FINAL

Phase Two Environmental Site Assessment

1157 – 1171 North Shore Boulevard East
Burlington, Ontario

Prepared for:

Spruce Partners Inc.
117 George Street
Oakville, Ontario L6J 3B8

Attn: Mr. Paul Sustronk

September 13, 2018

Pinchin File: 212394.001

MEMBER OF
THE PINCHIN GROUP

Issued To:	**Spruce Partners Inc.**
Contact:	**Mr. Paul Sustronk**
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Pinchin File:	**212394.001**
Issuing Office:	**6 - 875 Main Street West, Suite 200, Hamilton ON L8S 4P9**
Primary Pinchin Contact:	**Celine Hanna**

Céline Hanna

Author: Celine Hanna, B.Sc.,
Project Manager
905.577.6206 ext. 1709
channa@pinchin.com

Reviewer: Francesco Gagliardi, C.E.T., LET, QP_{ESA}
Operations Manager
905.577.6206 ext. 1719
fgagliardi@pinchin.com

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1.0 EXECUTIVE SUMMARY

Pinchin Ltd. (Pinchin) was retained by Spruce Partners Inc. (Client), to complete a Phase Two Environmental Site Assessment (Phase Two ESA) of the property located at 1157 – 1171 North Shore Boulevard East in Burlington, Ontario (hereafter referred to as the Site or Phase Two Property). The Phase Two Property is presently developed with a four-storey multi-tenant residential building (Site Building A) located on the southeast portion of the Phase One Property, a four-storey multi-tenant residential building (Site Building B) located on the central portion of the Phase One Property and an automotive parking/storage structure (Site Building C), located on the north portion of the Phase One Property.

The Phase Two ESA was conducted at the request of the Client in relation to the potential acquisition of the Site. Pinchin understands that the Client intends to redevelop the Site for seniors living facility. Given that there is no change in land use (i.e., residential to residential), the province does not require that a Record of Site Condition (RSC) be obtained. However, as part of the proposed redevelopment, the Client will be required to obtain development permits through the City of Burlington and Halton Region. Based on Pinchin's understand of the City of Burlington's and Halton Region's requirements, the Phase Two ESA will need to be completed in accordance with the Province of Ontario's *Ontario Regulation 153/04: Records of Site Condition – Part XV.1 of the Act*, which was last amended by Ontario Regulation 312/17 on July 28, 2017 (O. Reg. 153/04).

The objectives of this Phase Two ESA were to assess the soil quality in relation to four areas of potential environmental concern (APECs) and related potentially contaminating activities (PCAs) and contaminants of potential concern (COPCs) identified in a Phase One ESA completed by Pinchin in accordance with O. Reg. 153/04. The identified APECs, PCAs and COPCs are summarized in the following table:

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern on Phase One Property	Potentially Contaminating Activity	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC #1 (Former Coal-Storage)	Northwest portion of the Phase One Property, located in the boiler room of Site Building C	Other- Historical Coal-Storage	On-Site (PCA #1)	BTEX PHCs PAHs	Soil

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern on Phase One Property	Potentially Contaminating Activity	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC #2 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #2)	PHCs (F2-F4) PCBs	Soil
APEC #3 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #3)	PHCs (F2-F4) PCBs	Soil
APEC #4 (Current on-Site Pole Mounted Transformer)	Northeast-central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #4)	PHCs (F2-F4) PCBs	Soil

Notes:

BTEX – benzene, toluene, ethylbenzene and xylenes
PHCs – petroleum hydrocarbon fractions F1-F4
PAHs – polycyclic aromatic hydrocarbons
PCBs- polychlorinated biphenyls

The Phase Two ESA was completed by Pinchin on February 5, 2018, and included the advancement of five boreholes at the Phase Two Property. Groundwater was not considered to be a media of concern based on the Phase One ESA and, as such, none of the boreholes were completed as groundwater monitoring wells. The boreholes were advanced to depths ranging from approximately 1.68 metres below floor surface (mbfs) to 6.40 metres below ground surface (mbgs). Select soil samples collected from each of the borehole locations were submitted for laboratory analyses of benzene, toluene, ethylbenzene and xylenes (collectively referred to as ‘BTEX’), petroleum hydrocarbons (PHCs) in the F1 to F4 fraction ranges (F1-F4) or F2 to F4 fraction ranges (F2-F4), polycyclic aromatic hydrocarbons (PAHs) and/or polychlorinated biphenyl (PCBs). Four additional boreholes were advanced to depths ranging from 5.18 to 7.77 mbgs for geotechnical purposes, the findings of which are provided under a separate cover.

Based on Site-specific information, the applicable regulatory standards for the Phase Two Property were determined to be the *“Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition”,* provided in the MOECC document entitled, “*Soil, Ground Water and Sediment*

Standards for Use Under Part XV.1 of the Environmental Protection Act" dated April 15, 2011 *(Table 3 Standards)* for medium and fine-textured soils and residential/parkland/ institutional property use.

The laboratory results for the submitted soil samples indicated that all reported concentrations for the parameters analyzed met the corresponding *Table 3 Standards*.

It is the opinion of the Qualified Person (QP) who supervised the Phase Two ESA that the applicable *Table 3 Standards* for soil at the Phase Two Property have been met as of the Certification Date of February 5, 2018 and that no further subsurface investigation is required in relation to assessing the environmental quality of soil at the Phase Two Property.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

2.0 INTRODUCTION

A Phase Two ESA is defined as an "assessment of property conducted in accordance with the regulations by or under the supervision of a QP to determine the location and concentration of one or more contaminants in the land or water on, in or under the property". Under O. Reg. 153/04, the purpose of a Phase Two ESA is as follows:

- To determine the location and concentration of contaminants in the land or water on, in or under the Phase Two Property;
- To obtain information about environmental conditions in the land or water on, in or under the Phase Two Property necessary to undertake a Risk Assessment, in accordance with O. Reg. 153/04, with respect to one or more contaminants of concern; and
- To determine if applicable Site Condition Standards and standards specified in a Risk Assessment for contaminants on, in or under the Phase Two Property were met as of the certification date by developing an understanding of the geological and hydrogeological conditions at the Phase Two Property and conducting one or more rounds of field sampling for all contaminants associated with any APEC identified in the Phase Two ESA sampling and analysis plan (SAP) and for any such contaminants identified during subsequent Phase Two ESA activities and analyses of environmental conditions at the Phase Two Property.

This Phase Two ESA was conducted at the request of the Client to support the potential acquisition and redevelopment of the Site for use as a seniors living facility. The submittal of a Record of Site Condition (RSC) to the Ontario Ministry of the Environment and Climate Change (MOECC) is not required given there is no change in land use (i.e., residential to residential). However, as part of the proposed redevelopment, the Client will be required to obtain development permits through the City of Burlington and Halton Region. Based on Pinchin's understand of the City of Burlington's and Halton Region's requirements, the Phase Two ESA will need to be completed in accordance with the Province of Ontario's *Ontario Regulation 153/04: Records of Site Condition – Part XV.1 of the Act*, which was last amended by Ontario Regulation 312/17 on July 28, 2017 (O. Reg. 153/04).

The overall objectives of this Phase Two ESA were to assess the soil quality in relation to APECs and related COPCs identified in a Phase One ESA completed by Pinchin, the findings of which were summarized in the draft report entitled "*Phase One Environmental Site Assessment, 1157-1171 North Shore Boulevard, Burlington, Ontario*", completed by Pinchin for the Client and dated March 9, 2018 (2018 Pinchin Phase One ESA Report). The property assessed by the Pinchin Phase One ESA is referred to herein as the Phase One Property. The Phase Two ESA was conducted on the whole Phase One Property, at specific APECs identified during the Phase One ESA.

2.1 Site Description

This Phase Two ESA was completed for all of Part Lot 23 RCP Plan 99 as in 49127 Except Part 1 20R5688 & Plan 610, situated at municipal addresses 1157, 1159, 1161, 1163, 1167, 1169 and 1171 North Shore Boulevard East, Burlington, Ontario. The Phase Two Property is 2.9 acres (1.2 hectares) in size and is bounded by Queen Elizabeth Way (QEW) on-ramps to the southwest, single-family residential dwellings to the northwest, multi-tenant residential buildings to the northeast and North Shore Boulevard East to the southeast. A Key Map showing the Phase Two Property location is provided on Figure 1 and a detailed plan of the Phase Two Property and surrounding lands is provided on Figure 2 (all Figures are provided within Section 9.0).

The Phase Two Property is developed with a four-storey multi-tenant residential building (Site Building A) located on the southeast portion of the Phase One Property, a four-storey multi-tenant residential building (Site Building B) located on the central portion of the Phase One Property and an automotive parking/storage structure (Site Building C), located on the north portion of the Phase One Property.

A summary of the pertinent details of the Phase Two Property is provided in the following table:

Detail	Source/Reference	Information
Legal Description	Service Ontario Parcel Register	Part Lot 23 RCP Plan 99 as in 49127 Except Part 1 20R5688 & Plan 610
Municipal Address	http://burlington.maps.arcgis.com Client	1157-1171 North Shore Boulevard East, Burlington, Ontario, L7S 1C3
Parcel Identification Number (PIN)	ServiceOntario Parcel Register	07084-0398 (LT)
Current Owner	ServiceOntario Parcel Register	Brant Park Co-operative Apartments (Burlington) Limited
Owner Contact Information	Client	Mr. John Coleman 1157-1171 North Shore Boulevard East, Burlington, Ontario, L7S 1C3 905.520.5286 Jcoleman5@cogeco.ca
Current Occupants	Client	Multi-tenant residential
Occupants Contact Information	Client	Multi-tenant residential

Detail	Source/Reference	Information
Client Contact Information	Authorization to Proceed Form for Pinchin Proposal	Mr. Paul Sustronk Spruce Partners Inc. 117 George Street, Oakville, ON L6J 3B8 paul@sprucepartnersinc.com
Site Area	http://burlington.maps.arcgis.com	11,724 m^2 (2.9 acres)
Current Zoning	http://burlington.maps.arcgis.com City of Burlington Zoning By-Law 2020, Part 6, Updated December 15, 2015	DRH-Apartment Building, Retirement Home
Centroid UTM Co-ordinate	Google Earth	596836 Easting
		4796689 Northing
		Zone 17T

At the time of writing this Phase Two ESA report, a final legal survey was not available however, when received will be provided within Appendix A prior to finalizing this report (all Appendices are provided in Section 10.0).

2.2 Property Ownership

The entirety of the Phase Two Property is currently owned by Brant Park Co-Operative Apartments (Burlington) Limited, located at the Site. Contact information for the Phase Two Property owner is provided in the preceding section. It is Pinchin's understanding that the Site will be changing ownership to the Client.

Pinchin was retained by Mr. Paul Sustronk of Spruce partners Inc. (Client) to conduct the Phase Two ESA of the Site. Contact information for Mr. Sustronk is provided in the preceding section.

2.3 Current and Proposed Future Uses

The Phase Two Property is presently utilized for residential land use and it is Pinchin's understanding that the Client intends to redevelop the Phase Two Property for seniors living facility.

2.4 Applicable Site Condition Standards

The Phase Two Property is currently a residential property located within the City of Burlington and the proposed future land use is residential. It is Pinchin's understanding that drinking water for the Phase Two

Property and surrounding properties within 250 metres of the Phase Two Property is supplied by Halton Region. Source water is obtained by Halton Region from Lake Ontario.

The overburden/bedrock interface was not encountered during the drilling activities; however, sampler refusal was encountered between 5.15 mbgs and 7.77 on inferred bedrock based on the geotechnical assessment. Based on the available information, the depth to bedrock is interpreted to be greater than two mbgs over more than two-thirds of the Phase Two Property and, as such, the Phase Two Property is not a shallow soil property as defined in Section 43.1 of O. Reg. 153/04.

The Phase Two Property does not contain a water body nor is it located within 30 metres of a water body and the use of standards for properties situated within 30 metres of a water body is not required.

Section 41 of O. Reg. 153/04 states that a property is classified as an “environmentally sensitive area” if the pH of the surface soil (less than 1.5 mbgs) is less than 5 or greater than 9, if the pH of the subsurface soil (greater than 1.5 mbgs) is less than 5 or greater than 11, or if the property is an area of natural significance or is adjacent to or contains land within 30 metres of an area of natural significance. A total of two representative soil samples collected from the boreholes advanced at the Phase Two Property were submitted for pH analyses. The pH analytical results are summarized in Table 1 (all Tables are provided in Section 9.0). The pH values measured in the submitted soil samples were within the limits for non-sensitive sites. The Phase Two Property is also not an area of natural significance and it is not adjacent to, nor does it contain land within 30 metres of, an area of natural significance. As such, the Phase Two Property is not an environmentally sensitive area.

As discussed further in Section 6.4, based on the results of grain size analysis completed on representative soil sample collected during the Phase Two ESA and the observed stratigraphy at the borehole locations at the Phase Two Property, it is the QP’s opinion that over two-thirds of the overburden at the Phase Two Property is medium and fine-textured as defined by O. Reg. 153/04. Therefore, the soil at the Phase Two Property has been considered medium and fine-textured for the purpose of establishing the applicable MOECC Site Condition Standards.

Based on the above, the appropriate Site Condition Standards for the Phase Two Property are the Table 3 Standards for:

- Medium and fine-textured soils; and
- Residential/parkland/institutional property use.

As such, all analytical results have been compared to these *Table 3 Standards*.

Pinchin submitted notification to the City of Burlington and Halton Region indicating the intent to apply the non-potable ground water standards. At the time of writing this report, no response had been received from the City of Burlington and Halton Region. When a formal response is received, it will be reviewed by

Pinchin. Based on previous notifications within the City of Burlington, it is Pinchin's experience that no objection will be received. A copy of Pinchin's requests submitted to the City of Burlington and Halton Region are provided in Appendix F of this report.

3.0 BACKGROUND INFORMATION

3.1 Physical Setting

The Phase Two Property is located in the west portion of the City of Burlington at an elevation of approximately 82 metres above mean sea level (mamsl). The topography of the Phase Two Property is generally flat with little relief. The properties surrounding the Phase Two Property are at an equivalent grade with a gradual decrease in elevation towards the southeast and east. There are no drainage features (e.g., open ditches or swales) present on-Site. Surface water (e.g., storm runoff) is captured via a catch basin in the grassed area on the southwest portion of the Site and discharges to a main storm sewer line to the southwest of the Phase Two Property via underground piping.

There are no open water bodies or areas of natural significance located on-Site or within the area assessed by the Pinchin Phase One ESA (the Phase One Study Area). A plan showing the Phase One Study Area is presented on Figure 3. The nearest surface water body to the Phase Two Property is Lake Ontario located approximately 360 m east of the Phase Two Property at an elevation of approximately 75 mamsl.

3.2 Past Investigations

3.2.1 Summary of Previous Environmental Investigations by Others

The Client informed Pinchin that no previous environmental reports are known to be available for the Phase Two Property.

3.2.2 Pinchin Phase One ESA Summary

From January 28, 2018 through February 6, 2018, Pinchin conducted a Phase One ESA in accordance with O.Reg.153/04 for the Phase Two Property. The Phase One ESA consisted of a Site visit, interviews with Site personnel, records review, evaluation of information, and preparation of a written report which was completed under the supervision of a QP. A plan showing the Phase One Study Area is attached as Figure 3.

The Phase One ESA was completed recently (i.e., within three months of the start of the Phase Two ESA) and in accordance with the requirements of O. Reg. 153/04. Therefore, the information provided within the Phase One ESA Report is considered adequate such that it can be relied upon for the purpose of this Phase Two ESA.

Based on information obtained during the Phase One ESA, a total of four APECs and corresponding potentially contaminating activities (PCAs) and COPCs were identified that could potentially affect the environmental condition of the subsurface media on, in or under the Phase Two Property. The COPCs associated with each APEC were determined based on a review of the PCAs and substances associated with the related activities, and on several sources of information, including but not limited to, Pinchin's experience with environmental contamination and hazardous substances, common industry practices for analysis of such contaminants and point sources, literature reviews of COPCs and associated hazardous substances, and evaluations of contaminant mobility and susceptibility for migration in the subsurface.

The following table presents the APECs and their associated PCAs and COPCs:

Summary of APECs

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern on Phase One Property	Potentially Contaminating Activity	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC #1 (Former Coal-Storage)	Northwest portion of the Phase One Property, located in the boiler room of Site Building C	Other-Historical Coal-Storage	On-Site (PCA #1)	BTEX PHCs PAHs	Soil
APEC #2 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55-Transformer Manufacturing, Processing and Use	On-Site (PCA #2)	PHCs (F2-F4) PCBs	Soil
APEC #3 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55-Transformer Manufacturing, Processing and Use	On-Site (PCA #3)	PHCs (F2-F4) PCBs	Soil
APEC #4 (Current on-Site Pole Mounted Transformer)	Northeast-central portion of the Phase One Property	Item 55-Transformer Manufacturing, Processing and Use	On-Site (PCA #4)	PHCs (F2-F4) PCBs	Soil

Notes: BTEX – benzene, toluene, ethylbenzene, xylenes

PHCs – petroleum hydrocarbon fractions F1-F4

PAHs – polycyclic aromatic hydrocarbons
PCBs – polychlorinated biphenyls

A plan showing the locations of the identified APECs and PCAs with respect to the Phase Two Property and surrounding properties is attached as Figure 4.

4.0 SCOPE OF INVESTIGATION

4.1 Overview of Site Investigation

The scope of work for this Phase Two ESA was prepared to address the APECs identified at the Phase Two Property and consisted of the following:

- Prepared a health and safety plan and arranged for the completion of underground utility locates prior to the commencement of drilling activities;
- Developed a detailed SAP prior to the advancement of the boreholes and the installation of the monitoring wells. The SAP was outlined in the document entitled "*Sampling and Analysis Plan for Phase Two Environmental Site Assessment, 1157-1171 North Shore Boulevard East, Burlington, Ontario*", dated January 30, 2018, which is provided in Appendix B. Based on Pinchin's knowledge of the surrounding properties and known hydrogeological conditions, boreholes were advanced at the Phase Two Property to a maximum depth of approximately 1.68 mbgs for environmental investigation purposes. Select boreholes (BH03 and BH05) were advanced at deeper depths for geotechnical investigation purposes;
- Retained Strata Drilling Group Inc. (Strata) to advance boreholes using a hand-held electric drill or a Geoprobe 6620DT™ drill rig. Strata is licensed by the MOECC in accordance with Ontario Regulation 903 (as amended) (O. Reg. 903) to undertake borehole drilling/well installation activities. Strata advanced five boreholes at the Phase Two Property to investigate the potential for soil contaminants associated with the APECs identified in the Phase One ESA. No monitoring wells were installed as groundwater was not considered to be a media of concern;
- Collected soil samples at regular intervals within each borehole;
- Field screened soil samples for petroleum-derived vapours in soil headspace using a combustible gas indicator (CGI) calibrated to hexane, in addition to visual and olfactory considerations;
- Submitted a minimum of one "worst case" soil sample from each borehole for chemical analyses of:
  - BTEX;

    - PHCs F1-F4 or F2-F4;
    - PAHs; and/or
    - PCBs.
- Submitted two duplicate soil samples for chemical analysis of the above-noted parameters for quality assurance/quality control (QA/QC) purposes;
- Submitted one representative soil samples for the laboratory analysis of grain size and two representative soil samples for the laboratory analysis of pH in order to confirm the appropriate MOECC Site Condition Standards;
- Compared the soil analytical results to the applicable criteria stipulated in the *Table 3 Standards*; and
- Prepared a report (this report) documenting the findings of the Phase Two ESA which meets the reporting requirements listed in *Schedule E* and *Table 1 – Mandatory Requirements for Phase Two Environmental Site Assessment Reports* of O. Reg. 153/04.

4.2 Media Investigated

The scope of work for this Phase Two ESA was prepared to address the APECs and corresponding media at the Phase Two Property as identified through completion of the Phase One ESA.

The medium of concern for the Phase Two ESA was soil. Pinchin did not conduct sediment sampling as part of this Phase Two ESA as there are no surface water bodies and, therefore no sources of sediment, present on-Site. Groundwater was not investigated as part of this Phase Two ESA, as groundwater was not identified as a potentially impacted media in the 2018 Pinchin Phase One ESA Report based on contaminant characteristics and/or nature of PCAs (i.e. surface source of potential COPCs).

For assessing the soil at the Phase Two Property for the presence of COPCs, a total of five boreholes were advanced at locations across the Phase Two Property for the purpose of collecting soil samples. A total of seven soil samples (including two duplicate samples), comprising select “worst case” samples collected from each of the boreholes, were submitted for laboratory analysis of the COPCs.

4.3 Phase One Conceptual Site Model

A conceptual site model (CSM) was created to provide a summary of the findings of the Phase One ESA. The Phase One CSM is summarized in Figures 1 through 4, which illustrate the following features within the Phase One Study Area, where present:

- Existing buildings and structures;
- Water bodies located in whole or in part within the Phase One Study Area;
- Areas of natural significance located in whole or in part within the Phase One Study Area;

- Drinking water wells located at the Phase One Property;
- Land use of adjacent properties;
- Roads within the Phase One Study Area;
- PCAs within the Phase One Study Area, including the locations of tanks; and
- APECs at the Phase One Property.

The following provides a narrative summary of the Phase One CSM:

- The Phase One Property is an irregular-parcel of land approximately 2.8 acres (1.16 hectares) in area located on the west side of North Shore Boulevard East. There is no record of industrial use or of a commercial use (e.g., garage, bulk liquid dispensing facility or dry cleaner) that would require classifying the Phase One Property as an enhanced investigation property;
- No water bodies were identified within the Phase One Study Area. The nearest water body is Lake Ontario which is located approximately 360 m east of the Phase One Property;
- No areas of natural significance were identified within the Phase One Study Area;
- No drinking water wells were located on the Phase One Property;
- A multi-tenant residential building is located adjacent to the northeast portion of the Phase One Property and single-family residential dwellings are located adjacent to the northwest portion of the Phase One Property. The adjacent property to the southwest is undeveloped, vacant land. Northshore Boulevard East is located immediately southwest of the Phase One Property, respectively;
- A total of eight PCAs were identified within the Phase One Study Area, consisting of four PCAs at the Phase One Property and four PCAs within the Phase One study, outside of the Phase One Property. As shown on Figure 4, the off-Site PCAs are located at transgradient or downgradient properties or are at least 50 m from the Phase One Property. As such, these off-Site PCAs are not considered to result in APECs at the Phase One Property. All other PCAs identified within the Phase One Study Area at the Phase One Property represent APECs at the Phase One Property, as shown on Figure 5;
- Underground utilities at the Phase One Property provide potable water, natural gas, electrical, telephone, cable and sewer services to the Site Building. These services enter the basements of the Site Buildings. One concrete catch basin was observed in the grassed area located on the southeast portion of the Phase One Property and it is expected to connect to the storm sewer system. Plans were not available to confirm the depths of these utilities but they are estimated to be located approximately 2 to 3 mbgs.

The depth to groundwater at the Phase Two Property is inferred to be between 1.35 mbgs and 3.91 mbgs and, as such, it is possible that the utility corridors may act as preferential pathways for contaminant distribution and transport in the event that shallow subsurface contaminants exist at the Phase One Property;

- The Phase One Property and the surrounding properties located within the Phase One Study Area are located within lacustrine deposits with the primary native material consisting of sand and gravel. Bedrock is expected to consist of shale, limestone, dolostone and siltstone of the Queenston Formation. The topography is considered to be mainly flat to rolling low local relief with dry surface water drainage conditions; and
- The Phase One Property is relatively flat with a slight grade downwards in elevation to the southeast and east. The area surrounding the Phase One Property slopes gradually to the southeast towards Lake Ontario. Lake Ontario is located approximately 358 m east of the Phase One Property. Lake Ontario is the nearest major body of water, at an elevation of approximately 77 mamsl. Regional groundwater flow is inferred to be to the east-southeast towards Lake Ontario.

There were no deviations from the Phase One ESA requirements specified in O. Reg. 153/04 or absence of information that have resulted in uncertainty that would affect the validity of the Phase One CSM.

4.4 Deviations from Sampling and Analysis Plan

No notable constraints and limitations with respect to the SAP were documented during the field activities, and as such Pinchin has conducted the Phase Two ESA in a manner generally consistent with the SAP provided in Appendix B with the following exception:

- Borehole BH03 and BH05 were advanced to depth of 6.40 and 5.94 mbgs, respectively. The deeper than proposed depths of 1.5 mbgs as stipulated in the SAP were due to deeper soil information requirements for geotechnical investigations pruposes.

4.5 Impediments

Pinchin had full access to the Phase Two Property throughout the completion of the Phase Two ESA.

5.0 INVESTIGATION METHOD

5.1 General

The Phase Two ESA field work was conducted in accordance with Pinchin's standard operating procedures (SOPs) as provided in the SAP, which have been developed in accordance with the procedures and protocols provided in the MOECC document entitled "*Guidance on Sampling and*

Analytical Methods for Use at Contaminated Sites in Ontario", dated December 1996, in the Association of Professional Geoscientists of Ontario document entitled *"Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended)"*, dated April 2011, and in O. Reg. 153/04.

No deviations from Pinchin's SOPs occurred during the Phase Two ESA.

5.2 Drilling and Excavating

Pinchin retained Strata to advance a total of five boreholes (BH01 through BH05) at the Phase Two Property on February 5, 2018 to investigate the potential presence of COPCs associated with the APECs identified in the Phase One ESA. Interior boreholes (BH01 and BH02) were drilled to a maximum depth of 1.68 metres below floor surface (mbfs) using an electric drill. Exterior boreholes (BH03, BH04 and BH05) were drilled to a maximum depth of 6.40 mbgs using a Geoprobe 7822DT™ drill rig.

The locations of the boreholes was selected using the following rationale:

- BH01 and BH02 – Completed within the below grade boiler room (in the area historically used for coal storage) in order to investigate soil quality in relation to APEC #1;
- BH03 – Completed in the vicinity of the west-most pole-mounted transformer to investigate soil quality in relation to APEC #2;
- BH04 – Completed in the vicinity of the centrally pole-mounted transformer to investigate soil quality in relation to APEC #3; and
- BH05 – Completed in the vicinity of the east-most pole-mounted transformer to investigate soil quality in relation to APEC #4;

The locations of the boreholes are provided on Figure 5. A description of the subsurface stratigraphy encountered during the drilling program is documented in the borehole logs included in Appendix C.

Measures taken to minimize the potential for cross-contamination during the borehole drilling program included:

- The use of dedicated, disposable PVC soil sample liners for soil sample collection during direct-push drilling;
- The cleaning of all non-dedicated drilling and soil sampling equipment (i.e., spatula used for sample collection) before initial use and between sample and borehole locations; and
- The use of dedicated and disposable nitrile gloves for all soil sample handling.

Soil samples were collected at continuous intervals during direct-push drilling at a general frequency of two soil samples for every 1.52 metres drilled.

No excavating activities (e.g., test pitting) were completed as part of the Phase Two ESA.

5.3 Soil Sampling

Soil samples were collected in the boreholes at continuous and regular intervals using 3.81 centimetre (cm) inner diameter (ID) direct push soil samplers.

Discrete soil samples were collected from the dedicated sample liners using a stainless-steel spatula. Dedicated and disposable nitrile gloves were worn during the collection of each soil sample. A portion of each sample was placed in a resealable plastic bag for field screening and a portion was containerized in laboratory-supplied glass sampling jars. Following sample collection, the sample jars were placed into dedicated coolers with ice for storage pending transport to Maxxam Analytics (Maxxam) in Mississauga, Ontario. Formal chain of custody records were maintained between Pinchin and the staff at Maxxam.

Subsurface soil conditions were logged on-Site by Pinchin personnel at the time of borehole drilling. Based on the soil samples recovered during the environmental borehole drilling program and geotechnical investigation, the soil stratigraphy at the drilling locations generally consists of fill material comprised of gravel below the concrete floor surface within Site Building C or sand and silt topsoil at the exterior drill locations. The native soil stratigraphy consists of silty to at least 6.40 mbgs. The geotechnical investigation identified native silty clay to a maximum depth of approximately 7.77 mbgs. Wet soil conditions were encountered within boreholes BH01 and BH02 below the concrete floor slab.

No odours or staining were observed in the soil samples collected during the borehole drilling program.

A detailed description of the subsurface stratigraphy encountered during the environmental borehole drilling program is documented in the borehole logs included in Appendix C.

5.4 Field Screening Measurements

Soil samples were collected at each of the sampling intervals during the borehole drilling activities and analyzed in the field for petroleum-derived vapour concentrations in soil headspace with an RKI Eagle™ CGI operated in methane elimination mode. The soil samples collected for field-screening purposes were placed in resealable plastic bags. The plastic bags were stored in a warm environment for a minimum of five minutes and agitated in order to release organic vapours within the soil pore space prior to analysis with the CGI.

Based on a review of the operator's manual, the RKI Eagle™ CGI has an accuracy/precision of up to +/- 25 ppm, or +/- 5% of the reading (whichever is greater). The CGI was calibrated prior to field use by Pine according to Pine's standard operating procedures. A copy of Pine's calibration record for the CGI is provided in Appendix D.

Soil samples collected during the drilling activities completed on February 5, 2018, were field screened for petroleum-derived vapour concentrations using the RKI Eagle™ CGI. The organic vapour concentrations measured in the soil samples were all non-detectable (i.e. value of 0 or less than 5 ppm by volume (ppm$_v$)). As such, the primary considerations in selecting soil samples for submission was sample depth and samples collected from the near surface, which were considered to represent “worst case” samples with respect to assessing impacts related to historical coal storage and pole-mounted transformers.

5.5 Groundwater Sampling

Groundwater sampling was not completed as part of this Phase Two ESA.

5.6 Sediment Sampling

Sediment sampling was not completed as part of this Phase Two ESA.

5.7 Analytical Testing

Select “worst-case” soil samples were delivered to Maxxam for analyses. Maxxam is an independent laboratory accredited by the Canadian Association for Laboratory Accreditation. Formal chain of custody records of the sample submissions were maintained between Pinchin and the staff at Maxxam. Maxxam conducted the laboratory analysis in accordance with the MOECC document entitled *“Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act”* dated March 9, 2004 and revised on July 1, 2011 (*Analytical Protocol)*.

5.8 Residue Management Procedures

Soil cuttings generated by the borehole drilling program were deposited on the ground surface at the Phase Two Property. During the drilling sampling activities, no evidence of non-aqueous phase liquid (NAPL) or significant staining was observed in the subsurface. As such, the limited volumes of wash water utilized to clean the sampling equipment were discharged to the ground surface at the Phase Two Property.

5.9 Elevation Surveying

As part of the geotechnical investigation, all of the boreholes locations and ground surface elevations were surveyed by Pinchin using a Sokkia Model GRX 2 Global Navigation Satellite System (GNSS) rover. The ground surface elevations are geodetic, based on GNSS and local base station telemetry with a precision static of less than 20 mm. The measured elevations are presented in the borehole logs included in Appendix C.

Given that no groundwater monitoring wells were installed at the Phase Two Property, groundwater contours were not completed as part of this Phase Two ESA.

5.10 Quality Assurance and Quality Control Measures

The QA/QC protocols that were followed during borehole drilling and soil sampling so that representative samples were obtained are described in the following subsections.

5.10.1 Sample Containers, Preservation, Labelling, Handling and Custody of Samples

Soil samples were containerized within laboratory-prepared sample containers in accordance with the *Analytical Protocol*.

The following soil sample containers and preservatives were used:

- BTEX and PHC F1: 40 millilitre (mL) glass vials with septum-lids, pre-charged with methanol preservative; and
- PHCs F2-F4, PAHs, PCBs, pH and grain size: 120 or 250 mL unpreserved clear glass wide-mouth jars with a Teflon^{TM}–lined lid.

Each soil sample was labelled with a unique sample identifier along with the company name, sampling date, Pinchin project number and analysis required.

Each sample was placed in a cooler on ice immediately upon collection and prior to submission to Maxxam for analysis. Formal chain of custody records of the sample submissions were maintained between Pinchin and the staff at Maxxam.

5.10.2 Equipment Cleaning Procedures

Dedicated, single-use PVC sample liners were used for each soil sample collected, which precluded the need for drilling equipment cleaning during soil sample collection. Equipment utilized in soil sample collection and handling (i.e., spatulas used to remove soil from the sample liners) was cleaned with a solution of Alconox™ detergent and potable water prior to initial use and between samples.

5.10.3 Field Quality Control Measures

A total of two field duplicate soil samples were collected by Pinchin during the Phase Two ESA for analysis of one or more of the COPCs. The frequency of field duplicate soil sample analysis complied with the requirement that one field duplicate soil sample is analyzed for every ten regular soil samples submitted for analysis of the COPCs. The soil sample field duplicate pairings and corresponding analytical schedules are summarized as follows:

- Soil sample “BH01-1” and its corresponding field duplicate “DUP-1” were submitted for laboratory analysis of BTEX, PHCs (F1-F4) and PAHs; and
- Soil sample “BH05-1” and its corresponding field duplicate “DUP-2” were submitted for laboratory analysis of PCBs.

The calibrations of the RKI Eagle™ CGI used for field screening were checked by the equipment supplier (Pine) prior to use in the field by Pinchin.

Pine completed the calibration checks in accordance with the equipment manufacturers' specifications and/or Pine's SOPs. As described in Section 5.4, calibration checks and recalibration (if required) were completed for the RKI Eagle™ CGI during the drilling program.

5.10.4 QA/QC Sampling Program Deviations

There were no deviations from the QA/QC sampling program outlined in the SAP.

6.0 REVIEW AND EVALUATION

6.1 Geology

Based on the stratigraphic information obtained from the soil samples recovered during the drilling activities completed as part of the Phase Two ESA, the interior concrete-covered floor surface within Site Building C is underlain by granular soil fill materials to a maximum depth of approximately 0.15 mbfs. The ground surface at the exterior drilling locations consisted of sand and silt topsoil to a maximum depth of approximately 0.76 mbgs. The native soil underlying the surficial soil fill materials is generally comprised of clayey silt with trace to some sand and trace gravel to a maximum depth of 7.77 mbgs according to the geotechnical assessment.

The water table was not encountered during this Phase Two ESA.

The overburden/bedrock interface was not encountered during the drilling activities; however, sampler refusal was encountered at 5.94 mbgs in BH05 and 6.40 mbgs in BH03 on inferred bedrock. Sample refusal was also encountered in the geotechnical boreholes between 5.18 mbgs in BH07 and 7.77 mbgs in BH06. Based on geological data published by the Ontario Geological Survey, bedrock is expected to consist of shale, limestone, dolostone and siltstone of the Queenston Formation. Based on this information, the overburden thickness at the Phase Two Property is expected to be at least 5.18 metres.

Cross-sections summarizing the subsurface geological conditions have been provided as Figures 6A and 6B.

6.2 Fine-Medium Soil Texture

One soil sample collected from borehole BH04 advanced at the Phase Two Property was submitted for 75 micron single-sieve grain size analysis. The soil sample selected for analysis was considered to be representative of the primary stratigraphic units observed at the borehole locations, which was a native silty clay unit. As indicated in Table 1, one soil sample (BH04-2) that was representative of the native silt clay (subgrade) material present beneath the topsoil at the Site was classified as fine-textured (6.6% coarse-grained soil).

Based on the grain size analysis results and the observed stratigraphy at the borehole locations at the Phase Two Property, it is the QP's opinion that over two-thirds of the overburden at the Phase Two Property is medium and fine-textured as defined by O. Reg. 153/04. Therefore, the soil at the Phase Two Property was interpreted to be medium and fine-textured for the purpose of determining the MOECC Site Condition Standards applicable to the Phase Two Property.

6.3 Soil Field Screening

Soil vapour headspace concentrations measured in the soil samples collected as part of this Phase Two ESA are presented in the borehole logs. Soil vapour headspace values measured with the CGI in methane elimination mode were below the detection limit of 5 ppm by volume (ppm$_v$) in all of the collected soil samples.

One most apparent "worst case" soil sample, based on visual and/or olfactory considerations and contaminant characteristics, recovered from each borehole was submitted for laboratory analysis of BTEX, PHCs (F1-F4) or (F2-F4), PAHs and/or PCBs.

6.4 Soil Quality

A total of five environmental boreholes were advanced at the Phase Two Property at the locations shown on Figure 5 in order to assess for the presence of subsurface impacts resulting from the APECs identified in the Pinchin Phase One ESA. Select soil samples were collected from each of the advanced environmental boreholes and submitted for laboratory analysis of the COPCs. The depth intervals of the soil samples submitted for analysis ranged between 0 to 0.61 mbgs and 0.23 to 1.52 mbgs. The soil sample locations, depths and laboratory analyses are summarized in Table 1 and in the borehole logs.

The soil sample analytical results were compared to the *Table 3 Standards* and the following subsections provide a discussion of the findings.

6.4.1 BTEX

The soil sample analytical results for BTEX, along with the corresponding *Table 3 Standards*, are presented in Table 1. As indicated in Table 1, all reported concentrations of BTEX in the soil samples submitted for analysis were below the *Table 3 Standards*.

6.4.2 PHCs (F1-F4 or F2-F4)

The soil sample analytical results for PHCs (F1-F4 or F2-F4), along with the corresponding *Table 3 Standards*, are presented in Table 1. As indicated in Table 1, all reported concentrations of PHCs (F1- F4 or F2-F4) in the soil samples submitted for analysis were below the *Table 3 Standards*.

6.4.3 PAHs

The soil sample analytical results for PAHs, along with the corresponding *Table 3 Standards*, are presented in Table 1. As indicated in Table 1, all reported concentrations of PAHs in the soil samples submitted for analysis were below the *Table 3 Standards*.

6.4.4 PCBs

The soil sample analytical results for PCB parameters, along with the corresponding *Table 3 Standards*, are presented in Table 1. As indicated in Table 1, all reported concentrations of PCBs in the soil samples submitted for analysis were below the *Table 3 Standards*.

6.4.5 General Comments on Soil Quality

The soil sample results show no evidence of chemical or biological transformations of chemical parameters in the subsurface.

The soil sample analytical results also show no evidence of NAPLs in the subsurface at the Site. In addition, no evidence of NAPL was observed during borehole drilling.

6.5 Groundwater Quality

Groundwater sampling was not completed as part of this Phase Two ESA.

6.6 Sediment Quality

Sediment sampling was not completed as part of this Phase Two ESA.

6.7 Quality Assurance and Quality Control Results

QA/QC comprises technical activities that are used to measure or assess the effect of errors or variability in sampling and analysis. It may also include specification of acceptance criteria for the data and corrective actions to be taken when they are exceeded. QA/QC also includes checks performed to evaluate laboratory analytical quality, checks designed to assess the combined influence of field sampling and laboratory analysis, and checks to specifically evaluate the potential for cross contamination during sampling and sample handling.

The QA/QC samples collected and submitted for analysis by Pinchin during the Phase Two ESA consisted of the following:

- Field duplicate soil samples to assess the suitability of field sampling methods and laboratory performance; and

In addition to the above, laboratory quality control activities and sample checks employed by Maxxam included:

- Method blanks - where a clean sample is processed simultaneously with and under the same conditions (i.e., using the same reagents and solvents) as the samples being analyzed. These are used to confirm whether the instrument, reagents and solvents used are contaminant free;
- Laboratory duplicates - where two samples obtained from the sample container are analyzed. These are used to evaluate laboratory precision;
- Surrogate spike samples - where a known mass of compound not found in nature (e.g., deuterated compounds such as toluene-d8) but that has similar characteristics to the analyzed compounds is added to a sample at a known concentration. These are used to assess the recovery efficiency;
- Matrix spike samples - where a known mass of target analyte is added to a matrix sample with known concentrations. These are used to evaluate the influence of the matrix on a method's recovery efficiency; and
- Use of standard or certified reference materials - a reference material where the content or concentration has been established to a very high level of certainty (usually by a national regulatory agency). These are used to assess accuracy.

The results of the field QA/QC samples are discussed in the following subsections.

6.7.1 Soil Duplicate Results

During borehole soil sampling activities, a total of two separate soil duplicate sample pairs were submitted for laboratory analysis. The field duplicate samples were collected by vertically splitting the soil cores into two halves, with one half collected as the regular sample and the other half collected as the field duplicate sample. The sample pairings and corresponding laboratory analyses are as follows:

- Soil sample "BH01-1" and its corresponding field duplicate "DUP-1" were submitted for laboratory analysis of BTEX, PHCs and PAHs; and
- Soil sample "BH05-1" and its corresponding field duplicate "DUP-2" were submitted for laboratory analysis of PCBs;

The quality of the analytical results was evaluated by calculating relative percent differences (RPDs) for the parameters analyzed for the original and field duplicate samples. The RPD for each parameter was calculated using the following equation:

$$\text{RPD} = \frac{(\text{Original Concentration} - \text{Duplicate Concentration}) \text{ X } 100}{(\text{Original Concentration} + \text{Duplicate Concentration})/2}$$

An RPD was not calculated unless the parameter concentration in both the original and duplicate sample had detectable concentrations above the corresponding practical quantitation limit for the parameter, which is equal to five times the lowest laboratory reportable detection limit (RDL).

None of the RPDs could be calculated due to parameter concentrations being below the RDL. All of the soil samples collected were within the *Table 3 Standards* and, as such, it is Pinchin's opinion that the soil duplicate QA/QC is unlikely to impact the overall interpretation of the analytical data.

6.7.2 Deviations from Analytical Protocol

There were no deviations from the holding times, preservation methods, storage requirements and container types specified in the *Analytical Protocol* during the completion of the Phase Two ESA.

6.7.3 Laboratory Certificates of Analysis

Pinchin has reviewed the laboratory Certificates of Analysis provided by Maxxam for the samples submitted during the Phase Two ESA and confirms the following:

- All laboratory Certificates of Analysis contain a complete record of the sample submission and analysis and meet the requirements of Section 47(3) of O. Reg. 153/04;
- A laboratory Certificate of Analysis has been received for each sample submitted for analysis during the Phase Two ESA;
- All laboratory Certificates of Analysis have been included in full in Appendix E; and
- All of the analytical data reported in the Certificates of Analysis have been summarized, in full, in Tables 1 and 2.

6.7.4 Laboratory Comments Regarding Sample Analysis

Maxxam routinely conducts internal QA/QC analyses in order to satisfy regulatory QA/QC requirements. The results of the Maxxam QA/QC analyses for the submitted soil samples are summarized in the laboratory Certificates of Analyses provided in Appendix E. Also included in Appendix E are all correspondences between the laboratory and staff at Pinchin.

The following summarizes general comments noted by Maxxam on the laboratory Certificates of Analysis for the submitted soil samples:

- Laboratory Certificate R5025921 – A volume greater than 10 g of soil was submitted in the methanol vial collected within BH02-1 for laboratory analysis of BTEX and PHC (F1). Based on the volume of soil exceeding the protocol specification of approximately 5 g, methanol was added to the sample in order to permit extraction. Pinchin does not consider this to be an issue of significant concern and it has no impact on the overall interpretation of the analytical data.

- The temperatures of the submitted soil samples upon receipt met the sample preservation requirements of the *Analytical Protocol* of 5 ± 3ºC (i.e., 3ºC); and
- The custody seal was present and intact on all submissions.

6.7.5 QA/QC Sample Summary

The overall evaluation of the QA/QC sample results indicates no issues with respect to field collection methods and laboratory performance, and no apparent bias due to ambient conditions at the Phase Two Property and during transportation of the sample containers/samples to and from the analytical laboratory.

As such, it is the QP's opinion that the soil analytical data obtained during the Phase Two ESA are representative of actual Site conditions and are appropriate for meeting the objective of assessing whether the soil at the Phase Two Property meets the applicable MOECC Site Condition Standards.

6.8 Phase Two Conceptual Site Model

The Phase Two Property is situated at municipal addresses 1157, 1159, 1161, 1163, 1167, 1169 and 1171 North Shore Boulevard East, Burlington, Ontario. The Phase Two Property is bounded by QEW on-ramps to the southwest, single-family residential dwellings to the northwest, multi-tenant residential buildings to the northeast and North Shore Boulevard East to the southeast. A key map showing the Phase Two Property location is provided as Figure 1.

A Phase One CSM was created during the Pinchin Phase One ESA in order to provide a detailed visualization of the APECs which could occur on, in, under, or affecting the Phase Two Property. The Phase One CSM is summarized in Figures 1 through 4, which illustrate the following features within the Phase One Study Area, where present:

- Existing buildings and structures;
- Water bodies located in whole or in part within the Phase One Study Area;
- Areas of natural significance located in whole or in part within the Phase One Study Area;
- Drinking water wells located at the Phase One Property;
- Land use of adjacent properties;
- Roads within the Phase One Study Area;
- PCAs within the Phase One Study Area, including the locations of tanks; and
- APECs at the Phase One Property.

The following subsections expand on the Phase One CSM with the information collected during the completion of the Phase Two ESA.

6.8.1 *Potentially Contaminating Activities*

The Phase One ESA identified a total of eight PCAs within the Phase One Study Area that could potentially affect the environmental condition of the subsurface media on, in or under the Phase Two Property. As noted in the table below, four of the PCAs located within the Phase One Study Area, outside of the Phase Two Property were not considered to result in APECs at the Phase Two Property. The PCAs and their corresponding APECs at the Phase Two Property are summarized in the following table:

Area of Potential Environmental Concern	Location of Area of Potential Environmental Concern on Phase One Property	Potentially Contaminating Activity	Location of PCA (On-Site or Off-Site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil and/or Sediment)
APEC #1 (Former Coal-Storage)	Northwest portion of the Phase One Property, located in the boiler room of Site Building C	Other- Historical Coal-Storage	On-Site (PCA #1)	BTEX PHCs PAHs	Soil
APEC #2 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #2)	PHCs (F2-F4) PCBs	Soil
APEC #3 (Current on-Site Pole Mounted Transformer)	Central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #3)	PHCs (F2-F4) PCBs	Soil
APEC #4 (Current on-Site Pole Mounted Transformer)	Northeast-central portion of the Phase One Property	Item 55- Transformer Manufacturing, Processing and Use	On-Site (PCA #4)	PHCs (F2-F4) PCBs	Soil

Area of Potential Environmental Concern	**Location of Area of Potential Environmental Concern on Phase One Property**	**Potentially Contaminating Activity**	**Location of PCA (On-Site or Off-Site)**	**Contaminants of Potential Concern**	**Media Potentially Impacted (Groundwater, Soil and/or Sediment)**
NA (Three USTs associated with a private fuel outlet located at 1230 North Shore Boulevard East)	NA	Item 28- Gasoline and Associated Products Storage in Fixed Tanks	Off-Site	NA	NA
NA (One UST associated with an expired PFO was located at 1182 North Shore Boulevard East)	NA	Item 28- Gasoline and Associated Products Storage in Fixed Tanks	Off-Site	NA	NA
NA (pole-mounted transformer located immediately south-southeast of the Phase One Property)	NA	Item 55 – Transformer Manufacturing, Processing and Use	Off-Site	NA	NA
NA (pad-mounted transformer located at 1201 North Shore Boulevard East)	NA	Item 55 – Transformer Manufacturing, Processing and Use	Off-Site	NA	NA

Figures 4 and 5 show the locations of the on-Site PCAs/APECs and off-Site PCAs located within the Phase One Study Area.

6.8.2 Areas of Potential Environmental Concern

The Phase Two ESA included an assessment of soil quality within each of the APECs. A summary of the findings for each of the APECs is provided below.

APEC #1

According to the Site representative, the Site Buildings were historically heated by a coal-fired boiler located in the basement of Site Building C. At the time of Pinchin's Phase One ESA, evidence of three historical coal chutes were observed on the central-south exterior elevation of Site Building C which were connected to storage area within the basement boiler room. At the time of Pinchin's Phase One ESA, the Site Buildings were serviced by a natural gas-fired boiler and no coal storage was observed. The historical presence of coal storage at the Phase Two Property represented a PCA that required investigation as part of the Phase Two ESA. The subsurface investigation of APEC #1 as part of the Phase Two ESA included the advancement of two boreholes (BH01 and BH02). The soil samples submitted from the boreholes completed within APEC #1 were analyzed for BTEX, PHCs (F1-F4) and PAHs and met the *Table 3 Standards*.

APECs #2, 3 and 4

At the time of the Pinchin's Phase One ESA, three oil-containing pole-mounted transformers were observed in three separate locations to the north of Site Building B. The presence of oil-containing pole-mounted transformers at the Phase Two Property each represented a PCA that required investigation as part of the Phase Two ESA. The subsurface investigation of APECs #2, 3 and 4 as part of the Phase Two ESA included the advancement of a total of three boreholes (BH03, BH04 and BH05). The soil samples submitted from the boreholes completed within APECs #2, 3 and 4 were analyzed for PHCs (F2-F4) and PCBs and met the *Table 3 Standards*.

The following table summarizes the boreholes completed to investigate each of the APECs:

APEC	**Investigation Location**
APEC #1	BH01 and BH02
APEC #2	BH03
APEC #3	BH04
APEC #4	BH05

6.8.3 Subsurface Utilities and Construction Features

Underground utilities which are known or inferred to be present at the Phase Two Property include natural gas lines which traverse the Phase Two Property in a northwest/southeast direction, buried telephone lines located along the northeast boundary of the Phase Two Property and buried telecommunication lines surrounding Site Buildings A and B. Buried water utilities entered to the Site from North Shore Boulevard and runs along the east Site boundary. Buried storm and sanitary sewer lines are inferred to be located at various locations on the Phase Two Property; however, these could not be located at the time of the Phase Two ESA. Overhead electrical lines were located in various locations of the Phase Two Property. The approximate locations of these utilities are illustrated on Figure 5.

Interaction of the groundwater at the Phase Two Property with buried utilities is possible given that the inferred water table in some areas of the Phase Two Property is located at approximate depths of between 1.35 mbgs and 3.91 mbgs and the utilities are known to be located at depths ranging from approximately 2 to 3 mbgs. However, given that no soil impacts were identified at the Phase Two Property and that groundwater is not a media of concern, preferential migration of contaminants along utilities is not considered to be a concern.

6.8.4 Physical Setting

Based on the work completed as part of this Phase Two ESA, the following subsections provide a summary of the physical setting of the Phase Two Property.

Stratigraphy

The observed stratigraphy at the borehole locations completed for the Phase Two ESA generally consisted of sand and silt topsoil to approximately 0.76 mbgs followed by native silty clay to depth of 7.77 mbgs followed by inferred bedrock. The borehole locations are shown on Figures 5 and 6. Cross-sections summarizing the subsurface geological conditions at the time of the Phase Two ESA (i.e., prior to redevelopment) have been provided as Figures 6B and 6C.

Hydrogeological Characteristics

The groundwater flow direction in the confined aquifer at the Phase Two Property is inferred to be towards the southeast. Groundwater was not considered to be a media of potential concern and, as such, was not investigated as part of the Phase Two ESA.

Depth to Bedrock and Shallow Soil Property Assessment

The overburden/bedrock interface was not encountered during the drilling activities; however, sampler refusal was encountered between 5.94 and 7.77 mbgs on inferred bedrock. As such, the Phase Two Property is not a shallow soil property, as defined by Section 43.1 of O. Reg. 153/04.

Depth to Water Table

Based on water well records reviewed within the Phase One Study Area, the depth to the water table at the Phase Two Property is expected to be between 1.35 mbgs and 3.91 mbgs based on nearby well record identified in the Water Well Information System database.

Site Sensitivity

The pH values measured in the submitted soil samples were within the limits for non-sensitive sites. The Phase Two Property is also not an area of natural significance and it is not adjacent to, nor does it contain land within 30 metres of, an area of natural significance. As such, the Phase Two Property is not an environmentally sensitive area as defined by Section 41 of O. Reg. 153/04.

Soil Imported to Phase Two Property

No soil was imported to the Phase Two Property during completion of the Phase Two ESA.

Proposed Buildings and Other Structures

Pinchin understands that the future use of the Phase Two Property will be for a seniors living facility. Based on the development plans provided to Pinchin, the proposed building is to comprise of a 17 storey senior living facility with two levels of underground parking. The underground parking levels will also contain storage areas, mechanical and electrical rooms and a non-hazardous household waste holding areas. The proposed building will be located centrally on the Phase Two Property encompassing the majority of the Phase Two surface area. An amenity courtyard will be located centrally on the Phase Two Property and an asphalt covered driveway and ramp to underground parking area located on the north side of the Phase Two Property.

6.8.5 Applicable Site Condition Standards

Based on the grain size analysis of representative soil samples collected during the Phase Two ESA and the observed stratigraphy at the borehole locations, Pinchin concluded that over two-thirds of the overburden at the Phase Two Property is medium and fine-textured as defined by O. Reg. 153/04 and Site Condition Standards for coarse-textured soil were not applied.

Based on the information obtained from the Phase One and Two ESAs, the appropriate Site Condition Standards for the Phase Two Property are:

- "*Table 3: Full Depth Generic Site Condition Standards for Use in a Potable Ground Water Condition*", provided in the MOECC document entitled, "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*" dated April 15, 2011 (*Table 3 Standards*) for:
  - Medium/fine-textured soils; and
  - Residential/parkland/institutional property use.

Pinchin submitted notification to the City of Burlington and Halton Region indicating the intent to apply the non-potable ground water standards. At the time of writing this report, no response had been received from the City of Burlington and Halton Region. When a formal response is received, it will be reviewed by Pinchin. A copy of Pinchin's requests submitted to the City of Burlington and Halton Region are provided in Appendix F of this report.

6.8.6 Contaminants Exceeding Applicable Site Condition Standards in Soil

All soil samples collected during the Phase Two ESA met the applicable *Table 3 Standards* for the parameters analyzed.

6.8.7 Meteorological and Climatic Conditions

Minor temporal groundwater table fluctuations are expected to have had a minimal effect on contaminant distribution throughout the Phase Two Property, as no contaminants have been identified.

6.8.8 Soil Vapour Intrusion

No volatile parameters were identified at concentrations exceeding the *Table 3 Standards*. As such, soil vapour intrusion into buildings at the Phase Two Property is not considered a concern.

6.8.9 Contaminant Exposure Assessment

Given that all soil samples collected during the Phase Two ESA met the applicable *Table 3 Standards*, Pinchin considered that an evaluation of potential exposure pathways and receptors was unnecessary.

7.0 CONCLUSIONS

Pinchin completed a Phase Two ESA at the Phase Two Property in accordance with the requirements stipulated in O. Reg. 153/04 for the purpose of supporting development permit applications. Given there is no change in land use (i.e., residential to residential), there is no mandatory requirement to submit an RSC, nor is one being considered.

The Phase Two ESA completed by Pinchin included the advancement of five boreholes at the Phase Two Property.

Based on Site-specific information, the applicable regulatory standards for the Phase Two Property were determined to be the *Table 3 Standards* for residential land use and medium and fine-textured soils. Soil samples were collected from each of the borehole locations and submitted for laboratory analysis of BTEX, PHCs, PAHs and/or PCBs.

The laboratory results for the submitted soil samples indicated that all reported concentrations for the parameters analyzed met the corresponding *Table 3 Standards*. The maximum reported soil concentrations for the parameters analyzed are summarized in Table 2.

It is the opinion of the QP who supervised the Phase Two ESA that the applicable *Table 3 Standards* for soil at the Phase Two Property have been met as of the Certification Date of February 5, 2018 and that no further subsurface investigation is required in relation to assessing the environmental quality of soil at the Phase Two Property.

7.1 Signatures

This Phase Two ESA was undertaken under the supervision of Francesco Gagliardi, C.E.T., LET, QP_{ESA} in accordance with the requirements of O. Reg. 153/04.

7.2 Terms and Limitations

This Phase Two ESA was performed for Spruce Partners Inc. (Client) in order to investigate potential environmental impacts at 1157-1171 North Shore Boulevard East in Burlington, Ontario (Site). The term recognized environmental condition means the presence or likely presence of any hazardous substance on a property under conditions that indicate an existing release, past release, or a material threat of a release of a hazardous substance into structures on the property or into the ground, groundwater, or surface water of the property. This Phase Two ESA does not quantify the extent of the current and/or recognized environmental condition or the cost of any remediation.

Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations. Samples have been analyzed for a limited number of contaminants that are expected to be present at the Site, and the absence of information relating to a specific contaminant does not indicate that it is not present.

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions on a property. Performance of this Phase Two ESA to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions on the Site, and recognizes reasonable limits on time and cost.

This Phase Two ESA was performed in general compliance with currently acceptable practices for environmental site investigations, and specific Client requests, as applicable to this Site.

This report was prepared for the exclusive use of the Client, as well as the City of Burlington and Halton Region, subject to the terms, conditions and limitations contained within the duly authorized proposal for this project. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted.

If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

8.0 REFERENCES

The following documents provided information used in this report:

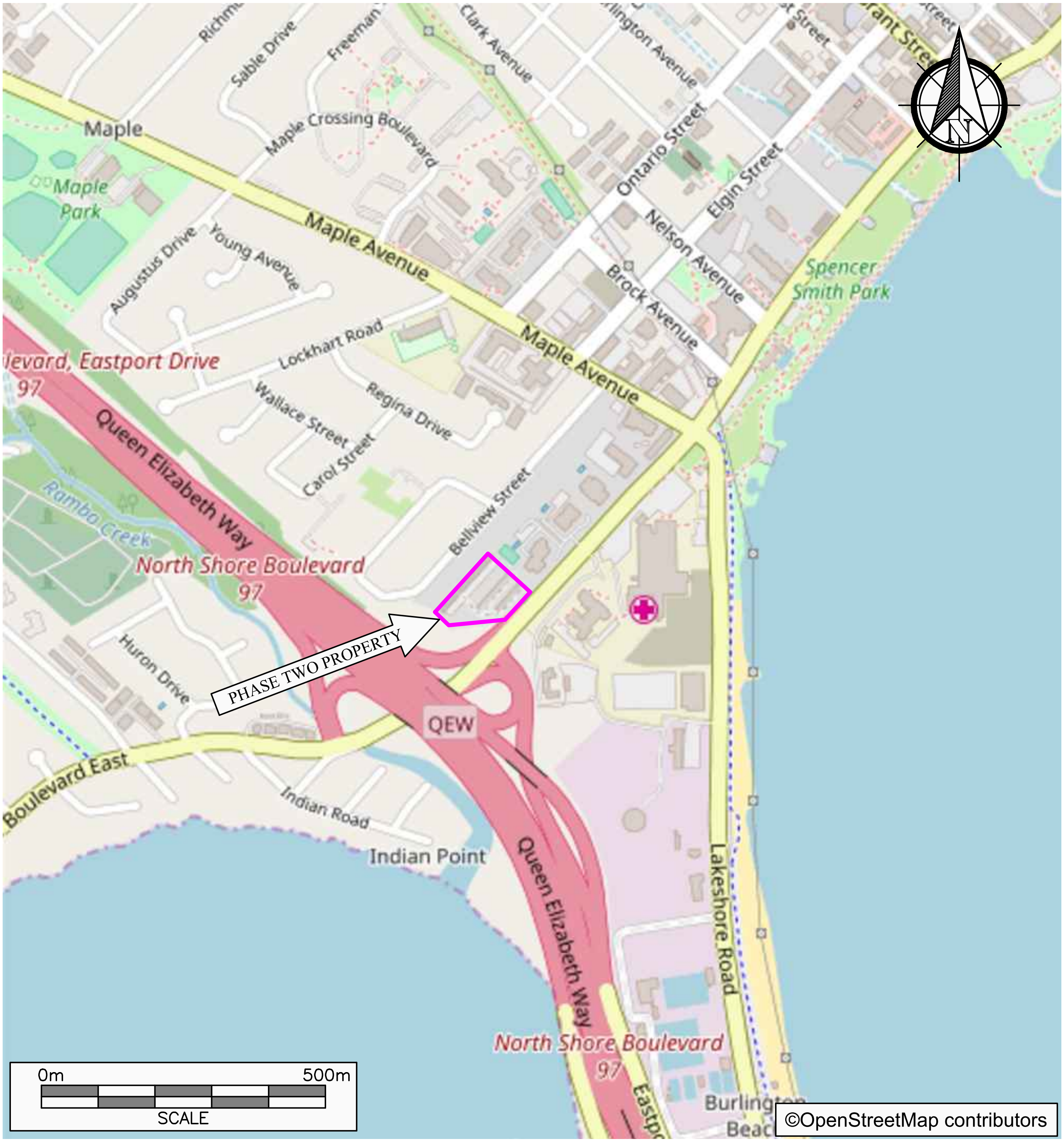
- Association of Professional Geoscientists of Ontario. Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended). April 2011.
- Ontario Ministry of the Environment. Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario. December 1996.
- Ontario Ministry of the Environment. Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. March 9, 2004 amended July 1, 2011.
- Ontario Ministry of the Environment. Soil, Groundwater and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act. April 15, 2011.
- Pinchin Ltd. Draft Phase One Environmental Site Assessment, 1157-1171 North Service Boulevard, Burlington, Ontario. Prepared for Spruce Partners Inc., March 9, 2018.
- Province of Ontario. Environmental Protection Act, R.S.O 1990, Chapter E.19.
- Province of Ontario. R.R.O. 1990, Regulation 347, General – Waste Management, as amended by Ontario Regulation 234/11.
- Province of Ontario. Ontario Regulation 153/04: Records of Site Condition – Part XV.1 of the Act. Last amended by Ontario Regulation 312/17 on July 28, 2017.
- U.S. Environmental Protection Agency - Region 1. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. Revised January 19, 2010.

J:\212000s\0212394.000 Phase I ESA_1157-1171 North Shore Blvd\0212394.001 Spruce_1157-1171NorthShoreBlvd_EDR PhTwo\Deliverables\212394.001 RSC Phase II, 115-1171 North Shore Blvd., Burlington - Sept 13, 2018.docx

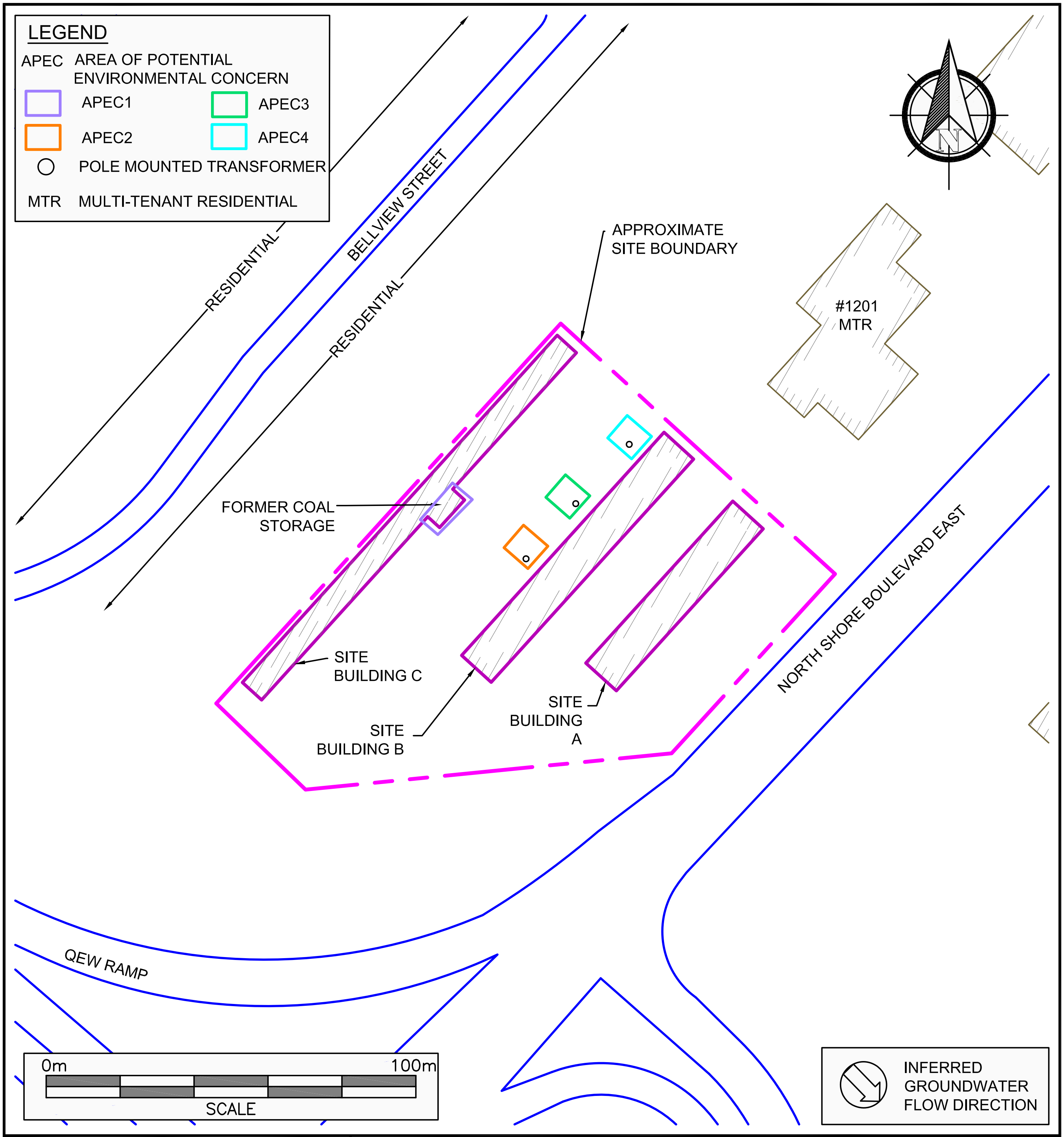
Template: Master Report for RSC Phase Two ESA Report – Unimpacted Site, EDR, February 2, 2018

APPENDIX I

Figures

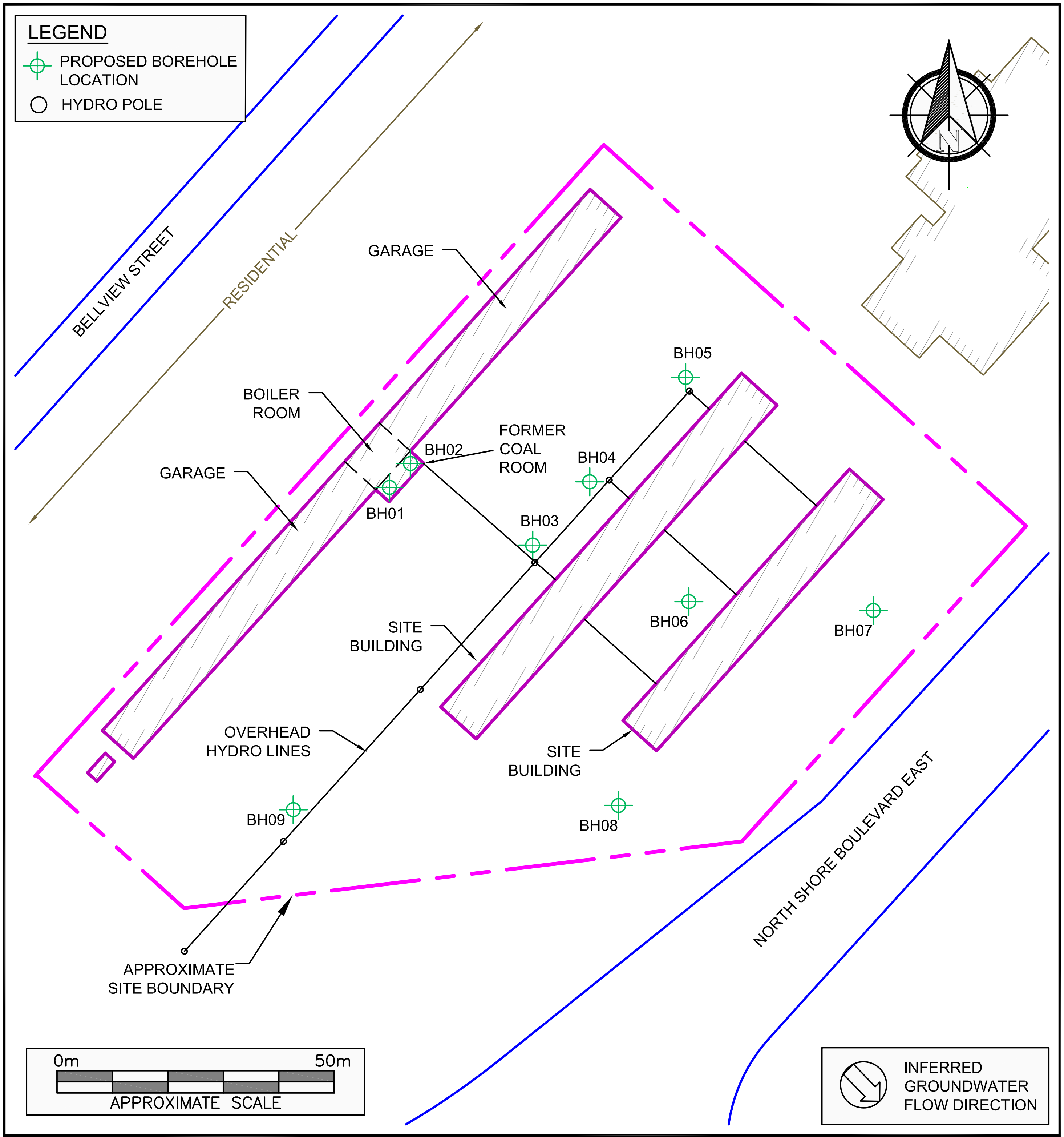


PROJECT NAME	SAMPLING AND ANALYSIS PLAN
CLIENT NAME	SPRUCE PARTNERS INC.
PROJECT LOCATION	1157-1171 NORTH SHORE BOULEVARD EAST, BURLINGTON, ONTARIO
FIGURE NAME	KEY MAP
FIGURE NO.	1
SCALE	AS SHOWN
PROJECT NO.	212394.001
DATE	JAN. 2018



PINCHIN

PROJECT NAME SAMPLING AND ANALYSIS PLAN			
CLIENT NAME SPRUCE PARTNERS INC.			
PROJECT LOCATION 1157-1171 NORTH SHORE BOULEVARD EAST, BURLINGTON, ONTARIO			
FIGURE NAME AREAS OF POTENTIAL ENVIRONMENTAL CONCERN			FIGURE NO. 2
SCALE AS SHOWN	PROJECT NO. 212394.001	DATE JAN. 2018	



PINCHIN

PROJECT NAME
SAMPLING AND ANALYSIS PLAN

CLIENT NAME
SPRUCE PARTNERS INC.

PROJECT LOCATION
1157-1171 NORTH SHORE BOULEVARD EAST, BURLINGTON, ONTARIO

FIGURE NAME
PROPOSED BOREHOLE LOCATION

FIGURE NO.
3

SCALE	PROJECT NO.	DATE
AS SHOWN	212394.001	JAN. 2018

APPENDIX II

Table

TABLE 1

PHASE TWO ESA SCOPE OF WORK SUMMARY

Spruce Partners Inc.

1157 - 1171 North Shore Boulevard East, Burlington, Ontario

APEC #	Sampling Location	Media Sampled	COPCs					Number of Samples Submitted for Analysis	Soil Sampling Depth Interval (mbgs/mbfs)	Sampling Frequency	Sampling System	Rationale/Notes
			PHCs (F1-F4)	PHCs (F2-F4)	BTEX	PAHs	PCBs					
1	BH1	Soil	●		●	●		1	0 - 1.5	Continous	Judgemental	Assess soil quality in relation to a former on-Site coal storage (PCA #1) within Site Building C.
	BH2	Soil	●		●	●		1	0 - 1.5	Continous	Judgemental	
2	BH3	Soil		●			●	1	0 - 1.5	Soil cores every 0.61 m	Judgemental	Assess soil quality in relation to three on-Site pole-mounted transformers (PCAs #2 to 4).
3	BH4	Soil		●			●	1	0 - 1.5		Judgemental	
4	BH5	Soil		●			●	1	0 - 1.5		Judgemental	

Notes:

PHCs	Petroleum Hydrocarbons
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
APEC	Area of Potential Environmental Concern
COPCs	Contaminants of Potential Concern
m	Metres
mbgs	Metres Below Ground Surface
mbfs	Metres Below Floor Surface
PCA	Potentially Contaminating Activity

APPENDIX III

Pinchin Standard Operating Procedures

SOP – EDR003 – REV004 – FIELD SCREENING OF SOIL SAMPLES

Title:	Field Screening of Soil Samples
Practice:	EDR
First Effective Date:	June 16, 2009
Version:	004
Version Date:	January 3, 2018
Author:	Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

TABLE OF CONTENTS

1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	June 16, 2009	N/A	MEM
001	November 26, 2010	Update approval signature	FG
002	September 25, 2013	Revised SOP to reflect current practices/Added section on O.Reg. 153/04 compliance	RLM
003	April 29, 2016	Updated Section 4.0/Modified time between readings to 1 hour	RLM
004	April 28, 2017	Removed reference to Pinchin West/In Section 5.2, clarified that soil vapour measurements do not need to be made within one hour of sampling during winter conditions	RLM
004	January 3, 2018	Reviewed and confirmed current	RLM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) presents the quantitative and qualitative methods to be used by Pinchin field personnel for field screening soil samples for potential impacts during field investigations.

The quantitative part of field screening consists of the measurement of vapour concentrations in soil sample headspace in order to assess the potential for volatile constituents to be present in the soil. The soil vapour readings obtained from these measurements are then used to assist in selecting potential "worst case" soil samples for submission to the laboratory for analysis. There are no regulatory standards for comparison with soil headspace vapour readings and we are using the general principle that the sample with the highest soil headspace vapour concentration from a group of samples is often the most likely to be impacted by volatile constituents.

The qualitative part of field screening includes assessing the soil for visual or olfactory indicators of potential contamination and is used in conjunction with the soil headspace vapour readings to select "worst case" soil samples to be submitted for laboratory analysis.

Note that soil vapour measurements have limited value when selecting "worst case" soil samples for laboratory analysis of non-volatile parameters such as metals. Visual observations of the presence of staining and debris (e.g., brick fragments and other building materials, coal ash, etc.), along with sample depth and likely migration pathways are to be factored into selecting the samples. The sample with the highest soil headspace vapour reading is not automatically selected under these circumstances.

Soil samples collected for soil vapour measurement must not be submitted for laboratory analysis except for analysis of non-volatile parameters (i.e., metals and inorganics) or grain size analysis.

This SOP also applies to the field screening of sediment samples but for simplicity, only soil samples are referred to below.

3.0 OVERVIEW

Not applicable.

4.0 DISTRIBUTION

This is an on-line document. Paper copies are valid only on the day they are printed. Refer to the author if you are in any doubt about the accuracy of this document.

This SOP will be distributed to all Pinchin staff and others as follows:

- Posted to the SOP section of the Environmental Due Diligence and Remediation (EDR) Practice Line on the Pinchin Orchard; and
- Distributed to senior staff at Le Groupe Gesfor Poirier and Pinchin LeBlanc for distribution as appropriate.

5.0 PROCEDURE

5.1 Equipment and Supplies

- Resealable plastic bags (e.g., Ziploc®);

  (Note that small capacity bags (e.g., 500 millilitre capacity) are preferred over larger sized bags. When conducting headspace screening of a set of soil samples, the size of bag used should be consistent throughout in order to maintain the same approximate headspace volume in each bag);
- Combustible gas indicator (CGI) capable of operating in methane-elimination and/or photo-ionization detector (PID);

  (The Project Manager will be responsible for selecting the appropriate instrument(s) for each project. CGIs (e.g., RKI Eagle or Gastechtor) are acceptable for screening of petroleum hydrocarbons (PHCs) and related compounds, whereas PIDs (e.g., MiniRAE) are acceptable for screening for volatile organic compounds (VOCs), including chlorinated solvents, but can also be used when screening for PHCs. For many projects, it will be appropriate to employ both a CGI and a PID); and
- Calibration equipment (e.g., calibration gas, regulators, tubing, calibration bags, etc. as provided by the equipment supplier).

5.2 Soil Headspace Vapour Measurement Procedure

The procedure for conducting soil headspace vapour measurements for soil sample headspace is as follows:

1. Unless pre-calibrated by the equipment supplier, calibrate the CGI/PID as per the instrument manufacturer's instructions before commencing soil vapour measurements. Record the date and time of calibration, and type and concentration of the calibration gas used in the field logbook or field forms;
2. Label the plastic bag with the sample number;
3. Create a split soil sample by splitting the sample core vertically (i.e., along the longitudinal axis) with one half used for soil headspace vapour measurement and the other half used to fill sample jars for laboratory analysis of volatile parameters (e.g., VOCs and PHCs (F1 fraction)). In other words, the depth interval of the soil subjected to soil headspace vapour measurements should be the same as the depth interval from which samples for volatile parameters are collected. This procedure doesn't apply to grab samples but is to be completed when soil cores are obtained, such as sampling with dual tube samplers, split-spoon samplers and hand augers. For grab samples, soil used for laboratory analysis and soil headspace vapour measurements should be collected from proximal locations;
4. Place the soil into the plastic bag until the bag is approximately one-quarter full as soon as possible after the sampling device is retrieved/opened;
5. Seal the bag and break apart the soil by manually kneading the soil in the sealed bag;
6. Allow the soil sample to equilibrate at ambient temperature for a minimum of 5 minutes but no longer than one hour before taking a soil headspace vapour measurement. The exception to this is that during winter conditions, the soil samples should be placed in a heated environment (e.g., building interior) to warm up for a minimum of 15 minutes before taking soil vapour measurements. In this case, the soil vapour measurements do not need to be completed within one hour of sample collection;
7. Do not store the bagged soil samples in direct sunlight prior to taking soil headspace vapour measurements;
8. When conducting soil headspace vapour measurements with a CGI, make sure it is switched to methane elimination mode;
9. When completing soil headspace vapour measurements of a soil sample using both a PID and CGI, the vapour measurement using the PID should be made first;

10. Immediately before taking a soil headspace vapour measurement, gently agitate the bag and then create a small opening in the top of the bag. Insert the tip of the CGI/PID into the headspace of the bag and quickly reseal the bag around the tip to minimize leakage. If there is any water inside the bag, ensure that the tip does not contact the water;
11. Record the maximum vapour concentration measured within the first 10 seconds after inserting the tip of the CGI/PID into the bag. Note any anomalies that occur during the taking of the measurement (e.g., if the readings displayed by the instrument progressively increase and do not reach an obvious peak);
12. Remove the tip of the CGI/PID from the bag and reseal the bag immediately in case additional soil headspace vapour measurements are needed. If the soil headspace vapour is measured for a sample using a PID and an additional measurement with a CGI is required, wait a minimum of five minutes after the bag is resealed before taking the measurement with the CGI;
13. Before completing the next soil headspace vapour measurement, allow the CGI/PID to reach “zero” or “baseline”. If the CGI/PID does not return to “zero” or “baseline” it should be recalibrated before further soil headspace vapour measurements are made; and
14. At the discretion of the Project Manager, a calibration check of the CGI/PID should be completed at least once per day or at a frequency of once per 100 soil headspace vapour measurements (for projects where numerous soil headspace vapour measurements are made on a daily basis such as a large remediation project). A calibration check is made by measuring the concentration of a sample of the calibration gas with the CGI/PID without making any adjustments to the instrument beforehand and comparing the measured concentration with the known concentration. The comparison of the measured concentration versus the actual concentration of the calibration gas indicates how much the instrument’s calibration may have been altered during soil headspace vapour measurements, which is known as “instrument drift”. Should the calibration check show instrument drift of more than 10%, the CGI/PID needs to be recalibrated before completing further soil headspace vapour measurements. Record all pertinent information for the calibration check (e.g., date and time, initial measured concentration, calibration gas type and concentration) in the field logbook or field forms.

5.3 Visual Screening

Visual screening consists of examining the soil sample for potential indicators of contamination as per the following:

1. Visually examine the soil sample, including breaking apart a portion of the sample;

2. Note any indications of a mottled appearance, dark discolouration or staining, free-phase product or unusual colour;
3. Note any indications of non-soil constituents, such as brick, asphalt, wood or concrete fragments, coal fragments, coal ash, etc.; and
4. Record the findings of the visual screening in the field logbook or field forms. If there is no visual evidence of impacts this should be noted.

5.4 Olfactory Screening

Record in the field logbook or field forms the presence of any odours noted during sample collection and visual screening. Field staff are not expected to directly smell soil samples to assess the presence/absence of odours.

If it is possible to identify the likely type of odour (e.g., PHC-like, solvent-like, etc.) then this information should be recorded along with a comment on the severity of the odour (e.g., slight, strong, etc.). If the odour cannot be readily identified, it should be described in the field notes as “unidentified odour”.

If no odours are observed, this information should also be recorded in the field logbook or field forms.

5.5 Additional Considerations for Ontario Regulation 153/04 Phase Two ESA Compliance

When completing a Phase Two Environmental Assessment (ESA) in accordance with Ontario Regulation 153/04, the following additional procedures must be undertaken:

- Calibration of the CGI/PID must be completed at the beginning of each field day and calibration checks must be made either at the end of each field day or after every 100 soil vapour readings (whichever occurs first); and
- Thorough records of the CGI/PID calibration and calibration checks must be kept, including any calibration sheets provided by the equipment supplier. The Quality Assurance/Quality Control section of the Phase Two ESA report requires a discussion of field screening instrument calibration, and equipment calibration records must be appended to the Phase Two ESA report.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of *Health & Safety Training* by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

Association of Professional Geoscientists of Ontario, *Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended),* April 2011.

Ontario Ministry of the Environment, *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*, December 1996.

9.0 APPENDICES

None.

I:\2018 SOP Updates\SOP - EDR003 - REV004 - Field Screening of Soil Samples.docx

Template: Master SOP Template – February 2014

SOP – EDR006 – REV003 – BOREHOLE DRILLING

Title:	Borehole Drilling
Practice:	EDR
First Effective Date:	November 25, 2010
Version:	003
Version Date:	January 3, 2018
Author:	Francesco Gagliardi and Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

TABLE OF CONTENTS

1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	November 25, 2010	N/A	FG
001	November 22, 2013	Streamlined text to reflect most common current practices/Removed sections covered by other SOPs	RM
002	April 29, 2016	Updated Section 4.0	RM
003	April 28, 2017	Removed reference to Pinchin West	RM
003	January 3, 2018	Reviewed and confirmed current	RM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) presents a description of the methods employed for the completion of boreholes and the collection of subsurface soil samples.

Boreholes are typically completed to determine geologic conditions for hydrogeological evaluation, to allow the installation of monitoring wells, and to allow for the collection of subsurface soil samples for laboratory analysis.

Several methods are available for the collection of shallow subsurface soil samples using hand-held equipment (e.g., hand augers, post-hole augers). However, the use of a drill rig, equipped with direct-push tooling, solid-stem augers and/or hollow-stem augers, is the most common method used by Pinchin to advance boreholes and will be the focus of this SOP.

A detailed discussion of all the various drilling rigs and drilling methods (e.g., direct push, augering, sonic drilling, air/water/mud rotary drilling, etc.) is beyond the scope of this SOP. The Project Manager will be responsible for determining the appropriate drill rig and drilling method for the site investigation.

The majority of the site investigations completed by Pinchin involve relatively straightforward drilling within the overburden within a one aquifer system. In some situations, such as when multiple aquifers are spanned by a borehole, when drilling into bedrock or when there are known impacts in the shallow subsurface, drilling using telescoped casing methods may be appropriate. Telescoped casing and bedrock drilling methods are beyond the scope of this SOP. In these situations, the Project Manager, in consultation with the drilling contractor, will be required to confirm the drilling requirements and procedures.

3.0 OVERVIEW

Not applicable.

4.0 DISTRIBUTION

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5.0 PROCEDURE

5.1 General

The overall borehole drilling program is to be managed in accordance with SOP-EDR005. In particular, utility locates must be completed in accordance with SOP-EDR021 before any drilling activities commence.

All non-dedicated drilling and sample collection equipment must be decontaminated in accordance with SOP-EDR009.

5.2 Prior Planning and Preparation

The planning requirements for borehole drilling programs are covered in detail in SOP-EDR005.

As noted above, the type of drilling rig and drilling method will be determined by the Project Manager when scoping out the site investigation. In some cases, a switch in drilling rig and/or drilling method may be required depending on site conditions. For example, if competent bedrock is encountered in the subsurface at a depth above the water table, bedrock coring would be required to advance the borehole deep enough to install a monitoring well.

5.3 Borehole Drilling Procedures

Once the final location for a proposed boring has been selected and utility clearances are complete, one last visual check of the immediate area should be performed before drilling proceeds. This last visual check should confirm the locations of any adjacent utilities (subsurface or overhead) and verification of adequate clearance.

In some instances, in particular where there is uncertainty regarding the location of buried utilities or the borehole is being completed near a buried utility, the use of a hydro-excavating (hydro-vac) unit will be required to advance the borehole to a depth below the bottom of the utility. The hydro-vac uses a combination of high-pressure water and high-suction vacuum (in the form of a vacuum truck) to excavate soil. This is also known as “daylighting”. The need to use a hydro-vac will be determined by the Project Manager.

If it is necessary to relocate any proposed borehole due to terrain, utilities, access, etc., the Project Manager must be notified and an alternate location will be selected.

5.4 Borehole Nomenclature

If a borehole is advanced strictly for the purpose of soil sampling and no monitoring well is installed, the borehole should be identified as “BHxx”. If a monitoring well is installed in a borehole, the borehole should be identified as “MWxx”.

To avoid confusion, for site investigations involving both boreholes and monitoring wells, the numerical identifiers are to be sequential (e.g., there should not be a BH01 and MW01 for the same project).

When completing supplemental drilling programs, the borehole number should start at either the next sequential number after the last borehole number used in the first stage, or label them as ‘100 series’, ‘200 series’, etc. as appropriate (e.g., BH101, MW102, etc. for the first series of additional boreholes).

It is also acceptable to add the 2 digit year either before or after the borehole or monitoring well name (e.g., 17-MW101 or MW101-17).

5.5 Borehole Advancement

Each borehole will be advanced incrementally to permit intermittent or continuous sampling as specified by the Project Manager. Typically, the sampling frequency is one sample for every 2.5 or 5 feet (0.75 or 1.5 metres) the borehole is advanced. At the discretion of the Project Manager, soil samples may be collected at a lower frequency in homogeneous soil or at a higher frequency if changes in stratigraphy or other visual observations warrant it.

5.6 Direct-Push Drilling

This method is most commonly used at Pinchin to obtain representative samples of the subsurface soil material at a site. Direct-push drilling is achieved by driving a steel sampler into the subsurface at 1.5 metre intervals until the desired depth is achieved. The samplers are advanced by the drilling rig by means of a hydraulic hammer. For each soil sample run, a dedicated PVC sample liner is placed within the steel sampler which collects the soil as the sampler is advanced. After each sample run, a new sampler is assembled and it is advanced deeper down the open borehole.

There are generally two methods of direct-push drilling which are used:

- Dual-tube sampling; and
- Macro-core sampling.

A dual-tube sampler consists of an 8.25 centimetre (cm) inner diameter steel tooling (outer tube), equipped with a steel cutting-shoe affixed to the advancing end. A smaller diameter steel tooling, consisting of a 5.75 cm inner diameter (inner tube), fits within the outer tube and contains a PVC sample liner within. These two tubes form the completed dual-tube sampler. The completed dual-tube sampler has a length of 1.5 metres.

A macro-core sampler consists of the smaller inner tube (mentioned above) used independently. The macro-core sampler measures approximately 1.5 metres in length.

The difference in drilling methods used is typically determined by soil conditions. Where soil conditions consist of tight or dense soil types (e.g., silts or clays), the macro-core sampling method may be used as this method provides less resistance to advancing the sampler. In soil types that are less resistive (e.g., loose sands), the dual-tube sampler may be used.

5.7 Auger Drilling (Split-Spoon)

The auger drilling method for borehole advancement and sampling involves using an auger drill rig to advance the borehole to the desired sampling depth and sampling with a split-spoon sampler. Borehole advancement with hollow stem augers is the preferred drilling method when sampling with split-spoon samplers as it minimizes the potential for sloughed material to reach the bottom of a borehole and possibly cross-contaminate samples when the split-spoon is driven beyond the bottom of the borehole. Solid stem augers can be used when drilling at sites with cohesive soils (e.g., silty clay), provided that the borehole remains open after the augers are removed from the ground prior to driving the split-spoon sampler.

The split-spoon sampler consists of an 18- or 24-inch (0.45- or 0.60-metre) long, 2-inch (5.1 cm) outside diameter tube, which comes apart lengthwise into two halves.

Once the borehole is advanced to the target depth, the sampler is driven continuously for either 18 or 24 inches (0.45 or 0.60 metres) by a 140-pound (63.5 kilogram) hammer. The hammer may be lifted and dropped by either the cathead and rope method, or by using an automatic or semi-automatic drop system.

The number of blows applied in each 6-inch (0.15 metre) increment is counted until one of the following occurs:

- A total of 50 blows have been applied during any one of the 6-inch (0.15 metre) increments described above;
- A total of 100 blows have been applied;

- There is no advancement of the sampler during the application of ten successive blows of the hammer (i.e., the spoon is "bouncing" on a cobble or bedrock); or
- The sampler has advanced the complete 18 or 24 inches (0.45 or 0.60 metre) without the limiting blow counts occurring as described above.

On the field form, record the number of blows required to drive each 6-inch (0.15 metre) increment of penetration. The first 6 inches is considered to be a seating drive.

The sum of the number of blows required for the second and third 6 inches (0.15 metres) of penetration is termed the "standard penetration resistance" or the "N-value". This information is typically provided on the borehole logs included in our site investigation reports.

The drill rods are then removed from the borehole and the split-spoon sampler unthreaded from the drill rods.

Caution must be used when drilling with augers below the groundwater table, particularly in sandy or silty soils. These soils tend to heave or "blow back" up the borehole due to the difference in hydraulic pressure between the inside of the borehole and the undisturbed formation soil. If blowback occurs, the drilling contractor will introduce water or drilling mud into the borehole or inside of the hollow-stem augers (if used) to equalize the hydraulic pressure and permit drilling deeper to proceed.

Heaving conditions and the use of water or drilling mud must be noted on the field logs, including the approximate volume of water or drilling mud used.

5.8 Auger Drilling (Direct Sampling)

In some jurisdictions (e.g., BC, Manitoba) it may be acceptable to collect soil samples directly from auger flights when using solid stem augers.

When sampling directly from auger flights, care must be exercised not to collect soils that were in direct contact with the auger or that were smeared along the edge of the borehole.

5.9 Borehole Advancement In Bedrock

It is sometimes possible to advance augers through weathered bedrock but borehole advancement through competent bedrock requires alternate drilling procedures. Bedrock drilling can be accomplished by advancing core barrels or tri-cone bits using air rotary or water rotary drilling methods. A description of the various bedrock drilling procedures is beyond the scope of this SOP.

The bedrock drilling method selected will depend in part on the type of bedrock, the borehole depth required, whether bedrock core logging is required, whether telescoped casing is required, etc. The Project Manager, in consultation with the drilling contractor, will determine the best method for advancing boreholes in competent bedrock.

5.10 Borehole Soil Sample Logging and Collection

The following describes the methods for logging and collection of samples from a split-spoon or direct-push sampler but can be adapted for sample collection from augers:

1. After the driller opens the split-spoon sampler or PVC liner, measure the length of the soil core retained in the sampler in inches or centimetres. Be sure to be consistent in the use of metric or imperial units, and that the units used are clearly noted in the field notes. The percentage of soil retained versus the length of the sampler is known as “sample recovery” and this information is presented on the borehole logs within our Phase II ESA reports;
2. Dedicated, disposable nitrile gloves are to be worn during soil logging and sampling;
3. When using a dual-tube or macro-core sampler with direct-push drilling, there is usually sufficient sample recovery to permit the collection of two soil samples from each sample run. In this case, if the sample recovery is greater than 2.5 feet (0.75 metres), divide the recovered soil into two depth intervals and log/collect a sample from each interval. Split-spoon samplers typically are not long enough nor provide enough sample to divide a sample run into two. However, if a recovered sample contains distinct stratigraphic units (e.g., fill material and native material, obviously impacted soil and non-impacted soil), the distinct units are to be sampled separately. It is especially important that potentially impacted soil (e.g., fill material, obviously impacted soil) is not mixed with potentially unimpacted soil (e.g., native soil, soil without obvious impacts) to form one sample;
4. Discard the top several centimetres in each core as this material is the most likely to have sloughed off the borehole wall and may not be representative of the soil from the intended depth interval;
5. To minimize the potential for cross-contamination, scrape the exterior of the soil core with a clean, stainless-steel putty knife, trowel or similar device to remove any smeared soil. Note that is not practical and can be skipped if the soil is non-cohesive (e.g., loose sand);
6. Split the soil core longitudinally along the length of the sampler and to the extent practical, collect the soil samples for laboratory analysis from the centre of the core (i.e., soil that has not contacted the sampler walls). When sampling directly from augers, soils in direct contact with the auger or soils retained on the augers that may have been in contact with the edge of the borehole should not be collected.

   Collect soil samples for potential volatile parameter analysis and soil vapour measurement (in that order) as soon as possible after the core is opened. The length of time between opening the sampler and sample collection for these parameters should not exceed 2 minutes. It is important to follow this as it minimizes the potential for volatile constituents in the soil to be lost. See SOP-EDR003 for additional details regarding the collection of soil samples for soil vapour measurement;

7. Drillers are not to open the split-spoon sampler or PVC liner until instructed to do so. If drilling and sample retrieval is occurring at a rate faster than Pinchin staff are able to sample and log the soil cores, the drillers are to be instructed to slow down or stop until further notice. This will prevent a back log of soil cores from accumulating and minimize the exposure of the soil cores to ambient conditions. This is particularly important when sampling for VOCs;
8. Collect soil samples for the remaining parameters to be analyzed;
9. Soil samples are to be labelled and handled in accordance with SOP-EDR013;
10. Record the parameters sampled for, the type(s) and number of sample containers, and the time and date of sample collection in the field notes;
11. Determine the soil texture in accordance with SOP-EDR019 and record this information in the field notes;
12. Soil samples collected for soil headspace vapour measurement must not be submitted for laboratory analysis except for analysis of non-volatile parameters (i.e., metals and inorganics) or grain size analysis;
13. Immediately following collection, place each sample container in a cooler containing ice bags or ice packs; and
14. After the maximum borehole drilling depth is reached, measure the borehole depth with a weighted measuring tape and record the total depth in the field notes if the borehole diameter is large enough to permit measurement.

5.11 Borehole Backfilling.

Following completion of each borehole in which a well is not installed, it must be properly backfilled with bentonite and/or bentonite grout by the drilling contractor. The drilling contractor is to be consulted to confirm the proper borehole abandonment procedures required by the local regulations (e.g., Ontario Regulation 903 for Ontario sites).

Drill cuttings are not be used to backfill boreholes.

Record the borehole backfilling method and materials used in the field notes.

5.12 Borehole Location Documentation

For each borehole, complete the following to document its location:

1. Photograph the completed borehole location. Close up photographs of the borehole are to be taken as well as more distant photographs that show the location of site landmarks relative to the borehole so that the photograph can be used to locate the borehole in the future; and
2. Using a measuring tape or measuring wheel, measure the distance between the borehole and a nearby landmark (e.g., corner of the nearest building) and provide a borehole location sketch in the field notes. Measurements are to be made at right angles relative to the orientation of the landmark or to a fixed axis (e.g., relative to true north). If required by the Project Manager, measure the UTM coordinates of the borehole with a hand-held GPS device.

5.13 Field Notes

The field notes must document all drilling equipment used, sample depths and measurements collected during the borehole drilling activities. The field notes must be legible and concise such that the entire borehole drilling and soil sampling event can be reconstructed later for future reference. The field notes are to be recorded on the field forms or in a field book.

5.14 Additional Considerations for O. Reg. 153/04 Phase Two ESA Compliance

None. Following this SOP will be sufficient to comply with the Ontario Regulation 153/04 requirements for Phase Two Environmental Site Assessments.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of Health & Safety Training by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

Canadian Standards Association, *Phase II Environmental Site Assessment, CSA Standard Z769-00 (R2008)*, dated 2000 and reaffirmed in 2008.

Association of Professional Geoscientists of Ontario, *Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended)*, April 2011.

9.0 APPENDICES

None.

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Template: Master SOP Template – February 2014

SOP – EDR009 – REV004 – FIELD DECONTAMINATION OF NON-DEDICATED MONITORING AND SAMPLING EQUIPMENT

Title:	Field Decontamination of Non-Dedicated Monitoring and Sampling Equipment
Practice:	EDR
First Effective Date:	August 03, 2009
Version:	004
Version Date:	January 3, 2018
Author:	Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

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1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	August 02, 2009	N/A	MEM
001	November 26, 2010	Updated Approval Signature/Added reference to Ontario Regulation 511/09	FG
002	September 20, 2013	Revised majority of text to reflect current practices/Focused on equipment cleaning and removed reference to personnel decontamination/Added section on O. Reg. 153/04 requirements/Revised reference list	RLM
003	April 29, 2016	Updated Section 4.0/Removed methanol as optional cleaning reagent	RLM
004	April 28, 2017	Removed reference to Pinchin West/In Section 5.2.2, modified requirements for cleaning water level tapes and interface probes/In Section 5.2.3, modified requirements for cleaning electrical or retrieval cables for pumps	RLM
004	January 3, 2018	Reviewed and confirmed current	RLM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) presents the general requirements for field decontamination of non-dedicated equipment used for monitoring of environmental media and the collection of environmental samples (i.e., equipment that is re-used between monitoring and sampling locations). Note that the procedures described in this SOP also apply to pumps used for well development.

3.0 OVERVIEW

The main purpose of non-dedicated monitoring and sampling equipment decontamination is to minimize the potential for cross-contamination during monitoring/sampling activities completed for site investigations. Cross-contamination can occur when equipment used to monitor/sample contaminated soil, groundwater or sediment is reused at another monitoring/sampling location without cleaning. This can result in the transfer of contaminants from a “dirty” monitoring/sampling location to a “clean” monitoring/sampling location, causing possible positive bias of subsequent samples. Positive sample bias can result in reported analytical results that are not representative of actual site conditions and, if significant cross-contamination occurs, can result in reported exceedances of the applicable regulatory standards for samples that would have met the standards had cross-contamination not occurred.

Site investigations completed by Pinchin typically use the following non-dedicated monitoring/sampling equipment:

- Manually operated equipment (e.g., water level tapes/interface probes using during groundwater monitoring and sampling, knifes/spatulas used for soil sampling, hand augers);
- Pumps for groundwater monitoring well development, purging and/or sampling (e.g., bladder pumps, submersible pumps); and
- Downhole drilling/sampling equipment (e.g., split-spoon samplers, augers).

The above list is not all inclusive and other non-dedicated monitoring/sampling equipment may be employed during a site investigation that requires decontamination. For example, it may be appropriate to decontaminate the bucket of a backhoe used for test pitting between test pit locations. The Project Manager will be responsible for identifying the additional monitoring/sampling equipment that requires decontamination and instructing field staff regarding the procedure to be followed for cleaning this equipment.

When conducting field monitoring and sampling work in the field, it is not always possible to judge whether a monitoring/sampling location is uncontaminated. Because of this, it is important that all non-dedicated monitoring/sampling equipment be properly cleaned before initial use and between uses to minimize the potential for cross-contamination to occur.

4.0 DISTRIBUTION

This is an on-line document. Paper copies are valid only on the day they are printed. Refer to the author if you are in any doubt about the accuracy of this document.

This SOP will be distributed to all Pinchin staff and others as follows:

- Posted to the SOP section of the Environmental Due Diligence and Remediation (EDR) Practice Line on the Pinchin Orchard; and
- Distributed to senior staff at Le Groupe Gesfor Poirier and Pinchin LeBlanc for distribution as appropriate.

5.0 PROCEDURE

5.1 Equipment and Supplies

The following is a list of equipment needed to perform the decontamination of non-dedicated monitoring and sampling equipment in accordance with this SOP:

- Personal Protective Equipment (PPE);
- Potable tap water;
- Distilled water (store bought);

- Volatile organic compound (VOC)-free deionized distilled water (supplied by the analytical laboratory);
- Laboratory grade, phosphate-free soap;
- Wash buckets (minimum of three);
- Scrub brushes;
- Paper towels; and
- Buckets or drums with resealable lids for containing liquids generated by equipment cleaning.

Other equipment required to clean drilling equipment (e.g., steam cleaner, power washer, tub for containing wash water, etc.) is typically provided by the drilling subcontractor. The Project Manager is responsible for ensuring that the drilling subcontractor brings the required cleaning equipment to the project site. Prior to mobilization, the Project Manager should also assess the availability of a potable water supply for drilling equipment cleaning at the project site. When no accessible potable water supply is available at a project site, the drilling subcontractor will need to bring a potable water supply to the site in the drill rig water supply tank or separate support vehicle, or arrange to have a third-party supplier deliver potable water to the site.

5.2 Procedure

5.2.1 General Procedures and Considerations

The following general procedures and considerations apply to all decontamination of non-dedicated monitoring/sampling equipment activities:

- Personnel will dress in suitable PPE to reduce personal exposure during equipment decontamination activities;
- In addition to cleaning between monitoring/sampling locations, all non-dedicated monitoring/sampling equipment must be cleaned before initial use. Field staff should not assume that the equipment was properly cleaned by the last person to use it;
- Prior to starting a drilling program, the downhole drilling equipment (e.g., augers) must be inspected and any “dirty” equipment must not be used in the drilling program or it must be cleaned prior to use; and
- All liquids and solids generated by the cleaning of non-dedicated monitoring/sampling equipment are to be containerized and managed in accordance with the procedures outlined in SOP-EDR020 – Investigation Derived Wastes.

5.2.2 Decontamination of Manually Operated Monitoring/Sampling Equipment

The procedure for decontaminating manually operated monitoring/sampling equipment is as follows:

- Wash the equipment in a bucket filled with a mixture of phosphate-free soap/potable water, while using a brush to remove any obvious contamination and/or adhered soil;
- Rinse the equipment thoroughly in a bucket filled with potable water;
- Rinse the equipment thoroughly using a spray bottle filled with distilled water, capturing the rinsate in a bucket; and
- Allow the equipment to air dry. If there is insufficient time to allow the equipment to air dry before reusing, or the equipment cleaning is occurring during winter conditions, the equipment should be dried after the final rinse with a clean paper towel.

At the discretion of the Project Manager, it may be acceptable to use spray bottles, rather than buckets, for lightly contaminated equipment or if no obvious contaminants are present.

Should soil or obvious contaminants remain on the equipment after cleaning, the above procedure must be repeated until the soil or contaminants have been removed. The equipment should not be reused if repeated cleanings do not remove the soil or contaminants.

The above equipment cleaning procedure applies to, but is not limited to, the following non-dedicated monitoring/sampling equipment:

- Knives/spatulas used for soil sampling;
- Hand augers;
- Water level tapes and interface probes (both the end probe and portion of the tape that entered the well);
- The exterior of submersible pumps and interior/exterior of bladder pumps (including the portion of the electrical or retrieval cables that contact groundwater in a well); and
- Various pieces of drilling equipment, including split-spoon samplers, hollow stem auger centre plugs, continuous sampling tubes, and the reusable portions of dual-tube samplers.

At the discretion of the Project Manager, the distilled water used for the final equipment rinse will be VOC-free deionized distilled water supplied by the analytical laboratory. For example, the use of VOC-free distilled water would be appropriate for a project where trace VOCs are being investigated and it is important to minimize the potential for cross-contamination and positive bias of VOC sample results.

For tapes associated with water level tapes and interface probes, if they were submerged in a monitoring well water free of non-aqueous phase liquids or obvious contamination, the tape can be cleaned at the discretion of the Project Manager by pulling the tape through a towel dampened with phosphate-free soap/potable water as the tape is retrieved. The end probe should then be cleaned as described above.

5.2.3 Decontamination of Groundwater Sampling Pumps

The exterior of each bladder or submersible pump that is used for well development, well purging and/or groundwater sampling, and the portion of any electrical or retrieval cables that entered the well, are to be cleaned following the procedure described above for decontaminating manually operated monitoring/sampling equipment.

Submersible pumps are not designed to be disassembled in the field and cleaning of the interior of this type of pump requires flushing of cleaning solutions through the pump. After cleaning the exterior of the pump, the minimum decontamination requirement for a submersible pump is the flushing of a phosphate-free soap/potable water mixture contained in a bucket through the pump (i.e., pumping the mixture through the pump and capturing the pump outflow in the same bucket or a separate bucket), followed by flushing distilled water contained in a separate bucket through the pump and capturing the pump outflow in the same bucket or separate bucket. Note that store bought distilled water is acceptable for this purpose.

At the discretion of the Project Manager and depending on the requirements of the project, the final step in the process is a final flush with laboratory-supplied VOC-free distilled water.

The following summarizes the flushing sequence for decontaminating the interior of a submersible pump:

- Soap/water mixture*;
- Distilled water (store bought)*; and
- Distilled water (laboratory supplied VOC-free distilled water - to be confirmed by the Project Manager).

* Minimum requirement.

Bladder pumps are designed for disassembly in the field to facilitate the replacement of the bladders. The internal parts of a bladder pump are to be cleaned in accordance with the procedure described above for decontaminating manually operated monitoring/sampling equipment. Whenever possible, bladders are to be disposed of between well locations. However, if it is necessary to reuse a bladder, it must be cleaned in accordance with the procedure for cleaning manually operated monitoring/sampling equipment. It should be noted that bladders are difficult to clean and the decontamination procedure needs to be thorough.

Flushing of a bladder pump with distilled water after cleaning and reassembly is not required unless specified by the Project Manager.

5.2.4 Decontamination of Downhole Drilling Equipment

Hollow stem and solid stem augers used for borehole advancement are to be decontaminated by the drilling contractor using the following procedure:

- Wherever possible, all augers used for borehole drilling should be cleaned before initial use and between borehole locations by steam cleaning or power washing with potable water. However, the minimum requirements for auger cleaning are as follows:
  - Use a brush or shovel to remove excess soil from <u>all</u> used augers; and
  - Any augers that <u>may come into contact with groundwater</u> are to be decontaminated by steam cleaning or power washing with potable water. An auger must not be used for the balance of the drilling program if obvious contaminants or residual soil remain on the auger following decontamination, unless subsequent cleaning efforts remove these materials.

As noted previously, downhole drilling equipment used for soil sample retrieval (e.g., split-spoon samplers, continuous sampling tubes and the reusable portions of dual-tube samplers used with direct push rigs) and the hollow stem auger centre plug are to be decontaminated following the procedure outlined above for cleaning manually operated monitoring/sampling equipment.

5.3 Decontamination Records

Field personnel will be responsible for documenting the decontamination of non-dedicated monitoring/sampling equipment and drilling equipment in their field log book or field forms. The documentation should include the type of equipment cleaned and the frequency of cleaning, the methods and reagents used for equipment cleaning, and how fluids generated by the equipment cleaning were stored.

5.4 Additional Considerations for Ontario Regulation 153/04 Phase Two ESA Compliance

When completing a Phase Two Environmental Assessment (ESA) in accordance with Ontario Regulation 153/04, the following additional procedures must be undertaken:

- All augers must have excess soil removed by a brush or shovel and be steam cleaned or power washed before initial use and between borehole locations regardless of whether they contact the groundwater or not (i.e., the minimum requirements listed above for auger cleaning are not sufficient); and

- Thorough records of the frequency and cleaning materials used for the decontamination of non-dedicated monitoring/sampling equipment and downhole drilling equipment must be kept. The Quality Assurance/Quality Control section of the Phase Two ESA report requires a summary of what steps were taken to minimize the potential for cross-contamination during the Phase Two ESA. The handling and disposal of fluids generated by equipment decontamination must also be well documented in the field for inclusion in the Phase Two ESA report.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of *Health & Safety Training* by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

Association of Professional Geoscientists of Ontario, *Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended),* April 2011.

9.0 APPENDICES

None.

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Template: Master SOP Template – February 2014

SOP – EDR013 – REV004 – SAMPLE HANDLING DOCUMENTATION

Title:	Sample Handling Documentation
Practice:	EDR
First Effective Date:	August 03, 2009
Version:	004
Version Date:	January 3, 2018
Author:	Mark McCormack and Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

TABLE OF CONTENTS

1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	August 03, 2009	N/A	MEM
001	November 26, 2010	Updated Approval Signature/Added reference to Ontario Regulation 511/09	FG
002	September 12, 2013	Updated text/Added tables from MOE lab protocol/Streamlined reference section/Added O. Reg. 153/04 compliance section	RLM
003	April 29, 2016	Updated Section 4.0/Aligned document retention with PEP	RLM
004	April 28, 2017	Removed reference to Pinchin West	RLM
004	January 3, 2018	Reviewed and confirmed current	RLM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) presents the general requirements for sample handling and documentation practices.

3.0 OVERVIEW

Not applicable.

4.0 DISTRIBUTION

This is an on-line document. Paper copies are valid only on the day they are printed. Refer to the author if you are in any doubt about the accuracy of this document.

This SOP will be distributed to all Pinchin staff and others as follows:

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- Distributed to senior staff at Le Groupe Gesfor Poirier and Pinchin LeBlanc for distribution as appropriate.

5.0 PROCEDURE

5.1 Equipment Required

- Laboratory-supplied sample containers;
- Field log book or field forms; and
- Laboratory-supplied Chain-of-Custody forms.

5.2 Procedures

5.2.1 Sample Labelling

Sample labels are to be filled out in the field at the time of sampling as completely as possible by field personnel. All sample labels shall be filled out using waterproof ink. At a minimum, each label shall contain the following information:

- Sample identifier, consisting of sample location (borehole number, monitoring well number, surface sample location, etc.) and sample number (if appropriate). For example, the second soil sample collected during borehole advancement at borehole BH3 would be labelled “BH3-2”;
- Pinchin project number;
- Date and time of sample collection;
- Company name (i.e., Pinchin); and
- Type of analysis.

5.2.2 Sample Containers, Preservation and Holding Times

The sample containers, sample preservation and holding times for projects in Ontario are to be those specified in Table A (for soil and sediment) and Table B (groundwater) from the Ontario Ministry of the Environment Climate Change (MOECC, formerly the Ontario Ministry of the Environment) document entitled *“Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act”,* dated March 9, 2004, amended as of July 1, 2011. These tables are attached and form part of this SOP.

With reference to the attached Tables A and B, field personnel must use the sample containers appropriate for the parameters being sampled for, undertake any required field preservation or filtration and observe the sample holding times.

Each province has its own preservation and holding time regulations or guidance, which are generally similar. It is the Project Manager’s responsibility to ensure that field staff are aware of, and can meet, the requirements in the province they are working in.

5.2.3 Sample Documentation

The following sections describe documentation required in the field notes and on the Chain-of-Custody forms.

Field Notes

Documentation of observations and data from the field will provide information on sample collection and also provide a permanent record of field activities. The observations and data will be recorded using a pen with permanent ink in the field log book or on field forms.

The information in the field book or field forms will, at a minimum, include the following:

- Site name;
- Name of field personnel;
- Sample location (borehole number, monitoring well number, surface sample location, etc.);
- Sample number;
- Date and time of sample collection;
- Description of sample;
- Matrix sampled;
- Sample depth (if applicable);
- Method of field preservation (if applicable);
- Whether filtration was completed for water samples;
- Analysis requested;
- Field observations;
- Results of any field measurements (e.g., field screening measurements, depth to water, etc.); and
- Volumes purged (if applicable).

In addition to the above, other pertinent information is to be recorded in the field log book or field forms depending on the type of sampling being completed (e.g., field parameter measurements and pumping rates for low flow sampling) as required by the SOP for the particular sampling activity.

Sufficient information should be recorded to allow the sampling event to be reconstructed without relying on the sampler's memory.

All field notes are to be scanned and saved to the project folder on the server immediately upon returning from the field.

Sample Chain-of-Custody

Sample Chain-of-Custody maintains the traceability of the samples from the time they are collected until the analytical data are issued by the laboratory. Initial information concerning collection of the samples will be recorded in the field log book or field forms as described above. Information on the custody, transfer, handling and shipping of samples will be recorded on a Chain-of-Custody for each sample submission.

All signed Chain-of-Custody forms will be photocopied or duplicate copies retained prior to sample shipment. A Chain-of-Custody should be laboratory-specific and will typically be supplied by the laboratory with the sample containers requested for the project. The sampler will be responsible for fully filling out the Chain-of-Custody for each sample submission.

The Chain-of-Custody will be signed by the sampler when the sampler relinquishes the samples to anyone else (i.e., courier or laboratory). Until samples are picked up by the courier or delivered to the laboratory, they must be stored in a secure area. The following information needs to be provided on the Chain-of-Custody at a minimum:

- Company name;
- Name, address, phone number, fax number and e-mail address of the main contact for the submission (typically the Project Manager);
- Project information (project number, site address, quotation number, rush turnaround number, etc.);
- Regulatory standards or criteria applicable to the samples (including whether the samples are for regulated drinking water or whether the samples are for a Record of Site Condition);
- Sample identifiers;
- Date and time of sample collection;
- Matrix (e.g., soil, groundwater, sediment, etc.);
- Field preservation information (e.g., whether groundwater samples for metals analysis were field filtered);
- Analyses required;
- Number of sample containers per sample;
- Analytical turnaround required (i.e., standard or rush turnaround);
- Sampler’s name and signature;
- Date and time that custody of the samples was transferred;

- Name and signature of person accepting custody of the samples from Pinchin, and date and time of custody transfer; and
- Method of shipment (if applicable).

The person responsible for delivery of the samples to the laboratory or transfer to a courier will sign the Chain-of-Custody, retain a duplicate copy or photocopy of the Chain-of-Custody so it can be scanned and saved to the project file, document the method of shipment, and send the original copy of the Chain-of Custody with the samples.

5.3 Additional Considerations for Ontario Regulation. 153/04 Phase Two ESA Compliance

Custody seals must be placed on all coolers containing samples prior to transfer to a courier or delivery to the laboratory. The laboratory will comment on the presence/absence of custody seals in the Certificate-of-Analysis for each submission and this information must be discussed in the Quality Assurance/Quality Control section of the Phase Two Environmental Site Assessment report.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of *Health & Safety Training* by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

Ontario Ministry of the Environment and Climate Change, *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*, March 9, 2004, as amended as of July 1, 2011.

9.0 APPENDICES

Appendix I	Tables A and B From Ontario MOECC Laboratory Protocol

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Template: Master SOP Template – February 2014

APPENDIX I

Tables A and B From Ontario MOECC Laboratory Protocol

TABLE A: SOIL AND SEDIMENT Sample Handling and Storage Requirements

SOIL Inorganic Parameters	**Container[1]**	**Field Preservation**	**Storage Temp.[2]**	**Preserved Holding Time[3]**	**Unpreserved Holding Time[3]**
Chloride, electrical conductivity	glass, HDPE or PET	none	5 ± 3 °C		30 days as received (without lab drying); indefinite when dried at the lab
Cyanide (CN^-)	glass wide-mouth jar, Teflon™ lined lid	protect from light	5 ± 3 °C		14 days
Fraction organic carbon (FOC)	glass jar, Teflon™ lined lid	none	5 ± 3 °C		28 days as received(without lab drying); indefinite storage time when dried
Hexavalent chromium	glass, HDPE	none	5 ± 3 °C		30 days as received
Metals (includes hydride-forming metals, SAR, HWS boron, calcium, magnesium, sodium)	glass, HDPE	none	5 ± 3 °C		180 days as received (without lab drying); indefinite when dried at the lab
Mercury, methyl mercury	glass, HDPE or PET	none	5 ± 3 °C		28 days
pH	glass, HDPE or PET	none	5 ± 3 °C		30 days as received
SOIL Organic Parameters	**Container [1,5,6,7,20]**	**Field Preservation**	**Storage Temp.[2]**	**Preserved Holding Time[3]**	**Unpreserved Holding Time[3]**
BTEX [8], PHCs (F1)[8], THMs, VOCs[7] **NB: SEE FOOTNOTE #20**	40–60 mL glass vial (charged with methanol preservative, pre-weighed)[6]AND glass jar (for moisture content) [hermetic samplers are an acceptable alternative [5, 18]]	methanol (aqueous $NaHSO_4$ is an acceptable alternative for bromomethane)[6, 7, 18,20]	5 ± 3 °C	14 days	hermetic samples: stabilize with methanol preservative within 48 hours of sampling[18]
1,4-Dioxane[9, 15]	when processed as a VOC sample: same as per VOCs above; when processed as an extractable: same as per ABNs below; (consult laboratory)[9,15,18]		5 ± 3 °C	14 days	when processed as a VOC sample: same as per VOCs above; when processed as an extractable: same as per ABNs below; (consult laboratory)[18]
PHCs (F2–F4)	glass wide-mouth jar, Teflon™ lined lid	none	5 ± 3 °C		14 days
ABNs, CPs, OCs, PAHs	glass wide-mouth jar, Teflon™ lined lid	none	5 ± 3 °C		60 days
Dioxins and furans, PCBs	glass wide-mouth jar Teflon™ lined lid	none	5 ± 3 °C		indefinite storage time

HDPE = high density polyethylene; PET = polyethylene terephthalate; HWS = hot water soluble boron; THM = trihalomethanes; VOC = volatile organic compounds; BTEX = benzene, toluene, ethylbenzene, xylenes; PHCs = petroleum hydrocarbons; CPs = chlorophenols; PCBs = polychlorinated biphenyls; OCs = organochlorine pesticides

[1–20]footnotes immediately follow Table B

TABLE B: GROUND WATER Sample Handling and Storage Requirement

GROUND WATER Inorganic Parameters	**Container[10]**	**Field Preservation**	**Storage Temperature[2]**	**Preserved Holding Time[3]**	**Unpreserved Holding Time[3]**
Chloride, electrical conductivity, pH	HDPE or glass	none	5 ± 3 °C		28 days
Cyanide (CN$^-$)	HDPE or glass	NaOH to a pH > 12	5 ± 3 °C	14 days	must be field preserved
Hexavalent chromium	HDPE or glass	field filter followed by buffer solution to a pH 9.3–9.7 [17]	5 ± 3 °C	28 days[17]	24 hours[17]
Metals (includes hydride-forming metals, calcium, magnesium, sodium)	HDPE or Teflon™ [10]	field filter followed by HNO$_3$ to pH < 2[11]	room temperature when preserved	60 days	must be field preserved
Mercury	glass or Teflon™ [10]	field filter followed by HCl to pH < 2[11]	room temperature when preserved	28 days	must be field preserved
Methyl mercury	glass or Teflon™	DO NOT FILTER HCl or H$_2$SO$_4$ to pH <2[12]	5 ± 3 °C	28 days	DO NOT FILTER must be field preserved[12]
GROUND WATER Organic Parameters[10, 13, 14]	**Container[10, 13, 14]**	**Field Preservation**	**Storage Temperature[2]**	**Preserved Holding Time[3]**	**Unpreserved Holding Time[3]**
BTEX, PHCs (F1),THMs, VOCs;	40–60 mL glass vials (minimum of 2)[14] (no headspace)	NaHSO$_4$ or HCl to a pH < 2[16]	5 ± 3 °C	14 days	7 days
1,4-Dioxane[9, 15]	when processed as a VOC sample: same as per VOCs above; when processed as an extractable: same as per ABNs below; (consult laboratory)[9, 15]		5 ± 3 °C	14 days	14 days
PHCs (F2–F4)	1L amber glass bottle, Teflon™ lined lid	NaHSO$_4$ or HCl to a pH < 2[16]	5 ± 3 °C	40 days	7 days
ABNs, CP, OCs, PAHs[19], PCBs	1L amber glass bottle, Teflon™ lined lid	none	5 ± 3 °C		14 days
Dioxins and furans	1L amber glass bottle, Teflon™ lined lid	None	5 ± 3 °C		indefinite storage time

HDPE = high density polyethylene;THM = trihalomethanes; VOC = volatile organic compounds; BTEX = benzene, toluene, ethylbenzene, xylenes; PHCs = petroleum hydrocarbons; CPs = chlorophenols; PCBs = polychlorinated biphenyls; OCs = organochlorine pesticides

[1] One soil container is generally sufficient for inorganic analysis and another for extractable organics. A separate container is required for BTEX, THM, VOC and PHC (F1) moisture analysis.

[2] Storage temperature refers to storage at the laboratory. Samples should be cooled and transported as soon as possible after collection.

[3] Holding time refers to the time delay between time of sample collection and time stabilization/analysis is initiated. For samples stabilized with methanol, the hold time for the recovered methanol extract is up to 40 days.

[4] PET can not be used for samples requiring antimony analysis.

[5] As an alternative, the USEPA has investigated hermetic sample devices that take and seal a single core sample. The sample is submitted as is to the laboratory where it is extruded into an extracting solvent. Samples must be received at the laboratory within 48 hours of sampling. (Note that replicate samples are necessary for bisulphate and methanol extraction for all samples plus laboratory duplicates and spikes.) Consult the laboratory for the number of samples required.

[6] The USEPA has approved field preservation. Pre-weighed vials containing known weights of methanol preservative (or aqueous sodium bisulphate if used for bromomethane) are sent to the field. Sample cores (approximately 5 g) are extruded directly into the vial. The vials are sealed, and submitted directly to the laboratory. In practice, this technique requires great care to prevent losses of methanol due to leaking vials or through splashing. Consult the laboratory for the number of containers required.

[7] Methanol-preserved samples may elevate the detection limit for bromomethane (VOC); a separate bisulphate-preserved sample or hermetically sealed sample may be submitted at the time of sampling if bromomethane is a chemical of concern – contact the laboratory to determine if a separate sample should be collected.

[8] For BTEX and PHC (F1) pre-charging the soil sampling container with methanol preservative is an accepted deviation from the CCME method.

[9] 1,4-Dioxane may be analyzed with the ABNs or VOCs; sample container requirements used for ABNs or VOCs are both acceptable. If 1,4-dioxane is to be analyzed with ABNs, follow the ABN sample container requirements; similarly if it is to be analyzed with VOCs, follow VOC sample container requirements. Consult the laboratory for the container type and the total number required (see also footnote #15).

[10] Samples containing visual sediment at the time of analysis should be documented and noted on the Certificate of Analysis or written report as results may be biased high due to the inclusion of sediment in the extraction.

[11] Field filter with 0.45µm immediately prior to adding preservative or filling pre-charged container.

[12] Sample directly into a HCl or H_2SO_4 preserved container, or add acid to an unfiltered sample immediately after sample collection in the field.

[13] Aqueous organic samples should be protected from light. If amber bottles are not available, glass should be wrapped in foil.

[14] Separate containers are required for each organic water analysis. Consult the laboratory for required volumes. Chloride and electrical conductivity can be taken from the same container.

[15] For 1,4-dioxane in soil and sediment, no preservative is required if processed as an ABN, however. Methanol is an acceptable alternative if processed as a VOC. For 1,4-dioxane in groundwater, no preservative is required, however, $NaHSO_4$ or HCl are acceptable alternatives.

[16] Preserved to reduce biodegradation, however effervescence/degassing may occur in some ground water samples. In this case, rinse preservative out three times with sample and submit to the laboratory as unpreserved.

[17] To achieve the 28-day holding time, use the ammonium sulfate buffer solution [i.e., $(NH_4)_2SO_4/NH_4OH$] or $(NH_4)_2SO_4/NH_4OH/NaOH$ + NaOH] as specified in EPA Method 218.6 (revision 3.3, 1994) or Standard Methods 3500-Cr Chromium (2009).Using only NaOH without the ammonium sulfate buffer to adjust the pH would require analysis within 24 hours of sampling.

[18] Alternatively, to achieve a longer hold time, hermetic samples may be frozen within 48 hours of sampling as per ASTM method D6418 – 09; however, storage stability must be validated by the laboratory with no more than 10% losses.

[19] For benzo(a)pyrene in ground water samples filtration prior to analysis on a duplicate sample is permitted.

[20] For VOC, BTEX, F1 PHCs, 1,4 dioxane soil samples collected before July 1, 2011, the following sampling and handling requirements are also permitted.

SOIL Organic Parameters	**Container**	**Preservative**	**Storage Temperature**	**Preserved Holding Time**	**Unpreserved Holding Time**
VOC, BTEX, F1 PHCs, 1,4-dioxane*	glass jar, Teflon lined lid, no headspace, separate container required Hermetic samplers are an acceptable alternative	none field preservation with aqueous sodium bisulphate and methanol is an acceptable alternative	5 ± 3C	See notations 1-3 below	Stabilize by extraction or freezing within 48 hrs of receipt at the laboratory (7days from sampling). Frozen or field preserved samples must be extracted within 14 days of sampling.

*Special care must be used when sampling for VOC, BTEX and F1 in soil and sediment. Studies have shown that substantial losses can occur through volatilization and bacterial degradation. There are several allowable options for field collection of samples. Each is discussed below. Consult SW846, Method 5035A for additional detail. The laboratory is required to stabilize the sample on the day of receipt, either by extraction or freezing.

1. Collection in soil containers: To minimize volatilization losses, minimize sample handling and mixing during the process of filling the sample container. The bottle should be filled with headspace and voids minimized. Care is required to ensure that no soil remains on the threads of the jar, preventing a tight seal and allowing volatilization losses. To minimize losses through bacterial degradation, commence cooling of the samples immediately and transport the samples to the lab as soon as possible, ideally on the day of sampling. Samples must be received at the laboratory within 48 hours of sampling. Freezing can be used to extend the hold time to 14 days, however the practice is difficult to implement in the field and can cause sample breakage.
2. As an alternative, the USEPA has investigated hermetic sample devices that take and seal a single core sample. The sampler is submitted as is to the laboratory where it is extruded into the extracting solvent. Samples must be received at the laboratory within 48 hours of sampling. This technique minimizes volatilization losses and is worth consideration for critical sites. (Note that replicate samplers are necessary for bisulphate and methanol extraction for all samples plus lab duplicates and spikes). Consult the laboratory for the number of samplers required.

3 The USEPA has also approved field preservation. Pre-weighed vials containing known weights of methanol and aqueous sodium bisulphate preservative are sent to the field. Sample cores (≈5 g) are extruded directly into the vial. The vials are sealed, and submitted directly to the laboratory. In practice, this technique requires great care to implement successfully. Losses due to leaking vials, through splashing and effervescence (aqueous bisulphate) can easily occur and make the sample unusable. Consult the laboratory for the number of containers required.

SOP – EDR019 – REV004 – SOIL SAMPLE LOGGING

Title:	Soil Sample Logging
Practice:	EDR
First Effective Date:	August 03, 2013
Version:	004
Version Date:	January 3, 2018
Author:	Francesco Gagliardi and Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

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1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	November 26, 2010	N/A	FG
001	October 31, 2013	Streamlined SOP to focus only on soil sample logging/Added O. Reg. 153/04 compliance section	RLM
002	April 29, 2016	Updated Section 4.0	RLM
003	April 28, 2017	Removed reference to Pinchin West	RLM
004	January 3, 2018	Modified percentages of minor constituents in Section 5.1.3/Clarified when geotechnical terms can be used for soil logging in Section 5.2	RLM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) presents the methods used to describe the physical characteristics of soil samples collected during site investigations.

The methods and equipment used for retrieving soil samples are provided in other SOPs (e.g., SOP-EDR007 – Borehole Drilling) and will not be repeated herein.

3.0 OVERVIEW

Not applicable.

4.0 DISTRIBUTION

This is an on-line document. Paper copies are valid only on the day they are printed. Refer to the author if you are in any doubt about the accuracy of this document.

This SOP will be distributed to all Pinchin staff and others as follows:

- Posted to the SOP section of the Environmental Due Diligence and Remediation (EDR) Practice Line on the Pinchin Orchard; and
- Distributed to senior staff at Le Groupe Gesfor Poirier and Pinchin LeBlanc for distribution as appropriate.

5.0 PROCEDURE

5.1 General Procedures

For each soil sample collected during a site investigation, the following information is to be recorded in the field log book or field forms in the order presented below:

- Depth;
- Primary soil texture;
- Colour;
- Minor constituents*;
- Noticeable odours;
- Noticeable staining;
- Noticeable free-phase product/sheen*; and
- Moisture content.

*These constituents only need to be noted if they are actually present in the sample.

5.1.1 Primary Soil Texture

The primary soil texture should be determined using the attached flow chart as a guide to help classify the soil.

5.1.2 Colour

Describe the primary colour of the soil sample (e.g., brown, grey, black, green, white, yellow, red). The relative lightness or darkness of the primary colour can be described using the adjectives “light” or “dark” as appropriate. Soil that exhibits different shades or tints is to be described by using two colours (e.g., brown-grey). If the soil sample contains spots of a different colour, this is to be described as “mottling” (e.g., grey with green mottling).

5.1.3 Minor Constituents

Note the presence of minor constituents in the soil that are “natural” materials (e.g., gravel, cobbles, sand, oxidation, etc.) or “man-made” materials (e.g., asphalt, brick, concrete, coal or glass fragments, coal ash, etc.). Gravel comprises particles between 5 millimetres (mm) and 75 mm in diameter. Cobbles comprise particles greater than 75 mm in diameter (approximately the size of a man’s fist) and boulders are particles greater than 150 mm in diameter (approximately the size of man’s head).

When the percentage of the minor constituents in the soil is between approximately 1 and 10%, the adjective used to describe the relative amount of the minor constituent is “trace” (e.g., silty sand with trace brick fragments).

When the percentage of minor constituents of soil is between approximately 10 and 20%, the adjective used to describe the relative amount of the minor constituent is “some” (e.g., silty sand with some concrete fragments).

When the percentage of the “natural” minor soil constituents is between approximately 20 and 35%, the minor soil type is described by adding a ‘y’ or ‘ey’ to the soil type (e.g., silty, sandy, clayey).

When the percentage of the “natural” minor soil constituents is also greater than 35%, the minor soil type is described by using “and” the soil type (e.g., sand and gravel, sand and silt).

When the percentage of the “man-made” minor soil constituents is between approximately 30 and 50%, describe the soil as per the normal procedure and add “with” the minor constituent type(s) (e.g., silty sand with coal ash and brick fragments).

5.1.4 Noticeable Odours

Field staff are not expected to directly smell soil samples to assess the presence/absence of odours.

If it is possible to identify the likely type of odour then this information should be recorded along with a comment on the severity of the odour (e.g., slight, strong, etc.). Identification of specific chemical compounds, such as petroleum hydrocarbons (PHCs) or solvents is acceptable; however, this identification should be referenced as “xxxx-like” (e.g., PHC-like, solvent-like, etc.). This principle also applies when describing staining and free-phase product.

If the odour cannot be readily identified, it should be described in the field notes as “unidentified odour”. If no noticeable odours are observed, this needs to be recorded in the field notes as “no odour”.

5.1.5 Noticeable Staining

Describe the colour and possible source of the staining (e.g., black PHC-like staining).

If no noticeable staining is observed, this needs to be recorded in the field notes as “no staining”.

5.1.6 Noticeable Free-Phase Product/Sheen

Describe the colour, odour, possible composition and relative viscosity (if sufficient product is present to assess) of the product (e.g., dark brown, viscous, motor oil-like product). Identification of the composition of the product is acceptable but needs to be described as PHC-like, motor oil-like. Alternatively, the product can be described as “resembling” a substance (e.g., “resembling motor oil”).

The presence of any observed iridescent sheen is to be recorded in the field notes. Note that the presence of an iridescent sheen by itself in the soil does not constitute the presence of free-phase product but may be an indicator that free-phase product is present within the vicinity of the borehole.

5.1.7 Moisture Content

Describe the moisture content of the soil sample using one of the following three terms:

- Dry – no visible evidence of water and the soil is dry to the touch;
- Moist – visible evidence of water but the soil is relatively dry to the touch. Do not use the term “damp” to describe this type of soil; and
- Wet – visible evidence of water and the soil is wet to the touch. Free water is evident when sandy soil is squeezed. Do not use the term “saturated” to describe this type of soil.

5.1.8 Recording Soil Sample Descriptions in Field Notes

Recording the information in the field notes consistently in the above order will make it easier to prepare the borehole logs for the site investigation report.

Example soil sample descriptions are as follows:

- Sand, grey, trace gravel, PHC-like odours, free-phase PHC-like product, wet;
- Silty sand, brownish-grey, some gravel, trace asphalt and brick fragments, no odours or staining, moist; and
- Silty clay, brown, trace gravel, no odours or staining, moist to wet at 2.4 mbgs.

5.2 General Considerations

Where any physical properties change within a soil sample, the depth at which this transition takes place needs to be recorded. For example, for a soil sample collected from 1.8 to 2.4 metres below ground surface (mbgs), if the upper 0.3 metres has no odours but PHC-like odours are present below this depth then the field notes need to state “no odours from 1.8 to 2.1 mbgs, PHC-like odours from 2.1 to 2.4 mbgs”.

Some soil samples will contain a thin seam of a different soil type, such as a sand seam within a silty clay. The depth interval of any such seam is to be recorded in the field notes, and the material comprising the seam should be described separately using the logging procedure outlined above.

Unless soil sampling is being completed as part of a combined environmental/geotechnical investigation and EDR staff logging the soil samples have the appropriate geotechnical training, avoid the use of geotechnical terms (e.g., stiff, dense, high plasticity, etc.) when logging soil samples. If any geotechnical terms are inadvertently included in the field notes by staff who have not had geotechnical training, they must not be included in the borehole logs provided in our report.

5.3 Additional Considerations for Ontario Regulation 153/04 Phase Two ESA Compliance

None. Following this SOP will be sufficient to comply with the Ontario Regulation 153/04 requirements for Phase Two ESAs with respect to field logging. Risk assessments completed in accordance with Ontario Regulation 153/04 will typically require soil samples to be submitted to a laboratory for full soil texture analysis, but this is beyond the scope of field logging.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of *Health & Safety Training* by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

American Society for Testing and Materials, *ASTM D2487-11 - Standard Practice for Classification of Soils for Engineering Purposes (United Soil Classification System)*, 2011.

Association of Professional Geoscientists of Ontario, *Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended)*, April 2011.

9.0 APPENDICES

Appendix 1 Soil Texture by Feel Chart

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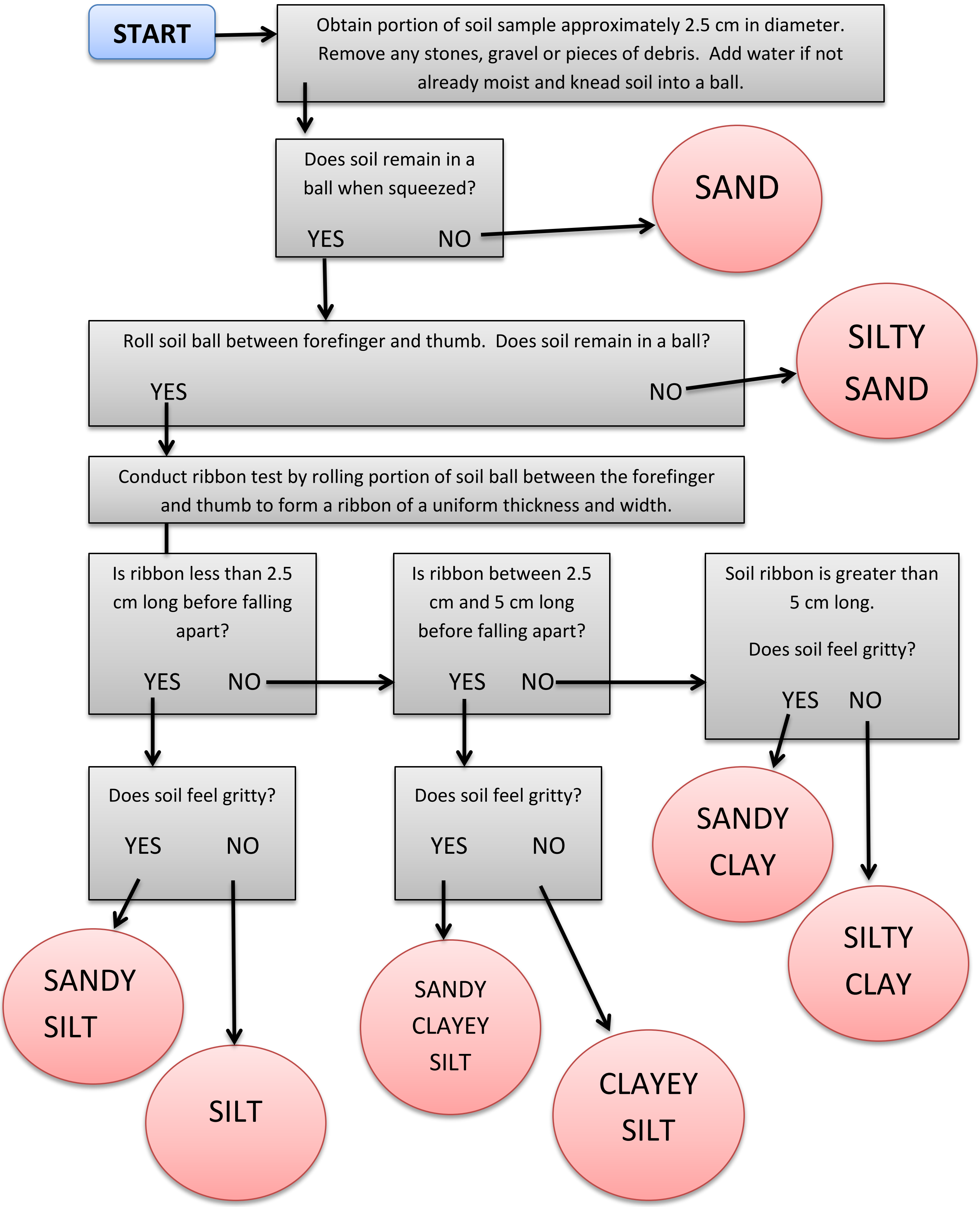
Template: Master SOP Template – February 2014

APPENDIX I

Soil Texture by Feel Chart

Key to Soil Texture by Feel



SOP – EDR025 – REV004 – QA/QC SAMPLING

Title:	QA/QC Sampling
Practice:	EDR
First Effective Date:	January 17, 2014
Version:	004
Version Date:	January 3, 2018
Author:	Robert MacKenzie
Authorized by:	Robert MacKenzie
Signature:	

TABLE OF CONTENTS

1.0 VERSION HISTORY

Version	Date	Summary of Changes	Author
Original	January 17, 2014	N/A	RLM
001	June 26, 2014	Amended blind duplicate sampling requirements	RLM
002	April 29, 2016	Updated Section 4.0/Amended O.Reg. 153/04 trip blank requirements	RLM
003	April 28, 2017	Removed reference to Pinchin West	RLM
004	January 3, 2018	In Section 5.2.6, clarified order of regular investigative sample and duplicate sample collection	RLM

2.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the standard procedures for collecting soil, water and sediment samples for quality assurance/quality control (QA/QC) purposes.

A QA/QC program is essentially a management system that ensures that quality standards are met within a stated level of confidence. The QC component of the program comprises daily activities in the field and laboratory that are used to control the quality of both the samples collected and the sample analytical data. The QA component of the program is made up of measures used to determine whether the QC activities are effective.

When completing a site investigation, one of our primary goals is to obtain analytical data that are representative of actual soil, water and/or sediment conditions at the site. The completion of a QA/QC program, consisting of the collection and analysis of various QA/QC samples, provides information for use in evaluating the accuracy of the analytical data used to assess the environmental quality of the site.

The type and number of samples comprising the QA/QC program will be determined by the Project Manager on a site-by-site basis, but will typically include at a minimum a trip blank when collecting water samples for volatile parameter analysis and duplicate soil, water or sediment samples. Other types of QA/QC samples may be collected (e.g., equipment or field blanks) to meet project-specific requirements at the discretion of the Project Manager or to meet regulatory requirements.

The QA/QC sampling requirements and procedures for indoor air, soil vapour and sorbent tube samples are described in SOP-EDR012, SOP-EDR018 and SOP-EDR027, respectively.

3.0 OVERVIEW

The types of samples collected for the QA/QC program during site investigations may include the following:

- Trip blanks;
- Field blanks;
- Equipment blanks; and
- Field duplicates.

Trip blanks are used to assess whether ambient air conditions may have resulted in positive bias of water samples collected for volatile parameter analysis during transportation of the sample containers to and from a project site. Note that the term “positive bias” means that reported sample concentrations are greater than actual in situ sample concentrations due to some form of “cross-contamination”.

Field blanks are collected to assess whether ambient air conditions may have resulted in positive bias of samples collected at a project site for volatile parameter analysis at the time of sampling.

Equipment blanks are collected to assess the efficiency of non-dedicated monitoring/sampling equipment cleaning procedures.

Duplicate samples are collected to assess whether field sampling and laboratory analytical methods are suitable and reproducible.

The analytical results of the QA/QC samples are reviewed by the Project Manager to assess whether any data quality issues are evident which may affect the interpretation of the soil, water and/or sediment sample analytical data.

4.0 DISTRIBUTION

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This SOP will be distributed to all Pinchin staff and others as follows:

- Posted to the SOP section of the Environmental Due Diligence and Remediation (EDR) Practice Line on the Pinchin Orchard; and
- Distributed to senior staff at Le Groupe Gesfor Poirier and Pinchin LeBlanc for distribution as appropriate.

5.0 PROCEDURE

5.1 Equipment and Supplies

The equipment/supplies required for QA/QC sample collection are the same as that used for regular investigative sampling, except for the following:

- Volatile organic compound (VOC)-free distilled water supplied by the analytical laboratory for use in the collection of field blanks and/or equipment blanks;
- Additional sample jars supplied by the analytical laboratory for the collection of field blanks, equipment blanks and field duplicates; and
- Trip blanks supplied by the analytical laboratory.

5.2 QA/QC Sampling Procedures

5.2.1 General Procedures for QA/QC Blank Sampling

The analytical laboratory that will be completing the analysis of the regular investigative samples and QA/QC samples for a project must supply the water used to collect field blanks and equipment blanks. Water provided by another analytical laboratory or store-bought distilled water must not be used.

5.2.2 Trip Blanks

A trip blank is a set of VOC sample vials filled by the analytical laboratory with VOC-free distilled water and shipped with the sample containers. A trip blank is to be stored with the sample containers provided by the analytical laboratory during travel to the project site, while on the project site, and during travel from the project site back to the analytical laboratory. The sample containers comprising a trip blank are not to be opened in the field.

For some projects, submissions of volatile parameter samples to the analytical laboratory over several days will be required. In this case, a trip blank sample should accompany each submission to the laboratory. If this situation is anticipated, the Project Manager must request that the analytical laboratory provide sufficient trip blanks so that a trip blank can accompany the submission of each set of samples to the laboratory.

Trip blanks are to be analyzed for the same volatile parameters (i.e., VOCs and/or petroleum hydrocarbons (PHCs) (F1 fraction)) as the regular investigative samples. For example, if the groundwater sampling program includes analysis of VOCs and PHCs (F1-F4 fractions), then the trip blank(s) require analysis of VOCs and PHCs (F1 fraction). If the groundwater sampling program only includes VOC analysis, then the trip blank(s) require analysis of VOCs only.

Unless specified by the Project Manager, trip blanks are not required for soil and sediment sampling, or for water sampling involving only non-volatile parameters. At the discretion of the Project Manager and to meet project-specific requirements, trip blanks for non-volatile parameters can be prepared and analyzed using the same principles as for volatile parameter trip blanks.

5.2.3 Field Blanks

A field blank is a set of VOC sample vials filled during a sampling event at a project site with VOC-free distilled water supplied by the analytical laboratory and submitted for analysis of volatile parameters (i.e., VOCs and/or PHCs (F1 fraction)).

Field blanks are to be collected at a sample location considered “worst case” with respect to ambient air conditions (e.g., adjacent to and downwind of the pump island of an active retail fuel outlet, inside an active on-the-premises dry cleaner, etc.). At project sites where there is no obvious “worst case” ambient air location, the field blank can be collected at a sampling location picked randomly. The field blank collection location and rationale for selecting it must be documented in the field notes.

If a groundwater sampling event at a project site occurs over more than one day, a field blank is to be collected for each day of sampling.

Some project sites may have an isolated area where the ambient air conditions are significantly poorer than the remainder of the site and a field blank collected from this area may not be representative of conditions elsewhere on the site. In this case, at the discretion of the Project Manager, the collection of two field blanks may be appropriate, with one field blank collected from the poor ambient air area and one field blank collected from a location outside of this area.

Unless specified by the Project Manager, field blanks are not required for soil and sediment sampling, or for water sampling involving only non-volatile parameters. At the discretion of the Project Manager and to meet project-specific requirements, field blanks for non-volatile parameters can be collected and analyzed using the same principles as for volatile parameter field blanks.

5.2.4 Equipment Blanks

An equipment blank is collected by pouring VOC-free distilled water supplied by the analytical laboratory either over or through non-dedicated sampling/monitoring equipment that has been cleaned following sampling/monitoring using the procedures outlined in SOP-EDR009. The resulting rinsate is then captured in sample containers appropriate for the intended analysis. Note that the surface over which the distilled water is poured must be the surface from which samples are collected from or that is in contact with the medium being monitored. For example, if an equipment blank is being collected from a split-spoon sampler, the distilled water must be poured through the interior of the sampler, and not the exterior of the sampler.

The Project Manager will be responsible for determining the sampling/monitoring equipment from which equipment blanks will be obtained, the number of equipment blanks and the parameters to be analyzed. Regarding the latter, the parameters analyzed for equipment blanks are typically the parameters of concern for a given project site.

5.2.5 Evaluation of Blank Sample Results

The Project Manager will evaluate the results of the blank sample analysis to assess whether these results show that bias may have been introduced to investigative samples collected during the field sampling activities. Judgement by the Project Manager will be required to assess whether the blank sample results have any effect on the interpretation of the investigative sample results. This is assessed on a case-by-case basis, but the following general principles can be applied:

- If all soil, groundwater and/or sediment samples collected for a site investigation meet the applicable environmental standards/criteria, the presence of detectable or elevated parameter concentrations in the blanks has no effect on the interpretation of the investigative sample results;
- If parameters have detectable or elevated concentrations in the blank samples but none of these parameters are present in the regular investigative samples at concentrations exceeding the applicable environmental standards/criteria, the blank sample results have no effect on the interpretation of the investigative sample results;
- If parameters have detectable or elevated parameter concentrations in the blank samples and one or more of these parameters are present in the regular investigative samples at concentrations exceeding the applicable environmental standards/criteria, then positive bias of the regular investigative samples may have occurred. The Project Manager will need to assess a number of variables, including the relative parameter concentrations in the blank and regular investigative samples, to determine whether the regular investigative sample data are considered representative and usable for assessing the environmental quality of the site. If the regular investigative sample data are questionable, then resampling may be required; and
- If the regular investigative samples have exceedances of the applicable environmental standards/criteria and the blank samples have non-detectable parameter concentrations, the blank sample results have no effect on the interpretation of the investigative sample results.

5.2.6 General Procedures for QA/QC Duplicate Sampling

Whenever possible, duplicate samples are to be collected from “worst case” sample locations. The reason for this is that Relative Percent Differences (RPDs) are calculated using the analytical results of the duplicate and regular investigative samples to evaluate the suitability and reproducibility of field sampling and laboratory analytical methods. However, RPDs for a given parameter can only be calculated if there are detectable concentrations in both samples, and “worst case” sample locations are the most likely to have detectable levels of parameters of concern. The calculation and evaluation of RPDs is discussed at the end of this section.

When filling sample containers, the order of collection is to fill the sample container for a particular parameter or parameters for the regular investigative sample first and then fill the sample container for the same parameter or parameters for the duplicate sample second. For example, if groundwater was being sampled for PAHs and metals and a duplicate sample was required, the order of filling the sample containers would regular investigative sample for PAHs, duplicate sample for PAHs, regular investigative sample for metals and duplicate sample for metals.

5.2.7 Field Duplicate Samples – Soil/Sediment

Soils/sediments are frequently heterogeneous because they are typically deposited in horizontal layers over time, causing both small scale and large scale grain size variations that can often result in significant variations in contaminant concentrations between layers. Because of this, it is important that duplicate soil/sediment samples be collected from the same vertical depths as the regular investigative samples in sample cores or at discrete sampling locations (e.g., grab samples).

When collecting a duplicate soil/sediment sample from a sampling device that provides a soil core (e.g., dual-tube sampler, split-spoon sampler), the soil core is to be split in half vertically (i.e., longitudinally). A portion of one half of the core is used for the regular investigative sample and a portion of the other half of the core is used for the duplicate sample. The portion of each core placed in sample jars for analysis must be obtained from the same depth interval within the cores.

When collecting a duplicate soil/sediment sample from a grab sample (e.g., excavation floor or sidewall), the field duplicate sample must be collected as close as possible to the regular investigative sample location at the sample depth and within the same soil layer.

There are no special procedures for collecting field duplicates of composite soil/sediment samples given that the soil/sediment is homogenized during the composite sample collection procedure.

A field duplicate soil/sediment sample must be collected at the same time as the regular investigative sample. Retroactively splitting a soil/sediment sample to obtain a field duplicate sample is not permitted.

5.2.8 Field Duplicate Samples – Surface Water/Potable Water/Groundwater

There are no special procedures for collecting surface water/potable water/groundwater field duplicate samples with the following exceptions:

- When collecting a duplicate water sample for metals analysis and field filtering is required, a new filter is to be used to collect the duplicate sample unless the groundwater has a low sediment content; and
- When collecting a duplicate surface water sample, the sample containers for the same parameter(s) should be immersed in the surface water body at the same location and at the same time whenever possible.

5.2.9 Duplicate Sample Labelling

The duplicate sample should have the term “DUP” in the sample identifier to distinguish it as a duplicate sample.

5.2.10 Evaluation of Duplicate Sample Results

Duplicate sample results are evaluated by calculating RPDs using the following equation:

$$\text{RPD} = \frac{\text{Absolute Value (Original Concentration – Duplicate Concentration)}}{\text{(Original Concentration + Duplicate Concentration)/2}} \text{ X } 100\%$$

RPDs are not calculated unless the parameter concentrations in both the regular investigative sample and duplicate sample are detectable concentrations above the corresponding practical quantitation limit (PQL) for the parameter, which is equal to five times the lowest laboratory reportable detection limit (RDL).

For example, if the RDL for a parameter is 0.1 parts per million (ppm), and the concentration in the regular investigative sample is 0.4 ppm and the concentration in the duplicate sample is 0.6 ppm, the RPD cannot be calculated because the concentration in the regular investigative sample (0.4 ppm) is less than the PQL of 0.5 ppm (5 times the RDL of 0.1 ppm).

Also, if the regular investigative sample concentration is 2 ppm and the duplicate sample concentration is <1 ppm, then the RPD cannot be calculated regardless of the PQL since detectable concentrations were not reported for both samples.

Calculated RPDs for the regular investigative and field duplicate samples are compared to established performance standards to evaluate the suitability and reproducibility of field sampling and laboratory analytical methods. In Ontario, the Ontario Ministry of the Environment and Climate Change (formerly the Ontario Ministry of the Environment) provides duplicate sample performance standards in the document *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the*

Environmental Protection Act, dated March 9, 2004, amended as of July 1, 2011. Although these performance standards only strictly apply to laboratory duplicate samples, they are considered suitable for comparison to field duplicate samples. Other provinces provide their own similar guidance.

When calculated RPDs exceed the performance standards, the Project Manager will evaluate whether these results have any effect on the interpretation of the investigative sample results. This is judged on a case-by-case basis, but in many situations RPD values above the performance standards can be attributed to small scale heterogeneity inherent in soil samples or variations in the quantity of sediment in groundwater or surface water samples, and are not indicative of poor field sampling or laboratory procedures. The results of internal laboratory QA/QC sampling may provide additional information as to the precision of the data. Furthermore, if all soil, water and/or sediment samples collected for a site investigation meet the applicable environmental standards/criteria, the apparent lack of precision shown by elevated RPD values should not affect the interpretation of the investigative sample results.

Sometimes a regular investigative sample will meet the applicable environmental standards/criteria and its corresponding duplicate sample will fail the applicable environmental standards/criteria (or vice versa). In Ontario, it is permitted to average the parameter concentrations of two samples provided they are collected at the same time and from the same sample location and depth. The resulting average parameter concentrations are then compared with the applicable standards to determine whether the sample meets or fails the standards. This approach is not acceptable in all jurisdictions. In situations where averaging is not acceptable to the regulatory agency, the “worst case” sample result is to be used in assessing the environmental condition of the project site.

5.3 Fieldwork Records

The field notes must include the following information with respect to QA/QC samples:

- The date and time of sampling for all blank/duplicate samples;
- The sample location for field blanks and the rationale for selecting the field blank locations;
- The type of equipment from which a rinsate was collected for equipment blanks and the parameters to be analyzed; and
- The corresponding regular investigative sample location/sample interval for duplicate samples and the parameters to be analyzed.

5.4 Additional Considerations for Ontario Regulation 153/04 Phase Two ESA Compliance

When completing a Phase Two ESA in accordance with Ontario Regulation 153/04, the QA/QC sampling program must consist of the following as a minimum:

- At least one field duplicate soil, sediment or groundwater sample must be collected for every ten samples submitted for analysis. The frequency is one duplicate sample for one to 10 regular investigative samples, two duplicate samples for 11 to 20 samples, etc. for all parameters analyzed. For example, even if only one groundwater sample is collected for PAHs analysis, a duplicate of this sample must be collected.

When sampling for VOCs, one trip blank sample must be submitted to the laboratory for VOCs analysis for each submission to the laboratory. In other words, if a groundwater sampling program lasts three days and samples are submitted to the laboratory at the end of each day, there must be a total of three trip blanks submitted with the samples (i.e., one per day of sampling). Note that analysis of trip blank samples for other volatile parameters (e.g., PHCs (F1 Fraction)) is not mandatory but can be completed at the discretion of the Qualified Person.

6.0 TRAINING

The Practice Leader is responsible for identifying the training needs of EDR staff and ensuring that staff are trained and competent before undertaking work assignments.

All trained personnel are responsible for identifying coaching or re-training needs (if they are uncomfortable with work assignments that have been assigned).

The careful application of *Health & Safety Training* by each employee is an integral part of all activities and is assumed as part of this SOP.

7.0 MAINTENANCE OF SOP

1 Year.

8.0 REFERENCES

Association of Professional Geoscientists of Ontario, *Guidance for Environmental Site Assessments under Ontario Regulation 153/04 (as amended),* April 2011.

Ontario Ministry of the Environment and Climate Change, *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*, March 9, 2004, as amended as of July 1, 2011.

Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Province of British Columbia, *British Columbia Field Sampling Manual*, 2003.

9.0 APPENDICES

None.

I:\2018 SOP Updates\SOP - EDR025 - REV004 - QA QC Sampling.docx

Template: Master SOP Template – February 2014

APPENDIX C
Borehole Logs

Log of Borehole: BH01

Project #: 212394.001

Logged By: JL

Project: Phase Two Environmental Site Assessment

Client: Spruce Partners Inc.

Location: 1157-1171 North Shore Boulevard East, Burlington, ON

Drill Date: February 5, 2018

Project Manager: CH

SUBSURFACE PROFILE					SAMPLE				
Depth	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sampler #	Recovery (%)	Sample ID	Soil Vapour Concentration (ppmv) (RKI)	Laboratory Analysis
ft m 0 0		Ground Surface	0.00						
		Concrete	0.08	No Monitoring Well Installed					
		Gravel	0.15						
1 2		***Silt*** Brown clayey silt, some sand, wet.			1	100	BH01-1/ DUP-1	<5	BTEX, PHCs, PAHs, pH
3 1 4 5		Borehole terminated at 1.68 mbgs due to sampler refusal.	1.68				BH01-2	<5	
6 2 7		End of Borehole Soil vapour concentration measured using an RKI Eagle combustible gas indicator (RKI).							

Contractor: Strata Drilling Group

Drilling Method: Direct Push

Well Casing Size: NA

Pinchin Ltd.
6-875 Main Street West, Suite 200
Hamilton, ON L8S 4P9

Grade Elevation: 79.79 mamsl

Top of Casing Elevation: NA

Sheet: 1 of 1

PINCHIN

Log of Borehole: BH02

Project #: 212394.001

Logged By: JL

Project: Phase Two Environmental Site Assessment

Client: Spruce Partners Inc.

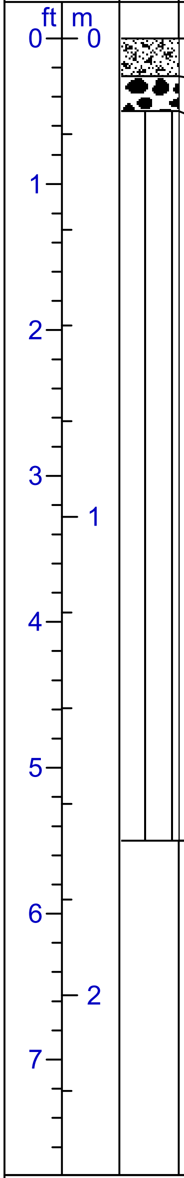
Location: 1157-1171 North Shore Boulevard East, Burlington, ON

Drill Date: February 5, 2018

Project Manager: CH

SUBSURFACE PROFILE

SAMPLE



Description	Measured Depth (m)	Monitoring Well Details	Sampler #	Recovery (%)	Sample ID	Soil Vapour Concentration (ppmv) (RKI)	Laboratory Analysis
Ground Surface	0.00	No Monitoring Well Installed					
Concrete	0.08						
Gravel	0.15						
Silt Brown clayey silt, some sand, wet.			1	100	BH01-1/ DUP-1	<5	BTEX, PHCs, PAHs
					BH01-2	<5	
Borehole terminated at 1.68 mbfs due to sampler refusal.	1.68						
End of Borehole							

Soil vapour concentration measured using an RKI Eagle combustible gas indicator (RKI).

Contractor: Strata Drilling Group

Drilling Method: Direct Push

Well Casing Size: NA

Pinchin Ltd.
6-875 Main Street West, Suite 200
Hamilton, ON L8S 4P9

Grade Elevation: 79.79 mamsl

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH03

Project #: 212394.001

Logged By: JL

Project: Phase Two Environmental Site Assessment

Client: Spruce Partners Inc.

Location: 1157-1171 North Shore Boulevard East, Burlington, ON

Drill Date: February 5, 2018

Project Manager: CH

SUBSURFACE PROFILE			SAMPLE				
Description	Measured Depth (m)	Monitoring Well Details	Sampler #	Recovery (%)	Sample ID	Soil Vapour Concentration (ppmv) (RKI)	Laboratory Analysis
Ground Surface	0.00						
Topsoil Dark brown sand and silt (topsoil), some organics, frozen to moist.	0.76	No Monitoring Well Installed	1	60	BH03-1	<5	PHCs, PCBs
Silt Dark brown clayey silt, some sand, damp.			2	30	BH03-2	<5	
Brown, some gravel from 1.52 to 3.35 mbgs			3	90	BH03-3	<5	
			4	90	BH03-4	<5	
Reddish brown, damp from 3.35 to 6.5 mbgs.			5	15	BH03-5	<5	
			6	15	BH03-6	<5	
	6.40		7	0	BH03-7	<5	
End of Borehole							

Borehole terminated at 6.4 mbgs due to auger refusal. At drilling completion, a wet cave was measured at 5.94 mbgs and water was measured at 5.79 mbgs.

Soil vapour concentration measured using an RKI Eagle combustible gas indicator (RKI).

Contractor: Strata Drilling Group

Drilling Method: Direct Push

Well Casing Size: NA

Pinchin Ltd.
6-875 Main Street West, Suite 200
Hamilton, ON L8S 4P9

Grade Elevation: 81.40 mamsl

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH04

Project #: 212394.001

Logged By: JL

Project: Phase Two Environmental Site Assessment

Client: Spruce Partners Inc.

Location: 1157-1171 North Shore Boulevard East, Burlington, ON

Drill Date: February 5, 2018

Project Manager: CH

SUBSURFACE PROFILE / SAMPLE

Depth: ft 0 1 2 3 4 5 6 7 8 9 10 11 12 13; m 0 1 2 3

Depth	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sampler #	Recovery (%)	Sample ID	Soil Vapour Concentration (ppmv) (RKI)	Laboratory Analysis
		Ground Surface	0.00						
		Topsoil Dark brown sand and silt, some organics, frozen to moist.	0.23	No Monitoring Well Installed	1	40	BH04-1	<5	
		Silt Dark brown clayey silt, some sand, damp.					BH04-2	<5	PHCs, PCBs
					2	10	BH04-3	<5	
			3.05				BH04-4	<5	
		End of Borehole Borehole terminated at 3.05 mbgs. Soil vapour concentration measured using an RKI Eagle combustible gas indicator (RKI).							

Contractor: Strata Drilling Group

Drilling Method: Direct Push

Well Casing Size: NA

Pinchin Ltd.
6-875 Main Street West, Suite 200
Hamilton, ON L8S 4P9

Grade Elevation: 81.28 mamsl

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH05

Project #: 212394.001

Logged By: JL

Project: Phase Two Environmental Site Assessment

Client: Spruce Partners Inc.

Location: 1157-1171 North Shore Boulevard East, Burlington, ON

Drill Date: February 5, 2018

Project Manager: CH

SUBSURFACE PROFILE

Depth ft	Depth m	Symbol	Description	Measured Depth (m)	Monitoring Well Details
0	0		Ground Surface	0.00	No Monitoring Well Installed
1 2			**Topsoil** Dark brown sand and silt, some organics, frozen to moist.	0.76	
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	1 2 3 4 5		**Silt** Dark brown clayey silt, some sand, damp. Brown from 1.52 to 3.35 mbgs Reddish brown, some gravel, damp from 3.35 to 4.57 mbgs. Some shale from 4.57 to 5.94 mbgs.	5.94	
20 21 22 23 24 25	6 7		End of Borehole Borehole terminated at 5.94 mbgs due to auger refusal. At drilling completion, a wet cave was measured at 5.64 mbgs Soil vapour concentration measured using an RKI Eagle combustible gas indicator (RKI).		

SAMPLE

Sampler #	Recovery (%)	Sample ID	Soil Vapour Concentration (ppmv) (RKI)	Laboratory Analysis
1	60	BH05-1/ DUP-2	<5	PHCs, PCBs
2	30	BH05-2	<5	
3	90	BH05-3	<5	
4	90	BH05-4	<5	
5	70	BH05-5	<5	
6	20	BH05-6	<5	

Contractor: Strata Drilling Group

Drilling Method: Direct Push

Well Casing Size: NA

Pinchin Ltd.
6-875 Main Street West, Suite 200
Hamilton, ON L8S 4P9

Grade Elevation: 81.53 mamsl

Top of Casing Elevation: NA

Sheet: 1 of 1

APPENDIX D

Field Instrument Calibration Records

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

6380 Tomken Road, Unit 1 & 2
Mississauga, ONTARIO L5T1Y4
Toll-free: (866) 688-0388

Pine Environmental Services, Inc.

Instrument ID	19828
Description	RKI Eagle 2 with I/R HC Sensor
Calibrated	1/18/2018 12:00:18PM

Manufacturer	RKI	**State Certified**	
Model Number	Eagle 2 (I.R. SENSOR)	**Status**	Pass
Serial Number/ Lot Number	E2B932	**Temp °C**	23
Location	Ontario	**Humidity %**	18
Department			

Calibration Specifications

Group #	1	**Range Acc %**	0.0000
Group Name	Hexane	**Reading Acc %**	3.0000
Stated Accy	Pct of Reading	**Plus/Minus**	0

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0 / 0	%LEL	0	%LEL	0	0	0.00%	Pass
15 / 15	%LEL	15	%LEL	15	15	0.00%	Pass

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
ON HEX 15%LEL HBH-262-0.165--2	ON HEX 15%LEL LOT HBH-262-0.165-2	Spec Air	32465	HBH-262-0.165-2		7/7/2021

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Kevin Johnson

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

APPENDIX E

Laboratory Certificates of Analysis

Maxxam
A Bureau Veritas Group Company

Your Project #: 212394.001
Site Location: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Your C.O.C. #: 648441-01-01

Attention: Celine Hanna

Pinchin Ltd
Unit 6
875 Main St W
Hamilton, ON
L8S 4R9

Report Date: 2018/02/20
Report #: R5001468
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

MAXXAM JOB #: B829203
Received: 2018/02/07, 16:19

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	3	N/A	2018/02/13	CAM SOP-00301	EPA 8270D m
Petroleum Hydro. CCME F1 & BTEX in Soil (1)	3	N/A	2018/02/12	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Soil (2)	3	2018/02/09	2018/02/10	CAM SOP-00316	CCME CWS m
Petroleum Hydrocarbons F2-F4 in Soil (2)	3	2018/02/09	2018/02/12	CAM SOP-00316	CCME CWS m
Moisture	7	N/A	2018/02/08	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM)	3	2018/02/09	2018/02/09	CAM SOP-00318	EPA 8270D m
Polychlorinated Biphenyl in Soil	4	2018/02/08	2018/02/09	CAM SOP-00309	EPA 8082A m
pH CaCl2 EXTRACT	2	2018/02/12	2018/02/12	CAM SOP-00413	EPA 9045 D m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905)817-5817
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 1

Maxxam Job #: B829203
Report Date: 2018/02/20

Pinchin Ltd
Client Project #: 212394.001
Site Location: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Sampler Initials: JL

O.REG 153 PAHS (SOIL)

Maxxam ID		GBB359	GBB360	GBB366		
Sampling Date		2018/02/05 12:00	2018/02/05 11:00	2018/02/05		
COC Number		648441-01-01	648441-01-01	648441-01-01		
	UNITS	**BH01-1 12:00**	**BH02-1**	**DUP 1**	**RDL**	**QC Batch**
Calculated Parameters						
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	<0.0071	<0.0071	0.0071	5390348
Polyaromatic Hydrocarbons						
Acenaphthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Acenaphthylene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Benzo(a)anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Benzo(a)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Benzo(b/j)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Benzo(g,h,i)perylene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Benzo(k)fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Chrysene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Dibenz(a,h)anthracene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Fluoranthene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Fluorene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
1-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
2-Methylnaphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Naphthalene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Phenanthrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Pyrene	ug/g	<0.0050	<0.0050	<0.0050	0.0050	5392840
Surrogate Recovery (%)						
D10-Anthracene	%	94	93	95		5392840
D14-Terphenyl (FS)	%	99	103	117		5392840
D8-Acenaphthylene	%	105	78	80		5392840

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

O.REG 153 PCBS (SOIL)

Maxxam ID		GBB361	GBB362	GBB363			GBB367		
Sampling Date		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45			2018/02/05		
COC Number		648441-01-01	648441-01-01	648441-01-01			648441-01-01		
	UNITS	**BH03-1**	**BH04-2**	**BH05-1**	**RDL**	**QC Batch**	**DUP 2**	**RDL**	**QC Batch**
Inorganics									
Moisture	%						18	1.0	5390937
PCBs									
Aroclor 1242	ug/g	<0.010	<0.010	<0.010	0.010	5391260	<0.010	0.010	5391260
Aroclor 1248	ug/g	<0.010	<0.010	<0.010	0.010	5391260	<0.010	0.010	5391260
Aroclor 1254	ug/g	<0.010	<0.010	<0.010	0.010	5391260	<0.010	0.010	5391260
Aroclor 1260	ug/g	<0.010	<0.010	<0.010	0.010	5391260	<0.010	0.010	5391260
Total PCB	ug/g	<0.010	<0.010	<0.010	0.010	5391260	<0.010	0.010	5391260
Surrogate Recovery (%)									
Decachlorobiphenyl	%	93	95	107		5391260	93		5391260

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

O.REG 153 PETROLEUM HYDROCARBONS (SOIL)

Maxxam ID		GBB359		GBB360		GBB366		
Sampling Date		2018/02/05 12:00		2018/02/05 11:00		2018/02/05		
COC Number		648441-01-01		648441-01-01		648441-01-01		
	UNITS	**BH01-1 12:00**	**QC Batch**	**BH02-1**	**QC Batch**	**DUP 1**	**RDL**	**QC Batch**
Inorganics								
Moisture	%	18	5390937	19	5390937	19	1.0	5390937
BTEX & F1 Hydrocarbons								
Benzene	ug/g	<0.020	5395642	<0.020	5394368	<0.020	0.020	5395642
Toluene	ug/g	<0.020	5395642	<0.020	5394368	<0.020	0.020	5395642
Ethylbenzene	ug/g	<0.020	5395642	<0.020	5394368	<0.020	0.020	5395642
o-Xylene	ug/g	<0.020	5395642	<0.020	5394368	<0.020	0.020	5395642
p+m-Xylene	ug/g	<0.040	5395642	<0.040	5394368	<0.040	0.040	5395642
Total Xylenes	ug/g	<0.040	5395642	<0.040	5394368	<0.040	0.040	5395642
F1 (C6-C10)	ug/g	<10	5395642	<10	5394368	<10	10	5395642
F1 (C6-C10) - BTEX	ug/g	<10	5395642	<10	5394368	<10	10	5395642
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/g	<10	5392873	<10	5392873	<10	10	5392873
F3 (C16-C34 Hydrocarbons)	ug/g	<50	5392873	<50	5392873	<50	50	5392873
F4 (C34-C50 Hydrocarbons)	ug/g	<50	5392873	<50	5392873	<50	50	5392873
Reached Baseline at C50	ug/g	Yes	5392873	Yes	5392873	Yes		5392873
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	99	5395642	106	5394368	99		5395642
4-Bromofluorobenzene	%	100	5395642	105	5394368	101		5395642
D10-Ethylbenzene	%	104	5395642	79	5394368	101		5395642
D4-1,2-Dichloroethane	%	96	5395642	102	5394368	98		5395642
o-Terphenyl	%	96	5392873	97	5392873	94		5392873

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

RESULTS OF ANALYSES OF SOIL

Maxxam ID		GBB361	GBB362	GBB363			GBB364	GBB365	
Sampling Date		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45			2018/02/05 14:00	2018/02/05 14:15	
COC Number		648441-01-01	648441-01-01	648441-01-01			648441-01-01	648441-01-01	
	UNITS	**BH03-1**	**BH04-2**	**BH05-1**	**RDL**	**QC Batch**	**BH01-1 2:00**	**BH04-2 2:15**	**QC Batch**
Inorganics									
Moisture	%	14	16	18	1.0	5391117			
Available (CaCl2) pH	pH						7.88	7.75	5395027

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		GBB361	GBB362	GBB363		
Sampling Date		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45		
COC Number		648441-01-01	648441-01-01	648441-01-01		
	UNITS	**BH03-1**	**BH04-2**	**BH05-1**	**RDL**	**QC Batch**
F2-F4 Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	ug/g	<10	<10	<10	10	5392332
F3 (C16-C34 Hydrocarbons)	ug/g	<50	<50	<50	50	5392332
F4 (C34-C50 Hydrocarbons)	ug/g	<50	<50	<50	50	5392332
Reached Baseline at C50	ug/g	Yes	Yes	Yes		5392332
Surrogate Recovery (%)						
o-Terphenyl	%	89	88	90		5392332

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C

Custody Seal Present/Intact

Sample GBB360 [BH02-1] : F1/BTEX Analysis: Greater than 10g of soil was submitted in the field preserved vial. This significantly exceeds the protocol specification of approximately 5g. Additional methanol was added to the vial to ensure extraction efficiency.

Results relate only to the items tested.

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5391260	Decachlorobiphenyl	2018/02/08	95	60 - 130	99	60 - 130	96	%		
5392332	o-Terphenyl	2018/02/12	95	60 - 130	95	60 - 130	100	%		
5392840	D10-Anthracene	2018/02/09	96	50 - 130	87	50 - 130	89	%		
5392840	D14-Terphenyl (FS)	2018/02/09	93	50 - 130	100	50 - 130	99	%		
5392840	D8-Acenaphthylene	2018/02/09	101	50 - 130	113	50 - 130	90	%		
5392873	o-Terphenyl	2018/02/10	99	60 - 130	104	60 - 130	98	%		
5394368	1,4-Difluorobenzene	2018/02/12	108	60 - 140	105	60 - 140	104	%		
5394368	4-Bromofluorobenzene	2018/02/12	103	60 - 140	101	60 - 140	105	%		
5394368	D10-Ethylbenzene	2018/02/12	95	60 - 140	81	60 - 140	78	%		
5394368	D4-1,2-Dichloroethane	2018/02/12	101	60 - 140	97	60 - 140	96	%		
5395642	1,4-Difluorobenzene	2018/02/12	100	60 - 140	99	60 - 140	99	%		
5395642	4-Bromofluorobenzene	2018/02/12	101	60 - 140	99	60 - 140	102	%		
5395642	D10-Ethylbenzene	2018/02/12	103	60 - 140	98	60 - 140	94	%		
5395642	D4-1,2-Dichloroethane	2018/02/12	100	60 - 140	102	60 - 140	96	%		
5390937	Moisture	2018/02/08							1.4	20
5391117	Moisture	2018/02/08							2.2	20
5391260	Aroclor 1242	2018/02/08					<0.010	ug/g	NC	50
5391260	Aroclor 1248	2018/02/08					<0.010	ug/g	NC	50
5391260	Aroclor 1254	2018/02/08					<0.010	ug/g	NC	50
5391260	Aroclor 1260	2018/02/08	103	60 - 130	112	60 - 130	<0.010	ug/g	NC	50
5391260	Total PCB	2018/02/08	103	60 - 130	112	60 - 130	<0.010	ug/g	NC	50
5392332	F2 (C10-C16 Hydrocarbons)	2018/02/12	87	50 - 130	86	80 - 120	<10	ug/g	NC	30
5392332	F3 (C16-C34 Hydrocarbons)	2018/02/12	88	50 - 130	86	80 - 120	<50	ug/g	NC	30
5392332	F4 (C34-C50 Hydrocarbons)	2018/02/12	85	50 - 130	83	80 - 120	<50	ug/g	NC	30
5392840	1-Methylnaphthalene	2018/02/09	93	50 - 130	105	50 - 130	<0.0050	ug/g	NC	40
5392840	2-Methylnaphthalene	2018/02/09	92	50 - 130	94	50 - 130	<0.0050	ug/g	NC	40
5392840	Acenaphthene	2018/02/09	96	50 - 130	97	50 - 130	<0.0050	ug/g	NC	40
5392840	Acenaphthylene	2018/02/09	85	50 - 130	115	50 - 130	<0.0050	ug/g	NC	40
5392840	Anthracene	2018/02/09	91	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
5392840	Benzo(a)anthracene	2018/02/09	94	50 - 130	94	50 - 130	<0.0050	ug/g	NC	40
5392840	Benzo(a)pyrene	2018/02/09	86	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40
5392840	Benzo(b/j)fluoranthene	2018/02/09	87	50 - 130	95	50 - 130	<0.0050	ug/g	NC	40

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5392840	Benzo(g,h,i)perylene	2018/02/09	71	50 - 130	87	50 - 130	<0.0050	ug/g	NC	40
5392840	Benzo(k)fluoranthene	2018/02/09	88	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
5392840	Chrysene	2018/02/09	99	50 - 130	100	50 - 130	<0.0050	ug/g	NC	40
5392840	Dibenz(a,h)anthracene	2018/02/09	72	50 - 130	85	50 - 130	<0.0050	ug/g	NC	40
5392840	Fluoranthene	2018/02/09	101	50 - 130	114	50 - 130	<0.0050	ug/g	NC	40
5392840	Fluorene	2018/02/09	84	50 - 130	85	50 - 130	<0.0050	ug/g	NC	40
5392840	Indeno(1,2,3-cd)pyrene	2018/02/09	75	50 - 130	92	50 - 130	<0.0050	ug/g	NC	40
5392840	Naphthalene	2018/02/09	85	50 - 130	93	50 - 130	<0.0050	ug/g	NC	40
5392840	Phenanthrene	2018/02/09	93	50 - 130	90	50 - 130	<0.0050	ug/g	NC	40
5392840	Pyrene	2018/02/09	96	50 - 130	106	50 - 130	<0.0050	ug/g	NC	40
5392873	F2 (C10-C16 Hydrocarbons)	2018/02/10	95	50 - 130	96	80 - 120	<10	ug/g	NC	30
5392873	F3 (C16-C34 Hydrocarbons)	2018/02/10	97	50 - 130	98	80 - 120	<50	ug/g	NC	30
5392873	F4 (C34-C50 Hydrocarbons)	2018/02/10	93	50 - 130	93	80 - 120	<50	ug/g	NC	30
5394368	Benzene	2018/02/12	97	60 - 140	92	60 - 140	<0.020	ug/g	NC	50
5394368	Ethylbenzene	2018/02/12	97	60 - 140	91	60 - 140	<0.020	ug/g	NC	50
5394368	F1 (C6-C10) - BTEX	2018/02/12					<10	ug/g	NC	30
5394368	F1 (C6-C10)	2018/02/12	94	60 - 140	96	80 - 120	<10	ug/g	NC	30
5394368	o-Xylene	2018/02/12	103	60 - 140	97	60 - 140	<0.020	ug/g	NC	50
5394368	p+m-Xylene	2018/02/12	96	60 - 140	91	60 - 140	<0.040	ug/g	NC	50
5394368	Toluene	2018/02/12	92	60 - 140	88	60 - 140	<0.020	ug/g	NC	50
5394368	Total Xylenes	2018/02/12					<0.040	ug/g	NC	50
5395027	Available (CaCl2) pH	2018/02/12			99	97 - 103			0.51	N/A
5395642	Benzene	2018/02/12	98	60 - 140	109	60 - 140	<0.020	ug/g		
5395642	Ethylbenzene	2018/02/12	101	60 - 140	96	60 - 140	<0.020	ug/g		
5395642	F1 (C6-C10) - BTEX	2018/02/12					<10	ug/g	NC	30
5395642	F1 (C6-C10)	2018/02/12	97	60 - 140	92	80 - 120	<10	ug/g	NC	30
5395642	o-Xylene	2018/02/12	104	60 - 140	100	60 - 140	<0.020	ug/g		
5395642	p+m-Xylene	2018/02/12	98	60 - 140	92	60 - 140	<0.040	ug/g		
5395642	Toluene	2018/02/12	97	60 - 140	97	60 - 140	<0.020	ug/g		

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5395642	Total Xylenes	2018/02/12					<0.040	ug/g		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5777 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

IMMEDIATE TEST

INVOICE TO:

Company Name: #47523 Pinchin Ltd
Attention: Accounts Payable
Address: Unit 6 875 Main St W
Hamilton ON L8S 4R9
Tel: (905) 577-6206 x Fax: (905) 577-6207 x
Email: ap@pinchin.com

REPORT TO:

Company Name:
Attention: Celine Hanna
Address:
Tel: (905) 577-6206 x1709 Fax:
Email: channa@pinchin.com

PROJECT INFORMATION:

Quotation #: A70927
P.O. #:
Project: ~~214483.001~~ 212394.001
Project Name: Phase II
Site #: 1157 North Shore Blvd. E, Burlington
Sampled By: Jason Coplante

Laboratory Use Only:

Maxxam Job #:
Bottle Order #: 648441
COC #: C#648441-01-01
Project Manager: Antonella Brasil

07-Feb-18 16:19
Antonella Brasil
B829203
MAF ENV-1132

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☒ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☒ Table 3 ☐ Agri/Other ☒ For RSC
☐ Table ___

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ______
☐ PWQO
☐ Other ______

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ______

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
...ease provide advance notice for rush projects
...ard) TAT: ☒
...sh TAT is not specified)
Working days for most tests
...rd TAT for certain tests such as BOD and Dioxins/Furans are > 5
...Project Manager for details.
...h TAT (if applies to entire submission)
______ Time Required: ______ ☐
Number: ______ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle):	Metals / Hg / Cr VI	Petroleum Hydrocarbons (Soil) (F1-F4), BTEX	PAHs (Soil)	PCBs (Soil)	PHC (F2-F4)	pH					# of Bottles	Comments
1		BH01-1	2018/02/05	12:00	Soil			X	X								3	
2		BH02-1		11:00				X	X								3	
3		BH03-1		10:45						X	X						2	
4		BH04-2		12:15						X	X						2	
5		BH05-1		12:45						X	X						2	
6		BH01-1		2:00								X					1	
7		BH04-2		2:15								X					1	
8		Dup1		—				X	X								3	
9		Dup2		—						X							1	
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Jason Coplante	2018/02/07	8:55am		2018/02/07	1619	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	5/3/1	Present	✓	
		Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF. 435081

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

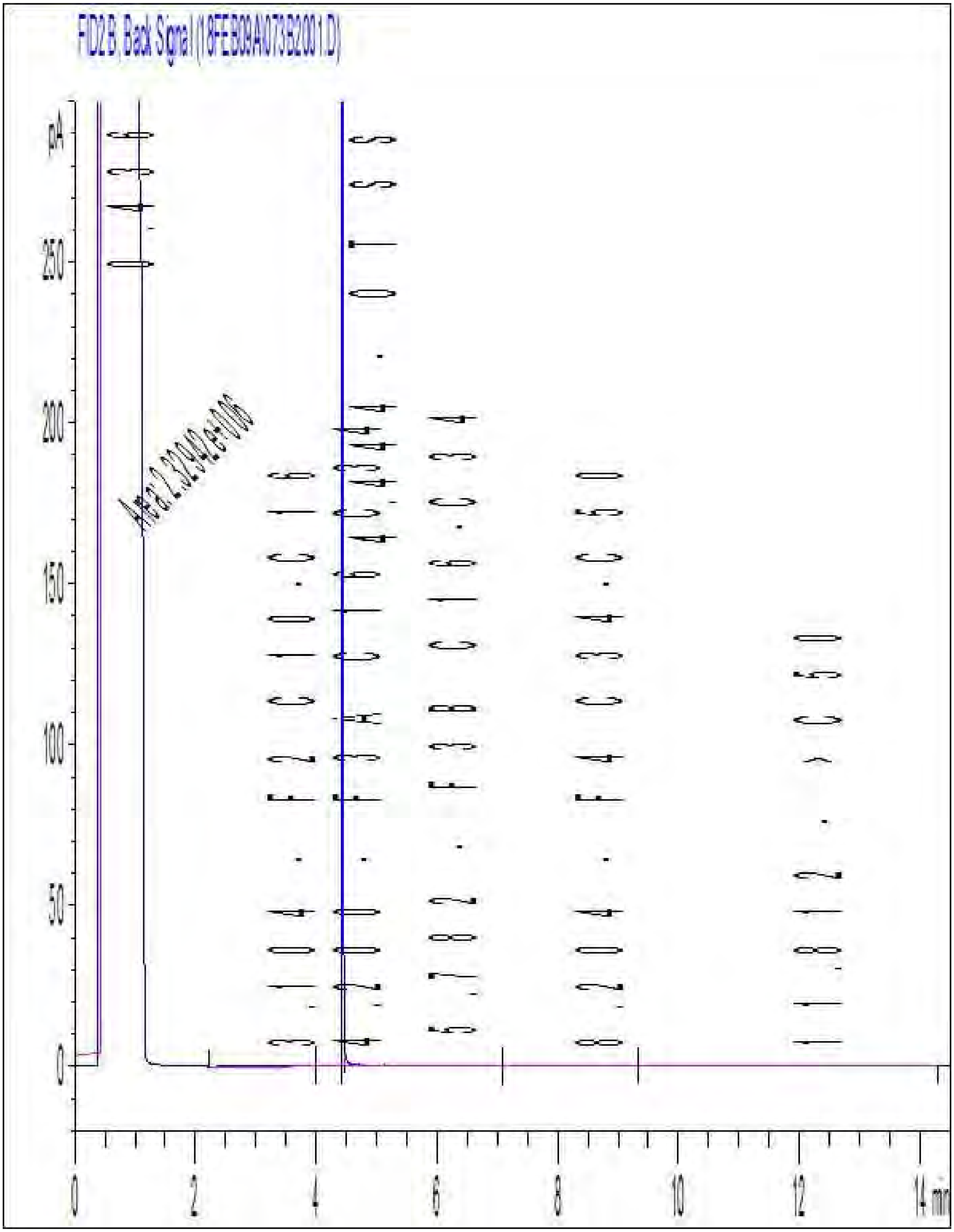
White: Maxxa Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB359

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH01-1 12:00

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

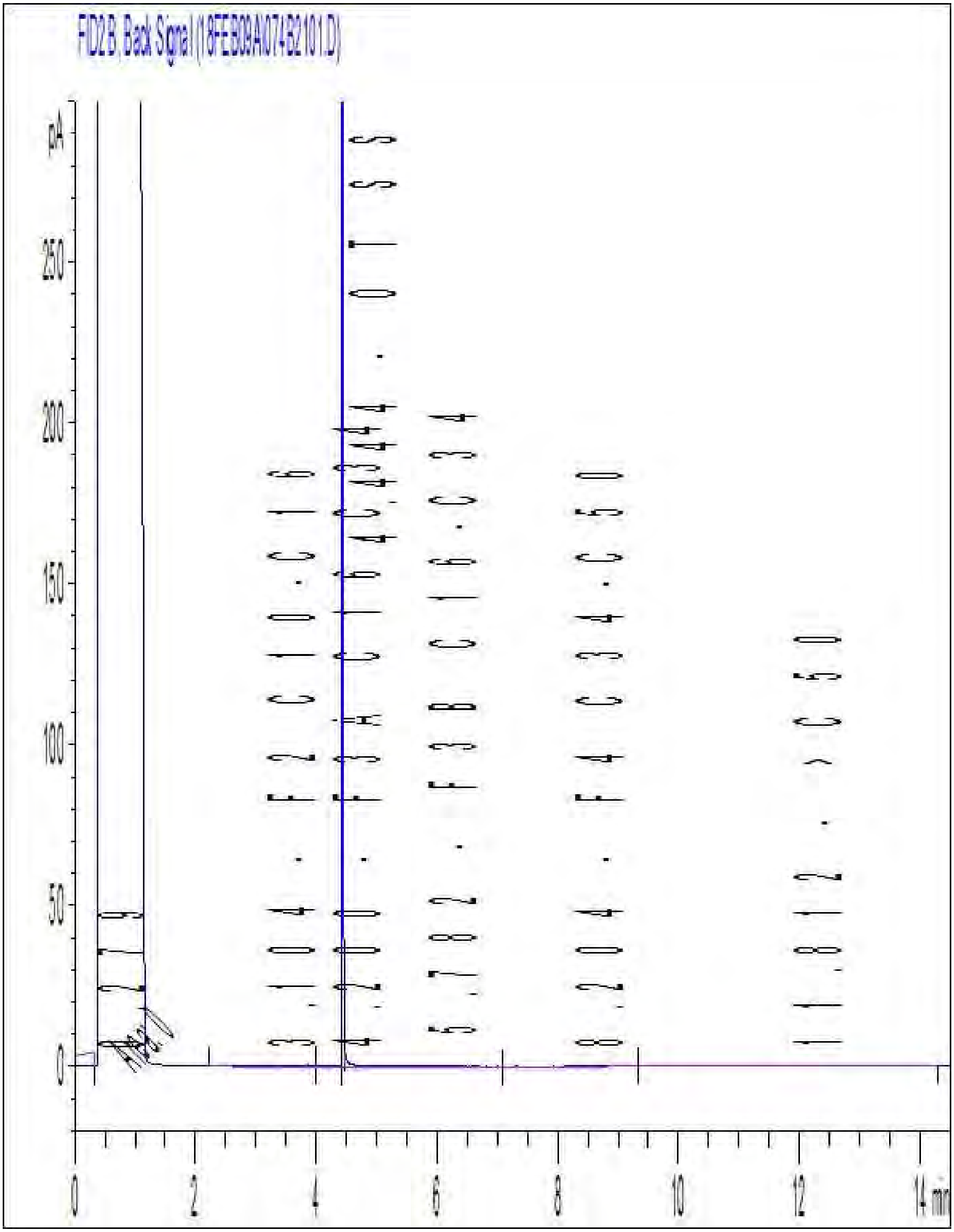


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB359 Lab-Dup

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH01-1 12:00

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

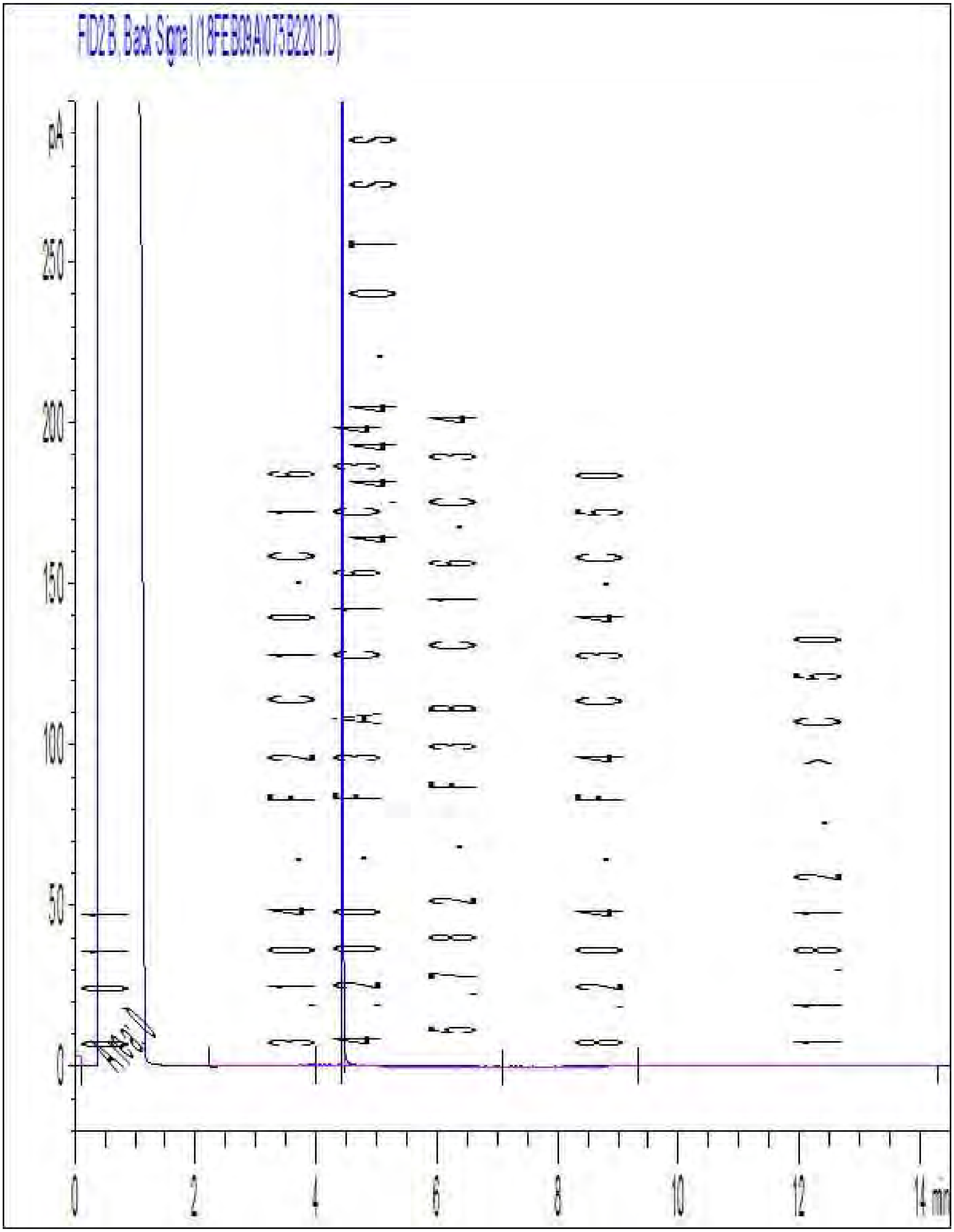


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB360

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH02-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

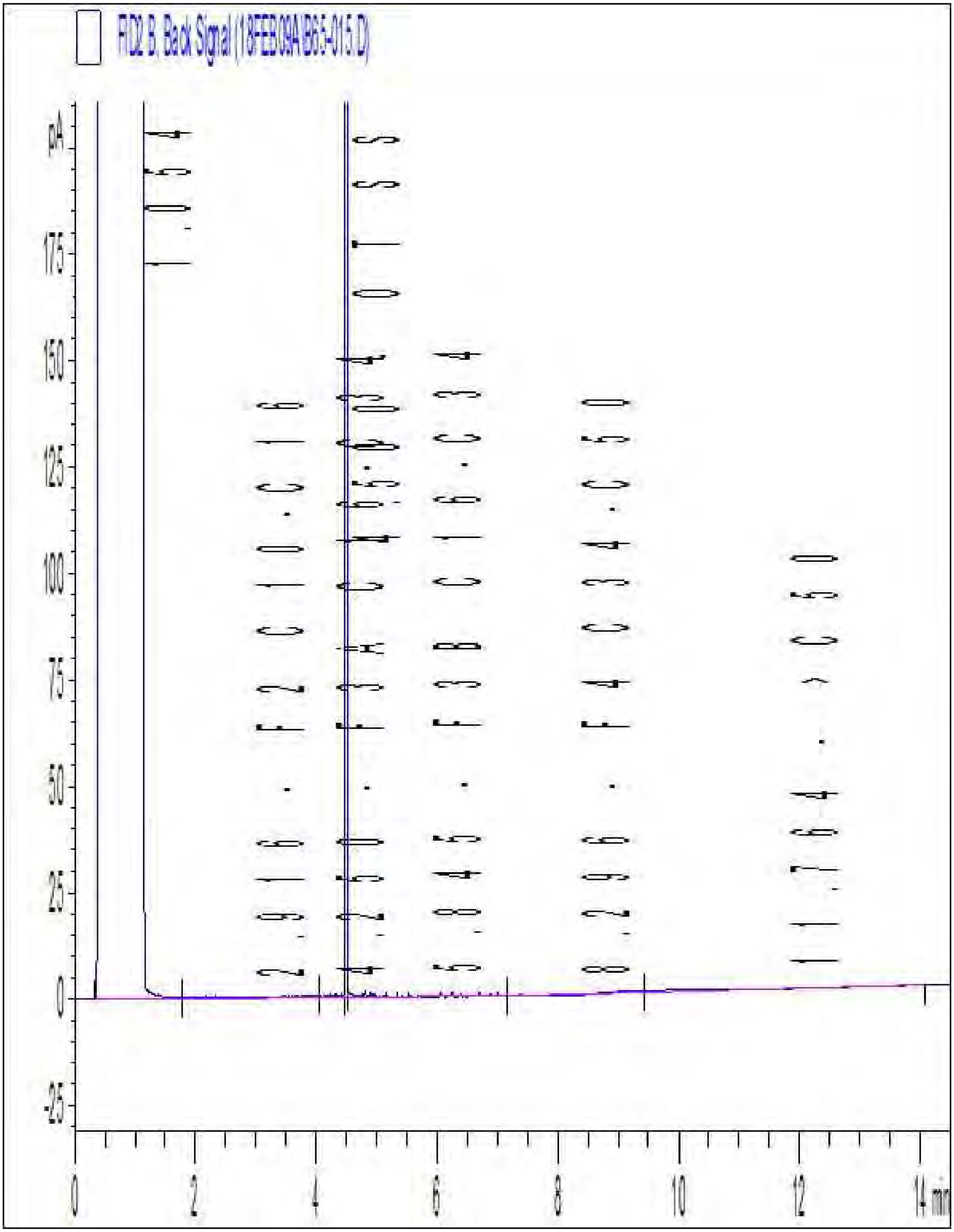


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB361

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH03-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

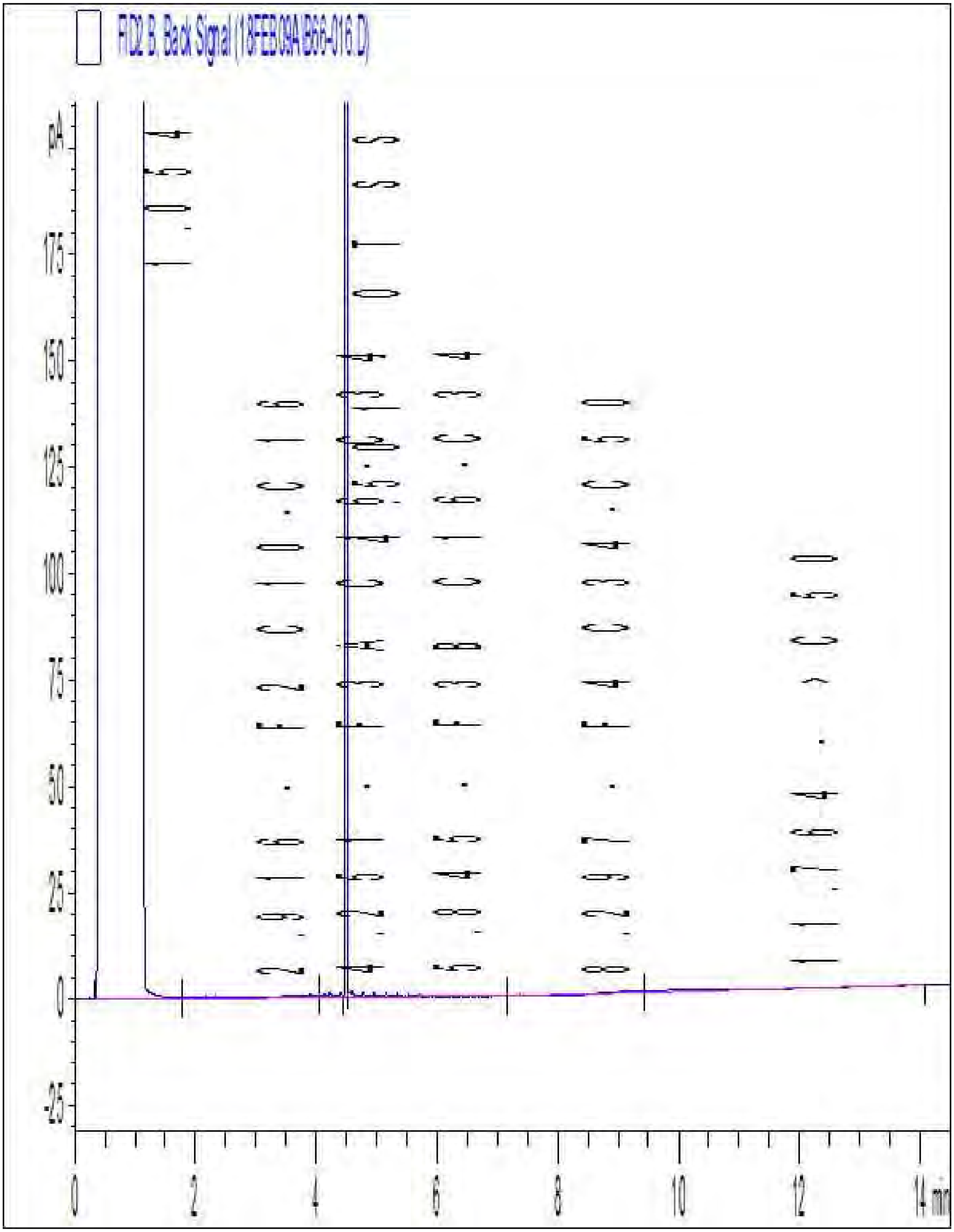


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB362

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH04-2

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

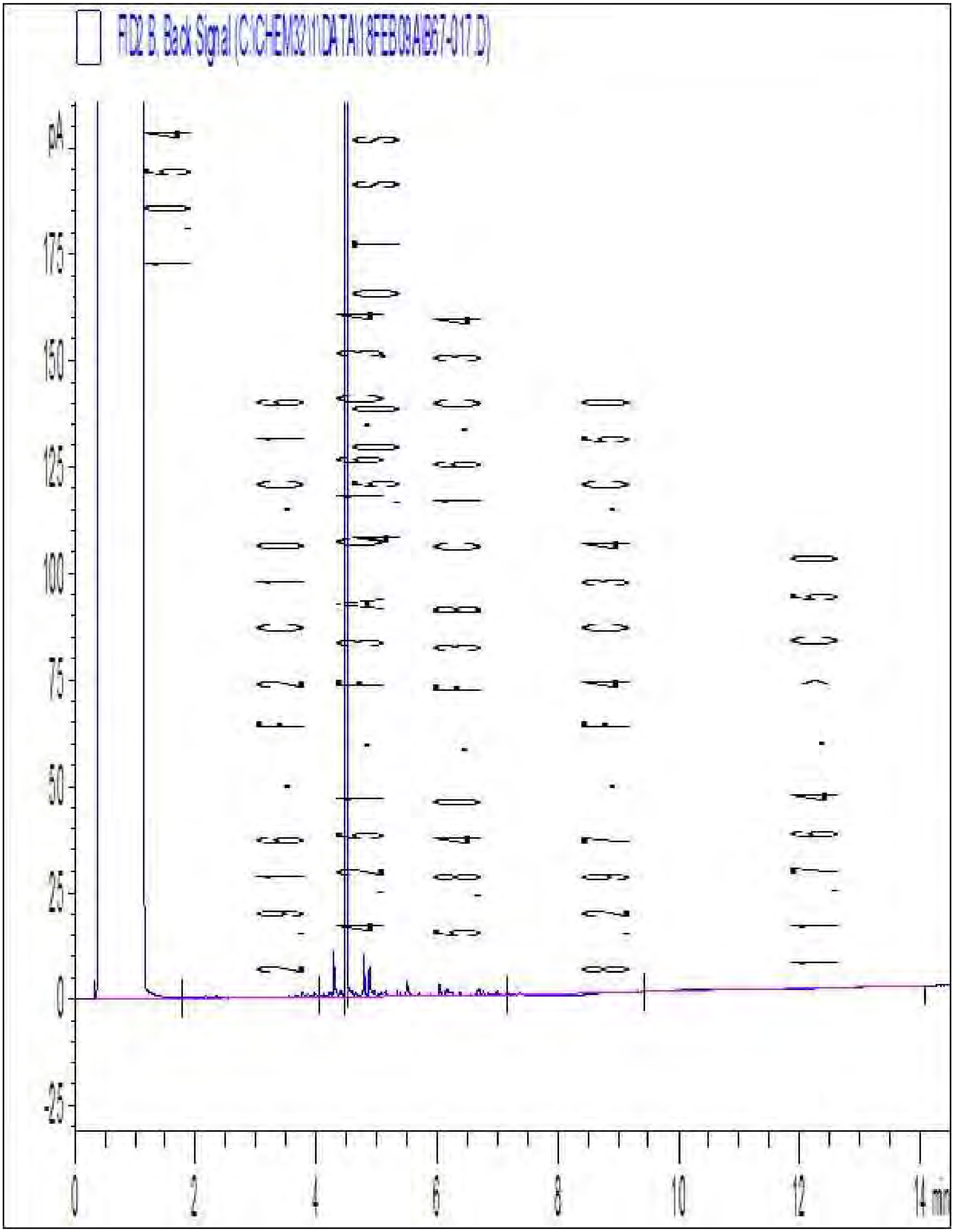


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB363

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH05-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

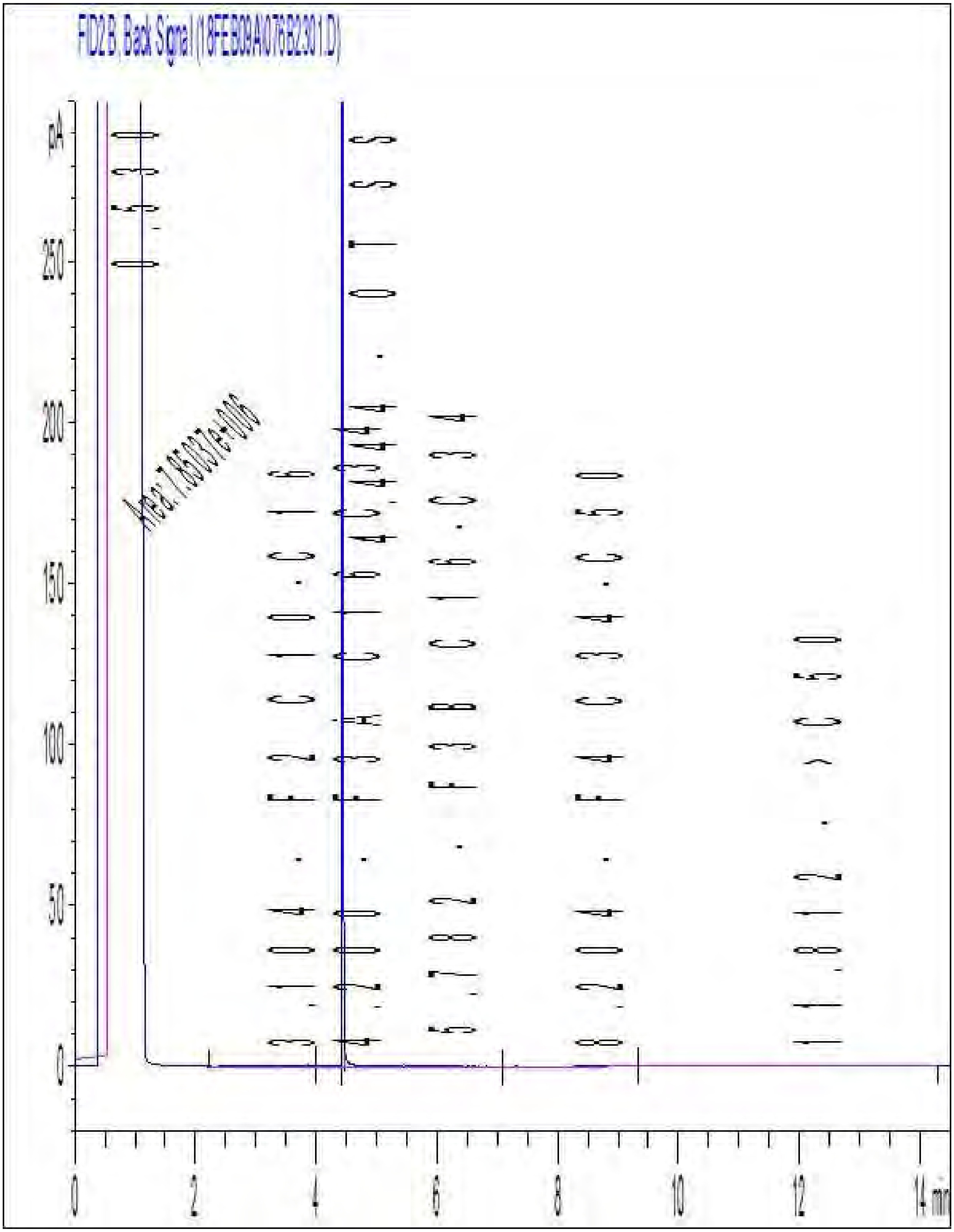


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/02/20
Maxxam Sample: GBB366

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: DUP 1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your Project #: 212394.001
Site Location: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Your C.O.C. #: 648441-01-01

Attention: Celine Hanna

Pinchin Ltd
Unit 6
875 Main St W
Hamilton, ON
L8S 4R9

Report Date: 2018/03/01
Report #: R5025921
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829203
Received: 2018/02/07, 16:19

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Methylnaphthalene Sum	3	N/A	2018/02/13	CAM SOP-00301	EPA 8270D m
Petroleum Hydro. CCME F1 & BTEX in Soil (1)	3	N/A	2018/02/12	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Soil (2)	3	2018/02/09	2018/02/10	CAM SOP-00316	CCME CWS m
Petroleum Hydrocarbons F2-F4 in Soil (2)	3	2018/02/09	2018/02/12	CAM SOP-00316	CCME CWS m
Moisture	7	N/A	2018/02/08	CAM SOP-00445	Carter 2nd ed 51.2 m
PAH Compounds in Soil by GC/MS (SIM)	3	2018/02/09	2018/02/09	CAM SOP-00318	EPA 8270D m
Polychlorinated Biphenyl in Soil	4	2018/02/08	2018/02/09	CAM SOP-00309	EPA 8082A m
pH CaCl2 EXTRACT	2	2018/02/12	2018/02/12	CAM SOP-00413	EPA 9045 D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam’s profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 212394.001
Site Location: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Your C.O.C. #: 648441-01-01

Attention: Celine Hanna

Pinchin Ltd
Unit 6
875 Main St W
Hamilton, ON
L8S 4R9

Report Date: 2018/03/01
Report #: R5025921
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B829203
Received: 2018/02/07, 16:19

(1) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is the date sampled unless otherwise stated.
(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Senior Project Manager
Email: ABrasil@maxxam.ca
Phone# (905)817-5817
==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total Cover Pages : 2

RESULTS OF ANALYSES OF SOIL

Maxxam ID		GBB359	GBB360		GBB361	GBB362	GBB363		
Sampling Date		2018/02/05 12:00	2018/02/05 11:00		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45		
COC Number		648441-01-01	648441-01-01		648441-01-01	648441-01-01	648441-01-01		
	UNITS	**BH01-1 12:00**	**BH02-1**	**QC Batch**	**BH03-1**	**BH04-2**	**BH05-1**	**RDL**	**QC Batch**
Inorganics									
Moisture	%	18	19	5390937	14	16	18	1.0	5391117

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		GBB364	GBB365		GBB366	GBB367		
Sampling Date		2018/02/05 14:00	2018/02/05 14:15		2018/02/05	2018/02/05		
COC Number		648441-01-01	648441-01-01		648441-01-01	648441-01-01		
	UNITS	**BH01-1 2:00**	**BH04-2 2:15**	**QC Batch**	**DUP 1**	**DUP 2**	**RDL**	**QC Batch**
Inorganics								
Moisture	%				19	18	1.0	5390937
Available (CaCl2) pH	pH	7.88	7.75	5395027				

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		GBB359			GBB359			GBB360		
Sampling Date		2018/02/05 12:00			2018/02/05 12:00			2018/02/05 11:00		
COC Number		648441-01-01			648441-01-01			648441-01-01		
	UNITS	**BH01-1 12:00**	**RDL**	**QC Batch**	**BH01-1 12:00 Lab-Dup**	**RDL**	**QC Batch**	**BH02-1**	**RDL**	**QC Batch**
Calculated Parameters										
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	0.0071	5390348				<0.0071	0.0071	5390348
Polyaromatic Hydrocarbons										
Acenaphthene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Acenaphthylene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Anthracene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Benzo(a)anthracene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Benzo(a)pyrene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Benzo(b/j)fluoranthene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Benzo(g,h,i)perylene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Benzo(k)fluoranthene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Chrysene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Dibenz(a,h)anthracene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Fluoranthene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Fluorene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
1-Methylnaphthalene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
2-Methylnaphthalene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Naphthalene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Phenanthrene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Pyrene	ug/g	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840	<0.0050	0.0050	5392840
Surrogate Recovery (%)										
D10-Anthracene	%	94		5392840	95		5392840	93		5392840
D14-Terphenyl (FS)	%	99		5392840	103		5392840	103		5392840
D8-Acenaphthylene	%	105		5392840	106		5392840	78		5392840

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

SEMI-VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		GBB366		
Sampling Date		2018/02/05		
COC Number		648441-01-01		
	UNITS	**DUP 1**	**RDL**	**QC Batch**
Calculated Parameters				
Methylnaphthalene, 2-(1-)	ug/g	<0.0071	0.0071	5390348
Polyaromatic Hydrocarbons				
Acenaphthene	ug/g	<0.0050	0.0050	5392840
Acenaphthylene	ug/g	<0.0050	0.0050	5392840
Anthracene	ug/g	<0.0050	0.0050	5392840
Benzo(a)anthracene	ug/g	<0.0050	0.0050	5392840
Benzo(a)pyrene	ug/g	<0.0050	0.0050	5392840
Benzo(b/j)fluoranthene	ug/g	<0.0050	0.0050	5392840
Benzo(g,h,i)perylene	ug/g	<0.0050	0.0050	5392840
Benzo(k)fluoranthene	ug/g	<0.0050	0.0050	5392840
Chrysene	ug/g	<0.0050	0.0050	5392840
Dibenz(a,h)anthracene	ug/g	<0.0050	0.0050	5392840
Fluoranthene	ug/g	<0.0050	0.0050	5392840
Fluorene	ug/g	<0.0050	0.0050	5392840
Indeno(1,2,3-cd)pyrene	ug/g	<0.0050	0.0050	5392840
1-Methylnaphthalene	ug/g	<0.0050	0.0050	5392840
2-Methylnaphthalene	ug/g	<0.0050	0.0050	5392840
Naphthalene	ug/g	<0.0050	0.0050	5392840
Phenanthrene	ug/g	<0.0050	0.0050	5392840
Pyrene	ug/g	<0.0050	0.0050	5392840
Surrogate Recovery (%)				
D10-Anthracene	%	95		5392840
D14-Terphenyl (FS)	%	117		5392840
D8-Acenaphthylene	%	80		5392840

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		GBB359			GBB359			GBB360		
Sampling Date		2018/02/05 12:00			2018/02/05 12:00			2018/02/05 11:00		
COC Number		648441-01-01			648441-01-01			648441-01-01		
	UNITS	**BH01-1 12:00**	**RDL**	**QC Batch**	**BH01-1 12:00 Lab-Dup**	**RDL**	**QC Batch**	**BH02-1**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons										
Benzene	ug/g	<0.020	0.020	5395642				<0.020	0.020	5394368
Toluene	ug/g	<0.020	0.020	5395642				<0.020	0.020	5394368
Ethylbenzene	ug/g	<0.020	0.020	5395642				<0.020	0.020	5394368
o-Xylene	ug/g	<0.020	0.020	5395642				<0.020	0.020	5394368
p+m-Xylene	ug/g	<0.040	0.040	5395642				<0.040	0.040	5394368
Total Xylenes	ug/g	<0.040	0.040	5395642				<0.040	0.040	5394368
F1 (C6-C10)	ug/g	<10	10	5395642				<10	10	5394368
F1 (C6-C10) - BTEX	ug/g	<10	10	5395642				<10	10	5394368
F2-F4 Hydrocarbons										
F2 (C10-C16 Hydrocarbons)	ug/g	<10	10	5392873	<10	10	5392873	<10	10	5392873
F3 (C16-C34 Hydrocarbons)	ug/g	<50	50	5392873	<50	50	5392873	<50	50	5392873
F4 (C34-C50 Hydrocarbons)	ug/g	<50	50	5392873	<50	50	5392873	<50	50	5392873
Reached Baseline at C50	ug/g	Yes		5392873	Yes		5392873	Yes		5392873
Surrogate Recovery (%)										
1,4-Difluorobenzene	%	99		5395642				106		5394368
4-Bromofluorobenzene	%	100		5395642				105		5394368
D10-Ethylbenzene	%	104		5395642				79		5394368
D4-1,2-Dichloroethane	%	96		5395642				102		5394368
o-Terphenyl	%	96		5392873	95		5392873	97		5392873

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		GBB361	GBB362	GBB363			GBB366		
Sampling Date		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45			2018/02/05		
COC Number		648441-01-01	648441-01-01	648441-01-01			648441-01-01		
	UNITS	**BH03-1**	**BH04-2**	**BH05-1**	**RDL**	**QC Batch**	**DUP 1**	**RDL**	**QC Batch**
BTEX & F1 Hydrocarbons									
Benzene	ug/g						<0.020	0.020	5395642
Toluene	ug/g						<0.020	0.020	5395642
Ethylbenzene	ug/g						<0.020	0.020	5395642
o-Xylene	ug/g						<0.020	0.020	5395642
p+m-Xylene	ug/g						<0.040	0.040	5395642
Total Xylenes	ug/g						<0.040	0.040	5395642
F1 (C6-C10)	ug/g						<10	10	5395642
F1 (C6-C10) - BTEX	ug/g						<10	10	5395642
F2-F4 Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	ug/g	<10	<10	<10	10	5392332	<10	10	5392873
F3 (C16-C34 Hydrocarbons)	ug/g	<50	<50	<50	50	5392332	<50	50	5392873
F4 (C34-C50 Hydrocarbons)	ug/g	<50	<50	<50	50	5392332	<50	50	5392873
Reached Baseline at C50	ug/g	Yes	Yes	Yes		5392332	Yes		5392873
Surrogate Recovery (%)									
1,4-Difluorobenzene	%						99		5395642
4-Bromofluorobenzene	%						101		5395642
D10-Ethylbenzene	%						101		5395642
D4-1,2-Dichloroethane	%						98		5395642
o-Terphenyl	%	89	88	90		5392332	94		5392873

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		GBB361	GBB362	GBB363	GBB367		
Sampling Date		2018/02/05 10:45	2018/02/05 12:15	2018/02/05 12:45	2018/02/05		
COC Number		648441-01-01	648441-01-01	648441-01-01	648441-01-01		
	UNITS	**BH03-1**	**BH04-2**	**BH05-1**	**DUP 2**	**RDL**	**QC Batch**
PCBs							
Aroclor 1242	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5391260
Aroclor 1248	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5391260
Aroclor 1254	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5391260
Aroclor 1260	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5391260
Total PCB	ug/g	<0.010	<0.010	<0.010	<0.010	0.010	5391260
Surrogate Recovery (%)							
Decachlorobiphenyl	%	93	95	107	93		5391260

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.0°C

Custody Seal Present/Intact

Sample GBB360 [BH02-1] : F1/BTEX Analysis: Greater than 10g of soil was submitted in the field preserved vial. This significantly exceeds the protocol specification of approximately 5g. Additional methanol was added to the vial to ensure extraction efficiency.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5390937	JGH	RPD	Moisture	2018/02/08	1.4		%	20
5391117	JGH	RPD	Moisture	2018/02/08	2.2		%	20
5391260	SVS	Matrix Spike	Decachlorobiphenyl	2018/02/08		95	%	60 - 130
			Aroclor 1260	2018/02/08		103	%	60 - 130
			Total PCB	2018/02/08		103	%	60 - 130
5391260	SVS	Spiked Blank	Decachlorobiphenyl	2018/02/08		99	%	60 - 130
			Aroclor 1260	2018/02/08		112	%	60 - 130
			Total PCB	2018/02/08		112	%	60 - 130
5391260	SVS	Method Blank	Decachlorobiphenyl	2018/02/08		96	%	60 - 130
			Aroclor 1242	2018/02/08	<0.010		ug/g	
			Aroclor 1248	2018/02/08	<0.010		ug/g	
			Aroclor 1254	2018/02/08	<0.010		ug/g	
			Aroclor 1260	2018/02/08	<0.010		ug/g	
			Total PCB	2018/02/08	<0.010		ug/g	
5391260	SVS	RPD	Aroclor 1242	2018/02/08	NC		%	50
			Aroclor 1248	2018/02/08	NC		%	50
			Aroclor 1254	2018/02/08	NC		%	50
			Aroclor 1260	2018/02/08	NC		%	50
			Total PCB	2018/02/08	NC		%	50
5392332	KLI	Matrix Spike	o-Terphenyl	2018/02/12		95	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/12		87	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2018/02/12		88	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2018/02/12		85	%	50 - 130
5392332	KLI	Spiked Blank	o-Terphenyl	2018/02/12		95	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/12		86	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2018/02/12		86	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2018/02/12		83	%	80 - 120
5392332	KLI	Method Blank	o-Terphenyl	2018/02/12		100	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/12	<10		ug/g	
			F3 (C16-C34 Hydrocarbons)	2018/02/12	<50		ug/g	
			F4 (C34-C50 Hydrocarbons)	2018/02/12	<50		ug/g	
5392332	KLI	RPD	F2 (C10-C16 Hydrocarbons)	2018/02/12	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2018/02/12	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2018/02/12	NC		%	30
5392840	RAJ	Matrix Spike [GBB359-01]	D10-Anthracene	2018/02/09		96	%	50 - 130
			D14-Terphenyl (FS)	2018/02/09		93	%	50 - 130
			D8-Acenaphthylene	2018/02/09		101	%	50 - 130
			Acenaphthene	2018/02/09		96	%	50 - 130
			Acenaphthylene	2018/02/09		85	%	50 - 130
			Anthracene	2018/02/09		91	%	50 - 130
			Benzo(a)anthracene	2018/02/09		94	%	50 - 130
			Benzo(a)pyrene	2018/02/09		86	%	50 - 130
			Benzo(b/j)fluoranthene	2018/02/09		87	%	50 - 130
			Benzo(g,h,i)perylene	2018/02/09		71	%	50 - 130
			Benzo(k)fluoranthene	2018/02/09		88	%	50 - 130
			Chrysene	2018/02/09		99	%	50 - 130
			Dibenz(a,h)anthracene	2018/02/09		72	%	50 - 130
			Fluoranthene	2018/02/09		101	%	50 - 130
			Fluorene	2018/02/09		84	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2018/02/09		75	%	50 - 130
			1-Methylnaphthalene	2018/02/09		93	%	50 - 130

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			2-Methylnaphthalene	2018/02/09		92	%	50 - 130
			Naphthalene	2018/02/09		85	%	50 - 130
			Phenanthrene	2018/02/09		93	%	50 - 130
			Pyrene	2018/02/09		96	%	50 - 130
5392840	RAJ	Spiked Blank	D10-Anthracene	2018/02/09		87	%	50 - 130
			D14-Terphenyl (FS)	2018/02/09		100	%	50 - 130
			D8-Acenaphthylene	2018/02/09		113	%	50 - 130
			Acenaphthene	2018/02/09		97	%	50 - 130
			Acenaphthylene	2018/02/09		115	%	50 - 130
			Anthracene	2018/02/09		90	%	50 - 130
			Benzo(a)anthracene	2018/02/09		94	%	50 - 130
			Benzo(a)pyrene	2018/02/09		93	%	50 - 130
			Benzo(b/j)fluoranthene	2018/02/09		95	%	50 - 130
			Benzo(g,h,i)perylene	2018/02/09		87	%	50 - 130
			Benzo(k)fluoranthene	2018/02/09		92	%	50 - 130
			Chrysene	2018/02/09		100	%	50 - 130
			Dibenz(a,h)anthracene	2018/02/09		85	%	50 - 130
			Fluoranthene	2018/02/09		114	%	50 - 130
			Fluorene	2018/02/09		85	%	50 - 130
			Indeno(1,2,3-cd)pyrene	2018/02/09		92	%	50 - 130
			1-Methylnaphthalene	2018/02/09		105	%	50 - 130
			2-Methylnaphthalene	2018/02/09		94	%	50 - 130
			Naphthalene	2018/02/09		93	%	50 - 130
			Phenanthrene	2018/02/09		90	%	50 - 130
			Pyrene	2018/02/09		106	%	50 - 130
5392840	RAJ	Method Blank	D10-Anthracene	2018/02/09		89	%	50 - 130
			D14-Terphenyl (FS)	2018/02/09		99	%	50 - 130
			D8-Acenaphthylene	2018/02/09		90	%	50 - 130
			Acenaphthene	2018/02/09	<0.0050		ug/g	
			Acenaphthylene	2018/02/09	<0.0050		ug/g	
			Anthracene	2018/02/09	<0.0050		ug/g	
			Benzo(a)anthracene	2018/02/09	<0.0050		ug/g	
			Benzo(a)pyrene	2018/02/09	<0.0050		ug/g	
			Benzo(b/j)fluoranthene	2018/02/09	<0.0050		ug/g	
			Benzo(g,h,i)perylene	2018/02/09	<0.0050		ug/g	
			Benzo(k)fluoranthene	2018/02/09	<0.0050		ug/g	
			Chrysene	2018/02/09	<0.0050		ug/g	
			Dibenz(a,h)anthracene	2018/02/09	<0.0050		ug/g	
			Fluoranthene	2018/02/09	<0.0050		ug/g	
			Fluorene	2018/02/09	<0.0050		ug/g	
			Indeno(1,2,3-cd)pyrene	2018/02/09	<0.0050		ug/g	
			1-Methylnaphthalene	2018/02/09	<0.0050		ug/g	
			2-Methylnaphthalene	2018/02/09	<0.0050		ug/g	
			Naphthalene	2018/02/09	<0.0050		ug/g	
			Phenanthrene	2018/02/09	<0.0050		ug/g	
			Pyrene	2018/02/09	<0.0050		ug/g	
5392840	RAJ	RPD [GBB359-01]	Acenaphthene	2018/02/09	NC		%	40
			Acenaphthylene	2018/02/09	NC		%	40
			Anthracene	2018/02/09	NC		%	40
			Benzo(a)anthracene	2018/02/09	NC		%	40
			Benzo(a)pyrene	2018/02/09	NC		%	40

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Benzo(b/j)fluoranthene	2018/02/09	NC		%	40
			Benzo(g,h,i)perylene	2018/02/09	NC		%	40
			Benzo(k)fluoranthene	2018/02/09	NC		%	40
			Chrysene	2018/02/09	NC		%	40
			Dibenz(a,h)anthracene	2018/02/09	NC		%	40
			Fluoranthene	2018/02/09	NC		%	40
			Fluorene	2018/02/09	NC		%	40
			Indeno(1,2,3-cd)pyrene	2018/02/09	NC		%	40
			1-Methylnaphthalene	2018/02/09	NC		%	40
			2-Methylnaphthalene	2018/02/09	NC		%	40
			Naphthalene	2018/02/09	NC		%	40
			Phenanthrene	2018/02/09	NC		%	40
			Pyrene	2018/02/09	NC		%	40
5392873	BWW	Matrix Spike [GBB359-01]	o-Terphenyl	2018/02/10		99	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/10		95	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2018/02/10		97	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2018/02/10		93	%	50 - 130
5392873	BWW	Spiked Blank	o-Terphenyl	2018/02/10		104	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/10		96	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2018/02/10		98	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2018/02/10		93	%	80 - 120
5392873	BWW	Method Blank	o-Terphenyl	2018/02/10		98	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2018/02/10	<10		ug/g	
			F3 (C16-C34 Hydrocarbons)	2018/02/10	<50		ug/g	
			F4 (C34-C50 Hydrocarbons)	2018/02/10	<50		ug/g	
5392873	BWW	RPD [GBB359-01]	F2 (C10-C16 Hydrocarbons)	2018/02/10	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2018/02/10	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2018/02/10	NC		%	30
5394368	DAN	Matrix Spike	1,4-Difluorobenzene	2018/02/12		108	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		103	%	60 - 140
			D10-Ethylbenzene	2018/02/12		95	%	60 - 140
			D4-1,2-Dichloroethane	2018/02/12		101	%	60 - 140
			Benzene	2018/02/12		97	%	60 - 140
			Toluene	2018/02/12		92	%	60 - 140
			Ethylbenzene	2018/02/12		97	%	60 - 140
			o-Xylene	2018/02/12		103	%	60 - 140
			p+m-Xylene	2018/02/12		96	%	60 - 140
			F1 (C6-C10)	2018/02/12		94	%	60 - 140
5394368	DAN	Spiked Blank	1,4-Difluorobenzene	2018/02/12		105	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		101	%	60 - 140
			D10-Ethylbenzene	2018/02/12		81	%	60 - 140
			D4-1,2-Dichloroethane	2018/02/12		97	%	60 - 140
			Benzene	2018/02/12		92	%	60 - 140
			Toluene	2018/02/12		88	%	60 - 140
			Ethylbenzene	2018/02/12		91	%	60 - 140
			o-Xylene	2018/02/12		97	%	60 - 140
			p+m-Xylene	2018/02/12		91	%	60 - 140
			F1 (C6-C10)	2018/02/12		96	%	80 - 120
5394368	DAN	Method Blank	1,4-Difluorobenzene	2018/02/12		104	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		105	%	60 - 140
			D10-Ethylbenzene	2018/02/12		78	%	60 - 140

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			D4-1,2-Dichloroethane	2018/02/12		96	%	60 - 140
			Benzene	2018/02/12	<0.020		ug/g	
			Toluene	2018/02/12	<0.020		ug/g	
			Ethylbenzene	2018/02/12	<0.020		ug/g	
			o-Xylene	2018/02/12	<0.020		ug/g	
			p+m-Xylene	2018/02/12	<0.040		ug/g	
			Total Xylenes	2018/02/12	<0.040		ug/g	
			F1 (C6-C10)	2018/02/12	<10		ug/g	
			F1 (C6-C10) - BTEX	2018/02/12	<10		ug/g	
5394368	DAN	RPD	Benzene	2018/02/12	NC		%	50
			Toluene	2018/02/12	NC		%	50
			Ethylbenzene	2018/02/12	NC		%	50
			o-Xylene	2018/02/12	NC		%	50
			p+m-Xylene	2018/02/12	NC		%	50
			Total Xylenes	2018/02/12	NC		%	50
			F1 (C6-C10)	2018/02/12	NC		%	30
			F1 (C6-C10) - BTEX	2018/02/12	NC		%	30
5395027	TA1	Spiked Blank	Available (CaCl2) pH	2018/02/12		99	%	97 - 103
5395027	TA1	RPD	Available (CaCl2) pH	2018/02/12	0.51		%	N/A
5395642	LRA	Matrix Spike	1,4-Difluorobenzene	2018/02/12		100	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		101	%	60 - 140
			D10-Ethylbenzene	2018/02/12		103	%	60 - 140
			D4-1,2-Dichloroethane	2018/02/12		100	%	60 - 140
			Benzene	2018/02/12		98	%	60 - 140
			Toluene	2018/02/12		97	%	60 - 140
			Ethylbenzene	2018/02/12		101	%	60 - 140
			o-Xylene	2018/02/12		104	%	60 - 140
			p+m-Xylene	2018/02/12		98	%	60 - 140
			F1 (C6-C10)	2018/02/12		97	%	60 - 140
5395642	LRA	Spiked Blank	1,4-Difluorobenzene	2018/02/12		99	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		99	%	60 - 140
			D10-Ethylbenzene	2018/02/12		98	%	60 - 140
			D4-1,2-Dichloroethane	2018/02/12		102	%	60 - 140
			Benzene	2018/02/12		109	%	60 - 140
			Toluene	2018/02/12		97	%	60 - 140
			Ethylbenzene	2018/02/12		96	%	60 - 140
			o-Xylene	2018/02/12		100	%	60 - 140
			p+m-Xylene	2018/02/12		92	%	60 - 140
			F1 (C6-C10)	2018/02/12		92	%	80 - 120
5395642	LRA	Method Blank	1,4-Difluorobenzene	2018/02/12		99	%	60 - 140
			4-Bromofluorobenzene	2018/02/12		102	%	60 - 140
			D10-Ethylbenzene	2018/02/12		94	%	60 - 140
			D4-1,2-Dichloroethane	2018/02/12		96	%	60 - 140
			Benzene	2018/02/12	<0.020		ug/g	
			Toluene	2018/02/12	<0.020		ug/g	
			Ethylbenzene	2018/02/12	<0.020		ug/g	
			o-Xylene	2018/02/12	<0.020		ug/g	
			p+m-Xylene	2018/02/12	<0.040		ug/g	
			Total Xylenes	2018/02/12	<0.040		ug/g	
			F1 (C6-C10)	2018/02/12	<10		ug/g	
			F1 (C6-C10) - BTEX	2018/02/12	<10		ug/g	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5395642	LRA	RPD	F1 (C6-C10)	2018/02/12	NC		%	30
			F1 (C6-C10) - BTEX	2018/02/12	NC		%	30

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Maxxam Job #: B829203
Report Date: 2018/03/01

Pinchin Ltd
Client Project #: 212394.001
Site Location: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, Scientific Service Specialist

Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5777 www.maxxam.ca

CHAIN OF COUSTODY RECORD

Page 1 of 1

IMMEDIATE TEST

INVOICE TO:

Company Name: #47523 Pinchin Ltd
Attention: Accounts Payable
Address: Unit 6 875 Main St W
Hamilton ON L8S 4R9
Tel: (905) 577-6206 x Fax: (905) 577-6207 x
Email: ap@pinchin.com

REPORT TO:

Company Name:
Attention: Celine Hanna
Address:
Tel: (905) 577-6206 x1709 Fax:
Email: channa@pinchin.com

PROJECT INFORMATION:

Quotation #: A70927
P.O. #:
Project: ~~214483.001~~ 212394.001
Project Name: Phase II
Site #: 1157 North Shore Blvd. E, Burlington
Sampled By: Jason Caplante

Laboratory Use Only:

Maxxam Job #:	Bottle Order #:
	648441
COC #:	**Project Manager:**
C#648441-01-01	Antonella Brasil

07-Feb-18 16:19
Antonella Brasil
B829203
MAF ENV-1132

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)

☐ Table 1 ☒ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☒ Coarse
☒ Table 3 ☐ Agri/Other ☒ For RSC
☐ Table ___

Other Regulations

☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality ________
☐ PWQO
☐ Other ________

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ______

Turnaround Time (TAT) Required:
…ease provide advance notice for rush projects
…rd) TAT: ☒
…sh TAT is not specified):
Working days for most tests
…rd TAT for certain tests such as BOD and Dioxins/Furans are > 5 …Project Manager for details.
…h TAT (if applies to entire submission)
________ Time Required: ________ ☐
Number: ________ (call lab for #)

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	Petroleum Hydrocarbons (Soil) (F1-F4), BTEX	PAHs (Soil)	PCBs (Soil)	PHC (F2-F4)	pH						# of Bottles	Comments
1		BH01-1	2018/02/05	12:00	Soil		X	X									3	
2		BH02-1		11:00			X	X									3	
3		BH03-1		10:45					X	X							2	
4		BH04-2		12:15					X	X							2	
5		BH05-1		12:45					X	X							2	
6		BH01-1		2:00							X						1	
7		BH04-2		2:15							X						1	
8		Dup1		—			X	X									3	
9		Dup2	↓	—	↓				X								1	
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Jason Caplante	2018/02/07	8:55am		2018/02/07	16:19	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Recei	Custody Seal	Yes	No
	5/3/1	Present	✓	
		Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

435081

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

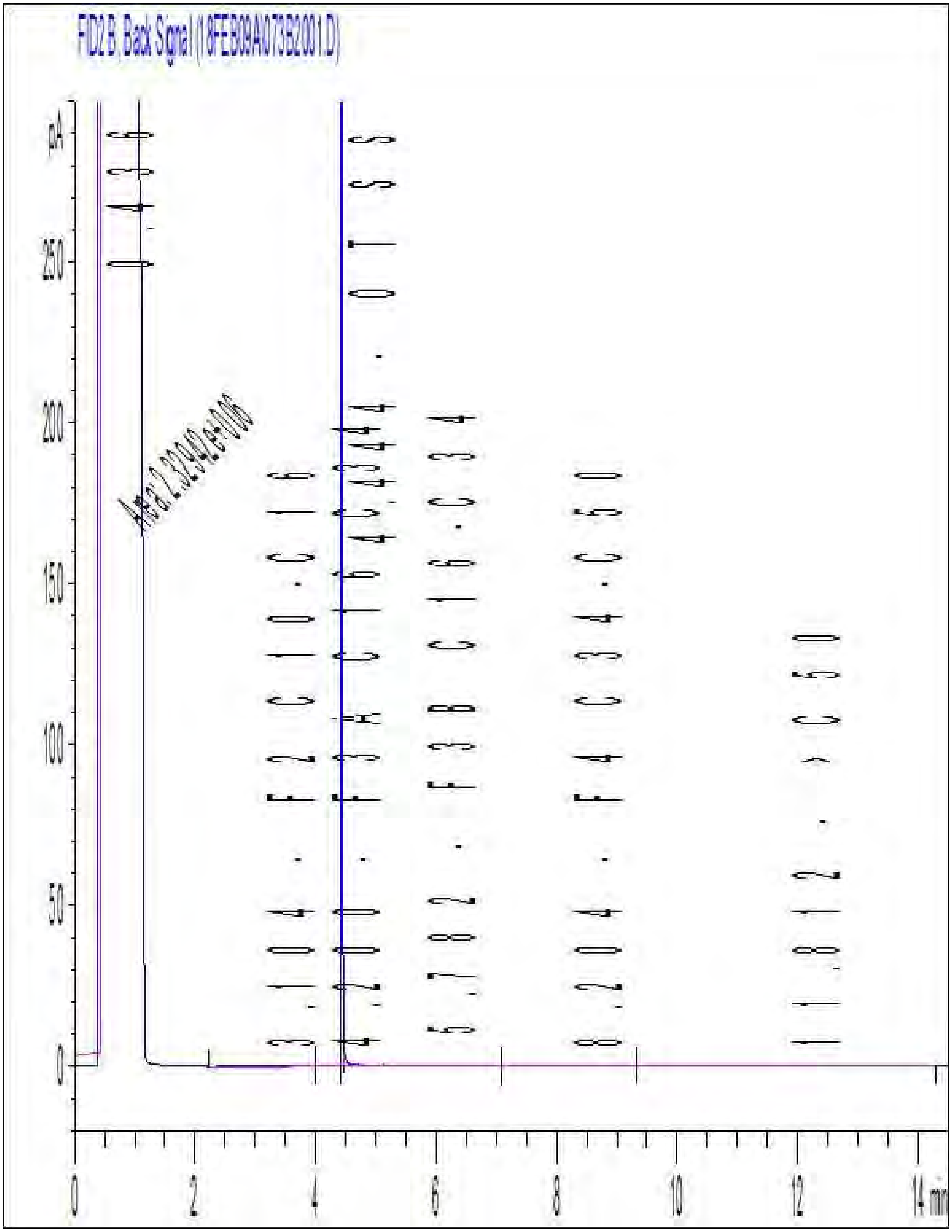
White: Maxxa Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

Maxxam Job #: B829203
Report Date: 2018/03/01
Maxxam Sample: GBB359

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH01-1 12:00

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

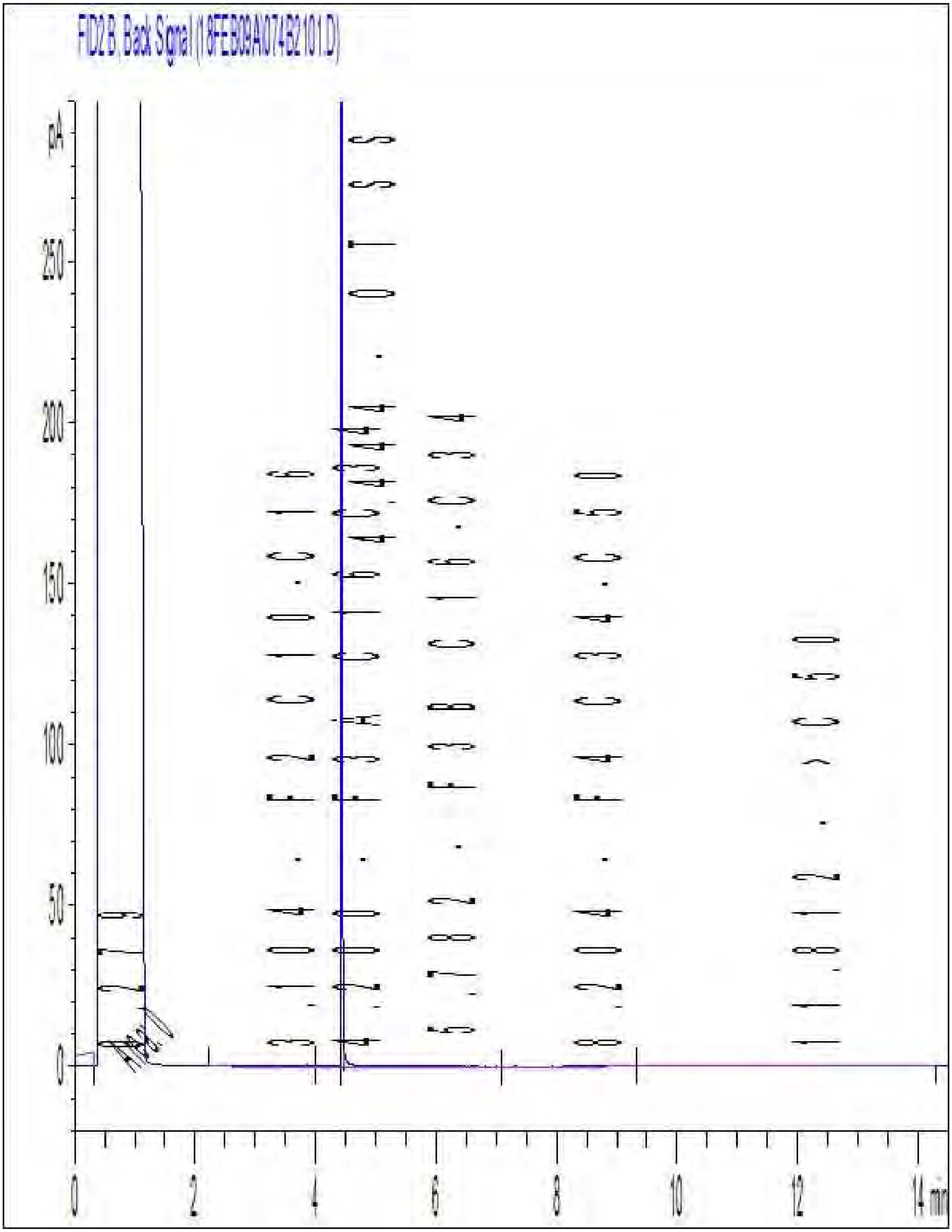


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/03/01
Maxxam Sample: GBB359 Lab-Dup

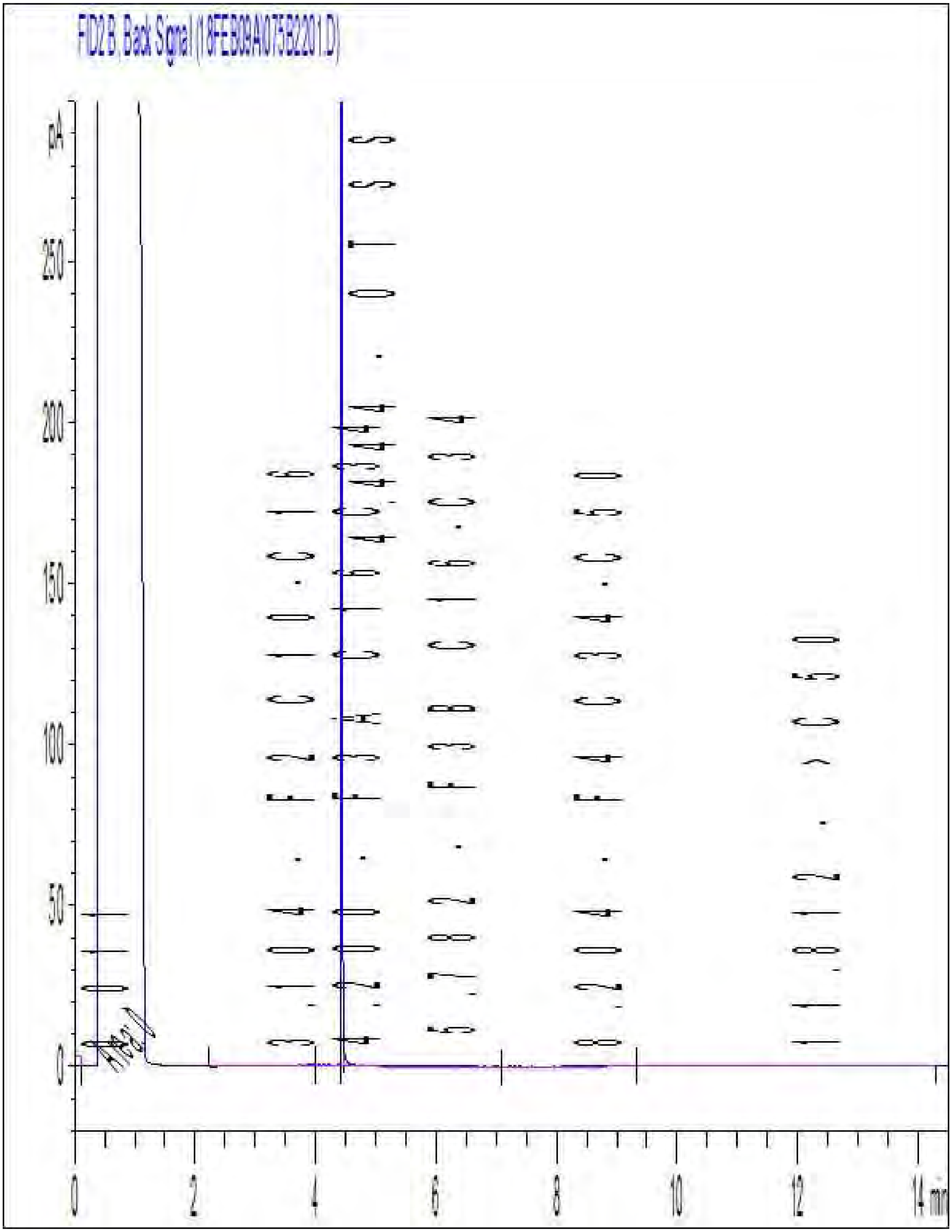
Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH01-1 12:00

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

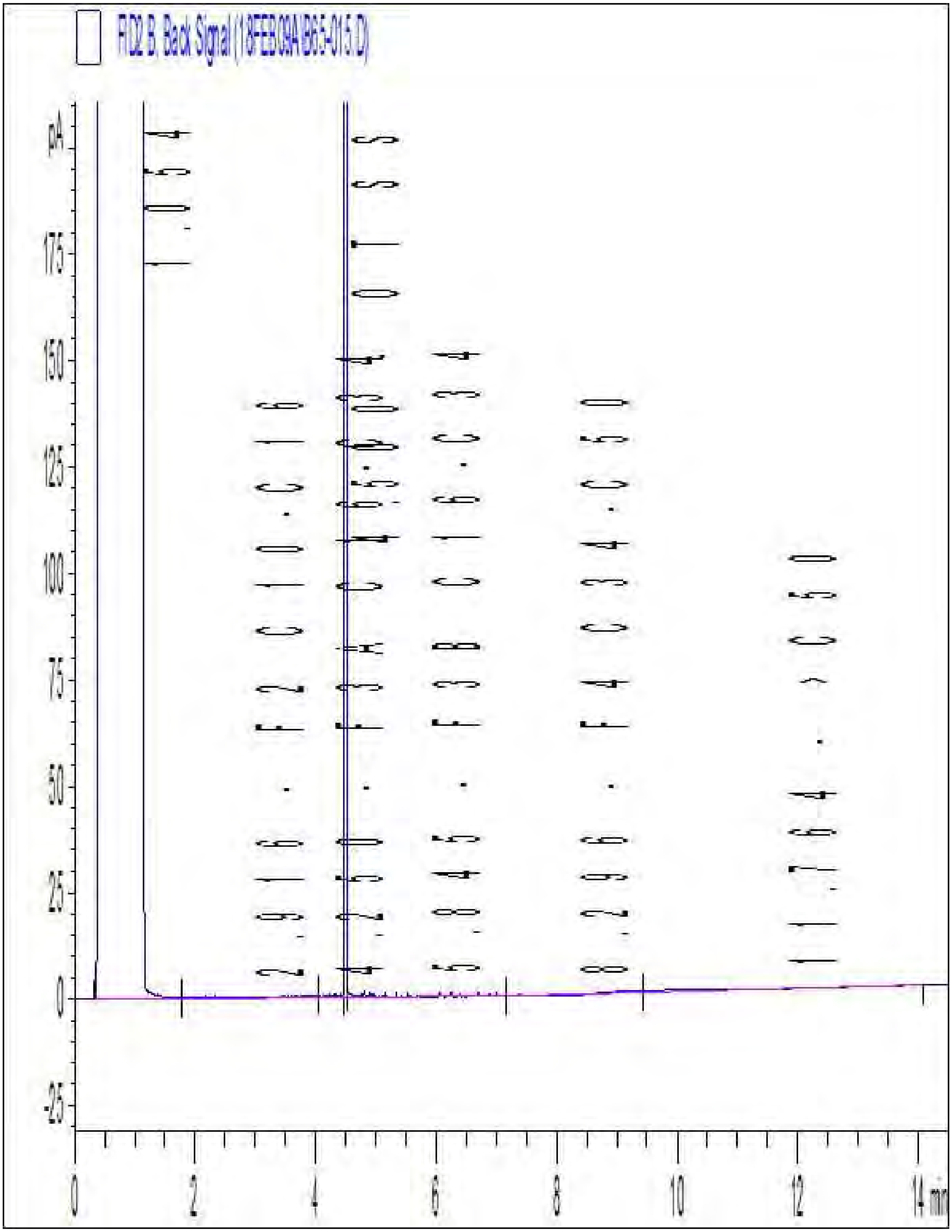


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/03/01
Maxxam Sample: GBB361

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH03-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

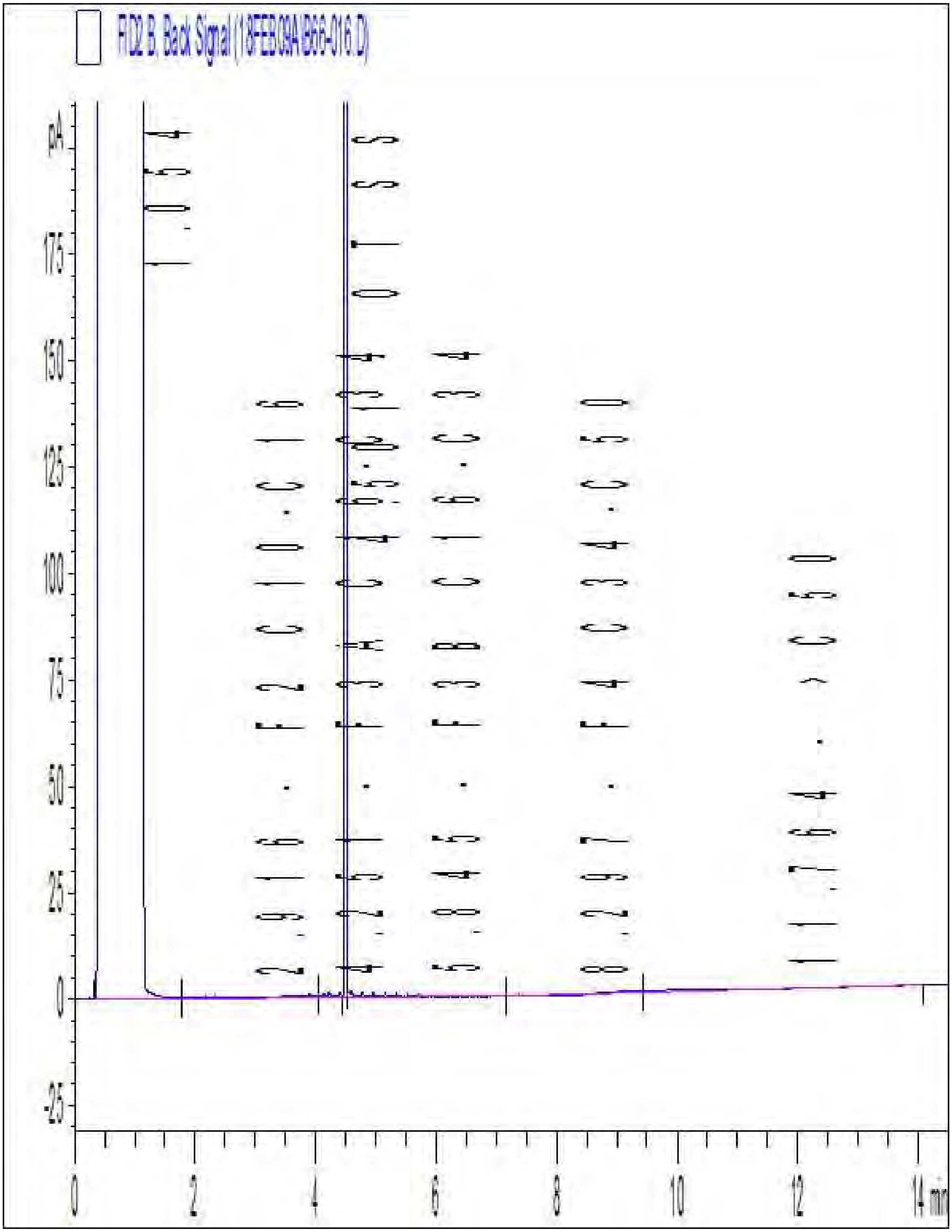


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/03/01
Maxxam Sample: GBB362

Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH04-2

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

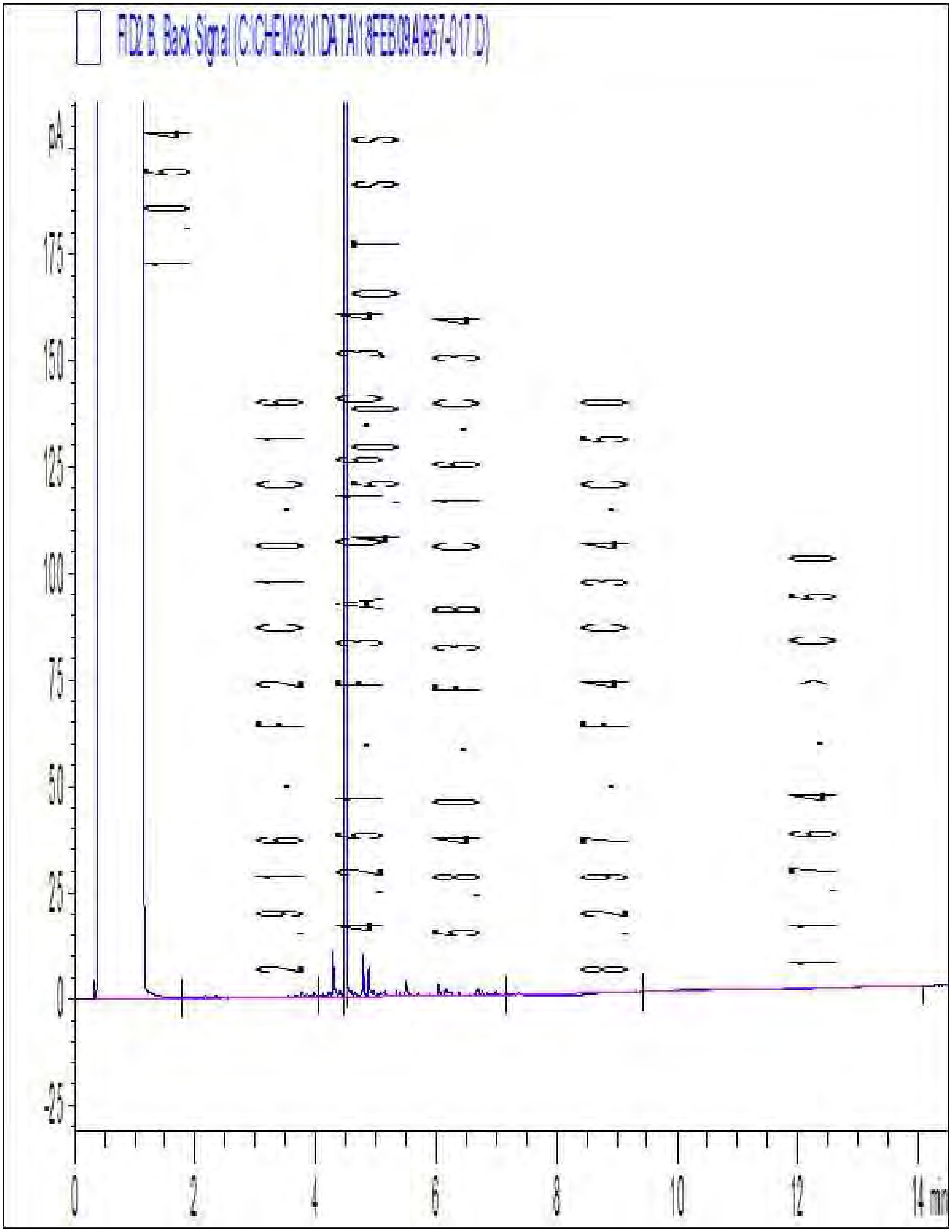


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B829203
Report Date: 2018/03/01
Maxxam Sample: GBB363

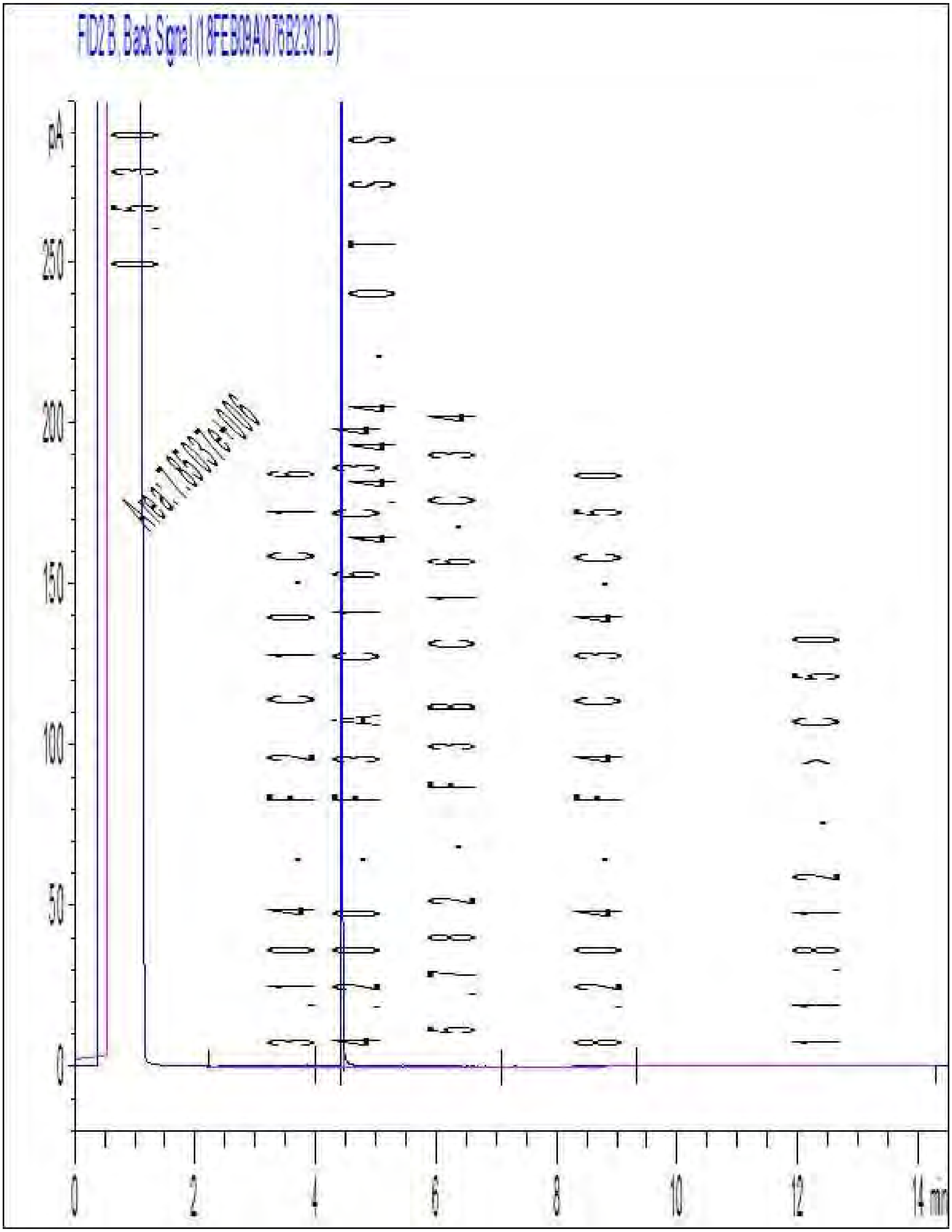
Pinchin Ltd
Client Project #: 212394.001
Project name: PHASE II/ 1157 NORTH SHORE BLVD. E, BURLINGTON
Client ID: BH05-1

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

APPENDIX F

Non-Potable Standards Use Notification Correspondence

April 13, 2018

Regional Municipality of Halton
1151 Bronte Road
Oakville, ON L6M 3L1

Attention: Ms. Sarah Cranston and Mr. John Kisneris

Re: Notification of Intent to Apply the Non-Potable Groundwater Standards
1157-1171 North Shore Boulevard East, Burlington
Pinchin File: 212394.001

Pinchin Ltd. (Pinchin) is currently conducting a Phase Two Environmental Site Assessment (ESA) at the property which holds municipal address 1157-1171 North Shore Boulevard East, Burlington, Ontario (Site).

The applicable standards being used for comparison as part of the Phase Two ESA are those stipulated within the Ontario Ministry of the Environment and Climate Change (MOECC) document entitled "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*" dated April 15, 2011 and pursuant to Ontario Regulation 153/04 (as amended).

In accordance with Ontario Regulation 153/04, the following Site characteristics must be present in order to apply non-potable groundwater standards:

- The property and all other properties located within 250 metres of the property boundaries are supplied by a municipal drinking water system;
- The property is not located in an area designated in a municipal official plan as a well-head protection area or other designation identified by the municipality for the protection of groundwater;
- If the property is located in a well-head protection area or other designation identified by the municipality, the municipality provides consent in writing that the non-potable groundwater site conditions standards may be applied; and
- The property use is not specified as agricultural or other use.

The Site is intended to be a community-zoned property located in the City of Burlington, Ontario. It is Pinchin's understanding that drinking water in the area is serviced by Halton Region, with the source water originating from Lake Ontario.

This letter hereby notifies Halton Region of Pinchin's intent to assess the Site in a non-potable scenario pursuant to Ontario Regulation 153/04 (as amended) on behalf of Pinchin's client. In this regard, we would ask that Halton Region provide its consent (in writing) that the non-potable groundwater site conditions standards may be applied for the purposes of filing a Record of Site Condition.

We trust that this information meets your current needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Pinchin Ltd.

Prepared by:	Reviewed by:
Celine Hanna, B.Sc.	Francesco Gagliardi, C.E.T., LET, QP$_{ESA}$
Project Manager	Operations Manager
905.577.6206 ext. 1709	905.577.6206 ext. 1719
channa@pinchin.com	fgagliardi@pinchin.com

J:\212000s\0212394.000 Phase I ESA_1157-1171 North Shore Blvd\0212394.001 Spruce_1157-1171NorthShoreBlvd_EDR PhTwo\Deliverables\App F - letter\212394.001_Request Letter for Non Potable SCS - Region_1157-1171Northshore.._.docx

Template: Master Letter Template, December 29, 2015

April 13, 2018

City of Burlington
426 Brant Street
P.O. Box 5013
Burlington, ON L7R 3Z6

Attention: Mr. Ben Doulatyeri

Re: Notification of Intent to Apply the Non-Potable Groundwater Standards
1157-1171 North Shore Boulevard East, Burlington
Pinchin File: 212394.001

Pinchin Ltd. (Pinchin) is currently conducting a Phase Two Environmental Site Assessment (ESA) at the property which holds municipal address 1157-1171 North Shore Boulevard East, Burlington, Ontario (Site).

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- If the property is located in a well-head protection area or other designation identified by the municipality, the municipality provides consent in writing that the non-potable groundwater site conditions standards may be applied; and
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This letter hereby notifies the City of Burlington of Pinchin's intent to assess the Site in a non-potable scenario pursuant to Ontario Regulation 153/04 (as amended) on behalf of Pinchin's client. In this regard, we would ask that the City of Burlington provide its consent (in writing) that the non-potable groundwater site conditions standards may be applied for the purposes of filing a Record of Site Condition.

We trust that this information meets your current needs. Should you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Pinchin Ltd.

Prepared by:	Reviewed by:
Celine Hanna, B.Sc.	Francesco Gagliardi, C.E.T., LET, QP$_{ESA}$
Project Manager	Operations Manager
905.577.6206 ext. 1709	905.577.6206 ext. 1719
channa@pinchin.com	fgagliardi@pinchin.com

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Template: Master Letter Template, December 29, 2015