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Phase I Environmental Site Assessment

Surface Parking Lot
East Part of 851 Richmond Road
Ottawa, Ontario

Prepared For

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EXECUTIVE SUMMARY

Assessment

Paterson Group was retained by Homestead Land Holdings to conduct a Phase I Environmental Site Assessment (ESA) for part of the property at 851 Richmond Road, in the City of Ottawa, Ontario. The purpose of this Phase I-Environmental Site Assessment (Phase I-ESA) was to research the past and current use of the site and study area and to identify any environmental concerns with the potential to have impacted the subject properties.

The subject site currently consists of a paved surface parking lot, used by the residents of the apartment building at 851 Richmond Road. No structures are currently present on the subject site. Based on historical searches, three aboveground diesel fuel oil storage tanks were present near the centre of the subject property, from the 1940s until the 1950's. A coal storage yard, as well as a retail fuel outlet were present to the north and south, respectively, within that time period as well. A rail line was formerly located along the north edge of the subject property. The former aboveground storage tanks, retail fuel outlet, coal yard and rail line were all considered to be potentially contaminating activities, and were addressed as part of a subsurface geotechnical investigation conducted concurrently with this Phase I-ESA.

Following the historical research, a site visit was conducted to assess the subject site and Phase I ESA study area. The site visit did not identify any additional PCAs or APECs.

As part of a geotechnical investigation, conducted in conjunction with the Phase I-ESA, 6 boreholes were placed on the subject for geotechnical purposes. Three (3) of these boreholes were instrumented with groundwater monitoring wells. Analytical soil and groundwater testing was conducted on samples collected from these locations. All final soil and groundwater parameters were in compliance with site standards, with the exception of one soil sample near the centre north of the site, which was found to have an exceedance of the F2 petroleum hydrocarbon fraction.

Based on the results of this Phase I – ESA no further investigatory work is required at this time, provided that the site will be redeveloped in the near future.

Recommendation

Impacted soil was identified in the area of borehole BH3. It is understood that the subject property will be developed with a multi storey apartment building, with underground parking. It is recommended that any impacted soil encountered during the site redevelopment project be removed from the property and disposed of at an approved waste disposal facility. Prior to disposal, a Toxicity Characteristic Leaching Procedure analysis will be required on a representative impacted soil sample.

1.0 INTRODUCTION

At the request of Homestead Land Holdings Ltd. (Homestead), Paterson Group (Paterson) conducted a Phase I Environmental Site Assessment (Phase I ESA) of the east side of 851 Richmond Road, in the City of Ottawa, Ontario. The purpose of this Phase I ESA was to research the past and current use of the site and study area and to identify any environmental concerns with the potential to have impacted the subject property.

Paterson was engaged to conduct this Phase I ESA by Mr. David Trousdale of Homestead. Homestead's offices are located at 80 Johnson Street, Kingston Ontario. Mr. Trousdale can be reached by telephone at (613) 546-3146.

This report has been prepared specifically and solely for the above noted project which is described herein. It contains all of our findings and results of the environmental conditions at this site.

This Phase I-ESA report has been prepared in general accordance with the requirements of Ontario Regulation 153/04 as amended by O.Reg. 269/11 (Environmental Protection Act), and also complies with the requirements of CSA Z768-01. The conclusions presented herein are based on information gathered from a limited historical review and field inspection program. The findings of the Phase I - ESA are based on a review of readily available geological, historical and regulatory information and a cursory review made at the time of the field assessment. The historical research relies on information supplied by others, such as, local, provincial and federal agencies and was limited within the scope-of-work, time and budget of the project herein.

2.0 PHASE I PROPERTY INFORMATION

Address:	851 Richmond Road, Ottawa, Ontario.
Legal Description:	Part of Lot 26, Concession 1 (Ottawa Front), Geographic Township of Nepean, City of Ottawa.
Property Identification Number:	Part of 04751-0112.
Location:	The subject site is located on the north side of Richmond Road, east of Woodroffe Avenue.
Latitude and Longitude:	42° 22' 49" N, 75° 46' 21" W;
Site Description:	
Configuration:	Rectangular.
Site Area:	0.26 hectare.
Zoning:	R5C, residential 5 th density.
Current Use:	The subject site is currently used for surface parking for the tenants of the residential building at 851 Richmond Road.
Services:	The subject site is located in an area serviced by municipal water and sewer.

3.0 SCOPE OF INVESTIGATION

The scope of work for this Phase I – Environmental Site Assessment was as follows:

- Determine the historical activities on the subject site and study area by conducting a review of readily available records, reports, photographs, plans, mapping, databases and regulatory agencies;
- Investigate the existing conditions present at the subject site and study area by conducting site reconnaissance;
- Conduct interviews with persons knowledgeable of current and historic operations on the subject property, and if warranted, neighbouring properties;
- Present the results of our findings in a comprehensive report in general accordance with the requirements of Ontario Regulation 269/11 amending O.Reg. 153/04 made under the Environmental Protection Act and in compliance with the requirements of CSA Z768-01;
- Provide a preliminary environmental site evaluation based on our findings;
- Provide preliminary remediation recommendations and further investigative work if contamination is suspected or encountered.

4.0 RECORDS REVIEW

4.1 General

Phase I-ESA Study Area Determination

A radius of approximately 250 m was determined to be appropriate as a Phase I ESA study area for this assignment. Properties outside the 250 m radius are not considered to have impacted the subject land, based on their significant distance from the site.

First Developed Use Determination

According to the city directories and aerial photos, the first developed use of the subject site was in the early 1950's as a diesel fuel oil storage area (equipped with three aboveground storage tanks). The entire property at 851 Richmond Road was later redeveloped with a residential apartment building in the mid 1970's and the subject site became a paved parking lot for the residents of the tower.

Fire Insurance Plans

Fire Insurance Plans (FIPs) from 1956 were reviewed for the area of the subject site. According to the FIPs, the subject property was occupied by three aboveground diesel fuel oil tanks.

Adjacent to the west, off the subject property, was a retail fuel outlet with two underground storage tanks, and the property to the east was occupied by a wood and coal merchant and a coal shed. To the north was a Canadian Pacific railway line, and to the south, Richmond Road, followed by a Ottawa Transportation Commission Right of Way, then Byron Avenue and residences.

City of Ottawa Street Directories

City directories at the National Archives were reviewed in approximate 10 year intervals from 1940 to 2011 as part of the Phase I ESA.

Based on the directories, 851 Richmond Road was first listed in 1974 as an apartment building. The address 851 Richmond Road was not listed prior to that, however Sunlight Oil Co (which was shown on the 1956 FIP under 855 Richmond Road) was present from the 1940's until the 1950's.

Adjacent properties were listed as commercial, industrial and residential. The property to the east was listed as Leafloor Bros. Coal from the 1950's until the

1960's. The property was then used as a restaurant up until the time of this report. A retail fuel outlet was located further to the east in the 1950's and 1960's.

These off-site activities are considered to be potentially contaminating activities, however, due to their separation distances from the subject property, and their locations with respect to the anticipated groundwater flow direction, they are not considered to be areas of potential environmental concern.

Chain of Title

Paterson requisitioned a title search for the subject property from Read Abstracts Ltd. of Ottawa, Ontario. The title search indicated that the property first changed hands between individuals in 1836. The property had been owned by individuals, estates and trustees until 1958, when it was acquired by B.P. Canada Limited. In 1972, the property was purchased by Belcourt Construction Limited. This coincides with the approximate construction date of the residential apartment building at 851 Richmond Road. After 1972, the property was owned by various companies until being acquired by the current owners, Homestead Land Holdings Limited, in 1997.

Current Plan of Survey

A current survey plan was reviewed as a part of this assessment. The survey plan was prepared by Annis, O'Sullivan, Vollebekk Ltd, and dated March 2017.

4.2 Environmental Source Information

Environment Canada

A search of the National Pollutant Release Inventory (NPRI) was conducted electronically on June 9, 2017. The subject site was not listed in the NPRI database. No records of pollutant release were listed in the database for properties located within the Phase I Study Area.

PCB Inventory

A search of national PCB waste storage sites was conducted. No PCB waste storage sites were identified in the study area.

Ontario Ministry of Environment (MOECC) Instruments

A request was submitted to the MOECC Freedom of Information office for information with respect to certificates of approval, permits to take water,

certificates of property use or any other similar MOECC issued instruments for the site. No records were identified by the MOECC.

MOECC Coal Gasification Plant Inventory

The Ontario Ministry of Environment document titled "Municipal Coal Gasification Plant Site Inventory, 1991" was reviewed to reference the locations of former plants with respect to the site. No coal gasification plants were identified within the Phase I study area.

MOECC Incident Reports

A request was submitted to the MOECC Freedom of Information office for information with respect to records concerning environmental incidents, orders, offences, spills, discharges of contaminants or inspections maintained by the MOECC for the site or adjacent properties. A response from the MOECC was not available at the time of preparation of this report.

MOECC Waste Management Records

A request was submitted to the MOECC Freedom of Information office for information with respect to waste management records. A response from the MOECC was not available at the time of preparation of this report.

MOECC Submissions

A request was submitted to the MOECC Freedom of Information office for information with respect to reports related to environmental conditions have been submitted to the MOECC. A response from the MOECC was not available at the time of preparation of this report.

MOECC Brownfields Environmental Site Registry

A search of the MOECC Brownfields Environmental Site Registry was conducted as part of this assessment, for the subject site and properties located within the Phase I study area. There are no records of site condition (RSC) listed in the registry for the Phase I Property. An RSC was identified for the property addressed as 761-793 Richmond Road (currently addressed 75 Cleary Avenue), located approximately 170 m northeast of the Phase I property. According to the information provided in the registry, a soil and groundwater remediation program was conducted in 2009. Contaminants of concern included polynuclear aromatic hydrocarbons (PAHs), benzene, toluene, ethylbenzene and xylenes (BTEX) and petroleum hydrocarbons (PHCs) in the soil and PAHs and BTEX in the groundwater.

Based on its distance from the subject property in combination with the inferred groundwater flow direction to the north, there is no potential for this site to have impacted the Phase I property. No other RSCs were identified for properties within the Phase I study area.

MOECC Waste Disposal Site Inventory

The Ontario Ministry of Environment document titled "Waste Disposal Site Inventory in Ontario, 1991" was reviewed as part of the historical research. This document includes all recorded active and closed waste disposal sites, industrial manufactured gas plants and coal tar distillation plants in the Province of Ontario. Based on the available information, there are no landfills within the study area.

Areas of Natural Significance

A search for areas of natural significance and features within the Phase I study area was conducted on the web site of the Ontario Ministry of Natural Resources (MNR) on June 9, 2017. The search did not reveal any natural features or areas of natural significance within the Phase I study area.

Technical Standards and Safety Authority (TSSA)

The TSSA, Fuels Safety Branch in Toronto was contacted electronically on June 29, 2017 to inquire about current and former underground storage tanks, spills and incidents for the site and neighbouring properties. The TSSA search did not return any records for the subject site or adjacent properties. A copy of the TSSA correspondence is included in Appendix 2.

City of Ottawa Landfill Document

The document entitled "Old Landfill Management Strategy, Phase I – Identification of Sites, City of Ottawa", was reviewed. No former landfills were located within the study area.

Former Industrial Sites

The report entitled "Mapping and Assessment of Former Industrial Sites, City of Ottawa" was reviewed. The property address (851 Richmond Road) was not listed in the report, however Sunlight Oil Co. was listed at 855 Richmond Road as a non-industrial bulk storage of diesel and fuel oil.

Based on the fire insurance plans reviewed for this Phase I-ESA, it is known that the Sunlight Oil Co. was located on the subject property. No other industrial sites were listed in the study area.

City of Ottawa Historic Land Use Inventory

According to a response from the City of Ottawa, there is one activity associated with the Phase I Property and seven activities associated with properties located within 50 m. The activities are identified in Table 1 below. The distances and orientations with respect to the site listed in Table 1 are based on depicted locations in the site map attached by the City. A copy of the City's response has been included in Appendix 2.

Table 1 City of Ottawa HLUI Database				
Address	Activity Number	Name / Activity	Distance and Orientation from Site	Potentially Contaminating Activity (PCA) (Y/N)
Richmond Road				
797	3897	Dentech Inc. (Dental Software Solutions)	37 m east	N
801	4218 461	Dave Rennie's Autocare	100 m east	Y
805	8401	Leafloor Brothers Wood & Coal	Adjacent to the east	Y
851	602	ACOM (other machinery and equipment industries)	Adjacent to the west	N
855	13260	Sunlight Oil Co. Bulk fuel depot	Subject site	Y
865	13703	Retail fuel outlet	Adjacent to the west	N

The former use of the subject property as a diesel fuel oil depot may have impacted the subject property. Other potentially contaminating activities include the former wood and coal dealer adjacent to the east, and the former retail fuel outlet adjacent to the west. The remaining HLUI entries are not considered to pose an environmental concern to the subject site.

Previous Environmental Reports

Paterson has conducted several environmental studies in the area of the subject site. No potentially contaminating activities, other than the ones already identified, were noted in a review of past reports.

4.3 Physical Setting Sources

Aerial Photographs

Historical air photos from the National Air Photo Library were reviewed in approximate ten (10) year intervals. The review period dates back to the first available air photos for the site. Based on the review, the following observations have been made:

- | | |
|------|--|
| 1946 | The subject property appears to be occupied by a structure, but due to the resolution of the photo, it is not possible to distinguish the nature of the building. Part of the property also appears vacant. The property to the east is occupied by a large building. Vacant fields are present to the south. A rail line is present to the north, and residential dwellings can be seen beyond the rail line. |
| 1952 | No significant changes appear to have been made to the subject site or neighbouring properties. |
| 1976 | The subject property appears to be vacant (parking area) for the newly constructed apartment building. Residential development has occurred to the south of the property. |
| 1986 | No significant changes have been made to the subject site or adjacent properties. |
| 1992 | No significant changes have been made to the subject site or adjacent properties. |
| 2008 | (City of Ottawa Website) No significant changes have been made to the subject site or adjacent properties. Single family dwellings have been constructed on the former rail line to the north. |
| 2014 | (City of Ottawa Website) No significant changes have been made to the subject site or adjacent properties. |

Laser copies of selected aerial photographs reviewed are included in Appendix 1.

Topographic Maps

Topographic information was obtained from Natural Resources Canada – The Atlas of Canada website. The topographic maps indicate that the elevation of the subject site is approximately 70 m ASL, and that the regional topography in the general area of the site slopes gradually downward to the north towards the Ottawa River, approximately 360 m north. An illustration of the referenced topographic map is presented on Figure 2 – Topographic Map, appended to this report.

Physiographic Maps

The Ontario Geological Survey publication ‘The Physiography of Southern Ontario, Third Edition’ was reviewed as a part of this assessment. According to the publication and attached mapping, the site is situated within the Ottawa Valley Clay Plains physiographic region, described as “clay plains interrupted by ridges of rock or sand”. Mapping shows the subject site as situated on an area of clay plains.

Geological Maps

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of interbedded limestone, dolomite, shale and/or sandstone of the Gull River formation. Overburden consists of a silty sand to sandy silt glacial till with a drift thickness of up to 2.5 m.

Water Well Records

A search of the MOECC’s web site for all drilled well records within 250 m of the subject site was conducted on June 9, 2017. A total of 3 wells were encountered within the study area. All three wells consisted of potable water wells. Two records pertained to wells drilled in 1951 and 1952. These domestic wells are considered to have been replaced by municipal water sources. The third potable well was drilled in 2011. The well is located approximately 150 m northeast of the subject property, and is located downgradient with respect to groundwater flow direction.

Water Bodies and Areas of Natural Significance

No creeks, rivers, streams, lakes or any other water body was identified in the Phase I study area.

The Ottawa River is the closest significant water body and is present approximately 360 m north of the site. No areas of natural significance are known to exist within the Phase I study area.

5.0 INTERVIEWS

Property Owner Representative

A representative from Homestead Land Holdings indicated that the subject property is to be converted from a surface parking lot to an 11 storey apartment building. The existing apartment building adjacent to the site will remain in place.

6.0 SITE RECONNAISSANCE

6.1 General Requirements

The site assessment was conducted June 8, 2017. Weather conditions were sunny, with a temperature of approximately 25° C. Mr. Adrian Menyhart from the Environmental Department of Paterson Group conducted the site visit. In addition to the site, the uses of neighbouring properties within the Phase I study area were also assessed at the time of the site assessment.

6.2 Specific Observations at Phase I Property

Buildings and Structures

There are no buildings or structures located on the subject property. The property consists of a asphaltic paved parking area.

Underground Utilities

Light standards and bollards with electrical receptacles are present on the subject property. These are fed from underground electrical services. Catch basins are also present on the subject site. The catch basins lead to the municipal drain system.

Site Features

The subject site consists of an asphaltic surface parking lot, used by tenants of the adjacent building at 851 Richmond Road. No significant staining was noted on the property. No vegetation was observed.

Neighbouring Properties

An inspection of the neighbouring properties was conducted from publicly accessible roadways at the time of the site inspection. Land use adjacent to the subject site was as follows:

- North - Residential dwellings;
- South - Richmond Road, followed by parkland, the Byron Avenue;
- East - Restaurant, followed by automotive service garage;
- West - Residential apartment building followed by restaurant;

No concerns were noted with the current use of the surrounding properties. The automotive service garage is located approximately 100 m to the east. Due to the significant separation distance and cross-gradient location, it is not considered to pose a concern to the subject site. Property use within the Phase I study area is shown on Drawing PE3724-2 - Surrounding Land Use Plan.

7.0 SUBSURFACE GEOTECHNICAL INVESTIGATION

7.1 Scope of Investigation

A subsurface geotechnical investigation was carried out on June 1st, 2017 in conjunction with the Phase I-ESA. The subsurface investigation consisted of the placement of 6 boreholes across the subject property for geotechnical coverage. Three (3) boreholes were equipped with groundwater monitoring wells. All boreholes were drilled under the full time supervision of Paterson personnel, to a maximum depth of 6.9 m below ground surface.

7.2 Applicable Site Standards

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

- Full depth generic soil and groundwater conditions; coarse textured soils.
- Potable groundwater condition
- Residential land use.

The potable groundwater standards were chosen based on the presence of a potable groundwater monitoring well within the Phase I-ESA study area to the northeast.

7.3 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The CPCs for the soil and/or groundwater within the former APECs identified on the property, include benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbons, fractions 1 through 4 (PHCs F₁-F₄) or metals.

7.4 Soil Sampling

A total of 28 soil samples were obtained from the boreholes by means of split spoon sampling with the sampling of shallow soils directly from auger flights. Samples were taken at approximate 0.76 to 1.52 m intervals. The depths at which split spoon and auger flight samples were obtained from the boreholes are shown as “SS” and “AU” on the Soil Profile and Test Data Sheets, appended to this report. In order to install groundwater monitoring wells, three (3) boreholes were cored into the bedrock. Rock core samples are shown as “RC” on the Soil Profile and Test Data Sheets.

Site soils generally consist of a pavement structure and/or crushed stone, over a combination of silt, sand and clay, underlain glacial till. Fractured limestone was encountered at the borehole locations where rock was cored for monitoring well installation.

7.5 Field Screening Measurements

All soil samples collected were submitted to a preliminary screening procedure, which included visual screening for colour and evidence of metals, as well as a soil vapour screening with an RKI Eagle gas detector with methane elimination and calibrated to hexane.

The soil vapours were measured by inserting the analyzer probe into the nominal headspace above the soil sample. Samples were then agitated/manipulated

gently as the measurements were taken. The peak reading registered within the first 15 seconds was recorded as the vapour measurement.

The parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The combustible vapour readings were not detected above 0 ppm.

Soil samples were selected for analytical testing based on visual appearance and location.

7.6 Soil Quality

Table 2: Analytical Test Results – Soil BTEX and PHCs F₁-F₄				
Parameter	MDL (µg/g)	Soil Samples (µg/g) June 1, 2017		MOECC Table 2 Residential Coarse Standards (µg/g)
		BH3-SS5	BH6-SS5	
Benzene	0.02	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	1.1
Toluene	0.05	nd	nd	2.3
Xylenes	0.05	nd	nd	3.1
PHC F ₁	7	nd	nd	55
PHC F ₂	4	159	38	98
PHC F ₃	8	49	41	300
PHC F ₄	6	nd	nd	2800
Notes: <input type="checkbox"/> MDL – Method Detection Limit <input type="checkbox"/> nd – not detected above the MDL <input type="checkbox"/> nt – not tested for this parameter <input type="checkbox"/> bold – exceeds MOECC Table 3 standard				

No BTEX parameters were identified above the laboratory detection limits, the BTEX results were in compliance with the MOECC standards. All PHC parameters were found to be in compliance with the MOECC Table 2 standards, with the exception of the F₂ PHC fraction in Sample BH3-SS5.

**Table 3:
Analytical Test Results – Soil
Metals**

Parameter	MDL (µg/g)	Soil Samples (µg/g) June 1, 2017		MOECC Table 2 Residential Coarse Standards (µg/g)
		BH1-SS1	BH3-SS2	
Antimony	0.2	nd	nd	7.5
Arsenic	1.0	nd	nd	18
Barium	0.5	122	114	390
Beryllium	0.2	nd	nd	4
Boron	5.0	16.5	22.3	120
Cadmium	0.1	nd	nd	1.2
Chromium (total)	1.0	26.4	24.3	160
Cobalt	0.1	8.0	8.2	22
Copper	0.5	26.0	45.6	140
Lead	1.0	107	57.4	120
Mercury	0.05	0.1	nd	0.27
Molybdenum	0.5	nd	nd	6.9
Nickel	0.5	18.7	19.8	100
Selenium	0.5	nd	nd	2.4
Silver	0.2	nd	nd	20
Thallium	0.05	nd	nd	1
Uranium	0.05	nd	nd	23
Vanadium	5.0	29.4	28.6	86
Zinc	5.0	55.8	51.9	340
Notes: <input type="checkbox"/> MDL – Method Detection Limit <input type="checkbox"/> nd – not detected above the MDL <input type="checkbox"/> NA – not applicable <input type="checkbox"/> Bold – Value exceeds selected MOECC Standard				

All detected metals parameters were found to be in compliance with the MOECC Table 2 standards.

7.7 Groundwater Quality

Table 4: Analytical Test Results – Groundwater BTEX/PHC (F₁ – F₄)						
Parameter	MDL (µg/L)	Groundwater Samples (µg/L) June 9, 2017				MOECC Table 2 Residential Standards (µg/L)
		BH1-GW1	BH3-GW1	BH3-GW2 (July 20, 2017)	BH5-GW1	
Benzene	0.5	nd	nd	nd	nd	5
Ethylbenzen	0.5	nd	nd	nd	nd	2.4
Toluene	0.5	nd	128	nd	nd	24
Xylenes	0.5	nd	nd	nd	nd	300
PHC F ₁	25	nd	nd	-	nd	750
PHC F ₂	100	nd	nd	-	nd	150
PHC F ₃	100	nd	nd	-	nd	500
PHC F ₄	100	nd	nd	-	nd	500
Notes: <input type="checkbox"/> MDL – Method Detection Limit <input type="checkbox"/> nd – not detected above the MDL <input type="checkbox"/> bold – exceeds selected MOECC standard						

None of the analytical test parameters were detected above the laboratory detection limits with the exception of toluene in Sample BH3-GW1. The presence of the individual toluene concentration was considered to be anomalous, and since no BTEX were detected in the soil sample from that borehole location. A subsequent groundwater sample was collected on July 20 2017 from BH3 to confirm that no toluene is present. In fact, no toluene was detected in that sample. All final groundwater BTEX and PHC concentrations were in compliance with the site standards.

8.0 REVIEW AND EVALUATION OF INFORMATION

8.1 Land Use History

The following table indicates the current and past uses of the site as well as associated potentially contaminating activities dating back to the first developed use of the site.

Table 5 - Land Use History			
Time Period	Land Use	Potentially Contaminating Activities	Areas of Potential Environmental Concern
Prior to 1940's	Vacant	None	None
1940's – 1970's	Diesel fuel oil storage	Aboveground storage tanks	Aboveground storage tanks
1970's – present	Paved surface parking lot	None	None

Potentially Contaminating Activities

As stated in the above table, the former above ground storage tanks on the subject property are considered to be a potentially contaminating activity. The adjacent property to the west, a former retail fuel outlet, and the adjacent property to the east, a former coal yard, are also both considered to be potentially contaminating activities. The former rail line, adjacent to the north, is considered to be a potentially contaminating activity as well. Other potentially contaminating activities were noted in the study area however due to their significant separation distances, they are not considered to pose a concern to the subject property.

Areas of Potential Environmental Concern

The former aboveground fuel tanks on the subject site, is considered to be an area of potential environmental concern, however based on environmental testing of soil and groundwater collected during the geotechnical investigation, the former concern are no longer considered to be APECs. As a result, there are no longer any APECs on the subject property.

Contaminants of Potential Concern

Contaminants of potential concern are considered to be metals (due to fill encountered during the investigation), petroleum hydrocarbons (PHCs), and benzene, toluene, ethylbenzene and xylenes (BTEX) due to the former ASTs. Metals in the groundwater are not considered to be contaminants of potential concern since the analytical test results of metals in the soil were in compliance with site standards.

8.2 Conceptual Site Model

Geological and Hydrogeological Setting

Based on the subsurface investigation, fill material was encountered below the asphalt surface, to depths between 1.52 m and 2.59 m. In certain areas, fill was

noted on top of bedrock, and in others, on top of glacial till, to depths up to 4.60 m. Fractured limestone bedrock was encountered below the fill and/or glacial till.

Contaminants of Potential Concern

Contaminants of potential concern include metals, PHCs and BTEX.

Existing Buildings and Structures

There are no existing buildings or structures on the subject property.

Water Bodies

There are no water bodies on the subject site or within the Phase I study area. The closest water body is the Ottawa River, located approximately 260 m to the north of the site.

Areas of Natural Significance

No areas of natural significance were identified on the site or in the Phase I study area.

Drinking Water Wells

Based on the results of the well record search, three potable wells were identified within the study area. Two of these wells were drilled for domestic purposes and are likely no longer in use due to the presence of municipally treated groundwater in the area. The third well was drilled in 2011, and may still in use.

Neighbouring Land Use

Neighbouring land use in the Phase I study area is currently residential and commercial.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

The former aboveground storage tanks on the subject property are considered to be an area of potential environmental concern, which have been addressed through analytical soil and groundwater testing conducted during a subsurface geotechnical investigation. The former coal yard to the east, the former retail fuel outlet to the west, as well as the former rail line to the north were considered to be potentially contaminating activities. Other potentially contaminating activities also included former and current automotive garages east and west of the site, and former retail fuel outlets east and west of the site.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there was a potentially contaminating activity that represents an area of potential environmental concern on the subject site, although this had been addressed and is no longer considered to be an area of potential environmental concern. The presence of potentially contaminating activities was confirmed by a variety of independent sources, and as such, the conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

9.0 CONCLUSION

Assessment

Paterson Group was retained by Homestead Land Holdings to conduct a Phase I Environmental Site Assessment (ESA) for part of the property at 851 Richmond Road, in the City of Ottawa, Ontario. The purpose of this Phase I-Environmental Site Assessment (Phase I-ESA) was to research the past and current use of the site and study area and to identify any environmental concerns with the potential to have impacted the subject property.

The subject site currently consists of a paved surface parking lot, used by the residents of the apartment building at 851 Richmond Road. No structures are currently present on the subject site. Based on historical searches, three aboveground fuel oil storage tanks were present near the centre of the subject property, from the 1940s until the 1960's. A coal storage yard, as well as a retail fuel outlet were present to the east and west, respectively, within that time period as well. A rail line was formerly located to the north of the subject property. The former aboveground storage tanks were considered to be an area of potential environmental concern with respect to the subject site, while the former retail fuel outlet, former coal yard and former rail line were all considered to be potentially contaminating activities. The area of potential environmental concern, as well as potentially contaminating activities were address as part of a geotechnical investigation conducted concurrently with this Phase I-ESA.

Following the historical research, a site visit was conducted to assess the subject site and Phase I ESA study area. The site visit did not identify any additional PCAs or APECs.

As part of a geotechnical investigation, conducted in conjunction with the Phase I-ESA, 6 boreholes were placed on the subject for geotechnical purposes. Three (3) of these boreholes were instrumented with groundwater monitoring wells. Analytical soil and groundwater testing was conducted on samples collected from these locations. All final soil and groundwater parameters were in compliance with site standards, with the exception of one soil sample near the centre north of the site, which was found to have an exceedance of the F2 petroleum hydrocarbon fraction.

Based on the results of this Phase I – ESA no further investigatory work is required at this time.

Recommendation

Impacted soil was identified in the area of borehole BH3. It is understood that the subject property will be developed with a multi storey apartment building, with underground parking. It is recommended that any impacted soil encountered during the site redevelopment project be removed from the property and disposed of at an approved waste disposal facility. This work should be monitored by Paterson personnel. Prior to disposal, a Toxicity Characteristic Leaching Procedure analysis will be required on a representative impacted soil sample.

10.0 STATEMENT OF LIMITATIONS

This Phase I - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04 as amended by O.Reg. 269/11, and meets the requirements of CSA Z768-01. The conclusions presented herein are based on information gathered from a limited historical review and field inspection program. The findings of the Phase I - ESA are based on a review of readily available geological, historical and regulatory information and a cursory review made at the time of the field assessment. The historical research relies on information supplied by others, such as, local, provincial and federal agencies and was limited within the scope-of-work, time and budget of the project herein.

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 Homestead Land Holdings Ltd. Permission and notification from Homestead Land Holdings Ltd. and Paterson will be required to release this report to any other party.

Paterson Group Inc.

Adrian Menyhart, P.Eng.



Mark S. D'Arcy, P.Eng.

Report Distribution:

- Homestead Land Holdings Ltd. (6 copies)
- Paterson Group (1 copy)

11.0 REFERENCES

Federal Records

Air photos at the Energy Mines and Resources Air Photo Library.
National Archives.
Maps and photographs (Geological Survey of Canada surficial and subsurface mapping).
Natural Resources Canada – The Atlas of Canada.
Environment Canada, National Pollutant Release Inventory.
PCB Waste Storage Site Inventory.

Provincial Records

MOECC Freedom of Information and Privacy Office.
MOECC Municipal Coal Gasification Plant Site Inventory, 1991.
MOECC document titled “Waste Disposal Site Inventory in Ontario”.
MOECC Brownfields Environmental Site Registry.
Office of Technical Standards and Safety Authority, Fuels Safety Branch.
MNR Areas of Natural Significance.
MOECC Water Well Inventory.
Chapman, L.J., and Putnam, D.F., 1984: ‘The Physiography of Southern Ontario, Third Edition’, Ontario Geological Survey Special Volume 2.

Municipal Records

City of Ottawa Document “Old Landfill Management Strategy, Phase I - Identification of Sites.”, prepared by Golder Associates, 2004.
The City of Ottawa Historical Land Use Inventory.
Intera Technologies Limited Report “Mapping and Assessment of Former Industrial Sites, City of Ottawa”, 1988.
The City of Ottawa geoOttawa website.

Local Information Sources

Current Plan of Survey, prepared by Annis, O’Sullivan, Vollebekk Ltd.
Personal Interviews.

Public Information Sources

Google Earth.
Google Maps/Street View.

FIGURES

FIGURE 1 – KEY PLAN

FIGURE 2 – TOPOGRAPHIC MAP

DRAWING PE4053-1 – SITE PLAN

DRAWING PE4053-2 – SURROUNDING LAND USE PLAN

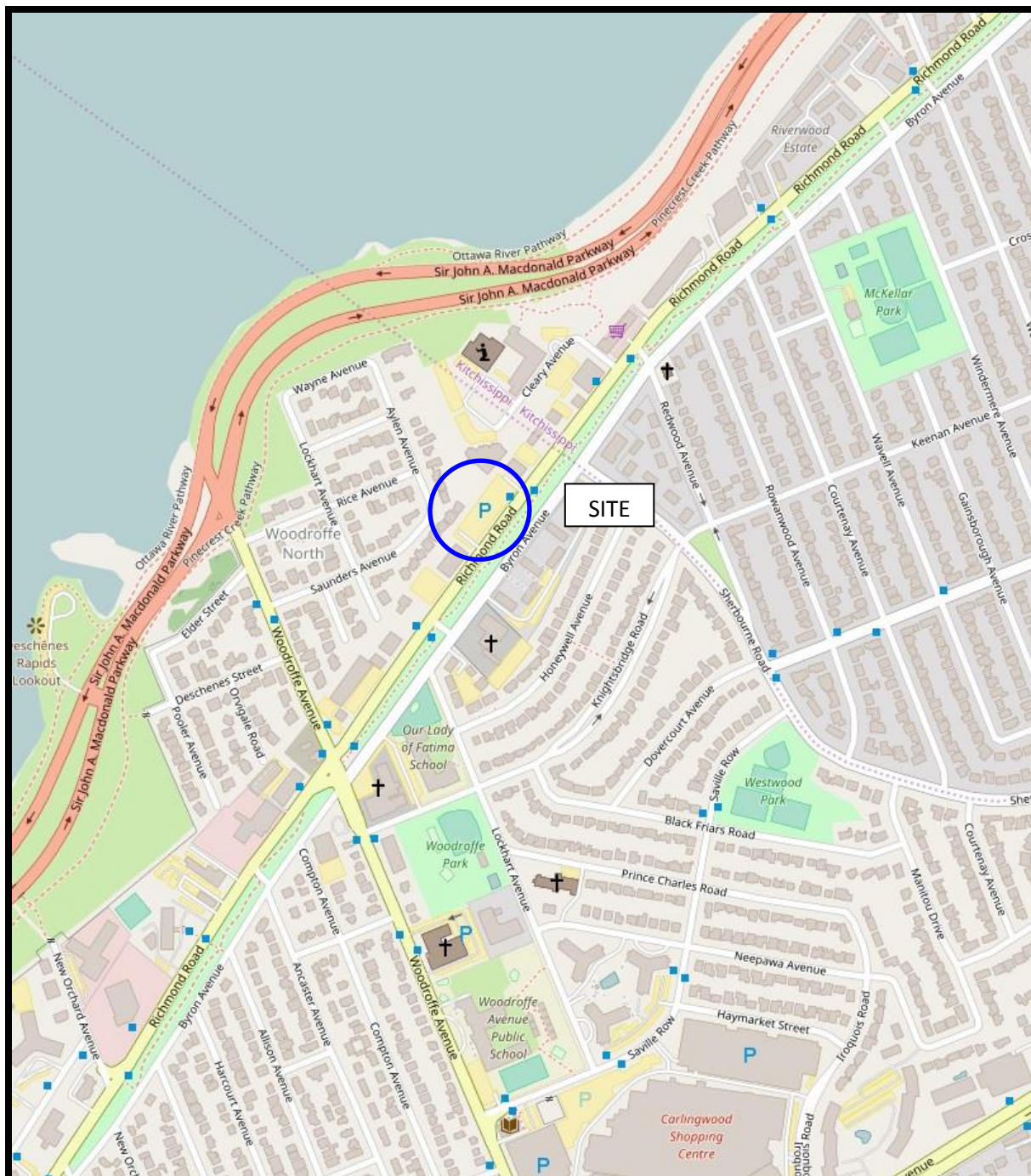


FIGURE 1
KEY PLAN

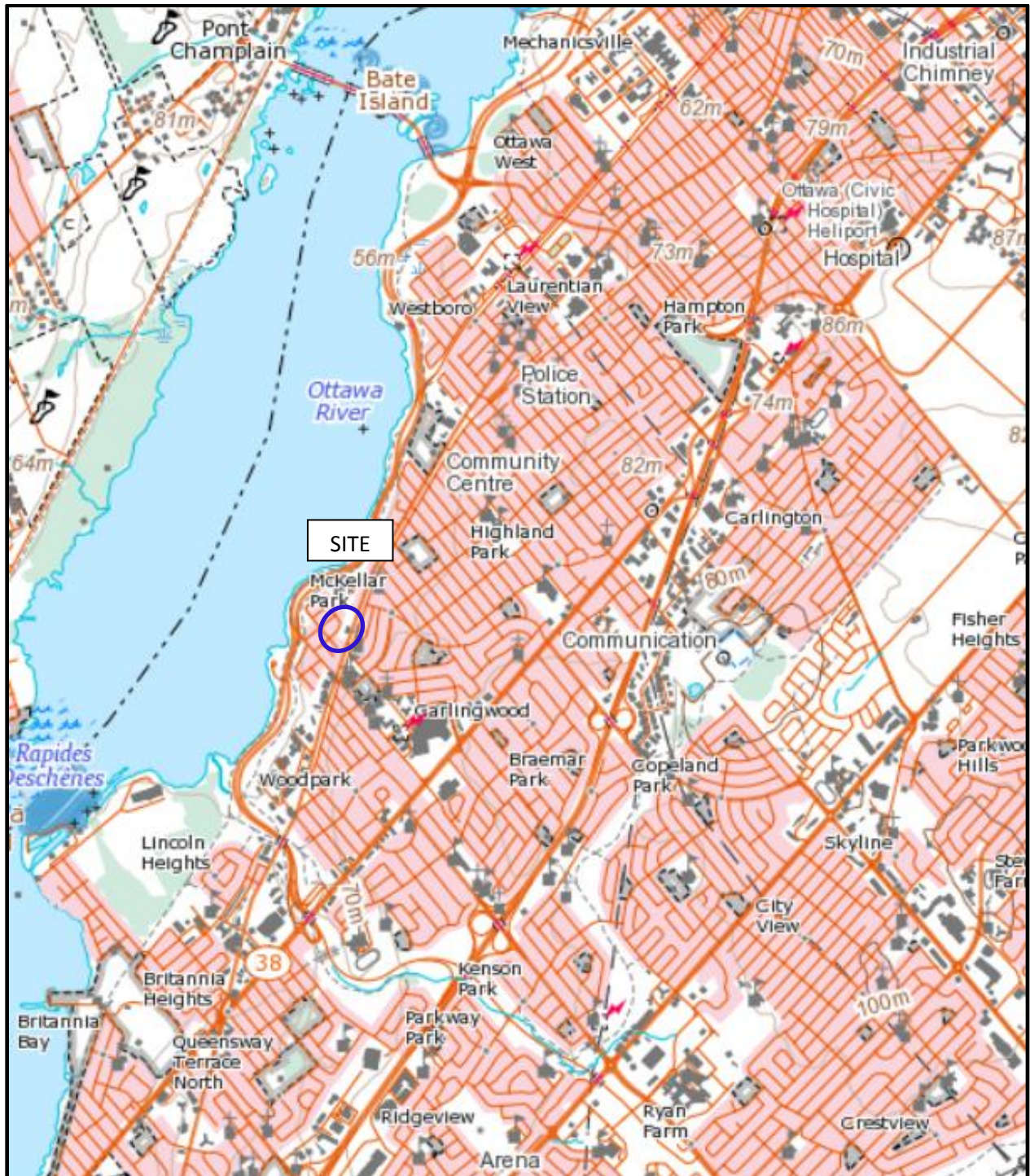
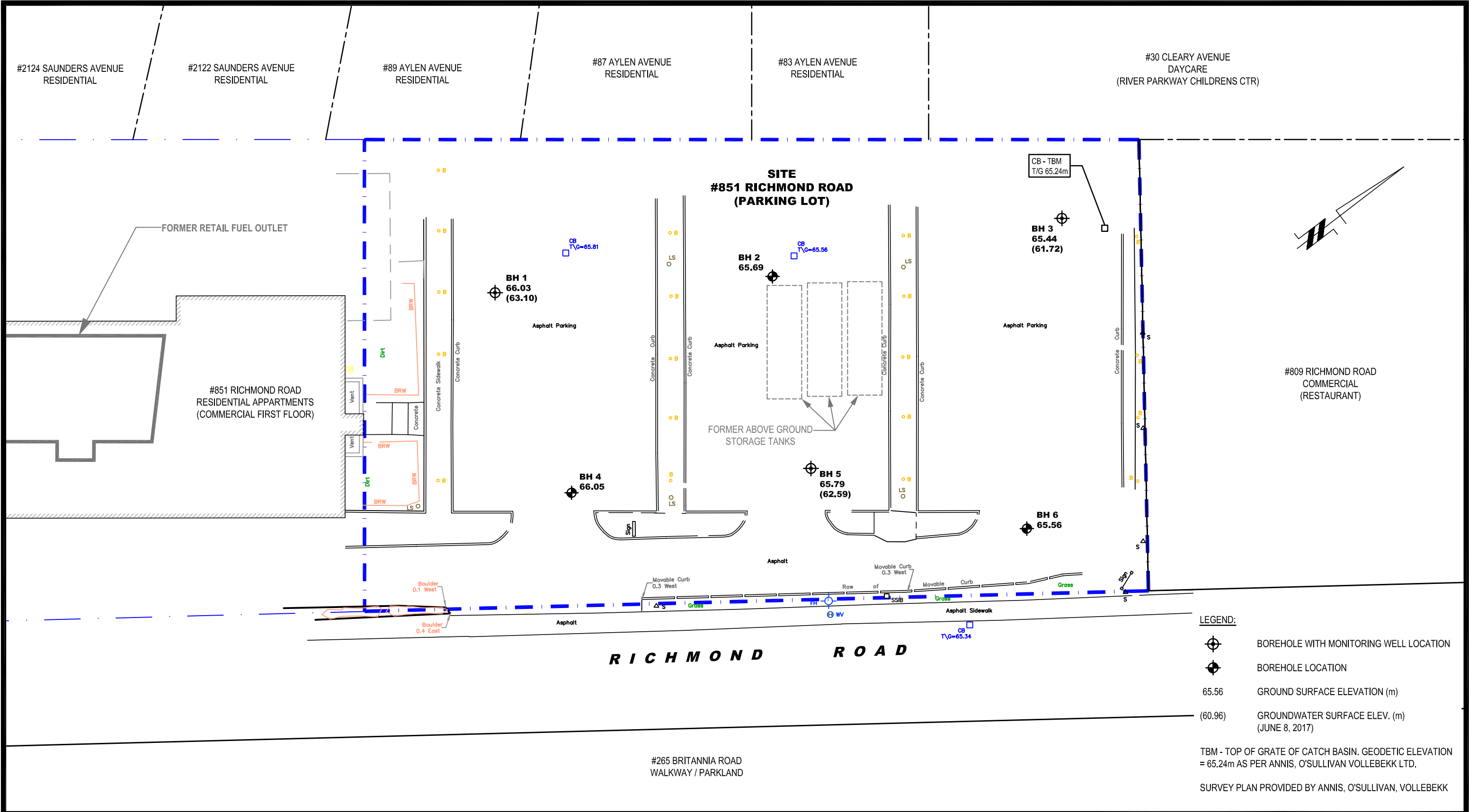


FIGURE 2
TOPOGRAPHIC MAP



<div><div>patersongroup</div><div>consulting engineers</div><div>154 Colonnade Road South Ottawa, Ontario K2E 7J5 Tel: (613) 226-7381 Fax: (613) 226-6344</div></div>					<div><div>HOMESTEAD LAND HOLDINGS</div><div>PHASE I - ENVIRONMENTAL SITE ASSESSMENT</div><div>851 RICHMOND ROAD</div><div>OTTAWA, ONTARIO</div><div>SITE PLAN</div></div>	Scale:	1:300	Date:	07/2017
						Drawn by:	RCG	Report No.:	PE4053-1
						Checked by:	AM	Dwg. No.:	PE4053-1
						Approved by:	MSD	Revision No.:	0
	NO.	REVISIONS	DATE	INITIAL					

p:\autocad drawings\environmental\pe4053\pe4053-1.dwg

PHASE I - ENVIRONMENTAL SITE ASSESSMENT STUDY AREA



AREAS OF POTENTIAL CONCERN:

- 1. FORMER FUEL OIL ABOVE GROUND STORAGE TANK

POTENTIALLY CONTAMINATING ACTIVITIES:

- 2. FORMER RETAIL FUEL OUTLET
- 3. FORMER RETAIL COAL YARD
- 4. FORMER CANADIAN PACIFIC RAIL LINE
- 5. FORMER RETAIL FUEL OUTLET
- 6. FORMER RETAIL FUEL OUTLET
- 7. AUTOMOTIVE SERVICE GARAGE
- 8. FORMER RETAIL FUEL OUTLET

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

0			
NO.	REVISIONS	DATE	INITIAL

HOMESTEAD LAND HOLDINGS
PHASE I - ENVIRONMENTAL SITE ASSESSMENT
851 RICHMOND ROAD
OTTAWA, ONTARIO

SURROUNDING LAND USE PLAN

Scale:	~1:3000	Date:	07/2017
Drawn by:	RCG	Report No.:	PE4053-1
Checked by:	AM	Dwg. No.:	PE4053-2
Approved by:	MSD	Revision No.:	0

APPENDIX 1

SURVEY PLAN

AERIAL PHOTOGRAPHS

TOPOGRAPHICAL PLAN OF SURVEY OF

PART OF LOT 26
CONCESSION 1 (OTTAWA FRONT)
Geographic Township of Nepean
CITY OF OTTAWA

Prepared by Annis, O'Sullivan, Vollebakk Ltd.

Scale 1:200
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 Metres

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND
CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Surveyor's Certificate

- I CERTIFY THAT:
- This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the Land Titles Act and the regulations made under them.
 - The survey was completed on the 24th day of March, 2017.

April 10, 2017 Edward M. Lancaster
Date Ontario Land Surveyor

Notes & Legend

- | Denotes | |
|---------|------------------------------------|
| —O— | Survey Monument Planted |
| —S— | Survey Monument Found |
| SSB | Standard Iron Bar |
| SSSB | Short Standard Iron Bar |
| IB | Iron Bar |
| CC | Cut Cross |
| (WIT) | Witness |
| Mess. | Measured |
| (AOG) | Annis, O'Sullivan, Vollebakk Ltd. |
| (1992) | (1992) Plan Dated July 31, 1998 |
| (P2) | Registered Plan 4M-1067 |
| (P3) | (AOG) Plan dated February 8, 2016 |
| (P4) | (AOG) Plan dated February 16, 1973 |
| (I) | Inst. No. N621870 |
| ○ | Deciduous Tree |
| ★ | Coniferous Tree |
| ○ FH | Fire Hydrant |
| ○ W | Water Valve |
| ○ M+S | Maintenance Hole (Sanitary) |
| ○ CB | Catch Basin |
| ○ BM | Bollard |
| △ S | Sign |
| ○ PG-M | Metal Pole |
| ○ LS | Light Standard |
| □ AC | Air Conditioner |
| ○ | Diameter |
| ○ | Location of Elevations |
| ○ | Top of Concrete Curb Elevation |
| ○ | Top of Retaining Wall Elevation |
| C/L | Centreline |
| CRW | Concrete Retaining Wall |
| BRW | Brick Retaining Wall |
| — | Property Line |

Bearings are grid bearings, derived from the Westerly limit of Richmond Road, shown to be N 36° 14' 30" E on Plan (AOG) dated February 8, 2016 and are referred to the Central Meridian of MTM Zone 18 (1983 West Longitude) NAD-83 (original).

SITE AREA = 6061.8 m²

Topographic data was collected under Winter Conditions.
Show cover and ice preclude determining location and elevation of some topographical data that is otherwise visible.

ELEVATION NOTES

- Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
- It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that its relative elevation and description agrees with the information shown on this drawing.

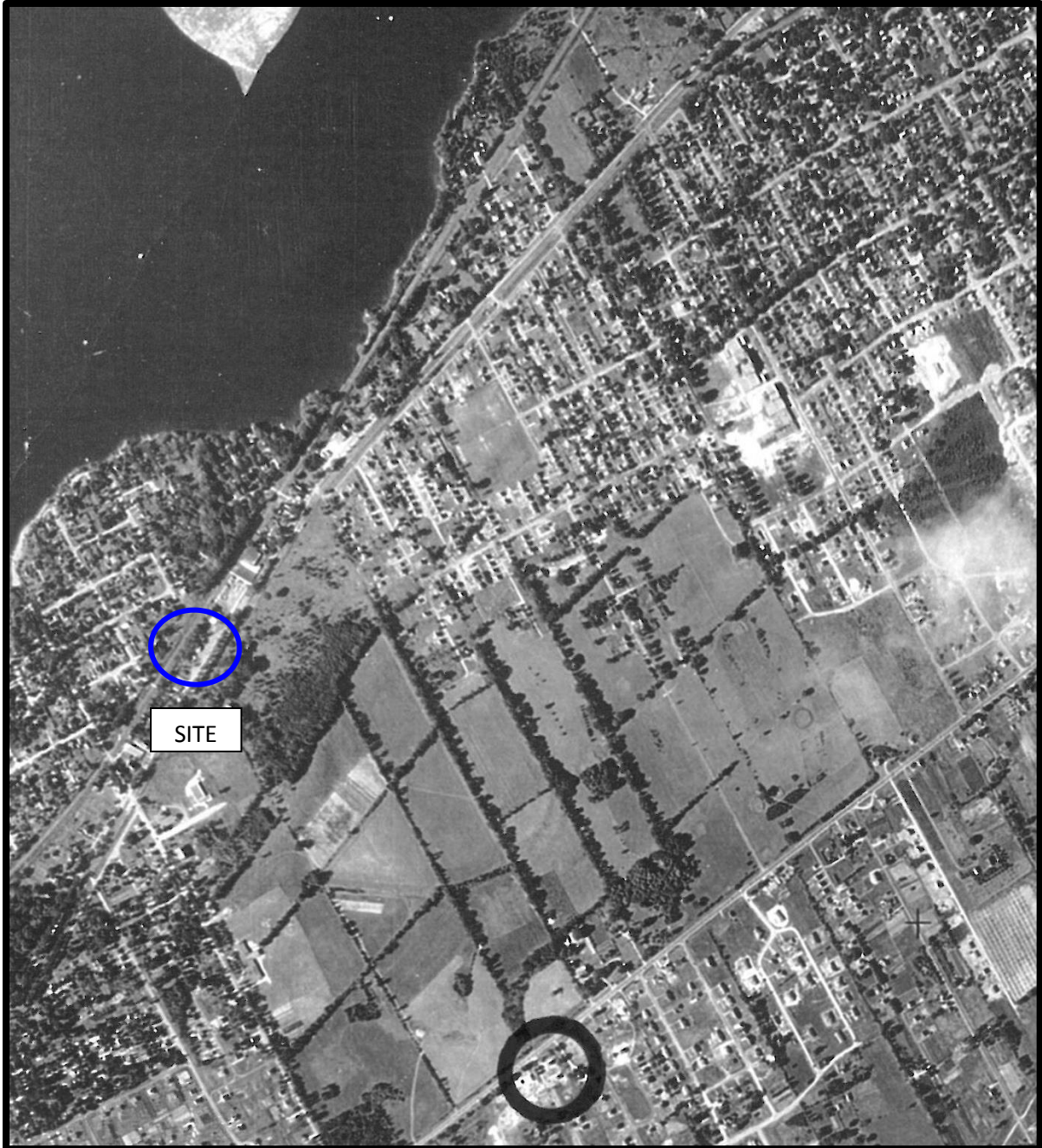
UTILITY NOTES

- This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
- Only visible surface utilities were located.
- A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

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ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
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Nepean, Ont. K2E 7S6
Phone: (613) 737-0850 / Fax: (613) 737-1075
Email: annis@annissv.com
Ontario
Land Surveyors
Reg. No. 19552-P 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100



AERIAL PHOTOGRAPH
1946



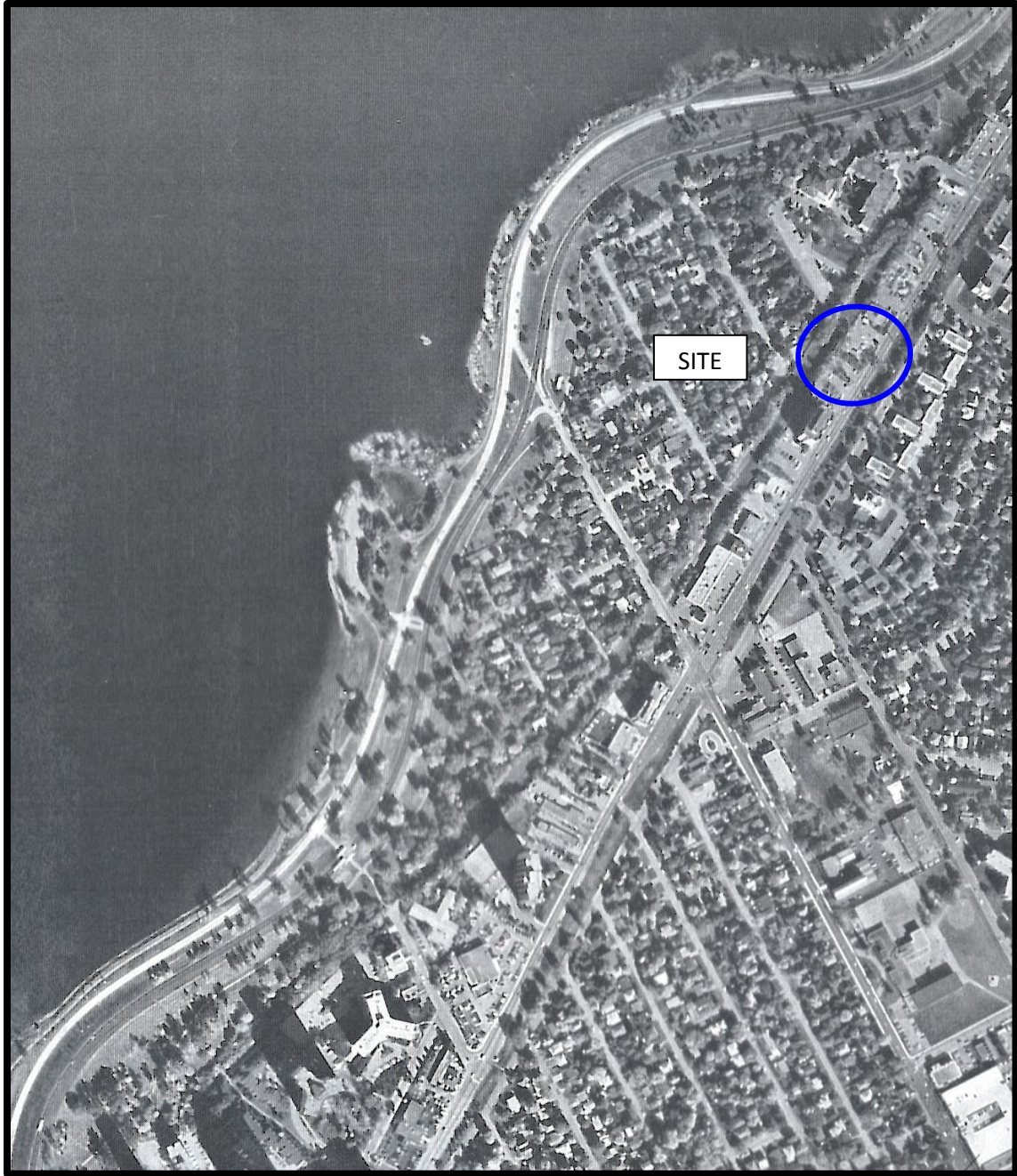
AERIAL PHOTOGRAPH
1952



AERIAL PHOTOGRAPH
1976



AERIAL PHOTOGRAPH
1986



AERIAL PHOTOGRAPH
1992

APPENDIX 2

MOECC FREEDOM OF INFORMATION REQUEST

TSSA CORRESPONDENCE

CHAIN OF TITLE

Ministry of the Environment
and Climate Change

Freedom of Information and
Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de
l'Action en matière de changement
climatique

Bureau de l'accès à l'information et
de la protection de la vie privée

12^e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél.: (416) 314-4075
Télec.: (416) 314-4285



June 9, 2017

Adrian Menyhart
Paterson Group Inc
154 Colonnade Road
Ottawa, ON K2E 7J5

Dear Adrian Menyhart:

RE: ***Freedom of Information and Protection of Privacy Act Request***
Our File # A-2017-04165, Your Reference PE4053

The Ministry is in receipt of your request made pursuant to the *Freedom of Information and Protection of Privacy Act* and has received your payment in the amount of \$5.00 (non-refundable application fee), along with your \$30.00 deposit.

**The search is being conducted on the following: 851 Richmond Road, Ottawa.
If there is any discrepancy please contact us immediately.**

You may expect a reply or additional communication as your request is processed.
For your information, the Ministry charges for search, copying and preparation time.

If you have any questions regarding this matter, please contact Kaitlynn Low at
kaitlynn.low@ontario.ca.

Yours truly,


Janet Dadufalza
FOI Manager

Adrian Menyhart

From: Public Information Services <publicinformationsservices@tssa.org>
Sent: June-29-17 10:44 AM
To: Adrian Menyhart
Subject: RE: Records Search Request - 851 Richmond Road

Hi Adrian,

Thank you for your inquiry.

We have no record in our database of any fuel storage tanks at the subject address (addresses).

For a further search in our archives please submit your request in writing to Public Information Services via e-mail (publicinformationsservices@tssa.org) or through mail along with a fee of \$56.50 (including HST) per location. The fee is payable with credit card (Visa or MasterCard) or with a Cheque made payable to TSSA.

Although TSSA believes the information provided pursuant to your request is accurate, please note that TSSA does not warrant this information in any way whatsoever.

Thank you,

Roxana



Roxana Mashtaler | Public Information Agent

Facilities
345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel: +1-416-734-3472 | Fax: +1-416-231-6183 | E-Mail: mashtaler@tssa.org
www.tssa.org



From: Adrian Menyhart [mailto:AMenyhart@Patersongroup.ca]
Sent: Tuesday, June 27, 2017 8:49 AM
To: Public Information Services <publicinformationsservices@tssa.org>
Subject: Records Search Request - 851 Richmond Road

Good Morning,

Could you please complete a search of your records for underground/aboveground storage tanks, historical spills or other incidents/infractions for the following properties in Ottawa, ON:

30 Cleary Avenue
75 Cleary Avenue
797 Richmond Road
801 Richmond Road
809 Richmond Road
851 Richmond Road

875 Richmond Road
881 Richmond Road
887 Richmond Road
911 Richmond Road

Best Regards,

Adrian Menyhart, P.Eng.

patersongroup
solution oriented engineering

154 Colonnade Road South
Ottawa, Ontario, K2E 7J5
Tel: (613) 226-7381 Ext. 208
Fax: (613) 226-6344
Email: amenyhart@patersongroup.ca

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READ Abstracts Limited

331 Cooper Street, Suite 300, Ottawa, Ontario K2P 0A4

Email: search@readsearch.com

Tel.: 613-236-0664

Fax: 613-236-3677

ENVIRONMENTAL SEARCH

July 4, 2017

Paterson Group

Attn: Adrian Menyhart

BRIEF DESCRIPTION OF LAND:

851 Richmond Road, Ottawa

Part of Lot 26, Concession 1 OF Nepean, as in N621870

PIN: 04751-0112

LAST REGISTERED OWNER: HOMESTEAD LAND HOLDINGS LIMITED

CHAIN OF TITLE:

Deed RO104 registered September 9, 1836

From Ira Honeywell to Robert Berry

(there are no deeds registered in this time frame)

Deed NP7956 registered September 5, 1882

From Mary Ann Barrie to Daniel Cleary

Deed NP24301 registered May 4, 1911

From Daniel Cleary to George M. Mason Ltd.

Deed NP35331 registered March 3, 1922

From George A. Welch, trustees of George M. Mason Ltd. to Jean and Albert Leafloor

Deed NP50862 registered October 29, 1943

From Jean Leafloor and the estate of Albert Leafloor to Samuel Leafloor

Deed CR316570 registered November 24, 1953

From George A. Welch, trustees of George M. Mason Ltd. to Samuel Leafloor

Deed CR316573 registered November 24, 1953

From Samuel Leafloor to Arthur A. Dupont, in trust

Deed CR369348 registered March 5, 1958
From Arthur A. Dupont, in trust to B. P. Canada Limited

Deed CR621774 registered November 10, 1972
From B. P. Oil Limited to Belcourt Constructions (Ottawa) Limited

Deed CR716528 registered September 12, 1977
From B. P. Oil Limited to Belcourt Constructions (Ottawa) Limited

Deed NS7907 registered March 20, 1978
From Belcourt Constructions (Ottawa) Limited to Beaufort Realities (1964) Inc.

Deed NS15448 registered June 1, 1978
From Beaufort Realities (1964) Inc. to Fidelitas Holdings Co. Ltd.

Lease NS208684 registered September 8, 1983
From Beaufort Realities (1964) Inc. to Guaranty Trust Company of Canada

Deed N345454 registered July 15, 1986
From Fidelitas Holdings Co. Ltd. to Edward Egarhos and Anthony Bastas, carrying on business as Whitehall Estates Limited

Lease N413722 registered October 29, 1987
From Whitehall Estates Limited to Coinamatic Canada Inc.

Deed N621870 registered June 16, 1992
From Edward Egarhos and Anthony Bastas, and Whitehall Estates Limited to Wartham Corp.

Deed LT1038182 registered April 15, 1997
From Wartham Corp. to Homestead Land Holdings Limited

Lease OC254263 registered October 25, 2001
From Homestead Land Holdings Limited to Bell Mobility Inc.

Lease OC1015390 registered August 12, 2009
From Homestead Land Holdings Limited to Videotron Ltd.

APPENDIX 3

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

DATUM TBM - Top of grate of catch basin (refer to Dwg. PG4163-1). Geodetic elevation = 65.24m.

FILE NO. **PG4163**

REMARKS

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger

DATE June 1, 2017

[illegible]

DATUM	TBM - Top of grate of catch basin (refer to Dwg. PG4163-1). Geodetic elevation = 65.24m.
--------------	--

FILE NO. PG4163

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger

DATE June 1, 2017

[illegible]

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 851 Richmond Road
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin (refer to Dwg. PG4163-1). Geodetic elevation = 65.24m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 1, 2017

FILE NO.
PG4163

HOLE NO.
BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
Asphaltic concrete	0.09					0	65.44					
FILL: Grey-brown sand, trace silt		SS	1	58	21							
		SS	2	33	35	1	64.44					
		SS	3	67	18	2	63.44					
	2.36	SS	4	88	50+							
GLACIAL TILL: Brown silty clay with sand, gravel, fractured rock and boulders		RC	1	94		3	62.44					
		RC	2	67								
		SS	5	100	50+	4	61.44					
	3.99											
BEDROCK: Poor to excellent quality, grey limestone		RC	3	80	39	5	60.44					
						6	59.44					
		RC	4	100	96							
	6.98											
End of Borehole												
(GWL @ 3.72m - June 8, 2017)												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed △ Remoulded				

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Multi-Storey Building - 851 Richmond Road
Ottawa, Ontario

DATUM TBM - Top of grate of catch basin (refer to Dwg. PG4163-1). Geodetic elevation = 65.24m.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 1, 2017

FILE NO.
PG4163

HOLE NO.
BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
Asphaltic concrete	0.09					0	66.05					
FILL: Grey-brown sand, trace silt	0.76	SS	1	75	20							
FILL: Brown silty sand, some clay, trace gravel	1.52	SS	2	83	8	1	65.05					
GLACIAL TILL: Brown sandy silt, trace clay and gravel	2.39	SS	3	75	24	2	64.05					
End of Borehole		SS	4	100	50+							
Practical refusal to augering at 2.39m depth												
(GWL @ 2.19m - June 8, 2017)												

DATUM	TBM - Top of grate of catch basin (refer to Dwg. PG4163-1). Geodetic elevation = 65.24m.
--------------	--

FILE NO. PG4163

REMARKS

HOLE NO. **BH 5**

BORINGS BY CME 55 Power Auger

DATE June 1, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Monitoring Well Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE												
Asphaltic concrete	0.06					0	65.79					
FILL: Brown sand with gravel, trace silt and clay		SS	1	46	57							
		SS	2	42	11	1	64.79					
	1.52											
GLACIAL TILL: Brown sand with gravel, trace silt	2.06					2	63.79					
		RC	1	81	21							
						3	62.79					
		RC	2	64	16							
BEDROCK: Very poor to fair quality, grey limestone						4	61.79					
		RC	3	100	68	5	60.79					
	5.72											
End of Borehole												
(GWL @ 3.20m - June 8, 2017)												

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

HOLE NO. **BH 6**

[illegible]

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 = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = D_{60} / D_{10}

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		Overconsolidation 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.
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SYMBOLS AND TERMS (continued)

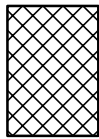
STRATA PLOT



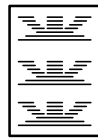
Topsoil



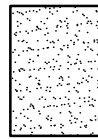
Asphalt



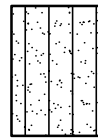
Fill



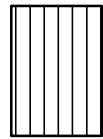
Peat



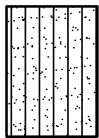
Sand



Silty Sand



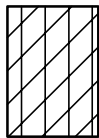
Silt



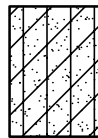
Sandy Silt



Clay



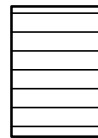
Silty Clay



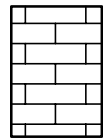
Clayey Silty Sand



Glacial Till



Shale



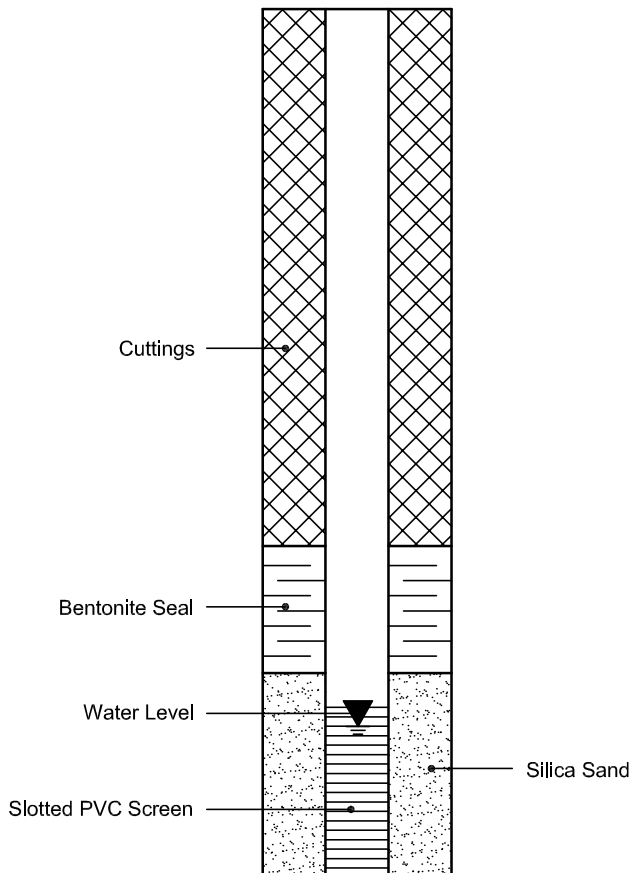
Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 21815
Project: PE4053
Custody: 110616

Report Date: 14-Jun-2017
Order Date: 7-Jun-2017

Order #: 1723349

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

Paracel ID	Client ID
1723349-01	BH1-SS1
1723349-02	BH3-SS2
1723349-03	BH3-SS5
1723349-04	BH6-SS5

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21815

Report Date: 14-Jun-2017

Order Date: 7-Jun-2017

Project Description: PE4053

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	12-Jun-17	13-Jun-17
Mercury by CVAA	EPA 7471B - CVAA, digestion	13-Jun-17	13-Jun-17
PHC F1	CWS Tier 1 - P&T GC-FID	12-Jun-17	13-Jun-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-Jun-17	11-Jun-17
REG 153: Metals by ICP/OES, soil	based on MOE E3470, ICP-OES	13-Jun-17	13-Jun-17
Solids, %	Gravimetric, calculation	12-Jun-17	12-Jun-17

Certificate of Analysis

Report Date: 14-Jun-2017

Client: Paterson Group Consulting Engineers

Order Date: 7-Jun-2017

Client PO: 21815

Project Description: PE4053

	Client ID:	BH1-SS1	BH3-SS2	BH3-SS5	BH6-SS5
	Sample Date:	01-Jun-17	01-Jun-17	01-Jun-17	01-Jun-17
	Sample ID:	1723349-01	1723349-02	1723349-03	1723349-04
	MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	91.5	95.2	88.3	91.0
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Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	-	-
Arsenic	1.0 ug/g dry	<1.0	<1.0	-	-
Barium	1.0 ug/g dry	122	114	-	-
Beryllium	1.0 ug/g dry	<1.0	<1.0	-	-
Boron	1.0 ug/g dry	16.5	22.3	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	1.0 ug/g dry	26.4	24.3	-	-
Cobalt	1.0 ug/g dry	8.0	8.2	-	-
Copper	1.0 ug/g dry	26.0	45.6	-	-
Lead	1.0 ug/g dry	107	57.4	-	-
Mercury	0.1 ug/g dry	0.1	<0.1	-	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	-	-
Nickel	1.0 ug/g dry	18.7	19.8	-	-
Selenium	1.0 ug/g dry	<1.0	<1.0	-	-
Silver	0.5 ug/g dry	<0.5	<0.5	-	-
Thallium	1.0 ug/g dry	<1.0	<1.0	-	-
Uranium	1.0 ug/g dry	<1.0	<1.0	-	-
Vanadium	1.0 ug/g dry	29.4	28.6	-	-
Zinc	1.0 ug/g dry	55.8	51.9	-	-

Volatiles

Benzene	0.02 ug/g dry	-	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	-	-	<0.05	<0.05
Toluene	0.05 ug/g dry	-	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	-	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	-	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	-	-	<0.05	<0.05
Toluene-d8	Surrogate	-	-	109%	113%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	-	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	-	159	38
F3 PHCs (C16-C34)	8 ug/g dry	-	-	49	41
F4 PHCs (C34-C50)	6 ug/g dry	-	-	<6	<6

Certificate of Analysis

Report Date: 14-Jun-2017

Client: Paterson Group Consulting Engineers

Order Date: 7-Jun-2017

Client PO: 21815

Project Description: PE4053

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	8.61		ug/g		108	50-140			

Certificate of Analysis

Report Date: 14-Jun-2017

Client: Paterson Group Consulting Engineers

Order Date: 7-Jun-2017

Client PO: 21815

Project Description: PE4053

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	ND	1.0	ug/g dry	ND				30	
Barium	75.6	1.0	ug/g dry	77.1			1.9	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	7.95	1.0	ug/g dry	7.77			2.3	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	19.2	1.0	ug/g dry	19.5			1.2	30	
Cobalt	10.4	1.0	ug/g dry	10.6			2.0	30	
Copper	24.4	1.0	ug/g dry	25.0			2.5	30	
Lead	12.6	1.0	ug/g dry	13.2			4.6	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	21.3	1.0	ug/g dry	21.8			2.0	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	1.24	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	28.6	1.0	ug/g dry	28.8			0.5	30	
Zinc	54.0	1.0	ug/g dry	55.8			3.2	30	
Physical Characteristics									
% Solids	91.2	0.1	% by Wt.	91.5			0.4	25	
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	0.436	0.05	ug/g dry	0.429			1.6	50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	0.790	0.05	ug/g dry	0.801			1.4	50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	7.27		ug/g dry		104	50-140			

Certificate of Analysis

Report Date: 14-Jun-2017

Client: Paterson Group Consulting Engineers

Order Date: 7-Jun-2017

Client PO: 21815

Project Description: PE4053

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	192	7	ug/g		96.2	80-120			
F2 PHCs (C10-C16)	119	4	ug/g	ND	118	60-140			
F3 PHCs (C16-C34)	238	8	ug/g	ND	113	60-140			
F4 PHCs (C34-C50)	140	6	ug/g	ND	100	60-140			
Metals									
Antimony	272		ug/L	ND	109	70-130			
Arsenic	384		ug/L	158	90.4	70-130			
Barium	1750		ug/L	1540	82.3	70-130			
Beryllium	245		ug/L	5.02	96.0	70-130			
Boron	393		ug/L	155	95.1	70-130			
Cadmium	238		ug/L	3.88	93.6	70-130			
Chromium	600		ug/L	389	84.4	70-130			
Cobalt	425		ug/L	212	85.2	70-130			
Copper	726		ug/L	500	90.1	70-130			
Lead	489		ug/L	263	90.3	70-130			
Mercury	1.44	0.1	ug/g	ND	96.2	70-130			
Molybdenum	223		ug/L	5.12	87.3	70-130			
Nickel	660		ug/L	435	89.9	70-130			
Selenium	212		ug/L	ND	84.7	70-130			
Silver	239		ug/L	ND	95.5	70-130			
Thallium	181		ug/L	3.72	71.0	70-130			
Uranium	297		ug/L	ND	119	70-130			
Vanadium	808		ug/L	576	92.9	70-130			
Zinc	1300		ug/L	1120	75.1	70-130			
Volatiles									
Benzene	4.20	0.02	ug/g		105	60-130			
Ethylbenzene	4.34	0.05	ug/g		108	60-130			
Toluene	4.27	0.05	ug/g		107	60-130			
m,p-Xylenes	7.59	0.05	ug/g		94.9	60-130			
o-Xylene	4.83	0.05	ug/g		121	60-130			
Surrogate: Toluene-d8	6.59		ug/g		82.4	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21815

Report Date: 14-Jun-2017

Order Date: 7-Jun-2017

Project Description: PE4053

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

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

CCME PHC additional information:

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



Client Name: PATERSON GROUP	Project Reference: PE4053	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: ADRIAN MENYHART	Quote #	
Address: 154 COLONNADE RD. S.	PO # 21815	
Telephone: 618-226-7381	Email Address: amenyhart@patersongroup.ca	
Criteria: <input checked="" type="checkbox"/> O, Reg. 153/04 (As Amended) Table 3 <input type="checkbox"/> RSC Filing <input type="checkbox"/> O, Reg. 558/00 <input type="checkbox"/> PWQO <input type="checkbox"/> CCME <input type="checkbox"/> SUB (Storm) <input type="checkbox"/> SUB (Sanitary) Municipality: _____ <input type="checkbox"/> Other: _____		

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

Required Analyses

Parcel Order Number:

1723349

Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)				
				Date	Time											
1 BH1 - SS1	S		1	JUNE 1 2017									250 mL			✓
2 BH3 - SS2	S		1										↓			✓
3 BH3 - SS5	S		2										250 mL + nail			✓
4 BH6 - SS5	S		2										↓			✓
5																
6 BH2 - SS2	S		1										hold. 250 mL			✓
7																
8																
9																
10																

Comments:

Method of Delivery:

Parcel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): ADRIAN MENYHART	Date/Time: 07/06/17 4:10 PM	Date/Time: 06/07/17 5:00 PM	Date/Time: 06/07/17 5:15 PM
Date/Time: JUNE 7 2017	Temperature: _____ °C	Temperature: 22.8 °C	pH Verified [] By: _____

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 21817
Project: PE4053
Custody: 113228

Report Date: 16-Jun-2017
Order Date: 12-Jun-2017

Order #: 1724092

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

Paracel ID	Client ID
1724092-01	BH1-GW1
1724092-02	BH3-GW1
1724092-03	BH5-GW1

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	16-Jun-17	16-Jun-17
PHC F1	CWS Tier 1 - P&T GC-FID	14-Jun-17	16-Jun-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	13-Jun-17	14-Jun-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

Client ID:	BH1-GW1	BH3-GW1	BH5-GW1	-
Sample Date:	09-Jun-17	09-Jun-17	09-Jun-17	-
Sample ID:	1724092-01	1724092-02	1724092-03	-
MDL/Units	Water	Water	Water	-

Volatiles

Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	128	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene-d8	Surrogate	104%	100%	102%	-

Hydrocarbons

F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	-
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F3 + F4 PHCs	200 ug/L	<200	<200	<200	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

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	31.9		ug/L		99.8	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	30.4		ug/L		95.0	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1950	25	ug/L		97.7	68-117			
F2 PHCs (C10-C16)	1270	100	ug/L		70.5	60-140			
F3 PHCs (C16-C34)	3270	100	ug/L		87.8	60-140			
F4 PHCs (C34-C50)	1930	100	ug/L		77.9	60-140			
Volatiles									
Benzene	45.6	0.5	ug/L		114	60-130			
Ethylbenzene	36.4	0.5	ug/L		90.9	60-130			
Toluene	28.9	0.5	ug/L		72.3	60-130			
m,p-Xylenes	72.6	0.5	ug/L		90.8	60-130			
o-Xylene	34.6	0.5	ug/L		86.6	60-130			
Surrogate: Toluene-d8	26.2		ug/L		81.9	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 21817

Report Date: 16-Jun-2017

Order Date: 12-Jun-2017

Project Description: PE4053

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

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

Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Adrian Menyhart

Client PO: 22082
Project: PE4053
Custody: 37384

Report Date: 25-Jul-2017
Order Date: 21-Jul-2017

Order #: 1730016

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

Paracel ID
1730016-01

Client ID
BH3-GW2

Approved By:



Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22082

Report Date: 25-Jul-2017

Order Date: 21-Jul-2017

Project Description: PE4053

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	25-Jul-17	25-Jul-17

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22082

Report Date: 25-Jul-2017

Order Date: 21-Jul-2017

Project Description: PE4053

Client ID:	BH3-GW2	-	-	-
Sample Date:	20-Jul-17	-	-	-
Sample ID:	1730016-01	-	-	-
MDL/Units	Ground Water	-	-	-

Volatiles

Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
Toluene-d8	Surrogate	112%	-	-	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22082

Report Date: 25-Jul-2017

Order Date: 21-Jul-2017

Project Description: PE4053

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	88.0		ug/L		110	50-140			

Certificate of Analysis

Report Date: 25-Jul-2017

Client: Paterson Group Consulting Engineers

Order Date: 21-Jul-2017

Client PO: 22082

Project Description: PE4053

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	87.7		ug/L		110	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22082

Report Date: 25-Jul-2017

Order Date: 21-Jul-2017

Project Description: PE4053

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Benzene	36.2	0.5	ug/L		90.4	60-130			
Ethylbenzene	40.1	0.5	ug/L		100	60-130			
Toluene	37.9	0.5	ug/L		94.8	60-130			
m,p-Xylenes	77.3	0.5	ug/L		96.7	60-130			
o-Xylene	37.1	0.5	ug/L		92.7	60-130			
Surrogate: Toluene-d8	79.2		ug/L		99.0	50-140			

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 22082

Report Date: 25-Jul-2017

Order Date: 21-Jul-2017

Project Description: PE4053

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.

Paracel ID: 1730016



RESPONSIVE
RELIABLE

Office
9 St. Laurent Blvd.
Ontario K1G 4J8
749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)

Nº 37384

Page 1 of 1

Client Name: <u>Paterson Group</u>	Project Reference: <u>PE4053</u>	Turnaround Time: <input type="checkbox"/> 1 Day <input type="checkbox"/> 3 Day <input checked="" type="checkbox"/> 2 Day <input checked="" type="checkbox"/> Regular Date Required: _____
Contact Name: <u>Adrian Menyhart</u>	Quote #	
Address: <u>154 Colonnade Rd S Ottawa, ON</u>	PO # <u>22032</u>	
Telephone: <u>613-226-7381</u>	Email Address: <u>amenyhart@patersongroup.ca</u>	

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

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

Required Analyses

Parcel Order Number:		Matrix	Air Volume	# of Containers	Sample Taken		BTEX	VOCs SVOCs Metals										
Sample ID/Location Name					Date	Time												
1	BH3- GW2	GW		2	July 20/17	PM	✓											
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments:

Method of Delivery:

Paracel

Relinquished By (Sign): <u>[Signature]</u>	Received by Driver/Depot: <u>[Signature]</u>	Received at Lab: <u>DUMPERN</u>	Verified By: <u>Rachel Subject</u>
Relinquished By (Print): <u>Greg L</u>	Date/Time: <u>7/27/17 3:00 PM</u>	Date/Time: <u>JUL 21 04:45</u>	Date/Time: <u>July 24/17</u>
Date/Time: <u>July 20, 2017</u>	Temperature: <u>22.6</u> °C	Temperature: <u>22.6</u> °C	pH Verified [X] By: <u>N/A</u> <u>10:15</u>

Chain of Custody (Blank) - Rev 0.4 Feb 2016

APPENDIX 4

QUALIFICATIONS OF ASSESSORS

Adrian Menyhart, B.Eng/ing./P.Eng.

Adrian received his Bachelor's of Engineering from Carleton University in 2011, with a specialization in environmental engineering. During the summers of 2009 through 2011, Adrian worked for the Canadian Food Inspection Agency as an Inspector within the Ottawa region. During Adrian's summer experience he would gain invaluable experience with time management, relations with other government departments as well as the general public and data and information collection. Upon completion of Adrian's summer employment with Canadian Food Inspection Agency in 2011, Adrian started his career as a junior environmental specialist at Paterson within the Environmental Division under the guidance of Mark D'Arcy and other senior personnel. During his time at Paterson, Adrian has accumulated extensive experience with Phase I and Phase II environmental site assessments, remediation inspections, environmental monitoring and field procedures. Being fluently bilingual in English and French, Adrian has experience working in both Ontario and Quebec, and is currently pursuing membership with governing engineering bodies in both provinces. Adrian's work experience has provided an opportunity to gain valuable knowledge about the environment industry, which has lead to his advancement within the Paterson office and ability to be a contributor to the Environmental Divisions success.

EDUCATION

B.Eng. 2011, Environmental Engineering, Carleton University, Ottawa, ON

LICENCE/ PROFESSIONAL AFFILIATIONS

Ordre des Ingénieurs du Québec
Professional Engineers of Ontario
Ottawa Geotechnical Group

YEARS OF EXPERIENCE

With Paterson: 5

With other Firms: 1

OFFICE LOCATION

Paterson's Ottawa Office

SELECT LIST OF PROJECTS

- Ottawa Heart Institute Construction, Ottawa, ON (project manager) – Conducted air sampling for parameters such as particulate matter, lead, mould and asbestos
- Ottawa Arts Gallery Expansion, Ottawa, ON (remediation supervisor) – Provided guidance in the segregation of soils on the site, managing contaminated and clean materials, providing daily correspondence with the client.
- Rideau Centre Expansion, Ottawa, ON (remediation supervisor) – Provided guidance in the segregation of soils on the site, managing contaminated and clean materials.
- Tweedsmuir and Carling Avenue water and sewer main rehabilitation, Ottawa, ON (remediation supervisor) – Provided guidance for the management of contaminated materials within the sewer and water main excavations.
- Conducted numerous designated substance surveys and asbestos surveys throughout Ontario and Quebec, collecting representative samples of potential asbestos containing materials and preparing comprehensive reports.
- Conducted numerous air sampling programs, collecting samples for environmental parameters such as asbestos, lead and mould, and preparing reports.
- Conducted Phase I and II Environmental Site Assessments across Ontario and Quebec
- Groundwater Monitoring and Sampling

PROFESSIONAL EXPERIENCE

September 2011 to present, **Junior Environmental Engineer, Paterson Group Inc.,** Ottawa, Ontario

- Provide on-site environmental expertise for remediation projects including Ottawa Arts Gallery, Rideau Centre Expansion and Tall Ships Landing, among various small scale remediation project within the greater Ottawa area.
- Coordinate field programs and prepare reports for Phase I and II projects across Ontario and Quebec.
- Oversee environmental investigations for drilling and test pitting on numerous proposed utility installations, residential and commercial developments.
- Conduct designated substance surveys in Ontario and Quebec.
- Coordinate air sampling programs for various environmental parameters, comparing results with regulatory standards and other guidelines.
- Problem solving to help advance or maintain project schedules.
- Complete environmental reports with recommendations for environmental concerns.
- Liaising with contractors, consultants and government officials.
- Provide cost estimates for environment field programs and construction costs.

June to September from 2009 to 2011, **Inspector, Canadian Food Inspection Agency,** Ottawa, Ontario

- Conducted the trapping program for the Emerald Ash Borer across Eastern Ontario.
- Assisted in the preparation and training of other inspectors for the trapping program.
- Conducted inspections for restricted wood products at various campgrounds.
- Assisted other inspectors in inspecting shipments of wood products from other countries, in certain cases, seizing and disposing of items.
- Compiling data and preparing reports.

Mark S. D'Arcy, P.Eng., QP_{ESA} Senior Environmental/Geotechnical Engineer

After receiving his Bachelors of Applied Science from Queen's University in 1991 in Geological Engineering, Mark joined Paterson Group Inc. During the first 10 years of Mark's career, he was heavily involved in all aspects of field work, including drilling boreholes, excavating test pits, conducting phase I site inspections, environmental sampling and analysis and inspection of environmental remediations. During Mark's field experience, he gained invaluable field and office experience, which would prepare Mark to become the Environmental Division Manager. Mark's field experience ranges from Phase I Environmental Site Assessments (ESAs) to on-site soil and groundwater remediations, as well as, environmental/geotechnical borehole investigations. Mark's field experience has provided extensive knowledge of subsurface conditions, contractor relations and project management. These skills would provide Mark with the ability to understand a variety of situations, which has lead Paterson to an extremely successful Environmental Department. Mark became the Environmental Manager in 2006, which consisted of two engineers and two field technicians. Mark has been an integral part in growing the Environmental Division, which now consists of nine engineers and three field technicians. Mark is the Senior Project Manager for a wide variety of environmental projects within the Eastern Ontario area including Phase I ESAs, Phase II ESAs, remediations for filing Records of Site Condition in the Ontario Ministry of the Environment and Climate Change (MOECC) Environmental Site Registry, Brownfield Applications and Landfill Monitoring Programs. As the Senior Project Manager, Mark is responsible for directing project personnel, final report review and overall project success. Mark has proven leadership and ability to manage small to large scale projects within the allotted time and budget.

EDUCATION

B.A.Sc. 1991, Geological Engineering, Queen's University, Kingston, ON

LICENCE/ PROFESSIONAL AFFILIATIONS

Professional Engineers of Ontario

ESA Qualified Person with MOECC

Ottawa Geotechnical Group

Consulting Engineers of Ontario

YEARS OF EXPERIENCE

With Paterson: 25

OFFICE LOCATION

154 Colonnade Road South,
Nepean, Ontario, K2E 7J5

SELECT LIST OF PROJECTS

- 222 Beechwood Avenue, Ottawa, Ontario (Senior Project Manager for Phase I ESA, Phase II ESA, Phase III ESA, Environmental Remediation)
- 409 MacKay Street, Ottawa, Ontario (Senior Project Manager for Phase I ESA, Phase II ESA, Phase III ESA, Environmental Remediation)
- Art's Court Redevelopment, Ottawa, Ontario (Senior Project Manager for Phase I ESA, Phase II ESA, Phase III ESA, Environmental Remediation)
- Visitor Welcome Centre, Phase II and Phase III, Parliament Hill, Ottawa, Ontario (Senior Project Manager for Environmental Remediation)
- Mattawa Landfill, Mattawa, Ontario (Senior Project Manager, Annual Water Quality Monitoring report)
- Multi-Phase Redevelopment of the Ottawa Train Yards, Ottawa, Ontario (Senior Project Manager)
- Rideau Centre Expansion, Ottawa, Ontario(Senior Project Manager for Phase I ESA, Phase II ESA, Phase III ESA, Environmental Remediation)
- 26 Stanley Avenue, Ottawa, Ontario, Phase I ESA, Phase II ESA (Senior Project Manager)
- Riverview Development – Kingston, Ontario, Phase I ESA, Phase II ESA, and filing of an RSC in the MOECC Environmental Site Registry (Senior Project Manager)
- Monitoring Landfills for River Valley, Kipling and Lavagine (Senior Project Manager)

PROFESSIONAL EXPERIENCE

May 2001 to present, **Manager of Environmental Division, Paterson Group Inc.,** Ottawa, Ontario

- Manage all aspects of the environmental division (management of personnel, budgeting, invoicing, scheduling, business development, reporting, marketing, and fieldwork).
- Review day to day operations within the environmental division.
- Design, perform, and lead Phase I, II and Phase III ESAs, Remediation's, Brownfield Applications and Record of Site conditions, fieldwork surveys, excavation, monitoring, laboratory analysis, and interpretation.
- Write, present, and publish reports with methodology and laboratory analysis results, along with recommendations for environmental findings.
- Responsible for ensuring projects meet Ministry of Environment and Climate Change Standards and Guidelines.
- Building and fostering relationships with clients, stakeholders, and Ministry officials.
- Supervise and continuous training of staff in environmental methods (environmental sampling techniques, technical expertise and guidance).
- Applied due diligence in ensuring the health and safety of staff and the public in field locations.

1991 to 2001, **Geotechnical and Environmental Engineer, Paterson Group Inc.,** Ottawa, Ontario

- Provide on-site geotechnical and environmental expertise to various clients.
- Oversee geotechnical and environmental investigations for drilling and test pitting on numerous proposed utility installations, residential and commercial developments.
- Problem solving to help advance or maintain project schedules.
- Complete environmental reports with recommendations to meet environmental standards set by MOE and CCME standards.
- Conduct site inspections, bearing medium evaluations, bearing surface inspections, concrete testing and field density testing.
- Liaising with contractors, consultants and government officials.
- Provide cost estimates for geotechnical and environmental field programs and construction costs.
- Review RFI's, submittals, monthly progress reports and other various construction related work.