

ATTACHMENT – 7
ENVIRONMENTAL PHASE II



15 August 2017

LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT

2275 Quadra Street, Victoria, BC

Submitted to:
The City of Victoria
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REPORT





Executive Summary

Golder Associates Ltd. (Golder) was retained by the City of Victoria (CoV) to conduct a Phase II Environmental Site Assessment (Phase II ESA) at 2275 Quadra Street, Victoria, BC (the "Site").

The Site consists of a rectangular parcel of land approximately 3.21 hectares in area and is occupied by the Crystal Pool and Fitness Centre building, a parking area, two tennis courts, a basketball court, and two baseball diamonds. The Site building has a footprint area of approximately 3,150 m² and is being used by the CoV as a recreation centre.

Two areas of potential environmental concern (APECs) were previously identified at the Site in a Phase I ESA conducted by Golder (Golder 2017). APEC 1 was located onsite and APEC 2 was located off site to the west of the Site. The primary objective of the Phase II ESA was to assess soil and groundwater in APEC 1, in the area of the former heating oil underground storage tank and to determine if it should be considered an area of environmental concern (AEC). Assessment of APEC 2 was not part of this Limited Phase II ESA scope of work.

APEC 1 was investigated with a field program that included drilling a total of three boreholes with a track-mounted drilling rig with one of the boreholes completed as a groundwater monitoring well, and conducting one round of groundwater sampling. A soil vapour probe was also installed in one of the boreholes in the event that, based on the conditions encountered, future sampling for vapour would be required.

APEC 1 has been retained as AEC1 (Area of Environmental Concern). One soil sample exceeded the Provincial Contaminated Sites Regulation (CSR) residential land use (RL) standards for light and heavy extractable petroleum hydrocarbons and phenanthrene. The groundwater sample collected exceeded the CSR freshwater aquatic life (AW-F) standards for light extractable petroleum hydrocarbons in water and naphthalene.



Study Limitations

This report was prepared for the exclusive use of the City of Victoria. The report, which specifically includes all figures, tables and appendices, is based on data and information made available to and/or collected by Golder Associates Ltd. during site investigation work, and is based solely on the conditions of the property at the time of the field investigations, the information provided in the reports, and supplemented by historical information and data obtained by Golder Associates Ltd., as described in this report.

The assessment of environmental conditions and possible hazards at this site has been made using the results of chemical analyses of discrete soil and groundwater samples from a limited number of locations. The site conditions between sampling locations have been inferred based on conditions observed at borehole and monitoring well locations. Subsurface conditions may vary from these sample locations. Additional study, including further subsurface investigation, can reduce inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a site may be contaminated and remains undetected.

Except where specifically stated to the contrary, the information contained in this report was provided to Golder Associates Ltd. by others, and has not been independently verified or otherwise examined by Golder Associates Ltd. to determine its accuracy or completeness. Golder Associates Ltd. has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in this jurisdiction, subject to the time limits and financial and physical constraints applicable to the services. Golder Associates Ltd. makes no other warranty, expressed or implied.

The content of this report is based on information collected during our investigation, our present understanding of the site conditions, and our professional judgement in light of such information available at the time of this report. This report provides a professional opinion, and therefore no warranty is either expressed, implied or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments, as required, prior to any reliance upon the information presented herein.

This report was not prepared for, and does not contain sufficient information for, the purpose of submission to BC Ministry of Environment (BC MoE) for review under the Contaminated Sites program. The report may not be relied upon by BC MoE or by others, without Golder's expressed written consent.



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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the City of Victoria (CoV) to conduct a Limited Phase II Environmental Site Assessment (Phase II ESA) at the property located at 2275 Quadra Street, Victoria, BC (the "Site"). Golder understands that the CoV requires the Limited Phase II ESA to confirm the absence or presence of potential contaminants of concern (PCOCs) in one area of potential environmental concern (APEC) that was previously identified at the Site in a Phase I ESA conducted by Golder (Golder 2017).

The Limited Phase II ESA was conducted in accordance with the scope of work that is outlined in Golder's proposal titled "Proposal for Limited Phase II Environmental Site Assessment and Preliminary Geotechnical Investigation for 2275 Quadra Street, Victoria, BC", dated 24 May 2017 (Golder Proposal No. P1671469-003-L-Rev0).

The results presented in this report should be interpreted and used in accordance with the limitations and considerations set out in Golder Associates Ltd. *Study Limitations*, which appears at the beginning of this report.

1.1 Background

Golder previously conducted a Phase I ESA for the CoV in 2017. Based on the desktop review of available information and a detailed Site visit, two APECs were identified. The APECs identified in the Phase I ESA are summarised below. Further details are provided in Golder's report titled "Phase 1 Environmental Site Assessment, 2275 Quadra Street, Victoria, BC (Golder Report No. 1671469-001-R-Rev0).

On-Site

- **APEC 1:** A heating oil underground storage tank (UST) was historically located at the northeast corner of the Site building. The UST was removed; however, no details on the condition of the soil surrounding the UST were available and no samples were collected to assess the soil quality. There is a potential that heating oil could have leaked from the UST and contaminated the soil and/or groundwater in the area.

Off-Site

- **APEC 2:** The Husky gas station located at 2100 Quadra Street located approximately 20 m west of the Site has been present since at least 1969 when it was first listed in the city directory. The property was listed in the BC Ministry of Environment (MoE) Site Registry and in January 2003, a notification about actual or likely substance migration to neighbouring site was submitted to 2120 Quadra Street regarding the potential for elevated light extractable petroleum hydrocarbons (LEPH) and/or benzene, toluene, ethylbenzene, xylene (BTEX) concentrations in groundwater. During the Site Reconnaissance, it was also noted that groundwater monitoring wells were present on the property at 2100 Quadra Street as well as on Quadra Street and Pembroke Street, adjacent to the property. There is a potential that the gas station operations could have caused contamination to the soil and/or groundwater which could have migrated to the Site.



2.0 SITE DESCRIPTION

2.1 Site Location and Setting

The Site consists of a rectangular parcel of land approximately 3.21 hectares in area and is located in an area primarily zoned for low and high density residential dwellings, commercial and light industrial uses. The Site is occupied by the Crystal Pool and Fitness Centre building, a parking area, two tennis courts, a basketball court, and two baseball diamonds. The Site building has a footprint area of approximately 3,150 m². The Site is being used by the CoV as a recreation centre. Approximately 75% of the Site is covered by the grass in the baseball diamonds, 10% by the building, and 15% by the paved parking area and tennis and basketball courts.

3.0 OBJECTIVE AND SCOPE OF WORK

The primary objective of the Limited Phase II ESA was to assess soil and groundwater quality in APEC 1 identified at the Site in the Phase I ESA and to determine if APEC 1 represent an area of environmental concern (AEC).

The scope of work for the Limited Phase II ESA comprised the following:

- developed a site-specific Health and Safety Environment Plan (HaSEP) for undertaking investigation activities on the Site.
- subcontracted a private utility locator contractor, Kelly's 1st Call Locating, to place a BC One Call and conduct utility locates in the proposed drilling locations.
- conducted an intrusive investigation that included drilling three (3) boreholes with one of the boreholes completed as a monitoring well. A soil vapour probe was also installed in one of the boreholes in the event that, based on the conditions encountered, future sampling for vapour were to be required.
- collected soil samples for analysis of PCOCs that included light and heavy extractable petroleum hydrocarbons (LEPH/HEPH) and polycyclic aromatic hydrocarbons (PAHs).
- purged and developed the monitoring well to improve connection to the aquifer and to remove sediment introduced during drilling.
- measured field parameters in the groundwater recovered from the monitoring well including: pH, temperature, electrical conductivity, and oxidation reduction potential (Redox) and collected groundwater samples for analysis of PCOCs including metals, LEPH/HEPH and PAHs.
- reviewed the analytical data provided by the laboratory and compared the results to federal guidelines and provincial standards.
- summarized the findings of the investigation in this report, including borehole logs, analytical data tables, figures, conclusions and recommendations for additional work (if required).



4.0 REGULATORY FRAMEWORK

In British Columbia, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the British Columbia Ministry of Environment (MoE), pursuant to the *Environmental Management Act* (SBC 2003) Chapter 53 assented October 23, 2003, including amendments up to November 23, 2016. The two key regulations under the *Environmental Management Act* relating to the assessment and remediation of contaminated sites are the Contaminated Sites Regulation (“CSR”; BC Reg. 375/96 including amendments up to BC Reg. 184/2016, July 19, 2016) and the Hazardous Waste Regulation (“HWR”; BC Reg. 63/88 including amendments up to BC Reg. 179/2016, July 19, 2016).

In addition, the Ground Water Protection Regulation (“GPWR”; BC Reg. 30/2016 including amendments up to BC Reg. 152/2016, June 10, 2016) under the *Water Act* (RSBC 1996, Chapter 483) establishes standards to protect groundwater supplies by requiring wells in BC, including environmental boreholes, test pits and monitoring wells, to be properly constructed, maintained, and, at the end of their service, properly deactivated and ultimately closed.

4.1.1 Soil

The CSR provides Generic Numerical Soil Standards (Schedule 4) and Matrix Numerical Soil Standards (Schedule 5) for use in the assessment of soil quality at sites subject to investigation. The CSR soil standards are divided into six categories based on land use and include standards for wildlands, agricultural, urban park, residential, commercial land use (CL) and industrial land use (IL). The RL guidelines were applied with consideration to the zoning in the area and environmental and human health.

4.1.1 Groundwater

The standards presented in the CSR provide numerical concentrations for the evaluation of groundwater quality and are divided into different categories based on water use. The CSR specifies numerical water quality standards (Schedule 6) used for the evaluation of chemical concentrations in groundwater. Groundwater standards are available for specific uses; (e.g., aquatic life, irrigation, livestock watering and drinking water). The CSR freshwater (AW-F) and drinking water (DW) standards are used for comparison of analytical results from the Site on the presence of groundwater supply wells in the area that may be used for drinking water purposes and due the lack of sufficient data to determine if the groundwater has the potential to migrate within 500m of an aquatic receiving environment.

4.1 Soil Vapour

The CSR provides Generic Numerical Vapour Standards (Schedule 11) for use in the assessment of soil vapour quality at sites subject to investigation. The vapour standards are divided into categories based on land use. The residential land use applies to the Site on the current zoning and the anticipated future Site use. The MoE Guidance Document # 4 Technical Guidance on Contaminated Sites – Vapour Investigation and Remediation,



dated September 2010 (TG4), allows for the modification of vapour potential contaminants of concern (PCOCs) following soil and groundwater testing, for select volatile compounds.

Based on available historical information, the potential presence of volatile PCOCs was considered to exist at the on Site AEC. During the Limited Phase II ESA investigations conducted at the Site, drilling was completed to obtain preliminary soil and groundwater quality data to evaluate the presence of PCOCs; however, soil vapour sampling was not included as part of the scope of work for the Limited Phase II ESA.

5.0 METHODS

5.1 Soil Sampling and Characterization

On 14 June 2017, three (3) boreholes were advanced on the Site with a drilling rig. One (1) of the boreholes was completed as a groundwater monitoring well and with a soil vapour probe. Prior to drilling, proposed locations were screened for the presence of underground utilities and/or obstructions by Kelly's 1st Call Locating on 8 June 2017. Boreholes were pre-clear by hydro-vacuum exaction to a depth of 1.2 metres below ground surface (mbgs) by McRae's Environmental of Victoria, BC. All three borehole locations were advanced by Drillwell Enterprises Ltd. (Drillwell) using a track mounted sonic drill rig. Boreholes were drilled with the rig to depths of up to approximately 5.8 mbgs, as outlined in the proposal.

During the drilling phase of the subsurface investigation, the soil conditions were logged by a Golder field technician, based on observations of the soil cuttings. Soil samples were collected directly from the sonic cores with dedicated Nitrile gloves that were changed between each sample. Samples comprised soils that had not been in direct contact with the core barrel. Soil samples for laboratory analysis were collected in pre-cleaned 125-ml glass soil sample jars supplied by the laboratory. The samples were packed so that minimal to no headspace remained in the jar. Sample jars were packed in cardboard boxes, labelled, placed in a cooler with a chain-of-custody form and several ice packs, and delivered to the laboratory.

Field-screening of soil samples was completed using the dry headspace method, where plastic headspace bags were partially filled with soil, then sealed, shaken, and left to stand for several minutes. The headspace over the soil was then monitored for the presence of organic vapours using a MiniRAE 2000 photoionization detector (PID) containing a 10.6 eV ultraviolet lamp calibrated to 100 parts per million ("ppm") isobutylene.

Laboratory analysis of selected soil samples was conducted by ALS Canada Ltd. (ALS) of Burnaby, BC. Soil samples were selected for analysis based on visual and olfactory observations and the results of field headspace screening. At least 10 percent of samples were collected in duplicate for each parameter for quality assurance / quality control (QA/QC) purposes.

The results of the soil analyses are presented in Table 1 and summarised in Section 6.0. Borehole locations are presented on Figure 3 and reproductions of borehole logs are presented in Appendix A. Laboratory reports and chain of custody forms are provided in Appendix B.



5.2 Monitoring Well and Vapour Probe Installation, Monitoring and Sampling

The planned scope of work for the Limited Phase II ESA included the installation of one (1) monitoring well (MW17-01) to assess groundwater quality at APEC 1. The monitoring well was constructed with 51 mm diameter, Schedule 40, threaded PVC pipe. The monitoring well was assembled without the use of glues or solvents that might compromise the quality of water samples. The monitoring well screen was constructed with No. 10 size slotted PVC pipe and installed across the inferred water table with screen length of 1.5 m. A clean filter sand pack was placed around the screened portion of the well to minimize the entry of fines into the well and to permit the flow of groundwater into the well. The sand pack was installed from the base of the borehole to approximately 0.3 m above the top of the screen. A bentonite seal was placed above the sand pack and extended along the annular space between the well and the borehole wall to ground surface. The monitoring well also had a shallow vapour probe attached to the monitoring well casing. This probe was installed in the event that, based on soil and/or groundwater results, future sampling for vapour were to be required. The monitoring well was completed with a flush-mounted casing (i.e., road box). The monitoring well construction details are shown on the well logs that are presented in Appendix A.

Development of the groundwater monitoring wells was conducted on 14 and 15 June 2017, following the completion of the drilling program. Dedicated Waterra™ foot valves and tubing were used to initially purge (develop) water from the monitoring well. The purpose of well development was to remove material introduced during drilling and to improve the hydraulic connection of the well with the surrounding formation.

On 22 June 2017, groundwater samples were collected from the monitoring well. The groundwater sampling was conducted using dedicated high density polyethylene (HDPE) tubing and a peristaltic pump using low-flow protocols to minimize disturbance and sample turbidity. Field parameters (i.e., pH, electrical conductivity, temperature, redox and dissolved oxygen) were monitored during purging and, upon stabilization of the field parameters, samples were collected.

The groundwater samples were placed in clean, laboratory-supplied containers. Where necessary, the appropriate preservatives were added to the sample containers, in accordance with laboratory instructions.

Copies of the groundwater development and purging/sampling forms, filled out at the time of development/sampling, are presented in Appendix C.

5.2.1 Laboratory Analysis

ALS performed chemical analyses for soil and groundwater samples collected during the Limited Phase II ESA. ALS has achieved proficiency certification by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analyses conducted. Samples were packed with ice in coolers and transported to the laboratory with chain-of-custody forms. The samples were received by the laboratory within 1 to 4 days of sampling. Analyses were conducted within the recommended holding periods for the soil and groundwater samples. Copies of the laboratory analytical reports and the corresponding Chain of Custody forms are presented in Appendix B.



5.2.2 Quality Assurance and Quality Control

To assess and document that the sampling and analytical data were interpretable, meaningful and reproducible, conformance to a Golder QA/QC program was followed.

The quality assurance (QA) measures used in the collection, preservation and shipment of samples included the following management controls:

- 1) Sampling methods were consistent with established Golder protocols, industry standards and provincial/federal requirements.
- 2) Field notes were recorded during all stages of the investigation.
- 3) Chain-of-Custody procedures were used for the shipment of samples to the laboratories. Samples included in a shipment were identified on a Golder Chain-of-Custody form, with one copy retained by Golder personnel, after sign-off.
- 4) The analysis of approximately one duplicate sample for every 10 samples analysed per analytical parameter was targeted.
- 5) Samples were stored in coolers and chilled with ice or ice packs, during transport and prior to submission to the analytical laboratory and analysed within recommended holding times.

The quality control (QC) measures established for the field program included the following technical aspects:

- Submission of blind field duplicate samples (i.e., paired sample analyses). A blind field duplicate sample is a second sample of a certain media (e.g., soil or water) from the same location that is submitted to the analytical laboratory under a separate label such that the laboratory has no prior knowledge that it is a duplicate.
- The relative percent difference (RPD) between paired sample results was used to assess duplicate sample data. The RPD is a measure of the variability between two outcomes from the same procedure or process and is calculated by:

$$RPD (\%) = \frac{(X_1 - X_2)}{\text{average}(X_1, X_2)} \times 100$$

where x_1 is the original sample result, and x_2 is the paired analysis result; and

- Where the concentration of a given parameter is less than five times the method detection limit (MDL), the laboratory results are considered to be less precise, and the RPD is not calculated. For parameters with concentrations less than five times the MDL, but still above the MDL, the difference factor (DF) between paired analyses results is calculated by:

$$DF = \frac{(X_1 - X_2)}{MDL}$$

where x_1 is the original sample result and x_2 is the paired analysis result.



Golder's internal data quality objectives (DQOs) for samples were as follows:

- an RPD less than or equal to 35% for soil
- an RPD less than or equal to 20% for groundwater
- a DF less than or equal to 2.0 (for both soil and groundwater)

6.0 RESULTS

6.1 Field Observations

6.1.1 Subsurface Stratigraphy

As presented on the borehole logs that are provided in Appendix A, soil conditions were observed at boreholes BH17-01 to BH17-03 to a maximum depth of approximately 5.8 mbgs. The material within the inferred former tank area was generally observed as sand and gravel. The soils outside of the inferred tank area at the Site was generally clay, clayey sand and gravel.

Visual and olfactory observations of contamination were noted in APEC 1, where a hydrocarbon-like odour was observed at all three boreholes at depths ranging from approximately 0.1 to 3.4 mbgs.

Field recorded headspace vapour levels ranged from 0.1 to 175 parts per million (ppm). Headspace vapour level versus depth profiles are also provided on the borehole logs in Appendix A.

6.2 Analytical Results

6.2.1 Soil

Soil analytical results for the boreholes locations are presented in attached Table 1 and summarized in Figure 4 and Table A, below. Original analytical laboratory reports are provided in Appendix B. The analytical data were evaluated in the context of specific APECs and parameters that exceeded the respective criteria (shown in brackets) were identified. A summary of the parameters that exceeded one or more regulatory criteria is presented in Table A, below.

Table A: Soil Samples Exceeding CSR Standards

| AEC | Description | Location | Depth (mbgs) | Parameter exceeding CSR Standards |
|------------|--------------------|-----------------|---------------------|---|
| 1 | Former UST | BH17-03 | 1.2 to 1.4 | Extractable petroleum hydrocarbons, carbon range 10-19 (EPH ₁₀₋₁₉), extractable petroleum hydrocarbons, carbon range 19-32 (EPH ₁₉₋₃₂), light extractable petroleum hydrocarbons (LEPH), heavy extractable petroleum hydrocarbons (HEPH) and phenanthrene |



6.2.2 Groundwater

Groundwater analytical results are presented in Table 2 and summarized on Figure 5. Original analytical laboratory reports are provided in Appendix B. Data was evaluated in the context of the APEC and concentrations of the parameters that exceeded one or more regulatory criteria are presented in Table B, below.

Table B: Groundwater Samples Exceeding CSR Standards

| AEC | Description | Location | Screen Interval (mbgs) | Parameter exceeding CSR Standards |
|-----|-------------|----------|------------------------|-----------------------------------|
| 1 | Former UST | MW17-01 | 1.8 to 3.3 | LEPHw and Naphthalene |

6.3 Quality Assurance / Quality Control Program

6.3.1 Field Duplicate Samples

The RPDs and DFs that were calculated and were evaluated against the project targets for the media type are presented in Table 3. One soil sample was analysed in duplicate and the QA/QC criteria for RPD was exceeded for 2-methylnaphthalene with an RPD of 42.36%. There is no applicable CSR standard for 2-methylnaphthalene therefore the elevated RPD did not affect whether or not these samples exceeded the respective guidelines. The elevated PRD is inferred to be related to heterogeneity in the soil samples.

6.3.2 Laboratory QA/QC Program

The laboratory QA/QC program consisted of one or more of the following analysis: instrument and extraction surrogate recoveries, analysis of method blank, laboratory duplicate, matrix spike, laboratory control samples. The laboratory QA/QC results are presented in the certificates of analysis provided in Appendix B. As indicated, no laboratory QA/QC issues were reported on the certificates of analysis.

6.3.3 Summary of QA/QC Results

Based on the results of the field duplicate sample analyses, the analytical results are considered to be acceptable for the purposes of this investigation.

7.0 EVALUATION OF APEC 1- FORMER UST

The Phase I ESA identified a historical heating oil UST that was historically located at the northeast corner of the Site building and was removed in the 1990s. Hydrocarbon-like odour and elevated PID readings were noted in the soil samples collected from all three boreholes completed in the area. Soil samples collected from 1.2 to 1.4 mbgs from BH17-03 exceeded the applicable CSR RL standards for EPH₁₀₋₁₉, EPH₁₉₋₃₂, LEPH, HEPH and phenanthrene. The concentrations of LEPH and EPH₁₀₋₁₉ were more than five times the applicable standards. Samples collected from BH17-03 at a depth of 3.1 to 3.3 and all samples collected from BH17-01 and BH17-02, did not exceed applicable standards for the parameters analyzed.



Groundwater samples were collected from the monitoring well installed at MW17-01. A hydrocarbon-like sheen was noted during the development of the well and hydrocarbon-like odour was also noted during both the development and sampling of the monitoring well. The groundwater sample analyzed from MW17-01 exceeded the CSR AW-F standard for LEPHw and naphthalene, with the measured concentration of naphthalene more than three times the applicable standard.

8.0 CONCLUSIONS

Golder completed a Limited Phase II ESA for the purposes of assessing soil and groundwater quality in APEC 1 that was identified in the Phase I ESA (Golder 2017). Based on the information collected during the Phase II ESA, APEC 1 has been retained as AEC 1. Soil samples exceeded the CSR RL standards for EPH₁₀₋₁₉, EPH₁₉₋₃₂, LEPH, HEPH and phenanthrene. The groundwater samples collected exceeded the CSR AW-F standards for LEPH and naphthalene.

9.0 CLOSURE

We trust this information in this report is sufficient for your needs at this time. Should you like to discuss the results of the investigation, please do not hesitate to contact the undersigned at 250-881-7372.

GOLDER ASSOCIATES LTD.

For

Konane Dion-Belair, BEng, EIT
Junior Environmental Scientist

KDB/REM/asd

Robert McLennan, PEng
Principle

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10.0 REFERENCES

- BC MoE (British Columbia Ministry of Environment). 1988. *Hazardous Waste Regulation*. [B.C. Reg. 63/88, O.C. 268/88, includes amendments up to B.C. Reg. 179/2016, 19 July 2016]. Victoria, BC.
- BC MoE (British Columbia Ministry of Environment). 1996. *Contaminated Sites Regulation*. [B.C. Reg. 375/96, O.C. 184/2016, includes amendments up to B.C. Reg. 184/2016, 19 July 2016]. Victoria, BC.
- BC MoE (British Columbia Ministry of Environment). 2004. *Environmental Management Act* [SBC 2003, Chapter 53 updated to 8 July 2004]. Victoria, BC.
- Golder Associates Ltd. 2017. *Phase I Environmental Site Assessment, 2275 Quadra Street, Victoria, BC*. Prepared for the Corporation of the City of Victoria. Submitted on 21 February 2017.

Table 1
Soil Analytical Results - Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons
2275 Quadra Street, Victoria, B.C.

| Sample Location Sample Control Number Date Sampled Depth (m bgs) Laboratory ID QA/QC | CSR ¹ Standards for RL | MCS | BH17-01 06906-10 14-Jun-2017 2.5 - 2.7 FDA | BH17-01 06906-11 14-Jun-2017 2.5 - 2.7 FDA | BH17-01 06907-02 14-Jun-2017 3.5 - 3.7 L1943831-14 | BH17-02 06906-04 12-Jun-2017 1.6 - 1.8 L1943831-4 | BH17-02 06906-06 14-Jun-2017 3.3 - 3.5 L1943831-6 | BH17-03 06906-03 12-Jun-2017 1.2 - 1.4 L1943831-3 | BH17-03 06907-07 14-Jun-2017 3.1 - 3.3 L1943831-19 |
|---|--|-----|--|--|--|---|---|---|--|
| Field Measurements Headspace (ppm) | | | 125 | 125 | 0.2 | 10.6 | 0.2 | 175 | 1.5 |
| Physical Tests Moisture (%) | | | 12.8 | 13.2 | 27.0 | 23.9 | 9.23 | 9.82 | 27.7 |
| Hydrocarbons | | | | | | | | | |
| EPH10-19 | 1,000* | G | <200 | <200 | <200 | <200 | <200 | 5120 | <200 |
| EPH19-32 | 1,000* | G | <200 | <200 | <200 | <200 | <200 | 1750 | <200 |
| LEPH | 1,000 | G | <200 | <200 | <200 | <200 | <200 | 5110 | <200 |
| HEPH | 1,000 | G | <200 | <200 | <200 | <200 | <200 | 1750 | <200 |
| Polycyclic Aromatic Hydrocarbons | | | | | | | | | |
| Acenaphthene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <1.5 | <0.050 |
| Acenaphthylene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.30 | <0.050 |
| Anthracene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.70 | <0.050 |
| Benz(a)anthracene | 1 | G | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Benzo(a)pyrene | 1 | T | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Benzo(b)fluoranthene | 1 | G | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Benzo(g,h,i)perylene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Benzo(k)fluoranthene | 1 | G | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.070 | <0.050 |
| Chrysene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Dibenz(a,h)anthracene | 1 | G | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| Fluoranthene | | | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.20 | <0.050 |
| Fluorene | | | 0.087 | 0.060 | <0.050 | <0.050 | <0.050 | 2.01 | <0.050 |
| Indeno(1,2,3-c,d)pyrene | 1 | G | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| 2-Methylnaphthalene | | | 0.432 | 0.281 | <0.050 | <0.050 | <0.050 | 2.78 | <0.050 |
| Naphthalene | 5 | G | <0.20 | 0.066 | <0.050 | <0.050 | <0.050 | <0.40 | 0.055 |
| Phenanthrene | 5 | G | 0.209 | 0.146 | <0.050 | 0.290 | <0.050 | 5.01 | <0.050 |
| Pyrene | 10 | G | 0.062 | <0.050 | <0.050 | 0.052 | <0.050 | 1.51 | <0.050 |

Notes:

Results are expressed in milligrams per kilogram (mg/kg) unless otherwise indicated.

¹ Standards shown are from the *Contaminated Sites Regulation* ("CSR"; BC Reg. 375/96, O.C. 1480/96, including amendments up to BC Reg. 184/2016, effective July 19, 2016).

Criteria listed for Residential (RL)

CSR Standards reflect the most conservative standard (MCS) of G = Generic; T = Toxicity to Invertebrates and Plants;

EPH (C10-C19) = extractable petroleum hydrocarbons, carbon range 10-19

EPH (C19-C32) = extractable petroleum hydrocarbons, carbon range 19-32

EDA = field duplicate available

FDA = field duplicate
FD = field duplicate

FD = field duplicate
HEPH = heavy extractable petroleum hydrocarbons

LEPH = light extractable petroleum hydrocarbons

m.bqs = metres below ground surface

QA/QC = quality assurance/quality control

QA/QC = quality assurance/quality control
* = standard for LEPH conservatively applied to EPH (C10<19); and standard for HEPH conservatively applied to EPH (C19-32).

$< \equiv$ less than laboratory reporting limit

Groundwater Analytical Results - Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons
2275 Quadra Street, Victoria, B.C.

| Sample Location Sample Control Number Date Sampled Laboratory ID QA/QC | CSR ¹ Standards DW | CSR ¹ Standards for FW | MW17-01 06908-01 22-Jun-2017 L1948029-1 |
|--|-------------------------------------|---|--|
| Field Measurements | | | |
| Temperature (°C) | | | 17.3 |
| pH | | | 7.14 |
| Specific Conductivity (µS/cm) | | | 837 |
| Reduction Oxidation Potential (mV) | | | -170.0 |
| Dissolved Oxygen (mg/L) | | | 0.35 |
| Hydrocarbons | | | |
| EPH (C10-C19) | 5 | 5 | 0.89 |
| LEPH | | 0.5 | 0.85 |
| EPH (C19-C32) | | | <0.25 |
| HEPH | | | <0.25 |
| Polycyclic Aromatic Hydrocarbons | | | |
| Acenaphthene | | 0.06 | 0.00170 |
| Acenaphthylene | | | <0.00030 |
| Acridine | | 0.0005 | <0.000050 |
| Anthracene | | 0.001 | <0.000090 |
| Benz(a)anthracene | | 0.001 | <0.000050 |
| Benzo(a)pyrene | 0.00001 | 0.0001 | <0.0000050 |
| Benzo(b)fluoranthene | | | <0.000050 |
| Benzo(g,h,i)perylene | | | <0.000050 |
| Benzo(k)fluoranthene | | | <0.000050 |
| Chrysene | | 0.001 | <0.000050 |
| Dibenz(a,h)anthracene | | | <0.0000050 |
| Fluoranthene | | 0.002 | <0.000050 |
| Fluorene | | 0.12 | 0.00197 |
| Indeno(1,2,3-c,d)pyrene | | | <0.000050 |
| Naphthalene | | 0.01 | 0.0369 |
| Phenanthrene | | 0.003 | 0.000976 |
| Pyrene | | 0.0002 | 0.000050 |
| Quinoline | | 0.034 | <0.0040 |

Notes:

All parameter units in milligrams per litre (mg/L), unless otherwise noted.

¹ Standards shown are from the *Contaminated Sites Regulation* ("CSR"; BC Reg. 375/96, O.C. 1480/96, including amendments up to BC Reg. 184/2016, effective July 19, 2016).

EPH (C10-C19) = extractable petroleum hydrocarbons, carbon range 10-19

EPH (C19-C32) = extractable petroleum hydrocarbons, carbon range 19-32

FW = Freshwater Aquatic Life; DW = Drinking Water

HEPH = heavy extractable petroleum hydrocarbons

LEPH = light extractable petroleum hydrocarbons

QA/QC = Quality Assurance/Quality Control

< = Less than the detection limit indicated

Table 3
Quality Assurance and Quality Control Results - Soil
2275 Quadra Street, Victoria, B.C.

| Location SCN | BH17-01 06906-10 | BH17-01 06906-11 | Method Reporting Limit | Mean | Relative Percent Difference | Difference Factor (DF) |
|---|---------------------|---------------------|------------------------------|--------|-----------------------------------|------------------------------|
| Laboratory ID | 14-Jun-2017 | 14-Jun-2017 | | | | |
| Depth (m bgs) | 2.5 - 2.7 | 2.5 - 2.7 | | | | |
| Date Sampled | L1943831-10 | L1943831-11 | | | | |
| QA/QC | FDA | FD | | | | |
| Physical Tests | | | | | | |
| Moisture (%) | 12.8 | 13.2 | 0.25 | 13 | 3.08% | NA |
| Hydrocarbons | | | | | | |
| EPH10-19 | <200 | <200 | 200 | NC | NC | NC |
| EPH19-32 | <200 | <200 | 200 | NC | NC | NC |
| LEPH | <200 | <200 | 200 | NC | NC | NC |
| HEPH | <200 | <200 | 200 | NC | NC | NC |
| Polycyclic Aromatic Hydrocarbons | | | | | | |
| Acenaphthene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Acenaphthylene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Anthracene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Benz(a)anthracene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Benzo(a)pyrene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Benzo(b)fluoranthene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Benzo(g,h,i)perylene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Benzo(k)fluoranthene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Chrysene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Dibenz(a,h)anthracene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Fluoranthene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| Fluorene | 0.087 | 0.060 | 0.050 | 0.0735 | NA | 0.54 |
| Indeno(1,2,3-c,d)pyrene | <0.050 | <0.050 | 0.050 | NC | NC | NC |
| 2-Methylnaphthalene | 0.432 | 0.281 | 0.050 | 0.3565 | 42.36% | NA |
| Naphthalene | <0.20 | 0.066 | 0.050 | NC | NC | NC |
| Phenanthrene | 0.209 | 0.146 | 0.050 | 0.1775 | NA | 1.26 |
| Pyrene | 0.062 | <0.050 | 0.050 | NC | NC | NC |

Notes:

Results are expressed in milligrams per kilogram (mg/kg) unless otherwise indicated.

Difference Factor (DF) is calculated when the mean value is less than five times the method reporting limit; Golder's internal QA/QC target is less than 2.

Method Reporting Limit indicates the minimum concentration that could be measured by laboratory instrumentation for a specific sample.

Mean indicates the mean or average value calculated of a field duplicate pair (the FDA and the FD).

Relative Percent Difference (RPD) is calculated when the mean value is greater than five times the method reporting limit; Golder's internal QA/QC target is less than 35%.

BOLD font indicates the parameter analysed exceeds Golder's internal QA/QC targets.

EPH (C10-C19) = extractable petroleum hydrocarbons, carbon range 10-19

EPH (C19-C32) = extractable petroleum hydrocarbons, carbon range 19-32

FDA = field duplicate available

FD = field duplicate

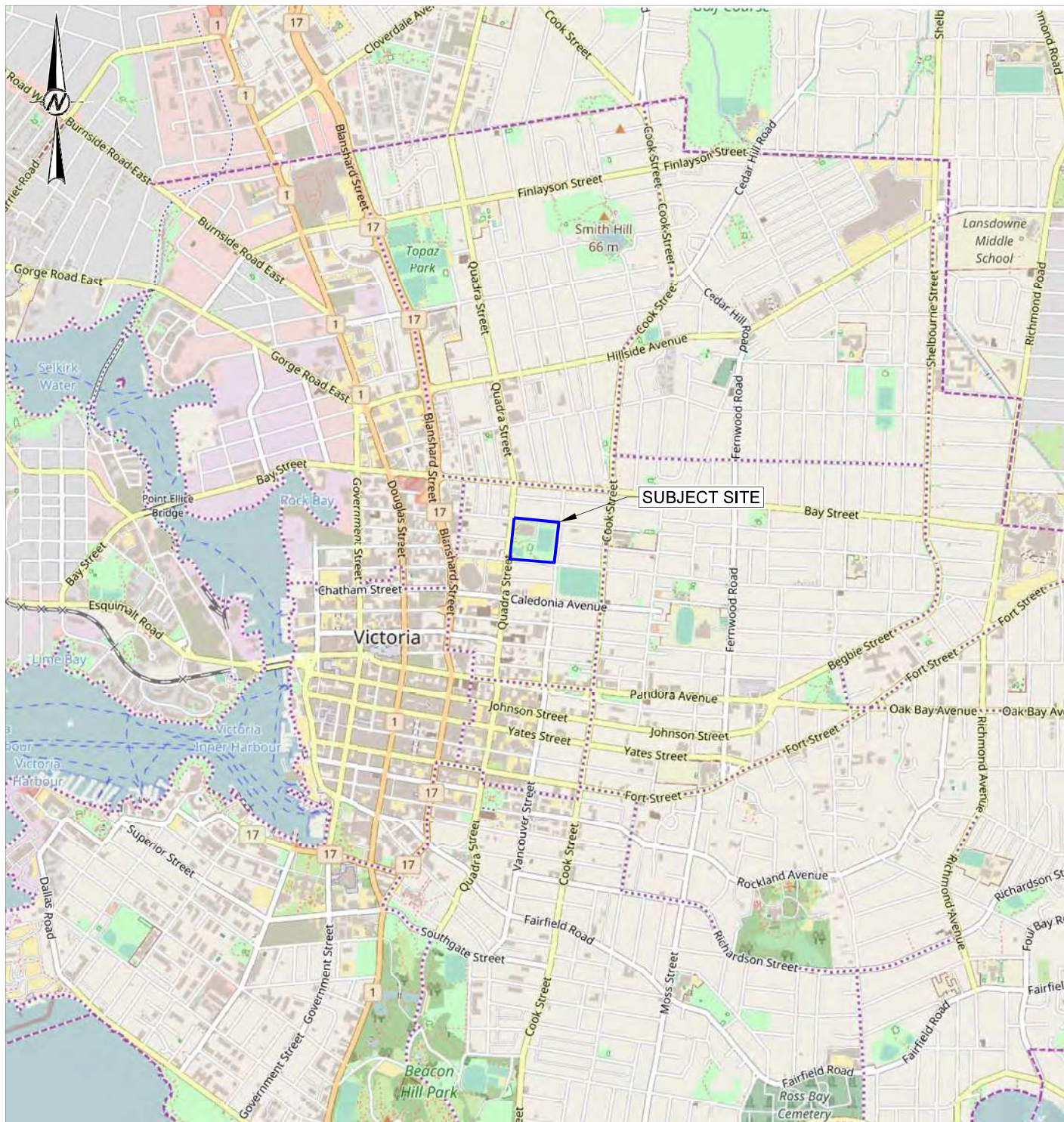
HEPH = heavy extractable petroleum hydrocarbons

LEPH = light extractable petroleum hydrocarbons

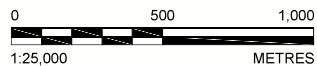
NA = not applicable

QA/QC = quality assurance/quality control

SCN = sample control number



REFERENCE(S)
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THE CITY OF VICTORIA

CONSULTANT



| | |
|------------|----------------|
| YYYY-MM-DD | 2017-08-03 |
| DESIGNED | K. DION-BELAIR |
| PREPARED | H. KING |
| REVIEWED | A. BONTEMPO |
| APPROVED | J. FILLIPONE |

PROJECT
LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT
2275 QUADRA STREET
VICTORIA, BC

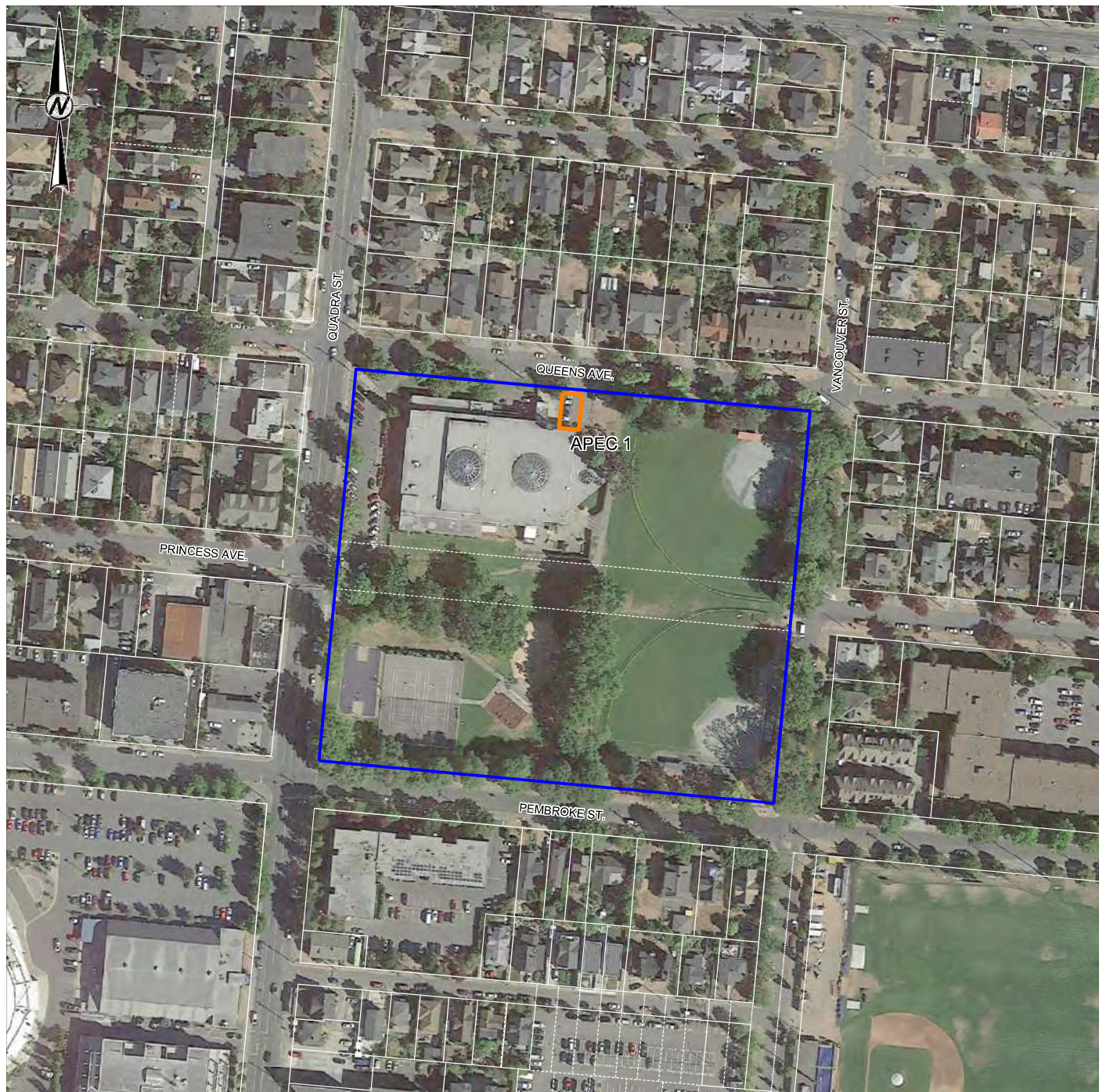
TITLE
KEY PLAN

PROJECT NO.
1671469

PHASE
2000

REV.
0

FIGURE
1



LEGEND

- SUBJECT SITE (APPROXIMATE LIMITS)
- AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)

AREA OF POTENTIAL ENVIRONMENTAL CONCERN

APEC 1: FORMER UNDERGROUND STORAGE TANK

REFERENCE(S)

1. CADASTRAL LINEWORK - CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - CITY OF VICTORIA. ACCESSED 2016-01-26.
2. IMAGERY OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE. IMAGERY DATE: AUGUST 18, 2016. GOOGLE EARTH IMAGE IS NOT TO SCALE.

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|------------|----------------|
| YYYY-MM-DD | 2017-08-03 |
| DESIGNED | K. DION-BELAIR |
| PREPARED | H. KING |
| REVIEWED | A. BONTEMPO |
| APPROVED | J. FILLIPONE |

PROJECT

LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT
2275 QUADRA STREET
VICTORIA, BC

TITLE

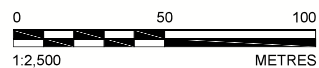
SITE PLAN

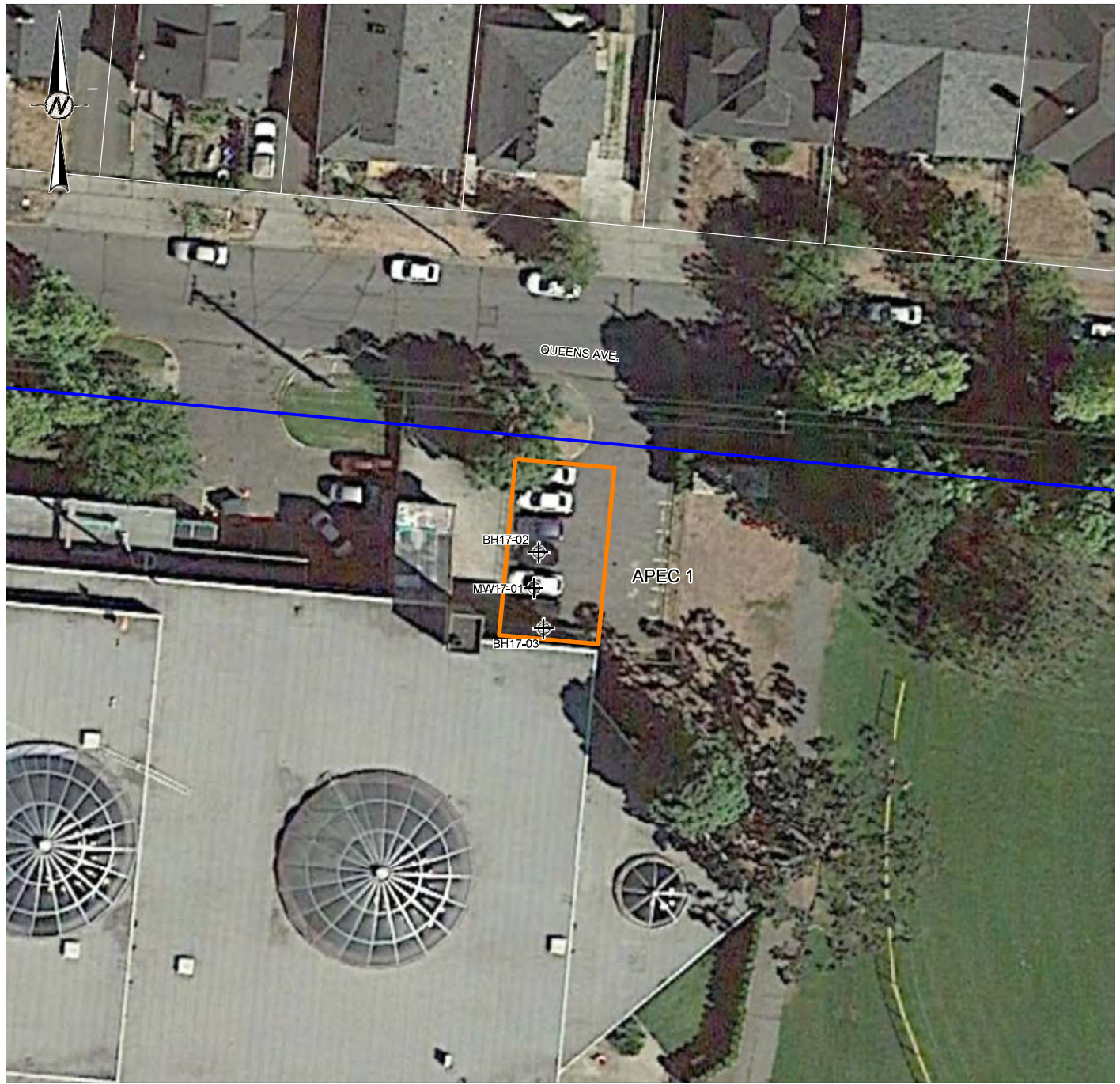
PROJECT NO.
1671469

PHASE
2000





REV.
0

FIGURE
2





LEGEND

-  SUBJECT SITE (APPROXIMATE LIMITS)
-  AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
-  BOREHOLE LOCATIONS
-  MONITORING WELL LOCATION

AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
APEC 1: FORMER UNDERGROUND STORAGE TANK

CLIENT
THE CITY OF VICTORIA

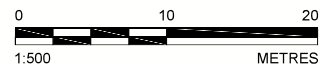
CONSULTANT



| | |
|------------|----------------|
| YYYY-MM-DD | 2017-08-03 |
| DESIGNED | K. DION-BELAIR |
| PREPARED | H. KING |
| REVIEWED | A. BONTEMPO |
| APPROVED | J. FILLIPONE |

REFERENCE(S)

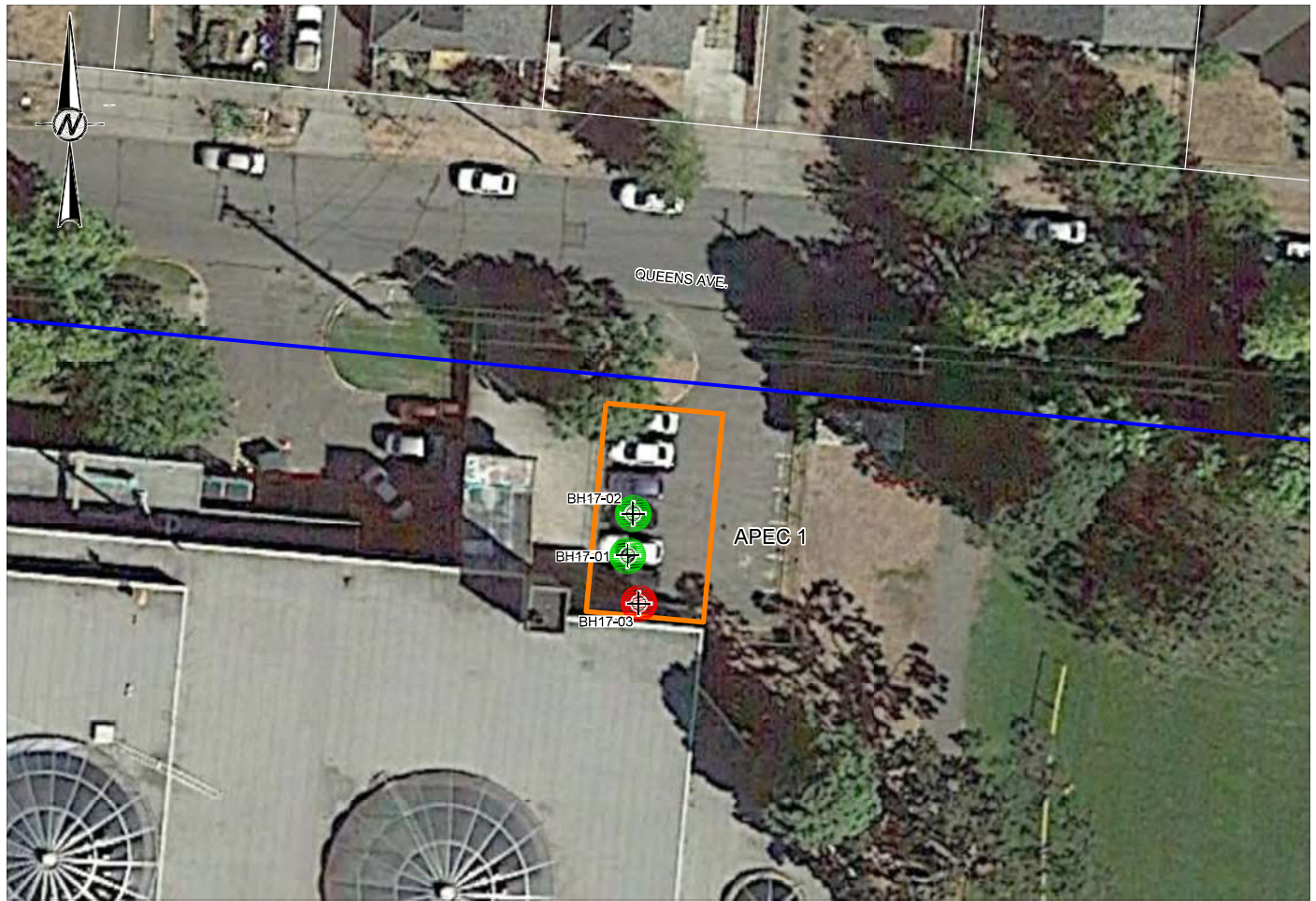
1. CADASTRAL LINEWORK - CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - CITY OF VICTORIA. ACCESSED 2016-01-26.
2. IMAGERY OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE. IMAGERY DATE: AUGUST 18, 2016. GOOGLE EARTH IMAGE IS NOT TO SCALE.



PROJECT
LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT
2275 QUADRA STREET
VICTORIA, BC

TITLE
INVESTIGATION LOCATIONS

| | | | |
|------------------------|---------------|-----------|-------------|
| PROJECT NO. 1671469 | PHASE 2000 | REV. 0 | FIGURE 3 |
|------------------------|---------------|-----------|-------------|



| | Standard CSR Residential Land Use | Sample Location Date Sampled Depth (m bgs) QA/QC | BH17-01 14-Jun-2017 2.5 - 2.7 FDA | BH17-01 14-Jun-2017 2.5 - 2.7 FD | BH17-01 14-Jun-2017 3.5 - 3.7 | BH17-02 12-Jun-2017 1.6 - 1.8 | BH17-02 14-Jun-2017 3.3 - 3.5 | BH17-03 12-Jun-2017 1.2 - 1.4 | BH17-03 14-Jun-2017 3.1 - 3.3 |
|--|--|---|--|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Hydrocarbons | | Hydrocarbons | | | | | | | |
| EPH10-19 | 1,000 | EPH10-19 | <200 | <200 | <200 | <200 | <200 | 5120 | <200 |
| EPH19-32 | 1,000 | EPH19-32 | <200 | <200 | <200 | <200 | <200 | 1750 | <200 |
| LEPH | 1,000 | LEPH | <200 | <200 | <200 | <200 | <200 | 5110 | <200 |
| HEPH | 1,000 | HEPH | <200 | <200 | <200 | <200 | <200 | 1750 | <200 |
| Polycyclic Aromatic Hydrocabons | | Polycyclic Aromatic Hydrocabons | | | | | | | |
| Phenanthrene | 5 | Phenanthrene | 0.209 | 0.146 | <0.050 | 0.290 | <0.050 | 5.01 | <0.050 |

LEGEND

- SUBJECT SITE (APPROXIMATE LIMITS)
- AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
- BOREHOLE LOCATIONS
- MONITORING WELL LOCATION
- INDICATES CONCENTRATIONS OF PETROLEUM HYDROCARBON PARAMETERS ARE LESS THAN THE CSR RL STANDARDS FOR PARAMETERS ANALYZED
- INDICATES CONCENTRATIONS OF PETROLEUM HYDROCARBON PARAMETERS ARE GREATER THAN THE CSR RL STANDARDS FOR ONE OR MORE PARAMETERS

AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
APEC 1: FORMER UNDERGROUND STORAGE TANK

CLIENT
THE CITY OF VICTORIA

CONSULTANT



YYYY-MM-DD 2017-08-03
DESIGNED K. DION-BELAIR
PREPARED H. KING
REVIEWED A. BONTEMPO
APPROVED J. FILLIPONE

REFERENCE(S)

- CADASTRAL LINEWORK - CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - CITY OF VICTORIA, ACCESSED 2016-01-26.
- IMAGERY OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE. IMAGERY DATE: AUGUST 18, 2016. GOOGLE EARTH IMAGE IS NOT TO SCALE.

NOTE(S)

BOLD AND RED TEXT INDICATES THAT THE CONCENTRATION EXCEEDS THE APPLICABLE CSR STANDARDS FOR RESIDENTIAL LAND USE.

ABBREVIATION(S)

EPH - EXTRACTABLE PETROLEUM HYDROCARBONS
LEPH - LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS
HEPH - HEAVY EXTRACTABLE PETROLEUM HYDROCARBONS
CSR - CONTAMINATED SITE REGULATION
MBGS - METRE BELOW GROUND SURFACE
QA/QC - QUALITY ASSURANCE/ QUALITY CONTROL
FDA - FIELD DUPLICATE ANALYZED
FD - FIELD DUPLICATE



PROJECT
LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT
2275 QUADRA STREET
VICTORIA, BC

TITLE

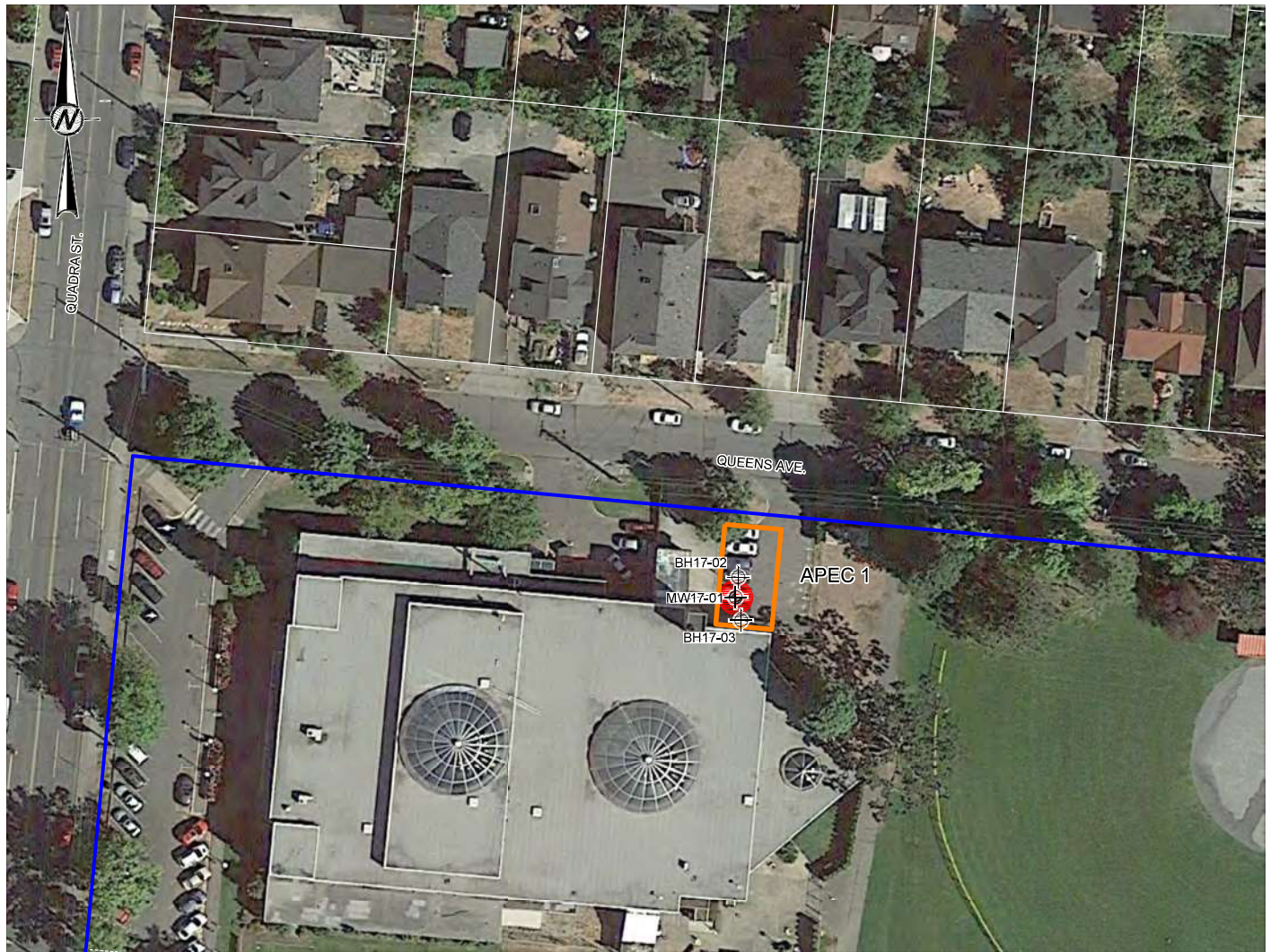
**SOIL ANALYTICAL RESULTS - PETROLEUM HYDROCARBONS
AND POLYCYCLIC AROMATIC HYDROCARBONS**

PROJECT NO.
1671469

PHASE
2000

REV.
0





FIGURE
4



| | |
|--|---|
| | Standard CSR Freshwater Aquatic Life |
| Hydrocarbons | |
| LEPH | 0.5 |
| Polycyclic Aromatic Hydrocabons | |
| Naphthalene | 0.01 |

| | |
|--|--------------------|
| Sample Location | MW17-01 |
| Date Sampled | 22-Jun-2017 |
| QA/QC | |
| Hydrocarbons | |
| LEPH | 0.85 |
| Polycyclic Aromatic Hydrocabons | |
| Naphthalene | 0.0369 |

LEGEND

- SUBJECT SITE (APPROXIMATE LIMITS)
- AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
-  BOREHOLE LOCATIONS
-  MONITORING WELL LOCATION
-  INDICATES CONCENTRATION OF THE PETROLEUM HYDROCARBON PARAMETERS ARE LESS THAN THE APPLICABLE CSR STANDARDS FOR THE PROTECTION OF AQUATIC LIFE
-  INDICATES CONCENTRATION OF THE PETROLEUM HYDROCARBON PARAMETERS ARE GREATER THAN THE APPLICABLE CSR STANDARDS FOR THE PROTECTION OF AQUATIC LIFE

AREA OF POTENTIAL ENVIRONMENTAL CONCERN (APEC)
APEC 1: FORMER UNDERGROUND STORAGE TANK

CLIENT
THE CITY OF VICTORIA

CONSULTANT



| | |
|------------|----------------|
| YYYY-MM-DD | 2017-08-03 |
| DESIGNED | K. DION-BELAIR |
| PREPARED | H. KING |
| REVIEWED | A. BONTEMPO |
| APPROVED | J. FILLIPONE |

REFERENCE(S)

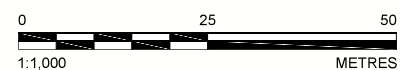
- CADASTRAL LINEWORK - CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - CITY OF VICTORIA, ACCESSED 2016-01-26.
- IMAGERY OBTAINED FROM GOOGLE EARTH PRO, USED UNDER LICENSE. IMAGERY DATE: AUGUST 18, 2016. GOOGLE EARTH IMAGE IS NOT TO SCALE.

NOTE(S)

BOLDED AND RED TEXT INDICATES THAT THE CONCENTRATION EXCEEDS THE APPLICABLE CSR STANDARDS FOR THE PROTECTION OF AQUATIC LIFE.

ABBREVIATIONS

LEPH - LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS
CSR - CONTAMINATED SITE REGULATION
QA/QC - QUALITY ASSURANCE/ QUALITY CONTROL



PROJECT
LIMITED PHASE II ENVIRONMENTAL SITE ASSESSMENT
2275 QUADRA STREET
VICTORIA, BC

TITLE
GROUNDWATER ANALYTICAL RESULTS - PETROLEUM
HYDROCARBONS AND POLYCYCLIC AROMATIC
HYDROCARBONS

| | | |
|-------------|-------|------|
| PROJECT NO. | PHASE | REV. |
| 1671469 | 2000 | 0 |

FIGURE
5



APPENDIX A

Borehole Logs

PROJECT No.: 1671469 / 2000 / 2003

RECORD OF BOREHOLE: BH17-02

SHEET 1 OF 1

CLIENT: City of Victoria

PROJECT: Limited Phase II Environmental Site Assessment

LOCATION: 2275 Quadra Street, Victoria BC

DRILLING DATE: June 12, 2017

DATUM: NAD 83

N: ~5364565 E: ~473603 UTM NAD83 Zone: 10

Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING CONTRACTOR: McRae's Environmental Services Ltd./Drillwell Enterprises Ltd.

| DEPTH SCALE METRES | DRILLING RIG METHOD | SOIL PROFILE | | | SAMPLES | | | | PID ppm | | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m | | | | ADDITIONAL LAB. TESTING | PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION | | | | |
|-----------------------|------------------------|--|-------------|-----------------------|---------|------|------------|----------|--------------------|------------|---|--|--|---|----------------------------|--|------------------|--|--|--|
| | | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (m) | NUMBER | TYPE | BLOWS/0.3m | CORE No. | CORE RECOVERY % | 5 10 15 20 | | | | 20 40 60 80 | | | | | | |
| | | | | | | | | | | PID ppm | | | | WATER CONTENT PERCENT Wp ——— W ——— WL 10 20 30 40 NP Non-Plastic | | | | | | |
| 0 | Hydrovac Vacuumed | Ground Surface (ASPHALT) | | | | | | | | | | | | | | | Concrete Sand | | | |
| | | (CH/GP) CLAY and GRAVEL, fine to coarse gravel; grey, no odour; cohesive, w~PL. | | 0.30 | | | | | | | | | | | | | | | | |
| 1 | | (CH) CLAY; grey-brown; cohesive, w~PL, firm. | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | Bentonite Chips | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 5 | | (SC) CLAYEY SAND, some gravel, fine sand; brown, no odour; cohesive, w~PL, firm. | 3.30 | 4 | HV | | | | | | | | | | | | | | | |
| | | - grey at 4 m depth | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 5 | | (SC/GW) CLAYEY SAND and GRAVEL, fine sand, fine gravel; grey, no odour; non-cohesive, moist, soft. | 4.80 | 5 | HV | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| 6 | | (SC) CLAYEY SAND, some gravel, fine sand; grey, no odour; cohesive, sw>PL, soft. | 5.50 | 6 | HV | | | | | | | | | | | | | | | |
| | | | 5.80 | | | | | | | | | | | | | | | | | |
| 6 | | End of Borehole, Reached desired depth | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | |

DEPTH SCALE

1 : 50



SOIL CLASSIFICATION SYSTEM: GACS

LOGGED: KDB

CHECKED: AB

PROJECT No.: 1671469 / 2000 / 2003

RECORD OF BOREHOLE: BH17-03

SHEET 1 OF 1

CLIENT: City of Victoria

PROJECT: Limited Phase II Environmental Site Assessment

LOCATION: 2275 Quadra Street, Victoria BC

DRILLING DATE: June 12, 2017

DATUM: NAD 83

N: ~5364557 E: ~473603 UTM NAD83 Zone: 10

Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING CONTRACTOR: McRae's Environmental Services Ltd./Drillwell Enterprises Ltd.

| DEPTH SCALE METRES | DRILLING RIG METHOD | SOIL PROFILE | | | SAMPLES | | | | PID ppm | | | | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m | | | | ADDITIONAL LAB. TESTING | PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION | | |
|-----------------------|------------------------|---|-------------|-----------------------|---------|------|------------|----------|--------------------|---------------------------|-----|-----|---|--|----|----|----------------------------|--|--|--|
| | | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (m) | NUMBER | TYPE | BLOWS/0.3m | CORE No. | CORE RECOVERY % | 5 10 15 20 | | | | 20 40 60 80 | | | | | | |
| | | | | | | | | | | PID ppm | | | | WATER CONTENT PERCENT Wp ——— W ——— WI NP — Non-Plastic | | | | | | |
| | | | | | | | | | | 50 | 100 | 150 | 200 | 10 | 20 | 30 | 40 | | | |
| 0 | | Ground Surface (ASPHALT) | | 0.10 | | | | | | | | | | | | | | Concrete Sand | | |
| | | (SP) SAND, some fine to coarse gravel; grey, PHC like odour; non-cohesive, moist. | | | | | | | | | | | | | | | | | | |
| 1 | | | | | 1 | HV | | | | | | | | | | | | | | |
| | | | | | 2 | HV | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| | | | | | 3 | HV | | | | ⊕ | | | | | | | | | | |
| 3 | Hydrovac Vacuumed | (CH) CLAY; grey-brown; cohesive, w~PL, firm. | | 3.00 | 4 | HV | | | | ⊕ | | | | | | | | Bentonite Chips | | |
| | | - w>PL at 3,6 m dept | | | | | | | | | | | | | | | | | | |
| 4 | | | | | 5 | HV | | | | ⊕ | | | | | | | | | | |
| | | - grey at 4,6 m depth; soft | | | | | | | | | | | | | | | | | | |
| 5 | | | | | 6 | HV | | | | ⊕ | | | | | | | | | | |
| | | | | | 7 | HV | | | | ⊕ | | | | | | | | | | |
| 6 | | End of Borehole. Reached desired depth | | 5.80 | | | | | | | | | | | | | | | | |
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DEPTH SCALE

1 : 50



SOIL CLASSIFICATION SYSTEM: GACS

LOGGED: KDB

CHECKED: AB

PROJECT No.: 1671469 / 2000 / 2003

RECORD OF BOREHOLE: MW17-01

SHEET 1 OF 1

CLIENT: City of Victoria

PROJECT: Limited Phase II Environmental Site Assessment

LOCATION: 2275 Quadra Street, Victoria BC

DRILLING DATE: June 12, 2017

DATUM: NAD 83

N: ~5364563 E: ~473604 UTM NAD83 Zone: 10

Note: Northing and Easting Coordinates have been determined by GPS in the field and are approximate only.

DRILLING CONTRACTOR: McRae's Environmental Services Ltd./Drillwell Enterprises Ltd.

| DEPTH SCALE METRES | DRILLING RIG METHOD | SOIL PROFILE | | | SAMPLES | | | | PID ppm | | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m | | | | ADDITIONAL LAB. TESTING | PIEZOMETER, STANDPIPE OR THERMISTOR INSTALLATION |
|-----------------------|---|--|-------------|-----------------------|---------|------|------------|----------|--------------------|------------|---|--|--|--|----------------------------|---|
| | | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (m) | NUMBER | TYPE | BLOWS/0.3m | CORE No. | CORE RECOVERY % | 5 10 15 20 | | 20 40 60 80 | | | | |
| | | | | | | | | | | PID ppm | | WATER CONTENT PERCENT Wp ——— W ——— WL NP Non-Plastic | | | | |
| 0 | Hydrovac Vacuumed | Ground Surface (ASPHALT) | | | | | | | | | | | | | Flush Mount | |
| 1 | | (SP/GW) SAND and GRAVEL, medium to coarse sand, fine to coarse gravel; grey, PHC like odour; non-cohesive, moist. | | 0.10 | 1 | HV | | | | | | | | | | Sand Bentonite Sand Probe Bentonite 6/21/2017 Sand Screen Bentonite chips |
| 2 | | | | | 2 | HV | | | | | | | | | | |
| 3 | | | | | 3 | HV | | | | | | | | | | |
| 4 | | | | | 4 | HV | | | | | | | | | | |
| 5 | | | | | 5 | HV | | | | | | | | | | |
| 6 | | | | | 6 | HV | | | | | | | | | | |
| 7 | (SC) CLAYEY SAND, some gravel, fine sand, fine to coarse gravel; grey-brown, no odour; cohesive, w~PL, firm. | | 3.40 | | | | | | | | | | | | | |
| 8 | | | | 5 | HV | | | | | | | | | | | |
| 9 | (SC/GW) CLAYEY SAND and GRAVEL, fine sand, fine to coarse gravel; grey, no odour; cohesive, w~PL, firm. | | 4.70 | 6 | HV | | | | | | | | | | | |
| 10 | | | | 7 | HV | | | | | | | | | | | |
| 11 | End of Borehole. | | 5.20 | | | | | | | | | | | | | |
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DEPTH SCALE

1 : 50



SOIL CLASSIFICATION SYSTEM: GACS

LOGGED: KDB

CHECKED: AB



APPENDIX B

Certificates of Analysis



GOLDER ASSOCIATES LTD.
ATTN: Konane Dion-Belair
3795 Carey Road, Second Floor
Victoria BC V8Z 6T8

Date Received: 16-JUN-17
Report Date: 23-JUN-17 17:49 (MT)
Version: FINAL

Client Phone: 250-881-7372

Certificate of Analysis

Lab Work Order #: L1943831
Project P.O. #: NOT SUBMITTED
Job Reference: 1671469/2000
C of C Numbers: 06906, 06907
Legal Site Desc:

Amber Springer, B.Sc
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

23-JUN-17 17:49 (MT)

Version: FINAL

| Sample ID Description Sampled Date Sampled Time Client ID | | L1943831-3 Soil 12-JUN-17 10:30 06906-03 | L1943831-4 Soil 12-JUN-17 08:50 06906-04 | L1943831-6 Soil 14-JUN-17 09:10 06906-06 | L1943831-10 Soil 14-JUN-17 11:00 06906-10 | L1943831-11 Soil 14-JUN-17 11:00 06906-11 |
|---|--|--|--|--|---|---|
| Grouping | Analyte | | | | | |
| SOIL | | | | | | |
| Physical Tests | Moisture (%) | 9.82 | 23.9 | 9.23 | 12.8 | 13.2 |
| Hydrocarbons | EPH10-19 (mg/kg) | 5120 | <200 | <200 | <200 | <200 |
| | EPH19-32 (mg/kg) | 1750 | <200 | <200 | <200 | <200 |
| | LEPH (mg/kg) | 5110 | <200 | <200 | <200 | <200 |
| | HEPH (mg/kg) | 1750 | <200 | <200 | <200 | <200 |
| | Surrogate: 2-Bromobenzotrifluoride (%) | 109 | 96.3 | 93.9 | 91.7 | 90.8 |
| Polycyclic Aromatic Hydrocarbons | Acenaphthene (mg/kg) | <1.5 ^{DLCI} | <0.050 | <0.050 | <0.050 | <0.050 |
| | Acenaphthylene (mg/kg) | <0.30 ^{DLCI} | <0.050 | <0.050 | <0.050 | <0.050 |
| | Anthracene (mg/kg) | <0.70 ^{DLCI} | <0.050 | <0.050 | <0.050 | <0.050 |
| | Benz(a)anthracene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Benzo(a)pyrene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Benzo(b)fluoranthene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Benzo(g,h,i)perylene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Benzo(k)fluoranthene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Chrysene (mg/kg) | <0.070 ^{DLCI} | <0.050 | <0.050 | <0.050 | <0.050 |
| | Dibenz(a,h)anthracene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | Fluoranthene (mg/kg) | <0.20 ^{DLCI} | <0.050 | <0.050 | <0.050 | <0.050 |
| | Fluorene (mg/kg) | 2.01 | <0.050 | <0.050 | 0.087 | 0.060 |
| | Indeno(1,2,3-c,d)pyrene (mg/kg) | <0.050 | <0.050 | <0.050 | <0.050 | <0.050 |
| | 2-Methylnaphthalene (mg/kg) | 2.78 | <0.050 | <0.050 | 0.432 | 0.281 |
| | Naphthalene (mg/kg) | <0.40 ^{DLCI} | <0.050 | <0.050 | <0.20 ^{DLQ} | 0.066 |
| | Phenanthrene (mg/kg) | 5.01 | 0.290 | <0.050 | 0.209 | 0.146 |
| | Pyrene (mg/kg) | 1.51 | 0.052 | <0.050 | 0.062 | <0.050 |
| | Surrogate: Acenaphthene d10 (%) | 113.4 | 81.3 | 81.6 | 84.5 | 86.3 |
| | Surrogate: Chrysene d12 (%) | 78.5 | 97.9 | 94.1 | 98.3 | 95.9 |
| | Surrogate: Naphthalene d8 (%) | 74.8 | 77.2 | 77.9 | 77.6 | 85.1 |
| | Surrogate: Phenanthrene d10 (%) | 93.6 | 89.3 | 85.2 | 91.6 | 91.1 |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID Description Sampled Date Sampled Time Client ID | | L1943831-14 Soil 14-JUN-17 11:20 06907-02 | L1943831-19 Soil 14-JUN-17 13:10 06907-07 | | | |
|---|--|---|---|--|--|--|
| Grouping | Analyte | | | | | |
| SOIL | | | | | | |
| Physical Tests | Moisture (%) | 27.0 | 27.7 | | | |
| Hydrocarbons | EPH10-19 (mg/kg) | <200 | <200 | | | |
| | EPH19-32 (mg/kg) | <200 | <200 | | | |
| | LEPH (mg/kg) | <200 | <200 | | | |
| | HEPH (mg/kg) | <200 | <200 | | | |
| | Surrogate: 2-Bromobenzotrifluoride (%) | 90.8 | 94.5 | | | |
| Polycyclic Aromatic Hydrocarbons | Acenaphthene (mg/kg) | <0.050 | <0.050 | | | |
| | Acenaphthylene (mg/kg) | <0.050 | <0.050 | | | |
| | Anthracene (mg/kg) | <0.050 | <0.050 | | | |
| | Benz(a)anthracene (mg/kg) | <0.050 | <0.050 | | | |
| | Benzo(a)pyrene (mg/kg) | <0.050 | <0.050 | | | |
| | Benzo(b)fluoranthene (mg/kg) | <0.050 | <0.050 | | | |
| | Benzo(g,h,i)perylene (mg/kg) | <0.050 | <0.050 | | | |
| | Benzo(k)fluoranthene (mg/kg) | <0.050 | <0.050 | | | |
| | Chrysene (mg/kg) | <0.050 | <0.050 | | | |
| | Dibenz(a,h)anthracene (mg/kg) | <0.050 | <0.050 | | | |
| | Fluoranthene (mg/kg) | <0.050 | <0.050 | | | |
| | Fluorene (mg/kg) | <0.050 | <0.050 | | | |
| | Indeno(1,2,3-c,d)pyrene (mg/kg) | <0.050 | <0.050 | | | |
| | 2-Methylnaphthalene (mg/kg) | <0.050 | <0.050 | | | |
| | Naphthalene (mg/kg) | <0.050 | 0.055 | | | |
| | Phenanthrene (mg/kg) | <0.050 | <0.050 | | | |
| | Pyrene (mg/kg) | <0.050 | <0.050 | | | |
| | Surrogate: Acenaphthene d10 (%) | 83.4 | 83.7 | | | |
| | Surrogate: Chrysene d12 (%) | 91.6 | 91.4 | | | |
| | Surrogate: Naphthalene d8 (%) | 80.4 | 81.5 | | | |
| | Surrogate: Phenanthrene d10 (%) | 85.6 | 86.9 | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

| QC Type Description | Parameter | Qualifier | Applies to Sample Number(s) |
|---|---|-----------|-----------------------------|
| Qualifiers for Individual Parameters Listed: | | | |
| Qualifier | Description | | |
| DLCI | Detection Limit Raised: Chromatographic Interference due to co-elution. | | |
| DLQ | Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria. | | |

Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|--------|--|---------------------------------|
| EPH-TUMB-FID-VA | Soil | EPH in Solids by Tumbler and GCFID | BC MOE EPH GCFID |
| Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH). | | | |
| LEPH/HEPH-CALC-VA | Soil | LEPHs and HEPHs | BC MOE LABORATORY MANUAL (2005) |
| Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999). | | | |
| MOISTURE-VA | Soil | Moisture content | CWS for PHC in Soil - Tier 1 |
| This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours. | | | |
| PAH-TMB-H/A-MS-VA | Soil | PAH - Rotary Extraction (Hexane/Acetone) | EPA 3570/8270 |
| This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analysed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation. Because the two isomers cannot be readily chromatographically separated, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter. | | | |

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

| Laboratory Definition Code | Laboratory Location |
|----------------------------|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA |

Chain of Custody Numbers:

| | |
|-------|-------|
| 06906 | 06907 |
|-------|-------|

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

Page 1 of 6

Client: GOLDER ASSOCIATES LTD.
3795 Carey Road, Second Floor
Victoria BC V8Z 6T8

Contact: Konane Dion-Belair

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|------------------------------------|-----------------|--------------------|--------|-----------|-------|-----|--------|-----------|
| EPH-TUMB-FID-VA Soil | | | | | | | | |
| Batch | R3751693 | | | | | | | |
| WG2551284-4 DUP | | L1943831-3 | | | | | | |
| EPH10-19 | | 5120 | 5160 | | mg/kg | 0.7 | 40 | 21-JUN-17 |
| EPH19-32 | | 1750 | 1630 | | mg/kg | 7.1 | 40 | 21-JUN-17 |
| WG2551335-4 DUP | | L1943831-11 | | | | | | |
| EPH10-19 | | <200 | <200 | RPD-NA | mg/kg | N/A | 40 | 21-JUN-17 |
| EPH19-32 | | <200 | <200 | RPD-NA | mg/kg | N/A | 40 | 21-JUN-17 |
| WG2551284-3 IRM | | ALS PHC2 RM | | | | | | |
| EPH10-19 | | | 106.7 | | % | | 70-130 | 20-JUN-17 |
| EPH19-32 | | | 116.7 | | % | | 70-130 | 20-JUN-17 |
| WG2551335-3 IRM | | ALS PHC2 RM | | | | | | |
| EPH10-19 | | | 103.6 | | % | | 70-130 | 21-JUN-17 |
| EPH19-32 | | | 119.8 | | % | | 70-130 | 21-JUN-17 |
| WG2551284-1 MB | | | | | | | | |
| EPH10-19 | | | <200 | | mg/kg | | 200 | 20-JUN-17 |
| EPH19-32 | | | <200 | | mg/kg | | 200 | 20-JUN-17 |
| Surrogate: 2-Bromobenzotrifluoride | | | 95.9 | | % | | 60-140 | 20-JUN-17 |
| WG2551335-1 MB | | | | | | | | |
| EPH10-19 | | | <200 | | mg/kg | | 200 | 21-JUN-17 |
| EPH19-32 | | | <200 | | mg/kg | | 200 | 21-JUN-17 |
| Surrogate: 2-Bromobenzotrifluoride | | | 86.2 | | % | | 60-140 | 21-JUN-17 |
| MOISTURE-VA Soil | | | | | | | | |
| Batch | R3750482 | | | | | | | |
| WG2551306-4 DUP | | L1943831-3 | | | | | | |
| Moisture | | 9.82 | 8.82 | | % | 11 | 20 | 18-JUN-17 |
| WG2551306-2 LCS | | | | | | | | |
| Moisture | | | 102.6 | | % | | 90-110 | 18-JUN-17 |
| WG2551306-6 LCS | | | | | | | | |
| Moisture | | | 102.9 | | % | | 90-110 | 18-JUN-17 |
| WG2551306-1 MB | | | | | | | | |
| Moisture | | | <0.25 | | % | | 0.25 | 18-JUN-17 |
| WG2551306-5 MB | | | | | | | | |
| Moisture | | | <0.25 | | % | | 0.25 | 18-JUN-17 |
| PAH-TMB-H/A-MS-VA Soil | | | | | | | | |
| Batch | R3752438 | | | | | | | |
| WG2551335-4 DUP | | L1943831-11 | | | | | | |
| Acenaphthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Acenaphthylene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |



Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

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| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|-------------------------|-----------------|--------------------|--------|-----------|-------|-----|--------|-----------|
| PAH-TMB-H/A-MS-VA | Soil | | | | | | | |
| Batch | R3752438 | | | | | | | |
| WG2551335-4 DUP | | L1943831-11 | | | | | | |
| Anthracene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Benz(a)anthracene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Benzo(a)pyrene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Benzo(b)fluoranthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Benzo(g,h,i)perylene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Benzo(k)fluoranthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Chrysene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Dibenz(a,h)anthracene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Fluoranthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| Fluorene | | 0.060 | 0.061 | | mg/kg | 2.2 | 50 | 22-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| 2-Methylnaphthalene | | 0.281 | 0.293 | | mg/kg | 4.0 | 50 | 22-JUN-17 |
| Naphthalene | | 0.066 | 0.068 | | mg/kg | 2.5 | 50 | 22-JUN-17 |
| Phenanthrene | | 0.146 | 0.148 | | mg/kg | 1.6 | 50 | 22-JUN-17 |
| Pyrene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 22-JUN-17 |
| WG2551284-2 LCS | | | | | | | | |
| Acenaphthene | | | 82.9 | | % | | 60-130 | 22-JUN-17 |
| Acenaphthylene | | | 81.3 | | % | | 60-130 | 22-JUN-17 |
| Anthracene | | | 79.0 | | % | | 60-130 | 22-JUN-17 |
| Benz(a)anthracene | | | 92.1 | | % | | 60-130 | 22-JUN-17 |
| Benzo(a)pyrene | | | 84.3 | | % | | 60-130 | 22-JUN-17 |
| Benzo(b)fluoranthene | | | 88.4 | | % | | 60-130 | 22-JUN-17 |
| Benzo(g,h,i)perylene | | | 72.7 | | % | | 60-130 | 22-JUN-17 |
| Benzo(k)fluoranthene | | | 94.3 | | % | | 60-130 | 22-JUN-17 |
| Chrysene | | | 97.5 | | % | | 60-130 | 22-JUN-17 |
| Dibenz(a,h)anthracene | | | 78.7 | | % | | 60-130 | 22-JUN-17 |
| Fluoranthene | | | 86.3 | | % | | 60-130 | 22-JUN-17 |
| Fluorene | | | 82.1 | | % | | 60-130 | 22-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | 78.0 | | % | | 60-130 | 22-JUN-17 |
| 2-Methylnaphthalene | | | 83.1 | | % | | 60-130 | 22-JUN-17 |
| Naphthalene | | | 84.0 | | % | | 50-130 | 22-JUN-17 |
| Phenanthrene | | | 83.8 | | % | | 60-130 | 22-JUN-17 |
| Pyrene | | | 90.3 | | % | | 60-130 | 22-JUN-17 |
| WG2551335-2 LCS | | | | | | | | |
| Acenaphthene | | | 84.6 | | % | | 60-130 | 22-JUN-17 |

Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

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| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|-------------------------|-----------------|-----------|---------|-----------|-------|-----|--------|-----------|
| PAH-TMB-H/A-MS-VA | Soil | | | | | | | |
| Batch | R3752438 | | | | | | | |
| WG2551335-2 | LCS | | | | | | | |
| Acenaphthylene | | | 83.6 | | % | | 60-130 | 22-JUN-17 |
| Anthracene | | | 80.6 | | % | | 60-130 | 22-JUN-17 |
| Benz(a)anthracene | | | 92.2 | | % | | 60-130 | 22-JUN-17 |
| Benzo(a)pyrene | | | 90.7 | | % | | 60-130 | 22-JUN-17 |
| Benzo(b)fluoranthene | | | 94.4 | | % | | 60-130 | 22-JUN-17 |
| Benzo(g,h,i)perylene | | | 69.0 | | % | | 60-130 | 22-JUN-17 |
| Benzo(k)fluoranthene | | | 102.3 | | % | | 60-130 | 22-JUN-17 |
| Chrysene | | | 96.8 | | % | | 60-130 | 22-JUN-17 |
| Dibenz(a,h)anthracene | | | 84.7 | | % | | 60-130 | 22-JUN-17 |
| Fluoranthene | | | 89.9 | | % | | 60-130 | 22-JUN-17 |
| Fluorene | | | 83.7 | | % | | 60-130 | 22-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | 78.2 | | % | | 60-130 | 22-JUN-17 |
| 2-Methylnaphthalene | | | 85.3 | | % | | 60-130 | 22-JUN-17 |
| Naphthalene | | | 86.8 | | % | | 50-130 | 22-JUN-17 |
| Phenanthrene | | | 86.1 | | % | | 60-130 | 22-JUN-17 |
| Pyrene | | | 93.7 | | % | | 60-130 | 22-JUN-17 |
| WG2551284-1 | MB | | | | | | | |
| Acenaphthene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Acenaphthylene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Anthracene | | | <0.0040 | | mg/kg | | 0.004 | 22-JUN-17 |
| Benz(a)anthracene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(a)pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(b)fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(g,h,i)perylene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(k)fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Chrysene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Dibenz(a,h)anthracene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Fluorene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| 2-Methylnaphthalene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Naphthalene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Phenanthrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |



Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

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| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|-----------------------------|-----------------|-------------------|---------|-----------|-------|-----|--------|-----------|
| PAH-TMB-H/A-MS-VA | Soil | | | | | | | |
| Batch | R3752438 | | | | | | | |
| WG2551284-1 MB | | | | | | | | |
| Surrogate: Naphthalene d8 | | | 73.5 | | % | | 50-130 | 22-JUN-17 |
| Surrogate: Acenaphthene d10 | | | 77.5 | | % | | 60-130 | 22-JUN-17 |
| Surrogate: Phenanthrene d10 | | | 77.2 | | % | | 60-130 | 22-JUN-17 |
| Surrogate: Chrysene d12 | | | 84.8 | | % | | 60-130 | 22-JUN-17 |
| WG2551335-1 MB | | | | | | | | |
| Acenaphthene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Acenaphthylene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Anthracene | | | <0.0040 | | mg/kg | | 0.004 | 22-JUN-17 |
| Benz(a)anthracene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(a)pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(b)fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(g,h,i)perylene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Benzo(k)fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Chrysene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Dibenz(a,h)anthracene | | | <0.0050 | | mg/kg | | 0.005 | 22-JUN-17 |
| Fluoranthene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Fluorene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| 2-Methylnaphthalene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Naphthalene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Phenanthrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Pyrene | | | <0.010 | | mg/kg | | 0.01 | 22-JUN-17 |
| Surrogate: Naphthalene d8 | | | 78.8 | | % | | 50-130 | 22-JUN-17 |
| Surrogate: Acenaphthene d10 | | | 81.5 | | % | | 60-130 | 22-JUN-17 |
| Surrogate: Phenanthrene d10 | | | 81.2 | | % | | 60-130 | 22-JUN-17 |
| Surrogate: Chrysene d12 | | | 87.4 | | % | | 60-130 | 22-JUN-17 |
| Batch | R3753177 | | | | | | | |
| WG2551284-4 DUP | | L1943831-3 | | | | | | |
| Acenaphthene | | <1.5 | <1.5 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Acenaphthylene | | <0.30 | <0.30 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Anthracene | | <0.70 | <0.80 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Benz(a)anthracene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Benzo(a)pyrene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Benzo(b)fluoranthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |



Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

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| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|-------------------------|-----------------|-------------------|--------|-----------|-------|-----|-------|-----------|
| PAH-TMB-H/A-MS-VA | Soil | | | | | | | |
| Batch | R3753177 | | | | | | | |
| WG2551284-4 DUP | | L1943831-3 | | | | | | |
| Benzo(g,h,i)perylene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Benzo(k)fluoranthene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Chrysene | | <0.070 | <0.060 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Dibenz(a,h)anthracene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Fluoranthene | | <0.20 | <0.20 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Fluorene | | 2.01 | 1.91 | | mg/kg | 5.1 | 50 | 23-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | <0.050 | <0.050 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| 2-Methylnaphthalene | | 2.78 | 2.66 | | mg/kg | 4.4 | 50 | 23-JUN-17 |
| Naphthalene | | <0.40 | <0.40 | RPD-NA | mg/kg | N/A | 50 | 23-JUN-17 |
| Phenanthrene | | 5.01 | 4.64 | | mg/kg | 7.7 | 50 | 23-JUN-17 |
| Pyrene | | 1.51 | 1.40 | | mg/kg | 7.3 | 50 | 23-JUN-17 |

Quality Control Report

Workorder: L1943831

Report Date: 23-JUN-17

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Legend:

| | |
|-------|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

Sample Parameter Qualifier Definitions:

| Qualifier | Description |
|-----------|---|
| RPD-NA | Relative Percent Difference Not Available due to result(s) being less than detection limit. |

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

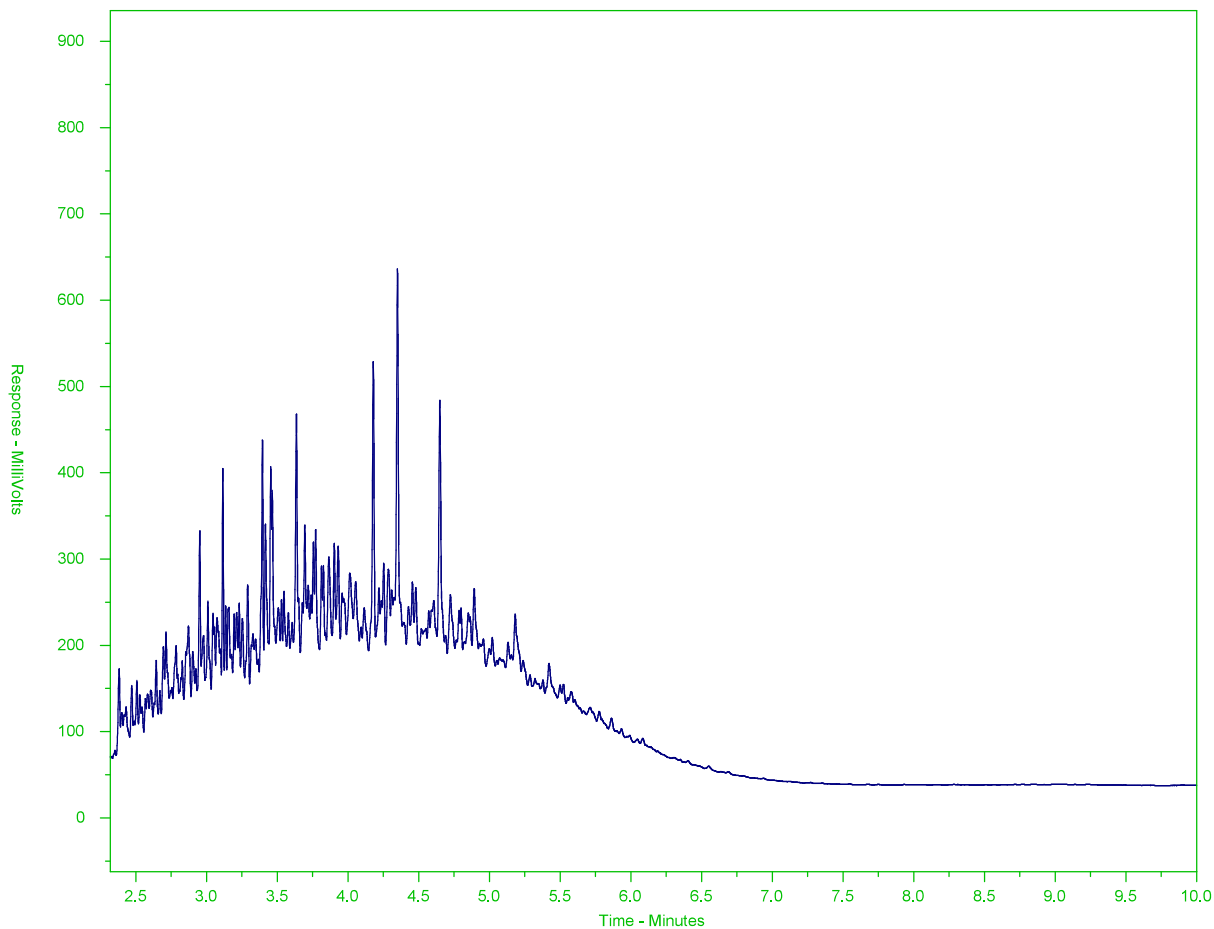
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-3
Client Sample ID: 06906-03



| | | | |
|-----------------------|-------|-----------------------------------|--|
| ← EPH10-19 → | | ← EPH19-32 → | |
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

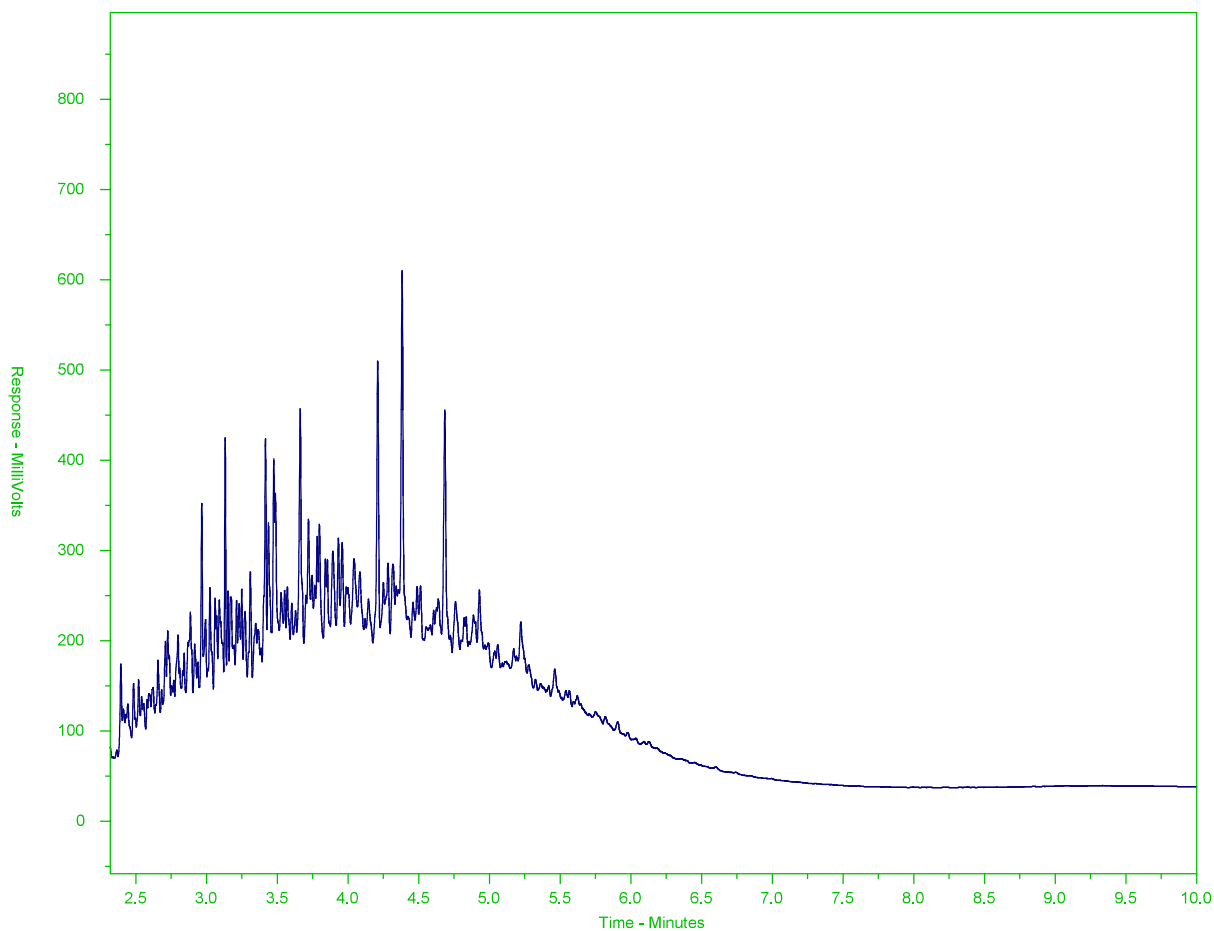
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: WG2551284-4#L1943831-3
Client Sample ID: 06906-03



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | Motor Oils/ Lube Oils/ Grease | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

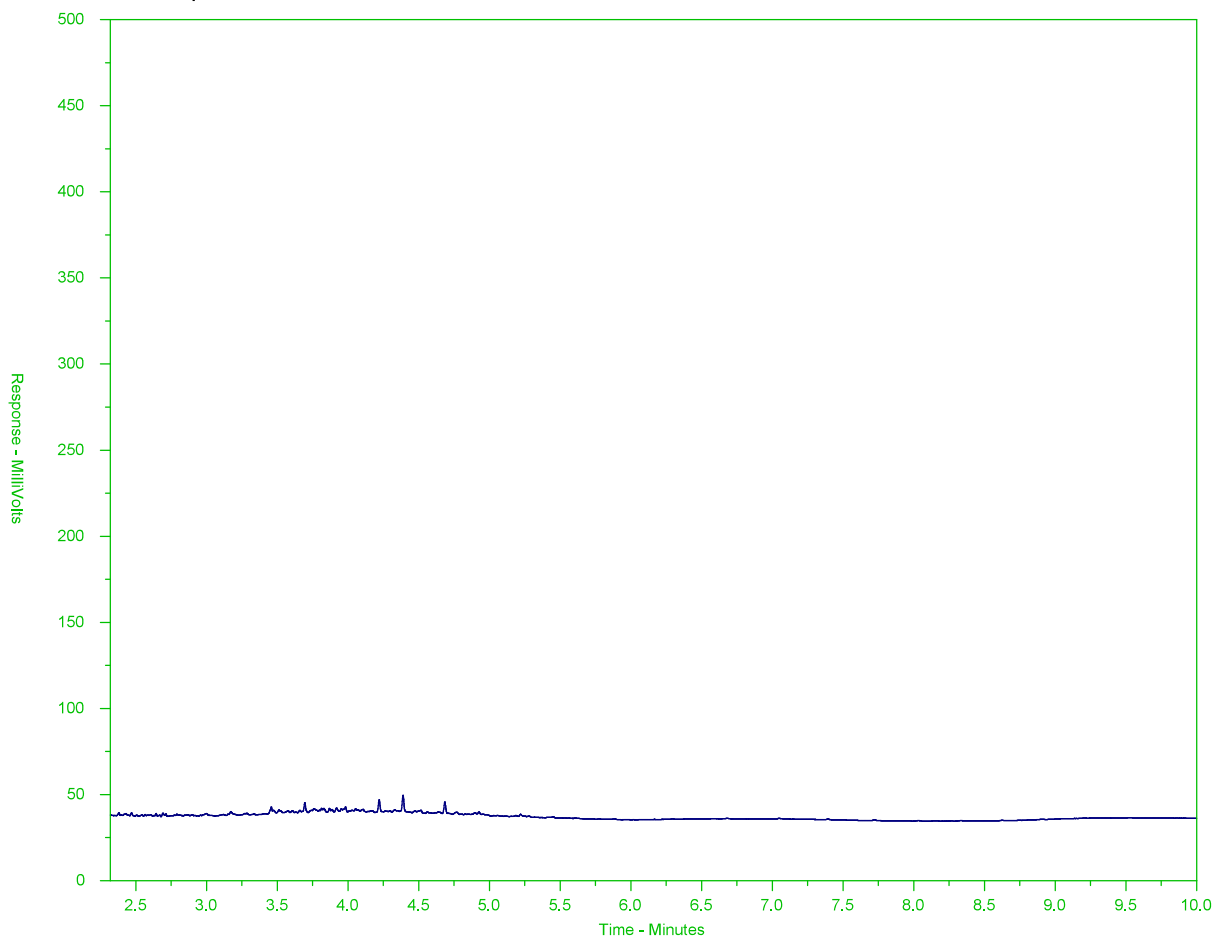
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-4
Client Sample ID: 06906-04



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-----------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

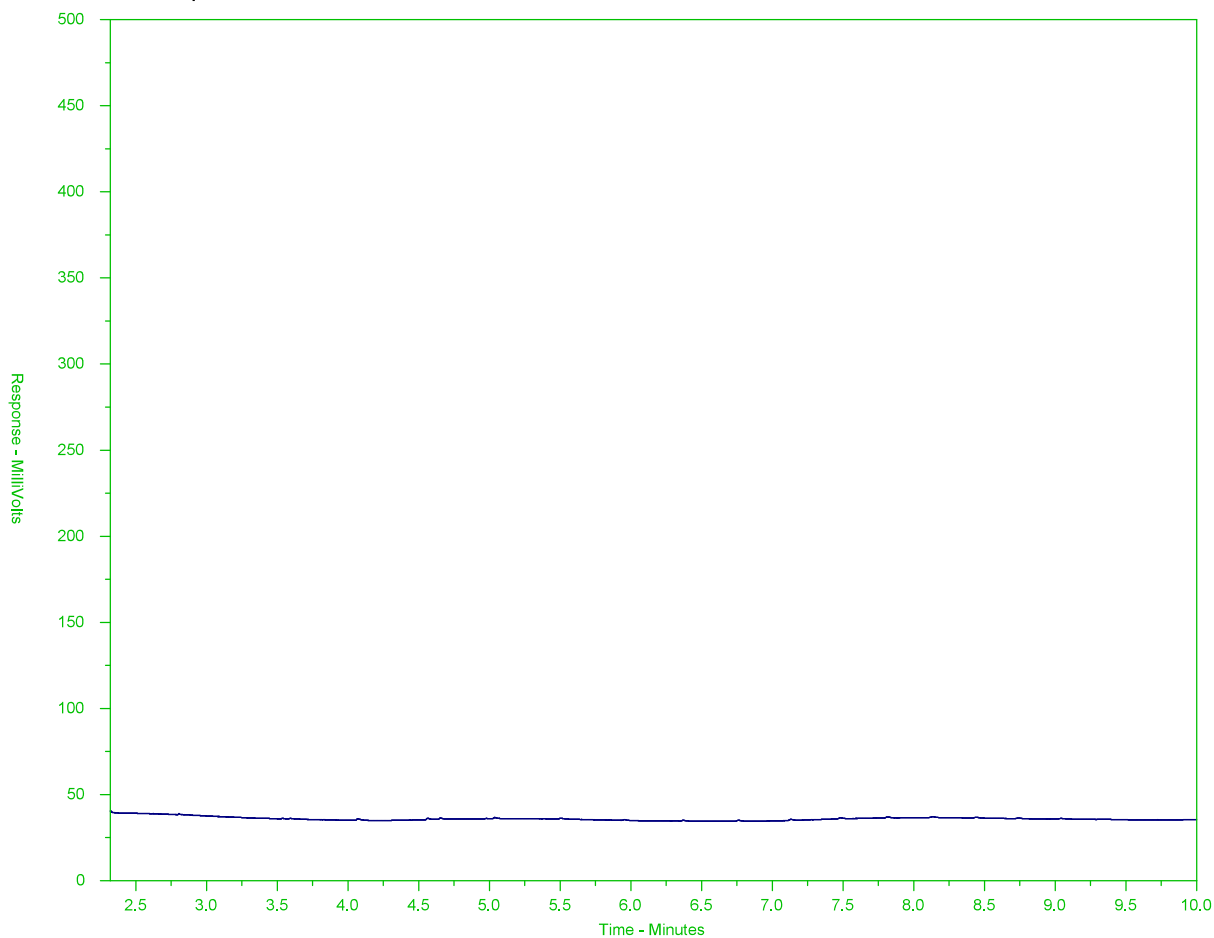
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-6
Client Sample ID: 06906-06



| | | | |
|-----------------------|-------|-----------------------------------|--|
| ← EPH10-19 → | | ← EPH19-32 → | |
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

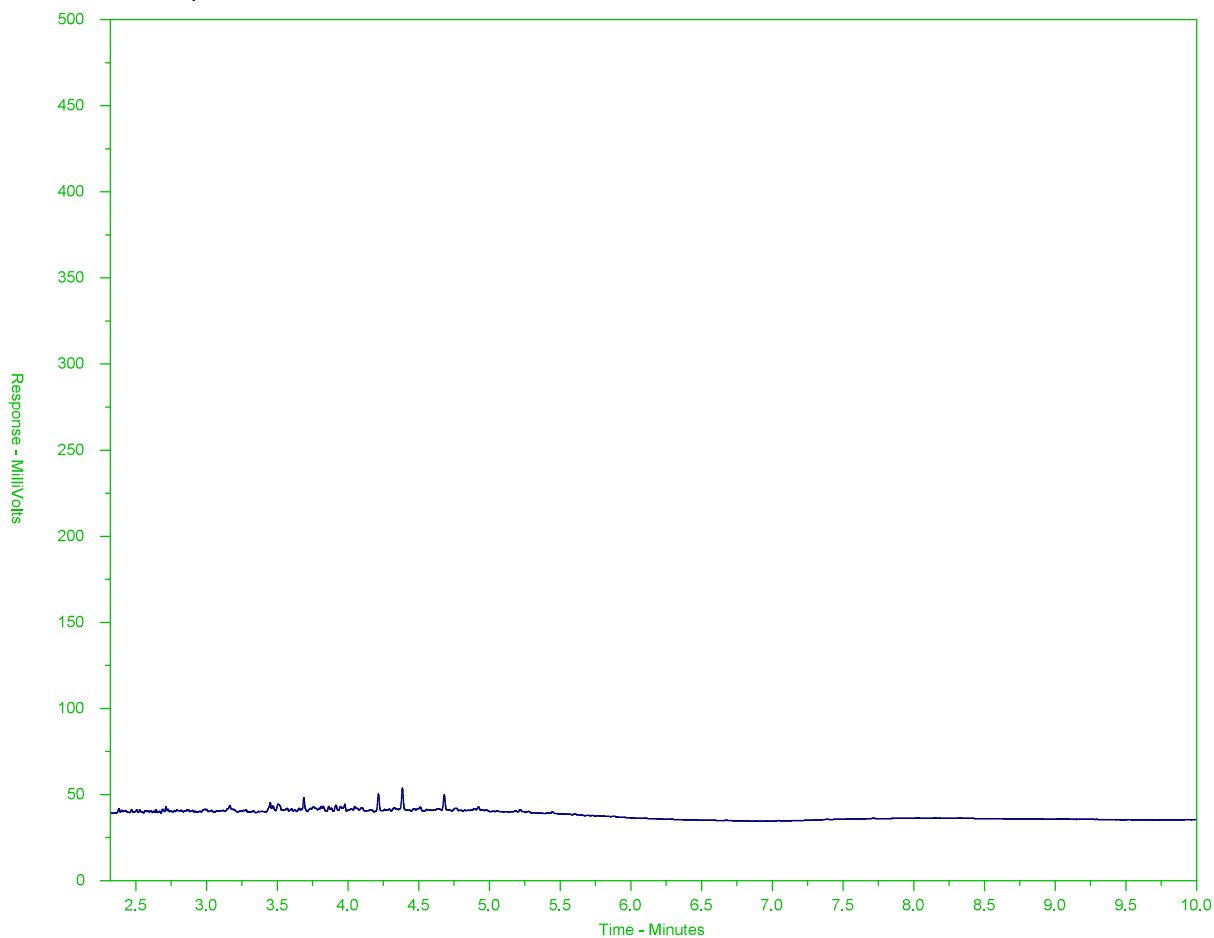
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-10
Client Sample ID: 06906-10



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-----------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

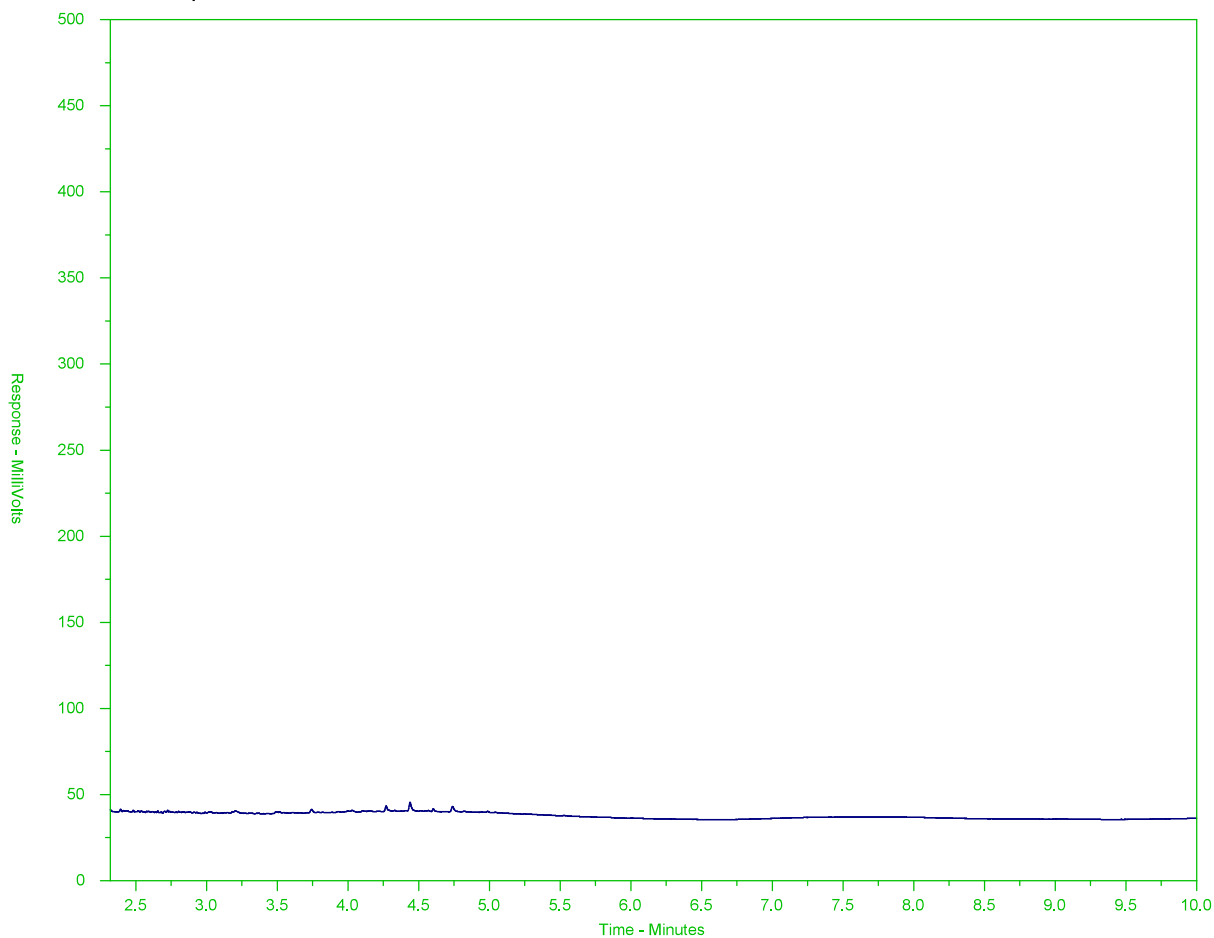
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-11
Client Sample ID: 06906-11



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-----------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

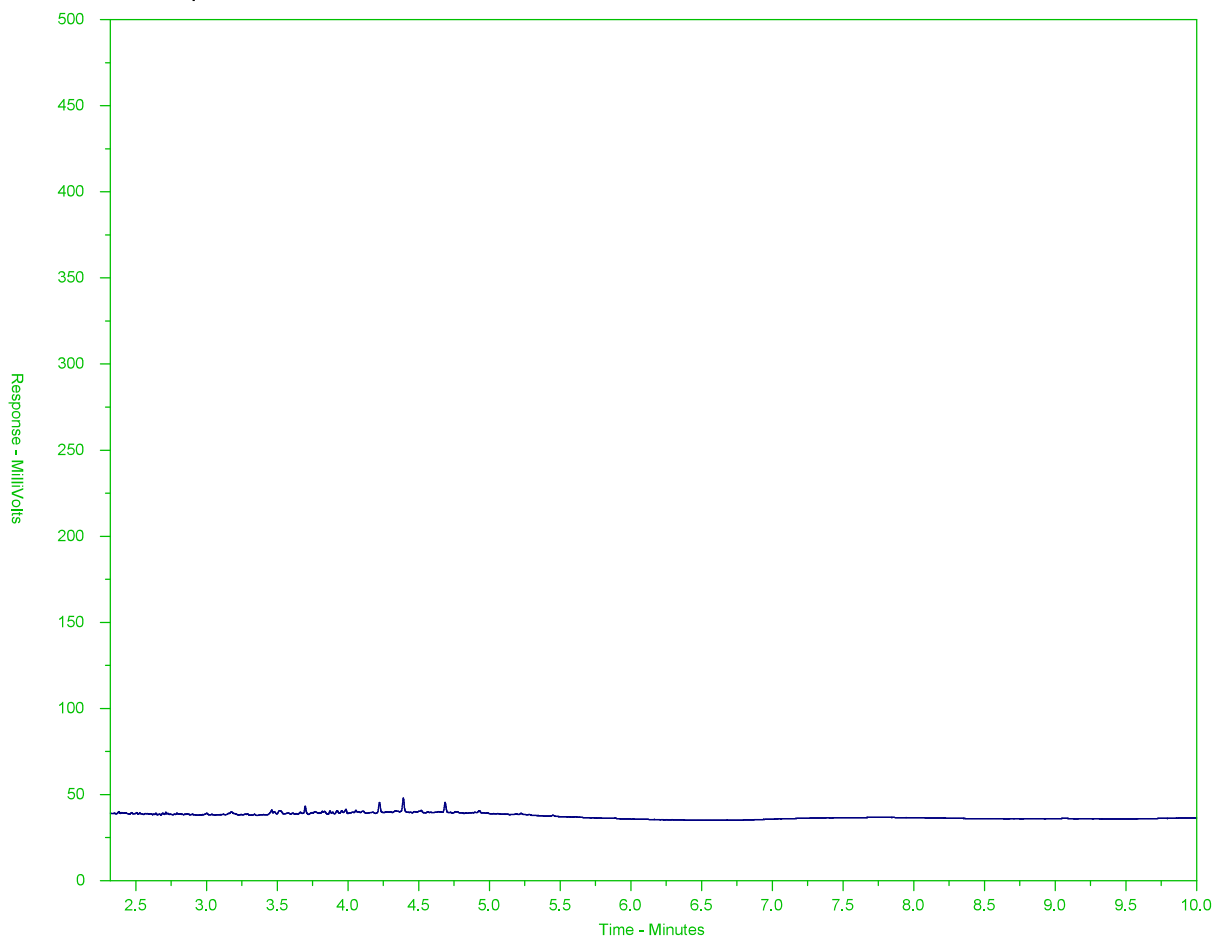
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: WG2551335-4#L1943831-11
Client Sample ID: 06906-11



| | | | |
|-----------------------|-------|-----------------------------------|--|
| ← EPH10-19 → | | ← EPH19-32 → | |
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

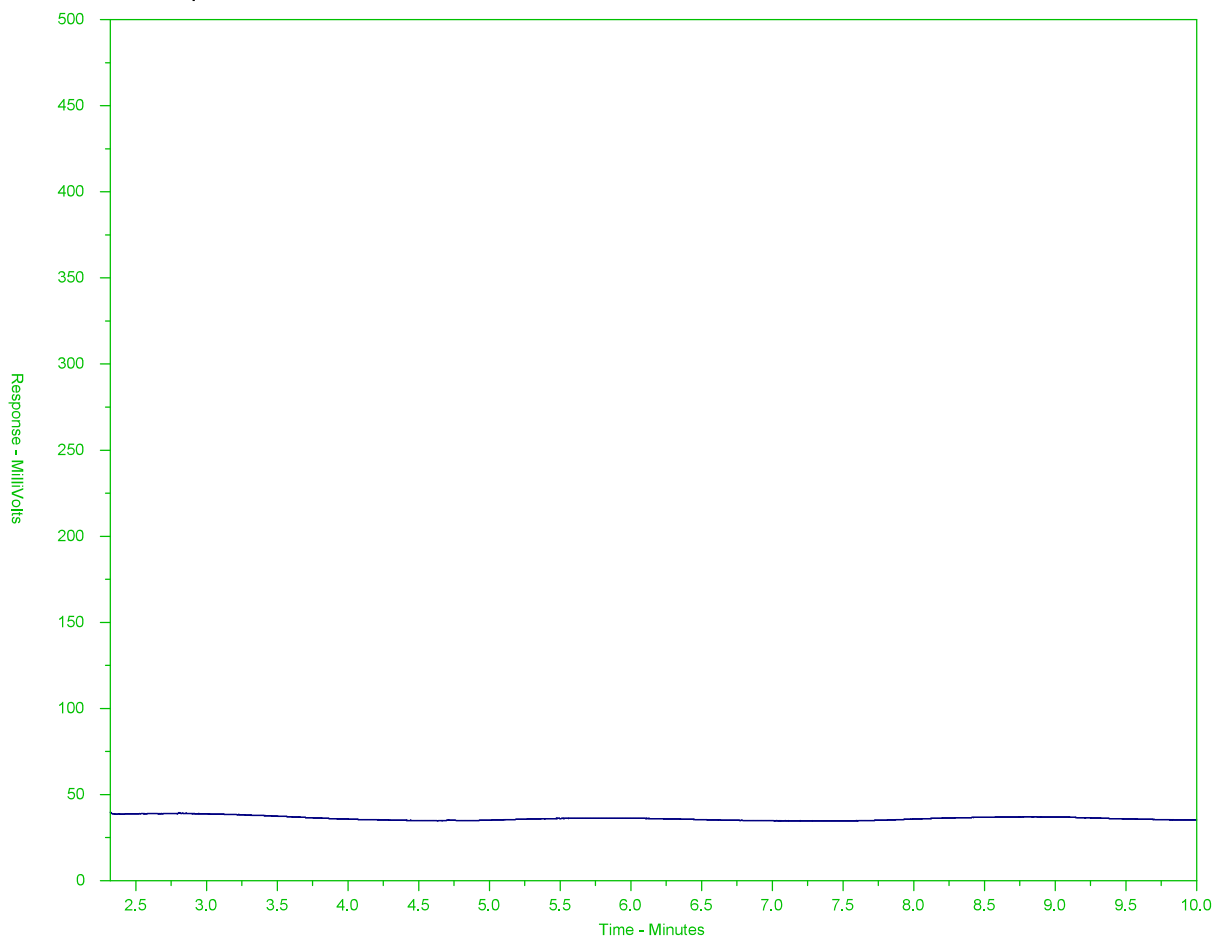
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-14
Client Sample ID: 06907-02



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-----------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

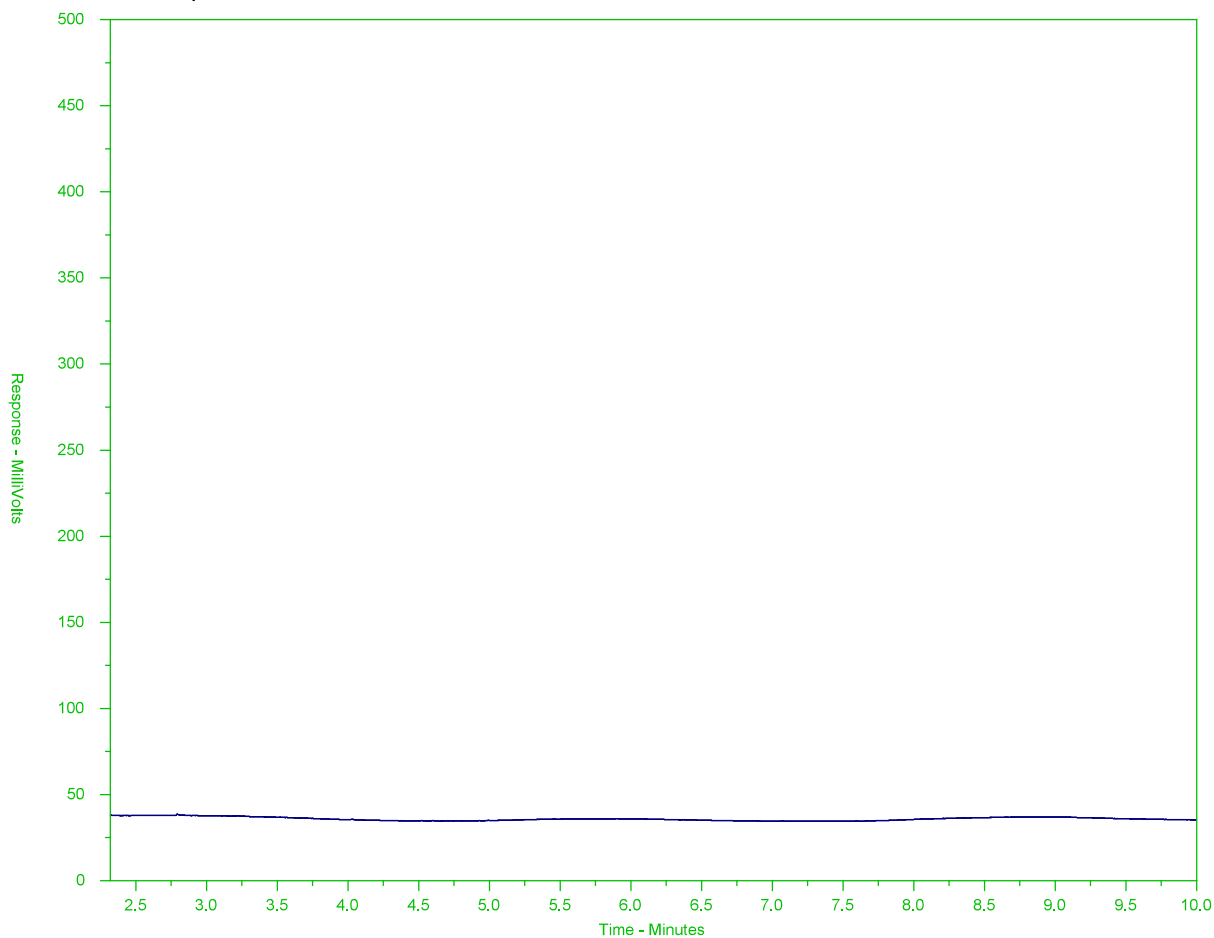
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1943831-19
Client Sample ID: 06907-07



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-------|-----------------------------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | | ← Motor Oils/ Lube Oils/ Grease → | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.



Golder Associates

200 - 2920 Virtual Way
Vancouver, British Columbia, Canada V5M 0C4
Telephone (604) 296-4200 Fax (604) 298-5253

CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST

No. 06906

page 1 of 2

| | | |
|--|--------------------------------------|---|
| Project Number: 1671469/2000 | | Laboratory Name: AL3 |
| Short Title: Crystal Pool Phase I ESA | Golder Contact: Wendy Beards | Address: 8081 Longhead Hwy, Burnaby, BC |
| Golder E-mail Address 1: wendy-beards@golder.com | Golder E-mail Address 2: @golder.com | Telephone/Fax: Contact: Amber Sanger |

| | |
|--|---|
| Office Name: Victoria | EQUIS Facility Code: _____ |
| Turnaround Time: <input type="checkbox"/> 24 hr <input type="checkbox"/> 48 hr <input checked="" type="checkbox"/> 72 hr | EQUIS upload: <input type="checkbox"/> Regular (5 Days) <input checked="" type="checkbox"/> Other |

| Note: Final Reports to be issued by e-mail | | | | | | | Quote No.: Q62593 | | | Analyses Required | | | RUSH (Select TAT above) | Remarks (over) |
|--|-----------------|-------|------------------|----------------------|----------------------|----------------------|--------------------|------------------|--------------------|----------------------|--------------|--|-------------------------|----------------|
| Sample Control Number (SCN) | Sample Location | Sa. # | Sample Depth (m) | Sample Matrix (over) | Date Sampled (D/M/Y) | Time Sampled (HH:MM) | Sample Type (over) | QAQC Code (over) | Related SCN (over) | Number of Containers | LEOH/HEX/PAH | | | |
| 0906-01 | BH17-02 | 1 | 1.2-1.5 | Soil | 12/04/17 | 09:50 | Diene | | | 2 | | | | |
| -02 | BH17-01 | 1 | 1.3-1.5 | | 12/04/17 | 09:30 | | FDA | 06906-12 | 2 | | | | |
| -03 | BH17-03 | 1 | 1.2-1.4 | | 12/04/17 | 10:30 | | | | 2 | X | | | |
| -04 | BH17-02 | 2 | 1.6-1.8 | | 14/04/17 | 08:50 | | | | 2 | X | | | |
| -05 | | 3 | 2.5-2.7 | | | 09:00 | | | | 2 | | | | |
| -06 | | 4 | 3.3-3.5 | | | 09:10 | | | | 2 | X | | | |
| -07 | | 5 | 4.8-5.0 | | | 09:30 | | | | 2 | | | | |
| -08 | | 6 | 5.6-5.8 | | | 09:50 | | | | 2 | | | | |
| -09 | BH17-01 | 2 | 1.8-2.1 | | | 10:50 | | | | 2 | | | | |
| -10 | | 3 | 2.5-2.7 | | | 11:00 | | FDA | 06906-11 | 2 | X | | | |
| -11 | | 3 | 2.5-2.7 | | | 11:00 | | FD | 06906-10 | 2 | X | | | |
| -12 | BH17-01 | 2 | 1.3-1.5 | | 12/06/17 | 09:30 | | FD | 06906-02 | 2 | | | | |



| | | | | | | |
|--|---|---------------------|----------------|-------------------------------|-------------------------------------|--------------|
| Sample Signature: [Signature] | Relinquished by: Signature: [Signature] | Company: Golder | Date: 15/06/17 | Time: 09:30 | Received by: Signature: [Signature] | Company: HCS |
| Comments: Hold sample, not currently selected for analysis | Method of Shipment: | Waybill No.: | | | Date: June 15 | Time: 10:15 |
| | Shipped by: | Shipment Condition: | Temp (°C): 2.6 | Cooler opened by: [Signature] | Date: June 16 | Time: 8:25 |



**Golder
Associates**

200 - 2920 Virtual Way
Vancouver, British Columbia, Canada V5M 0C4
Telephone (604) 296-4200 Fax (604) 298-5253

CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST

No. 06907

page 2 of 2

| | | | |
|---|--|---|--|
| Project Number: 167 1469/2000 | | Laboratory Name: ALS | |
| Short Title: Crystal Pool Phase 1 | | Address: 8081 Lougheed Hwy, Burnaby, BC | |
| Golder E-mail Address 1: Wendy-bea.ste@golder.com | | Telephone/Fax: Contact: Amber Sprague | |
| Golder E-mail Address 2: Wendy-bea.ste@golder.com | | Golder Contact: Wendy Bea.ste | |
| Golder E-mail Address 3: Wendy-bea.ste@golder.com | | @golder.com | |

| | | | | | | | | | |
|---|-----------------|---|------------------|--|----------------------|---|--------------------|--|--------------------|
| Office Name: Victoria | | EQUIS Facility Code: 062593 | | EQUIS upload: <input checked="" type="checkbox"/> Regular (5 Days) | | EQUIS upload: <input type="checkbox"/> 72 hr | | EQUIS upload: <input type="checkbox"/> Other | |
| Turnaround Time: <input type="checkbox"/> 24 hr | | Criteria: <input checked="" type="checkbox"/> CSR | | Criteria: <input type="checkbox"/> CCME | | Criteria: <input type="checkbox"/> BC Water Quality | | Criteria: <input type="checkbox"/> Other | |
| Note: Final Reports to be issued by e-mail | | | | | | | | | |
| Quote No.: 062593 | | | | | | | | | |
| Sample Control Number (SCN) | Sample Location | Sa. # | Sample Depth (m) | Sample Matrix (over) | Date Sampled (D/M/Y) | Time Sampled (HH:MM) | Sample Type (over) | QAQC Code (over) | Related SCN (over) |
| 06907-01 | BH17-01 | 4 | 32-34 | Soil | 14/06/17 | 11:10 | Disturb | | |
| -02 | | 5 | 35-37 | | | 11:20 | | | |
| -03 | | 6 | 47-50 | | | 11:30 | | | |
| -04 | | 7 | 56-58 | | | 11:40 | | | |
| -05 | BH17-03 | 2 | 16-19 | | | 12:50 | | | |
| -06 | | 3 | 25-28 | | | 13:00 | | | |
| -07 | | 4 | 31-33 | | | 13:10 | | | |
| -08 | | 5 | 40-42 | | | 13:20 | | | |
| -09 | | 6 | 48-50 | | | 13:30 | | | |
| -10 | | 7 | 56-58 | | | 13:40 | | | |
| -11 | | 7 | 56-58 | | | 13:40 | | | |
| -12 | | | | | | | | | |

Charge
ground



L1943831-COFC

| | | | | | | |
|---|--|---------------------|-----------------------------|--------------------------|------------------------------------|--------------|
| Sampler's Signature: [Signature] | Relinquished by: Signature [Signature] | Company: Golder | Date: 15/06/17 | Time: 09:30 | Received by: Signature [Signature] | Company: HCS |
| Comments: Hold Sample not currently selected for analysis | | Waybill No.: | Received for Lab by: Trevor | | Date: June 15 | Time: 10:15 |
| Shipped by: | | Shipment Condition: | Temp (°C): 2.6 | Cooler opened by: Trevor | Date: June 16 | Time: 8:25 |
| Seal Intact: | | | | | | |

WHITE: Golder Copy YELLOW: Lab Copy

ESED



GOLDER ASSOCIATES LTD.
ATTN: Wendy Beairsto
3795 Carey Road, Second Floor
Victoria BC V8Z 6T8

Date Received: 24-JUN-17
Report Date: 30-JUN-17 12:45 (MT)
Version: FINAL

Client Phone: 250-881-7372

Certificate of Analysis

Lab Work Order #: L1948029
Project P.O. #: NOT SUBMITTED
Job Reference: 1671469/2000
C of C Numbers: 06908
Legal Site Desc:

Amber Springer, B.Sc
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

| Sample ID Description Sampled Date Sampled Time Client ID | | L1948029-1 22-JUN-17 14:57 06908-01 | | | | |
|---|--|--|--|--|--|--|
| Grouping | Analyte | | | | | |
| WATER | | | | | | |
| Hydrocarbons | EPH10-19 (mg/L) | 0.89 | | | | |
| | EPH19-32 (mg/L) | <0.25 | | | | |
| | LEPH (mg/L) | 0.85 | | | | |
| | HEPH (mg/L) | <0.25 | | | | |
| | Surrogate: 2-Bromobenzotrifluoride (%) | 90.1 | | | | |
| Polycyclic Aromatic Hydrocarbons | Acenaphthene (mg/L) | 0.00170 | | | | |
| | Acenaphthylene (mg/L) | ^{DLCI} <0.00030 | | | | |
| | Acridine (mg/L) | <0.000050 | | | | |
| | Anthracene (mg/L) | ^{DLCI} <0.000090 | | | | |
| | Benz(a)anthracene (mg/L) | <0.000050 | | | | |
| | Benzo(a)pyrene (mg/L) | <0.0000050 | | | | |
| | Benzo(b)fluoranthene (mg/L) | <0.000050 | | | | |
| | Benzo(g,h,i)perylene (mg/L) | <0.000050 | | | | |
| | Benzo(k)fluoranthene (mg/L) | <0.000050 | | | | |
| | Chrysene (mg/L) | <0.000050 | | | | |
| | Dibenz(a,h)anthracene (mg/L) | <0.0000050 | | | | |
| | Fluoranthene (mg/L) | <0.000050 | | | | |
| | Fluorene (mg/L) | 0.00197 | | | | |
| | Indeno(1,2,3-c,d)pyrene (mg/L) | <0.000050 | | | | |
| | Naphthalene (mg/L) | 0.0369 | | | | |
| | Phenanthrene (mg/L) | 0.000976 | | | | |
| | Pyrene (mg/L) | 0.000050 | | | | |
| | Quinoline (mg/L) | ^{DLCI} <0.0040 | | | | |
| | Surrogate: Acridine d9 (%) | 77.0 | | | | |
| | Surrogate: Chrysene d12 (%) | 60.8 | | | | |
| | Surrogate: Naphthalene d8 (%) | 65.5 | | | | |
| | Surrogate: Phenanthrene d10 (%) | 74.7 | | | | |

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

| Qualifier | Description |
|-----------|---|
| DLCI | Detection Limit Raised: Chromatographic Interference due to co-elution. |

Test Method References:

| ALS Test Code | Matrix | Test Description | Method Reference** |
|---|--------|------------------|---------------------------------|
| EPH-ME-FID-VA | Water | EPH in Water | BC Lab Manual |
| EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH. | | | |
| LEPH/HEPH-CALC-VA | Water | LEPHs and HEPHs | BC MOE LABORATORY MANUAL (2005) |
| Light and Heavy Extractable Petroleum Hydrocarbons in water. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Water by GC/FID" (Version 2.1, July 20, 1999). | | | |
| PAH-ME-MS-VA | Water | PAHs in Water | EPA 3511/8270D (mod) |
| PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter. | | | |

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

| Laboratory Definition Code | Laboratory Location |
|----------------------------|---|
| VA | ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA |

Chain of Custody Numbers:

06908

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg ww - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



Quality Control Report

Workorder: L1948029

Report Date: 30-JUN-17

Page 1 of 3

Client: GOLDER ASSOCIATES LTD.
3795 Carey Road, Second Floor
Victoria BC V8Z 6T8

Contact: Wendy Beairsto

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|------------------------------------|-----------------|-----------|------------|-----------|-------|-----|----------|-----------|
| EPH-ME-FID-VA | Water | | | | | | | |
| Batch | R3757029 | | | | | | | |
| WG2558441-2 | LCS | | | | | | | |
| EPH10-19 | | | 92.8 | | % | | 70-130 | 29-JUN-17 |
| EPH19-32 | | | 89.0 | | % | | 70-130 | 29-JUN-17 |
| WG2558441-1 | MB | | | | | | | |
| EPH10-19 | | | <0.25 | | mg/L | | 0.25 | 29-JUN-17 |
| EPH19-32 | | | <0.25 | | mg/L | | 0.25 | 29-JUN-17 |
| Surrogate: 2-Bromobenzotrifluoride | | | 77.0 | | % | | 60-140 | 29-JUN-17 |
| PAH-ME-MS-VA | Water | | | | | | | |
| Batch | R3756433 | | | | | | | |
| WG2558441-2 | LCS | | | | | | | |
| Acenaphthene | | | 86.6 | | % | | 60-130 | 29-JUN-17 |
| Acenaphthylene | | | 98.1 | | % | | 60-130 | 29-JUN-17 |
| Acridine | | | 89.0 | | % | | 60-130 | 29-JUN-17 |
| Anthracene | | | 89.8 | | % | | 60-130 | 29-JUN-17 |
| Benz(a)anthracene | | | 107.8 | | % | | 60-130 | 29-JUN-17 |
| Benzo(a)pyrene | | | 105.0 | | % | | 60-130 | 29-JUN-17 |
| Benzo(b)fluoranthene | | | 103.5 | | % | | 60-130 | 29-JUN-17 |
| Benzo(g,h,i)perylene | | | 121.1 | | % | | 60-130 | 29-JUN-17 |
| Benzo(k)fluoranthene | | | 99.8 | | % | | 60-130 | 29-JUN-17 |
| Chrysene | | | 103.0 | | % | | 60-130 | 29-JUN-17 |
| Dibenz(a,h)anthracene | | | 125.0 | | % | | 60-130 | 29-JUN-17 |
| Fluoranthene | | | 97.0 | | % | | 60-130 | 29-JUN-17 |
| Fluorene | | | 93.1 | | % | | 60-130 | 29-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | 126.6 | | % | | 60-130 | 29-JUN-17 |
| Naphthalene | | | 77.0 | | % | | 50-130 | 29-JUN-17 |
| Phenanthrene | | | 89.4 | | % | | 60-130 | 29-JUN-17 |
| Pyrene | | | 100.4 | | % | | 60-130 | 29-JUN-17 |
| Quinoline | | | 113.4 | | % | | 60-130 | 29-JUN-17 |
| WG2558441-1 | MB | | | | | | | |
| Acenaphthene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Acenaphthylene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Acridine | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Anthracene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Benz(a)anthracene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Benzo(a)pyrene | | | <0.0000050 | | mg/L | | 0.000005 | 29-JUN-17 |
| Benzo(b)fluoranthene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |



Quality Control Report

Workorder: L1948029

Report Date: 30-JUN-17

Page 2 of 3

| Test | Matrix | Reference | Result | Qualifier | Units | RPD | Limit | Analyzed |
|-----------------------------|----------|-----------|------------|-----------|-------|-----|----------|-----------|
| PAH-ME-MS-VA | Water | | | | | | | |
| Batch | R3756433 | | | | | | | |
| WG2558441-1 MB | | | | | | | | |
| Benzo(g,h,i)perylene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Benzo(k)fluoranthene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Chrysene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Dibenz(a,h)anthracene | | | <0.0000050 | | mg/L | | 0.000005 | 29-JUN-17 |
| Fluoranthene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Fluorene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Indeno(1,2,3-c,d)pyrene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Naphthalene | | | <0.000050 | | mg/L | | 0.00005 | 29-JUN-17 |
| Phenanthrene | | | <0.000020 | | mg/L | | 0.00002 | 29-JUN-17 |
| Pyrene | | | <0.000010 | | mg/L | | 0.00001 | 29-JUN-17 |
| Quinoline | | | <0.000050 | | mg/L | | 0.00005 | 29-JUN-17 |
| Surrogate: Acridine d9 | | | 74.9 | | % | | 60-130 | 29-JUN-17 |
| Surrogate: Chrysene d12 | | | 87.6 | | % | | 60-130 | 29-JUN-17 |
| Surrogate: Naphthalene d8 | | | 74.1 | | % | | 50-130 | 29-JUN-17 |
| Surrogate: Phenanthrene d10 | | | 73.6 | | % | | 60-130 | 29-JUN-17 |

Quality Control Report

Workorder: L1948029

Report Date: 30-JUN-17

Page 3 of 3

Legend:

| | |
|-------|---|
| Limit | ALS Control Limit (Data Quality Objectives) |
| DUP | Duplicate |
| RPD | Relative Percent Difference |
| N/A | Not Available |
| LCS | Laboratory Control Sample |
| SRM | Standard Reference Material |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| ADE | Average Desorption Efficiency |
| MB | Method Blank |
| IRM | Internal Reference Material |
| CRM | Certified Reference Material |
| CCV | Continuing Calibration Verification |
| CVS | Calibration Verification Standard |
| LCSD | Laboratory Control Sample Duplicate |

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

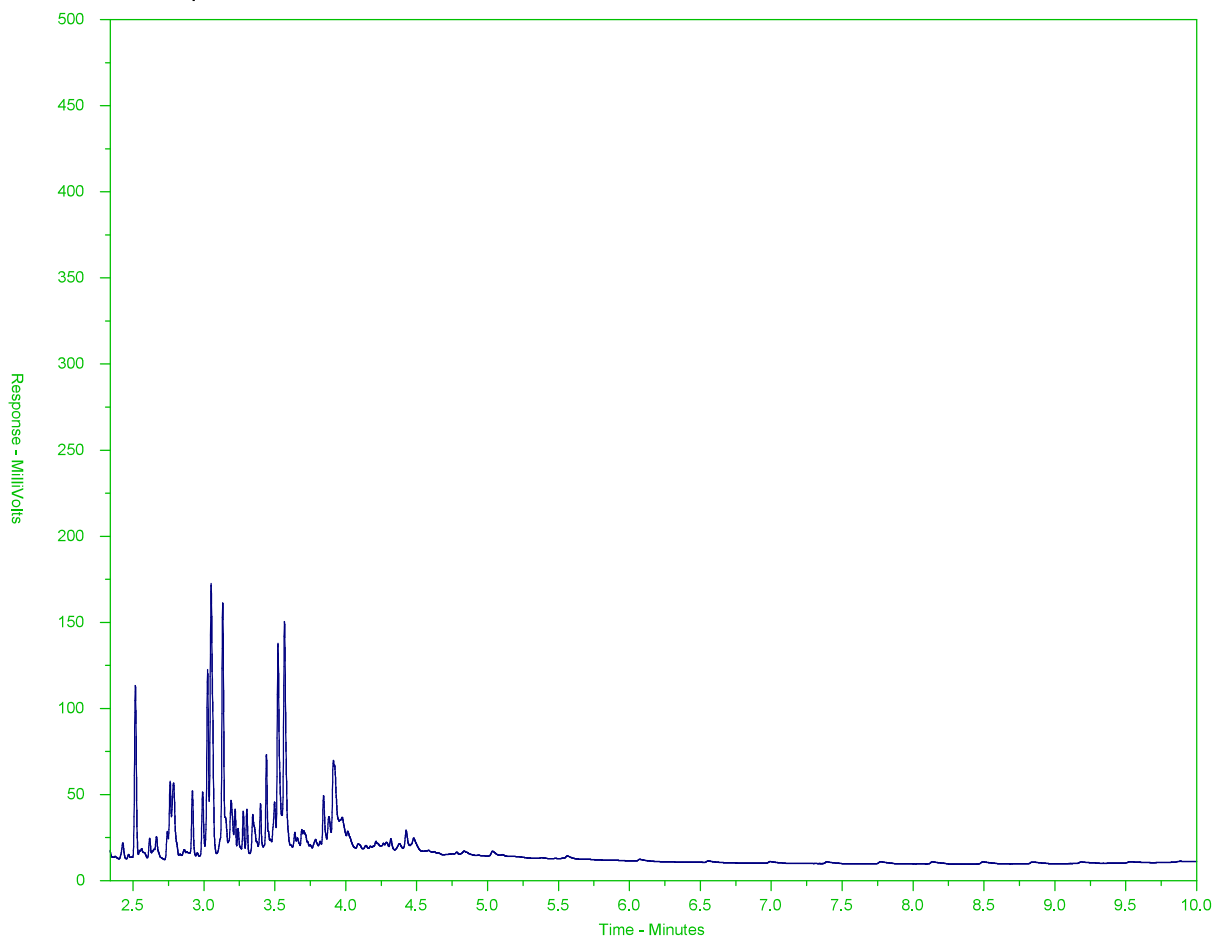
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

BC EPH HYDROCARBON DISTRIBUTION REPORT



ALS Sample ID: L1948029-1
Client Sample ID: 06908-01



| ← EPH10-19 → | | ← EPH19-32 → | |
|-----------------------|-----------------------------------|--------------|--|
| nC10 | nC19 | nC32 | |
| 174°C | 330°C | 467°C | |
| 346°F | 626°F | 873°F | |
| ← Gasoline → | ← Motor Oils/ Lube Oils/ Grease → | | |
| ← Diesel/ Jet Fuels → | | | |

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

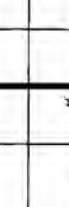


CHAIN OF CUSTODY RECORD/ANALYSIS REQUEST


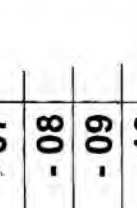
No. 06908

page (of

| Project Number: 1671469 / 2000 Short Title: Crystal Pool Phase II ESA Golder E-mail Address 1: wady-brainsto @golder.com Golder Contact: Wendy Brains Address: 2081 Loghead Hwy Burnaby BC Contact: Amber Springs Telephone/Fax: @golder.com | | | | | | Laboratory Name: ALS Address: Contact: Telephone/Fax: | | | | | | |
|---|-----------------|-------|------------------|----------------------|----------------------|--|--------------------|------------------|--------------------|----------------------|-------------------------|----------------|
| Office Name: Victoria EQUIS Facility Code: Q62593 EQUIS upload: <input checked="" type="checkbox"/> Regular (5 Days) <input type="checkbox"/> 72 hr <input type="checkbox"/> Other <input type="checkbox"/> 24 hr <input type="checkbox"/> 48 hr <input type="checkbox"/> BC Water Quality <input type="checkbox"/> CSME | | | | | | Analytes Required LF PH / HEM / OAHIS | | | | | | |
| Turnaround Time: <input type="checkbox"/> 24 hr <input checked="" type="checkbox"/> 4-23 Criteria: <input checked="" type="checkbox"/> CSR <input type="checkbox"/> FCM | | | | | | Quote No.: | | | | | | |
| Note: Final Reports to be issued by e-mail | | | | | | | | | | | | |
| Sample Control Number (SCN) | Sample Location | Sa. # | Sample Depth (m) | Sample Matrix (over) | Date Sampled (D/M/Y) | Time Sampled (HH:MM) | Sample Type (over) | QAQC Code (over) | Related SCN (over) | Number of Containers | RUSH (Select TAT above) | Remarks (over) |
| 06908 - 01 | MW17-01 | | | WG | 22/06/19 | 14:57 | | FDA | 06908-02 | 2 | X | |
| ↓ - 02 | ↓ | | | ↓ | ↓ | ↓ | | FD | 06908-01 | 2 | | |
| - 03 | | | | | | | | | | | | |
| - 04 | | | | | | | | | | | | |
| - 05 | | | | | | | | | | | | |
| - 06 | | | | | | | | | | | | |
| - 07 | | | | | | | | | | | | |
| - 08 | | | | | | | | | | | | |
| - 09 | | | | | | | | | | | | |
| - 10 | | | | | | | | | | | | |
| - 11 | | | | | | | | | | | | |
| - 12 | | | | | | | | | | | | |


 L1948029-COFC

x1 cooler.
 Charge ground

| | | | | | | | |
|---|--|---|--|--|--|---|--|
| Relinquished by: Signature  | | Company us/cda Date 22/06/19 | | Received By: Signature  | | Company ALS Date June 23 | |
| Method of Shipment: | | Waybill No.: | | Temp (°C) Cooler opened by: Shawn | | Date June 24 | |
| Shipped by: | | Shipment Condition: Seal Intact: | | Temp (°C) Cooler opened by: | | Date June 24 | |

WHITE: Golder Copy YELLOW: Lab Copy

DESIGN



APPENDIX C

Groundwater Sampling and Development Sheets

GROUNDWATER DEVELOPMENT AND SAMPLING DATA

☒ Development

☐ Purging/Sampling

Well No.: M41701

Project Name:

Crystal Pool Phase II

Project No.:

1671469/2000

Location:

22245 Quad

Date:

June 14, 2017

Weather:

Overcast

Temperature: ~15°C

Completed By:

KOB

GPS Coordinates:

Reviewed By:

MONITORING WELL INFORMATION

Time of Measurement:

1445

Depth to Product:

m

Product Thickness:

m

Depth to Water (A):

1.38

m below

☒ TOP

Depth to Bottom of Well (B):

3.17m

m below

☒ TOP

Diameter of Standpipe:

mm

Well Condition:

Tidally Influenced: ☐ Yes ☒ No

Pressurized: ☐ Yes ☒ No

Well Headspace:

ppm

One Well Volume:

(B-A)*2.0 = 3.6

Litres - for a 51 mm (2.0 inch) diameter well

(B-A)*1.1 =

Litres - for a 38 mm (1.5 inch) diameter well

EQUIPMENT LIST

Pump

☒ Waterra

☐ Hydrolift

☐ Bailer (Type: _____)

☐ Peristaltic

☐ Submersible

☐ Bladder

Multimeter

pH/Temp Meter

Conductivity Meter

Dissolved Oxygen Meter

ORP (Redox) Meter

Organic Vapour Meter

Model: YSI Pro

☐ Rental Equipment:

Model:

Model:

Model:

Model:

Model:

☒ Field Pump

pH4

pH7

pH10

1413 us/cm

Pump Details:

☐ D.O. Ampoule

☒ Field Calibration

DO

WELL DEVELOPMENT/PURGING

Purge Volume: Well Vol. X

16

= 22

litres

Start:

June 14-15:00

Finish:

June 15-10:28

Avg. Flow Rate:

L/min.

Sample intake depth:

| Time | Volume Removed (L) | Temp. (°C) | pH (Units) | <input checked="" type="checkbox"/> Cond. <input type="checkbox"/> Specific Cond. $\mu\text{S/cm}$ or mS/cm (circle one) | Redox (mV) | Diss. O ₂ * (mg/L) | Water Level (m) | Remarks |
|--------------|--------------------|-------------|-------------|---|-------------|-------------------------------|-----------------|-----------------|
| <u>06:15</u> | <u>7</u> | <u>17.4</u> | <u>9.96</u> | <u>504.6</u> | <u>17.1</u> | <u>4.75</u> | <u>1.58</u> | |
| <u>09:22</u> | <u>12</u> | <u>17.4</u> | <u>8.56</u> | <u>491.3</u> | <u>17.9</u> | <u>4.70</u> | <u>2.25</u> | |
| <u>09:27</u> | <u>18</u> | <u>17.3</u> | <u>8.32</u> | <u>576.3</u> | <u>17.5</u> | <u>2.88</u> | <u>2.128</u> | |
| <u>10:34</u> | <u>23</u> | <u>17.1</u> | <u>7.76</u> | <u>662</u> | <u>11.2</u> | <u>4.87</u> | <u>2.37</u> | |
| <u>10:53</u> | <u>32</u> | | | | | | | |
| <u>10:25</u> | | | | | | | <u>1.410</u> | <u>- Static</u> |
| <u>11:15</u> | <u>82</u> | | | | | | | |

* Record DO in Mg/L, not percentage

Comments:

Odour:

☒ Yes

☐ No

If yes

PHC-like

Sheen:

☒ Yes

☐ No

If yes

Hydrocarbon-like OR ☐ Metallic-like

Turbidity:

Clear

Very Silty

| Analysis | Type | Container Size | | | | | | | Filtered | | Preservatives |
|----------|---|----------------|--------|--------|--------|-----|-----|-----|------------------------------|-----------------------------|---------------|
| | | 40 mL | 120 mL | 250 mL | 500 mL | 1 L | 2 L | 4 L | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |

SCN No.

Field Dup.

Consumables: ☐ Waterra Tubing

☐ HDPE/Teflon Tubing

☐ Groundwater Filter

☐ Silicon Tubing

☐ D.O. Ampoules

☐ Footvalve

O:\Final\2013\1412\FORM UPDATE PROJECT 2013\Word Files - April\GW Development and Sampling Data.docx

April 26, 2013



GROUNDWATER DEVELOPMENT
AND SAMPLING DATA
☐ Development
☒ Purging/Sampling
Well No. MW17-01

Project Name:

Crystal Pool
2275 Quail St

Project No.:

1671469/2000

Location:

Date:

June 28 2017

Weather:

Sunny

Temperature:

~18°C

Completed By:

KOIS

GPS Coordinates:

Reviewed By:

MONITORING WELL INFORMATION

Time of Measurement:

09:17Tidally Influenced: ☐ Yes ☐ No

Depth to Product:

N/A

m

Product Thickness:

m

Pressurized: ☐ Yes ☐ No

Depth to Water (A):

1.472

m below

☒ TOP

Well Headspace:

ppm

Depth to Bottom of Well (B):

3.182

m below

☒ TOP

One Well Volume:

(B-A)*2.0 = 3.3

Litres - for a 51 mm (2.0 inch) diameter well

Diameter of Standpipe:

mm

(B-A)*1.1 =

Litres - for a 38 mm (1.5 inch) diameter well

Well Condition:

Good

EQUIPMENT LIST

Pump

☐ Waterra☐ Hydrolift☐ Bailer (Type: _____)☒ Peristaltic☐ Submersible☐ Bladder

Multimeter

pH/Temp Meter

Conductivity Meter

Dissolved Oxygen Meter

ORP (Redox) Meter

Organic Vapour Meter

Model:

Ysg Prot☐ Rental Equipment

Model:

Model:

Model:

Model:

Model:

☒ Field Bump

pH4

pH7

pH10

1413 us/cm

Pump Details:

☐ D.O. Ampoule☒ Field CalibrationPD

WELL DEVELOPMENT/PURGING

Purge Volume:

Well Vol. X

3= 9.9

litres

Start:

09:32

Finish:

10:30

Avg. Flow Rate:

L/min.

Sample intake depth:

~2.2m

| Time | Volume Removed (L) | Temp. (°C) | pH (Units) | <input type="checkbox"/> Cond <input checked="" type="checkbox"/> Specific Cond. | Redox (mV) | Diss. O ₂ * (mg/L) | Water Level (m) | Remarks |
|-------|--------------------|------------|------------|--|------------|-------------------------------|-----------------|---------|
| 09:35 | 1 | 16.2 | 7.34 | 555.0 | -23.4 | 0.61 | 1.648 | |
| 09:39 | 2 | 16.1 | 7.18 | 613 | -73.5 | 0.54 | 1.640 | |
| 09:43 | 3 | 16.0 | 7.20 | 643 | -124.3 | 0.51 | 1.635 | |
| 09:47 | 4 | 16.1 | 7.25 | 623 | -141.5 | 0.48 | 1.644 | |
| 09:51 | 5 | 16.0 | 7.25 | 663 | -163.9 | 0.56 | 1.646 | |
| 09:56 | 6 | 16.1 | 7.28 | 667 | -169.5 | 0.61 | 1.648 | |
| 10:01 | 7 | 16.0 | 7.26 | 683 | -151.3 | 0.81 | 1.652 | |
| 10:06 | 8 | 16.0 | 7.23 | 716 | -175.7 | 0.67 | 1.653 | |

* Record DO in Mg/L, not percentage

Comments:

Odour:

☒ Yes☐ No

If yes

PHC-like

Sheen:

☐ Yes☒ No

If yes

☐ Hydrocarbon-like OR ☐ Metallic-like

Turbidity:

Clear

4-5 mg/L

Very Silty

| Analysis | Type | Container Size | | | | | | | Filtered | Preservatives |
|------------------|--|----------------|--------|--------|--------|-----|-----|-----|--|---------------|
| | | 40 mL | 120 mL | 250 mL | 500 mL | 1 L | 2 L | 4 L | | |
| <u>LCM/17001</u> | <input type="checkbox"/> Plastic <input checked="" type="checkbox"/> Glass | | 2x2 | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes <input type="checkbox"/> No | |

SCN No.

06 108-01Consumables: ☐ Waterra Tubing☒ HDPE/Teflon Tubing☐ Groundwater Filter

Field Dup.

06908-02☒ Silicon Tubing☐ D.O. Ampoules☐ Footvalve

GROUNDWATER DEVELOPMENT AND SAMPLING DATA

☐ Development
☐ Purging/Sampling

Well No.: MW17-01

Project Name:

Crystal Pool

Project No.:

1671469/2006

Location:

2275 Quada St

Date:

June 28 2017

Weather:

Sunny

Temperature: ~20°C

Completed By:

KOB

GPS Coordinates:

Reviewed By:

MONITORING WELL INFORMATION

Time of Measurement:

Depth to Product:

m

Product Thickness:

m

Tidally Influenced: ☐ Yes ☐ No

Pressurized: ☐ Yes ☐ No

Depth to Water (A):

m below

☐ TOP

Well Headspace: ppm

Depth to Bottom of Well (B):

m below

☐ TOP

One Well Volume:

(B-A)*2.0 = Litres - for a 51 mm (2.0 inch) diameter well

(B-A)*1.1 = Litres - for a 38 mm (1.5 inch) diameter well

Diameter of Standpipe:

mm

Well Condition:

EQUIPMENT LIST

Pump

☐ Waterra

Multimeter

Model:

☐ Rental Equipment:

☐ Hydrolift

pH/Temp Meter

Model:

☐ Bailer (Type:)

Conductivity Meter

Model:

☐ Field Bump

☐ Peristaltic

Dissolved Oxygen Meter

Model:

☐ pH4

☐ pH7

☐ Submersible

ORP (Redox) Meter

Model:

☐ pH10

☐ Bladder

Organic Vapour Meter

Model:

☐ 1413 us/cm

Pump Details:

☐ D.O. Ampoule

☐ Field Calibration

WELL DEVELOPMENT/PURGING

Purge Volume: Well. Vol. X

= litres

Start:

Finish:

Avg. Flow Rate:

L/min.

Sample intake depth:

| Time | Volume Removed (L) | Temp. (°C) | pH (Units) | <input type="checkbox"/> Cond. <input checked="" type="checkbox"/> Specific Cond. (uS/cm or mS/cm (circle one)) | Redox (mV) | Diss. O ₂ * (mg/L) | Water Level (m) | Remarks |
|-------|--------------------|------------|------------|---|------------|-------------------------------|-----------------|---|
| 10:11 | 9 | 16.0 | 7.22 | 727 | -182.2 | 0.53 | 1.656 | |
| 10:16 | 10 | 16.0 | 7.21 | 748 | -186.6 | 0.51 | 1.657 | |
| 10:21 | 11 | 16.0 | 7.20 | 772 | -191.1 | 0.49 | 1.659 | |
| 10:26 | 12 | 15.9 | 7.13 | 837 | -189.1 | 0.40 | 1.665 | |
| 10:31 | 13 | 16.1 | 7.17 | 814 | -190.5 | 0.51 | 1.668 | |
| 10:36 | 14 | 16.1 | 7.14 | 786 | -175.0 | 0.45 | 1.612 | |
| 14:17 | Stopped | 17.7 | 7.56 | 636 | -87.3 | 0.49 | 1.606 | Purging Will Return in afternoon. Resured @ 14:13 |

* Record DO in Mg/L, not percentage

Comments:

Odour:

☐ Yes

☐ No

If yes

Sheen:

☐ Yes

☐ No

If yes

☐ Hydrocarbon-like OR ☐ Metallic-like

Turbidity:

Clear

|||||

Very Silty

| Analysis | Type | Container Size | | | | | | | Filtered | | Preservatives |
|----------|---|----------------|--------|--------|--------|-----|-----|-----|------------------------------|-----------------------------|---------------|
| | | 40 mL | 120 mL | 250 mL | 500 mL | 1 L | 2 L | 4 L | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| | <input type="checkbox"/> Plastic <input type="checkbox"/> Glass | | | | | | | | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |

SCN No.

Consumables: ☐ Waterra Tubing

☐ HDPE/Teflon Tubing

☐ Groundwater Filter

Field Dup.

☐ Silicon Tubing

☐ D.O. Ampoules

☐ Footvalve

| time | Vol | temp | pH | cond | Redox | DO | WL |
|---------------------------------|-----|------|------|------|--------|------|-------|
| 14:22 | 2 | 17.3 | 7.21 | 727 | -132.6 | 0.47 | 1.612 |
| 14:27 | 3 | 17.4 | 7.12 | 790 | -78.1 | 0.72 | 1.621 |
| 14:33 | 4 | 17.6 | 7.10 | 834 | -134.6 | 0.73 | 1.630 |
| 14:37 | 4.5 | 17.4 | 7.11 | 877 | -141.7 | 0.76 | 1.626 |
| 14:40 | 5 | 17.3 | 7.10 | 868 | -149.6 | 0.69 | 1.630 |
| 14:45 | 6 | 17.5 | 7.12 | 834 | -158.0 | 0.56 | 1.632 |
| 14:49 | 6.5 | 17.3 | 7.13 | 836 | -165.5 | 0.43 | 1.634 |
| 14:53 | 7 | 17.2 | 7.15 | 829 | -170.0 | 0.36 | 1.638 |
| 14:57 | 7.5 | 17.3 | 7.14 | 837 | -172.8 | 0.35 | 1.641 |
| Sampled due to stable parameter | | | | | | | |

TDC = 0.11 m bgs

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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