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## 2016 BASELINE GROUNDWATER MONITORING AND SAMPLING REPORT

Normtek Decontamination  
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Fort St. John, BC

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REPORT



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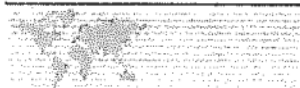
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### 1.0 INTRODUCTION AND OBJECTIVE

Golder Associates Ltd. (Golder) was retained by Normtek Radiation Services (Normtek) to conduct the 2016 Groundwater Monitoring and Sampling Program at the Normtek Decontamination Facility located at 9676 Swanson Street, Fort St. John, BC (the "Site").

The objective of the 2016 Groundwater Monitoring and Sampling Program was to conduct annual monitoring at the Normtek facility as part of the BC Ministry of Environment's (MoE's) approval requirements for this hazardous waste facility<sup>1</sup>.

This report summarizes the activities completed and the results of the 2016 Groundwater Monitoring and Sampling Program.

### 2.0 BACKGROUND

A Baseline Monitoring Program was completed for the Site by Ghostpine Environmental Services Ltd. (Ghostpine) in December 2015<sup>2</sup> (herein referred to as the 2015 Baseline Program report). Details regarding the Site facilities and operations were provided in the 2015 Baseline Program report and are summarized below.

Normtek leases the Site from CnL Resources Ltd. The facility is located on a 1.62 hectare property and facilities at the Site include an office building, change room facilities, a self-contained wash bay, two storage and equipment bays, a 70 m<sup>3</sup> concrete containment pad, and a stormwater containment pond. Normtek uses the facility to provide services related to naturally occurring radioactive materials (NORM) management including detection, decontamination of equipment and final disposal of NORM waste. The facility creates three waste types including non-hazardous wash water, non-hazardous solid waste (garbage/PPE) and NORM waste. Waste processing that is not contained and could cause contamination is handled in the decontamination bay and/or the decontamination pad on Site. The Site location and Site Plan are shown in Figure 1 and Figure 2, respectively.

The Site is located within an area zoned as light industrial.

As part of the 2015 Baseline Program, nine boreholes were drilled at the Site in September 2015, with monitoring wells installed in each borehole. Three of the boreholes (MW15-1 through MW15-3) were drilled to a depth of 45 metres below ground surface (mbgs) and six of the boreholes were drilled to a depth of 4.1 mbgs (MW15-4 through MW15-9).

The subsurface stratigraphy at the Site was generally described by Ghostpine to be fill (sand and gravel) from ground to approximately 1 metres below ground surface (mbgs), followed by silty clay to clay with silt to 27 mbgs, sand, and sand and gravel to 43 mbgs, and silty clay to 44 mbgs. The shallow monitoring wells were installed within the shallow fill unit, while the three deep monitoring wells were installed within the deeper sand or sand and gravel unit, with approximately 30 m of silty clay to clay separating the shallow groundwater from the monitoring wells installed in the deeper sand, and sand and gravel unit.

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<sup>1</sup> A copy of the MoE approval permit was not available to Golder.

<sup>2</sup> "Baseline Groundwater Monitoring for Normtek Hazardous Waste Facility at 9676 Swanson Street, Fort St. John, BC" dated December 2015, prepared by Ghostpine Environmental Services Ltd. for Normtek Radiation Services Ltd. (Ghostpine Project Number: 6096).



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Depth to groundwater in the shallow monitoring wells varied from 2.7 m to 2.9 mbgs, while depth to groundwater in the deep monitoring wells varied from 34.4 m to 42.7 mbgs. The shallow groundwater flow direction in October 2015 was to the east at a horizontal hydraulic gradient of 0.009 m/m, while the deep groundwater flow direction in October 2015 was to south at a horizontal hydraulic gradient of 0.14 m/m.

Groundwater samples were collected by Ghostpine from three of the Site monitoring wells in October 2015 (MW15-2, MW15-3 and MW15-9); however, the remaining six monitoring wells were dry or contained insufficient water volume for sampling in October 2015. Groundwater samples were analyzed for petroleum hydrocarbons<sup>3</sup>, dissolved and total metals<sup>4</sup>, and anions.

Groundwater concentrations in the three monitoring wells met the applicable BC Contaminated Sites Regulation (CSR) freshwater aquatic life (AW) and drinking water standards, with the exception of sulfate and magnesium. Ghostpine concluded that the elevated sulphate is likely representative of natural processes.

For the NORM parameters (lead, uranium and thorium), dissolved lead and uranium were less than the CSR AW and DW standards. There are no CSR water standards for thorium. However, total thorium and uranium groundwater concentrations in the shallow monitoring well (MW15-9) was approximately one order of magnitude greater than the total thorium concentration in the deep monitoring wells (MW15-2 and MW15-3), and which Ghostpine interpreted to potentially indicate the presence of NORMs in shallow groundwater.

Groundwater concentrations of petroleum hydrocarbons were reported to be less than the laboratory reporting limit, with the exception of detectable LEPH<sub>w</sub> (and EPH<sub>C10-19w</sub>), which was interpreted by Ghostpine to be potentially associated with *"pre-existing conditions from historical activities on site, or from industrial activities surrounding sites"*.

Ghostpine recommended that annual monitoring be completed to monitor groundwater quality at the Site, including evaluating trends in NORM indicators.

### 3.0 SCOPE OF WORK

The scope of work for the 2016 Groundwater Monitoring and Sampling Program included the following general tasks:

- **Health and Safety Environment Plan (HaSEP).** Preparing a HaSEP prior to initiating the field work at the Site, which included summary of the work performed on-Site, project Site personnel, and addressed workers' health and safety, and established contingency plans for emergencies that could have occurred during the field work.
- **Groundwater Monitoring, Sampling and Analysis.** The groundwater monitoring and sampling included conducting the following:
  - Measuring depth to groundwater at the nine Site monitoring wells. Based on the groundwater elevations, the horizontal groundwater flow direction and gradient in the shallow and deep groundwater were assessed.

<sup>3</sup> including benzene, toluene, ethylbenzene, xylenes (BTEX); volatile petroleum hydrocarbons (VPH); extractable petroleum hydrocarbons (EPH); light extractable petroleum hydrocarbons (LEPH); heavy extractable petroleum hydrocarbons (HEPH); and, polycyclic aromatic hydrocarbons (PAHs).

<sup>4</sup> including NORM indicators of lead, uranium and thorium.



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- Collecting groundwater samples from the monitoring wells, and submitting the groundwater samples for chemical analyses for the similar parameters as the 2015 Baseline Program, including salinity, inorganics, total and dissolved metals, and petroleum hydrocarbons.
- **Reporting.** Preparing this report summarizing the activities completed and results of the 2016 Groundwater Monitoring and Sampling Program, including comparison of the groundwater analytical results to applicable provincial standards.

### 3.1 Deviations from the Proposed Scope of Work

The field program was conducted by Golder on October 28, 2016, as outlined in our 18 August 2016 proposal entitled "*Proposal to Conduct 2016 Baseline Groundwater Monitoring and Sampling Program, Normtek Decontamination Facility, 9676 Swanson Street, Fort St. John, BC*", with the exception of:

- Our Aug. 19, 2016 proposal indicated that three monitoring wells would be sampled (the three monitoring wells containing sufficient water in October 2015 for sampling). Sufficient water was present in seven of the monitoring wells for sampling in October 2016; therefore, seven monitoring wells were sampled.

## 4.0 METHODS

The following sections describe the methods to complete field tasks that were undertaken by Golder on 28 October 2016.

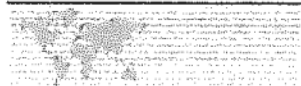
### 4.1 Health, Safety and Environment Plan

Prior to the commencement of field activities, Golder prepared a Site-specific and task-specific HaSEP. The plan included specific health and safety requirements to be implemented during the work and established procedures to be followed by Golder staff in the event of an emergency. The document was reviewed and signed by Golder field staff prior to commencing the work on Site. The field work was completed in accordance with this plan and without incident.

### 4.2 Groundwater Monitoring and Sampling

Prior to water level measurements, concentrations of combustible gas and organic vapour in the well headspace were monitored with a RKI Eagle. The depths to groundwater and free phase product thickness (if any) in the monitoring wells were then measured using an oil-and-water interface probe meter.

Groundwater samples were collected from the seven monitoring well containing sufficient water volume for sampling (MW15-4, MW15-5, MW15-6, MW15-7, MW15-8, and MW15-9). Groundwater samples were collecting either using a bailer or a peristaltic pump, depending on the depth to groundwater and available water volume in the monitoring wells. For deep monitoring wells and small water column, a bailer was used to obtain a sample. For shallow wells, a peristaltic pump was used and water was sampled using low-flow sampling procedure.



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Prior to sampling, groundwater was pumped through a YSI 556 water quality meter fitted within a flow-through-cell for those wells purged using peristaltic pump. The water quality parameters, including temperature, pH, conductivity, dissolved oxygen, and redox potential, were monitored during purging. After adequate stabilization was observed in the water quality parameters, the YSI 556 was disconnected from the sampling train. Groundwater samples were then collected into laboratory supplied containers using either a bailer or peristaltic pump.

The groundwater samples were submitted under chain-of-custody protocol to ALS for chemical analyses of salinity, inorganics (bromide, chloride, fluoride, nitrate [as N], nitrite [as N], and sulphate), total and dissolved metals, and petroleum hydrocarbons (BTEX, VPH, LEPH, HEPH, PAH). Groundwater samples submitted for the analysis of dissolved metals were filtered at the time of collection using dedicated 0.45 µm membrane filter.

For QA/QC purposes, a duplicate groundwater sample (DUP-A) was collected from monitoring well MW15-4 and submitted for analysis.

Prior to the collection of the water samples, any equipment used to collect the samples was washed with laboratory-grade detergent and rinsed with distilled water. Nitrile gloves were worn when handling sampling equipment and samples and were changed between sample locations. Waste materials derived during this 2016 Groundwater Monitoring and Sampling Program (purged groundwater) was stored on-Site, pending the results of the laboratory analysis.

The monitoring well locations are shown in Figure 2. Groundwater sampling sheets are provided in Appendix A, and the laboratory Certificate of Analysis report is provided in Appendix B.

### 4.3 Groundwater Flow Direction

Depth to groundwater was measured by Golder in October 2016, and based on the monitoring well elevation data from Ghostpine in October 2015<sup>5</sup>, the groundwater elevations in the monitoring wells were calculated. Golder used the elevation data to evaluate the inferred groundwater flow direction beneath the Site.

### 4.4 Quality Assurance/Quality Control (QA/QC)

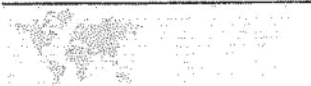
A quality assurance and quality control (QA/QC) program was implemented during the field program so that sampling and analytical data were interpretable, meaningful and reproducible. Standard industry field procedures were used in both the collection (field program) and analysis (laboratory) of the groundwater samples. The following includes a brief summary of the QA/QC measures implemented by Golder during the field program and during review of the data, as well as QA/QC measures implemented by the laboratory.

Quality Control (QC) measures used in the collection, preservation and shipment of samples included the following:

- Sampling methods were consistent with established Golder protocols and provincial/federal requirements.
- Field notes were recorded during the stages of the investigation and are available upon request.

<sup>5</sup> Golder relied on the survey information provided in the 2015 Baseline Groundwater Monitoring report and cannot confirm the accuracy of the survey data.

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- Sample locations were recorded and marked in the field.
- Samples were stored in coolers and chilled with ice or ice packs during transport to the analytical laboratory.
- Samples were transported to the laboratory using ALS Laboratory (ALS) chain of custody procedures. Copies of the Chain-of-Custody forms are provided in Appendix A.

The Quality Assurance (QA) measures established for the field program included:

- Submission of blind field duplicate samples for a minimum of 10 percent of the samples analyzed. A blind field duplicate sample is a second sample of a certain media (e.g., soil, water, vapour) from the same location that is submitted to the analytical lab under a separate label such that the lab has no prior knowledge that it is a duplicate. One duplicate water sample was collected as part of the Quality Assurance and Control program (QA/QC).
- Submission of field and travel blanks with the water samples.
  - A field blank was collected to assess potential contamination introduced in the field during the sampling process and were generated by filling a sample container set with laboratory grade distilled and deionized water (DDI). The samples were filled in the field, exposing them to the sampling environment. Theoretically sample concentrations in field blank samples should be below reportable detection limits.
  - A trip blank was prepared by the laboratory for petroleum hydrocarbon parameters. The samples were transported to and from Site prior to submitting them to laboratory for analyses. Trip blanks are used to determine potential contamination caused during the samples transportation. Similar to the field blanks, in theory, trip blank samples should be below reportable detection limits.
- The relative percent difference (RPD) between field duplicate 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:

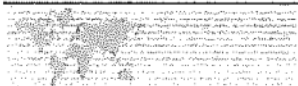
$$\left| \left( \frac{x1 - x2}{\text{average}(x1, x2)} \right) \right| \times 100$$

where x1 is the original sample result and x2 is the blind field duplicate result;

- When the concentration in a sample was less than five times the laboratory reporting limit (LRL), the difference factor (DF) was calculated. The DF is also a measure of the variability between two outcomes from the same procedure or process and is calculated by:

$$\left| \left( \frac{x1 - x2}{LRL} \right) \right|$$

where x1 is the original sample result, x2 is the blind field duplicate result and LRL is the laboratory report.



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In 2009, the BC Ministry of Environment updated the British Columbia Laboratory Manual which contains recommended Data Quality Objectives (DQOs) for laboratories duplicate RPDs (MoE, 2009). It is recognized that these DQOs are intended for laboratory duplicates and do not include provisions for additional variability in field duplicates. However, these DQOs are considered a conservative screen for assessing the quality of field duplicates. The DQOs applied to this investigation are as follows:

- For parameters in groundwater, a RPD of less than 20%.
- For parameters with concentrations less than five times the LRL, the difference factor should be less than two (2).

In general, a RPD greater than these targets may reflect "within sample" variability (which reflects the nature of the contaminant distribution, or variation in the test procedures). Where the DQO was exceeded, further examination was conducted on a case-by-case basis.

The following criteria were considered acceptable for laboratory QA/QC samples:

- Analytical blanks should be below the detection limits used for the specific analysis.
- Laboratory duplicates should fall within the Data Quality Objectives set by the laboratory.
- Analytical results for the reference materials or spiked standards should be within the target specified by the laboratory.

ALS Laboratory Group, Environmental Division (ALS) of Vancouver, BC performed the chemical analysis of the groundwater samples for this investigation. ALS has achieved proficiency certification by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analyses performed. The analytical laboratory also incorporated and reported the results of internal checks to Golder. These were used to assess the reliability, accuracy and reproducibility of the data.

Reports from the lab are internally reviewed prior to submission. If internal QA/QC problems are encountered, the field samples and internal QA/QC samples are re-analysed.

Copies of the laboratory Certificate of Analysis reports are presented in Appendix B.

### 5.0 REGULATORY FRAMEWORK

In British Columbia, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the BC MoE, pursuant to the Environmental Management Act (SBC 2003 CHAPTER 53, assented to 23 October 2003). Exceptions include federal lands and waters with migratory fish; these fall under the jurisdiction of Environment Canada and the Department of Fisheries and Oceans (DFO), respectively. The two key regulations under the Environmental Management Act relating to the assessment and remediation of contaminated sites are the Contaminated Sites Regulation (CSR) standards [includes amendments up to BC Reg. 184/2016, 19 July 2016]; and the Hazardous Waste Regulation ("HWR"; BC Reg. 63/88, O.C. 268/88 including amendments up to BC Reg. 179/2016, July 19, 2016). The CSR is the principal document for the evaluation of the environmental quality of soil, sediment, groundwater and vapour.

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It should be noted that the groundwater standards provided in this report are the CSR standards up to BC Reg. 184/2016, 19 July 2016. BC MoE recently announced the Stage 10 omnibus changes to the CSR (announced 27 October 2016, effective as of 1 November 2017). The scope of work for this assessment did not include comparing current and previously collected analytical data to the Stage 10 omnibus changes.

### 5.1.1 Groundwater Standards

The CSR provides Generic Numerical Water Standards (CSR Schedules 6 and 10) for the assessment of groundwater quality. The groundwater quality standards are divided into four categories that include standards for the protection of aquatic life (AW), standards for the consumption of drinking water by humans (DW) and standards for irrigation and livestock watering use. BC MoE Protocol #21 – *Water Use Determination* (BC MoE 2016) provides guidance on the applicability of water use at a property under assessment or remediation. Irrigation and livestock watering use standards were considered not applicable at the Site based on BC MoE Protocol #21. The rationale for applying AW and DW standards at the Site is provided below.

#### Aquatic Life Standards (AW)

According to Ghostpine, the nearest water body to the Site is the Peace River, located approximately 5 km south of the Site and several intermittent drainages are located within 1.5 km of the Site which discharge into the Peace River. However, there are ditches located on the west and east Site boundaries, which are inferred to discharge into the intermittent drainages. Based on the available information and guidance provided in BC MoE Protocol #21, the CSR Schedule 6 aquatic life (freshwater) standards were considered applicable to groundwater at the Site.

#### Drinking Water Standards (DW)

Based on BC MoE Protocol #21, current and future groundwater use as potential drinking water should be assessed where an aquifer underlies a site<sup>6</sup>.

According to Ghostpine, no water wells are registered on the Site, and five water wells are located within 1.5 km of the Site, with the nearest water well is located approximately 400 m south of the Site. Based on the available information the CSR Schedules 6 and 10 drinking water (DW) standards are considered applicable to groundwater at the Site.

In addition, the CSR Schedule 6 iron and manganese drinking water standards only apply at sites where certain CSR Schedule 2 activities were or are present (as defined in the footnotes of Schedule 6). Based on the former and current land use, the CSR Schedule 6 DW standards for iron and manganese do not apply to the Site.

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<sup>6</sup> Potential lines of evidence required to obtain an exemption from applying drinking water standards at a site include assessing natural background water quality in the area of the Site and evaluating the hydrogeological subsurface conditions (i.e., hydraulic conductivity testing and aquifer yield tests).

## **6.0 RESULTS**

### **6.1 Site Hydrogeology**

The results of the depth to groundwater observed on 28 October 2016 (as well as October 2014) are presented in Table 1.

In October 2016, the depth to groundwater ranged from 0.48 m to 1.33 mbgs in the shallow monitoring wells and from 41.4 m to 42.7 mbgs in the deep monitoring wells. The groundwater elevations ranged from 679.38 m to 680.26 metres above sea level (masl) in the shallow groundwater, and were approximately 638.7 masl in the deep groundwater. MW15-1, a deep monitoring well installed at a depth of approximately 35 mbgs, was dry in October 2016.

The groundwater elevations in the shallow monitoring wells were approximately 1.4 m to 2.4 m higher in October 2016 compared to October 2015, while the groundwater elevations in the deep monitoring wells were similar in October 2015 and 2016.

Figure 3 presents the October 2016 groundwater elevations in the shallow monitoring wells, along with the groundwater equipotentials. The shallow groundwater flow direction in October 2016 was generally to the east-southeast, similar to October 2015. As MW15-1 was dry in October 2016, the deep groundwater flow direction could not be evaluated.

### **6.2 Groundwater Monitoring**

#### **6.2.1 Field Observations**

Field data collected during the groundwater sampling program are provided in Appendix A, and summarized in Table 2.

No sheen, odour and/or free product were noted in the monitoring wells during the purging process and sample collection. Vapour headspace in the monitoring wells were less than instrument detection levels, with the exception of a vapour headspace of 25 ppm at MW15-8. In the three monitoring wells with sufficient water, groundwater field parameters in the shallow monitoring wells were observed to be:

- Temperature ranged from 5.6°C to 8.8°C
- pH ranged from 6.7 to 8.8
- Conductivity ranged from 1,906  $\mu\text{S}/\text{cm}$  to 5690  $\mu\text{S}/\text{cm}$
- Redox potential ranged from -526 mV to -573 mV
- Dissolved oxygen ranged from 1.3 mg/L to 3.2 mg/L

In sufficient water was present to monitor field parameters in the deep monitoring wells.



### 6.2.2 Analytical Results

Seven monitoring wells were sampled by Golder on 28 October 2015. Two monitoring wells (MW15-1 and MW15-3) were either dry or had insufficient water for sampling; therefore, no samples were collected from these monitoring wells. Tabulated groundwater analytical results compared to the applicable CSR AW and DW water standards are provided in Tables 2 and 3. Groundwater analytical results for salinity and inorganics and hydrocarbons are shown in Figure 4, groundwater analytical results for dissolved metals are shown in Figure 5, and groundwater analytical results for petroleum hydrocarbons are shown in Figure 6. The laboratory Certificate of Analysis report from ALS is provided in Appendix B.

#### *Salinity and Inorganics (Table 2)*

The reported groundwater salinity and inorganics concentrations were less than the CSR AW and DW standards, with the exception of the following:

- **Chloride:** At MW15-8, the chloride concentration of 344 mg/L exceeded the CSR DW standard of 250 mg/L but was less than the CSR AW standard of 1,500 mg/L.
- **Sulphate:** Sulphate concentrations ranged from 332 mg/L to 4,550 mg/L. Sulphate concentrations in six of the seven monitoring wells exceeded the CSR DW and AW standards of 500 mg/L and 1,000 mg/L, respectively.

The hardness in the groundwater samples ranged from 1,330 mg/L to 4,680 mg/L.

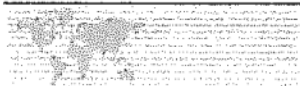
Salinity groundwater concentrations ranged from 1.1 g/L to 3.6 g/L in the seven monitoring wells, less than the CSR AW standard of 15 g/L (no CSR DW standard).

#### *Dissolved Metals (Table 2)*

The reported groundwater dissolved metals concentrations in the samples analyzed were less than the CSR AW and DW, with the exception of the following:

- **Magnesium:** Magnesium concentrations ranged from 121 mg/L to 865 mg/L, exceeding the CSR DW standard of 100 mg/L in the seven monitoring wells sampled. There is no CSR AW standard for magnesium.
- **Selenium:** The selenium concentration of 0.0137 mg/L at MW15-6 exceeded the CSR AW and DW standard of 0.01 mg/L.
- **Sodium:** Sodium concentrations of 340 mg/L and 269 mg/L from MW15-4 and MW15-8, respectively, exceeded the CSR DW standard of 200 mg/L. There is no CSR AW standard for sodium.
- **Uranium:** Uranium concentrations ranged from 0.0198 mg/L to 0.252 mg/L, exceeding the CSR DW standard of 0.02 mg/L in six of the seven monitoring wells.





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### ***Petroleum Hydrocarbons (Table 3)***

Groundwater concentrations of petroleum hydrocarbon (including BTEX, VPH, EPH<sub>C10-19</sub>, EPH<sub>C19-32</sub>, LEPH, HEPH, and PAHs) were less than the laboratory reporting limit in the seven monitoring wells sampled, and therefore, less than the applicable CSR AW and DW standards.

### **6.3 Quality Assurance/Quality Control Review**

Standard Golder field procedures were used throughout the investigation. Chain-of-custody procedures were followed during sampling events. Samples were submitted to the laboratory under Chain-of-Custody protocols using forms that did not identify the expected concentrations, or QA/QC samples, such as field duplicate samples. The samples were stored in coolers prior to submission to the analytical laboratory, and appropriately completed chain-of-custody forms accompanied the submissions. Groundwater samples were received at the laboratory at an acceptable temperature and the analyses completed within the recommended holding times, with the exception of nitrate. For nitrate/nitrite, the analysis was completed within 4 days of sampling collection (recommended holding time for nitrate/nitrite is 3 days). As nitrate/nitrite is not considered to be a parameter associated with the NORM operations, the exceedance of the holding time is not expected to change the interpretation of this assessment.

#### **6.3.1 Field Program**

##### **Paired Analysis**

One duplicate sample pair (MW15-4 and DUP-A) was submitted for inorganics, metals, and hydrocarbons (Tables 4 and 5). The number of groundwater samples submitted for duplicate analysis met Golder's DQO.

The calculated RPDs and metals met Golder's DQOs (Tables 4 and 5).

##### **Field Blank and Travel Blank Analysis**

A field blank and travel blank water samples were submitted for inorganics, metals, and hydrocarbons (Tables 4 and 5), with the results less than the laboratory reporting limits.

#### **6.3.2 Laboratory Program**

The quality of the laboratory data generated was assessed using the appropriate laboratory control samples and laboratory quality duplicate analysis. Quality control samples consisted of analytical method blanks, analysis of reference materials, laboratory replicate samples and laboratory analytical spikes for analysis. The results of the internal laboratory QC testing are provided in the laboratory reports included as Appendix B.

Based on review of the laboratory results, the laboratory control completed for water analysis by ALS showed that Matrix Spike recovery results for the following metal parameters could not be accurately calculated due to high analyte background in the samples:

- Dissolved arsenic, barium, calcium, iron, and manganese and/or sodium; and total aluminum, copper, calcium, iron, and nitrate (as N) in several samples

ALS concluded that the results of the Method Blank, Duplicates, and Matrix Spike results listed above are not believed to negatively impact the data quality for the reported samples.

In general, review of the laboratory QC analyses suggests the laboratory data is accurate and reproducible, and can be relied upon for environmental site investigation purposes.

### 6.3.3 Summary

The results of the field and laboratory QA/QC program indicate that the laboratory data is accurate and reproducible and can be relied upon for environmental site investigation purposes.

## 7.0 DISCUSSION

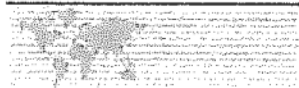
The Site is used by Normtek to provide services related to NORM management including detection, decontamination of equipment and final disposal of NORM waste. We understand that waste processing that is not contained and could cause contamination is handled in the decontamination bay and/or the decontamination pad on Site.

The subsurface stratigraphy at the Site was generally described by Ghostpine to be fill (sand and gravel) from ground to approximately 1 mbgs, followed by silty clay to clay with silt to 27 mbgs, sand, and sand and gravel to 43 mbgs, and silty clay to 44 mbgs. The shallow monitoring wells were installed within the shallow fill unit, while the three deep monitoring wells were installed within the deeper sand or sand and gravel unit, with approximately 30 m of silty clay to clay separating the shallow groundwater from the monitoring wells installed in the deeper sand, and sand and gravel unit.

In October 2016, the groundwater elevations ranged from 679.38 m to 680.26 masl in the shallow groundwater, and were approximately 638.7 masl in the deep sand or sand and gravel unit. The groundwater elevations in the shallow monitoring wells were approximately 1.4 m to 2.4 m higher in October 2016 compared to October 2015, while the groundwater elevations in the deep monitoring wells were similar in October 2015 and 2016. The shallow groundwater flow direction in October 2016 was generally to the east-southeast, similar to October 2015. Based on the groundwater flow direction in shallow groundwater at the Site to be to the east-southeast, MW15-8 is considered to be located hydraulically upgradient of most Site facilities.

In the 2016 Groundwater Monitoring and Sampling Program, seven of the nine Site monitoring wells contained sufficient groundwater for sampling, and groundwater concentrations met the applicable CSR AW and DW standards with the exceptions of:

- Chloride (at MW15-8 only)
- Magnesium (at the seven monitoring wells sampled)
- Selenium (at MW15-6 only)
- Sodium (at MW15-4 and MW15-8 only)
- Sulphate (at six of the seven monitoring wells sampled)
- Uranium (at six of the seven monitoring wells sampled)



## 2016 BASELINE GROUNDWATER MONITORING AND SAMPLING REPORT

For the NORM parameters (lead, uranium), dissolved lead were less than the CSR AW and DW standards and little variation was noted between the dissolved and total lead concentrations in shallow and deep monitoring wells. Dissolved uranium in the six monitoring wells sampled were greater than the CSR DW standard, and the dissolved uranium groundwater concentrations in the shallow monitoring wells were up to one order of magnitude greater than the groundwater concentration in the deep monitoring well. This indicates that shallow groundwater at the Site appears to be either impacted by NORM or naturally occurring geochemical conditions may increase the shallow dissolved uranium groundwater concentrations relative to groundwater quality in the deeper sand unit.

Groundwater concentrations of petroleum hydrocarbon (including BTEX, VPH, EPH<sub>C10-19</sub>, EPH<sub>C19-32</sub>, LEPH, HEPH, and PAHs) were less than the laboratory reporting limit in the seven monitoring wells sampled in October 2016. Hydrocarbons detected in the deep monitoring wells in 2015 were interpreted by Ghostpine to be potentially associated with *"pre-existing conditions from historical activities on site, or from industrial activities surrounding sites"*. Golder notes that drilling muds and fluids may also introduce anthropogenic materials to the subsurface.

Similar to 2015, groundwater concentrations of sulphate and magnesium exceeded the CSR AW and/or DW standards. Higher sulphate concentrations are common in the region based on hard groundwater conditions and native soils high in evaporative derived salts. In addition to elevated magnesium, sulphate and uranium, groundwater concentrations of chloride, selenium and sodium exceeded the CSR AW and/or DW standards in 2016. It is noted that chloride, magnesium, sodium, sulphate, and uranium are elevated at MW15-8, which is inferred to be located hydraulically upgradient of the Site facilities. Therefore, the elevated concentrations of these parameters may be either naturally occurring or migrating from a source located hydraulically upgradient of the Site.

## 8.0 CONCLUSION AND RECOMMENDATIONS

The objective of the 2016 Groundwater Monitoring and Sampling Program was to conduct annual monitoring at the Normtek facility as part of the BC Ministry of Environment's (MoE's) approval requirements for this hazardous waste facility. The 2016 Groundwater Monitoring and Sampling Program was completed by Golder on 28 October 2016 at the Normtek facility in Fort St. John, BC. Based on the results presented in this report, Golder concludes the following items:

- Seven of the nine monitoring wells contained sufficient groundwater for collecting groundwater samples in 2016. The two monitoring wells with insufficient volume of water were MW15-1 and MW15-3, both deep monitoring wells screened within the deep sand/sand and gravel unit.
- The shallow groundwater flow direction in October 2016 was generally to the east-southeast, similar to that reported in 2015.
- In the shallow monitoring wells, groundwater concentrations of the parameters analyzed met the BC MoE CSR AW and DW standards, with the exception of chloride, dissolved magnesium, dissolved selenium, sodium, sulphate, and dissolved uranium.
- In the deep monitoring well, groundwater concentrations of the parameters analyzed met the CSR AW and DW standards, with the exception of dissolved magnesium and sulphate.
- Groundwater concentrations of petroleum hydrocarbon were less than the laboratory reporting limit in the seven monitoring wells sampled in October 2016.

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## 2016 BASELINE GROUNDWATER MONITORING AND SAMPLING REPORT

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### Recommendations

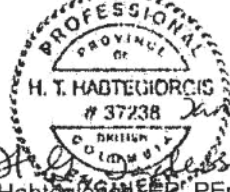
Based on the results conclusions provided above, Golder recommends the following:


- A review of the BC MoE's approval requirements for the facility be conducted to evaluate if the current scope for the annual monitoring program meet's MoE's requirements.
- Continued annual monitoring of groundwater quality at the Site, similar to the scope conducted in 2016. In addition, as additional data is collected, trends of groundwater concentrations of parameters associated with the Site operations should be conducted.
- A desktop review of groundwater quality in the area should be conducted to evaluate if the elevated chloride, magnesium, selenium, sodium, sulphate, and/or uranium in groundwater at the Site is associated with Site operations, naturally occurring conditions, or sources located hydraulically upgradient of the Site. Should it be determined that Site operations have impacted groundwater quality at the Site, then additional monitoring wells may be required to delineate the groundwater contamination.
- If MW15-1 and MW15-3 continue to be dry or contain insufficient for sampling, consideration should be given to replacing these monitoring wells.

### 9.0 CLOSURE

We trust that the foregoing is adequate for your current needs. Please do not hesitate to contact us if you have any questions regarding this report.

#### GOLDER ASSOCIATES LTD.

  
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Jan 11, 2017

  
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HH/DA/syd

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Table 1: Summary of Groundwater Elevations  
2016 Baseline Groundwater Monitoring  
9676 Sawson Street, Fort St. John, BC

Monitoring Well ID	Ground Surface Elevation* (masl)	Top of Casing Elevation* (masl)	Well Depth** (mbtop)	8-Oct-2016^			9-Oct-2016^			28-Oct-16			Change in Water Level (Oct 2015 to Oct 2016) (m)
				Depth to Water		Groundwater Elevation (masl)	Depth to Water		Groundwater Elevation (masl)	Depth to Water		Groundwater Elevation (masl)	
				(mbtop)	(mbgs)			(mbtop)		(mbgs)			(mbtop)
MW15-1***	681.14	682.33	35.90	35.55	34.36	646.78	34.35	33.16	647.98	Dry		<646.53	-
MW15-2	681.36	682.36	45.41	43.65	42.65	638.71	42.40	41.40	639.96	43.664	42.66	638.70	-0.01
MW15-3***	680.09	680.92	43.88	42.22	41.39	638.70	41.39	40.56	639.53	42.228	41.40	638.69	-0.01
MW15-4	679.85	680.78	3.94	3.80	2.87	676.98	2.88	1.95	677.9	1.405	0.48	679.38	2.40
MW15-5	680.16	681.13	3.37	Dry			Dry			1.587	0.62	679.54	-
MW15-6	679.88	680.80	3.95	Dry			Dry			1.307	0.39	679.49	-
MW15-7	681.38	682.40	3.95	3.77	2.75	678.63	2.70	1.68	679.70	2.347	1.33	680.05	1.42
MW15-8	681.14	682.210	3.78	Dry			Dry			1.950	0.88	680.26	-
MW15-9	681.24	681.18	2.96	2.67	2.73	678.51	2.72	2.78	678.46	1.119	1.18	680.06	1.55

## Notes:

\* Ground surface and top of casing elevation information taken from the Ghostpine Environmental Services Ltd. 2015 Baseline Groundwater Monitoring Report.

\*\* Measured well depths based on 2016 measurement.

\*\*\* Not sampled in 2016

^ Dates inferred from Ghostpine 2015 report (Tables C and D).

masl = metres above sea level

mbtop = metres below top of pipe

mbgs = metres below ground surface

Notes:

Results are expressed in milligrams per litre (mg/L), unless otherwise noted.

Standards chosen from the Contaminated Sites Remediation ("CSR") BC Reg. 375/96, O.C. 1480/96 and M271/2004, including amendments up to BC Reg. 184/2016, July 19, 2016).

Standards shown from the Contaminated Sites Regulation ("CSR", BC Reg. 375)  
Land Use abbreviations: AW (Aquatic Life, freshwater) and DW (Drinking Water)

Land Use abbreviations: AW (Agriculture), C (Commercial), I (Industrial), R (Residential), S (Shrubland), T (Timberland), U (Urban).

S = CSR Schedule 10 standard.  
 H = standard in Harfmann state.

H = standard is Hardness dependent  
 nH = standard is nH dependent

pH = standard is pH dependent  
Cl = standard is chloride ion

sal = standard varies with salinity and/or salinity based assumptions

Vx: Standard is valence dependent: VI refers to chromium VI and III refers to chromium III

V = Standard is valence dependent; V  
T = standard varies with temperature

$T$  = standard varies with temperature  
 0.470C = quality assurance / quality

QA/QC = quality assurance / quality control, FUA = field duplicate available, FD = field duplicate  
 non = non-detectable activity unit

psu = practical salinity unit  
 † unless otherwise specified

Salinity is a unitless parameter that is roughly equivalent to grams per litre.

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Yellow font indicates concentration exceeds applicable CSR DW standard

0.040

Boxed font indicates concentration exceeds applicable CSR AW standard

**Table 3: Groundwater Analytical Results - Petroleum Hydrocarbons**  
**2016 Baseline Groundwater Monitoring Program**  
**9676 Swanson Street, Fort St. John, BC**

Location Golder Sample ID Laboratory ID Date Sampled QA/QC	CSR Aquatic Life	Notes	CSR Drinking Water	Notes	MW15-2 MW1S-2 L1850699-3 28-Oct-2016	MW15-4 MW1S-4 L1850699-6 28-Oct-2016 FDA	DUP-A L1850699-7 28-Oct-2016 FD	MW15-5 MW1S-5 L1850699-11 28-Oct-2016	MW15-6 MW1S-6 L1850699-5 28-Oct-2016	MW15-7 MW1S-7 L1850699-4 28-Oct-2016	MW15-8 MW1S-8 L1850699-1 28-Oct-2016	MW15-9 MW1S-9 L1850699-2 28-Oct-2016
<b>Field Parameters</b>												
Headspace Vapours (ppm)					ND	ND		ND	ND	ND	25	ND
<b>Monoaromatic Hydrocarbons</b>												
benzene	4		0.005		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
ethylbenzene	2		0.0024		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
methyl tertiary butyl ether (MTBE)	34		0.015		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
styrene	0.72				<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
toluene	0.39		0.024		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
ortho-xylene					<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
meta- & para-xylene					<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
total xylene			0.3		<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075
VHw <sub>6-10</sub>	1.5 / 15		15		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
VPHw	1.5				<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
<b>Other Hydrocarbons</b>												
EPHw <sub>10-19</sub>	0.5 / 5		5		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
EPHw <sub>19-32</sub>					<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
LEPHw	0.5				<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
HEPHw					<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
<b>Polycyclic Aromatic Hydrocarbons</b>												
acenaphthene	0.06				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
acenaphthylene					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
acridine	0.0005				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
anthracene	0.001				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
benzo(a)anthracene	0.001				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
benzo(a)pyrene	0.0001		0.00001		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
benzo(b)fluoranthene					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
benzo(g,h,i)perylene					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
benzo(k)fluoranthene					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
chrysene	0.001				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
dibenzo(a,h)anthracene					<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
fluoranthene	0.002				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
fluorene	0.12				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
indeno(1,2,3-c,d)pyrene					<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
naphthalene	0.01				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
phenanthrene	0.003				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
pyrene	0.0002				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
quinoline	0.034				<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

**Notes:**

Results are expressed in milligrams per litre (mg/L), unless otherwise noted.

Standards shown from the Contaminated Sites Regulation ("CSR"; BC Reg. 375/96, O.C. 1480/96 and M271/2004, including amendments up to BC Reg. 184/2016, July 19, 2016).

Land Use abbreviations: AW (Aquatic Life); IW (Irrigation); LW (Livestock); and DW (Drinking Water).

S = CSR Schedule 10 standard

EPHw<sub>10-19</sub> = extractable petroleum hydrocarbons, carbon range 10-19; LEPHw = light extractable petroleum hydrocarbonsWhere water use for the protection of aquatic life applies, the standards for EPHw<sub>10-19</sub> is equivalent to LEPHw, when no LEPHw analysis is undertaken.VPHw = volatile petroleum hydrocarbons; VHw<sub>6-10</sub> = volatile hydrocarbons, carbon range 6-10Where water use for the protection of aquatic life applies, the standards for VHw<sub>6-10</sub> equivalent to VPHw, when no VPHw analysis is undertaken.

PAH = polycyclic aromatic hydrocarbon

QA/QC = quality assurance / quality control, FDA = field duplicate available, FD = Field duplicate

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Yellow font indicates concentration exceeds applicable CSR DW standard.

0.0499

Boxed font indicates concentration exceeds applicable CSR AW standard.

Table 4: QA/QC Results - Inorganics and Total and Dissolved Metals  
2016 Baseline Groundwater Monitoring Program  
9676 Swanson Street, Fort St. John, BC

Location Golder Sample ID Laboratory ID Date Sampled QA/QC	MW1S-4						Blanks	
	MW1S-4 L1850699-6 28-Oct-2016 FDA	DUP-A L1850699-7 28-Oct-2016 FD	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	FIELD BLANK L1850699-9 28-Oct-16	TRAVLE BLANK L1850699-10 28-Oct-16
<b>General Parameters</b>								
Hardness (as CaCO <sub>3</sub> ) (mg/L)	4620	4680	0.50	4650	1.3%	NA	<0.50	-
salinity (psu)	3.5	3.6	1.0	3.6	NA	0.10	<1.0	<1.0
<b>Other Inorganics</b>								
bromide	<2.5	<2.5	0.050	NC	-	-	<0.050	<0.050
chloride	71	80	0.50	76	12%	NA	<0.50	<0.50
fluoride	<1.0	<1.0	0.020	NC	-	-	<0.020	<0.020
nitrate (as N)	<0.25	<0.25	0.0050	NC	-	-	<0.0050	<0.0050
nitrite (as N)	<0.050	<0.050	0.0010	NC	-	-	<0.0010	<0.0010
sulphate	4220	4550	0.30	4385	7.5%	NA	<0.30	<0.30
<b>Total Metals</b>								
aluminum	3.40	3.53	0.010	3.47	3.8%	NA	<0.010	<0.010
antimony	0.00093	0.00103	0.00050	0.00098	NA	0.20	<0.00050	<0.00050
arsenic	0.0026	0.0030	0.0010	0.0028	NA	0.40	<0.0010	<0.0010
barium	0.091	0.091	0.020	0.091	NA	0.00	<0.020	<0.020
beryllium	<0.010	<0.010	0.0050	NC	-	-	<0.0050	<0.0050
boron	0.24	0.23	0.10	0.24	NA	0.10	<0.10	<0.10
cadmium	0.000155	0.000183	0.000050	0.000169	NA	0.56	<0.000050	<0.000050
calcium	449	443	0.10	446	1.3%	NA	<0.10	<0.10
chromium	0.00413	0.00435	0.00050	0.00424	5.2%	NA	<0.00050	<0.00050
cobalt	0.00310	0.00334	0.00050	0.00322	7.5%	NA	<0.00050	<0.00050
copper	0.0123	0.0118	0.0010	0.01205	4.1%	NA	<0.0010	<0.0010
iron	4.22	4.36	0.030	4.29	3.3%	NA	<0.030	<0.030
lead	0.0037	0.0037	0.0010	0.0037	NA	0.00	<0.0010	<0.0010
lithium	0.430	0.431	0.050	0.431	0.23%	NA	<0.050	<0.050
magnesium	828	835	0.10	832	0.84%	NA	<0.10	<0.10
manganese	0.486	0.510	0.010	0.498	4.8%	NA	<0.010	<0.010
mercury	<0.00020	<0.00020	0.00020	NC	-	-	<0.00020	<0.00020
molybdenum	0.0037	0.0035	0.0010	0.0036	NA	0.20	<0.0010	<0.0010
nickel	0.0131	0.0129	0.0050	0.0130	NA	0.04	<0.0050	<0.0050
potassium	7.7	7.8	2.0	7.8	NA	0.05	<2.0	<2.0
selenium	<0.0010	<0.0010	0.0010	NC	-	-	<0.0010	<0.0010
silver	0.000192	0.000101	0.000050	0.000147	NA	1.82	<0.000050	<0.000050
sodium	379	379	2.0	379	0.00%	NA	<2.0	<2.0
thallium	<0.00020	<0.00020	0.00020	NC	-	-	<0.00020	<0.00020
titanium	0.079	0.084	0.050	0.082	NA	0.10	<0.050	<0.050
uranium	0.211	0.189	0.00020	0.200	11%	NA	<0.00020	<0.00020
vanadium	<0.060	<0.060	0.030	NC	-	-	<0.030	<0.030
zinc	0.038	0.041	0.0050	0.040	7.6%	NA	<0.0050	<0.0050
<b>Dissolved Metals</b>								
aluminum	<0.010	<0.010	0.010	NC	-	-	<0.010	-
antimony	0.00071	0.00069	0.00050	0.00070	NA	0.04	<0.00050	-
arsenic	0.0013	0.0014	0.0010	0.0014	NA	0.10	<0.0010	-
barium	0.030	0.030	0.020	0.030	NA	0.00	<0.020	-
beryllium	<0.010	<0.010	0.0050	NC	-	-	<0.0050	-
boron	0.20	0.21	0.10	0.21	NA	0.10	<0.10	-
cadmium	0.000090	0.000096	0.000050	0.000093	NA	0.12	<0.000050	-
calcium	444	446	0.10	445	0.45%	NA	<0.10	-
chromium	<0.00050	<0.00050	0.00050	NC	-	-	<0.00050	-
cobalt	0.00082	0.00077	0.00050	0.00080	NA	0.10	<0.00050	-
copper	0.0079	0.0078	0.0010	0.0079	1.3%	NA	<0.0010	-
iron	<0.060	<0.060	0.030	NC	-	-	<0.030	-
lead	<0.0010	<0.0010	0.0010	NC	-	-	<0.0010	-
lithium	0.398	0.403	0.050	0.401	1.2%	NA	<0.050	-
magnesium	854	865	0.10	860	1.3%	NA	<0.10	-
manganese	0.190	0.184	0.010	0.187	3.2%	NA	<0.010	-
mercury	<0.00020	<0.00020	0.00020	NC	-	-	<0.00020	-
molybdenum	0.0033	0.0033	0.0010	0.0033	NA	0.00	<0.0010	-
nickel	0.0086	0.0080	0.0050	0.0083	NA	0.12	<0.0050	-
potassium	5.3	5.2	2.0	5.3	NA	0.05	<2.0	-
selenium	<0.0010	<0.0010	0.0010	NC	-	-	<0.0010	-
silver	<0.000050	<0.000050	0.000050	NC	-	-	<0.000050	-
sodium	337	340	2.0	339	0.89%	NA	<2.0	-
thallium	<0.00020	<0.00020	0.00020	NC	-	-	<0.00020	-
titanium	<0.050	<0.050	0.050	NC	-	-	<0.050	-
uranium	0.178	0.179	0.00020	0.179	0.56%	NA	<0.00020	-
vanadium	<0.060	<0.060	0.030	NC	-	-	<0.030	-
zinc	0.017	0.017	0.0050	0.017	NA	0.00	<0.0050	-

**Notes:**

Results are expressed in milligrams per litre (mg/L), unless otherwise noted.

QA/QC = quality assurance / quality control, FDA = field duplicate available, FD = Field duplicate

Laboratory Reporting Limit (LRL) 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 LRL; Golder's internal QA/QC target is less than 20%.

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

**BOLD** font indicates the parameter analyzed exceeds Golder's data quality objectives.



Table 5: QA/QC Results - Petroleum Hydrocarbons  
2016 Baseline Groundwater Monitoring Program  
9676 Swanson Street, Fort St. John, BC

Location Golder Sample ID Laboratory ID Date Sampled QA/QC	MW1S-4		Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	Blanks	
	MW1S-4 L1850699-6 28-Oct-2016 FDA	DUP-A L1850699-7 28-Oct-2016 FD					FIELD BLANK L1850699-9 28-Oct-16	TRAVLE BLANK L1850699-10 28-Oct-16
<b>Monoaromatic Hydrocarbons</b>								
benzene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
ethylbenzene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
methyl tertiary butyl ether (MTBE)	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
styrene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
toluene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
ortho-xylene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
meta- & para-xylene	<0.00050	<0.00050	0.0005	NC	-	-	<0.00050	<0.00050
total xylene	<0.00075	<0.00075	0.00075	NC	-	-	<0.00075	<0.00075
VHw <sub>6-10</sub>	<0.10	<0.10	0.1	NC	-	-	<0.10	<0.10
VPHw	<0.10	<0.10	0.1	NC	-	-	<0.10	<0.10
<b>Other Hydrocarbons</b>								
EPHw <sub>10-19</sub>	<0.25	<0.25	0.25	NC	-	-	<0.25	<0.25
EPHw <sub>19-32</sub>	<0.25	<0.25	0.25	NC	-	-	<0.25	<0.25
LEPHw	<0.25	<0.25	0.25	NC	-	-	<0.25	<0.25
HEPHw	<0.25	<0.25	0.25	NC	-	-	<0.25	<0.25
<b>Polycyclic Aromatic Hydrocarbons</b>								
acenaphthene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
acenaphthylene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
acridine	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
anthracene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
benzo(a)anthracene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
benzo(a)pyrene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
benzo(b)fluoranthene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
benzo(g,h,i)perylene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
benzo(k)fluoranthene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
chrysene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
dibenzo(a,h)anthracene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
fluoranthene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
fluorene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
indeno(1,2,3-c,d)pyrene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
naphthalene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
phenanthrene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
pyrene	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050
quinoline	<0.000050	<0.000050	0.00005	NC	-	-	<0.000050	<0.000050

**Notes:**

Results are expressed in milligrams per litre (mg/L), unless otherwise noted.

QA/QC = quality assurance / quality control, FDA = field duplicate available, FD = Field duplicate

Laboratory Reporting Limit (LRL) indicates the minimum concentration that could be measured by laboratory instrumentation for a specific sample.

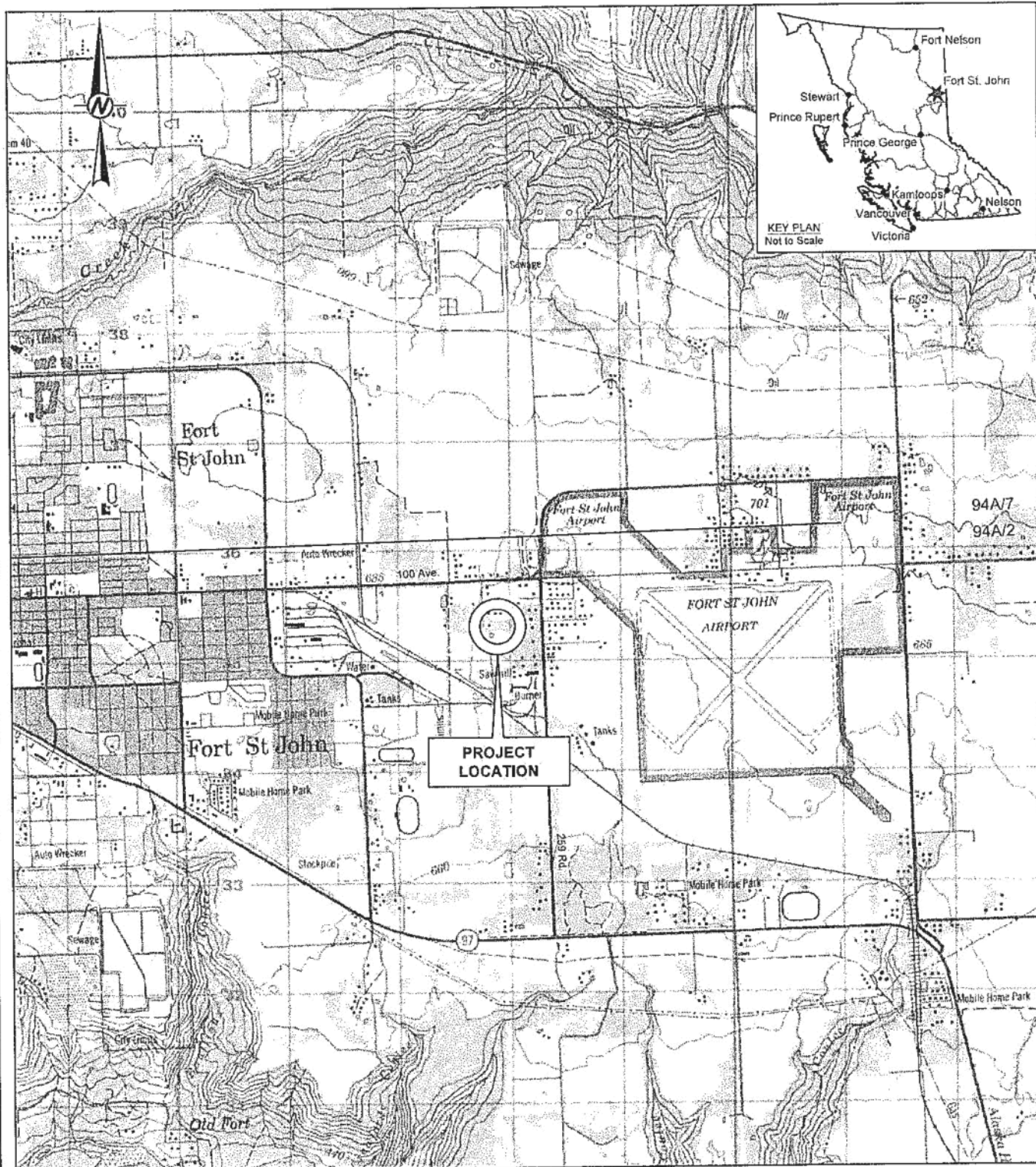
Mean indicates the mean or average value calculated of a field duplicate pair (the FDA and the FD).

Relative Percent Difference (RPD) is calculated when the mean value is greater than five times the LRL; Golder's internal

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

**BOLD** font indicates the parameter analyzed exceeds Golder's data quality objectives.

File Name: 1663385\_1000\_01 - Key Plan.dwg  
 Plot Date: 2017-01-09 10:00:00  
 Plot Path: C:\Users\jgallagher\Documents\1663385\_1000\_01 - Key Plan.dwg



#### REFERENCE

Base Mapping from CanMatrix 1: 250000 NTS - 94A/02, 94A/07  
 Canvec Data Obtained From GeoGratis, Centre For Topographic Information (NRCan, ESS)  
 Department of Natural Resources, Canada, Datum: NAD83, Projection: UTM Zone 10

#### CLIENT

**NORMTEK RADIATION SERVICES LTD.**

#### CONSULTANT



YYYY-MM-DD	2017-01-09
PREPARED	RTJ
DESIGN	HH
REVIEW	DVA
APPROVED	DVA



#### PROJECT

**2016 BASELINE GROUNDWATER MONITORING  
 NORMTEK DECONTAMINATION FACILITY  
 9676 SWANSON STREET, FORT ST. JOHN, BC**

#### TITLE

**SITE LOCATION MAP**

PROJECT No.  
**1663385**

PHASE  
**1000**

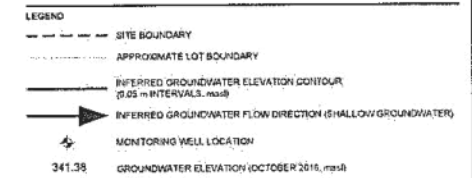
Rev.  
**A**

FIGURE  
**1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

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**NOTES**

1. msl = METRES ABOVE SEA LEVEL
2. WATER ELEVATIONS FOR DEEP MONITORING WELLS MW15-1, MW15-2 AND MW15-3 NOT INCLUDED.

**REFERENCE**


MAP IS BASED ON A PDF CREATED BY GHOSZPINE ENVIRONMENTAL SERVICES  
 REF. NO. 6096-03-000 DATE: NOV. 27, 2015  
 BACKGROUND IMAGE SUPPLIED BY AND SOURCED UNDER LICENSE FROM GOOGLE  
 EARTH PRO CH. DEC 15, 2016 IMAGE DATE: JUNE 26, 2012  
 IMAGE GEOREFERENCED BY GOLDER AND INTENDED FOR INDICATIVE PURPOSES ONLY  
 DATUM: NAD83, PROJECTION: UTM ZONE 19



**CLIENT**  
 NORMTEK RADIATION SERVICES LTD.

**PROJECT**  
 2016 BASELINE GROUNDWATER MONITORING  
 NORMTEK DECONTAMINATION FACILITY  
 9676 SWANSON STREET, FORT ST. JOHN, BC

**TITLE**  
 SHALLOW GROUNDWATER ELEVATIONS AND INFERRED  
 GROUNDWATER FLOW DIRECTION

<b>CONSULTANT</b>		YYYY-MM-DD	2017-01-09
	PREPARED	RTJ	
	DESIGN	HH	
	REVIEW	DVA	
	APPROVED	DVA	

PROJECT NO. 1663385	PHASE 1000	Rev. A	FIGURE 3
------------------------	---------------	-----------	-------------

Location		MW15-1 (dry)	MW15-2	MW15-3 (dry)	MW15-4		MW15-5	MW15-6	MW15-7	MW15-8	MW15-9
Date Sampled		28-Oct-15	28-Oct-16	28-Oct-15	28-Oct-16	28-Oct-16	28-Oct-16	28-Oct-16	28-Oct-16	28-Oct-16	28-Oct-16
QA/QC					FDA	FD					
<b>General Parameters</b>											
salinity (as NaCl)	15 g/L	-	1.5	-	3.5	3.6	2.1	1.9	1.9	3.2	1.1
<b>Other Inorganics</b>											
bromide		-	<1.0	-	<2.5	<2.5	<1.0	<1.0	2.3	<2.5	2.15
chloride	1500	250	<10	-	71	60	132	31	101	344	140
fluoride	2 - 3	1.6	<0.40	-	<1.0	<1.0	0.54	<0.40	0.55	<1.0	0.41
nitrate (as N)	400	10	0.88	-	<0.25	<0.25	<0.10	0.54	<0.10	0.28	0.502
nitrite (as N)	0.2 - 2	3.2	<0.020	-	<0.050	<0.050	<0.020	<0.020	<0.020	<0.050	<0.010
sulphate	1000	500	1460	-	4220	4550	2250	2190	1160	3290	332

LEGEND	
---	SITE BOUNDARY
---	APPROXIMATE LOT BOUNDARY
+	MONITORING WELL LOCATION
●	GROUNDWATER CONCENTRATION EXCEEDS THE APPLICABLE CSR, AW AND/OR DW STANDARDS
○	GROUNDWATER CONCENTRATION MEETS THE APPLICABLE CSR, AW AND DW STANDARDS

ABBREVIATIONS	
AW	AQUATIC LIFE
CSR	CONTAMINATED SITES REGULATION
DW	DRINKING WATER
FD	FIELD DUPLICATE
FDA	FIELD DUPLICATE AVAILABLE
H	STANDARD IS HARDNESS DEPENDENT
QA/QC	QUALITY ASSURANCE-QUALITY CONTROL
T	STANDARD VARIES WITH TEMPERATURE
V	STANDARD IS VALENCE DEPENDENT, VI REFERS TO CHROMIUM VI AND III REFERS TO CHROMIUM III

- NOTES**
- FIGURE SHOULD BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT AND TABLES.
  - CONCENTRATIONS ARE IN mg/L, UNLESS OTHERWISE INDICATED.

**REFERENCE**

MAP IS BASED ON A PDF CREATED BY GHOSHPINE ENVIRONMENTAL SERVICES  
 REF NO. 6296-03-000 DATE: NOV. 27, 2015

BACKGROUND IMAGE SUPPLIED BY AND SOURCED UNDER LICENSE FROM GOOGLE  
 EARTH PRO CH. DEC 15, 2015 IMAGE DATE: JUNE 26, 2012

IMAGE GEOREFERENCED BY GOLDER AND INTENDED FOR INDICATIVE PURPOSES ONLY

LOT BOUNDARIES WERE PROVIDED BY BC LAND TITLE AND SURVEY

DATUM: NAD83, PROJECTION: UTM ZONE 10



**CLIENT**

NORMTEK RADIATION SERVICES LTD.

**PROJECT**

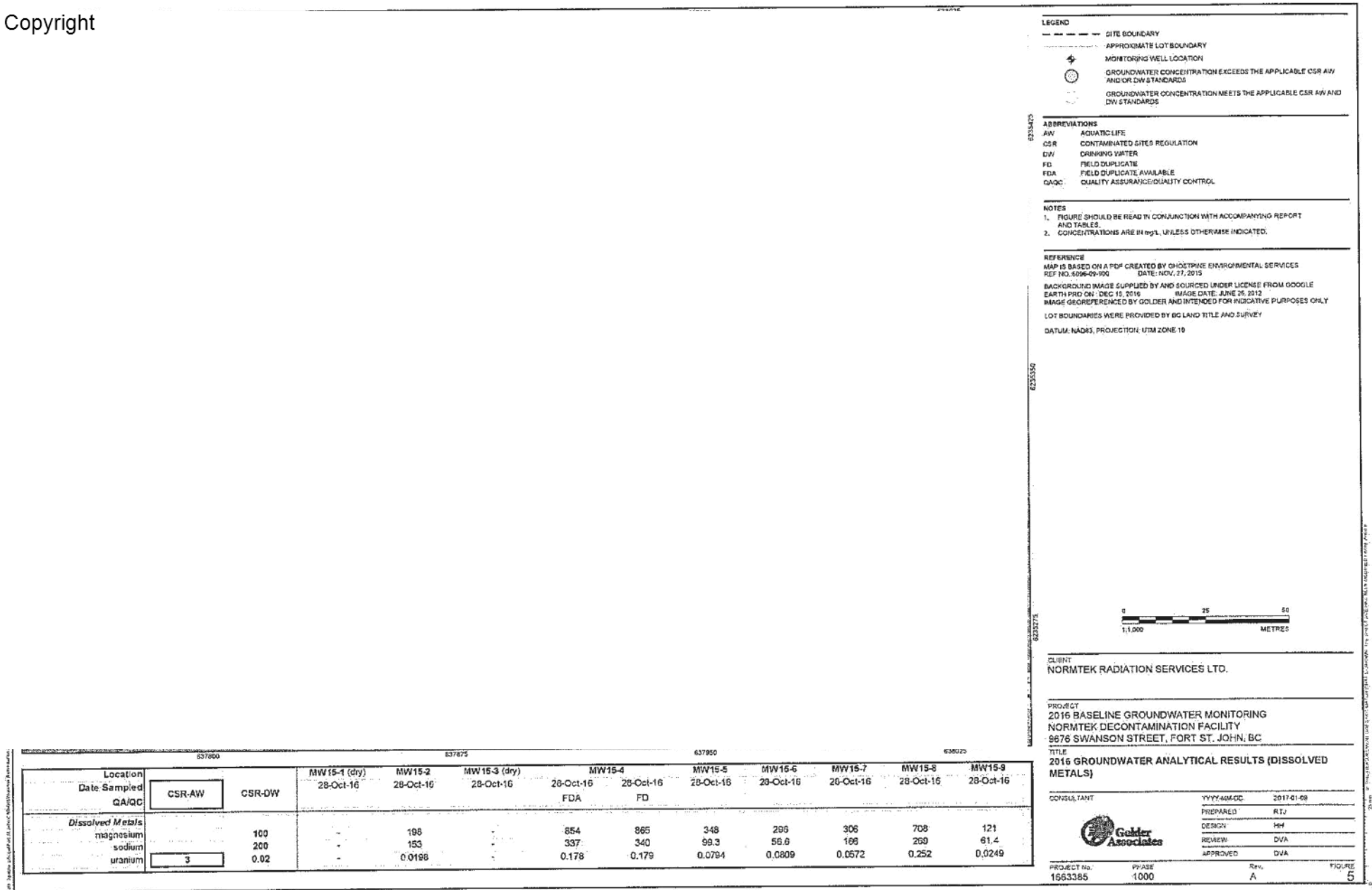
2015 BASELINE GROUNDWATER MONITORING  
 NORMTEK DECONTAMINATION FACILITY  
 9676 SWANSON STREET, FORT ST. JOHN, BC

**TITLE**

2016 GROUNDWATER ANALYTICAL RESULTS (SALINITY AND INORGANICS)

CONSULTANT		YYYY-MM-DD	2017-01-09
PREPARED		RTJ	
DESIGN		HM	
REVIEW		DVA	
APPROVED		DVA	

PROJECT No. 1663365 PHASE 1000 Rev. A FIGURE 4



**LEGEND**

--- SITE BOUNDARY

--- APPROPRIATE LOT BOUNDARY

--- MICHIGANS WELL LOCATION

● GROUNDWATER CONCENTRATION EXCEEDS THE APPLICABLE CSR AW AND DW RANGES

○ GROUNDWATER CONCENTRATION MEETS THE APPLICABLE CSR AW AND DW STANDARDS

**ABBREVIATIONS**

AW AQUATIC LIFE

BTEX BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND STYRENE

CONT CONTAMINATED SITES REGULATION

DW DRINKING WATER

EPH<sub>15-18</sub> EXTRACTABLE PETROLEUM HYDROCARBONS

FD FIELD DUPLICATE

FDA FIELD DUPLICATE AVAILABLE

LEPH<sub>15</sub> LIGHT EXTRACTABLE PETROLEUM HYDROCARBONS

LRL LABORATORY REPORTING UNIT

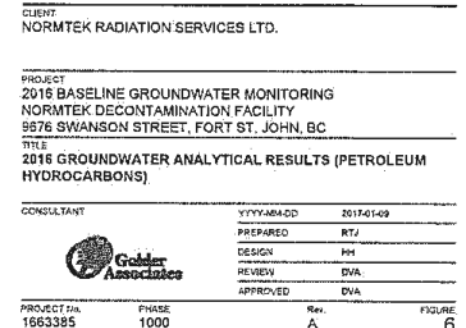
PAH POLYCYCLIC AROMATIC HYDROCARBONS

QA/QC QUALITY ASSURANCE/QUALITY CONTROL

SHC<sub>15</sub> VOLATILE HYDROCARBONS, CARBON RANGE 8-10

VPH<sub>15</sub> VOLATILE PETROLEUM HYDROCARBONS

- REFERENCE  
MAP IS BASED ON A PDF CREATED BY GHOSTTINE ENVIRONMENTAL SERVICES  
REF NO. 6599-09-900 DATE : NOV. 27, 2015  
BACKGROUND IMAGE SUPPLIED BY AND SOURCED UNDER LICENSE FROM GOOGLE  
EARTH PRO ON: DEC 15, 2016 IMAGE DATE: JUNE 25, 2012  
IMAGE GEOREFERENCE BY GOLDBER AND INTENDED FOR INDICATIVE PURPOSES ONLY  
LOT BOUNDARIES WERE PROVIDED BY BC LAND TITLE AND SURVEY  
DATUM: NAD83, PROJECTION: UTM ZONE 10





# APPENDIX A

## Groundwater Monitoring Field Data



# Groundwater Monitoring and Low-Flow Sample Collection

Location: <u>4676 Swanson St, PST, BC</u>	Pump: <input type="checkbox"/> Water <input type="checkbox"/> Peristaltic <input type="checkbox"/> Geo-submersible <input type="checkbox"/> Bladder
Project #: <u>1663385-1000</u>	Pump Description: _____
Date: <u>Oct 28, 2016</u>	Water Quality Meter (YSI) Model/Serial No.: _____
Personnel: <u>S. Rusnak</u>	Monitoring Equipment: _____
Weather: _____	Decontamination Method: _____

Well ID	Sample Collection Time	Groundwater Monitoring Data					Field Parameters								Comments (general appearance of sample, well condition, field duplicates)			
		Depth to water (mbtoc)	Depth to NAPL (mbtoc)	Thickness of NAPL (mm)	Depth to bottom (mbtoc)	Headspace Vapours (ppm)	Time	Purge Rate (L/min)	Cumulative Purge Volume (L)	Temp (°C)	pH	EC (µS/cm or mS/cm)	Turbidity (NTU)	DO (mg/L)		Redox Potential (mV)		
MWIS-8	10:13	1.950	n/d	n/d	3.725	25	9:59			7.0	7.34	5007		1.65	-489.2			
							10:00			7.3	7.27	5132		1.42	-540.2			
							10:07			7.2	7.24	5140		1.44	-515.0			
							10:10			7.0	7.19	5123		1.13	-517.8			
							10:13			6.6	7.10	5113		1.25	-526.0			
							10:20	3.6										
MWIS-1	8:7	35.897	n/d	n/d	35.897	n/d												
MWIS-9	14:16	K	N	K	2.461	n/d	13:53			7.1	7.22	3642		1.15	-579.2	Not still flush mount submerged w/ sev		
							13:58			6.4	6.53	3665		0.78	-618.2			
							14:01			6.3	6.80	2472		1.07	-638.0			
							14:04			6.3	6.76	2602		1.18	-644.5			
							14:07			6.0	6.74	2436		1.26	-630.0			
							14:10			5.9	6.71	2280		1.67	-574.5			
							14:13			5.7	6.71	2006		3.13	-526.8			
							14:16	5.6		6.69	1906		3.17	-537.1				
MWIS-3	11:40	43.664	n/d	4.458	n/d										NOT enough water for geo sub too deep for peristaltic Bailer Used			

ALS Amber Springer 778-370-3259

**Note:** Recommended stabilization criteria: temp  $\pm 0.5^{\circ}\text{C}$ ; pH  $\pm 0.1$  units; EC  $\pm 3\%$ ; DO  $\pm 1$  mg/L; ORP  $\pm 10$  mV; for at least three successive measurements that are made every 3-5 minutes

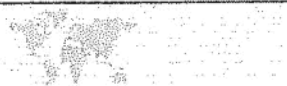
# Groundwater Monitoring and Low-Flow Sample Collection

Location: <u>9676 Swanson St, F&amp;S, BC</u> Project #: <u>1662385-1000</u> Date: <u>01.28.2016</u> Personnel: <u>S. Rusnak</u> Weather: _____							Pump: <input type="checkbox"/> Waterra <input type="checkbox"/> Peristaltic <input type="checkbox"/> Geo-submersible <input type="checkbox"/> Bladder Pump Description: _____ Water Quality Meter (YSI) Model/Serial No.: _____ Monitoring Equipment: _____ Decontamination Method: _____										
Well ID	Sample Collection Time	Groundwater Monitoring Data					Field Parameters							Comments (general appearance of sample, well condition, field duplicates)			
		Depth to water (mbtoc)	Depth to NAPL (mbtoc)	Thickness of NAPL (mm)	Depth to bottom (mbtoc)	Headspace Vapours (ppm)	Time	Purge Rate (L/min)	Cumulative Purge Volume (L)	Temp (°C)	pH	EC (µS/m or mS/cm)	Turbidity (NTU)		DO (mg/L)	Redox Potential (mV)	
MWIS-7	15:28	2347	N/A	N/A	4956 3.540	N/A											
MWIS-6	15:18	1307	N/A	N/A	3949	N/A											
MWIS-4	12:44	1405	N/A	N/A	3943	N/A			8.8	7.24	5690		1.30	-573.1		DUP-A	
MWIS-3	N/S	42.328	N/A	N/A	~43 852 ↓ approx 5 min	N/A	Add Sample										-not enough water for geo-5-6 -too deep for peristaltic

**Note:** Recommended stabilization criteria: temp  $\pm 0.5^{\circ}\text{C}$ ; pH  $\pm 0.1$  units; EC  $\pm 3\%$ ; DO  $\pm 1$  mg/L; ORP  $\pm 10$  mV; for at least three successive measurements that are made every 3-5 minutes

## Groundwater Monitoring and Low-Flow Sample Collection

[illegible]



## APPENDIX B

### Laboratory Certificate of Analysis Report



GOLDER ASSOCIATES LTD.  
ATTN: Tom Horvath  
10628 Peck Lane  
Site 18 Comp 26, SS2 Stn Main  
Fort St. John BC V1J 4M7

Date Received: 28-OCT-16  
Report Date: 08-NOV-16 11:37 (MT)  
Version: FINAL

Client Phone: 250-785-9281

## Certificate of Analysis

Lab Work Order #: L1850699  
Project P.O. #: NOT SUBMITTED  
Job Reference:  
C of C Numbers: 14-473946  
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  
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Environmental

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RIGHT SOLUTIONS RIGHT PARTNER

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1850699-1 GW 28-OCT-16 10:13 MW1S-8	L1850699-2 GW 28-OCT-16 14:16 MW1S-9	L1850699-3 GW 28-OCT-16 11:40 MW1S-2	L1850699-4 GW 28-OCT-16 15:28 MW1S-7	L1850699-5 GW 28-OCT-16 15:18 MW1S-6
Grouping	Analyte					
<b>WATER</b>						
Physical Tests	Hardness (as CaCO3) (mg/L)	4180	1330	1740	2180	2580
	Salinity (psu)	3.2	1.1	1.5	1.9	1.9
Anions and Nutrients	Bromide (Br) (mg/L)	<2.5 <sup>DLDS</sup>	2.16	<1.0 <sup>DLDS</sup>	2.3	<1.0 <sup>DLDS</sup>
	Chloride (Cl) (mg/L)	344	140	<10 <sup>DLDS</sup>	101	31 <sup>DLDS</sup>
	Fluoride (F) (mg/L)	<1.0 <sup>DLDS</sup>	0.41	<0.40 <sup>DLDS</sup>	0.55 <sup>DLDS</sup>	<0.40 <sup>DLDS</sup>
	Nitrate (as N) (mg/L)	0.28 <sup>DLDS</sup>	0.602 <sup>DLDS</sup>	0.88 <sup>DLDS</sup>	<0.10 <sup>DLDS</sup>	0.54 <sup>DLDS</sup>
	Nitrite (as N) (mg/L)	<0.050 <sup>DLDS</sup>	<0.010 <sup>DLDS</sup>	<0.020 <sup>DLDS</sup>	<0.020 <sup>DLDS</sup>	<0.020 <sup>DLDS</sup>
	Sulfate (SO4) (mg/L)	3290	332	1490	1160	2190
Total Metals	Aluminum (Al)-Total (mg/L)	0.130	0.779	3.21	12.7	0.167
	Antimony (Sb)-Total (mg/L)	0.00093	<0.00050	<0.00050	0.00107	<0.00050
	Arsenic (As)-Total (mg/L)	0.0016	0.0033	0.0032	0.0125	<0.0010
	Barium (Ba)-Total (mg/L)	0.029	0.109	0.101	0.354	0.051
	Beryllium (Be)-Total (mg/L)	<0.010 <sup>DLHC</sup>	<0.0050	<0.0050	<0.0050	<0.0050
	Boron (B)-Total (mg/L)	0.38	0.11	0.10	0.14	0.27
	Cadmium (Cd)-Total (mg/L)	0.000071	<0.000050	0.000665	0.000272	0.000073
	Calcium (Ca)-Total (mg/L)	539	278	366	303	540
	Chromium (Cr)-Total (mg/L)	<0.00050	0.00208	0.00735	0.0105	<0.00050
	Cobalt (Co)-Total (mg/L)	0.00062	0.0122	0.00495	0.0499	<0.00050
	Copper (Cu)-Total (mg/L)	0.0116	0.0036	0.0237	0.0182	0.0055
	Iron (Fe)-Total (mg/L)	0.152	9.46	5.43	71.9	0.225
	Lead (Pb)-Total (mg/L)	<0.0010	<0.0010	0.0033	0.0174	<0.0010
	Lithium (Li)-Total (mg/L)	0.404	<0.050	<0.050	0.060	0.289
	Magnesium (Mg)-Total (mg/L)	644	98.6	197	247	290
	Manganese (Mn)-Total (mg/L)	0.034	5.69	0.186	11.7	0.046
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Total (mg/L)	0.0033	0.0021	0.0019	0.0019	0.0015
	Nickel (Ni)-Total (mg/L)	0.0086	0.0153	0.0140	0.0942	<0.0050
	Potassium (K)-Total (mg/L)	4.5	2.1	5.2	4.9	21.2
	Selenium (Se)-Total (mg/L)	0.0012	<0.0010	0.0051	0.0028	0.0125
	Silver (Ag)-Total (mg/L)	<0.000050	0.000104	0.000099	0.000243	0.000222
	Sodium (Na)-Total (mg/L)	282	51.8	141	125	52.4
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020	0.00034	<0.00020
	Titanium (Ti)-Total (mg/L)	<0.050	<0.050	0.064	0.170	<0.050
	Uranium (U)-Total (mg/L)	0.228	0.0214	0.0196	0.0398	0.0835
	Vanadium (V)-Total (mg/L)	<0.060 <sup>DLHC</sup>	<0.030	<0.030	<0.030	<0.030
	Zinc (Zn)-Total (mg/L)	<0.010 <sup>DLHC</sup>	0.760	0.0325	0.0521	0.0074
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L1850699 CONTD....  
 PAGE 3 of 10  
 08-NOV-16 11:37 (MT)  
 Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1850699-6 GW 28-OCT-16 12:44 MW1S-4	L1850699-7 GW 28-OCT-16 12:44 DUP-A	L1850699-9 GW 28-OCT-16 15:45 FIELD BLANK	L1850699-10 GW 28-OCT-16 15:50 TRAVEL BLANK	L1850699-11 MW1S-5
Grouping	Analyte					
<b>WATER</b>						
Physical Tests	Hardness (as CaCO3) (mg/L)	4620	4680	<0.50		2750
	Salinity (psu)	3.5	3.6	<1.0	<1.0	2.1
Anions and Nutrients	Bromide (Br) (mg/L)	<2.5 <sup>DLDS</sup>	<2.5 <sup>DLDS</sup>	<0.050	<0.050	<1.0 <sup>DLDS</sup>
	Chloride (Cl) (mg/L)	71	80	<0.50	<0.50	132
	Fluoride (F) (mg/L)	<1.0 <sup>DLDS</sup>	<1.0 <sup>DLDS</sup>	<0.020	<0.020	0.54
	Nitrate (as N) (mg/L)	<0.25 <sup>DLDS</sup>	<0.25 <sup>DLDS</sup>	<0.0050	<0.0050	<0.10 <sup>DLDS</sup>
	Nitrite (as N) (mg/L)	<0.050 <sup>DLDS</sup>	<0.050 <sup>DLDS</sup>	<0.0010	<0.0010	<0.020 <sup>DLDS</sup>
	Sulfate (SO4) (mg/L)	4220	4550	<0.30	<0.30	2250
Total Metals	Aluminum (Al)-Total (mg/L)	3.40	3.53	<0.010	<0.010	1.90
	Antimony (Sb)-Total (mg/L)	0.00093	0.00103	<0.00050	<0.00050	0.00094
	Arsenic (As)-Total (mg/L)	0.0026	0.0030	<0.0010	<0.0010	0.0013
	Barium (Ba)-Total (mg/L)	0.091	0.091	<0.020	<0.020	0.076
	Beryllium (Be)-Total (mg/L)	<0.010 <sup>DLHC</sup>	<0.010 <sup>DLHC</sup>	<0.0050	<0.0050	<0.0050
	Boron (B)-Total (mg/L)	0.24	0.23	<0.10	<0.10	0.11
	Cadmium (Cd)-Total (mg/L)	0.000155	0.000183	<0.000050	<0.000050	0.000168
	Calcium (Ca)-Total (mg/L)	449	443	<0.10	<0.10	529
	Chromium (Cr)-Total (mg/L)	0.00413	0.00435	<0.00050	<0.00050	0.00200
	Cobalt (Co)-Total (mg/L)	0.00310	0.00334	<0.00050	<0.00050	0.00281
	Copper (Cu)-Total (mg/L)	0.0123	0.0118	<0.0010	<0.0010	0.0074
	Iron (Fe)-Total (mg/L)	4.22	4.36	<0.030	<0.030	2.01
	Lead (Pb)-Total (mg/L)	0.0037	0.0037	<0.0010	<0.0010	0.0021
	Lithium (Li)-Total (mg/L)	0.430	0.431	<0.050	<0.050	0.277
	Magnesium (Mg)-Total (mg/L)	828	835	<0.10	<0.10	331
	Manganese (Mn)-Total (mg/L)	0.486	0.510	<0.010	<0.010	0.640
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Total (mg/L)	0.0037	0.0035	<0.0010	<0.0010	0.0019
	Nickel (Ni)-Total (mg/L)	0.0131	0.0129	<0.0050	<0.0050	0.0058
	Potassium (K)-Total (mg/L)	7.7	7.8	<2.0	<2.0	4.3
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Silver (Ag)-Total (mg/L)	0.000192	0.000101	<0.000050	<0.000050	0.000101
	Sodium (Na)-Total (mg/L)	379	379	<2.0	<2.0	92.1
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Titanium (Ti)-Total (mg/L)	0.079	0.084	<0.050	<0.050	<0.050
	Uranium (U)-Total (mg/L)	0.211	0.189	<0.00020	<0.00020	0.0825
	Vanadium (V)-Total (mg/L)	<0.060 <sup>DLHC</sup>	<0.060 <sup>DLHC</sup>	<0.030	<0.030	<0.030
	Zinc (Zn)-Total (mg/L)	0.038	0.041	<0.0050	<0.0050	0.0265
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		FIELD

\* 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		L1850699-1 GW 28-OCT-16 10:13 MW1S-8	L1850699-2 GW 28-OCT-16 14:16 MW1S-9	L1850699-3 GW 28-OCT-16 11:40 MW1S-2	L1850699-4 GW 28-OCT-16 15:28 MW1S-7	L1850699-5 GW 28-OCT-16 15:18 MW1S-6
Grouping	Analyte					
<b>WATER</b>						
<b>Dissolved Metals</b>	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.010	0.014	<0.010	0.092	<0.010
	Antimony (Sb)-Dissolved (mg/L)	0.00082	<0.00050	<0.00050	0.00084	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.0016	0.0035	<0.0010	0.0065	<0.0010
	Barium (Ba)-Dissolved (mg/L)	0.025	0.114	<0.020	0.107	0.046
	Beryllium (Be)-Dissolved (mg/L)	<0.010 <sup>DLHC</sup>	<0.0050	<0.0050	<0.0050	<0.0050
	Boron (B)-Dissolved (mg/L)	0.38	0.13	<0.10	0.22	0.28
	Cadmium (Cd)-Dissolved (mg/L)	0.000079	<0.000050	0.000364	<0.000050	0.000062
	Calcium (Ca)-Dissolved (mg/L)	507	332	372	370	547
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00302	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00056	0.0135	<0.00050	0.0360	<0.00050
	Copper (Cu)-Dissolved (mg/L)	0.0111	<0.0010	0.0016	0.0026	0.0050
	Iron (Fe)-Dissolved (mg/L)	<0.060 <sup>DLHC</sup>	11.6 <sup>DTC</sup>	<0.030	39.9	<0.030
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Lithium (Li)-Dissolved (mg/L)	0.424	<0.050 <sup>DTC</sup>	<0.050	0.138 <sup>DTC</sup>	0.291
	Magnesium (Mg)-Dissolved (mg/L)	708	121 <sup>DTC</sup>	198	306 <sup>DTC</sup>	296
	Manganese (Mn)-Dissolved (mg/L)	0.022	7.23 <sup>DTC</sup>	0.043	8.28	0.040
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	0.0034	0.0017	0.0012	0.0015	0.0016
	Nickel (Ni)-Dissolved (mg/L)	0.0084	0.0173	<0.0050	0.0699	<0.0050
	Potassium (K)-Dissolved (mg/L)	4.8	2.2	4.8	<2.0	22.1
	Selenium (Se)-Dissolved (mg/L)	0.0012	<0.0010	0.0055	0.0028	0.0137
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	0.000080 <sup>DTC</sup>	<0.000050
	Sodium (Na)-Dissolved (mg/L)	269	61.4	153	166	56.6
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Titanium (Ti)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050 <sup>DTC</sup>	<0.050
	Uranium (U)-Dissolved (mg/L)	0.252	0.0249	0.0198	0.0572 <sup>DTC</sup>	0.0809
	Vanadium (V)-Dissolved (mg/L)	<0.060 <sup>DLHC</sup>	<0.030	<0.030	<0.030	<0.030
	Zinc (Zn)-Dissolved (mg/L)	<0.010 <sup>DLHC</sup>	0.322	<0.0050	0.0117	0.0070
<b>Volatile Organic Compounds</b>	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075

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



# ALS ENVIRONMENTAL ANALYTICAL REPORT

L1850699 CONTD....

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08-NOV-16 11:37 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L1850699-6 GW 28-OCT-16 12:44 MW1S-4	L1850699-7 GW 28-OCT-16 12:44 DUP-A	L1850699-9 GW 28-OCT-16 15:45 FIELD BLANK	L1850699-10 GW 28-OCT-16 15:50 TRAVEL BLANK	L1850699-11  MW1S-5
Grouping	Analyte					
<b>WATER</b>						
<b>Dissolved Metals</b>	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.010	<0.010	<0.010		<0.010
	Antimony (Sb)-Dissolved (mg/L)	0.00071	0.00069	<0.00050		<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.0013	0.0014	<0.0010		<0.0010
	Barium (Ba)-Dissolved (mg/L)	0.030	0.030	<0.020		0.034
	Beryllium (Be)-Dissolved (mg/L)	<0.010 <sup>DLHC</sup>	<0.010 <sup>DLHC</sup>	<0.0050		<0.0050
	Boron (B)-Dissolved (mg/L)	0.20	0.21	<0.10		0.12
	Cadmium (Cd)-Dissolved (mg/L)	0.000090	0.000096	<0.000050		0.000106
	Calcium (Ca)-Dissolved (mg/L)	444	446	<0.10		529
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050		<0.00050
	Cobalt (Co)-Dissolved (mg/L)	0.00082	0.00077	<0.00050		0.00260
	Copper (Cu)-Dissolved (mg/L)	0.0079	0.0078	<0.0010		0.0025
	Iron (Fe)-Dissolved (mg/L)	<0.060 <sup>DLHC</sup>	<0.060 <sup>DLHC</sup>	<0.030		0.132
	Lead (Pb)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		<0.0010
	Lithium (Li)-Dissolved (mg/L)	0.398	0.403	<0.050		0.281
	Magnesium (Mg)-Dissolved (mg/L)	854	865	<0.10		348
	Manganese (Mn)-Dissolved (mg/L)	0.190	0.184	<0.010		0.668
	Mercury (Hg)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		<0.00020
	Molybdenum (Mo)-Dissolved (mg/L)	0.0033	0.0033	<0.0010		0.0016
	Nickel (Ni)-Dissolved (mg/L)	0.0086	0.0080	<0.0050		<0.0050
	Potassium (K)-Dissolved (mg/L)	5.3	5.2	<2.0		3.9
	Selenium (Se)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010		<0.0010
	Silver (Ag)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050		<0.000050
	Sodium (Na)-Dissolved (mg/L)	337	340	<2.0		99.3
	Thallium (Tl)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020		<0.00020
	Titanium (Ti)-Dissolved (mg/L)	<0.050	<0.050	<0.050		<0.050
	Uranium (U)-Dissolved (mg/L)	0.178	0.179	<0.00020		0.0794
	Vanadium (V)-Dissolved (mg/L)	<0.060 <sup>DLHC</sup>	<0.060 <sup>DLHC</sup>	<0.030		<0.030
	Zinc (Zn)-Dissolved (mg/L)	0.017	0.017	<0.0050		0.0112
<b>Volatile Organic Compounds</b>	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	ortho-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	meta- & para-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00075	<0.00075	<0.00075	<0.00075	<0.00075

\* 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		L1850699-1 GW 28-OCT-16 10:13 MW1S-8	L1850699-2 GW 28-OCT-16 14:16 MW1S-9	L1850699-3 GW 28-OCT-16 11:40 MW1S-2	L1850699-4 GW 28-OCT-16 15:28 MW1S-7	L1850699-5 GW 28-OCT-16 15:18 MW1S-6
Grouping	Analyte					
<b>WATER</b>						
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)	92.0	91.6	94.3	92.8	94.4
	Surrogate: 1,4-Difluorobenzene (SS) (%)	100.5	100.5	100.6	100.1	100.6
Hydrocarbons	EPH10-19 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	EPH19-32 (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	LEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	HEPH (mg/L)	<0.25	<0.25	<0.25	<0.25	<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)	93.3	96.7	93.4	99.8	97.0
	Surrogate: 3,4-Dichlorotoluene (SS) (%)	69.7 <sup>SURR-ND</sup>	79.5	65.9 <sup>SURR-ND</sup>	69.9 <sup>SURR-ND</sup>	79.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acenaphthylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acridine (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benz(a)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(a)pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(b)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(g,h,i)perylene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(k)fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Chrysene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Dibenz(a,h)anthracene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluoranthene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluorene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Indeno(1,2,3-c,d)pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Pyrene (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Quinoline (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acridine d9 (%)	96.8	80.9	88.8	91.4	77.6
	Surrogate: Chrysene d12 (%)	80.6	74.6	87.4	78.5	73.9
	Surrogate: Naphthalene d8 (%)	84.3	78.9	73.4	82.4	67.5
	Surrogate: Phenanthrene d10 (%)	97.0	92.9	96.8	95.5	89.5

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L1850699 CONTD....

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08-NOV-16 11:37 (MT)

Version: FINAL

		Sample ID	L1850699-6	L1850699-7	L1850699-9	L1850699-10	L1850699-11
		Description	GW	GW	GW	GW	
		Sampled Date	28-OCT-16	28-OCT-16	28-OCT-16	28-OCT-16	
		Sampled Time	12:44	12:44	15:45	15:50	
		Client ID	MW1S-4	DUP-A	FIELD BLANK	TRAVEL BLANK	MW1S-5
Grouping	Analyte						
<b>WATER</b>							
Volatile Organic Compounds	Surrogate: 4-Bromofluorobenzene (SS) (%)		92.7	91.4	93.7	95.7	94.0
	Surrogate: 1,4-Difluorobenzene (SS) (%)		100.3	100.4	100.1	100.0	100.0
Hydrocarbons	EPH10-19 (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	EPH19-32 (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	LEPH (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	HEPH (mg/L)		<0.25	<0.25	<0.25	<0.25	<0.25
	Volatile Hydrocarbons (VH6-10) (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	VPH (C6-C10) (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)		102.3	99.8	104.0	99.8	96.2
	Surrogate: 3,4-Dichlorotoluene (SS) (%)		72.3	71.4	84.9	81.6	85.5
Polycyclic Aromatic Hydrocarbons	Acenaphthene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acenaphthylene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Acridine (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Anthracene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benz(a)anthracene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(a)pyrene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(b)fluoranthene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(g,h,i)perylene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Benzo(k)fluoranthene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Chrysene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Dibenz(a,h)anthracene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluoranthene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Fluorene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Indeno(1,2,3-c,d)pyrene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Naphthalene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Phenanthrene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Pyrene (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Quinoline (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Surrogate: Acridine d9 (%)		91.8	90.0	89.9	93.6	88.0
	Surrogate: Chrysene d12 (%)		97.9	91.9	94.5	95.4	95.6
	Surrogate: Naphthalene d8 (%)		92.2	88.1	89.1	90.5	82.8
	Surrogate: Phenanthrene d10 (%)		106.2	96.4	103.5	102.7	97.7

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

## Reference Information

## Qualifiers for Individual Samples Listed:

Sample Number	Client Sample ID	Qualifier	Description
L1850699-10	TRAVEL BLANK	WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

## QC Samples with Qualifiers &amp; Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1850699-9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1850699-9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1850699-9
Matrix Spike	Boron (B)-Dissolved	MS-B	L1850699-1, -11, -2, -3, -4, -5, -6, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1850699-9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1850699-9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1850699-1, -11, -2, -3, -4, -5, -6, -7
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1850699-9
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1850699-9
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L1850699-9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1850699-9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1850699-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1850699-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1850699-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1850699-9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1850699-1, -11, -2, -3, -4, -5, -6, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1850699-1, -11, -2, -3, -4, -5, -6, -7
Matrix Spike	Aluminum (Al)-Total	MS-B	L1850699-1, -10, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Copper (Cu)-Total	MS-B	L1850699-11
Matrix Spike	Calcium (Ca)-Total	MS-B	L1850699-1, -10, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Iron (Fe)-Total	MS-B	L1850699-1, -10, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Nitrate (as N)	MS-B	L1850699-1, -10, -2, -3, -4, -5, -6, -7, -9

## Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

## Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level) Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	EPA 300.1 (mod)
CL-IC-N-VA	Water	Chloride in Water by IC Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	EPA 300.1 (mod)
EPH-ME-FID-VA	Water	EPH in Water 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.	BC Lab Manual
F-IC-N-VA	Water	Fluoride in Water by IC Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	EPA 300.1 (mod)
HARDNESS-CALC-VA	Water	Hardness Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.	APHA 2340B

## Reference Information

<b>HG-DIS-CVAFS-VA</b>	Water	Dissolved Hg in Water by CVAFS LOR=50ppt	APHA 3030B/EPA 1631E (mod)
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
<b>HG-TOT-CVAFS-VA</b>	Water	Total Hg in Water by CVAFS LOR=50ppt	EPA 1631E (mod)
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).			
<b>LEPH/HEPH-CALC-VA</b>	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).			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-DIS-ICP-VA</b>	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-TOT-ICP-VA</b>	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
<b>NO2-L-IC-N-VA</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>NO3-L-IC-N-VA</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>PAH-ME-MS-VA</b>	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(i)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
<b>SALINITY-EC-VA</b>	Water	Salinity by calculation using EC	APHA 2520 B
Salinity is determined by the APHA 2520B Electrical Conductivity Method. Salinity is a unitless parameter that is roughly equivalent to grams per Litre. ALS applies the unit of psu (practical salinity unit) to indicate that salinity values are derived from the Practical Salinity Scale			
<b>SO4-IC-N-VA</b>	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>VH-HSFID-VA</b>	Water	VH in Water by Headspace GC/FID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
<b>VH-SURR-FID-VA</b>	Water	VH Surrogates for Waters	BC Env. Lab Manual (VH in Solids)

## Reference Information

<b>VOC7-HSMS-VA</b>	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
<b>VOC7/VOC-SURR-MS-VA</b>	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
<b>VPH-CALC-VA</b>	Water	VPH is VH minus select aromatics	BC MOE LABORATORY MANUAL (2005)
These results are determined according to the British Columbia Ministry of Environment Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water". The concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and, in solids, Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10).			
<b>XYLENES-CALC-VA</b>	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes			
Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

\*\* 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:

14-473946

## 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 wwt - 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: L1850699

Report Date: 08-NOV-16

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Client: GOLDER ASSOCIATES LTD.  
10628 Peck Lane Site 18 Comp 26, SS2 Stn Main  
Fort St. John BC V1J 4M7  
Contact: Tom Horvath

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BR-L-IC-N-VA	Water							
Batch R3585105								
WG2422287-2 LCS								
Bromide (Br)			100.1		%		85-115	30-OCT-16
WG2422287-21 LCS								
Bromide (Br)			101.0		%		85-115	30-OCT-16
WG2422287-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-16 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-19 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
WG2422287-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	30-OCT-16
Batch R3585959								
WG2423374-6 DUP		L1850699-11						
Bromide (Br)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	01-NOV-16
WG2423374-15 LCS								
Bromide (Br)			99.6		%		85-115	01-NOV-16
WG2423374-2 LCS								
Bromide (Br)			99.5		%		85-115	01-NOV-16
WG2423374-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	01-NOV-16
WG2423374-10 MB								
Bromide (Br)			<0.050		mg/L		0.05	01-NOV-16
WG2423374-13 MB								
Bromide (Br)			<0.050		mg/L		0.05	01-NOV-16
WG2423374-4 MB								
Bromide (Br)			<0.050		mg/L		0.05	01-NOV-16
WG2423374-7 MB								
Bromide (Br)			<0.050		mg/L		0.05	01-NOV-16
CL-IC-N-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-VA		Water						
Batch R3585105								
WG2422287-2	LCS							
Chloride (Cl)			101.0		%		90-110	30-OCT-16
WG2422287-21	LCS							
Chloride (Cl)			101.6		%		90-110	30-OCT-16
WG2422287-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-16	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-19	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
WG2422287-7	MB							
Chloride (Cl)			<0.50		mg/L		0.5	30-OCT-16
Batch R3585959								
WG2423374-6	DUP	L1850699-11						
Chloride (Cl)		132	131		mg/L	0.5	20	01-NOV-16
WG2423374-15	LCS							
Chloride (Cl)			100.8		%		90-110	01-NOV-16
WG2423374-2	LCS							
Chloride (Cl)			100.8		%		90-110	01-NOV-16
WG2423374-1	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-16
WG2423374-10	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-16
WG2423374-13	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-16
WG2423374-4	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-16
WG2423374-7	MB							
Chloride (Cl)			<0.50		mg/L		0.5	01-NOV-16
EPH-ME-FID-VA		Water						





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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EPH-ME-FID-VA Water								
Batch	R3586893							
WG2425963-2	LCS							
EPH10-19			92.6		%		70-130	04-NOV-16
EPH19-32			87.4		%		70-130	04-NOV-16
WG2426020-2	LCS							
EPH10-19			93.5		%		70-130	04-NOV-16
EPH19-32			87.1		%		70-130	04-NOV-16
WG2425963-1	MB							
EPH10-19			<0.25		mg/L		0.25	04-NOV-16
EPH19-32			<0.25		mg/L		0.25	04-NOV-16
Surrogate: 2-Bromobenzotrifluoride			92.2		%		60-140	04-NOV-16
WG2426020-1	MB							
EPH10-19			<0.25		mg/L		0.25	04-NOV-16
EPH19-32			<0.25		mg/L		0.25	04-NOV-16
Surrogate: 2-Bromobenzotrifluoride			93.8		%		60-140	04-NOV-16
F-IC-N-VA Water								
Batch	R3585105							
WG2422287-2	LCS							
Fluoride (F)			98.4		%		90-110	30-OCT-16
WG2422287-21	LCS							
Fluoride (F)			99.8		%		90-110	30-OCT-16
WG2422287-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-10	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-16	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-19	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-4	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
WG2422287-7	MB							
Fluoride (F)			<0.020		mg/L		0.02	30-OCT-16
Batch	R3585959							
WG2423374-6	DUP	L1850699-11						
Fluoride (F)		0.54	0.55		mg/L	3.0	20	01-NOV-16
WG2423374-15	LCS							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>F-IC-N-VA</b>								
Water								
Batch	R3585959							
WG2423374-15	LCS							
Fluoride (F)			99.1		%		90-110	01-NOV-16
WG2423374-2	LCS							
Fluoride (F)			98.1		%		90-110	01-NOV-16
WG2423374-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-NOV-16
WG2423374-10	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-NOV-16
WG2423374-13	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-NOV-16
WG2423374-4	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-NOV-16
WG2423374-7	MB							
Fluoride (F)			<0.020		mg/L		0.02	01-NOV-16
<b>HG-DIS-CVAFS-VA</b>								
Water								
Batch	R3584251							
WG2422353-9	DUP	L1850699-7						
Mercury (Hg)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	31-OCT-16
WG2422353-2	LCS							
Mercury (Hg)-Dissolved			95.9		%		80-120	31-OCT-16
WG2422353-1	MB	NP						
Mercury (Hg)-Dissolved			<0.000050		mg/L		0.00005	31-OCT-16
<b>HG-TOT-CVAFS-VA</b>								
Water								
Batch	R3583554							
WG2422544-2	LCS							
Mercury (Hg)-Total			95.4		%		80-120	30-OCT-16
WG2422544-1	MB							
Mercury (Hg)-Total			<0.000050		mg/L		0.00005	30-OCT-16
Batch	R3584993							
WG2423574-2	LCS							
Mercury (Hg)-Total			101.9		%		80-120	01-NOV-16
WG2423574-1	MB							
Mercury (Hg)-Total			<0.000050		mg/L		0.00005	01-NOV-16
WG2423574-4	MS	L1850699-10						
Mercury (Hg)-Total			105.1		%		70-130	01-NOV-16
<b>MET-D-CCMS-VA</b>								
Water								



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water								
Batch R3584764								
WG2422377-2 LCS								
Aluminum (Al)-Dissolved			102.9		%		80-120	31-OCT-16
Antimony (Sb)-Dissolved			103.3		%		80-120	31-OCT-16
Arsenic (As)-Dissolved			105.6		%		80-120	31-OCT-16
Cadmium (Cd)-Dissolved			104.4		%		80-120	31-OCT-16
Chromium (Cr)-Dissolved			104.8		%		80-120	31-OCT-16
Cobalt (Co)-Dissolved			102.6		%		80-120	31-OCT-16
Copper (Cu)-Dissolved			101.1		%		80-120	31-OCT-16
Lead (Pb)-Dissolved			103.1		%		80-120	31-OCT-16
Molybdenum (Mo)-Dissolved			106.1		%		80-120	31-OCT-16
Nickel (Ni)-Dissolved			101.3		%		80-120	31-OCT-16
Selenium (Se)-Dissolved			102.9		%		80-120	31-OCT-16
Silver (Ag)-Dissolved			105.0		%		80-120	31-OCT-16
Thallium (Tl)-Dissolved			102.6		%		80-120	31-OCT-16
Uranium (U)-Dissolved			103.9		%		80-120	31-OCT-16
WG2422377-1 MB NP								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	31-OCT-16
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	31-OCT-16
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	31-OCT-16
Cadmium (Cd)-Dissolved			<0.000005		mg/L		0.000005	31-OCT-16
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	31-OCT-16
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	31-OCT-16
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	31-OCT-16
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	31-OCT-16
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	31-OCT-16
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	31-OCT-16
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	31-OCT-16
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	31-OCT-16
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	31-OCT-16
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	31-OCT-16
Batch R3586339								
WG2423291-2 LCS								
Aluminum (Al)-Dissolved			105.8		%		80-120	01-NOV-16
Antimony (Sb)-Dissolved			93.8		%		80-120	01-NOV-16
Arsenic (As)-Dissolved			97.0		%		80-120	01-NOV-16
Cadmium (Cd)-Dissolved			80.8		%		80-120	01-NOV-16



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA Water								
Batch R3586339								
WG2423291-2 LCS								
Chromium (Cr)-Dissolved			91.1		%		80-120	01-NOV-16
Cobalt (Co)-Dissolved			92.4		%		80-120	01-NOV-16
Copper (Cu)-Dissolved			92.6		%		80-120	01-NOV-16
Lead (Pb)-Dissolved			98.6		%		80-120	01-NOV-16
Molybdenum (Mo)-Dissolved			101.5		%		80-120	01-NOV-16
Nickel (Ni)-Dissolved			94.6		%		80-120	01-NOV-16
Selenium (Se)-Dissolved			98.3		%		80-120	01-NOV-16
Silver (Ag)-Dissolved			98.2		%		80-120	01-NOV-16
Thallium (Tl)-Dissolved			100.0		%		80-120	01-NOV-16
Uranium (U)-Dissolved			99.4		%		80-120	01-NOV-16
WG2423291-1 MB NP								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	01-NOV-16
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	01-NOV-16
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	01-NOV-16
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	01-NOV-16
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	01-NOV-16
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	01-NOV-16
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	01-NOV-16
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	01-NOV-16
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	01-NOV-16
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	01-NOV-16
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	01-NOV-16
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	01-NOV-16
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	01-NOV-16
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	01-NOV-16
Batch R3588747								
WG2423291-7 DUP L1850699-6								
Aluminum (Al)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	05-NOV-16
Antimony (Sb)-Dissolved		0.00071	0.00069		mg/L	1.6	20	05-NOV-16
Arsenic (As)-Dissolved		0.0013	0.0012		mg/L	2.6	20	05-NOV-16
Cadmium (Cd)-Dissolved		0.000090	0.000071	J	mg/L	0.000019	0.0001	05-NOV-16
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-NOV-16
Cobalt (Co)-Dissolved		0.00082	0.00082		mg/L	0.7	20	05-NOV-16
Copper (Cu)-Dissolved		0.0079	0.0074		mg/L	6.4	20	05-NOV-16



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA Water</b>								
Batch	R3588747							
WG2423291-7 DUP		L1850699-6						
Lead (Pb)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-NOV-16
Molybdenum (Mo)-Dissolved		0.0033	0.0034		mg/L	2.9	20	05-NOV-16
Nickel (Ni)-Dissolved		0.0086	0.0080		mg/L	7.6	20	05-NOV-16
Selenium (Se)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-NOV-16
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	05-NOV-16
Thallium (Tl)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	05-NOV-16
Uranium (U)-Dissolved		0.178	0.179		mg/L	0.2	20	05-NOV-16
<b>MET-DIS-ICP-VA Water</b>								
Batch	R3584291							
WG2422377-2 LCS								
Barium (Ba)-Dissolved			97.8		%		80-120	31-OCT-16
Beryllium (Be)-Dissolved			97.8		%		80-120	31-OCT-16
Boron (B)-Dissolved			95.3		%		80-120	31-OCT-16
Calcium (Ca)-Dissolved			99.99		%		80-120	31-OCT-16
Iron (Fe)-Dissolved			97.8		%		80-120	31-OCT-16
Lithium (Li)-Dissolved			99.99		%		80-120	31-OCT-16
Magnesium (Mg)-Dissolved			98.1		%		80-120	31-OCT-16
Manganese (Mn)-Dissolved			99.9		%		80-120	31-OCT-16
Potassium (K)-Dissolved			98.8		%		80-120	31-OCT-16
Sodium (Na)-Dissolved			98.6		%		80-120	31-OCT-16
Titanium (Ti)-Dissolved			98.7		%		80-120	31-OCT-16
Vanadium (V)-Dissolved			97.3		%		80-120	31-OCT-16
Zinc (Zn)-Dissolved			98.7		%		80-120	31-OCT-16
WG2422377-1 MB		NP						
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	31-OCT-16
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	31-OCT-16
Boron (B)-Dissolved			<0.10		mg/L		0.1	31-OCT-16
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	31-OCT-16
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	31-OCT-16
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	31-OCT-16
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	31-OCT-16
Manganese (Mn)-Dissolved			<0.0050		mg/L		0.005	31-OCT-16
Potassium (K)-Dissolved			<2.0		mg/L		2	31-OCT-16
Sodium (Na)-Dissolved			<2.0		mg/L		2	31-OCT-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA Water								
Batch	R3584291							
WG2422377-1 MB		NP						
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	31-OCT-16
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	31-OCT-16
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	31-OCT-16
Batch	R3585114							
WG2423291-2 LCS								
Barium (Ba)-Dissolved			94.6		%		80-120	01-NOV-16
Beryllium (Be)-Dissolved			95.8		%		80-120	01-NOV-16
Boron (B)-Dissolved			97.5		%		80-120	01-NOV-16
Calcium (Ca)-Dissolved			101.7		%		80-120	01-NOV-16
Iron (Fe)-Dissolved			97.7		%		80-120	01-NOV-16
Lithium (Li)-Dissolved			94.9		%		80-120	01-NOV-16
Magnesium (Mg)-Dissolved			100.3		%		80-120	01-NOV-16
Manganese (Mn)-Dissolved			97.0		%		80-120	01-NOV-16
Potassium (K)-Dissolved			101.7		%		80-120	01-NOV-16
Sodium (Na)-Dissolved			101.7		%		80-120	01-NOV-16
Titanium (Ti)-Dissolved			102.2		%		80-120	01-NOV-16
Vanadium (V)-Dissolved			97.7		%		80-120	01-NOV-16
Zinc (Zn)-Dissolved			95.8		%		80-120	01-NOV-16
WG2423291-1 MB		NP						
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	01-NOV-16
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	01-NOV-16
Boron (B)-Dissolved			<0.10		mg/L		0.1	01-NOV-16
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	01-NOV-16
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	01-NOV-16
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	01-NOV-16
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	01-NOV-16
Manganese (Mn)-Dissolved			<0.0050		mg/L		0.005	01-NOV-16
Potassium (K)-Dissolved			<2.0		mg/L		2	01-NOV-16
Sodium (Na)-Dissolved			<2.0		mg/L		2	01-NOV-16
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	01-NOV-16
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	01-NOV-16
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	01-NOV-16



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<b>MET-DIS-ICP-VA</b>								
Batch R3587182								
WG2423291-7 DUP L1850699-6								
Barium (Ba)-Dissolved		0.030	0.030		mg/L	0.0	20	02-NOV-16
Beryllium (Be)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	02-NOV-16
Boron (B)-Dissolved		0.20	0.21		mg/L	4.4	20	02-NOV-16
Calcium (Ca)-Dissolved		444	442		mg/L	0.5	20	02-NOV-16
Iron (Fe)-Dissolved		<0.060	<0.060	RPD-NA	mg/L	N/A	20	02-NOV-16
Lithium (Li)-Dissolved		0.398	0.403		mg/L	1.2	20	02-NOV-16
Magnesium (Mg)-Dissolved		854	858		mg/L	0.5	20	02-NOV-16
Manganese (Mn)-Dissolved		0.190	0.191		mg/L	0.4	20	02-NOV-16
Potassium (K)-Dissolved		5.3	5.3		mg/L	1.0	20	02-NOV-16
Sodium (Na)-Dissolved		337	340		mg/L	1.1	20	02-NOV-16
Titanium (Ti)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	02-NOV-16
Vanadium (V)-Dissolved		<0.060	<0.060	RPD-NA	mg/L	N/A	20	02-NOV-16
Zinc (Zn)-Dissolved		0.017	0.017		mg/L	4.9	20	02-NOV-16
<b>MET-T-CCMS-VA</b>								
Batch R3586398								
WG2424154-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	02-NOV-16
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	02-NOV-16
Arsenic (As)-Total			<0.00010		mg/L		0.0001	02-NOV-16
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	02-NOV-16
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	02-NOV-16
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	02-NOV-16
Copper (Cu)-Total			<0.00050		mg/L		0.0005	02-NOV-16
Lead (Pb)-Total			<0.000050		mg/L		0.00005	02-NOV-16
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	02-NOV-16
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	02-NOV-16
Selenium (Se)-Total			<0.000050		mg/L		0.00005	02-NOV-16
Silver (Ag)-Total			<0.000010		mg/L		0.00001	02-NOV-16
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	02-NOV-16
Uranium (U)-Total			<0.000010		mg/L		0.00001	02-NOV-16
Batch R3586444								
WG2423435-2 LCS								
Aluminum (Al)-Total			104.2		%		80-120	01-NOV-16
Antimony (Sb)-Total			105.2		%		80-120	01-NOV-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA		Water						
Batch R3586444								
WG2423435-2 LCS								
Arsenic (As)-Total			102.7		%		80-120	01-NOV-16
Cadmium (Cd)-Total			93.3		%		80-120	01-NOV-16
Chromium (Cr)-Total			104.0		%		80-120	01-NOV-16
Cobalt (Co)-Total			102.4		%		80-120	01-NOV-16
Copper (Cu)-Total			101.1		%		80-120	01-NOV-16
Lead (Pb)-Total			102.9		%		80-120	01-NOV-16
Molybdenum (Mo)-Total			108.9		%		80-120	01-NOV-16
Nickel (Ni)-Total			100.4		%		80-120	01-NOV-16
Selenium (Se)-Total			100.1		%		80-120	01-NOV-16
Silver (Ag)-Total			103.4		%		80-120	01-NOV-16
Thallium (Tl)-Total			104.7		%		80-120	01-NOV-16
Uranium (U)-Total			103.4		%		80-120	01-NOV-16
WG2423435-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	01-NOV-16
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	01-NOV-16
Arsenic (As)-Total			<0.00010		mg/L		0.0001	01-NOV-16
Cadmium (Cd)-Total			<0.000005C		mg/L		0.000005	01-NOV-16
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	01-NOV-16
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	01-NOV-16
Copper (Cu)-Total			<0.00050		mg/L		0.0005	01-NOV-16
Lead (Pb)-Total			<0.000050		mg/L		0.00005	01-NOV-16
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	01-NOV-16
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	01-NOV-16
Selenium (Se)-Total			<0.000050		mg/L		0.00005	01-NOV-16
Silver (Ag)-Total			<0.000010		mg/L		0.00001	01-NOV-16
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	01-NOV-16
Uranium (U)-Total			<0.000010		mg/L		0.00001	01-NOV-16
Batch R3588747								
WG2423435-3 DUP		L1850699-1						
Aluminum (Al)-Total		0.130	0.128		mg/L	2.0	20	04-NOV-16
Antimony (Sb)-Total		0.00093	0.00093		mg/L	0.1	20	05-NOV-16
Arsenic (As)-Total		0.0016	0.0017		mg/L	9.3	20	05-NOV-16
Cadmium (Cd)-Total		0.000071	0.000074		mg/L	4.9	20	05-NOV-16
Chromium (Cr)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	05-NOV-16





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MET-T-CCMS-VA Water								
Batch	R3588747							
WG2423435-3	DUP	L1850699-1						
Cobalt (Co)-Total		0.00062	0.00062		mg/L	1.1	20	05-NOV-16
Copper (Cu)-Total		0.0116	0.0113		mg/L	2.2	20	05-NOV-16
Lead (Pb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	05-NOV-16
Molybdenum (Mo)-Total		0.0033	0.0033		mg/L	1.9	20	05-NOV-16
Nickel (Ni)-Total		0.0086	0.0087		mg/L	1.2	20	05-NOV-16
Selenium (Se)-Total		0.0012	0.0010		mg/L	13	20	05-NOV-16
Silver (Ag)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	05-NOV-16
Thallium (Tl)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	05-NOV-16
Uranium (U)-Total		0.228	0.225		mg/L	1.1	20	05-NOV-16
MET-TOT-ICP-VA Water								
Batch	R3585247							
WG2423435-2	LCS							
Barium (Ba)-Total			99.5		%		80-120	01-NOV-16
Beryllium (Be)-Total			98.1		%		80-120	01-NOV-16
Boron (B)-Total			94.5		%		80-120	01-NOV-16
Calcium (Ca)-Total			98.5		%		80-120	01-NOV-16
Iron (Fe)-Total			97.9		%		80-120	01-NOV-16
Lithium (Li)-Total			102.5		%		80-120	01-NOV-16
Magnesium (Mg)-Total			99.9		%		80-120	01-NOV-16
Manganese (Mn)-Total			99.1		%		80-120	01-NOV-16
Potassium (K)-Total			99.4		%		80-120	01-NOV-16
Sodium (Na)-Total			97.2		%		80-120	01-NOV-16
Titanium (Ti)-Total			99.3		%		80-120	01-NOV-16
Vanadium (V)-Total			98.6		%		80-120	01-NOV-16
Zinc (Zn)-Total			96.6		%		80-120	01-NOV-16
WG2423435-1	MB							
Barium (Ba)-Total			<0.010		mg/L		0.01	01-NOV-16
Beryllium (Be)-Total			<0.0050		mg/L		0.005	01-NOV-16
Boron (B)-Total			<0.10		mg/L		0.1	01-NOV-16
Calcium (Ca)-Total			<0.050		mg/L		0.05	01-NOV-16
Iron (Fe)-Total			<0.030		mg/L		0.03	01-NOV-16
Lithium (Li)-Total			<0.010		mg/L		0.01	01-NOV-16
Magnesium (Mg)-Total			<0.10		mg/L		0.1	01-NOV-16
Manganese (Mn)-Total			<0.0050		mg/L		0.005	01-NOV-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-TOT-ICP-VA Water								
Batch R3585247								
WG2423435-1 MB								
Potassium (K)-Total			<2.0		mg/L		2	01-NOV-16
Sodium (Na)-Total			<2.0		mg/L		2	01-NOV-16
Titanium (Ti)-Total			<0.010		mg/L		0.01	01-NOV-16
Vanadium (V)-Total			<0.030		mg/L		0.03	01-NOV-16
Zinc (Zn)-Total			<0.0050		mg/L		0.005	01-NOV-16
Batch R3586269								
WG2423435-3 DUP L1850699-1								
Barium (Ba)-Total		0.029	0.029		mg/L	0.6	20	02-NOV-16
Beryllium (Be)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	02-NOV-16
Boron (B)-Total		0.38	0.39		mg/L	2.1	20	02-NOV-16
Calcium (Ca)-Total		539	535		mg/L	0.8	20	02-NOV-16
Iron (Fe)-Total		0.152	0.160		mg/L	5.2	20	02-NOV-16
Lithium (Li)-Total		0.404	0.403		mg/L	0.2	20	02-NOV-16
Magnesium (Mg)-Total		644	638		mg/L	1.0	20	02-NOV-16
Manganese (Mn)-Total		0.034	0.034		mg/L	0.0	20	02-NOV-16
Potassium (K)-Total		4.5	4.5		mg/L	0.4	20	02-NOV-16
Sodium (Na)-Total		282	279		mg/L	0.9	20	02-NOV-16
Titanium (Ti)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	02-NOV-16
Vanadium (V)-Total		<0.060	<0.060	RPD-NA	mg/L	N/A	20	02-NOV-16
Zinc (Zn)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	02-NOV-16
WG2424154-2 LCS								
Barium (Ba)-Total			95.8		%		80-120	02-NOV-16
Beryllium (Be)-Total			94.9		%		80-120	02-NOV-16
Boron (B)-Total			98.0		%		80-120	02-NOV-16
Calcium (Ca)-Total			96.8		%		80-120	02-NOV-16
Iron (Fe)-Total			95.1		%		80-120	02-NOV-16
Lithium (Li)-Total			99.0		%		80-120	02-NOV-16
Magnesium (Mg)-Total			98.9		%		80-120	02-NOV-16
Manganese (Mn)-Total			95.2		%		80-120	02-NOV-16
Potassium (K)-Total			100.2		%		80-120	02-NOV-16
Sodium (Na)-Total			99.7		%		80-120	02-NOV-16
Titanium (Ti)-Total			97.1		%		80-120	02-NOV-16
Vanadium (V)-Total			95.2		%		80-120	02-NOV-16
Zinc (Zn)-Total			95.9		%		80-120	02-NOV-16
WG2424154-1 MB								



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-TOT-ICP-VA</b>								
Water								
Batch	R3586269							
WG2424154-1	MB							
Barium (Ba)-Total			<0.010		mg/L		0.01	02-NOV-16
Beryllium (Be)-Total			<0.0050		mg/L		0.005	02-NOV-16
Boron (B)-Total			<0.10		mg/L		0.1	02-NOV-16
Calcium (Ca)-Total			<0.050		mg/L		0.05	02-NOV-16
Iron (Fe)-Total			<0.030		mg/L		0.03	02-NOV-16
Lithium (Li)-Total			<0.010		mg/L		0.01	02-NOV-16
Magnesium (Mg)-Total			<0.10		mg/L		0.1	02-NOV-16
Manganese (Mn)-Total			<0.0050		mg/L		0.005	02-NOV-16
Potassium (K)-Total			<2.0		mg/L		2	02-NOV-16
Sodium (Na)-Total			<2.0		mg/L		2	02-NOV-16
Titanium (Ti)-Total			<0.010		mg/L		0.01	02-NOV-16
Vanadium (V)-Total			<0.030		mg/L		0.03	02-NOV-16
Zinc (Zn)-Total			<0.0050		mg/L		0.005	02-NOV-16
<b>NO2-L-IC-N-VA</b>								
Water								
Batch	R3585105							
WG2422287-2	LCS							
Nitrite (as N)			100.2		%		90-110	30-OCT-16
WG2422287-21	LCS							
Nitrite (as N)			100.7		%		90-110	30-OCT-16
WG2422287-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-10	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-16	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-19	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-4	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16
WG2422287-7	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	30-OCT-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-VA Water								
Batch	R3585959							
WG2423374-6	DUP	L1850699-11						
Nitrite (as N)		<0.020	<0.020	RPD-NA	mg/L	N/A	20	01-NOV-16
WG2423374-15	LCS							
Nitrite (as N)			99.9		%		90-110	01-NOV-16
WG2423374-2	LCS							
Nitrite (as N)			99.7		%		90-110	01-NOV-16
WG2423374-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-NOV-16
WG2423374-10	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-NOV-16
WG2423374-13	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-NOV-16
WG2423374-4	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-NOV-16
WG2423374-7	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	01-NOV-16
NO3-L-IC-N-VA Water								
Batch	R3585105							
WG2422287-2	LCS							
Nitrate (as N)			101.6		%		90-110	30-OCT-16
WG2422287-21	LCS							
Nitrate (as N)			102.4		%		90-110	30-OCT-16
WG2422287-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-10	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-16	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-19	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-4	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16
WG2422287-7	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	30-OCT-16



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>NO3-L-IC-N-VA</b>								
Batch R3585959								
WG2423374-6	DUP	L1850699-11						
Nitrate (as N)		<0.10	<0.10	RPD-NA	mg/L	N/A	20	01-NOV-16
WG2423374-15	LCS							
Nitrate (as N)			101.5		%		90-110	01-NOV-16
WG2423374-2	LCS							
Nitrate (as N)			101.5		%		90-110	01-NOV-16
WG2423374-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-NOV-16
WG2423374-10	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-NOV-16
WG2423374-13	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-NOV-16
WG2423374-4	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-NOV-16
WG2423374-7	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	01-NOV-16
<b>PAH-ME-MS-VA</b>								
Batch R3587525								
WG2425963-2	LCS							
Acenaphthene			90.3		%		60-130	07-NOV-16
Acenaphthylene			97.8		%		60-130	07-NOV-16
Acridine			84.8		%		60-130	07-NOV-16
Anthracene			93.9		%		60-130	07-NOV-16
Benz(a)anthracene			84.8		%		60-130	07-NOV-16
Benzo(a)pyrene			85.5		%		60-130	07-NOV-16
Benzo(b)fluoranthene			87.5		%		60-130	07-NOV-16
Benzo(g,h,i)perylene			87.5		%		60-130	07-NOV-16
Benzo(k)fluoranthene			84.1		%		60-130	07-NOV-16
Chrysene			93.5		%		60-130	07-NOV-16
Dibenz(a,h)anthracene			91.3		%		60-130	07-NOV-16
Fluoranthene			96.7		%		60-130	07-NOV-16
Fluorene			88.3		%		60-130	07-NOV-16
Indeno(1,2,3-c,d)pyrene			88.8		%		60-130	07-NOV-16
Naphthalene			80.4		%		50-130	07-NOV-16
Phenanthrene			94.8		%		60-130	07-NOV-16
Pyrene			98.5		%		60-130	07-NOV-16
Quinoline			95.9		%		60-130	07-NOV-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ME-MS-VA		Water						
Batch R3587525								
WG2425963-1 MB								
Acenaphthene			<0.000010		mg/L		0.00001	07-NOV-16
Acenaphthylene			<0.000010		mg/L		0.00001	07-NOV-16
Acridine			<0.000010		mg/L		0.00001	07-NOV-16
Anthracene			<0.000010		mg/L		0.00001	07-NOV-16
Benz(a)anthracene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-NOV-16
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Chrysene			<0.000010		mg/L		0.00001	07-NOV-16
Dibenz(a,h)anthracene			<0.0000050		mg/L		0.000005	07-NOV-16
Fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Fluorene			<0.000010		mg/L		0.00001	07-NOV-16
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	07-NOV-16
Naphthalene			<0.000050		mg/L		0.00005	07-NOV-16
Phenanthrene			<0.000020		mg/L		0.00002	07-NOV-16
Pyrene			<0.000010		mg/L		0.00001	07-NOV-16
Quinoline			<0.000050		mg/L		0.00005	07-NOV-16
Surrogate: Acridine d9			102.1		%		60-130	07-NOV-16
Surrogate: Chrysene d12			90.0		%		60-130	07-NOV-16
Surrogate: Naphthalene d8			90.0		%		50-130	07-NOV-16
Surrogate: Phenanthrene d10			104.0		%		60-130	07-NOV-16
Batch R3589912								
WG2426020-2 LCS								
Acenaphthene			98.0		%		60-130	07-NOV-16
Acenaphthylene			103.9		%		60-130	07-NOV-16
Acridine			95.9		%		60-130	07-NOV-16
Anthracene			101.7		%		60-130	07-NOV-16
Benz(a)anthracene			98.2		%		60-130	07-NOV-16
Benzo(a)pyrene			116.1		%		60-130	07-NOV-16
Benzo(b)fluoranthene			96.6		%		60-130	07-NOV-16
Benzo(g,h,i)perylene			110.7		%		60-130	07-NOV-16
Benzo(k)fluoranthene			109.3		%		60-130	07-NOV-16
Chrysene			108.7		%		60-130	07-NOV-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-ME-MS-VA	Water							
<b>Batch</b>	<b>R3589912</b>							
<b>WG2426020-2 LCS</b>								
Dibenz(a,h)anthracene			98.0		%		60-130	07-NOV-16
Fluoranthene			109.5		%		60-130	07-NOV-16
Fluorene			109.7		%		60-130	07-NOV-16
Indeno(1,2,3-c,d)pyrene			102.7		%		60-130	07-NOV-16
Naphthalene			95.5		%		50-130	07-NOV-16
Phenanthrene			109.0		%		60-130	07-NOV-16
Pyrene			110.9		%		60-130	07-NOV-16
Quinoline			99.2		%		60-130	07-NOV-16
<b>WG2426020-1 MB</b>								
Acenaphthene			<0.000010		mg/L		0.00001	07-NOV-16
Acenaphthylene			<0.000010		mg/L		0.00001	07-NOV-16
Acridine			<0.000010		mg/L		0.00001	07-NOV-16
Anthracene			<0.000010		mg/L		0.00001	07-NOV-16
Benz(a)anthracene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(a)pyrene			<0.0000050		mg/L		0.000005	07-NOV-16
Benzo(b)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(g,h,i)perylene			<0.000010		mg/L		0.00001	07-NOV-16
Benzo(k)fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Chrysene			<0.000010		mg/L		0.00001	07-NOV-16
Dibenz(a,h)anthracene			<0.0000050		mg/L		0.000005	07-NOV-16
Fluoranthene			<0.000010		mg/L		0.00001	07-NOV-16
Fluorene			<0.000010		mg/L		0.00001	07-NOV-16
Indeno(1,2,3-c,d)pyrene			<0.000010		mg/L		0.00001	07-NOV-16
Naphthalene			<0.000050		mg/L		0.00005	07-NOV-16
Phenanthrene			<0.000020		mg/L		0.00002	07-NOV-16
Pyrene			<0.000010		mg/L		0.00001	07-NOV-16
Quinoline			<0.000050		mg/L		0.00005	07-NOV-16
Surrogate: Acridine d9			100.1		%		60-130	07-NOV-16
Surrogate: Chrysene d12			98.7		%		60-130	07-NOV-16
Surrogate: Naphthalene d8			88.4		%		50-130	07-NOV-16
Surrogate: Phenanthrene d10			110.1		%		60-130	07-NOV-16
SALINITY-EC-VA	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SALINITY-EC-VA								
Batch R3585614								
WG2422823-2	DUP	L1850699-7						
Salinity		3.6	3.6		psu	0.0	20	01-NOV-16
WG2422823-1	MB							
Salinity			<1.0		psu		1	01-NOV-16
Batch R3589585								
WG2426626-2	DUP	L1850699-11						
Salinity		2.1	2.1		psu	0.3	20	05-NOV-16
WG2426626-1	MB							
Salinity			<1.0		psu		1	05-NOV-16
SO4-IC-N-VA								
Batch R3585105								
WG2422287-2	LCS							
Sulfate (SO4)			101.7		%		90-110	30-OCT-16
WG2422287-21	LCS							
Sulfate (SO4)			102.2		%		90-110	30-OCT-16
WG2422287-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-10	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-13	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-16	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-19	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-4	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
WG2422287-7	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	30-OCT-16
Batch R3585959								
WG2423374-6	DUP	L1850699-11						
Sulfate (SO4)		2250	2250		mg/L	0.0	20	01-NOV-16
WG2423374-15	LCS							
Sulfate (SO4)			101.5		%		90-110	01-NOV-16
WG2423374-2	LCS							
Sulfate (SO4)			101.3		%		90-110	01-NOV-16
WG2423374-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	01-NOV-16





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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>SO4-IC-N-VA Water</b>								
Batch	R3585959							
WG2423374-10 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-NOV-16
WG2423374-13 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-NOV-16
WG2423374-4 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-NOV-16
WG2423374-7 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	01-NOV-16
<b>VH-HSFID-VA Water</b>								
Batch	R3587280							
WG2425091-3 DUP		L1850699-9						
Volatile Hydrocarbons (VH6-10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	03-NOV-16
WG2425091-2 LCS								
Volatile Hydrocarbons (VH6-10)			110.0		%		70-130	03-NOV-16
WG2426024-2 LCS								
Volatile Hydrocarbons (VH6-10)			110.6		%		70-130	04-NOV-16
WG2425091-1 MB								
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	03-NOV-16
WG2426024-1 MB								
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	04-NOV-16
<b>VOC7-HSMS-VA Water</b>								
Batch	R3587803							
WG2425091-3 DUP		L1850699-9						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
Ethylbenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
Methyl t-butyl ether (MTBE)		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
Styrene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
meta- & para-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
ortho-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	04-NOV-16
WG2425091-2 LCS								
Benzene			112.3		%		70-130	04-NOV-16
Ethylbenzene			110.4		%		70-130	04-NOV-16
Methyl t-butyl ether (MTBE)			106.3		%		70-130	04-NOV-16
Styrene			101.8		%		70-130	04-NOV-16
Toluene			107.6		%		70-130	04-NOV-16
meta- & para-Xylene			119.2		%		70-130	04-NOV-16



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC7-HSMS-VA	Water							
Batch	R3587803							
WG2425091-2	LCS							
ortho-Xylene			112.2		%		70-130	04-NOV-16
WG2426024-2	LCS							
Benzene			112.9		%		70-130	04-NOV-16
Ethylbenzene			109.4		%		70-130	04-NOV-16
Methyl t-butyl ether (MTBE)			107.2		%		70-130	04-NOV-16
Styrene			102.2		%		70-130	04-NOV-16
Toluene			108.1		%		70-130	04-NOV-16
meta- & para-Xylene			118.7		%		70-130	04-NOV-16
ortho-Xylene			111.5		%		70-130	04-NOV-16
WG2425091-1	MB							
Benzene			<0.00050		mg/L		0.0005	04-NOV-16
Ethylbenzene			<0.00050		mg/L		0.0005	04-NOV-16
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	04-NOV-16
Styrene			<0.00050		mg/L		0.0005	04-NOV-16
Toluene			<0.00050		mg/L		0.0005	04-NOV-16
meta- & para-Xylene			<0.00050		mg/L		0.0005	04-NOV-16
ortho-Xylene			<0.00050		mg/L		0.0005	04-NOV-16
WG2426024-1	MB							
Benzene			<0.00050		mg/L		0.0005	04-NOV-16
Ethylbenzene			<0.00050		mg/L		0.0005	04-NOV-16
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	04-NOV-16
Styrene			<0.00050		mg/L		0.0005	04-NOV-16
Toluene			<0.00050		mg/L		0.0005	04-NOV-16
meta- & para-Xylene			<0.00050		mg/L		0.0005	04-NOV-16
ortho-Xylene			<0.00050		mg/L		0.0005	04-NOV-16

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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
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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## Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
<b>Anions and Nutrients</b>							
Nitrate in Water by IC (Low Level)	11	Not provided	01-NOV-16 06:34	3	4	days	EHT
Nitrite in Water by IC (Low Level)	11	Not provided	01-NOV-16 06:34	3	4	days	EHT

## Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.  
 EHTR: Exceeded ALS recommended hold time prior to sample receipt.  
 EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.  
 EHT: Exceeded ALS recommended hold time prior to analysis.  
 Rec. HT: ALS recommended hold time (see units).

## Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.  
 Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1850699 were received on 28-OCT-16 16:30.

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.

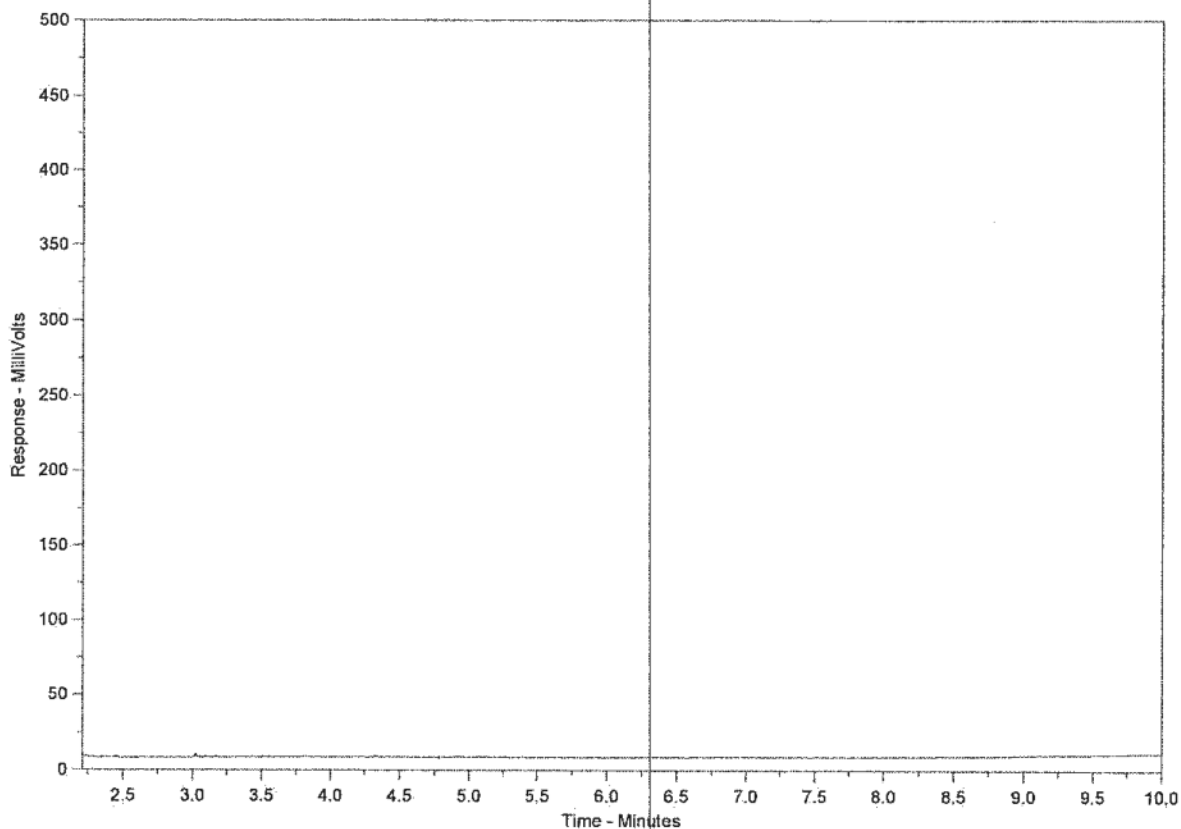
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-1  
Client Sample ID: MW1S-8



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

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

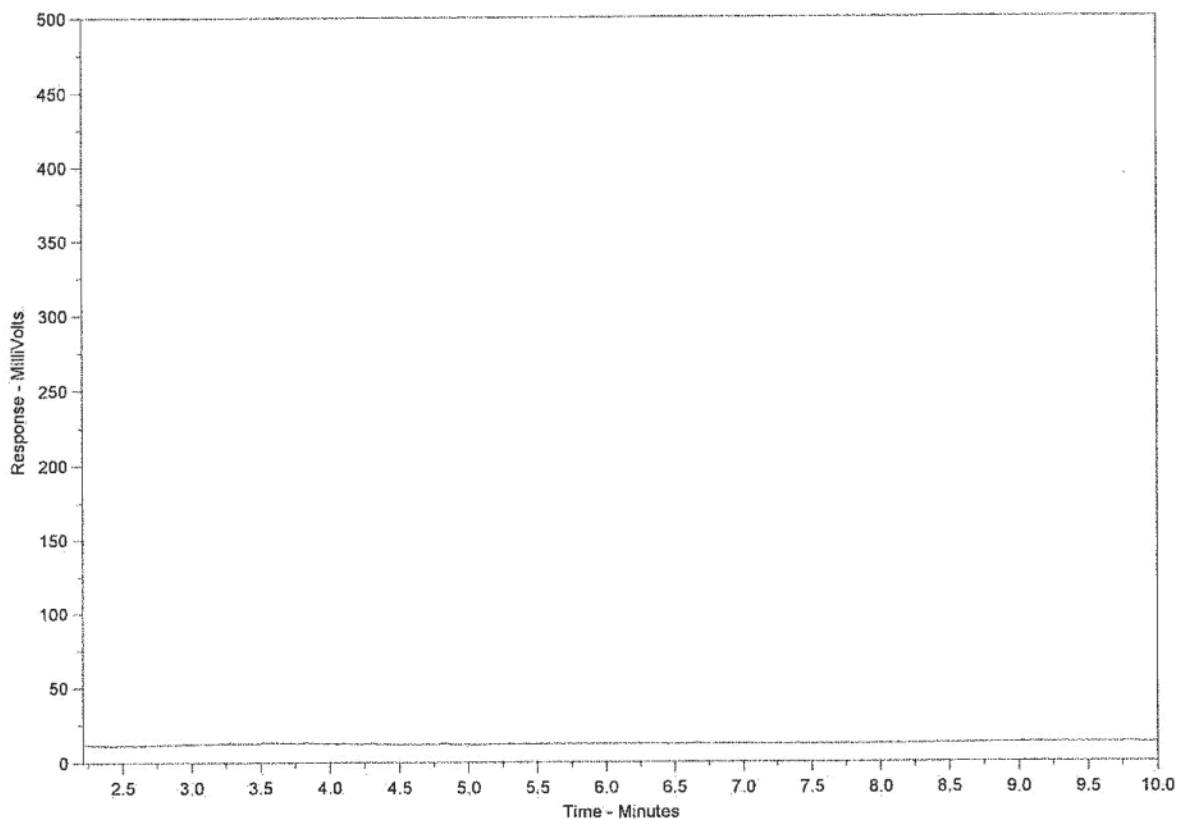
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-2

Client Sample ID: MW1S-9



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →		
← Diesel / Jet Fuels →		
← Motor Oils / Lube Oils / Grease →		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

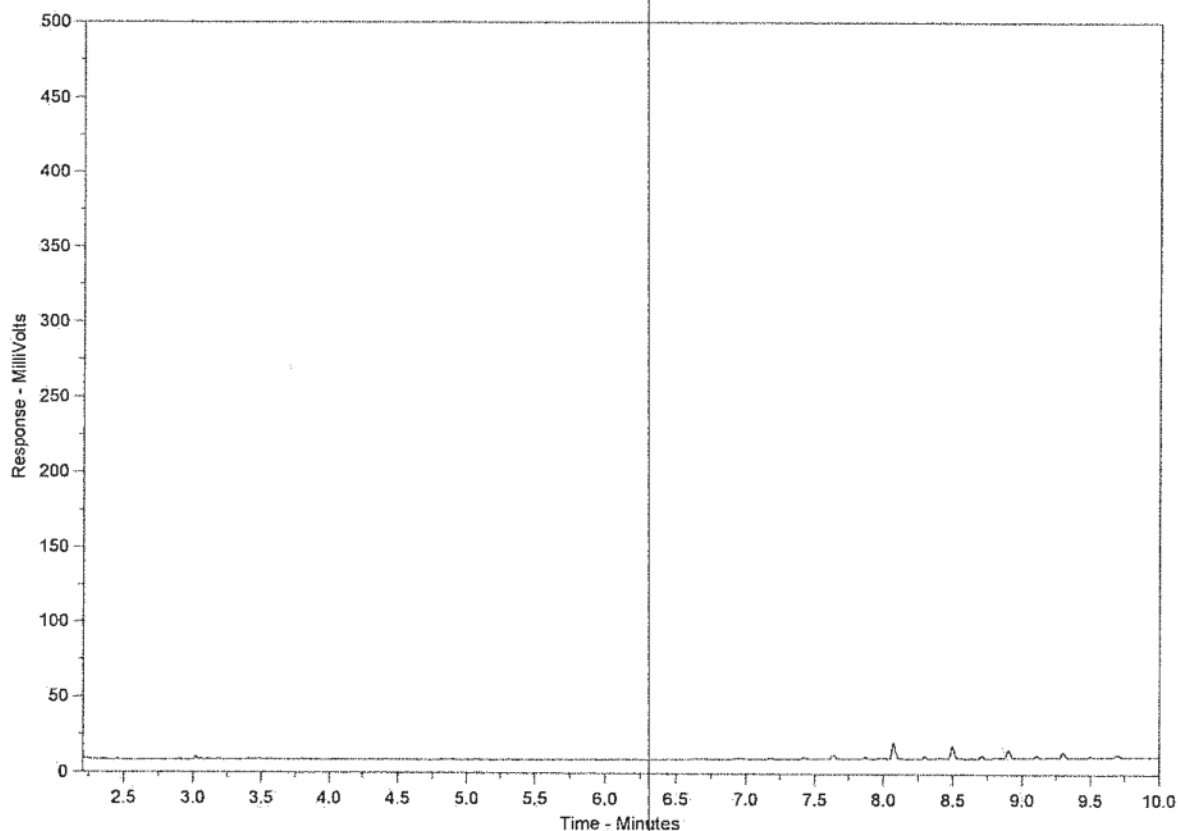
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-3  
Client Sample ID: MW1S-2



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

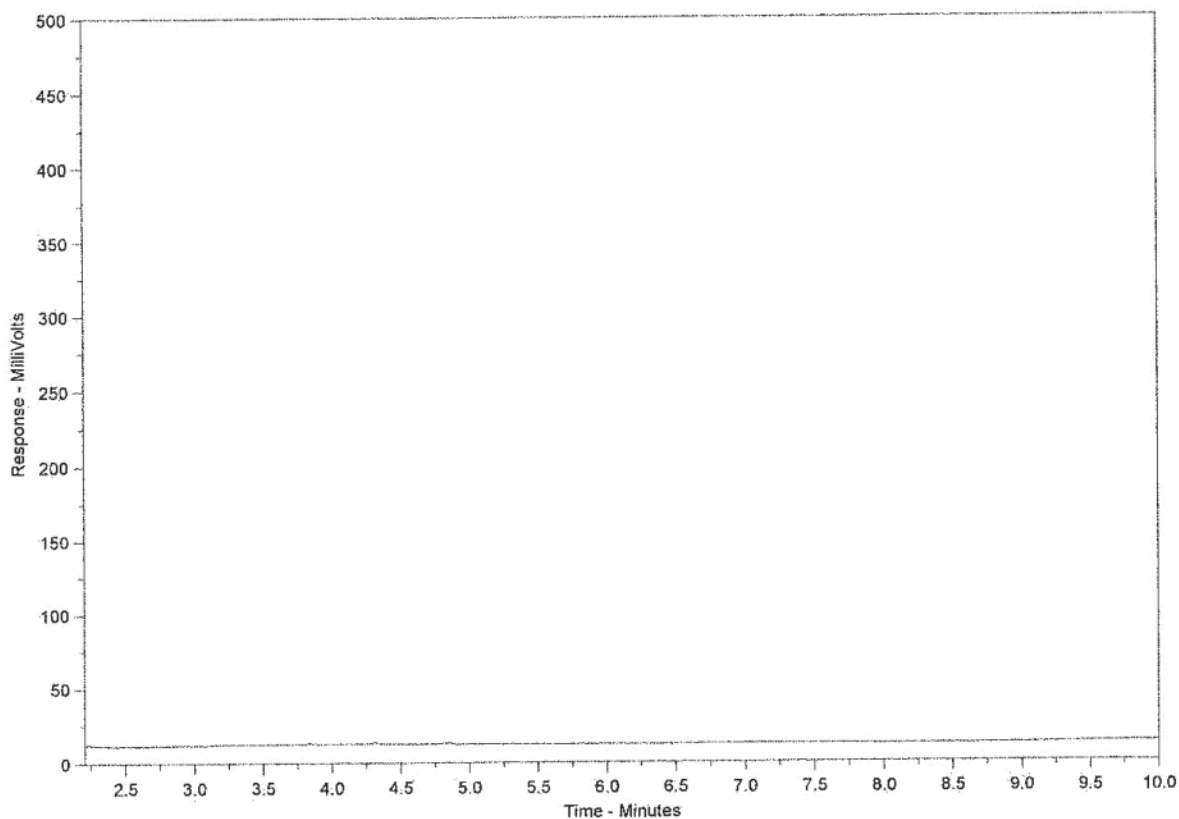
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-4  
Client Sample ID: MW1S-7



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

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

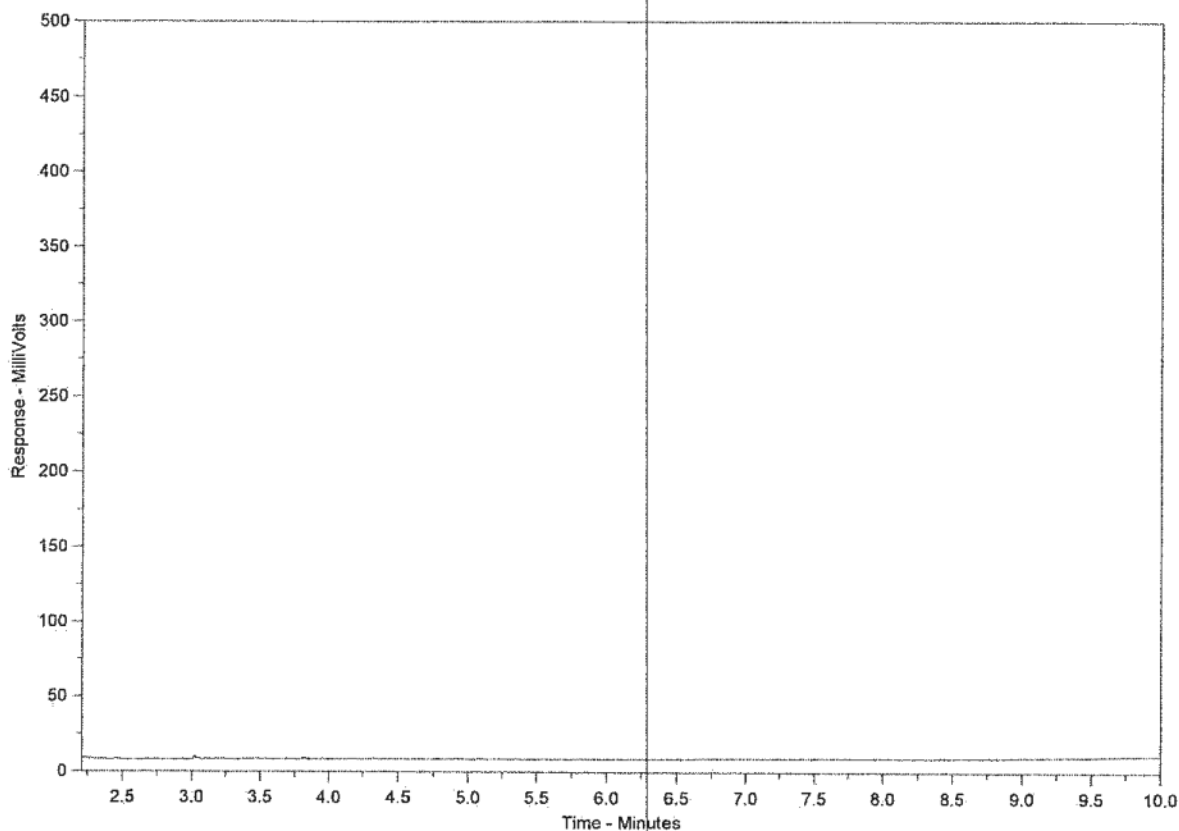
A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.



# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-5  
Client Sample ID: MW1S-6



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

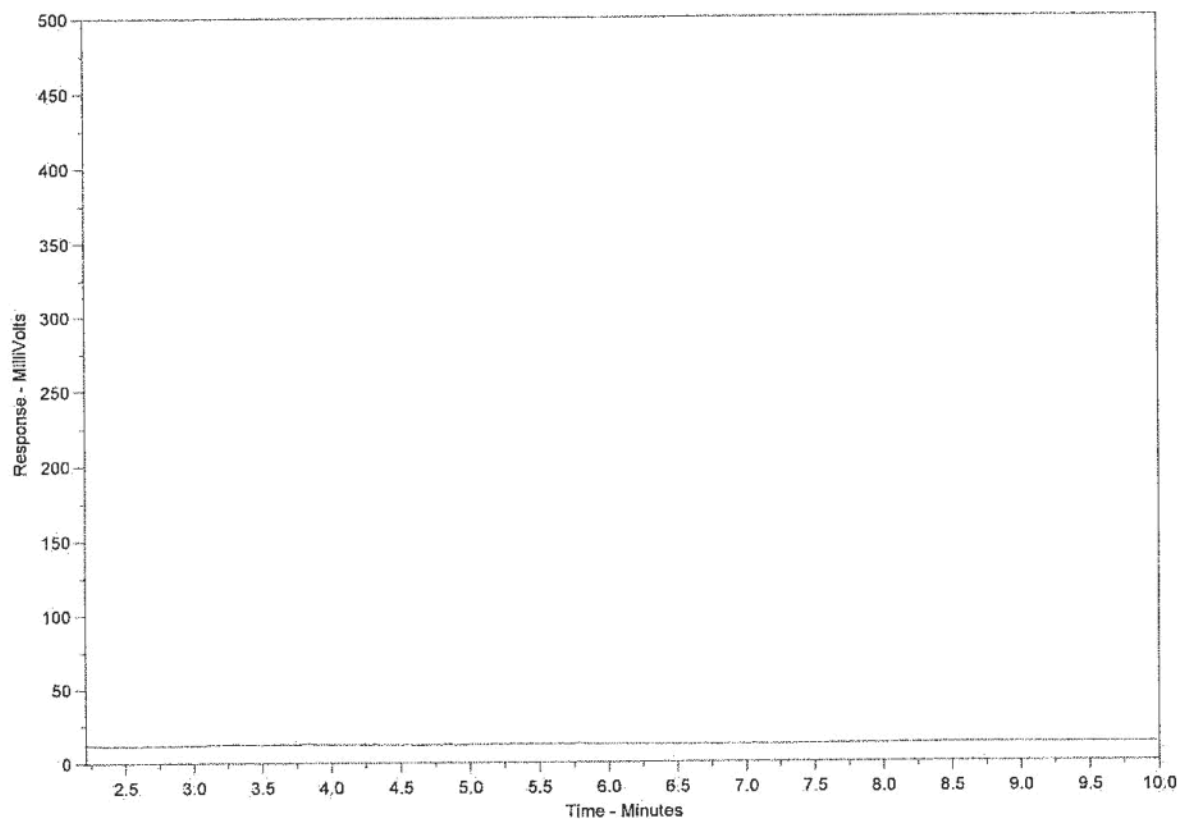
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-6  
Client Sample ID: MW1S-4



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

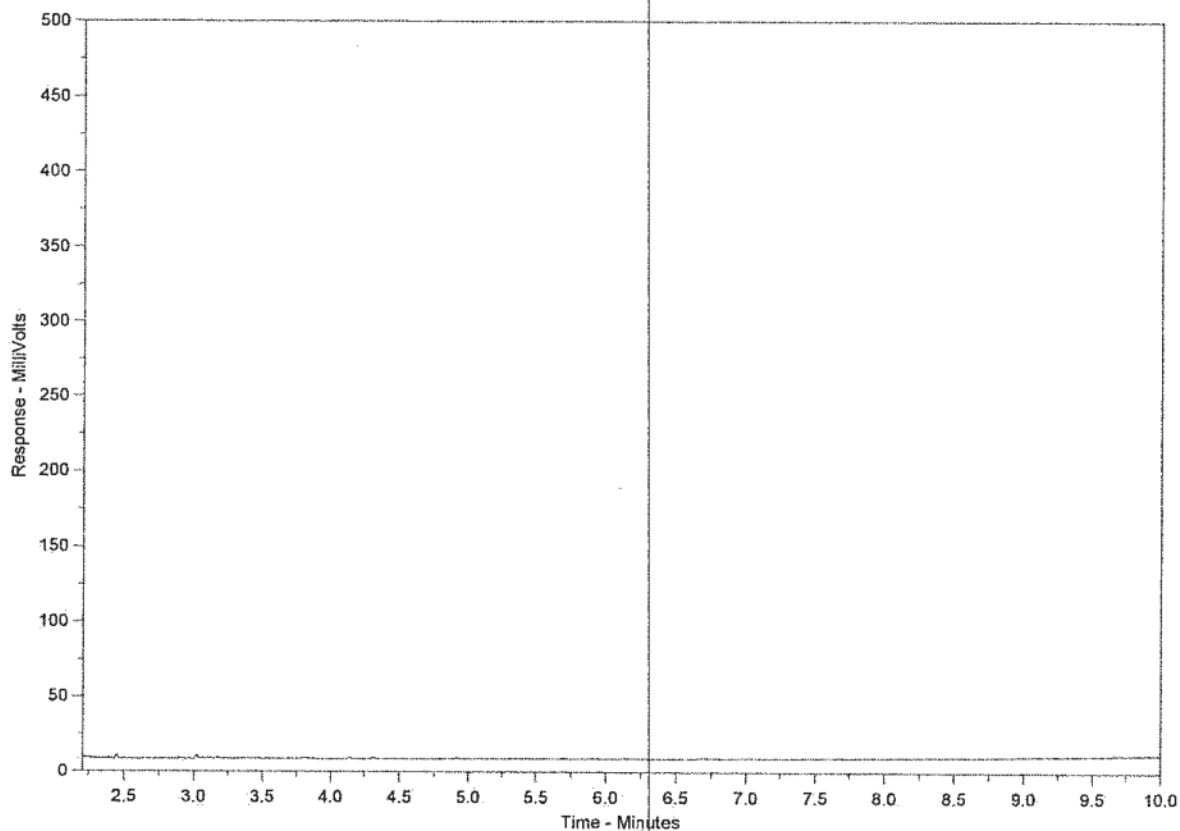
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-7  
Client Sample ID: DUP-A



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

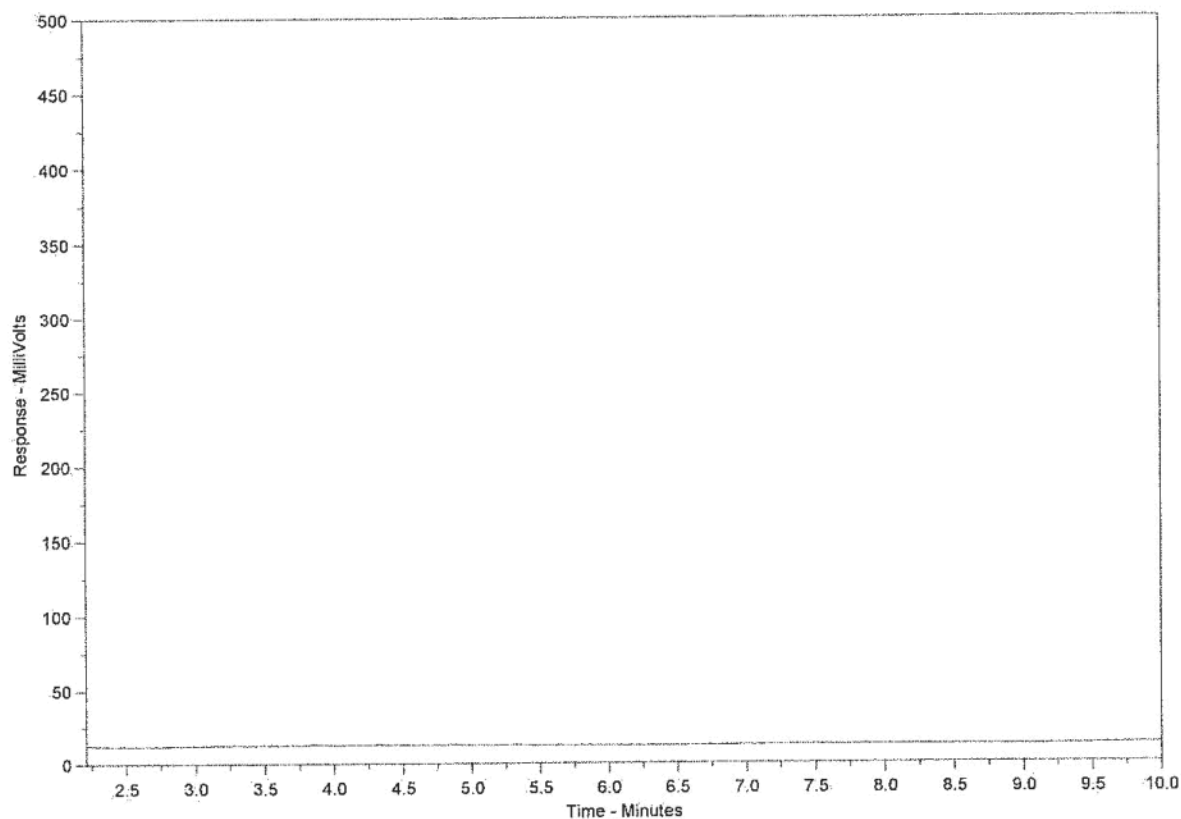
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-9  
Client Sample ID: FIELD BLANK



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

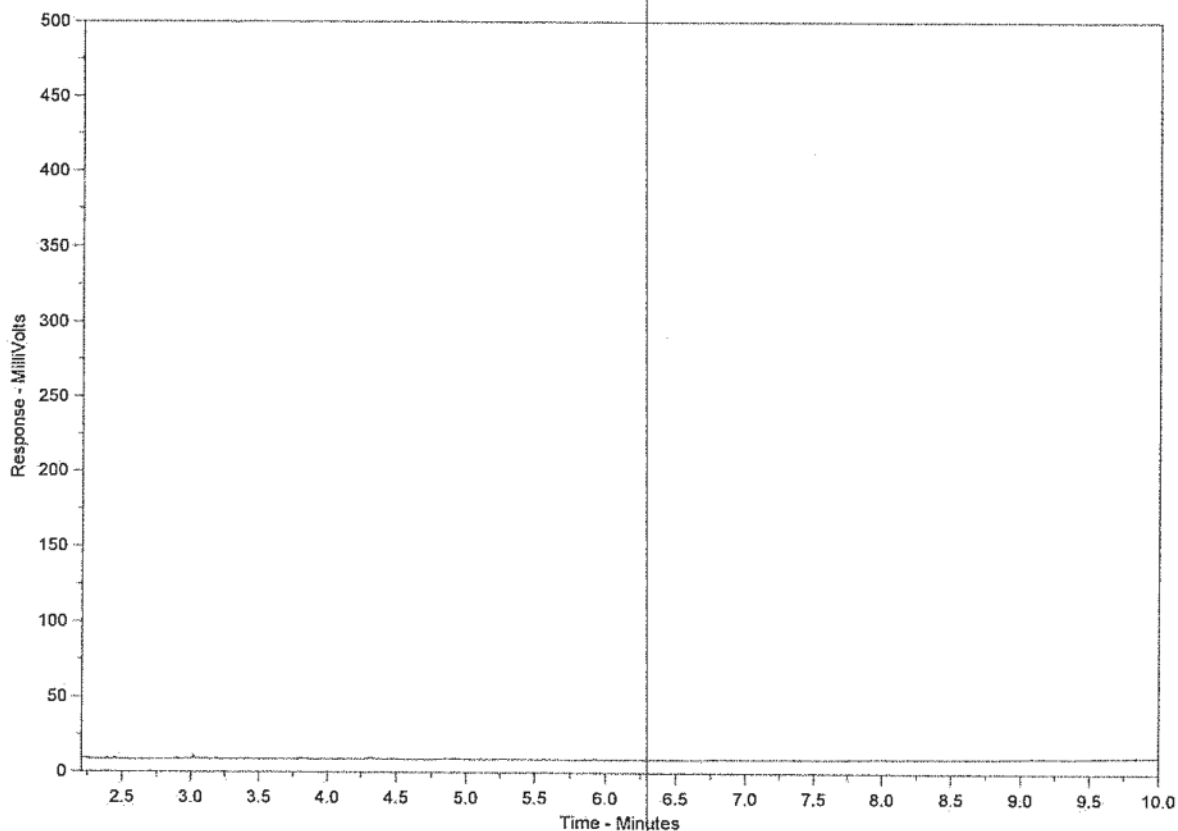
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-10  
Client Sample ID: TRAVEL BLANK



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

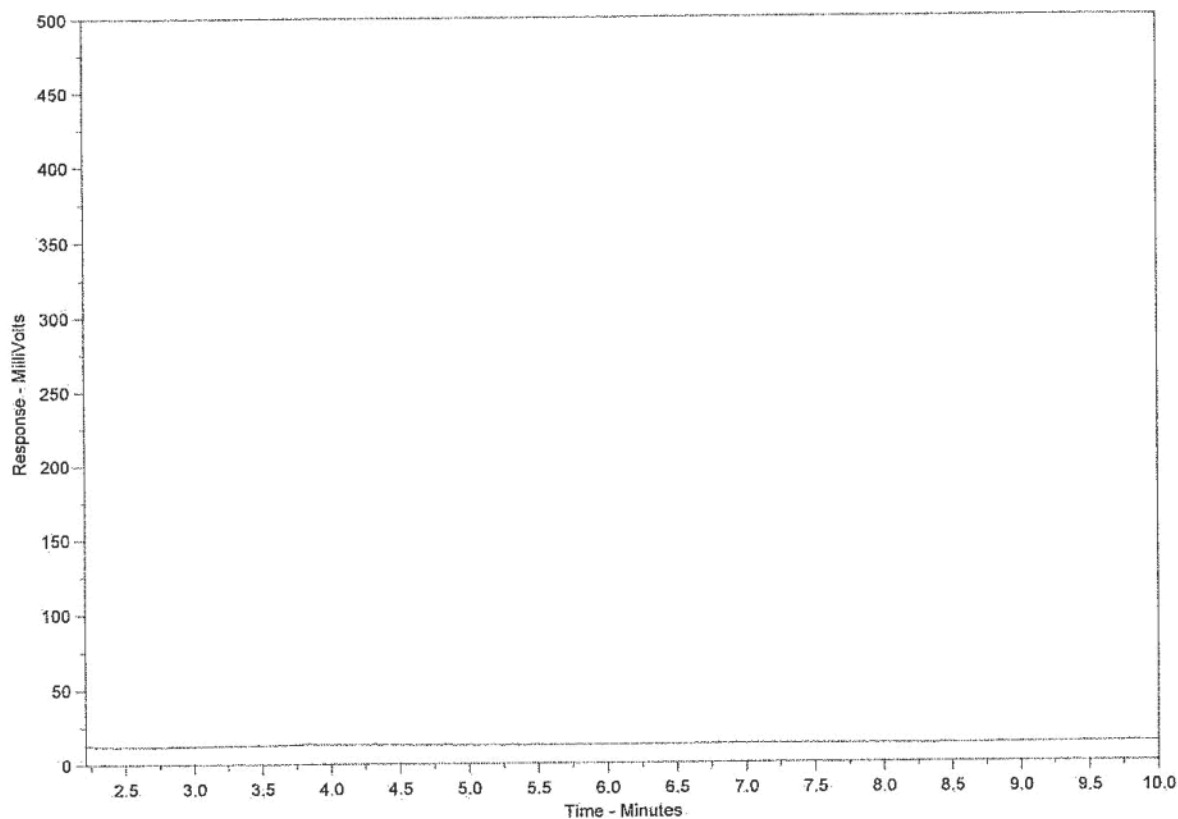
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the response scale at the left.

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

# Hydrocarbon Distribution Report



ALS Sample ID: L1850699-11  
Client Sample ID: MW1S-5



nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
<div><div>← Gasoline →</div><div>← Diesel / Jet Fuels →</div><div>← Motor Oils / Lube Oils / Grease →</div></div>		

The EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample. For further interpretation, a current library of reference products is available on [www.alsglobal.com](http://www.alsglobal.com) or upon request.

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 by as much as 0.5 minutes.

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

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



<b>Report To</b>		<b>Report Format / Distribution</b>			<b>Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)</b>														
Company: <b>Golden Associates</b>		Select Report Format: <input checked="" type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3pm)														
Contact: <b>Tom Horvath</b>		Quality Control (QC) Report with Report <input type="checkbox"/> Yes <input type="checkbox"/> No			P <input type="checkbox"/> Prior-by (2-4 business days if received by 3pm)														
Address:		<input type="checkbox"/> Criteria on Report - provide details below if box checked			E <input type="checkbox"/> Emergency (1-2 business days if received by 3pm)														
Phone: <b>(250) 329-4800</b>		Select Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			E2 <input type="checkbox"/> Same day or weekend emergency if received by 10am - contact ALS for surcharge.														
		Email 1 or Fax			Specify Date Required for E2,E or P:														
		Email 2			<b>Analysis Request</b>														
Invoice To <input type="checkbox"/> Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<b>Invoice Distribution</b>			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below														
Copy of Invoice with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																	
Company:		Email 1 or Fax: <b>+horvath@golden.com</b>																	
Contact:		Email 2:																	
<b>Project Information</b>		<b>Select Project Type, Oil and Gas Required Fields (client use)</b>																	
ALS Quote #:		Approver ID:			Cost Center:														
Job #:		GL Account:			Routing Code:														
PO / AFE:		Activity Code:																	
LSD:		Location:																	
ALS Lab Work Order # (lab use only): <b>L1850699</b>		ALS Contact: <b>Geoff</b>			Sampler: <b>Scott Rusnak</b>														
<b>ALS Sample # (lab use only)</b>	<b>Sample Identification and/or Coordinates</b> (This description will appear on the report.)			Date (dd mmm-yy)	Time (hh:mm)	Sample Type	BTEX	VPH	LEPH	EPH <sub>10-14</sub>	EPH <sub>14-32</sub>	PAH	Diss. Metals	Total Metals	Anions	Chloride	Sulfidity Parameters	Number of Containers	
	MWIS-8		28-Oct-16	10:13	GW	-	/	/	/	/	/	/	/	/	/	/	/	9	
	MWIS-9			14:16		-	/	/	/	/	/	/	/	/	/	/	/	9	
	MWIS-2			11:40		-	/	/	/	/	/	/	/	/	/	/	/	9	
	MWIS-7			15:28		-	/	/	/	/	/	/	/	/	/	X	/	9	
	MWIS-6			15:18		-	/	/	/	/	/	/	/	/	/	X	/	9	
	MWIS-4			12:44		-	/	/	/	/	/	/	/	/	/	X	X	9	
	DUP-A			12:44		-	/	/	/	/	/	/	/	/	/	X	X	9	
	MWIS-3		28-Oct-16	13:38		-	/	/	/	/	/	/	/	/	/	X	/	9	
	Field Blank			15:45		X	/	/	/	/	/	/	/	/	/	X	/	9	
	Travel Blank		28-Oct-16	15:50	GW	X	X	X	X	X	X	X	X	X	X	X	X	4	
<b>Drinking Water (DW) Samples' (client use)</b>		<b>Special Instructions / Specify Criteria to add on report (client Use)</b>			<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b>														
Are samples taken from a Regulated DW System?					Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>														
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					Ice packs Yes <input type="checkbox"/> No <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>														
Are samples for human drinking water use?					Cooling Initiated <input type="checkbox"/>														
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					INITIAL COOLER TEMPERATURES (C): <b>5</b> <b>4</b> FINAL COOLER TEMPERATURES (C):														
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (lab use only)</b>			<b>FINAL SHIPMENT RECEPTION (lab use only)</b>														
Released by: <b>Scott Rusnak</b>		Date: <b>28/10/16</b> Time: <b>16:26</b>			Received by: <b>Geoff</b> Date: <b>OCT. 28/16</b> Time: <b>16:30</b>														

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY      YELLOW - CLIENT COPY

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form

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**Golder Associates Ltd.**  
**590 McKay Avenue, Suite 300**  
**Kelowna, British Columbia, V1Y 5A8**  
**Canada**  
**T: +1 (250) 860 8424**







January 4, 2017

Normtek Radiation Services Ltd.  
115, 1925 - 18<sup>th</sup> Avenue NE  
Calgary AB  
T2E 7T8

Attention: Cody Cuthill  
President, Chief Executive Officer

Re: 2017 Annual Groundwater Monitoring and Sampling Program  
Decontamination Facility, 9676 Swanson Street, Fort St. John,  
British Columbia

Under the authorization of Normtek Radiation Services Ltd. (Normtek), Summit Liability Solutions Inc. (Summit) completed a groundwater monitoring and sampling program at the referenced location on November 2, 2017. The program was undertaken to satisfy annual groundwater monitoring and sampling as part of the BC Ministry of the Environment (MoE) approval for a hazardous waste facility.

The site location and regional topography are shown on Figures 1 and 2.

## **SITE LOCATION AND BACKGROUND INFORMATION**

The site is a naturally occurring radioactive material (NORM) detection, decontamination, and disposal facility located in an industrial area on the east side of the city of Fort St. John, BC. The infrastructure on the site includes an office building, garage/storage and equipment bay, self-contained wash bay, concrete containment pad, and a storm water containment pond. The nearest surface water body is the dugout serving as the storm water pond located in the southeast corner of the site. There are numerous residences within 1 km of the site.

A site plan with monitoring well locations is included as Figure 3.

A search of the iMapBC groundwater information database did not identify any registered water well within approximately 1.5 km of the site. A copy of the water well map is provided in Appendix A.

In December 2015, Ghostpine Environmental Services Ltd. (Ghostpine) prepared a *Baseline Groundwater Monitoring for Normtek Hazardous Waste Facility at 9676 Swanson Street, Fort St. John, BC*. In September 2015 nine boreholes were drilled at the site, and monitoring wells were installed in each borehole. Three boreholes (MW15-1 to MW15-3) were drilled to a depth of 45 metres below ground surface (mbgs) and six boreholes



(MW15-4 to MW15-9) were drilled to 4.1 mbgs. The shallow monitoring wells were installed within a fill unit and the deeper monitoring wells were installed within a sand and gravel deposit with approximately 30 m layer of silty clay to clay between the shallow and deep monitoring wells.

In October 2016 six monitoring wells were dry or contained insufficient water volumes for sampling. Three wells (MW15-2, MW15-3, and MW15-9) were sampled and groundwater samples were analysed for petroleum hydrocarbons, dissolved and total metals, and anions. The samples met the applicable BC Contaminated Sites Regulation (CSR) criteria, with the exception of sulphate and magnesium.

Groundwater samples were also analysed for NORM and the laboratory results for all the samples were within the applicable BCS CSR criteria. The report was not available.

In January 2017, Golder Associates Ltd. (Golder) prepared a *2016 Baseline Groundwater Monitoring and Sampling Report*. In October 2016 seven of the nine monitoring wells were sampled and monitored. Two monitoring wells (MW15-1 and MW15-3) were dry at the time of the assessment. The laboratory analytical results showed elevated chloride, dissolved magnesium, dissolved selenium, sodium, sulphate, and dissolved uranium. Groundwater concentrations for all the water samples analysed for petroleum hydrocarbons met the BC CSR criteria. The report recommended continual annual groundwater monitoring of wells with sufficient water volumes, and the replacement of monitoring wells MW15-1 and MW15-3 if they continue to be dry. Furthermore, the report recommended a review of the current MoE approval requirements as well as a desktop review of the groundwater quality in the area to evaluate potential naturally elevated chloride, magnesium, selenium, sulphate, and/or uranium levels in the groundwater.

## **SUMMIT GROUNDWATER MONITORING PROGRAM**

On November 1, 2017, Summit environmental specialists measured combustible vapour concentrations and depth to groundwater in all the monitoring wells with the exception of MW15-3, which was inaccessible. The combustible vapour concentrations, if detected, were measured using an RKI Eagle 2 gas detector. The gas detector was calibrated against hexane standards and operated in methane elimination mode. Depth to groundwater was measured using an interface probe capable of detecting phase-separated hydrocarbon liquids. Field readings were collected from all the monitoring wells, with the exception of MW15-1 and MW15-2 which did not contain sufficient groundwater, and MW15-3 which was inaccessible. Electrical conductivity (EC), pH, oxidation-reduction potential (ORP), temperature, and dissolved oxygen (DO) were measured using an in-situ smarTROLL Multiparameter Handheld unit.

After monitoring, the wells were purged dry, or a minimum of three casing volumes of groundwater were removed, and the wells were allowed to recharge. Groundwater samples were collected from the monitoring wells, with the exception of MW15-1, MW15-



2, and MW15-3. The wells were purged and groundwater samples were recovered using dedicated PVC bailers or Waterra tubing. Duplicate groundwater samples were not collected from the monitoring wells due to insufficient recovered groundwater.

Samples were submitted to Exova Laboratory (Exova) for detailed salinity, petroleum hydrocarbon (PHC) benzene, toluene, ethylbenzene, xylenes, volatile hydrocarbons (VH<sub>6-10</sub> and VPH<sub>w</sub>), light extractable petroleum hydrocarbons (EPH<sub>10-19</sub> and LEPH), heavy extractable petroleum hydrocarbons (HEPH), polycyclic aromatic hydrocarbons (PAH), and dissolved metals analyses.

Site photographs taken during the 2017 monitoring and sampling program are included in Appendix B.

## **FIELD MONITORING RESULTS**

The monitoring well completion details and field monitoring results are summarized in Table 1.

Combustible vapour concentrations were not detected in the monitoring wells on November 1, 2017. Phase-separated hydrocarbon liquids were not detected at the groundwater surface in any monitoring well.

The depth to groundwater measured in the monitoring wells on November 1, 2017 ranged from 1.095 to 2.50 metres below surface grade (mbsg) for the shallow monitoring wells, and 35.98 to 45.14 mbsg for the deep monitoring wells. The principal direction of shallow groundwater flow beneath the site appeared to be towards the southeast at an average gradient of approximately 0.006797 m/m (Golder 2016).

## **RESULTS OF LABORATORY ANALYSES**

The results of the groundwater analyses are summarized in Tables 2 to 5 along with the *British Columbia Contaminated Sites Regulation (CSR)*, *Generic Numerical Water Standards, Drinking Water (DW) and Aquatic Life (AW) criteria* (BC MoE, 2017) for commercial land use. Data from the Golder 2016 report is included in the tables for reference purposes.

Chloride concentrations in the groundwater samples ranged from 53.8 mg/L to 167 mg/L and met the BC MoE 2017 criteria.

Consistent with historical data, sulphate, dissolved sodium, magnesium, and manganese concentrations exceeding the BC MoE criteria were broadly detected across the site.



Petroleum hydrocarbon (benzene, toluene, ethylbenzene, xylenes,  $VH_{6-10}$ ,  $VPH_w$ ,  $EPH_{10-19}$ ,  $LEPH$ , and  $HEPH$ ) and polycyclic aromatic hydrocarbon concentrations were not detected in the groundwater samples.

Consistent with historical data, dissolved metals concentrations met the BC MoE criteria with the exception of uranium. The elevated uranium concentrations ( $37.7 \mu\text{g/L}$  to  $240 \mu\text{g/L}$ ) appear to be naturally occurring.

A copy of the laboratory analytical report is provided in Appendix C.

### **Quality Assurance/Quality Control (QA/QC)**

Laboratory samples were obtained and processed using Summit's standard procedures for groundwater monitoring, and were transported using chain of custody procedures. Laboratory QA/QC data, including replicate samples analyses, are provided in the Appendix C. A review of the QA/QC results indicates that no data quality issues were identified and that the data is considered to be accurate and reliable.

### **SUMMARY**

Summit conducted a groundwater monitoring program at the Normtek Radiation Services Decontamination Facility on November 1, 2017.

Based on the groundwater monitoring program and analytical results, there is no evidence of increased groundwater contamination at the site. Summit recommends continuing with the groundwater monitoring program during the fall of 2018. Further, a desktop review of groundwater in the area could provide useful information regarding naturally elevated chloride, magnesium, selenium, sulphate, and uranium levels.

### **CLOSURE AND LIMITATIONS**

This report has been prepared in accordance with generally accepted environmental consulting practices, based on an agreed scope of work. Information presented herein was obtained while conducting authorized groundwater monitoring and sampling activities at Normtek Decontamination Facility in Fort St. John, BC. Although the data was collected at specific locations, the reported information is believed to provide a reasonable representation of the general environmental conditions at the site. The environmental assessment was limited to a study of those contaminants specifically addressed in this report.

This report has been prepared for the exclusive use of Normtek Radiation Services Ltd. Any use that a third party makes of this report, or reliance on, or decisions made, based on the report, are the responsibility of such third parties. Summit Liability Solutions Inc.



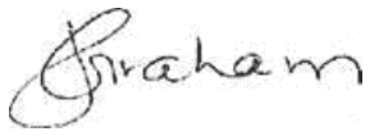
accepts no responsibility for loss or damage, if any, suffered by any third party as a result of decisions made or actions taken on the basis of this report.

Unless noted otherwise, all information provided by others in the preparation of this report is assumed to be factual and complete. Summit Liability Solutions Inc. reserves the right to change or modify the opinions or recommendations provided in this report should new or differing information become available in the future.

We trust that the foregoing information is satisfactory for your present requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned at 780.875.4700 Ext. 211.

Sincerely,

**SUMMIT LIABILITY SOLUTIONS INC.**



Jennifer Graham, C.Tech,  
Project Manager, EAS  
Summit Liability Solutions Inc.

Tomas Navratil,  
Environmental Specialist, EAS  
Summit Liability Solutions Inc.



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Summit Liability Solutions Inc.

## TABLES



Normtek Radiation Services Ltd.  
9676 Swanson Street Fort St. John  
Commercial Land Use

Table 1

Summary of Groundwater Field Monitoring Results

Monitoring Well ID	Date	Easting (m)	Northing (m)	Ground Elevation (m)*	Casing Elevation (m)*	Groundwater Elevation (m)*	Total Depth (mbtoc)	Depth to Groundwater (mbtoc)	Lithology of Screen Interval*	Notes
MW15-1	8-Oct-16	637783	6235371	681.14	682.33	646.78	35.900	35.550	Sand and Gravel	Historical Information*
	9-Oct-16					647.98		34.350		
	28-Oct-16					~		~		
	1-Nov-17					646.35	35.985	35.980		Old Waterra tube was removed from the PVC pipe. GWM well was dry.
MW15-2	8-Oct-16	637820	6235322	681.36	682.36	638.71	45.410	43.650	Sand and Gravel	Historical Information*
	9-Oct-16					639.96		42.400		
	28-Oct-16					638.70		43.664		
	1-Nov-17					637.22	45.145	45.140		Insufficient volume of water for GW monitoring or sampling.
MW15-3	8-Oct-16	638002	6235325	680.09	680.92	638.70	43.880	42.220	Sand and Gravel	Historical Information*
	9-Oct-16					639.53		41.390		
	28-Oct-16					638.64		42.280		
	1-Nov-17					~		~		Old Waterra tube was stuck in the PVC pipe. Not able to remove it.
MW15-4	8-Oct-16	637997	6235325	679.85	680.76	676.96	3.940	3.800	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					677.88		2.880		
	28-Oct-16					679.31		1.451		
	1-Nov-17					677.86	3.940	2.900		Quick recharge, moderate turbidity
MW15-5	8-Oct-16	638000	6235371	680.16	681.13	~	3.940	~	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					~		~		
	28-Oct-16					679.543		1.587		
	1-Nov-17					679.435	3.950	1.695		Moderate turbidity
MW15-6	8-Oct-16	637947	6235325	679.88	680.80	~	3.950	~	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					~		~		
	28-Oct-16					679.493		1.307		
	1-Nov-17					678.690	3.930	2.110		Moderate turbidity
MW15-7	8-Oct-16	637821	6235322	681.38	682.40	678.630	3.950	3.770	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					679.700		2.700		
	28-Oct-16					680.053		2.347		
	1-Nov-17					679.900	3.945	2.500		Moderate turbidity
MW15-8	8-Oct-16	637780	6235372	681.14	682.21	~	3.780	~	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					~		~		
	28-Oct-16					680.260		1.950		
	1-Nov-17					679.715	3.785	2.495		Moderate turbidity
MW15-9	8-Oct-16	637800	6235359	681.24	681.18	678.51	2.960	2.670	Silty Clay/Clay Silt	Historical Information*
	9-Oct-16					678.46		2.720		
	28-Oct-16					680.06		1.119		
	1-Nov-17					680.09	2.965	1.095		Moderate turbidity
Checked By: Jennifer Graham										

Notes:

mags - metres above ground surface

mbgs - metres below ground surface

mbtoc - metres below top of casing

m - metres

m/s - metres per second

\*Data obtained from the 2016 Baseline Groundwater Monitoring and Sampling Report, Golder Associates, January 2017

~ - no data available



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Table 2

Monitoring Well ID	Sample Collection Date	Lab Sample ID	Field Parameters						pH	Electrical Conductivity (EC)	Chloride (Cl <sup>-</sup> )	Sulphate (SO <sub>4</sub> )	Dissolved Calcium (Ca)	Dissolved Magnesium (Mg)	Dissolved Sodium (Na)	Dissolved Potassium (K)	Dissolved Iron (Fe)	Dissolved Manganese (Mn)	Hardness
			pH	Electrical Conductivity	Temperature	Oxidation/Reduction Potential	Dissolved Oxygen	Organic Vapour Analysis											
Units			-	µS/cm	°C	mV	mg/L	ppm	Standard Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg CaCO <sub>3</sub> /L
MW15-2	28-Oct-16*	L1850699-3	~	~	~	~	~	ND	~	~	<10	1490	372	198	153	4.8	<30	43	1740
MW15-4	28-Oct-16*	L1850699-6	7.24	5690	8.8	-573.1	1.3	ND	~	5690	71	4220	444	854	340	5.3	<60	190	4620
	1-Nov-17	1236965-1	7.40	3596.9	1.48	1328.3	4.93	ND	7.48	61410	63.9	4410	467	923	367	5.2	<50	585	4960
MW15-5	28-Oct-16*	L1850699-11	7.20	3501	7.3	-503.8	2.7	ND	7.24	3501	132	2250	529	348	99.3	3.9	132	668	2750
	1-Nov-17	1236965-2	7.24	2022.0	0.89	1344.2	7.99	ND	7.48	3820	167	2130	623	350	102	3.0	<50	635	3000
MW15-6	28-Oct-16*	L1850699-5	~	~	~	~	~	ND	7.20	~	31	2190	547	296	56.6	22.1	<30	40	2550
	1-Nov-17	1236965-3	7.16	2346.6	2.82	1320.0	3.24	ND	7.45	3630	53.8	2170	592	342	72.2	20.3	<50	286	2880
MW15-7	28-Oct-16*	L1850699-4	~	~	~	~	~	ND	~	~	101	1160	370	306	166	<2.0	39900	8280	2180
	1-Nov-17	1236965-4	6.73	2347.4	1.99	1334.4	1.36	ND	6.90	3260	107	769	369	300	173	2.0	<50	8950	2160
MW15-8	28-Oct-16*	L1850699-1	7.10	5113	6.6	-526	1.3	25	7.1	5113	344	3290	507	708	269	4.8	<60	22	4180
	1-Nov-17	1236965-5	NR	NR	NR	NR	NR	ND	7.49	5480	147	3690	526	747	307	5.6	<50	83	4390
MW15-9	28-Oct-16*	L1850699-2	6.69	1906	5.6	-537.1	3.2	ND	6.69	1906	140	322	332	121	61.4	2.2	11600	7230	1330
	1-Nov-17	1236965-6	6.73	2284.7	2.20	1329.8	2.20	ND	7.06	2520	146	375	432	125	70	2.0	<50	9560	1590
CSR Drinking Water (DW) Standards (a)			ns	ns	ns	ns	ns	ns	ns	ns	250	500	ns	ns	200	ns	6500	1500	ns
CSR Aquatic Life (AW) Standards (a)			ns	ns	ns	ns	ns	ns	ns	ns	1500	4290 <sup>(H)</sup>	ns	ns	ns	ns	ns	ns	ns
																		Checked By: Tomas Navratil	

Notes:

<sup>(a)</sup> British Columbia Contaminated Sites Regulation (CSR), Stage 10 Omnibus Amendments, Environment Management Act, Ministerial Order No.14426, Generic Numerical Water Standards, Schedule 3.2 Drinking Water (DW) and Aquatic Life (AW) values (BC MoE, 2017)

<sup>(1)</sup> Guideline value dependent on Cl concentration, range listed.

<sup>(2)</sup> If comparing to DW unit of measurement is µg/L. If comparing to AW and LW unit of measurement is mg/L

\*Data obtained from the 2016 Baseline Groundwater Monitoring and Sampling Report, Golder Associates, January 2017

H - Standard is hardness dependant

mg/L - milligrams per litre

µg/L - micrograms per litre

µS/cm - microSiemens per centimetre

ns - no standard

~ - no data available

mV - millivolts

ppm - parts per million

mg CaCO<sub>3</sub>/L - milligrams calcium carbonate per litre

NR - not recorded

ND - not detected

Exceeds Criteria





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Table 3

**Summary of Groundwater Analytical Results - Petroleum Hydrocarbons**

Monitor Well ID	Sample Date	Lab Sample ID	Benzene	Toluene	Ethylbenzene	Xylenes	VH <sub>WE-10</sub>	VPHw	EPH <sub>WE-10-19</sub>	LEPHw	HEPHw
Units			µg/L								
MW15-2	28-Oct-16*	L1850699-3	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
MW15-4	28-Oct-16*	L1850699-6	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-1	<1	<1	<1	<1	<50	<50	<200	<200	<200
MW15-5	28-Oct-16*	L1850699-11	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-2	<1	<1	<1	<1	<50	<50	<200	<200	<200
MW15-6	28-Oct-16*	L1850699-5	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-3	<1	<1	<1	<1	<50	<50	<200	<200	<200
MW15-7	28-Oct-16*	L1850699-4	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-4	<1	<1	<1	<1	<50	<50	<200	<200	<200
MW15-8	28-Oct-16*	L1850699-1	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-5	<1	<1	<1	<1	<50	<50	<200	<200	<200
MW15-9	28-Oct-16*	L1850699-2	<0.5	<0.5	<0.5	<0.5	<100	<100	<250	<250	<250
	1-Nov-17	1236965-6	<1	<1	<1	<1	<50	<50	<200	<200	<200
CSR Drinking Water (DW) Standards <sup>(a)</sup>			5	60	140	90	15000	ns	5000	ns	ns
CSR Aquatic Life (AW) Standards <sup>(a)</sup>			400	5	2000	300	15000	1500	5000	500	ns
									Checked By: Tomas Navratil		

**Notes:**

<sup>(a)</sup> British Columbia Contaminated Sites Regulation (CSR), Stage 10 Omnibus Amendments, Environment Management Act, Ministerial Order No.14426. Generic Numerical Water Standards, Schedule 3.2 Drinking Water (DW) and Aquatic Life (AW) values (BC MoE, 2017)

\*Data obtained from the 2016 Baseline Groundwater Monitoring and Sampling Report, Golder Associates, January 2017

VH<sub>WE-10</sub> - includes volatile petroleum hydrocarbons

VPHw - includes volatile petroleum hydrocarbons with the exception of benzene, toluene, ethylbenzene and xylenes

EPH<sub>WE-10-19</sub> - includes light extractable petroleum hydrocarbons

LEPHw - includes light extractable petroleum hydrocarbons with the exception of acenaphthene, acridine, anthracene, fluorene, naphthalene and phenanthrene

ns - no standard

µg/L - micrograms per litre

~ - no data available

ns - no standard



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Table 4

**Summary of Groundwater Analytical Results - Polycyclic Aromatic Hydrocarbons**

Monitor Well ID	Sample Collection Date	Lab Sample ID	Acenaphthene	Acridine	Anthracene	Chrysene	Fluorene	Naphthalene	Phenanthrene	Benzo(a)anthracene	Benzo(a)pyrene	Pyrene	Quinoline
Units			µg/L										
MW15-2	28-Oct-16	L1850699-3*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW15-4	28-Oct-16	L1850699-6*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-1	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
MW15-5	28-Oct-16	L1850699-11*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-2	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
MW15-6	28-Oct-16	L1850699-5*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-3	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
MW15-7	28-Oct-16	L1850699-4*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-4	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
MW15-8	28-Oct-16	L1850699-1*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-5	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
MW15-9	28-Oct-16	L1850699-2*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	1-Nov-17	1236965-6	<0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.02	<0.34
CSR Drinking Water (DW) Standards <sup>(a)</sup>			250	ns	1000	7	150	80	ns	0.07	0.01	100	0.05
CSR Aquatic Life (AW) Standards <sup>(a)</sup>			60	0.5	1	1	120	10	3	1	0.1	0.2	34
Checked By:										Tomas Navratil			

**Notes:**

<sup>(a)</sup> British Columbia Contaminated Sites Regulation (CSR), Stage 10 Omnibus Amendments, Environment Management Act, Ministerial Order No.14426. Generic Numerical Water Standards, Schedule 3.2 Drinking Water (DW) and Aquatic Life (AW) values (BC MoE, 2017)

\*Data obtained from the 2016 Baseline Groundwater Monitoring and Sampling Report, Golder Associates, January 2017

mbgs - metres below ground surface

µg/L - micrograms per litre

ns - no standard



Normtek Radiation Services Ltd.  
9676 Swanson Street Fort St. John  
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Table 5

Summary of Groundwater Analytical Results - Dissolved Metals

Monitoring Well ID	Sample Collection Date	Lab Sample ID	Aluminum (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Boron (B)	Cadmium (Cd)	Chromium (total)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Thallium (Tl)	Titanium (Ti)	Uranium (U)	Vanadium (V)	Zinc (Zn)	Lithium (Li)			
			µg/L																								
MW15-2	28-Oct-16	L1850699-3	<10	<0.5	<1	<20	<5	<100	0.364	<0.5	<5	16	<1	<0.2	12	<5	5.5	<0.05	<0.2	<50	19.8	<30	<5	<50			
MW15-4	28-Oct-16	L1850699-6	<10	0.71	0.13	30	<10	200	0.09	<0.5	8.2	7.9	<1	<0.2	0.0033	8.6	<1	<0.05	<0.2	<50	178	<60	17	398			
	1-Nov-17	1236965-1	97	<1	1	37	<0.5	253	0.1	<2	4.8	7	<0.5	<0.005	<5	12.0	<1	<0.05	<0.3	<2	185	0.8	9	428			
MW15-5	28-Oct-16	L1850699-11	<10	<0.5	<1	34	<5	120	0.106	<0.5	2.6	2.5	<1	<0.2	0.0016	<5	<1	<0.05	<0.2	<50	79.4	<30	12	281			
	1-Nov-17	1236965-2	276	<1	<1	32	<0.5	79	0.07	<2	1.0	<5	<0.5	<0.005	<5	4.0	<1	<0.05	<0.3	<2	60.0	<0.5	14	211			
MW15-6	28-Oct-16	L1850699-5	<10	<0.5	<1	46	<5	280	0.062	<0.5	<5	5.0	<1	<0.2	0.0016	<5	13.7	<0.05	<0.2	<50	80.9	<30	7	291			
	1-Nov-17	1236965-3	94	<0.4	0.4	27	<0.2	259	0.32	<1	0.7	3	<0.2	<0.005	<2	4.4	1.0	<0.02	<0.1	<1	75.9	0.3	4	244			
MW15-7	28-Oct-16	L1850699-4	92	0.84	6.5	107	<5	220	<0.5	0.003	36	2.6	<1	<0.2	0.0015	69.9	2.8	0.08	<0.2	<50	57.2	<30	11.7	138			
	1-Nov-17	1236965-4	105	0.5	4.1	63	<0.2	157	<0.02	2.7	32.2	<2	<0.2	<0.005	<2	68.4	2.3	<0.02	<0.1	<2	37.7	2.5	10	66			
MW15-8	28-Oct-16	L1850699-1	<10	0.82	1.6	25	<10	380	0.79	<0.5	5.6	11.1	<1	<0.2	0.0034	8.4	1.2	<0.05	<0.2	<50	252	<60	<10	424			
	1-Nov-17	1236965-5	282	<1	1	23	<0.5	294	0.07	<2	0.6	5	<0.5	<0.005	<5	6.7	<1	<0.05	<0.3	<5	240	0.6	7	344			
MW15-9	28-Oct-16	L1850699-2	14	<0.5	3.5	114	<5	130	<0.5	<0.5	13.5	<10	<1	<0.2	0.0017	17.3	<1	<0.05	<0.2	<50	24.9	<30	32.2	<50			
	1-Nov-17	1236965-6	139	<0.4	2.3	99	<0.2	126	<0.02	<1	17	<2	<0.2	<0.005	9	25.1	0.8	<0.02	<0.1	<2	17	0.7	61	25			
CSR Drinking Water (DW) Standards <sup>(a)</sup>			9500	6	10	1000	8	5000	5	80	1	1500	10	1	250	80	10	20	0.04	ns	20	20	3000	8			
CSR Aquatic Life (AW) Standards <sup>(a)</sup>			ns	90	50	10000	1.5	12000	4 <sup>(b)</sup>	ns	40	90 <sup>(b)</sup>	160 <sup>(b)</sup>	0.25	10000	1500 <sup>(b)</sup>	20	15 <sup>(b)</sup>	3	1000	85	ns	75**	ns			
																				Checked By:				Tomas Navrati			

Notes:

(a) British Columbia Contaminated Sites Regulation (CSR), Stage 10 Omnibus Amendments, Environment Management Act Ministerial Order No.14426. Generic Numerical Water Standards, Schedule 3.2 Drinking Water (DW) and Aquatic Life (AW) values (BC MoE, 2017)

<sup>(2)</sup> Guideline value varies with pH, range listed.

µg/L - micrograms per litre

mg CaCO<sub>3</sub>/L - milligrams of calcium carbonate per litre

ns - no standard

\*Data obtained from the 2016 Baseline Groundwater Monitoring and Sampling Report, Golder Associates, January 2017

\*\*British Columbia Ministry of Environment and Climate Change Strategy, Protocol 10 For Contaminated Sites - Hardness for Site Specific Freshwater Standards for Zinc, Version 2.0 Nov, 2017.

H - Standard is hardness dependant

Exceeds Criteria

## FIGURES

Figure 1: Site Location



Prepared By:

Map Derived AER Disposition Spatial  
Processing Tool  
UTM Coordinates-NAD 83-UTM Zone 10  
Job Number: EAS0004438

Prepared For:



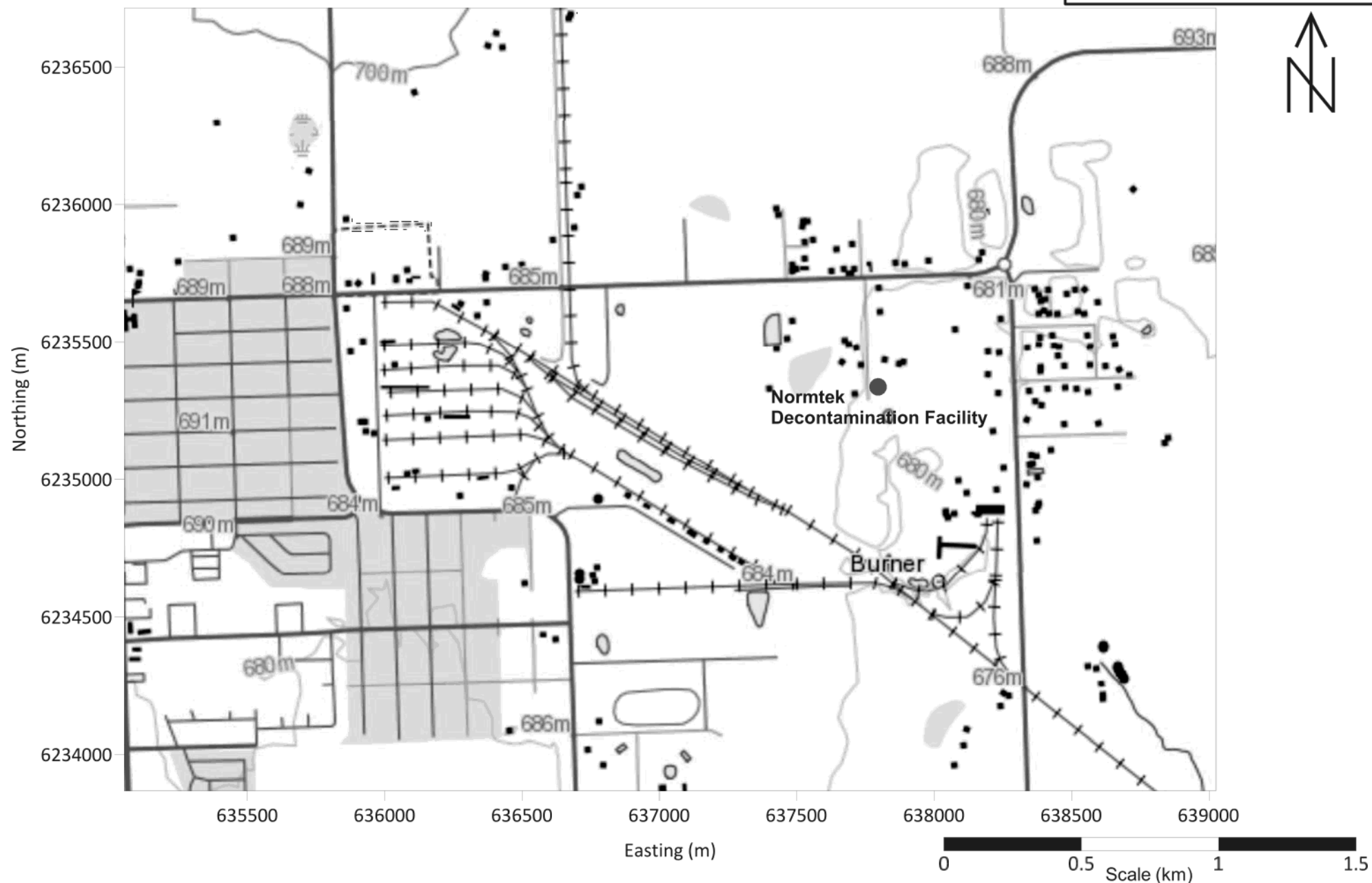
**LEGEND**

- Site Location
- Primary Highway

Normtek Radiation Services Ltd.  
Decontamination Facility  
9676 Swanson Street, Fort St. John, B.C.  
2-Nov-2017  
Project Manager: Jen Graham  
Technician: Andrew Arnold  
Summit Liability Solutions Inc.



Figure 2: Topographic Map



Prepared By:

Map Derived from Government of Canada  
GeoGratis Geo-Spatial Data  
UTM Coordinates-NAD 83-UTM Zone 10  
Job Number: EAS0004438

Prepared For:



**LEGEND**

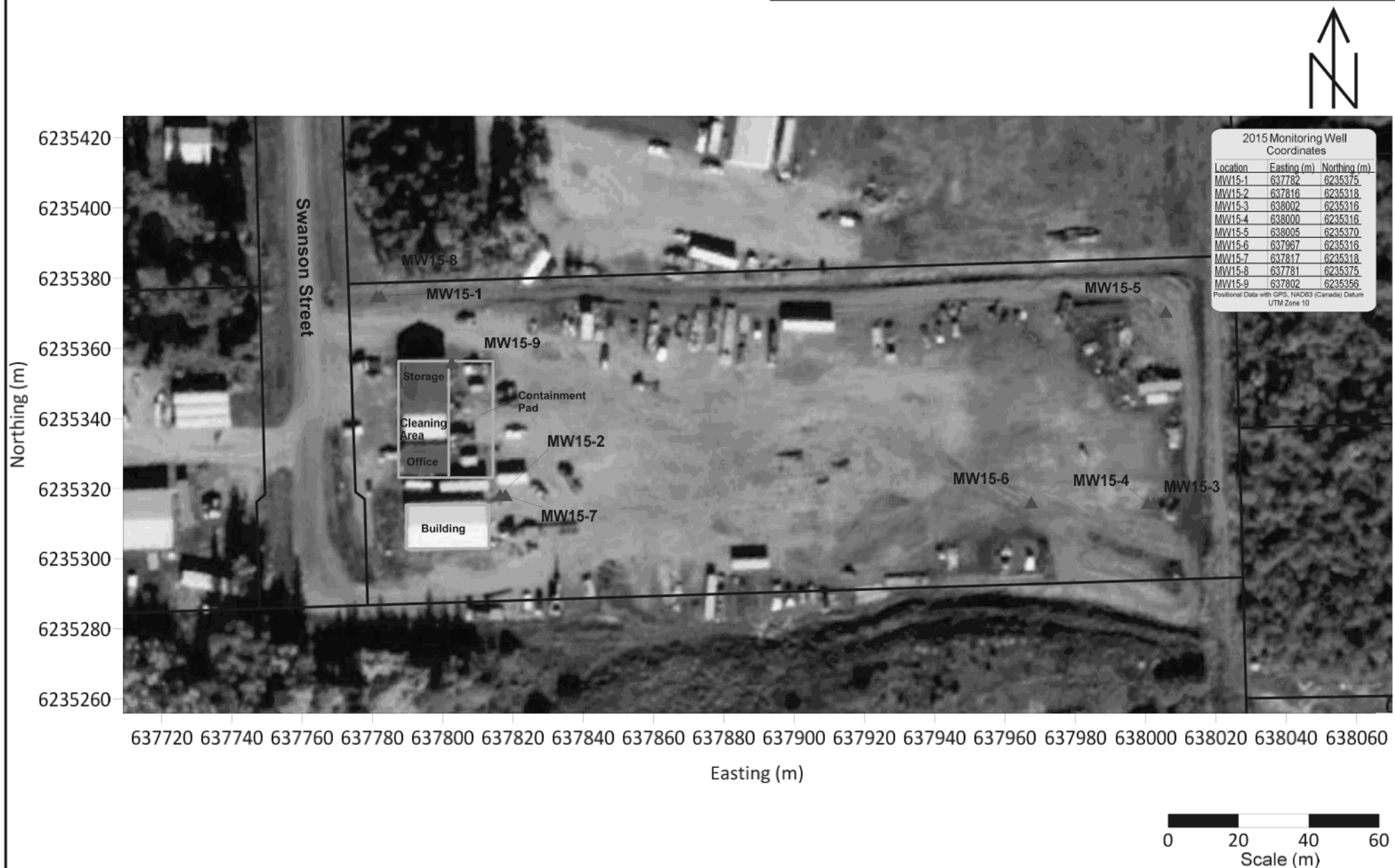
● Site Location

— Creek/Watercourse  
— Road

Normtek Radiation Services Ltd.  
Decontamination Facility  
9676 Swanson Street, Fort St. John, B.C.  
2-Nov-2017  
Project Manager: Jen Graham  
Technician: Andrew Arnold  
Summit Liability Solutions Inc.



Figure 3: Site Plan Showing Monitoring Well Locations



<p>Prepared By:</p>	<p>UTM Coordinates-NAD 83-UTM Zone 12 Job Number: EAS0004438</p>	<p><b>LEGEND</b></p> <ul style="list-style-type: none"> <li>▲ Monitoring Well Location - Below Standard Range</li> <li>▲ Monitoring Well Location - Above Standard Range For Routine Chemistry</li> </ul>	<p>Normtek Radiation Services Ltd. Decontamination Facility 9676 Swanson Street, Fort St. John, B.C. 2-Nov-2017 Project Manager: Jen Graham Technician: Andrew Arnold Summit Liability Solutions Inc.</p>
	<p>Prepared For:</p>		

**APPENDIX A**  
**WATER WELL RECONNAISSANCE DATA**





### Legend

- Water Wells - All

0 0.41 0.81 km

1: 20,000

### Copyright/Disclaimer

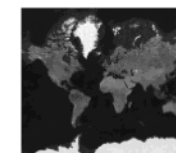
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Datum:

Projection: WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere

### Key Map of British Columbia



**APPENDIX B  
SITE PHOTOGRAPHS**

**Normtek**  
**9676 Swanson Street Fort St. John**  
**Daily Field Report**  
**1-Nov-2017**  
**EAS0004438**

Photograph 1: Viewing east at the entrance to the yard showing monitoring wells MW15-1 and MW15-8 and the Normtek office/shop building.



Photograph 2: Viewing south from the entrance to the yard toward monitoring wells MW15-2 and MW15-7.



**Normtek**  
**9676 Swanson Street Fort St. John**  
**Daily Field Report**  
**1-Nov-2017**  
**EAS0004438**

Photograph 3: Viewing east showing monitoring well MW15-5 in the northeast corner of the yard.



Photograph 4: Viewing west through the yard towards the Normtek office/shop building.



**Normtek**  
**9676 Swanson Street Fort St. John**  
**Daily Field Report**  
**1-Nov-2017**  
**EAS0004438**

Photograph 5: Viewing the exposed metal casing at the ground level of the monitoring well MW15-9.



Photograph 6: Viewing the stuck waterra tubing stuck in the well.



**APPENDIX C**  
**LABORATORY CERTIFICATES**

## Report Transmission Cover Page

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Proj. Acct. code:	

Contact	Company	Address
Accounts Payable	Summit Liability Solutions Inc.	Suite 110, 855-42nd Ave SE Calgary, AB T2G 1Y8 Phone: (403) 802-3633 Fax: Email: accounting@summitls.ca

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Jennifer Graham	Summit Liability Solutions Inc.	Vintage Park, Suite 110 885 - 42nd Ave S Calgary, AB T2G 1Y3 Phone: (780) 214-0070 Fax: Email: jgraham@summitls.ca
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Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Invoice
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Reverse Crosstab	Test Report

RecLloyd Results	Summit Liability Solutions Inc.	5006 - 18 Street Lloydminster, AB T9V 1V4 Phone: (000) 000-0000 Fax: Email: recloyd@summitls.ca
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Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Invoice
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Reverse Crosstab	Test Report

t navratil	Summit Liability Solutions Inc.	Vintage Park, Suite 110 885 - 42nd Ave S Calgary, AB T2G 1Y3 Phone: (780) 214-0070 Fax: Email: tnavratil@summitls.ca
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Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Test Report

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## Analytical Report

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions		

		Reference Number	1236965-1	1236965-2	1236965-3	
		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW15-4 / 2.0 C	MW15-5 / 2.0 C	MW15-6 / 2.0 C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
<b>Metals Dissolved</b>						
Iron	Dissolved	µg/L	<50	<50	<20	10
Manganese	Dissolved	µg/L	585	635	286	5
Silicon	Dissolved	mg/L	7.44	7.47	7.51	0.05
Sulfur	Dissolved	mg/L	1470	709	722	0.3
Aluminum	Dissolved	µg/L	97	276	94	2
Antimony	Dissolved	µg/L	<1	<1	<0.4	0.2
Arsenic	Dissolved	µg/L	1	<1	0.4	0.2
Barium	Dissolved	µg/L	37	32	27	1
Beryllium	Dissolved	µg/L	<0.5	<0.5	<0.2	0.1
Bismuth	Dissolved	µg/L	<2	<2	<1	0.5
Boron	Dissolved	µg/L	253	79	259	2
Cadmium	Dissolved	µg/L	0.1	0.07	0.32	0.01
Chromium	Dissolved	µg/L	<2	<2	<1	0.5
Cobalt	Dissolved	µg/L	4.8	1	0.7	0.1
Copper	Dissolved	µg/L	7	<5	3	1
Lead	Dissolved	µg/L	<0.5	<0.5	<0.2	0.1
Lithium	Dissolved	µg/L	428	211	244	1
Molybdenum	Dissolved	µg/L	<5	<5	<2	1
Nickel	Dissolved	µg/L	12	4	4.4	0.5
Selenium	Dissolved	µg/L	<1	<1	1	0.2
Silver	Dissolved	µg/L	<0.05	<0.05	<0.02	0.01
Strontium	Dissolved	µg/L	5630	2680	3080	1
Thallium	Dissolved	µg/L	<0.3	<0.3	<0.1	0.05
Tin	Dissolved	µg/L	<5	<5	<2	1
Titanium	Dissolved	µg/L	<2	<2	<1	0.5
Uranium	Dissolved	µg/L	185	60.0	75.9	0.5
Vanadium	Dissolved	µg/L	0.8	<0.5	0.3	0.1
Zinc	Dissolved	µg/L	9	14	4	1
Zirconium	Dissolved	µg/L	<5	<5	<2	1
Mercury	Dissolved	µg/L	<0.005	<0.005	<0.005	0.005
Subsample	Field Filtered		Lab Filtered	Lab Filtered	Lab Filtered	
<b>Routine Water</b>						
pH			7.48	7.48	7.45	
Temperature of observed		°C	20.5	20.4	20.4	
pH						
Electrical Conductivity	at 25 °C	µS/cm	6110	3820	3630	1
Electrical Conductivity	at 25 °C	dS/m	6.11	3.82	3.63	0.001
Calcium	Dissolved	mg/L	467	623	592	0.2
Magnesium	Dissolved	mg/L	923	350	342	0.2



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Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions		

		Reference Number	1236965-1	1236965-2	1236965-3	
		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW15-4 / 2.0 C	MW15-5 / 2.0 C	MW15-6 / 2.0 C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
<b>Routine Water - Continued</b>						
Sodium	Dissolved	mg/L	367	102	72.2	0.4
Potassium	Dissolved	mg/L	5.2	3	20.3	0.4
Chloride	Dissolved	mg/L	63.9	167	53.8	0.4
Sulfate (SO4)	Dissolved	mg/L	4410	2130	2170	0.9
Hardness	Dissolved as CaCO3	mg/L	4960	3000	2880	
SAR	Dissolved		2.3	0.8	0.6	
Salinity	Dissolved as NaCl	g/L	0.926	0.256	0.182	0.001
Sodium Chloride	Calculated	g/L	0.105	0.258	0.089	
<b>Mono-Aromatic Hydrocarbons - Water</b>						
Benzene		µg/L	<1	<1	<1	1
Ethylbenzene		µg/L	<1	<1	<1	1
Methyl t-Butyl Ether		µg/L	<1	<1	<1	1
Styrene		µg/L	<1	<1	<1	1
Toluene		µg/L	<0.5	<0.5	<0.5	0.5
Total Xylenes (m,p,o)		µg/L	<1	<1	<1	1
<b>Volatile Petroleum Hydrocarbons - Water</b>						
VHw6-10		µg/L	<50	<50	87	50
VPW (VHw6-10 minus BTEX)		µg/L	<50	<50	87	50
<b>Extractable Petroleum Hydrocarbons - Water</b>						
2-Methylnonane	Surrogate	%	82	78	77	60-140
EPHw10-19		µg/L	<200	<200	<200	200
LEPHw		µg/L	<200	<200	<200	200
EPHw19-32		µg/L	<200	<200	<200	200
HEPHw		µg/L	<200	<200	<200	200
<b>Polycyclic Aromatic Hydrocarbons - Water</b>						
Acenaphthene		µg/L	<0.1	<0.1	<0.1	0.1
Acenaphthylene		µg/L	<0.1	<0.1	<0.1	0.1
Acridine		µg/L	<0.05	<0.05	<0.05	0.05
Anthracene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(a)anthracene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(a)pyrene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(b)fluoranthene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(g,h,i)perylene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(k)fluoranthene		µg/L	<0.02	<0.02	<0.02	0.02
Chrysene		µg/L	<0.1	<0.1	<0.1	0.1
Dibenzo(a,h)anthracene		µg/L	<0.01	<0.01	<0.01	0.01
Fluoranthene		µg/L	<0.1	<0.1	<0.1	0.1
Fluorene		µg/L	<0.1	<0.1	<0.1	0.1

## Analytical Report

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions		

		Reference Number	1236965-1	1236965-2	1236965-3
		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017
		Sample Time	NA	NA	NA
		Sample Location			
		Sample Description	MW15-4 / 2.0 C	MW15-5 / 2.0 C	MW15-6 / 2.0 C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
<b>Polycyclic Aromatic Hydrocarbons - Water - Continued</b>					
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	0.1
Naphthalene	µg/L	<0.1	<0.1	<0.1	0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	0.1
Pyrene	µg/L	<0.02	<0.02	<0.02	0.02
Quinoline	µg/L	<0.34	<0.34	<0.34	0.34
<b>PAH - Water - Surrogate Recovery</b>					
2-Fluorobiphenyl	PAH - Surrogate	%	73.14	66.25	64.65
p-Terphenyl-d14	PAH - Surrogate	%	79.67	81.02	70.86
Naphthalene-d8	PAH - Surrogate	%	82.71	82.63	82.59
Quinoline-d7	PAH - Surrogate	%	108.40	94.31	96.78

## Analytical Report

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Proj. Acct. code:	

		Reference Number	1236965-4	1236965-5	1236965-6	
		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW15-7 / 2.0 C	MW15-8 / 2.0 C	MW15-9 / 2.0 C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
<b>Metals Dissolved</b>						
Iron	Dissolved	µg/L	23400	100	5670	10
Manganese	Dissolved	µg/L	8950	83	9560	5
Silicon	Dissolved	mg/L	7.08	7.81	7.12	0.05
Sulfur	Dissolved	mg/L	256	1230	125	0.3
Aluminum	Dissolved	µg/L	105	282	139	2
Antimony	Dissolved	µg/L	0.5	<1	<0.4	0.2
Arsenic	Dissolved	µg/L	4.1	1	2.3	0.2
Barium	Dissolved	µg/L	63	23	99	1
Beryllium	Dissolved	µg/L	<0.2	<0.5	<0.2	0.1
Bismuth	Dissolved	µg/L	<1	<2	<1	0.5
Boron	Dissolved	µg/L	157	294	126	2
Cadmium	Dissolved	µg/L	<0.02	0.07	<0.02	0.01
Chromium	Dissolved	µg/L	2.7	<2	<1	0.5
Cobalt	Dissolved	µg/L	32.2	0.6	17	0.1
Copper	Dissolved	µg/L	<2	5	<2	1
Lead	Dissolved	µg/L	<0.2	<0.5	<0.2	0.1
Lithium	Dissolved	µg/L	66	344	25	1
Molybdenum	Dissolved	µg/L	<2	<5	9	1
Nickel	Dissolved	µg/L	68.4	6.7	25.1	0.5
Selenium	Dissolved	µg/L	2.3	<1	0.8	0.2
Silver	Dissolved	µg/L	<0.02	<0.05	<0.02	0.01
Strontium	Dissolved	µg/L	1700	4530	1620	1
Thallium	Dissolved	µg/L	<0.1	<0.3	<0.1	0.05
Tin	Dissolved	µg/L	<2	<5	<2	1
Titanium	Dissolved	µg/L	2	<2	<1	0.5
Uranium	Dissolved	µg/L	37.7	240	17	0.5
Vanadium	Dissolved	µg/L	2.5	0.6	0.7	0.1
Zinc	Dissolved	µg/L	10	7	61	1
Zirconium	Dissolved	µg/L	17	<5	9	1
Mercury	Dissolved	µg/L	<0.005	<0.005	<0.005	0.005
Subsample	Field Filtered		Lab Filtered	Lab Filtered	Lab Filtered	
<b>Routine Water</b>						
pH			6.90	7.49	7.06	
Temperature of observed pH		°C	20.2	20.0	20.0	
Electrical Conductivity	at 25 °C	µS/cm	3260	5480	2520	1
Electrical Conductivity	at 25 °C	dS/m	3.26	5.48	2.52	0.001
Calcium	Dissolved	mg/L	369	526	432	0.2
Magnesium	Dissolved	mg/L	300	747	125	0.2

## Analytical Report


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		Reference Number	1236965-4	1236965-5	1236965-6	
		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	MW15-7 / 2.0 C	MW15-8 / 2.0 C	MW15-9 / 2.0 C	
		Matrix	Water	Water	Water	
Analyte		Units	Results	Results	Results	Nominal Detection Limit
<b>Routine Water - Continued</b>						
Sodium	Dissolved	mg/L	173	307	70.0	0.4
Potassium	Dissolved	mg/L	2	5.6	2.0	0.4
Chloride	Dissolved	mg/L	107	147	146	0.4
Sulfate (SO <sub>4</sub> )	Dissolved	mg/L	769	3690	375	0.9
Hardness	Dissolved as CaCO <sub>3</sub>	mg/L	2160	4390	1590	
SAR	Dissolved		1.6	2.0	0.8	
Salinity	Dissolved as NaCl	g/L	0.437	0.773	0.177	0.001
Sodium Chloride	Calculated	g/L	0.176	0.243	0.178	
<b>Mono-Aromatic Hydrocarbons - Water</b>						
Benzene		µg/L	<1	<1	<1	1
Ethylbenzene		µg/L	<1	<1	<1	1
Methyl t-Butyl Ether		µg/L	<1	<1	<1	1
Styrene		µg/L	<1	<1	<1	1
Toluene		µg/L	<0.5	<0.5	<0.5	0.5
Total Xylenes (m,p,o)		µg/L	<1	<1	<1	1
<b>Volatile Petroleum Hydrocarbons - Water</b>						
VHw6-10		µg/L	<50	<50	<50	50
VPW (VHw6-10 minus BTEX)		µg/L	<50	<50	<50	50
<b>Extractable Petroleum Hydrocarbons - Water</b>						
2-Methylnonane	Surrogate	%	81	73	74	60-140
EPHw10-19		µg/L	<200	<200	<200	200
LEPHw		µg/L	<200	<200	<200	200
EPHw19-32		µg/L	<200	<200	<200	200
HEPHw		µg/L	<200	<200	<200	200
<b>Polycyclic Aromatic Hydrocarbons - Water</b>						
Acenaphthene		µg/L	<0.1	<0.1	<0.1	0.1
Acenaphthylene		µg/L	<0.1	<0.1	<0.1	0.1
Acridine		µg/L	<0.05	<0.05	<0.05	0.05
Anthracene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(a)anthracene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(a)pyrene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(b)fluoranthene		µg/L	<0.01	<0.01	<0.01	0.01
Benzo(g,h,i)perylene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(k)fluoranthene		µg/L	<0.02	<0.02	<0.02	0.02
Chrysene		µg/L	<0.1	<0.1	<0.1	0.1
Dibenzo(a,h)anthracene		µg/L	<0.01	<0.01	<0.01	0.01
Fluoranthene		µg/L	<0.1	<0.1	<0.1	0.1
Fluorene		µg/L	<0.1	<0.1	<0.1	0.1

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		Sample Date	Nov 01, 2017	Nov 01, 2017	Nov 01, 2017
		Sample Time	NA	NA	NA
		Sample Location			
		Sample Description	MW15-7 / 2.0 C	MW15-8 / 2.0 C	MW15-9 / 2.0 C
		Matrix	Water	Water	Water
Analyte	Units	Results	Results	Results	Nominal Detection Limit
<b>Polycyclic Aromatic Hydrocarbons - Water - Continued</b>					
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	0.1
Naphthalene	µg/L	<0.1	<0.1	<0.1	0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	0.1
Pyrene	µg/L	<0.02	<0.02	<0.02	0.02
Quinoline	µg/L	<0.34	<0.34	<0.34	0.34
<b>PAH - Water - Surrogate Recovery</b>					
2-Fluorobiphenyl	PAH - Surrogate	%	76.28	64.62	75.71
p-Terphenyl-d14	PAH - Surrogate	%	82.18	81.54	93.28
Naphthalene-d8	PAH - Surrogate	%	79.72	82.95	82.96
Quinoline-d7	PAH - Surrogate	%	98.87	94.79	111.67

Approved by:   
 Randy Neumann, BSc  
 Vice President

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).  
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## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Proj. Acct. code:	

## Extractable Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
EPHw10-19	µg/mL	0.15	-2.500	2.500	yes
EPHw19-32	µg/mL	0.2	-2.500	2.500	yes

Date Acquired: November 03, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
C20	µg/mL	98.48	85	115	yes
EPHw10-19	µg/mL	93.99	70	130	yes
EPHw19-32	µg/mL	109.77	70	130	yes

Date Acquired: November 03, 2017

## Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.00964497	-0.04	0.05	yes
Sulfur	mg/L	-0.0205436	-0.3	0.2	yes
Mercury	µg/L	-0.0007151	-0.038000	0.064000	yes
Aluminum	µg/L	1.44449	-2	2	yes
Antimony	µg/L	-0.0134366	-0.2	0.2	yes
Arsenic	µg/L	-0.00460182	-0.2	0.2	yes
Barium	µg/L	0.0512501	-1	1	yes
Beryllium	µg/L	1.73364e-005	-0.0	0.1	yes
Bismuth	µg/L	-0.0487416	-1.5	1.5	yes
Boron	µg/L	-0.390122	-2	2	yes
Cadmium	µg/L	0.000940108	-0.01	0.01	yes
Chromium	µg/L	-0.0246317	-0.3	0.3	yes
Cobalt	µg/L	-0.00034256	-0.1	0.1	yes
Copper	µg/L	0.0419912	-1	1	yes
Lead	µg/L	-0.00413926	-0.1	0.1	yes
Lithium	µg/L	-0.162893	-1	1	yes
Molybdenum	µg/L	-0.0949991	-1	1	yes
Nickel	µg/L	0.0475045	-0.5	0.5	yes
Selenium	µg/L	-0.00616865	-0.2	0.2	yes
Silver	µg/L	-0.00455579	-0.10	0.10	yes
Strontium	µg/L	0.0180285	-1	1	yes
Thallium	µg/L	-0.000185457	-0.05	0.05	yes
Tin	µg/L	-0.112665	-1	1	yes
Titanium	µg/L	0.00385139	-0.5	0.5	yes
Uranium	µg/L	-0.0020165	-0.5	0.5	yes
Vanadium	µg/L	-0.0519754	-0.1	0.1	yes
Zinc	µg/L	1.15394	-0	2	yes
Zirconium	µg/L	-0.00163028	-1	1	yes

Date Acquired: November 06, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Sulfur	mg/L	2.2	2.2	10	0.1	yes

**Quality Control**

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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**Metals Dissolved - Continued**

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	<0.2	<0.2	10	0.4	yes
Arsenic	µg/L	0.9	0.9	10	0.4	yes
Barium	µg/L	105	108	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	175	185	10	4	yes
Cadmium	µg/L	0.03	0.04	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	0.2	0.2	10	0.2	yes
Copper	µg/L	1	1	10	2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	59	64	10	2	yes
Molybdenum	µg/L	2	2	10	2	yes
Nickel	µg/L	2.0	2.0	10	1.1	yes
Selenium	µg/L	0.2	0.2	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	131	129	10	2	yes
Thallium	µg/L	<0.05	<0.05	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	2.6	2.5	10	1.1	yes
Vanadium	µg/L	0.2	0.2	10	0.2	yes
Zinc	µg/L	<1	<1	10	2	yes

Date Acquired: November 06, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	mg/L	0.000429	0.000310	0.000490	yes
Aluminum	µg/L	966	938	1092	yes
Antimony	µg/L	39.0	35.2	43.0	yes
Arsenic	µg/L	40.5	36.7	43.3	yes
Barium	µg/L	193	186	210	yes
Beryllium	µg/L	18.8	17.3	22.1	yes
Bismuth	µg/L	101	95.7	114.3	yes
Boron	µg/L	387	344	434	yes
Cadmium	µg/L	2.05	1.86	2.25	yes
Chromium	µg/L	101	92.2	110.2	yes
Cobalt	µg/L	20.1	18.5	21.7	yes
Copper	µg/L	203	189	214	yes
Lead	µg/L	20.0	18.4	22.0	yes
Lithium	µg/L	187	175	223	yes
Molybdenum	µg/L	207	187	226	yes
Nickel	µg/L	101	94.3	106.5	yes
Selenium	µg/L	39.5	35.8	43.0	yes
Silver	µg/L	20.0	18.40	22.00	yes

**Quality Control**

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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**Metals Dissolved - Continued**

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Strontium	µg/L	202	180	216	yes
Thallium	µg/L	9.88	9.30	11.10	yes
Tin	µg/L	198	180	220	yes
Titanium	µg/L	101	92.4	110.4	yes
Uranium	µg/L	96.6	92.7	107.5	yes
Vanadium	µg/L	19.8	18.0	22.0	yes
Zinc	µg/L	205	183	219	yes
Zirconium	µg/L	212	180	220	yes
Date Acquired: November 06, 2017					
Mercury	mg/L	0.000097	0.000070	0.000130	yes
Date Acquired: November 07, 2017					
Mercury	mg/L	0.000019	0.000006	0.000036	yes
Aluminum	µg/L	52	45	55	yes
Antimony	µg/L	2.0	1.8	2.3	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	4.6	4.1	5.5	yes
Boron	µg/L	19	18	22	yes
Cadmium	µg/L	0.11	0.09	0.11	yes
Chromium	µg/L	5.0	4.5	5.5	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10	9	11	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	9	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.1	4.4	5.5	yes
Selenium	µg/L	1.9	1.7	2.2	yes
Silver	µg/L	0.99	0.84	1.08	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.50	0.47	0.56	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.4	4.5	5.5	yes
Uranium	µg/L	5.0	4.5	5.5	yes
Vanadium	µg/L	0.9	0.9	1.1	yes
Zinc	µg/L	10	9	11	yes
Zirconium	µg/L	11	9	11	yes
Date Acquired: November 06, 2017					
Silicon	mg/L	9.90	8.98	10.78	yes
Sulfur	mg/L	148	138.5	155.3	yes
Date Acquired: November 06, 2017					
Silicon	mg/L	2.08	1.88	2.24	yes
Sulfur	mg/L	10.4	9.2	11.0	yes
Date Acquired: November 06, 2017					



## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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### Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.22	0.18	0.22	yes
Sulfur	mg/L	3.0	2.8	3.3	yes

Date Acquired: November 06, 2017

### Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-1	1	yes
Ethylbenzene	ng	0	-1	1	yes
m,p-Xylene	ng	0	-1	1	yes
Methyl t-Butyl Ether	ng	0	-1	1	yes
o-Xylene	ng	0	-1	1	yes
Styrene	ng	0	-1	1	yes
Toluene	ng	0	-1.0	1.0	yes
Total Xylenes (m,p,o)	ng	0	-1	1	yes

Date Acquired: November 04, 2017

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	96.00	80	120	yes
Ethylbenzene	ng	90.00	80	120	yes
Methyl t-Butyl Ether	ng	96.00	80	120	yes
Styrene	ng	98.00	80	120	yes
Toluene	ng	106.00	80	120	yes
Total Xylenes (m,p,o)	ng	84.00	80	120	yes

Date Acquired: November 04, 2017

Benzene	ng	97.20	80	120	yes
Ethylbenzene	ng	89.40	80	120	yes
m,p-Xylene	ng	90.00	80	120	yes
Methyl t-Butyl Ether	ng	82.20	80	120	yes
o-Xylene	ng	89.20	80	120	yes
Styrene	ng	92.40	80	120	yes
Toluene	ng	87.60	80	120	yes
Total Xylenes (m,p,o)	ng	90.00	80	120	yes

Date Acquired: November 04, 2017

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	µg/L	7	8	25	5	yes
Ethylbenzene	µg/L	3	5	30	5	yes
Methyl t-Butyl Ether	µg/L	<1	<1	25	5	yes
Styrene	µg/L	<1	<1	25	5	yes
Toluene	µg/L	526	497	25	5.0	yes
Total Xylenes (m,p,o)	µg/L	43	47	30	5	yes

Date Acquired: November 04, 2017

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	µg/L	82	75	125	yes
Ethylbenzene	µg/L	83	70	130	yes
m,p-Xylene	µg/L	83	70	130	yes

## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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### Mono-Aromatic Hydrocarbons - Water -

#### Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Methyl t-Butyl Ether	µg/L	106	75	125	yes
o-Xylene	µg/L	86	70	130	yes
Styrene	µg/L	117	75	125	yes
Toluene	µg/L	76	75	125	yes
Total Xylenes (m,p,o)	µg/L	84	70	130	yes
Date Acquired: November 04, 2017					

### PAH - Water - Surrogate Recovery

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
2-Fluorobiphenyl	%	99.92	80	120	yes
p-Terphenyl-d14	%	101.05	80	120	yes
Naphthalene-d8	%	101.71	80	120	yes
Date Acquired: November 03, 2017					

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
2-Fluorobiphenyl	%	81.57	77.19	20	0.150	yes
p-Terphenyl-d14	%	86.83	87.40	20	0.250	yes
Naphthalene-d8	%	95.12	90.17	20	0.250	yes
Date Acquired: November 03, 2017						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
2-Fluorobiphenyl	%	81.57	50.100	129.900	yes
p-Terphenyl-d14	%	86.83	59.990	130.010	yes
Naphthalene-d8	%	95.12	50.100	129.900	yes
Date Acquired: November 03, 2017					

### Polycyclic Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Acenaphthene	ng/mL	0	-0.099	0.099	yes
Acenaphthylene	ng/mL	0	-0.099	0.099	yes
Acridine	ng/mL	0	-0.050	0.050	yes
Anthracene	ng/mL	0	-0.099	0.099	yes
Benzo(a)anthracene	ng/mL	0	-0.009	0.009	yes
Benzo(a)pyrene	ng/mL	0	-0.009	0.009	yes
Benzo(b)fluoranthene	ng/mL	0	-0.009	0.009	yes
Benzo(g,h,i)perylene	ng/mL	0	-0.099	0.099	yes
Benzo(k)fluoranthene	ng/mL	0	-0.020	0.020	yes
Chrysene	ng/mL	0	-0.099	0.099	yes
Dibenzo(a,h)anthracene	ng/mL	0	-0.009	0.009	yes
Fluoranthene	ng/mL	0	-0.099	0.099	yes
Fluorene	ng/mL	0	-0.099	0.099	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	0	-0.099	0.099	yes
Naphthalene	ng/mL	0	-0.099	0.099	yes
Phenanthrene	ng/mL	0	-0.099	0.099	yes

## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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## Polycyclic Aromatic Hydrocarbons - Water - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Pyrene	ng/mL	0.00257	-0.020	0.020	yes
Quinoline	ng/mL	0	-0.339	0.339	yes
Date Acquired: November 03, 2017					

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Acenaphthene	ng/mL	97.85	80	120	yes
Acenaphthylene	ng/mL	97.75	80	120	yes
Acridine	ng/mL	98.25	80	120	yes
Anthracene	ng/mL	98.43	80	120	yes
Benzo(a)anthracene	ng/mL	98.10	80	120	yes
Benzo(a)pyrene	ng/mL	100.05	80	120	yes
Benzo(b)fluoranthene	ng/mL	100.42	80	120	yes
Benzo(g,h,i)perylene	ng/mL	98.66	80	120	yes
Benzo(k)fluoranthene	ng/mL	98.52	80	120	yes
Chrysene	ng/mL	97.81	80	120	yes
Dibenzo(a,h)anthracene	ng/mL	100.75	80	120	yes
Fluoranthene	ng/mL	97.81	80	120	yes
Fluorene	ng/mL	98.30	80	120	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	105.76	80	120	yes
Naphthalene	ng/mL	98.60	80	120	yes
Phenanthrene	ng/mL	98.62	80	120	yes
Pyrene	ng/mL	97.62	80	120	yes
Quinoline	ng/mL	96.12	80	120	yes
Date Acquired: November 03, 2017					

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Acenaphthene	µg/L	<0.1	<0.1	20	0.500	yes
Acenaphthylene	µg/L	<0.1	<0.1	20	0.500	yes
Acridine	µg/L	0.09	0.09	20	0.250	yes
Anthracene	µg/L	<0.1	<0.1	20	0.500	yes
Benzo(a)anthracene	µg/L	0.09	0.09	20	0.050	yes
Benzo(a)pyrene	µg/L	0.09	0.08	20	0.050	yes
Benzo(b)fluoranthene	µg/L	0.09	0.09	20	0.050	yes
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	20	0.500	yes
Benzo(k)fluoranthene	µg/L	0.09	0.09	20	0.100	yes
Chrysene	µg/L	<0.1	<0.1	20	0.500	yes
Dibenzo(a,h)anthracene	µg/L	0.096	0.096	20	0.050	yes
Fluoranthene	µg/L	<0.1	<0.1	20	0.500	yes
Fluorene	µg/L	<0.1	<0.1	20	0.500	yes
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	20	0.500	yes
Naphthalene	µg/L	<0.1	<0.1	20	0.500	yes
Phenanthrene	µg/L	<0.1	<0.1	20	0.500	yes
Pyrene	µg/L	0.09	0.08	20	0.100	yes
Quinoline	µg/L	<0.34	<0.34	20	1.700	yes
Date Acquired: November 03, 2017						

## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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## Polycyclic Aromatic Hydrocarbons - Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Acenaphthene	µg/L	94.9	50.010	129.990	yes
Acenaphthylene	µg/L	90.2	50.010	129.990	yes
Acridine	µg/L	91.00	59.990	130.010	yes
Anthracene	µg/L	88.5	59.990	130.010	yes
Benzo(a)anthracene	µg/L	92.03	59.990	130.010	yes
Benzo(a)pyrene	µg/L	89.12	59.990	130.010	yes
Benzo(b)fluoranthene	µg/L	89.27	59.990	130.010	yes
Benzo(g,h,i)perylene	µg/L	89.0	59.990	130.010	yes
Benzo(k)fluoranthene	µg/L	94.80	59.990	130.010	yes
Chrysene	µg/L	89.0	59.990	130.010	yes
Dibenzo(a,h)anthracene	µg/L	96.40	59.990	130.010	yes
Fluoranthene	µg/L	90.4	59.990	130.010	yes
Fluorene	µg/L	86.7	50.010	129.990	yes
Indeno(1,2,3-c,d)pyrene	µg/L	93.7	59.990	130.010	yes
Naphthalene	µg/L	96.7	50.010	129.990	yes
Phenanthrene	µg/L	96.2	59.990	130.010	yes
Pyrene	µg/L	89.32	59.990	130.010	yes
Quinoline	µg/L	109.55	50.010	129.990	yes

Date Acquired: November 03, 2017

## Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0194311	-0.2	0.2	yes
Magnesium	mg/L	-0.014406	-0.1	0.1	yes
Sodium	mg/L	0.00688318	-0.4	0.4	yes
Potassium	mg/L	0.0110505	-0.4	0.4	yes
Iron	mg/L	0.00780416	-0.01	0.01	yes
Manganese	mg/L	0.000329571	-0.004	0.004	yes
Chloride	mg/L	0.28	-0.4	0.4	yes

Date Acquired: November 05, 2017

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.00	6.95	0	0.10	yes
Electrical Conductivity	dS/m	13.3	13.7	10	0.002	yes
Calcium	mg/L	82.5	82.4	10	0.6	yes
Magnesium	mg/L	10.4	10.3	10	0.7	yes
Sodium	mg/L	4.4	4.4	10	1.2	yes
Potassium	mg/L	1.4	1.4	10	1.2	yes
Iron	mg/L	<0.01	<0.01	10	0.05	yes
Manganese	mg/L	<0.005	<0.005	10	0.010	yes
Chloride	mg/L	2.7	2.7	10	0.5	yes

Date Acquired: November 05, 2017

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH		9.15	8.90	9.44	yes

## Quality Control

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8 Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.: Proj. Acct. code:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
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### Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	2.73	2.600	2.858	yes
Calcium	mg/L	249	230.0	260.0	yes
Magnesium	mg/L	96.3	92.3	102.0	yes
Sodium	mg/L	243	233.3	257.3	yes
Potassium	mg/L	244	229.0	259.0	yes
Iron	mg/L	9.73	8.91	10.20	yes
Manganese	mg/L	2.40	2.240	2.540	yes
Date Acquired: November 06, 2017					
pH		6.88	6.78	6.96	yes
Electrical Conductivity	dS/m	0.078	0.069	0.083	yes
Calcium	mg/L	53.0	44.9	56.9	yes
Magnesium	mg/L	20.2	17.9	22.0	yes
Sodium	mg/L	52.4	47.7	55.5	yes
Potassium	mg/L	51.9	45.8	55.8	yes
Iron	mg/L	2.14	1.89	2.25	yes
Manganese	mg/L	0.525	0.468	0.552	yes
Chloride	mg/L	84.3	74.9	86.9	yes
Date Acquired: November 05, 2017					
Calcium	mg/L	5.3	4.6	5.7	yes
Magnesium	mg/L	2.0	1.8	2.2	yes
Sodium	mg/L	5.5	4.7	5.7	yes
Potassium	mg/L	5.4	4.5	5.5	yes
Iron	mg/L	0.22	0.19	0.24	yes
Manganese	mg/L	0.056	0.048	0.058	yes
Chloride	mg/L	15.0	13.3	16.5	yes
Date Acquired: November 05, 2017					

### Volatile Petroleum Hydrocarbons - Water

<b>Blanks</b>		<b>Units</b>	<b>Measured</b>	<b>Lower Limit</b>	<b>Upper Limit</b>	<b>Passed QC</b>	
VHw6-10		ng	0	-50	50	yes	
Date Acquired: November 04, 2017							
<b>Replicates</b>		<b>Units</b>	<b>Replicate 1</b>	<b>Replicate 2</b>	<b>% RSD Criteria</b>	<b>Absolute Criteria</b>	<b>Passed QC</b>
VHw6-10		µg/L	624	583	25		yes
VPHw (VHw6-10 minus		µg/L	<50	<50	25		yes
Date Acquired: November 04, 2017							

## Methodology and Notes

Bill To: Summit Liability Solutions Inc. Suite 110, 855-42nd Ave SE Calgary, AB, Canada T2G 1Y8	Project ID: EAS 0004438 Project Name: Normtek FSJ Project Location: 9676 Swanson Rd FSJ LSD: P.O.:	Lot ID: <b>1236965</b> Control Number: C0076819 Date Received: Nov 2, 2017 Date Reported: Nov 8, 2017 Report Number: 2239039
Attn: Accounts Payable Sampled By: Tomas & Beth Company: Summit Liability Solutions	Proj. Acct. code:	

## Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* Conductivity, 2510 B	Nov 6, 2017	Exova Edmonton
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	Nov 6, 2017	Exova Edmonton
BTEX-VPH - Water (MS) (FSJ)	BCELM	* Volatile Hydrocarbons in Water by GC/FID, VH Water	Nov 4, 2017	Exova Fort St. John
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl-E	Nov 5, 2017	Exova Edmonton
EPH - Water (Surrey)	BCELM	Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Waters (LEPH & HEPH)., LEPH/HEPH Calculation	Nov 3, 2017	Exova Surrey
EPH - Water (Surrey)	BCELM	* Extractable Petroleum Hydrocarbons (EPH) in Water by GC/FID, EPH Water	Nov 3, 2017	Exova Surrey
Mercury (Dissolved) in water	APHA	* Cold Vapour Atomic Absorption Spectrometric Method, 3112 B	Nov 7, 2017	Exova Edmonton
Metals ICP-MS (Dissolved) in water	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 6, 2017	Exova Edmonton
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	Nov 5, 2017	Exova Edmonton
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 5, 2017	Exova Edmonton
PAH - Water (Surrey)	BCELM	* Polycyclic Aromatic Hydrocarbons in Water by GC/MS - PBM, PAH Water	Nov 3, 2017	Exova Surrey

\* Reference Method Modified

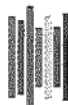
## References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
BCELM	B.C. Environmental Laboratory Manual
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



Project Information

Project ID: EAS 0004438  
Project Name: Normtek EST  
Project Location: 9676 Swanson Rd EST  
Legal Location: \_\_\_\_\_  
PO/AFE#: \_\_\_\_\_  
Proj. Acct. Code: \_\_\_\_\_  
Quote #: \_\_\_\_\_

Invoice to:

Company: \_\_\_\_\_  
Address: \_\_\_\_\_

Attention: \_\_\_\_\_

Phone: \_\_\_\_\_

Cell: \_\_\_\_\_

Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

Agreement ID: \_\_\_\_\_

Copy of report: \_\_\_\_\_

Report To:

Company: Summit Liability Solutions  
Address: \_\_\_\_\_

Attention: Jennifer Graham

Phone: \_\_\_\_\_

Cell: \_\_\_\_\_

Fax: \_\_\_\_\_

E-mail 1: jgraham@summitls.ca

E-mail 2: #fna.vrati1@summitls.ca

Copy of invoice: \_\_\_\_\_

Report Results

E-Mail ☒  
Mail ☐  
Online ☐  
Fax ☐  
PDF ☐  
Excel ☐  
QA/QC ☐

Regulatory Requirement

HCDWQG  
Ab Tier 1  
SPIGEC  
BCCSR  
Other (list below)

Sample Custody (please print)

Sampled by: Tomas & Beth

Company: Summit Liability Solutions

This section for Lab use only

Date/Time stamp:

NOV 2 10:11 AM

RUSH Priority

Emergency (contact lab for turnaround and pricing)

Priority 1-2 working days (100% surcharge)

Urgent 2-3 working days (50% surcharge)

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Date Required: Regular - No rush

Signature: Beth

Special Instructions/Comments (please include contact information including ph. # if different from above).

Site I.D.	Sample Description	Depth start end in cm m	Date/Time Sampled	Matrix	Sampling Method
1	MWIS-4		NOV 2017	water	
2	MWIS-5				
3	MWIS-6				
4	MWIS-7				
5	MWIS-8				
6	MWIS-9				
7					
8					
9					
10					
11					
12					
13					
14					
15					

Number of Containers

Detailed Salinities  
Dissolved Metals  
Mercury  
BTEX  
EPH10-19 EPH19-32  
ALPHA/HEPH  
PAH  
VPH  
VH6-10

Enter tests above  
(✓ relevant samples below)

Indicate in the space allotted any deficiencies by the corresponding number.

1. Indicate any samples that were not packaged well
2. Indicate any samples not received in Exova supplies
3. Indicate any samples that were not clearly labeled
4. Indicate any samples not received within the required hold time or temp.
5. Indicate any missing or extra samples
6. Indicate any samples that were received broken
7. Indicate any samples where sufficient volume was not received
8. Indicate any samples received in an inappropriate container

Submission of this form acknowledges acceptance of Exova's Standard Terms and Conditions (<http://www.exova.com/about/terms-and-conditions/>)

Please indicate any potentially hazardous samples

Page 1 of 1

Control # C 0076819

Lot: 1236965 COC



Shipping: COD Y/ N

# and size of coolers

Temp. received:

2.0

Delivery Method:

Waybill:

Received by: HM



**NORMTEK RADIATION SERVICES LTD  
HAZARDOUS WASTE FACILITY  
AUTHORIZATION RS107598  
2016 ANNUAL REPORT**

**Date: Jan 28, 2017**



**Normtek Annual Report**  
**Authorization Number: RS 107598**  
**Facility Location 9676 Swanson Street Fort St. John BC V1J 4J2**

**1) A summary of monthly records of waste received, shipped and processed with the month-end inventory (including tank bottom waste generated);**

A total of 135 shipments of NORM impacted waste and equipment was received at the Normtek's Facility in 2016. Of these shipments 19 shipments were pond, vessel or tank bottom wastes, 3 produced water filter waste, 1 frac sand and 113 contaminated equipment. Normtek follows the IAEA recommendations in managing waste at the point of generation and as such any pond, tank or vessel waste that could be collected, classified and shipped direct to disposal was completed. Normtek accepted waste that required dewatering, bulking or cleaning at its waste management facility. The following outlines the volumes of waste received and disposed of at the Normtek facility.

Normtek receives solid NORM pond, vessel and tank bottom waste and processes by removing the produced waters from the sludge. Sludge being disposed of at licensed NORM salt caverns and liquids disposed of at Class 1B disposal wells. Normtek also receives solid NORM waste in the form of equipment or mixed waste such as produced water filters, PPE, pond liners or tarp. Waste which cannot be decontaminated to below Health Canada's UDRL is sent for NORM Landfill disposal (Silverberry). Wash waters are collected and disposed of in a Class 1B disposal well and solids are separated and sent for licensed salt cavern disposal. Recyclable materials are sent to scrap metal yards.

<b>Waste Description</b>	<b>Volume (Tonnes)</b>
Waste Inventory from Previous Year	21.82
NORM Pond, Vessel or Tank Bottom Waste Received at Facility	115.00
NORM Produced Water Filters Received at Facility	8.28
Generated Leachable Toxic Waste for Decontamination Activities (Pipeline Tools and Filters)	6.00
Produced Water Removed from pond, vessel or Tank Bottoms	41.62
Wash Water generated at Facility (Decontamination activities)	106.21
Wash Water Disposed of at Class 1B disposal Well	126.83
NORM Waste Disposed of at Salt Cavern Facilities	88.00
NORM Waste Disposed of at Silverberry Landfill	7.79
NORM Waste Sent Direct from Field to Salt Cavern Disposal	256.00
Inventory of Tank Bottom Leachable Toxic Waste for Salt Cavern Disposal at Dec 31, 2016	13.20
Inventory of Wash Water for Class 1B Disposal Well on Dec 31, 2016	21.00

Normtek started with 21.82 tonnes of waste at the beginning of the reporting year and received a total of 115.00 tonnes of NORM pond, vessel or tank bottom waste. Normtek generated 6 tonnes of leachable toxic solids with 106.21 tonnes of wash waters from decontaminating equipment for a total of 249.03 tonnes. Normtek processed the waste received and disposed of 88 tonnes sludge to salt

caverns, 126.83 tonnes wash waters to Class 1B Disposal wells and had an inventory of 13.2 tonnes at the end of the reporting period for a total of 249.03 tonnes. At no time did the total Leachable Toxic Waste (Tank Bottoms) exceed 100 tonne (100,000) Kg on site during any given month.

## **2) Summary of any manifest discrepancies**

All manifests received were recorded with the descriptor "Naturally Occurring Radioactive Materials - NORM". No shipments were identified to have a secondary hazard of "Leachable Toxic Waste" including vessel or tank bottom waste and produced water filters. Normtek considers all tank bottom waste received from generators to potentially contain leachable toxic waste unless proven otherwise. No discrepancies in vessel or tank bottom or produced water filter waste volumes were noted in 2016.

## **3) Summary of the results of all monitoring programs;**

The following monitoring programs are related to monitoring of radioactive materials and not the BC hazardous waste Regulations. These monitoring programs follow the best safety principles and practices of radiation protection as outlined by the International Atomic Energy Agency (IAEA). Canada has signed international agreements with the IAEA outlining Canada's commitment to radiation safety and that which is expected by provincial and federal governments. The IAEA outlines the requirements for regulatory control, however, the BC Ministry of Environment has not developed any regulations for radioactive materials with the exception discharges to the environment require an approval. As such companies that handle, store, use, process or possess are not regulated. As the B.C. Ministry of Environments has no NORM waste or radioactive waste regulations or codes of practice, Normtek follows requirements of the Alberta Energy Regulator and IAEA waste management best Practices as related to their facility monitoring programs.

### **a) Fence Line Gamma Dose Rate Monitoring**

Fence line monitoring conducted by Normtek is for the purpose of verifying potential exposures to members of the public from gamma radiation emitted from radioactive materials and is not a requirement under the hazardous waste regulations. Fence line gamma radiation dose rates are recorded monthly. The maximum exposure limits for members of the public is 1000  $\mu\text{Sv/a}$ , above background, as provided for under Canada's Radiation Protection Regulations and the Canadian NORM Guidelines. The Canadian NORM Guidelines also provides for a 2000 hour work year for incidentally exposed workers whom may be subject to a continuous gamma radiation field of 0.5  $\mu\text{Sv/hr}$  (above background). No hourly limit per year has been provided for members of the public. Normtek conservatively utilizes 200 hours per year. It is highly unlikely a member of the public will spend 200 hours at the Normtek facility fence line. Based off this conservative timeline the exposure at the fence line should not exceed 1.5  $\mu\text{Sv/hr}$ . In 2016, Normtek was able to maintain fence line gamma dose rates at background levels.

### **b) Worker gamma exposure Monitoring**

Worker gamma exposure monitoring is conducted by Normtek for the purpose of verifying annual gamma radiation exposures to workers from operations. Verifying Worker exposures from radioactive materials is not a requirement under the hazardous waste regulations. As a

radiation protection best practice Normtek employees are badged under Health Canada's national dosimetry program. No workers were exposed to gamma radiation in excess of 1000  $\mu\text{Sv/a}$  in 2016.

**c) Low Level Radioactive (LLRD) Dust Monitoring**

Low level radioactive dust monitoring is a radiation best practice if there is a potential for LLRD's BC Occupational Health and Safety Regulations requires monitoring if a worker may be subject o hazardous substances (Section 5) The BC hazardous waste regulations do not require monitoring of LLRD's. Normtek's monitoring of LLRD's showed no elevated readings to be found that were distinguishable from background from operations.

**d) Decontamination Pad Crack Monitoring**

Monitoring of Normtek's decontamination pad for cracks is completed by Normtek as it can contain open NORM contamination from decontaminating equipment that is not under regulatory control of the BC hazardous waste regulations. Alberta set a precedence of requiring their licensed NORM decontamination facility to monitor cracks in their decontamination pad and repair accordingly. Normtek inspects and repairs cracks each spring after the ground has thawed from winter. In addition monthly monitoring of cracks is completed and repairs instigated of any cracks which appear to pose an integrity issue. Normtek maintained repair of all cracks within accordance with its internal procedures. .

**e) Surface Contamination Monitoring**

Occupational Health and Safety Regulations requires monitoring of work sites if an employer has a potential to subject a worker to a hazardous substance (Section 5). The BC hazardous waste regulations do not outline NORM to be a hazardous substance however it is clearly documented that NORM is hazardous to health. As such, Normtek conducts surface contamination monitoring of its lunchroom, washroom and work benches to verify contamination control methods are effective. This monitoring is a radiation best practice as documented by the IAEA and incorporated by Normtek.

**f) Radon Gas Monitoring**

Occupational Health and Safety Regulations requires monitoring of work sites if an employer has a potential to subject a worker to a hazardous substance. The BC hazardous waste regulations do not outline NORM to be a hazardous substance. Radon gas monitoring showed no elevated radon levels above background within Normtek's indoor decontamination bay.

#### **4) Assessment of the groundwater and surface water monitoring data**

Ground water monitoring wells were installed as per Normtek's ground water monitoring plan developed by Ghostpine Environmental in Sept 2015. Attached (appendix A) is their report received by Normtek July 11, 2016. Since the sampling had been done over 6 months prior to receiving the report Normtek hired Golder and Associates to complete further testing attached (Appendix B) is their report accordingly.

Both reports outline high levels of uranium within the ground waters. These are indicator that the natural background is high within these ground waters and not from operations associated with Normtek's business as Normtek has not received an uranium impacted materials. Although the Hazardous waste Regulations do not govern NORM or require monitoring ground water for NORM, Normtek will be conducting further radiochemical analysis of ground water in the spring of 2017 for the isotopes they are handling (Ra 226, Ra 228, Th 228 and Lead 210). A gross alpha beta analysis will also be completed.

Surface water monitoring consists of monitoring Normtek's surface water containment pond prior to release. Normtek did not make any releases in 2016 and as such no analysis was completed. Monthly monitoring of the surface water pond levels includes visible inspection for hydrocarbon sheen. No sheen was identified.

#### **5) Summary of all inspection results and the tank integrity testing**

Normtek has not completed the installation of the tanks as outlined in the hazardous waste application at this time. All hazardous waste in the form of tank bottom waste received was consolidated into roll off vacuum containers. Wash water was removed into separate roll off vacuum containers and disposed of at approved produced water disposal facilities (Tervita). Process water from decontamination activities were collected into the decontamination pad sump and also transferred to the roll off vacuum containers and disposed of in the same manner. It is expected the wash water tanks will be installed in 2017. Normtek inspected visually the sump and indoor decontamination bay which are metal lined with concrete as secondary containment. No pitting was noticed and sump confirmed to contain its contents.

#### **6) Facility Audit and Non-compliance issues.**

A facility WRAP Audit was supplied in last years annual report. WRAP has Normtek scheduled in for their follow up audit in 2017 and will be forwarded accordingly.

**Yours Truly,**



**Cody Cuthill**  
President and CEO  
Normtek Radiation Services Ltd.



**NORMTEK RADIATION SERVICES LTD  
HAZARDOUS WASTE FACILITY  
AUTHORIZATION RS107598  
2017 ANNUAL REPORT**

**Date: Jan 30, 2018**

**Normtek Annual Report**  
**Authorization Number: RS 107598**  
**Facility Location 9676 Swanson Street Fort St. John BC V1J 4J2**

**1) A summary of monthly records of waste received, shipped and processed with the month-end inventory (including tank bottom waste generated);**

A total of 29 shipments of NORM impacted waste and equipment was received at the Normtek's Facility in 2017 involving tank bottom waste. A total of four shipments of leachable toxic waste (produced water filters) were received at the facility in 2017. Normtek follows the IAEA recommendations in managing waste at the point of generation and as such any pond, tank or vessel waste that could be collected, classified and shipped direct to disposal was completed. Normtek accepted leachable toxic waste in the form of vessel, pond or equipment waste (classified as Leachable Toxic Waste - Tanks Bottoms.) that required dewatering and bulking for shipping to licensed salt cavern disposal due to the primary hazard or Naturally Occurring Radioactive Materials (NORM). NORM's are not regulated under the hazardous waste regulations and as such only waste which contained the leachable toxic waste are secondary hazard or included in this report. Normtek encourages the development of NORM regulations or addition of NORM's to the hazardous waste regulations so that reporting of NORM waste is completed by all companies. The following outlines the volumes of hazardous waste (leachable toxic waste received by Normtek.

<b>Waste Description</b>	<b>Volume (tonnes)</b>
Waste Inventory from Previous Year - Tank Bottom Waste Containing Leachable Toxic Waste	13.20
Waste Inventory from Previous Year - Produced Water Filters Containing Leachable Toxic Waste	0.00
NORM Tank Bottom Waste Containing Leachable Toxic Waste Received at Facility	169.40
NORM Produced Water Filters Containing Leachable Toxic Waste Received at Facility	4.65
Generated Leachable Toxic Waste for Decontamination Activities (Pipeline Tools)	5.50
Produced Waters Removed from Leachable toxic waste for disposal at 1B disposal well	113.85
NORM Waste Disposed of at Salt Cavern Facilities	68.75
NORM Produced Water Filters containing Leachable Toxic Waste Disposed of at Silverberry Landfill	4.65
Waste Inventory of Tank Bottom Waste Containing Leachable Toxic Waste at Dec 31, 2017	5.50
Waste Inventory of Produced Water Filters Containing Leachable Toxic Waste at Dec 31, 2017	0.00

**2) Summary of any manifest discrepancies**

All manifests received were recorded with the descriptor "Naturally Occurring Radioactive Materials - NORM". No shipments were identified to have a secondary hazard of "Leachable Toxic Waste". This has been standard practice in the light of no NORM regulations. Normtek considers all tank bottom waste received to potentially contain leachable toxic waste unless proven otherwise. No discrepancies in leachable toxic waste were reported in 2017.

### **3) Summary of the results of all monitoring programs;**

The following monitoring programs are related to monitoring of radioactive materials and not the BC hazardous waste Regulations. These monitoring programs follow the best safety principles and practices of radiation protection as outlined by the International Atomic Energy Agency (IAEA). Canada has signed international agreements with the IAEA outlining Canada's commitment to radiation safety and that which is expected by provincial and federal governments. The IAEA outlines the requirements for regulatory control; however, the BC Ministry of Environment has not developed any regulations for radioactive materials with the exception discharges to the environment require an approval. As such companies that handle, store, use, process or possess are not regulated. As the B.C. Ministry of Environments has no NORM waste or radioactive waste regulations or codes of practice, Normtek follows requirements of the Alberta Energy Regulator and IAEA waste management best Practices as related to their facility monitoring programs.

#### **a) Fence Line Gamma Dose Rate Monitoring**

Fence line monitoring conducted by Normtek is for the purpose of verifying potential exposures to members of the public from gamma radiation emitted from radioactive materials and is not a requirement under the hazardous waste regulations. Fence line gamma radiation dose rates are recorded monthly. The maximum exposure limits for members of the public is 1000  $\mu\text{Sv/a}$ , above background, as provided for under Canada's Radiation Protection Regulations and the Canadian NORM Guidelines. The Canadian NORM Guidelines also provides for a 2000 hour work year for incidentally exposed workers whom may be subject to a continuous gamma radiation field of 0.5  $\mu\text{Sv/hr}$  (above background). No hourly limit per year has been provided for members of the public. Normtek conservatively utilizes 200 hours per year. It is highly unlikely a member of the public will spend 200 hours at the Normtek facility fence line. Based off this conservative timeline the exposure at the fence line should not exceed 1.5  $\mu\text{Sv/hr}$ . In 2017, Normtek was able to maintain fence line gamma dose rates at background levels.

#### **b) Worker gamma exposure Monitoring**

Worker gamma exposure monitoring is conducted by Normtek for the purpose of verifying annual gamma radiation exposures to workers from operations. Verifying Worker exposures from radioactive materials is not a requirement under the hazardous waste regulations. As a radiation protection best practice Normtek employees are badged under Health Canada's national dosimetry program. No workers were exposed to gamma radiation in excess of 1000  $\mu\text{Sv/a}$  in 2017.

#### **c) Low Level Radioactive (LLRD) Dust Monitoring**

Low level radioactive dust monitoring is a radiation best practice if there is a potential for LLRD's BC Occupational Health and Safety Regulations requires monitoring if a worker may be subject to hazardous substances (Section 5) The BC hazardous waste regulations do not require monitoring of LLRD's. Normtek's monitoring of LLRD's showed no elevated readings to be found that were distinguishable from background from operations.

#### **d) Decontamination Pad Crack Monitoring**

Monitoring of Normtek's decontamination pad for cracks is completed by Normtek as it can contain open NORM contamination from decontaminating equipment that is not under regulatory control of the BC hazardous waste regulations. Alberta set a precedence of requiring their licensed NORM decontamination facility to monitor cracks in their decontamination pad and repair accordingly. Normtek inspects and repairs cracks each spring after the ground has thawed from winter. In addition monthly monitoring of cracks is completed and repairs instigated of any cracks which appear to pose an integrity issue. Normtek maintained repair of all cracks within accordance with its internal procedures. .

#### **e) Surface Contamination Monitoring**

Occupational Health and Safety Regulations requires monitoring of work sites if an employer has a potential to subject a worker to a hazardous substance (Section 5). The BC hazardous waste regulations do not outline NORM to be a hazardous substance however it is clearly documented that NORM is hazardous to health. As such, Normtek conducts surface contamination monitoring of its lunchroom, washroom and work benches to verify contamination control methods are effective. This monitoring is a radiation best practice as documented by the IAEA and incorporated by Normtek.

#### **f) Radon Gas Monitoring**

Occupational Health and Safety Regulations requires monitoring of work sites if an employer has a potential to subject a worker to a hazardous substance. The BC hazardous waste regulations do not outline NORM to be a hazardous substance. Radon gas monitoring showed no elevated radon levels above background within Normtek's indoor work areas.

### **4) Assessment of the groundwater and surface water monitoring data**

Ground water monitoring wells were monitored by Summit Environmental. A copy of their report attached (Appendix A). The report outlines no contamination of ground water was observed, however uranium concentrations were noted and consistent with previous reports completed by Ghostpine Environmental and Golder and Associates. Since Normtek has not received any Uranium impacted materials it can only be concluded the results are natural to the area and an indicator that the natural background is high within these ground waters and not from operations associated with Normtek's business.

Although the Hazardous waste Regulations do not govern NORM or require monitoring ground water for NORM, Normtek had Summit Environmental obtain one litre water samples from the well that had sufficient water for radiochemical analysis. Normtek's gamma spectroscopy analysis of ground water indicated no contamination of groundwater from operations and was consistent with the high uranium levels found within the NEBC area.

Surface water monitoring consists of monitoring Normtek's surface water containment pond prior to release. Normtek release water from this pond in may of 2017 after the spring thaw. No hydrocarbon sheen was present and Testing of PH and chlorides showed no contamination from operations. A total of 320 cubic meters was released on site and allowed to continue its natural course of drainage.



## **5) Summary of all inspection results and the tank integrity testing**

Normtek completed the installation of one 400 Bbl. tank on its decontamination pad to handle non-hazardous wash waters prior to disposal at a licensed 1B disposal well. Visual inspection of this tank along with all sumps and Normtek's indoor decontamination bay, which are metal, lined with concrete as secondary containment, revealed no excessive deterioration, wear, pitting or corrosion and the equipment was confirmed to contain its contents.

## **6) Facility Audit and Non-compliance issues.**

A facility WRAP Audit was supplied in the 2015 annual report. This audit was scheduled to be completed again by WRAP in 2017, however has been postponed to 2018. In 2017 Normtek became SECOR compliant.

**Yours Truly,**



**Cody Cuthill**

CEO

Normtek Radiation Services Ltd.