ARCADIS Design & Consultancy for natural and built assets

Public Services and Procurement Canada

2017 ENVIRONMENTAL MONITORING PROGRAM - CAMBRIDGE BAY AIRPORT FTA LTU

Cambridge Bay Airport, NU

February 22, 2018

2017 ENVIRONMENTAL MONITORING PROGRAM - FTA LTU

CAMBRIDGE BAY AIRPORT
VICTORIA ISLAND, NU

Elliott Holden, B.Eng.
Environmental Engineer in Training

Maurenia Lynds, M.A.Sc., P.Eng.
Environmental Engineer/Project Manager

Troy Austrins, P.Eng., PMP
Senior Reviewer

Prepared for:
Public Services and Procurement Canada
Environmental Services - Western Region
Suite 1650, 635 - 8th Ave SW
Calgary, Alberta T2P 3M3

Prepared by:
Arcadis Canada Inc.
329 Churchill Avenue North
Ottawa, ON, K1Z 5B8
Tel (613) 721-0555
Fax (613) 721-0029

Our Ref.:

102089-002

Date:

February 22, 2018

CONTENTS

TABLES (In-Text)

TABLES (Attached)

FIGURES (Attached)

APPENDICES

ACRONYMS AND ABBREVIATIONS

Arcadis	Arcadis Canada Inc.
BTEX	Benzene, Toluene, Ethyl Benzene and Xylenes
CCME	Canadian Council of Ministers of the Environment
CCME FWAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life
COC	Contaminant of Concern
DWSV	Drinking Water Screening Value
ESA	Environmental Site Assessment
FCSAP	Federal Contaminated Sites Action Plan
FIGQG	Federal Interim Groundwater Quality Guidelines
FTA	Fire Training Area
HC	Health Canada
km	kilometre(s)
kg	kilogram
L	litre(s)
LTU	Land Treatment Unit
m	metre(s)
m asl	metre(s) above sea level
m bgs	metre(s) below ground surface
NWB	Nunavut Water Board
OVM	Organic Vapour Measurement
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	Poly-and-perfluoroalkyl Substances
PHC	Petroleum Hydrocarbon
ppm	parts per million
PWGSC	Public Works and Government Services Canada
RDL	Reportable Detection Limit
TC	Transport Canada
TOR	Terms of Reference

EXECUTIVE SUMMARY

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) [formerly Public Works and Government Services Canada (PWGSC)] on behalf of Transport Canada (TC) to conduct an Environmental Monitoring Program at the Cambridge Bay Airport Fire Training Area (FTA) Land Treatment Unit (LTU) in Cambridge Bay, Nunavut. The 2017 field activities were completed from July 24 to August 10, 2017.

The FTA LTU was constructed between 2014 and 2015 to treat petroleum hydrocarbon (PHC) impacted soil excavated from an area where fire training exercises were conducted. Approximately 4,300 cubic metres (m^3) of PHC impacted soil was removed from the FTA excavation. This volume was less than the original assessment's estimate of 7,000 m^3. As a result, approximately 25% of the LTU remains unused. The FTA LTU has two sumps: one located in the LTU's northwest corner and one located in the LTU's southeast corner.

The 2017 Environmental Monitoring Program included:

1. A groundwater and soil monitoring program that met the requirements of Nunavut Water Board (NWB) License 1BR-FTA1217. This included modifying the soil sampling requirements to a single sampling event at the FTA LTU as no active soil treatment is currently occurring at the site. Soil (7 samples), sump water (2 samples), seepage water (1 sample) and groundwater (3 samples) samples were collected and submitted for analysis;
2. The repair of damaged monitoring wells;
3. A geochemical assessment to confirm a potential seepage issue outside the FTA LTU's northwest corner;
4. A Class A cost estimate for future proposed work (under separate cover); and,
5. The comparison of historical and current monitoring data from the various sampled media to assess for natural attenuation and the integrity of the LTU.

Sump Water

In 2017, similar sump water results to 2016 were observed. Both sump water samples met the NWB Licence requirements and applicable CCME guidelines. Concentrations of oil and grease, dissolved lead, total zinc and BTEX in both sump water samples, FTASUMP01 and FTASUMP02, were either below the laboratory RDLs or at least 2.5 times less than the applicable criteria.

However, both sump water samples contained concentrations of multiple perfluorinated compounds including PFHpA, PFHxS, PFHxA, PFOA and PFPeA above the applicable HC DWSVs. The concentrations of these perfluorinated compounds ranged between 0.35 and 89 µg/L. In some cases, the exceedances were greater than 100 times the applicable HC DWSVs. Furthermore, the concentration of PFOS in sump water sample FTASUMP02 (12 µg/L) exceeded both the applicable HC DWSV (0.6 µg/L) and ECCC FEQG (6 µg/L). Our recommendation remains similar to 2016, that the sump water should not be discharged to ground surface as it contains PFAS exceedances.

Soil Hydrocarbon Remediation

In 2017, similar soil results to 2016 were observed. All seven soil samples had concentrations of BTEX and PHCs that met the NWB Licence requirements. However, these soil sample results apply to the upper 0.35 metres (m) of the impacted soil profile in the LTU; lower soil depths have not been assessed to date. The average depth of the soil profile in the LTU is one metre (1.0 m).

The PHC concentrations in five (FTA1702, FTA1703, FTA1704, FTA1705 and FTA1706) of the seven soil samples collected ranged from concentrations below the laboratory RDLs to detections that were less than the applicable guideline values. One soil sample, FTA1701, and its duplicate, FTADUP01, both had a concentration of PHC fraction F2 (540 mg/kg) above the CWS-PHC guideline of 230 mg/kg for commercial/industrial land use.

Assessment of the 2017 soil nutrient results indicate that the phosphorous concentration in the upper 0.3 m of the impacted soil is below the optimal range for hydrocarbon degradation.

Groundwater Monitoring Program

The 2016 groundwater samples were the first full round of groundwater samples collected as part of the NWB Licence requirement. In 2017, groundwater samples were collected from three of the eleven monitoring wells (MW15-1, MW15-5 and MW15-8). In addition, similar to 2016, the concentration of BTEX, PHCs and PAHs were all below the applicable guidelines and the concentration of BTEX and PAHs for MW15-1 and MW15-5 were below the laboratory RDLs.

However, several parameters reported concentrations above the CCME FWAL guidelines including: phenols, dissolved arsenic, dissolved iron, dissolved uranium, and dissolved chloride. Several of these elevated groundwater parameters are likely a result of naturally elevated background concentrations.

Geochemical Assessment

As part of the Geochemical Assessment, water samples were collected from the northwest sump area in the FTA LTU, ponded water in the suspected seepage area outside the FTA LTU's northwest corner, a groundwater monitoring well adjacent to the northwest corner of the FTA LTU (i.e., monitoring well MW15-1), ponded water in areas unaffected by seepage, and from a groundwater monitoring well located outside any impacted area (monitoring well MW13-8 was selected). These water samples were analyzed for major cations and anions, PHCs, per- and polyfluoroalkyl substances (PFAS), and trace metals. In addition, field parameters including pH, conductivity, and total dissolved solids were collected at each sampling location. The inorganic and organic chemical signature of each water sample was then compared.

Based on the analytical results from the Geochemical Assessment, it was shown that similar PFAS compounds were present in the Northwest Sump Area (FTA SUMP01) and the Ponded Water in the Northwest Seepage Area (FTA-SW-NW01). As well, the concentrations of PFAS in the water collected from the Northwest Seepage Area were of the same order of magnitude, but lower than those in the northwest sump and that Perfluorobutanioc acid, PFHxA, and PFPeA was confirmed to be present in the groundwater collected from MW15-1, located adjacent to the northwest corner of the FTA LTU, but at lower concentrations than in FTA SUMP01 and FTA-SW-NW01. Finally, in addition to low concentrations

of PFAS, the groundwater in MW15-1 showed other indications of possible flow from beneath the LTU when the data from this well was compared to MW13-8, the monitoring well located outside the impacted area.

With the exception of the PFAS results, it is difficult to draw direct comparisons/contrasts between the parameters in the sump water, the ponded water in the suspected seepage area, and 'unaffected' pond water, as the effects of recent precipitation events and the variability in area contributing surface run-off to the ponds etc. may have an impact (e.g. chloride in the sump is lower than in either pond). However, there were other geochemical indicators (i.e., TDS and pH) that suggest the ponded water in the northwest seepage area (FTA-SW-NW01) has been impacted by seepage and/or groundwater discharge from beneath the FTA LTU.

In summary, the surface water pond and shallow groundwater in the northwest corner appear to be showing evidence of FTA LTU-derived impacts.

Recommendations

Arcadis proposes the following future work at the FTA LTU:

1. To confirm the initial results of the seepage assessment, it is recommended that a second set of seepage water samples be collected with the analytical list expanded to include metals, anions, dissolved nutrients including ammonia, and total and dissolved organic carbon (TOC and DOC) in the surface water and sump samples. This extra data will facilitate further evaluation of the link of seepage to sump water. As well, confirming the initial correlations with a second set of seepage samples will allow more knowledgeable decisions to be made regarding more expensive alternatives for investigating liner integrity, the extent of seepage and/or risk management and/or remedial approaches, as detailed in Arcadis report entitled, "*Assessment Options Analysis, Fire Training Area Land Treatment Unit*", dated November 2016.

2. Complete a groundwater monitoring program at the FTA LTU and excavation area to assess the parameters listed in the license. Attempts should be made to sample the monitoring wells during freshet conditions and warmest weeks at Cambridge Bay, when liquid groundwater conditions are more probable and when groundwater levels are presumed to be at their highest to further evaluate groundwater trends. Based on temperature statistics obtained from ECCC, this sampling period would best occur in mid-July.

3. Arcadis recommends that an evaluation of background conditions be conducted to confirm the source of the elevated phenols, dissolved arsenic, dissolved iron and dissolved uranium concentrations

4. Complete a soil sampling program to assess the level of biodegradation and confirm that soil concentrations remain below the NWB Licence requirements. Select soil samples should be analyzed for nutrients, moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4. Additionally, tilling of the soils will aid in decreasing soil compaction and increase the rate at which water can infiltrate into the soil during future dewatering activities, as required.

Once active treatment re-commences, Arcadis recommends the number of soil samples submitted for laboratory analysis from the upper 0.3 m bgs of the soil in the FTA LTU be increased to 15 samples to better assess the effectiveness of hydrocarbon degradation. In addition, Arcadis recommends 15 additional soil samples from the soil located below 0.3 m bgs be submitted for laboratory analysis.

5. Arcadis recommends a phosphorous-dominant fertilizer be thoroughly mixed into the soil once active treatment at the FTA LTU is re-commenced.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) [formerly Public Works and Governments Services Canada (PWGSC)] on behalf of Transport Canada (TC) to conduct an environmental monitoring program at the Cambridge Bay Airport Fire Training Area (FTA) Land Treatment Unit (LTU) in Cambridge Bay, Nunavut.

This report is submitted under Northern Standing Offer Contract Number EW699-141143/001/NCS and conducted in according with the Terms of Reference (TOR) Amendment entitled, "*Apron and Fire Training Area Site Remedial Activities Supervision and Environmental Monitoring Program, Cambridge Bay Airport, Victoria Island, Nunavut"* and the Arcadis proposal entitled, "*Fire Training Area (FTA) LTU, Site Remedial Activities Supervision and Environmental Monitoring Program, Cambridge Bay Airport, Victoria Island, Nunavut"* dated, July 13, 2017. Throughout this report the FTA LTU and FTA excavation area will be referred to as "the site."

1.1 Project Objectives

The objectives of the 2017 Environmental Monitoring Program were to:

1. Complete an environmental monitoring program that meets the Nunavut Water Board (NWB) License 1BR-FTA1217 requirements. This included modifying the soil sampling requirements to a single sampling event at the LTU, as no active soil treatment is currently occurring at the site;
2. Complete a groundwater monitoring program at the FTA LTU (four monitoring wells) and FTA excavated area (seven monitoring wells), in accordance with Part J, Item 7 of NWB license 1BR-FTA1217;
3. Repair damaged monitoring wells, if required and/or feasible;
4. Conduct geochemical assessment to confirm the source of seepage outside the FTA LTU identified in 2016. In addition, identify potential mitigative measures to remediate the issue;
5. Submit soil, sump water, seepage water, and groundwater samples for laboratory analysis and analyze data;
6. Provide a Class A cost estimate for future proposed work, if warranted (under separate cover); and,
7. Prepare draft and final reports of the above investigations.

2 BACKGROUND INFORMATION

As part of the airport operations transfer agreement between TC and the Government of Nunavut (GN), two areas of environmental concern (AECs) were identified for remediation at the Cambridge Bay Airport:

1. AEC 1: an area on the apron near the airport terminal where airplanes are refueled, hereafter referred to as the Apron excavation area; and,
2. AEC 2: a fire training area (FTA) located at the northwest end of the airport runway, hereafter referred to as the FTA excavation area.

The location of the Apron and FTA excavation areas are shown in **Figure 1**.

Previous investigation confirmed petroleum hydrocarbon (PHC) impacted soil and dissolved metal impacted groundwater in both AECs. To address these impacts, TC developed remedial action plans for both AECs that involved excavation of the impacted soil and placement into constructed LTUs located near the northwest end of the airport runway.

TC obtained an operating license (IBR-FTA1217) through the Nunavut Water Board (NWB) in 2011, in anticipation of construction activities.

The FTA remediation program was completed by the contractor Uplogiaq Inc., owned by GPEC International. The FTA LTU was constructed from 2014 to 2015 and occupies a footprint of approximately 75 metres (m) x 250 m. The FTA LTU is located immediately north of the FTA excavation area at the northwest end of the airport runway. The base of the FTA LTU was graded to direct captured water towards two sumps: one located in the LTU's northwest corner and one located in the LTU's southeast corner. A 0.25 m thick demarcation layer (base layer) of granular material was compacted over the LTU's geomembrane liner. Similar granular material was used to cover the portion of the geomembrane liner that extends over the berm walls.

As indicated in previous reports, a drum cache was uncovered during grubbing activities along the south side of the LTU footprint. The soil from the drum cache area was excavated to an extent where remaining soils did not exhibit contaminants of concern above the selected soil remediation standards, with the exception of one south wall sample (exceeding PHC fraction F1 criteria). The remaining impact at this location was not considered significant as it was isolated below the ground surface and was covered with clean material.

Approximately 4,300 m^3 of impacted soil was removed from the FTA excavation. This volume was less than the original assessment's estimate of 7,000 m^3. The maximum achieved depths of the excavation were limited by permafrost levels that ranged from 1.7 to 2.0 metres below ground surface (m bgs). All confirmatory samples were below applicable remediation criteria. Subsequently, the impacted soil occupies an area approximately 66 m x 180 m (approximately 75% of the LTU). In the remaining area of the LTU, the granular demarcation layer remains exposed. Four groundwater monitoring wells (MW15-1 to MW15-4) were installed around the LTU and seven groundwater monitoring wells (MW15-5 to MW15-11) were installed through and around the FTA excavation area.

Dillon Consulting Ltd. (Dillon) performed the remediation oversight, data gap analysis and sampling in 2014 and 2015 at the FTA LTU. Concurrently with the 2015 remediation activities, several soil and groundwater samples were collected and analyzed for poly– and perfluoroalkyl substances (PFASs);

specifically, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). This was done to characterize current site conditions with regard to the previously identified contaminants of potential concern associated with the FTA and to develop an understanding of potential fate and transport considerations to support future assessment of environmental risks as warranted.

Review of the laboratory results of the PFAS samples indicated two groundwater samples and two soil samples exhibited concentrations that exceed criteria for the protection of freshwater aquatic receptors. These results suggest that PFAS migration through soils and seasonal groundwater may have been facilitated by the presence of PHCs. The FTA remedial activities removed both PHC and PFAS-impacted soils from the FTA thus reducing potential risks to downgradient receptors.

3 ENVIRONMENTAL QUALITY GUIDELINES

Analytical results for the soil samples collected were evaluated against the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines, specifically the Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CSQGs) and the Canada-Wide Standards for Petroleum Hydrocarbons in Soil (CWS-PHC) for commercial/industrial land use and fine grain size. Soils were also compared against the Nunavut Water Board Licence No. 1BR-FTA1217, Part J, Remediation Requirements.

As per the NWB Licence, groundwater analytical results, as well as analytical results for surface water samples collected from the two LTU sumps, were evaluated against the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (freshwater and marine), hereafter referred to as CCME FWAL. Canadian water quality guidelines are intended to protect freshwater and marine life from anthropogenic stressors such as chemical inputs or changes to physical conditions. Surface water samples collected from the sumps were also evaluated against the NWB Licence, Part D, Effluent Quality Limits.

The following summarizes the site conditions in support of the guidelines selected:

- Grain size analysis of soils samples collected by Dillon in 2014 and 2015 indicate that the soil at the site is fine grained (based on the predominant soil texture).
- The FTA LTU and excavation area are on airport land that has been classified as commercial.
- Groundwater is not used as a source of potable water on-site or in the area. The Hamlet of Cambridge Bay obtains potable water from a surface water body located over four kilometers northeast of the site.
- Freshwater waterbodies are located north and northwest of the FTA LTU and excavation area (within 300 m). The marine waterbody of Cambridge Bay is located to the south of both the Apron LTU and excavation area (within 200 and 100 m respectively),
- Groundwater elevations measured in monitoring wells within around the FTA LTU suggest groundwater flows south towards Cambridge Bay.

PFOS and other PFASs are anthropogenic chemicals that have been introduced to the environment through their broad application including manufacturing products and consumer products. Based on risk assessment activities under the Canadian Environmental Protection Act, 1999, it was concluded that PFOS and its associated salts and precursors may be entering the environment in concentrations that may have an immediate or long-term harmful effect on the environment or biological diversity. Historically, PFOS and other PFASs were used in aqueous film forming foams which were typically used during fire fighting training activities.

There are currently no Canadian environmental quality guidelines for PFAS. The United States Environmental Protection Agency has developed health advisories for Perfloro-n-Octanoic Acid (PFOA) and PFOS, but these are not legally enforced standards and are subject to change as new information becomes available. In the absence of definitive guidelines, Health Canada (HC) and Environment and Climate Change Canada (ECCC) have taken steps to develop PFAS screening values, until such time that environmental quality guidelines are developed.

HC has derived drinking water screening values (DWSVs) for PFAS, as well as soil screening values (SSV) for PFOS and PFOA. Screening values are developed at the request of a federal department in the event of a spill, leak or other unforeseen event and are based on readily-available scientific studies. They have not been subjected to as thorough a review as actual guideline values. They are designed for the protection of human health through direct exposure through drinking water. It should be noted these drinking water screening values have not considered other exposure pathways such as the protection from consumption of fish or irrigation of food crops.

In 2013, ECCC developed draft ecological receptor Federal Environmental Quality Guidelines (FEQGs) for PFOS. They were revised in 2015 but have not been finalized. These FEQGs are summarized in Table 3-1. The values are based on laboratory toxicity studies. If concentrations are detected above these values in the environment, ECCC presumes that adverse effects may occur.

Table 3-1: Draft FEQG for PFOS in the Environment in Canada (from ECCC, 2013)

Water (µg/L)	Fish Tissue (ng/g wet weight)	Wildlife Diet (ng/g wet weight food)		Bird Egg (ng/g wet weight)
		Mammalian	Avian	
6	8,300	4.6	8.2	1,900

For the purposes of the PFAS assessments at FTAs on TC properties, the more applicable of either the Health Canada screening values or the FEQGs should be used for the human health evaluation (e.g. based on land use scenarios and lowest applicable screening values). In October 2015, the National Guidelines and Standards Office, Environment Canada, issued Version 1.3 of the Director General-approved Federal Soil Quality Guidelines (FSQGs) for PFOS available to the Federal Contaminated Sites Action Plan (FCSAP).

Analytical results for surface water samples collected by Arcadis in 2016 were compared to the HC drinking water screening values and the draft FEQGs for PFOS.

4 PROGRAM METHODOLOGY

The following sections outline the scope of work and methodology implemented during the 2017 Environmental Monitoring Program. The field activities were completed between July 24 and August 10, 2017.

4.1 Site Specific Health and Safety Plan

Arcadis prepared a site-specific health and safety plan (HASP) prior to the field activities. The HASP included the documentation of all foreseeable work hazards and mitigative actions. It also contained a list of emergency contact numbers and protocols to follow in the event of an incident. Arcadis ensured that the HASP was communicated to all site personnel and that all field staff were aware of all contaminants of concern, associated precautions, and required personal protective equipment.

A health and safety kick-off meeting and daily tailgate meetings, including task specific job safety analyses, were conducted to inform on-site personnel of the potential risks and appropriate safety controls. The HASP has been retained on file by Arcadis.

4.2 Nunavut Water Board Licence Requirements

In accordance with the NWB Licence (1BR-FTA1217), the sampling plan developed by Arcadis and implemented during the 2017 site visit was reviewed by Maxxam Analytics Inc. (Maxxam). Maxxam is certified by the Canadian Association for Laboratory Accreditation Inc. (CALA). **Appendix A** contains the letter from Maxxam in response to their review of Arcadis' 2017 sampling plan.

4.2.1 Sump Water Sampling

Arcadis collected grab samples from the surface water around the FTA LTU sumps on July 25, 2017. Sump water sample FTASUMP01 was collected from the sump located in the northwest corner of the LTU and sump water sample FTASUMP02 was collected from the sump located in the southeast corner of the LTU. In accordance with the NWB Licence, Part D, Number 4, the samples were submitted for the following analyses: pH, oil and grease, dissolved lead, total zinc, dissolved lead, and benzene, toluene, ethylbenzene and xylene (BTEX), and petroleum hydrocarbon fraction F1 (PHC F1).

All sump water sample containers were placed in a cooler with ice immediately after they were collected and then stored in a refrigerator prior to their shipment. Sump water samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NT on July 26, 2017. Analysis of the samples was completed by the Maxxam laboratory in Edmonton, AB. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B**.

4.2.2 Soil Sampling

Arcadis conducted FTA LTU soil sampling in accordance with the NWB Licence requirements. All soil samples were analyzed for BTEX and PHC Fractions F1 to F4. A total of six soil samples (FTA1701 to FTA1706) and one duplicate sample (FTADUP01) were collected on August 6, 2017. Soil samples were collected after the 2017 tilling activities.

Sample locations were chosen by dividing the FTA LTU into six sections of approximately equal area (approximately 50 metre by 30 metre areas), as shown in **Figure 3**. Samples were collected in the centre each area at a depth of approximately 0.3 metres below ground surface (m bgs). **Figure 3** also shows sample locations.

All sampling equipment was decontaminated between each sample location with Alconox and distilled water. A new pair of nitrile gloves were worn for the collection of each sample. LTU field conditions and soil descriptions, including approximate grain size, colour, moisture content, and nature and extent of apparent contamination, were documented for each soil sampling location. The GPS coordinates of each soil sample were also collected using a Garmin eTrex 10, with an accuracy of 3 metres.

All soil sample containers were placed in a cooler with ice immediately after they were collected and then stored in a refrigerator prior to shipment. The samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NWT on August 8, 2017. Analysis of the soil samples was completed by the Maxxam laboratory in Edmonton, AB. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B**.

4.2.3 Groundwater Monitoring and Sampling at the FTA LTU and Excavation Area

Arcadis conducted groundwater monitoring and sampling during the 2017 field program at the FTA LTU and the FTA excavation area. Eleven groundwater monitoring wells are located at the site: four wells located around the FTA LTU (MW15-1 to MW15-4) and seven wells in the FTA Excavation Area (MW15-5 to MW-15-11), as shown in **Figure 2**.

Arcadis collected groundwater samples from all wells with a sufficient volume of water present. One blind duplicate sample was also collected. Before sample collection, a minimum of three well volumes were purged. Purge water was disposed of in the FTA LTU following completion of all sampling. Groundwater could only be collected from three of the eleven monitoring wells (MW15-1, MW15-5 and MW15-8). The groundwater in eight of the monitoring wells (MW15-2, MW15-3, MW15-4, MW15-6, MW15-7, MW15-9, MW15-10, and MW15-11) was frozen.

Sampling and purging was conducted using low-flow sampling techniques via a peristaltic pump and dedicated tubing. Volatile organic compound levels inside each monitoring well were measured with a MiniRae 3000 immediately after removing the well cap. Physical chemistry parameters including pH, oxidation-reduction potential, conductivity, turbidity, dissolved oxygen, total dissolved solids and temperature were monitored using a calibrated Horiba U-52. Water level drawdown was monitored using a Heron oil/water interface probe. Where the recharge was not sufficient to conduct low flow sampling techniques, the well was purged dry three times before sampling. All sampling equipment was decontaminated between sample locations with Alconox and distilled water. A new pair of nitrile gloves were worn prior to each sampling event.

In accordance with the NWB Licence requirements, Part J, Number 7, the groundwater samples were submitted for BTEX, PHC F1-F4, polycyclic aromatic hydrocarbons (PAHs), total alkalinity, nitrate-nitrite, ammonia nitrogen, oil and grease, total phenols, calcium, magnesium, sodium, potassium, chloride,

sulphate, dissolved metals, total suspended solids and total dissolved solids analysis. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B.**

All groundwater sample bottles were placed in a cooler with ice packs immediately after they were collected. The groundwater samples were then stored in a refrigerator prior to their shipment. Groundwater samples were shipped in coolers with ice packs to the Maxxam depot in Yellowknife, NWT. Analysis of the groundwater samples was completed at the Maxxam laboratory in Edmonton, AB.

4.3 Per- and Polyfluoroalkyl Substance (PFAS) Sampling

Arcadis collected one grab surface water sample from the FTA LTU northwest sump (FTASUMP01) and one grab surface water sample from the FTA LTU southeast sump (FTASUMP02) on July 26, 2017 for PFAS analysis.

All PFAS surface water sampling procedures adhered to TC's February 2016 PFAS Field Sampling Guidance Document. Arcadis applied the following procedure to reduce the potential PFAS contamination during sampling:

- A pencil was used to label sample containers;
- Each sample container was transported in an individual-sealable plastic bag;
- All samples were kept in their own cooler separate from other sample containers;
- Field notes were taken on non-waterproof paper on an aluminum clip board with a pencil;
- A new pair of nitrile gloves were worn prior to each sampling round;
- 100% cotton clothes were worn during sampling (the items were put through a wash cycle without detergent, air dried, and stored in a cotton pillow case);
- A pillow case was used on the driver's seat of the truck used to transport samples as a barrier between vehicle seating materials; and,
- Steel-toed boots were worn but contact with any soil to be collected for PFAS analysis was prevented.

The PFAS analysis was completed by the Maxxam laboratory in Mississauga, ON. Copies of the Certificate of Analysis laboratory reports are attached in **Appendix B.**

4.4 Geochemical Assessment

Arcadis completed a Geochemical Assessment to assess the potential seepage issues suspected of occurring at the northwest corner of FTA LTU. As part of this assessment, water samples were collected from the northwest sump area in the FTA LTU (FTASUMP01), ponded water in the suspected seepage area (FTA-SW-NW01, refer to photo 5 in Appendix C), a groundwater monitoring well adjacent to the northwest corner of FTA LTU (MW15-1), ponded water in areas unaffected by seepage (SW1701 refer to photo 6 in Appendix C), and a groundwater monitoring well located outside any impacted area (MW13-8). A sample of rain water was not collected due to insufficient precipitation during the 2017 field program. These water samples were analyzed for major cations and anions, PHCs, per- and polyfluoroalkyl substances (PFAS), and trace metals. In addition, field parameters including pH, conductivity, and total dissolved solids were collected at each sampling location. The inorganic and organic chemical signature of each water sample was then compared.

5 QUALITY ASSURANCE AND QUALITY CONTROL

To assess the reliability of the laboratory analytical data, one duplicate sample was taken for approximately every ten samples collected. Arcadis generated the duplicate soil samples by alternately placing approximately 10% of the sample volume into the primary sample container and then placing the same amount into the duplicate container. Arcadis continued placing aliquots of approximately 10% of the container volume into each container until both containers were filled. Parent and duplicate samples collected for BTEX/F1 analysis were collected side by side by inserting a plunger into an undisturbed area of the soil column and placing the soil from the plunger in their respective methanol vials. A trip blank and field blank were collected during the groundwater sampling program. Duplicate groundwater samples were collected by filling the duplicate sample bottles immediately after the primary sample was collected.

Analytical data quality was assessed by submission of the following soil and groundwater samples:

- Soil sample FTA 1701 (primary) and FTADUP01 (duplicate) were analyzed for BTEX and PHC fractions F1-F4;
- Groundwater sample MW15-8 (primary) and FTADUP01 (duplicate) were analyzed for PHC fractions F1-F4, BTEX, PAHs, total alkalinity, nitrate-nitrite, ammonia nitrogen, oil and grease, total phenols, calcium, magnesium, sodium, potassium, chloride, sulphate, dissolved metals, total suspended solids and total dissolved solids analysis; and,
- The Trip Blank and Field Blank were analyzed for BTEX and PHC fractions F1-F4.

For each set of duplicates, the relative percent difference (RPD) was calculated using the following formula:

$$RPD = \frac{|X_1 - X_2|}{X_{average}} \times 100$$

where, X_1 and X_2 are the duplicate concentrations and $X_{average}$ is the mean of these two values. Results for duplicate analyses of field duplicate samples were considered acceptable where RPD values were <50% for soil duplicate analyses and <50% for water duplicate analyses, consistent with common industry practices.

RPDs can be calculated only when the compound is detected in both the original and the duplicate sample at a concentration above the method detection limit. Alternative criteria are used to evaluate duplicate pairs where one or both of the results is less than five times the detection or quantitation limit, or where one or both of the results is less than the detection or quantitation limit (i.e., nd or ‘not-detected’).

6 ENVIRONMENTAL MONITORING PROGRAM RESULTS

The following sections summarize the analytical results for all samples collected during the 2017 Environmental Monitoring Program.

6.1 Nunavut Water Board Licence Requirements Sampling Results

6.1.1 Sump Water Analytical Results

Arcadis collected a grab sample from the standing water in each FTA LTU sump on July 25, 2017. Sump water sample FTASUMP01 was collected from the sump located in the northwest corner of the LTU and sump water sample FTASUMP02 was collected from the sump located in the southeast corner of the LTU.

Both sump water samples met all NWB Licence requirements and applicable CCME guidelines. Concentrations of oil and grease, dissolved lead, total zinc and BTEX in both sump water samples, FTASUMP01 and FTASUMP02, were either below the laboratory's reportable detection limits (RDLs) or at least 2.5 times less than the applicable criteria.

The Sump Water analytical results are presented in **Table 7**. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

6.1.2 Soil Analytical Results

A total of seven soil samples (including one duplicate sample) were collected from the FTA LTU and submitted for the laboratory analysis of BTEX and PHCs. They were identified as: FTA1701, FTA1702, FTA1703, FTA1704, FTA1705, FTA1706 and FTADUP01.

All seven soil samples had concentrations of BTEX and PHCs that met the NWB Licence requirements.

The PHC concentrations in five of the soil samples (FTA1702, FTA1703, FTA1704, FTA1705 and FTA1706) ranged from concentrations below the laboratory RDLs to detections that were less than the applicable guideline values.

BTEX concentrations in all seven soil samples were below the laboratory RDLs.

However, the following soil exceedance was detected:

- Soil samples (FTA1701 and its Duplicate FTADUP01) both had a concentration of PHC fraction F2 (540 mg/kg) above the CWS-PHC guideline of 230 mg/kg for commercial/industrial land use.

The soil analytical results are presented in **Table 9**. Exceedances are shown on **Figure 3**. Laboratory certificate of analysis, including lab QA/QC results, are included in **Appendix B**.

6.1.3 Groundwater Conditions

The casing and riser on all groundwater monitoring wells around the FTA LTU and excavation area were found to be in good condition with the exception of monitoring wells MW15-8 (refer to Photos 1 in Appendix C). Monitoring well MW15-8 is located south of the FTA excavation area adjacent to an Airport access road refer to Figure 2). Arcadis made repairs to monitoring wells MW15-8 during the 2017 field program (refer to photo 2 and 3 in Appendix C). These repairs did not impact the riser height on monitoring wells MW15-8. No damage was noted and no repairs were needed on all other monitoring wells. No measurable thickness of light non-aqueous phase liquid (LNAPL) was identified in any of the monitoring wells. No sheens were observed in the purged groundwater or from the groundwater samples after collection.

During the 2017 field program, the groundwater table was found at depths ranging between 1.588 to 2.204 metres below top of casing (m btc). Groundwater elevations ranged between 23.527 to 25.659 metres above sea level (m asl). The interpreted shallow horizontal groundwater flow direction is towards the south at the FTA LTU and excavation area. The groundwater monitoring data is presented in **Table 1.**

6.1.4 Groundwater Analytical Results

Groundwater samples were collected from three monitoring wells (MW15-1, MW15-5 and MW15-8); one located adjacent to the FTA LTU (MW15-1) and two were in the excavation area (MW15-5 and MW15-8). The analytical results for the groundwater samples were compared to the CCME FWAL guidelines.

The concentration of BTEX, PHCs and PAHs were all below the applicable guidelines. The concentration of BTEX and PAHs for MW15-1 and MW15-5 were below the laboratory RDLs.

However, the following exceedances were detected:

- Concentrations of dissolved arsenic, dissolved iron and dissolved uranium was reported above the CCME FWAL long-term effect guidelines of 0.005 mg/L, 0.3 mg/L and 0.015 mg/L at 0.011 mg/L, 2.2 mg/L and 0.018 mg/L, respectively, for MW15-1;
- MW15-5 reported concentrations of dissolved iron and dissolved uranium just above the CCME FWAL guidelines of 0.3 mg/L and 0.015 mg/L, respectively at 0.48 mg/L and 0.028 mg/L;
- MW15-8, and its Duplicate (FTADUP01) reported concentrations of dissolved iron above the CCME FWAL guideline of 0.3 mg/L at concentrations of 1.8 mg/L and 2.1 mg/L;
- Dissolved chloride was reported at concentrations above CCME FWAL long-term and/or short-term effects guidelines in all four groundwater samples. The exceedance factors ranged from 2 to 13 times the short-term guideline of 120 mg/L; and,
- Phenols reported concentrations above the CCME FWAL guideline of 0.004 mg/L for all four groundwater samples. The exceedance factors ranged from 4 to 35 times the guideline.

The groundwater analytical results are presented in **Tables 2 to 5.** Exceedances are shown on **Figure 3**. Laboratory certificates of analysis including lab QA/QC results are included in **Appendix B**.

6.2 Per- and Polyfluoroalkyl Substance (PFAS) Sampling Results

For the PFAS sampling, Arcadis collected a grab sample from the standing water in each FTA LTU sump on July 25, 2017. The following exceedances were detected:

- Exceedance of multiple perfluorinated compounds were detected in both sump water samples. Both samples had concentrations of Perfluoroheptanoic Acid (PFHpA), Perfluorohexane Sulfonate (PFHxS), Perfluorohexanoic Acid (PFHxA), Perfluoro-n-Octanoic Acid (PFOA), and Perfluoropentanoic Acid (PFPeA) above the applicable HC DWSVs.
- Concentrations of these perfluorinated compounds ranged between 0.35 and 89 µg/L. In some cases, exceedances were greater than 100 times the applicable HC DWSVs.
- The concentration of Perfluorooctane Sulfonate (PFOS) in sump water sample FTA SUMP02 (12 µg/L) exceeded both the applicable HC DWSV (at 0.6 µg/L) and ECCC FEQG (at 6 µg/L).

The Sump Water PFAS analytical results are presented in **Table 8**. Exceedances are shown on **Figure 3**. Laboratory certificate of analysis including lab QA/QC results are included in **Appendix B**.

6.3 Geochemical Assessment Results

For the Geochemical Assessment, water samples were collected from the northwest sump area in the FTA LTU (FTASUMP01), ponded water in the suspected seepage area (FTA-SW-NW01), a groundwater monitoring well adjacent to the northwest corner of FTA LTU (MW15-1), ponded water in areas unaffected by seepage (SW1701), and a groundwater monitoring well located outside any impacted area (MW13-8). The results are presented in **Tables 10 to 14**. Based on the analytical results, the following was observed:

- Similar PFAS compounds were present in the Northwest Sump Area (FTA SUMP01) and the Ponded Water in the Northwest Seepage Area (FTA-SW-NW01). The concentrations in the water collected from the Northwest Seepage Area were of the same order of magnitude, but lower than those in the Northwest Sump;
- Perfluorobutanioc acid, PFHxA, and PFPeA was confirmed to be present in the groundwater collected from MW15-1, located adjacent to the northwest corner of the FTA LTU, but at lower concentrations that FTA SUMP01 and FTA-SW-NW01;
- In addition to low concentrations of PFAS, the groundwater in MW15-1 showed other indications of possible flow from beneath the LTU when the data from this well was compared to MW13-8 (the monitoring well located outside the impacted area);
- With only one exception, BTEX and PHCs were not detected in any of the water samples. PHC F3 was detected in MW15-1 but only at the RDL concentration of 200 µg/L;
- There was evidence of reducing conditions, including lower sulphate, lower ORP, and predominance of reduced nitrogen species (ammonia) versus oxidized forms (nitrate) in MW13-8, the well located outside the impacted area; and,
- There was a higher concentration of chloride and TDS in MW15-1.

7 QUALITY ASSURANCE AND QUALITY CONTROL

Arcadis quantitatively assessed the analytical quality of the data through calculating the relative percent difference (RPD) between each sample and its duplicate. A summary of the analytical results for the original and duplicate samples, along with the calculated RPDs, are included in the analytical results.

7.1 Soil Duplicates

In general, RPD value below 50% are considered acceptable for soil results. The calculated RPDs for soil sample FTA 1701 (parent sample) and its duplicate, FTADUP01, ranged from 2% to 18%, below the upper limit of 50% for soil, and were therefore deemed acceptable by Arcadis.

Arcadis considers that the results of the QA/QC analysis indicate that soil samples can be considered representative of site conditions.

7.2 Groundwater Duplicates

In general, RPD values below 50% are considered acceptable for groundwater results. The calculated RPDs for groundwater sample MW15-8 (parent sample) and its duplicate, FTA DUP01 DUP01, ranged from 2.75% to 31%. Arcadis considers that the results of the QA/QC analysis indicate that groundwater samples can be considered as representative of site conditions.

Additionally, a trip blank and a field blank were submitted for analyses of BTEX and PHCs. Both reported non-detect concentrations. The trip blank results determined that no cross-contamination occurred from other samples, ambient conditions, or other sources that samples may have been exposed to. The field blank results determined that no field or transporting environments have impacted the samples.

8 DISCUSSION AND RECOMMENDATIONS

8.1 Sump Water

In 2016, the sump water concentrations met the NWB Licence requirements for pH, oil and grease, dissolved lead, total zinc and BTEX. However, PFASs analytical results for the surface water samples collected from both sumps reported concentrations of PFHxA, PFHpA, PFHxS and PFPeA above their respective DWSVs, as developed by HC. Surface water sample FTASUMP02 collected from the sump located in the southeast corner of the FTA LTU also reported concentrations of PFOA and PFOS above the HC DWSV and/or and EC FEQG for PFOS. Given these PFAS exceedances, it was recommended that the sump water should not be discharged to ground surface.

In 2017, similar sump sampling results were observed. Both sump water samples met the NWB Licence requirements and applicable CCME guidelines. Concentrations of oil and grease, dissolved lead, total zinc and BTEX in both sump water samples, FTASUMP01 and FTASUMP02, were either below the laboratory RDLs or at least 2.5 times less than the applicable criteria.

However, both sump water samples contained concentrations of multiple perfluorinated compounds including PFHpA, PFHxS, PFHxA, PFOA and PFPeA above the applicable HC DWSVs. The concentrations of these perfluorinated compounds ranged between 0.35 and 89 µg/L. In some cases, the exceedances were greater than 100 times the applicable HC DWSVs. Furthermore, the concentration of PFOS in sump water sample FTASUMP02 (12 µg/L) exceeded both the applicable HC DWSV (0.6 µg/L) and ECCC FEQG (6 µg/L). Again, as in 2016, it is recommended that the sump water not be discharged to ground surface due to these PFAS exceedances.

8.2 Soil Hydrocarbon Remediation

In 2016, the soil samples collected by Arcadis were the first soil samples collected as part of the NWB Licence requirements. In 2016, a total of seven soil samples were collected and the BTEX and PHC concentrations met the NWB Licence requirements. Furthermore, only one soil sample reported a concentration of PHC fraction F2 above the CWS-PHC guideline of 230 mg/kg for a commercial/industrial land use.

In 2017, similar results were observed in comparison to previous 2016 sampling as all seven soil samples had concentrations of BTEX and PHCs that met the NWB Licence requirements.

The PHC concentrations in five of the soil samples (FTA1702, FTA1703, FTA1704, FTA1705 and FTA1706) ranged from concentrations below the laboratory RDLs to detections that were less than the applicable guideline values. One soil sample, FTA1701, and its duplicate, FTADUP01 both had a concentration of PHC fraction F2 (540 mg/kg) above the CWS-PHC guideline of 230 mg/kg for a commercial/industrial land use.

The moisture content detected in the upper 0.35 m of soil in the FTA LTU in 2017 ranged between 4.2% and 16%. These levels are below the lower limit of moisture content of 20% typically required to support healthy microbial populations (USEPA, 1994). The optimal moisture content for PHC biodegradation ranges between 40% and 80% (GC, 2006). Arcadis recommends the continued practice of sump water recirculation to elevate soil moisture levels and help promote microbial growth in the FTA LTU's soil.

Nitrogen and phosphorus are essential for promoting the microbial activities needed for hydrocarbon degradation; however, excessive concentrations of these nutrients have been found to decrease the biodegradation rate (USEPA ,1994). Federal guidelines for landfarming petroleum contaminated hydrocarbon soil recommends the carbon-to-nitrogen-to-phosphorus ratio remain between 100:10:1 and 100:1:0.5 to encourage effective biodegradation. Table 8-1 shows average nitrogen and phosphorus concentration in the FTA LTU's soil along with the estimated effective nutrient ranges.

Table 8-1: Average Nutrient Concentrations for the FTA LTU's soil

Petroleum Hydrocarbons	Effective Nutrient Range for FTA LTU(1)(2)	2017 Average Concentration
Nitrogen (mg/kg)	75 - 8	264
Phosphorus (mg/kg)	8 - 7	2

Note:
(1) Carbon content used to derive the effective nutrient ranges for the FTA LTU was based on the average total petroleum concentration in the FTA LTU in 2017.
(2) The effective nutrient range is based on the Federal Guidelines for Landfarming Petroleum Contaminated Hydrocarbon (GC, 2006) and does not consider site-specific climatic conditions.

The average nitrogen concentration in the upper 0.3 m of soil in the FTA LTU is above the estimated effective nitrogen range. Conversely, the average phosphorous concentration is below the lower limit of the estimated effective phosphorous range. Arcadis recommends a phosphorous-dominant fertilizer be thoroughly mixed into the soil within the FTA LTU. Nutrient concentration should continue to be monitored during future monitoring programs.

Arcadis recommends the number of soil samples submitted for laboratory analysis from the upper 0.3 m bgs of the soil in the FTA LTU be increased to 15 samples to better assess the effectiveness of hydrocarbon degradation. In addition, Arcadis recommends 15 additional soil samples from the soil located below 0.3 m bgs be submitted for laboratory analysis. Select soil samples should be analyzed for nutrients, moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4.

8.3 Groundwater Monitoring Program

In 2016, the groundwater samples collected and analyzed were the first full round of groundwater samples collected as part of the NWB Licence requirements. During the 2016 field program, groundwater samples could only be collected from four of the eleven monitoring wells (MW15-1, MW15-4, MW15-5 and MW15-8) due to frozen conditions. At that time, several parameters reported concentrations above the CCME FWAL guidelines including: phenols, dissolved nitrites and nitrates, dissolved copper, dissolved chloride, dissolved iron, dissolved uranium, and dissolved zinc. BTEX, PHC F1 – F4 and PAHs were either below the laboratory RDLs or below the CWS-PHCs standards and the CCME FWAL guidelines.

In 2017, groundwater samples were collected from three of the eleven monitoring wells (MW15-1, MW15-5 and MW15-8). As well, similar to 2016, the concentration of BTEX, PHCs and PAHs were all below the applicable guidelines and the concentration of BTEX and PAHs for MW15-1 and MW15-5 were below the laboratory RDLs.

However, several parameters reported concentrations above the CCME FWAL guidelines including: phenols, dissolved arsenic, dissolved iron, dissolved uranium, and dissolved chloride.

8.4 Geochemical Assessment

Based on the analytical results from the Geochemical Assessment, it was shown that similar PFAS compounds were present in the Northwest Sump Area (FTA SUMP01) and the Ponded Water in the Northwest Seepage Area (FTA-SW-NW01). As well, the PFAS concentrations in the water collected from the Northwest Seepage Area were of the same order of magnitude, but lower than those in the Northwest Sump and, Perfluorobutanioc acid, PFHxA, and PFPeA was confirmed to be present in the groundwater collected from MW15-1, located adjacent to the northwest corner of the FTA LTU, but at lower concentrations that FTA SUMP01 and FTA-SW-NW01. Finally, in addition to low concentrations of PFAS, the groundwater in MW15-1 showed other indications of possible flow from beneath the LTU when the data from this well was compared to MW13-8, the monitoring well located outside the impacted area.

With the exception of the PFAS results, it is difficult to draw direct comparisons/contrasts between the parameters in the sump water, the ponded water in the suspected seepage area, and ‘unaffected’ pond water, as the effects of recent precipitation events and the variability in area contributing surface run-off to the ponds etc. may have an impact (e.g. chloride in the sump is lower than in either pond). However, arguably there are other geochemical indicators that the ponded water in the northwest seepage area (FTA-SW-NW01) is showing effects of seepage and/or groundwater discharge from beneath the FTA LTU. Specifically,

- The TDS in this ponded water was similar to that measured in MW15-1, the NW well, and were higher than that in the unaffected pond (SW1701); and,
- The pH in the Sump and Ponded water in Suspected Seepage Area appeared similar, and was higher than that in the unaffected ponded water.

In summary, the surface water pond and shallow groundwater in the northwest corner appear to be showing evidence of FTA LTU-derived impacts.

8.5 Recommendations

Arcadis proposes the following future work at the FTA LTU:

1. The sump water contains concentrations of multiple PFAS compounds above the applicable HC DWSVs. Based on this PFAS information and the results from the Geochemical Assessment, there appears to be evidence that the FTA LTU is impacting the areas outside the LTU. However, with the exception of the PFAS results, it is difficult to draw direct comparisons/contrasts between the parameters in the sump water and those in other areas exterior to the LTU.

   To confirm the initial results from this 2017 monitoring program, it is recommended that a second set of seepage water samples be collected with the analytical list expanded to include metals, anions, dissolved nutrients including ammonia, and total and dissolved organic carbon (TOC and DOC) in the surface water and sump samples. This extra data will facilitate further evaluation of the link of seepage to the sump water. As well, confirming the initial correlations with a second set of seepage samples will allow more knowledgeable decisions to be made regarding more expensive alternatives for investigating liner integrity, the extent of seepage and/or risk management and/or remedial approaches, as detailed in Arcadis report entitled, "*Assessment options Analysis, Fire Training Area Land Treatment Unit*", dated November 2016.

2. To continue to be in compliance with the NWB License requirements and identified chemicals of concern, a groundwater monitoring program must be completed at the FTA LTU and excavation area to assess the parameters set out in the license. Attempts should be made to sample the monitoring wells during freshet conditions and warmest weeks at Cambridge Bay, when liquid groundwater conditions are more probable and when groundwater levels are presumed to be at their highest to further evaluate groundwater trends. Based on temperature statistics obtained from ECCC, this sampling period would best occur in mid-July.

3. Several of the groundwater parameters; such as dissolved arsenic, dissolved iron and dissolved uranium, are likely a result of naturally elevated background concentrations. Arcadis recommends that an evaluation of background conditions be conducted to confirm this.

4. Complete a soil sampling program to assess the level of biodegradation and confirm that soil concentrations remain below the NWB Licence requirements. Select soil samples should be analyzed for nutrients, moisture, pH, bulk density, BTEX, and PHC Fractions F1 to F4. Additionally, tilling of the soils will aid in decreasing soil compaction and increase the rate at which water can infiltrate into the soil during future dewatering activities, as required. Once active treatment re-commences, Arcadis recommends the number of soil samples submitted for laboratory analysis from the upper 0.3 m bgs of the soil in the FTA LTU be increased to 15 samples to better assess the effectiveness of hydrocarbon degradation. In addition, Arcadis recommends 15 additional soil samples from the soil located below 0.3 m bgs be submitted for laboratory analysis.

5. Arcadis recommends a phosphorous-dominant fertilizer be thoroughly mixed into the soil once active treatment at the FTA LTU is re-commenced.

9 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by Arcadis Canada Inc. (Arcadis) for Public Services and Procurement Canada (PSPC) / Transport Canada (TC). It is intended for the sole and exclusive use of PSPC/TC. Any use, reliance on or decision made by any other person other than PSPC/TC based on this report is the sole responsibility of such other person. PSPC, TC and Arcadis make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

This report has been prepared in accordance with generally accepted engineering and environmental practices for the exclusive use of PSPC/TC. This report is based on the historical information provided and information obtained during this work program.

Third party information reviewed and used to compile the data and conclusions contained in this report is assumed to be complete and correct. Arcadis used this information in good faith and will not accept any responsibility for deficiencies, misinterpretation or incompleteness of the information contained in documents prepared by third parties.

The investigation undertaken by Arcadis with respect to this report and any conclusions or recommendations made in this report reflect Arcadis' judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to the site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken. Notwithstanding these limitations, this report is believed to provide a reasonable representation of activities completed and site conditions as of July and August 2017.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by PSPC/TC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Arcadis. Nothing in this report is intended to constitute or provide a legal opinion.

10 REFERENCES

Canada-Nunavut Geoscience Office and Geological Survey of Canada, Geology of Nunavut Map, 2006.

Canada-Nunavut Geoscience Office and Geological Survey of Canada, Surficial Materials of Nunavut Map, 2006.

Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, 2012.

Canadian Council of Ministers of the Environment, Canadian Soil Quality Guidelines for Protection of Environmental and Human Health, Summary Table, Update 7.1, 2010.

Canadian Council of Ministers of the Environment, Canada Wide Standards for Petroleum Hydrocarbons, January 2008.

Dillion Consulting Limited. 2014 Apron Groundwater Monitoring Report, Cambridge Bay Airport, Victoria Island, Nunavut. March 4, 2015.

Dillion Consulting Limited. Site Activities Report, Cambridge Bay Airport Fire Training Area, Victoria Island, NU. PWGSC Project No. R.056019.005, March 2016

Dillion Consulting Limited. Closer Report, Cambridge Bay Airport Fire Training Area, Victoria Island, Nu. PWGSC Project No. R.056019.005, January 2016.

Dillion Consulting Limited. 2015 Apron Groundwater and LTU Soils Monitoring Report, Cambridge Bay Airport, Victoria Island, Nunavut. January 2016.

Environment Canada (EC) Draft Federal Environmental Quality Guidelines for PFOS. 2013.

Government of Canada (GC) Federal Contaminated Sites Action Plan. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. March 2006 (editorial update 2013)

Government of Canada (GC) Federal Contaminated Sites Action Plan. Interim Advice to Federal Departments for the Management of Federal Contaminated Sites Containing Perfluorooctane Sulfonate, Version 1.3, October 1, 2015.

Government of Canada (GC) Federal Contaminated Sites Action Plan. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. March 2006, updated 2013.

Health Canada. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0. 2010, revised 2012.

Health Canada (HC). Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.

Transport Canada, Per-and Polyfluorinated Alkyl Substances (PFAS) Field Sampling Guidance, February 2016.

United States Environmental Protection Agency (USEPA) How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites, A Guide for Corrective Action Plan Reviewers, EPA 510-B-17-003, October 2017.

TABLES

Table 1
Groundwater Monitoring Results

Monitoring Well	GPS Coordinates NAD83	Well Top Elevation (m asl)	2016 Water Level (m btc)	2017 Water Level (m btc)	2016 Ice Level (m btc)	2017 Ice Level (m btc)	2016 Depth Bottom (m btc)	2017 Depth to Bottom (m btc)	Groudwater Elevation (m asl)	Condition of Well Structure	2017 OVM Readings (ppm)	Temp (°C)	pH	Redox Potential (mV)	Elec. Conductivity (uS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	TDS (g/L)
Date			01-Aug-16	26-Jul-17	01-Aug-16	26-Jul-17	01-Aug-16	26-Jul-17	26-Jul-17									
FTA LTU Area Monitoring Wells																		
MW15-1	N7666914.554 E493434.999	27.247	1.483	1.588	ND	ND	1.960	2.025	25.66	Well in good condition.	ND	4.01	6.88	-72	2.94	13.4	0.05	1.89
MW15-2	N7666907.268 E493570 .236	28.700	1.773	ND	1.774	1.936	(1)	(1)	(1)	Well casing has heaved due to frost action. Well remains in good condition.	0.2	-	-	-	-	-	-	-
MW15-3	N7666833.113 E493675 .878	28.381	ND	ND	2.327	2.275	(1)	(1)	(1)	Well casing has heaved due to frost action and hinge is slightly damaged.	0.5	-	-	-	-	-	-	-
MW15-4	N7666799 .272 E493595 .47	27.597	1.993	2.249	ND	ND	2.329	(1)	(1)	Well in good condition	0.1	-	-	-	-	-	-	-
FTA Excavation Area Monitoring Wells																		
MW15-5	N7666753.517 E493617.796	27.154	2.132	2.204	ND	ND	2.218	2.235	24.95	Well in good condition	0.3	5.02	7.25	32	7.48	8.1	0.02	4.69
MW15-6	N7666727.524 E493600.189	27.229	ND	ND	2.266	2.614	(1)	(1)	(1)	Well in good condition	ND	-	-	-	-	-	-	-
MW15-7	N7666677.668 E493600.9	21.607	ND	ND	1.898	1.848	(1)	(1)	(1)	Well casing has heaved due to frost action. Well remains in good condition.	0.7	-	-	-	-	-	-	-
MW15-8	N7666703.379 E493616.704	25.115	1.588	1.804	ND	ND	2.584	2.512	23.311	Well in good condition.	ND	4.98	7.04	-25	2.22	4.3	0.01	1.41
MW15-9	N7666741.162 E493588.639	27.467	ND	ND	2.106	2.134	(1)	(1)	(1)	Well in good condition	0.1	-	-	-	-	-	-	-
MW15-10	N7666741.128 E493606.61	27.527	ND	ND	2.282	2.294	(1)	(1)	(1)	Well in good condition	0.7	-	-	-	-	-	-	-
MW15-11	N7666767.062 E493595 .694	27.355	ND	ND	2.006	2.074	(1)	(1)	(1)	Well in good condition	1.1	-	-	-	-	-	-	-

Notes:

m btc	metres below top of casing
m asl	metres above sea level
ND	none detected
OVM	organic vapour measurement (measured as IBL with a MiniRae 3000)
(1)	Depth to bottom measurement could not be made as the water in the well was frozen.
(3)	where low flow sampling methods where employed, field parameters were collected.

Table 2
Groundwater Analytical Results
Petroleum Hydrocarbons

Sample Date				2016-08-01	2016-08-02	2017-07-30	2016-08-03	2016-08-03		2016-08-02	2017-08-07	2016-08-02	2017-07-30	2017-07-30		2016-08-03	2016-08-03	2017-08-09	2017-08-09
Sample ID	**Units**	**RDL**	**CCME[1]**	**MW15-1**	**MW15-1 (2016/08/02)**	**MW15-1**	**MW15-4**	**DUP01 (Duplicate of MW15-4)**	**RPD (%)**	**MW15-5**	**MW15-5**	**MW15-8**	**MW15-8**	**FTA DUP01 (Duplicate of MW15-8)**	**RPD (%)**	**TRIP BLANK**	**FIELD BLANK**	**TRIP BLANK**	**FIELD BLANK**
Sampling Company				Arcadis	Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam
Volatiles																			
Benzene	µg/L	0.40	370/110	-	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	2/115	-	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	90/25	-	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	n/v	-	<0.80	<0.80	<0.80	<0.80	nc	<0.80	<0.80	<0.80	<0.80	<0.80	nc	<0.80	<0.80	<0.80	<0.80
o-Xylene	µg/L	0.40	n/v	-	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40	<0.40	nc	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	n/v	-	<0.80	<0.80	<0.80	<0.80	nc	<0.80	<0.80	<0.80	<0.80	<0.80	nc	<0.80	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	n/v	-	<100	<100	<100	<100	nc	<100	<100	<100	<100	<100	nc	<100	<100	<100	<100
F1 (C6-C10)	µg/L	100	n/v	-	<100	<100	<100	<100	nc	<100	<100	<100	<100	<100	nc	<100	<100	<100	<100
Petroleum Hydrocarbons																			
F2 (C10-C16 Hydrocarbons)	µg/L	100	n/v	<100	-	<100	<100	<100	nc	<100	<100	<100	<100	140	nc	<100	<100	<100	<100
F3 (C16-C34 Hydrocarbons)	µg/L	100	n/v	<200	-	200	<200	<200	nc	<200	100	<200	110	150	31%	<200	<200	<200	<200
F4 (C34-C50 Hydrocarbons)	µg/L	200	n/v	<200	-	<200	<200	<200	nc	<200	<200	<200	<200	<200	nc	<200	<200	<200	<200
Reached Baseline at C50	µg/L	N/A	n/v	Yes	-	Yes	Yes	Yes	nc	Yes	Yes	Yes	Yes	Yes	nc	Yes	Yes	Yes	Yes

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration exceeds the CCME guideline**
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
N/A	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 3
Groundwater Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample Date				2016-08-01	2017-07-30	2016-08-03	2016-08-03		2016-08-02	2017-08-07	2016-08-02	2017-07-30	2017-07-30	
Sample ID	**Units**	**RDL**	**CCME[1]**	**MW15-1**	**MW15-1**	**MW15-4**	**DUP01 (Duplicate of MW15-4)**	**RPD (%)**	**MW15-5**	**MW15-5**	**MW15-8**	**MW15-8**	**FTA DUP01 (Duplicate of MW15-8)**	**% RPD**
Sampling Company				Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis	
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	
Polycyclic Aromatics														
Benzo[a]pyrene equivalency	µg/L	0.010	0.015	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	<0.010	<0.010	nc
Acenaphthene	µg/L	0.10	5.8	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	<0.10	<0.10	nc
Acenaphthylene	µg/L	0.10	n/v	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	<0.10	<0.10	nc
Acridine	µg/L	0.1	4.4	<0.20	<0.050	<0.20	<0.20	nc	<0.20	<0.20	<0.050	<0.050	<0.050	nc
Anthracene	µg/L	0.010	0.012	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	<0.010	<0.010	nc
Benzo(a)anthracene	µg/L	0.0085	0.018	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc
Benzo(b&j)fluoranthene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc
Benzo(k)fluoranthene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc
Benzo(g,h,i)perylene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc
Benzo(c)phenanthrene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	<0.050	<0.050	nc
Benzo(a)pyrene	µg/L	0.0075	0.015	<0.0075	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	nc
Benzo[e]pyrene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	<0.050	<0.050	nc
Chrysene	µg/L	0.0085	n/v	<0.22	<0.0085	<0.22	<0.22	nc	<0.22	<0.22	<0.0085	<0.0085	<0.0085	nc
Dibenz(a,h)anthracene	µg/L	0.0075	n/v	<0.0075	<0.0075	<0.0075	<0.0075	nc	<0.0075	<0.0075	<0.0075	<0.0075	<0.0075	nc
Fluoranthene	µg/L	0.010	0.04	<0.010	<0.010	<0.010	<0.010	nc	<0.010	<0.010	<0.010	<0.010	<0.010	nc
Fluorene	µg/L	0.050	3	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	<0.050	<0.050	nc
Indeno(1,2,3-cd)pyrene	µg/L	0.0085	n/v	<0.0085	<0.0085	<0.0085	<0.0085	nc	<0.0085	<0.0085	<0.0085	<0.0085	<0.0085	nc
2-Methylnaphthalene	µg/L	0.10	n/v	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	<0.10	<0.10	nc
Naphthalene	µg/L	0.10	1.1/1.4	<0.10	<0.10	<0.10	<0.10	nc	<0.10	<0.10	<0.10	0.36	0.37	2.74%
Phenanthrene	µg/L	0.050	0.4	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	<0.050	<0.050	nc
Perylene	µg/L	0.050	n/v	<0.050	<0.050	<0.050	<0.050	nc	<0.050	<0.050	<0.050	<0.050	<0.050	nc
Pyrene	µg/L	0.020	0.025	<0.020	<0.020	<0.020	<0.020	nc	<0.020	<0.020	<0.020	<0.020	<0.020	nc
Quinoline	µg/L	0.20	3.4	<0.20	<0.20	<0.20	<0.20	nc	<0.20	<0.20	<0.20	<0.20	<0.20	nc

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration exceeds the CCME guideline**
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 4
Groundwater Analytical Results
Inorganics

Sample Date				2016-08-02	2017-07-30	2016-08-03	2016-08-03		2016-08-02	2017-08-07	2016-08-02	2017-07-30	2017-07-30	
Sample ID	**Units**	**RDL**	**CCME[1]**	**MW15-1**	**MW15-1**	**MW15-4**	**DUP01 (Duplicate of MW15-4)**	**RPD (%)**	**MW15-5**	**MW15-5**	**MW15-8**	**MW15-8**	**FTA DUP01 (Duplicate of MW15-8)**	**RPD (%)**
Sampling Company				Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis	
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	
Misc. Inorganics														
Dissolved Cadmium (Cd)	mg/L	0.000020	0.001(short), 0.00009(long) /0.00012	<0.000020		<0.000020	0.000020	nc	0.000040		<0.000020			nc
Dissolved Calcium (Ca)	mg/L	0.30	n/v	210	-	-	-	nc	-	-	-	-	-	nc
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	230	-	-	-	nc	-	-	-	-	-	nc
Dissolved Aluminum (Al)	mg/L	0.0030	1*	0.023	0.019	0.0052	0.0053	nc	0.0065	0.005	0.0064	0.0034	0.0043	23%
Dissolved Antimony (Sb)	mg/L	0.00060	n/v	0.0010	<0.00060	<0.00060	<0.00060	nc	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	nc
Dissolved Arsenic (As)	mg/L	0.00020	0.005/0.0125	**0.013**	**0.011**	0.00066	0.00068	nc	0.00059	0.00097	0.0019	0.0018	0.0022	20%
Dissolved Barium (Ba)	mg/L	0.010	n/v	0.062	0.065	0.066	<0.10	nc	0.091	0.047	0.083	0.063	0.059	7%
Dissolved Beryllium (Be)	mg/L	0.0010	n/v	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc
Dissolved Boron (B)	mg/L	0.020	29(short), 1.5(long)	0.027	0.08	0.35	0.26	30%	0.074	0.054	0.30	0.44	0.44	0%
Dissolved Calcium (Ca)	mg/L	0.30	n/v	170	140	470	500	6%	350	550	120	170	180	6%
Total Calcium (Ca)	mg/L	0.30	n/v	170	160	480	510	6%	370	590	120	160	160	0%
Dissolved Chromium (Cr)	mg/L	0.0010	0.001/0.0015	**0.0016**	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc
Dissolved Cobalt (Co)	mg/L	0.00030	n/v	0.0068	0.0067	0.0010	0.0010	nc	0.00070	0.0096	0.012	0.026	0.029	11%
Dissolved Copper (Cu)	mg/L	0.00020	0.004**	0.0016	0.0033	0.003	0.0028	7%	**0.0041**	0.0033	0.0025	0.0032	0.0026	21%
Dissolved Iron (Fe)	mg/L	0.060	0.3	**4.7**	**2.2**	<0.060	<0.060	nc	<0.060	**0.48**	**1.9**	**1.8**	**2.1**	15%
Dissolved Lead (Pb)	mg/L	0.00020	0.007**	<0.00020	0.00030	<0.00020	<0.00020	nc	<0.00020	<0.00020	0.00022	0.00022	<0.00020	nc
Dissolved Lithium (Li)	mg/L	0.020	n/v	<0.020	<0.020	0.078	<0.20	nc	0.030	0.042	<0.020	0.024	0.027	12%
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	220	170	530	540	2%	270	370	85	100	110	10%
Total Magnesium (Mg)	mg/L	0.20	n/v	210	200	540	550	2%	280	420	83	93	93	0%
Dissolved Manganese (Mn)	mg/L	0.0040	n/v	0.96	0.94	0.33	0.35	6%	0.14	1.4	1.5	1.4	1.4	0%
Dissolved Molybdenum (Mo)	mg/L	0.00020	0.1	0.0041	0.010	0.0013	0.0014	7%	0.0030	0.0049	0.0044	0.0034	0.0033	3%
Dissolved Nickel (Ni)	mg/L	0.00050	0.15**	0.0070	0.0061	0.0058	0.0057	2%	0.0036	0.018	0.021	0.039	0.043	10%
Dissolved Phosphorus (P)	mg/L	0.10	n/v	0.42	0.17	<0.10	<1.0	nc	<0.10	<0.10	<0.10	<0.10	<0.10	nc
Dissolved Potassium (K)	mg/L	0.30	n/v	16	17	45	48	6%	17	21	38	55	52	6%
Total Potassium (K)	mg/L	0.30	n/v	16	19	45	47	4%	18	23	38	53	53	0%
Dissolved Selenium (Se)	mg/L	0.00020	0.001	0.00034	0.00029	0.00041	0.00040	nc	0.00057	0.00039	0.00029	0.00026	0.00029	12%
Dissolved Silicon (Si)	mg/L	0.10	n/v	12	10	3	3.1	3%	3.6	4.1	4.3	4.2	4.4	5%
Dissolved Silver (Ag)	mg/L	0.00010	0.00025 /0.0075	<0.00010	<0.00010	<0.00010	<0.00010	nc	<0.00010	0.00014	<0.00010	<0.00010	<0.00010	nc
Dissolved Sodium (Na)	mg/L	0.50	n/v	260	220	1500	1500	0%	300	920	130	240	240	0%
Total Sodium (Na)	mg/L	0.50	n/v	260	230	1600	1500	6%	310	990	130	200	200	0%
Dissolved Strontium (Sr)	mg/L	0.020	n/v	0.19	0.18	0.64	0.66	3%	0.35	0.55	0.19	0.33	0.33	0%
Dissolved Sulphur (S)	mg/L	0.20	n/v	6.3	22	620	630	2%	220	730	80	110	120	9%
Dissolved Thallium (Tl)	mg/L	0.00020	0.0008	<0.00020	<0.00020	<0.00020	<0.00020	nc	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	nc
Dissolved Tin (Sn)	mg/L	0.0010	n/v	<0.0010	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc
Dissolved Titanium (Ti)	mg/L	0.0010	n/v	0.0016	<0.0010	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc
Dissolved Uranium (U)	mg/L	0.00010	0.033(short), 0.015 (long)	0.012	**0.018**	0.0068	0.0069	1%	0.013	**0.028**	0.0061	0.01	0.011	10%
Dissolved Vanadium (V)	mg/L	0.0010	n/v	0.0040	0.0044	<0.0010	<0.0010	nc	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	nc
Dissolved Zinc (Zn)	mg/L	0.0030	0.030	0.0043	0.0040	<0.0030	<0.0030	nc	<0.0030	0.0032	<0.0030	<0.0030	<0.0030	nc

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration exceeds the CCME**
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 4
Groundwater Analytical Results
Inorganics

Sample Date				2017-08-09
Sample ID	**Units**	**RDL**	**CCME[1]**	**FTA-SW-NW01**
Sampling Company				Arcadis
Laboratory				Maxxam
Misc. Inorganics				
Dissolved Cadmium (Cd)	mg/L	0.000020	0.001(short), 0.00009(long) /0.00012	<0.020
Dissolved Calcium (Ca)	mg/L	0.30	n/v	n/v
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	n/v
Dissolved Aluminum (Al)	mg/L	0.0030	1*	0.015
Dissolved Antimony (Sb)	mg/L	0.00060	n/v	<0.00060
Dissolved Arsenic (As)	mg/L	0.00020	0.005/0.0125	**0.0073**
Dissolved Barium (Ba)	mg/L	0.010	n/v	0.028
Dissolved Beryllium (Be)	mg/L	0.0010	n/v	<0.0010
Dissolved Boron (B)	mg/L	0.020	29(short), 1.5(long)	0.062
Dissolved Calcium (Ca)	mg/L	0.30	n/v	130
Total Calcium (Ca)	mg/L	0.30	n/v	n/v
Dissolved Chromium (Cr)	mg/L	0.0010	0.001/0.0015	<0.0010
Dissolved Cobalt (Co)	mg/L	0.00030	n/v	0.0032
Dissolved Copper (Cu)	mg/L	0.00020	0.004**	0.0023
Dissolved Iron (Fe)	mg/L	0.060	0.3	**0.41**
Dissolved Lead (Pb)	mg/L	0.00020	0.007**	<0.00020
Dissolved Lithium (Li)	mg/L	0.020	n/v	0.023
Dissolved Magnesium (Mg)	mg/L	0.20	n/v	230
Total Magnesium (Mg)	mg/L	0.20	n/v	n/v
Dissolved Manganese (Mn)	mg/L	0.0040	n/v	0.18
Dissolved Molybdenum (Mo)	mg/L	0.00020	0.1	0.011
Dissolved Nickel (Ni)	mg/L	0.00050	0.15**	0.0054
Dissolved Phosphorus (P)	mg/L	0.10	n/v	<0.10
Dissolved Potassium (K)	mg/L	0.30	n/v	19
Total Potassium (K)	mg/L	0.30	n/v	n/v
Dissolved Selenium (Se)	mg/L	0.00020	0.001	0.00024
Dissolved Silicon (Si)	mg/L	0.10	n/v	5.6
Dissolved Silver (Ag)	mg/L	0.00010	0.00025 /0.0075	<0.00010
Dissolved Sodium (Na)	mg/L	0.50	n/v	250
Total Sodium (Na)	mg/L	0.50	n/v	n/v
Dissolved Strontium (Sr)	mg/L	0.020	n/v	0.25
Dissolved Sulphur (S)	mg/L	0.20	n/v	58
Dissolved Thallium (Tl)	mg/L	0.00020	0.0008	<0.00020
Dissolved Tin (Sn)	mg/L	0.0010	n/v	<0.0010
Dissolved Titanium (Ti)	mg/L	0.0010	n/v	<0.0010
Dissolved Uranium (U)	mg/L	0.00010	0.033(short), 0.015 (long)	0.011
Dissolved Vanadium (V)	mg/L	0.0010	n/v	0.0037
Dissolved Zinc (Zn)	mg/L	0.0030	0.030	<0.0030

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration exceeds the CCME**
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 4
Groundwater Analytical Results
Inorganics

Sample Date			2017-08-09	2017-08-09
Sample ID	**Units**	**RDL**	**FTA-SW-NW01**	**SW1701**
Sampling Company			Arcadis	Arcadis
Laboratory			Maxxam	Maxxam
Inorganics				
Low Level Elements				
Total Cadmium (Cd)	mg/L	0.020	0.020	<0.020
Elements				
Total Aluminum (Al)	mg/L	0.0030	0.060	0.019
Total Antimony (Sb)	mg/L	0.00060	<0.00060	<0.00060
Total Arsenic (As)	mg/L	0.00020	0.0078	0.0023
Total Barium (Ba)	mg/L	0.010	0.028	0.042
Total Beryllium (Be)	mg/L	0.0010	<0.0010	<0.0010
Total Boron (B)	mg/L	0.020	0.057	0.032
Total Calcium (Ca)	mg/L	0.30	120	64
Total Chromium (Cr)	mg/L	0.0010	<0.0010	<0.0010
Total Cobalt (Co)	mg/L	0.00030	0.0034	<0.00030
Total Copper (Cu)	mg/L	0.00020	0.0026	0.00079
Total Iron (Fe)	mg/L	0.060	0.57	0.15
Total Lead (Pb)	mg/L	0.00020	<0.00020	<0.00020
Total Lithium (Li)	mg/L	0.020	<0.020	0.026
Total Magnesium (Mg)	mg/L	0.20	220	120
Total Manganese (Mn)	mg/L	0.0040	0.17	0.012
Total Molybdenum (Mo)	mg/L	0.00020	0.012	0.0052
Total Nickel (Ni)	mg/L	0.00050	0.0058	0.00051
Total Phosphorus (P)	mg/L	0.10	<0.10	<0.10
Total Potassium (K)	mg/L	0.30	18	11
Total Selenium (Se)	mg/L	0.00020	0.00037	<0.00020
Total Silicon (Si)	mg/L	0.10	5.6	2.0
Total Silver (Ag)	mg/L	0.00010	<0.00010	<0.00010
Total Sodium (Na)	mg/L	0.50	240	110
Total Strontium (Sr)	mg/L	0.020	0.23	0.12
Total Sulphur (S)	mg/L	0.20	57	47
Total Thallium (Tl)	mg/L	0.00020	<0.00020	<0.00020
Total Tin (Sn)	mg/L	0.0010	<0.0010	<0.0010
Total Titanium (Ti)	mg/L	0.0010	0.0043	<0.0010
Total Uranium (U)	mg/L	0.00010	0.012	0.0027
Total Vanadium (V)	mg/L	0.0010	0.0047	0.0019
Total Zinc (Zn)	mg/L	0.0030	<0.0030	<0.0030

Notes:

1	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration**
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 5
Groundwater Analytical Results
Miscellaneous

Sample Date				2016-08-01	2016-08-02	2017-07-30	2016-08-03	2016-08-03		2016-08-02	2017-08-07	2016-08-02	2017-07-30	2017-07-30	
Sample ID	**Units**	**RDL**	**CCME[1]**	**MW15-1**	**MW15-1**	**MW15-1**	**MW15-4**	**DUP01 (Duplicate of MW15-4)**	**RPD (%)**	**MW15-5**	**MW15-5**	**MW15-8**	**MW15-8**	**FTA DUP01 (Duplicate of MW15-8)**	**RPD (%)**
Sampling Company				Arcadis	Arcadis	Arcadis	Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis	
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	
Calculated Parameters															
Hardness (CaCO3)	mg/L	0.50	n/v	1500	-	1220	3300	3500	6%	2000	3230	660	794	787	1%
Dissolved Nitrate (NO3)	mg/L	0.089	550(short), 13(long)/ 1500(short), 200(long)	<0.044	-	0.058	**52**	**53**	2%	**26**	0.12	0.060	0.46	0.50	8%
Nitrate plus Nitrite (N)	mg/L	0.020	n/v	<0.020	-	<0.014	12	12	0%	6.0	0.027	<0.020	0.12	0.13	8%
Dissolved Nitrite (NO2)	mg/L	0.033	0.1	<0.033	-	<0.033	0.098	**0.17**	nc	0.089	<0.033	<0.033	0.040	0.042	5%
Misc. Inorganics															
pH	pH	N/A	6.5-9.0	7.81	-	7.29	7.79	7.8	0%	7.59	7.47	7.87	7.47	7.5	0%
Total Dissolved Solids	mg/L	10	n/v	2100	-	1800	7700	7600	1%	3700	5700	1400	1500	1500	0%
Total Suspended Solids	mg/L	1.0	background dependant	4.7	-	11	6.7	6	11%	9.3	<1.0	7.3	9.3	11	17%
Anions															
Alkalinity (PP as CaCO3)	mg/L	0.50	n/v	<0.50	-	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	<0.50	<0.50	nc
Alkalinity (Total as CaCO3)	mg/L	0.50	n/v	1100	-	1100	360	360	0%	350	360	450	470	470	0%
Bicarbonate (HCO3)	mg/L	0.50	n/v	1300	-	1300	430	440	2%	420	440	550	570	570	0%
Carbonate (CO3)	mg/L	0.50	n/v	<0.50	-	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	<0.50	<0.50	nc
Hydroxide (OH)	mg/L	0.50	n/v	<0.50	-	<0.50	<0.50	<0.50	nc	<0.50	<0.50	<0.50	<0.50	<0.50	nc
Dissolved Sulphate (SO4)	mg/L	5.0	n/v	18	-	73	1600	1600	0%	680	2100	230	320	310	3%
Dissolved Chloride (Cl)	mg/L	1.0	640(short), 120(long)	**550**	-	**400**	**2900**	**2500**	15%	**1200**	**1600**	**180**	**330**	**320**	3%
Nutrients															
Total Ammonia (N)	mg/L	0.25	temp and pH dependant	-	4.7	6.1	2.2	2.3	4%	0.58	1.4	0.36	1.1	1.2	9%
Dissolved Nitrite (N)	mg/L	0.010	n/v	<0.010	-	<0.010	0.030	0.051	nc	0.027	<0.010	<0.010	0.012	0.013	8%
Dissolved Nitrate (N)	mg/L	0.010	n/v	<0.010	-	0.013	12	12	0%	6.0	0.027	0.014	0.10	0.11	10%
Misc. Organics															
Extractable (n-Hex.) Oil and grease	mg/L	2.0	n/v	<2.0	-	2.0	<2.0	3.0	nc	<2.0	<2.0	3.0	4.0	3.0	29%
Phenols	mg/L	0.0020	0.004	**0.32**	-	**0.14**	**0.025**	**0.023**	8%	**0.016**	**0.019**	**0.019**	**0.017**	**0.021**	21%

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
6.5	**Concentration exceeds the CCME guideline**
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 6
Surface Water Analytical Results
Petroleum Hydrocarbons

Sample Date					2016-08-04	2017-08-09	2017-08-09
Sample ID	Units	RDL	CCME[1]	NWB License[2]	FTA-SW-NW01	FTA-SW-NW01	SW1701
Sampling Company					Arcadis	Arcadis	Arcadis
Laboratory					Maxxam	Maxxam	Maxxam
Volatiles							
Benzene	µg/L	0.40	370/110	370	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	2/115	2	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	90/25	90	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	n/v	n/v	<0.80	<0.80	<0.80
o-Xylene	µg/L	0.40	n/v	n/v	<0.40	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	n/v	n/v	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	n/v	n/v	<100	<100	<100
F1 (C6-C10)	µg/L	100	n/v	n/v	<100	<100	<100
Petroleum Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	µg/L	100	n/v	n/v	<100	<100	<100
F3 (C16-C34 Hydrocarbons)	µg/L	200	n/v	n/v	<200	<200	<200
F4 (C34-C50 Hydrocarbons)	µg/L	200	n/v	n/v	<200	<200	<200
Reached Baseline at C50	µg/L	n/a	n/v	n/v	Yes	Yes	Yes

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
[2]	NWB License (1BR-FTA1217) effluent quality guidelines
6.5	**Concentration exceeds the CCME guideline**
	Concentration exceeds the NWB License guideline
*	standard dependent on pH
**	standard dependent on hardness
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
n/a	Not applicable.
RDL	Reportable Detection Limit

Table 7
Sump Analytical Results
Metals and Volatiles

Sample Date					2016-07-26	2017-07-25	2016-07-26	2017-07-25
Sample ID	Units	RDL	CCME[1]	NWB License[2]	FTASUMP 01	FTASUMP 01	FTASUMP 02	FTASUMP 02
Sampling Company					Arcadis	Arcadis	Arcadis	Arcadis
Laboratory					Maxxam	Maxxam	Maxxam	Maxxam
Misc. Inorganics								
pH	n/a	n/a	6.5 to 9.0	6 to 9	8.23	8.41	8.2	8.15
Misc. Organics								
Oil and Grease	mg/L	2.0	n/v	5.0	<2.0	<2.0	<2.0	<2.0
Metals								
Total Zinc (Zn)	mg/L	0.0030	0.030	0.5	<0.0030	<0.0030	<0.0030	0.0046
Dissolved Lead (Pb)	mg/L	0.00020	0.001**	0.001	<0.00020	<0.00020	<0.00020	0.00040
Volatiles								
Benzene	µg/L	0.40	370/110	370	<0.40	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	2/115	2	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	90/25	90	<0.40	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	n/v	n/v	<0.80	<0.80	<0.80	<0.80
o-Xylene	µg/L	0.40	n/v	n/v	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	n/v	n/v	<0.80	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	n/v	n/v	<100	<100	<100	<100
F1 (C6-C10)	µg/L	100	n/v	n/v	<100	<100	<100	<100

Notes:

[1]	CCME Water Quality Guidelines for the Protection of Aquatic Life, (Freshwater/Marine)
[2]	NWB License (1BR-FTA1217/TC) effluent quality guidelines
6.5	**Concentration exceeds the CCME guideline**
	Concentration exceeds the NWB License guideline
*	Standard dependent on pH
**	Standard dependent on hardness
n/v	No standard/guideline value
-	Parameter not analyzed / not available.
n/a	Not applicable.

Table 8
Sump Analytical Results
Perfluorinated Compounds

Sample Date					2016-07-26	2017-07-25	2016-07-26	2016-07-26		2017-07-25
Sample ID	Units	RDL	Drinking Water Screening Values[1]	FEQGs for PFOS[2]	FTASUMP01	FTA SUMP01	FTASUMP02	SUMPDUP (Duplicate of FTASUMP 02)	RPD (%)	FTA SUMP02
Sampling Company					Arcadis	Arcadis	Arcadis	Arcadis		Arcadis
Laboratory					Maxxam	Maxxam	Maxxam	Maxxam		Maxxam
Perfluorinated Compounds										
Perfluorobutane Sulfonate (PFBS)	µg/L	0.040	15	n/v	0.43	0.9	5.7	5.8	2%	13
Perfluorobutanoic acid	µg/L	0.040	n/v	n/v	0.72	1.5	10	9.8	2%	<0.80
Perfluorodecane Sulfonate	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluorodecanoic Acid (PFDA)	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluorododecanoic Acid (PFDoA)	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluoroheptane sulfonate	µg/L	0.040	n/v	n/v	<0.020	<0.040	1.5	1.6	6%	2.5
Perfluoroheptanoic Acid (PFHpA)	µg/L	0.040	0.2	n/v	**0.37**	**0.98**	**5.3**	**5.2**	2%	**13**
Perfluorohexane Sulfonate (PFHxS)	µg/L	0.040	0.6	n/v	**1.3**	**4.2**	**51**	**60**	16%	**89**
Perfluorohexanoic Acid (PFHxA)	µg/L	0.040	0.2	n/v	**3.2**	**6.5**	**45**	**44**	2%	**71**
Perfluoro-n-Octanoic Acid (PFOA)	µg/L	0.040	0.2	n/v	0.13	**0.35**	**7.3**	**7.9**	8%	**12**
Perfluorononanoic Acid (PFNA)	µg/L	0.040	0.2	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluorooctane Sulfonamide (PFOSA)	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluorooctane Sulfonate (PFOS)	µg/L	0.040	0.6	6	0.11	0.18	**17**	**21**	21%	**12**
Perfluoropentanoic Acid (PFPeA)	µg/L	0.040	0.2	n/v	**2.7**	**7.9**	**29**	**26**	11%	**46**
Perfluorotetradecanoic Acid	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluorotridecanoic Acid	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80
Perfluoroundecanoic Acid (PFUnA)	µg/L	0.040	n/v	n/v	<0.020	<0.040	<0.80	<0.80	nc	<0.80

Notes:

[1]	Health Canada (HC) Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.
[2]	Environment Canada (EC) Draft Federal Environmental Quality Guidelines for PFOS. 2013.
6.5	**Concentration exceeds the HC guideline**
6.6	**Concentration exceeds the FEQG for PFOS**
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
RPD	Relative Percent Difference
ITALICS	RPD alert limit exceeded
RDL	Reportable Detection Limit
nc	Not calculable

Table 9
Soil Analytical Results
Petroleum Hydrocarbons

Sample Date							2017-08-06	2017-08-06		2017-08-06	2017-08-06	2017-08-06	2017-08-06	2017-08-06
Sample ID	Units	RDL	CCME CWS[1]	CCME CSQG[2]	NWB License (Commercial)[3]	NWB License (Industrial)[4]	FTA 1701	FTADUP01 (Duplicate of FTA 1701)	RPD (%)	FTA 1702	FTA 1703	FTA 1704	FTA 1705	FTA 1706
Coordinates NAD83 (UTM Zone 13W)							493540 E 7666891 N	493540 E 7666891 N		493594 E 7666876 N	493640 E 7666864 N	493533 E 7666864 N	493588 E 7666849 N	493632 E 7666837 N
Sampling Company							Arcadis	Arcadis		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory							Maxxam	Maxxam		Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Physical Properties														
Moisture	%	0.30	n/v	n/v	n/v	n/v	6.1	6.2	2%	6.2	4.2	14	5.3	16
Petroleum Hydrocarbons														
F2 (C10-C16 Hydrocarbons)	mg/kg	10	230	n/v	1300	5600	**540**	**540**	0%	<10	29	47	<10	28
F3 (C16-C34 Hydrocarbons)	mg/kg	50	2500	n/v	2500	6600	1100	1000	10%	140	460	64	170	160
F4 (C34-C50 Hydrocarbons)	mg/kg	50	6600	n/v	2500	6600	220	200	10%	130	170	<50	65	55
Reached Baseline at C50	-	-	n/v	n/v	n/v	n/v	Yes	Yes	nc	Yes	Yes	Yes	Yes	Yes
Volatiles														
Benzene	mg/kg	0.0050	n/v	0.0068	5	5	<0.0050	<0.0050	nc	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	0.020	n/v	0.08	0.8	0.8	<0.020	<0.020	nc	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	n/v	0.018	20	20	<0.010	<0.010	nc	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	mg/kg	0.040	n/v	2.4	17	20	<0.040	<0.040	nc	<0.040	<0.040	<0.040	<0.040	<0.040
m & p-Xylene	mg/kg	0.040	n/v	n/v	n/v	n/v	<0.040	<0.040	nc	<0.040	<0.040	<0.040	<0.040	<0.040
o-Xylene	mg/kg	0.020	n/v	n/v	n/v	n/v	<0.020	<0.020	nc	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	170	n/v	1300	5600	15	18	18%	18	<10	<10	<10	<10
F1 (C6-C10)	mg/kg	10	170	n/v	1300	5600	15	18	18%	18	<10	<10	<10	<10

Notes:

1 Canadian-Wide Standards for Petroleum Hydrocarbons in Soil, January 2008, Tier 1, Ecological Soil Contact, Commercial/Industrial, fine-grained soils, Table 2 Surface soils

2 Canadian Environmental Quality Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, 2004, Commercial, fine-grained, surface soil

3 NWB License (1BR-FTA1217) Remediation Requirements, commercial land use, fine-grained soils

4 NWB License (1BR-FTA1217) Remediation Requirements, industrial land use, fine-grained soils

6.5 **Concentration exceeds the CCME guideline**

Concentration exceeds the NWB License guideline

n/v No standard/guideline value.

- Parameter not analyzed / not available.

RPD Relative Percent Difference

ITALICS RPD alert limit exceeded

RDL Reportable Detection Limit

nc Not calculable

Table 10
Geochemical Monitoring for Seepage
Dissolved and Total Inorganics

Sample Date			2017-07-25	2017-08-09	2017-07-30	2017-08-09	2017-08-08
Sample ID			FTASUMP01	FTA-SW-NW01	MW15-1	SW1701	MW13-8
Location	Units	RDL	FTA LTU Northwest Sump Area	Ponded Water in Suspected Seepage Area	Well Adjacent to FTA LTU Northwest Corner	Ponded Water in Areas Unaffected by Seepage	Groundwater Well Outside any Impacted Area
Sampling Company			Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Dissolved Inorganics							
Dissolved Calcium (Ca)	mg/L	0.30	130	130	140	77	290
Total Calcium (Ca)	mg/L	0.30	120	120	160	64	260
Dissolved Magnesium (Mg)	mg/L	0.20	100	230	170	140	170
Total Magnesium (Mg)	mg/L	0.20	97	220	200	120	160
Dissolved Potassium (K)	mg/L	0.30	11	19	17	13	20
Total Potassium (K)	mg/L	0.30	11	18	19	11	20
Dissolved Sodium (Na)	mg/L	0.50	60	250	220	120	69
Total Sodium (Na)	mg/L	0.5	58	240	230	110	65

Notes:

RDL Reportable Detection Limit

Table 11
Geochemical Monitoring for Seepage
Miscellaneous Parameters

Sample Date			2017-08-09	2017-08-09	2017-07-30	2017-08-09	2017-08-08
Sample ID			**FTA SUMP01**	**FTA-SW-NW01**	**MW15-1**	**SW1701**	**MW13-8**
Location	**Units**	**RDL**	**FTA LTU Northwest Sump Area**	**Ponded Water in Suspected Seepage Area**	**Well Adjacent to FTA LTU Northwest Corner**	**Ponded Water in Areas Unaffected by Seepage**	**Groundwater Well Outside any Impacted Area**
Sampling Company			Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Calculated Parameters							
Dissolved Nitrate (NO3)	mg/L	0.089	<0.044	<0.044	0.058	<0.044	**48**
Nitrate plus Nitrite (N)	mg/L	0.022	<0.014	<0.014	<0.014	<0.014	11
Dissolved Nitrite (NO2)	mg/L	0.033	<0.033	<0.033	<0.033	<0.033	0.070
Anions							
Dissolved Sulphate (SO4)	mg/L	1.0 - 5.0	400	180	73	150	890
Dissolved Chloride (Cl)	mg/L	1.0 - 5.0	130	610	400	360	92
Nutrients							
Dissolved Nitrite (N)	mg/L	0.010	<0.010	<0.010	<0.010	<0.010	0.021
Dissolved Nitrate (N)	mg/L	0.010	<0.010	<0.010	0.013	<0.010	11

Notes:

RDL Reportable Detection Limit

Table 12
Geochemical Monitoring for Seepage
Petroleum Hydrocarbons

Sample Date	Units	RDL	2017-07-25[3]	2017-08-09	2017-07-30	2017-08-09	2017-08-08
Sample ID			**FTASUMP 01**	**FTA-SW-NW01**	**MW15-1**	**SW1701**	**MW13-8**
Location			**FTA LTU Northwest Sump Area**	**Ponded Water in Suspected Seepage Area**	**Well Adjacent to FTA LTU Northwest Corner**	**Ponded Water in Areas Unaffected by Seepage**	**Groundwater Well Outside any Impacted Area**
Sampling Company			Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory			Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Volatiles							
Benzene	µg/L	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Toluene	µg/L	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Ethylbenzene	µg/L	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
m & p-Xylene	µg/L	0.80	<0.80	<0.80	<0.80	<0.80	<0.80
o-Xylene	µg/L	0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Xylenes (Total)	µg/L	0.80	<0.80	<0.80	<0.80	<0.80	<0.80
F1 (C6-C10) - BTEX	µg/L	100	<100	<100	<100	<100	<100
F1 (C6-C10)	µg/L	100	<100	<100	<100	<100	<100
Petroleum Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	µg/L	100	<100	<100	<100	<100	<100
F3 (C16-C34 Hydrocarbons)	µg/L	200	<100	<100	200	<100	<100
F4 (C34-C50 Hydrocarbons)	µg/L	200	<200	<200	<200	<200	<200

Notes:

RDL Reportable Detection Limit

Table 13
Geochemical Monitoring for Seepage
Perfluorinated Compounds

Sample Date				2017-07-25	2017-08-09	2017-08-09	2017-08-09	2017-08-08
Sample ID	Units	RDL	FEQGs for PFOS[2]	FTA SUMP01	FTA-SW-NW01	MW15-1	SW1701	MW13-8
Location				FTA LTU Northwest Sump Area	Ponded Water in Suspected Seepage Area	Well Adjacent to FTA LTU Northwest Corner	Ponded Water in Areas Unaffected by Seepage	Groundwater Well Outside any Impacted Area
Sampling Company				Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam
Perfluorinated Compounds								
Perfluorobutane Sulfonate (PFBS)	µg/L	0.020	n/v	0.9	0.39	<0.020	<0.020	<0.020
Perfluorobutanoic acid	µg/L	0.020	n/v	1.5	0.96	0.34	<0.020	0.2
Perfluorodecane Sulfonate	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluorodecanoic Acid (PFDA)	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluorododecanoic Acid (PFDoA)	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluoroheptane sulfonate	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluoroheptanoic Acid (PFHpA)	µg/L	0.020	n/v	0.98	0.35	<0.020	<0.020	<0.020
Perfluorohexane Sulfonate (PFHxS)	µg/L	0.020	n/v	4.2	0.23	<0.020	<0.020	<0.020
Perfluorohexanoic Acid (PFHxA)	µg/L	0.020	n/v	6.5	3.9	0.22	<0.020	<0.020
Perfluoro-n-Octanoic Acid (PFOA)	µg/L	0.020	n/v	0.35	0.048	<0.020	<0.020	<0.020
Perfluorononanoic Acid (PFNA)	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluorooctane Sulfonamide (PFOSA)	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluorooctane Sulfonate (PFOS)	µg/L	0.020	6	0.18	0.025	<0.020	<0.020	<0.020
Perfluoropentanoic Acid (PFPeA)	µg/L	0.020	n/v	7.9	5.2	0.39	<0.020	<0.020
Perfluorotetradecanoic Acid	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluorotridecanoic Acid	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020
Perfluoroundecanoic Acid (PFUnA)	µg/L	0.020	n/v	<0.040	<0.020	<0.020	<0.020	<0.020

Notes:

RDL Reportable Detection Limit

Table 14
Geochemical Monitoring for Seepage
Field Parameters

Sample Date		2017-08-09	2017-08-09	2017-07-27	2017-08-09	2017-08-08
Sample ID		FTA SUMP01	FTA-SW-NW01	MW15-1	SW1701	MW13-8
Location	Units	FTA LTU Northwest Sump Area	Ponded Water in Suspected Seepage Area	Well Adjacent to FTA LTU Northwest Corner	Ponded Water in Areas Unaffected by Seepage	Groundwater Well Outside any Impacted Area
Sampling Company		Arcadis	Arcadis	Arcadis	Arcadis	Arcadis
Field Parameters						
Temperature	^{o}C	16.11	10.75	6.51	15.21	7.49
pH		8.67	8.53	6.80	7.56	7.07
ORP	mV	181	234	-15	61	109
Conductivity	mS/cm	1.21	3.05	2.92	1.64	1.87
Turbidity	NTU	13.7	8.6	10.1	1.4	12.2
Dissolved Oxygen	mg/L	8.16	13.42	0.00	10.17	1.69
Total Dissolved Solids	g/L	0.776	1.95	1.79	1.05	1.24

FIGURES

Legend

Approximate Boundaries of Site

Metres
250 0 250 500
1:15000

Title: **SITE LOCATION**

Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT FTA LTU**

Client: **PWGSC/TC**

ARCADIS

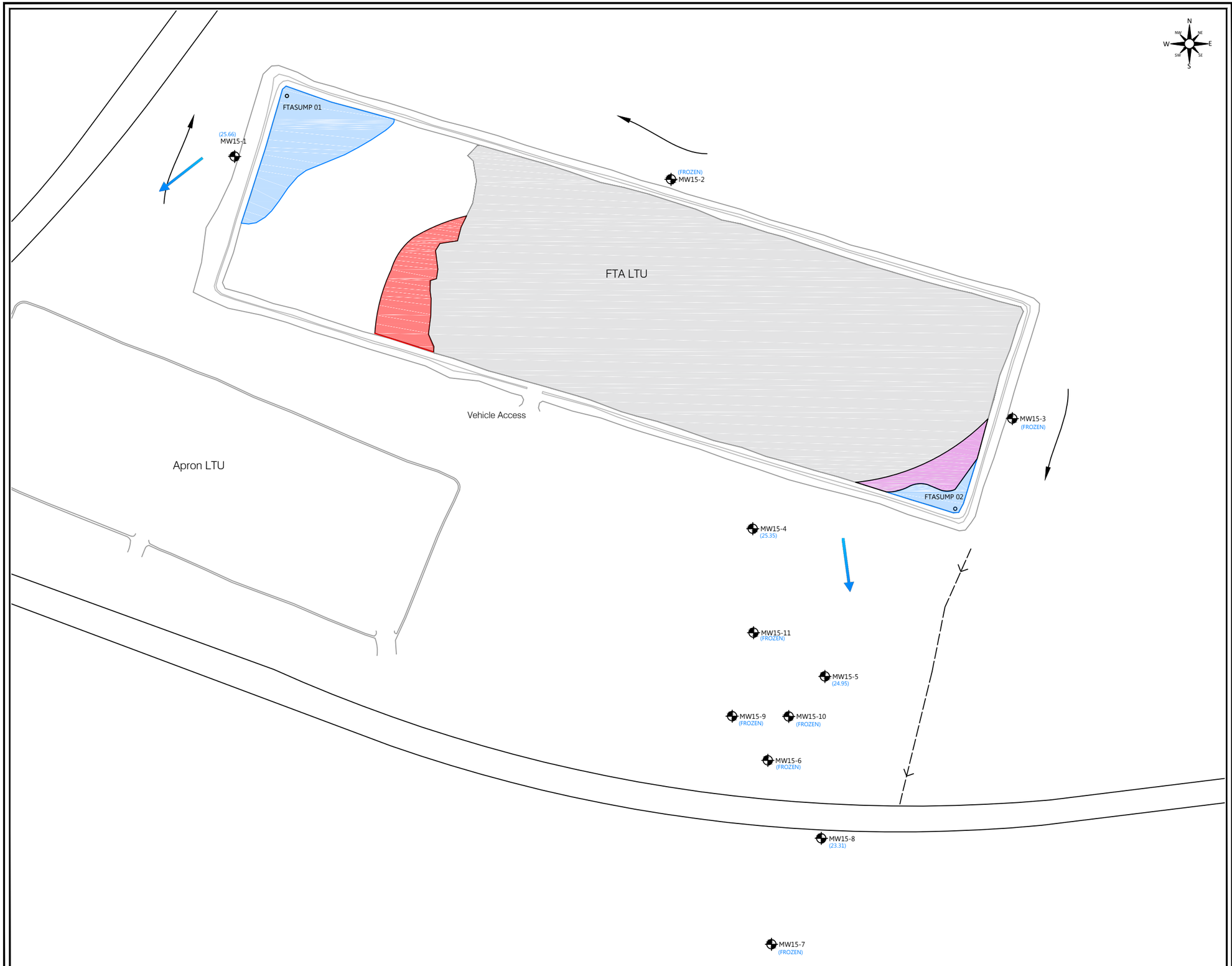
Date: **NOVEMBER 2017**

FIGURE 1

TO BE PRINTED IN COLOUR ON 11"X17" PAPER ONLY - DO NOT SCALE

updated on:30-Nov-17 by dlogan

Z:\Projects\2017\102089-002 PWGSC - Cambridge Bay - FTA LTU\Figures\1-CAD\102089-002 Remedial Actvities Figures.dwg(layout)



LEGEND

- LTU Bottom of Berm
- LTU Top of Berm
- Drainage Swale
- Tilled Area
- Scrap Metal Pile
- Boulders and Concrete Debris Pile
- Contaminated Area
- Water
- Monitoring Well
- Test Pit Location
- Apron Soil Transferred in 2017
- Extent of FTA Soil Excavation in 2017
- (18.75) Measured Ground Water Elevation (m asl) by Arcadis in 2017
- Estimated Groundwater Flow Direction in 2017
- Storm Water Drainage Direction

Metres

20 0 20 40

1:1150

Title:
2017 GROUNDWATER MONITORING

Project:
2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT FTA LTU

Client:
PWGSC/TC

ARCADIS

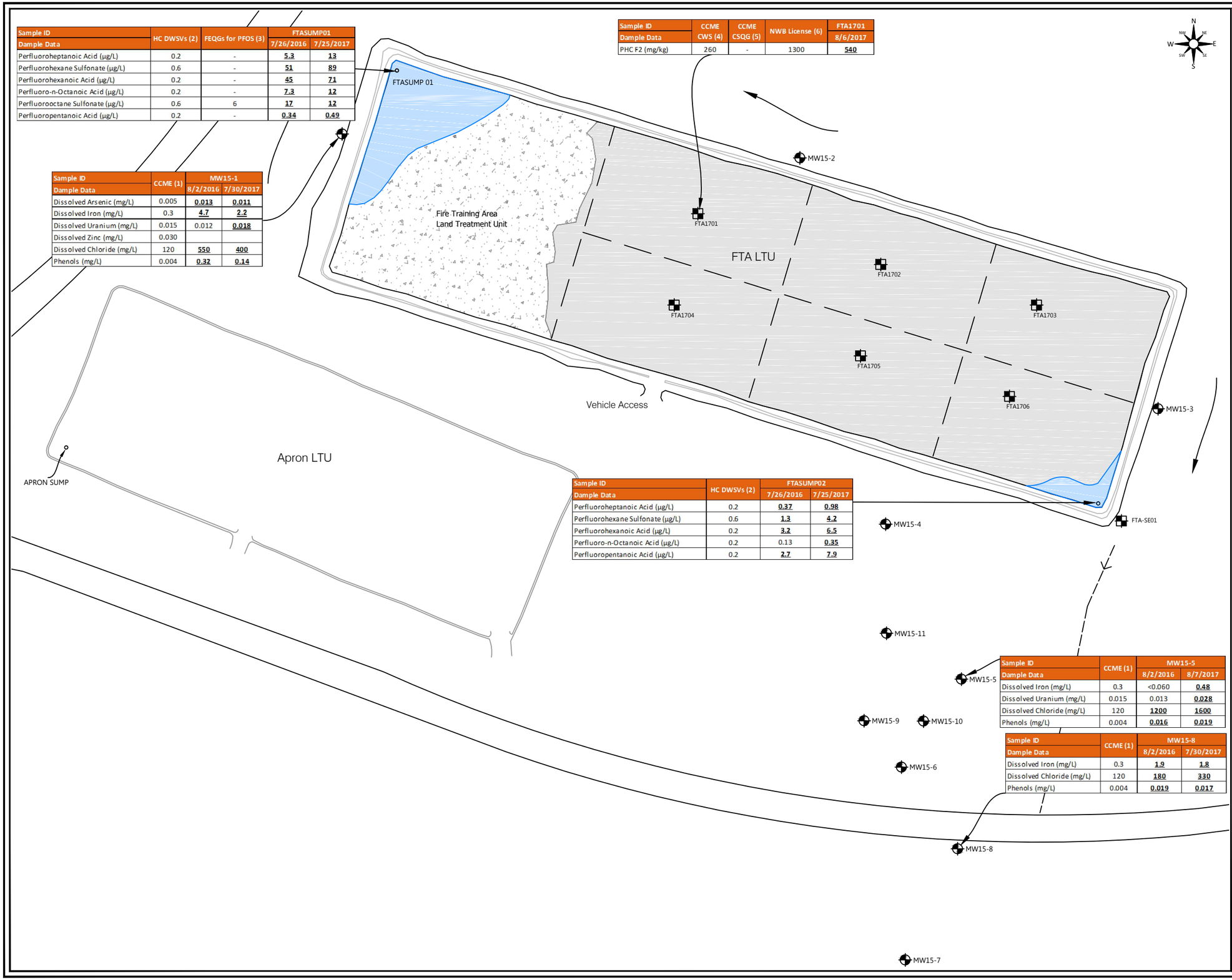
Date:
NOVEMBER 2017

FIGURE 2

Sample ID	HC DWSVs (2)	FEQGs for PFOS (3)	FTASUMP01	
Dample Data			7/26/2016	7/25/2017
Perfluoroheptanoic Acid (µg/L)	0.2	-	**5.3**	**13**
Perfluorohexane Sulfonate (µg/L)	0.6	-	**51**	**89**
Perfluorohexanoic Acid (µg/L)	0.2	-	**45**	**71**
Perfluoro-n-Octanoic Acid (µg/L)	0.2	-	**7.3**	**12**
Perfluorooctane Sulfonate (µg/L)	0.6	6	**17**	**12**
Perfluoropentanoic Acid (µg/L)	0.2	-	**0.34**	**0.49**

Sample ID	CCME (1)	MW15-1	
Dample Data		8/2/2016	7/30/2017
Dissolved Arsenic (mg/L)	0.005	**0.013**	**0.011**
Dissolved Iron (mg/L)	0.3	**4.7**	**2.2**
Dissolved Uranium (mg/L)	0.015	0.012	**0.018**
Dissolved Zinc (mg/L)	0.030		
Dissolved Chloride (mg/L)	120	**550**	**400**
Phenols (mg/L)	0.004	**0.32**	**0.14**

Sample ID	CCME CWS (4)	CCME CSQG (5)	NWB License (6)	FTA1701
Dample Data				8/6/2017
PHC F2 (mg/kg)	260	-	1300	**540**



Sample ID	HC DWSVs (2)	FTASUMP02	
Dample Data		7/26/2016	7/25/2017
Perfluoroheptanoic Acid (µg/L)	0.2	**0.37**	**0.98**
Perfluorohexane Sulfonate (µg/L)	0.6	**1.3**	**4.2**
Perfluorohexanoic Acid (µg/L)	0.2	**3.2**	**6.5**
Perfluoro-n-Octanoic Acid (µg/L)	0.2	0.13	**0.35**
Perfluoropentanoic Acid (µg/L)	0.2	**2.7**	**7.9**

Sample ID	CCME (1)	MW15-5	
Dample Data		8/2/2016	8/7/2017
Dissolved Iron (mg/L)	0.3	<0.060	**0.48**
Dissolved Uranium (mg/L)	0.015	0.013	**0.028**
Dissolved Chloride (mg/L)	120	**1200**	**1600**
Phenols (mg/L)	0.004	**0.016**	**0.019**

Sample ID	CCME (1)	MW15-8	
Dample Data		8/2/2016	7/30/2017
Dissolved Iron (mg/L)	0.3	**1.9**	**1.8**
Dissolved Chloride (mg/L)	120	**180**	**330**
Phenols (mg/L)	0.004	**0.019**	**0.017**

LEGEND

- FTA Bottom of Berm
- FTA Top of Berm
- Storm water drainage direction
- Drainage Swale
- Monitoring Well
- Test Pit Location
- Surface Water Sample Location
- Water
- Granular Cover
- Limit of contaminated material reported (Uplogiaq, Sept 2015)

NOTES:

(1) CCME Water Quality Guidelines for the Protection of Aquatic Life (Freshwater/Marine)
(2) Health Canada (HC) Summary of Drinking Water Screening Values for PFOS and PFOA. 2016.
(3) Environment Canada (EC) Draft Federal Environmental Quality Guidelines for PFOS. 2013.
(4) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil, January 2008, Tier 1, Ecological Soil Contact, Commercial/Industrial, coarse-grained soils, Table 3 Surface soils
(5) Canadian Environmental Quality Guidelines, CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, 2004, Commercial, coarse-grained, surface soil
(6) NWB License (1BR-FTA1217) Remediation Requirements, commercial land use, fine-grained soils

Metres
20 0 20 40
1:1100

Title: **FTA LTU - GROUNDWATER AND SOIL ANALYTICAL RESULTS**

Project: **2017 ENVIRONMENTAL MONITORING PROGRAM AT CAMBRIDGE BAY AIRPORT FTA LTU**

Client: **PWGSC/TC**

ARCADIS

Date: **NOVEMBER 2017**

FIGURE 3

APPENDIX A

Laboratory Reponse to Sampling and Quality Control Protocols

maxxam.ca

MAXXAM ANALYTICS
6740 Campobello Rd
Mississauga, ON L5N 2L8

Office 905 817 5700
Toll Free 800 563 6266
Fax 905 817 5777

July 20, 2017

Maurenia Lynds
Arcadis Canada Inc.
329 Churchill Ave N.
Ottawa, ON K1Z 5B8

RE: Cambridge Bay – FTA LTU Sampling Plans (as provided by Arcadis Canada Inc.)

Dear Maurenia;

We have completed a thorough review of the sampling plan you've provided in support of your project listed above.

While Maxxam cannot provide approval for field sampling plans, we can comment that the indicated planned frequency of field QC samples, as applicable to soil and groundwater related parameters in general, is in line with the frequency of analysis of QC samples (for soil and groundwater analyses) in our laboratories.

Should you require anything further please feel free to contact me at your convenience.

Sincerely,

Maxxam Analytics International Corporation
Susan Bigg, Certified Auditor
Senior QA Manager, Ontario and Manitoba

APPENDIX B

Certificates of Analysis

Your Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Your C.O.C. #: M07081

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/17
Report #: R2429732
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768254
Received: 2017/08/11, 10:03

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/16	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/16	2017/08/16	AB SOP-00037	CCME PHC-CWS m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Silica gel clean up employed.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Your C.O.C. #: M07081

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/17
Report #: R2429732
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768254
Received: 2017/08/11, 10:03

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RS5338		
Sampling Date		2017/08/09 15:15		
COC Number		M07081		
	UNITS	FIELD BLANK	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	0.20	8724895
Volatiles				
Benzene	ug/L	<0.40	0.40	8724271
Toluene	ug/L	<0.40	0.40	8724271
Ethylbenzene	ug/L	<0.40	0.40	8724271
m & p-Xylene	ug/L	<0.80	0.80	8724271
o-Xylene	ug/L	<0.40	0.40	8724271
Xylenes (Total)	ug/L	<0.80	0.80	8724271
F1 (C6-C10) - BTEX	ug/L	<100	100	8724271
F1 (C6-C10)	ug/L	<100	100	8724271
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	96	N/A	8724271
4-Bromofluorobenzene (sur.)	%	101	N/A	8724271
D4-1,2-Dichloroethane (sur.)	%	99	N/A	8724271
O-TERPHENYL (sur.)	%	108	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		RS5337		
Sampling Date		2017/08/09		
COC Number		M07081		
	UNITS	TRIP BLANK	RDL	QC Batch
Volatiles				
Benzene	ug/L	<0.40	0.40	8725667
Toluene	ug/L	<0.40	0.40	8725667
Ethylbenzene	ug/L	<0.40	0.40	8725667
m & p-Xylene	ug/L	<0.80	0.80	8725667
o-Xylene	ug/L	<0.40	0.40	8725667
Xylenes (Total)	ug/L	<0.80	0.80	8725667
F1 (C6-C10) - BTEX	ug/L	<100	100	8725667
F1 (C6-C10)	ug/L	<100	100	8725667
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	104	N/A	8725667
4-Bromofluorobenzene (sur.)	%	98	N/A	8725667
D4-1,2-Dichloroethane (sur.)	%	99	N/A	8725667

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	6.7°C
Package 2	5.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724271	1,4-Difluorobenzene (sur.)	2017/08/13	98	70 - 130	99	70 - 130	104	%		
8724271	4-Bromofluorobenzene (sur.)	2017/08/13	100	70 - 130	100	70 - 130	102	%		
8724271	D4-1,2-Dichloroethane (sur.)	2017/08/13	111	70 - 130	106	70 - 130	102	%		
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8725667	1,4-Difluorobenzene (sur.)	2017/08/14	98	70 - 130	98	70 - 130	98	%		
8725667	4-Bromofluorobenzene (sur.)	2017/08/14	103	70 - 130	102	70 - 130	101	%		
8725667	D4-1,2-Dichloroethane (sur.)	2017/08/14	101	70 - 130	100	70 - 130	98	%		
8724271	Benzene	2017/08/12	107	70 - 130	108	70 - 130	<0.40	ug/L	NC	30
8724271	Ethylbenzene	2017/08/12	102	70 - 130	108	70 - 130	<0.40	ug/L	NC	30
8724271	F1 (C6-C10) - BTEX	2017/08/12					<100	ug/L	NC	30
8724271	F1 (C6-C10)	2017/08/12	76	70 - 130	90	70 - 130	<100	ug/L	NC	30
8724271	m & p-Xylene	2017/08/12	102	70 - 130	108	70 - 130	<0.80	ug/L	NC	30
8724271	o-Xylene	2017/08/12	98	70 - 130	102	70 - 130	<0.40	ug/L	NC	30
8724271	Toluene	2017/08/12	98	70 - 130	100	70 - 130	<0.40	ug/L	NC	30
8724271	Xylenes (Total)	2017/08/12					<0.80	ug/L	NC	30
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30
8725667	Benzene	2017/08/14	100	70 - 130	95	70 - 130	<0.40	ug/L	2.2	30
8725667	Ethylbenzene	2017/08/14	105	70 - 130	102	70 - 130	<0.40	ug/L	1.0	30
8725667	F1 (C6-C10) - BTEX	2017/08/14					<100	ug/L	NC	30
8725667	F1 (C6-C10)	2017/08/14	81	70 - 130	112	70 - 130	<100	ug/L	0.49	30
8725667	m & p-Xylene	2017/08/14	106	70 - 130	101	70 - 130	<0.80	ug/L	2.7	30
8725667	o-Xylene	2017/08/14	103	70 - 130	98	70 - 130	<0.40	ug/L	1.5	30
8725667	Toluene	2017/08/14	96	70 - 130	90	70 - 130	<0.40	ug/L	2.6	30

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8725667	Xylenes (Total)	2017/08/14					<0.80	ug/L	1.7	30

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

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

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

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

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

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768254
Report Date: 2017/08/17

ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Location: CAMBAY FTA LTU AND APRON LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017081

Page 1 of 1

Report Information

Company: ARCADIS CANADA INC.
Contact: MAURENIA LYNDS
Phone: 613 721 0555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 102089-002
SITE: CAM BAY FTA LTU AND APRON LTU

Same as CoC

Project/LSD

Special Instructions

PLEASE PUT PROJECT # 102089-002 AND 102089-003 ON COC.

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 & VOC ☐	~~BTEX F1-F2~~ PHC F2-F4	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	HOLD - DO NOT ANALYZE
11	TRIP BLANK		2017		W	2	X										
12	FIELD BLANK		2017/08/09	15:15	W	4	X	X										
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

2.2.2 ice/seal yes

RECEIVED IN YELLOWKNIFE
By: [signature]
2017 -08- 11 16:03

Temp: 6 7 / 7 5 / 7 4 ices yes

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
ELLIOTT HOLDEN	2017/08/10	10:00	Jenna Walter	20170812	1224	B768254

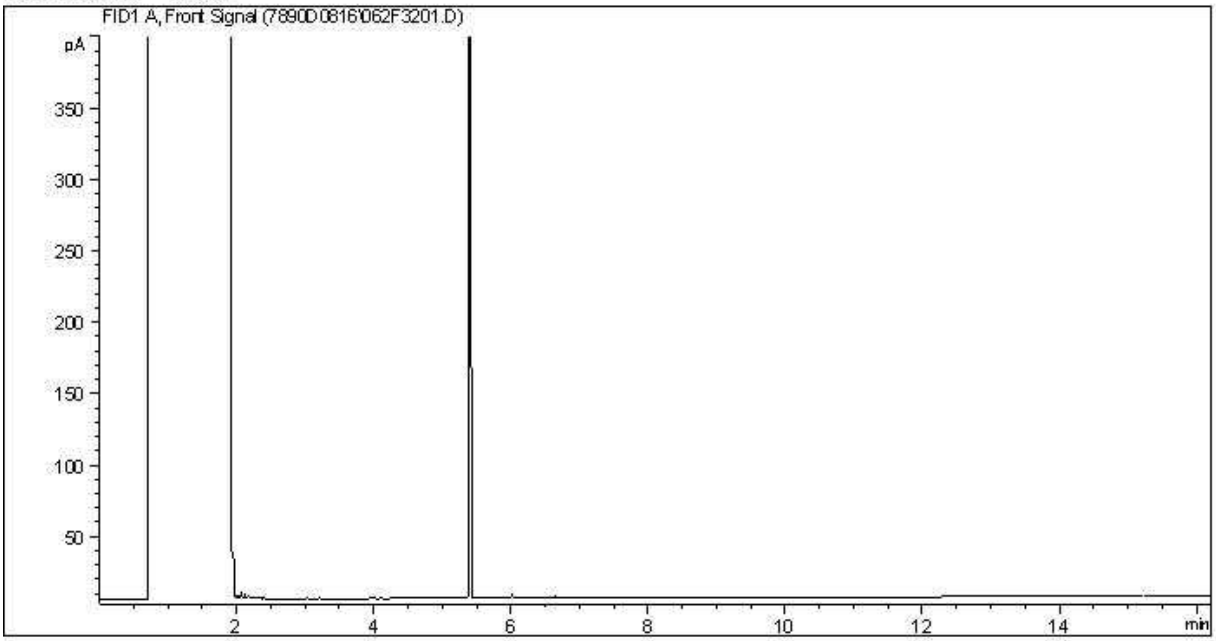
AB FCD-00331/6

Maxxam Job #: B768254
Report Date: 2017/08/17
Maxxam Sample: RS5338

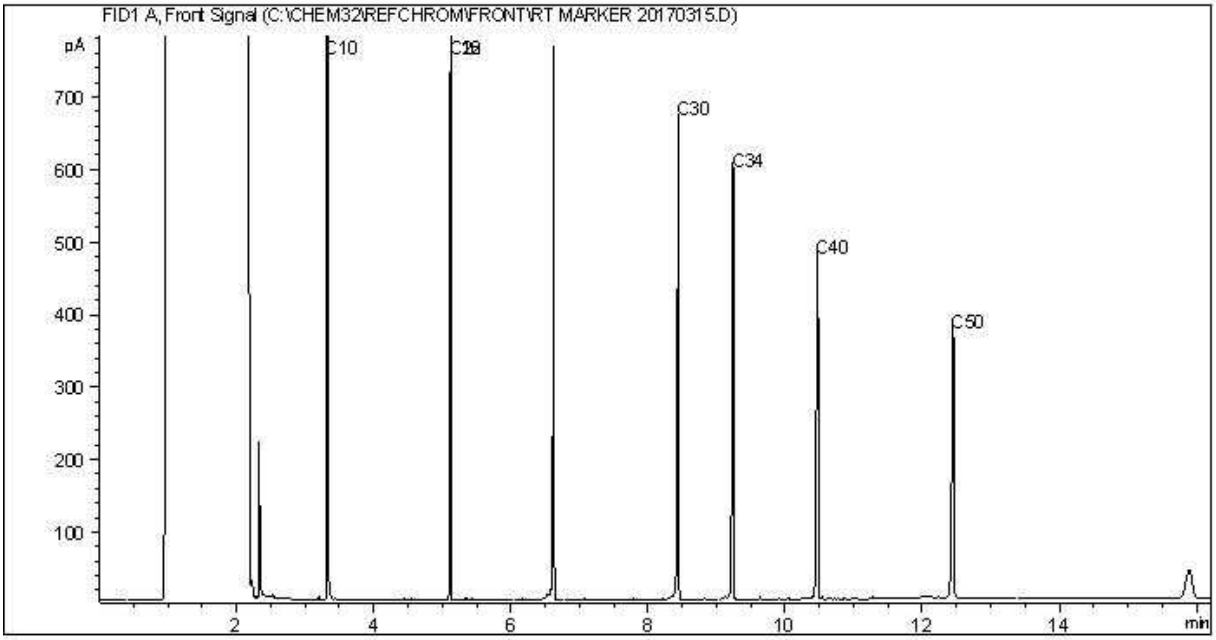
ARCADIS Canada
Client Project #: 102089-002/102089-003
Site Reference: CAMBAY FTA LTU AND APRON LTU
Client ID: FIELD BLANK

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

Success Through Science®

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M057441

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/10
Report #: R2426145
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B764578
Received: 2017/08/01, 09:48

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2017/08/03	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	3	N/A	2017/08/04	AB SOP-00039	CCME CWS/EPA 8260C m
Cadmium - low level CCME - Dissolved	3	N/A	2017/08/08	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	3	N/A	2017/08/03	AB SOP-00020	SM 22 4500-Cl E m
Conductivity @25C	3	N/A	2017/08/03	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons (F2-F4 in water) (1)	3	2017/08/03	2017/08/03	AB SOP-00037 / AB SOP-00040	CCME PHC-CWS m
Hardness	3	N/A	2017/08/04	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	2	N/A	2017/08/05	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	1	N/A	2017/08/09	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (2)	2	N/A	2017/08/04	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Dissolved (2)	1	N/A	2017/08/10	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	2	2017/08/03	2017/08/04	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2017/08/09	2017/08/09	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	3	N/A	2017/08/05	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2017/08/02	AB WI-00065	Auto Calc
Ion Balance	2	N/A	2017/08/03	AB WI-00065	Auto Calc
Sum of cations, anions	3	N/A	2017/08/04	AB WI-00065	Auto Calc
Ammonia-N (Total)	3	N/A	2017/08/03	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	3	N/A	2017/08/04	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2017/08/04	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	3	N/A	2017/08/04	AB SOP-00023	SM 22 4110 B m
Oil and Grease (Gravimetric, n-Hexane)	3	2017/08/04	2017/08/04	EENVSOP-00093	SM 22 5520 B m
Benzo[a]pyrene Equivalency (3)	3	N/A	2017/08/08	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	3	2017/08/02	2017/08/05	AB SOP-00037 / AB SOP-00003	EPA 3510C/8270D m
pH @25°C (4)	3	N/A	2017/08/03	AB SOP-00005	SM 22 4500 H+ B m
Phenols (4-AAP)	1	N/A	2017/08/02	EENVSOP-00061	MMCW 154 1996 m

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M057441

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/10
Report #: R2426145
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B764578
Received: 2017/08/01, 09:48

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Phenols (4-AAP)	2	N/A	2017/08/09	EENVSOP-00061	MMCW 154 1996 m
Sulphate by Automated Colourimetry	3	N/A	2017/08/03	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Filt. Residue)	3	2017/08/04	2017/08/08	AB SOP-00065	SM 22 2540 C m
Total Dissolved Solids (Calculated)	3	N/A	2017/08/04	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	3	2017/08/03	2017/08/04	AB SOP-00061	SM 22 2540 D m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M057441

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/10
Report #: R2426145
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B764578
Received: 2017/08/01, 09:48

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RQ5149	RQ5150	RQ5151		
Sampling Date		2017/07/30 13:30	2017/07/30 11:50	2017/07/30		
COC Number		M057441	M057441	M057441		
	UNITS	MW15-1	MW15-8	FTA DUP01	RDL	QC Batch
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.14	0.10	8711925
F3 (C16-C34 Hydrocarbons)	mg/L	0.20	0.11	0.15	0.10	8711925
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	<0.20	<0.20	0.20	8711925
Volatiles						
Benzene	ug/L	<0.40	<0.40	<0.40	0.40	8717283
Toluene	ug/L	<0.40	<0.40	<0.40	0.40	8717283
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	0.40	8717283
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	0.80	8717283
o-Xylene	ug/L	<0.40	<0.40	<0.40	0.40	8717283
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	0.80	8717283
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	100	8717283
F1 (C6-C10)	ug/L	<100	<100	<100	100	8717283
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	101	102	102	N/A	8717283
4-Bromofluorobenzene (sur.)	%	102	103	104	N/A	8717283
D4-1,2-Dichloroethane (sur.)	%	111	110	111	N/A	8717283
O-TERPHENYL (sur.)	%	109	101	97	N/A	8711925

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RQ5149		RQ5150		RQ5151	RQ5151		
Sampling Date		2017/07/30 13:30		2017/07/30 11:50		2017/07/30	2017/07/30		
COC Number		M057441		M057441		M057441	M057441		
	UNITS	MW15-1	RDL	MW15-8	QC Batch	FTA DUP01	FTA DUP01 Lab-Dup	RDL	QC Batch
Calculated Parameters									
Anion Sum	meq/L	34	N/A	25	8713886	25	N/A	N/A	8713886
Cation Sum	meq/L	31	N/A	29	8713886	30	N/A	N/A	8713886
Hardness (CaCO3)	mg/L	1100	0.50	830	8713884	870	N/A	0.50	8713884
Ion Balance (% Difference)	%	3.5	N/A	6.3	8713885	8.6	N/A	N/A	8713885
Dissolved Nitrate (NO3)	mg/L	0.058	0.044	0.46	8714049	0.50	N/A	0.044	8714049
Nitrate plus Nitrite (N)	mg/L	<0.014	0.014	0.12	8714050	0.13	N/A	0.014	8714050
Dissolved Nitrite (NO2)	mg/L	<0.033	0.033	0.040	8714049	0.042	N/A	0.033	8714049
Calculated Total Dissolved Solids	mg/L	1700	10	1500	8713889	1500	N/A	10	8713889
Misc. Inorganics									
Conductivity	uS/cm	2900	1.0	2400	8715229	2400	N/A	1.0	8715229
pH	pH	7.29	N/A	7.47	8715217	7.50	N/A	N/A	8715217
Low Level Elements									
Dissolved Cadmium (Cd)	ug/L	0.030	0.020	0.020	8714267	<0.020	N/A	0.020	8714267
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	<0.50	8715225	<0.50	N/A	0.50	8715225
Alkalinity (Total as CaCO3)	mg/L	1100	0.50	470	8715225	470	N/A	0.50	8715225
Bicarbonate (HCO3)	mg/L	1300	0.50	570	8715225	570	N/A	0.50	8715225
Carbonate (CO3)	mg/L	<0.50	0.50	<0.50	8715225	<0.50	N/A	0.50	8715225
Hydroxide (OH)	mg/L	<0.50	0.50	<0.50	8715225	<0.50	N/A	0.50	8715225
Dissolved Sulphate (SO4)	mg/L	73	1.0	320 (1)	8715606	310 (1)	310	5.0	8715606
Dissolved Chloride (Cl)	mg/L	400 (1)	5.0	330 (1)	8715576	320 (1)	310	5.0	8715576
Nutrients									
Dissolved Nitrite (N)	mg/L	<0.010	0.010	0.012	8714779	0.013	N/A	0.010	8714779
Dissolved Nitrate (N)	mg/L	0.013	0.010	0.10	8714779	0.11	N/A	0.010	8714779
Elements									
Dissolved Aluminum (Al)	mg/L	0.019	0.0030	0.0034	8718222	0.0043	N/A	0.0030	8718222
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	8718222	<0.00060	N/A	0.00060	8718222

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (WATER)

Maxxam ID		RQ5149		RQ5150		RQ5151	RQ5151		
Sampling Date		2017/07/30 13:30		2017/07/30 11:50		2017/07/30	2017/07/30		
COC Number		M057441		M057441		M057441	M057441		
	UNITS	MW15-1	RDL	MW15-8	QC Batch	FTA DUP01	FTA DUP01 Lab-Dup	RDL	QC Batch
Dissolved Arsenic (As)	mg/L	0.011	0.00020	0.0018	8718222	0.0022	N/A	0.00020	8718222
Dissolved Barium (Ba)	mg/L	0.065	0.010	0.063	8716686	0.059	N/A	0.010	8722226
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	8718222	<0.0010	N/A	0.0010	8718222
Dissolved Boron (B)	mg/L	0.080	0.020	0.44	8716686	0.44	N/A	0.020	8722226
Dissolved Calcium (Ca)	mg/L	140	0.30	170	8716686	180	N/A	0.30	8722226
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	8718222	<0.0010	N/A	0.0010	8718222
Dissolved Cobalt (Co)	mg/L	0.0067	0.00030	0.026	8718222	0.029	N/A	0.00030	8718222
Dissolved Copper (Cu)	mg/L	0.0033	0.00020	0.0032	8718222	0.0026	N/A	0.00020	8718222
Dissolved Iron (Fe)	mg/L	2.2	0.060	1.8	8716686	2.1	N/A	0.060	8722226
Dissolved Lead (Pb)	mg/L	0.00030	0.00020	<0.00020	8718222	<0.00020	N/A	0.00020	8718222
Dissolved Lithium (Li)	mg/L	<0.020	0.020	0.024	8716686	0.027	N/A	0.020	8722226
Dissolved Magnesium (Mg)	mg/L	170	0.20	100	8716686	110	N/A	0.20	8722226
Dissolved Manganese (Mn)	mg/L	0.94	0.0040	1.4	8716686	1.4	N/A	0.0040	8722226
Dissolved Molybdenum (Mo)	mg/L	0.010	0.00020	0.0034	8718222	0.0033	N/A	0.00020	8718222
Dissolved Nickel (Ni)	mg/L	0.0061	0.00050	0.039	8718222	0.043	N/A	0.00050	8718222
Dissolved Phosphorus (P)	mg/L	0.17	0.10	<0.10	8716686	<0.10	N/A	0.10	8722226
Dissolved Potassium (K)	mg/L	17	0.30	55	8716686	52	N/A	0.30	8722226
Dissolved Selenium (Se)	mg/L	0.00029	0.00020	0.00026	8718222	0.00029	N/A	0.00020	8718222
Dissolved Silicon (Si)	mg/L	10	0.10	4.2	8716686	4.4	N/A	0.10	8722226
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	8718222	<0.00010	N/A	0.00010	8718222
Dissolved Sodium (Na)	mg/L	220	0.50	240	8716686	240	N/A	0.50	8722226
Dissolved Strontium (Sr)	mg/L	0.18	0.020	0.33	8716686	0.33	N/A	0.020	8722226
Dissolved Sulphur (S)	mg/L	22	0.20	110	8716686	120	N/A	0.20	8722226
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	8718222	<0.00020	N/A	0.00020	8718222
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	8718222	<0.0010	N/A	0.0010	8718222
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	8718222	<0.0010	N/A	0.0010	8718222
Dissolved Uranium (U)	mg/L	0.018	0.00010	0.010	8718222	0.011	N/A	0.00010	8718222
Dissolved Vanadium (V)	mg/L	0.0044	0.0010	<0.0010	8718222	<0.0010	N/A	0.0010	8718222
Dissolved Zinc (Zn)	mg/L	0.0040	0.0030	<0.0030	8718222	<0.0030	N/A	0.0030	8718222

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		RQ5149			RQ5150	RQ5151		
Sampling Date		2017/07/30 13:30			2017/07/30 11:50	2017/07/30		
COC Number		M057441			M057441	M057441		
	UNITS	MW15-1	RDL	QC Batch	MW15-8	FTA DUP01	RDL	QC Batch
Calculated Parameters								
Total Hardness (CaCO3)	mg/L	1220	0.50	8714574	794	787	0.50	8714574
Misc. Inorganics								
Total Dissolved Solids	mg/L	1800 (1)	25	8716525	1500 (1)	1500 (1)	50	8716525
Total Suspended Solids	mg/L	11	1.0	8715288	9.3	11	1.0	8715288
Nutrients								
Total Ammonia (N)	mg/L	6.1 (2)	0.075	8715966	1.1	1.2	0.015	8715966
Misc. Organics								
Extractable (n-Hex.) Oil and grease	mg/L	2.0	2.0	8716875	4.0	3.0	2.0	8716875
Phenols	mg/L	0.14 (2)	0.020	8714640	0.017	0.021	0.0020	8720589

RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis.
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		RQ5149	RQ5150	RQ5151		
Sampling Date		2017/07/30 13:30	2017/07/30 11:50	2017/07/30		
COC Number		M057441	M057441	M057441		
	UNITS	MW15-1	MW15-8	FTA DUP01	RDL	QC Batch
Polycyclic Aromatics						
Benzo[a]pyrene equivalency	ug/L	<0.010	<0.010	<0.010	0.010	8714517
Acenaphthene	ug/L	<0.10	<0.10	<0.10	0.10	8709927
Acenaphthylene	ug/L	<0.10	<0.10	<0.10	0.10	8709927
Acridine	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Anthracene	ug/L	<0.010	<0.010	<0.010	0.010	8709927
Benzo(a)anthracene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
Benzo(b&j)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
Benzo(k)fluoranthene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
Benzo(g,h,i)perylene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
Benzo(c)phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Benzo(a)pyrene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	8709927
Benzo[e]pyrene	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Chrysene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
Dibenz(a,h)anthracene	ug/L	<0.0075	<0.0075	<0.0075	0.0075	8709927
Fluoranthene	ug/L	<0.010	<0.010	<0.010	0.010	8709927
Fluorene	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	<0.0085	<0.0085	0.0085	8709927
2-Methylnaphthalene	ug/L	<0.10	<0.10	<0.10	0.10	8709927
Naphthalene	ug/L	<0.10	0.36 (1)	0.37 (1)	0.10	8709927
Phenanthrene	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Perylene	ug/L	<0.050	<0.050	<0.050	0.050	8709927
Pyrene	ug/L	<0.020	<0.020	<0.020	0.020	8709927
Quinoline	ug/L	<0.20	<0.20	<0.20	0.20	8709927
Surrogate Recovery (%)						
D10-ANTHRACENE (sur.)	%	111	109	107	N/A	8709927
D8-ACENAPHTHYLENE (sur.)	%	104	100	99	N/A	8709927
D8-NAPHTHALENE (sur.)	%	89	83	83	N/A	8709927
TERPHENYL-D14 (sur.)	%	91	88	101	N/A	8709927

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Qualifying ion outside of acceptance criteria. Results are tentatively identified and potentially biased high.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		RQ5149		RQ5150	RQ5151		
Sampling Date		2017/07/30 13:30		2017/07/30 11:50	2017/07/30		
COC Number		M057441		M057441	M057441		
	UNITS	MW15-1	QC Batch	MW15-8	FTA DUP01	RDL	QC Batch
Elements							
Total Calcium (Ca)	mg/L	160	8720188	160	160	0.30	8715238
Total Magnesium (Mg)	mg/L	200	8720188	93	92	0.20	8715238
Total Potassium (K)	mg/L	19	8720188	53	53	0.30	8715238
Total Sodium (Na)	mg/L	230	8720188	200	200	0.50	8715238
RDL = Reportable Detection Limit							

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	0.7°C
Package 2	1.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8709927	D10-ANTHRACENE (sur.)	2017/07/29	98	50 - 130	104	50 - 130	105	%		
8709927	D8-ACENAPHTHYLENE (sur.)	2017/07/29	93	50 - 130	96	50 - 130	98	%		
8709927	D8-NAPHTHALENE (sur.)	2017/07/29	91	50 - 130	94	50 - 130	96	%		
8709927	TERPHENYL-D14 (sur.)	2017/07/29	80	50 - 130	123	50 - 130	122	%		
8711925	O-TERPHENYL (sur.)	2017/08/01	96	60 - 130	93	60 - 130	103	%		
8717283	1,4-Difluorobenzene (sur.)	2017/08/04	98	70 - 130	98	70 - 130	102	%		
8717283	4-Bromofluorobenzene (sur.)	2017/08/04	103	70 - 130	101	70 - 130	103	%		
8717283	D4-1,2-Dichloroethane (sur.)	2017/08/04	115	70 - 130	113	70 - 130	108	%		
8709927	2-Methylnaphthalene	2017/07/29	87	50 - 130	91	50 - 130	<0.10	ug/L	NC	30
8709927	Acenaphthene	2017/07/29	85	50 - 130	88	50 - 130	<0.10	ug/L	NC	30
8709927	Acenaphthylene	2017/07/29	87	50 - 130	90	50 - 130	<0.10	ug/L	NC	30
8709927	Acridine	2017/07/29	96	50 - 130	97	50 - 130	<0.050	ug/L	NC	30
8709927	Anthracene	2017/07/29	83	50 - 130	93	50 - 130	<0.010	ug/L	NC	30
8709927	Benzo(a)anthracene	2017/07/29	81	50 - 130	120	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(a)pyrene	2017/07/29	63	50 - 130	111	50 - 130	<0.0075	ug/L	NC	30
8709927	Benzo(b&j)fluoranthene	2017/07/29	66	50 - 130	121	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(c)phenanthrene	2017/07/29	100	50 - 130	118	50 - 130	<0.050	ug/L	NC	30
8709927	Benzo(g,h,i)perylene	2017/07/29	62	50 - 130	129	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo(k)fluoranthene	2017/07/29	64	50 - 130	114	50 - 130	<0.0085	ug/L	NC	30
8709927	Benzo[e]pyrene	2017/07/29	67	50 - 130	123	50 - 130	<0.050	ug/L	NC	30
8709927	Chrysene	2017/07/29	70	50 - 130	113	50 - 130	<0.0085	ug/L	NC	30
8709927	Dibenz(a,h)anthracene	2017/07/29	59	50 - 130	128	50 - 130	<0.0075	ug/L	NC	30
8709927	Fluoranthene	2017/07/29	89	50 - 130	100	50 - 130	<0.010	ug/L	NC	30
8709927	Fluorene	2017/07/29	88	50 - 130	89	50 - 130	<0.050	ug/L	NC	30
8709927	Indeno(1,2,3-cd)pyrene	2017/07/29	59	50 - 130	129	50 - 130	<0.0085	ug/L	NC	30
8709927	Naphthalene	2017/07/29	80	50 - 130	83	50 - 130	<0.10	ug/L	NC	30
8709927	Perylene	2017/07/29	58	50 - 130	117	50 - 130	<0.050	ug/L	NC	30
8709927	Phenanthrene	2017/07/29	86	50 - 130	91	50 - 130	<0.050	ug/L	NC	30
8709927	Pyrene	2017/07/29	86	50 - 130	99	50 - 130	<0.020	ug/L	NC	30
8709927	Quinoline	2017/07/29	102	50 - 130	108	50 - 130	<0.20	ug/L	NC	30
8711925	F2 (C10-C16 Hydrocarbons)	2017/08/01	123	60 - 130	109	70 - 130	<0.10	mg/L	NC	30

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8711925	F3 (C16-C34 Hydrocarbons)	2017/08/01	102	60 - 130	103	70 - 130	<0.10	mg/L	72 (1)	30
8711925	F4 (C34-C50 Hydrocarbons)	2017/08/01	100	60 - 130	99	70 - 130	<0.20	mg/L	NC	30
8714640	Phenols	2017/08/02	100	80 - 120	99	80 - 120	<0.0020	mg/L	NC	20
8714779	Dissolved Nitrate (N)	2017/08/03	103	80 - 120	103	80 - 120	<0.010	mg/L	0.67	20
8714779	Dissolved Nitrite (N)	2017/08/03	103	80 - 120	101	80 - 120	<0.010	mg/L	NC	20
8715217	pH	2017/08/03			100	97 - 103			0.66	N/A
8715225	Alkalinity (PP as CaCO3)	2017/08/03					<0.50	mg/L	NC	20
8715225	Alkalinity (Total as CaCO3)	2017/08/03			103	80 - 120	<0.50	mg/L	8.5	20
8715225	Bicarbonate (HCO3)	2017/08/03					<0.50	mg/L	8.5	20
8715225	Carbonate (CO3)	2017/08/03					<0.50	mg/L	NC	20
8715225	Hydroxide (OH)	2017/08/03					<0.50	mg/L	NC	20
8715229	Conductivity	2017/08/03			100	90 - 110	<1.0	uS/cm	1.3	10
8715238	Total Calcium (Ca)	2017/08/04	98	80 - 120	101	80 - 120	<0.30	mg/L	1.9	20
8715238	Total Magnesium (Mg)	2017/08/04	101	80 - 120	103	80 - 120	<0.20	mg/L	1.4	20
8715238	Total Potassium (K)	2017/08/04	103	80 - 120	104	80 - 120	<0.30	mg/L	2.7	20
8715238	Total Sodium (Na)	2017/08/04	101	80 - 120	103	80 - 120	<0.50	mg/L	1.2	20
8715288	Total Suspended Solids	2017/08/04	107	80 - 120	109	80 - 120	<1.0	mg/L	0	20
8715576	Dissolved Chloride (Cl)	2017/08/03	NC	80 - 120	101	80 - 120	<1.0	mg/L	2.5	20
8715606	Dissolved Sulphate (SO4)	2017/08/03	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.24	20
8715966	Total Ammonia (N)	2017/08/03	100	80 - 120	102	80 - 120	<0.015	mg/L	3.3	20
8716525	Total Dissolved Solids	2017/08/08	98	80 - 120	100	80 - 120	<10	mg/L	1.1	20
8716686	Dissolved Barium (Ba)	2017/08/04	96	80 - 120	99	80 - 120	<0.010	mg/L	0.45	20
8716686	Dissolved Boron (B)	2017/08/04	100	80 - 120	102	80 - 120	<0.020	mg/L	0.75	20
8716686	Dissolved Calcium (Ca)	2017/08/04	NC	80 - 120	100	80 - 120	<0.30	mg/L	0.26	20
8716686	Dissolved Iron (Fe)	2017/08/04	101	80 - 120	105	80 - 120	<0.060	mg/L	NC	20
8716686	Dissolved Lithium (Li)	2017/08/04	98	80 - 120	100	80 - 120	<0.020	mg/L	1.3	20
8716686	Dissolved Magnesium (Mg)	2017/08/04	96	80 - 120	103	80 - 120	<0.20	mg/L	0.28	20
8716686	Dissolved Manganese (Mn)	2017/08/04	93	80 - 120	99	80 - 120	<0.0040	mg/L	0.17	20
8716686	Dissolved Phosphorus (P)	2017/08/04	101	80 - 120	97	80 - 120	<0.10	mg/L	NC	20
8716686	Dissolved Potassium (K)	2017/08/04	101	80 - 120	104	80 - 120	<0.30	mg/L	1.8	20
8716686	Dissolved Silicon (Si)	2017/08/04	100	80 - 120	106	80 - 120	<0.10	mg/L	0.20	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8716686	Dissolved Sodium (Na)	2017/08/04	98	80 - 120	103	80 - 120	<0.50	mg/L	0.25	20
8716686	Dissolved Strontium (Sr)	2017/08/04	92	80 - 120	98	80 - 120	<0.020	mg/L	0.32	20
8716686	Dissolved Sulphur (S)	2017/08/04					<0.20	mg/L	0.63	20
8716875	Extractable (n-Hex.) Oil and grease	2017/08/04			106	70 - 130	<2.0	mg/L		
8717283	Benzene	2017/08/04	105	70 - 130	106	70 - 130	<0.40	ug/L	1.9	30
8717283	Ethylbenzene	2017/08/04	103	70 - 130	106	70 - 130	<0.40	ug/L	2.9	30
8717283	F1 (C6-C10) - BTEX	2017/08/04					<100	ug/L	NC	30
8717283	F1 (C6-C10)	2017/08/04	88	70 - 130	100	70 - 130	<100	ug/L	NC	30
8717283	m & p-Xylene	2017/08/04	102	70 - 130	106	70 - 130	<0.80	ug/L	2.1	30
8717283	o-Xylene	2017/08/04	102	70 - 130	105	70 - 130	<0.40	ug/L	2.0	30
8717283	Toluene	2017/08/04	96	70 - 130	99	70 - 130	<0.40	ug/L	1.4	30
8717283	Xylenes (Total)	2017/08/04					<0.80	ug/L	2.1	30
8718222	Dissolved Aluminum (Al)	2017/08/05	102	80 - 120	100	80 - 120	<0.0030	mg/L	NC	20
8718222	Dissolved Antimony (Sb)	2017/08/05	100	80 - 120	96	80 - 120	<0.00060	mg/L	NC	20
8718222	Dissolved Arsenic (As)	2017/08/05	97	80 - 120	102	80 - 120	<0.00020	mg/L	4.1	20
8718222	Dissolved Beryllium (Be)	2017/08/05	99	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Chromium (Cr)	2017/08/05	97	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Cobalt (Co)	2017/08/05	95	80 - 120	101	80 - 120	<0.00030	mg/L	NC	20
8718222	Dissolved Copper (Cu)	2017/08/05	92	80 - 120	100	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Lead (Pb)	2017/08/05	91	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Molybdenum (Mo)	2017/08/05	103	80 - 120	100	80 - 120	<0.00020	mg/L	4.3	20
8718222	Dissolved Nickel (Ni)	2017/08/05	95	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20
8718222	Dissolved Selenium (Se)	2017/08/05	99	80 - 120	100	80 - 120	<0.00020	mg/L	0.48	20
8718222	Dissolved Silver (Ag)	2017/08/05	99	80 - 120	101	80 - 120	<0.00010	mg/L	NC	20
8718222	Dissolved Thallium (Tl)	2017/08/05	91	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8718222	Dissolved Tin (Sn)	2017/08/05	98	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Titanium (Ti)	2017/08/05	98	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Uranium (U)	2017/08/05	98	80 - 120	99	80 - 120	<0.00010	mg/L	14	20
8718222	Dissolved Vanadium (V)	2017/08/05	99	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20
8718222	Dissolved Zinc (Zn)	2017/08/05	98	80 - 120	102	80 - 120	<0.0030	mg/L	NC	20
8720188	Total Calcium (Ca)	2017/08/09	NC	80 - 120	97	80 - 120	<0.30	mg/L		

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8720188	Total Magnesium (Mg)	2017/08/09	98	80 - 120	102	80 - 120	<0.20	mg/L		
8720188	Total Potassium (K)	2017/08/09	94	80 - 120	100	80 - 120	<0.30	mg/L		
8720188	Total Sodium (Na)	2017/08/09	92	80 - 120	100	80 - 120	<0.50	mg/L	0.69	20
8720589	Phenols	2017/08/09	103	80 - 120	94	80 - 120	<0.0020	mg/L	NC	20
8722226	Dissolved Barium (Ba)	2017/08/10	96	80 - 120	92	80 - 120	<0.010	mg/L	0.89	20
8722226	Dissolved Boron (B)	2017/08/10	102	80 - 120	97	80 - 120	<0.020	mg/L	NC	20
8722226	Dissolved Calcium (Ca)	2017/08/10	104	80 - 120	99	80 - 120	<0.30	mg/L	1.5	20
8722226	Dissolved Iron (Fe)	2017/08/10	102	80 - 120	99	80 - 120	<0.060	mg/L	0.98	20
8722226	Dissolved Lithium (Li)	2017/08/10	94	80 - 120	92	80 - 120	<0.020	mg/L	NC	20
8722226	Dissolved Magnesium (Mg)	2017/08/10	106	80 - 120	102	80 - 120	<0.20	mg/L	0.052	20
8722226	Dissolved Manganese (Mn)	2017/08/10	98	80 - 120	95	80 - 120	<0.0040	mg/L	1.6	20
8722226	Dissolved Phosphorus (P)	2017/08/10	104	80 - 120	98	80 - 120	<0.10	mg/L	NC	20
8722226	Dissolved Potassium (K)	2017/08/10	97	80 - 120	96	80 - 120	<0.30	mg/L	3.6	20
8722226	Dissolved Silicon (Si)	2017/08/10	109	80 - 120	105	80 - 120	<0.10	mg/L	0.25	20
8722226	Dissolved Sodium (Na)	2017/08/10	99	80 - 120	99	80 - 120	<0.50	mg/L	1.8	20
8722226	Dissolved Strontium (Sr)	2017/08/10	96	80 - 120	93	80 - 120	<0.020	mg/L	2.3	20
8722226	Dissolved Sulphur (S)	2017/08/10					<0.20	mg/L	4.6	20

N/A = Not Applicable

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

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

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

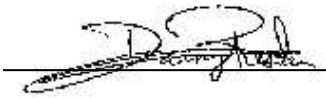
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B764578
Report Date: 2017/08/10

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

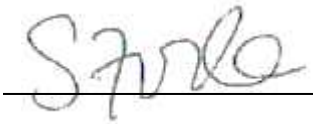
VALIDATION SIGNATURE PAGE

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

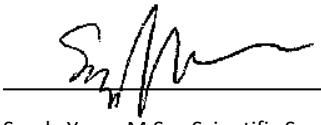


Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst



Sandy Yuan, M.Sc., Scientific Specialist

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

095(2)

CHAIN OF CUSTODY RECORD

M 057441

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: BS0993	☒ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE, SW CALGARY, AB, T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-002	Rush TAT (Surcharges will be applied) ☐ Same Day ☐ 2 Days ☐ 1 Day ☐ 3-4 Days
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY FTA LTU	Date Required:
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Rush Confirmation #:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: ~~EF~~ E HOLDEN	

Laboratory Use Only

	YES	NO	Cooler ID	Temp
Seal Present	✓			
Seal Intact	✓			1 1 1
Cooling Media	✓			
Seal Present	✓			
Seal Intact	✓			7 0 1
Cooling Media	✓			
Seal Present				
Seal Intact				
Cooling Media				

Depot Reception

RECEIVED IN YELLOWKNIFE
By: ALYSSA MUELLER
2017 -08- 01 09:48
ice/seal yes all
Temp: 0.1 2.1 2

Regulatory Criteria

☐ AT1
☐ CCME
☐ Drinking Water
☐ D50 (Drilling Waste)
☐ Saskatchewan
☐ Other:

Special Instructions

(1) pH, conductivity, total hardness, total Alkalinity

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F4	BTEX F1-F4	Routine Water (1)	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	~~Salinity~~ Nitrate-Nitrite	~~Sieve (75 micron)~~ Oil & Grease	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Ammonia Nitrogen	TOTAL PHENOLS	Ca, Mg, Na, K	Chloride/Sulphate	Dissolved Metals	PAHs	TSS AND TDS			HOLD - DO NOT ANALYZE
1	MW15-1		2017/07/30	13:30	GW	11		X		X			X	X			X	X	X	X	X	X	X			
2	MW15-8		2017/07/30	11:50	GW	11		X		X			X	X			X	X	X	X	X	X	X			
3	FTADUP01		2017/07/30		GW	11		X		X			X	X			X	X	X	X	X	X	X			
4																					F/P					
5																										
6																										
7																										
8																										
9																										
10																										

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
~~EF~~ ELLIOTT HOLDEN	2017/07/31	10:00	Danielle Boisvert	2017/08/02	09:52	B764578

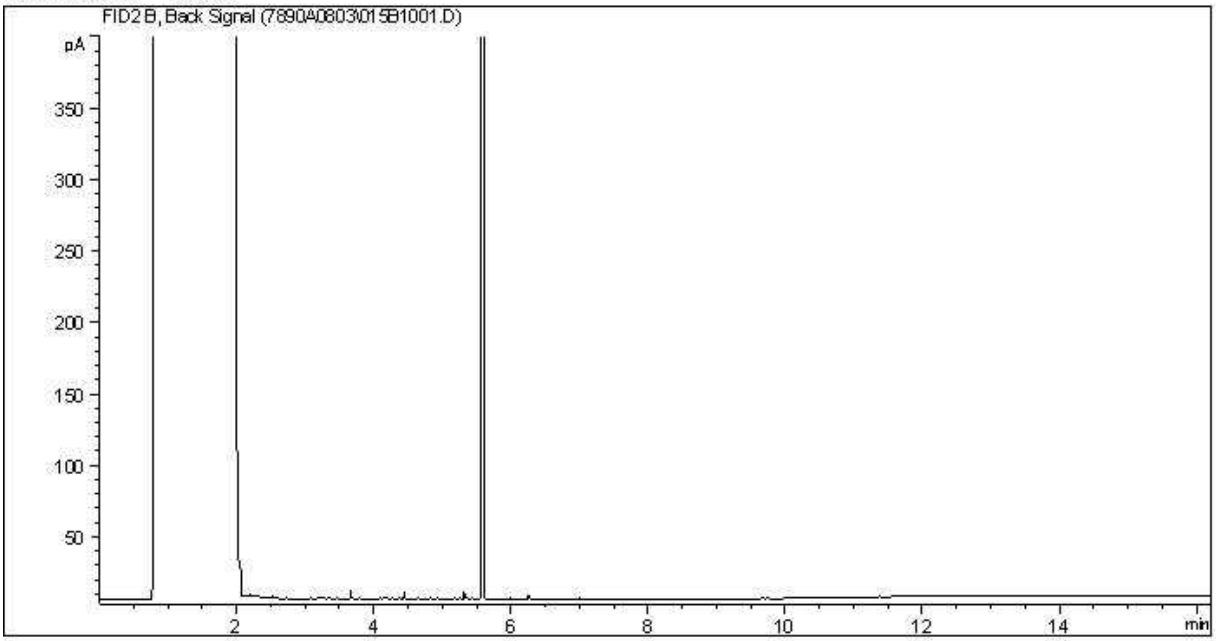
AB FCD-00331/7

Maxxam Job #: B764578
Report Date: 2017/08/10
Maxxam Sample: RQ5149

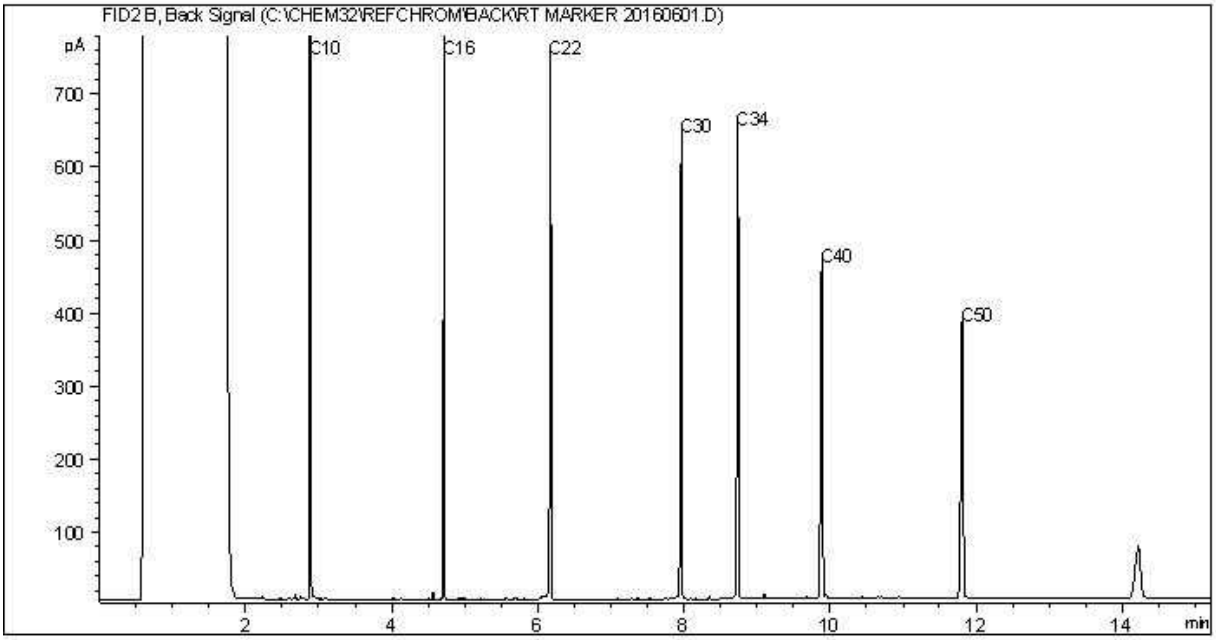
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAM BAY FTA LTU
Client ID: MW15-1

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890A



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

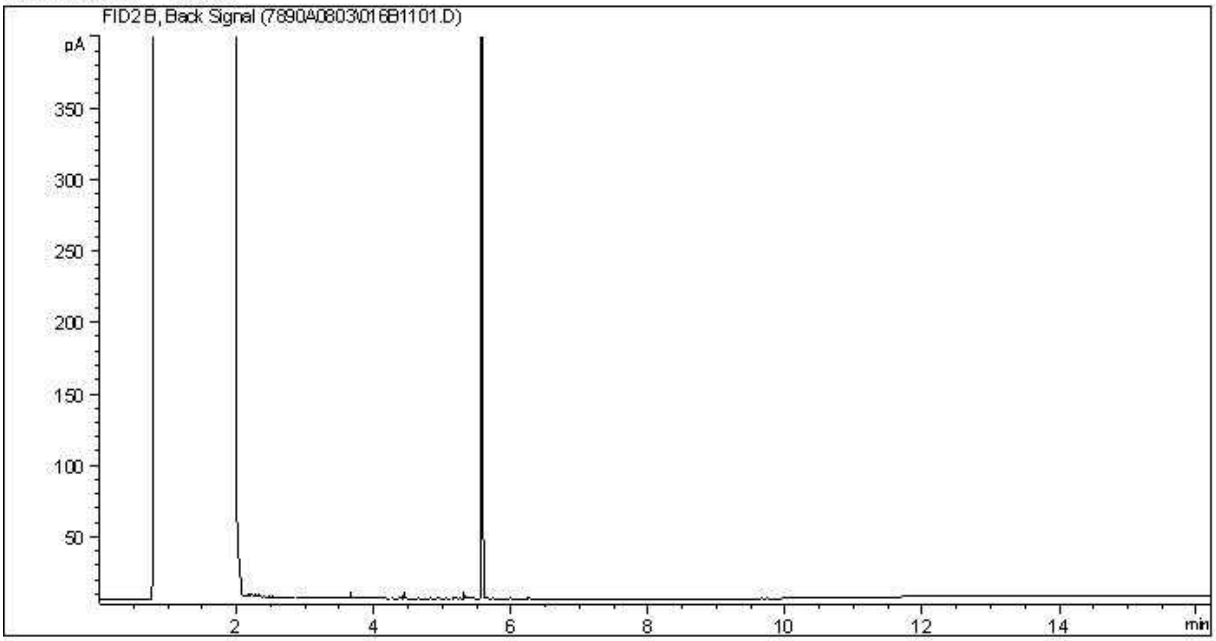
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B764578
Report Date: 2017/08/10
Maxxam Sample: RQ5150

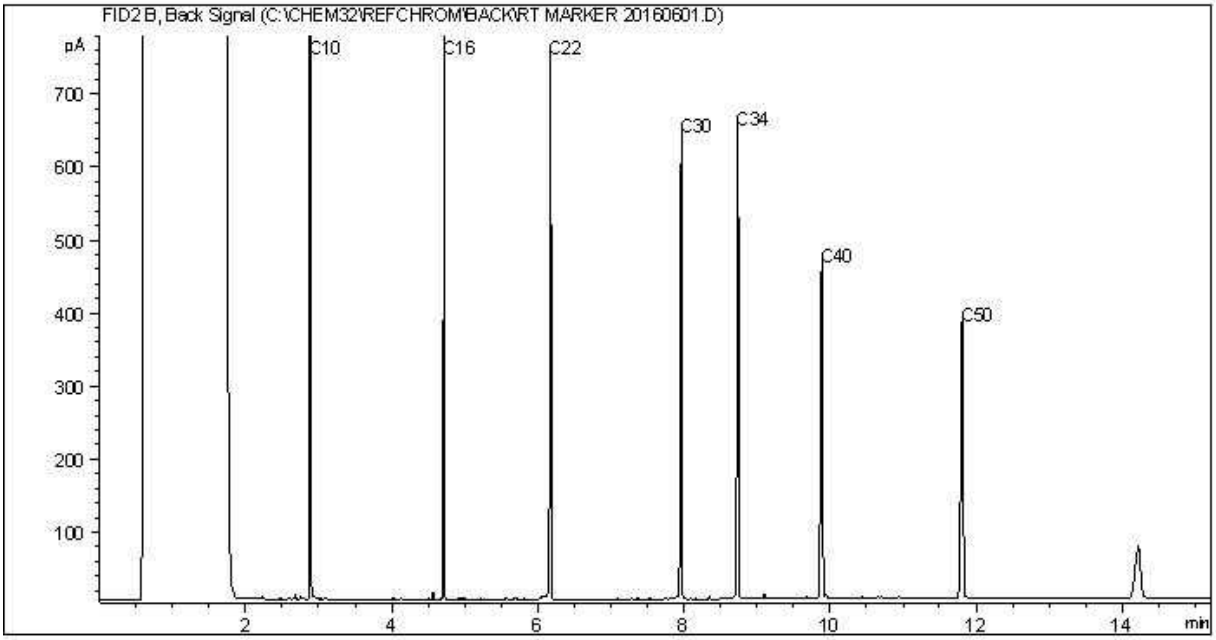
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAM BAY FTA LTU
Client ID: MW15-8

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890A



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

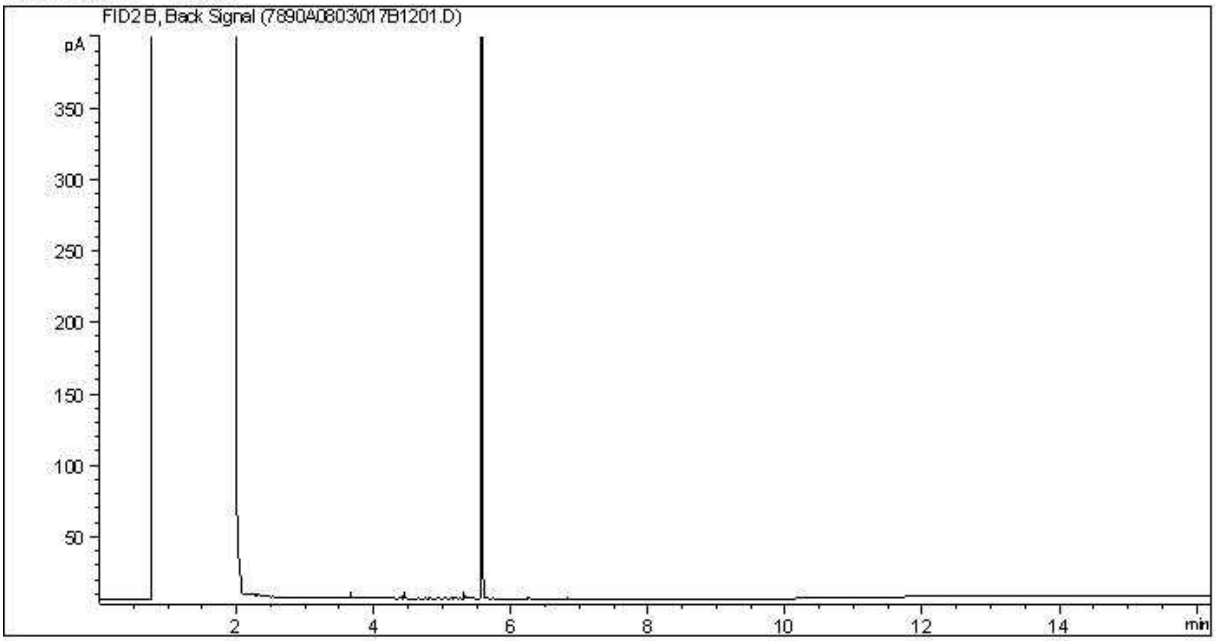
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B764578
Report Date: 2017/08/10
Maxxam Sample: RQ5151

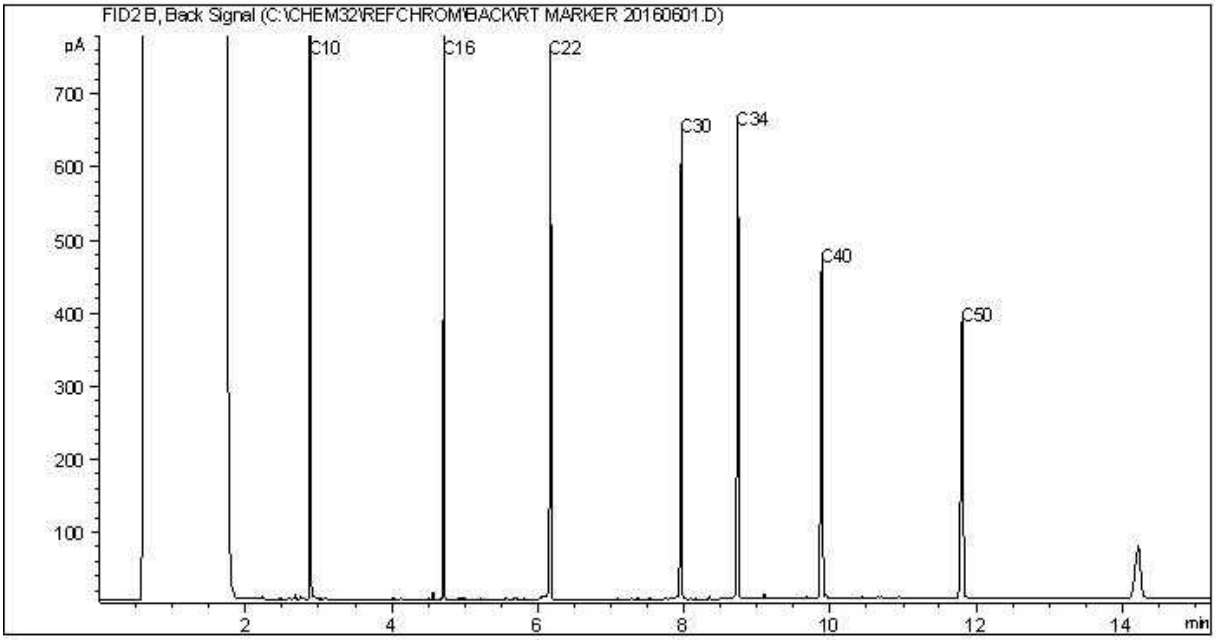
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAM BAY FTA LTU
Client ID: FTA DUP01

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890A



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M017074

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/18
Report #: R2430845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768022
Received: 2017/08/10, 10:00

Sample Matrix: GROUND WATER
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2017/08/13	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME - Dissolved	1	N/A	2017/08/14	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	1	N/A	2017/08/14	AB SOP-00020	SM 22 4500-Cl E m
Conductivity @25C	1	N/A	2017/08/13	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons (F2-F4 in water) (1)	1	2017/08/15	2017/08/16	AB SOP-00037	CCME PHC-CWS m
Hardness	1	N/A	2017/08/17	AB WI-00065	Auto Calc
Hardness Total (calculated as CaCO3)	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Elements by ICP - Dissolved (2)	1	N/A	2017/08/17	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2017/08/18	2017/08/18	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	1	N/A	2017/08/13	AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2017/08/13	AB WI-00065	Auto Calc
Sum of cations, anions	1	N/A	2017/08/17	AB WI-00065	Auto Calc
Ammonia-N (Total)	1	N/A	2017/08/15	AB SOP-00007	EPA 350.1 R2.0 m
Nitrate and Nitrite	1	N/A	2017/08/13	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	1	N/A	2017/08/13	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	1	N/A	2017/08/12	AB SOP-00023	SM 22 4110 B m
Oil and Grease (Gravimetric, n-Hexane)	1	2017/08/14	2017/08/14	EENVSOP-00093	SM 22 5520 B m
Benzo[a]pyrene Equivalency (3)	1	N/A	2017/08/17	AB SOP-00003	Auto Calc
PAH in Water by GC/MS	1	2017/08/13	2017/08/16	AB SOP-00037 / AB SOP-00003	EPA 3510C/8270D m
pH @25°C (4)	1	N/A	2017/08/13	AB SOP-00005	SM 22 4500 H+ B m
Phenols (4-AAP)	1	N/A	2017/08/17	EENVSOP-00061	MMCW 154 1996 m
Sulphate by Automated Colourimetry	1	N/A	2017/08/14	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Filt. Residue)	1	2017/08/14	2017/08/15	AB SOP-00065	SM 22 2540 C m
Total Dissolved Solids (Calculated)	1	N/A	2017/08/17	AB WI-00065	Auto Calc
Total Suspended Solids (NFR)	1	2017/08/14	2017/08/14	AB SOP-00061	SM 22 2540 D m

Remarks:

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M017074

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/18
Report #: R2430845
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768022
Received: 2017/08/10, 10:00

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.
(4) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (GROUND WATER)

Maxxam ID		RS3943		
Sampling Date		2017/08/07 14:30		
COC Number		M017074		
	UNITS	MW15-5	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	0.20	8724895
Volatiles				
Benzene	ug/L	<0.40	0.40	8724922
Toluene	ug/L	<0.40	0.40	8724922
Ethylbenzene	ug/L	<0.40	0.40	8724922
m & p-Xylene	ug/L	<0.80	0.80	8724922
o-Xylene	ug/L	<0.40	0.40	8724922
Xylenes (Total)	ug/L	<0.80	0.80	8724922
F1 (C6-C10) - BTEX	ug/L	<100	100	8724922
F1 (C6-C10)	ug/L	<100	100	8724922
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	102	N/A	8724922
4-Bromofluorobenzene (sur.)	%	100	N/A	8724922
D4-1,2-Dichloroethane (sur.)	%	107	N/A	8724922
O-TERPHENYL (sur.)	%	117	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		RS3943	RS3943		
Sampling Date		2017/08/07 14:30	2017/08/07 14:30		
COC Number		M017074	M017074		
	UNITS	MW15-5	MW15-5 Lab-Dup	RDL	QC Batch
Calculated Parameters					
Anion Sum	meq/L	95	N/A	N/A	8724236
Cation Sum	meq/L	98	N/A	N/A	8724236
Hardness (CaCO3)	mg/L	2900	N/A	0.50	8724234
Ion Balance (% Difference)	%	1.8	N/A	N/A	8724235
Dissolved Nitrate (NO3)	mg/L	0.12	N/A	0.044	8724435
Nitrate plus Nitrite (N)	mg/L	0.027	N/A	0.014	8724436
Dissolved Nitrite (NO2)	mg/L	<0.033	N/A	0.033	8724435
Calculated Total Dissolved Solids	mg/L	5700	N/A	10	8724238
Misc. Inorganics					
Conductivity	uS/cm	8100	N/A	1.0	8724961
pH	pH	7.47	N/A	N/A	8724959
Low Level Elements					
Dissolved Cadmium (Cd)	ug/L	0.068	N/A	0.020	8724430
Anions					
Alkalinity (PP as CaCO3)	mg/L	<0.50	N/A	0.50	8724960
Alkalinity (Total as CaCO3)	mg/L	360	N/A	0.50	8724960
Bicarbonate (HCO3)	mg/L	440	N/A	0.50	8724960
Carbonate (CO3)	mg/L	<0.50	N/A	0.50	8724960
Hydroxide (OH)	mg/L	<0.50	N/A	0.50	8724960
Dissolved Sulphate (SO4)	mg/L	2100 (1)	N/A	20	8724981
Dissolved Chloride (Cl)	mg/L	1600 (1)	1600	10	8724975
Nutrients					
Dissolved Nitrite (N)	mg/L	<0.010	N/A	0.010	8724652
Dissolved Nitrate (N)	mg/L	0.027	N/A	0.010	8724652
Elements					
Dissolved Aluminum (Al)	mg/L	0.0050	N/A	0.0030	8724712
Dissolved Antimony (Sb)	mg/L	<0.00060	N/A	0.00060	8724712
Dissolved Arsenic (As)	mg/L	0.00097	N/A	0.00020	8724712

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ROUTINE WATER & DISS. REGULATED METALS (GROUND WATER)

Maxxam ID		RS3943	RS3943		
Sampling Date		2017/08/07 14:30	2017/08/07 14:30		
COC Number		M017074	M017074		
	UNITS	MW15-5	MW15-5 Lab-Dup	RDL	QC Batch
Dissolved Barium (Ba)	mg/L	0.047	N/A	0.010	8729154
Dissolved Beryllium (Be)	mg/L	<0.0010	N/A	0.0010	8724712
Dissolved Boron (B)	mg/L	0.054	N/A	0.020	8729154
Dissolved Calcium (Ca)	mg/L	550 (1)	N/A	3.0	8729154
Dissolved Chromium (Cr)	mg/L	<0.0010	N/A	0.0010	8724712
Dissolved Cobalt (Co)	mg/L	0.0096	N/A	0.00030	8724712
Dissolved Copper (Cu)	mg/L	0.0033	N/A	0.00020	8724712
Dissolved Iron (Fe)	mg/L	0.48	N/A	0.060	8729154
Dissolved Lead (Pb)	mg/L	<0.00020	N/A	0.00020	8724712
Dissolved Lithium (Li)	mg/L	0.042	N/A	0.020	8729154
Dissolved Magnesium (Mg)	mg/L	370	N/A	0.20	8729154
Dissolved Manganese (Mn)	mg/L	1.4	N/A	0.0040	8729154
Dissolved Molybdenum (Mo)	mg/L	0.0049	N/A	0.00020	8724712
Dissolved Nickel (Ni)	mg/L	0.018	N/A	0.00050	8724712
Dissolved Phosphorus (P)	mg/L	<0.10	N/A	0.10	8729154
Dissolved Potassium (K)	mg/L	21	N/A	0.30	8729154
Dissolved Selenium (Se)	mg/L	0.00039	N/A	0.00020	8724712
Dissolved Silicon (Si)	mg/L	4.1	N/A	0.10	8729154
Dissolved Silver (Ag)	mg/L	0.00014	N/A	0.00010	8724712
Dissolved Sodium (Na)	mg/L	920 (1)	N/A	5.0	8729154
Dissolved Strontium (Sr)	mg/L	0.55	N/A	0.020	8729154
Dissolved Sulphur (S)	mg/L	730 (1)	N/A	2.0	8729154
Dissolved Thallium (Tl)	mg/L	<0.00020	N/A	0.00020	8724712
Dissolved Tin (Sn)	mg/L	<0.0010	N/A	0.0010	8724712
Dissolved Titanium (Ti)	mg/L	<0.0010	N/A	0.0010	8724712
Dissolved Uranium (U)	mg/L	0.028	N/A	0.00010	8724712
Dissolved Vanadium (V)	mg/L	<0.0010	N/A	0.0010	8724712
Dissolved Zinc (Zn)	mg/L	0.0032	N/A	0.0030	8724712

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF GROUND WATER

Maxxam ID		RS3943		
Sampling Date		2017/08/07 14:30		
COC Number		M017074		
	UNITS	MW15-5	RDL	QC Batch
Calculated Parameters				
Total Hardness (CaCO3)	mg/L	3230	0.50	8729643
Misc. Inorganics				
Total Dissolved Solids	mg/L	5700 (1)	50	8725841
Total Suspended Solids	mg/L	<1.0	1.0	8725539
Nutrients				
Total Ammonia (N)	mg/L	1.4	0.015	8725834
Misc. Organics				
Extractable (n-Hex.) Oil and grease	mg/L	<2.0	2.0	8725530
Phenols	mg/L	0.019 (2)	0.010	8729852

RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis.
(2) Detection limits raised due to matrix interference.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

SEMIVOLATILE ORGANICS BY GC-MS (GROUND WATER)

Maxxam ID		RS3943		
Sampling Date		2017/08/07 14:30		
COC Number		M017074		
	UNITS	MW15-5	RDL	QC Batch
Polycyclic Aromatics				
Benzo[a]pyrene equivalency	ug/L	<0.010	0.010	8724500
Acenaphthene	ug/L	<0.10	0.10	8724898
Acenaphthylene	ug/L	<0.10	0.10	8724898
Acridine	ug/L	<0.050	0.050	8724898
Anthracene	ug/L	<0.010	0.010	8724898
Benzo(a)anthracene	ug/L	<0.0085	0.0085	8724898
Benzo(b&j)fluoranthene	ug/L	<0.0085	0.0085	8724898
Benzo(k)fluoranthene	ug/L	<0.0085	0.0085	8724898
Benzo(g,h,i)perylene	ug/L	<0.0085	0.0085	8724898
Benzo(c)phenanthrene	ug/L	<0.050	0.050	8724898
Benzo(a)pyrene	ug/L	<0.0075	0.0075	8724898
Benzo[e]pyrene	ug/L	<0.050	0.050	8724898
Chrysene	ug/L	<0.0085	0.0085	8724898
Dibenz(a,h)anthracene	ug/L	<0.0075	0.0075	8724898
Fluoranthene	ug/L	<0.010	0.010	8724898
Fluorene	ug/L	<0.050	0.050	8724898
Indeno(1,2,3-cd)pyrene	ug/L	<0.0085	0.0085	8724898
2-Methylnaphthalene	ug/L	<0.10	0.10	8724898
Naphthalene	ug/L	<0.10	0.10	8724898
Phenanthrene	ug/L	<0.050	0.050	8724898
Perylene	ug/L	<0.050	0.050	8724898
Pyrene	ug/L	<0.020	0.020	8724898
Quinoline	ug/L	<0.20	0.20	8724898
Surrogate Recovery (%)				
D10-ANTHRACENE (sur.)	%	103	N/A	8724898
D8-ACENAPHTHYLENE (sur.)	%	102	N/A	8724898
D8-NAPHTHALENE (sur.)	%	110	N/A	8724898
TERPHENYL-D14 (sur.)	%	85	N/A	8724898

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (GROUND WATER)

Maxxam ID		RS3943		
Sampling Date		2017/08/07 14:30		
COC Number		M017074		
	UNITS	**MW15-5**	**RDL**	**QC Batch**
Elements				
Total Calcium (Ca)	mg/L	590 (1)	3.0	8730476
Total Magnesium (Mg)	mg/L	420 (1)	2.0	8730476
Total Potassium (K)	mg/L	23 (1)	3.0	8730476
Total Sodium (Na)	mg/L	990 (1)	5.0	8730476

RDL = Reportable Detection Limit
(1) Detection limits raised due to sample matrix.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	8.7°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8724898	D10-ANTHRACENE (sur.)	2017/08/16	105	50 - 130	81	50 - 130	113	%		
8724898	D8-ACENAPHTHYLENE (sur.)	2017/08/16	99	50 - 130	77	50 - 130	104	%		
8724898	D8-NAPHTHALENE (sur.)	2017/08/16	103	50 - 130	78	50 - 130	112	%		
8724898	TERPHENYL-D14 (sur.)	2017/08/16	108	50 - 130	99	50 - 130	140 (1)			
8724922	1,4-Difluorobenzene (sur.)	2017/08/14	101	70 - 130	99	70 - 130	106	%		
8724922	4-Bromofluorobenzene (sur.)	2017/08/14	100	70 - 130	99	70 - 130	100	%		
8724922	D4-1,2-Dichloroethane (sur.)	2017/08/14	114	70 - 130	105	70 - 130	102	%		
8724652	Dissolved Nitrate (N)	2017/08/12	117	80 - 120	102	80 - 120	<0.010	mg/L	1.1	20
8724652	Dissolved Nitrite (N)	2017/08/12	115	80 - 120	99	80 - 120	<0.010	mg/L	NC	20
8724712	Dissolved Aluminum (Al)	2017/08/13	95	80 - 120	98	80 - 120	<0.0030	mg/L	15	20
8724712	Dissolved Antimony (Sb)	2017/08/13	100	80 - 120	93	80 - 120	<0.00060	mg/L	NC	20
8724712	Dissolved Arsenic (As)	2017/08/13	98	80 - 120	96	80 - 120	<0.00020	mg/L	1.3	20
8724712	Dissolved Beryllium (Be)	2017/08/13	98	80 - 120	90	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Chromium (Cr)	2017/08/13	98	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Cobalt (Co)	2017/08/13	96	80 - 120	97	80 - 120	<0.00030	mg/L	0.72	20
8724712	Dissolved Copper (Cu)	2017/08/13	96	80 - 120	96	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Lead (Pb)	2017/08/13	94	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Molybdenum (Mo)	2017/08/13	103	80 - 120	98	80 - 120	<0.00020	mg/L	0.28	20
8724712	Dissolved Nickel (Ni)	2017/08/13	95	80 - 120	96	80 - 120	<0.00050	mg/L	16	20
8724712	Dissolved Selenium (Se)	2017/08/13	102	80 - 120	101	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Silver (Ag)	2017/08/13	99	80 - 120	97	80 - 120	<0.00010	mg/L	NC	20
8724712	Dissolved Thallium (Tl)	2017/08/13	94	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8724712	Dissolved Tin (Sn)	2017/08/13	99	80 - 120	93	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Titanium (Ti)	2017/08/13	108	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Uranium (U)	2017/08/13	95	80 - 120	95	80 - 120	<0.00010	mg/L	1.5	20
8724712	Dissolved Vanadium (V)	2017/08/13	100	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8724712	Dissolved Zinc (Zn)	2017/08/13	94	80 - 120	96	80 - 120	<0.0030	mg/L	NC	20
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724898	2-Methylnaphthalene	2017/08/16	110	50 - 130	71	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthene	2017/08/16	99	50 - 130	72	50 - 130	<0.10	ug/L	NC	30
8724898	Acenaphthylene	2017/08/16	97	50 - 130	76	50 - 130	<0.10	ug/L	NC	30
8724898	Acridine	2017/08/16	101	50 - 130	78	50 - 130	<0.050	ug/L	NC	30
8724898	Anthracene	2017/08/16	99	50 - 130	76	50 - 130	<0.010	ug/L	NC	30
8724898	Benzo(a)anthracene	2017/08/16	105	50 - 130	93	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(a)pyrene	2017/08/16	90	50 - 130	90	50 - 130	<0.0075	ug/L	NC	30
8724898	Benzo(b&j)fluoranthene	2017/08/16	85	50 - 130	92	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(c)phenanthrene	2017/08/16	114	50 - 130	99	50 - 130	<0.050	ug/L	NC	30
8724898	Benzo(g,h,i)perylene	2017/08/16	64	50 - 130	89	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo(k)fluoranthene	2017/08/16	73	50 - 130	97	50 - 130	<0.0085	ug/L	NC	30
8724898	Benzo[e]pyrene	2017/08/16	78	50 - 130	93	50 - 130	<0.050	ug/L	NC	30
8724898	Chrysene	2017/08/16	84	50 - 130	94	50 - 130	<0.0085	ug/L	NC	30
8724898	Dibenz(a,h)anthracene	2017/08/16	89	50 - 130	88	50 - 130	<0.0075	ug/L	NC	30
8724898	Fluoranthene	2017/08/16	97	50 - 130	74	50 - 130	<0.010	ug/L	NC	30
8724898	Fluorene	2017/08/16	104	50 - 130	72	50 - 130	<0.050	ug/L	NC	30
8724898	Indeno(1,2,3-cd)pyrene	2017/08/16	83	50 - 130	78	50 - 130	<0.0085	ug/L	NC	30
8724898	Naphthalene	2017/08/16	101	50 - 130	75	50 - 130	<0.10	ug/L	NC	30
8724898	Perylene	2017/08/16	68	50 - 130	89	50 - 130	<0.050	ug/L	NC	30
8724898	Phenanthrene	2017/08/16	101	50 - 130	76	50 - 130	<0.050	ug/L	NC	30
8724898	Pyrene	2017/08/16	96	50 - 130	74	50 - 130	<0.020	ug/L	NC	30
8724898	Quinoline	2017/08/16	106	50 - 130	116	50 - 130	<0.20	ug/L	NC	30
8724922	Benzene	2017/08/14	108	70 - 130	105	70 - 130	<0.40	ug/L	1.8	30
8724922	Ethylbenzene	2017/08/14	104	70 - 130	103	70 - 130	<0.40	ug/L	5.8	30
8724922	F1 (C6-C10) - BTEX	2017/08/14					<100	ug/L	NC	30
8724922	F1 (C6-C10)	2017/08/14	86	70 - 130	104	70 - 130	<100	ug/L	NC	30
8724922	m & p-Xylene	2017/08/14	102	70 - 130	101	70 - 130	<0.80	ug/L	22	30
8724922	o-Xylene	2017/08/14	100	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8724922	Toluene	2017/08/14	97	70 - 130	96	70 - 130	<0.40	ug/L	NC	30
8724922	Xylenes (Total)	2017/08/14					<0.80	ug/L	22	30
8724959	pH	2017/08/13			100	97 - 103			0.32	N/A

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724960	Alkalinity (PP as CaCO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Alkalinity (Total as CaCO3)	2017/08/13			100	80 - 120	<0.50	mg/L	1.4	20
8724960	Bicarbonate (HCO3)	2017/08/13					<0.50	mg/L	1.4	20
8724960	Carbonate (CO3)	2017/08/13					<0.50	mg/L	NC	20
8724960	Hydroxide (OH)	2017/08/13					<0.50	mg/L	NC	20
8724961	Conductivity	2017/08/13			100	90 - 110	<1.0	uS/cm	0	10
8724975	Dissolved Chloride (Cl)	2017/08/14	NC	80 - 120	106	80 - 120	<1.0	mg/L	1.1	20
8724981	Dissolved Sulphate (SO4)	2017/08/14	108	80 - 120	106	80 - 120	<1.0	mg/L	NC	20
8725530	Extractable (n-Hex.) Oil and grease	2017/08/14			102	70 - 130	<2.0	mg/L		
8725539	Total Suspended Solids	2017/08/14	90	80 - 120	91	80 - 120	<1.0	mg/L	0	20
8725834	Total Ammonia (N)	2017/08/15	NC	80 - 120	103	80 - 120	<0.015	mg/L	3.3	20
8725841	Total Dissolved Solids	2017/08/15	98	80 - 120	101	80 - 120	<10	mg/L	1.1	20
8729154	Dissolved Barium (Ba)	2017/08/17	105	80 - 120	98	80 - 120	<0.010	mg/L	0.074	20
8729154	Dissolved Boron (B)	2017/08/17	107	80 - 120	100	80 - 120	<0.020	mg/L	0.28	20
8729154	Dissolved Calcium (Ca)	2017/08/17	99	80 - 120	95	80 - 120	<0.30	mg/L	0.28	20
8729154	Dissolved Iron (Fe)	2017/08/17	104	80 - 120	101	80 - 120	<0.060	mg/L	0.22	20
8729154	Dissolved Lithium (Li)	2017/08/17	104	80 - 120	98	80 - 120	<0.020	mg/L	1.5	20
8729154	Dissolved Magnesium (Mg)	2017/08/17	105	80 - 120	100	80 - 120	<0.20	mg/L	0.29	20
8729154	Dissolved Manganese (Mn)	2017/08/17	103	80 - 120	96	80 - 120	<0.0040	mg/L	0.55	20
8729154	Dissolved Phosphorus (P)	2017/08/17	112	80 - 120	99	80 - 120	<0.10	mg/L	5.7	20
8729154	Dissolved Potassium (K)	2017/08/17	110	80 - 120	104	80 - 120	<0.30	mg/L	0.58	20
8729154	Dissolved Silicon (Si)	2017/08/17	NC	80 - 120	105	80 - 120	<0.10	mg/L	0.24	20
8729154	Dissolved Sodium (Na)	2017/08/17	102	80 - 120	106	80 - 120	<0.50	mg/L	0.35	20
8729154	Dissolved Strontium (Sr)	2017/08/17	101	80 - 120	98	80 - 120	<0.020	mg/L	0.27	20
8729154	Dissolved Sulphur (S)	2017/08/17					<0.20	mg/L	0.19	20
8729852	Phenols	2017/08/17	80	80 - 120	93	80 - 120	<0.0020	mg/L	NC	20
8730476	Total Calcium (Ca)	2017/08/18	NC	80 - 120	101	80 - 120	<0.30	mg/L	7.8 (2)	20
8730476	Total Magnesium (Mg)	2017/08/18	NC	80 - 120	105	80 - 120	<0.20	mg/L	8.4 (2)	20
8730476	Total Potassium (K)	2017/08/18	NC	80 - 120	103	80 - 120	<0.30	mg/L	8.7 (2)	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8730476	Total Sodium (Na)	2017/08/18	NC	80 - 120	106	80 - 120	<0.50	mg/L	12 (3)	20

N/A = Not Applicable

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

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

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) Detection limits raised due to sample matrix.

(3) Detection limits raised due to dilution to bring analyte within the calibrated range.

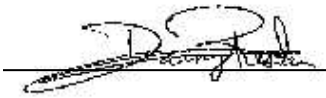
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768022
Report Date: 2017/08/18

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

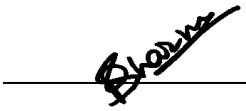
VALIDATION SIGNATURE PAGE

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



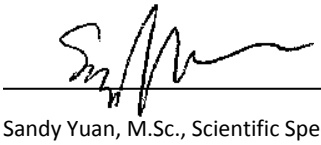
Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst



Sandy Yuan, M.Sc., Scientific Specialist

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017074

Report Information

Company: ARCADIS CANADA INC
Contact: MAURENIA LYNDS
Phone: 613 721 0555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 102089-0032
SITE: CAM BAY ~~APPEN~~ LTU ETA

Same as CoC

Project/LSD

Special Instructions

(1) pH, conductivity, total hardness, total Alkalinity

Analysis Requested

#	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-~~F2~~ F4	BTEX F1-F4	Routine Water (1)	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	~~Salinity 4~~ NITRATE - NITRITE	~~Sieve (75 micron)~~ OIL & GREASE	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	AMMONIA NITROGEN	TOTAL PHENOLS	Ca, Mg, Na, K	CHLORIDE/SULPHATE	DISSOLVED METALS	PAHs	TSS AND TDS		HOLD - DO NOT ANALYZE
11	MW15-5		2017/08/07	14:30	GW	11		X		X			X	X			X	X	X	X	X	X	X		
12																									
13																									
14																									
15																									
16																									
17																									
18																									
19																									
20																									
21																									
22																									
23																									
24																									
25																									
26																									
27																									
28																									
29																									
30																									
Please indicate Filtered, Preserved or Both (F, P, F/P) →																					F/P				

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-08-10 1600

Temp: 10, 6, 10 / 1, 1 mys gys

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
[signature] ELLIOTT HOLDEN	2017/08/08	10:00	[signature] Danielle Boisvert	2017/08/11	10:55	B768022 JWF

4, 2, 3
5, 7, 2
5, 3, 3
ice-yes all
seal-yes all (not intact)

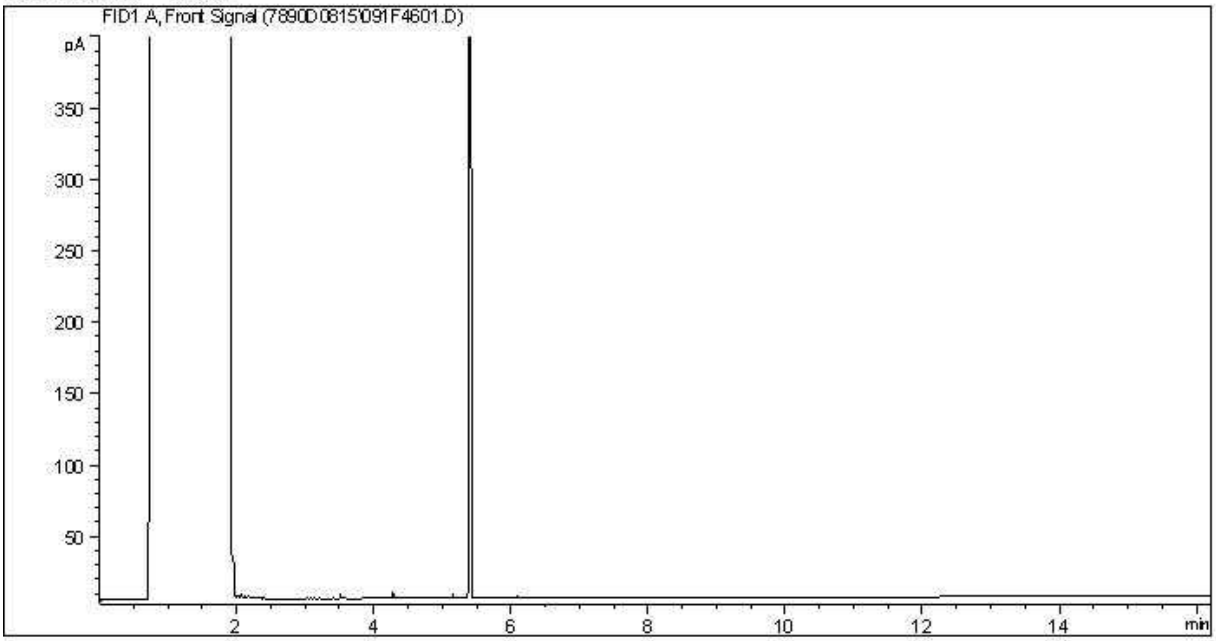
AB FCD-00331/6

Maxxam Job #: B768022
Report Date: 2017/08/18
Maxxam Sample: RS3943

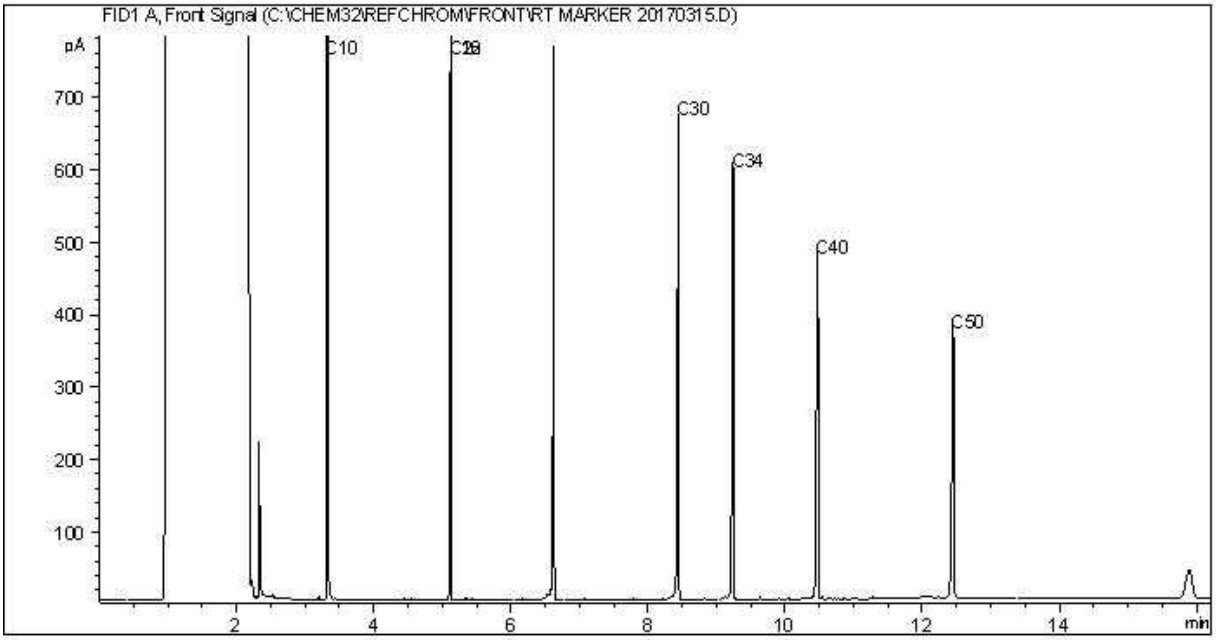
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAM BAY FTA LTU
Client ID: MW15-5

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

659

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017075

Report Information	Comments
Company: ARCADIS CANADA INC.	QUOTE: B50993
Contact: MAURENIA LYNDS	PROJECT: 102089-002
Phone: 613 721 0555	SITE: CAM BAY
Email: MAURENIA.LYNDS@ARCADIS.COM	FTA CTU
Sampled by: ELLIOTT HOLDEN	

Same as CoC

Project/LSD

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PFAS								HOLD - DO NOT ANALYZE	Special Instructions
11	FTA-SW-NW01		2017/08/09	9:00	SW	2											X									
12	MW15-1		2017/08/09	14:00	GW	2											X									
13	SW 1701		2017/08/09	15:00	SW	2											X									
14																										
15																										
16																										
17																										
18																										
19																										
20																										
21																										
22																										
23																										
24																										
25																										
26																										
27																										
28																										
29																										
30																										

Please indicate Filtered, Preserved or Both (F, P, F/P) →

2.2.2
ice/seal yes.

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-08-11 10:03

Temp: 6/7 / 7/5 / 7/4 mys yes

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
EH ELLIOTT HOLDEN	2017/08/10	10:00	[signature] Jenna Walter	20170812	1224	B768251

AB FCD-00331/6

Maxxam
A Bureau Veritas Group Company

Your P.O. #: N/A
Your Project #: B768251
Your C.O.C. #: ma

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/09/01
Report #: R4684332
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7H5183
Received: 2017/08/15, 09:27

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water by SPE/LCMS (1)	3	2017/08/17	2017/08/25	CAM SOP-00894	EPA 537 m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marijane Cruz, Senior Project Manager
Email: MCruz@maxxam.ca
Phone# (905)817-5756

==========

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

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EYD860			EYD861		
Sampling Date		2017/08/09 09:00			2017/08/09 14:00		
COC Number		ma			ma		
	UNITS	RS5331-01R/FTA-SW-NW01	RDL	QC Batch	RS5332-01R/MW15-1	RDL	QC Batch
Miscellaneous Parameters							
Perfluorobutane Sulfonate (PFBS)	ug/L	0.39	0.020	5123557	<0.020	0.020	5123557
Perfluorobutanoic acid	ug/L	0.96 (1)	0.20	5123557	0.34	0.020	5123557
Perfluorodecane Sulfonate	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluorodecanoic Acid (PFDA)	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluorododecanoic Acid (PFDoA)	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluoroheptane sulfonate	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.35	0.020	5123557	<0.020	0.020	5123557
Perfluorohexane Sulfonate (PFHxS)	ug/L	0.23	0.020	5123557	<0.020	0.020	5123557
Perfluorohexanoic Acid (PFHxA)	ug/L	3.9 (1)	0.20	5123557	0.22	0.020	5123557
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.048	0.020	5123557	<0.020	0.020	5123557
Perfluorononanoic Acid (PFNA)	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Perfluorooctane Sulfonate (PFOS)	ug/L	0.025	0.020	5123557	<0.020	0.020	5123557
Perfluoropentanoic Acid (PFPeA)	ug/L	5.2 (1)	0.20	5123557	0.39	0.020	5123557
Perfluorotetradecanoic Acid	ug/L	<0.20 (2)	0.20	5138915	<0.20 (2)	0.20	5123557
Perfluorotridecanoic Acid	ug/L	<0.20 (2)	0.20	5138915	<0.20 (2)	0.20	5123557
Perfluoroundecanoic Acid (PFUnA)	ug/L	<0.020	0.020	5123557	<0.020	0.020	5123557
Surrogate Recovery (%)							
13C2-Perfluorodecanoic acid	%	85	N/A	5123557	79	N/A	5123557
13C2-Perfluorododecanoic acid	%	70	N/A	5123557	65	N/A	5123557
13C2-Perfluorohexanoic acid	%	85	N/A	5123557	90	N/A	5123557
13C2-perfluorotetradecanoic acid	%	56	N/A	5138915	72	N/A	5123557
13C2-Perfluoroundecanoic acid	%	78	N/A	5123557	75	N/A	5123557
13C4-Perfluorobutanoic acid	%	77	N/A	5123557	58	N/A	5123557
13C4-Perfluoroheptanoic acid	%	90	N/A	5123557	90	N/A	5123557
13C4-Perfluorooctanesulfonate	%	84	N/A	5123557	83	N/A	5123557
13C4-Perfluorooctanoic acid	%	95	N/A	5123557	95	N/A	5123557
13C5-Perfluorononanoic acid	%	91	N/A	5123557	89	N/A	5123557
13C5-Perfluoropentanoic acid	%	83	N/A	5123557	86	N/A	5123557

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

N/A = Not Applicable

(1) Due to high concentration of the target analyte, a reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

(2) Due to matrix interference, the extracted internal standard analyte exhibited low recovery and as such, may not have allowed for accurate recovery correction of the associated native compound. A reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

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

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EYD860			EYD861		
Sampling Date		2017/08/09 09:00			2017/08/09 14:00		
COC Number		ma			ma		
	UNITS	**RS5331-01R/FTA-SW-NW01**	**RDL**	**QC Batch**	**RS5332-01R/MW15-1**	**RDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	83	N/A	5123557	79	N/A	5123557
18O2-Perfluorohexanesulfonate	%	103	N/A	5123557	97	N/A	5123557

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EYD862		
Sampling Date		2017/08/09 15:00		
COC Number		ma		
	UNITS	RS5333-01R/SW 1701	RDL	QC Batch
Miscellaneous Parameters				
Perfluorobutane Sulfonate (PFBS)	ug/L	<0.020	0.020	5123557
Perfluorobutanoic acid	ug/L	<0.020	0.020	5123557
Perfluorodecane Sulfonate	ug/L	<0.020	0.020	5123557
Perfluorodecanoic Acid (PFDA)	ug/L	<0.020	0.020	5123557
Perfluorododecanoic Acid (PFDoA)	ug/L	<0.020	0.020	5123557
Perfluoroheptane sulfonate	ug/L	<0.020	0.020	5123557
Perfluoroheptanoic Acid (PFHpA)	ug/L	<0.020	0.020	5123557
Perfluorohexane Sulfonate (PFHxS)	ug/L	<0.020	0.020	5123557
Perfluorohexanoic Acid (PFHxA)	ug/L	<0.020	0.020	5123557
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	<0.020	0.020	5123557
Perfluorononanoic Acid (PFNA)	ug/L	<0.020	0.020	5123557
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.020	0.020	5123557
Perfluorooctane Sulfonate (PFOS)	ug/L	<0.020	0.020	5123557
Perfluoropentanoic Acid (PFPeA)	ug/L	<0.020	0.020	5123557
Perfluorotetradecanoic Acid	ug/L	<0.20 (1)	0.20	5138915
Perfluorotridecanoic Acid	ug/L	<0.20 (1)	0.20	5138915
Perfluoroundecanoic Acid (PFUnA)	ug/L	<0.020	0.020	5123557
Surrogate Recovery (%)				
13C2-Perfluorodecanoic acid	%	85	N/A	5123557
13C2-Perfluorododecanoic acid	%	69	N/A	5123557
13C2-Perfluorohexanoic acid	%	88	N/A	5123557
13C2-perfluorotetradecanoic acid	%	50	N/A	5138915
13C2-Perfluoroundecanoic acid	%	78	N/A	5123557
13C4-Perfluorobutanoic acid	%	76	N/A	5123557
13C4-Perfluoroheptanoic acid	%	96	N/A	5123557
13C4-Perfluorooctanesulfonate	%	93	N/A	5123557
13C4-Perfluorooctanoic acid	%	95	N/A	5123557
13C5-Perfluorononanoic acid	%	95	N/A	5123557
13C5-Perfluoropentanoic acid	%	86	N/A	5123557

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Due to matrix interference, the extracted internal standard analyte exhibited low recovery and as such, may not have allowed for accurate recovery correction of the associated native compound. A reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

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

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EYD862		
Sampling Date		2017/08/09 15:00		
COC Number		ma		
	UNITS	**RS5333-01R/SW 1701**	**RDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	83	N/A	5123557
18O2-Perfluorohexanesulfonate	%	92	N/A	5123557

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	7.3°C

Sample EYD860, PFOS and PFOA in water by SPE/LCMS: Test repeated.
Sample EYD862, PFOS and PFOA in water by SPE/LCMS: Test repeated.

Results relate only to the items tested.

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

Maxxam
A Bureau Veritas Group Company

Maxxam Job #: B7H5183
Report Date: 2017/09/01

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5123557	13C2-Perfluorodecanoic acid	2017/08/25	89	50 - 150	83	%		
5123557	13C2-Perfluorododecanoic acid	2017/08/25	83	50 - 150	74	%		
5123557	13C2-Perfluorohexanoic acid	2017/08/25	93	50 - 150	94	%		
5123557	13C2-perfluorotetradecanoic acid	2017/08/25	78	50 - 150	73	%		
5123557	13C2-Perfluoroundecanoic acid	2017/08/25	84	50 - 150	83	%		
5123557	13C4-Perfluorobutanoic acid	2017/08/25	90	50 - 150	97	%		
5123557	13C4-Perfluoroheptanoic acid	2017/08/25	97	50 - 150	96	%		
5123557	13C4-Perfluorooctanesulfonate	2017/08/25	96	50 - 150	88	%		
5123557	13C4-Perfluorooctanoic acid	2017/08/25	91	50 - 150	96	%		
5123557	13C5-Perfluorononanoic acid	2017/08/25	87	50 - 150	92	%		
5123557	13C5-Perfluoropentanoic acid	2017/08/25	88	50 - 150	89	%		
5123557	13C8-Perfluorooctane Sulfonamide	2017/08/25	80	50 - 150	84	%		
5123557	18O2-Perfluorohexanesulfonate	2017/08/25	88	50 - 150	101	%		
5138915	13C2-perfluorotetradecanoic acid	2017/08/31	87	50 - 150	83	%		
5123557	Perfluorobutane Sulfonate (PFBS)	2017/08/25	116	70 - 130	<0.020	ug/L	9.9	30
5123557	Perfluorobutanoic acid	2017/08/25	113	70 - 130	<0.020	ug/L	5.4	30
5123557	Perfluorodecane Sulfonate	2017/08/25	105	70 - 130	<0.020	ug/L	2.5	30
5123557	Perfluorodecanoic Acid (PFDA)	2017/08/25	109	70 - 130	<0.020	ug/L	4.9	30
5123557	Perfluorododecanoic Acid (PFDoA)	2017/08/25	113	70 - 130	<0.020	ug/L	3.1	30
5123557	Perfluoroheptane sulfonate	2017/08/25	98	70 - 130	<0.020	ug/L	10	30
5123557	Perfluoroheptanoic Acid (PFHpA)	2017/08/25	102	70 - 130	<0.020	ug/L	11	30
5123557	Perfluorohexane Sulfonate (PFHxS)	2017/08/25	113	70 - 130	<0.020	ug/L	10	30
5123557	Perfluorohexanoic Acid (PFHxA)	2017/08/25	107	70 - 130	<0.020	ug/L	5.4	30
5123557	Perfluoro-n-Octanoic Acid (PFOA)	2017/08/25	108	70 - 130	<0.020	ug/L	3.0	30
5123557	Perfluorononanoic Acid (PFNA)	2017/08/25	112	70 - 130	<0.020	ug/L	2.6	30
5123557	Perfluorooctane Sulfonamide (PFOSA)	2017/08/25	114	70 - 130	<0.020	ug/L	1.5	30
5123557	Perfluorooctane Sulfonate (PFOS)	2017/08/25	105	70 - 130	<0.020	ug/L	6.2	30
5123557	Perfluoropentanoic Acid (PFPeA)	2017/08/25	118	70 - 130	<0.020	ug/L	4.9	30
5123557	Perfluorotetradecanoic Acid	2017/08/25	114	70 - 130	<0.020	ug/L	4.5	30
5123557	Perfluorotridecanoic Acid	2017/08/25	116	70 - 130	<0.020	ug/L	2.0	30
5123557	Perfluoroundecanoic Acid (PFUnA)	2017/08/25	115	70 - 130	<0.020	ug/L	4.6	30

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

QUALITY ASSURANCE REPORT(CONT'D)

			SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5138915	Perfluorotetradecanoic Acid	2017/08/31	105	70 - 130	<0.020	ug/L	3.1	30
5138915	Perfluorotridecanoic Acid	2017/08/31	110	70 - 130	<0.020	ug/L	5.9	30

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

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

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

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

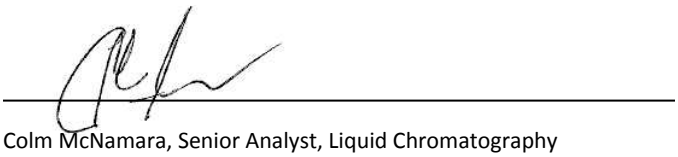
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7H5183
Report Date: 2017/09/01

Maxxam Analytics
Client Project #: B768251
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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



Colm McNamara, Senior Analyst, Liquid Chromatography

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

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

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-002
Site Location: CAMBAY FTA LTU
Your C.O.C. #: M057444

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/25
Report #: R2434589
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768019
Received: 2017/08/10, 10:00

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1)	7	N/A	2017/08/13	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons (F2-F4 in soil) (2)	7	2017/08/13	2017/08/15	AB SOP-00036	CCME PHC-CWS m
Elements by ICP -Soils	5	2017/08/15	2017/08/17	AB SOP-00001 / AB SOP-00042	EPA 200.7 CFR 2012 m
Moisture	7	N/A	2017/08/14	AB SOP-00002	CCME PHC-CWS m
Phosphorus, Potassium - Available	5	2017/08/17	2017/08/17	AB SOP-00028 / AB SOP-00042	EPA 200.7 CFR 2012 m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002
Site Location: CAMBAY FTA LTU
Your C.O.C. #: M057444

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/25
Report #: R2434589
Version: 2 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768019
Received: 2017/08/10, 10:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

Maxxam ID		RS3925		RS3926	RS3926		RS3927	RS3928		
Sampling Date		2017/08/06 10:00		2017/08/06 10:15	2017/08/06 10:15		2017/08/06 10:30	2017/08/06 10:45		
COC Number		M057444		M057444	M057444		M057444	M057444		
	UNITS	FTA1701	QC Batch	FTA1702	FTA1702 Lab-Dup	QC Batch	FTA1703	FTA1704	RDL	QC Batch
Physical Properties										
Moisture	%	6.1	8724969	6.2	N/A	8724969	4.2	14	0.30	8724969
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	540	8725076	<10	N/A	8725081	29	47	10	8725076
F3 (C16-C34 Hydrocarbons)	mg/kg	1100	8725076	140	N/A	8725081	460	64	50	8725076
F4 (C34-C50 Hydrocarbons)	mg/kg	220	8725076	130	N/A	8725081	170	<50	50	8725076
Reached Baseline at C50	mg/kg	Yes	8725076	Yes	N/A	8725081	Yes	Yes	N/A	8725076
Field Preserved Volatiles										
Benzene	mg/kg	<0.0050	8724825	<0.0050	<0.0050	8724825	<0.0050	<0.0050	0.0050	8724825
Toluene	mg/kg	<0.020	8724825	<0.020	<0.020	8724825	<0.020	<0.020	0.020	8724825
Ethylbenzene	mg/kg	<0.010	8724825	<0.010	<0.010	8724825	<0.010	<0.010	0.010	8724825
Xylenes (Total)	mg/kg	<0.040	8724825	<0.040	<0.040	8724825	<0.040	<0.040	0.040	8724825
m & p-Xylene	mg/kg	<0.040	8724825	<0.040	<0.040	8724825	<0.040	<0.040	0.040	8724825
o-Xylene	mg/kg	<0.020	8724825	<0.020	<0.020	8724825	<0.020	<0.020	0.020	8724825
F1 (C6-C10) - BTEX	mg/kg	15	8724825	18	22	8724825	<10	<10	10	8724825
F1 (C6-C10)	mg/kg	15	8724825	18	22	8724825	<10	<10	10	8724825
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	97	8724825	93	96	8724825	95	95	N/A	8724825
4-Bromofluorobenzene (sur.)	%	105	8724825	99	101	8724825	101	103	N/A	8724825
D10-o-Xylene (sur.)	%	100	8724825	106	102	8724825	104	111	N/A	8724825
D4-1,2-Dichloroethane (sur.)	%	102	8724825	99	101	8724825	98	101	N/A	8724825
O-TERPHENYL (sur.)	%	92	8725076	120	N/A	8725081	88	87	N/A	8725076

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

Maxxam ID		RS3929	RS3930	RS3931		
Sampling Date		2017/08/06 11:00	2017/08/06 11:15	2017/08/06		
COC Number		M057444	M057444	M057444		
	UNITS	FTA1705	FTA1706	FTADUP01	RDL	QC Batch
Physical Properties						
Moisture	%	5.3	16	6.2	0.30	8724969
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	28	540	10	8725076
F3 (C16-C34 Hydrocarbons)	mg/kg	170	160	1000	50	8725076
F4 (C34-C50 Hydrocarbons)	mg/kg	65	55	200	50	8725076
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	8725076
Field Preserved Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	8724825
Toluene	mg/kg	<0.020	<0.020	<0.020	0.020	8724825
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	8724825
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	8724825
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	8724825
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	8724825
F1 (C6-C10) - BTEX	mg/kg	<10	<10	18	10	8724825
F1 (C6-C10)	mg/kg	<10	<10	18	10	8724825
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	95	96	95	N/A	8724825
4-Bromofluorobenzene (sur.)	%	102	103	107	N/A	8724825
D10-o-Xylene (sur.)	%	104	113	101	N/A	8724825
D4-1,2-Dichloroethane (sur.)	%	102	103	101	N/A	8724825
O-TERPHENYL (sur.)	%	86	86	88	N/A	8725076

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		RS3925	RS3925	RS3927	RS3928	RS3930	RS3931		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00	2017/08/06 10:30	2017/08/06 10:45	2017/08/06 11:15	2017/08/06		
COC Number		M057444	M057444	M057444	M057444	M057444	M057444		
	UNITS	FTA1701	FTA1701 Lab-Dup	FTA1703	FTA1704	FTA1706	FTADUP01	RDL	QC Batch
Nutrients									
Available (Mod Kel) Phosphorus (P)	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	8728979

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		RS3925	RS3925	RS3927	RS3928	RS3930	RS3931		
Sampling Date		2017/08/06 10:00	2017/08/06 10:00	2017/08/06 10:30	2017/08/06 10:45	2017/08/06 11:15	2017/08/06		
COC Number		M057444	M057444	M057444	M057444	M057444	M057444		
	UNITS	FTA1701	FTA1701 Lab-Dup	FTA1703	FTA1704	FTA1706	FTADUP01	RDL	QC Batch
Elements									
Total Iron (Fe)	mg/kg	7400	7700	8900	7200	8800	7400	10	8726402
Total Potassium (K)	mg/kg	1400 (1)	1500	1800	930	1800	1400	25	8726402

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
(1) Matrix Spike exceeds acceptance limits due to matrix interference. Reanalysis yields similar results.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	9.0°C
Package 2	9.7°C

Results for Total Nitrogen are attached to this report. The reference number from Maxxam campobello is B7H7176.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8724825	1,4-Difluorobenzene (sur.)	2017/08/13			99	60 - 130	94	%				
8724825	4-Bromofluorobenzene (sur.)	2017/08/13			103	60 - 130	102	%				
8724825	D10-o-Xylene (sur.)	2017/08/13			96	60 - 130	94	%				
8724825	D4-1,2-Dichloroethane (sur.)	2017/08/13			102	60 - 130	108	%				
8725076	O-TERPHENYL (sur.)	2017/08/15	84	60 - 130	91	60 - 130	93	%				
8725081	O-TERPHENYL (sur.)	2017/08/15	104	60 - 130	107	60 - 130	94	%				
8724825	Benzene	2017/08/13			93	50 - 130	<0.0050	mg/kg	NC	50		
8724825	Ethylbenzene	2017/08/13			92	50 - 130	<0.010	mg/kg	NC	50		
8724825	F1 (C6-C10) - BTEX	2017/08/13					<10	mg/kg	16	30		
8724825	F1 (C6-C10)	2017/08/13	110	60 - 140	112	50 - 130	<10	mg/kg	16	30		
8724825	m & p-Xylene	2017/08/13			95	50 - 130	<0.040	mg/kg	NC	50		
8724825	o-Xylene	2017/08/13			93	50 - 130	<0.020	mg/kg	NC	50		
8724825	Toluene	2017/08/13			90	50 - 130	<0.020	mg/kg	NC	50		
8724825	Xylenes (Total)	2017/08/13					<0.040	mg/kg	NC	50		
8724969	Moisture	2017/08/14					<0.30	%	4.9	20		
8725076	F2 (C10-C16 Hydrocarbons)	2017/08/15	88	60 - 130	94	70 - 130	<10	mg/kg	NC	40		
8725076	F3 (C16-C34 Hydrocarbons)	2017/08/15	85	60 - 130	90	70 - 130	<50	mg/kg	NC	40		
8725076	F4 (C34-C50 Hydrocarbons)	2017/08/15	79	60 - 130	85	70 - 130	<50	mg/kg	NC	40		
8725081	F2 (C10-C16 Hydrocarbons)	2017/08/15	108	60 - 130	111	70 - 130	<10	mg/kg	NC	40		
8725081	F3 (C16-C34 Hydrocarbons)	2017/08/15	106	60 - 130	108	70 - 130	<50	mg/kg	NC	40		
8725081	F4 (C34-C50 Hydrocarbons)	2017/08/15	102	60 - 130	104	70 - 130	<50	mg/kg	NC	40		
8726402	Total Iron (Fe)	2017/08/17	NC	75 - 125	109	80 - 120	<10	mg/kg	4.9	30	87	78 - 122
8726402	Total Potassium (K)	2017/08/17	133 (1)	75 - 125	103	80 - 120	<25	mg/kg	6.9	35	69	55 - 145

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8728979	Available (Mod Kel) Phosphorus (P)	2017/08/17	95	75 - 125	101	80 - 120	<4.0	mg/kg	NC	35		

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

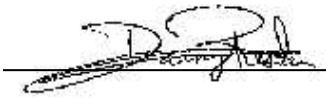
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768019
Report Date: 2017/08/25

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

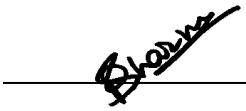
VALIDATION SIGNATURE PAGE

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

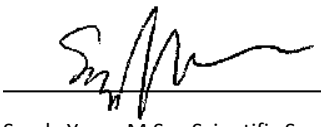


Daniel Reslan, cCT, QP, Organics Supervisor

Justin Geisel, B.Sc., Organics Supervisor



Poonam Sharma, cCT, Organics Supervisor



Sandy Yuan, M.Sc., Scientific Specialist

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 057444

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: B50993	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE. SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-002	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY FTA CTU	[ ] Same Day [ ] 2 Days [ ] 1 Day [ ] 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only — RECEIVED IN YELLOWKNIFE By: Depot Reception 2017-08-10 10:00

	YES	NO	Cooler ID	Temp
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
			1	4.2.3
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
			2	5.7.2
Seal Present	✓			
Seal Intact	✓			
Cooling Media	✓			
			3	5.3.3

Temp: 8 / 10 / 9 ice packs
9 / 10 / 10 bags

Analysis Requested

Sample Identification	Depth (Unit) (cm)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☒ VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☐ Tot ☐ Diss	Mercury ☐ Total ☐ Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	TOTAL IRON	TOTAL POTASSIUM	AVAILABLE PHOSPHORUS	TOTAL NITROGEN	HOLD - DO NOT ANALYZE
1 FTA1701	0.0-0.2	2017/08/06	10:00	SOIL	4	X		X								X	X	X	X	
2 FTA1702	0.0-0.2	2017/08/06	10:15	SOIL	4	X		X								X	X	X	X	
3 FTA1703	0.0-0.2	2017/08/06	10:30	SOIL	4	X		X								X	X	X	X	
4 FTA1704	0.0-0.2	2017/08/06	10:45	SOIL	4	X		X								X	X	X	X	
5 FTA1705	0.0-0.2	2017/08/06	11:00	SOIL	4	X		X								X	X	X	X	
6 FTA1706	0.0-0.2	2017/08/06	11:15	SOIL	4	X		X								X	X	X	X	
7 FTADUP01	0.0-0.2	2017/08/06		SOIL	4	X		X								X	X	X	X	
8																				
9																				
10																				

Regulatory Criteria: [ ] AT1 [X] CCME [ ] Drinking Water [ ] D50 (Drilling Waste) [ ] Saskatchewan [ ] Other:

Special Instructions

Please indicate Filtered, Preserved or Both (F, P, F/P)

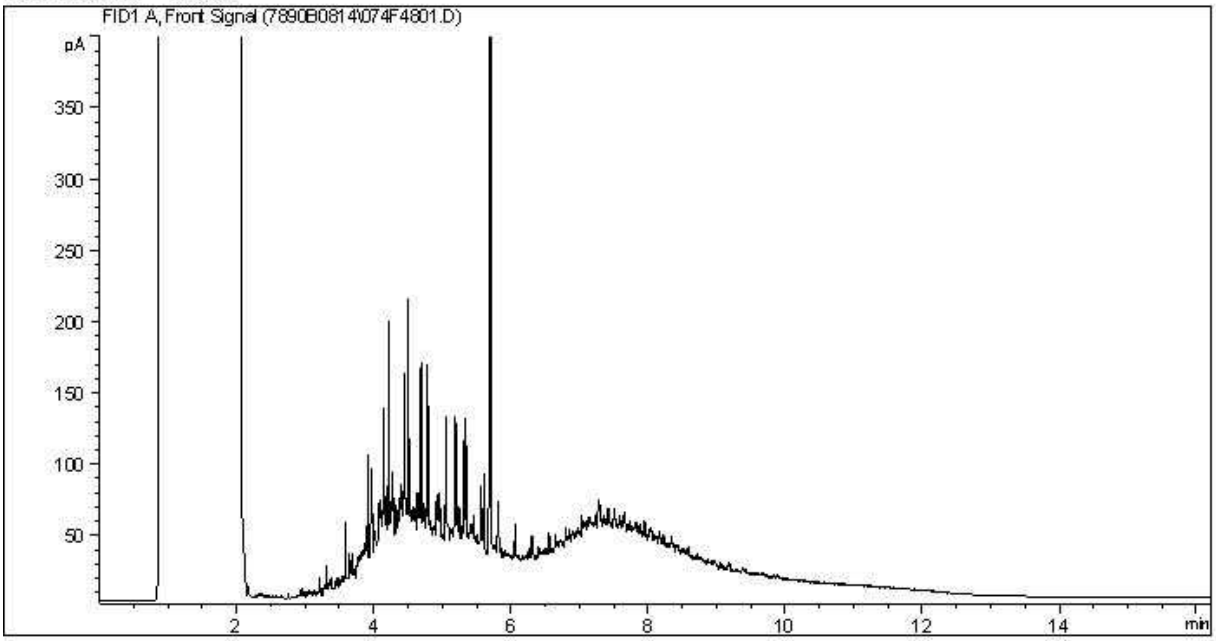
Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
ELLIOTT HOLDEN	2017/08/08	10:00	Danielle Boisvert	2017/08/11	10:55	B768019 JWF

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

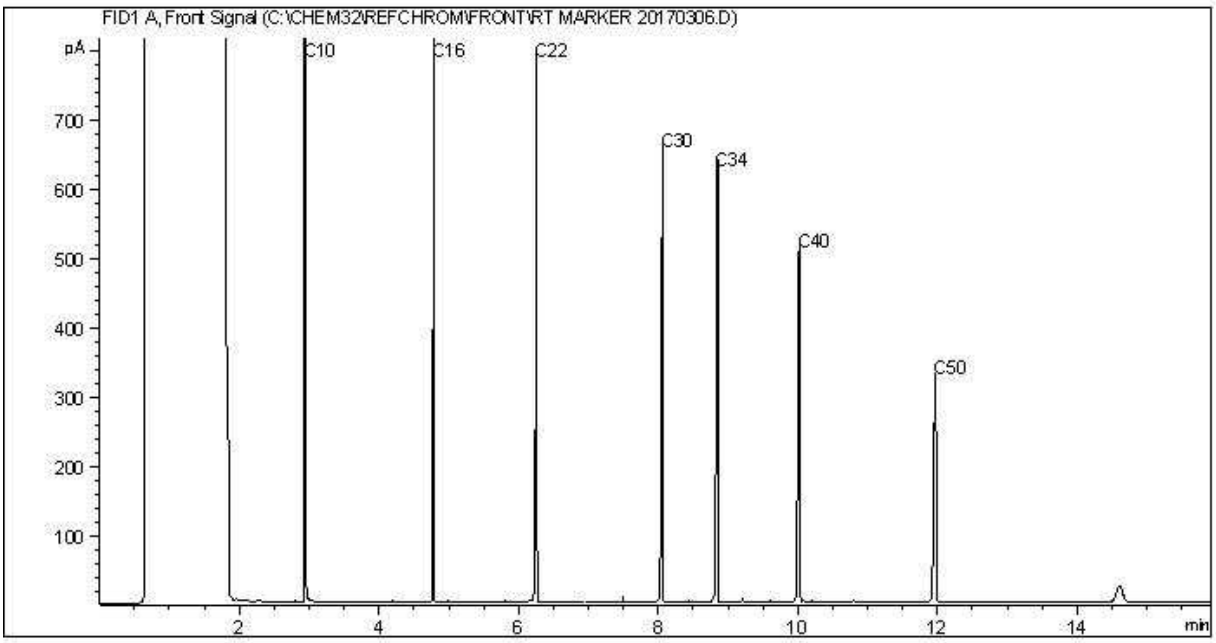
AB FCD-00331/7

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



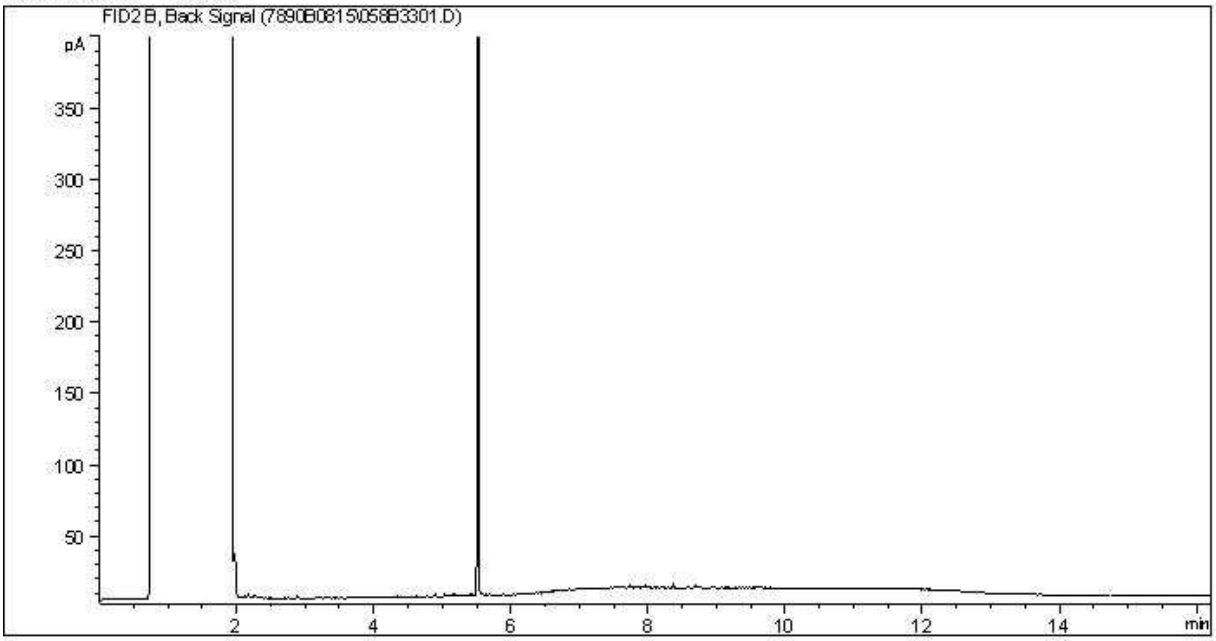
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

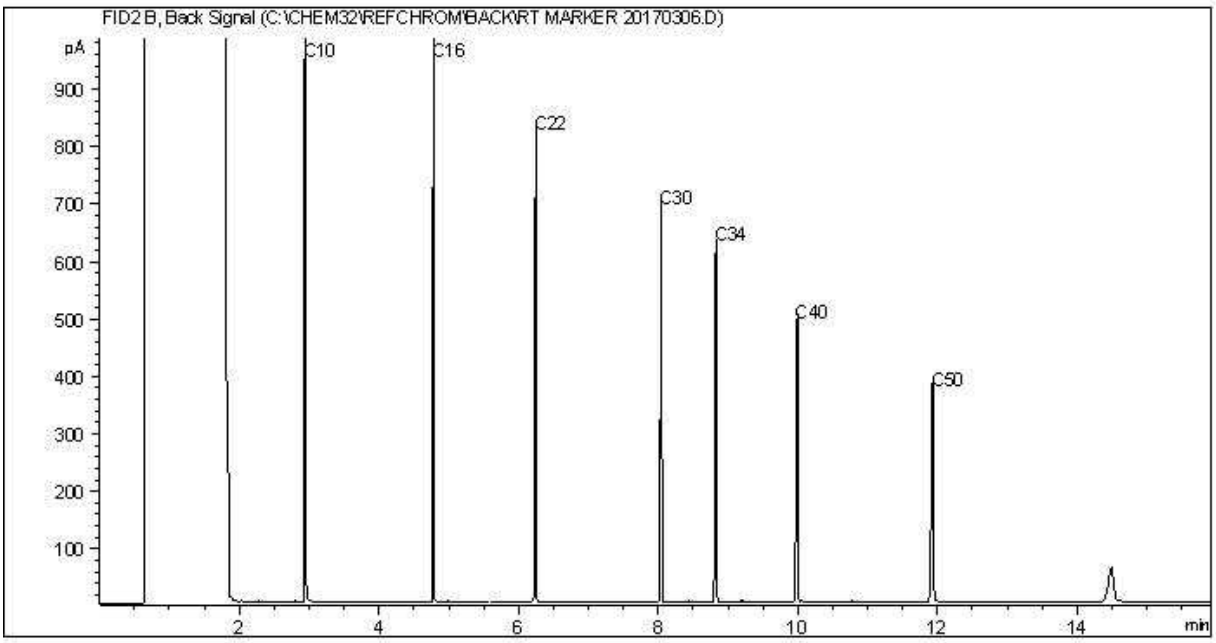
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



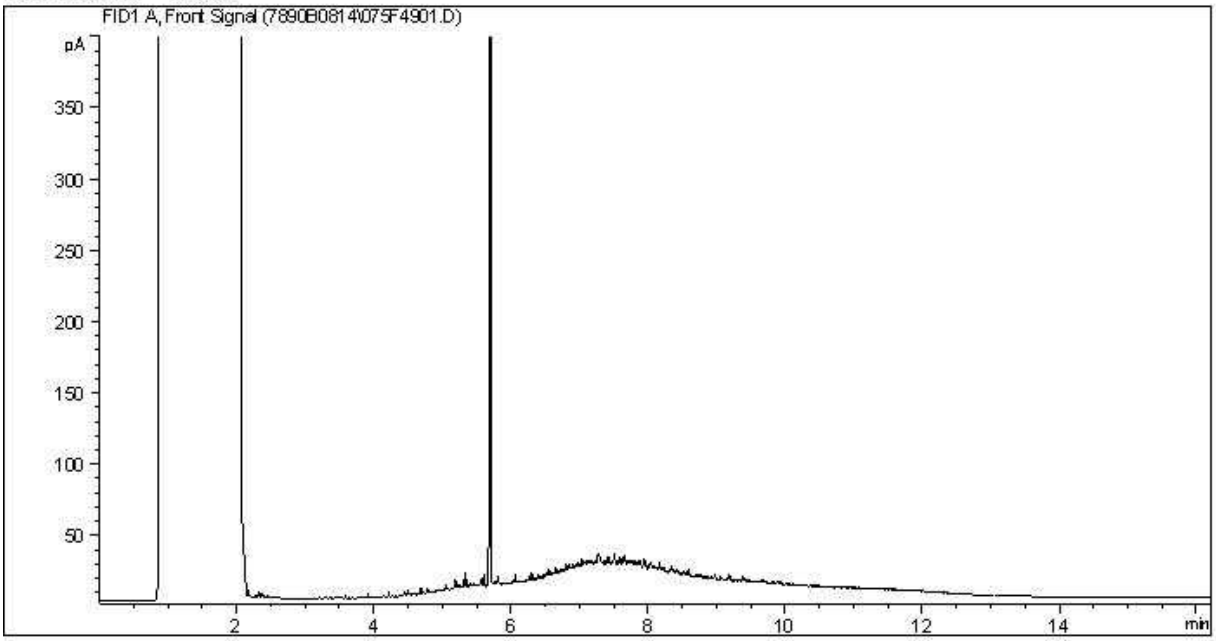
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

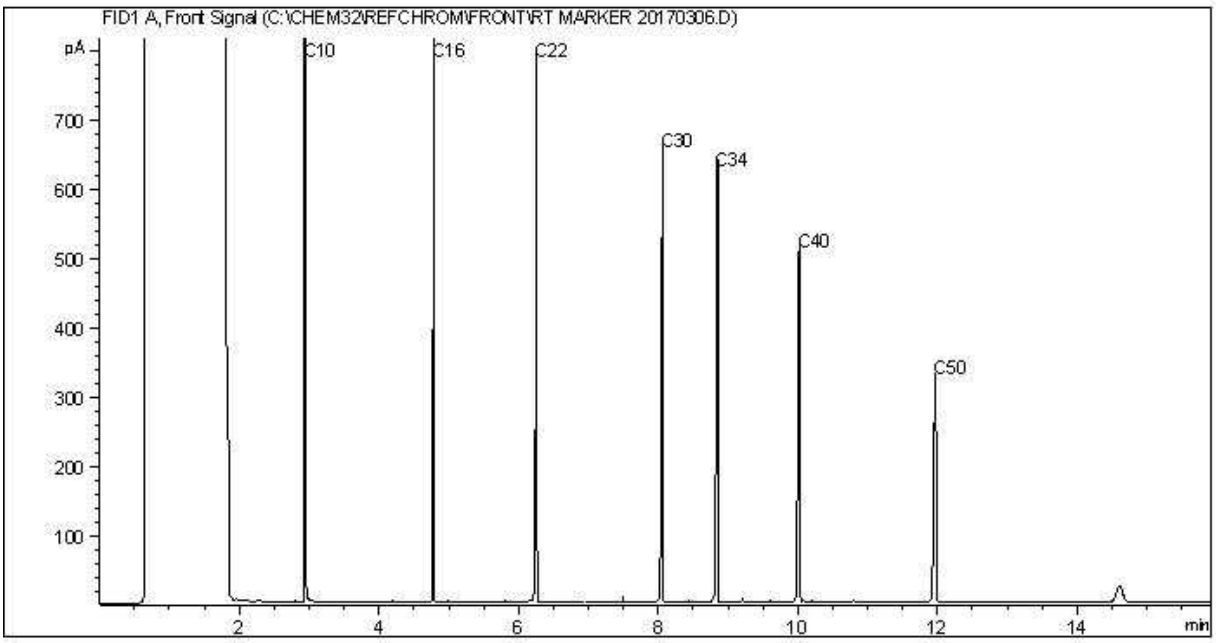
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



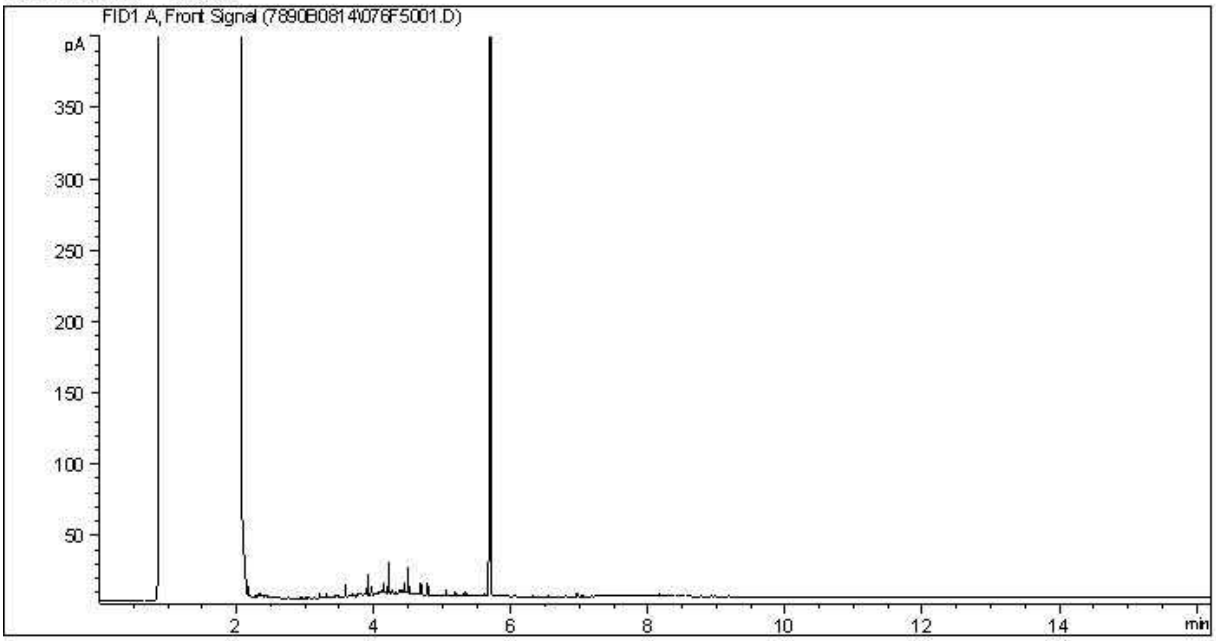
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

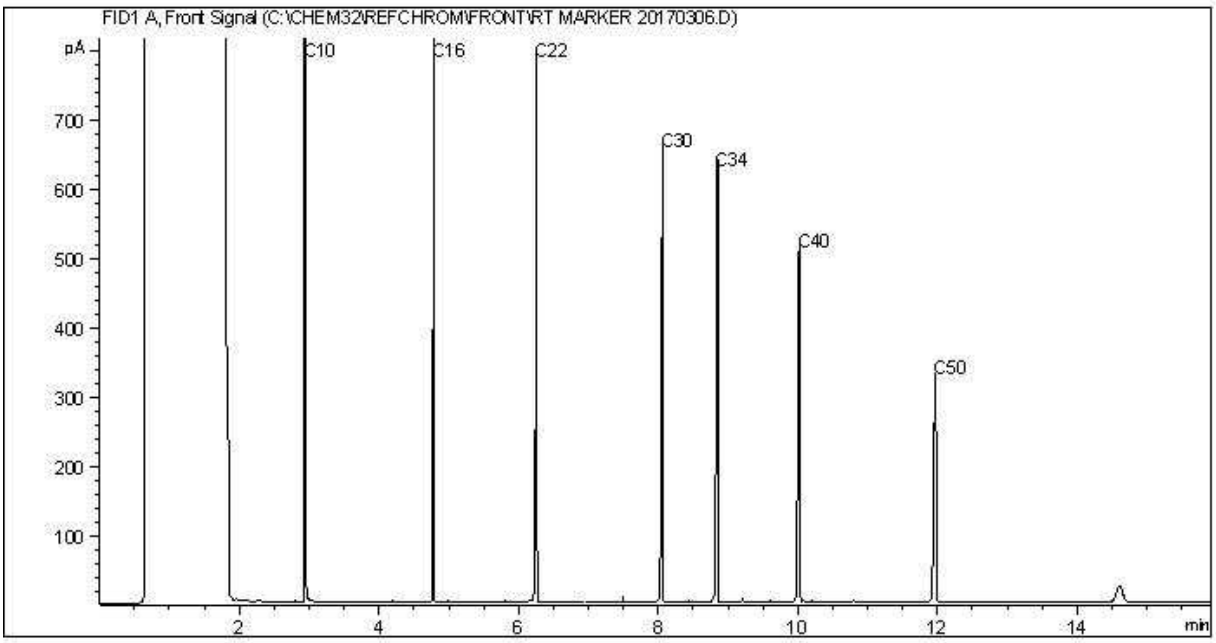
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

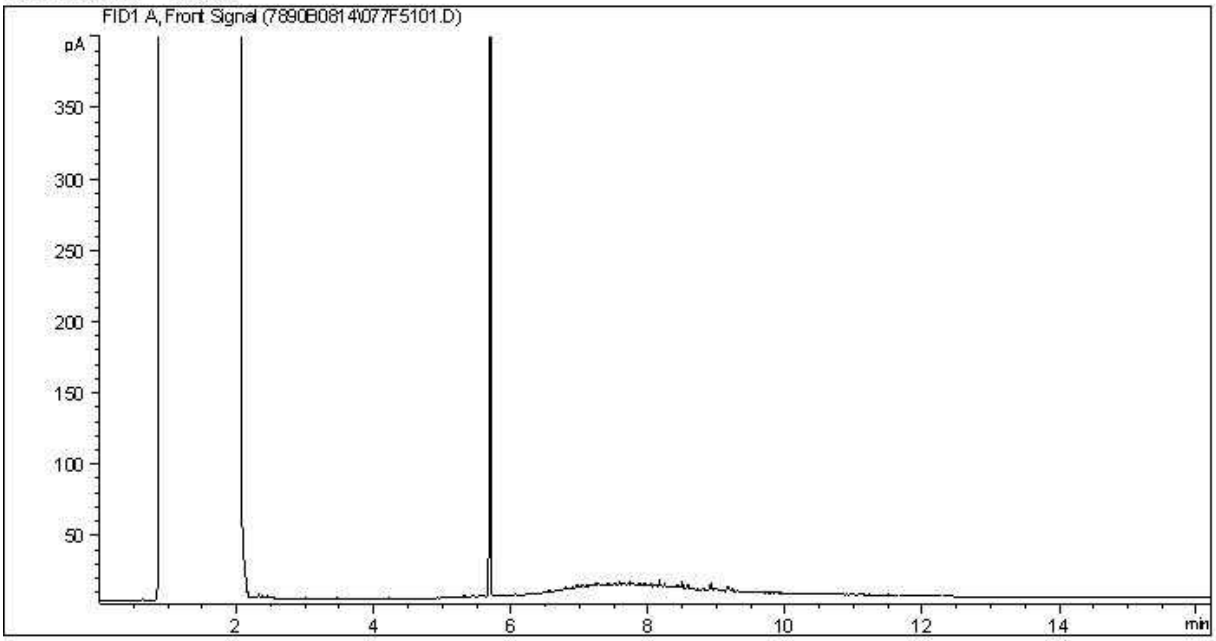
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768019
Report Date: 2017/08/25
Maxxam Sample: RS3929

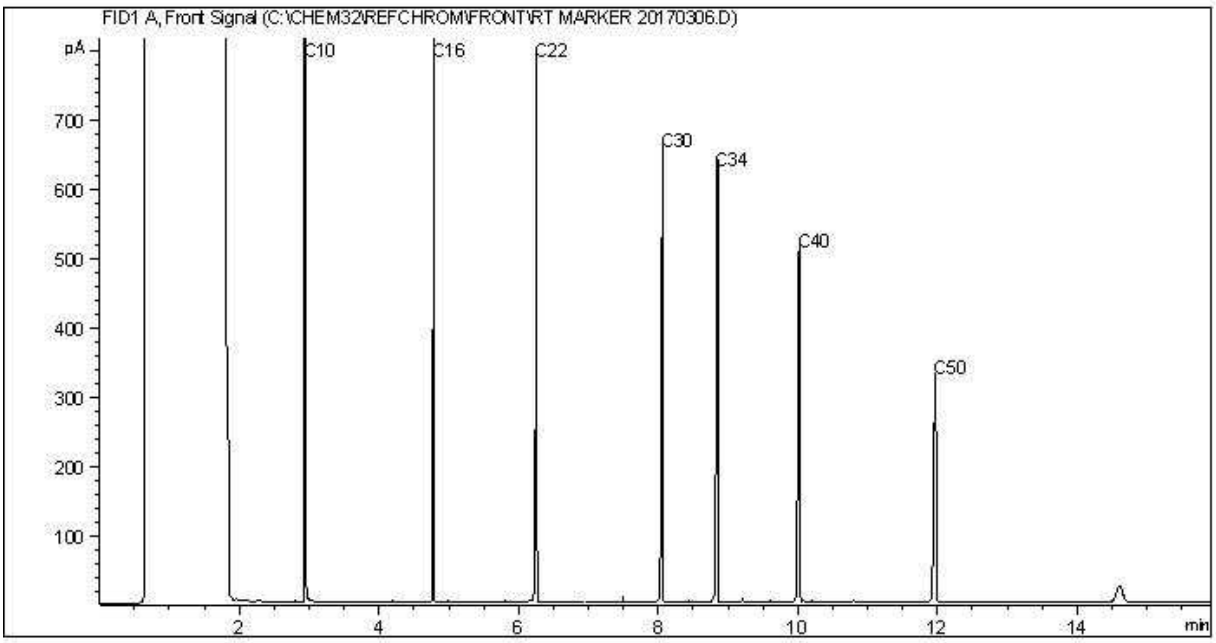
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAMBAY FTA LTU
Client ID: FTA1705

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

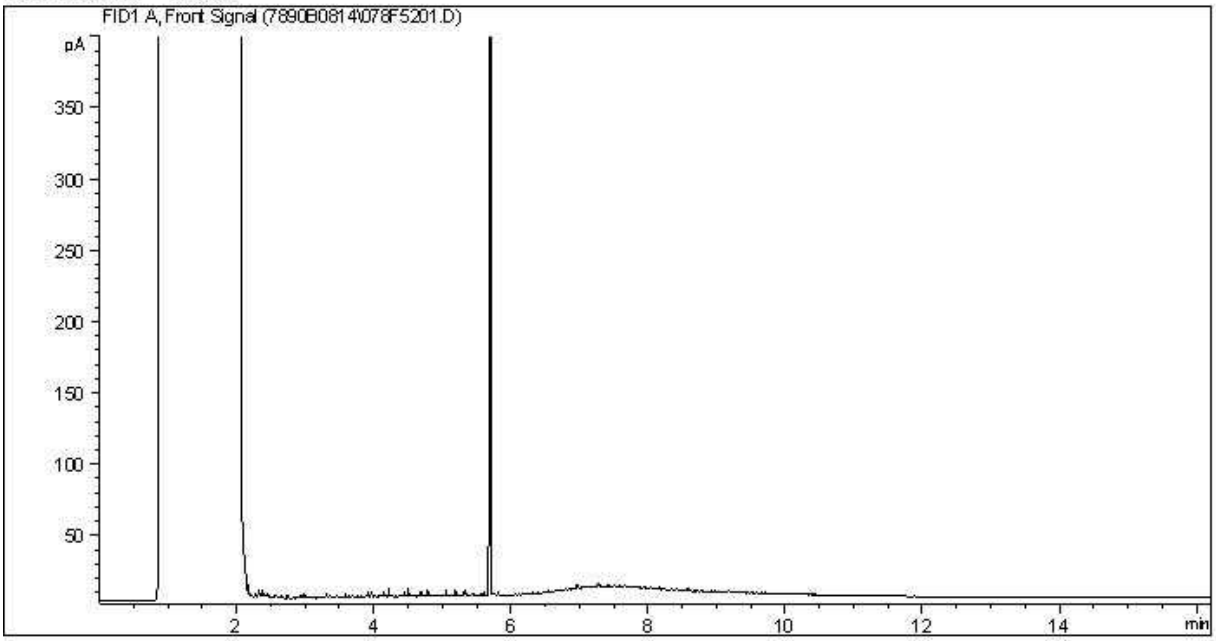
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768019
Report Date: 2017/08/25
Maxxam Sample: RS3930

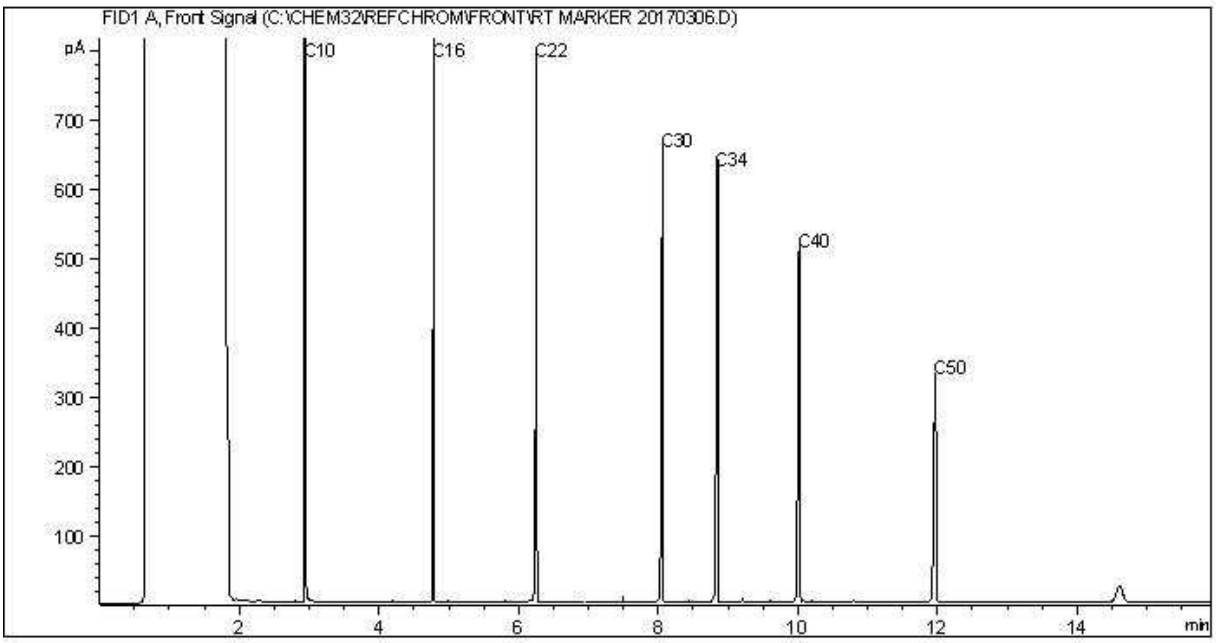
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAMBAY FTA LTU
Client ID: FTA1706

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

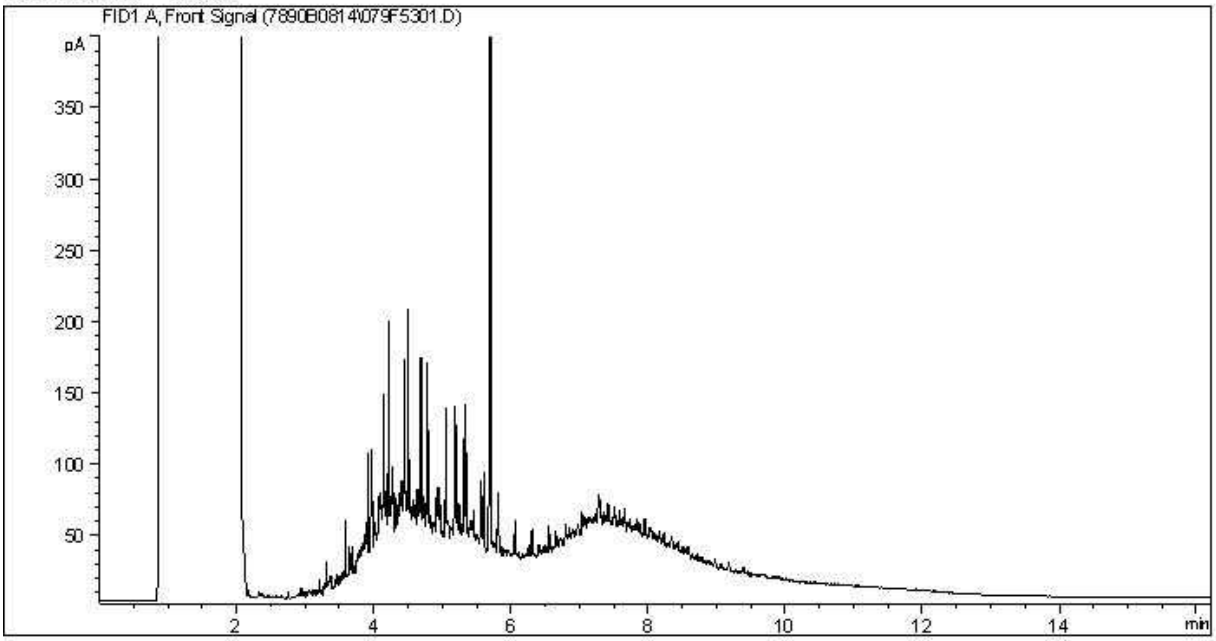
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768019
Report Date: 2017/08/25
Maxxam Sample: RS3931

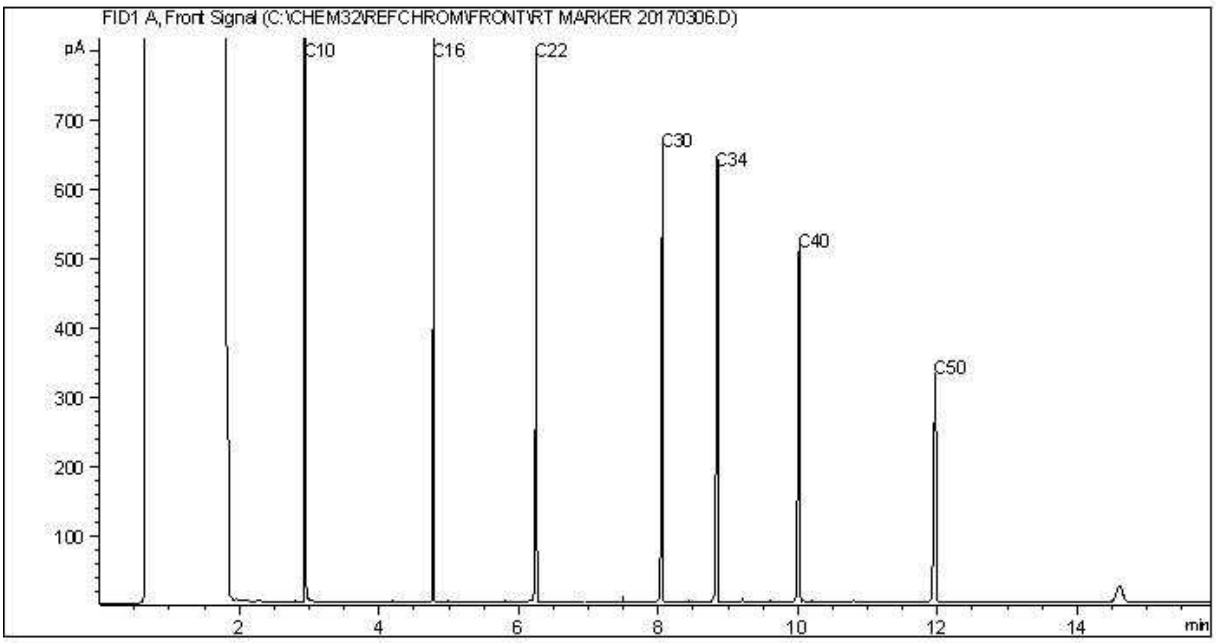
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAMBAY FTA LTU
Client ID: FTADUP01

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 102089-002
Site Location: CAMBAY FTA LTU
Your C.O.C. #: M057437

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421793
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763378
Received: 2017/07/27, 16:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	2	N/A	2017/07/30	AB SOP-00039	CCME CWS/EPA 8260C m
Elements by ICPMS - Total	2	2017/07/30	2017/07/30	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Oil and Grease (Gravimetric, n-Hexane)	2	2017/07/31	2017/07/31	EENVSOP-00093	SM 22 5520 B m
Lead Dissolved-Lab Filtered (1)	2	N/A	2017/08/01	AB SOP-00043	EPA 200.8 R5.4 m
pH @25°C (2)	2	N/A	2017/07/30	AB SOP-00005	SM 22 4500 H+ B m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling.
(2) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Maxxam endeavours to analyze samples as soon as possible after receipt.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Your Project #: 102089-002
Site Location: CAMBAY FTA LTU
Your C.O.C. #: M057437

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/01
Report #: R2421793
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763378
Received: 2017/07/27, 16:00

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		RP8620	RP8621		
Sampling Date		2017/07/25 17:00	2017/07/25 17:30		
COC Number		M057437	M057437		
	UNITS	FTA SUMP01	FTA SUMP02	RDL	QC Batch
Misc. Inorganics					
pH	pH	8.41	8.15	N/A	8711310
Misc. Organics					
Extractable (n-Hex.) Oil and grease	mg/L	<2.0	<2.0	2.0	8711928

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (SURFACE WATER)

Maxxam ID		RP8620	RP8621		
Sampling Date		2017/07/25 17:00	2017/07/25 17:30		
COC Number		M057437	M057437		
	UNITS	FTA SUMP01	FTA SUMP02	RDL	QC Batch
Elements					
Total Zinc (Zn)	mg/L	<0.0030	0.0046	0.0030	8711242
Lab Filtered Elements					
Dissolved Lead (Pb)	mg/L	<0.00020	0.00040	0.00020	8713065
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

VOLATILE ORGANICS BY GC-MS (SURFACE WATER)

Maxxam ID		RP8620	RP8621		
Sampling Date		2017/07/25 17:00	2017/07/25 17:30		
COC Number		M057437	M057437		
	UNITS	FTA SUMP01	FTA SUMP02	RDL	QC Batch
Volatiles					
Benzene	ug/L	<0.40	<0.40	0.40	8707472
Toluene	ug/L	<0.40	<0.40	0.40	8707472
Ethylbenzene	ug/L	<0.40	<0.40	0.40	8707472
m & p-Xylene	ug/L	<0.80	<0.80	0.80	8707472
o-Xylene	ug/L	<0.40	<0.40	0.40	8707472
Xylenes (Total)	ug/L	<0.80	<0.80	0.80	8707472
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	8707472
F1 (C6-C10)	ug/L	<100	<100	100	8707472
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	100	99	N/A	8707472
4-Bromofluorobenzene (sur.)	%	105	102	N/A	8707472
D4-1,2-Dichloroethane (sur.)	%	96	93	N/A	8707472

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	3.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8707472	1,4-Difluorobenzene (sur.)	2017/07/26	109	70 - 130	114	70 - 130	101	%		
8707472	4-Bromofluorobenzene (sur.)	2017/07/26	96	70 - 130	97	70 - 130	87	%		
8707472	D4-1,2-Dichloroethane (sur.)	2017/07/26	115	70 - 130	119	70 - 130	109	%		
8707472	Benzene	2017/07/26	105	70 - 130	109	70 - 130	<0.40	ug/L	NC	30
8707472	Ethylbenzene	2017/07/26	88	70 - 130	90	70 - 130	<0.40	ug/L	NC	30
8707472	F1 (C6-C10) - BTEX	2017/07/26					<100	ug/L	NC	30
8707472	F1 (C6-C10)	2017/07/26	72	70 - 130	91	70 - 130	<100	ug/L	NC	30
8707472	m & p-Xylene	2017/07/26	92	70 - 130	93	70 - 130	<0.80	ug/L	NC	30
8707472	o-Xylene	2017/07/26	98	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8707472	Toluene	2017/07/26	86	70 - 130	97	70 - 130	<0.40	ug/L	27	30
8707472	Xylenes (Total)	2017/07/26					<0.80	ug/L	NC	30
8711242	Total Zinc (Zn)	2017/07/30	101	80 - 120	101	80 - 120	<0.0030	mg/L	NC	20
8711310	pH	2017/07/30			100	97 - 103			0.034	N/A
8711928	Extractable (n-Hex.) Oil and grease	2017/07/31			104	70 - 130	<2.0	mg/L		
8713065	Dissolved Lead (Pb)	2017/08/01	98	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20

N/A = Not Applicable

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

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

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

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

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

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763378
Report Date: 2017/08/01

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

1460

CHAIN OF CUSTODY RECORD

M057437

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: # 28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: B50993	☐ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE, SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K1Z 5B8	Project #: 102089-002	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY FTA CTU	☐ Same Day ☐ 2 Days ☒ 1 Day ☐ 3-4 Days
Email: NATALIE.ROBINSON@PWGSC	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: -TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present	✓		Temp	1	0	2
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	pH	DISSOLVED LEAD	TOTAL ZINC	OIL AND GREASE	HOLD - DO NOT ANALYZE
1	FTA SUMP01		2017/07/25	17:00	SW	7	X										X	X	X	X	
2	FTA SUMP02		2017/07/25	17:30	SW	7	X										X	X	X	X	
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
	Please indicate Filtered, Preserved or Both (F, P, F/P)						P											P	P		

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-07-27 @ 16:00
ice - Yes
C3 - Yes
Temp: 1 1 4 1 4

Regulatory Criteria

- ☐ AT1
- ☒ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

PRESERVATIVE WAS RINSED OUT OF SAMPLE CONTAINER FOR DISSOLVED LEAD

RUSH

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
[signature] Elliott Holden	2017/07/26	9:15	[signature] Nicholas Y.	2017/07/29	11:30	B763378 HSA

AB FCD-00331/7

Your Project #: 102089-002
Site Location: CAMBAY FTA LTU
Your C.O.C. #: M057438

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/04
Report #: R2423836
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B763382
Received: 2017/07/27, 16:00

Sample Matrix: SURFACE WATER
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Perfluorinated Compounds - Subcontract (1)	2	N/A	2017/08/04		

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Ontario (From Calgary)

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B763382
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF SURFACE WATER

Maxxam ID		RP8630	RP8631	
Sampling Date		2017/07/25 17:00	2017/07/25 17:30	
COC Number		M057438	M057438	
	UNITS	FTA SUMP01	FTA SUMP02	QC Batch
Parameter				
Subcontract Parameter	ug/L	ATTACHED	ATTACHED	8717336

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763382
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	3.0°C

Results for PFOS and PFOA are attached to this report. The reference number from Maxxam Mississauga is B7G4489.

Results relate only to the items tested.

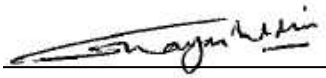
Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B763382
Report Date: 2017/08/04

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAMBAY FTA LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 057438

Page 1 of 1

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company: #28344 PRIVATE CLIENTS	Company: ARCADIS CANADA INC.	Quotation #: B50993	☐ 5 - 7 Days Regular (Most analyses)
Contact Name: NATALIE ROBINSON	Contact Name: MAURENIA LYNDS	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: 1650, 635-8th AVE, SW CALGARY, AB T2P 3M3	Address: 329 CHURCHILL AVE N OTTAWA ON K2Z 5B8	Project #: 102089-002	Rush TAT (Surcharges will be applied)
Phone: 403-292-6882	Phone: 613 721 0555	Site Location: CAM BAY FTA LTU	☐ Same Day ☐ 2 Days ☐ 1 Day ☒ 3-4 Days
Email: NATALIE.ROBINSON@	Email: MAURENIA.LYNDS@	Site #:	Date Required:
Copies: PWGSC-TPSGC.GC.CA	Copies: ARCADIS.COM	Sampled By: E HOLDEN	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present	✓		Temp	1	0	2
Seal Intact	✓					
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						
	YES	NO	Cooler ID			
Seal Present			Temp			
Seal Intact						
Cooling Media						

Depot Reception

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	~~Basic Class II Landfill~~ PFAS	PFAS silt	HOLD - DO NOT ANALYZE
1	FTA SUMP01		2017/07/25	17:00	SW	2										X		
2	FTA SUMP02		2017/07/25	17:30	SW	2										X		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Please indicate Filtered, Preserved or Both (F, P, F/P)

RECEIVED IN YELLOWKNIFE
By: [signature]
2017-07-27 @ 16:00
Ice - yes
Cs - yes
Temp: 1.4 / 1.4

Regulatory Criteria

- ☐ AT1
- ☒ CCME
- ☐ Drinking Water
- ☐ D50 (Drilling Waste)
- ☐ Saskatchewan
- ☐ Other:

Special Instructions

RUSH

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Elliott Holden	2017/07/26	9:15	Nicholas Yu	2017/07/29	11:30	B763382 HSA

AB FCD-00331/7

Your P.O. #: N/A
Your Project #: B763382
Your C.O.C. #: b763382-onte-01-01

Attention:Parminder Virk

Maxxam Analytics
Edmonton - Environmental
9331 48th St
Edmonton, AB
T6B 2R4

Report Date: 2017/08/04
Report #: R4633431
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7G4489
Received: 2017/08/02, 09:11

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
PFOS and PFOA in water by SPE/LCMS (1)	2	2017/08/03	2017/08/04	CAM SOP-00894	EPA 537 m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Per- and polyfluoroalkyl substances (PFAS) identified as surrogates on the certificate of analysis represent the extracted internal standard.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Marijane Cruz, Senior Project Manager
Email: MCruz@maxxam.ca
Phone# (905)817-5756

==========

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

Maxxam Job #: B7G4489
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763382
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EWC288			EWC289		
Sampling Date		2017/07/25 17:00			2017/07/25 17:30		
COC Number		b763382-onte-01-01			b763382-onte-01-01		
	UNITS	RP8630-FTA SUMP01	RDL	QC Batch	RP8631-FTA SUMP02	RDL	QC Batch
Miscellaneous Parameters							
Perfluorobutane Sulfonate (PFBS)	ug/L	0.90	0.040	5103712	13	0.80	5104229
Perfluorobutanoic acid	ug/L	1.5	0.040	5103712	<0.80	0.80	5104229
Perfluorodecane Sulfonate	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Perfluorodecanoic Acid (PFDA)	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Perfluorododecanoic Acid (PFDoA)	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Perfluoroheptane sulfonate	ug/L	<0.040	0.040	5103712	2.5	0.80	5104229
Perfluoroheptanoic Acid (PFHpA)	ug/L	0.98	0.040	5103712	13	0.80	5104229
Perfluorohexane Sulfonate (PFHxS)	ug/L	4.2	0.40	5103712	89 (1)	8.0	5104229
Perfluorohexanoic Acid (PFHxA)	ug/L	6.5	0.40	5103712	71 (1)	8.0	5104229
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	0.35	0.040	5103712	12	0.80	5104229
Perfluorononanoic Acid (PFNA)	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Perfluorooctane Sulfonamide (PFOSA)	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Perfluorooctane Sulfonate (PFOS)	ug/L	0.18	0.040	5103712	12	0.80	5104229
Perfluoropentanoic Acid (PFPeA)	ug/L	7.9	0.40	5103712	46 (1)	8.0	5104229
Perfluorotetradecanoic Acid	ug/L	<0.40 (2)	0.40	5103712	<0.80	0.80	5104229
Perfluorotridecanoic Acid	ug/L	<0.40 (2)	0.40	5103712	<0.80	0.80	5104229
Perfluoroundecanoic Acid (PFUnA)	ug/L	<0.040	0.040	5103712	<0.80	0.80	5104229
Surrogate Recovery (%)							
13C2-Perfluorodecanoic acid	%	71		5103712	94		5104229
13C2-Perfluorododecanoic acid	%	69		5103712	80		5104229
13C2-perfluorotetradecanoic acid	%	60		5103712	50		5104229
13C2-Perfluoroundecanoic acid	%	70		5103712	88		5104229
13C4-Perfluorobutanoic acid	%	70		5103712	89		5104229
13C4-Perfluoroheptanoic acid	%	71		5103712	103		5104229
13C4-Perfluorooctanesulfonate	%	67		5103712	124		5104229
13C4-Perfluorooctanoic acid	%	75		5103712	118		5104229
13C5-Perfluorononanoic acid	%	71		5103712	119		5104229
13C5-Perfluoropentanoic acid	%	67		5103712	41 (3)		5104229

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

(1) Due to high concentration of the target analyte, a reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly (10x).

(2) Due to matrix interference, the extracted internal standard exhibited low recovery and as such, may not have allowed for accurate recovery correction of the associated native compound. A reduced sample volume was extracted and analyzed. Detection limit was adjusted accordingly.

(3) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low extracted internal standard analyte recovery.

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

Maxxam Job #: B7G4489
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763382
Your P.O. #: N/A

RESULTS OF ANALYSES OF WATER

Maxxam ID		EWC288			EWC289		
Sampling Date		2017/07/25 17:00			2017/07/25 17:30		
COC Number		b763382-onte-01-01			b763382-onte-01-01		
	UNITS	**RP8630-FTA SUMP01**	**RDL**	**QC Batch**	**RP8631-FTA SUMP02**	**RDL**	**QC Batch**
13C8-Perfluorooctane Sulfonamide	%	73		5103712	111		5104229
18O2-Perfluorohexanesulfonate	%	71		5103712	116		5104229

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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

Maxxam Job #: B7G4489
Report Date: 2017/08/04

Maxxam Analytics
Client Project #: B763382
Your P.O. #: N/A

GENERAL COMMENTS

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

Package 1	2.7°C

Revised Report (2017/08/04) : Sample comment revised.

Sample EWC288 [RP8630-FTA SUMP01] : Perfluorinated Compounds (PFCs): Due to high concentration of the target analytes, sample required dilution. Detection limit was adjusted accordingly.

Results relate only to the items tested.

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

Maxxam Job #: B7G4489
Report Date: 2017/08/04

QUALITY ASSURANCE REPORT

Maxxam Analytics
Client Project #: B763382
Your P.O. #: N/A

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5103712	13C2-Perfluorodecanoic acid	2017/08/04			80	50 - 150	96	%		
5103712	13C2-Perfluorododecanoic acid	2017/08/04			95	50 - 150	86	%		
5103712	13C2-perfluorotetradecanoic acid	2017/08/04			74	50 - 150	101	%		
5103712	13C2-Perfluoroundecanoic acid	2017/08/04			93	50 - 150	95	%		
5103712	13C4-Perfluorobutanoic acid	2017/08/04			79	50 - 150	91	%		
5103712	13C4-Perfluoroheptanoic acid	2017/08/04			82	50 - 150	94	%		
5103712	13C4-Perfluorooctanesulfonate	2017/08/04			82	50 - 150	76	%		
5103712	13C4-Perfluorooctanoic acid	2017/08/04			91	50 - 150	85	%		
5103712	13C5-Perfluorononanoic acid	2017/08/04			89	50 - 150	83	%		
5103712	13C5-Perfluoropentanoic acid	2017/08/04			79	50 - 150	83	%		
5103712	13C8-Perfluorooctane Sulfonamide	2017/08/04			91	50 - 150	91	%		
5103712	18O2-Perfluorohexanesulfonate	2017/08/04			79	50 - 150	80	%		
5104229	13C2-Perfluorodecanoic acid	2017/08/04	95	50 - 150	106	50 - 150	96	%		
5104229	13C2-Perfluorododecanoic acid	2017/08/04	79	50 - 150	103	50 - 150	99	%		
5104229	13C2-perfluorotetradecanoic acid	2017/08/04	41 (1)	50 - 150	106	50 - 150	105	%		
5104229	13C2-Perfluoroundecanoic acid	2017/08/04	95	50 - 150	104	50 - 150	96	%		
5104229	13C4-Perfluorobutanoic acid	2017/08/04	103	50 - 150	104	50 - 150	96	%		
5104229	13C4-Perfluoroheptanoic acid	2017/08/04	107	50 - 150	104	50 - 150	98	%		
5104229	13C4-Perfluorooctanesulfonate	2017/08/04	110	50 - 150	106	50 - 150	93	%		
5104229	13C4-Perfluorooctanoic acid	2017/08/04	110	50 - 150	103	50 - 150	92	%		
5104229	13C5-Perfluorononanoic acid	2017/08/04	115	50 - 150	106	50 - 150	93	%		
5104229	13C5-Perfluoropentanoic acid	2017/08/04	28 (1)	50 - 150	104	50 - 150	101	%		
5104229	13C8-Perfluorooctane Sulfonamide	2017/08/04	103	50 - 150	103	50 - 150	99	%		
5104229	18O2-Perfluorohexanesulfonate	2017/08/04	103	50 - 150	99	50 - 150	91	%		
5103712	Perfluorobutane Sulfonate (PFBS)	2017/08/04			112	70 - 130	<0.020	ug/L	1.2	30
5103712	Perfluorobutanoic acid	2017/08/04			110	70 - 130	<0.020	ug/L	5.0	30
5103712	Perfluorodecane Sulfonate	2017/08/04			116	70 - 130	<0.020	ug/L	13	30
5103712	Perfluorodecanoic Acid (PFDA)	2017/08/04			101	70 - 130	<0.020	ug/L	17	30
5103712	Perfluorododecanoic Acid (PFDoA)	2017/08/04			103	70 - 130	<0.020	ug/L	19	30
5103712	Perfluoroheptane sulfonate	2017/08/04			96	70 - 130	<0.020	ug/L	9.9	30
5103712	Perfluoroheptanoic Acid (PFHpA)	2017/08/04			106	70 - 130	<0.020	ug/L	6.4	30

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

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5103712	Perfluorohexane Sulfonate (PFHxS)	2017/08/04			102	70 - 130	<0.020	ug/L	6.1	30
5103712	Perfluorohexanoic Acid (PFHxA)	2017/08/04			96	70 - 130	<0.020	ug/L	1.6	30
5103712	Perfluoro-n-Octanoic Acid (PFOA)	2017/08/04			92	70 - 130	<0.020	ug/L	1.3	30
5103712	Perfluorononanoic Acid (PFNA)	2017/08/04			92	70 - 130	<0.020	ug/L	18	30
5103712	Perfluorooctane Sulfonamide (PFOSA)	2017/08/04			91	70 - 130	<0.020	ug/L	20	30
5103712	Perfluorooctane Sulfonate (PFOS)	2017/08/04			94	70 - 130	<0.020	ug/L	4.6	30
5103712	Perfluoropentanoic Acid (PFPeA)	2017/08/04			113	70 - 130	<0.020	ug/L	2.4	30
5103712	Perfluorotetradecanoic Acid	2017/08/04			103	70 - 130	<0.020	ug/L	8.2	30
5103712	Perfluorotridecanoic Acid	2017/08/04			104	70 - 130	<0.020	ug/L	8.0	30
5103712	Perfluoroundecanoic Acid (PFUnA)	2017/08/04			91	70 - 130	<0.020	ug/L	13	30
5104229	Perfluorobutane Sulfonate (PFBS)	2017/08/04	97	70 - 130	104	70 - 130	<0.0048	ug/L	16	30
5104229	Perfluorobutanoic acid	2017/08/04	98	70 - 130	101	70 - 130	<0.0043	ug/L	16	30
5104229	Perfluorodecane Sulfonate	2017/08/04	106	70 - 130	99	70 - 130	<0.0046	ug/L	3.1	30
5104229	Perfluorodecanoic Acid (PFDA)	2017/08/04	115	70 - 130	98	70 - 130	<0.0040	ug/L	5.6	30
5104229	Perfluorododecanoic Acid (PFDoA)	2017/08/04	113	70 - 130	103	70 - 130	<0.0028	ug/L	13	30
5104229	Perfluoroheptane sulfonate	2017/08/04	115	70 - 130	97	70 - 130	<0.0048	ug/L	0.31	30
5104229	Perfluoroheptanoic Acid (PFHpA)	2017/08/04	105	70 - 130	101	70 - 130	<0.0033	ug/L	0.98	30
5104229	Perfluorohexane Sulfonate (PFHxS)	2017/08/04	NC	70 - 130	96	70 - 130	<0.24	ug/L	0	30
5104229	Perfluorohexanoic Acid (PFHxA)	2017/08/04	114	70 - 130	101	70 - 130	<0.0029	ug/L	14	30
5104229	Perfluoro-n-Octanoic Acid (PFOA)	2017/08/04	109	70 - 130	102	70 - 130	<0.0046	ug/L	4.9	30
5104229	Perfluorononanoic Acid (PFNA)	2017/08/04	103	70 - 130	97	70 - 130	<0.0038	ug/L	2.5	30
5104229	Perfluorooctane Sulfonamide (PFOSA)	2017/08/04	109	70 - 130	101	70 - 130	<0.0036	ug/L	1.9	30
5104229	Perfluorooctane Sulfonate (PFOS)	2017/08/04	105	70 - 130	80	70 - 130	<0.0026	ug/L	2.5	30
5104229	Perfluoropentanoic Acid (PFPeA)	2017/08/04	92	70 - 130	100	70 - 130	<0.0027	ug/L	0.013	30
5104229	Perfluorotetradecanoic Acid	2017/08/04	99	70 - 130	97	70 - 130	<0.0038	ug/L	12	30
5104229	Perfluorotridecanoic Acid	2017/08/04	148 (2)	70 - 130	101	70 - 130	<0.0033	ug/L	6.7 (2)	30

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

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
5104229	Perfluoroundecanoic Acid (PFUnA)	2017/08/04	107	70 - 130	100	70 - 130	<0.0043	ug/L	5.4	30

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

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

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

(1) Extracted internal standard analyte recovery was below the defined lower control limit (LCL). Laboratory spiked water resulted in satisfactory recovery of the extracted internal standard analyte. When considered together, these QC data suggest that matrix interferences may be biasing the data low. Because quantitation is performed using isotope dilution techniques, any losses of the native compound that may occur during any of the sample preparation, extraction, cleanup or determinative steps will be mirrored by a similar loss of the labeled standard, and as such can be accounted for and corrected. Therefore, the quantification of these target compounds is not affected by the low extracted internal standard analyte recovery.

(2) Recovery of the matrix spike was below the lower control limit. Laboratory spiked water resulted in satisfactory recovery of the compound of interest. When considered together, these QC data suggest that matrix interferences may be biasing the data low.

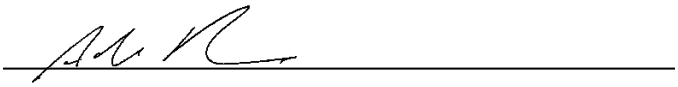
Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B7G4489
Report Date: 2017/08/04

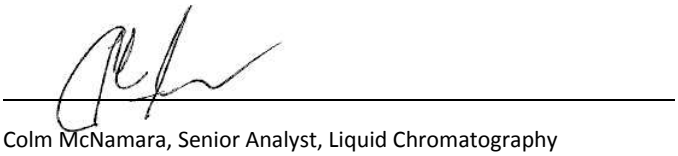
Maxxam Analytics
Client Project #: B763382
Your P.O. #: N/A

VALIDATION SIGNATURE PAGE

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



Adam Robinson, Supervisor, LC/MS/MS



Colm McNamara, Senior Analyst, Liquid Chromatography

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

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

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M017079

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/20
Report #: R2431098
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768128
Received: 2017/08/11, 10:03

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS/FID	2	N/A	2017/08/14	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME - Dissolved	1	N/A	2017/08/18	AB WI-00065	Auto Calc
Cadmium - low level CCME (Total)	2	N/A	2017/08/17	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	3	N/A	2017/08/15	AB SOP-00020	SM 22 4500-Cl-E m
CCME Hydrocarbons (F2-F4 in water) (1)	3	2017/08/15	2017/08/16	AB SOP-00037	CCME PHC-CWS m
Elements by ICP - Dissolved (2)	2	N/A	2017/08/18	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP-Dissolved-Lab Filtered (3)	1	N/A	2017/08/17	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	3	2017/08/16	2017/08/17	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Dissolved (2)	1	N/A	2017/08/17	AB SOP-00043	EPA 200.8 R5.4 m
Elements by ICPMS - Total	2	2017/08/16	2017/08/17	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Nitrate and Nitrite	3	N/A	2017/08/14	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2017/08/14	AB WI-00065	Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	3	N/A	2017/08/12	AB SOP-00023	SM 22 4110 B m
Sulphate by Automated Colourimetry	3	N/A	2017/08/15	AB SOP-00018	SM 22 4500-SO4 E m

Remarks:

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

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope

Your Project #: 102089-002
Site Location: CAM BAY FTA LTU
Your C.O.C. #: M017079

Attention:Maurenia Lynds

ARCADIS Canada
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z 5B8

Report Date: 2017/08/20
Report #: R2431098
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B768128
Received: 2017/08/11, 10:03

dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Silica gel clean up employed.
(2) Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.
(3) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling. Dissolved > Total Imbalance: Whenever applicable, Dissolved >Total for any parameter that falls within method uncertainty for duplicates is likely equivalent. If RPD is >20% samples were reanalyzed and confirmed.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Parminder Virk, Project Manager
Email: PVirk@maxxam.ca
Phone# (403)735-2235

==========

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

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		RS4662	RS4663		
Sampling Date		2017/08/09 09:00	2017/08/09 15:00		
COC Number		M017079	M017079		
	UNITS	FTA-SW-NW01	SW1701	RDL	QC Batch
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	<0.20	0.20	8724895
Volatiles					
Benzene	ug/L	<0.40	<0.40	0.40	8724907
Toluene	ug/L	<0.40	<0.40	0.40	8724907
Ethylbenzene	ug/L	<0.40	<0.40	0.40	8724907
m & p-Xylene	ug/L	<0.80	<0.80	0.80	8724907
o-Xylene	ug/L	<0.40	<0.40	0.40	8724907
Xylenes (Total)	ug/L	<0.80	<0.80	0.80	8724907
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	8724907
F1 (C6-C10)	ug/L	<100	<100	100	8724907
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	99	98	N/A	8724907
4-Bromofluorobenzene (sur.)	%	97	100	N/A	8724907
D4-1,2-Dichloroethane (sur.)	%	112	115	N/A	8724907
O-TERPHENYL (sur.)	%	108	92	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		RS4662		
Sampling Date		2017/08/09 09:00		
COC Number		M017079		
	UNITS	FTA-SW-NW01	RDL	QC Batch
Low Level Elements				
Dissolved Cadmium (Cd)	ug/L	<0.020	0.020	8724430
Elements				
Dissolved Aluminum (Al)	mg/L	0.015	0.0030	8725669
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	8725669
Dissolved Arsenic (As)	mg/L	0.0073	0.00020	8725669
Dissolved Barium (Ba)	mg/L	0.028	0.010	8730280
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	8725669
Dissolved Boron (B)	mg/L	0.062	0.020	8730280
Dissolved Calcium (Ca)	mg/L	130	0.30	8730280
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	8725669
Dissolved Cobalt (Co)	mg/L	0.0032	0.00030	8725669
Dissolved Copper (Cu)	mg/L	0.0023	0.00020	8725669
Dissolved Iron (Fe)	mg/L	0.41	0.060	8730280
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	8725669
Dissolved Lithium (Li)	mg/L	0.023	0.020	8730280
Dissolved Magnesium (Mg)	mg/L	230	0.20	8730280
Dissolved Manganese (Mn)	mg/L	0.18	0.0040	8730280
Dissolved Molybdenum (Mo)	mg/L	0.011	0.00020	8725669
Dissolved Nickel (Ni)	mg/L	0.0054	0.00050	8725669
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	8730280
Dissolved Potassium (K)	mg/L	19	0.30	8730280
Dissolved Selenium (Se)	mg/L	0.00024	0.00020	8725669
Dissolved Silicon (Si)	mg/L	5.6	0.10	8730280
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	8725669
Dissolved Sodium (Na)	mg/L	250	0.50	8730280
Dissolved Strontium (Sr)	mg/L	0.25	0.020	8730280
Dissolved Sulphur (S)	mg/L	58	0.20	8730280
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	8725669
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	8725669
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	8725669
Dissolved Uranium (U)	mg/L	0.011	0.00010	8725669
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

REGULATED METALS (CCME/AT1) - DISSOLVED

Maxxam ID		RS4662		
Sampling Date		2017/08/09 09:00		
COC Number		M017079		
	UNITS	**FTA-SW-NW01**	**RDL**	**QC Batch**
Dissolved Vanadium (V)	mg/L	0.0037	0.0010	8725669
Dissolved Zinc (Zn)	mg/L	<0.0030	0.0030	8725669
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		RS4662	RS4663		
Sampling Date		2017/08/09 09:00	2017/08/09 15:00		
COC Number		M017079	M017079		
	UNITS	FTA-SW-NW01	SW1701	RDL	QC Batch
Low Level Elements					
Total Cadmium (Cd)	ug/L	0.020	<0.020	0.020	8724431
Elements					
Total Aluminum (Al)	mg/L	0.060	0.019	0.0030	8727699
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00060	8727699
Total Arsenic (As)	mg/L	0.0078	0.0023	0.00020	8727699
Total Barium (Ba)	mg/L	0.028	0.042	0.010	8727692
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	0.0010	8727699
Total Boron (B)	mg/L	0.057	0.032	0.020	8727692
Total Calcium (Ca)	mg/L	120	64	0.30	8727692
Total Chromium (Cr)	mg/L	<0.0010	<0.0010	0.0010	8727699
Total Cobalt (Co)	mg/L	0.0034	<0.00030	0.00030	8727699
Total Copper (Cu)	mg/L	0.0026	0.00079	0.00020	8727699
Total Iron (Fe)	mg/L	0.57	0.15	0.060	8727692
Total Lead (Pb)	mg/L	<0.00020	<0.00020	0.00020	8727699
Total Lithium (Li)	mg/L	<0.020	0.026	0.020	8727692
Total Magnesium (Mg)	mg/L	220	120	0.20	8727692
Total Manganese (Mn)	mg/L	0.17	0.012	0.0040	8727692
Total Molybdenum (Mo)	mg/L	0.012	0.0052	0.00020	8727699
Total Nickel (Ni)	mg/L	0.0058	0.00051	0.00050	8727699
Total Phosphorus (P)	mg/L	<0.10	<0.10	0.10	8727692
Total Potassium (K)	mg/L	18	11	0.30	8727692
Total Selenium (Se)	mg/L	0.00037	<0.00020	0.00020	8727699
Total Silicon (Si)	mg/L	5.6	2.0	0.10	8727692
Total Silver (Ag)	mg/L	<0.00010	<0.00010	0.00010	8727699
Total Sodium (Na)	mg/L	240	110	0.50	8727692
Total Strontium (Sr)	mg/L	0.23	0.12	0.020	8727692
Total Sulphur (S)	mg/L	57	47	0.20	8727692
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	0.00020	8727699
Total Tin (Sn)	mg/L	<0.0010	<0.0010	0.0010	8727699
Total Titanium (Ti)	mg/L	0.0043	<0.0010	0.0010	8727699
Total Uranium (U)	mg/L	0.012	0.0027	0.00010	8727699
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		RS4662	RS4663		
Sampling Date		2017/08/09 09:00	2017/08/09 15:00		
COC Number		M017079	M017079		
	UNITS	**FTA-SW-NW01**	**SW1701**	**RDL**	**QC Batch**
Total Vanadium (V)	mg/L	0.0047	0.0019	0.0010	8727699
Total Zinc (Zn)	mg/L	<0.0030	<0.0030	0.0030	8727699
RDL = Reportable Detection Limit					

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		RS4662	RS4663		RS4664		
Sampling Date		2017/08/09 09:00	2017/08/09 15:00		2017/08/09 14:30		
COC Number		M017079	M017079		M017079		
	UNITS	FTA-SW-NW01	SW1701	RDL	FTASUMP01	RDL	QC Batch
Calculated Parameters							
Dissolved Nitrate (NO3)	mg/L	<0.044	<0.044	0.044	<0.044	0.044	8724435
Nitrate plus Nitrite (N)	mg/L	<0.014	<0.014	0.014	<0.014	0.014	8724436
Dissolved Nitrite (NO2)	mg/L	<0.033	<0.033	0.033	<0.033	0.033	8724435
Anions							
Dissolved Sulphate (SO4)	mg/L	180	150	1.0	400 (1)	5.0	8724678
Dissolved Chloride (Cl)	mg/L	610 (1)	360 (1)	5.0	130	1.0	8724677
Nutrients							
Dissolved Nitrite (N)	mg/L	<0.010	<0.010	0.010	<0.010	0.010	8724679
Dissolved Nitrate (N)	mg/L	<0.010	<0.010	0.010	<0.010	0.010	8724679

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		RS4664		
Sampling Date		2017/08/09 14:30		
COC Number		M017079		
	UNITS	FTASUMP01	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	0.10	8724895
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	0.20	8724895
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	109	N/A	8724895

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		RS4663	RS4664		
Sampling Date		2017/08/09 15:00	2017/08/09 14:30		
COC Number		M017079	M017079		
	UNITS	SW1701	FTASUMP01	RDL	QC Batch
Elements					
Dissolved Calcium (Ca)	mg/L	N/A	130	0.30	8730280
Total Calcium (Ca)	mg/L	N/A	120	0.30	8727692
Dissolved Magnesium (Mg)	mg/L	N/A	100	0.20	8730280
Total Magnesium (Mg)	mg/L	N/A	97	0.20	8727692
Dissolved Potassium (K)	mg/L	N/A	11	0.30	8730280
Total Potassium (K)	mg/L	N/A	11	0.30	8727692
Dissolved Sodium (Na)	mg/L	N/A	60	0.50	8730280
Total Sodium (Na)	mg/L	N/A	58	0.50	8727692
Lab Filtered Elements					
Dissolved Calcium (Ca)	mg/L	77	N/A	0.30	8729251
Dissolved Magnesium (Mg)	mg/L	140	N/A	0.20	8729251
Dissolved Potassium (K)	mg/L	13	N/A	0.30	8729251
Dissolved Sodium (Na)	mg/L	120	N/A	0.50	8729251

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

GENERAL COMMENTS

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

Package 1	6.7°C
Package 2	5.3°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8724895	O-TERPHENYL (sur.)	2017/08/15	95	60 - 130	103	60 - 130	98	%		
8724907	1,4-Difluorobenzene (sur.)	2017/08/13	93	70 - 130	97	70 - 130	99	%		
8724907	4-Bromofluorobenzene (sur.)	2017/08/13	98	70 - 130	100	70 - 130	98	%		
8724907	D4-1,2-Dichloroethane (sur.)	2017/08/13	107	70 - 130	103	70 - 130	105	%		
8724677	Dissolved Chloride (Cl)	2017/08/15	105	80 - 120	106	80 - 120	<1.0	mg/L	3.7	20
8724678	Dissolved Sulphate (SO4)	2017/08/15	115	80 - 120	109	80 - 120	<1.0	mg/L	8.1	20
8724679	Dissolved Nitrate (N)	2017/08/12	101	80 - 120	102	80 - 120	<0.010	mg/L	NC	20
8724679	Dissolved Nitrite (N)	2017/08/12	98	80 - 120	99	80 - 120	<0.010	mg/L	NC	20
8724895	F2 (C10-C16 Hydrocarbons)	2017/08/15	107	60 - 130	117	70 - 130	<0.10	mg/L	NC	30
8724895	F3 (C16-C34 Hydrocarbons)	2017/08/15	101	60 - 130	112	70 - 130	<0.10	mg/L	7.4	30
8724895	F4 (C34-C50 Hydrocarbons)	2017/08/15	96	60 - 130	106	70 - 130	<0.20	mg/L	NC	30
8724907	Benzene	2017/08/13	100	70 - 130	100	70 - 130	<0.40	ug/L	3.6	30
8724907	Ethylbenzene	2017/08/13	102	70 - 130	99	70 - 130	<0.40	ug/L	NC	30
8724907	F1 (C6-C10) - BTEX	2017/08/13					<100	ug/L	NC	30
8724907	F1 (C6-C10)	2017/08/13	80	70 - 130	99	70 - 130	<100	ug/L	NC	30
8724907	m & p-Xylene	2017/08/13	99	70 - 130	99	70 - 130	<0.80	ug/L	NC	30
8724907	o-Xylene	2017/08/13	101	70 - 130	102	70 - 130	<0.40	ug/L	NC	30
8724907	Toluene	2017/08/13	92	70 - 130	92	70 - 130	<0.40	ug/L	NC	30
8724907	Xylenes (Total)	2017/08/13					<0.80	ug/L	NC	30
8725669	Dissolved Aluminum (Al)	2017/08/17	94	80 - 120	98	80 - 120	<0.0030	mg/L	0.033	20
8725669	Dissolved Antimony (Sb)	2017/08/17	106	80 - 120	99	80 - 120	<0.00060	mg/L	NC	20
8725669	Dissolved Arsenic (As)	2017/08/17	NC	80 - 120	98	80 - 120	<0.00020	mg/L	1.1	20
8725669	Dissolved Beryllium (Be)	2017/08/17	100	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Chromium (Cr)	2017/08/17	94	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Cobalt (Co)	2017/08/17	91	80 - 120	97	80 - 120	<0.00030	mg/L	1.9	20
8725669	Dissolved Copper (Cu)	2017/08/17	88	80 - 120	97	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Lead (Pb)	2017/08/17	93	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Molybdenum (Mo)	2017/08/17	108	80 - 120	100	80 - 120	<0.00020	mg/L	2.0	20
8725669	Dissolved Nickel (Ni)	2017/08/17	89	80 - 120	97	80 - 120	<0.00050	mg/L	1.4	20
8725669	Dissolved Selenium (Se)	2017/08/17	102	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Silver (Ag)	2017/08/17	98	80 - 120	99	80 - 120	<0.00010	mg/L	NC	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8725669	Dissolved Thallium (Tl)	2017/08/17	93	80 - 120	99	80 - 120	<0.00020	mg/L	NC	20
8725669	Dissolved Tin (Sn)	2017/08/17	102	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Titanium (Ti)	2017/08/17	100	80 - 120	95	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Uranium (U)	2017/08/17	93	80 - 120	95	80 - 120	<0.00010	mg/L	2.5	20
8725669	Dissolved Vanadium (V)	2017/08/17	99	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
8725669	Dissolved Zinc (Zn)	2017/08/17	94	80 - 120	98	80 - 120	<0.0030	mg/L	7.8	20
8727692	Total Barium (Ba)	2017/08/17	94	80 - 120	95	80 - 120	<0.010	mg/L	0.40	20
8727692	Total Boron (B)	2017/08/17	96	80 - 120	96	80 - 120	<0.020	mg/L	NC	20
8727692	Total Calcium (Ca)	2017/08/17	NC	80 - 120	90	80 - 120	<0.30	mg/L	0.24	20
8727692	Total Iron (Fe)	2017/08/17	100	80 - 120	102	80 - 120	<0.060	mg/L	0.16	20
8727692	Total Lithium (Li)	2017/08/17	98	80 - 120	100	80 - 120	<0.020	mg/L	NC	20
8727692	Total Magnesium (Mg)	2017/08/17	97	80 - 120	99	80 - 120	<0.20	mg/L	0.24	20
8727692	Total Manganese (Mn)	2017/08/17	93	80 - 120	94	80 - 120	<0.0040	mg/L	0.57	20
8727692	Total Phosphorus (P)	2017/08/17	96	80 - 120	95	80 - 120	<0.10	mg/L	NC	20
8727692	Total Potassium (K)	2017/08/17	99	80 - 120	101	80 - 120	<0.30	mg/L	0.35	20
8727692	Total Silicon (Si)	2017/08/17	103	80 - 120	102	80 - 120	<0.10	mg/L	2.5	20
8727692	Total Sodium (Na)	2017/08/17	101	80 - 120	103	80 - 120	<0.50	mg/L	1.2	20
8727692	Total Strontium (Sr)	2017/08/17	92	80 - 120	93	80 - 120	<0.020	mg/L	0.28	20
8727692	Total Sulphur (S)	2017/08/17					<0.20	mg/L	0.50	20
8727699	Total Aluminum (Al)	2017/08/17	93	80 - 120	101	80 - 120	<0.0030	mg/L	0.30	20
8727699	Total Antimony (Sb)	2017/08/17	103	80 - 120	100	80 - 120	<0.00060	mg/L	NC	20
8727699	Total Arsenic (As)	2017/08/17	103	80 - 120	102	80 - 120	<0.00020	mg/L	2.1	20
8727699	Total Beryllium (Be)	2017/08/17	103	80 - 120	103	80 - 120	<0.0010	mg/L	NC	20
8727699	Total Chromium (Cr)	2017/08/17	103	80 - 120	104	80 - 120	<0.0010	mg/L	NC	20
8727699	Total Cobalt (Co)	2017/08/17	101	80 - 120	101	80 - 120	<0.00030	mg/L	NC	20
8727699	Total Copper (Cu)	2017/08/17	99	80 - 120	100	80 - 120	<0.00020	mg/L	NC	20
8727699	Total Lead (Pb)	2017/08/17	98	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20
8727699	Total Molybdenum (Mo)	2017/08/17	105	80 - 120	101	80 - 120	<0.00020	mg/L	0.81	20
8727699	Total Nickel (Ni)	2017/08/17	100	80 - 120	101	80 - 120	<0.00050	mg/L	1.9	20
8727699	Total Selenium (Se)	2017/08/17	102	80 - 120	101	80 - 120	<0.00020	mg/L	NC	20
8727699	Total Silver (Ag)	2017/08/17	102	80 - 120	101	80 - 120	<0.00010	mg/L	NC	20

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8727699	Total Thallium (Tl)	2017/08/17	103	80 - 120	102	80 - 120	<0.00020	mg/L	NC	20
8727699	Total Tin (Sn)	2017/08/17	102	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
8727699	Total Titanium (Ti)	2017/08/17	102	80 - 120	98	80 - 120	<0.0010	mg/L	NC	20
8727699	Total Uranium (U)	2017/08/17	101	80 - 120	100	80 - 120	<0.00010	mg/L	8.3	20
8727699	Total Vanadium (V)	2017/08/17	105	80 - 120	104	80 - 120	<0.0010	mg/L	0.10	20
8727699	Total Zinc (Zn)	2017/08/17	101	80 - 120	101	80 - 120	<0.0030	mg/L	NC	20
8729251	Dissolved Calcium (Ca)	2017/08/17	96	80 - 120	96	80 - 120	<0.30	mg/L		
8729251	Dissolved Magnesium (Mg)	2017/08/17	99	80 - 120	98	80 - 120	<0.20	mg/L		
8729251	Dissolved Potassium (K)	2017/08/17	99	80 - 120	100	80 - 120	<0.30	mg/L		
8729251	Dissolved Sodium (Na)	2017/08/17	98	80 - 120	100	80 - 120	<0.50	mg/L		
8730280	Dissolved Barium (Ba)	2017/08/18	97	80 - 120	98	80 - 120	<0.010	mg/L		
8730280	Dissolved Boron (B)	2017/08/18	100	80 - 120	101	80 - 120	<0.020	mg/L		
8730280	Dissolved Calcium (Ca)	2017/08/18	NC	80 - 120	100	80 - 120	<0.30	mg/L	0.16	20
8730280	Dissolved Iron (Fe)	2017/08/18	97	80 - 120	101	80 - 120	<0.060	mg/L		
8730280	Dissolved Lithium (Li)	2017/08/18	98	80 - 120	99	80 - 120	<0.020	mg/L		
8730280	Dissolved Magnesium (Mg)	2017/08/18	NC	80 - 120	104	80 - 120	<0.20	mg/L	0.46	20
8730280	Dissolved Manganese (Mn)	2017/08/18	NC	80 - 120	99	80 - 120	<0.0040	mg/L		
8730280	Dissolved Phosphorus (P)	2017/08/18	108	80 - 120	100	80 - 120	<0.10	mg/L		
8730280	Dissolved Potassium (K)	2017/08/18	102	80 - 120	103	80 - 120	<0.30	mg/L	0.82	20
8730280	Dissolved Silicon (Si)	2017/08/18	105	80 - 120	107	80 - 120	<0.10	mg/L		
8730280	Dissolved Sodium (Na)	2017/08/18	NC	80 - 120	106	80 - 120	<0.50	mg/L	0.53	20
8730280	Dissolved Strontium (Sr)	2017/08/18	95	80 - 120	99	80 - 120	<0.020	mg/L		

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

QUALITY ASSURANCE REPORT(CONT'D)

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8730280	Dissolved Sulphur (S)	2017/08/18					<0.20	mg/L		

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

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

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam Job #: B768128
Report Date: 2017/08/20

ARCADIS Canada
Client Project #: 102089-002
Site Location: CAM BAY FTA LTU
Sampler Initials: EH

VALIDATION SIGNATURE PAGE

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

Justin Geisel, B.Sc., Organics Supervisor

Poonam Sharma, cCT, Organics Supervisor

Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone (780)577-7100 Fax (780)450-4187

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

M 017079

Page 1 of 1

Report Information

Company: ARCADIS CANADA INC.
Contact: MAURENIA LYNDS
Phone: 6137210555
Email: MAURENIA.LYNDS@ARCADIS.COM
Sampled by: ELLIOTT HOLDEN

Comments

QUOTE: B50993
PROJECT: 102089-0082
SITE: CAM BAY
FTA LTU

Same as CoC

Project/LSD

#	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☐ Diss ☐	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	MAJOR CATIONS AND ANIONS (1)	PHC F1-F4 / BTEX	DISSOLVED METALS	TOTAL METALS	PHC F2-F4				HOLD - DO NOT ANALYZE
11	FTA-SW-NW01		2017/08/09	9:00	SW	8											X	X	X	X					
12	~~MW15-1~~		~~2017/08/09~~	~~14:00~~	~~GW~~																				
13	SW1701		2017/08/09	15:00	SW	7											X	X		X					
14	FTA SUMP01		2017/08/09	14:30	SW	6											X				X				
15																									
16																									
17																									
18																									
19																									
20																									
21																									
22																									
23																									
24																									
25																									
26																									
27																									
28																									
29																									
30																									
	Please indicate Filtered, Preserved or Both (F, P, F/P) →																		F/P						

Special Instructions

(1) NITRATE, NITRITE, CHLORIDE, SULPHATE, Ca, Mg, K, Na

2.2.2
ice/seal yes

RECEIVED IN YELLOWKNIFE
By: [signature] WEWACHWEH LW
2017-08-11 10:03

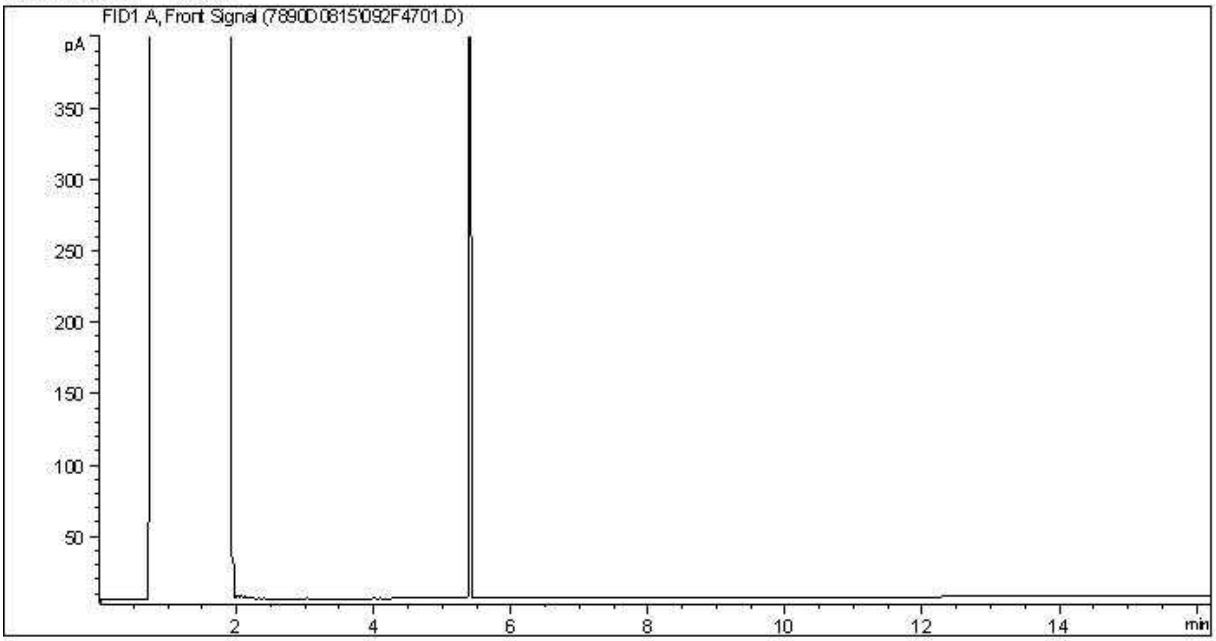
Temp: 6/7/7 7/5/4
ice yes
cust yes

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
EH ELLIOTT HOLDEN	2017/08/10	10:00	[signature] JennWalter	20170812	12:24	B768128

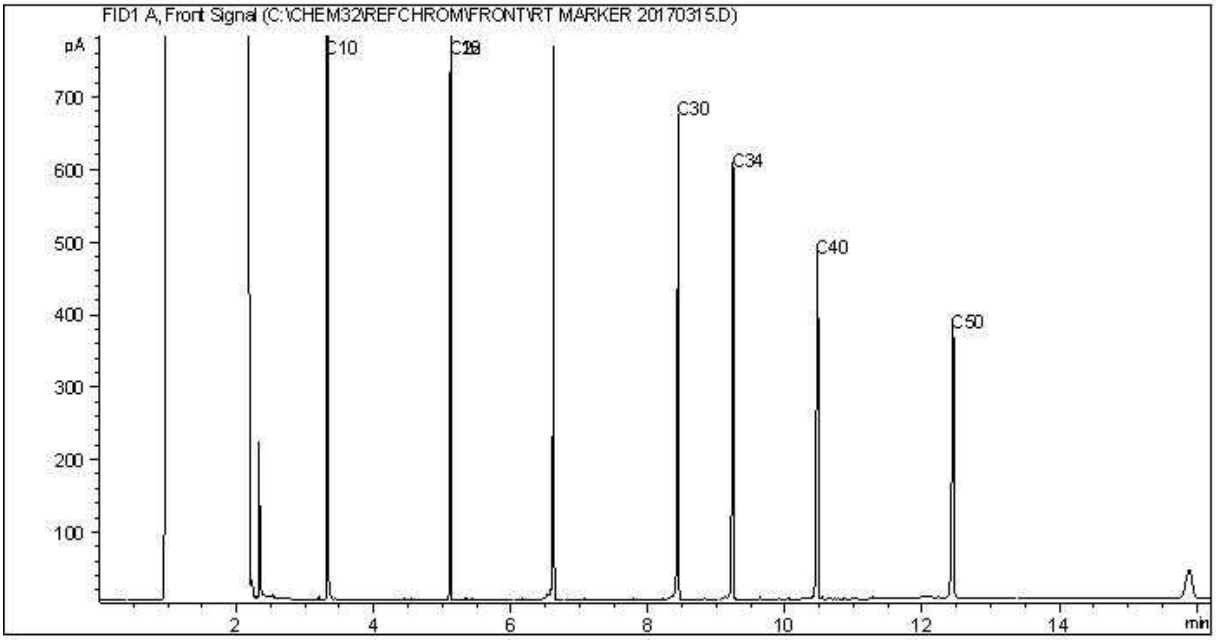
AB FCD-00331/6

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

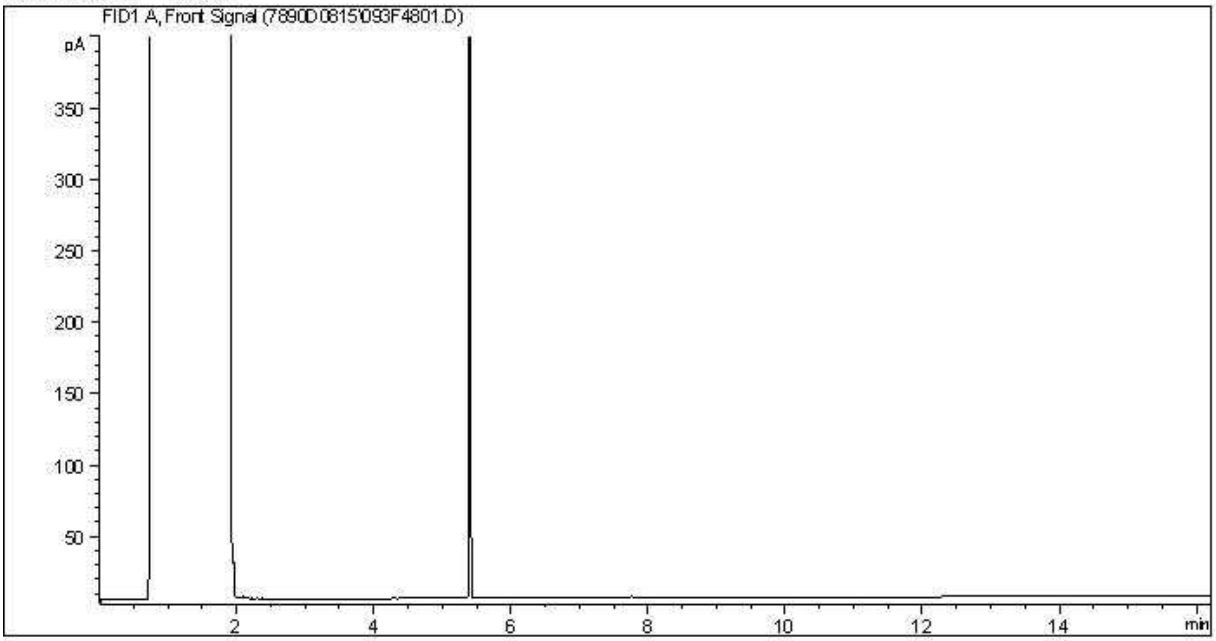
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B768128
Report Date: 2017/08/20
Maxxam Sample: RS4663

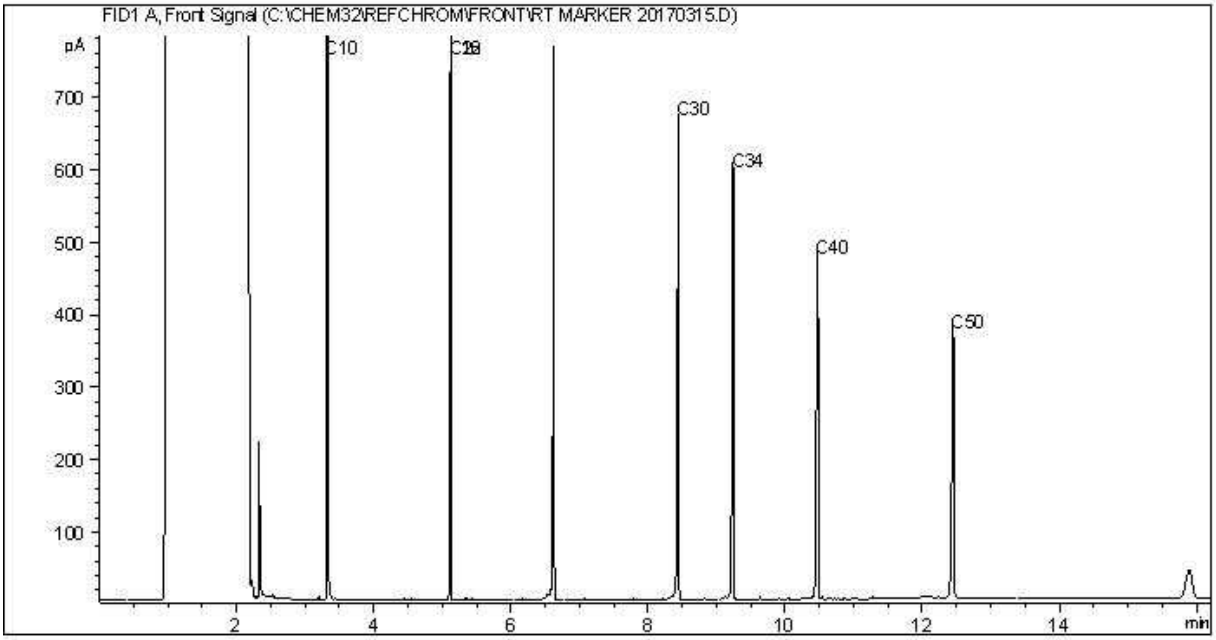
ARCADIS Canada
Client Project #: 102089-002
Site Reference: CAM BAY FTA LTU
Client ID: SW1701

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



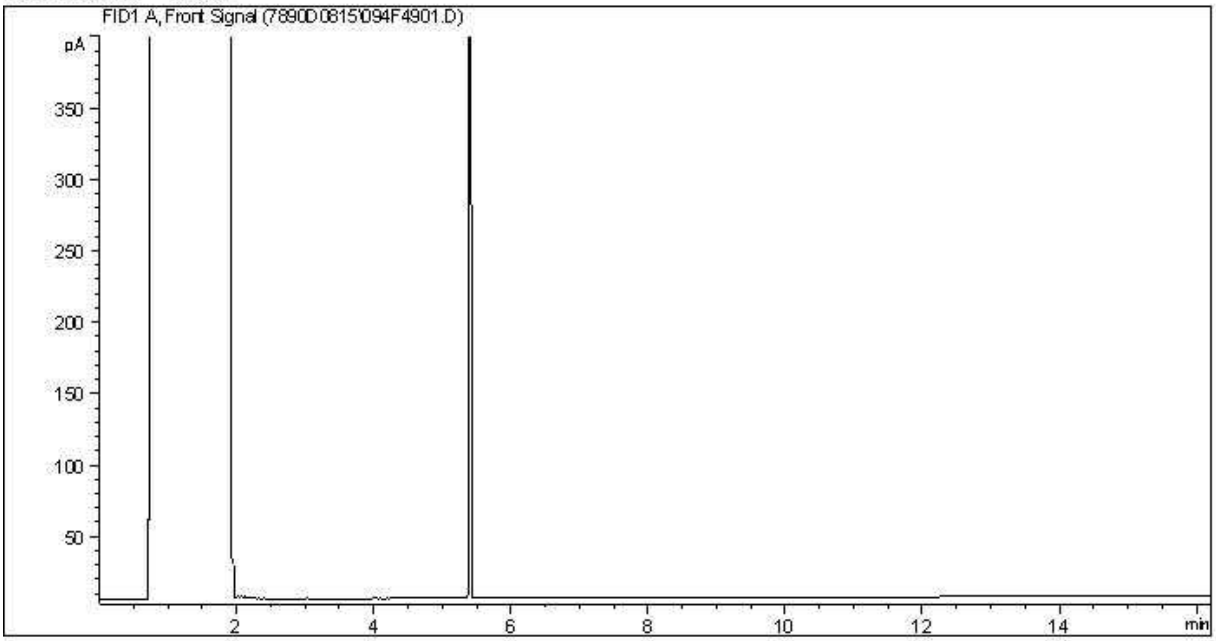
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

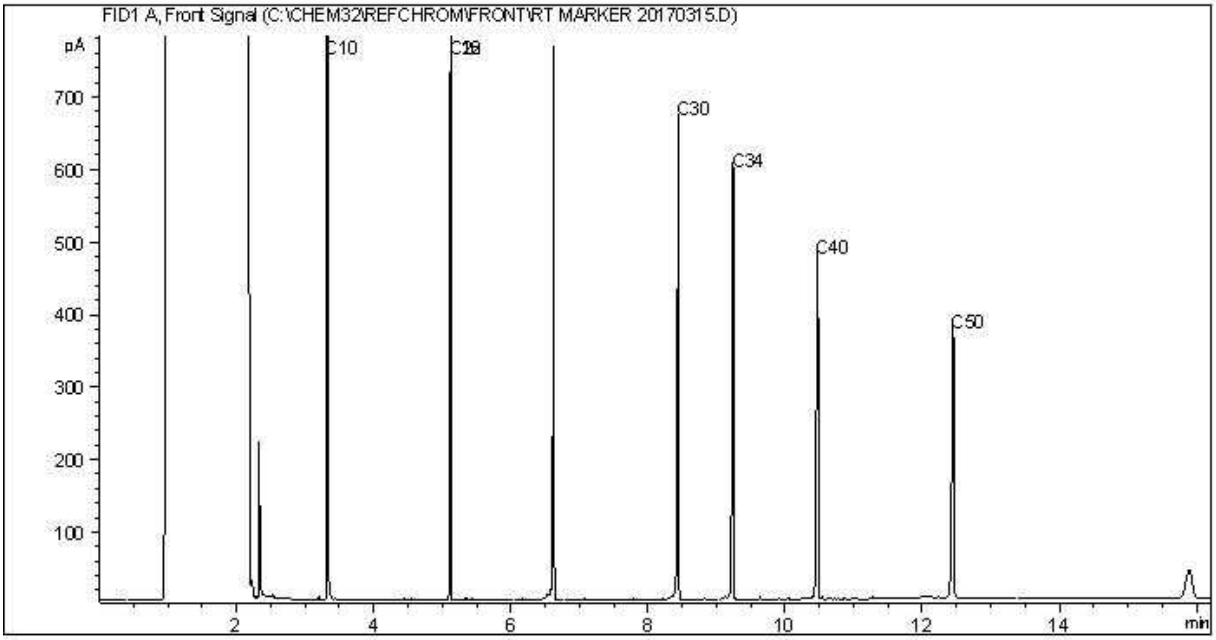
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: 7890D



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

APPENDIX C

Site Photographs

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport – Fire Training Area Land Treatment Unit
Cambridge Bay, NU

Photo: 1

Date:
July 26, 2017

Description:
Monitoring well MW15-8 prior to its repair.

Location:
South of the FTA Excavation Area facing north

Photo: 2

Date:
July 28, 2017

Description:
Adjustable ABS Coupling used to repair Monitoring well MW15-8

Location:
South of the FTA Excavation Area

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport – Fire Training Area Land Treatment Unit
Cambridge Bay, NU

Photo: 3

Date:
July 28, 2017

Description:
Monitoring well MW15-8 post repair.

Location:
South of the FTA Excavation Area facing north

Photo: 4

Date:
August 7, 2017

Description:
Surface water outside the FTA LTU's northwest corner

Location:
Near the FTA LTU's northwest corner facing southeast

Project Photographs

2017 Environmental Monitoring Program
Cambridge Bay Airport – Fire Training Area Land Treatment Unit
Cambridge Bay, NU

Photo: 5

Date:
August 9, 2017

Description:
Location of surface water FTA-SW-NW01 in the suspected seepage area outside the FTA LTU's northwest corner

Location:
Near the FTA LTU's northwest corner facing east

Photo: 6

Date:
August 9, 2017

Description:
Location of surface water SW1701.

Location:
Approximately 475 m northeast of the FTA LTU's northeast corner facing east

Arcadis Canada Inc.

329 Churchill Avenue North

Suite 200

Ottawa, Ontario K1Z 5B8

Tel 613 721 0555

Fax 613 721 0029

www.arcadis-canada.com