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Phase II Environmental Site Assessment

314 Bell Street South
City of Ottawa, Ontario

Prepared For

HD & P Architects

August 27, 2021

Report: PE5372-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the property addressed 314 Bell Street South, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II ESA Property.

The subsurface investigation consisted of three (3) boreholes, all which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of a fill layer of sand and/or silty sand with crushed, underlain by a fill material consisting of silty sand with traces of gravel, clay and occasional cobbles, followed by limestone bedrock with some shale.

Four (4) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs) and metals. All results were in compliance with the standards, except concentrations of PHC (F3 and F4) in Sample BH3-21-AU1, which were above the MECP Table 7 Residential Standards.

Groundwater samples from monitoring wells BH1-21, BH2-21 and BH3-21 were collected during the August 16, 2021 sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Groundwater samples were analyzed for BTEX and PHCs. No concentrations of BTEX and PHCs were detected above the laboratory detection limits. The groundwater results comply with the MECP Table 7 Standards.

Recommendations

Based on the findings of the Phase II ESA, it is recommended that a soil remediation be carried out in conjunction with the construction excavation. A representative sample of impacted soil must be submitted for a leachate analysis in accordance with O.Reg. 347/558 prior to disposal at an approved landfill site.

Any excess soil that meets site standards and requires removal for construction purposes must be handled in accordance with O. Reg. 406/19, On-Site and Excess Soil Management. Additional information regarding O.Reg. 406/19 can be provided upon request.

Monitoring Wells

If the monitoring wells installed on the Phase II ESA Property are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of HD & P Architects, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment at 314 Bell Street South (the Phase II ESA Property), in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II ESA Property, during the Phase I ESA conducted by Paterson in August of 2021.

1.1 Site Description

Address:	314 Bell Street South, Ottawa, Ontario
Location:	The subject site is located on the west side of Bell Street South, approximately 73 m south of Plymouth Street, in the City of Ottawa, Ontario. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Legal Description:	Part 1 of Lot D of Registered Plan 82717, in the City of Ottawa, Ontario.
PIN:	04104-0196
Latitude and Longitude:	45° 24' 10.13" N, 75° 42’ 13.56" W.

Site Description:

Configuration:	Rectangular.
Site Area:	801 m^2 (approximate).
Zoning:	R4UD – Residential Zone.

1.2 Property Ownership

Paterson was engaged to conduct this Phase I ESA by Mr. Lucas Tardioli of HD and P Architects. The office of HD and P Architects is located at 170 Main Street, Ottawa, Ontario.

1.3 Current and Proposed Future Uses

The Phase II ESA Property is occupied by a 3-storey residential building (quadruplex) with a basement, situated on the northern portion of the site. The original 2-storey building exterior is finished in red brick while the newer additional from 2005 is finished in vinyl siding with a sloped shingle style roof.

It is our understanding that the Phase II ESA Property will be redeveloped with two (2) residential low-rise buildings with basement. A record of site condition (RSC) will not be required as per O.Reg 154/03.

1.4 Applicable Site Condition Standard

The site condition standards for the 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 Ontario Ministry of Environment, Conservation and Parks (MECP), April 2011. The MECP selected Table 7 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Generic site conditions for shallow soils
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

Section 35 of O.Reg. 153/04 does apply to the Phase II ESA Property in that the property does not rely upon potable groundwater.

Section 41 of O.Reg. 153/04 does not apply to the Phase II ESA Property, as the property is not within 30m of an environmentally sensitive area.

Section 43.1 of O.Reg. 153/04 does apply to the Phase II ESA Property in that the property is a Shallow Soil property.

The intended use of the Phase II ESA Property is residential; therefore, the Residential Standards have been selected for the purpose of this Phase II ESA.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II ESA Property is located on the west side of Bell Street South, approximately 73 m south of Plymouth Street, in the City of Ottawa, Ontario. The site is situated an urban mixed-used area.

The Phase II ESA Property is occupied by a quadruplex situated on the northern half of the site, while the southern half exists as a gavel covered laneway parking lot. Site drainage consists primarily of infiltration.

The site is relatively at the grade of Bell Street South and slopes downs in a westerly direction, while the regional topography slopes downwards in a northwesterly/northerly direction.

2.2 Past Investigations

Paterson completed a Phase I ESA in July of 2021 for the Phase II ESA Property. Based on the findings of the Phase I ESA, three (3) off-site historical potentially contaminating activities (PCA) were considered to have resulted in areas of potential environmental concern (APECs) on the Phase I ESA Property.

As per Column A of Table 2 of the O.Reg. 153/04, as amended, the following PCAs that generated APECs on the Phase I ESA Property are:

- PCA 28 – "Gasoline and Associated Products Storage in Fixed Tanks" associated with a historical underground storage tank located on the southwest corner of 306 Bell Street South (APEC 1).
- PCA 28 – "Gasoline and Associated Products Storage in Fixed Tanks" associated with two (2) historical underground storage tanks located immediately south at 316 Bell Street South (APEC 2).
- PCA 52 – "Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems," associated with the presence of a historical automotive repair garage located immediately south at 316 Bell Street South (APEC 2).

The rationale for identifying the above PCAs and APECs is based on a review of fire insurance plans. A Phase II ESA was recommended to address the aforementioned APECs.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on August 4, 2021. The field program consisted of drilling three (3) boreholes to address the APECs identified on the Phase II ESA Property.

All of the boreholes were completed with monitoring well installations. Boreholes were drilled to a maximum depth of 8.33 m below the ground surface (mbgs).

3.2 Media Investigated

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

Contaminants of potential concern on the Phase II ESA Property include benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs, F1-F4). These CPCs may be present in the soil and/or groundwater beneath the Phase II ESA Property.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada mapping, drift thickness in the area of the subject site is on the order of 0 to 1 m across the site. The overburden consisted of exposed bedrock. Bedrock in the area consists of interbedded limestone and shale of the Verulam Formation.

Existing Buildings and Structures

A 3-storey residential building with a basement occupies the northern portion of the Phase I ESA Property. The original 2-storey building exterior is finished in red brick while the newer additional from 2005 is finished in vinyl siding with a sloped shingle style roof. The quadruplex is heated by natural gas and electrical baseboard heaters as a secondary heat source.

Subsurface Services and Utilities

The Phase I ESA Property is situated in a municipally serviced area. Underground utilities and/or structures include electricity entering from Bell Street South along the southern portion of the site, while natural gas, water and sewer enter onto the site along the northern portion.

Areas of Natural Significance

No areas of natural significance were identified in the Phase I Study Area.

Water Bodies

No natural water bodies were identified in the Phase I Study Area.

Drinking Water Wells

There are no potable water wells on the Phase I ESA Property, nor are they expected to be present as the subject land is situated in a municipally serviced area.

Neighbouring Land Use

Neighbouring land use in the Phase I study area consists primarily of residential with some commercial land uses. Land use is shown on Drawing PE5372-2 - Surrounding Land Use Plan.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of the Phase I-ESA report, three (3) off-site PCAs and the resultant APECs are summarized in Table 1, along with their respective locations and contaminants of potential concern (CPCs).

Table 1: Potentially Contaminating Activities and Areas of Potential Environmental Concern

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Resulting from the former presence of a UST at 306 Bell Street South	Northwestern corner of the Phase I ESA Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater
APEC 2: Resulting from the former presence of 2 USTs and an automotive repair garage at 316 Bell Street South	Southeastern corner of the Phase I ESA Property	PCA 28 – Gasoline and Associated Products Storage in Fixed Tanks PCA 52 – Storage, maintenance, fuelling and repair of equipment, vehicles, and material used to maintain transportation systems	Off-site	BTEX PHCs (F_1-F_4)	Soil and Groundwater

Contaminants of Potential Concern

As per Section 7.1 of the Phase I-ESA report, the contaminants of potential concern (CPCs) in soil and/or groundwater include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs) and metals.

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 off-site PCAs that have resulted in APECs on the Phase I ESA Property. A variety of independent sources were consulted as part of this assessment, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

There were no deviations from the Sampling and Analysis Plan which is included in Appendix 1 of this report.

3.5 Impediments

Overhead wires across the site were present, and as such, BH-2-21 could not be placed on the southeast corner of the Phase II ESA Property. No other physical impediments were encountered during the Phase II ESA field program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation conducted for this Phase II ESA consisted of drilling three (3) boreholes (BH1-21 through BH3-21) across the Phase II ESA Property to address the APECs identified in the Phase I ESA. The boreholes were drilled to a maximum depth of 8.33 m below ground surface (bgs) to intercept groundwater.

The boreholes were drilled using a low clearance track mounted drill rig operated by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE5372-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of eight (8) soil samples and 14 rock core samples were obtained from the boreholes by means of auger sampling from auger flights/auger samples and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals.

The depths at which grab samples, split spoon, and core samples were obtained from the boreholes are shown as "**AU**", "**SS**" and "**RC**", respectively on the Soil Profile and Test Data Sheets.

The borehole profiles generally consist of a granular material (silty sand and crushed stone), followed by fill material consisting of silty sand gravel, traces of clay and topsoil and occasional cobbles and boulders, overlying limestone bedrock.

The quality of the fill material was considered a potential environmental concern on the Phase I ESA Property, and as such, it has been taken into account in the analytical testing.

4.3 Field Screening Measurements

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

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. A photo ionization detector (PID) was used to measure the volatile organic vapour concentrations.

The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement.

The PID readings were found to range from 0 to 2.0 ppm in the soil samples obtained. These results do not indicate the potential for significant contamination from volatile contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1. The results of the vapour survey are presented on the Soil Profile and Test Data sheets.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the Phase II ESA Property as part of the subsurface investigation. The monitoring wells consisted of 32 mm diameter, Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Borehole locations and elevations were surveyed geodetically by Paterson personnel.

TABLE 2. Monitoring Well Construction Details						
Well ID	**Ground Surface Elevation**	**Total Depth (m BGS)**	**Screened Interval (m BGS)**	**Sand Pack (m BGS)**	**Bentonite Seal (m BGS)**	**Casing Type**
BH1-21	72.13	6.70	3.70-6.70	3.40-6.70	0.18-3.40	Flushmount
BH2-21	73.37	6.73	3.73-6.73	3.61-6.73	0.18-3.61	Flushmount
BH3-21	71.72	8.33	5.33-8.33	4.82-8.33	0.18-4.82	Flushmount

4.5 Groundwater Sampling

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

4.6 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples, as well as analyzed parameters are presented in Tables 3 and 4.

TABLE 3: Soil Samples Submitted and Analyzed Parameters						
Sample ID	**Sample Depth / Stratigraphic Unit**	**Parameters Analyzed**				**Rationale**
		BTEX	**PHCs (F1-F4)**	**PAHs**	**Metals**	
August 4, 2021						
BH1-AU1	0.025-0.051m Fill	X	X	X	X	Assess the quality of the fill material and APEC 1.
BH2-SS2	0.76-1.37m Fill	X	X			Assess the quality of the fill material and APEC 1.
BH3-AU1	0.025-0.051m Fill	X	X	X		Assess the quality of the fill material and APEC 2.
DUP	0.025-0.051m Fill	X	X			Duplicate soil sample (BH1-AU1) for QA/QC purposes.

TABLE 4: Groundwater Samples Submitted and Analyzed Parameters				
Sample ID	Screened Interval	Parameters Analyzed		Rationale
		BTEX	PHCs (F1-F4)	
August 16, 2021				
BH1-GW1	3.70-6.70m	X	X	Assess potential groundwater impacts from the USTs on the adjacent properties to the north and south and former garage (APEC 1 and 2).
BH2-GW1	3.73-6.73m	X	X	
BH3-GW1	5.33-8.33m	X	X	
DUP	5.33-8.33m	X	X	Duplicate groundwater sample (BH3-GW1) for QA/QC purposes.

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

4.7 Residue Management

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

4.8 Elevation Surveying

Boreholes were surveyed at geodetic elevations by Paterson personnel.

4.9 Quality Assurance and Quality Control Measures

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

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils encountered during the field program consisted of a fill layer of sand and/or silty sand with crushed, underlain by a fill material consisting of silty sand with traces of gravel, clay and occasional cobbles, followed by limestone bedrock with some shale. Bedrock was encountered at depths ranging from approximately 0.94 to 2.39 below grade. Bedrock was cored to a maximum depth of 8.33 m below grade.

Groundwater was encountered within the overburden at depths ranging from approximately 2.57 to 3.16 mbgs.

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on August 16 of 2021 using an electronic water level meter. 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
BH1-21	72.13	2.82	69.31	August 16, 2021
BH2-21	73.37	2.57	70.80	August 16, 2021
BH3-21	71.72	3.16	68.56	August 16, 2021

Based on the groundwater elevations measured during the sampling events, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE5372-3.

Based on the contour mapping, groundwater flow at the subject site is in a westerly direction. A horizontal hydraulic gradient of approximately 0.07m/m was calculated.

5.3 Fine-Coarse Soil Texture

Grain-size analysis was not completed for the Phase II ESA Property. As such, the more stringent, coarse-grained soil standards were used.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in vapour readings ranging from 0 to 2.0 ppm. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Three (3) soil samples and a duplicate sample were submitted for BTEX, PHCs (F1-F4), PAHs and/or metals analysis. The results of the analytical testing are presented below in Tables 6, 7 and 8. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 6: Analytical Test Results – Soil
BTEX and PHCs F_1-F_4

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 4, 2021				MECP Table 7 Residential Standards (µg/g)
		BH1-21-AU1	BH2-21-SS2	BH3-21-AU1	DUP	
Benzene	0.02	nd	nd	nd	nd	0.21
Toluene	0.05	nd	nd	nd	nd	2
Ethylbenzene	0.05	nd	nd	nd	nd	2.3
Xylenes	0.05	nd	nd	nd	nd	3.1
PHC F_1	7	nd	nd	nd	nd	55
PHC F_2	4	80	nd	80	80	98
PHC F_3	8	258	38	**690**	**338**	300
PHC F_4	6	1140	46	2700	1520	2800
PHC F_4 Gravimetric	6	1720	NA	**4040**	2590	2800

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not analyzed
- **Bold and underlined** – parameter exceeds the select MECP standard

No detectable BTEX parameters were identified in any of the soil samples analyzed. Concentrations of PHC F3-F4 were identified above the selected MECP Table 7 Residential Standards in soil sample BH3-21-AU1 and its' duplicate.

TABLE 7: Analytical Test Results – Soil
Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 4, 2021	MECP Table 7 Residential Standards (µg/g)
		BH1-21-AU1	
Antimony	1.0	nd	7.5
Arsenic	1.0	5.2	18
Barium	1.0	55.1	390
Beryllium	0.5	0.6	4
Boron	5.0	6.0	120
Cadmium	0.5	nd	1.2
Chromium	5.0	24.0	160
Cobalt	1.0	6.4	22
Copper	5.0	8.6	140
Lead	1.0	24.5	120
Molybdenum	1.0	nd	6.9
Nickel	5.0	13.4	100
Selenium	1.0	nd	2.4
Silver	0.3	nd	20
Thallium	1.0	nd	1
Uranium	1.0	nd	23
Vanadium	10.0	35.1	86
Zinc	20.0	61.8	340

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

All metal concentrations comply with the selected MECP Table 7 Residential Standards.

TABLE 8: Analytical Test Results – Soil
PAHs

Parameter	MDL (µg/g)	Soil Samples (µg/g) August 4, 2021		MECP Table 7 Residential Standards (µg/g)
		BH1-21-AU1	BH3-21-AU1	
Acenaphthene	0.02	nd	nd	7.9
Acenaphthylene	0.02	nd	0.09	0.15
Anthracene	0.02	0.05	0.08	0.67
Benzo[a]anthracene	0.02	0.12	0.25	0.5
Benzo[a]pyrene	0.02	0.19	0.30	0.3
Benzo[b]fluoranthene	0.02	0.17	0.27	0.78
Benzo[g,h,i]perylene	0.02	0.20	0.31	6.6
Benzo[k]fluoranthene	0.02	0.09	0.18	0.78
Chrysene	0.02	0.14	0.27	7
Dibenzo[a,h]anthracene	0.02	nd	nd	0.1
Fluoranthene	0.02	0.29	0.45	0.69
Fluorene	0.02	nd	nd	62
Indeno [1,2,3-cd] pyrene	0.02	0.10	0.17	0.38
1-Methylnaphthalene	0.02	nd	nd	0.99
2-Methylnaphthalene	0.02	nd	nd	0.99
Methylnaphthalene (1&2)	0.04	nd	nd	0.99
Naphthalene	0.01	0.02	0.02	0.6
Phenanthrene	0.02	0.17	0.20	6.2
Pyrene	0.02	0.25	0.41	78

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

All PAH concentrations comply with the selected MECP Table 7 Residential Standards.

The analytical results for BTEX, PHCs, PAHs and Metals tested in soil are shown on Drawing PE5372-4 – Analytical Testing Plan – Soil.

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

TABLE 9: Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
PHC F_2	80	BH3-21-AU1	0.025-0.051m Fill
PHC F_3	**690**		
PHC F_4	2700		
PHC $F_{4\ Gravimetric}$	**4040**		
Arsenic	5.2	BH1-21-AU1	0.025-0.051m Fill
Barium	55.1		
Beryllium	0.6		
Boron	6.0		

TABLE 9: Maximum Concentrations – Soil			
Parameter	**Maximum Concentration (µg/g)**	**Borehole**	**Depth Interval (m BGS)**
Chromium	24.0		
Cobalt	6.4		
Copper	8.6		
Lead	24.5		
Nickel	13.4		
Vanadium	35.1		
Zinc	61.8		
Acenaphthylene	0.09	BH3-21-AU1	0.025-0.051m Fill
Anthracene	0.08		
Benzo[a]anthracene	0.25		
Benzo[a]pyrene	0.30		
Benzo[b]fluoranthene	0.27		
Benzo[g,h,i]perylene	0.31		
Benzo[k]fluoranthene	0.18		
Chrysene	0.27		
Fluoranthene	0.45		
Naphthalene	0.02		
Phenanthrene	0.20		
Pyrene	0.41		

Notes:
- **Bold and underlined** – parameter exceeds the select MECP standard

No other parameters were identified above the laboratory method detection limits.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1-21 through BH3-21 as well as a duplicate were submitted for laboratory analysis of BTEX and PHCs (fractions, F1-F4). The groundwater samples were obtained from the screened intervals noted in Table 2. The results of the analytical testing are presented in Table 10. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 10: Analytical Test Results – Groundwater
BTEX and PHCs

Parameter	MDL (µg/L)	Groundwater Samples (µg/L)				MECP Table 7 Standards (µg/L)
		August 16, 2021				
		BH1-GW1	BH2-GW1	BH3-GW1	DUP	
Benzene	0.5	nd	nd	nd	nd	0.5
Toluene	0.5	nd	nd	nd	nd	320
Ethylbenzene	0.5	nd	nd	nd	nd	54
Xylenes	0.5	nd	nd	nd	nd	72
PHC F_1	25	nd	nd	nd	nd	420
PHC F_2	100	nd	nd	nd	NA	150
PHC F_3	100	nd	nd	nd	NA	500
PHC F_4	100	nd	nd	nd	NA	500

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

No detectable PHC concentrations were identified in any of the groundwater samples analyzed. The groundwater results comply with the MECP Table 7 Standards.

The analytical results for BTEX and PHCs tested in groundwater are shown on Drawing PE5372-6–Analytical Testing Plan – Groundwater.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the August 2021 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type.

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

A duplicate soil sample and groundwater sample (DUP) were obtained from BH1-21-AU1 and BH3-21-GW1 and analyzed for BTEX and PHCs. Test results for the duplicate soil sample and RPD calculations are provided below in Table 11. The duplicate groundwater sample concentrations were not detected.

TABLE 11: QA/QC Results – Soil				
Parameter	BH1-21-AU1	DUP	RDP (%)	QA/QC Results
PHC-F1	80	80	0	Within the acceptable range
PHC-F2	258	330	26	Outside the acceptable range
PHC-F3	1140	1520	28	Outside the acceptable range
PHC-F4	1720	2950	40	Outside the acceptable range

The majority of the RPD results are outside the acceptable range. It is not uncommon that very high concentrations or values will yield higher RPD values, and as such, the RPD value is not an accurate measure in this case.

Based on the analytical laboratory results, it is our opinion that the overall 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, as amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

Based on the findings of the Phase I ESA completed for the subject site, three (3) PCAs and the resultant APECs are summarized in Table1 in Section 3.3, along with their respective locations and contaminants of potential concern (CPCs).

Contaminants of Potential Concern

As per Section 3.3, the contaminants of potential concern (CPCs) in soil and/or groundwater include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs) and metals.

Subsurface Structures and Utilities

The Phase II ESA Property is situated in a municipally serviced area. Underground utilities and/or overhead utilities include electricity entering from Bell Street South along the southern portion of the site, while natural gas, water and sewer enter onto the site along the northern portion.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE5372-4A and 4B. The stratigraphy consists of:

- A fill layer consisting of crushed stone with sand and/or silty sand was encountered in all of the boreholes, approximately 0.4 m thick. Groundwater was not encountered in this layer.
- Fill material consisting of silty sand with traces of gravel, clay and occasional cobbles was encountered in all of the boreholes, extending to depths of approximately 0.94 to 2.39mbgs. Topsoil was identified in BH2-21. Groundwater was not encountered in this layer.
- Limestone bedrock was encountered in all of the boreholes All of the boreholes were terminated in this layer at depths ranging from approximately 6.78 to 8.33 mbgs. Groundwater was encountered in this layer in all of the boreholes.

Hydrogeological Characteristics

Groundwater at the Phase II ESA Property was encountered in the bedrock. During the most recent groundwater monitoring event, groundwater flow was measured in a westerly direction, with a hydraulic gradient of 0.07 m/m. Groundwater contours are shown on Drawing PE5372-3 – Test Hole Location Plan.

Approximate Depth to Bedrock

Bedrock was encountered during the drilling program at depths ranging from approximately 0.94 to 2.39 mbgs.

Approximate Depth to Water Table

The depth to the water table at the subject site varies between approximately 2.57 to 3.16m below existing grade.

Sections 41 and 43.1 of the Regulation

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

Section 43.1 of the Regulation does apply to the Phase II ESA Property as bedrock across the site is located on average, less than 2 m below ground surface.

Fill Placement

The fill material consisted of silty sand with traces of gravel, clay and occasional cobbles was encountered in all of the boreholes, extending to depths of approximately 0.94 to 2.39 mbgs.

Existing Buildings and Structures

A 3-storey residential building with a basement occupies the northern portion of the Phase I ESA Property. The original 2-storey building exterior is finished in red brick while the newer additional from 2005 is finished in vinyl siding with a sloped shingle style roof. The quadruplex is heated by natural gas and electrical baseboard heaters as a secondary heat source.

Proposed Buildings and Other Structures

The proposed site development for the Phase II ESA Property will include two (2) residential low-rise buildings with basement.

Areas of Natural Significance

There are no areas of natural significance in the Phase I Study Area.

Water Bodies

There are no natural water bodies in the Phase I Study Area.

Environmental Condition

Areas Where Contaminants are Present

PHCs impact in the fill material is present on the western half of the Phase II ESA Property.

No contaminants of concern were identified in the groundwater.

Types of Contaminants

PHCs (fractions F3 and F4) are present on the Phase II ESA Property.

Contaminated Media

The impacted media is present in the fill material. No groundwater was impacted.

What Is Known About Areas Where Contaminants Are Present

Based on the findings of the Phase II ESA, the fill material on the western half of the Phase II ESA appears to be impacted with PHCs. It is known that the contaminants are isolated in the fill material only as there was no impacted groundwater.

Distribution and Migration of Contaminants

Based on the findings of the Phase II ESA, distribution and migration of contaminants is not considered to have occurred on the Phase II ESA Property.

Discharge of Contaminants

Based on the findings of the Phase II ESA, discharge of contaminants in the upper fill material may be a result of spillage or leaks from parked vehicles.

Climatic and Meteorological Conditions

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

Based on the clean groundwater, contaminant distribution is not considered to have occurred on the Phase II ESA Property.

Potential for Vapour Intrusion

Based on the nature of contaminates, the potential for vapour intrusion is not expected to occur on the Phase II ESA Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the property addressed 314 Bell Street South, in the Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that were identified during the Phase I ESA and considered to result in areas of potential environmental concern (APECs) on the Phase II ESA Property.

The subsurface investigation consisted of three (3) boreholes, all which were instrumented with groundwater monitoring wells. The general soil profile encountered during the field program consisted of a fill layer of sand and/or silty sand with crushed, underlain by a fill material consisting of silty sand with traces of gravel, clay and occasional cobbles, followed by limestone bedrock with some shale.

Four (4) soil samples, including a duplicate sample, were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons (PHCs, F1-F4), polycyclic aromatic hydrocarbons (PAHs) and metals. All results were in compliance with the standards, except concentrations of PHC (F3 and F4) in Sample BH3-21-AU1, which were above the MECP Table 7 Residential Standards.

Groundwater samples from monitoring wells BH1-21, BH2-21 and BH3-21 were collected during the August 16, 2021 sampling event. No free product or petroleum hydrocarbon sheen was noted on the purge water during the groundwater sampling events.

Groundwater samples were analyzed for BTEX and PHCs. No concentrations of BTEX and PHCs were detected above the laboratory detection limits. The groundwater results comply with the MECP Table 7 Standards.

Recommendations

Based on the findings of the Phase II ESA, it is recommended that a soil remediation be carried out in conjunction with the construction excavation. A representative sample of impacted soil must be submitted for a leachate analysis in accordance with O.Reg. 347/558 prior to disposal at an approved landfill site.

Any excess soil that meets site standards and requires removal for construction purposes must be handled in accordance with O. Reg. 406/19, On-Site and Excess Soil Management. Additional information regarding O.Reg. 406/19 can be provided upon request.

Monitoring Wells

If the monitoring wells installed on the Phase II ESA Property are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

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

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

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

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

Paterson Group Inc.

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

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

Report Distribution:

- HD & P Architects
- Paterson Group

FIGURES

Figure 1 - Key Plan

Drawing PE5372-3 – Test Hole Location Plan

Drawing PE5372-4 – Analytical Testing Plan – Soil (BTEX, Metals, PAHs)

Drawing PE5372-4A – Cross-section A – A' – Soil (BTEX, Metals, PAHs)

Drawing PE5372-4B – Cross-section B – B' – Soil (BTEX, Metals, PAHs)

Drawing PE5372-5 – Analytical Testing Plan – Soil (PHCs)

Drawing PE5372-5A – Cross-section A – A' – Soil (PHCs)

Drawing PE5372-5B – Cross-section B – B' – Soil (PHCs)

Drawing PE5372-6 – Analytical Testing Plan – Groundwater

Drawing PE5372-6A – Cross-section A – A' – Groundwater

Drawing PE5372-6B – Cross-section B – B' – Groundwater

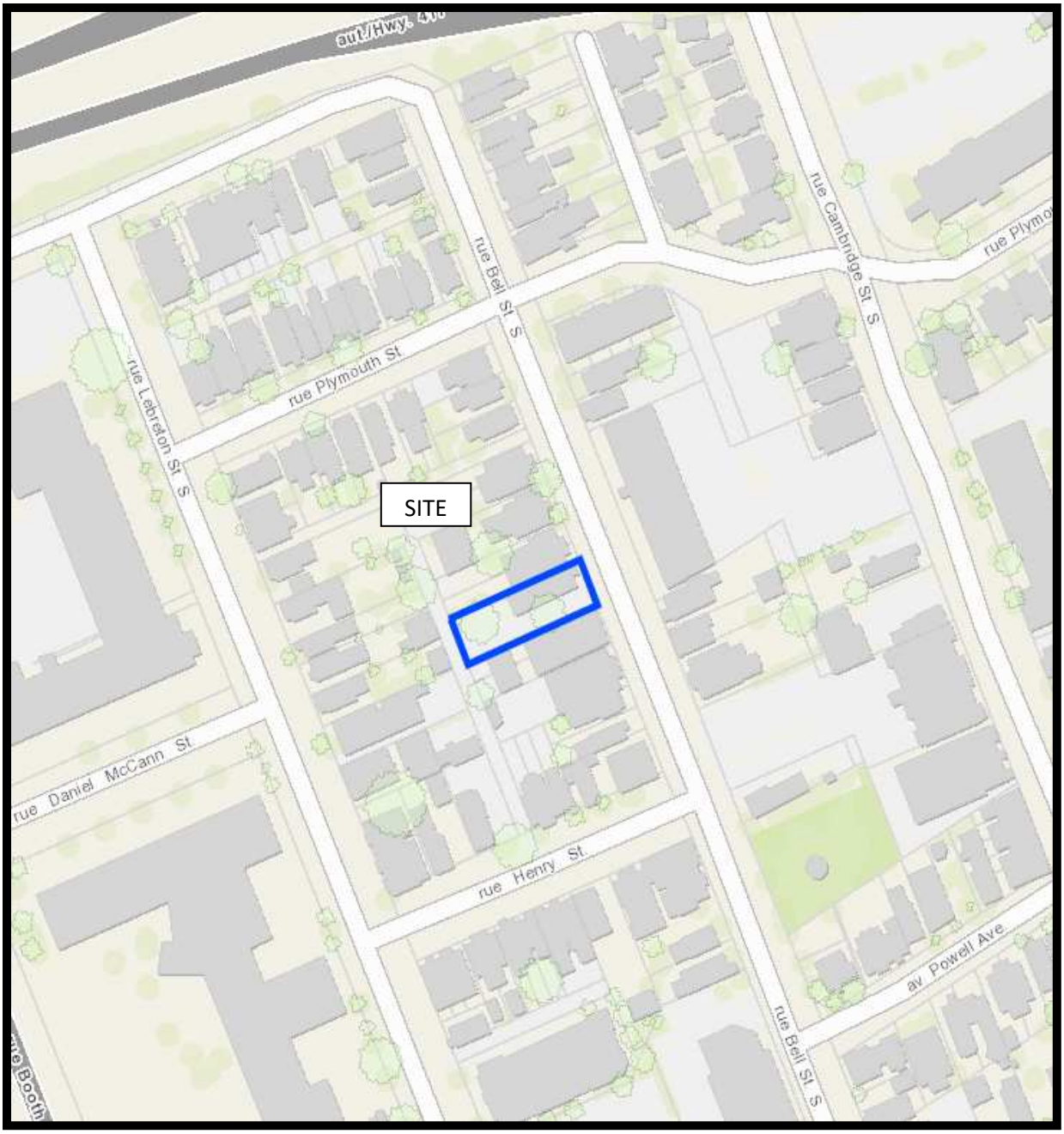
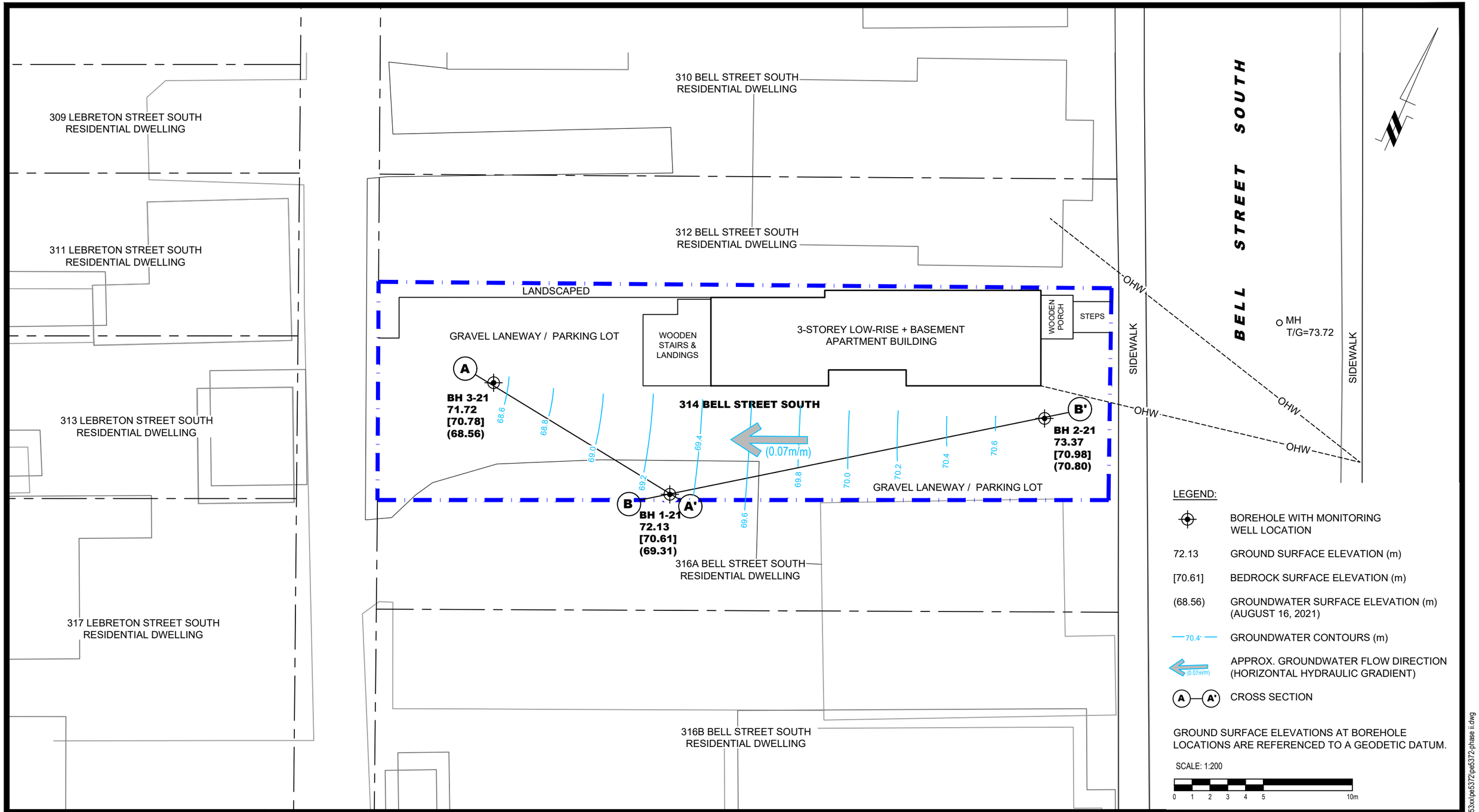


FIGURE 1

KEY PLAN



LEGEND:

⊕	BOREHOLE WITH MONITORING WELL LOCATION
72.13	GROUND SURFACE ELEVATION (m)
[70.61]	BEDROCK SURFACE ELEVATION (m)
(68.56)	GROUNDWATER SURFACE ELEVATION (m) (AUGUST 16, 2021)
70.4	GROUNDWATER CONTOURS (m)
(0.07m/m)	APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)
A — A'	CROSS SECTION

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

SCALE: 1:200

0 1 2 3 4 5 10m

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consulting engineers

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HD & P ARCHITECTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:200	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-3
Approved by: MSD	Revision No.:

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309 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

311 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

313 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

317 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

310 BELL STREET SOUTH
RESIDENTIAL DWELLING

BH3-21-AU1	0.025-0.051m	4-Aug-21
BTEX comply with the MECP Table 7 Standards		
PAHs comply with the MECP Table 7 Standards		
DUP(BH3-AU1)	0.025-0.051m	4-Aug-21
BTEX comply with the MECP Table 7 Standards		

312 BELL STREET SOUTH
RESIDENTIAL DWELLING

LANDSCAPED

GRAVEL LANEWAY / PARKING LOT

WOODEN STAIRS & LANDINGS

3-STOREY LOW-RISE + BASEMENT APARTMENT BUILDING

WOODEN PORCH

STEPS

314 BELL STREET SOUTH

A

BH 3-21
71.72
[70.78]
(68.56)

BH 1-21
72.13
[70.61]
(69.31)

B

A'

B'

BH 2-21
73.37
[70.98]
(70.80)

GRAVEL LANEWAY / PARKING LOT

316A BELL STREET SOUTH
RESIDENTIAL DWELLING

BH2-21-SS2	0.76-1.37m	4-Aug-21
BTEX comply with the MECP Table 7 Standards		
Metals comply with the MECP Table 7 Standards		

BH1-21-AU1	0.025-0.051m	4-Aug-21
BTEX comply with the MECP Table 7 Standards		
PAHs comply with the MECP Table 7 Standards		

316B BELL STREET SOUTH
RESIDENTIAL DWELLING

OHW

OHW

OHW

OHW

SIDEWALK

BELL STREET SOUTH

SIDEWALK

MH
T/G=73.72

FH
T/S=75.00

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 72.13 — GROUND SURFACE ELEVATION (m)
- [70.61] — BEDROCK SURFACE ELEVATION (m)
- (68.56) — GROUNDWATER SURFACE ELEVATION (m) (AUGUST 16, 2021)
- A — A' — CROSS SECTION

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

SCALE: 1:200

0 1 2 3 4 5 10m

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NO.	REVISIONS	DATE	INITIAL

HD & P ARCHITECTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (BTEX, METALS, PAHs)

Scale: 1:200	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-4
Approved by: MSD	Revision No.:

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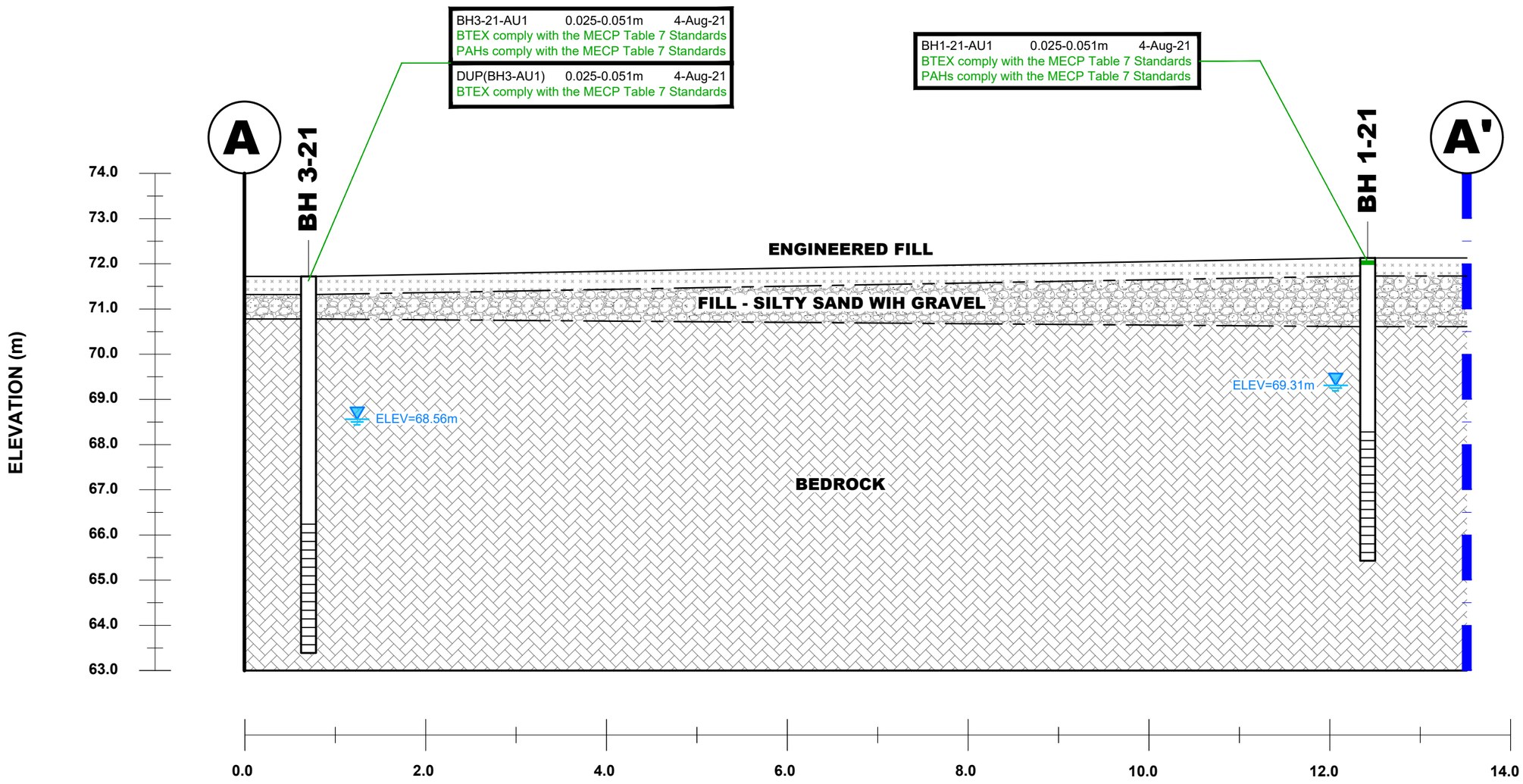

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

CROSS SECTION A - A' - SOIL (BTEX, METALS, PAHs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-4A
Approved by: MSD	Revision No.:

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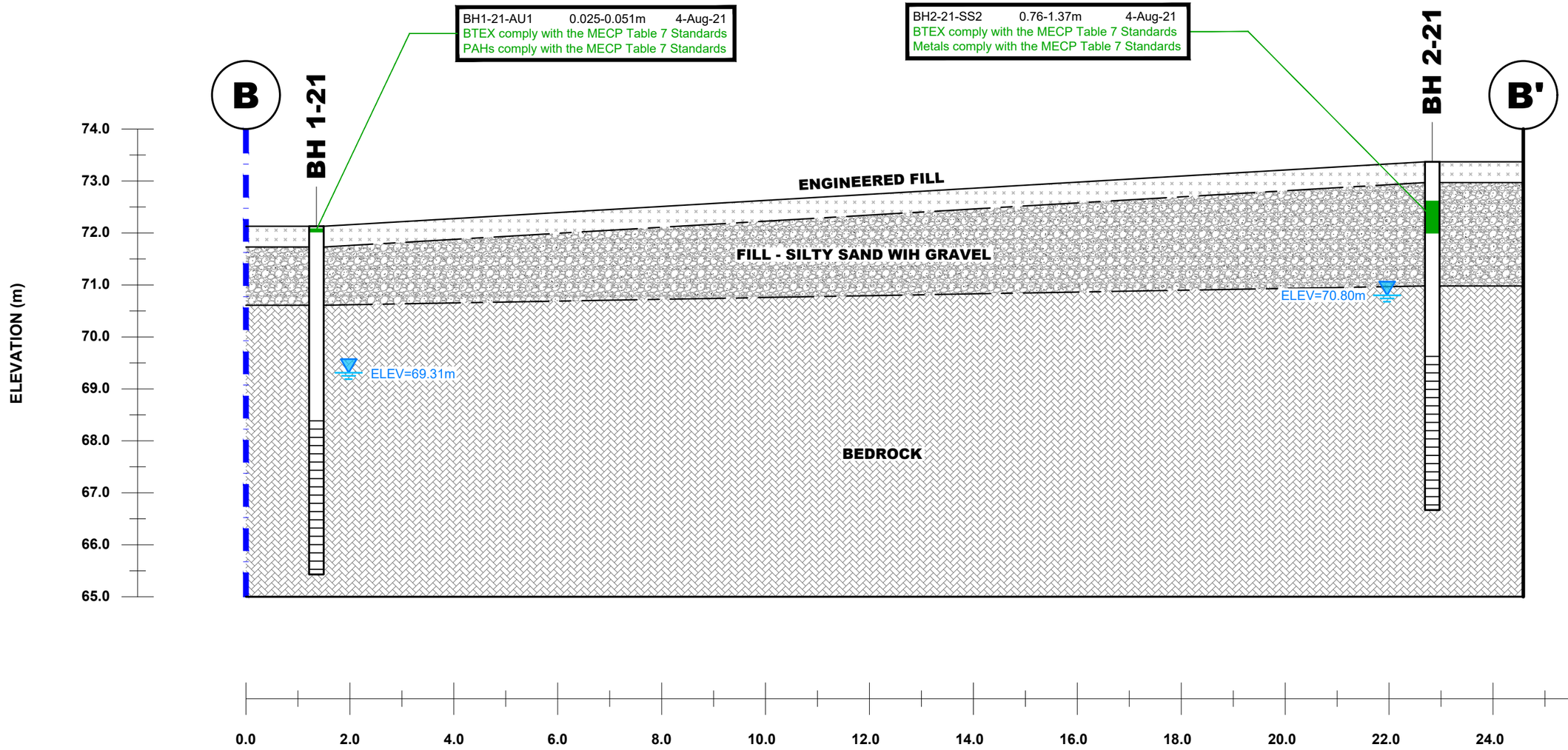

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:
CROSS SECTION B - B' - SOIL (BTEX, METALS, PAHs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-4B
Approved by: MSD	Revision No.:

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309 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

311 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

313 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

317 LEBRETON STREET SOUTH
RESIDENTIAL DWELLING

310 BELL STREET SOUTH
RESIDENTIAL DWELLING

BH3-21-AU1	0.025-0.051m	4-Aug-21
Parameter	Results (µg/g)	Standard (µg/g)
PHC-F3	690	300
PHC-F4	4040	2800

DUP(BH3-AU1)	0.025-0.051m	4-Aug-21
Parameter	Results (µg/g)	Standard (µg/g)
PHC-F3	338	300

312 BELL STREET SOUTH
RESIDENTIAL DWELLING

LANDSCAPED

GRAVEL LANEWAY / PARKING LOT

WOODEN STAIRS & LANDINGS

3-STOREY LOW-RISE + BASEMENT APARTMENT BUILDING

WOODEN PORCH

STEPS

314 BELL STREET SOUTH

A

BH 3-21
71.72
[70.78]
(68.56)

BH 1-21
72.13
[70.61]
(69.31)

B

A'

B'

BH 2-21
73.37
[70.98]
(70.80)

GRAVEL LANEWAY / PARKING LOT

OHW

OHW

OHW

OHW

SIDEWALK

BELL STREET SOUTH

MH
T/G=73.72

SIDEWALK

FH
T/S=75.00

316A BELL STREET SOUTH
RESIDENTIAL DWELLING

BH2-21-SS2	0.76-1.37m	4-Aug-21
PHCs comply with the MECP Table 7 Standards		

BH1-21-AU1	0.025-0.051m	4-Aug-21
PHCs comply with the MECP Table 7 Standards		

316B BELL STREET SOUTH
RESIDENTIAL DWELLING

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- 72.13 — GROUND SURFACE ELEVATION (m)
- [70.61] — BEDROCK SURFACE ELEVATION (m)
- (68.56) — GROUNDWATER SURFACE ELEVATION (m) (AUGUST 16, 2021)
- A — A' — CROSS SECTION

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

SCALE: 1:200

0 1 2 3 4 5 10m

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (PHCs)

Scale: 1:200	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-5
Approved by: MSD	Revision No.:

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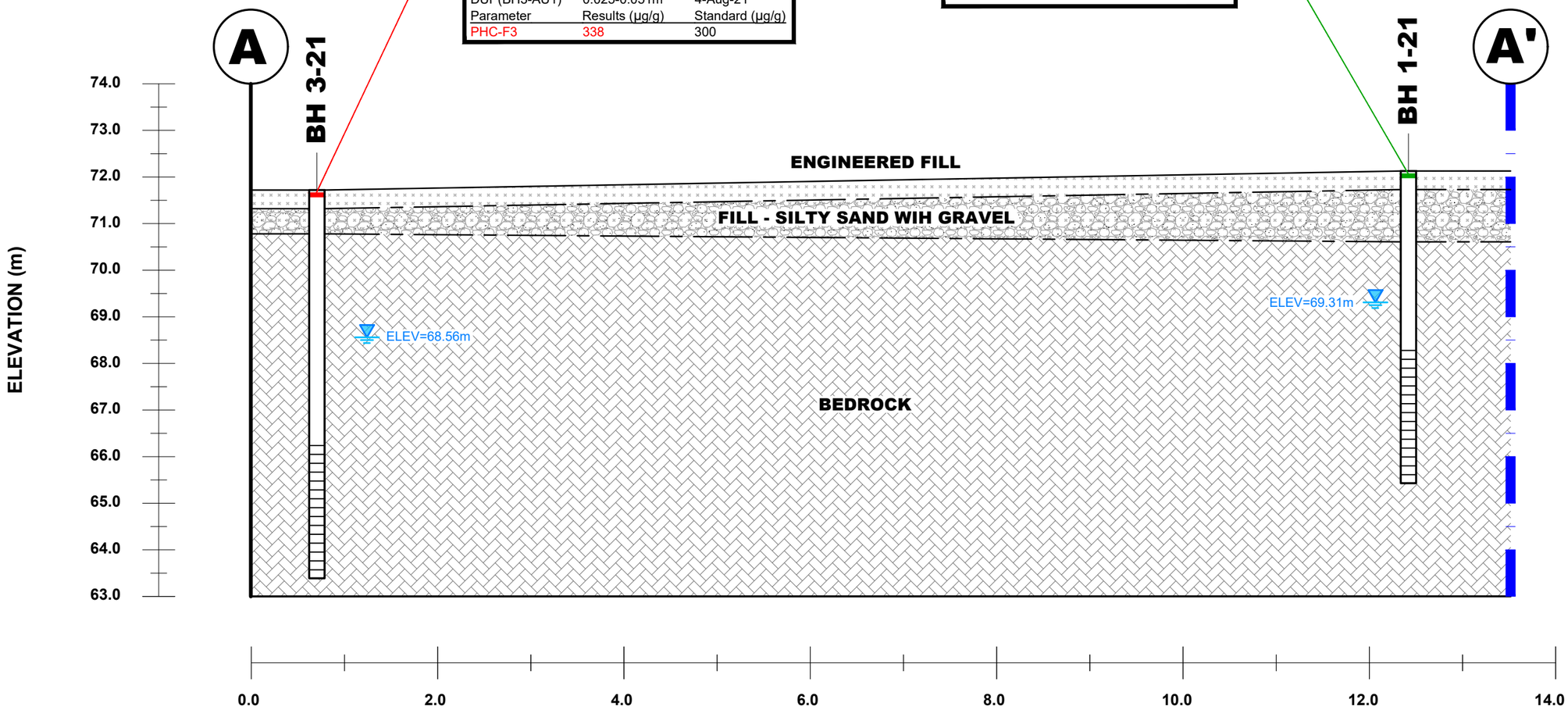
BH3-21-AU1	0.025-0.051m	4-Aug-21
Parameter	Results (µg/g)	Standard (µg/g)
PHC-F3	690	300
PHC-F4	4040	2800
DUP(BH3-AU1)	0.025-0.051m	4-Aug-21
Parameter	Results (µg/g)	Standard (µg/g)
PHC-F3	338	300

BH1-21-AU1 0.025-0.051m 4-Aug-21
PHCs comply with the MECP Table 7 Standards



SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

CROSS SECTION A - A' - SOIL (PHCs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-5A
Approved by: MSD	Revision No.:

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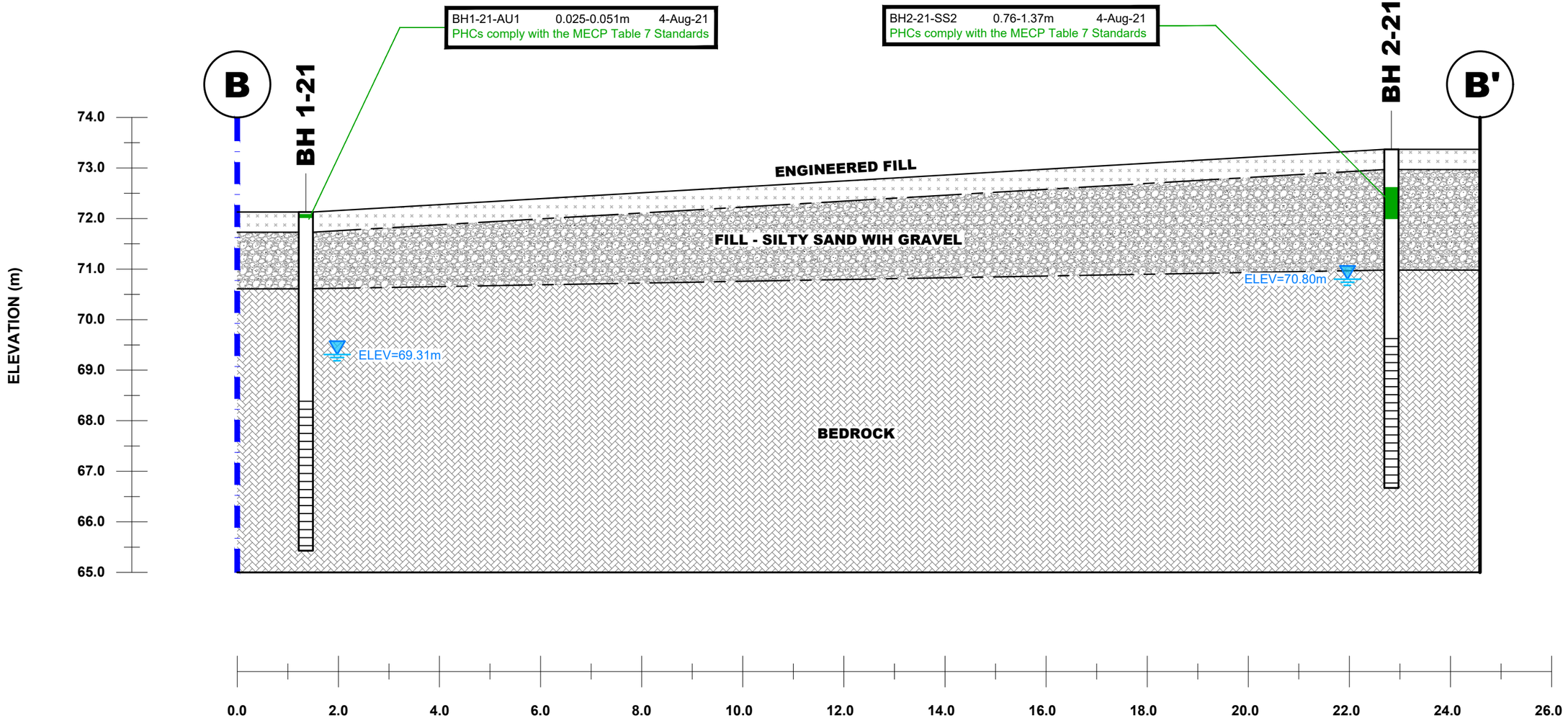

SOIL RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 7 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

CROSS SECTION B - B' - SOIL (PHCs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-5B
Approved by: MSD	Revision No.:

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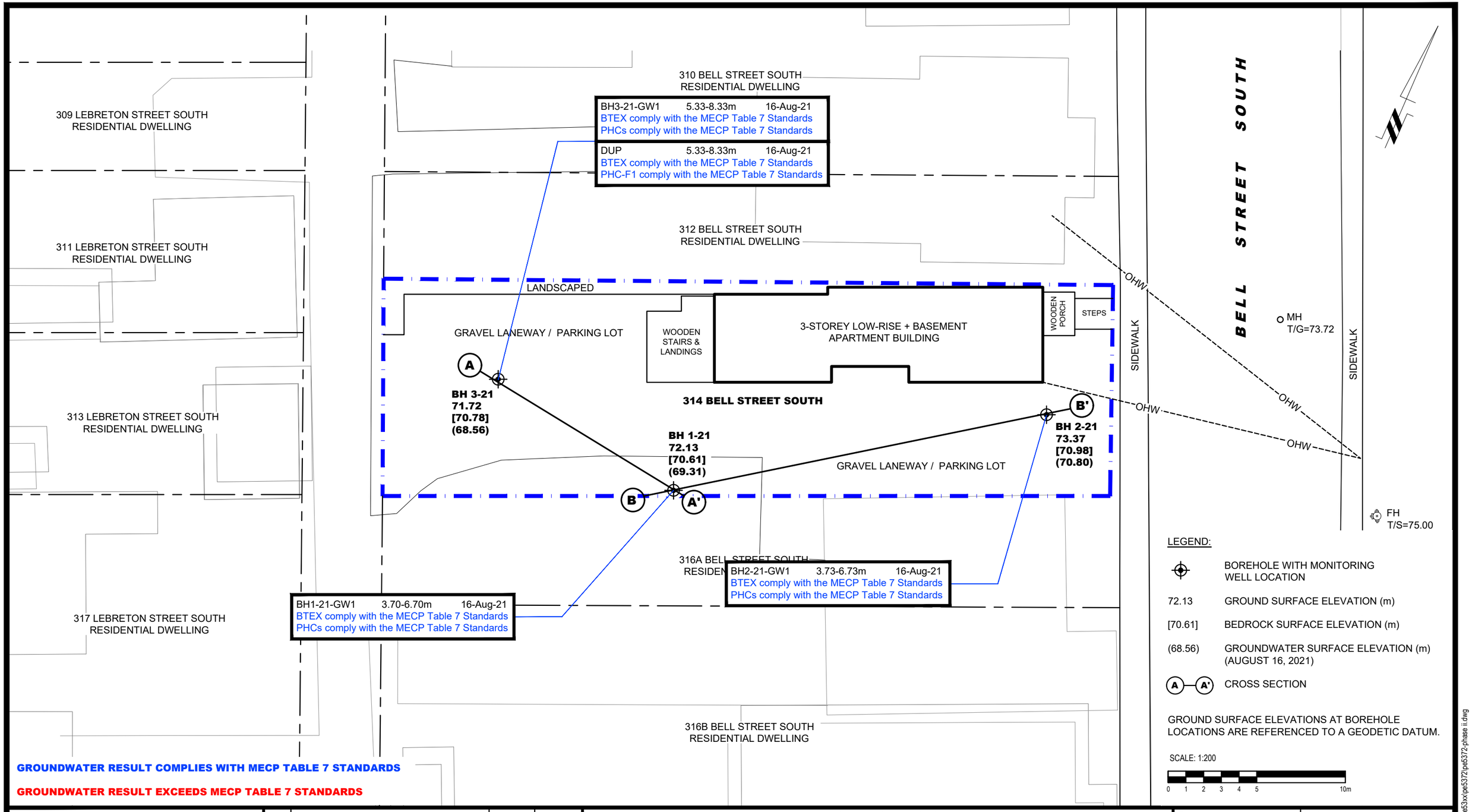

LEGEND:

⊕	BOREHOLE WITH MONITORING WELL LOCATION
72.13	GROUND SURFACE ELEVATION (m)
[70.61]	BEDROCK SURFACE ELEVATION (m)
(68.56)	GROUNDWATER SURFACE ELEVATION (m) (AUGUST 16, 2021)
A — A'	CROSS SECTION

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

SCALE: 1:200

0 1 2 3 4 5 10m

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:

ANALYTICAL TESTING PLAN - GROUNDWATER (BTEX, PHCs)

Scale: 1:200	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-6
Approved by: MSD	Revision No.:

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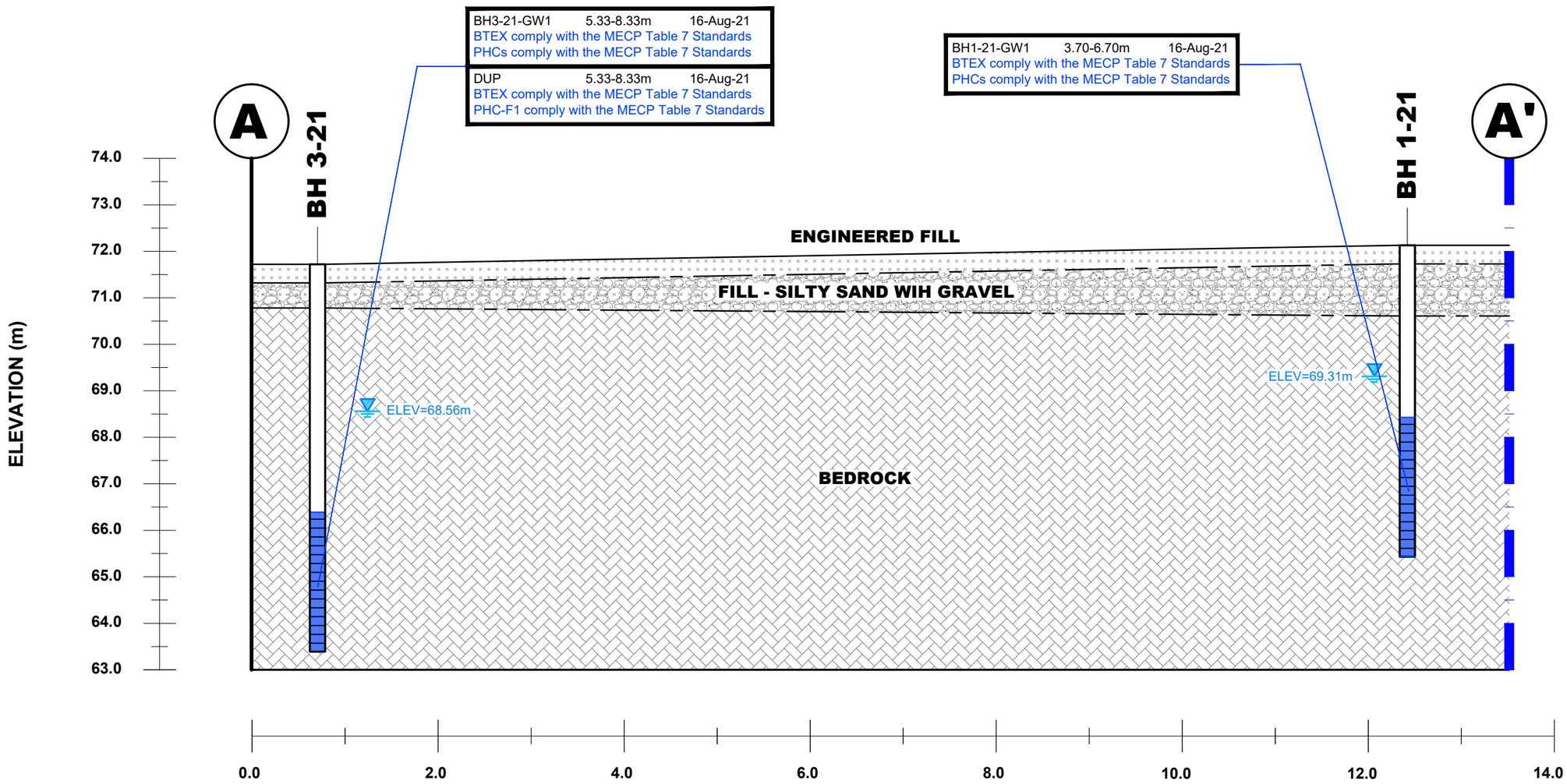

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

HD & P ARCHITECTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - GROUNDWATER (BTEX, PHCs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-6A
Approved by: MSD	Revision No.:

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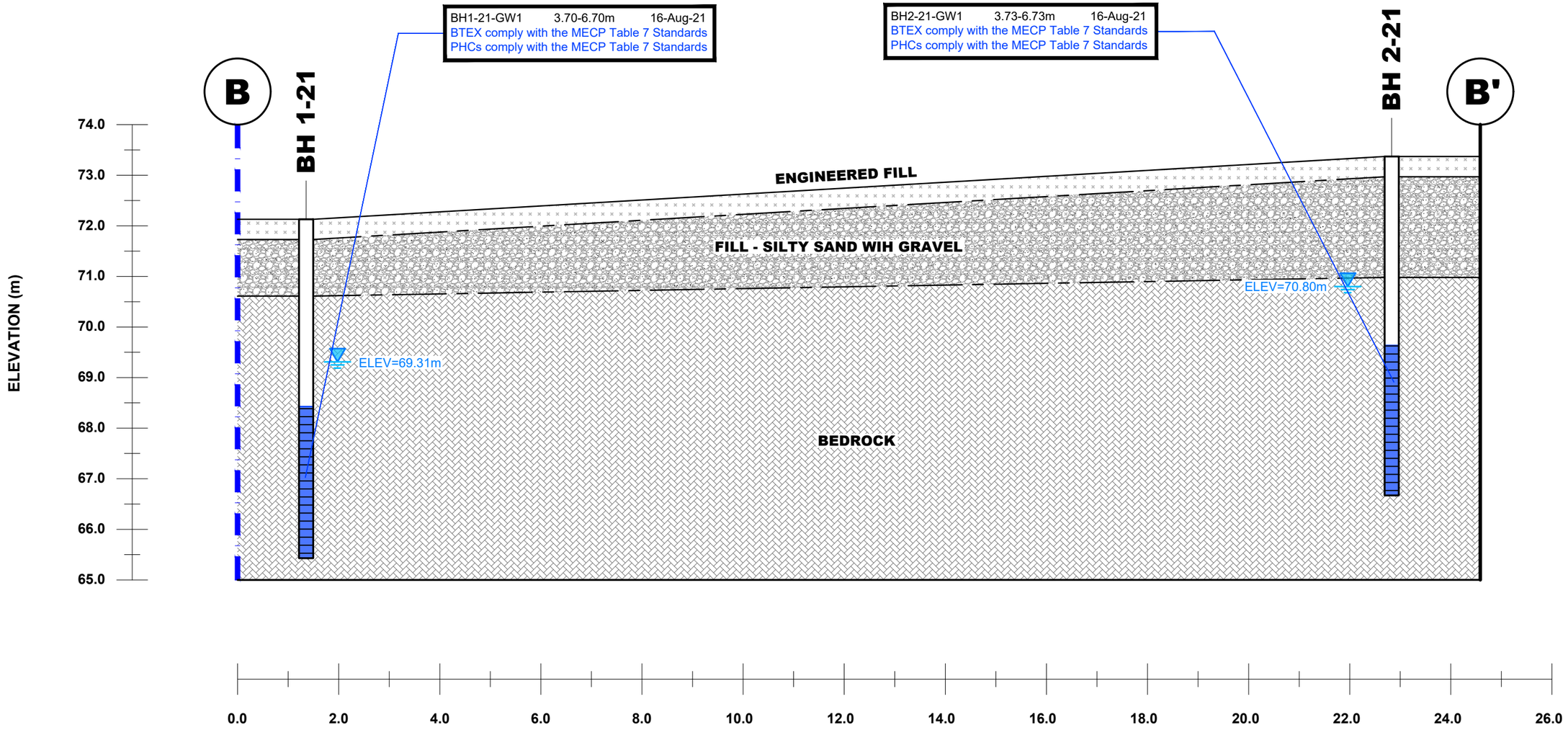

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 7 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 7 STANDARDS

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NO.	REVISIONS	DATE	INITIAL

HD & P ARCHITECTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
314 BELL STREET SOUTH

OTTAWA, ONTARIO

Title:
CROSS SECTION B-B' - GROUNDWATER (BTEX, PHCs)

Scale: AS SHOWN	Date: 08/2021
Drawn by: YA	Report No.: PE5372-2
Checked by: MW	Dwg. No.: PE5372-6B
Approved by: MSD	Revision No.:

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
314 Bell Street South
Ottawa, Ontario

Prepared For

HD & P Architects

August 2021

Report: PE5372-SAP

TABLE OF CONTENTS

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Lucas Tardioli of HD and P Architects to conduct a Phase II Environmental Site Assessment (ESA) for the Phase II ESA Property addressed 314 Bell Street South, Ottawa, Ontario.

The Phase II ESA was carried out to address the APECs identified in the Paterson Phase I ESA, dated August 2021. The following subsurface investigation program was developed to identify and delineate potential environmental concerns.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1-21	Assess soil and groundwater conditions on the Phase I Property due to APEC 1.	Boreholes to be advanced to approximately 6.70m to intercept the groundwater table.
BH2-21	Assess soil and groundwater conditions on the Phase I Property due to APEC 1.	Boreholes to be advanced to approximately 6.70m to intercept the groundwater table.
BH3-21	Assess soil and groundwater conditions on the Phase I Property due to APECs 1 and 2.	Boreholes to be advanced to approximately 8.00m to intercept the groundwater table.

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

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

2.0 ANALYTICAL TESTING PROGRAM

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

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

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

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

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

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

Equipment

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

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

Determining Borehole Locations

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

After drilling is completed a plan with the borehole locations must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Elevations were surveyed at geodetic elevations by Paterson personnel.

Drilling Procedure

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

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.

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

Spoon Washing Procedure

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

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

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

Screening Procedure

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

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

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

3.2 Monitoring Well Installation Procedure

Equipment

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

Procedure

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

3.3 Monitoring Well Sampling Procedure

Equipment

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

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

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

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

5.0 DATA QUALITY OBJECTIVES

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

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

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

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

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

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

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

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

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

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
314 Bell Street South
Ottawa, Ontario

DATUM Geodetic

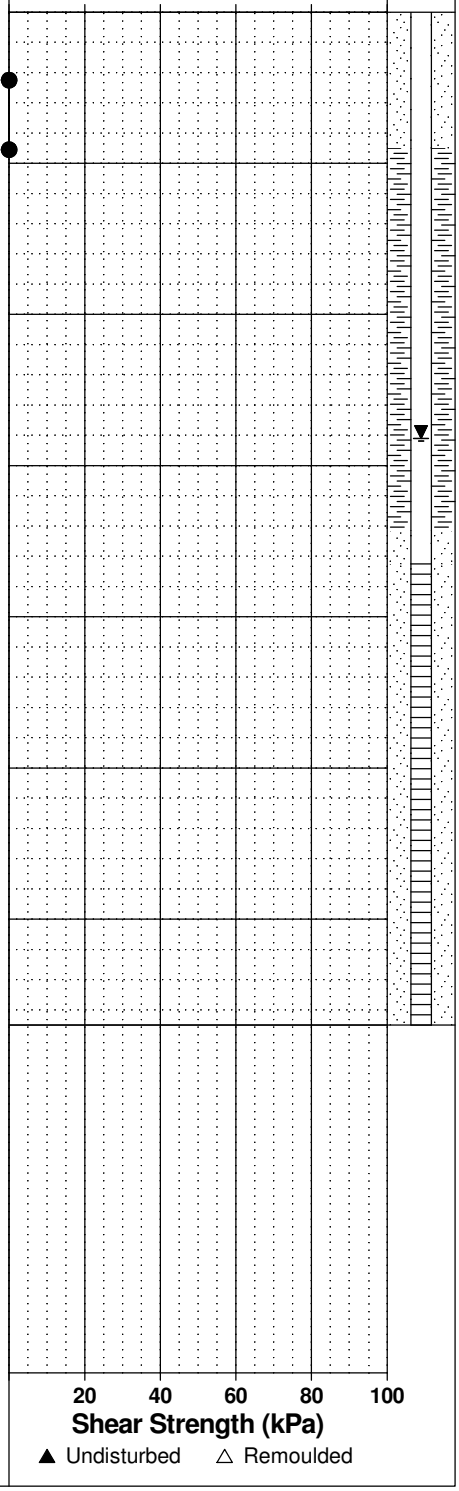
FILE NO. PE5372

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	72.13
FILL: Brown silty sand with crushed stone		AU	1				
0.40							
FILL: Brown silty sand with gravel, trace clay, occasional cobbles and boulders		SS	2	50		1	71.13
1.52						2	70.13
		RC	1	100	50	3	69.13
BDRCOk: Fair to good quality, grey limestone		RC	2	100	70	4	68.13
		RC	3	100	78	5	67.13
		RC	4	100	83	6	66.13
6.70							
End of Borehole							
(GWL @ 2.82m - August 16, 2021)							



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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
314 Bell Street South
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5372

REMARKS

HOLE NO. BH 2-21

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	73.37
FILL: Crushed stone with sand		AU	1				
0.40							
FILL: Brown silty sand, trace clay, gravel and topsoil, occasional cobbles and boulders		SS	2	75	13	1	72.37
		SS	3	56	50+	2	71.37
2.39		SS	4	50	50+		
		RC	1	100	89	3	70.37
		RC	2	100	97	4	69.37
BEDROCK: Excellent to good quality, grey limestone						5	68.37
		RC	3	100	88		
- fair quality by 6.1m depth						6	67.37
		RC	4	100	67		
6.73							
End of Borehole							
(GWL @ 2.57m - August 16, 2021)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
314 Bell Street South
Ottawa, Ontario

DATUM Geodetic

FILE NO. PE5372

REMARKS

HOLE NO. BH 3-21

BORINGS BY CME-55 Low Clearance Drill **DATE** August 4, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	71.72
FILL: Crushed stone with sand (0.40)		AU	1				
FILL: Brown silty sand with gravel, trace clay, occasional cobbles and boulders (0.94)		SS	2	67	50+	1	70.72
		RC	1	81	23		
		RC	2	100	50	2	69.72
		RC	3	100	90	3	68.72
BEDROCK: Poor to good quality, grey limestone interbedded with black shale						4	67.72
		RC	4	100	81	5	66.72
		RC	5	100	64	6	65.72
		RC	6	100	88	7	64.72
(8.33)						8	63.72
End of Borehole							
(GWL @ 3.16m - August 16, 2021)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

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

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

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

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

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

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

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

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

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

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

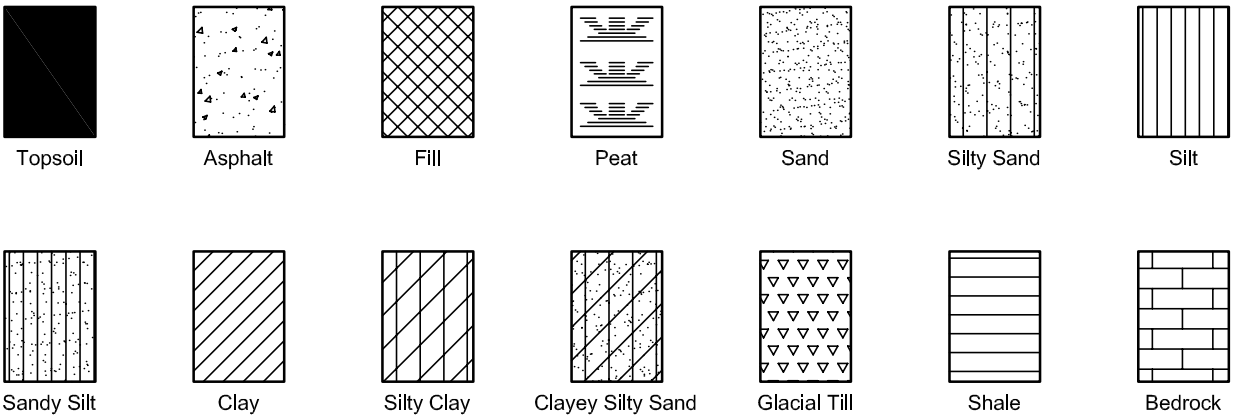
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

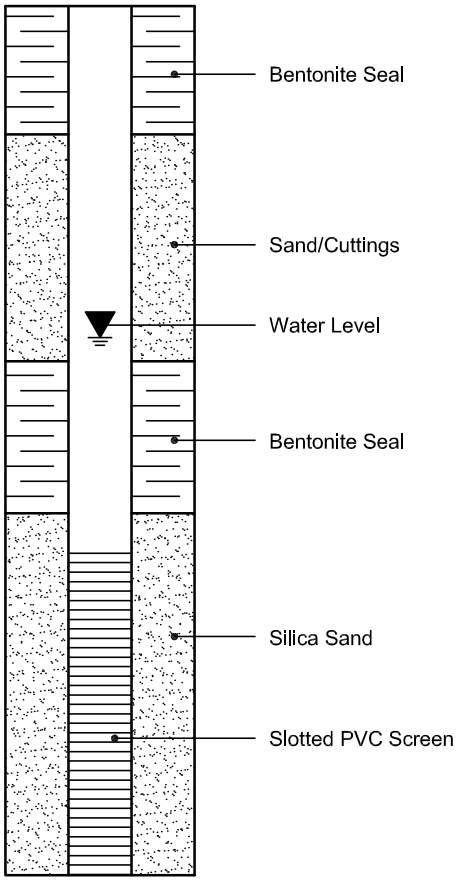
SYMBOLS AND TERMS (continued)

STRATA PLOT

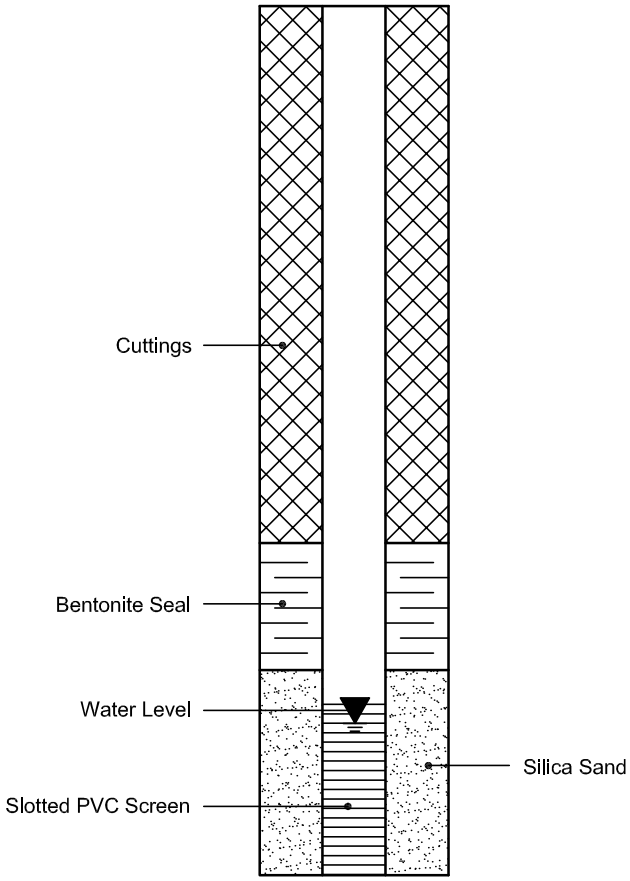


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO: 32545
Project: PE5372
Custody: 133062

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

Order #: 2132575

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

Paracel ID	Client ID
2132575-01	BH1-21-AU1
2132575-02	BH2-21-SS2
2132575-03	BH3-21-AU1
2132575-04	DUP-1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 12-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Aug-2021

Client PO: 32545

Project Description: PE5372

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	10-Aug-21	10-Aug-21
PHC F1	CWS Tier 1 - P&T GC-FID	10-Aug-21	10-Aug-21
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	12-Aug-21	12-Aug-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Aug-21	12-Aug-21
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	10-Aug-21	10-Aug-21
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	7-Aug-21	12-Aug-21
Solids, %	Gravimetric, calculation	9-Aug-21	10-Aug-21

Certificate of Analysis

Report Date: 12-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Aug-2021

Client PO: 32545

Project Description: PE5372

	Client ID:	BH1-21-AU1	BH2-21-SS2	BH3-21-AU1	DUP-1
	Sample Date:	04-Aug-21 09:00	04-Aug-21 09:00	04-Aug-21 09:00	04-Aug-21 09:00
	Sample ID:	2132575-01	2132575-02	2132575-03	2132575-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.8	85.3	95.4	94.3
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	5.2	-	-
Barium	1.0 ug/g dry	-	55.1	-	-
Beryllium	0.5 ug/g dry	-	0.6	-	-
Boron	5.0 ug/g dry	-	6.0	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	24.0	-	-
Cobalt	1.0 ug/g dry	-	6.4	-	-
Copper	5.0 ug/g dry	-	8.6	-	-
Lead	1.0 ug/g dry	-	24.5	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	13.4	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	10.0 ug/g dry	-	35.1	-	-
Zinc	20.0 ug/g dry	-	61.8	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	104%	113%	105%	105%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<80 [1]	<4	<80 [1]	<80 [1]
F3 PHCs (C16-C34)	8 ug/g dry	258	38	690	338
F4 PHCs (C34-C50)	6 ug/g dry	1140 [3]	46	2700 [3]	1520 [3]
F4G PHCs (gravimetric)	50 ug/g dry	1720	-	4040	2590
Semi-Volatiles					

Certificate of Analysis

Report Date: 12-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Aug-2021

Client PO: 32545

Project Description: PE5372

	Client ID:	BH1-21-AU1	BH2-21-SS2	BH3-21-AU1	DUP-1
	Sample Date:	04-Aug-21 09:00	04-Aug-21 09:00	04-Aug-21 09:00	04-Aug-21 09:00
	Sample ID:	2132575-01	2132575-02	2132575-03	2132575-04
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthene	0.02 ug/g dry	<0.04 [1]	-	<0.04 [1]	-
Acenaphthylene	0.02 ug/g dry	<0.04 [1]	-	0.09	-
Anthracene	0.02 ug/g dry	0.05	-	0.08	-
Benzo [a] anthracene	0.02 ug/g dry	0.12	-	0.25	-
Benzo [a] pyrene	0.02 ug/g dry	0.19	-	0.30	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.17	-	0.27	-
Benzo [g,h,i] perylene	0.02 ug/g dry	0.20	-	0.31	-
Benzo [k] fluoranthene	0.02 ug/g dry	0.09	-	0.18	-
Chrysene	0.02 ug/g dry	0.14	-	0.27	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.04 [1]	-	<0.04 [1]	-
Fluoranthene	0.02 ug/g dry	0.29	-	0.45	-
Fluorene	0.02 ug/g dry	<0.04 [1]	-	<0.04 [1]	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	0.10	-	0.17	-
1-Methylnaphthalene	0.02 ug/g dry	<0.04 [1]	-	<0.04 [1]	-
2-Methylnaphthalene	0.02 ug/g dry	<0.04 [1]	-	<0.04 [1]	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.08 [1]	-	<0.08 [1]	-
Naphthalene	0.01 ug/g dry	<0.02 [1]	-	0.02	-
Phenanthrene	0.02 ug/g dry	0.17	-	0.20	-
Pyrene	0.02 ug/g dry	0.25	-	0.41	-
2-Fluorobiphenyl	Surrogate	105%	-	113%	-
Terphenyl-d14	Surrogate	114%	-	136%	-

Certificate of Analysis

Report Date: 12-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 6-Aug-2021

Client PO: 32545

Project Description: PE5372

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*0.773*		*ug/g*		*57.9*	*50-140*			
Surrogate: Terphenyl-d14	*1.13*		*ug/g*		*84.7*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*8.65*		*ug/g*		*108*	*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)	300	7	ug/g dry	308			2.8	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND			NC	30	
F3 PHCs (C16-C34)	38	8	ug/g dry	23			NC	30	
F4 PHCs (C34-C50)	41	6	ug/g dry	62			NC	30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			NC	30	
Arsenic	8.8	1.0	ug/g dry	9.0			1.4	30	
Barium	54.8	1.0	ug/g dry	64.5			16.3	30	
Beryllium	0.6	0.5	ug/g dry	0.6			0.9	30	
Boron	10.8	5.0	ug/g dry	11.8			8.6	30	
Cadmium	ND	0.5	ug/g dry	ND			NC	30	
Chromium	18.0	5.0	ug/g dry	20.0			10.3	30	
Cobalt	9.3	1.0	ug/g dry	10.6			13.5	30	
Copper	15.9	5.0	ug/g dry	17.7			10.7	30	
Lead	8.5	1.0	ug/g dry	8.8			3.8	30	
Molybdenum	2.2	1.0	ug/g dry	2.3			5.7	30	
Nickel	23.0	5.0	ug/g dry	25.7			11.1	30	
Selenium	ND	1.0	ug/g dry	ND			NC	30	
Silver	ND	0.3	ug/g dry	ND			NC	30	
Thallium	ND	1.0	ug/g dry	ND			NC	30	
Uranium	ND	1.0	ug/g dry	ND			NC	30	
Vanadium	28.6	10.0	ug/g dry	31.8			10.6	30	
Zinc	41.2	20.0	ug/g dry	45.3			9.4	30	
Physical Characteristics									
% Solids	96.5	0.1	% by Wt.	96.4			0.0	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND			NC	40	
Acenaphthylene	ND	0.02	ug/g dry	ND			NC	40	
Anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			NC	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND			NC	40	
Chrysene	ND	0.02	ug/g dry	ND			NC	40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND			NC	40	
Fluoranthene	0.056	0.02	ug/g dry	0.049			14.6	40	
Fluorene	ND	0.02	ug/g dry	ND			NC	40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND			NC	40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND			NC	40	
Naphthalene	ND	0.01	ug/g dry	ND			NC	40	
Phenanthrene	0.044	0.02	ug/g dry	0.033			28.8	40	
Pyrene	0.044	0.02	ug/g dry	0.036			19.4	40	
Surrogate: 2-Fluorobiphenyl	*1.05*		*ug/g dry*		*66.2*	*50-140*			
Surrogate: Terphenyl-d14	*1.51*		*ug/g dry*		*95.1*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND			NC	50	
Ethylbenzene	0.772	0.05	ug/g dry	0.832			7.4	50	
Toluene	0.223	0.05	ug/g dry	0.240			7.5	50	
m,p-Xylenes	4.16	0.05	ug/g dry	4.40			5.7	50	
o-Xylene	2.94	0.05	ug/g dry	3.08			4.8	50	
Surrogate: Toluene-d8	*9.48*		*ug/g dry*		*108*	*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)	169	7	ug/g	ND	84.6	80-120			
F2 PHCs (C10-C16)	88	4	ug/g	ND	105	60-140			
F3 PHCs (C16-C34)	262	8	ug/g	23	116	60-140			
F4 PHCs (C34-C50)	230	6	ug/g	62	129	60-140			
F4G PHCs (gravimetric)	860	50	ug/g	ND	86.0	80-120			
Metals									
Antimony	52.1	1.0	ug/g	ND	104	70-130			
Arsenic	55.7	1.0	ug/g	3.6	104	70-130			
Barium	78.3	1.0	ug/g	25.8	105	70-130			
Beryllium	52.4	0.5	ug/g	ND	104	70-130			
Boron	51.1	5.0	ug/g	ND	92.8	70-130			
Cadmium	50.6	0.5	ug/g	ND	101	70-130			
Chromium	61.9	5.0	ug/g	8.0	108	70-130			
Cobalt	57.5	1.0	ug/g	4.3	106	70-130			
Copper	57.1	5.0	ug/g	7.1	100	70-130			
Lead	46.8	1.0	ug/g	3.5	86.5	70-130			
Molybdenum	54.1	1.0	ug/g	ND	106	70-130			
Nickel	61.8	5.0	ug/g	10.3	103	70-130			
Selenium	48.6	1.0	ug/g	ND	96.9	70-130			
Silver	50.4	0.3	ug/g	ND	101	70-130			
Thallium	48.7	1.0	ug/g	ND	97.1	70-130			
Uranium	49.1	1.0	ug/g	ND	97.5	70-130			
Vanadium	67.6	10.0	ug/g	12.7	110	70-130			
Zinc	65.6	20.0	ug/g	ND	94.9	70-130			
Semi-Volatiles									
Acenaphthene	0.167	0.02	ug/g	ND	83.8	50-140			
Acenaphthylene	0.150	0.02	ug/g	ND	75.5	50-140			
Anthracene	0.176	0.02	ug/g	ND	88.6	50-140			
Benzo [a] anthracene	0.167	0.02	ug/g	ND	83.8	50-140			
Benzo [a] pyrene	0.202	0.02	ug/g	ND	101	50-140			
Benzo [b] fluoranthene	0.202	0.02	ug/g	ND	101	50-140			
Benzo [g,h,i] perylene	0.187	0.02	ug/g	ND	94.1	50-140			
Benzo [k] fluoranthene	0.190	0.02	ug/g	ND	95.6	50-140			
Chrysene	0.214	0.02	ug/g	ND	107	50-140			
Dibenzo [a,h] anthracene	0.162	0.02	ug/g	ND	81.3	50-140			
Fluoranthene	0.196	0.02	ug/g	0.049	74.1	50-140			
Fluorene	0.159	0.02	ug/g	ND	80.0	50-140			
Indeno [1,2,3-cd] pyrene	0.147	0.02	ug/g	ND	74.1	50-140			
1-Methylnaphthalene	0.127	0.02	ug/g	ND	63.9	50-140			
2-Methylnaphthalene	0.143	0.02	ug/g	ND	71.9	50-140			
Naphthalene	0.162	0.01	ug/g	ND	81.4	50-140			
Phenanthrene	0.160	0.02	ug/g	0.033	64.0	50-140			
Pyrene	0.191	0.02	ug/g	0.036	77.8	50-140			
Surrogate: 2-Fluorobiphenyl	*0.988*		*ug/g*		*62.1*	*50-140*			
Surrogate: Terphenyl-d14	*1.47*		*ug/g*		*92.6*	*50-140*			
Volatiles									
Benzene	3.54	0.02	ug/g	ND	88.5	60-130			
Ethylbenzene	4.30	0.05	ug/g	ND	108	60-130			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 32545

Report Date: 12-Aug-2021

Order Date: 6-Aug-2021

Project Description: PE5372

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	4.26	0.05	ug/g	ND	107	60-130			
m,p-Xylenes	8.69	0.05	ug/g	ND	109	60-130			
o-Xylene	4.49	0.05	ug/g	ND	112	60-130			
Surrogate: Toluene-d8	*7.36*		*ug/g*		*92.0*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - Jar reads: "BH1-21-SS2"
Applies to samples: BH2-21-SS2

Sample Qualifiers :

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

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

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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

CCME PHC additional information:

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

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Chain Of Custody
(Lab Use Only)
№ 133062

Client Name: PATERSON	Project Ref: PE5372	Page __ of __
Contact Name: MARK D'ARCY	Quote #:	Turnaround Time
Address: 154 COLONNADE RD	PO #: 32545	☐ 1 day ☐ 3 day
	E-mail: MDARCY@PATERSONGROUP.CA	☐ 2 day ☒ Regular
Telephone:		Date Required:

☒ REG 153/04 ☐ REG 406/19	Other Regulation	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)
☐ Table 1 ☐ Res/Park ☐ Med/Fine	☐ REG 558 ☐ PWQO	
☐ Table 2 ☐ Ind/Comm ☐ Coarse	☐ CCME ☐ MISA	
☐ Table 3 ☐ Agri/Other	☐ SU - Sani ☐ SU - Storm	
☒ Table 7	Mun:	
For RSC: ☐ Yes ☐ No	☐ Other:	

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)					
1	BH1-21-AU1	S		2	AUGUST 4	12pm	X		X									
2	BH2-21-SS2	S		2	↓		X			X								
3	BH3-21-AU1	S		2			X		X									
4	DUP-1	S		2			X											
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: Drop Box

Relinquished By (Sign): Kat Linscott	Received By Driver/Depot:	Received at Lab: JV neepawa Dok mai	Verified By:
Relinquished By (Print): KAT LINSCOTT	Date/Time:	Date/Time: AUG 06, 2021 03:29	Date/Time: Aug 6 2021 16:01
Date/Time: Aug 6/2021	Temperature: °C	Temperature: 19.3 °C	pH Verified: ☐ By:

Chain of Custody (Env) xlsx

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Certificate of Analysis

Paterson Group Consulting Engineers

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

Client PO:
Project: PE5372
Custody: 133058

Report Date: 19-Aug-2021
Order Date: 16-Aug-2021

Order #: 2134107

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

Paracel ID	Client ID
2134107-01	BH1-21
2134107-02	BH2-21
2134107-03	BH3-21
2134107-04	DUP

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 624 - P&T GC-MS	17-Aug-21	17-Aug-21
PHC F1	CWS Tier 1 - P&T GC-FID	17-Aug-21	17-Aug-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	17-Aug-21	18-Aug-21

Certificate of Analysis

Report Date: 19-Aug-2021

Client: **Paterson Group Consulting Engineers**

Order Date: 16-Aug-2021

Client PO:

Project Description: PE5372

	Client ID:	BH1-21	BH2-21	BH3-21	DUP
	Sample Date:	16-Aug-21 09:00	16-Aug-21 09:00	16-Aug-21 09:00	16-Aug-21 09:00
	Sample ID:	2134107-01	2134107-02	2134107-03	2134107-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Benzene	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
Toluene	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%	103%	105%	104%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-

Certificate of Analysis

Report Date: 19-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 16-Aug-2021

Client PO:

Project Description: PE5372

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*84.0*		*ug/L*		*105*	*50-140*			

Certificate of Analysis

Report Date: 19-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 16-Aug-2021

Client PO:

Project Description: PE5372

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	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: Toluene-d8	*84.8*		*ug/L*		*106*	*50-140*			

Certificate of Analysis

Report Date: 19-Aug-2021

Client: Paterson Group Consulting Engineers

Order Date: 16-Aug-2021

Client PO:

Project Description: PE5372

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2110	25	ug/L	ND	106	68-117			
F2 PHCs (C10-C16)	1840	100	ug/L	ND	115	60-140			
F3 PHCs (C16-C34)	4130	100	ug/L	ND	105	60-140			
F4 PHCs (C34-C50)	3120	100	ug/L	ND	126	60-140			
Volatiles									
Benzene	39.2	0.5	ug/L	ND	98.0	60-130			
Ethylbenzene	38.2	0.5	ug/L	ND	95.6	60-130			
Toluene	42.6	0.5	ug/L	ND	107	60-130			
m,p-Xylenes	77.1	0.5	ug/L	ND	96.3	60-130			
o-Xylene	40.3	0.5	ug/L	ND	101	60-130			
Surrogate: Toluene-d8	*83.6*		*ug/L*		*105*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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: 2134107

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2134107	№ 133058

Page __ of __

Client Name: Paterson	Project Ref: PE 5372
Contact Name: Mark D'Arcy	Quote #:
Address: 154 colonnade	PO #:
Telephone: 613 226 7381	E-mail: MDArcy@patersongroup.ca

Turnaround Time

☐ 1 day ☐ 3 day ☐ 2 day ☑ Regular

Date Required: _____

Regulation			
☐ REG 153/04	☐ REG 406/19	Other Regulation	
☐ Table 1	☐ Res/Park	☐ Med/Fine	☐ REG 558 ☐ PWQO
☐ Table 2	☐ Ind/Comm	☐ Coarse	☐ CCME ☐ MISA
☒ Table 3	☐ Agri/Other		☐ SU - Sani ☐ SU - Storm
☐ Table ___			Mun:
For RSC: ☐ Yes ☐ No			☐ Other:

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

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	PHCs F1 + BTEX				
1	BH1-21	GW		3	Aug 16 2021		✓											
2	BH2-21	GW		3	Aug 16 2021		✓											
3	BH3-21	GW		3	Aug 16 2021		✓							✓				
4	DUP	GW		#2	Aug 16 2021													
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery: PARACEL COURIER

Relinquished By (Sign): GPat	Received By Driver/Depot: A. Flouse	Received at Lab: Ottawa	Verified By:
Relinquished By (Print): Grant Paterson	Date/Time: 16/08/21 3:16	Date/Time: Aug 16, 2021 03.55	Date/Time: Aug 16, 2021 16:42
Date/Time: Aug 16 2021	Temperature: °C	Temperature: 16.7 °C	pH Verified: ☐ By: