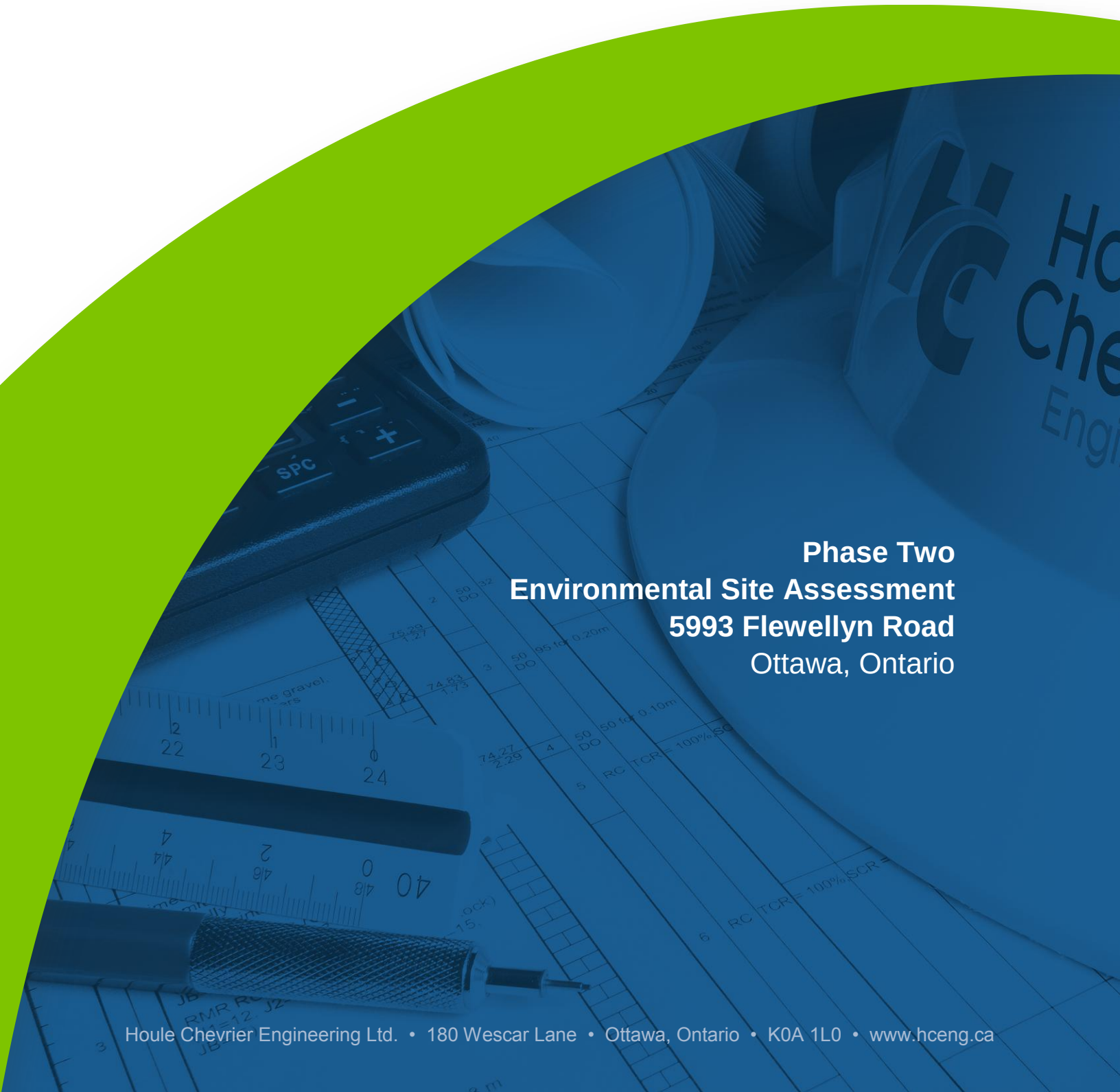
Houle Chevrier Engineering



Phase Two
Environmental Site Assessment
5993 Flewellyn Road
Ottawa, Ontario

Houle Chevrier Engineering Ltd. • 180 Wescar Lane • Ottawa, Ontario • K0A 1L0 • www.hceng.ca

Houle Chevrier Engineering

Submitted to:

Tartan Homes Ltd.
233 Metcalfe Street
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Phase Two Environmental Site Assessment 5993 Flewellyn Road Ottawa, Ontario

July 15, 2014
Project: 14-150

EXECUTIVE SUMMARY

The Phase One ESA report previously carried out for the subject property recommended that a Phase Two ESA investigation be carried out for the property 5993 Flewellyn Road in Ottawa, Ontario. The Phase Two ESA investigated the following Areas of Potential Environmental Concern (APECs) that were identified in the Phase One ESA:

APEC 1: Old Farm House

The interview identified that the former farm house burned down in 1965. The interview also identified that the former farm house was heated by coal and switched to heating oil in 1962. Miscellaneous debris including a fuel tank from a snowmobile and oil containers were identified during the site reconnaissance. The contaminants of concern are PHCs, BTEX, PAHs and metals.

APEC 2: Rusted Metal Debris

The site reconnaissance identified rusted metal debris along the west property boundary in the northwest portion of the subject property. The contaminants of concern are PHCs, BTEX and metals.

APEC 3: Oil Changes in Fields

The interview identified that oil changes on tractors were performed once or twice a year in the fields at different locations. The locations where the oil changes were performed are not known and, therefore, it is not technically possible to identify and investigate those areas. The contaminants of concern are PHCs and BTEX.

The Phase Two ESA investigation was carried out during May and June 2014. The components of the Phase Two ESA investigation consisted of advancing three (3) boreholes and installing three (3) monitoring wells to assess the soil and groundwater in the area of APEC 1 and APEC 2. Soil and groundwater samples were collected and submitted to Paracel Laboratories Ltd. of Ottawa, Ontario for laboratory analyses of selected parameters.

The data collected during the borehole drilling indicated that the site is underlain by a surficial layer of topsoil overlying glacial till. Possible bedrock was encountered at depths ranging from 5.2 to 5.5 metres below ground surface.

The groundwater levels measured in the monitoring wells ranged from 5.8 to 7.1 metres below ground surface.

The analytical results of the soil and groundwater sampling meet the applicable MOE Table 3 site condition standards for the contaminants of concern identified during the Phase One ESA.

Based on the results of the current investigation, no further investigations are required at this time.

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1.0 INTRODUCTION

Houle Chevrier Engineering Ltd. (HCEL) was retained by Tartan Land Development to carry out a Phase Two Environmental Site Assessment (ESA) for the property located 5993 Flewellyn Road in Ottawa, Ontario (hereafter referred to as "the subject property"). The general location of the subject property is illustrated on the Key Plan, Figure 1.

The purpose of the Phase Two ESA was to investigate the areas of potential environmental concern identified in the Phase One ESA dated October 2013, and to assess the potential for environmental impact at the subject property. This Phase Two ESA was completed in general accordance with Ontario Regulation 153/04.

1.1 Phase Two Property Description

The subject property is approximately 62.8 hectares (155.3 acres) in size. The legal description for the property is Part of Lot 25, Concession 9, as in C+216436, save & except parts, subject to Easements NS260743 & N391074, Geographic Township of Goulbourn, City of Ottawa; PIN 04449-0516.

1.2 Phase Two Property Ownership

The subject property is owned by Mr. William Davidson, who can be contacted at 613-266-0740.

1.3 Current and Future Land Uses

The current land use is agricultural land and has historically been agricultural land with a residence. The subject property is currently zoned as rural countryside. Plans are being prepared to develop the land as residential. In accordance with Section 168.3.1 of the Environmental Protection Act (Ministry of Environment, December 31, 2011) a Record of Site Condition is not required to be filed for the subject property.

1.4 Applicable Site Condition Standard

Site restoration standards were selected for this site in accordance with the requirements of Ontario Regulation 153/04, Record of Site Condition – Part XV.1 of the Environmental Protection Act (O. Reg. 153/04, Ministry of Environment, October 31, 2011).

The following information was considered in selecting the site condition standards:

- The subject property is within an urban area;
- Drinking water wells may be located on the subject property or within 250 metres of the subject property;
- The current property use is agricultural; however, plans are being prepared to develop the property as residential;

- The overburden thickness in the area of the APECs investigated is greater than 2 metres;
- A grain size distribution analysis was completed on a sample of the glacial till from borehole 14-1. The grain size distribution curve is provided in Appendix B and indicates that approximately 61 percent of particles are greater than 75 micrometres in diameter.

Based on the above information, the current Ministry of Environment (MOE) Table 3 full depth generic site condition standards for coarse grained soil, residential property use, in a potable groundwater condition as outlined in the MOE, Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (MOE, April 15, 2011) was selected for the subject property.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The subject property is agricultural land and has historically been agricultural land. The subject property is currently serviced by overhead hydro.

The subject property has a relatively flat topography gently sloping from the northwest down to the southeast. The subject property is at elevations of approximately 103 to 113 metres above sea level. Surrounding topography generally slopes gradually downwards to the southeast. Based on the topography of the area, it is expected that the local shallow groundwater flow is towards the southeast.

2.2 Past Investigations

A Phase One ESA was conducted by Houle Chevrier Engineering Ltd. for the subject property and is provided in the report titled “Phase One Environmental Site Assessment, 1575 Diamondview Road, Ottawa, Ontario” dated October 2013. The Phase One ESA was carried out under the supervision of a qualified person in accordance with the Ontario Regulation 153/04 made under the Environmental Protection Act. The following Areas of Potential Environmental Concern (APECs) were determined through the Phase One ESA to exist for the subject property:

APEC 1: Old Farm House

The interview identified that the former farm house burned down in 1965. The interview also identified that the former farm house was heated by coal and switched to heating oil in 1962. Miscellaneous debris including a fuel tank from a snowmobile and oil containers were identified during the site reconnaissance. The contaminants of concern are PHCs, BTEX, PAHs and metals.

APEC 2: Rusted Metal Debris

The site reconnaissance identified rusted metal debris along the west property boundary in the northwest portion of the subject property. The contaminants of concern are PHCs, BTEX and metals.

APEC 3: Oil Changes in Fields

The interview identified that oil changes on tractors were performed once or twice a year in the fields at different locations. The locations where the oil changes were performed are not known and, therefore, it is not technically possible to identify and investigate those areas. The contaminants of concern are PHCs and BTEX.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The objectives of the Phase Two ESA were based on the results of the Phase One ESA and are to document the presence or absence of contaminants in the land or water on, in or under the subject property, and if contaminants are present, to identify the locations of and concentrations of contaminants in the land or water on, in or under the subject site, and to assess if the subject property meets the applicable Ministry of the Environment site condition standards. The presence or absence of contaminants was investigated at discrete sampling locations using a limited number of samples.

The following tasks were completed during the Phase Two ESA:

- Preparation of a sampling and analysis plan;
- Three (3) boreholes were advanced at the site to collect soil samples;
- The three (3) boreholes were instrumented with monitoring wells in order to collect groundwater samples;
- Soil and groundwater samples were submitted to an accredited laboratory for laboratory analysis of contaminants of concern;
- Compare the analytical results with the applicable site condition standard; and,
- Preparation of a Phase Two Environmental Site Assessment report.

3.2 Media Investigated

This Phase Two ESA included sampling and analysis of soil and groundwater. No sediment sampling was conducted as no surface water bodies are present on the subject property. The rationale for sampling the soil and groundwater was to investigate the potential for contamination at the APECs identified in the Phase One ESA.

The soil quality at discrete locations on the subject property was assessed by collecting soil samples from three (3) boreholes, numbered 14-1 to 14-3, at regular depth intervals. All soil samples were field preserved in methanol and screened in the field and at the office, with a subset being submitted for laboratory analysis of the identified contaminants of concern. The locations of the boreholes are provided on Figure 2.

The groundwater quality at the subject property was assessed through the collection of groundwater samples from the three (3) monitoring wells that were installed. Groundwater samples were collected in laboratory supplied bottles using dedicated sampling equipment.

3.3 Phase One Conceptual Site Model

The Phase One Conceptual Site Model (CSM) prepared as part of the Phase One ESA identified the following details:

- A garage with a summer kitchen that was attached to the former house, a detached garage, a barn and two (2) wooden stables for horses were observed on the subject property;
- Surrounding land use has historically been agricultural and currently remains the same with a residential subdivision to the west along Fernbank Road;
- No areas of natural significance are present on the subject property or within the Phase One study area;
- The portion of the property (40 hectares along Fernbank Road) being considered for development is located within the City of Ottawa urban boundary;
- Locations of where potentially contaminating activities have occurred;
- Areas of potential environmental concern on the subject property.

3.3.1 Potentially Contaminating Activities

The following potentially contaminating activities were identified during the Phase One ESA:

- There was a fire that burned down the former house located on the subject property.
- The former house that burned down was heated by coal and oil.
- Miscellaneous debris including an old snowmobile and fuel tank was observed adjacent to the summer kitchen.
- A pile of miscellaneous debris with old rusted parts was observed on the west property line of the subject property in the area of the stables.
- Oil changes were performed in the agricultural fields on the subject property. The oil changes were performed only once or twice a year and in different locations and therefore, it is not technically possible to identify and investigate those areas.

3.3.2 Areas of Potential Environmental Concern

The areas of potential environmental concern (APEC) on the subject property are summarized in the following table:

APEC	Location of APEC on Phase One Property	PCA	Location of PCA	Contaminants of Potential Concern	Media Potentially Impacted
APEC 1	Northwest portion of subject property	• Heating oil • Debris • House fire	On site	• BTEX[1] • PHCs[2] • Metals • PAHs[3]	• Soil • Shallow Groundwater
APEC 2	Northwest portion of subject property	• Rusted metal debris • Rusted oil containers	On site	• BTEX • PHCs • Metals	• Soil • Shallow Groundwater

APEC	Location of APEC on Phase One Property	PCA	Location of PCA	Contaminants of Potential Concern	Media Potentially Impacted
APEC 3	Unknown	• Oil changes	On site	• PHCs • BTEX	• Soil • Shallow Groundwater

Notes:

1. BTEX – Bezene, Toluene, Ethylbenze and Xylenes
2. PHCs – Petroleum Hydrocarbon
3. PAHs – Polycyclic Aromatic Hydrocarbons

3.4 Deviations from Sampling and Analysis Plan

One (1) deviation occurred from the sampling and analysis plan. One (1) additional groundwater sampling event was carried out due to the results of the first sampling event.

3.5 Impediments

No impediments occurred during the investigation.

4.0 INVESTIGATION METHODS

4.1 General

Three (3) boreholes (numbered 14-1 to 14-3) were advanced on May 26, 2014. Soil samples were recovered at regular depth intervals and screened for combustible headspace gas concentrations and visual and olfactory indications of contamination. Well screens were installed in both of the boreholes. Soil and groundwater samples were collected from the boreholes and well screens, and submitted to Paracel Laboratories Ltd. for chemical analyses of selected parameters.

4.2 Borehole Drilling

The boreholes were advanced at the subject property using a direct push drill rig supplied and operated by Strata Drilling Group.

Cross-contamination between samples was minimized by using dedicated tube samplers. Clean gloves were worn and changed between each sample.

4.3 Soil Sampling

Soil samples were collected following the Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (MOE, 1996). Soil samples were collected from the tube sampler and placed directly into sample jars and resealable zipper bags using nitrile gloves. An approximately 5 gram soil sample was also obtained using new disposable syringes and placed into methanol preserved vials for volatile organic compounds (VOCs) analysis.

Geological descriptions of the collected soil samples based on the Record of Borehole sheets in Appendix A are summarized in the following table:

Borehole	Sample	Sample Depth (metres below ground surface)	Geological Description
BH14-1	SA1	0.0 – 1.2	Brown silty sand, trace silt, with gravel and cobbles (Glacial Till)
	SA2	1.2 – 2.4	
	SA3	2.4 – 3.1	Grey silty sand, some gravel and cobbles, possible boulders (Glacial Till)
	SA4	3.1 – 3.7	
	SA5	3.7 – 4.3	
	SA6	4.3 – 4.9	

Borehole	Sample	Sample Depth (metres below ground surface)	Geological Description
	SA7	4.9 – 5.5	
BH14-2	SA1	0.0 – 1.2	Grey brown silty sand, some gravel, possible cobbles and boulders (Glacial Till)
	SA2	1.2 – 1.8	
	SA3	1.8 – 2.4	
	SA4	2.4 – 3.1	
BH14-3	SA1	0.0 – 1.2	Brown silty sand, some gravel, possible boulders (Glacial Till)
	SA2	1.2 – 2.0	Grey silty sand, some gravel, possible cobbles and boulders (Glacial Till)
	SA3	2.0 – 2.7	

4.4 Groundwater Monitoring Well Installation

Groundwater monitoring wells were installed in boreholes 14-1, 14-2 and 14-3 by Strata Drilling Group at the time of drilling the boreholes. The monitoring wells were constructed with 51 mm diameter PVC screens and risers. Silica sand was placed around the screen and to 0.3 metres above the top of the screen. The remaining annulus space to ground surface was sealed with bentonite to minimize cross-contamination. The monitoring well construction details are provided in the Record of Borehole sheets in Appendix A.

4.5 Groundwater Field Measurements

A Heron Instruments oil/water interface meter was used to measure groundwater levels and did not detect the presence of free petroleum product in any of the monitoring wells.

4.6 Groundwater Sampling

Groundwater samples were collected following the Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario (MOE, 1996). All groundwater samples were collected in laboratory supplied bottles, using a peristaltic groundwater pump with dedicated tubing. Prior to sampling, the monitoring wells were developed by purging the wells using a low flow groundwater pump. The groundwater samples were obtained after field tests showed that the pH, conductivity, total dissolved solids, oxidation reduction potential and temperature had stabilized. All groundwater samples were stored in a cooler filled with ice and were submitted to Paracel Laboratories Ltd. for analyses of selected parameters

4.7 Sediment Sampling

No sediments were sampled as part of the Phase Two ESA work program as there are no surface water bodies present on the site.

4.8 Analytical Testing

Laboratory analysis of soil samples and groundwater samples was carried out by Paracel Laboratories Ltd. located at 300-2319 St. Laurent Boulevard in Ottawa, Ontario.

4.9 Residue Management Procedures

No excess soil cuttings were produced during the borehole drilling. Water used during cleaning and purged groundwater produced during the well development and groundwater sampling was stored on-site in sealed plastic containers.

4.10 Quality Assurance and Quality Control Measures

Soil Samples

Soil samples were collected in clear glass jars and vials containing methanol preservative supplied by the laboratory. The jars were partially pre-labeled prior to going out in the field to record the client (Houle Chevrier Engineering Ltd.), project number, borehole number and date of sampling on each laboratory supplied jar. In the field, a black pen or permanent marker was used to fill in the sample number and date. This allowed for the time spent in the field labeling jars to be minimized and reduced possible errors. A chain of custody was clearly completed to include the information for each sample collected and was attached to the sampling cooler storing the samples while the samples were transferred to the analytical laboratory for chemical testing.

A new pair of nitrile gloves was worn for collecting each of the soil samples to minimize cross contamination between samples and to protect staff from exposure to contaminants. The sampling tubes were opened by the contractor and samples were collected directly into laboratory supplied jars using a putty scraper and/or knife which was wiped with a clean cloth and rinsed with a decontamination solution and distilled water following each sampling event. The samples for the vials containing the methanol preservative were collected using new plastic syringes supplied by the laboratory. Following collection of soil samples in laboratory supplied jars, the remaining soil in the sampling tubes was placed in a plastic resealable zipper bag for combustible headspace gas screening at the end of the day.

The soil samples collected in the laboratory supplied containers were immediately preserved in the field by placing the samples in a laboratory supplied cooler filled with ice packs to maintain the temperature between 4 and 10 degrees Celsius. Soil samples were returned to our office and placed into a dedicated refrigerator for storage of soil and groundwater samples. Soil samples were selected for submission based on combustible gas measurements and visual and

olfactory signs of contamination. All samples were submitted within the maximum allowable holding time of 14 days.

Groundwater

The groundwater samples were collected in laboratory supplied bottles and vials specific to the requested analysis. The jars were partially pre-labeled prior to going out in the field to record the client (Houle Chevrier Engineering Ltd.), project number, borehole number and date of sampling on each laboratory supplied jar. In the field a black pen or permanent marker was used to fill in the sample number and date.

A new pair of nitrile gloves was worn during the collection of each of the groundwater samples to minimize cross contamination between samples and to protect staff from exposure to contaminants. Groundwater was sampled from the wells using dedicated sampling equipment for each well.

The groundwater samples collected in the laboratory supplied containers were immediately cooled in the field by placing the samples in a laboratory supplied cooler filled with ice packs. Groundwater samples were submitted to the laboratory the same day for analysis. All samples were submitted within the maximum allowable holding time of 48 hours.

No equipment other than disposable nitrile gloves and dedicated groundwater sampling equipment was used in sampling the groundwater from the wells. No cleaning procedures were required as the gloves and dedicated sampling equipment were disposed of following sample collection.

5.0 REVIEW AND EVALUATION OF INFORMATION

5.1 Geology

Surficial geology at the subject property was interpreted from the stratigraphic information obtained during drilling at the specific test locations only. Detailed descriptions of soil conditions can be found on the Record of Borehole sheets in Appendix A.

The following presents an overview of the subsurface conditions encountered in the boreholes advanced during this investigation.

Topsoil

A surficial layer of topsoil was encountered at the borehole locations and had a thickness of approximately 0.1 to 0.2 metres.

Glacial Till

Glacial till was encountered at all three borehole locations below the surficial topsoil layer. The glacial till is generally composed of silty sand with gravel, cobbles and possible boulders. The thickness of the glacial till could not be fully determined due to practical refusal of the direct push drill rig on possible bedrock or boulders. Practical refusal occurred at varying depths of between 2.7 and 5.5 metres below ground surface.

Bedrock

Air hammering was used below the glacial till into the bedrock and/or boulders and therefore this portion of the boreholes could not be logged. The boreholes were terminated at depths ranging from approximately 6.7 to 9.1 metres below ground surface.

5.2 Groundwater Elevations

The groundwater levels were measured in the monitoring wells on June 3 and 12, 2014. No free product was detected by the Heron Instruments oil/water interface meter. The groundwater levels and combustible headspace vapour readings are summarized in the following table:

Borehole	Date Measured	Groundwater Depth Below Ground Surface (metres)	Combustible Headspace Vapour Reading (ppm)
14-1	03/06/2014	6.93	0
	12/06/2014	7.08	0
14-2	03/06/2014	6.68	0
	12/06/2014	6.91	30

14-3	03/06/2014	5.82	190

5.3 Site Condition Standards

Site condition standards were selected for this site in accordance with the requirements of Ontario Regulation 153/04, Records of Site Condition – Part XV.1 of the Environmental Protection Act (O. Reg. 153/04, MOE, October 31, 2011).

The following information was considered in selecting the site condition standards:

- The subject property is within an urban area;
- No drinking water wells are located on the subject property or within 250 metres of the subject property;
- The current property use is residential;
- The overburden thickness in the area of the APECs investigated is greater than 2 metres.

Based on the above information, the current Ministry of Environment (MOE) Table 3 full depth generic site condition standards for coarse grained soil, residential property use, in a non-potable groundwater condition as outlined in the MOE, Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (MOE, April 15, 2011) was selected for the subject property.

5.4 Soil Quality

The laboratory certificates of analysis for the selected soil samples are presented in Appendix C. The locations and depths of the selected soil samples submitted for laboratory analysis are summarized in the following table:

Borehole	Sample	Depth Interval (m bgs[1])	PHCs[2] F1-F4 / BTEX[3]	PAHs[4]	Metals
14-1	SA2	1.2 – 2.4	✓	✓	✓
14-101[5]	SA2	1.2 – 2.4	✓	✓	✓
14-2	SA2	1.2 – 1.8	✓	✓	✓

Borehole	Sample	Depth Interval (m bgs[1])	PHCs[2] F1-F4 / BTEX[3]	PAHs[4]	Metals
14-3	SA1	0.0 – 1.2	✓	✓	✓

Notes:

1. m bgs – metres below ground surface
2. PHCs F1 to F4 - Petroleum Hydrocarbon Fractions in the F1 to F4 ranges
3. BTEX – Benzene, Toluene, Ethylbenzene and Xylenes
4. PAHs – Polycyclic Aromatic Hydrocarbons
5. 14-101 is a duplicate of borehole 14-1

The analytical results from the laboratory certificates of analysis were compared with the applicable Table 3 site condition standards (MOE, 2011). The results are summarized in Tables 1 to 3 following the text of the report. As shown in Tables 1 to 3, the soil sample results satisfy the applicable MOE Table 3 site condition standards for all parameters analysed.

5.5 Groundwater Quality

The laboratory certificates of analysis for the groundwater samples are presented in Appendix D. The location, date and parameters analysed are summarized in the following table:

Monitoring Well	Screened Interval (m BGS[1])	Date Sampled	Water Level (m BGS)	Parameters Analysed
14-1	6.09 – 9.14	03/06/2014	6.93	PHCs/BTEX, Metals, PAHs
		12/06/2014	7.08	PHCs/BTEX, Metals, PAHs
14-2	3.91 – 6.96	04/06/2014	6.68	PHCs/BTEX, Metals, PAHs
		12/06/2014	6.91	PHCs/BTEX, Metals, PAHs
14-3	3.66 – 6.71	03/06/2014	5.82	PHCs/BTEX, Metals, PAHs

Notes:

1. m BGS – metres below ground surface

The analytical results from the laboratory certificates of analysis were compared with the applicable Table 3 site condition standards (MOE, 2011). The results are summarized in Tables 4 to 6 following the text of the report.

The duplicate sample BH14-101-GW SA1 from borehole 14-1, and the sample BH14-2-GW SA1 from borehole 14-2 obtained during the sampling event on June 3 and 4, 2014, exceeded the site condition standard for PHCs F3 (520 and 609 µg/L versus the standard of 500 µg/L). Additional samples were obtained from boreholes 14-1 and 14-2 on June 12, 2014. The concentration of PHCs F3 was below the method detection limit for the additional samples from boreholes 14-1 and 14-2, and therefore the marginal exceedance in the initial samples taken on June 3 and 4, 2014 is not considered significant. As indicated in Tables 4 to 6 the groundwater sample results satisfy the applicable MOE Table 3 site condition standards for all parameters analysed.

5.6 Sediment Quality

No sediments were investigated as part of the Phase Two ESA as there are no surface water bodies present on the site.

5.7 Quality Assurance and Quality Control Results

One (1) duplicate soil sample was submitted to Paracel Laboratories for analysis of PHCs, BTEX, Metals and PAHs. The soil sample BH14-101 SA2 is a duplicate of sample 14-1 SA2. As indicated in Tables 1 to 3, the results of the duplicate soil sample are similar to the original sample.

One (1) duplicate groundwater sample was submitted to Paracel Laboratories for analysis of PHCs, BTEX, Metals and PAHs. The groundwater sample BH14-101-GW SA1 is a duplicate of sample BH14-1-GW SA1. As indicated in Tables 1 to 3, the results of the duplicate groundwater sample are similar to the original sample with the exception of the parameter PHCs F3. The result of the duplicate sample is 520 µg/L which exceeds the site condition standard of 500 µg/L, while the original sample is 380 µg/L which is below the site condition standard. The difference in the results could be due to laboratory error and/or variation within the groundwater at the time of sampling.

One (1) trip blank water sample was submitted to Paracel Laboratories for analysis of PHCs and BTEX. The results of the trip blank were below the method detection limit for all parameters analysed which supports our sampling, transportation and handling methods in that PHCs and BTEX parameters were not introduced into the samples.

The Laboratory QA/QC results for the soil analysis are included with the laboratory analytical data provided in Appendix C. Soil sample holding times were met, and all laboratory quality

control blanks, duplicates and spikes and surrogate compound recoveries met applicable industry criteria with the exception of the following:

- The quality control duplicate results exceed the relative percent difference limits for PHCs F3 and F4 due to a non-homogeneous matrix.

The Laboratory QA/QC results for the groundwater analysis are included with the laboratory analytical data provided in Appendix D. Groundwater sample holding times were met, and all laboratory quality control blanks, duplicates and spikes and surrogate compound recoveries met applicable industry criteria with the exception of the following:

- The sample BH14-2 GW SA1 had greater than 5% sediment and therefore a whole bottle extraction was performed in accordance with Ontario Regulation 153/04;
- In the analysis for sample BH14-2 GW SA1 the quality control duplicate relative percent difference is high for vanadium, however, the sample result is less than ten times the method detection limit;
- In the analysis for sample BH14-2 GW SA1 the quality control spike recovery was outside acceptance limits for beryllium and silver. The batch was accepted based on other acceptable QC.

Based on the measures discussed above, sample collection and handling protocols are considered acceptable and associated analytical results reproducible. The quality of the field data and laboratory data from the investigation was sufficient in that decision making was not affected and the overall objectives of the investigation and assessment were met.

5.8 Phase Two Conceptual Site Model

5.8.1 Potentially Contaminating Activities

The following potentially contaminating activities were identified during the Phase One ESA:

- There was a fire that burned down the former house located on the subject property.
- The former house that burned down was heated by coal and oil.
- Miscellaneous debris including an old snowmobile and fuel tank was observed adjacent to the summer kitchen.
- A pile of miscellaneous debris with old rusted parts was observed on the west property line of the subject property in the area of the stables.
- Oil changes were performed in the agricultural fields on the subject property. The oil changes were performed only once or twice a year and in different locations and therefore, it is not technically possible to identify and investigate those areas.

5.8.2 Areas of Potential Environmental Concern (APECs)

A description and assessment of areas where potentially contaminating activities have occurred and areas of potential environmental concern are summarized in the following table:

APEC	Location of APEC on Phase One Property	PCA	Location of PCA	Contaminants of Potential Concern	Media Potentially Impacted
APEC 1	Northwest portion of subject property	• Heating oil • Debris • House fire	On site	• BTEX[1] • PHCs[2] • Metals • PAHs[3]	• Soil • Shallow Groundwater
APEC 2	Northwest portion of subject property	• Rusted metal debris • Rusted oil containers	On site	• BTEX • PHCs • Metals	• Soil • Shallow Groundwater
APEC 3	Unknown	• Oil changes	On site	• PHCs • BTEX	• Soil • Shallow Groundwater

As indicated on Tables 1 to 6, no soil or groundwater exceedances were identified in the Phase Two ESA compared with the MOE Table 3 site condition standards.

5.8.3 Subsurface Structures

No underground services are located on the subject property. Underground municipal water and sewer services, and natural gas are located along Fernbank Road and Flewellyn Road.

5.8.4 Physical Settings and Hydrogeological Characteristics of the Subject Property

The stratigraphy of the subject property is generally taken as a surficial layer of topsoil overlying glacial till.

The groundwater level measured in the monitoring wells ranged from between 5.8 to 7.1 metres below ground surface.

5.8.5 Selection of Site Condition Standards

Based on the results of the Phase One and Two ESAs conducted for the subject property, the site restoration standards selected for this site are the MOE Table 3 Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils).

5.8.6 Identified Contamination and Impacted Medium on the Subject Property

The Phase Two ESA investigated the APECs identified in the Phase One ESA and the results of the investigation for each APEC are summarized below:

APEC 1: Old Farm House

As indicated in Tables 1 to 6, the soil samples and groundwater samples submitted from boreholes 14-1 and 14-2 meet the applicable MOE Table 3 site condition standards for PHCs, BTEX, metals and PAHs.

APEC 2: Rusted Metal Debris

As indicated in Tables 1 and 6, the soil sample and groundwater sample submitted from borehole 14-3 meet the applicable site condition standards for PHCs, BTEX, metals and PAHs.

APEC 3: Oil Changes in Fields

The locations where the oil changes were performed are not known and, therefore, it is not technically possible to identify and investigate the isolated areas within the 62.8 hectares of property.

5.8.7 Summary of Identified Impacts

No impacts from APECs 1 and 2 were identified during the Phase Two ESA.

6.0 CONCLUSIONS

The Phase One ESA report previously carried out for the subject property recommended that a Phase Two ESA investigation be carried out for the property 5993 Flewellyn Road in Ottawa, Ontario. The Phase Two ESA investigated the following Areas of Potential Environmental Concern (APECs) that were identified in the Phase One ESA:

APEC 1: Old Farm House

The interview identified that the former farm house burned down in 1965. The interview also identified that the former farm house was heated by coal and switched to heating oil in 1962. Miscellaneous debris including a fuel tank from a snowmobile and oil containers were identified during the site reconnaissance. The contaminants of concern are PHCs, BTEX, PAHs and metals.

APEC 2: Rusted Metal Debris

The site reconnaissance identified rusted metal debris along the west property boundary in the northwest portion of the subject property. The contaminants of concern are PHCs, BTEX and metals.

APEC 3: Oil Changes in Fields

The interview identified that oil changes on tractors were performed once or twice a year in the fields at different locations. The locations where the oil changes were performed are not known and, therefore, it is not technically possible to identify and investigate those areas. The contaminants of concern are PHCs and BTEX.

The Phase Two ESA investigation was carried out during May and June 2014. The components of the Phase Two ESA investigation consisted of advancing three (3) boreholes and installing three (3) monitoring wells to assess the soil and groundwater in the area of APEC 1 and APEC 2. Soil and groundwater samples were collected and submitted to Paracel Laboratories Ltd. of Ottawa, Ontario for laboratory analyses of selected parameters.

The data collected during the borehole drilling indicated that the site is underlain by a surficial layer of topsoil overlying glacial till. Possible bedrock was encountered at depths ranging from 5.2 to 5.5 metres below ground surface.

The groundwater levels measured in the monitoring wells ranged from 5.8 to 7.1 metres below ground surface.

The analytical results of the soil and groundwater sampling meet the applicable MOE Table 3 site condition standards for the contaminants of concern identified during the Phase One ESA.

Based on the results of the current investigation, no further investigations are required at this time.

7.0 LIMITATION OF LIABILITY

This report was prepared for and the work referred to within it has been undertaken by Houle Chevrier Engineering Ltd. (HCEL) for the Tartan Homes Ltd. and is intended for the exclusive use of the Tartan Homes Ltd. This report may not be relied upon by any other person or entity without the express written consent of HCEL and Tartan Homes Ltd. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by HCEL with respect to this report and any conclusions or recommendations made in this report reflect the best judgements of HCEL based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, subsurface investigations at discrete locations and depths and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations on the site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Chemical parameters other than those addressed by the investigation described in this report may exist in soil and groundwater elsewhere on the site, the chemical parameters addressed in the report may exist in soil and groundwater at other locations at the site that were not investigated and concentrations of the chemical parameters addressed which are different than those reported may exist at other locations on the site than those from where the samples were taken.

Should new information become available during future work, including excavations, borings or other studies, HCEL should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Brett Painter, M.Sc.
Environmental Scientist

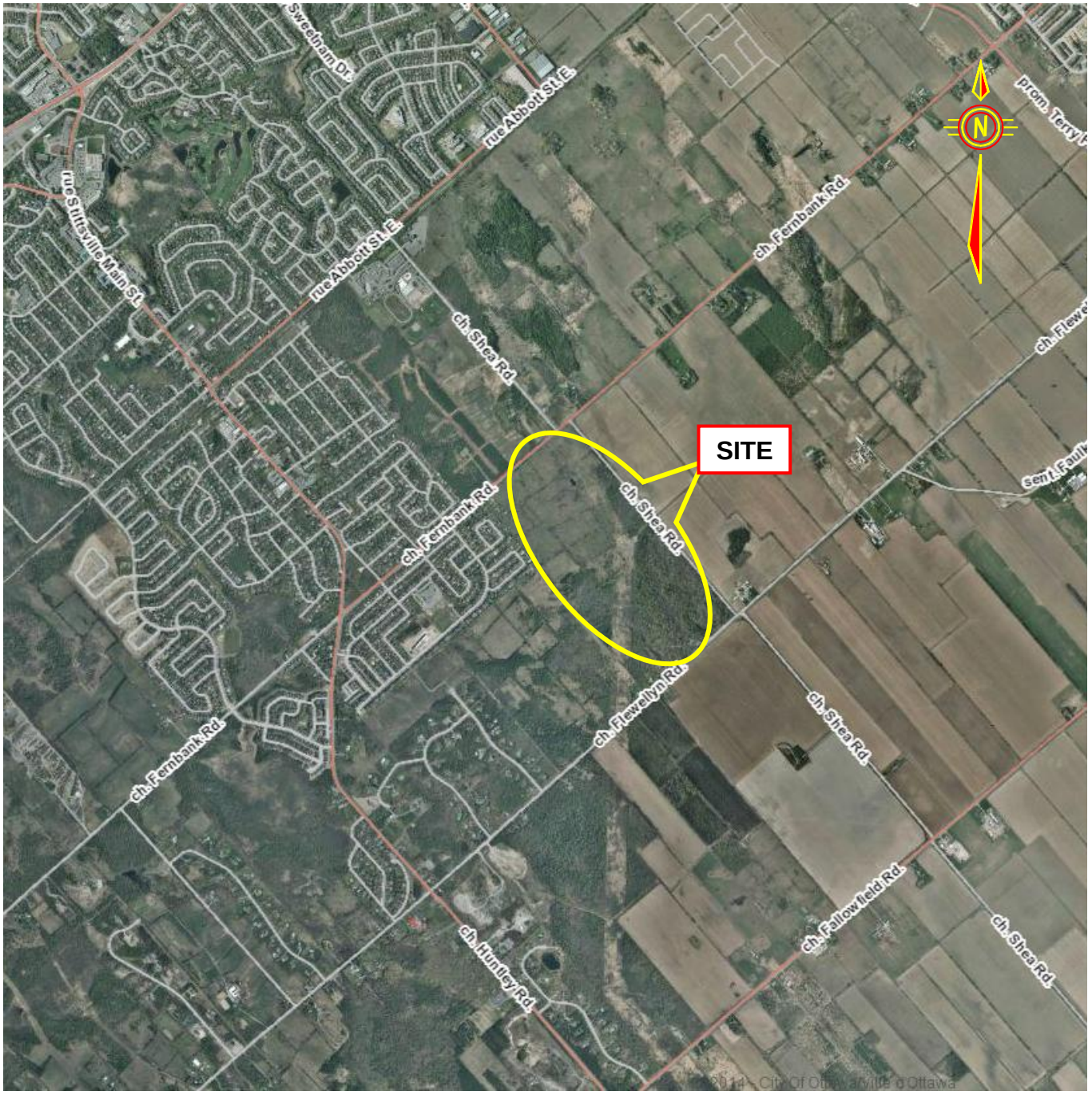
Andrew Chevrier, M.Eng., P.Eng.
Principal

8.0 REFERENCES

Houle Chevrier Engineering Ltd. Phase One Environmental Site Assessment, 5993 Flewellyn Road, Ottawa, Ontario. October 2013. Reference Number 13-422.

Ontario Ministry of the Environment. Ontario Regulation 153/04, Made under the Environmental Protection Act, Part XV.1 – Records of Site Condition. October 31, 2011.

KEY PLAN	FIGURE 1



N.T.S

Houle Chevrier Engineering

Date: July 2014

Project: 14-150

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BOREHOLE LOCATION PLAN

5993 FLEWELLYN ROAD
OTTAWA, ONTARIO

FIGURE 2

Project no: 14-150
Date: July 2014

LEGEND

BH14-1 — BOREHOLE LOCATION IN PLAN

6.68 — WATER LEVEL MEASUREMENT
METRES BELOW GROUND SURFACE

APPROXIMATE PROPERTY LINE

SCALE
1:1000
0 20 40 60m

TABLE 1
SOIL ANALYTICAL RESULTS
PETROLEUM PARAMETERS

Parameter	Units	MDL	MOE Table 3*	Sample Location:	BH14-1	BH14-1	BH14-2	BH14-3
				Sample ID:	BH14-1 SA2	BH14-101 SA2	BH14-2 SA2	BH14-3 SA1
				Laboratory Sample ID:	1422117-01	1422117-02	1422117-03	1422117-04
				Sample Depth (mBGS):	1.2 - 2.4	1.2 - 2.4	1.2 - 1.8	0.0 - 1.2
				Date Sampled:	2014-05-26	2014-05-26	2014-05-26	2014-05-26
Benzene	µg/g	0.02	0.21		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Ethylbenzene	µg/g	0.05	2		ND (0.05)	ND (0.05)	0.10	ND (0.05)
Toluene	µg/g	0.05	2.3		ND (0.05)	ND (0.05)	0.11	ND (0.05)
m/p-xylene	µg/g	0.05	NS		ND (0.05)	ND (0.05)	0.10	ND (0.05)
o-xylene	µg/g	0.05	NS		ND (0.05)	ND (0.05)	0.11	ND (0.05)
Total Xylene**	µg/g	0.05	3.1		ND (0.05)	ND (0.05)	0.22	ND (0.05)
F1 PHC's (C6-C10)	µg/g	7	55		ND (7)	ND (7)	ND (7)	ND (7)
F2 PHC's (C10-C16)	µg/g	4	98		ND (4)	ND (4)	ND (4)	ND (4)
F3 PHC's (C16-C34)	µg/g	8	300		49	ND (8)	ND (8)	ND (8)
F4 PHC's (C34-C50)	µg/g	6	2800		ND (6)	ND (6)	ND (6)	ND (6)

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 ** - Total Xylene is calculated using the sum of m/p-xylene and o-xylene
6 **Bold** - Exceeds MOE Table 3 Site Condition Standard

TABLE 2
SOIL ANALYTICAL RESULTS
METAL PARAMETERS

Parameter	Units	MDL	MOE Table 3*	Sample Location:	BH14-1	BH14-1	BH14-2	BH14-3
				Sample ID:	BH14-1 SA2	BH14-101 SA2	BH14-2 SA2	BH14-3 SA1
				Laboratory Sample ID:	1422117-01	1422117-02	1422117-03	1422117-04
				Sample Depth (mBGS):	1.2 - 2.4	1.2 - 2.4	1.2 - 1.8	0.0 - 1.2
				Date Sampled:	2014-05-26	2014-05-26	2014-05-26	2014-05-26
Antimony	µg/g	1	7.5		ND (1)	2	1	ND (1)
Arsenic	µg/g	1	18		ND (1)	1	1	2
Barium	µg/g	1	390		116	78	70	84
Beryllium	µg/g	0.5	4		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Boron	µg/g	5.0	120		ND (5.0)	ND (5.0)	ND (5.0)	ND (5.0)
Boron, available	µg/g	0.5	1.5		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Cadmium	µg/g	0.5	1.2		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Chromium	µg/g	5	160		16	14	32	16
Chromium (VI)	µg/g	0.2	8		0.3	ND (0.2)	ND (0.2)	ND (0.2)
Cobalt	µg/g	1	22		5	5	5	11
Copper	µg/g	5	140		11	10	15	33
Lead	µg/g	1	120		4	4	7	8
Mercury	µg/g	0.1	0.27		ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Molybdenum	µg/g	1	6.9		1	ND (1)	3	ND (1)
Nickel	µg/g	5	100		14	14	16	16
Selenium	µg/g	1	2.4		ND (1)	ND (1)	ND (1)	ND (1)
Silver	µg/g	0.3	20		ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
Thallium	µg/g	1	1		ND (1)	ND (1)	ND (1)	ND (1)
Uranium	µg/g	1	23		ND (1)	ND (1)	ND (1)	ND (1)
Vanadium	µg/g	10	86		22	20	21	31
Zinc	µg/g	20	340		22	ND (20)	22	31

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 **Bold** - Exceeds MOE Table 3 Site Condition Standard

TABLE 3
SOIL ANALYTICAL RESULTS
POLYCYCLIC AROMATIC HYDROCARBON

Parameter	Units	MDL	MOE Table 3*	Sample Location:	BH14-1	BH14-1	BH14-2	BH14-3
				Sample ID:	BH14-1 SA2	BH14-101 SA2	BH14-2 SA2	BH14-3 SA1
				Laboratory Sample ID:	1422117-01	1422117-02	1422117-03	1422117-04
				Sample Depth (mBGS):	1.2 - 2.4	1.2 - 2.4	1.2 - 1.8	0.0 - 1.2
				Date Sampled:	2014-05-26	2014-05-26	2014-05-26	2014-05-26
Acenaphthene	µg/g	0.02	7.9		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Acenaphthylene	µg/g	0.02	0.15		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Anthracene	µg/g	0.02	0.67		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[a]anthracene	µg/g	0.02	0.5		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[a]pyrene	µg/g	0.02	0.3		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[b]fluoranthene	µg/g	0.02	0.78		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[g,h,i]perylene	µg/g	0.02	6.6		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Benzo[k]fluoranthene	µg/g	0.02	0.78		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
1,1-Biphenyl	µg/g	0.02	0.31		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Chrysene	µg/g	0.02	7		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Dibenzo[a,h]anthracene	µg/g	0.02	0.1		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Fluoranthene	µg/g	0.02	0.69		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Fluorene	µg/g	0.02	62		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Indeno[1,2,3-cd]pyrene	µg/g	0.02	0.38		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
1-Methylnaphthalene	µg/g	0.02	0.99		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
2-Methylnaphthalene	µg/g	0.02	0.99		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Methylnaphthalene (1&2)	µg/g	0.04	0.99		ND (0.04)	ND (0.04)	ND (0.04)	ND (0.04)
Naphthalene	µg/g	0.01	0.6		ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Phenanthrene	µg/g	0.02	6.2		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Pyrene	µg/g	0.02	78		ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 **Bold** - Exceeds MOE Table 3 Site Condition Standard

TABLE 4
GROUNDWATER ANALYTICAL RESULTS
PETROLEUM PARAMETERS

			Sample Location:	BH14-1	BH14-1	BH14-1	BH14-2	BH14-2	BH14-3	Trip
			Sample ID:	BH14-1 GW SA1	BH14-101 GW SA1	BH14-1 GW SA2	BH14-2 GW SA1	BH14-2 GW SA2	BH14-3 GW SA1	Trip Blank
			Laboratory Sample ID:	1423172-01	1423172-02	1424256-01	1423202-01	1424256-02	1423172-03	1423172-04
			Date Sampled:	2014-06-03	2014-06-03	2014-06-12	2014-06-04	2014-06-12	2014-06-03	2014-06-02
Parameter	**Units**	**MDL**	**MOE Table 3***							
Benzene	µg/L	0.5	44	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Ethylbenzene	µg/L	0.5	2300	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Toluene	µg/L	0.5	18000	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
m/p-xylene	µg/L	0.5	NS	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
o-xylene	µg/L	0.5	NS	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Total Xylene**	µg/L	0.5	4200	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
F1 PHC's (C6-C10)	µg/L	25	750	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)	ND (25)
F2 PHC's (C10-C16)	µg/L	100	150	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
F3 PHC's (C16-C34)	µg/L	100	500	380	**520**	ND (100)	**609**	ND (100)	ND (100)	ND (100)
F4 PHC's (C34-C50)	µg/L	100	500	140	160	ND (100)	379	ND (100)	ND (100)	ND (100)

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 ** - Total Xylene is calculated using the sum of m/p-xylene and o-xylene
6 **Bold** - Exceeds MOE Table 3 Site Condition Standard

TABLE 5
GROUNDWATER ANALYTICAL RESULTS
METAL PARAMETERS

Parameter	Units	MDL	MOE Table 3*	Sample Location:	BH14-1	BH14-1	BH14-2	BH14-2	BH14-3
				Sample ID:	BH14-1 GW SA1	BH14-101 GW SA1	BH14-2 GW SA1	BH14-2 GW SA2	BH14-3 GW SA1
				Laboratory Sample ID:	1423172-01	1423172-02	1423202-01	1424256-02	1423172-03
				Date Sampled:	2014-06-03	2014-06-03	2014-06-04	2014-06-12	2014-06-03
Mercury	µg/L	0.1	0.29		ND (0.1)	ND (0.1)	ND (0.1)	NA	ND (0.1)
Antimony	µg/L	0.5	20000		ND (0.5)	ND (0.5)	1.1	ND (0.5)	ND (0.5)
Arsenic	µg/L	1	1900		ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Barium	µg/L	1	29000		82	82	80	64	69
Beryllium	µg/L	0.5	67		ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
Boron	µg/L	10	45000		79	79	43	40	56
Cadmium	µg/L	0.1	2.7		ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Chromium	µg/L	1	810		2	2	6	ND (1)	1
Chromium (VI)	µg/L	10	140		ND (10)	ND (10)	ND (10)	NA	ND (10)
Cobalt	µg/L	0.5	66		1.2	1.2	ND (0.5)	0.8	1.3
Copper	µg/L	0.5	87		2.2	4.1	1.7	2.4	1.0
Lead	µg/L	0.1	25		ND (0.1)	ND (0.1)	ND (0.1)	0.2	ND (0.1)
Molybdenum	µg/L	0.5	9200		ND (0.5)	ND (0.5)	0.7	ND (0.5)	1.0
Nickel	µg/L	1	490		4	4	3	3	4
Selenium	µg/L	1	63		ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Silver	µg/L	0.1	1.5		ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Sodium	µg/L	200	2300000		19900	19800	6340	5970	9140
Thallium	µg/L	0.1	510		ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Uranium	µg/L	0.1	420		0.2	0.2	0.3	0.2	0.5
Vanadium	µg/L	0.5	250		3.0	3.3	11.9	5.0	2.9
Zinc	µg/L	5	1100		8	18	25	8	5

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 **Bold** - Exceeds MOE Table 3 Site Condition Standard

TABLE 6
GROUNDWATER ANALYTICAL RESULTS
POLYCYCLIC AROMATIC HYDROCARBONS

Parameter	Units	MDL	MOE Table 3*	Sample Location:	BH14-1	BH14-1	BH14-2	BH14-2	BH14-3
				Sample ID:	BH14-1 GW SA1	BH14-101 GW SA1	BH14-2 GW SA1	BH14-2 GW SA2	BH14-3 GW SA1
				Laboratory Sample ID:	1423172-01	1423172-02	1423202-01	1424256-02	1423172-03
				Date Sampled:	2014-06-03	2014-06-03	2014-06-04	2014-06-12	2014-06-03
Acenaphthene	µg/L	0.05	600		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Acenaphthylene	µg/L	0.05	1.8		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Anthracene	µg/L	0.01	2.4		ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)	ND (0.01)
Benzo[a]anthracene	µg/L	0.01	4.7		ND (0.01)	ND (0.01)	0.10	0.05	ND (0.01)
Benzo[a]pyrene	µg/L	0.01	0.81		ND (0.01)	ND (0.01)	0.07	0.13	ND (0.01)
Benzo[b]fluoranthene	µg/L	0.05	0.75		ND (0.05)	ND (0.05)	0.12	0.10	ND (0.05)
Benzo[g,h,i]perylene	µg/L	0.05	0.2		ND (0.05)	ND (0.05)	0.06	0.06	ND (0.05)
Benzo[k]fluoranthene	µg/L	0.05	0.4		ND (0.05)	ND (0.05)	0.11	0.12	ND (0.05)
1,1-Biphenyl	µg/L	0.05	1000		ND (0.05)	ND (0.05)	ND (0.05)	NA	ND (0.05)
Chrysene	µg/L	0.05	1		ND (0.05)	ND (0.05)	0.14	0.18	ND (0.05)
Dibenzo[a,h]anthracene	µg/L	0.05	0.52		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Fluoranthene	µg/L	0.01	130		ND (0.01)	ND (0.01)	0.17	0.25	ND (0.01)
Fluorene	µg/L	0.05	400		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Indeno[1,2,3-cd]pyrene	µg/L	0.05	0.2		ND (0.05)	ND (0.05)	ND (0.05)	0.06	ND (0.05)
1-Methylnaphthalene	µg/L	0.05	1800		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
2-Methylnaphthalene	µg/L	0.05	1800		ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Methylnaphthalene (1&2)	µg/L	0.10	1800		ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)	ND (0.10)
Naphthalene	µg/L	0.05	1400		ND (0.05)	ND (0.05)	0.06	0.07	ND (0.05)
Phenanthrene	µg/L	0.05	580		ND (0.05)	ND (0.05)	0.08	0.20	ND (0.05)
Pyrene	µg/L	0.01	68		ND (0.01)	ND (0.01)	0.16	0.21	ND (0.01)

Notes:

1 MDL - Method Detection Limit
2 NS - No Standard
3 ND - Not Detected
4 * - Table 3: Full Depth Generic Site Condition Standards for Residential Property Use in a Non-Potable Ground Water Condition (coarse textured soils) (MOE, April 15, 2011)
5 **Bold** - Exceeds MOE Table 3 Site Condition Standard

APPENDIX A

Record of Borehole Sheets

RECORD OF BOREHOLE 14-1

PROJECT:
OUR PROJECT No.: 14-150
LOCATION: See Borehole Location Plan, Figure 2
BORING DATE: May 26, 2014

SHEET 1 OF 1
DATUM: N/A
DRILL RIG: GM 100 GT
SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE DATA: NUMBER	TYPE	BLOWS/0.3m	RECOVERY (%)	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm) 100 200 300 400 / COMBUSTIBLE VAPOUR CONCENTRATION (%LEL) 20 40 60 80	MONITORING WELL INSTALLATION AND NOTES
0		Ground Surface									
	Direct Push Double Tube	Dark brown, fine to medium grained sand, trace to some silt some gravel (TOPSOIL)		0.20							
1		Brown silty sand, with gravel and cobbles (GLACIAL TILL)			1	Direct Push		29.2			
2					2	Direct Push		40.0	PHCs, BTEX, PAHs & Metals	5	
				2.44	3	Direct Push		100.0		0	
3	Direct Push Macro	Grey silty sand, some gravel and cobbles, possible boulders (GLACIAL TILL)			4	Direct Push		100.0		5	
4					5	Direct Push		100.0		0	
					6	Direct Push		100.0		0	
5					7	Direct Push		100.0		0	
				5.49							
6		Air hammered, stratigraphy not logged Possilbe Bedrock or Boulders with voids									
7	Direct Push Air Hammer										
8											
9											
		End of Borehole		9.14							

Protective Steel Casing
Protective Cap
Bentonite
Filter Sand
51mm diameter, 3.05m long slotted PVC pipe

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH (m)	ELEVATION (m)
Jun. 03-14	00:00	6.93	
Jun. 12-14	00:00	7.08	

Houle Chevrier Engineering
180 Wescar Lane
R.R. 2
Carp, Ontario, K0A 1L0

LOGGED: A.N.
CHECKED:

RECORD OF BOREHOLE 14-2

PROJECT:
OUR PROJECT No.: 14-150
LOCATION: See Borehole Location Plan, Figure 2
BORING DATE: May 26, 2014

SHEET 1 OF 1
DATUM: N/A
DRILL RIG: GM 100 GT
SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY (%)	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm) 100 200 300 400 / COMBUSTIBLE VAPOUR CONCENTRATION (%LEL) 20 40 60 80	MONITORING WELL INSTALLATION AND NOTES
0		Ground Surface									Protective Steel Casing; Protective Cap
	Direct Push Double Tube	Dark brown, fine to medium grained sand, trace to some silt some gravel (TOPSOIL)		0.20							
1		Grey brown fine to medium grained sand, some silt and gravel, possilbe cobbles and boulders (GLACIAL TILL)			1	Direct Push		12.5			
					2	Direct Push		63	PHCs, BTEX, PAHs & Metals	5	
2	Direct Push Macro				3	Direct Push		92%		5	Bentonite
					4	Direct Push		92%		5	
3											
4											
5	Direct Push Air Hammer	Air hammered, stratigraphy not logged (Possible Bedrock or Boulders)		5.18							Filter Sand; 51mm diameter, 3.05m long slotted PVC pipe
6		End of Borehole		6.96							

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH (m)	ELEVATION (m)
Jun. 03-14	00:00	6.68 ▽	
Jun. 12-14	00:00	6.91 ▼	
		▼	

Houle Chevrier Engineering
180 Wescar Lane
R.R. 2
Carp, Ontario, K0A 1L0

LOGGED: A.N.
CHECKED:

RECORD OF BOREHOLE 14-3

PROJECT:
OUR PROJECT No.: 14-150
LOCATION: See Borehole Location Plan, Figure 2
BORING DATE: May 26, 2014

SHEET 1 OF 1
DATUM: N/A
DRILL RIG: GM 100 GT
SPT HAMMER:

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	RECOVERY (%)	LABORATORY ANALYSES	COMBUSTIBLE VAPOUR CONCENTRATION (ppm) 100 200 300 400 / COMBUSTIBLE VAPOUR CONCENTRATION (%LEL) 20 40 60 80	MONITORING WELL INSTALLATION AND NOTES
0	Direct Push Double Tube	Ground Surface									Protective Steel Casing; Protective Cap
		Dark brown, fine to medium grained sand, trace to some silt some gravel (TOPSOIL)		0.10							
1		Brown silty sand, some gravel, possible boulders (GLACIAL TILL)			1	Direct Push		31.0	PHCs, BTEX, PAHs & Metals	0	
	Direct Push Macro				2	Direct Push		63.0		0	Bentonite
2		Grey silty sand, some gravel, possible cobbles and boulders (GLACIAL TILL)		1.78	3	Direct Push		63.0		15	
3	Direct Push Air Hammer	Air hammered, stratigraphy not logged Probable GLACIAL TILL with cobbles and boulders		2.74							Filter Sand; 51mm diameter, 3.05m long slotted PVC pipe
4											
5											
6				6.71							

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH (m)	ELEVATION (m)
Jun. 04-14	00:00	5.82 ▽	
		▼	
		▼	

Houle Chevrier Engineering
180 Wescar Lane
R.R. 2
Carp, Ontario, K0A 1L0

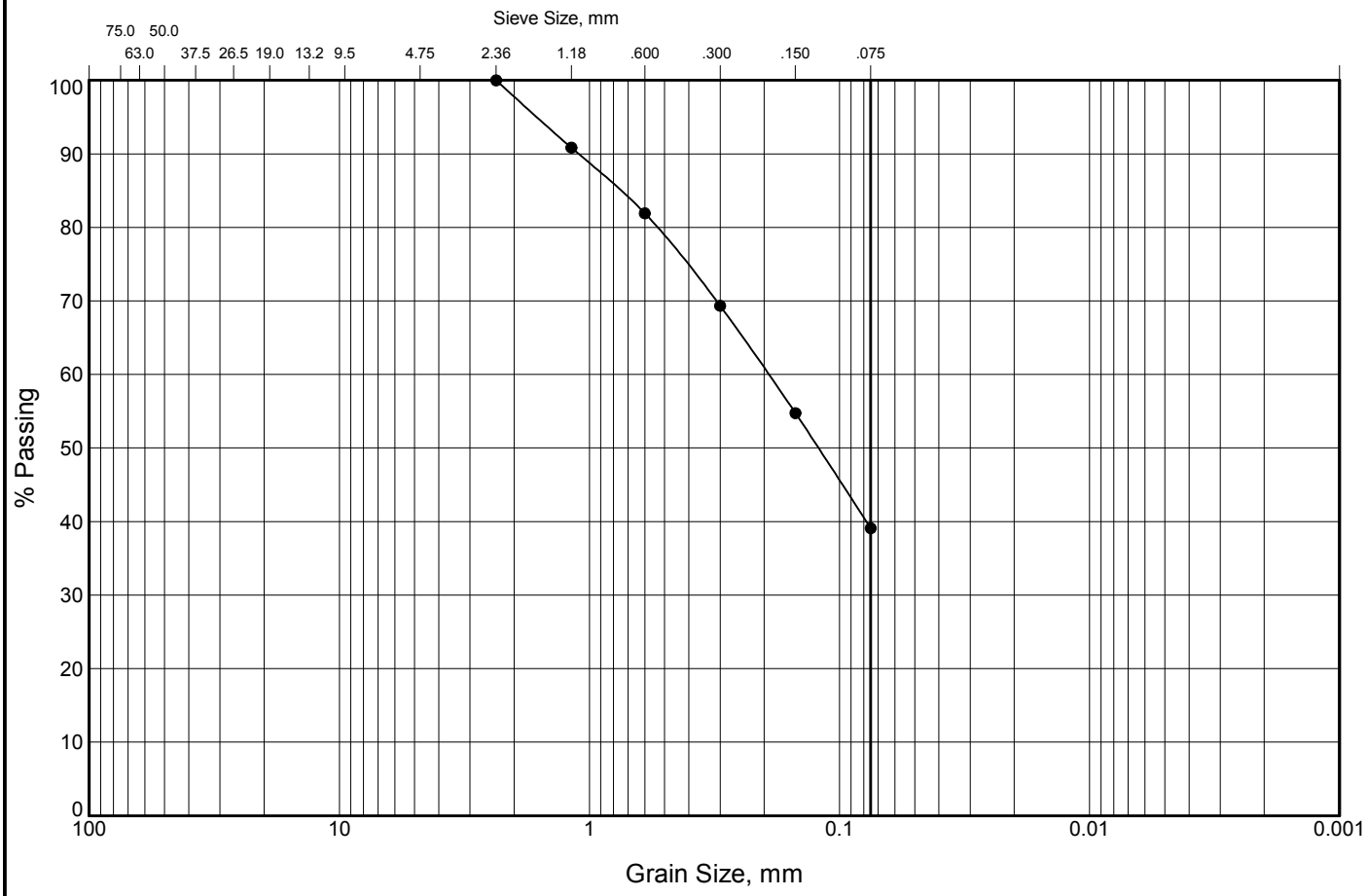
LOGGED: A.N.
CHECKED:

APPENDIX B

Grain Size Distribution Curve

GRAIN SIZE DISTRIBUTION

FIGURE B1



Coarse Textured when > 50% of particles by mass are 75 µm or larger in diameter	Medium and Fine Textured when > 50% of particles by mass are smaller than 75 µm in diameter
Environmental Protection Act - O. Reg. 153/04	

Borehole	Sample	Depth (m)	% > 75 µm	Legend
14-1	5	3.7 - 4.3	60.9	●

Houle Chevrier Engineering

Date: July 2014

Project: 14-150

MOE ENVIRONMENTAL GRAIN SIZE GRAPH 14-150 LAB TESTING.GPJ HOULE CHEVRIER FEB 9 2011.GDT 7-15-14

APPENDIX C

Soil Laboratory Certificates of Analysis

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

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Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

Houle Chevrier
180 Wescar Lane
Ottawa, ON K0A1L0
Attn: Brett Painter

Phone: (613) 836-1422
Fax: (613) 836-9731

Client PO:
Project: 14-150
Custody: 98560

Report Date: 2-Jun-2014
Order Date: 27-May-2014
Order #: 1422117

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

Paracel ID	Client ID
1422117-01	BH14-1 SA2
1422117-02	BH14-101 SA2
1422117-03	BH14-2 SA2
1422117-04	BH14-3 SA1

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	31-May-14	2-Jun-14
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	28-May-14	29-May-14
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	28-May-14	29-May-14
Mercury	EPA 7471B - CVAA, digestion	2-Jun-14	2-Jun-14
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	2-Jun-14	2-Jun-14
PAHs by GC-MS	EPA 8270 - GC-MS, extraction	27-May-14	29-May-14
PHC F1	CWS Tier 1 - P&T GC-FID	28-May-14	29-May-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	28-May-14	29-May-14
Solids, %	Gravimetric, calculation	28-May-14	28-May-14

PARACEL LABORATORIES LTD.

Order #: 1422117

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 SA2	BH14-101 SA2	BH14-2 SA2	BH14-3 SA1
	Sample Date:	26-May-14	26-May-14	26-May-14	26-May-14
	Sample ID:	1422117-01	1422117-02	1422117-03	1422117-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	92.9	93.6	90.8	91.2
Metals					
Antimony	1 ug/g dry	<1	2	1	<1
Arsenic	1 ug/g dry	<1	1	1	2
Barium	1 ug/g dry	116	78	70	84
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Boron, available	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	16	14	32	16
Chromium (VI)	0.2 ug/g dry	0.3	<0.2	<0.2	<0.2
Cobalt	1 ug/g dry	5	5	5	11
Copper	5 ug/g dry	11	10	15	33
Lead	1 ug/g dry	4	4	7	8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	<1	3	<1
Nickel	5 ug/g dry	14	14	16	16
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Uranium	1 ug/g dry	<1	<1	<1	<1
Vanadium	10 ug/g dry	22	20	21	31
Zinc	20 ug/g dry	22	<20	22	31
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	0.10	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	0.11	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	0.10	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	0.11	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	0.22	<0.05
Toluene-d8	Surrogate	96.5%	95.1%	94.5%	95.6%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 SA2	BH14-101 SA2	BH14-2 SA2	BH14-3 SA1
	Sample Date:	26-May-14	26-May-14	26-May-14	26-May-14
	Sample ID:	1422117-01	1422117-02	1422117-03	1422117-04
	MDL/Units	Soil	Soil	Soil	Soil
F3 PHCs (C16-C34)	8 ug/g dry	49	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Biphenyl	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Chrysene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Fluorene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	<0.04	<0.04
Naphthalene	0.01 ug/g dry	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Pyrene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
2-Fluorobiphenyl	Surrogate	70.6%	73.0%	63.5%	66.2%
Terphenyl-d14	Surrogate	78.5%	72.3%	82.3%	81.3%

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Biphenyl	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.02*		*ug/g*		*76.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.09*		*ug/g*		*81.9*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	*7.70*		*ug/g*		*96.3*	*50-140*			

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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)	254	8	ug/g dry	151			50.7	30	QR-04
F4 PHCs (C34-C50)	155	6	ug/g dry	53			98.6	30	QR-04
Metals									
Antimony	5.8	1	ug/g dry	ND			0.0	30	
Arsenic	1.1	1	ug/g dry	ND			0.0	30	
Barium	123	1	ug/g dry	116			5.4	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron, available	ND	0.5	ug/g dry	ND			0.0	35	
Boron	ND	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	15.7	5	ug/g dry	15.9			1.5	30	
Cobalt	4.8	1	ug/g dry	5.1			7.1	30	
Copper	10.7	5	ug/g dry	11.5			6.7	30	
Lead	4.1	1	ug/g dry	4.2			0.8	30	
Mercury	ND	0.1	ug/g dry	ND				35	
Molybdenum	ND	1	ug/g dry	1.4			0.0	30	
Nickel	13.3	5	ug/g dry	14.1			5.9	30	
Selenium	ND	1	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1	ug/g dry	ND			0.0	30	
Uranium	ND	1	ug/g dry	ND			0.0	30	
Vanadium	21.8	10	ug/g dry	21.8			0.1	30	
Zinc	ND	20	ug/g dry	22.2			0.0	30	
Physical Characteristics									
% Solids	81.6	0.1	% by Wt.	81.3			0.4	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND				40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Biphenyl	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND				40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND				40	
Surrogate: 2-Fluorobiphenyl	*1.14*		*ug/g dry*	*ND*	*69.5*	*50-140*			
Surrogate: Terphenyl-d14	*1.60*		*ug/g dry*	*ND*	*97.1*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*5.50*		*ug/g dry*	*ND*	*95.7*	*50-140*			

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	190	7	ug/g	ND	94.9	80-120			
F2 PHCs (C10-C16)	81	4	ug/g	ND	89.7	80-120			
F3 PHCs (C16-C34)	181	8	ug/g	ND	97.2	80-120			
F4 PHCs (C34-C50)	116	6	ug/g	ND	93.5	80-120			
Metals									
Antimony	42.3		ug/L	0.09	84.4	70-130			
Arsenic	44.9		ug/L	0.4	89.0	70-130			
Barium	102		ug/L	46.5	110	70-130			
Beryllium	40.6		ug/L	0.11	81.0	70-130			
Boron, available	5.32	0.5	ug/g	ND	106	70-122			
Boron	38.5		ug/L	ND	81.9	70-130			
Cadmium	42.9		ug/L	0.04	85.6	70-130			
Chromium (VI)	5.1	0.2	ug/g	ND	94.0	70-130			
Chromium	52.0		ug/L	6.4	91.2	70-130			
Cobalt	45.0		ug/L	2.1	85.9	70-130			
Copper	47.8		ug/L	4.6	86.4	70-130			
Lead	48.8		ug/L	1.7	94.2	70-130			
Mercury	1.58	0.1	ug/g	ND	105	72-128			
Molybdenum	46.4		ug/L	0.6	91.7	70-130			
Nickel	48.4		ug/L	5.6	85.5	70-130			
Selenium	43.2		ug/L	0.1	86.2	70-130			
Silver	42.4		ug/L	0.01	84.8	70-130			
Thallium	47.1		ug/L	0.04	94.1	70-130			
Uranium	48.2		ug/L	0.2	96.0	70-130			
Vanadium	56.5		ug/L	8.7	95.6	70-130			
Zinc	48.2		ug/L	8.9	78.7	70-130			
Semi-Volatiles									
Acenaphthene	0.200	0.02	ug/g	ND	97.5	50-140			
Acenaphthylene	0.132	0.02	ug/g	ND	64.4	50-140			
Anthracene	0.159	0.02	ug/g	ND	77.2	50-140			
Benzo [a] anthracene	0.109	0.02	ug/g	ND	52.9	50-140			
Benzo [a] pyrene	0.128	0.02	ug/g	ND	62.4	50-140			
Benzo [b] fluoranthene	0.107	0.02	ug/g	ND	52.1	50-140			
Benzo [g,h,i] perylene	0.166	0.02	ug/g	ND	81.0	50-140			
Benzo [k] fluoranthene	0.150	0.02	ug/g	ND	73.2	50-140			
Biphenyl	0.168	0.02	ug/g	ND	81.8	50-140			
Chrysene	0.171	0.02	ug/g	ND	83.0	50-140			
Dibenzo [a,h] anthracene	0.123	0.02	ug/g	ND	59.8	50-140			
Fluoranthene	0.139	0.02	ug/g	ND	67.7	50-140			
Fluorene	0.139	0.02	ug/g	ND	67.7	50-140			
Indeno [1,2,3-cd] pyrene	0.134	0.02	ug/g	ND	65.3	50-140			
1-Methylnaphthalene	0.157	0.02	ug/g	ND	76.5	50-140			
2-Methylnaphthalene	0.146	0.02	ug/g	ND	71.1	50-140			
Naphthalene	0.151	0.01	ug/g	ND	73.5	50-140			
Phenanthrene	0.137	0.02	ug/g	ND	66.7	50-140			
Pyrene	0.154	0.02	ug/g	ND	74.8	50-140			
Surrogate: 2-Fluorobiphenyl	*1.06*		*ug/g*		*64.4*	*50-140*			
Volatiles									

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	3.81	0.02	ug/g	ND	95.4	60-130			
Ethylbenzene	4.45	0.05	ug/g	ND	111	60-130			
Toluene	4.00	0.05	ug/g	ND	100	60-130			
m,p-Xylenes	8.55	0.05	ug/g	ND	107	60-130			
o-Xylene	4.49	0.05	ug/g	ND	112	60-130			

Certificate of Analysis

Report Date: 02-Jun-2014
Order Date:27-May-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Qualifier Notes:

QC Qualifiers :

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

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.

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www.paracellabs.com

Chain of Custody
(Lab Use Only)
№ 98560

Page 1 of 1

Client Name: Hasle Chemical Eng	Project Reference: 14-150	TAT: [✓] Regular	[ ] 3 Day
Contact Name: Brett Painter	Quote #	[ ] 2 Day	[ ] 1 Day
Address:	PO #	Date Required: ASAP	
Telephone: 613-836-1422	Email Address: bpainter@hceng.ca		

Criteria: [✓] O. Reg. 153/04 (As Amended) Table 2 [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [ ] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

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

Required Analyses

Paracel Order Number: 1422117

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	BH 14-1 SA2	S		2	May 26/14		✓		✓	✓	✓	✓	✓			250	ml + MEOH vial			
2	BH 14-101 SA2	S		2	"		✓		✓	✓	✓	✓	✓			↓				
3	BH 14-2 SA2	S		2	"		✓		✓	✓	✓	✓	✓							
4	BH 14-3 SA1	S		2	"		✓		✓	✓	✓	✓	✓							
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign):	Received by Driver/Depot: Karen Cull	Received at Lab: SUNEEPORN DAKMAI	Verified By:
Relinquished By (Print):	Date/Time: May 27/14 11:20	Date/Time: MAY 27, 2014 01:50	Date/Time: May 27/14 2:58
Date/Time: May 27, 2014	Temperature: 9.3 °C	Temperature: 11.9 °C	pH Verified [X] By: N/A

APPENDIX D

Groundwater Laboratory Certificates of Analysis

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Certificate of Analysis

Houle Chevrier
180 Wescar Lane
Ottawa, ON K0A1L0
Attn: Brett Painter

Phone: (613) 836-1422
Fax: (613) 836-9731

Client PO:
Project: 14-150
Custody: 15995

Report Date: 9-Jun-2014
Order Date: 3-Jun-2014
Order #: 1423172

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

Paracel ID	Client ID
1423172-01	BH14-1 GW SA-1
1423172-02	BH14-101 GW SA-1
1423172-03	BH14-3 GW SA-1
1423172-04	Trip Blank

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	5-Jun-14	6-Jun-14
Chromium, hexavalent	MOE E3056 - colourimetric	5-Jun-14	5-Jun-14
Mercury	EPA 245.1 - Cold Vapour AA	5-Jun-14	5-Jun-14
Metals, ICP-MS	EPA 200.8 - ICP-MS	4-Jun-14	5-Jun-14
PAHs by GC-MS	EPA 625 - GC-MS, extraction	5-Jun-14	9-Jun-14
PHC F1	CWS Tier 1 - P&T GC-FID	5-Jun-14	6-Jun-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	4-Jun-14	4-Jun-14

PARACEL LABORATORIES LTD.

Order #: 1423172

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 GW SA-1	BH14-101 GW SA-1	BH14-3 GW SA-1	Trip Blank
	Sample Date:	03-Jun-14	03-Jun-14	03-Jun-14	02-Jun-14
	Sample ID:	1423172-01	1423172-02	1423172-03	1423172-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	<0.1	<0.1	<0.1	-
Antimony	0.5 ug/L	<0.5	<0.5	<0.5	-
Arsenic	1 ug/L	<1	<1	<1	-
Barium	1 ug/L	82	82	69	-
Beryllium	0.5 ug/L	<0.5	<0.5	<0.5	-
Boron	10 ug/L	79	79	56	-
Cadmium	0.1 ug/L	<0.1	<0.1	<0.1	-
Chromium	1 ug/L	2	2	1	-
Chromium (VI)	10 ug/L	<10	<10	<10	-
Cobalt	0.5 ug/L	1.2	1.2	1.3	-
Copper	0.5 ug/L	2.2	4.1	1.0	-
Lead	0.1 ug/L	<0.1	<0.1	<0.1	-
Molybdenum	0.5 ug/L	<0.5	<0.5	1.0	-
Nickel	1 ug/L	4	4	4	-
Selenium	1 ug/L	<1	<1	<1	-
Silver	0.1 ug/L	<0.1	<0.1	<0.1	-
Sodium	200 ug/L	19900	19800	9140	-
Thallium	0.1 ug/L	<0.1	<0.1	<0.1	-
Uranium	0.1 ug/L	0.2	0.2	0.5	-
Vanadium	0.5 ug/L	3.0	3.3	2.9	-
Zinc	5 ug/L	8	18	5	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene-d8	Surrogate	99.6%	98.3%	98.3%	99.4%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	380	520	<100	<100
F4 PHCs (C34-C50)	100 ug/L	140	160	<100	<100

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 GW SA-1	BH14-101 GW SA-1	BH14-3 GW SA-1	Trip Blank
	Sample Date:	03-Jun-14	03-Jun-14	03-Jun-14	02-Jun-14
	Sample ID:	1423172-01	1423172-02	1423172-03	1423172-04
	MDL/Units	Water	Water	Water	Water
F1 + F2 PHCs	125 ug/L	<125	<125	<125	<125
F3 + F4 PHCs	200 ug/L	520	680	<200	<200
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] anthracene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [a] pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	<0.05	<0.05	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	<0.05	<0.05	-
Biphenyl	0.05 ug/L	<0.05	<0.05	<0.05	-
Chrysene	0.05 ug/L	<0.05	<0.05	<0.05	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	<0.01	<0.01	<0.01	-
Fluorene	0.05 ug/L	<0.05	<0.05	<0.05	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	<0.05	<0.05	-
1-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
2-Methylnaphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	<0.10	<0.10	-
Naphthalene	0.05 ug/L	<0.05	<0.05	<0.05	-
Phenanthrene	0.05 ug/L	<0.05	<0.05	<0.05	-
Pyrene	0.01 ug/L	<0.01	<0.01	<0.01	-
2-Fluorobiphenyl	Surrogate	75.4%	84.2%	67.3%	-
Terphenyl-d14	Surrogate	90.2%	93.6%	96.3%	-

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*15.9*		*ug/L*		*79.6*	*50-140*			
Surrogate: Terphenyl-d14	*19.3*		*ug/L*		*96.5*	*50-140*			
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						

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*78.5*		*ug/L*		*98.1*	*50-140*			

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	1.05	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	ND	1	ug/L	ND			0.0	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	ND	10	ug/L	ND			0.0	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	ND	1	ug/L	ND			0.0	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	ND	0.5	ug/L	ND			0.0	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	ND	0.5	ug/L	ND			0.0	20	
Nickel	ND	1	ug/L	ND			0.0	20	
Selenium	ND	1	ug/L	ND			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	ND	200	ug/L	ND			0.0	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	ND	0.5	ug/L	ND			0.0	20	
Zinc	ND	5	ug/L	ND			0.0	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND			0.0	30	
Ethylbenzene	ND	0.5	ug/L	ND			0.0	30	
Toluene	ND	0.5	ug/L	ND			0.0	30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND			0.0	30	
Surrogate: Toluene-d8	*78.9*		*ug/L*	*ND*	*98.6*	*50-140*			

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2010	25	ug/L	ND	100	68-117			
F2 PHCs (C10-C16)	1800	100	ug/L	ND	100	60-140			
F3 PHCs (C16-C34)	3740	100	ug/L	ND	101	60-140			
F4 PHCs (C34-C50)	2560	100	ug/L	ND	103	60-140			
Metals									
Mercury	2.92	0.1	ug/L	ND	97.3	78-137			
Antimony	46.1		ug/L	ND	92.1	80-120			
Arsenic	45.6		ug/L	0.03	91.1	80-120			
Barium	45.1		ug/L	ND	90.4	80-120			
Beryllium	45.9		ug/L	0.003	91.8	80-120			
Boron	47		ug/L	4	84.4	80-120			
Cadmium	45.3		ug/L	ND	90.5	80-120			
Chromium (VI)	193	10	ug/L	ND	96.5	70-130			
Chromium	46.1		ug/L	0.3	91.6	80-120			
Cobalt	46.7		ug/L	0.003	93.4	80-120			
Copper	47.7		ug/L	0.03	95.3	80-120			
Lead	44.1		ug/L	0.003	88.2	80-120			
Molybdenum	44.0		ug/L	0.38	87.3	80-120			
Nickel	47.0		ug/L	ND	94.0	80-120			
Selenium	46.0		ug/L	0.2	91.6	80-120			
Silver	45.2		ug/L	ND	90.3	80-120			
Sodium	1140		ug/L	0.7	114	80-120			
Thallium	44.1		ug/L	0.006	88.2	80-120			
Uranium	44.4		ug/L	0.1	88.7	80-120			
Vanadium	47.4		ug/L	0.10	94.6	80-120			
Zinc	48		ug/L	1	93.3	80-120			
Semi-Volatiles									
Acenaphthene	3.65	0.05	ug/L	ND	73.0	50-140			
Acenaphthylene	2.93	0.05	ug/L	ND	58.5	50-140			
Anthracene	3.80	0.01	ug/L	ND	75.9	50-140			
Benzo [a] anthracene	3.86	0.01	ug/L	ND	77.2	50-140			
Benzo [a] pyrene	3.56	0.01	ug/L	ND	71.1	50-140			
Benzo [b] fluoranthene	4.39	0.05	ug/L	ND	87.8	50-140			
Benzo [g,h,i] perylene	3.99	0.05	ug/L	ND	79.8	50-140			
Benzo [k] fluoranthene	4.68	0.05	ug/L	ND	93.7	50-140			
Biphenyl	3.96	0.05	ug/L	ND	79.2	50-140			
Chrysene	4.31	0.05	ug/L	ND	86.3	50-140			
Dibenzo [a,h] anthracene	3.74	0.05	ug/L	ND	74.8	50-140			
Fluoranthene	2.95	0.01	ug/L	ND	59.1	50-140			
Fluorene	3.70	0.05	ug/L	ND	74.1	50-140			
Indeno [1,2,3-cd] pyrene	3.92	0.05	ug/L	ND	78.4	50-140			
1-Methylnaphthalene	3.73	0.05	ug/L	ND	74.5	50-140			
2-Methylnaphthalene	3.73	0.05	ug/L	ND	74.6	50-140			
Naphthalene	3.58	0.05	ug/L	ND	71.6	50-140			
Phenanthrene	3.71	0.05	ug/L	ND	74.1	50-140			
Pyrene	3.73	0.01	ug/L	ND	74.7	50-140			
Surrogate: 2-Fluorobiphenyl	*14.9*		*ug/L*		*74.7*	*50-140*			
Volatiles									

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	42.4	0.5	ug/L	ND	106	50-140			
Ethylbenzene	43.8	0.5	ug/L	ND	110	50-140			
Toluene	41.9	0.5	ug/L	ND	105	50-140			
m,p-Xylenes	93.6	0.5	ug/L	ND	117	50-140			
o-Xylene	41.7	0.5	ug/L	ND	104	50-140			

Certificate of Analysis

Report Date: 09-Jun-2014
Order Date:3-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Chain of Custody
(Lab Use Only)
№ 15995

Page 1 of 1

Client Name: Houle Chevrier Engineering	Project Reference: 14-150	TAT: [✓] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: Brett Painter	Quote #	
Address: 180 Wescar Lane, RR2, Ottawa Ontario	PO #	Date Required:
Telephone: 613-836-1422	Email Address: bpainter@hceng.ca	

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

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

Paracel Order Number: 1423172

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: PHCs F1-F4 + BTEX	PAHs	Metals	Hg	CrVI						
1	BH14-1 GW SA1	GW	/	7	June 3	11:30am	✓	✓	✓	✓	✓						
2	BH14-101 GW SA1	GW	/	7	June 3	11:30am	✓	✓	✓	✓	✓						
3	BH 14-3 GW SA1	GW	/	7	June 3	1:30pm	✓	✓	✓	✓	✓						
4	Trip Blank	GW	/	3	June 2		✓										
5																	
6																	
7																	
8																	
9																	
10																	

Comments: Metals have been field filtered.

Method of Delivery: Walk-in

Relinquished By (Sign): Samantha Sabo	Received by Driver/Depot: Karen Cull	Received at Lab: SUNEEPORN DOKMAI	Verified By:
Relinquished By (Print): Samantha Sabo	Date/Time: Jun 3/14 4:47	Date/Time: JUN 4, 2014 11:30	Date/Time: June 4/14 12:54
Date/Time: June 3, 2014	Temperature: 15.4 °C	Temperature: 7.3 °C	pH Verified [X] By: Karen Cull

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Certificate of Analysis

Houle Chevrier
180 Wescar Lane
Ottawa, ON K0A1L0
Attn: Brett Painter

Phone: (613) 836-1422
Fax: (613) 836-9731

Client PO:
Project: 14-150
Custody: 16620

Report Date: 10-Jun-2014
Order Date: 4-Jun-2014
Order #: 1423202

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

Paracel ID	Client ID
1423202-01	BH14-2 GW SA1

Approved By: Mark Foto

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

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	5-Jun-14	6-Jun-14
Chromium, hexavalent	MOE E3056 - colourimetric	5-Jun-14	5-Jun-14
Mercury	EPA 245.1 - Cold Vapour AA	5-Jun-14	5-Jun-14
Metals, ICP-MS	EPA 200.8 - ICP-MS	6-Jun-14	6-Jun-14
PAHs by GC-MS	EPA 625 - GC-MS, extraction	5-Jun-14	9-Jun-14
PHC F1	CWS Tier 1 - P&T GC-FID	5-Jun-14	6-Jun-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	5-Jun-14	5-Jun-14

PARACEL LABORATORIES LTD.

Order #: 1423202

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-2 GW SA1	-	-	-
	Sample Date:	04-Jun-14	-	-	-
	Sample ID:	1423202-01	-	-	-
	MDL/Units	Water	-	-	-
Metals					
Mercury	0.1 ug/L	<0.1	-	-	-
Antimony	0.5 ug/L	1.1	-	-	-
Arsenic	1 ug/L	<1	-	-	-
Barium	1 ug/L	80	-	-	-
Beryllium	0.5 ug/L	<0.5	-	-	-
Boron	10 ug/L	43	-	-	-
Cadmium	0.1 ug/L	<0.1	-	-	-
Chromium	1 ug/L	6	-	-	-
Chromium (VI)	10 ug/L	<10	-	-	-
Cobalt	0.5 ug/L	<0.5	-	-	-
Copper	0.5 ug/L	1.7	-	-	-
Lead	0.1 ug/L	<0.1	-	-	-
Molybdenum	0.5 ug/L	0.7	-	-	-
Nickel	1 ug/L	3	-	-	-
Selenium	1 ug/L	<1	-	-	-
Silver	0.1 ug/L	<0.1	-	-	-
Sodium	200 ug/L	6340	-	-	-
Thallium	0.1 ug/L	<0.1	-	-	-
Uranium	0.1 ug/L	0.3	-	-	-
Vanadium	0.5 ug/L	11.9	-	-	-
Zinc	5 ug/L	25	-	-	-
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	98.6%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100 [5]	-	-	-
F3 PHCs (C16-C34)	100 ug/L	609 [5]	-	-	-
F4 PHCs (C34-C50)	100 ug/L	379 [5]	-	-	-

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-2 GW SA1	-	-	-
	Sample Date:	04-Jun-14	-	-	-
	Sample ID:	1423202-01	-	-	-
	MDL/Units	Water	-	-	-
F1 + F2 PHCs	125 ug/L	<125	-	-	-
F3 + F4 PHCs	200 ug/L	988	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] anthracene	0.01 ug/L	0.10	-	-	-
Benzo [a] pyrene	0.01 ug/L	0.07	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	0.12	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	0.06	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	0.11	-	-	-
Biphenyl	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	0.14	-	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	0.17	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-
Naphthalene	0.05 ug/L	0.06	-	-	-
Phenanthrene	0.05 ug/L	0.08	-	-	-
Pyrene	0.01 ug/L	0.16	-	-	-
2-Fluorobiphenyl	Surrogate	69.2%	-	-	-
Terphenyl-d14	Surrogate	90.4%	-	-	-

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*15.9*		*ug/L*		*79.6*	*50-140*			
Surrogate: Terphenyl-d14	*19.3*		*ug/L*		*96.5*	*50-140*			
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						

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*78.5*		*ug/L*		*98.1*	*50-140*			

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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	
Metals									
Mercury	ND	0.1	ug/L	ND			0.0	20	
Antimony	ND	0.5	ug/L	ND			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	22.2	1	ug/L	23.8			7.2	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	28	10	ug/L	33			16.9	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium (VI)	ND	10	ug/L	ND				20	
Chromium	5.2	1	ug/L	6.2			16.2	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	1.82	0.5	ug/L	1.88			3.5	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	0.87	0.5	ug/L	1.04			17.8	20	
Nickel	1.3	1	ug/L	1.2			9.3	20	
Selenium	1.4	1	ug/L	1.4			0.8	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	17900	200	ug/L	19100			6.1	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	ND	0.1	ug/L	ND			0.0	20	
Vanadium	4.46	0.5	ug/L	3.43			26.2	20	QR-01
Zinc	8	5	ug/L	7			11.5	20	
Volatiles									
Benzene	ND	0.5	ug/L	ND			0.0	30	
Ethylbenzene	ND	0.5	ug/L	ND			0.0	30	
Toluene	ND	0.5	ug/L	ND			0.0	30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND			0.0	30	
Surrogate: Toluene-d8	*78.9*		*ug/L*	*ND*	*98.6*	*50-140*			

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2010	25	ug/L	ND	100	68-117			
F2 PHCs (C10-C16)	1830	100	ug/L	ND	102	60-140			
F3 PHCs (C16-C34)	3650	100	ug/L	ND	98.1	60-140			
F4 PHCs (C34-C50)	2340	100	ug/L	ND	94.4	60-140			
Metals									
Mercury	2.92	0.1	ug/L	ND	97.3	78-137			
Antimony	50.2		ug/L	0.29	99.9	80-120			
Arsenic	52.3		ug/L	0.8	103	80-120			
Barium	64.6		ug/L	23.8	81.6	80-120			
Beryllium	61.6		ug/L	0.004	123	80-120			QM-07
Boron	80		ug/L	33	94.1	80-120			
Cadmium	43.0		ug/L	ND	86.1	80-120			
Chromium (VI)	193	10	ug/L	ND	96.5	70-130			
Chromium	60.2		ug/L	6.2	108	80-120			
Cobalt	55.8		ug/L	0.06	112	80-120			
Copper	57.3		ug/L	1.88	111	80-120			
Lead	45.4		ug/L	ND	91.1	80-120			
Molybdenum	44.8		ug/L	1.04	87.5	80-120			
Nickel	58.7		ug/L	1.2	115	80-120			
Selenium	55.7		ug/L	1.4	109	80-120			
Silver	35.0		ug/L	ND	70.0	80-120			QM-07
Sodium	1300		ug/L	296	99.9	80-120			
Thallium	44.9		ug/L	ND	90.1	80-120			
Uranium	50.8		ug/L	ND	102	80-120			
Vanadium	60.2		ug/L	3.43	114	80-120			
Zinc	48		ug/L	ND	95.2	80-120			
Semi-Volatiles									
Acenaphthene	3.65	0.05	ug/L	ND	73.0	50-140			
Acenaphthylene	2.93	0.05	ug/L	ND	58.5	50-140			
Anthracene	3.80	0.01	ug/L	ND	75.9	50-140			
Benzo [a] anthracene	3.86	0.01	ug/L	ND	77.2	50-140			
Benzo [a] pyrene	3.56	0.01	ug/L	ND	71.1	50-140			
Benzo [b] fluoranthene	4.39	0.05	ug/L	ND	87.8	50-140			
Benzo [g,h,i] perylene	3.99	0.05	ug/L	ND	79.8	50-140			
Benzo [k] fluoranthene	4.68	0.05	ug/L	ND	93.7	50-140			
Biphenyl	3.96	0.05	ug/L	ND	79.2	50-140			
Chrysene	4.31	0.05	ug/L	ND	86.3	50-140			
Dibenzo [a,h] anthracene	3.74	0.05	ug/L	ND	74.8	50-140			
Fluoranthene	2.95	0.01	ug/L	ND	59.1	50-140			
Fluorene	3.70	0.05	ug/L	ND	74.1	50-140			
Indeno [1,2,3-cd] pyrene	3.92	0.05	ug/L	ND	78.4	50-140			
1-Methylnaphthalene	3.73	0.05	ug/L	ND	74.5	50-140			
2-Methylnaphthalene	3.73	0.05	ug/L	ND	74.6	50-140			
Naphthalene	3.58	0.05	ug/L	ND	71.6	50-140			
Phenanthrene	3.71	0.05	ug/L	ND	74.1	50-140			
Pyrene	3.73	0.01	ug/L	ND	74.7	50-140			
Surrogate: 2-Fluorobiphenyl	*14.9*		*ug/L*		*74.7*	*50-140*			
Volatiles									

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	42.4	0.5	ug/L	ND	106	50-140			
Ethylbenzene	43.8	0.5	ug/L	ND	110	50-140			
Toluene	41.9	0.5	ug/L	ND	105	50-140			
m,p-Xylenes	93.6	0.5	ug/L	ND	117	50-140			
o-Xylene	41.7	0.5	ug/L	ND	104	50-140			

Certificate of Analysis

Report Date: 10-Jun-2014
Order Date:4-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Qualifier Notes:

Login Qualifiers :

Sample - Received with >5% sediment, instructed to perform whole bottle extraction (analyze with sediment)
Applies to samples: BH14-2 GW SA1

Sample Qualifiers :

5 : Water sample included significant sediment amount that was included in extraction process. This is expected to result in reduced accuracy of the reported result.

QC Qualifiers :

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

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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№ 16620

Page 1 of 1

Client Name: Stantec Cheverier Engineering	Project Reference: 14-150	TAT: [✓] Regular	[ ] 3 Day
Contact Name: Brett Painter	Quote #	[ ] 2 Day	[ ] 1 Day
Address: 180 Wescar Lane, Ottawa, Ontario, K0A 1L0	PO #	Date Required:	
Telephone: 613-836-1422	Email Address: bpainter@hcang.ca		

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

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

Required Analyses

Paracel Order Number: 1423202

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4 + BTEX	Metals	CrVI	Hg	PAHs						
1	BH 14-2 GW SA1	GW	✓	7	June 4/14	10:30am	✓	✓	✓	✓	✓						✓
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments: Metals have been field filtered

Method of Delivery: Walk-in

Relinquished By (Sign): Samantha Sabo	Received by Driver/Depot: Karen Cull	Received at Lab: SUNEEPORN DOKMAI	Verified By: MJC
Relinquished By (Print): Samantha Sabo	Date/Time: Jun 4/14 11:15	Date/Time: JUN 04, 2014 04:05	Date/Time: June 4/14 4:50
Date/Time: June 4, 2014	Temperature: 18.2 °C	Temperature: 13.3 °C	pH Verified [✓] By: MJC

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e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

Houle Chevrier
180 Wescar Lane
Ottawa, ON K0A1L0
Attn: Brett Painter

Phone: (613) 836-1422
Fax: (613) 836-9731

Client PO:
Project: 14-150
Custody: 16619

Report Date: 18-Jun-2014
Order Date: 13-Jun-2014
Order #: 1424256

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

Paracel ID	Client ID
1424256-01	BH14-1 GW SA2
1424256-02	BH14-2 GW SA2

Approved By:

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

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	13-Jun-14	17-Jun-14
Metals, ICP-MS	EPA 200.8 - ICP-MS	13-Jun-14	17-Jun-14
PHC F1	CWS Tier 1 - P&T GC-FID	13-Jun-14	17-Jun-14
PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	16-Jun-14	17-Jun-14
REG 153: PAHs by GC-MS	EPA 625 - GC-MS, extraction	13-Jun-14	13-Jun-14

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 GW SA2	BH14-2 GW SA2	-	-
	Sample Date:	12-Jun-14	12-Jun-14	-	-
	Sample ID:	1424256-01	1424256-02	-	-
	MDL/Units	Water	Water	-	-
Metals					
Antimony	0.5 ug/L	-	<0.5	-	-
Arsenic	1 ug/L	-	<1	-	-
Barium	1 ug/L	-	64	-	-
Beryllium	0.5 ug/L	-	<0.5	-	-
Boron	10 ug/L	-	40	-	-
Cadmium	0.1 ug/L	-	<0.1	-	-
Chromium	1 ug/L	-	<1	-	-
Cobalt	0.5 ug/L	-	0.8	-	-
Copper	0.5 ug/L	-	2.4	-	-
Lead	0.1 ug/L	-	0.2	-	-
Molybdenum	0.5 ug/L	-	<0.5	-	-
Nickel	1 ug/L	-	3	-	-
Selenium	1 ug/L	-	<1	-	-
Silver	0.1 ug/L	-	<0.1	-	-
Sodium	200 ug/L	-	5970	-	-
Thallium	0.1 ug/L	-	<0.1	-	-
Uranium	0.1 ug/L	-	0.2	-	-
Vanadium	0.5 ug/L	-	5.0	-	-
Zinc	5 ug/L	-	8	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
Toluene-d8	Surrogate	99.2%	99.5%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-
F1 + F2 PHCs	125 ug/L	<125	<125	-	-
F3 + F4 PHCs	200 ug/L	<200	<200	-	-

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO:

Project Description: 14-150

	Client ID:	BH14-1 GW SA2	BH14-2 GW SA2	-	-
	Sample Date:	12-Jun-14	12-Jun-14	-	-
	Sample ID:	1424256-01	1424256-02	-	-
	MDL/Units	Water	Water	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	<0.05	-	-
Acenaphthylene	0.05 ug/L	-	<0.05	-	-
Anthracene	0.01 ug/L	-	<0.01	-	-
Benzo [a] anthracene	0.01 ug/L	-	0.05	-	-
Benzo [a] pyrene	0.01 ug/L	-	0.13	-	-
Benzo [b] fluoranthene	0.05 ug/L	-	0.10	-	-
Benzo [g,h,i] perylene	0.05 ug/L	-	0.06	-	-
Benzo [k] fluoranthene	0.05 ug/L	-	0.12	-	-
Chrysene	0.05 ug/L	-	0.18	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	-	<0.05	-	-
Fluoranthene	0.01 ug/L	-	0.25	-	-
Fluorene	0.05 ug/L	-	<0.05	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	0.06	-	-
1-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
2-Methylnaphthalene	0.05 ug/L	-	<0.05	-	-
Methylnaphthalene (1&2)	0.10 ug/L	-	<0.10	-	-
Naphthalene	0.05 ug/L	-	0.07	-	-
Phenanthrene	0.05 ug/L	-	0.20	-	-
Pyrene	0.01 ug/L	-	0.21	-	-
2-Fluorobiphenyl	Surrogate	-	71.0%	-	-
Terphenyl-d14	Surrogate	-	82.5%	-	-

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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						
Metals									
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*14.1*		*ug/L*		*70.7*	*50-140*			
Surrogate: Terphenyl-d14	*20.1*		*ug/L*		*100*	*50-140*			
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	*79.4*		*ug/L*		*99.2*	*50-140*			

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

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	
Metals									
Antimony	ND	0.5	ug/L	0.65			0.0	20	
Arsenic	ND	1	ug/L	ND			0.0	20	
Barium	22.2	1	ug/L	22.1			0.6	20	
Beryllium	ND	0.5	ug/L	ND			0.0	20	
Boron	21	10	ug/L	21			0.9	20	
Cadmium	ND	0.1	ug/L	ND			0.0	20	
Chromium	5.5	1	ug/L	6.3			13.9	20	
Cobalt	ND	0.5	ug/L	ND			0.0	20	
Copper	10.5	0.5	ug/L	10.0			4.2	20	
Lead	ND	0.1	ug/L	ND			0.0	20	
Molybdenum	4.23	0.5	ug/L	4.13			2.3	20	
Nickel	1.1	1	ug/L	1.1			2.7	20	
Selenium	ND	1	ug/L	1.6			0.0	20	
Silver	ND	0.1	ug/L	ND			0.0	20	
Sodium	16300	200	ug/L	15500			5.3	20	
Thallium	ND	0.1	ug/L	ND			0.0	20	
Uranium	0.2	0.1	ug/L	0.2			0.5	20	
Vanadium	1.65	0.5	ug/L	1.84			10.6	20	
Zinc	18	5	ug/L	17			9.9	20	
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	*78.4*		*ug/L*	*ND*	*98.0*	*50-140*			

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	2000	25	ug/L	ND	100	68-117			
F2 PHCs (C10-C16)	1880	100	ug/L	ND	104	60-140			
F3 PHCs (C16-C34)	3840	100	ug/L	ND	103	60-140			
F4 PHCs (C34-C50)	2560	100	ug/L	ND	103	60-140			
Metals									
Antimony	52.6		ug/L	0.65	104	80-120			
Arsenic	52.4		ug/L	0.9	103	80-120			
Barium	68.4		ug/L	22.1	92.7	80-120			
Beryllium	49.2		ug/L	0.01	98.4	80-120			
Boron	67		ug/L	21	90.5	80-120			
Cadmium	48.2		ug/L	0.0008	96.3	80-120			
Chromium	53.6		ug/L	6.3	94.7	80-120			
Cobalt	47.6		ug/L	0.05	95.2	80-120			
Copper	56.5		ug/L	10.0	92.9	80-120			
Lead	47.3		ug/L	0.05	94.6	80-120			
Molybdenum	51.2		ug/L	4.13	94.1	80-120			
Nickel	48.4		ug/L	1.1	94.7	80-120			
Selenium	54.9		ug/L	1.6	107	80-120			
Silver	47.1		ug/L	0.01	94.2	80-120			
Sodium	1110		ug/L	179	92.9	80-120			
Thallium	46.3		ug/L	ND	92.6	80-120			
Uranium	47.8		ug/L	0.2	95.2	80-120			
Vanadium	50.4		ug/L	1.84	97.2	80-120			
Zinc	64		ug/L	17	94.6	80-120			
Semi-Volatiles									
Acenaphthene	3.29	0.05	ug/L	ND	65.9	50-140			
Acenaphthylene	2.59	0.05	ug/L	ND	51.8	50-140			
Anthracene	3.16	0.01	ug/L	ND	63.1	50-140			
Benzo [a] anthracene	2.72	0.01	ug/L	ND	54.5	50-140			
Benzo [a] pyrene	2.56	0.01	ug/L	ND	51.2	50-140			
Benzo [b] fluoranthene	4.22	0.05	ug/L	ND	84.4	50-140			
Benzo [g,h,i] perylene	2.88	0.05	ug/L	ND	57.5	50-140			
Benzo [k] fluoranthene	3.90	0.05	ug/L	ND	77.9	50-140			
Chrysene	2.93	0.05	ug/L	ND	58.5	50-140			
Dibenzo [a,h] anthracene	2.54	0.05	ug/L	ND	50.7	50-140			
Fluoranthene	2.60	0.01	ug/L	ND	52.0	50-140			
Fluorene	3.16	0.05	ug/L	ND	63.1	50-140			
Indeno [1,2,3-cd] pyrene	2.62	0.05	ug/L	ND	52.3	50-140			
1-Methylnaphthalene	2.88	0.05	ug/L	ND	57.6	50-140			
2-Methylnaphthalene	2.78	0.05	ug/L	ND	55.7	50-140			
Naphthalene	3.05	0.05	ug/L	ND	61.0	50-140			
Phenanthrene	3.28	0.05	ug/L	ND	65.6	50-140			
Pyrene	2.76	0.01	ug/L	ND	55.2	50-140			
Surrogate: 2-Fluorobiphenyl	*13.7*		*ug/L*		*68.5*	*50-140*			
Volatiles									
Benzene	34.5	0.5	ug/L	ND	86.4	50-140			
Ethylbenzene	31.1	0.5	ug/L	ND	77.6	50-140			
Toluene	31.7	0.5	ug/L	ND	79.2	50-140			

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	65.8	0.5	ug/L	ND	82.2	50-140			
o-Xylene	30.3	0.5	ug/L	ND	75.7	50-140			

Certificate of Analysis

Report Date: 18-Jun-2014
Order Date:13-Jun-2014

Client: **Houle Chevrier**
Client PO: Project Description: 14-150

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

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

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Chain of Custody
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Nº 16619

Page 1 of 1

Client Name: Houle Cherrier Eng.	Project Reference: 14-150	TAT: [✓] Regular	[ ] 3 Day
Contact Name: Brett Painter	Quote #	[ ] 2 Day	[ ] 1 Day
Address: 180 Wescar Lane, RR2, Carp, Ontario K0A 1L0	PO #	Date Required:	
Telephone: 613-836-1422	Email Address: bpainter@hceng.ca		

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

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

Paracel Order Number: 1424256

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs/BTEX	Metals (ICP)	PAHs							
1	BH14-1 GW SA2	GW	/	3	June 12	1 pm	✓									
2	BH14-2 GW SA2	GW	/	5	June 12	4pm	✓	✓	✓							
3																
4																
5																
6																
7																
8																
9																
10																

Comments: Metals have been field filtered.

Method of Delivery: Paracel Courier

Relinquished By (Sign): Samantha Sabo	Received by Driver/Depot: T. Scause	Received at Lab: SUNEEPORN DOK MAI	Verified By: MC
Relinquished By (Print): Samantha Sabo	Date/Time: 13/06/14 10:40pm	Date/Time: JUN 13 2014 12:05	Date/Time: June 13/14 12:39
Date/Time:	Temperature: ___ °C	Temperature: 9.9 °C	pH Verified [✓] By: MC

geotechnical

environmental

hydrogeology

materials testing & inspection

experience • knowledge • reliability