	Sample ID:	2414434-05	2414434-06				
	Matrix:	Soil	Soil				
	MDL/Units						
Metals							
Vanadium	10 ug/g	55	-	-	-	-	-
Zinc	20 ug/g	56	-	-	-	-	-
Volatiles							
Benzene	0.002 ug/g	<0.002	-	-	-	-	-
Ethylbenzene	0.002 ug/g	<0.002	-	-	-	-	-
Toluene	0.002 ug/g	<0.002	-	-	-	-	-
m,p-Xylenes	0.002 ug/g	<0.002	-	-	-	-	-
o-Xylene	0.002 ug/g	<0.002	-	-	-	-	-
Xylenes, total	0.002 ug/g	<0.002	-	-	-	-	-
Toluene-d8	Surrogate	106%	-	-	-	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	-	-	-	-	-
F2 PHCs (C10-C16)	4 mg/kg	<4	-	-	-	-	-
F3 PHCs (C16-C34)	8 mg/kg	18	-	-	-	-	-
F4 PHCs (C34-C50)	6 mg/kg	180 [2]	-	-	-	-	-
F4G PHCs (gravimetric)	50 ug/g	335	-	-	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	<0.02	-	-	-	-	-
2-Methylnaphthalene	0.02 mg/kg	<0.02	-	-	-	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	<0.04	-	-	-	-	-
Acenaphthene	0.02 mg/kg	<0.02	-	-	-	-	-
Acenaphthylene	0.02 mg/kg	<0.02	-	-	-	-	-
Anthracene	0.02 mg/kg	<0.02	-	-	-	-	-
Benzo [a] anthracene	0.02 mg/kg	<0.02	-	-	-	-	-
Benzo [a] pyrene	0.02 mg/kg	<0.02	-	-	-	-	-

	Client ID:	BH16-24-AU2	BH16-24-SS5			-	-
	Sample Date:	04-Apr-24 09:00	04-Apr-24 09:00				
	Sample ID:	2414434-05	2414434-06				
	Matrix:	Soil	Soil				
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	<0.02	-	-	-	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	<0.02	-	-	-	-	-
Benzo [k] fluoranthene	0.02 mg/kg	<0.02	-	-	-	-	-
Biphenyl	0.02 mg/kg	<0.02	-	-	-	-	-
Chrysene	0.02 mg/kg	<0.02	-	-	-	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	-	-	-	-	-
Fluoranthene	0.02 mg/kg	<0.02	-	-	-	-	-
Fluorene	0.02 mg/kg	<0.02	-	-	-	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	-	-	-	-	-
Naphthalene	0.01 mg/kg	<0.01	-	-	-	-	-
Phenanthrene	0.02 mg/kg	<0.02	-	-	-	-	-
Pyrene	0.02 mg/kg	<0.02	-	-	-	-	-
Quinoline	0.10 mg/kg	<0.10	-	-	-	-	-
2-Fluorobiphenyl	Surrogate	64.7%	-	-	-	-	-
Terphenyl-d14	Surrogate	73.6%	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
Conductivity	ND	5	uS/cm					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	mg/kg					
F2 PHCs (C10-C16)	ND	4	mg/kg					
F3 PHCs (C16-C34)	ND	8	mg/kg					
F4 PHCs (C34-C50)	ND	6	mg/kg					
F4G PHCs (gravimetric)	ND	50	ug/g					
Metals								
Antimony	ND	1	ug/g					
Arsenic	ND	1	ug/g					
Barium	ND	1	ug/g					
Beryllium	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5	ug/g					
Cobalt	ND	1	ug/g					
Copper	ND	5	ug/g					
Lead	ND	1	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1	ug/g					
Nickel	ND	5	ug/g					
Selenium	ND	1	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1	ug/g					
Tin	ND	5	ug/g					
Uranium	ND	1	ug/g					
Vanadium	ND	10	ug/g					
Zinc	ND	20	ug/g					
Semi-Volatiles								
1-Methylnaphthalene	ND	0.02	mg/kg					
2-Methylnaphthalene	ND	0.02	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylnaphthalene (1&2)	ND	0.04	mg/kg					
Acenaphthene	ND	0.02	mg/kg					
Acenaphthylene	ND	0.02	mg/kg					
Anthracene	ND	0.02	mg/kg					
Benzo [a] anthracene	ND	0.02	mg/kg					
Benzo [a] pyrene	ND	0.02	mg/kg					
Benzo [b] fluoranthene	ND	0.02	mg/kg					
Benzo [g,h,i] perylene	ND	0.02	mg/kg					
Benzo [k] fluoranthene	ND	0.02	mg/kg					
Biphenyl	ND	0.02	mg/kg					
Chrysene	ND	0.02	mg/kg					
Dibenzo [a,h] anthracene	ND	0.02	mg/kg					
Fluoranthene	ND	0.02	mg/kg					
Fluorene	ND	0.02	mg/kg					
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg					
Naphthalene	ND	0.01	mg/kg					
Phenanthrene	ND	0.02	mg/kg					
Pyrene	ND	0.02	mg/kg					
Quinoline	ND	0.10	mg/kg					
Surrogate: 2-Fluorobiphenyl	*1.01*		*%*	*75.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.31*		*%*	*98.1*	*50-140*			
Volatiles								
Benzene	ND	0.002	ug/g					
Ethylbenzene	ND	0.002	ug/g					
Toluene	ND	0.002	ug/g					
m,p-Xylenes	ND	0.002	ug/g					
o-Xylene	ND	0.002	ug/g					
Xylenes, total	ND	0.002	ug/g					
Surrogate: Toluene-d8	*0.423*		*%*	*106*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.12	0.01	N/A	0.12			3.5	30	
Conductivity	103	5	uS/cm	99.8			3.0	5	
pH	7.68	0.05	pH Units	7.73			0.6	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	mg/kg	ND			NC	30	
F3 PHCs (C16-C34)	80	8	mg/kg	40			66.7	30	QR-04
F4 PHCs (C34-C50)	289	6	mg/kg	184			44.5	30	QR-04
Metals									
Antimony	ND	1	ug/g	ND			NC	30	
Arsenic	2.7	1	ug/g	2.6			6.5	30	
Barium	12.9	1	ug/g	13.4			3.4	30	
Beryllium	ND	0.5	ug/g	ND			NC	30	
Boron	8.4	5.0	ug/g	7.8			7.1	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	11.7	5	ug/g	10.6			9.8	30	
Cobalt	3.1	1	ug/g	3.1			0.9	30	
Copper	12.8	5	ug/g	12.9			0.4	30	
Lead	9.0	1	ug/g	9.1			1.3	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	ND	1	ug/g	ND			NC	30	
Nickel	7.2	5	ug/g	7.3			1.2	30	
Selenium	ND	1	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1	ug/g	ND			NC	30	
Tin	ND	5	ug/g	ND			NC	30	
Uranium	ND	1	ug/g	ND			NC	30	
Vanadium	30.8	10	ug/g	28.6			7.2	30	
Zinc	68.9	20	ug/g	70.6			2.4	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	94.1	0.1	% by Wt.	94.2			0.2	25	
Semi-Volatiles									
1-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
2-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthylene	ND	0.02	mg/kg	ND			NC	40	
Anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] pyrene	ND	0.02	mg/kg	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	mg/kg	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Biphenyl	ND	0.02	mg/kg	ND			NC	40	
Chrysene	ND	0.02	mg/kg	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg	ND			NC	40	
Fluoranthene	ND	0.02	mg/kg	0.024			NC	40	
Fluorene	ND	0.02	mg/kg	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg	ND			NC	40	
Naphthalene	ND	0.01	mg/kg	0.220			NC	40	
Phenanthrene	ND	0.02	mg/kg	0.026			NC	40	
Pyrene	ND	0.02	mg/kg	0.024			NC	40	
Quinoline	ND	0.10	mg/kg	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*1.17*		*%*		*70.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.36*		*%*		*82.1*	*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)	199	7	mg/kg	ND	99.4	85-115			
F2 PHCs (C10-C16)	106	4	mg/kg	ND	112	60-140			
F3 PHCs (C16-C34)	335	8	mg/kg	40	128	60-140			
F4 PHCs (C34-C50)	453	6	mg/kg	184	185	60-140			QM-06
F4G PHCs (gravimetric)	1180	50	ug/g	ND	118	80-120			
Metals									
Arsenic	50.0	1	ug/g	1.0	97.9	70-130			
Barium	55.5	1	ug/g	5.3	100	70-130			
Beryllium	51.8	0.5	ug/g	ND	103	70-130			
Boron	51.6	5.0	ug/g	ND	97.0	70-130			
Cadmium	50.6	0.5	ug/g	ND	101	70-130			
Chromium (VI)	3.8	0.2	ug/g	ND	71.5	70-130			
Chromium	57.0	5	ug/g	ND	106	70-130			
Cobalt	52.0	1	ug/g	1.3	102	70-130			
Copper	53.1	5	ug/g	5.2	95.9	70-130			
Lead	49.5	1	ug/g	3.6	91.6	70-130			
Mercury	1.37	0.1	ug/g	ND	91.2	70-130			
Molybdenum	49.5	1	ug/g	ND	98.3	70-130			
Nickel	53.0	5	ug/g	ND	100	70-130			
Selenium	48.4	1	ug/g	ND	96.6	70-130			
Silver	45.5	0.3	ug/g	ND	91.0	70-130			
Thallium	50.0	1	ug/g	ND	99.9	70-130			
Tin	50.0	5	ug/g	ND	99.7	70-130			
Uranium	55.0	1	ug/g	ND	110	70-130			
Vanadium	65.6	10	ug/g	11.5	108	70-130			
Zinc	75.0	20	ug/g	28.2	93.4	70-130			
Semi-Volatiles									
1-Methylnaphthalene	0.200	0.02	mg/kg	ND	97.0	50-140			
2-Methylnaphthalene	0.155	0.02	mg/kg	ND	75.1	50-140			
Acenaphthene	0.166	0.02	mg/kg	ND	80.5	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acenaphthylene	0.185	0.02	mg/kg	ND	89.7	50-140			
Anthracene	0.205	0.02	mg/kg	ND	99.2	50-140			
Benzo [a] anthracene	0.179	0.02	mg/kg	ND	86.6	50-140			
Benzo [a] pyrene	0.151	0.02	mg/kg	ND	72.9	50-140			
Benzo [b] fluoranthene	0.176	0.02	mg/kg	ND	85.1	50-140			
Benzo [g,h,i] perylene	0.139	0.02	mg/kg	ND	67.4	50-140			
Benzo [k] fluoranthene	0.211	0.02	mg/kg	ND	102	50-140			
Biphenyl	0.177	0.02	mg/kg	ND	85.5	50-140			
Chrysene	0.198	0.02	mg/kg	ND	95.7	50-140			
Dibenzo [a,h] anthracene	0.155	0.02	mg/kg	ND	75.2	50-140			
Fluoranthene	0.201	0.02	mg/kg	0.024	85.5	50-140			
Fluorene	0.170	0.02	mg/kg	ND	82.2	50-140			
Indeno [1,2,3-cd] pyrene	0.136	0.02	mg/kg	ND	66.0	50-140			
Naphthalene	0.465	0.01	mg/kg	0.220	118	50-140			
Phenanthrene	0.194	0.02	mg/kg	0.026	81.5	50-140			
Pyrene	0.217	0.02	mg/kg	0.024	93.8	50-140			
Quinoline	0.203	0.10	mg/kg	ND	98.1	50-140			
Surrogate: 2-Fluorobiphenyl	*1.12*		*%*		*67.7*	*50-140*			
Surrogate: Terphenyl-d14	*1.30*		*%*		*78.4*	*50-140*			
Volatiles									
Benzene	0.202	0.002	ug/g	ND	101	60-140			
Ethylbenzene	0.220	0.002	ug/g	ND	110	60-140			
Toluene	0.209	0.002	ug/g	ND	104	60-140			
m,p-Xylenes	0.455	0.002	ug/g	ND	114	60-140			
o-Xylene	0.226	0.002	ug/g	ND	113	60-140			
Surrogate: Toluene-d8	*0.413*		*%*		*103*	*60-140*			

Qualifier Notes:

Sample Qualifiers :

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

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

Applies to Samples: BH12-24-SS2, BH13-24-AU1, BH15-24-AU1, BH16-24-AU2

QC Qualifiers:

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

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

Sample Data Revisions:

None

Certificate of Analysis

Report Date: 11-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 5-Apr-2024

Client PO: 59878

Project Description: PE5791

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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

PARACEL LABORATORIES LTD.

Paracel ID: 2414434

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2414434	

Client Name: Paterson Group	Project Ref: PE5791	Page 1 of 1
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 9 Auriga Drive, Ottawa, Ontario, K2E 7T9	PO #: 59878	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613-226-7381	E-mail: nsullivan@patersongroup.ca	Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☒ Ind/Comm ☒ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 7
For RSC: ☒ Yes ☐ No

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

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	BTEX	PHCs (F1-F4)	PAHs	ICP Metals	Chromium VI	Mercury	EC + SAR	pH
1	BH12-24-SS2	S		3	April 4, 2024		✔	✔	✔	✔	✔	✔	✔	
2	BH13-24-AU1	S		3	April 4, 2024		✔	✔	✔	✔	✔	✔	✔	✔
3	BH14-24-SS3	S		3	April 4, 2024		✔	✔	✔	✔	✔	✔	✔	
4	BH15-24-AU1	S		3	April 4, 2024		✔	✔	✔	✔	✔	✔	✔	
5	BH16-24-AU2	S		3	April 4, 2024		✔	✔	✔	✔	✔	✔	✔	
6	BH16-24-SS5	S		1	April 4, 2024									✔
7														
8														
9														
10														

Required Analysis

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received at Depot:	Received at Lab: SD	Verified By: SD
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: April 5, 2024 3:55	Date/Time: April 5, 2024 4:22pm
Date/Time: April 5, 2024	Temperature: °C	Temperature: 12.9	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Client PO: 59904
Project: PE5791
Custody:

Report Date: 15-Apr-2024
Order Date: 9-Apr-2024

Order #: 2415201

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

Paracel ID	Client ID
2415201-01	BH17-24-AU1
2415201-02	BH18-24-AU2
2415201-03	BH18-24-SS6
2415201-04	SOIL DUP-3

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	10-Apr-24	11-Apr-24
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	11-Apr-24	11-Apr-24
Conductivity	MOE E3138 - probe @25 °C, water ext	11-Apr-24	12-Apr-24
Mercury by CVAA	EPA 7471B - CVAA, digestion	11-Apr-24	12-Apr-24
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	11-Apr-24	12-Apr-24
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	11-Apr-24	14-Apr-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	11-Apr-24	11-Apr-24
PHC F1	CWS Tier 1 - P&T GC-FID	10-Apr-24	10-Apr-24
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	12-Apr-24	12-Apr-24
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	11-Apr-24	12-Apr-24
SAR	Calculated	12-Apr-24	12-Apr-24
Solids, %	CWS Tier 1 - Gravimetric	12-Apr-24	15-Apr-24

Certificate of Analysis

Report Date: 15-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 9-Apr-2024

Client PO: **59904**

Project Description: PE5791

	Client ID:	BH17-24-AU1	BH18-24-AU2	BH18-24-SS6	SOIL DUP-3	-	-
	Sample Date:	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00		
	Sample ID:	2415201-01	2415201-02	2415201-03	2415201-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	97.0	95.8	-	95.1	-	-
General Inorganics							
SAR	0.01 N/A	0.11	2.77	-	2.66	-	-
Conductivity	5 uS/cm	1390	719	-	699	-	-
pH	0.05 pH Units	7.59	-	10.37	-	-	-
Metals							
Antimony	1 ug/g	2	<1	-	<1	-	-
Arsenic	1 ug/g	<1	2	-	2	-	-
Barium	1 ug/g	46	69	-	75	-	-
Beryllium	0.5 ug/g	<0.5	<0.5	-	<0.5	-	-
Boron	5.0 ug/g	10.9	12.5	-	12.6	-	-
Cadmium	0.5 ug/g	<0.5	<0.5	-	<0.5	-	-
Chromium	5 ug/g	<5	46	-	51	-	-
Chromium (VI)	0.2 ug/g	<0.2	<0.2	-	<0.2	-	-
Cobalt	1 ug/g	<1	4	-	4	-	-
Copper	5 ug/g	25	9	-	9	-	-
Lead	1 ug/g	27	7	-	8	-	-
Mercury	0.1 ug/g	<0.1	<0.1	-	<0.1	-	-
Molybdenum	1 ug/g	2	1	-	1	-	-
Nickel	5 ug/g	<5	10	-	10	-	-
Selenium	1 ug/g	1	<1	-	<1	-	-
Silver	0.3 ug/g	<0.3	<0.3	-	<0.3	-	-
Thallium	1 ug/g	<1	<1	-	<1	-	-
Tin	5 ug/g	<5	<5	-	<5	-	-
Uranium	1 ug/g	<1	<1	-	<1	-	-

Certificate of Analysis

Report Date: 15-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 9-Apr-2024

Client PO: **59904**

Project Description: **PE5791**

	Client ID:	BH17-24-AU1	BH18-24-AU2	BH18-24-SS6	SOIL DUP-3	-	-
	Sample Date:	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00		
	Sample ID:	2415201-01	2415201-02	2415201-03	2415201-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Metals							
Vanadium	10 ug/g	<10	19	-	19	-	-
Zinc	20 ug/g	25	<20	-	<20	-	-
Volatiles							
Benzene	0.002 ug/g	0.004	0.003	-	0.004	-	-
Ethylbenzene	0.002 ug/g	0.003	0.006	-	0.005	-	-
Toluene	0.002 ug/g	0.019	0.018	-	0.019	-	-
m,p-Xylenes	0.002 ug/g	0.012	0.018	-	0.017	-	-
o-Xylene	0.002 ug/g	0.005	0.007	-	0.006	-	-
Xylenes, total	0.002 ug/g	0.017	0.025	-	0.024	-	-
Toluene-d8	Surrogate	104%	104%	-	105%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	7 mg/kg	<7	<7	-	<7	-	-
F2 PHCs (C10-C16)	4 mg/kg	<40 [1]	<40 [1]	-	<40 [1]	-	-
F3 PHCs (C16-C34)	8 mg/kg	153	465	-	574	-	-
F4 PHCs (C34-C50)	6 mg/kg	1900 [2]	1600 [2]	-	1920 [2]	-	-
F4G PHCs (gravimetric)	50 mg/kg	7510	2100	-	1750	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.02 mg/kg	0.02	<0.02	-	<0.02	-	-
2-Methylnaphthalene	0.02 mg/kg	0.03	<0.02	-	<0.02	-	-
Methylnaphthalene (1&2)	0.04 mg/kg	0.05	<0.04	-	<0.04	-	-
Acenaphthene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Acenaphthylene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Anthracene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Benzo [a] anthracene	0.02 mg/kg	0.03	0.05	-	0.03	-	-
Benzo [a] pyrene	0.02 mg/kg	0.03	0.05	-	0.04	-	-

	Client ID:	BH17-24-AU1	BH18-24-AU2	BH18-24-SS6	SOIL DUP-3	-	-
	Sample Date:	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00	05-Apr-24 09:00		
	Sample ID:	2415201-01	2415201-02	2415201-03	2415201-04		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Semi-Volatiles							
Benzo [b] fluoranthene	0.02 mg/kg	0.03	0.04	-	0.03	-	-
Benzo [g,h,i] perylene	0.02 mg/kg	0.03	0.06	-	0.04	-	-
Benzo [k] fluoranthene	0.02 mg/kg	0.03	0.04	-	0.02	-	-
Biphenyl	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Chrysene	0.02 mg/kg	0.03	0.07	-	0.05	-	-
Dibenzo [a,h] anthracene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Fluoranthene	0.02 mg/kg	0.05	0.09	-	0.07	-	-
Fluorene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 mg/kg	<0.02	<0.02	-	<0.02	-	-
Naphthalene	0.01 mg/kg	<0.01	<0.01	-	<0.01	-	-
Phenanthrene	0.02 mg/kg	0.05	0.06	-	0.04	-	-
Pyrene	0.02 mg/kg	0.06	0.09	-	0.07	-	-
Quinoline	0.10 mg/kg	<0.10	<0.10	-	<0.10	-	-
2-Fluorobiphenyl	Surrogate	64.4%	81.6%	-	69.8%	-	-
Terphenyl-d14	Surrogate	72.9%	87.0%	-	67.5%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics								
Conductivity	ND	5	uS/cm					
Hydrocarbons								
F1 PHCs (C6-C10)	ND	7	mg/kg					
F4G PHCs (gravimetric)	ND	50	mg/kg					
Metals								
Antimony	ND	1	ug/g					
Arsenic	ND	1	ug/g					
Barium	ND	1	ug/g					
Beryllium	ND	0.5	ug/g					
Boron	ND	5.0	ug/g					
Cadmium	ND	0.5	ug/g					
Chromium (VI)	ND	0.2	ug/g					
Chromium	ND	5	ug/g					
Cobalt	ND	1	ug/g					
Copper	ND	5	ug/g					
Lead	ND	1	ug/g					
Mercury	ND	0.1	ug/g					
Molybdenum	ND	1	ug/g					
Nickel	ND	5	ug/g					
Selenium	ND	1	ug/g					
Silver	ND	0.3	ug/g					
Thallium	ND	1	ug/g					
Tin	ND	5	ug/g					
Uranium	ND	1	ug/g					
Vanadium	ND	10	ug/g					
Zinc	ND	20	ug/g					
Semi-Volatiles								
1-Methylnaphthalene	ND	0.02	mg/kg					
2-Methylnaphthalene	ND	0.02	mg/kg					
Methylnaphthalene (1&2)	ND	0.04	mg/kg					
Acenaphthene	ND	0.02	mg/kg					
Acenaphthylene	ND	0.02	mg/kg					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anthracene	ND	0.02	mg/kg					
Benzo [a] anthracene	ND	0.02	mg/kg					
Benzo [a] pyrene	ND	0.02	mg/kg					
Benzo [b] fluoranthene	ND	0.02	mg/kg					
Benzo [g,h,i] perylene	ND	0.02	mg/kg					
Benzo [k] fluoranthene	ND	0.02	mg/kg					
Biphenyl	ND	0.02	mg/kg					
Chrysene	ND	0.02	mg/kg					
Dibenzo [a,h] anthracene	ND	0.02	mg/kg					
Fluoranthene	ND	0.02	mg/kg					
Fluorene	ND	0.02	mg/kg					
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg					
Naphthalene	ND	0.01	mg/kg					
Phenanthrene	ND	0.02	mg/kg					
Pyrene	ND	0.02	mg/kg					
Quinoline	ND	0.10	mg/kg					
Surrogate: 2-Fluorobiphenyl	*0.754*		*%*	*56.6*	*50-140*			
Surrogate: Terphenyl-d14	*1.07*		*%*	*80.6*	*50-140*			
Volatiles								
Benzene	ND	0.002	ug/g					
Ethylbenzene	ND	0.002	ug/g					
Toluene	ND	0.002	ug/g					
m,p-Xylenes	ND	0.002	ug/g					
o-Xylene	ND	0.002	ug/g					
Xylenes, total	ND	0.002	ug/g					
Surrogate: Toluene-d8	*0.423*		*%*	*106*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	1.21	0.01	N/A	1.30			7.2	30	
Conductivity	ND	5	uS/cm	4360			NC	5	
pH	7.32	0.05	pH Units	7.28			0.5	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	mg/kg	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	mg/kg	ND			NC	30	
F4 PHCs (C34-C50)	ND	6	mg/kg	ND			NC	30	
Metals									
Antimony	ND	1	ug/g	ND			NC	30	
Arsenic	7.2	1	ug/g	7.2			0.8	30	
Barium	16.9	1	ug/g	15.8			6.8	30	
Beryllium	ND	0.5	ug/g	ND			NC	30	
Boron	6.2	5.0	ug/g	6.8			9.9	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	23.9	5	ug/g	23.6			1.1	30	
Cobalt	7.2	1	ug/g	7.2			0.1	30	
Copper	11.5	5	ug/g	11.2			3.0	30	
Lead	20.0	1	ug/g	20.7			3.5	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	9.4	1	ug/g	9.5			1.5	30	
Nickel	17.0	5	ug/g	17.3			2.1	30	
Selenium	ND	1	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1	ug/g	ND			NC	30	
Tin	ND	5	ug/g	ND			NC	30	
Uranium	ND	1	ug/g	ND			NC	30	
Vanadium	16.3	10	ug/g	16.4			0.4	30	
Zinc	ND	20	ug/g	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Physical Characteristics									
% Solids	97.1	0.1	% by Wt.	97.0			0.2	25	
Semi-Volatiles									
1-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
2-Methylnaphthalene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthene	ND	0.02	mg/kg	ND			NC	40	
Acenaphthylene	ND	0.02	mg/kg	ND			NC	40	
Anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] anthracene	ND	0.02	mg/kg	ND			NC	40	
Benzo [a] pyrene	ND	0.02	mg/kg	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	mg/kg	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Biphenyl	ND	0.02	mg/kg	ND			NC	40	
Chrysene	ND	0.02	mg/kg	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	mg/kg	ND			NC	40	
Fluoranthene	ND	0.02	mg/kg	ND			NC	40	
Fluorene	ND	0.02	mg/kg	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	mg/kg	ND			NC	40	
Naphthalene	ND	0.01	mg/kg	ND			NC	40	
Phenanthrene	ND	0.02	mg/kg	ND			NC	40	
Pyrene	ND	0.02	mg/kg	ND			NC	40	
Quinoline	ND	0.10	mg/kg	ND			NC	40	
Surrogate: 2-Fluorobiphenyl	*0.956*		*%*		*63.3*	*50-140*			
Surrogate: Terphenyl-d14	*1.29*		*%*		*85.4*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	187	7	mg/kg	ND	109	85-115			
F2 PHCs (C10-C16)	92	4	mg/kg	ND	100	60-140			
F3 PHCs (C16-C34)	282	8	mg/kg	ND	124	60-140			
F4 PHCs (C34-C50)	181	6	mg/kg	ND	126	60-140			
F4G PHCs (gravimetric)	1150	50	mg/kg	ND	115	80-120			
Metals									
Antimony	35.9	1	ug/g	ND	71.8	70-130			
Arsenic	50.5	1	ug/g	2.9	95.4	70-130			
Barium	52.5	1	ug/g	6.3	92.3	70-130			
Beryllium	49.6	0.5	ug/g	ND	99.0	70-130			
Boron	45.3	5.0	ug/g	ND	85.1	70-130			
Cadmium	45.1	0.5	ug/g	ND	90.1	70-130			
Chromium (VI)	2.5	0.2	ug/g	ND	36.5	70-130			QM-05
Chromium	63.2	5	ug/g	9.4	107	70-130			
Cobalt	53.5	1	ug/g	2.9	101	70-130			
Copper	52.0	5	ug/g	ND	95.0	70-130			
Lead	53.0	1	ug/g	8.3	89.4	70-130			
Mercury	1.14	0.1	ug/g	ND	75.7	70-130			
Molybdenum	51.9	1	ug/g	3.8	96.1	70-130			
Nickel	55.9	5	ug/g	6.9	98.0	70-130			
Selenium	46.1	1	ug/g	ND	91.8	70-130			
Silver	43.3	0.3	ug/g	ND	86.5	70-130			
Thallium	46.0	1	ug/g	ND	91.6	70-130			
Tin	44.0	5	ug/g	ND	87.7	70-130			
Uranium	50.0	1	ug/g	ND	99.4	70-130			
Vanadium	60.7	10	ug/g	ND	108	70-130			
Zinc	49.5	20	ug/g	ND	87.1	70-130			
Semi-Volatiles									
1-Methylnaphthalene	0.131	0.02	mg/kg	ND	69.3	50-140			
2-Methylnaphthalene	0.135	0.02	mg/kg	ND	71.5	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acenaphthene	0.160	0.02	mg/kg	ND	84.8	50-140			
Acenaphthylene	0.171	0.02	mg/kg	ND	90.7	50-140			
Anthracene	0.186	0.02	mg/kg	ND	98.3	50-140			
Benzo [a] anthracene	0.140	0.02	mg/kg	ND	74.3	50-140			
Benzo [a] pyrene	0.131	0.02	mg/kg	ND	69.6	50-140			
Benzo [b] fluoranthene	0.130	0.02	mg/kg	ND	69.0	50-140			
Benzo [g,h,i] perylene	0.137	0.02	mg/kg	ND	72.5	50-140			
Benzo [k] fluoranthene	0.141	0.02	mg/kg	ND	74.7	50-140			
Biphenyl	0.163	0.02	mg/kg	ND	86.4	50-140			
Chrysene	0.160	0.02	mg/kg	ND	84.9	50-140			
Dibenzo [a,h] anthracene	0.125	0.02	mg/kg	ND	66.3	50-140			
Fluoranthene	0.177	0.02	mg/kg	ND	93.9	50-140			
Fluorene	0.144	0.02	mg/kg	ND	76.5	50-140			
Indeno [1,2,3-cd] pyrene	0.146	0.02	mg/kg	ND	77.5	50-140			
Naphthalene	0.151	0.01	mg/kg	ND	79.8	50-140			
Phenanthrene	0.166	0.02	mg/kg	ND	87.7	50-140			
Pyrene	0.177	0.02	mg/kg	ND	93.9	50-140			
Quinoline	0.187	0.10	mg/kg	ND	99.3	50-140			
Surrogate: 2-Fluorobiphenyl	*0.894*		*%*		*59.2*	*50-140*			
Surrogate: Terphenyl-d14	*1.11*		*%*		*73.5*	*50-140*			
Volatiles									
Benzene	0.202	0.002	ug/g	ND	101	60-140			
Ethylbenzene	0.220	0.002	ug/g	ND	110	60-140			
Toluene	0.209	0.002	ug/g	ND	104	60-140			
m,p-Xylenes	0.455	0.002	ug/g	ND	114	60-140			
o-Xylene	0.226	0.002	ug/g	ND	113	60-140			
Surrogate: Toluene-d8	*0.413*		*%*		*103*	*60-140*			

Qualifier Notes:

Sample Qualifiers :

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

Applies to Samples: BH17-24-AU1, BH18-24-AU2, SOIL DUP-3

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

Applies to Samples: BH17-24-AU1, BH18-24-AU2, SOIL DUP-3

QC Qualifiers:

QM-05 The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

Sample Data Revisions:

None

Certificate of Analysis

Report Date: 15-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 9-Apr-2024

Client PO: 59904

Project Description: PE5791

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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

PARACEL LABORATORIES LTD.

Paracel ID: 2415201

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2415201	

Client Name:	Paterson Group	Project Ref: PE5791	Page 1 of 1
Contact Name:	Nick Sullivan	Quote #:	Turnaround Time
Address:	9 Auriga Drive Ottawa, Ontario, K2E 7T9	PO #: 59904	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone:	613-226-7381	E-mail: nsullivan@patersongroup.ca	Date Required:

☒ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☒ Ind/Comm ☒ Coarse
☐ Table 3 ☐ Agri/Other
☒ Table 7
For RSC: ☒ Yes ☐ No

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

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	BTEX	PHCs (F1-F4)	PAHs	ICP Metals	Chromium VI	Mercury	EC + SAR	pH				
1	BH17-24-AU1	S		3	April 5, 2024		✔	✔	✔	✔	✔	✔	✔	✔				
2	BH18-24-AU2	S		3			✔	✔	✔	✔	✔	✔	✔					
3	BH18-24-SS6	S		1										✔				
4	SOIL DUP-3	S		3			✔	✔	✔	✔	✔	✔	✔					
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: Paracel Courier

Relinquished By (Sign): N. Sullivan	Received at Depot:	Received at Lab: SS	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time:	Date/Time: Apr 9, 24, 1656	Date/Time: April 10 2024 9:35
Date/Time: April 9, 2024	Temperature: °C	Temperature: 24.8, 21.2 °C	pH Verified: ☐ By:

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Certificate of Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Client PO: 59999
Project: PE5791
Custody: 72752

Report Date: 24-Apr-2024
Order Date: 18-Apr-2024

Order #: 2416420

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

Paracel ID	Client ID
2416420-01	BH1-24-GW1
2416420-02	BH6-24-GW1
2416420-03	BH10-24-GW1
2416420-04	BH16-24-GW1
2416420-05	BH17-24-GW1
2416420-06	BH18-24-GW1
2416420-07	GW-DUP-1
2416420-08	Trip Blank

Approved By:

Mark Foto, M.Sc.

Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME-FIGQG, PAHs by GC-MS	EPA 625 - GC-MS SIM, extraction	23-Apr-24	23-Apr-24
Hardness	Hardness as CaCO3	22-Apr-24	22-Apr-24
Chromium, hexavalent, water, low level	MOE E3056 - colourimetric	24-Apr-24	24-Apr-24
Metals, ICP-MS	EPA 200.8 - ICP-MS	22-Apr-24	22-Apr-24
PHC F1	CWS Tier 1 - P&T GC-FID	19-Apr-24	20-Apr-24
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	23-Apr-24	23-Apr-24
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	20-Apr-24	20-Apr-24

	Client ID:	BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	-	-
	Sample Date:	17-Apr-24 09:00	16-Apr-24 09:00	16-Apr-24 09:00	17-Apr-24 09:00		
	Sample ID:	2416420-01	2416420-02	2416420-03	2416420-04		
	Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
	MDL/Units						
General Inorganics							
Hardness	1 mg/L	511	2190	1260	1280	-	-
Metals							
Aluminum	1 ug/L	13	10	3	2	-	-
Antimony	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Arsenic	1 ug/L	1	<1	<1	<1	-	-
Barium	1 ug/L	185	246	207	176	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Boron	10 ug/L	66	82	46	52	-	-
Calcium	100 ug/L	155000	718000	399000	363000	-	-
Chromium (VI)	1 ug/L	<1	<1	<1	1	-	-
Chromium	1 ug/L	<1	<1	<1	<1	-	-
Cobalt	0.5 ug/L	<0.5	1.7	<0.5	<0.5	-	-
Copper	0.5 ug/L	1.0	2.9	1.6	2.3	-	-
Iron	100 ug/L	<100	<100	<100	<100	-	-
Lead	0.1 ug/L	<0.1	<0.1	<0.1	<0.1	-	-
Magnesium	200 ug/L	30000	97300	65000	91300	-	-
Manganese	5 ug/L	28	29	<5	6	-	-
Molybdenum	0.5 ug/L	2.6	1.9	24.2	2.4	-	-
Nickel	1 ug/L	<1	4	3	2	-	-
Selenium	1 ug/L	1	<1	<1	2	-	-
Silver	0.1 ug/L	<0.1	<0.1	0.1	<0.1	-	-
Thallium	0.1 ug/L	<0.1	<0.1	<0.1	0.1	-	-
Titanium	5 ug/L	<5	<5	<5	<5	-	-
Uranium	0.1 ug/L	2.3	3.5	2.4	4.4	-	-
Vanadium	0.5 ug/L	1.3	1.2	<0.5	<0.5	-	-

	Client ID:	BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	-	-
	Sample Date:	17-Apr-24 09:00	16-Apr-24 09:00	16-Apr-24 09:00	17-Apr-24 09:00		
	Sample ID:	2416420-01	2416420-02	2416420-03	2416420-04		
	Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
	MDL/Units						
Metals							
Zinc	5 ug/L	<5	<5	<5	<5	-	-
Volatiles							
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
Chloroform	0.5 ug/L	6.3	1.6	0.6	0.6	-	-
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	<3.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	<0.2	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-

	Client ID:	BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	-	-
	Sample Date:	17-Apr-24 09:00	16-Apr-24 09:00	16-Apr-24 09:00	17-Apr-24 09:00		
	Sample ID:	2416420-01	2416420-02	2416420-03	2416420-04		
	Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
	MDL/Units						
Volatiles							
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	<10.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Dibromofluoromethane	Surrogate	92.0%	90.5%	103%	90.2%	-	-

	Client ID:	BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	-	-
	Sample Date:	17-Apr-24 09:00	16-Apr-24 09:00	16-Apr-24 09:00	17-Apr-24 09:00		
	Sample ID:	2416420-01	2416420-02	2416420-03	2416420-04		
	Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
	MDL/Units						
Volatiles							
4-Bromofluorobenzene	Surrogate	104%	105%	102%	104%	-	-
Toluene-d8	Surrogate	106%	106%	106%	105%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	<0.025	<0.025	<0.025	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
2-Methylnaphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Methylnaphthalene (1&2)	0.00010 mg/L	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Acenaphthene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Acridine	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Acenaphthylene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Anthracene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Benzo [a] anthracene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Benzo [a] pyrene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Benzo [b&j] fluoranthene	0.00010 mg/L	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Benzo [g,h,i] perylene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Benzo [k] fluoranthene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Chrysene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Dibenzo [a,h] anthracene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Fluoranthene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Fluorene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Indeno [1,2,3-cd] pyrene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-

	Client ID:	BH1-24-GW1	BH6-24-GW1	BH10-24-GW1	BH16-24-GW1	-	-
	Sample Date:	17-Apr-24 09:00	16-Apr-24 09:00	16-Apr-24 09:00	17-Apr-24 09:00		
	Sample ID:	2416420-01	2416420-02	2416420-03	2416420-04		
	Matrix:	Ground Water	Ground Water	Ground Water	Ground Water		
	MDL/Units						
Semi-Volatiles							
Naphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Phenanthrene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005	-	-
Pyrene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	<0.00001	-	-
Quinoline	0.00010 mg/L	<0.00010	<0.00010	<0.00010	<0.00010	-	-
Terphenyl-d14	Surrogate	87.5%	80.5%	77.2%	78.2%	-	-
Nitrobenzene-d5	Surrogate	56.5%	50.1%	51.2%	52.7%	-	-
2-Fluorobiphenyl	Surrogate	68.0%	60.4%	55.7%	54.2%	-	-

Certificate of Analysis

Report Date: 24-Apr-2024

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 18-Apr-2024

Client PO: **59999**

Project Description: PE5791

	Client ID:	BH17-24-GW1	BH18-24-GW1	GW-DUP-1	Trip Blank	-	-
	Sample Date:	16-Apr-24 09:00	17-Apr-24 09:00	16-Apr-24 09:00	13-Apr-24 09:00		
	Sample ID:	2416420-05	2416420-06	2416420-07	2416420-08		
	Matrix:	Ground Water	Ground Water	Ground Water	Water		
	MDL/Units						
General Inorganics							
Hardness	1 mg/L	691	1190	734	-	-	-
Metals							
Aluminum	1 ug/L	4	5	5	-	-	-
Antimony	0.5 ug/L	<0.5	<0.5	<0.5	-	-	-
Arsenic	1 ug/L	<1	2	<1	-	-	-
Barium	1 ug/L	102	199	100	-	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	-	-	-
Boron	10 ug/L	82	243	83	-	-	-
Calcium	100 ug/L	223000	330000	238000	-	-	-
Chromium (VI)	1 ug/L	<1	<1	<1	-	-	-
Chromium	1 ug/L	<1	<1	<1	-	-	-
Cobalt	0.5 ug/L	<0.5	<0.5	<0.5	-	-	-
Copper	0.5 ug/L	1.8	1.8	2.0	-	-	-
Iron	100 ug/L	<100	358	<100	-	-	-
Lead	0.1 ug/L	<0.1	<0.1	<0.1	-	-	-
Magnesium	200 ug/L	32700	89300	33900	-	-	-
Manganese	5 ug/L	12	112	12	-	-	-
Molybdenum	0.5 ug/L	11.7	4.0	11.7	-	-	-
Nickel	1 ug/L	3	<1	3	-	-	-
Selenium	1 ug/L	<1	<1	<1	-	-	-
Silver	0.1 ug/L	<0.1	<0.1	<0.1	-	-	-
Thallium	0.1 ug/L	0.2	<0.1	0.2	-	-	-
Titanium	5 ug/L	<5	<5	<5	-	-	-
Uranium	0.1 ug/L	2.9	1.3	2.9	-	-	-
Vanadium	0.5 ug/L	<0.5	0.7	<0.5	-	-	-

	Client ID:	BH17-24-GW1	BH18-24-GW1	GW-DUP-1	Trip Blank	-	-
	Sample Date:	16-Apr-24 09:00	17-Apr-24 09:00	16-Apr-24 09:00	13-Apr-24 09:00		
	Sample ID:	2416420-05	2416420-06	2416420-07	2416420-08		
	Matrix:	Ground Water	Ground Water	Ground Water	Water		
	MDL/Units						
Metals							
Zinc	5 ug/L	<5	<5	<5	-	-	-
Volatiles							
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	<3.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	<0.2	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-

	Client ID:	BH17-24-GW1	BH18-24-GW1	GW-DUP-1	Trip Blank	-	-
	Sample Date:	16-Apr-24 09:00	17-Apr-24 09:00	16-Apr-24 09:00	13-Apr-24 09:00		
	Sample ID:	2416420-05	2416420-06	2416420-07	2416420-08		
	Matrix:	Ground Water	Ground Water	Ground Water	Water		
	MDL/Units						
Volatiles							
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	<10.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5	-	-
Toluene-d8	Surrogate	106%	106%	106%	107%	-	-

	Client ID:	BH17-24-GW1	BH18-24-GW1	GW-DUP-1	Trip Blank	-	-
	Sample Date:	16-Apr-24 09:00	17-Apr-24 09:00	16-Apr-24 09:00	13-Apr-24 09:00		
	Sample ID:	2416420-05	2416420-06	2416420-07	2416420-08		
	Matrix:	Ground Water	Ground Water	Ground Water	Water		
	MDL/Units						
Volatiles							
4-Bromofluorobenzene	Surrogate	100%	106%	101%	101%	-	-
Dibromofluoromethane	Surrogate	100%	89.0%	97.0%	97.8%	-	-
Hydrocarbons							
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	<0.025	<0.025	-	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	<0.1	-	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	<0.1	-	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	<0.1	-	-	-
Semi-Volatiles							
1-Methylnaphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
2-Methylnaphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Methylnaphthalene (1&2)	0.00010 mg/L	<0.00010	<0.00010	<0.00010	-	-	-
Acenaphthene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Acridine	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Acenaphthylene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Anthracene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	-	-	-
Benzo [a] anthracene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	-	-	-
Benzo [a] pyrene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	-	-	-
Benzo [b&j] fluoranthene	0.00010 mg/L	<0.00010	<0.00010	<0.00010	-	-	-
Benzo [g,h,i] perylene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Benzo [k] fluoranthene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Chrysene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Dibenzo [a,h] anthracene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Fluoranthene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	-	-	-
Fluorene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Indeno [1,2,3-cd] pyrene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-

	Client ID:	BH17-24-GW1	BH18-24-GW1	GW-DUP-1	Trip Blank	-	-
	Sample Date:	16-Apr-24 09:00	17-Apr-24 09:00	16-Apr-24 09:00	13-Apr-24 09:00		
	Sample ID:	2416420-05	2416420-06	2416420-07	2416420-08		
	Matrix:	Ground Water	Ground Water	Ground Water	Water		
	MDL/Units						
Semi-Volatiles							
Naphthalene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Phenanthrene	0.00005 mg/L	<0.00005	<0.00005	<0.00005	-	-	-
Pyrene	0.00001 mg/L	<0.00001	<0.00001	<0.00001	-	-	-
Quinoline	0.00010 mg/L	<0.00010	<0.00010	<0.00010	-	-	-
Terphenyl-d14	Surrogate	80.3%	79.2%	87.1%	-	-	-
Nitrobenzene-d5	Surrogate	50.1%	62.3%	61.7%	-	-	-
2-Fluorobiphenyl	Surrogate	60.1%	55.9%	60.4%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons								
F1 PHCs (C6-C10)	ND	0.025	mg/L					
F2 PHCs (C10-C16)	ND	0.1	mg/L					
F3 PHCs (C16-C34)	ND	0.1	mg/L					
F4 PHCs (C34-C50)	ND	0.1	mg/L					
Metals								
Aluminum	ND	1	ug/L					
Antimony	ND	0.5	ug/L					
Arsenic	ND	1	ug/L					
Barium	ND	1	ug/L					
Beryllium	ND	0.5	ug/L					
Boron	ND	10	ug/L					
Calcium	ND	100	ug/L					
Chromium (VI)	ND	1	ug/L					
Chromium	ND	1	ug/L					
Cobalt	ND	0.5	ug/L					
Copper	ND	0.5	ug/L					
Iron	ND	100	ug/L					
Lead	ND	0.1	ug/L					
Magnesium	ND	200	ug/L					
Manganese	ND	5	ug/L					
Molybdenum	ND	0.5	ug/L					
Nickel	ND	1	ug/L					
Selenium	ND	1	ug/L					
Silver	ND	0.1	ug/L					
Thallium	ND	0.1	ug/L					
Titanium	ND	5	ug/L					
Uranium	ND	0.1	ug/L					
Vanadium	ND	0.5	ug/L					
Zinc	ND	5	ug/L					
Semi-Volatiles								
1-Methylnaphthalene	ND	0.00005	mg/L					
2-Methylnaphthalene	ND	0.00005	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Methylnaphthalene (1&2)	ND	0.00010	mg/L					
Acenaphthene	ND	0.00005	mg/L					
Acridine	ND	0.00005	mg/L					
Acenaphthylene	ND	0.00005	mg/L					
Anthracene	ND	0.00001	mg/L					
Benzo [a] anthracene	ND	0.00001	mg/L					
Benzo [a] pyrene	ND	0.00001	mg/L					
Benzo [b&j] fluoranthene	ND	0.00010	mg/L					
Benzo [g,h,i] perylene	ND	0.00005	mg/L					
Benzo [k] fluoranthene	ND	0.00005	mg/L					
Chrysene	ND	0.00005	mg/L					
Dibenzo [a,h] anthracene	ND	0.00005	mg/L					
Fluoranthene	ND	0.00001	mg/L					
Fluorene	ND	0.00005	mg/L					
Indeno [1,2,3-cd] pyrene	ND	0.00005	mg/L					
Naphthalene	ND	0.00005	mg/L					
Phenanthrene	ND	0.00005	mg/L					
Pyrene	ND	0.00001	mg/L					
Quinoline	ND	0.00010	mg/L					
Surrogate: Terphenyl-d14	*0.0175*		*%*	*87.6*	*50-140*			
Surrogate: Nitrobenzene-d5	*0.0101*		*%*	*50.5*	*50-140*			
Surrogate: 2-Fluorobiphenyl	*0.0109*		*%*	*54.7*	*50-140*			
Volatiles								
Acetone	ND	5.0	ug/L					
Benzene	ND	0.5	ug/L					
Bromodichloromethane	ND	0.5	ug/L					
Bromoform	ND	0.5	ug/L					
Bromomethane	ND	0.5	ug/L					
Carbon Tetrachloride	ND	0.2	ug/L					
Chlorobenzene	ND	0.5	ug/L					
Chloroethane	ND	1.0	ug/L					
Chloroform	ND	0.5	ug/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloromethane	ND	3.0	ug/L					
Dibromochloromethane	ND	0.5	ug/L					
Dichlorodifluoromethane	ND	1.0	ug/L					
1,2-Dibromoethane	ND	0.2	ug/L					
1,2-Dichlorobenzene	ND	0.5	ug/L					
1,3-Dichlorobenzene	ND	0.5	ug/L					
1,4-Dichlorobenzene	ND	0.5	ug/L					
1,1-Dichloroethane	ND	0.5	ug/L					
1,2-Dichloroethane	ND	0.5	ug/L					
1,1-Dichloroethylene	ND	0.5	ug/L					
cis-1,2-Dichloroethylene	ND	0.5	ug/L					
trans-1,2-Dichloroethylene	ND	0.5	ug/L					
1,2-Dichloroethylene, total	ND	0.5	ug/L					
1,2-Dichloropropane	ND	0.5	ug/L					
cis-1,3-Dichloropropylene	ND	0.5	ug/L					
trans-1,3-Dichloropropylene	ND	0.5	ug/L					
1,3-Dichloropropene, total	ND	0.5	ug/L					
Ethylbenzene	ND	0.5	ug/L					
Hexane	ND	1.0	ug/L					
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L					
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L					
Methyl Isobutyl Ketone	ND	5.0	ug/L					
Methyl tert-butyl ether	ND	2.0	ug/L					
Methylene Chloride	ND	5.0	ug/L					
Styrene	ND	0.5	ug/L					
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L					
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L					
Tetrachloroethylene	ND	0.5	ug/L					
Toluene	ND	0.5	ug/L					
1,1,1-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					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
1,3,5-Trimethylbenzene	ND	0.5	ug/L					
Vinyl chloride	ND	0.5	ug/L					
m,p-Xylenes	ND	0.5	ug/L					
o-Xylene	ND	0.5	ug/L					
Xylenes, total	ND	0.5	ug/L					
Surrogate: 4-Bromofluorobenzene	*80.1*		*%*	*100*	*50-140*			
Surrogate: Dibromofluoromethane	*73.3*		*%*	*91.6*	*50-140*			
Surrogate: Toluene-d8	*85.2*		*%*	*107*	*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	0.025	mg/L	ND			NC	30	
Metals									
Aluminum	13.6	1	ug/L	13.5			0.9	20	
Antimony	ND	0.5	ug/L	ND			NC	20	
Arsenic	1.1	1	ug/L	1.1			2.2	20	
Barium	188	1	ug/L	185			2.0	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	65	10	ug/L	66			0.7	20	
Calcium	154000	100	ug/L	155000			1.0	20	
Chromium (VI)	ND	1	ug/L	ND			NC	20	
Chromium	ND	1	ug/L	ND			NC	20	
Cobalt	ND	0.5	ug/L	ND			NC	20	
Copper	0.95	0.5	ug/L	0.99			4.5	20	
Iron	ND	100	ug/L	ND			NC	20	
Lead	ND	0.1	ug/L	ND			NC	20	
Magnesium	29800	200	ug/L	30000			0.8	20	
Manganese	27.7	5	ug/L	28.4			2.2	20	
Molybdenum	2.49	0.5	ug/L	2.57			3.2	20	
Nickel	ND	1	ug/L	ND			NC	20	
Selenium	1.2	1	ug/L	1.3			4.0	20	
Silver	0.29	0.1	ug/L	ND			NC	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Titanium	ND	5	ug/L	ND			NC	20	
Uranium	2.3	0.1	ug/L	2.3			0.3	20	
Vanadium	1.31	0.5	ug/L	1.33			1.5	20	
Zinc	ND	5	ug/L	ND			NC	20	
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	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	
Chloroethane	ND	1.0	ug/L	ND			NC	30	
Chloroform	ND	0.5	ug/L	ND			NC	30	
Chloromethane	ND	3.0	ug/L	ND			NC	30	
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dibromoethane	ND	0.2	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	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	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
1,3,5-Trimethylbenzene	ND	0.5	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	*81.5*		*%*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*83.5*		*%*		*104*	*50-140*			
Surrogate: Toluene-d8	*83.7*		*%*		*105*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.92	0.025	mg/L	ND	96.1	85-115			
F2 PHCs (C10-C16)	1.8	0.1	mg/L	ND	111	60-140			
F3 PHCs (C16-C34)	5.3	0.1	mg/L	ND	136	60-140			
F4 PHCs (C34-C50)	3.3	0.1	mg/L	ND	135	60-140			
Metals									
Aluminum	63.6	1	ug/L	13.5	100	80-120			
Arsenic	53.2	1	ug/L	1.1	104	80-120			
Barium	220	1	ug/L	185	70.2	80-120			QM-07
Beryllium	49.4	0.5	ug/L	ND	98.6	80-120			
Boron	101	10	ug/L	66	69.2	80-120			QM-07
Calcium	8940	100	ug/L	ND	88.6	80-120			
Chromium (VI)	91	1	ug/L	ND	45.5	70-130			QM-05
Chromium	59.7	1	ug/L	ND	119	80-120			
Cobalt	54.0	0.5	ug/L	ND	108	80-120			
Copper	49.7	0.5	ug/L	0.99	97.4	80-120			
Iron	2320	100	ug/L	ND	92.3	80-120			
Lead	47.3	0.1	ug/L	ND	94.4	80-120			
Magnesium	38300	200	ug/L	30000	82.9	80-120			
Manganese	78.9	5	ug/L	28.4	101	80-120			
Molybdenum	49.5	0.5	ug/L	2.57	93.9	80-120			
Nickel	51.7	1	ug/L	ND	102	80-120			
Selenium	45.6	1	ug/L	1.3	88.5	80-120			
Silver	39.6	0.1	ug/L	ND	79.1	80-120			QM-07
Thallium	48.4	0.1	ug/L	ND	96.8	80-120			
Titanium	64.2	5	ug/L	ND	128	80-120			QM-07
Uranium	54.8	0.1	ug/L	2.3	105	80-120			
Vanadium	63.9	0.5	ug/L	1.33	125	80-120			QM-07
Zinc	43	5	ug/L	ND	82.2	80-120			
Semi-Volatiles									
1-Methylnaphthalene	0.00357	0.00005	mg/L	ND	71.4	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
2-Methylnaphthalene	0.00349	0.00005	mg/L	ND	69.9	50-140			
Acenaphthene	0.00320	0.00005	mg/L	ND	64.1	50-140			
Acridine	0.00256	0.00005	mg/L	ND	51.1	50-140			
Acenaphthylene	0.00284	0.00005	mg/L	ND	56.9	50-140			
Anthracene	0.00281	0.00001	mg/L	ND	56.3	50-140			
Benzo [a] anthracene	0.00279	0.00001	mg/L	ND	55.7	50-140			
Benzo [a] pyrene	0.00348	0.00001	mg/L	ND	69.5	50-140			
Benzo [b&j] fluoranthene	0.00757	0.00010	mg/L	ND	75.7	0-200			
Benzo [g,h,i] perylene	0.00335	0.00005	mg/L	ND	67.0	50-140			
Benzo [k] fluoranthene	0.00387	0.00005	mg/L	ND	77.4	50-140			
Chrysene	0.00358	0.00005	mg/L	ND	71.7	50-140			
Dibenzo [a,h] anthracene	0.00364	0.00005	mg/L	ND	72.9	50-140			
Fluoranthene	0.00326	0.00001	mg/L	ND	65.3	50-140			
Fluorene	0.00321	0.00005	mg/L	ND	64.1	50-140			
Indeno [1,2,3-cd] pyrene	0.00317	0.00005	mg/L	ND	63.5	50-140			
Naphthalene	0.00316	0.00005	mg/L	ND	63.2	50-140			
Phenanthrene	0.00340	0.00005	mg/L	ND	67.9	50-140			
Pyrene	0.00326	0.00001	mg/L	ND	65.2	50-140			
Quinoline	0.00263	0.00010	mg/L	ND	52.5	50-140			
Surrogate: Terphenyl-d14	*0.0142*		*%*		*71.2*	*50-140*			
Surrogate: Nitrobenzene-d5	*0.0100*		*%*		*50.1*	*50-140*			
Surrogate: 2-Fluorobiphenyl	*0.0111*		*%*		*55.7*	*50-140*			
Volatiles									
Acetone	101	5.0	ug/L	ND	101	50-140			
Benzene	40.5	0.5	ug/L	ND	101	60-130			
Bromodichloromethane	33.5	0.5	ug/L	ND	83.8	60-130			
Bromoform	29.8	0.5	ug/L	ND	74.4	60-130			
Bromomethane	41.9	0.5	ug/L	ND	105	50-140			
Carbon Tetrachloride	30.8	0.2	ug/L	ND	77.0	60-130			
Chlorobenzene	38.6	0.5	ug/L	ND	96.5	60-130			
Chloroethane	37.6	1.0	ug/L	ND	94.1	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	37.5	0.5	ug/L	ND	93.7	60-130			
Chloromethane	34.3	3.0	ug/L	ND	85.7	50-140			
Dibromochloromethane	32.5	0.5	ug/L	ND	81.3	60-130			
Dichlorodifluoromethane	37.2	1.0	ug/L	ND	93.0	50-140			
1,2-Dibromoethane	43.4	0.2	ug/L	ND	109	60-130			
1,2-Dichlorobenzene	36.4	0.5	ug/L	ND	91.0	60-130			
1,3-Dichlorobenzene	35.4	0.5	ug/L	ND	88.6	60-130			
1,4-Dichlorobenzene	34.8	0.5	ug/L	ND	87.0	60-130			
1,1-Dichloroethane	41.3	0.5	ug/L	ND	103	60-130			
1,2-Dichloroethane	41.5	0.5	ug/L	ND	104	60-130			
1,1-Dichloroethylene	40.6	0.5	ug/L	ND	101	60-130			
cis-1,2-Dichloroethylene	37.7	0.5	ug/L	ND	94.4	60-130			
trans-1,2-Dichloroethylene	35.9	0.5	ug/L	ND	89.8	60-130			
1,2-Dichloropropane	39.8	0.5	ug/L	ND	99.6	60-130			
cis-1,3-Dichloropropylene	35.6	0.5	ug/L	ND	89.0	60-130			
trans-1,3-Dichloropropylene	32.6	0.5	ug/L	ND	81.5	60-130			
Ethylbenzene	39.8	0.5	ug/L	ND	99.4	60-130			
Hexane	42.8	1.0	ug/L	ND	107	60-130			
Methyl Ethyl Ketone (2-Butanone)	85.0	5.0	ug/L	ND	85.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	89.6	10.0	ug/L	ND	89.6	50-140			
Methyl Isobutyl Ketone	80.3	5.0	ug/L	ND	80.3	50-140			
Methyl tert-butyl ether	95.2	2.0	ug/L	ND	95.2	50-140			
Methylene Chloride	44.4	5.0	ug/L	ND	111	60-130			
Styrene	34.6	0.5	ug/L	ND	86.4	60-130			
1,1,1,2-Tetrachloroethane	37.0	0.5	ug/L	ND	92.4	60-130			
1,1,2,2-Tetrachloroethane	31.0	0.5	ug/L	ND	77.4	60-130			
Tetrachloroethylene	35.4	0.5	ug/L	ND	88.6	60-130			
Toluene	41.4	0.5	ug/L	ND	104	60-130			
1,1,1-Trichloroethane	32.2	0.5	ug/L	ND	80.6	60-130			
1,1,2-Trichloroethane	36.5	0.5	ug/L	ND	91.2	60-130			
Trichloroethylene	35.8	0.5	ug/L	ND	89.4	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Trichlorofluoromethane	41.8	1.0	ug/L	ND	105	60-130			
1,3,5-Trimethylbenzene	39.0	0.5	ug/L	ND	97.4	60-130			
Vinyl chloride	39.7	0.5	ug/L	ND	99.3	50-140			
m,p-Xylenes	76.0	0.5	ug/L	ND	95.0	60-130			
o-Xylene	39.3	0.5	ug/L	ND	98.3	60-130			
Surrogate: 4-Bromofluorobenzene	*80.9*		*%*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*85.2*		*%*		*107*	*50-140*			
Surrogate: Toluene-d8	*83.3*		*%*		*104*	*50-140*			

Qualifier Notes:

QC Qualifiers:

QM-05	The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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

PARACE LABORATORIES LT

Paracel ID: 2416420

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Paracel Order Number (Lab Use Only): 2416420

Chain Of Custody (Lab Use Only): № 72752

Client Name: Paterson
Contact Name: Nick Sullivan
Address: 9 Auriga
Telephone: 613 226 7381

Project Ref: PE 5791
Quote #:
PO #: 59999
E-mail: Nsullivan@Patersongroup.ca

Page __ of __

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)

Required Analysis: VOCs; PHCs F1-F4; PAHs; ICP metals; Cr VI; Mercury

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time
1	BH1-24-GW1	GW		7	Apr 17	
2	BH6-24-GW1				Apr 16	
3	BH10-24-GW1				Apr 16	
4	BH106-24-GW1				Apr 17	
5	BH17-24-GW1				Apr 16	
6	BH18-24-GW1				Apr 17	
7	GW-DUP-1				Apr 16	
8	Trip Blank	O		1	~~Apr 13~~	
9						
10						

VOCs: X (Trip Blank)

Comments:

Method of Delivery:

Relinquished By (Sign): GPat
Relinquished By (Print): Grant Paterson
Date/Time: Apr 18

Received at Depot:
Date/Time:
Temperature: °C

Received at Lab: KB KB
Date/Time: April 18/24
Temperature: 10.8 °C

Verified By: SO
Date/Time: April 19, 2024 9:36a
pH Verified: ☑ By: SO

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www.paracellabs.com

Subcontracted Analysis

Paterson Group Consulting Engineers (Ottawa)
9 Auriga Drive
Ottawa, ON K2E 7T9
Attn: Nick Sullivan

Paracel Report No.	**2416420**
Client Project(s):	**PE5791**
Client PO:	**59999**
Reference:	**#24-017 Standing Offer 2024**
CoC Number:	**72752**

Order Date:	18-Apr-24
Report Date:	24-Apr-24

Sample(s) from this project were subcontracted for the listed parameters. A copy of the subcontractor's report is attached

Paracel ID	Client ID	Analysis
2416420-01	BH1-24-GW1	Mercury - trace level
2416420-02	BH6-24-GW1	Mercury - trace level
2416420-03	BH10-24-GW1	Mercury - trace level
2416420-04	BH16-24-GW1	Mercury - trace level
2416420-05	BH17-24-GW1	Mercury - trace level
2416420-06	BH18-24-GW1	Mercury - trace level
2416420-07	GW-DUP-1	Mercury - trace level

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CERTIFICATE OF ANALYSIS

Client:	Dale Robertson	Work Order Number:	532355
Company:	Paracel Laboratories Ltd. - Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd.	Regulation:	CCME Long Term Freshwater Quality Guidelines
	Ottawa, ON, K1G 4J8	Project #:	2416420
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	4/24/2024	Analysis Started:	4/29/2024
Arrival Temperature:	12 C	Analysis Completed:	5/1/2024

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH1-24-GW1	1997679	Ground Water	Grab		4/17/2024	
BH6-24-GW1	1997680	Ground Water	Grab		4/16/2024	
BH10-24-GW1	1997681	Ground Water	Grab		4/16/2024	
BH16-24-GW1	1997682	Ground Water	Grab		4/17/2024	
BH17-24-GW1	1997683	Ground Water	Grab		4/16/2024	
BH18-24-GW1	1997684	Ground Water	Grab		4/17/2024	
GW-DUP-1	1997685	Ground Water	Grab		4/16/2024	

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Mercury Dis. Water CV FF (S8)	Timmins	Determination of Dissolved Inorganic Mercury by Cold Vapour AA	Modified from EPA 245.7

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Phone: (705) 531-1121 Fax: (705) 531-1125 Web: www.testmark.ca

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd. - Ottawa

Work Order Number: 532355

This report has been approved by:

Adam Tam, M.Sc.
Laboratory Director

WORK ORDER RESULTS

Sample Description	BH1 - 24 - GW1		BH6 - 24 - GW1		BH10 - 24 - GW1		BH16 - 24 - GW1			
Sample Date	4/17/2024 12:00 AM		4/16/2024 12:00 AM		4/16/2024 12:00 AM		4/17/2024 12:00 AM			
Lab ID	1997679		1997680		1997681		1997682			
Mercury by CV (Dissolved)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: CCME Long Term Freshwater Quality Guidelines
Dissolved Mercury	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~

Sample Description	BH17 - 24 - GW1		BH18 - 24 - GW1		GW - DUP - 1			
Sample Date	4/16/2024 12:00 AM		4/17/2024 12:00 AM		4/16/2024 12:00 AM			
Lab ID	1997683		1997684		1997685			
Mercury by CV (Dissolved)	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: CCME Long Term Freshwater Quality Guidelines
Dissolved Mercury	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~

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CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd. - Ottawa

Work Order Number: 532355

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Organic Soil Analysis: Data reported for organic analysis in soils samples are corrected for moisture content.

Quality Control: All associated Quality Control data is available on request.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

ICPMS Dustfall Insoluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.

Regulation Comparisons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

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PARACE LABORATORIES LT

Paracel ID: 2416420

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2416420	№ 72752

Client Name: Paterson	Project Ref: PE 5791	Page __ of __
Contact Name: Nick Sullivan	Quote #:	Turnaround Time
Address: 9 Auriga	PO #: 59999	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 613 226 7381	E-mail: NSullivan@patersongroup.ca	Date Required:

☒ REG 153/04 ☐ REG 406/19

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

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

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	Required Analysis: VOCs	PHCs F1-F4	PAHs	ICP metals	Cr VI	Mercury
1	BH1-24-GW1	GW		7	Apr 17		↓	↓	↓	↓	↓	↓
2	BH6-24-GW1	↓		↓	Apr 16		↓	↓	↓	↓	↓	↓
3	BH10-24-GW1	↓		↓	Apr 16		↓	↓	↓	↓	↓	↓
4	BH106-24-GW1	↓		↓	Apr 17		↓	↓	↓	↓	↓	↓
5	BH17-24-GW1	↓		↓	Apr 16		↓	↓	↓	↓	↓	↓
6	BH18-24-GW1	↓		↓	Apr 17		↓	↓	↓	↓	↓	↓
7	GW-DUP-1	↓		↓	Apr 16		↓	↓	↓	↓	↓	↓
8	Trip Blank	O		1	~~Apr 13~~		X					
9												
10												

Comments:

Method of Delivery: Walk In

Relinquished By (Sign): GPat	Received at Depot:	Received at Lab:	Verified By: SO
Relinquished By (Print): Grant Paterson	Date/Time:	Date/Time: April 18/24 1627	Date/Time: April 19, 2024 9:36am
Date/Time: Apr 18	Temperature: °C	Temperature: 10.8 °C	pH Verified: ☑ By: SO

TESTMARK Laboratories Ltd.
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CERTIFICATE OF ANALYSIS

Client:	Dale Robertson	Work Order Number:	532355
Company:	Paracel Laboratories Ltd. - Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd.	Regulation:	CCME Long Term Freshwater Quality Guidelines
	Ottawa, ON, K1G 4J8	Project #:	2416420
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	4/24/2024	Analysis Started:	4/29/2024
Arrival Temperature:	12 C	Analysis Completed:	5/1/2024

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH1-24-GW1	1997679	Ground Water	Grab		4/17/2024	
BH6-24-GW1	1997680	Ground Water	Grab		4/16/2024	
BH10-24-GW1	1997681	Ground Water	Grab		4/16/2024	
BH16-24-GW1	1997682	Ground Water	Grab		4/17/2024	
BH17-24-GW1	1997683	Ground Water	Grab		4/16/2024	
BH18-24-GW1	1997684	Ground Water	Grab		4/17/2024	
GW-DUP-1	1997685	Ground Water	Grab		4/16/2024	

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Mercury Dis. Water CV FF (S8)	Timmins	Determination of Dissolved Inorganic Mercury by Cold Vapour AA	Modified from EPA 245.7

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CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd. - Ottawa

Work Order Number: 532355

This report has been approved by:

Adam Tam, M.Sc.
Laboratory Director

WORK ORDER RESULTS

Sample Description	BH1 - 24 - GW1		BH6 - 24 - GW1		BH10 - 24 - GW1		BH16 - 24 - GW1			
Sample Date	4/17/2024 12:00 AM		4/16/2024 12:00 AM		4/16/2024 12:00 AM		4/17/2024 12:00 AM			
Lab ID	1997679		1997680		1997681		1997682			
Mercury by CV (Dissolved)	Result	MDL	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: CCME Long Term Freshwater Quality Guidelines
Dissolved Mercury	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~

Sample Description	BH17 - 24 - GW1		BH18 - 24 - GW1		GW - DUP - 1			
Sample Date	4/16/2024 12:00 AM		4/17/2024 12:00 AM		4/16/2024 12:00 AM			
Lab ID	1997683		1997684		1997685			
Mercury by CV (Dissolved)	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: CCME Long Term Freshwater Quality Guidelines
Dissolved Mercury	<0.01	0.01	<0.01	0.01	<0.01	0.01	ug/L	~

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Phone: (705) 531-1121 Fax: (705) 531-1125 Web: www.testmark.ca

CERTIFICATE OF ANALYSIS

Paracel Laboratories Ltd. - Ottawa

Work Order Number: 532355

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Organic Soil Analysis: Data reported for organic analysis in soils samples are corrected for moisture content.

Quality Control: All associated Quality Control data is available on request.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

ICPMS Dustfall Insoluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.

Regulation Comparisons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

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PATERSON GROUP

Soil & Groundwater Management Plan

Public Road Redevelopment for Tunney's Pasture
Ottawa, Ontario

Prepared for Arcadis IBI Group

TABLE OF CONTENTS

1.0 Introduction

This Soil and Groundwater Management Plan (SGMP) was developed to minimize the soil and groundwater onsite that will require off-site disposal and when off-site disposal is required, ensuring that proper handling and disposal methods are undertaken. A high level fee estimate for the required items for soil and groundwater management during construction have been included at the end of this letter.

2.0 Soil Reuse

Soil is considered suitable for reuse on the subject site provided that the soil is not considered heavily impacted (no visible free product or significant petroleum hydrocarbon (PHC) odours) and is not used as final cover for landscaping purposes (with the exception of segregated topsoil and granular materials).

The excavated soil may be suitable for reuse on-site as backfill from a geotechnical perspective provided that it is maintained in a relatively dry condition, can be properly compacted, and is approved by the geotechnical engineer at the time of construction. Additionally, based on the conditions observed. cobbles and boulders are likely to be encountered in certain areas of the excavation. Thus, prior to reusing this soil, it will be necessary to cull out all material in excess of 300 mm in its largest dimension. Alternatively, cobbles and boulders could be processed and blended with the fill to a gradation suitable for reuse as engineered fill.

Site excavated soil can also be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and compacted to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective standard Proctor maximum dry density (SPMDD). Site excavated soil is not suitable for use as backfill against foundation walls due to the frost heave potential of the site excavated soils below settlement sensitive areas, such as concrete sidewalks and exterior concrete entrance areas.

It is recommended that stockpiles of excavated material intended for reuse be protected against increases in moisture content by securely covering the stockpiles prior to and during precipitation events. Therefore, the placement and compaction of the on-site soil should be completed during relatively dry and non-freezing conditions. If, due to any of the above conditions, the existing fill becomes unsuitable for reuse as engineered fill based on the geotechnical engineer, it should be transported and properly disposed off-site, and an imported fill material should be used. Protection of materials from increased moisture content is considered to be the responsibility of the Contractor.

3.0 Groundwater Re-use

Groundwater is considered to be suitable to manage on-site during situations where free product is not observed and no risk to the workers or the natural environment is considered to be present relating to its re-use. The groundwater must be able to be managed without entering any surface water bodies without appropriate treatment and permits.

4.0 Soil Requiring Off-Site Disposal

Soil is considered to require off-site disposal from an environmental perspective when the soil is heavily impacted. Heavily impacted soil is considered impacts that can re-contaminate areas due to leaching and consists of free product visible in the soil and/or significant PHC odours.

Based on the findings of the Phase II ESA investigation, the shallow fill material present beneath the surficial asphalt at BH4-24, BH6-24, BH13-24, and BH17-24 contains concentrations of heavier fractions of petroleum hydrocarbons (PHC F4 gravimetric) above the selected standards. Similarly, the same layer of soil/fill material present at BH5-24 contains an elevated concentration of barium above the selected standards. Given the low-mobility of these contaminants, and the non-impacted groundwater results, it is anticipated that the contamination is confined to the fill material layer above the bedrock. This contaminated soil will require excavation and disposal at a licensed waste disposal facility.

Excavated soil is not considered to be suitable for reuse on site during conditions where, in the opinion of the geotechnical engineer, the soil is saturated and/or does not have a suitable gradation for placement and compaction that will not achieve the required compaction specifications.

Soil to be disposed off-site must be evaluated by environmental personnel prior to their disposal. Heavily impacted soil must be disposed at an approved waste disposal facility. Soil observed to be clean or marginally impacted can be disposed of at a variety of waste disposal facilities, including, but not limited to, clean fill sites (clean soil only) and interim transfer stations. Based on the quality of the soil, as determined by the environmental personnel, the soil must be sent to the appropriate disposal facility.

At this time, soil disposal locations have not been selected. These locations will be selected by the construction contractor prior to mobilization.

5.0 Groundwater Requiring Off-Site Disposal

Groundwater must be disposed of off-site in situations where free product is observed. The groundwater must be disposed of following all applicable laws and regulations. Licensed pumping contractors are required to dispose of any impacted groundwater. If impacted groundwater is observed, all reasonable efforts must be made to limit the quantity of impacted groundwater pumped and disposed. Similarly, if a spill occurs all reasonable efforts should be made to protect the surface and groundwater resources. At no time is groundwater to be disposed of directly to surface water resources.

Any offsite groundwater must be disposed of through an approved method. Grossly impacted groundwater where a sheen and/or odour is identified must be treated prior to removal from site or be removed from site with the intention of offsite treatment. Excess groundwater may also be able to be disposed within the City of Ottawa Sanitary and/or Storm sewer system. Prior to disposal to the sewer system, a sewer discharge agreement must be completed with the City of Ottawa.

5.1 Construction Dewatering

The site-specific construction dewatering protocols will be provided in project- specific geotechnical and/or hydrogeological reports.

Generally, it is recommended that additional analytical testing prior to construction mobilization should be carried out to determine the appropriate disposal method. Any environmentally impacted groundwater should be pumped into a storage tanker for testing and potentially treatment before discharging to the sanitary sewer.

5.2 Groundwater Monitoring Decommissioning

All groundwater monitoring wells must be decommissioned in accordance with Ontario Regulation 903/90. It is recommended that the groundwater monitoring wells remain in place and in viable condition for as long as possible, to allow for any potential re-sampling.

6.0 Permits and Agreements

It is anticipated that the following permits and agreements will be required to conduct the Construction Contractor Obligations (with respect to the Soil and Groundwater Management Plan);

- ❑ Permit to Take Water (or water taking EASR)
- ❑ City of Ottawa Storm and/or Sanitary Sewer Discharge agreement
- ❑ Landfill agreement for soil disposal
- ❑ Clean Fill agreement for soil disposal

7.0 Soil Stockpiles and Handling

Any soil and construction debris that is temporarily stockpiled must be done so within the confines of the perimeter protection/construction fencing. All stockpiles will be covered, by the trade contractor, with plastic tarps (10 mil plastic minimum), or an impermeable geotextile and secured from wind. The stockpiles will be covered with plastic in a reasonable time frame as weather conditions dictate. If the stockpile is continuously being accessed then the stockpile will be covered prior to the end of the work day, as weather conditions dictate. Storm water runoff from the plastic covering is to be diverted away from all surface water resources and from open construction excavations.

Stockpiles should be clearly identified to eliminate cross contamination and improper usage. Soil identified as grossly impacted should be immediately loaded into truck and disposed of at the licensed waste facility. The volume of excess soil disposed of at the landfill should be minimized using segregation during excavation and subsequent stockpile sampling programs.

8.0 Federal and Provincial Confirmatory Soil and Groundwater Sampling Protocols

The soil and groundwater sampling protocols followed during the field sampling programs in Ontario should be in general accordance with the MECP document entitled *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario"*, dated May 1996.

8.1 Soil and Groundwater Standards

The soil and groundwater standards for the Ontario portion of the site were taken from the document entitled *"Soil, Groundwater and Sediment Standards for Use under Part XV.I of the Environmental Protection Act"* prepared by the Ontario Ministry of the Environment (now Ministry of the Environment, Conservation and Parks), dated April 15, 2011. Several of the Tables found in the document may be applicable to the subject site. The following Table may be applicable.

The Table 7 Standards are based on the following considerations:

- ❑ Coarse-Grained Soil Conditions
- ❑ Non-Potable Groundwater Conditions
- ❑ Community Land Use
- ❑ Shallow Soil Conditions

The applicable federal soil and groundwater standards are considered to be the Canadian Council of Ministers of the Environment (CCME). The standards are taken from the document entitled "*Canadian Environmental Quality Guidelines*", however, due to the proposed use of the block(s) as privately owned operations, only Provincial standards are deemed to apply for future uses.

8.2 Stockpile Sampling

Stockpiled soils are subject to minimum sampling requirements under O.Reg. 153/04. The sampling requirements are shown below;

MINIMUM STOCKPILE SAMPLING FREQUENCY	
Stockpile Volume (m^3)	Minimum Number of Analysed Samples
≤ 130	3
> 130 to 220	4
> 220 to 320	5
> 320 to 430	6
> 430 to 550	7
> 550 to 670	8
> 670 to 800	9
> 800 to 950	10
> 950 to 1100	11
> 1100 to 1250	12
> 1250 to 1400	13
> 1400 to 1550	14
> 1550 to 1700	15
> 1700 to 1850	16
> 1850 to 2050	17
> 2050 to 2200	18
> 2200 to 2350	19
> 2350 to 2500	20
> 2500 to 2700	21
> 2700 to 2900	22
> 2900 to 3100	23
> 3100 to 3300	24
> 3300 to 3500	25
> 3501 to 3700	26
> 3700 to 3900	27
> 3900 to 4100	28
> 4100 to 4300	29
> 4300 to 4500	30
> 4500 to 4700	31
> 4700 to 5000	32
> 5000	32+(Volume-5000)÷300

The soil samples collected from the stockpiles are required to be tested for the following (as a minimum) Petroleum Hydrocarbons F1-F4, Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Metals, hydride forming Metals, sodium adsorption ratio (SAR), electrical conductivity (EC), and any other contaminants of concern, as identified by the environmental consultant (Qualified Person). Analysis for EC and SAR is only required in areas where a substance (namely road salt) has been applied for the purposes of keeping the area safe under conditions of snow or ice.

9.0 Applicable Municipal Laws, Standards, Codes and Guidelines

9.1 Soil and Groundwater Standards

No municipal soil standards and guidelines are considered to apply.

Groundwater discharged into the sewer systems of the City of Ottawa and City of Gatineau must follow the applicable bylaws.

City of Ottawa

The City of Ottawa requires that all discharges fall within the limits of Sewer Use By-law No. 2003-514. A sewer use agreement is expected to be required to manage excess groundwater at selected sites.

10.0 Imported Material

All imported material may originate from a licensed pit, quarry or other aggregate site licensed under the Aggregate Resources Act, or, from a source site where all applicable excess soil regulations have been met. Imported material will be required to meet the specific standard for its final use. If clean fill is imported onto site from a property not licensed under the Aggregate Resources Act, in-situ, or stockpile sampling as outlined in Section 8.3, will be required prior to final placement.

All imported soil must be placed in accordance with Ontario Regulation 406/19.

11.0 Quality Assurance and Quality Control

A minimum of 10% of samples will be submitted as duplicates for the purposes of QA/QC. Only one parameter grouping per QA/QC sample is required.

Additional QA/QC procedures are outlined in the Environmental Quality Management Plan, available under a separate cover.

12.0 Unexpected Environmental Impacts

If unexpected environmental impacts are encountered during the course of construction or redevelopment of the block(s), the environmental consultant or their representative should be notified immediately and work should avoid the area until an inspection is completed.

Following an inspection by the environmental consultant or their representative recommendations will be made regarding appropriate material handling procedures at the location. Additional investigative work may be required to delineate the impacted areas (if required).

13.0 Estimated Soil and Groundwater Management Budget

The following table presents the approximate costs related to items discussed in this soil and groundwater management plan.

Table 1: Estimated Costs for Soil and Groundwater Management

Item	**Fees**
On-Site and Excess Soil Management (O.Reg. 406/19), including: • Reporting • Supplemental testing • Meetings and Consultation with stakeholders and contractors Note that the On-site and Excess Soil testing will provide valuable information for soil delineation purposes.	$85,000
Soil remediation – tipping fees ($60/mt)	Approx. 50 mt
Soil remediation. Includes: • Site supervision • Confirmatory soil sampling • Reporting	$17,000
Record of Site Condition (O.Reg. 153/04) – initial submission (note that additional revisions and submissions may be required based on Ministry comments)	$15,000 $10,000 (revisions)
Permit to take water or Water taking EASR (whichever is applicable)	$20,000 $8,000
City of Ottawa sewer discharge testing and permits	$5,000
TOTAL	$160,000