2012 Supplemental Investigation
Eureka High Arctic Weather Station, Nunavut

FINAL REPORT

Prepared for:

Public Works and Government Services Canada
10025 Jasper Avenue
Edmonton, Alberta T5J 1S6

On behalf of Environment Canada

Prepared by:

Franz Environmental Inc.
329 Churchill Avenue North
Suite 200,
Ottawa, Ontario K1Z 5B8
Tel: (613) 721-0555

SENES Consultants Ltd.
4921-49th Street
3rd Floor – NWT Commerce Place
Yellowknife, NT X1A 3S4
Tel: (867) 669-2092

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Catherine LeBlanc, B.Eng.
Chris Ludwig, M.Eng., P.Eng., PMP

Executive Summary

SENES Consultants Ltd. (SENES), in association with Franz Environmental Inc. (FRANZ), was retained by Public Works and Government Services Canada (PWGSC) on behalf of Environment Canada (EC) to conduct a supplemental field investigation in support of a Remedial Action Plan (RAP), at the Eureka High Arctic Weather Station ("the site"). The goal of the supplemental investigation was to close the identified data gaps in order to prepare a comprehensive RAP.

The 2012 field program conducted by SENES/FRANZ specifically focussed on i) delineating impacts in AEC D (Powerhouse) and the Delta, ii) assessing whether impacts existed in the area west of Station Creek, iii) assessing background metals concentrations for comparison to site levels, iv) identifying a suitable potential borrow source area for any construction associated with remedial activities, v) assessing geotechnical conditions of the slope west of the Powerhouse and vi) assessing the potential risks associated with vapour intrusion into indoor air through sub-slab and indoor air sampling. In order to address these objectives, SENES/FRANZ collected soil, surface water, sediment, infiltration water, indoor air and sub-slab vapour samples.

Results - Delineation of Impacts in AEC D and the Delta

Contamination around AEC D near Building #17 (Plumbing Shack) was not fully delineated in previous field programs, and was found to pose a potentially unacceptable risk to some receptors in a risk assessment previously performed at the site. The 2012 field program included the collection of soil, sediment, indoor air, and sub-slab vapour samples to address data gaps. Analysis of soil samples collected west of the Powerhouse, at the top and bottom of the slope near the drainage pond, provided full delineation of arsenic and PHC-related impacts in the area. Results were similar to previous investigations. Soil samples collected southeast of Building # 17 (Plumbing Shack), the Former Bunkhouse, and the Delta area exhibited concentrations of arsenic and PHC-related impacts above environmental quality guidelines. Delineation of the impacted area was achieved horizontally along the north and west boundaries. To achieve full delineation, additionally sampling east and south of the Carpentry/Plumbing Shop is required; however, based on existing data an estimate of the volume of impacted material can be developed. Elevated concentrations of petroleum hydrocarbon (PHC) related impacts in sediment relative to background conditions were observed in 2009 and 2010 in the area down slope of the Powerhouse. In combination with previous sample results, analytical data from samples collected in 2012 is sufficient to provide a reliable estimate of the volume of impacted sediment in the drainage pond.

Results - Area West of Station Creek

The area west of Station Creek was investigated to confirm that sources of contamination at the site (including the powerhouse and fuel handling area) had not caused impacts off-site.

Two of the four soil samples collected in the area exhibited concentrations of select PAHs above environmental quality guidelines. No exceedances of PHC or metals guidelines were observed. The applicable environmental quality guidelines in this area are very low for PAHs based on the potential that soil impacts may migrate to surface water and impact aquatic life. Given that a complete pathway for the transport of PAHs to surface water via groundwater is not anticipated at the site, SENES/FRANZ does not expect these relatively low exceedances to pose a threat to adjacent freshwater. No further action is recommended to address impacts in this area.

Results - Background Sampling

The previously completed Detailed Quantitative Risk Assessment (DQRA) results indicated that for soil, aluminum, boron and chromium exceeded ecological risk targets; for sediment aluminum, barium and iron exceeded ecological risk targets, and; for surface water, a variety of metals exceeded risk targets, but only in samples collected from an active layer water seep downgradient of the Powerhouse – these are not considered representative of surface water conditions at the site. The DQRA suggested all metals in soil, sediment and surface water are likely reflective of local conditions, as metal “impacts” were widespread but no anthropogenic source was apparent. The purpose of the background sampling program was to collect a sufficient number of samples to obtain a reliable representation of background conditions. By collecting additional samples, a more realistic average and maximum concentration of metals naturally occurring in soil, sediment, and surface water near the site could be calculated. The data collected as part of the background sampling program was required to update the site specific risk assessment and the calculation of site specific target levels.

The background soil sampling program indicated that naturally occurring arsenic concentrations are above environmental quality guidelines in the area around the site and that the metals that were identified in the DQRA to represent potentially unacceptable ecological risks (aluminum, boron and chromium) in soil exhibit the same average and range of concentrations in on-site versus background soils. Chemical analysis of background surface water samples indicated naturally elevated concentrations of aluminum, cadmium, copper, lead, iron, manganese, and zinc in surface water. The background sediment sampling program found arsenic and copper concentrations above environmental quality guidelines and indicated that the metals in on-site sediment that were identified in the DQRA to represent potentially unacceptable ecological risks (aluminum, barium and iron) exhibit a similar average and range of concentrations in on-site versus background soils. A more rigorous statistical comparison of background metals concentrations in soil, sediment and surface water with those observed within the Areas of

Concern is presented under separate cover in the Remedial Action Plan/Risk Management Plan.

Results – Potential Borrow Source Materials

In case excavation of impacted material is part of the RAP, the identification of a suitable potential borrow source was required. Two borrow sources (one identified in 2012 and one identified in a previous geotechnical report) were examined through sampling and chemical analysis in the 2012 field program. A sample for geotechnical analysis was also collected from the borrow source identified in 2012, near the "upper paradise" area. Chemical analysis of both borrow sources found only one compound (arsenic) in one sample above guidelines. This exceedance is likely related to background concentrations.

Results – Indoor Air and Subslab Vapour Sampling

Eight 24-hour air samples, including one duplicate sample, were collected from inside the operation and maintenance buildings at the Eureka HAWS. Five locations had concentrations of PHC F2 above the conservative reference thresholds: the Old Garage, Building #17, the Former Bunkhouse, the New Garage, and the Powerhouse. Some of these locations also exhibited benzene and xylenes above the reference thresholds. Of these, only Building #17 and the New Garage exhibited concentrations more than 2x the reference thresholds. Building #17 (Plumbing Shack) is primarily a storage building, and was observed to be occupied with tires and miscellaneous plumbing parts. The New Garage has a slab on grade concrete floor with a thermosyphon system within the slab; as a result, SENES/FRANZ was not able to install a sub-slab sample. Vehicle maintenance occurs in the New Garage. During sampling in summer 2012, SENES/FRANZ noted several containers of chemicals (coolant, antifreeze, motor oil, varsol, hydraulic oil) that would likely interfere with the sample. Two other samples, one 24-hour and one 20-minute, were collected from the crawlspace beneath the Powerhouse. Both exhibited concentrations of PHCs/BTEX below applicable reference thresholds strongly suggesting the indoor PHC concentrations are from stored products and maintenance activities. The results of the sub-slab vapour sampling from the Old Garage exhibited concentrations of PHC F1 and F2 above reference thresholds.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 8.0.

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1.0 INTRODUCTION

SENES Consultants Ltd. (SENES), in association with Franz Environmental Inc. (FRANZ), was retained by Public Works Government and Services Canada (PWGSC) on behalf of Environment Canada (EC) to conduct a supplemental field investigation, in support of the Remedial Action Plan (RAP), at the Eureka High Arctic Weather Station (HAWS), Nunavut (NU). The investigation targeted specific areas of environmental concern (AECs) identified in previous studies to confirm impacted areas.

This report describes the 2012 Supplemental Investigation completed for the Eureka HAWS and was prepared in accordance with the *Terms of Reference Remedial Planning and Remedial Action Plan Eureka High Arctic Weather Station FY11/12 and 12/13* dated March 2012, the SENES/FRANZ work plan dated June 14, 2012, and the sampling plan dated August 7, 2012. This sampling plan was adjusted in the field as appropriate and in response to conditions encountered during the field program. Based on a request by EC, soil sampling west of Station Creek was added to the field program.

The Eureka HAWS is located on the north side of Slidre Fjord, at the northwestern tip of Fosheim Peninsula, Ellesmere Island, Nunavut (see Figure 1; Appendix A). The site is accessed primarily by air, with an all season airstrip located approximately 1.5 km northeast of the main operations facility and living quarters.

The work focused on sampling soils, sediments, indoor air, and sub-slab vapour from Eureka HAWS operations and maintenance areas in AEC D, the delta, and west of Station Creek. Samples were analyzed for metals, petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), and selected geotechnical parameters. Background soil, sediment, and surface water samples were collected and analysed for metals. Samples from potential borrow source areas were collected to confirm that all chemicals of concern were below applicable guidelines.

1.1 Objectives

The objectives of the 2012 program at the Eureka HAWS were to:

1. Conduct Remediation Planning with a site investigation at the following areas:
    - Background Sampling Program
    - Supplemental Investigation at AEC D Building #17 (Plumbing Shack) and the delta
    - Indoor Air Sampling Program
2. Conduct a Phase I/II ESA at the PEARL facilities;
3. Conduct a feasibility study of remediation technologies; and
4. Prepare a comprehensive Remedial Action Plan (RAP) for the Site.

This supplemental investigation report covers objective 1. Objectives 2 to 4 will be covered under separate reports.

1.2 Scope of Work

The scope of work of this study included the following activities:

1. Review previous studies;
2. Preparation of a data gap analysis report;
3. Preparation of a sampling plan to cover the gaps identified;
4. Implement a field investigation and sampling program consisting of the following tasks:
    a. Preparation of a health and safety plan;
    b. Identification of underground utilities;
    c. Excavation of test pits and hand augering holes;
    d. Collection of soil, sediment, and surface water samples for chemical analysis; and
    e. Collection of indoor air and sub-slab vapour samples.
5. Interpretation of analytical data; and
6. Reporting.

1.3 Review of Previous Reports

A review of existing reports and previous site characterizations of the Eureka HAWS was completed prior to the 2012 field investigations. The goal of this review was to assemble relevant information pertaining to the contamination present within the study area, to identify any data gaps, and to assist in the planning of the required site characterization work.

In 2008 and 2009, FRANZ, in association with Columbia Environmental Consulting Ltd. (Columbia), was retained by PWGSC on behalf of EC to complete Phase III ESA activities at the Eureka HAWS. This work resulted in the following reports, which were reviewed in preparing this work plan.

1. *Phase III Environmental Site Assessment Eureka High Arctic Weather Station Nunavut Canada Final Report,* Franz Environmental Inc., March 2009. Prepared for Public Works Government Services Canada on behalf of Environment Canada (“2008 Phase III ESA”); and
2. *Phase III Environmental Site Assessment Eureka High Arctic Weather Station Nunavut Canada Final Report,* Franz Environmental Inc. and Columbia Environmental Consulting Ltd., January 2010. Prepared for Public Works Government Services Canada on behalf of Environment Canada (“2009 Phase III ESA”).

These investigations concluded that site specific risk assessment activities were warranted at five AECs:

1. AEC B-2: *in situ* Landfarm
2. AEC B-3: Suspected Landfill
3. AEC D: Powerhouse
4. AEC E: Hydrogen Building
5. AEC H: Old Maintenance Garage

Although all five areas had been identified as areas of concern in the 2009 Phase III ESA, FRANZ recommended any additional monitoring and risk management be focused on AEC D: the Powerhouse, and to a lesser extent, AEC H: the Old Maintenance Garage. The Powerhouse is in close proximity to the drinking water reservoir and may pose a risk to the drinking water supply. The Old Maintenance Garage is currently operational and hydrocarbon impacts from soil may pose a risk to human health.

In the summer of 2010, SENES/FRANZ were retained to conduct monitoring activities and to prepare a Detailed Quantitative Risk Assessment (DQRA) at HAWS. The work resulted in the following report, which was reviewed in preparing the sampling plan.

- *Detailed Quantitative Risk Assessment (DQRA), 2010 Monitoring Activities and Remedial Options Analysis,* SENES Consultants Ltd. and Franz Environmental Inc., March 2011. Prepared for Public Works Government Services Canada on behalf of Environment Canada (2010 DQRA)

A brief summary of the previous investigations at the Powerhouse is provided below.

AEC D: Powerhouse

Analytical results from the 2008 Phase III ESA found concentrations of contaminants in AEC D above applicable guidelines in soil, sediment, and surface water. The report concluded that the source of the contamination is likely fuel storage and handling in the Powerhouse. Surface staining and a strong hydrocarbon odour were observed along the western side of the building where an old exterior day tank was located (and is no longer present). A plastic drum with the top cut off was observed collecting dripping oil from an open valve on the external and west wall of the Powerhouse. The contaminants of concern in soil were identified as BTEX, PHC F1 to F4, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, arsenic, selenium, and zinc. The volume of PHC impacted soil near the Powerhouse was originally estimated in the 2008 Phase III ESA at approximately 3,200 m^3.

The results of the 2009 Phase III ESA confirmed that the source of PHC contamination in soil, sediment, and surface water was likely historic and recent powerhouse operations. The

contaminants of concern in soil addressed were those established in the 2008 Phase III ESA. All 2009 samples collected from the drainage channel leading from the drainage pond were below detection limits or guidelines, with the exception of naphthalene and phenanthrene in sediment near the discharge point into the fjord. During the 2009 site visit, an active layer water seep with hydrocarbon sheen was observed south of the Powerhouse in the road leading towards the sealift area and the fjord. It is not clear if the elevated PHCs in water from the seep were related to contamination from the upgradient powerhouse or from accumulation of impacted active layer water from the entire complex. No PHCs were detected in surface water sampled from the drinking water reservoir. Lead was slightly elevated when compared to CCME fresh water aquatic life but below drinking water guidelines. The metals concentrations in the surface water samples were consistent with background samples collected upstream of the Eureka station.

Results from the source water assessment indicated that the proximity of the drinking water reservoir to the powerhouse and *in situ* land farm, and the fact that the reservoir is cross-gradient from the impacted areas, may cause potential risk to drinking water quality. The results of the building reconnaissance indicated that there were a few minor confined oil leaks. Overall, the powerhouse was considered well-maintained and there were no obvious on-going sources of contamination identified. The high concentrations of PHC in soil identified previously by FRANZ indicated PHC liquid free product may be present in the soil and sediment. The elevated PAHs in the sediment downgradient of the drainage pond indicated that the contamination may have migrated south.

The 2009 Phase III ESA Report recommended a risk management plan, including a site specific risk assessment (or a preliminary quantitative risk assessment (PQRA)) and a monitoring plan developed to address the impacted soils, sediment, and surface water, including the drinking water reservoir. A source water/watershed protection plan was also recommended. The updated total volume of PHC contaminated soil in AEC D was approximately 1,200 m^3. The final NCSCS worksheet score for the site was 83.7, making AEC D a Class 1 – High Priority for Action.

The 2010 DQRA report results indicated that the source of PHC contamination in soil, sediment, and surface water likely originated from the location of the Powerhouse. A significant fuel spill was reported at an historic day tank located immediately to the north of the Powerhouse (at a location corresponding to the current garage) in 1996/97 and was found in the DQRA to be a likely on-going source of subsurface petroleum hydrocarbon contamination underneath and around the Powerhouse. The DQRA also noted that other unidentified fuel releases may also have contributed to the known impacts.

Including the data from previous years, overall, the confirmed contaminants of concern in soil were BTEX, PHC F1 to F4, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, phenanthrene, arsenic, selenium, and zinc. Also, consistent with previous years, the contamination was observed downgradient to the west toward the drinking water reservoir, and toward the east underneath the Powerhouse. The estimated extent of petroleum hydrocarbon-impacted soil in the immediate vicinity of the Powerhouse was estimated to be approximately 900 m^2. It appears that contamination accumulates along the shore of the drainage pond, downgradient and west of the Powerhouse, with an estimated area of 250 m^2. The total extent petroleum hydrocarbon-impacted soil in AEC D was estimated to be approximately 1,200 m^2.

The drainage pond is located west, adjacent and down slope of AEC D and immediately east and down slope of the drinking water reservoir. The drainage pond may act as a suitable intercept for contaminant runoff, since it is down slope from AEC D. Although the drainage pond is at a lower elevation than the drinking water reservoir, diffusion of contaminants may occur through a hydraulic connection. However, the sampling and analysis, including previous investigations and the 2009 Phase III ESA investigation of the water reservoir, did not indicate any detectable concentrations of PHCs or PAHs. Total metals in surface water were generally elevated above background; however, the concentrations were attributed to hard water. Aluminum and iron were above the CCME CWQG for the protection of FWAL. Overall, the data from the last three years suggest that the surface water quality along the drainage path to the discharge point into the fjord is not contaminated.

The drainage pond was investigated further in 2010, showing contamination in the surrounding soils and sediment. The sediment contained what appeared to be pure product as observed in previous years, and the associated sediment sample collected from immediately downgradient of the Powerhouse, contained elevated concentrations of BTEX, PHC F1-F4, and PAH. In previous years and in 2010, further downstream, the sediment did not appear to be contaminated. All samples collected in 2009, from further along the drainage pathway, were below detection limits or guidelines, with the exception of elevated naphthalene and phenanthrene in sediment near the discharge point into the fjord. In 2010, concentrations of PAHs decreased in number of parameter and in concentration further downstream. This suggests that some of the lighter PAHs are mobile and are settling in sediment. Arsenic was above the applicable guideline in all four sediment samples collected, but below the apparent background levels. Elements such as aluminum, calcium, iron, magnesium, manganese, phosphorus, potassium, and sodium are also common in background samples. Therefore, since there is no obvious source for metals, and there are similar metals in soils, the elevated metals in sediment were considered to be likely attributed to natural conditions.

During the 2009 site visit, an active layer water seep with visible hydrocarbon sheen was observed south of the Powerhouse in the road extending 50 m towards the sealift area and the fjord. In summer 2010, two soil samples were collected in the same locations as the active layer water seep area observed in 2009. The soil results did not contain elevated PHC concentrations, indicating that the PHC in the active layer water seep has not impacted the soil in the area. The results of the 2010 analysis of the seep water suggested that shallow seasonal active layer water transports PHC contamination. It is normally expected that the permafrost layer acts as a barrier to mobile fluid, inhibiting further vertical migration.

The extent of contamination, identified in previous years, does not appear to have changed the 2010 DQRA Report. Assuming an approximate depth of 1 m and area of 900 m^2, the total volume of contaminated soil in the immediate vicinity of the Powerhouse is 900 m^3. The total volume of contaminated soil along the drainage pond is 150 m^3, assuming an average depth of 0.6 m and an area of 250 m^2. The total volume of contaminated soil near the AST is 80 m^3, assuming an average depth of 1.0 m and an area of 80 m^2. The total estimated volume of the PHC impacted soil in AEC D was revised in the 2010 as 1,200 m^3, compared with the 2008 estimate of 3,200 m^3.

Detailed Quantitative Risk Assessment (DQRA) Results

The objectives of the DQRA were to identify contaminants of concern (COCs) in media at the site and to identify whether any unacceptable risks to human health or ecological receptors are present. The Site-Specific Human Health Risk Assessment indicated that there were potentially unacceptable risks to the operation and maintenance worker from PHCs fractions F1 and F2 in soil. This potentially unacceptable risk was attributable primarily to exposure to contaminated site soil via the inhalation of contaminant vapours emanating from subsurface soils at operation and maintenance buildings such as the Powerhouse/water storage and New Garage, the Old Garage, the Red Quonset north of the new garage, and down slope in the vicinity of Building # 17 (Plumbing Shack), the Former Bunk House, and the Old Transient Barracks. Hazard quotients for office site workers from all threshold and non-threshold contaminants indicated acceptable risk levels.

The Site-Specific Ecological Risk Assessment results indicate that:

- For soils, PHC F1 and F2, and aluminum, boron, and chromium exceeded risk targets for terrestrial plants and invertebrates, while aluminum exceeded risk targets for mammals and birds.
- For sediment, PHC F1 and F2, xylenes, and 1-methylnaphthalene (all associated with diesel fuel or furnace oil), along with aluminum, boron, and iron exceeded risk targets for benthic invertebrates and macrophytes.

- For surface water, PHC F1 and F2, as well as a number of metals exceeded risk targets, but only in samples collected from an active layer water seep downgradient of the Powerhouse – these are not considered representative of surface water conditions at the site.
- All metals in soil, sediment and surface water were considered likely reflective of local conditions, as metal "impacts" were widespread, but no anthropogenic sources were apparent. This was deemed to required confirmation through rigorous statistical analysis and possibly a comprehensive background sampling program.

Site specific target levels (indicated in bold underline below) were developed for the parameters exceeding target levels. The SSTLs were as follows:

Table 1-1: Summary of SSTLs in Soil and Sediment

Chemical Name	Hazard Quotient (HQ) Humans	Risk quotient (RQ) – Plants & Invertebrates (Soil) or benthic community (Sediment)	SSTL human health (mg/kg)	SSTL ecological health (mg/kg)
SOIL				
PHC F1	1.63 (target = 0.5)	0.1 (target = 1.0)	**170**	3700 (max. observed)
PHC F2	0.69 (target of 0.5)	1.8 (target = 1.0)	1794	**1374**
SEDIMENTS				
Xylenes	n/a	3.62 (target = 1.0)	n/a	**1.46**
1-methylnaphthalene	n/a	1.36 (target = 1.0)	n/a	**3.6**
PHC F1	n/a	28.7 (target = 1.0)	n/a	**10**
PHC F2	n/a	3,076 (target = 1.0)	n/a	**12**

Based on the SSTLs for soil and sediment, the following table presents a summary of the previously estimated volumes of soil impacted by PHCs F1-F2.

Table 1-2: Expected Volumes of Soils above SSTLs

Contaminant of Concern	**AEC**	**Average Impacted Depth Interval (m)**	**Max. Depth of Impacts (m)**	**Expected Area of Contamination (m^2)**	**Expected Volume (m^3)**	**Maximum Expected Volume (m^3)**
PHCs F1-F2	AEC B-2-1	0-1.0	1.4	5,700	5,700	8,000
	AEC D-1	0-0.7	1.2	1,800	1,300	2,200
	AEC H-1	0-1.0	1.3	300	300	400
	AEC H-2	0-0.2	0.5	1,200	250	600
			Total	**9,000**	**7,600**	**11,200**

An additional expected area of 2400 m^2 and volume of 480 m^3 of sediment within the drainage pond was expected to be above the SSTLs for one or more of toluene, PHC F1 and F2 and 1-methylnaphthalene.

2.0 2012 SUPPLEMENTAL INVESTIGATION METHODOLOGY

2.1 Health and Safety Plan

Prior to conducting any work on-site, a site-specific health and safety plan (HASP) was developed, distributed, and discussed with all personnel involved in the investigative program. A health and safety briefing occurred each day and a Job Briefing/Emergency Procedure sheet was completed with all on-site contractors. If any new hazards were encountered, the HASP was updated.

In any work area where there was a potential hazard, the work area was restricted to authorized personnel wearing the required personal protective equipment.

2.2 Data Gap Analysis

Prior to the start of the field program, a review of all previous reports was conducted in order to identify any data gaps required to be addressed prior to the preparation of the Remedial Action Plan (RAP). The data gaps that were identified included the following:

- Background sampling in soil, sediment and surface water to establish background metals concentrations.
- Delineation of soil impacts in AEC D.
- Indoor air sampling to establish the level of vapour intrusion in the operation and maintenance buildings to update the risk assessment.
- Assessment of soil quality adjacent to Former Fuel Storage Area, west of Station Creek, to assess whether contamination had migrated beyond Environment Canada site boundaries.
- Update to the chemical data in AEC A.
- Vertical delineation of sediment impacts in AEC D.
- Soil sampling as part of Borrow Source Assessment.
- Slope stability evaluation including the collection of geotechnical samples.

The results of the data gap analysis were used during the preparation of the sampling plan. The data gap analysis report was developed, distributed, and discussed with PWGSC and EC prior to the start of the field program. A copy of the Data Gap Analysis is provided in Appendix F.

2.3 Development of Detailed Sampling Plan

Based on the historical review and data gap analysis, a detailed sampling plan was designed to provide a comprehensive site assessment with respect to soil, sediment, surface water, indoor air, and sub-slab vapour. Sample locations were chosen to confirm the extent of impacted soil from known sources identified from previous studies, and to monitor the extent of contamination.

The sampling plan provided a detailed description of the sampling and type of measuring/testing conducted during the investigation including:

- Proposed sampling locations and numbers;
- Proposed sampling or measurement methods; and
- Parameters being sampled.

The sampling plan was developed, distributed, and discussed with PWGSC and EC prior to the start of the field program. Based on these discussions, it was determined that additional sampling at AEC A was not required and the risk management of AEC A would be a separate project. Table 2-1 summarizes the proposed sampling plan. A copy of the Sampling Plan Report is provided in Appendix G.

Table 2-1: Proposed Sampling Plan

Area	Media	COC	Number of Samples
Background	Soil	Metals	10 + 1 duplicate
	Sediment	Metals	10 + 1 duplicate
	Surface Water	Metals	10 + 1 duplicate
AEC D1	Soil	Metals	10 + 1 duplicate
		PAH	10 + 1 duplicate
		PHC	24 + 2 duplicates
		Geotechnical	6
	Sediment	PHC	6 + 1 duplicate
	Indoor Air/Vapour	BTEX/ PHCs	12 + 1 duplicate
Delta	Soil	PAH	10 + 1 duplicate
		PHC	16 + 2 duplicates

2.4 Soil Sampling Methodology

Soil sampling was conducted by either manual test pitting or with an excavator. Subsurface conditions encountered in the test pits were logged at the time of excavation. Soil descriptions including approximate grain size, colour, moisture content, stratigraphy, and nature and extent of apparent contamination were recorded for each unit. Vapour monitoring of the soil samples was conducted in the field using a combustible gas detector (Eagle RKI).

These procedures were followed during soil sampling activities:

- In areas where contamination by PHCs were expected, field combustible gas monitoring with the Eagle RKI was conducted throughout the depth of each test pit;
- Subsurface materials were inspected, described, and photographed; and
- Representative composite samples were collected from each soil horizon.

Once the samples were collected, the soil was placed in laboratory supply containers. The containers were transferred to a cooler to preserve the samples. Samples were subsequently kept at the appropriate temperature prior to submission to the laboratories. All sampling equipment was decontaminated with Alconox prior to the collection of subsequent samples

Field measurement of soil vapour is frequently used to screen soil samples for the presence of volatile organic compounds, including petroleum hydrocarbons, and for the selection of samples for subsequent laboratory analysis. Vapour screening involved partially filling a zippered bag with soil samples, then storing them at room temperature to allow headspace vapours to develop and equilibrate. Vapours were then measured using a combustible gas detector (Eagle RKI).

2.5 Sediment Sampling Methodology

Sediment samples were collected using a combination of a sediment core sampler and shovel. For each sample collected, a depth measurement, DGPS coordinates, and description of the sediment (including colour, odour, sheens, staining, water depth, grain size, sample recovery, and percent natural organic material), the presence of debris, and any unusual characteristics were recorded. Immediately after collection, the sediment was transferred into laboratory supplied containers. The bottled sediment samples were placed into a cooler and kept at the appropriate temperature prior to submission to the laboratories. All sampling equipment was decontaminated with Alconox prior to the collection of the subsequent sample.

2.6 Surface Water Sampling Methodology

Surface water was collected directly into laboratory supplied bottles by submerging the bottle under the surface of the water, removing the cap and allowing the bottle to fill, then recapping the bottle. Field parameters including pH, temperature, conductivity, dissolved oxygen, and oxidation-reduction potential were measured using hand-held YSI water quality meter, and recorded in field logs for inclusion in the this report. The containers were transferred to a cooler. Samples were subsequently kept at the appropriate temperature prior to submission to the laboratories.

2.7 Indoor Air and Sub-slab Vapour Sampling Methodology

Indoor air samples were collected from the breathing zone (i.e., above 1 m from the floor level) using laboratory supplied 6 L SUMMA® Canisters with a 24-hour mass control value for each of the maintenance buildings. Where buildings are raised on piles, a sample was collected from the crawl space underneath the building where feasible.

A pre-sampling inspection of each building was completed prior to the sampling event to identify conditions that would affect the testing of indoor air quality. The inspection included the evaluation of the type of structure and physical conditions. The sampling location was selected

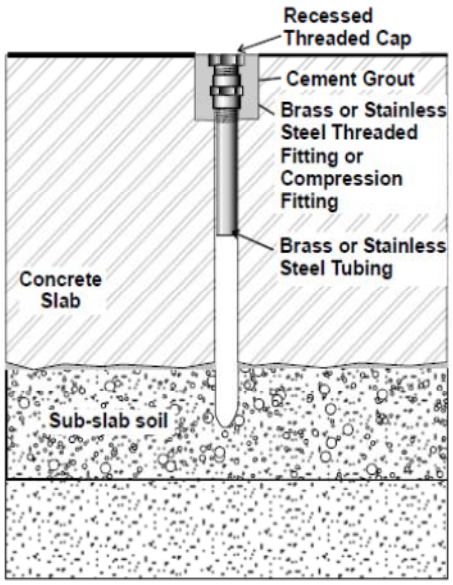
to be as close as possible to the source of contamination, and as far as possible from possibly confounding influences (e.g., cleaning products).
A sample of air was drawn directly from the air using a laboratory-calibrated valve/flow regulator. The pre-evacuated SUMMA® canisters were opened, enabling collection of a time-weighted air sample. The indoor air sample was collected over a period of 24 hours in order to obtain a representative sample.

Two crawlspace samples were collected by placing a 6 L and 1.4 L SUMMA® canister beneath the Powerhouse. Access to the crawlspace was outside, along the west side of the Powerhouse. A sample of air was drawn directly from the air using a laboratory-calibrated valve/flow regulator. The pre-evacuated SUMMA® canisters were opened, enabling collection of a time-weighted air sample. In order to obtain a representative sample, the 6 L sample was collected over a period of 24 hours and the 1.4 L sample was collected over a period of 20 minutes.

Sub-slab samples were collected to assess the vapour intrusion through the floor slab. Sub-slab vapour samples were collected by installing vapour probes beneath the floor slab (see Figure 2-1 for installation details). The vapour probes consisted of a brass nipple attached to a brass bushing, which is closed at the top with a brass nut. The vapour probes were installed into the floor slab with a Bosch hammer drill using a 1/2” concrete boring bit. The field assessor inserted the 3/8” brass nipple assembly into the hole and filled the area around the assembly with concrete.

Before sampling, the vapour probes were purged with Gilair pumps with low-flow attachments. The pump for sub-slab probes was calibrated to pump 50 mL/minute. The total purge volume was three times the volume of the sub-slab sampling probes.

Figure 2-1: Sub-slab Vapour Installation



(From DiGiulio, Dominic; Paul, Cynthia and Mosley, Ron. 2006. *Development of a Sub-Slab Gas Sampling Protocol to Support Assessment of Vapor Intrusion.* United States Environmental Protection Agency.)

The Gilair pump was attached to the sampling train with low-density polyethylene (LDPE) t-joints. A ball valve was connected the pumps and the t-joint so that the pumps could be turned off without allowing any ambient air into the sampling train. Samples were collected in 1.4 L laboratory supplied stainless steel SUMMA® canisters. A sample of air from each vapour probe was drawn directly from the sample tubing using a laboratory-calibrated valve/flow regulator calibrated for 20 minute sampling. The pre-evacuated SUMMA® canister was opened, enabling collection of time-weighted air samples.

2.8 Quality Assurance/Quality Control

2.8.1.1 Field Quality Assurance/Quality Program

A quality assurance (QA) program is a system of documented procedures to be followed during a process or program, while quality control (QC) is a system of checks and verifications which validate the reliability of a data set. The most important aspect of field QA/QC is that samples are collected, transported, and stored using well documented procedures. The nature of environmental fieldwork is such that, over the course of a large sampling program, small deviations from ideal protocols sometimes occur. It is important that any such occurrences are documented to ensure the integrity of data, which is being used to draw vital conclusions about environmental impact or human health risk. SENES/FRANZ uses properly trained personnel that are well acquainted with the correct and necessary procedures.

The field QA/QC program consisted of the following elements:

1. Field staff followed pre-established SENES/FRANZ Standard Operating Procedures (SOPs) for soil, sediment, surface water and air sampling.
2. Field staff completed proper documentation of all aspects of the sampling program that could potentially cause sampling bias. The documentation included daily field summary sheets, secure filing of field notes, completion of chain-of-custody forms, and memos written when any major deviation from ideal protocol occurred (e.g., an ice-pack melts, a bottle breaks, etc.).
3. Field staff decontaminated soil, sediment, and surface water sampling equipment. All sediment sampling equipment that came into contact with soil/sediments were cleaned with brushes (to remove soil) prior to each new sample collection.
4. At least one blind field duplicate sample for every ten collected soil, groundwater, surface water, and sediment samples was submitted to the contract laboratory. These duplicates were supplementary to any replicates analyzed as part of the standard lab QA/QC procedures.
5. Samples were delivered to the laboratory as soon as possible following the sampling, either directly by our personnel or by courier, to ensure that sample holding times were respected. Samples were immediately stored in coolers with ice packs to hold the sample temperature at approximately 4°C.

2.8.1.2 Quality Assurance/Quality Control Samples

Samples for QA/QC purposes were submitted in the form of blind field duplicates at a rate of approximately one per ten samples. These field duplicate samples submitted for laboratory analysis were sent without indication as to which sample the duplicate represented (i.e., blind).

Laboratory QA/QC consisted of duplicate analyses, method blanks, spike method blanks, surrogate standard recoveries, and the use of standard USEPA Methods. Laboratory reports detailed the handling and secure storage of samples, and the significant dates with respect to sample delivery, extraction, and analysis.

2.8.1.3 Data Validation of Quality Assurance/Quality Control Samples

Sampling procedures and laboratory analytical precision were evaluated by calculating the relative percent difference (RPD) for a sample and duplicate pair according to the following equation:

$$RPD = | X_1 - X_2 | / X_{avg} \times 100$$

where: x_1 and x_1 are the duplicate concentrations and x_{avg} is the mean of these two values.

The duplicate results were evaluated using criteria developed by Zeiner (1994), which draws from several data validation guidelines developed by the USEPA. According to these criteria, the RPD for duplicate samples should be less than 20% for aqueous samples, and less than

40% for solid samples. RPDs can only be calculated when the compound is detected in both the original and the duplicate sample at a concentration five times above the reportable detection limit (RDL). Alternative criteria are used to evaluate duplicate pairs where one or both of the results are less than five times the RDL, or where one or both of the results is less than the RDL (i.e. nd or 'not-detected'). The alternative criteria used for the evaluation of the data, adapted from Zeiner (1994), are presented in the Table 2-2. When both concentrations are less than the RDL, no calculation/evaluation criterion is required. Criteria for the evaluation of blind and duplicate sample results are also provided in Table 2-2.

The precision is considered acceptable when the evaluation criteria are met or when both results are below the RDL.

Table 2-2: Criteria for the Evaluation of Blind and Duplicate Sample Results

Scenario	Result A	Result B	Criteria for Acceptance	
			Aqueous (water)	Soil (Soil)
A	nd	nd	Acceptable precision; no evaluation required	
B	nd	positive	result B – 0.5 x MDL < MDL	result B – 0.5 x MDL < 2 x MDL
C	positive and > 5 x MDL	positive and > 5 x MDL	RPD < 20%	RPD < 40%
D	positive and < or = 5 x MDL	positive	|result B – result A| < MDL[1]	|result B – result A| < 2 x MDL[1]

Source: Zeiner, S.T., Realistic Criteria for the Evaluation of Field Duplicate Sample Results, Proceedings of Superfund XV, November 29-December 1, 1994, Sheraton Washington Hotel, Washington, D.C. – modified to use Method Detection Limit (RDL) or Reportable Detection Limit (RDL) in lieu of the Quantitation Limit (QL), the Instrument Detection Limit (IDL) and/or Laboratory Reporting Limit (LRL).

nd – not detected

positive – above the RDL

RPD – relative percent difference, |result A - result B| / | (result A + result B)/2|

1. When results reported is less than half the quantitation limit, use half the limit in the equation.

2.9 Laboratory Analytical Methodologies

Maxxam Analytical Services (Maxxam) of Calgary, Alberta was subcontracted to perform the laboratory chemical analysis for soil, sediment, and surface water. Maxxam in Mississauga conducted the indoor air and vapour sampling analysis. All laboratory analyses for this project were conducted under a defined quality control program. The Maxxam laboratory program includes replicate analysis, blank spikes, matrix spikes, instrumentation calibration, internal standards, method blanks, and internal QC checks. The laboratory program included verification of selected analytical methods with minimum detection limits less than the applicable environmental quality criteria or standards on which the numerical comparisons will be based. The standard Maxxam quality control protocols meet or exceed the requirements of all United

States and Canadian regulators. Maxxam is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).

Copies of the completed Chain of Custody forms and Laboratory Certificates of Analyses are provided in Appendix E.

2.10 Applicable Guidelines

2.10.1 Soil Guidelines

The chemical data for soil was compared to the appropriate guidelines (Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines (EQGs) for residential/parkland land use, potable groundwater, coarse-grained surficial soil). Potable groundwater was chosen due to the proximity of the area to the drinking water reservoir for the station. Coarse-grained soil was selected based on the observations of the soil samples collected in this investigation. In the absence of federal standards/guidelines, the 2011 Ontario Ministry of the Environment (MOE) Table 2 Standards (full-depth remediation, residential land use, potable ground water conditions, coarse-grained soils) were referenced.

In 2012, site soil was observed to be composed of coarse-grained sand with loam and clay. Previous field investigations have identified the soil as being fine-grained; however, the majority of the samples that exhibited fine-grained soil were collected from the bottom of the slope near the drainage pond. During the 2012 field program, SENES/FRANZ observed that much of the fine-grained material from the slope had been washed down the slope leaving only coarse-grained material on the slope and depositing the fine-grained material at the bottom. The deposit of fine-grained material at the bottom of the slope, where most previous samples were collected, could potentially over-represent the amount of fine-grained material at the site. The majority of the samples collected at the top of the slope and from the delta area were coarse-grained soil. SENES/FRANZ believes, based on observations of soil conditions elsewhere at the site that the (coarse) samples collected in 2012 are more representative of soil conditions elsewhere at the site that the slope-bottom samples collected previously; therefore, coarse-grained guidelines and standards were applied. In general, coarse soil guidelines are usually more conservative than those for fine grained soil, so this is a conservative approach.

2.10.2 Surface Water Guidelines

The surface water results were compared to the CCME Canadian Water Quality Guidelines (CWQG) for the protection of Fresh Water Aquatic Life (FWAL) or the Guidelines for Canadian Drinking Water Quality (GCDWQ) developed by the Federal-Provincial-Territorial Committee on Drinking Water.

2.10.3 Infiltration Water

The infiltration water from the test pits was compared to the 2012 Guidance of Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (Table 2: Residential/Parkland use, Tier 1, coarse soil). The 2004 Ontario Ministry of the Environment, Table 2 - Full Depth Generic Site Condition Standards in a Potable Ground Water Conditions and CWGS for the protection of FWAL were also included for comparison.

2.10.4 Sediment Guidelines

The sediment samples were compared to the CCME Interim Sediment Quality Guidelines (ISQG) and Probable Effect Level (PEL) for the protection of aquatic life.

2.10.5 Indoor Air and Vapour Guidelines

Soil vapour and indoor air guidelines are based on the inhalation pathway of exposure. While the guidelines may be called either “indoor air” or “soil vapour,” they are generally based on common toxicological research into the concentrations of contaminants that can be inhaled with little or no effect on human health.

The development of indoor air guidelines is relatively straightforward: scientific data on the effects of the compounds of interest on mammals are examined and low- or no-effects levels are calculated. Analytical data from indoor air samples can be compared directly to the guidelines.

Sources of indoor air guidelines are discussed below.

2.10.5.1 Reference Thresholds

SENES/FRANZ reviewed literature from Health Canada, the Canadian Council of Ministers of the Environment, the US Environmental Protection Agency, and the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) and the British Columbia Contaminated Sites Regulation (BC CSR) to identify suitable criteria to assess indoor air and soil vapour data. SENES/ FRANZ has adopted Health Canada guidelines and the supporting rationale for the CWS-PHC and Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CSQGs).

The TPHCWG uses the nomenclature “Reference Concentration” or “RfC” for what Health Canada routinely calls a “Tolerable Concentration” or “TC.” The terms are used interchangeably in this report, based on the source of the information, as both are indicative of the concentration of a chemical in air that causes no appreciable health effects over a lifetime of exposure.

Based on the Health Canada tolerable concentrations (TCs), the values adopted by the CWS-PHC from the TPHCWG, and the value for ethylbenzene adopted by the CSQGs from the US Environmental Protection Agency, the levels which are likely to have no deleterious effect on a population over a lifetime of exposure are summarized below in Table 2-3.

Table 2-3: Summary of Tolerable/Reference Concentrations

Compound	TC/RfC (in µg/m^3)	Source
Benzene	15,000	Health Canada, 1996
Toluene	3,800	Environment Canada, 2005
Ethylbenzene	1000	Environment Canada, 2005
Total Xylenes	180	Environment Canada, 2005
PHC Fraction F1	10,498	CWS-PHC, TPHCWG
PHC Fraction F2	840	CWS-PHC, TPHCWG

SENES/FRANZ investigated these contaminants of potential concern in indoor air based on the conclusions of the previous reports for Eureka HAWS. PHC Fraction F3 and PHC Fraction F4 were not assessed as they are not likely to partition into air. British Columbia offers only guidelines for C6-C13 (equivalent to PHC fraction F1 and a portion of PHC Fraction F2) and the CWS-PHC evaluates vapour intrusion for PHC Fraction F3 and PHC Fraction F4 as "not applicable."

Generic guidelines (or "target concentrations") for contaminants in air are obtained by applying conservative safety factors to the RfC. In the case of benzene, above, the tolerable concentration is based on a 5% lifetime risk of cancer (CCME, 2004). As a result, Health Canada recommends division of the TC_{05} by 5,000 to 50,000 to determine the level that will afford similar protection to the "essentially negligible" level (i.e., 10^{-5} or 10^{-6}, respectively, depending on jurisdiction). In accordance with HC guidelines for federal sites an essentially negligible level is 10^{-5}, yielding a threshold value for benzene of 3 µg/m^3 (i.e., 15,000 µg/m^3/5,000).

For non-carcinogens, the target concentration is calculated as follows:

$$C_{target} = \frac{(HQ)(RfC)}{t}$$

Where HQ is the acceptable hazard quotient, RfC is the reference concentration (from Table 2-3) and t is the fraction of time exposed (here evaluated as 1.0, indicating 24 hour / 7 day a week exposure as a conservative screening value). The hazard quotient is the ratio of the measured concentrations to the concentration at which no effects are anticipated. Where HQ<1, no adverse effects are anticipated.

As a conservative measure, the hazard quotient of 0.2 is typically used. This number is arrived at because five exposure media (air, water, soil, food and consumer products) are considered. As all five exposure pathways may not be fully characterized, in order to determine that risk is below the no effects level (i.e., HQ=1), the hazard quotient is divided by five. For petroleum hydrocarbons, an HQ of 0.5 is typically used (see Table 3.6, CCME 2008b). The resultant target concentrations are summarized in Table 2-4 below.

Table 2-4: Summary of Target Concentrations (Generic Air Guidelines)

Compound	TC/RfC (in µg/m^3)	ILCR	HQ	Target Concentration (in µg/m^3)
Benzene	15,000	10^{-5}	NA	3
Toluene	3,800	NA	0.2	760
Ethylbenzene	1000	NA	0.2	200
Total Xylenes	180	NA	0.2	36
PHC Fraction F1	10,498	NA	0.5	5,249
PHC Fraction F2	840	NA	0.5	420

The rationale for these threshold values is described below.

2.10.5.2 Rationale for the Tolerable/Reference Concentrations

2.10.5.2.1 Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX)

Health Canada completed assessments for 44 environmental contaminants in 1994, under its authority under the Canadian Environmental Protection Act (CEPA). Included in the substances investigated were benzene, toluene, ethylbenzene, and total xylenes. During the investigation, Health Canada developed tolerable daily intakes (TDIs), tolerable concentrations, and tumorigenic doses/concentrations.

SENES/FRANZ has adopted the TC values for toluene and total xylenes directly from Table 3a, "Tolerable Concentrations/Daily Intakes for Priority Substances (Non-Carcinogenic Effects) of Health Canada's *Health-Based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for Priority Substances.* The TC for toluene as indicated in Table 3a is 3.8 mg/m^3 (or 3800 µg/m^3) and for total xylenes, the TC is provisionally 0.18 mg/m^3 (or 180 µg/m^3). No TC was developed by Health Canada for ethylbenzene; however, in subsequent documentation of the development of the CSQGs for toluene, ethylbenzene and xylenes (Environment Canada, 2005), a TC for ethylbenzene is 1 mg/m^3 (or 1000 µg/m^3) is adopted from the USEPA's Integrated Risk Information System database. For all these compounds, the appropriate hazard quotient is 0.2, resulting in toluene, ethylbenzene and xylenes guideline thresholds of 760 µg/m^3, 200 µg/m^3 and 36 µg/m^3, respectively.

For carcinogenic (or potentially carcinogenic) compounds, Health Canada provides the tumorigenic concentration (TC_{05}), i.e., the concentration associated with a 5% increase in incidence or mortality due to tumours. Health Canada recommends division of the TC_{05} by 5,000 to 50,000 to determine the level that will afford similar protection to the "essentially negligible" level (i.e., 10^{-5} to 10^{-6}). For benzene, SENES/FRANZ has referred to the Table 3b value for TC_{05} (15 mg/m^3) and divided it by 5,000 to obtain an approximation of the 10^{-5} risk level in accordance with the guidance on acceptable risks for an acceptable threshold level of 3 µg/ m^3.

2.10.5.2.2 PHC Fractions

The TPHCWG report on *Development of Fraction Specific Reference Doses and Reference Concentrations for Total Petroleum Hydrocarbons* (Exxon Biomedical Sciences *et al*., 1997) used an indicator/surrogate approach to determine reference concentrations for specific PHC fractions. The TPHCWG separated PHC fractions by carbon-equivalent numbers and into aromatic and aliphatic groups. Based on the breakdown of PHC fractions by weight in the CWS-PHC Scientific Rationale Document (Table 3.7 of that report), the aromatic and aliphatic reference fractions can be combined by weighted addition to determine an appropriate RfC; however, SENES/FRANZ collected PHC fractionation samples and was able to calculated the site specific mass fractions. The F1 fraction by mass calculated SENES/FRANZ collected differed from the TPHCWG PHC in the volatile C6-C8 category as the PHCs at Eureka are expected to be highly weathered.

The calculated composition and RfCs for the TPHCWG PHC fractions based on the fractionation samples collected by SENES/FRANZ at Eureka in 2012 are presented in Table 2-5 and Table 2-6, below.

Table 2-5: Calculated Composition of PHC Fractions by Mass

TPH Sub-Fraction	F1	F2
Aliphatics		
C6-68	0.05	
>C8-C10	0.83	
>C10-C12		0.33
>C12-C16		0.39
Aromatics		
>C7-C8		
>C8-C10	0.12	
>C10-C12		0.12
>C12-C16		0.15
Total	1	1

Table 2-6: Reference Concentration, PHC Fractions

	RfC (mg/m^3)
Aliphatics	
C6-C8	18.4
C>8-C10	1
C>10-C12	1
C>12-C16	1
Aromatics	
C>7-C8	0.4
C>8-C10	0.2
C>10-C12	0.2
C>12-C16	0.2

Adapted from CCME, 2008b, Table 3.4

The appropriate RfC for the CWS-PHC-defined Fraction F1 can therefore be calculated as:

$$RfC_F = \sum_{aliphatics}(mf_x)(RfC_x) + \sum_{aromatics}(mf_x)(RfC_x)$$

Where RfC_F is the reference concentration for a CWS-PHC fraction (e.g., F1), mf_x is the mass fraction of the subcomponent (see Table 2-5) and RfC_x is the reference concentration of the subcomponent (see
Table 2-6).

For PHC Fraction F1, this calculation is:

$$RfC_{F1} = (0.05)(18.4) + (0.83)(1) + (0.12)(0.2)$$
$$= 1.696\, mg/m^3$$

For PHC Fraction F2, this calculation is:

$$RfC_{F2} = (0.33)(1) + (0.39)(1) + (0.12)(0.2) + (0.15)(0.2)$$
$$= 0.782\, mg/m^3$$

As discussed in Section 2.10.5.1, these RfC values must be multiplied by a hazard quotient value of 0.5 to account for risk posed by other pathways. The resulting guideline value for PHC F1 is therefore 848 µg/m^3, and for F2 is 391 µg/m^3.

For PHC Fraction F3 and PHC Fraction F4, the volatility is not considered sufficiently high to warrant vapour pathway calculations in the CWS-PHC.

2.10.5.3 Sub-Slab Vapour Attenuation

The British Colombia's MOE *2010 Technical Guidance on Contaminated Sites – Vapour Investigation and Remediation* provides a table of default permissible vapour attenuation factors (*α*) based on sample location, sample depth, and land-use. For sub-slab samples, the

recommended attenuation factor is 0.02 (or 50 times dilution). The Ontario MOE recommends an attenuation factor of 0.004 for commercial slab on grade buildings. Since the BC MOE attenuation factor is more conservative, SENES/FRANZ applied a 0.02 attenuation factor to the sub-slab vapour results. The attenuated sub-slab vapour results were compared to the same guidelines as the indoor air sample results.

3.0 SUPPLEMENTAL FIELD INVESTIGATION

3.1 Schedule

The field program was completed from August 12 to August 20, 2012. During the field investigations, weather conditions ranged from sunny to cloudy conditions with snow. Temperatures ranged from approximately 0 to 7°C. Fieldwork was completed by SENES/FRANZ personnel (C. LeBlanc and C. Aubin).

3.2 Field Reconnaissance

Following the mobilization of the field sampling crew to the site and a site health and safety briefing, SENES/FRANZ personnel completed a site reconnaissance visit on August 12, 2012. The purpose of this visit was to make observations about the physical site conditions, to identify sample locations, and to inspect for any other signs of environmental impacts.

3.3 Soil Sampling

3.3.1 Test Pit Excavations

The subsurface sampling program was carried out on August 13, 14, and 17, 2012 in the area of AEC D, the delta, and west of Station Creek (see Figures 4 and 5; Appendix A). Based on previous investigations, areas of petroleum hydrocarbon contamination were the primary focus.

Twenty-six test pits were advanced to permafrost to a maximum depth of 2.0 m using a rubber tire backhoe. Excavation into permafrost was not possible in some areas due to limitations of the excavating equipment and restrictions imposed by site topography and buildings. One of the areas where test pit depth was limited by the equipment was at the top of the slope in AEC D. Test pits were excavated to the maximum depth that the bucket could reach without using benching to access deeper soils. The creation of benches was not possible due to the limited space between the Powerhouse and the fuel pipe line. In the Delta area, the stability of excavation sidewalls did not allow excavation of test pits to the full mechanical capacity of the backhoe, as sidewall sloughing did not allow for a stable base from which to excavate.

Test pit excavations were completed in all areas where the backhoe could gain access and in areas of deep overburden. Test pitting is an efficient method for obtaining observations about impacted soils and stratigraphy, and for collecting soil samples. A backhoe provides large excavations to optimally expose the native materials, provide observations of the soil conditions, vertical profiles of the variable soil types, potential impacts at depth, and to identify permafrost boundaries. The backhoe was provided by the Eureka HAWS and the test pits are identified on tables and figures with a ‘TP12’ prefix. Samples were collected from multiple depths in the test pit where feasible based on field conditions. Samples collected from the upper soil layer were labelled with an “A” and samples from the bottom layer were labelled with a “B”.

3.3.2 Hand Auger Sampling

Fourteen hand auger excavations, including nine background test holes were advanced to refusal or a maximum depth of 1.0 m. Hand augering beyond 1.0 metre was not technically feasible. The hand auger samples were collected from August 16 to 19, 2012, down slope of the powerhouse in AEC D, the borrow source, and the background locations (see Figures 2 to 5; Appendix A). All hand auger locations are identified on tables and figures with a 'HA12' prefix.

Hand auger excavations were completed in all areas that were inaccessible to the backhoe. Conditions that prevented access were saturated soil, steep banks, and geological barriers. The purpose of the hand auger excavations was to expose the native materials to provide observations of the soil conditions, vertical profiles of the variable soil types, potential impacts at depth, and to identify permafrost boundaries.

3.3.3 Field Vapour Screening of Soil Samples

Vapour screening was conducted for each test pit where soil samples were to be potentially analyzed for PHCs (all 2012 locations). Vapour screening is a frequently used method to screen soil samples for the presence of combustible vapours and, therefore, petroleum hydrocarbon impacts. Screening can be a useful tool for the selection of samples for subsequent laboratory analysis. Complementing olfactory senses, field vapour screening can also be used for distinguishing diesel impacted soil from gasoline impacted soil. Typically, elevated combustible vapour readings (>80 ppm) are characteristic of gasoline-type petroleum hydrocarbon F1-BTEX. Results of the vapour screening are shown on the individual test pit logs in Appendix D.

3.3.4 Soil Sampling Program

Background

Background soil samples were collected in the areas of Blacktop Creek and Station Creek (see Figures 2 and 3; Appendix A). Nine samples were collected and submitted for metals analysis. A summary of the analysis is provided in Table 3-1 below.

AEC D

Ten test pits were excavated using a backhoe to provide an assessment of the horizontal and vertical extent of petroleum hydrocarbon (PHC) impacts in the soil (see Figure 4; Appendix A). Three additional test pits were excavated at the top of the slope west of the Powerhouse for geotechnical purposes. Soil was excavated to permafrost, which ranged from 1.2 to 2.0 m below grade level (bgl). Excavation of one test pit was stopped due to water infiltration at 0.8 m bgl. Three hand excavations were advanced at the bottom of the slope, west of the Powerhouse, for geotechnical and delineation purposes. Excavation of all three was stopped due to water infiltration at a depth of 0.8 to 1.0 m bgl.

A total of 29 soil samples, plus four QA/QC samples, were collected and submitted to the laboratory for analysis. Table 3-1 provides a summary of the soil samples collected during the summer 2012 field program at the Eureka HAWS.

Delta

Nine test pits were excavated using a backhoe to provide an assessment of the horizontal and vertical extent of PHC impacts in the soil (see Figure 5; Appendix A). Soil was excavated to between 0.6 and 1.6 m bgl. Excavation of all test pits was stopped due to water infiltration. Thirteen soil samples, plus one QA/QC sample, were collected and submitted to the laboratory for analysis. A summary of analysis is provided in Table 3-1.

West of Station Creek

Four test pits were excavated using a backhoe to determine if there was any impact in the soil west of Station Creek (see Figure 5; Appendix A). Soil was excavated to 1.0 to 1.5 m bgl. One test pit was stopped due to water infiltration at 1.0 m bgl. Four soil samples, plus one QA/QC sample, were collected and submitted to the laboratory for analysis. A summary of analysis is provided in Table 3-1.

Borrow Source

Two hand auger soil samples were collected from two potential borrow source areas. One sample was collected from Upper Paradise area and the second was from the Blacktop Creek area. A summary of analysis is provided in Table 3-1.

Table 3-1: Summary of the soil samples collected at the Eureka HAWS

Sample Location		Analysis						
		PHC	PAH	Metals	Sieve	Hydro-meter	Moisture	Fraction-ation
Back-ground	BG-HA12-1			✓				
	BG-HA12-2			✓				
	BG-HA12-DUP1 (of BG-HA12-2)			✓	✓			
	BG-HA12-3			✓				
	BG-HA12-4			✓				
	BG-HA12-5			✓				
	BG-HA12-6			✓				
	BG-HA12-7			✓				
	BG-HA12-8			✓				
	BG-HA12-9			✓				
AEC D: Power-house	D1-TP12-1A	✓	✓	✓				
	D1-TP12-1B	✓	✓	✓				
	D1-TP12-2				✓			
	D1-TP12-2A	✓						
	D1-TP12-2B	✓						

Sample Location		Analysis						
		PHC	PAH	Metals	Sieve	Hydro-meter	Moisture	Fraction-ation
AEC D: Power-house	D1-TP12-3A	✓						
	D1-TP12-3B	✓						
	D1-TP12-4A	✓	✓	✓				
	D1-TP12-4B	✓	✓	✓				✓
	DUP 1 (of D1-TP12-4B)	✓	✓	✓				
	D1-TP12-5A	✓						
	D1-TP12-5B	✓						
AEC D: Power-house	D1-TP12-6	✓	✓	✓				✓
	DUP 2 (of D1-TP12-6)	✓	✓	✓				
	D1-TP12-7A	✓						
	D1-TP12-7B	✓						
	D1-TP12-8A	✓	✓	✓				
	D1-TP12-8B	✓	✓	✓				
	D1-TP12-9A	✓	✓	✓				
	D1-TP12-9B	✓	✓	✓				
	D1-TP12-10				✓			
	D1-TP12-10A	✓						
	D1-TP12-10B	✓						
	D1-TP12-Geo1	✓			✓	✓	✓	✓
	D1-TP12-Geo2				✓	✓	✓	
	D1-TP12-Geo3				✓	✓	✓	
	D1-HA12-1				✓	✓	✓	
	D1-HA12-1A	✓						
	D1-HA12-1B	✓	✓	✓				✓
	DUP 4 (of D1-HA12-1B)	✓	✓	✓				
	D1-HA12-2	✓			✓	✓	✓	
	DUP 5 (of D1-HA12-2)	✓						
	D1-HA12-3	✓			✓	✓	✓	
Delta	Delta-TP12-1A	✓	✓	✓				
	Delta-TP12-1B	✓	✓	✓				
	Delta-TP12-2	✓						
	Delta-TP12-3A	✓	✓	✓				
	Delta-TP12-3B	✓	✓	✓				
	DUP 3 (of Delta-TP12-3B)	✓						
	Delta-TP12-4	✓	✓	✓				
	Delta-TP12-5	✓						
	Delta-TP12-6	✓	✓	✓				
	Delta-TP12-7	✓						

Sample Location		Analysis						
		PHC	PAH	Metals	Sieve	Hydro-meter	Moisture	Fraction-ation
Delta	Delta-TP12-8A	✓	✓	✓				
	Delta-TP12-8B	✓	✓	✓				
	Delta-TP12-9A	✓						
	Delta-TP12-9B	✓						
Station Creek	SC-TP12-1	✓	✓	✓				
	SC-TP12-2	✓			✓			
	SC-TP12-3	✓	✓	✓				
Station Creek	DUP 6 (of SC-TP12-3)	✓						
	SC-TP12-4	✓						
Borrow Source	Borrow-1	✓	✓	✓	✓	✓	✓	
	Borrow-2	✓	✓	✓				

3.3.5 Changes in Scope – Soil Sampling

Background

Due to a safety risk caused by the presence of a wolf in one of the proposed sampling locations, only nine soil samples were collected instead of the proposed ten samples; however, background samples collected in previous investigations were used to build the background sampling data set.

AEC D

A total of 16 sample locations, two more than the proposed 14 locations, were excavated to assess the soil impacts and conduct geotechnical analysis. Additional samples were collected during the geotechnical investigation at the bottom of the slope west of the Powerhouse to delineate the impacts. Two additional duplicate samples were collected for PHCs, metals, and PAHs in AEC D.

Delta

A total of nine sample locations were excavated, one more than proposed; however, at five locations, only one sample, not two per test pit, was collected due to water infiltration. Thirteen of the proposed 16 samples were collected for PHCs and eight of the proposed ten PAH and metals samples were collected. As extra duplicate samples were collected from the more heavily impacted areas in AEC D, only one PHC duplicate sample was collected in the delta area.

West of Station Creek

No samples were proposed in the area west of Station Creek in the original sampling plan; therefore, all four samples plus one duplicate that were collected represent a change in scope.

Borrow Source

The sample collected from Upper Paradise was also submitted for geotechnical sampling (sieve, hydrometer, and moisture analysis) as it represented a new potential borrow source area that was not covered in the 2011 WorleyParsons geotechnical report provided by PWGSC.

3.4 Water Sampling Program

3.4.1 Infiltration Water Sampling

SENES/FRANZ personnel collected two infiltration water samples from test pits in the delta area where sheen on the water was observed. Infiltration water samples are identified on tables and figures with a 'W12' prefix. Infiltration water samples were collected by lowering a bucket into the test pit. A separate bucket was used for each sample.

3.4.2 Surface Water Sampling

Nine surface water samples were collected from background locations near Blacktop Creek and Station Creek (see Figures 2 and 3; Appendix A). Surface water samples are identified on tables and figures with a 'SW12' prefix. Table 3-2 provides a summary of the water samples collected during the summer 2012 field program at the Eureka HAWS.

Table 3-2: Summary of the water samples collected at the Eureka HAWS

Sample Location	Analysis	
	PHC F2-F4	Metals
BG-SW12-1		✓
BG-SW12-2		✓
BG-SW12-DUP1 (of BG-SW12-2)		✓
BG-SW12-3		✓
BG-SW12-4		✓
BG-SW12-5		✓
BG-SW12-6		✓
BG-SW12-7		✓
BG-SW12-8		✓
BG-SW12-9		✓
Delta-W12-1 (infiltration water of Delta-TP12-4)	✓	
Delta-W12-2 (infiltration water of Delta-TP12-5)	✓	

3.4.3 Change in Scope – Water Sampling

Background

Due to a safety risk caused by the presence of a wolf at a proposed sampling location, only nine water samples were collected, rather than the proposed ten samples; however, background samples collected in previous investigations were used to build the background sampling data set.

Delta

Two water samples for PHC F2 to F4 were added to the sampling program when a sheen was observed on the surface of infiltration water in the test pits.

3.5 Sediment Sampling

3.5.1 Sediment Sampling Program

During the 2012 investigation, sediment samples were collected from 12 locations. Three of the samples were collected from the area down slope of the Powerhouse (AEC D) near the drainage pond (see Figure 7; Appendix A). At these locations, the sediment was sampled at two depths. Nine samples were collected as part of the background sampling program at Blacktop Creek and Station Creek (see Figures 2 and 3; Appendix A). Sediment samples are identified on tables and figures with a 'SED12' prefix. Table 3-3 provides a summary of the sediment samples collected during the summer 2012 field program at the Eureka HAWS.

Table 3-3: Summary of the sediment samples collected at the Eureka HAWS

Sample Location	Analysis	
	PHC	Metals
BG-SED12-1		✓
BG-SED12-2		✓
BG-SED12-DUP1 (of BG-SED12-2)		✓
BG-SED12-3		✓
BG-SED12-4		✓
BG-SED12-5		✓
BG-SED12-6		✓
BG-SED12-7		✓
BG-SED12-8		✓
BG-SED12-9		✓
D1-SED12-1A	✓	
D1-SED12-1B	✓	
D1-SED12-2A	✓	
D1-SED12-2B	✓	
D1-SED12-DUP1 (of D1-SED12-2B)	✓	
D1-SED12-3A	✓	
D1-SED12-3B	✓	

3.5.2 Change in Scope – Sediment Sampling

Background

Due to a safety risk caused by the presence of a wolf in a proposed sampling location, only nine sediment samples were collected instead of the proposed ten samples; however, background

samples collected in previous investigations were used to build the background sampling data set.

Delta

There were no changes in the scope in the sediment sampling at AEC D.

3.6 Indoor Air and Sub-Slab Vapour

3.6.1 Indoor Air and Sub-Slab Vapour Program

Eight indoor air samples and one QA/QC 24 hour indoor air sample were collected from the operations and maintenance buildings at the Eureka HAWS (see Figure 6; Appendix A). One 20 minute sample was collected from the crawlspace under the Powerhouse. One sub-slab vapour sample was collected in the Old Garage. All 11 samples were submitted for BTEX and PHC F1-F2 analysis. A summary is provided in Table 3-4.

Table 3-4: Summary of the indoor air and sib-slab samples collected at the Eureka HAWS

Sample Location	Type of Sample	PHC F1/BTEX and F2
Old Garage 2012	24 hour	✓
Old Transient Barracks 2012	24 hour	✓
Building 17 2012 (Plumbing Shack)	24 hour	✓
Former Bunkhouse 2012	24 hour	✓
New Garage 2012	24 hour	✓
Powerhouse 2012	24 hour	✓
DUP 1 (of Powerhouse 2012)	24 hour	✓
Crawlspace 2012 (Powerhouse)	24 hour	✓
Water Tank 2012	24 hour	✓
Old Garage VP 2012	20 minute	✓
Crawlspace 2 2012 (Powerhouse)	20 minute	✓

3.6.2 Change in Scope – Indoor Air and Sub-Slab Vapour Sampling

One additional 24-hour indoor air sample was collected in the water tanks area of the Powerhouse/ New Garage building. A second sample, a 20-minute air sample, was collected beneath the Powerhouse to supplement the 24-hour air sample collected in the crawlspace. The sub-slab vapour samples were not collected as proposed in the New Garage, Former Bunkhouse, Building 17 (Plumbing Shack), and the Old Transient Barracks, as their floors were wood rather than concrete with a small air space between the floor and the soil beneath the building. Sub-slab vapour sampling was not appropriate for the wood floor as there is a potential for short circuiting issues due to breakthrough in the floor. Additionally, there is a potential

connection with the vapour probe to the outside air though infiltrations from the edges of the buildings.

3.6.3 Summary of Samples Submitted

The chemical analytical program for surface water, soil and sediment and the associated testing protocols is provided in Table 3-5.

Table 3-5: Summary of the 2012 Chemical Analytical Program

Total	Analysis						
	PHC	**PAH**	**Metals**	**Sieve**	**Hydrometer**	**Moisture**	**Fractionation**
Soil	49	25	35	10	7	7	4
Sediment	7	---	10	---	---	---	---
Surface Water	2	---	10	---	---	---	---
Indoor Air and Sub-slab Vapour	11	---	---	---	---	---	---

*Includes duplicate and background analyses

4.0 INVESTIGATION RESULTS

As discussed in Section 2.2, the following responses were developed to respond to data gaps identified prior to the 2012 supplemental investigation:

1. Background sampling in soil, sediment and surface water to establish background metals concentrations.
2. Delineation of soil impacts in AEC D.
3. Indoor air sampling to establish the level of vapour intrusion in the operation and maintenance buildings to update the risk assessment.
4. Assessment of soil quality adjacent to Former Fuel Storage Area, west of Station Creek, to assess whether contamination had migrated beyond Environment Canada site boundaries.
5. Update to the chemical data in AEC A.
6. Vertical delineation of sediment impacts in AEC D.
7. Soil sampling as part of Borrow Source Assessment.
8. Slope stability evaluation including the collection of geotechnical samples.

SENES/FRANZ responded to each data gap as noted identified above, with the exception of AEC A. Based on discussions with PWGSC and EC, risk management of AEC A is considered a separate issue and project.

4.1 Background Sampling Program

The 2010 Detailed Quantitative Risk Assessment (DQRA) report concluded that concentrations of metals in soil, sediment and surface water observed above EQGs are likely reflective of local conditions. Specifically, the DQRA results indicated that:

- For soil, aluminum, boron and chromium exceeded ecological risk targets;
- For sediment aluminum, barium and iron exceeded ecological risk targets, and;
- For surface water, a variety of metals (aluminum, barium, chromium, cobalt, copper, iron, lead, lithium, nickel, vanadium and zinc) exceeded risk targets, but only in samples collected from an active layer water seep downgradient of the Powerhouse – these are not considered representative of surface water conditions at the site.

The DQRA suggested while some metals exceeded ecological risk targets in soil, sediment and surface water, these are likely reflective of local conditions, as metal “impacts” were widespread but no anthropogenic source was apparent. This needed to be confirmed through rigorous statistical analysis and possibly a comprehensive background sampling program.

The background field program consisted of the collection of soil, surface water, and sediment samples from two different areas deemed not to be influenced by site activities, based on an

interview with the Eureka HAWS Station Manager (see Figures 2 and 3; Appendix A). Nine samples of each medium were collected and submitted for metals analysis (see Appendix D for the sample logs).

The purpose of the background sampling program was to collect sufficient number of samples to obtain a reliable representation of background conditions. By collecting additional samples, a more realistic average and maximum concentration of metals naturally occurring in soil, sediment, and surface water near the site could be calculated. The data collected as part of the background sampling program was in support of updating the site specific risk assessment and the calculation of site specific target levels. In this report, basic statistics such as the average and maximum concentrations for each metal parameter were calculated using the background data collected in 2009, 2010, and 2012. The calculation of background metal concentrations through more advanced statistical analysis will be included in the Remediation Planning and Remedial Action Plan – Feasibility Study as part of the establishment of remedial objectives.

4.1.1 Soil Chemistry

Nine background samples (BG-HA12-1 to BG-HA12-9) and one duplicate sample (BG-HA12-DUP1) were collected. Samples BG-HA12-1 to BG-HA12-4 and the duplicate sample were collected east of the HAWS in the vicinity of Blacktop Creek (see Photograph 1; Appendix C), approximately 25 km from the airstrip (see Figure 2; Appendix A). The samples were submitted for metals and the analytical results reported no metal parameters above the applicable guidelines (see Figure 8; Appendix A and Table B-1; Appendix B). Samples BG-HA12-5 to BG-HA12-9 were collected approximately 1.5 km north of the HAWS (see Figure 3; Appendix A and Photograph 2; Appendix C). Two samples, BG-HA12-5 and BG-HA12-7, contained arsenic concentrations above the CCME Environmental Quality Guidelines (EQGs) (see Figure 9; Appendix A and Table B-1; Appendix B). A summary of the metals parameters above applicable guidelines is provided in Table 4-1.

Table 4-1: Parameters above Guidelines – Metals in Background Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
BG-HA12-5	As	12	17	>1x
BG-HA12-7	As	12	13	>1x

1. CCME (2007), Update 7.0, Table 2. CSQG, Residential / Parkland Use, coarse-grained soils.

An average concentration and the range of concentration for each metal parameter were calculated using the analytical results from the 2009, 2010, and 2012 field programs. The average concentration for each metal parameter was below applicable guidelines (see Table B-1; Appendix B).

Table 4-2 below shows the minimum, maximum and average concentrations for background versus on-site concentrations for those metals identified in the DQRA to represent a potentially unacceptable ecological risk. From this table it can be qualitatively observed that the ranges and average concentrations of the background and on-site metals concentrations are very similar, and there is no significant difference between the sample populations. In fact for some parameters, e.g., aluminum, background concentrations appear to be higher than those observed on site.

Table 4-2 Summary of Background Versus On-Site Concentrations for Metals Exceeding Ecological Risk Thresholds in DQRA

Parameter	CCME Residential/Parkland Criteria	Background Concentrations (from 2009, 2010, 2012 sampling) (mg/kg)		On-Site Concentrations (as reported in 2010 DQRA) (mg/kg)	
		Min. - Max.	Average	Min. - Max.	Average
Aluminum	NC	1,700 – 18,000	7,618	2,600-5,400	3,981
Boron	NC	2.2 – 22	10.4	7 - 18	9.9
Chromium	64	4.4 - 23.1	14.2	6.0 – 36.4	14.0

Notes: NC = no criteria

4.1.2 Surface Water Chemistry

Nine surface water samples were collected as part of the background sampling plan. Five samples (BG-SW12-1 to BG-SW12-5) and one duplicate sample (BG-SW12-DUP1) were collected from Blacktop Creek (see Figure 2; Appendix A). Samples BG-SW12-6 to BG-SW12-9 were collected from Station Creek (see Figure 3; Appendix A). Table 4-3 summarizes the parameters in each sample that were above applicable guidelines. All analytical results are presented in Figures 8 and 9 (Appendix A) and Table B-6 (Appendix B).

Table 4-3: Parameters above Guidelines – Metals in Background Surface Water

Sample ID	Exceeding Parameter	EQG[1] (mg/L)	Concentration in SW (mg/L)	Concentration/ EQG
BG-SW12-1	Al	0.1	4.7	47x
	As	0.005	0.0067	>1x
	Cd	0.000018	0.00012	>6x
	Cu	0.002	0.02	10x
	Fe	0.3	15	50x
	Pb	0.001	0.0083	>8x
	Mn	0.050 (AO)	0.4	8x
	Ni	0.025	0.034	>1x
	Zn	0.03	0.16	>5x
BG-SW12-2 / BG-SW12-DUP1	Al	0.1	2.7	27
	Cd	0.000018	0.000093	>5x
	Cu	0.002	0.013	>6x
	Fe	0.3	5.4	18x

Sample ID	Exceeding Parameter	EQG[1] (mg/L)	Concentration in SW (mg/L)	Concentration/ EQG
BG-SW12-2 / BG-SW12-DUP1	Pb	0.001	0.0048	>4x
	Mn	0.050 (AO)	0.32	>6x
	Zn	0.03	0.15	5x
BG-SW12-3	Al	0.1	2.7	27x
	Cd	0.000018	0.00011	>6x
	Cu	0.002	0.014	7x
	Fe	0.3	5.4	18x
	Pb	0.001	0.0046	>4x
	Mn	0.050 (AO)	0.36	>7x
	Ni	0.025	0.029	>1x
	Zn	0.03	0.2	>6x
BG-SW12-4	Al	0.1	3.1	31x
	Cd	0.000018	0.00012	>6x
	Cu	0.002	0.014	7x
	Fe	0.3	6	20x
	Pb	0.001	0.0051	>5x
	Mn	0.050 (AO)	0.34	>6x
	Ni	0.025	0.027	>1x
	Zn	0.03	0.28	>9x
BG-SW12-5	Al	0.1	2.9	29x
	Cd	0.000018	0.00013	>7x
	Cu	0.002	0.015	>7x
	Fe	0.3	8	>26x
	Pb	0.001	0.0057	>5x
	Mn	0.050 (AO)	0.37	>7x
	Ni	0.025	0.029	>1x
	Zn	0.03	0.52	>17x
BG-SW12-6	Al	0.1	0.14	>1x
	Cd	0.000018	0.000073	>4x
	Fe	0.03	0.32	>10
	Se	0.001	0.0023	>2
	Zn	0.03	2.4	80x
BG-SW12-7	Al	0.1	0.19	>1x
	Fe	0.03	0.34	>11x
	Si	0.001	0.0023	>2
BG-SW12-8	Al	0.1	0.2	2x
	Fe	0.03	0.36	12x
	Si	0.001	0.0022	>2x
BG-SW12-9	Al	0.1	0.25	>2x
	Fe	0.03	0.43	>14
	Si	0.001	0.0023	>2x

1. *CCME (2007), Summary Table – CWQG,* for the protection of *FWAL. or CCME Summary Table for Health-Based and Aesthetic Guidelines (Table 4), 2006 Update for Canadian Drinking Water Quality.*
2. *AO = Aesthetic Objective*

An average concentration for each metal parameter was calculated using the analytical results from the 2009 and 2012 field programs. Nine parameters, summarized in Table 4-4, had average concentrations above the applicable guidelines.

Table 4-4: Parameters above Guidelines – Average and Maximum Concentration of Metals in Background Surface Water

Exceeding Parameter	EQG[1] (mg/L)	Average Concentration in SW (mg/L)	Average Concentration/ EQG	Maximum Concentration in SW (mg/L)	Maximum Concentration/ EQG
Al	0.1	1.74	>17x	4.7	47x
Cd	0.000018	0.000071	>3x	0.00013	>7x
Cu	0.002	0.00813	>4x	0.02	10x
Fe	0.3	4.09	>13x	15	50x
Pb	0.001	0.00293	>2x	0.0083	>8x
Mn	0.050 (AO)	0.185	>3x	0.4	8x
Se	0.001	0.0015	>1x	0.0023	>2x
Ag	0.0001	0.00011	>1x	0.0019	19x
Zn	0.03	0.3257	>10x	2.4	80x

1. *CCME (2007), Summary Table – CWQG,* for the protection of *FWAL. or CCME Summary Table for Health-Based and Aesthetic Guidelines (Table 4), 2006 Update for Canadian Drinking Water Quality.*
2. *AO = Aesthetic Objective*

These results confirm that background concentrations of most metals are naturally elevated in surface waters in the Eureka area.

4.1.3 Sediment Chemistry

Five sediment samples (BG-SED12-1 to BG-SED12-5) and one duplicate sample (BG-SED12-DUP1) were collected from the bottom of Blacktop Creek (see Figure 2; Appendix A). Samples BG-SED12-6 to BG-SED12-9 were collected from the bottom of Station Creek (see Figure 3; Appendix A). A summary of the analytical results is provided in Table B-8; Appendix B. The analytical results indicated that all samples collected contained arsenic above the applicable guidelines and one sample, BG-SED12-3, contained copper above guidelines (see Figures 8 and 9; Appendix A). Metals parameters above applicable guidelines are summarized in Table 4-5. Arsenic was determined to be naturally elevated at Eureka in the DQRA.

Table 4-5: Parameters above Guidelines – Metals in Background Sediment

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
BG-SED12-1	As	5.9	9.2	>1x
BG-SED12-2 / BG-SED12-DUP1	As	5.9	12	>1x

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
BG-SED12-3	As	5.9	11	>1x
	Cu	35.7	36	>1x
BG-SED12-4	As	12	8	>1x
BG-SED12-5	As	5.9	6.1	>1x
BG-SED12-6	As	5.9	9.4	>1x
BG-SED12-7	As	5.9	11	>1x
BG-SED12-8	As	5.9	10	>1x
BG-SED12-9	As	5.9	9.9	>1x

1. CCME, Table 1 - ISQG, 2002 Update.

Table 4-6 below shows the minimum, maximum and average concentrations for background versus on-site concentrations for those metals in sediment identified in the DQRA to represent a potentially unacceptable ecological risk. From this table it can be qualitatively observed that the ranges and average concentrations of the background and on-site metals concentrations in sediment are very similar. In fact, the background concentrations appear to be greater than the concentrations of thee same metals on site.

Table 4-6 Summary of Background Versus On-Site Concentrations for Metals in Sediment Exceeding Ecological Risk Thresholds in DQRA

Parameter	CCME ISQG/PEL	Background Concentrations (from 2009, 2010, 2012 sampling) (mg/kg)		On-Site Concentrations (as reported in 2010 DQRA) (mg/kg)	
		Min. - Max.	Average	Min. - Max.	Average
Aluminum	NC/NC	4,800-13,000	7,790	1,600-7,100	4,175
Barium	NC/NC	33-67	45.3	13-57.6	35.1
Iron	NC/NC	16,000-34,000	23,700	9,300-26,000	20,325

1. Notes: NC = no criteria

4.2 AEC D: Powerhouse

Contamination around AEC D near Building #17 (Plumbing Shack) was not fully delineated during the 2010 field program. The 2010 DQRA report indicated that there was a potentially unacceptable risk to the operations and maintenance worker due to the inhalation of contaminated vapours. Sediment samples collected from the Drainage Pond, down slope west of the Powerhouse in previous field investigations, indicated that there were impacts; however, only sediments from the upper layer had been collected. The 2012 field program included the collection of soil, sediment, indoor air, and sub-slab vapour samples to address the data gaps.

Geotechnical information regarding the stability of the slope west of the Powerhouse leading towards the drainage pond would be required for the preparation of the RAP. Six geotechnical soil samples were collected in the area surrounding the slope in AEC D.

4.2.1 Soil Chemistry

There were a total of 16 sample locations in AEC D (see Figure 4; Appendix A). Thirteen locations were excavated using a backhoe and the remaining three were hand excavations. The three hand excavations were conducted at the bottom of the slope, west of the Powerhouse, as the area was not accessible to the backhoe. Samples were collected at two depths, subject to field conditions. The upper layer sample was given an "A" designation while the bottom layer sample was given a "B" designation in the sample name. The analytical results are summarized in Tables B-2 to B-5 (Appendix B) and in the sections below.

Metals

The analytical results and spatial distribution of the metals in soil collected from AEC D are presented in Table B-2 (Appendix B) and on Figure 4 (Appendix A). Ten samples, plus three duplicates samples, were submitted for metals analysis from AEC D.

Four samples contained concentrations of arsenic above the CCME EQGs of 12 mg/kg. All other metal concentrations were below guidelines. Table 4-7 and Figure 10 (Appendix A) summarizes the locations were arsenic was above guidelines.

Table 4-7: AEC D Parameters above Guidelines – Metals in Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
D1-TP12-1A	As	12	13	>1x
D1-TP12-8A	As	12	15	>1x
D1-TP12-9A	As	12	13	>1x
D1-HA12-1A / DUP 4	As	12	13	>1x

1. CCME (2007), Update 7.0, Table 2. CSQG, Residential / Parkland Use, coarse-grained soils.

Petroleum Hydrocarbons/PAH

The analytical results and spatial distribution of the PHCs and PAHs in soil collected from AEC D are presented in Table B-3 (Appendix B) and on Figure 10 (Appendix A). Field screening of the soil samples exhibited a range of vapour concentrations of 0 – 120 ppm.

Twenty-four soil samples and four duplicate samples were collected in AEC D and analysed for PHC F1-F4 and BTEX. Of the twenty-four PHC sample locations, ten locations and three of the

four duplicates were also sampled for PAHs. A summary of the locations where there were parameters above applicable guidelines is provided in Table 4-8 and Figure 10 (Appendix A).

Table 4-8: AEC D Parameters above Guidelines – PHCs and PAHs in Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
D1-TP12-1A	Naphthalene	0.013	0.053	>4x
D1-TP12-1B	F2	150	1100	>7x
	Naphthalene	0.013	0.08	>6x
D1-TP12-4A	F2	150	640	>4x
	Naphthalene	0.013	0.028	>2x
D1-TP12-4B / DUP-1	Ethylbenzene	0.082	0.12	>1x
	F1	30	330	11x
	F2	150	4700	>31x
	Naphthalene	0.013	0.29	>22x
	Phenanthrene	0.046	0.15	>3x
D1-TP12-5A	F2	150	1400	>9x
	F3	300	360	>1x
D1-TP12-5A	Ethylbenzene	0.082	0.6	>7x
	F1	30	220	>7x
	F2	150	5000	>33x
D1-TP12-6 / DUP-2	Ethylbenzene	0.082	1.5	>18x
	Xylenes	11	13	>1x
	F1	30	630	21x
	F2	150	7300	>48x
	F3	300	580	>2x
	Acenaphthene	0.28	0.43	>1x
	Naphthalene	0.013	4.8	>369x
	Phenanthrene	0.046	0.53	>11x
D1-TP12-8A	Naphthalene	0.013	0.02	>1x
	Phenanthrene	0.046	0.054	>1x
D1-TP12-8B	Benzene	0.03	0.088	>2x
	Ethylbenzene	0.082	1.5	>18x
	F1	30	330	11x
	F2	150	2800	>18x
	F3	300	2300	>7x
	Naphthalene	0.013	9.5	>780x
	Phenanthrene	0.046	0.43	>9x
D1-TP12-9A	F1	30	350	>11x
	F2	150	6800	>45x
	F3	300	780	>2x
	Naphthalene	0.013	0.39	30x
	Phenanthrene	0.046	0.33	>7x

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
D1-TP12-9B	F1	30	590	>19x
	F2	150	4700	>31x
	F3	300	360	>2x
	Naphthalene	0.013	1	>76x
	Phenanthrene	0.046	0.5	>10x
D1-TP12-10A	F1	30	160	>5x
	F2	150	7700	>51x
	F3	300	1200	4x
D1-TP12-10B	F1	30	89	>2x
	F2	150	5200	>34x
	F3	300	780	>2x
D1-TP12-Geo1	Ethylbenzene	0.082	0.28	>3x
	F1	30	780	26x
	F2	150	5900	>39x
D1-HA12-1A	Toluene	0.37	0.48	>1x
	Ethylbenzene	0.082	1.1	>13x
	F1	30	4400	>146x
	F2	150	40000	>266x
	F3	300	1800	6x
D1-HA12-1B / DUP-4	Benzene	0.03	0.17	>5x
	Toluene	0.37	6.5	>17x
	Ethylbenzene	0.082	9.3	>113x
	Xylene	11	73	>6x
	F1	30	3500	>116x
	F2	150	19000	>126x
	F3	300	670	>2x
	Naphthalene	0.013	45	>3461x
	Phenanthrene	0.046	0.77	>16x
D1-HA12-2 / DUP-5	Benzene	0.03	0.36	12x
	Toluene	0.37	3.2	>8x
	Ethylbenzene	0.082	4.8	>58x
	Xylene	11	29	>2x
	F1	30	1500	50x
	F2	150	12000	80x
	F3	300	900	3x
D1-HA12-3	F1	30	73	>2x
	F2	150	1400	>9x

1. *CCME (2007), CSQG, Table 2. Residential/Parkland land use, coarse-grained soils for BTEX and PAHs. CCME (2008) CWS Table 1, Tier 1, Residential/Parkland land use, coarse-grained surface soil for F1-F4: Protection of Eco Soil Contact from Table 3 - Technical Supplement.*

Four samples, D1-TP12-4B, D1-TP12-6, D1-TP12-Geo1, and D1-HA12-1B were submitted for PHC Fractionation analysis and the results are presented in Table B-4; Appendix B. The average PHC fractions by weight were calculated using the soil fractionation results and are summarized in Table 4-9 below.

Table 4-9: Caluculated Composition of PHC Fractions by Mass

TPH Sub-Fractions	F1	F2	F3	F4
Aliphatics				
C6-68	0.05			
>C8-C10	0.83			
>C10-C12		0.33		
>C12-C16		0.39		
>C16-C21			0.53	
>C21-C34			0.05	
>C34				0.40
Aromatics				
>C7-C8				
>C8-C10	0.12			
>C10-C12		0.12		
>C12-C16		0.15		
>C16-C21			0.30	
>C21-C34			0.12	
>C34				0.60
TOTAL	**1**	**1**	**1**	**1**

4.2.2 Soil Physical Properties

Six samples near the slope west of the Powerhouse were collected for geotechnical analysis to determine the physical properties of the soil. Three locations (D1-TP12-Geo1 to D1-TP12-Geo3) were excavated with a backhoe at the top of the slope, adjacent to the Powerhouse. The three remaining samples (D1-HA12-1 to D1-HA12-3) were excavated by hand at the bottom of the slope, near the drainage pond (see Photograph 3 and 4; Appendix C). Samples were collected for analysis of soil texture by hydrometer, texture class, and moisture. The results are summarized in Table B-5; Appendix B. One sample from the top of the slope and two at the bottom of the slope were classified as fine grain soils. The other three samples were considered coarse grain.

4.2.3 Sediment Chemistry

Six sediment samples and one duplicate were collected from three locations along the east edge of the drainage pond, west of the Powerhouse (see Figure 7; Appendix A). The samples were collected from two depths at each location. The upper layer sample was given an “A” designation while the bottom layer sample was given a “B” designation in the sample name. The seven samples were submitted for PHC analysis. The analytical results are provided in Table B-9; Appendix B. There are no CCME guidelines for BTEX and PHC F1-F4 for sediment. In 2009, two background sediment samples were collected and analyzed for PHCs. All parameters in the background samples were below the detection limit. All six samples collected from the drainage pound contained at least one parameter above the established background levels (see Photograph 5; Appendix C).

4.2.4 Air and Vapour Chemistry

Eight 24-hour air samples, including one duplicate sample, were collected from inside the operation and maintenance buildings at the Eureka HAWS (see Figure 6; Appendix A). One 24-hour sample and one 20-minute sample were collected in the crawlspace beneath the Powerhouse. In the Old Garage, one 20 minute sample was collected from the air space beneath the floor slab (see Photographs 6 to 9; Appendix C). All samples were analyzed for BTEX and PHC F1 and F2. The results are summarized in Figure 12 (Appendix A) and Table B-10 (Appendix B).

Six of eight 24-hour indoor air samples (including one duplicate) had concentrations above the applicable guidelines. The parameters above guidelines are summarized in Table 4-10.

Table 4-10: Indoor Air Samples with Concentrations above Guidelines

Parameter		Guideline	Old Garage 2012	Building 17 2012	Former Bunkhouse 2012	New Garage 2012	Powerhouse 2012	DUP 1 (from Powerhouse)
BTEX µg/m^3	Benzene	3	<1.2	3.7	<1.2	9.2	1.4	1.4
	Total Xylenes	36	37.2	18.6	<2.2	148	34.5	31.5
PHCs µg/m^3	F2 - C10-C16 (as Decane)	391	483	1090	727	1020	406	408

The Old Garage is used for winter storage of ATVs, snow sampling equipment, and contains a work bench with tools. There is also a pressure washer with an electric compressor, and a small portable diesel air compressor. Chemicals observed in the main area of the garage where the sampling occurred included epoxy solvent, curing compound, WD40, paint thinner, paint, wood stain, wood preserver, turbine oil, hydraulic oil and varathane. During the pre-sampling inspection, numerous cracks were observed in the concrete foundation.

Building #17 (Plumbing Shack) had a wood floor with a small space between the soil and bottom of the floor. Gaps were noted between the wood planks of the floor. Building # 17 (Plumbing Shack) is primarily a storage building, and was occupied with tires and miscellaneous plumbing parts. Building # 17 (Plumbing Shack) is also where the former water tank was located. During the 2012 field program, a pre-demolition survey was conducted at Building # 17 (Plumbing Shack) by another consultant.

The Former Bunkhouse contained beds, dry food supplies, a fridge, and tables and chairs. The foundation was wood overlain with carpet. The pre-sampling inspection did not identify any potentially compounding factors within the building.

The New Garage has a slab on grade concrete floor. Due to the construction of a thermosyphon system within the slab, SENES/FRANZ was not able to install a sub-slab sample. During the pre-sample inspection of the garage, SENES/FRANZ noted several containers of chemicals (coolant, antifreeze, motor oil, varsol, hydraulic oil) that might interfere with the sample. Vehicle maintenance does occur in the New Garage; however, none was conducted during the sample collection.

The Powerhouse contains the power generating equipment for the Eureka HAWS, including three diesel powered generators, and two 1100 L diesel fuel aboveground fuel storage tanks (AST). During the pre-sampling inspection two 250 L drums of motor oil and four 250 l drums labelled 15W40 were noted inside the Powerhouse. The Powerhouse has a concrete foundation with a crawlspace beneath the building.

Two samples, one 24-hour and one 20-minute, were collected from the crawlspace beneath the Powerhouse. Both contained concentrations below reference thresholds.

The attenuated results of the sub-slab vapour sample collected from the Old Garage contained concentrations of PHC F1 and F2 above guidelines (see Table 4-11).

Table 4-11: Sub-Slab Vapour Concentrations above Guidelines

Parameter		Guideline	Old Garage VP 2012
PHCs µg/m^3	F1-BTEX - C6-C10 (as Toluene)	848	1678
	F2 - C10-C16 (as Decane)	391	480

4.3 Delta

Contamination around the delta area south of AEC D was not fully delineated during the 2010 field program. The 2012 field program included the collection of soil samples in the delta area to address the data gaps. The delta is considered the flat area south of Building # 17 (Plumbing Shack) and north of the fjord.

4.3.1 Soil Chemistry

The nine sampling locations in the delta area were excavated using a backhoe (see Figure 5; Appendix A and Photographs 10 and 11; Appendix C). Four of the test pits were sampled at two depths. The upper layer sample was given an “A” designation while the bottom layer sample was given a “B” designation in the sample name. The remaining five locations could only be sampled at one depth due to water infiltration into the test pit. The analytical results are summarized in Tables B-2 and B-3 (Appendix B) and in the sections below.

Metals

The analytical results and spatial distribution of the metals in soil collected from the delta area are presented in Table B-2 (Appendix B) and on Figure 11 (Appendix A). Eight samples were submitted for metals analysis from the delta area.

Three samples contained concentrations of arsenic above the EQG of 12 mg/kg. All other metal concentrations were below guidelines. Table 4-12 and Figure 11 (Appendix A) summarize the locations were arsenic was above guidelines. It should be noted that the background arsenic concentrations also exceeded the EQG; therefore, these results are not considered significant.

Table 4-12: Delta Parameters above Guidelines – Metals in Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
Delta-TP12-1A	As	12	14	>1x
Delta-TP12-8A	As	12	21	>1x
Delta-TP12-8B	As	12	14	>1x

1. CCME (2007), Update 7.0, Table 2. CSQG, Residential / Parkland Use, coarse-grained soils.

Petroleum Hydrocarbons/PAHs

The analytical results and spatial distribution of the PHCs and PAHs in soil collected from the delta area are presented in Table B-3 (Appendix B) and on Figure 11 (Appendix A). Field screening of the soil samples exhibited a range of vapour concentrations from 0 –370 ppm.

Thirteen soil samples and one duplicate sample were collected in the delta area and analysed for PHC F1-F4 and BTEX. Of the 13 PHC sample locations, eight locations were also sampled for PAHs. A summary of the locations where there were PHC and PAH parameters above applicable guidelines are provided in Table 4-13 and Figure 11 (Appendix A).

Table 4-13: Delta Parameters above Guidelines – PHCs and PAHs in Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
Delta-TP12-1A	F1	30	1000	>33x
	F3	150	5900	>39x
	Naphthalene	0.013	0.47	>36x
	Phenanthrene	0.046	0.2	>4x
Delta-TP12-1B	F2	150	820	>5x
	Naphthalene	0.013	0.17	>13x
	Phenanthrene	0.046	0.14	>3x
Delta-TP12-2	Benzene	0.03	8.7	290x
Delta-TP12-3A	Toluene	0.37	1	>2x
	F1	30	630	21x
	F2	150	5600	>37x

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
Delta-TP12-3A	F3	300	1500	5x
	Naphthalene	0.013	3.9	300x
	Phenanthrene	0.046	0.55	>11x
Delta-TP12-3B / DUP 3	Benzene	0.03	0.96	32x
	Ethylbenzene	0.082	0.2	>2x
	F1	30	79	>2x
	F2	150	590	>3x
	Naphthalene	0.013	0.51	>39x
	Phenanthrene	0.046	0.13	>2x
Delta-TP12-4	Naphthalene	0.013	0.25	>19x
D1-TP12-6	Naphthalene	0.013	0.023	>1x
Delta-TP12-8B	Naphthalene	0.013	0.021	>1x
	Phenanthrene	0.046	0.047	>1x

1. *CCME (2007), CSQG, Table 2. Residential/Parkland land use, coarse-grained soils for BTEX and PAHs. CCME (2008) CWS Table 1, Tier 1, Residential/Parkland land use, coarse-grained surface soil for F1-F4: Protection of Eco Soil Contact from Table 3 - Technical Supplement.*

4.3.2 Infiltration Water Chemistry

Two infiltration water samples were collected in the delta area from two test pits (Delta-TP12-4 and Delta-TP12-5) where sheen was observed on the pooled infiltration water. The samples were submitted for PHC F2-F4 analysis. The analytical results for both samples indicated that all parameters were below the instrument detection limit, and therefore, below applicable guidelines for surface water. The analytical results are summarized in Table B-7; Appendix B.

4.4 Station Creek

Station Creek area is located west of Eureka HAWS, over the bridge along the west side of Station Creek. The area investigated included north of the road into Eureka HAWS and south to the fjord. The area west of Station Creek was included to confirm no off-site impacts from the Powerhouse area to the east and that there were no impacts from the former Fuel Handing Area located west of Station Creek near the fjord.

4.4.1 Soil Chemistry

There were four sampling locations in the Station Creek area and all were excavated using a backhoe (see Figure 5; Appendix A and Photographs 13 and 14; Appendix C). The analytical results are summarized in Tables B-2 and B-3 (Appendix B) and in the sections below.

Metals

The analytical results and spatial distribution of the metals in soil collected from the Station Creek area are presented in Table B-2 (Appendix B) and on Figure 11 (Appendix A). Two samples were submitted for metals analysis. All metal parameters were below guidelines.

Petroleum Hydrocarbons/PAH

The analytical results and spatial distribution of the PHCs and PAHs in soil collected from the Station Creek area are presented in Table B-3 (Appendix B) and on Figure 11 (Appendix A). Field screening of the soil samples exhibited a range of vapour concentrations of 30 to 55 ppm.

Four soil samples and one duplicate sample were collected in Station Creek area and analysed for PHC F1-F4 and BTEX. Of the four PHC sample locations, two locations were also sampled for PAHs. All PHC results were below applicable guidelines. The two PAH samples had parameters above guidelines. A summary of the locations where there were parameters above applicable guidelines is provided in Table 4-14 and Figure 11 (Appendix A).

Table 4-14: Station Creek Area Parameters above Guidelines –PAHs in Soil

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
SC-TP12-1	Naphthalene	0.013	0.025	>1x
	Phenanthrene	0.046	0.057	>1x
SC-TP12-3	Naphthalene	0.013	0.11	>8x
	Phenanthrene	0.046	0.16	>3x

1. *CCME (2007), CSQG, Table 2. Residential/Parkland land use, coarse-grained soils for BTEX and PAHs. CCME (2008) CWS Table 1, Tier 1, Residential/Parkland land use, coarse-grained surface soil for F1-F4: Protection of Eco Soil Contact from Table 3 - Technical Supplement.*

The EQGs for the ecological effects of PAHs were selected using the protection of freshwater aquatic life pathway, which tends to be lower than other pathways including human health and environmental protection. The protection of freshwater aquatic life pathway is not reflected in the overall CCME soil quality guidelines, with the exceptions of naphthalene and phenanthrene, and is generally only included on a site specific basis. Based on the proximity to of the sampling locations to surface water, either the drainage pond or the fjord, the protection of freshwater aquatic life pathway cannot be discounted at the site, and as a result, SENES/ FRANZ has considered it as a conservative approach.

Nevertheless, given that a complete pathway for the transport of PAHs to surface water via groundwater is not anticipated at the site given the presence of permafrost and a brief period where active layer water may be present, SENES/FRANZ does not expect these relatively low exceedances to pose a threat to adjacent freshwater. No further action is recommended in this respect.

Grain Size

One sample, SC-TP12-2, was submitted to grain size analysis (see Table B-5; Appendix B). The soil in the area west of Station Creek was coarse grain.

4.5 Borrow Source Assessment

In case excavation of impacted material is part of the RAP, the identification of a suitable potential borrow source was required. Two samples, Borrow-1 and Borrow-2, were collected to determine if the potential borrow sources areas had any chemicals of concern above applicable guidelines. Samples were submitted for metals, PHCs, and PAH analysis. Analytical results are summarized in Tables B-2 and B-3; Appendix B.

Borrow-1 was collected from a newly identified borrow source area near Upper Paradise (see Photograph 14; Appendix C). Since this area was not part of the 2011 WorleyParsons geotechnical report, geotechnical samples were also collected and analyzed (i.e., grain size, texture by hydrometer, texture class, and moisture). Geotechnical results are in Table B-5; Appendix B. Borrow-1 did not have any chemical parameters above applicable guidelines.

Borrow-2 was collected from the Blacktop Creek potential borrow source (see Photograph 15; Appendix C) and it had only one parameter above guidelines, arsenic. This is consistent with background levels identified at the site. Table 4-15 provides a summary of the parameter above guidelines.

Table 4-15: Parameters above Guidelines – Metals in Borrow Source

Sample ID	Exceeding Parameter	EQG[1] (mg/kg)	Concentration in soil (mg/kg)	Concentration/ EQG
Borrow-2	As	12	16	>1x

1. CCME (2007), Update 7.0, Table 2. CSQG, Residential / Parkland Use, coarse-grained soils.

4.6 Quality Assurance/Quality Control Results

Duplicate relative percent differences (RPDs) are calculated in Tables B-1 to B-3 and B-6 to B-10; Appendix B. In general, the results were found to be satisfactory or within control limits outlined by the program with the exception of the following anomalies.

Soil

Duplicate soil samples were collected from seven locations at the site and were submitted for the following analysis:

- Metals analysis – 4 samples;
- PHC analysis – 6 samples; and
- PAH analysis – 3 samples.

For metals, when comparing the duplicate sample against the primary sample, all parameters were within the control limits. Five of the six duplicate samples had several quality control results outside control limits for BTEX, PHC, and PAH parameters. In two instances of unacceptable results, when comparing the results of the duplicate pairs, one sample was above the EQG while the other one was below.

- D1-TP12-4B and DUP1: Benzene was above in DUP1 but below the EQG in D1-TP12-4B; and
- Delta-TP12-3B and DUP3: Ethylbenzene was above in Delta-TP12-3B but below in DUP3.

Large RPD numbers are often a result of low concentrations being measured and variation between samples is likely due to heterogeneity of the substrate. Due to the volatile nature of the PHC and PAH parameters being sampled, complete homogenization of the sample was not feasible. Attempts were alternating the placement small amounts of sample into the jars; however, this does not guarantee equal allocation of sample. Additionally, for all samples, the relatively small amounts of sample required for the analysis method used and possibly some heterogeneity in the samples, despite efforts to homogenize them, may contribute to variability in duplicate analyses.

Surface Water

One surface water duplicate sample was collected and analyzed for metals and the results were within the control limits.

Sediment

Two duplicate sediment samples were collected. One was analyzed for metals and the second for PHCs. The results were within the control limits.

5.0 DISCUSSION OF RESULTS

SENES/FRANZ conducted monitoring activities at the Eureka High Arctic Weather Station (HAWS) in Eureka, Nunavut to update and confirm the current environmental conditions in support of the Remedial Action Plan (RAP), at the following locations:

- AEC D: Powerhouse;
- Delta Area (south of AEC D);
- Background; and
- West of Station Creek.

The field investigation included 26 test pit excavations, 13 hand auger holes for soil sampling, 9 surface water samples and 12 sediment samples. The field program was completed from August 12 to August 20, 2012. The Contaminants of Concern (COCs) were petroleum hydrocarbons (PHC) as measured by PHC fraction F1 to F4, benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), and total metals. The results of the supplemental field investigations are discussed below. The data collected during the 2012 field program will be incorporated into the Remedial Action Plan (RAP) being prepared for the Eureka HAWS.

5.1 Background

The purpose of the background sampling program was to collect sufficient number of samples to obtain a reliable representation of background conditions. By collecting additional samples, a more realistic average and maximum concentration of metals naturally occurring in soil, sediment, and surface water near the site could be calculated. The data collected as part of the background sampling program was in support of updating the site specific risk assessment and the calculation of site specific target levels. In this report, the average and maximum concentrations for each metal parameter were calculated using the background data collected in 2009, 2010, and 2012. The calculation of representative background metal concentrations through more advanced statistical analysis will be included in the Remediation Planning and Remedial Action Plan – Feasibility Study as part of the establishment of remedial objectives.

The soil analytical results indicate that the average metal concentrations are below the EQG. Two samples from 2012 did have arsenic concentrations above EQGs. Both samples were collected north of Eureka HAWS around the Station Creek area. This indicates that there is some variability in the concentration of arsenic in the background soil, including natural levels above EQG.

As the concentrations of metals in the background soil samples were quite variable, even for the same element, SENES/FRANZ reviewed a document entitled “Till Geochemistry on the Borden

and Brodeur Peninsulas of Baffin and Devon Island" (NRCan, 2000). While the samples were not collected on Ellesmere Island, it was the closest available geochemical study to the site. The study involved the collection till samples at depths ranging from 20 to 30 cm bgl on Baffin and Devon Island. The soil samples were submitted for various metal analyses to determine background levels for the Baffin and Devon Islands. To determine if the range in metals concentration from the background at Eureka was typical of arctic environments, SENES/FRANZ calculated the average concentration along with the minimum and maximum concentration for each element (Table 5-1). Based on a review of the results, which consisted of a sample size of 225 samples, the range of concentrations is similar to those exhibited in the Eureka HAWS background sampling program (see Table B-1; Appendix B).

Table 5-1: Average and Range of Background Metals on Devon Island (mg/kg)

Element	Average Concentration	Minimum Concentration	Maximum Concentration
Aluminum (Al)	33608	12800	64900
Antimony (Sb)	5.0	<5	11
Arsenic (As)	11.8	<5	81
Barium (Ba)	152.8	38	625
Bismuth (Bi)	5.0	<5	7
Cadmium (Cd)	0.32	<0.2	6.4
Calcium (Ca)	30115	<100	100000
Chromium (Cr)	57.3	22	339
Cobalt (Co)	17.9	6	30
Copper (Cu)	37.3	10	203
Iron (Fe)	55770	20900	100000
Lead (Pb)	20.7	2	158
Magnesium (Mg)	16908	2300	67500
Manganese (Mn)	424.9	104	2083
Molybdenum (Mo)	3.0	<1	42
Nickel (Ni)	58.4	21	193
Potassium (K)	6999	2600	12400
Silver (Ag)	0.2	<0.2	0.7
Sodium (Na)	5944	2500	12800
Strontium (Sr)	63.1	9	511
Tin (Sn)	<20	<20	<20
Thallium (Tl)	293	<100	2300
Vanadium (V)	68.4	26	491
Zinc (Zn)	153.4	38	3087

As arsenic is the only metal above soil EQGs at the site SENES/FRANZ reviewed the available information regarding arsenic in the north. The CCME factsheet for arsenic states "Data from recent surveys undertaken by the Geological Survey of Canada demonstrate that the "natural background" concentrations of arsenic in surficial media such as glacial tills (the substrate on which most Canadian soils are developed) span several orders of magnitude, reflecting

changes in the bedrock geology and the effects of glacial erosion of bedrock debris. Concentrations of arsenic in glacial till samples from a number of Canadian sites range from 1 to 6590 mg/kg. In areas of arsenic-enriched bedrock, background concentrations can be significantly elevated." Arsenic in the soil on Devon Island ranged from below the laboratory detection limit of 5 mg/kg to 81 mg/kg. The maximum concentration from the 2012 Supplemental Investigation at Eureka was 21 mg/kg, which is within the range of arsenic concentrations found in pristine arctic environments (i.e., Devon Island).

The results of the background surface water samples collected from Blacktop Creek indicate that concentrations of aluminum, cadmium, copper, lead, iron, manganese, and zinc were above the EQGs in all five samples collected. Nickel was above the EQG in four of the five samples, and arsenic in one of the five samples. From Station Creek, all four samples collected reported concentrations of aluminum, selenium, and iron that were above the EQGs and one sample had cadmium and zinc above the guidelines. The average (from 2009 to 2012) concentrations were above EQGs for aluminum, cadmium, copper, iron, lead, manganese, selenium, silver, and zinc, indicating that elevated concentrations of these elements in surface water are likely due to naturally occurring conditions at the site and not a result of human activity.

All nine background sediment samples collected (five from Blacktop Creek and four from Station Creek) had arsenic concentrations above the EQG. One sample collected from Blacktop Creek contained copper above the guideline. The average concentration of arsenic was also above the EQGs indicating that elevated arsenic concentration in the sediment is likely due to naturally occurring conditions and not a result of human activity.

5.2 Powerhouse and Delta

The results of the soil samples collected west of the Powerhouse, at the top and bottom of the slope to the drainage pond, indicate that toluene, ethylbenzene, PHC F1 to F3, 2-methylnaphthalene, naphthalene, and phenanthrene are contaminants of concern with concentrations above the EQGs. Arsenic was also above the guideline in the metals sample collected at the bottom of the slope. While there are no guidelines for PHC in sediment, the sediment samples collected down slope of the Powerhouse had concentrations that were above the background concentrations established in 2009 for BTEX and PHC F1 to F3.

Southeast of the Powerhouse, in the direction of Building # 17 (Plumbing Shack) and the Former Bunkhouse, arsenic, BTEX and PHC F1 to F3, 2-methylnaphthalene, naphthalene, and phenanthrene were above soil guidelines. Where soil samples were collected from multiple depths, the concentrations of the contaminants were above guidelines at both depths in this area. Two samples collected in between the Powerhouse and Building # 17, near the fuel

pipeline, had BTEX and PHC concentrations below the EQGs, indicating horizontal delineation along the west side of the impacted area near Building # 17 (Plumbing Shack).

Test pits excavated to the southeast of Building # 17 (Plumbing Shack) and the Former Bunkhouse did contain concentrations of benzene, ethylbenzene, PHC F1 to F3, 2-methylnaphthalene, naphthalene, and phenanthrene above EQGs. Additional sampling within the delta area south of AEC D had concentrations above EQGs for benzene, ethylbenzene, PHC F1 and F2, 2-methylnaphthalene, naphthalene, and phenanthrene. The test pits in this area were stopped at shallower depths than planned due to water infiltration. Test pits south and southwest of Building # 17 (Plumbing Shack) and into the delta area indicated BTEX and PHC concentrations below EQGs; however, there was arsenic and naphthalene reported above the guidelines.

Two soil samples were collected south of the drinking water reservoir and west of the drainage pond. BTEX and PHC concentrations were reported below EQGs; however, there were concentrations of arsenic, naphthalene, and phenanthrene above the guidelines.

Air samples collected from the breathing zone of the operations and maintenance buildings were compared the Health Canada Tolerable Concentration adapted to reflect a 1 in 100,000 chance (deemed “essentially negligible” by Health Canada) of increased cancer risk. The PHC F1 and F2 concentrations were compared to the site specific concentrations calculated using the reference concentrations and the soil fractionation. Reference concentrations were reduced by half to account for potential exposure by pathways other than air inhalation, in accordance with standard practice.

An indoor air sample collected from the Old Garage had concentrations of xylenes and PHC F2 above the guidelines. A sub-slab sample was also collected from the Old Garage, which exhibited concentrations of PHC F1 and F2 above guidelines. As xylenes were not an issue in the sub-slab sample, confounding factors inside the Old Garage are mostly likely the cause of the xylenes. The PHC F1 concentration in the sub-slab sample was not detected at a similar level in the indoor air, despite application of the attenuation factor of 0.02; however, the attenuated PHC F2 concentration in the sub-slab air was similar to the measured concentration of F2 in the indoor air (480 µg/m^3 to 483 µg/m^3, respectively). Based on this apparent relationship, impacted soil may be a contributor to the elevated levels of PHC F2 in indoor air in the Old Garage. Storage of ATVs may, however, be a more likely reason for the elevated concentrations of F2 observed. Accumulated spillage of fuel during winter storage could cause interference in the analytical results, even when ATVs are absent in the summer. The results of the indoor air and sub-slab vapour results will be used to update the site-specific risk assessment.

Benzene was not detected above the laboratory detection limits in any of the test pits near Building # 17 (Plumbing Shack) indicating that the exceedance of benzene in the indoor air in Building # 17 (Plumbing Shack) is most likely not caused by soil vapour intrusion. The guideline value for benzene is low, and the concentrations under discussion are quite close to both the guideline and the detection limit. Even a very minor influence of a confounding factor, particularly emissions from vehicle exhaust (a common source of benzene in air) could elevate benzene concentrations to the levels observed in Building # 17 (Plumbing Shack).

Building # 17 (Plumbing Shack) and the Former Bunkhouse are both fully within the PHC impacted area of the Delta and both have wood foundations with a small crawlspace. The vapour intrusion from the PHC impacted soil cannot be discounted; however, during the collection of the 24-hour samples, preparation for the sealift was underway and heavy equipment was operating in the vicinity of these buildings. This may have influenced the PHC F2 concentrations in the samples.

The concentrations of PHC F2 above guidelines in the Powerhouse are most likely due to the presence of confounding factors such as drums of fuel, diesel ASTs, and the diesel generators. The air samples collected from the crawlspace beneath the Powerhouse did not have concentrations above the guidelines indicating that contaminated soil vapour intrusion is most likely not the cause of the elevated PHC F2 concentrations inside the Powerhouse. Similarly, the New Garage, which is attached to the Powerhouse, has elevated concentrations of benzene, xylenes, and PHC F2. None were detected above guidelines in the samples collected from the crawlspace. Compounding factors included the presence of coolant, antifreeze, motor oil, varsol, and hydraulic oil were located in the New Garage. Fuelling and maintenance activities also occur within the New Garage, but did not occur during sampling. Heavy equipment is often parked adjacent to the bay doors of the New Garage

5.3 Station Creek

Two of the four soil samples collected west of Station Creek had naphthalene and phenanthrene above EQGs. The concentrations were similar to those in the delta area where no PHC impacts were reported.

The EQGs for the ecological effects of PAHs were selected by choosing the lowest guideline value for an applicable pathway. For PAHs, the lowest guideline values are for the protection of freshwater aquatic life pathway, which is lower than guideline values based on pathways for the protection of human health and other pathways for environmental protection. Based on the proximity of the sampling locations to surface water, either the drainage pond or the fjord, the protection of freshwater aquatic life pathway cannot be discounted at the site. As a result, SENES/FRANZ has considered it as a conservative approach.

The reason that PAH exceedances of guidelines are observed when PHC exceedances are not is because the guideline values are very low for PAHs for the aquatic life pathway. The guideline for PHC F2 in soil is 600 mg/kg for the protection of fresh water for aquatic life. Based on the *Composition of Petroleum Mixtures Volume 2* by the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG, 1998) (which is one of the major sources for the CCME's Canada-Wide Standards for Petroleum Hydrocarbons in Soil) the percent mass of naphthalene, in the PHC F2 portion of diesel fuel is 0.52%. Based on this percentage, if impacts are caused by diesel fuel, over 200 times the naphthalene guideline of 0.013 mg/kg would be present in soil before PHC F2 approached a concentration of 600 mg/kg. While this does not consider the effects of weathering, it illustrates that the low guideline for naphthalene means that concentrations of naphthalene will be above guideline values even where PHC F2 is not. The situation with phenanthrene is similar with over 20 times the allowable phenanthrene of 0.046 mg/kg could be detected prior to PHC F2 approaching the guideline.

In other words, we can expect to see exceedances of guidelines for PAHs (when the freshwater aquatic life pathway is active) when levels of PHC F2 are as low as 2.5 mg/kg if the impacts are caused by diesel. This is very often below the detection limit for F2.

Given that a complete pathway for the transport of PAHs to surface water via groundwater is not anticipated at the site given the presence of permafrost and a brief period where active layer water may be present, SENES/FRANZ does not expect these relatively low exceedances to pose a threat to adjacent freshwater. No further action is recommended in this respect.

5.4 Borrow Source

Two samples were collected to identify a suitable borrow source if the RAP indicated that the removal of impacted material is a viable remedial plan. The 2011 WorleyParsons geotechnical report identified several potential borrow source areas; however, based on a conversation with the Eureka HAWS Station Manager, a new, more ideal, borrow source was identified near Upper Paradise. The sample collected from this area did not have any concentrations above the EQGs. The second borrow source sample collected from the Blacktop Creek area did have arsenic above the EQG. All other parameters were below the guidelines.

6.0 CONCLUSIONS AND RECOMMENDATIONS

1. Franz Environmental Inc. (FRANZ), in association with SENES Consultants Ltd. (SENES), was retained by Public Works and Government Services Canada on behalf of Environment Canada to conduct a supplemental field investigation, in support of the Remedial Action Plan (RAP), at the Eureka High Arctic Weather Station (HAWS), Ellesmere Island, Nunavut. The objectives of the supplemental investigation were to close the data gaps identified in the data gap analysis through a detailed soil, surface water, sediment, indoor air, and sub-slab vapour sampling program.

2. The intrusive investigation was completed from August 12 to August 20, 2012. The program consisted of completing a health and safety plan, collecting background soil, surface water and sediment samples, advancing test pits in areas of potential environmental concern, collecting soil samples from test pits, collecting indoor air samples at the operation and maintenance buildings, installation of a sub-slab vapour probe and collection of the sample, collection of geotechnical samples, submitting samples for laboratory analysis, and identification of potential borrow source areas.

Background Sampling Results

3. The purpose of the background sampling program was to collect sufficient number of samples to obtain a reliable representation of background conditions. The data collected as part of the background sampling program was in support of updating the site specific risk assessment and the calculation of site specific target levels.

4. The background sampling data for soil for aluminum, boron and chromium, the three metals identified in the 2010 Detailed Quantitative Risk Assessment (DQRA) to potentially represent unacceptable ecological risk, indicates there is no significant difference in range or average concentrations between on site and background levels for these parameters. As such, the observed elevated on-site concentrations are considered naturally occurring and no further action is recommended to address these and other metals in soil at the main facility site.

5. The results of the background surface water samples indicate that the concentrations of aluminum, arsenic, cadmium, copper, iron, lead, manganese, nickel, selenium, silver, and zinc were naturally above EQGs, suggesting that elevated concentrations of these elements in surface water are likely due to naturally occurring conditions at the site and not a result of human activity. As such, no further action is recommended to address these and other metals in surface water at the main facility site.

6. All nine background sediment samples contained arsenic above EQGs, while one sample contained elevated copper. These results indicate that elevated arsenic concentration in the

sediment are likely due to naturally occurring conditions and not due to human activity. Furthermore, the minimum, maximum and average concentrations for background versus on-site concentrations for the metals in sediment identified in the DQRA to represent a potentially unacceptable ecological risk (aluminum, barium and iron) were very similar. In fact, the background concentrations appear to be greater than the concentrations of these same metals on site. As such, no further action is recommended to address these and other metals in surface water at the main facility site.

AEC D: Powerhouse

7. The results of the soil samples collected west of the Powerhouse, at the top and bottom of the slope near drainage pond, confirm that toluene, ethylbenzene, PHC F1 to F3, 2-methylnaphthalene, naphthalene, and phenanthrene are present above the EQGs. Arsenic concentrations in the sample collected at the bottom of the slope were also above guidelines; however, arsenic has been shown to be naturally elevated above EQGs at the site.

8. Southeast of the Powerhouse, in the direction of Building # 17 (Plumbing Shack) and the Former Bunkhouse, concentrations of arsenic, BTEX and PHC F1 to F3, 2-methylnaphthalene, naphthalene, and phenanthrene were above soil guidelines. Test pits excavated to the southeast of Building # 17 (Plumbing Shack) and the Former Bunkhouse contained concentrations of benzene, ethylbenzene, PHC F1 to F3, 2-methylnaphthalene, naphthalene, phenanthrene above EQGs.

9. While there are no guidelines for PHC in sediment, elevated concentrations, relative to background samples collected in 2009, of BTEX and PHC F1 to F3 were reported in the sediment samples collected down slope of the Powerhouse. In combination with previous sample results, analytical data from samples collected in 2012 is sufficient to provide a reliable estimate of the volume of impacted sediment in the drainage pond.

10. Full delineation of arsenic and PHC-related impacts in the area of the Powerhouse area has been achieved.

Delta

11. Additional samples collected within the delta area, south of area of environmental concern (AEC) D, had concentrations above EQGs for arsenic, benzene, ethylbenzene, PHC F1 and F3, 2-methylnaphthalene, naphthalene, phenanthrene. Two soil samples were collected south of the drinking water reservoir and west of the drainage pond. BTEX and PHC concentrations were reported below EQGs; however, there were concentrations of arsenic, naphthalene, and phenanthrene above the guidelines.

12. Delineation of the impacted area was achieved horizontally along the north and west boundaries of Building # 17 (Plumbing Shack), the Former Bunkhouse, and the Delta area. To achieve full delineation, additionally sampling east and south of the Carpentry/Plumbing Shop is required; however, based on existing data an estimate of the volume of impacted material can be developed.

Area West of Station Creek

13. The area west of Station Creek was investigated to confirm that sources of contamination at the site (including the powerhouse and fuel handling area) had not caused impacts off-site. Two of the four soil samples collected in the area exhibited concentrations of select PAHs above environmental quality guidelines. No exceedances of PHC or metals guidelines were observed. The applicable environmental quality guidelines in this area are very low for PAHs based on the potential that soil impacts may migrate to surface water and impact aquatic life. Given that a complete pathway for the transport of PAHs to surface water via groundwater is not anticipated at the site, SENES/Franz does not expect these relatively low exceedances to pose a threat to adjacent freshwater. No further action is recommended to address impacts in this area.

Indoor Air and Sub-Slab Vapour Sampling

14. Indoor air and sub-slab vapour samples were collected to address the data gap that there is a potentially unacceptable risk from exposure to contaminated site soil via the inhalation of contaminant vapours emanating from subsurface soils at operation and maintenance buildings. The results of the indoor air and sub-slab vapour samples will be used to update the site-specific risk assessment.

15. Eight 24-hour air samples, including one duplicate sample, were collected from inside the operation and maintenance buildings at the Eureka HAWS. Five locations had concentrations of PHC F2 above the conservative reference thresholds: the Old Garage, Building #17, the Former Bunkhouse, the New Garage, and the Powerhouse. Some of these locations also exhibited benzene and xylenes above the reference thresholds. Of these, only Building #17 and the New Garage exhibited concentrations more than 2x the reference thresholds.

16. Building #17 (Plumbing Shack) is primarily a storage building, and was observed to be occupied with tires and miscellaneous plumbing parts. The New Garage has a slab on grade concrete floor with a thermosyphon system within the slab; as a result, SENES/Franz was not able to install a sub-slab sample. Vehicle maintenance occurs in the New Garage. During sampling in summer 2012, SENES/Franz noted several containers of chemicals (coolant, antifreeze, motor oil, varsol, hydraulic oil) that would likely interfere with the sample.

17. Two other samples, one 24-hour and one 20-minute, were collected from the crawlspace beneath the Powerhouse. Both exhibited concentrations of PHCs/BTEX below applicable reference thresholds strongly suggesting the indoor PHC concentrations within the Powerhouse are from stored products and maintenance activities.

18. The results of the sub-slab vapour sampling from the Old Garage exhibited concentrations of PHC F1 and F2 above reference thresholds. Vapour intrusion for PHC F2 cannot be discounted as a potential risk pathway in the Old Garage as concentration of PHC F2 in the sub-slab vapour sample and the 24-hour indoor air sample contained concentrations above reference thresholds.

Borrow Source Assessment

19. Two samples were collected to identify a suitable potential borrow source if the RAP indicated that the removal of impacted material is a viable remedial plan. The 2011 WorleyParsons geotechnical report identified several potential borrow source areas; however, based on a conversation with the Eureka HAWS Station Manager, a new, more ideal, borrow source was identified near the area known as Upper Paradise, west of the Eureka HAWS. The sample collected from this area did not have any concentrations of the tested parameters (metals, PHCs, and PAHs) above the EQGs. The second borrow source sample collected from the Blacktop Creek area did exhibit arsenic above the EQG; however arsenic is naturally elevated as demonstrated by the background sampling. All other parameters tested were below the guidelines.

Achievement of Delineation

20. The goal of the supplemental investigation was to close the identified data gaps in order to prepare a comprehensive remedial action plan. Based on a review of the collected data SENES/Franz believes the data available provides a strong foundation for the preparation of the RAP. In the delta area, additional soil sampling east of the carpentry/plumbing shop maybe required to confirm the east boundary of the PHC impacts in that area.

Recommendations

21. Remedial options to address the areas of environmental concern noted above and further recommendations are provided in the Remediation Options Analysis (ROA) and Remedial Action Plan (RAP) which is provided PWGSC and EC under separate cover. Included in the ROA report is a discussion on the potential for contaminant migration at the site and a more rigorous establishment of background metal concentrations to confirm the preliminary results reported herein.

7.0 LIMITATIONS

The Eureka Monitoring Activities was carried out by SENES Consultants Ltd. and FRANZ Environmental Inc. for Public Works Government Services Canada on behalf of Environmental Canada. It is intended for the sole and exclusive use of Public Works Government Services Canada and EC, its affiliated departments, agencies, companies and partners and their respective insurers, agents, employees and advisors.

Any use, reliance on or decision made by any person other than Public Works Government Services Canada or of Environmental Canada based on this report is the sole responsibility of such other person. Public Works Government Services Canada, of Environmental Canada, SENES Consultants Ltd., and Franz Environmental Inc. 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.

The investigation undertaken by SENES Consultants Ltd. and Franz Environmental Inc. with respect to this report and any conclusions or recommendations made in this report reflect SENES Consultants Ltd. and Franz Environmental Inc.'s 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 the preparation of this report. This report also relies upon data collected by others as noted in Section 1. Public Works Government Services Canada, of Environmental Canada, SENES Consultants Ltd., and Franz Environmental Inc. make no representation or warranty to anyone with regard to these data or information from others which are presented 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 these data referred to in this report. None of these data have been verified and they are subject to the limitations outlined in the reports by others.

This report has been prepared for specific application to this 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.

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 Public Works Government Services Canada or of Environmental Canada, copying and distributing this report, or use of or reliance on the information contained herein, in whole or in part, by any other party is not permitted without the express written permission of SENES Consultants Ltd. and Franz Environmental Inc. Nothing in this report is intended to constitute or provide a legal opinion.

8.0 CLOSURE

We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours truly,

SENES Consultants Ltd. and Franz Environmental Inc.

Catherine LeBlanc, B.Eng.
Project Manager and Report Author

Christian Ludwig, M.Eng., P.Eng., PMP
Project Principal and Senior Reviewer

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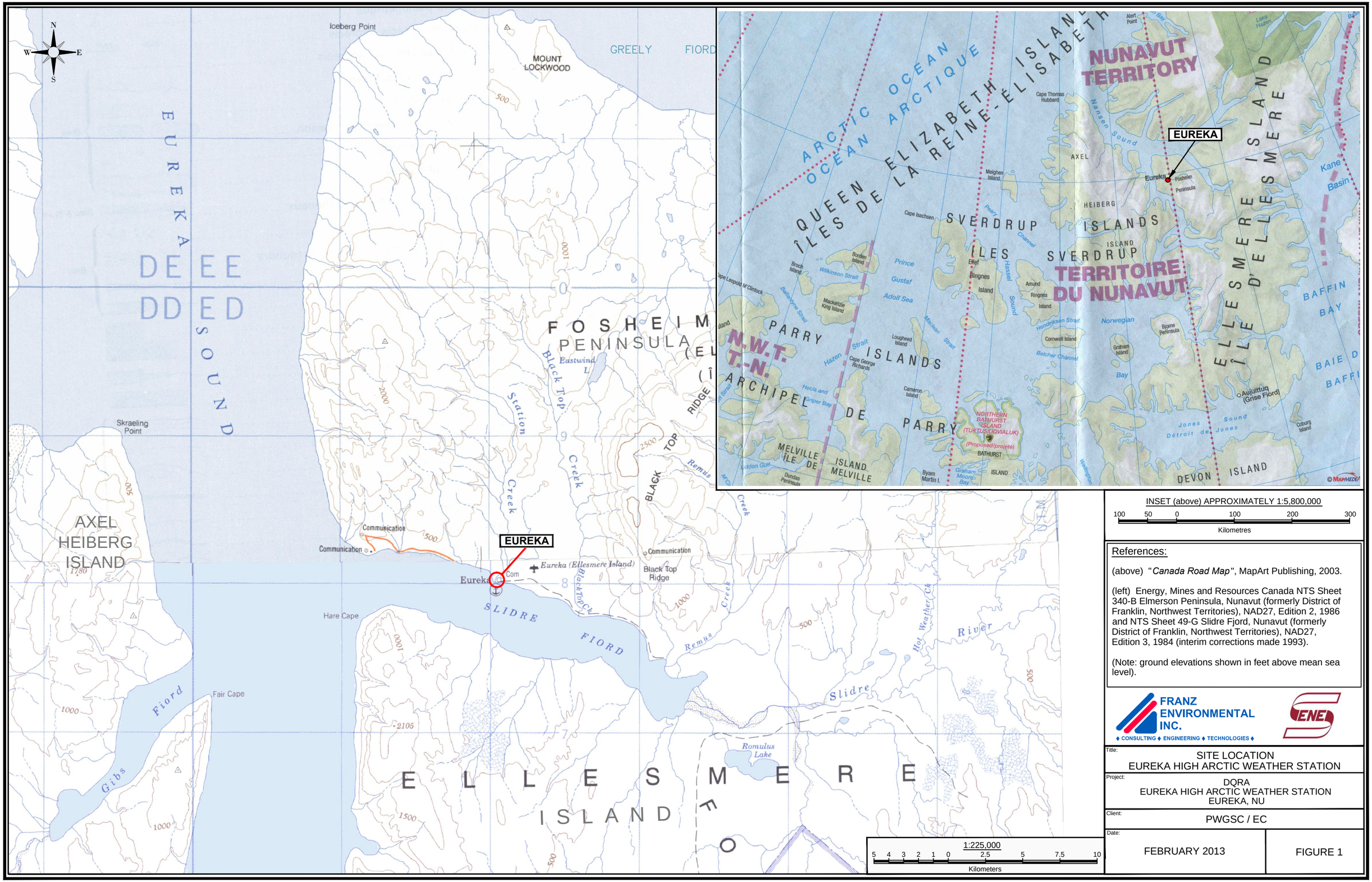
APPENDIX A

Figures



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100 50 0 100 200 300

Kilometres

1:225,000

5 4 3 2 1 0 2.5 5 7.5 10

Kilometers

References:

(above) "*Canada Road Map*", MapArt Publishing, 2003.

(left) Energy, Mines and Resources Canada NTS Sheet 340-B Elmerson Peninsula, Nunavut (formerly District of Franklin, Northwest Territories), NAD27, Edition 2, 1986 and NTS Sheet 49-G Slidre Fjord, Nunavut (formerly District of Franklin, Northwest Territories), NAD27, Edition 3, 1984 (interim corrections made 1993).

(Note: ground elevations shown in feet above mean sea level).

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

ENEL

Title: SITE LOCATION
EUREKA HIGH ARCTIC WEATHER STATION

Project: DQRA
EUREKA HIGH ARCTIC WEATHER STATION
EUREKA, NU

Client: PWGSC / EC

Date: FEBRUARY 2013

FIGURE 1

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Legend

- Soil Sampling Location
- Sediment Sampling Location
- Surface Water Sampling Location

Title: BACKGROUND SAMPLING LOCATIONS - BLACKTOP CREEK

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:10,000

FIGURE 2

updated on:14-Feb-13 by dlogan

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Legend

- Soil Sampling Location
- Sediment Sampling Location
- Surface Water Sampling Location

Title: BACKGROUND SAMPLING LOCATIONS - STATION CREEK

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:4000

FIGURE 3

updated on: 14-Feb-13 by dlogan

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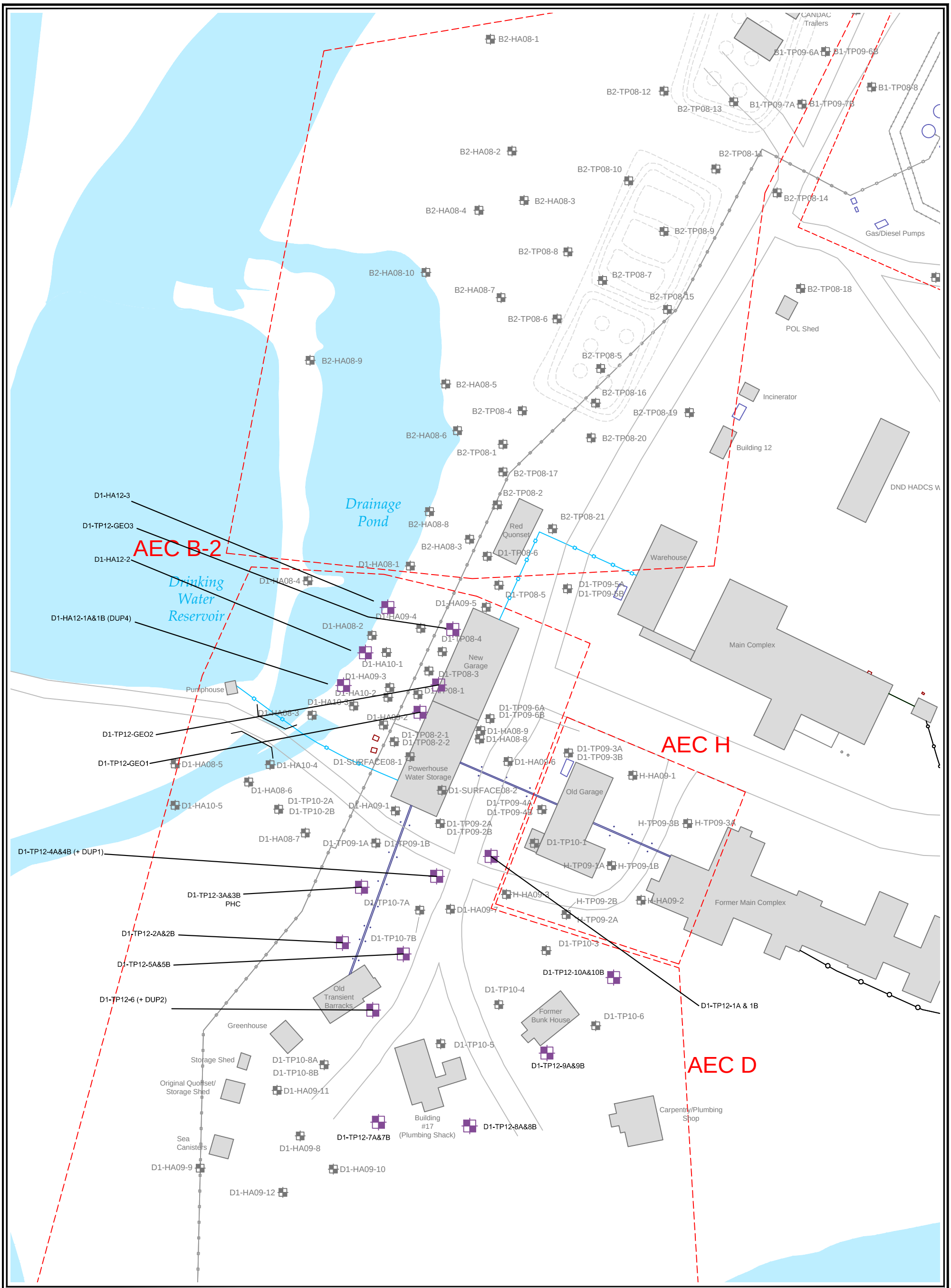

Legend

- Building
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Tank
- Powerbox
- Area of Environmental Concern(AEC)
- Soil Sampling Location

AEC B-2-1: In-Situ Landfarm (former Tank Farm)
AEC D-1: Powerhouse and Down Gradient
AEC H-1: Old Maintenance Garage
AEC H-2: Down Gradient Old Maintenance Garage

Title: SOIL SAMPLING LOCATIONS - AEC D

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:1000

25 20 15 10 5 0 metres 25 50

FIGURE 4

updated on 20-Feb-13 by dlogan

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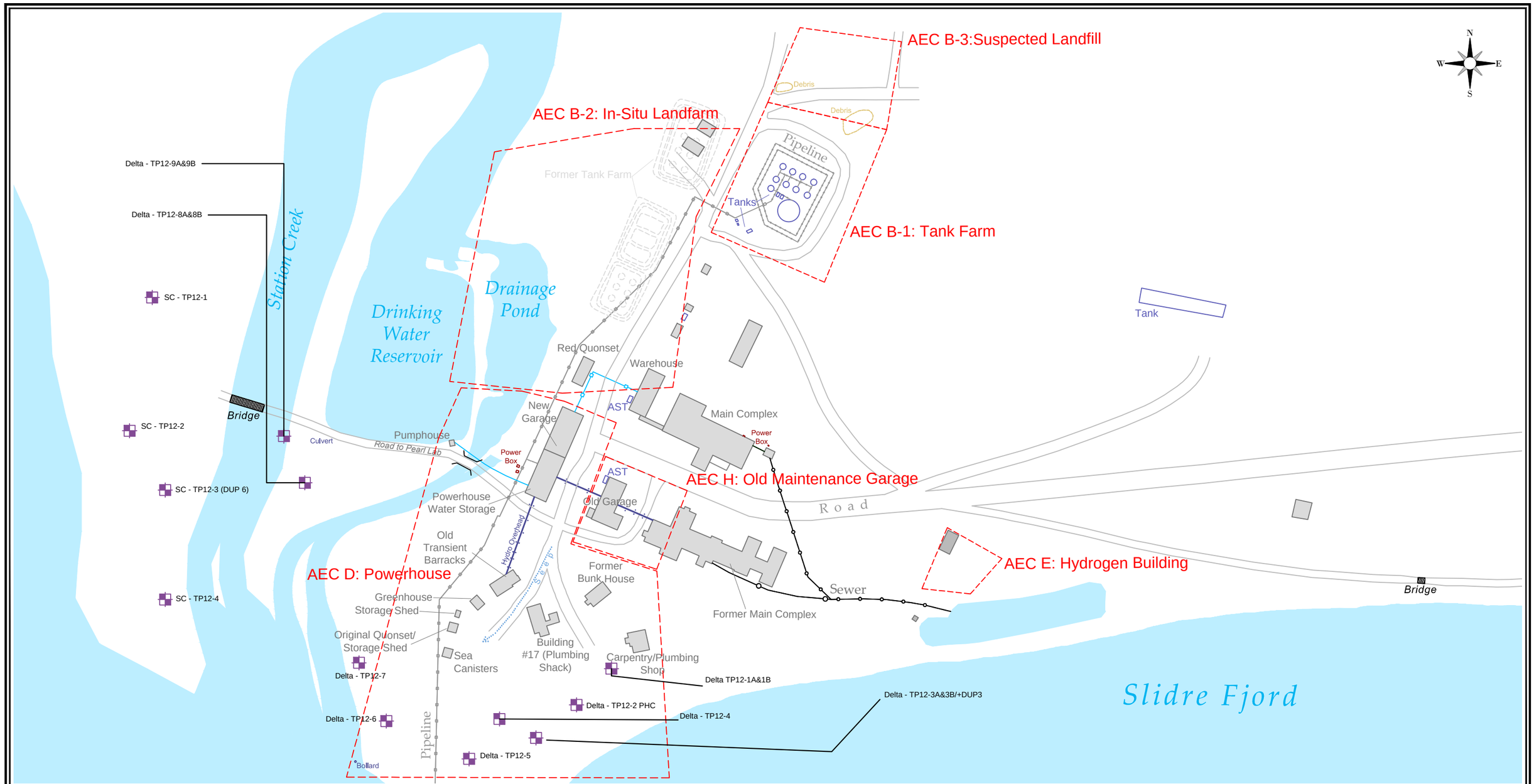

Legend

- Area of Environmental Concern(AEC)
- Building
- Tank
- Powerbox
- Debris
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Seep
- Soil Sampling Location - 2012

Title: SOIL SAMPLING LOCATIONS - DELTA AND STATION CREEK

FRANZ ENVIRONMENTAL INC. ♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1: 2000

50 40 30 20 10 0 metres 50 100

FIGURE 5

updated on 20-Feb-13 by dlogan

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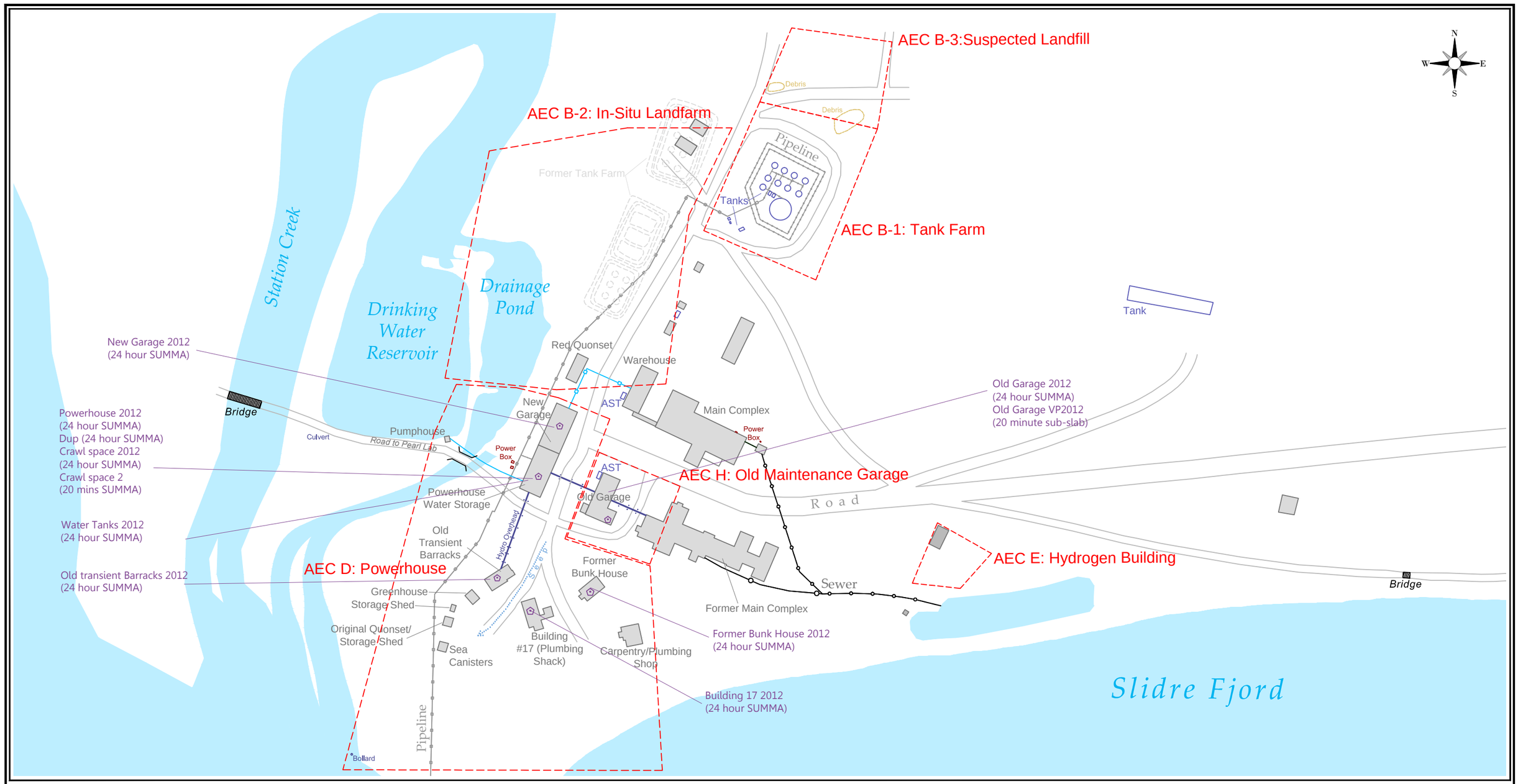

Legend

- Area of Environmental Concern(AEC)
- Building
- Tank
- Powerbox
- Debris
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Seep
- Indoor Air & Sub-slab Vapour

Title: INDOOR AIR & SUB-SLAB VAPOUR SAMPLING LOCATIONS

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:2000

50 40 30 20 10 0 metres 50 100

FIGURE 6

updated on 20-Feb-13 by dlogan

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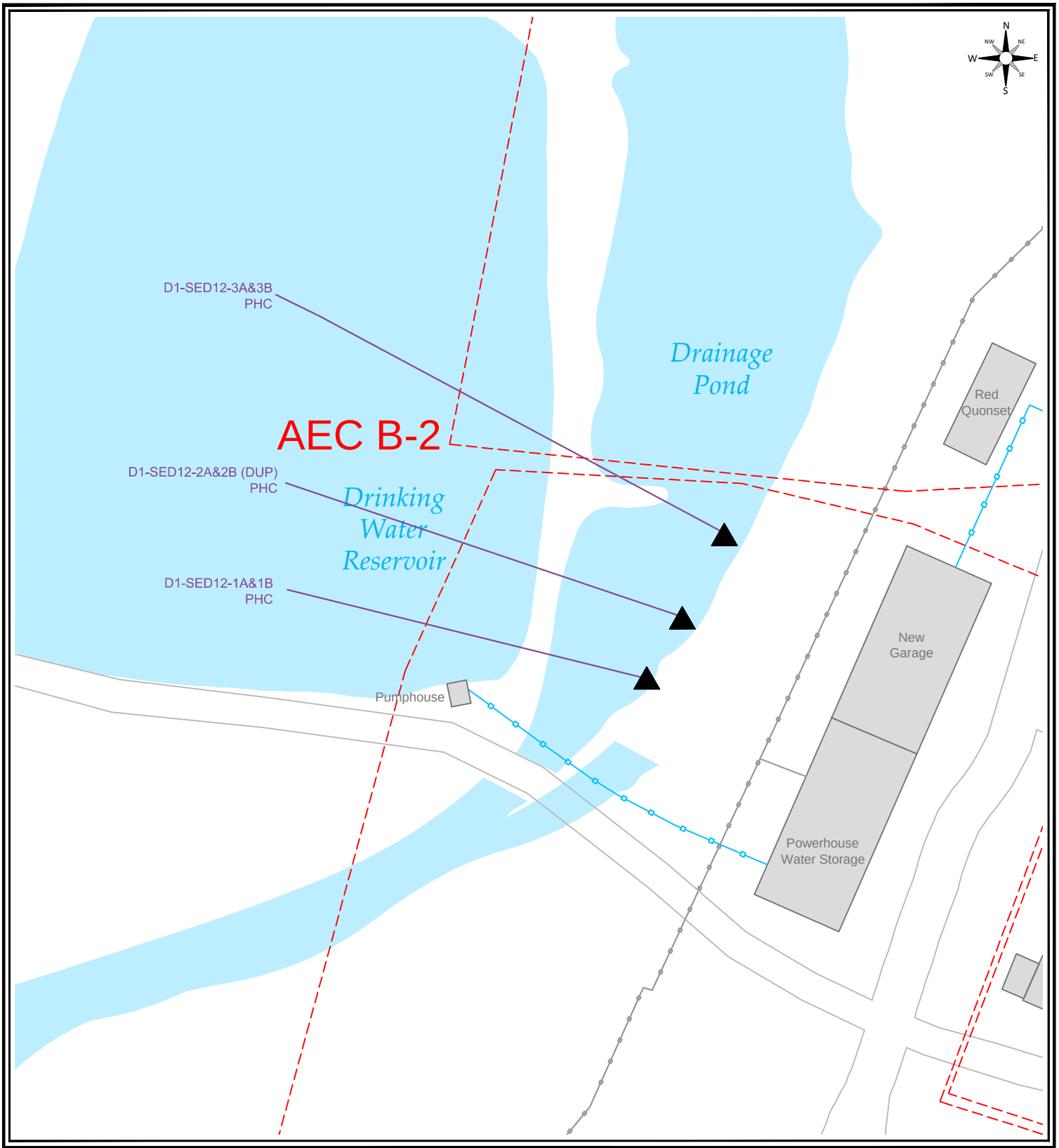

Legend

- Building
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Tank
- Powerbox
- Area of Environmental Concern(AEC)
- Sediment Sample Location & Identification Number (Type, Year, #: D1-SD10-05)

Title: SEDIMENT SAMPLING LOCATIONS

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:700

0 10 20 30 metres

FIGURE 7

updated on: 4-Mar-13 by dlogan

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Legend

- Soil Sampling Location
- Sediment Sampling Location
- Surface Water Sampling Location
- Parameter Sample Above Applicable Guidelines
- Parameter Sample Below Applicable Guidelines

Title: BLACKTOP CREEK - ANALYTICAL RESULTS

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1:10,000

FIGURE 8

updated on: 14-Feb-13 by dlogan

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Legend

- Soil Sampling Location
- Sediment Sampling Location
- Surface Water Sampling Location
- Parameter Sample Above Applicable Guidelines
- Parameter Sample Below Applicable Guidelines

Title:	STATION CREEK - ANALYTICAL RESULTS
FRANZ ENVIRONMENTAL INC. CONSULTING ENGINEERING TECHNOLOGIES	Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU
ENE	Client: PWGSC/EC
	Date: FEBRUARY 2013
SCALE 1:4000	FIGURE 9

updated on:14-Feb-13 by dlogan

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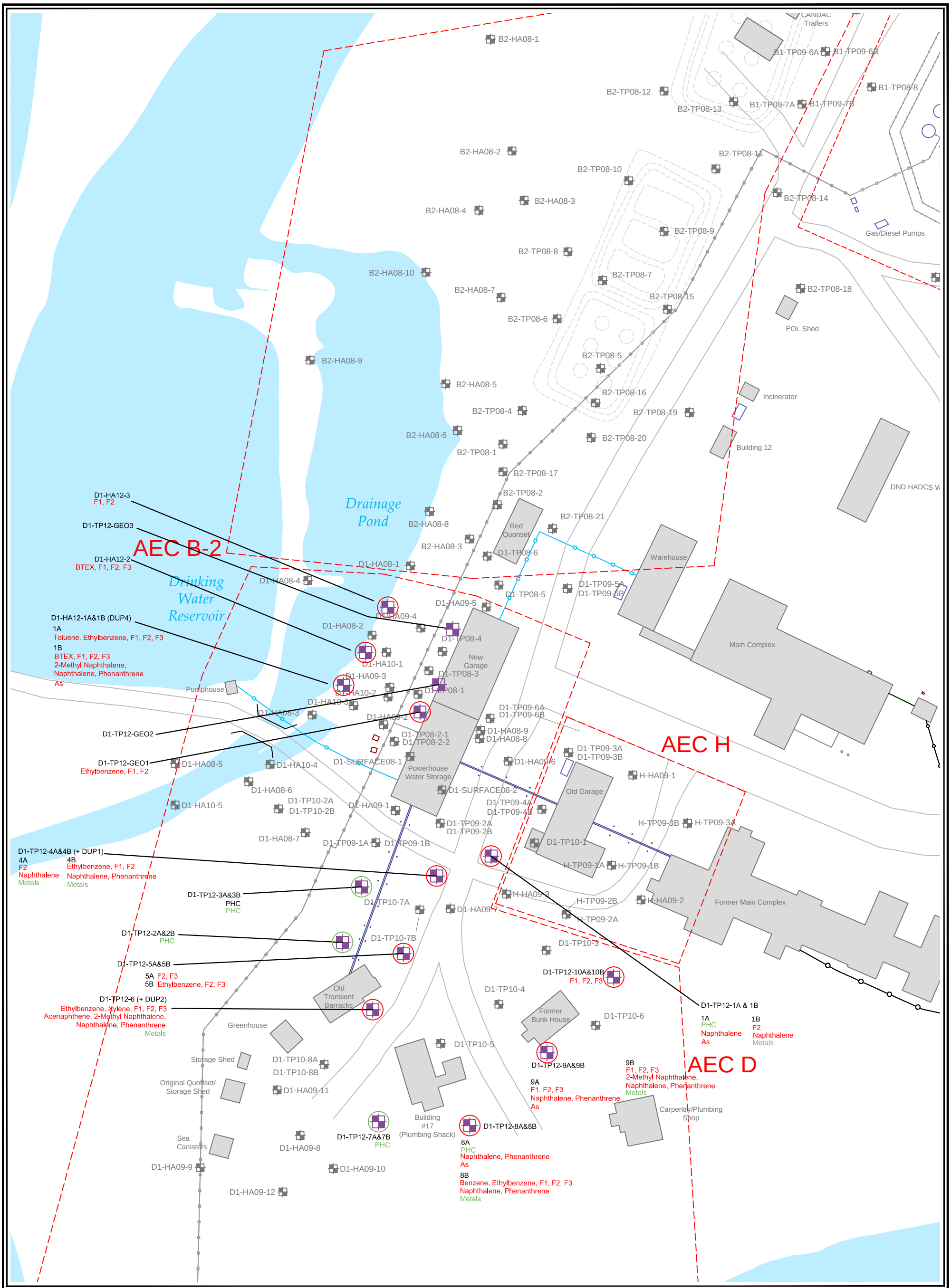


Legend

- Building
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Tank
- Powerbox
- Area of Environmental Concern(AEC)
- Sample Location Exceeding SSTLs
- *Parameter(s) with concentrations exceeding SSTLs*
- Sample Location Not Exceeding SSTLs
- Soil Sampling Location - 2012

AEC B-2-1: In-Situ Landfarm (former Tank Farm)
AEC D-1: Powerhouse and Down Gradient
AEC H-1: Old Maintenance Garage
AEC H-2: Down Gradient Old Maintenance Garage

Title: ANALYTICAL RESULTS - AEC D

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

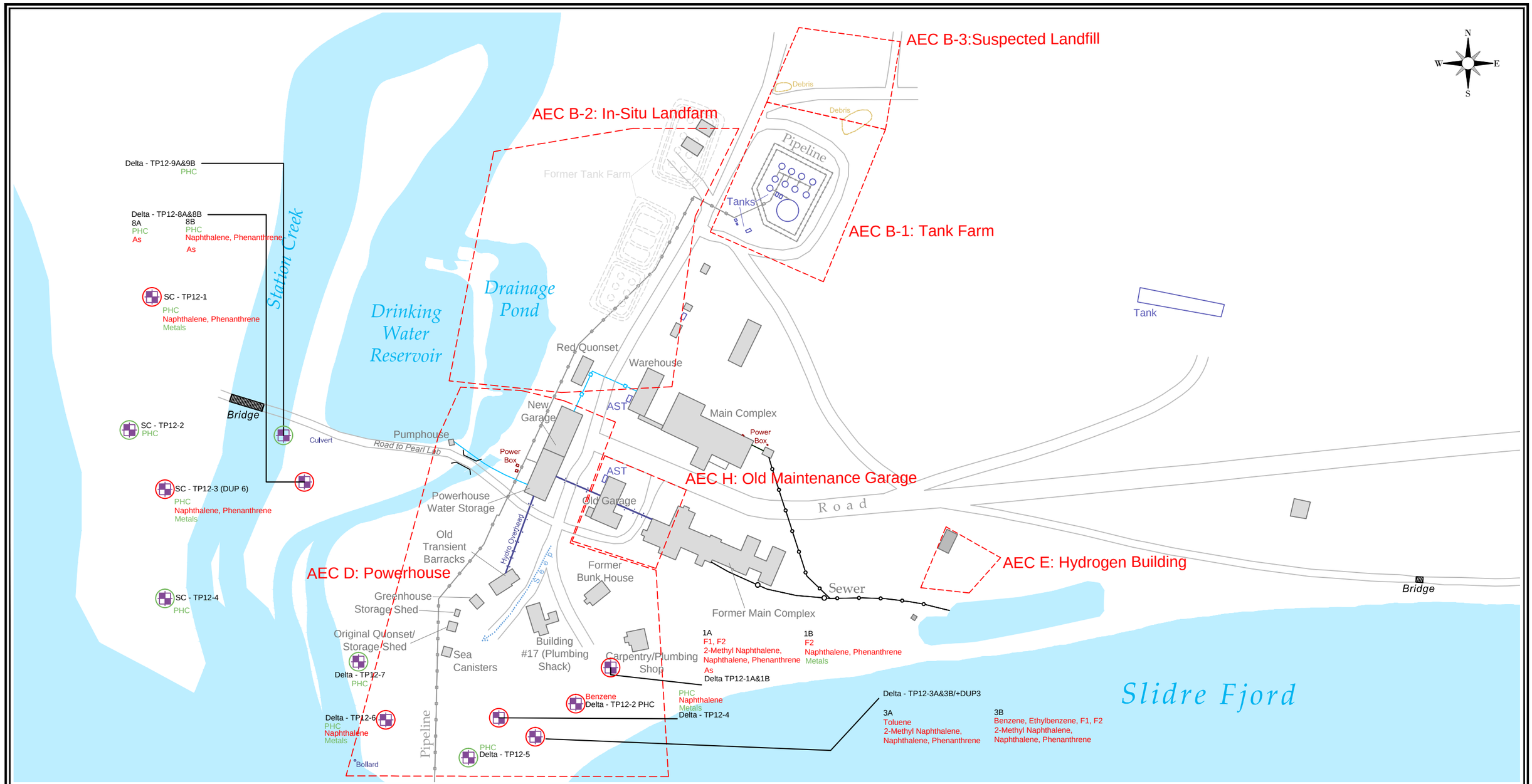
SCALE 1:1000

25 20 15 10 5 0 metres 25 50

FIGURE 10

updated on 20-Feb-13 by dlogan

Z:\Projects\2012\1570-120X Eureka HAWS\1570-1205 Supplemental Reporting\Figures\1-CAD\1570-1202 - EUREKA_SL -09-11-2012.dwg (layout)



Legend

- Area of Environmental Concern(AEC)
- Building
- Tank
- Powerbox
- Debris
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Seep
- Soil Sampling Location - 2012
- Sample Location Exceeding SSTLs
  Parameter(s) with concentrations exceeding SSTLs
- Sample Location Not Exceeding SSTLs

Title: ANALYTICAL RESULTS - DELTA AND STATION CREEK

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

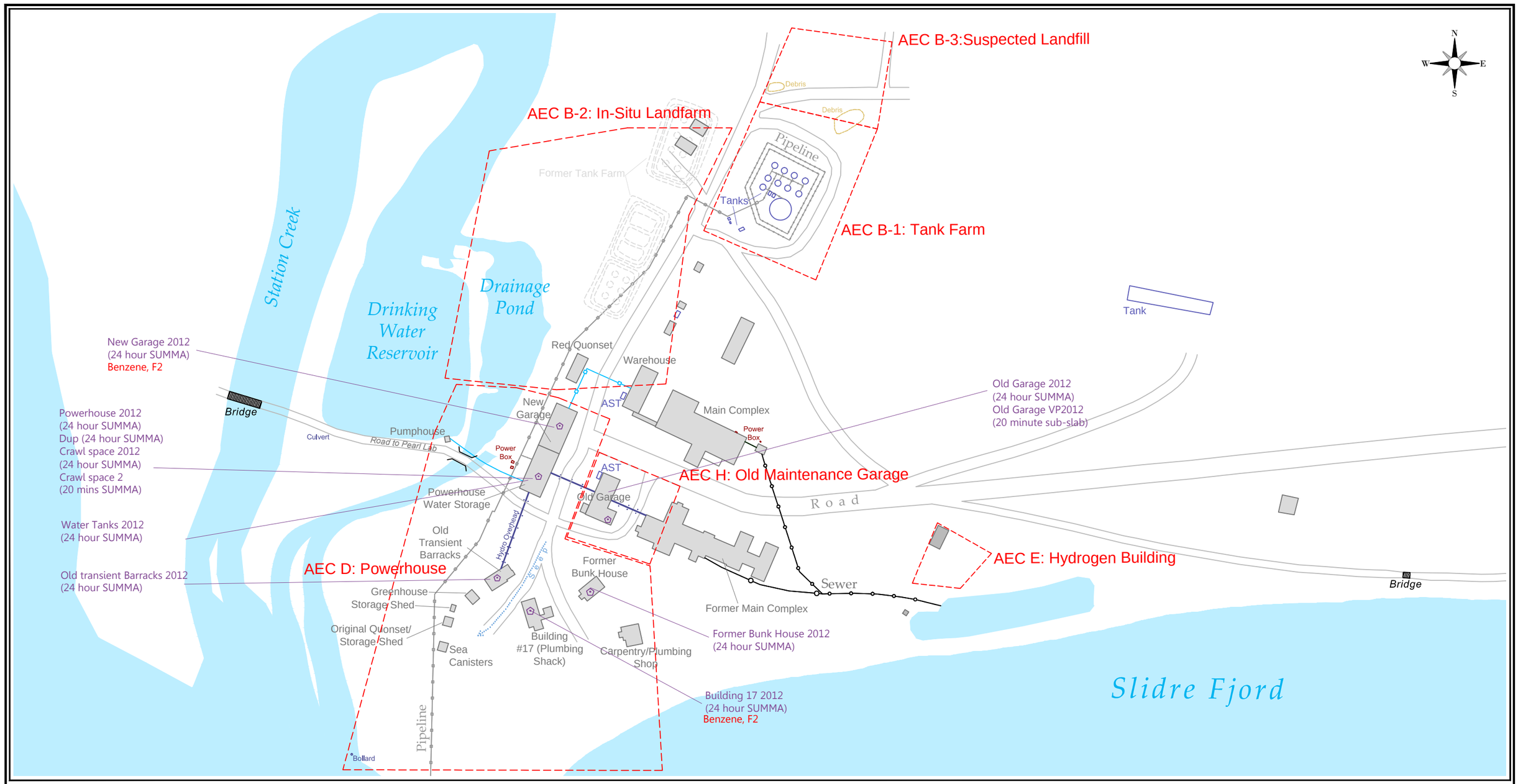
SCALE 1: 2000

50 40 30 20 10 0 metres 50 100

FIGURE 11

updated on 20-Feb-13 by dlogan

Z:\Projects\2012\1570-120X Eureka HAWS\1570-1205 Supplemental Reporting\Figures\1-CAD\1570-1202 - EUREKA_SL -09-11-2012.dwg(layout)



Legend

- Area of Environmental Concern(AEC)
- Building
- Tank
- Powerbox
- Debris
- Pipeline
- Hydro Overhead
- Water Line
- Road
- Sewer
- Seep
- Indoor Air & Sub-slab Vapour

Title: ANALYTICAL RESULTS - INDOOR AIR & VAPOUR SAMPLES

FRANZ ENVIRONMENTAL INC. ♦ CONSULTING ♦ ENGINEERING ♦ TECHNOLOGIES ♦

Project: EUREKA HIGH ARCTIC WEATHER STATION EUREKA, NU

Client: PWGSC/EC

Date: FEBRUARY 2013

SCALE 1: 2000

50 40 30 20 10 0 metres 50 100

FIGURE 12

updated on 20-Feb-13 by dlogan

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APPENDIX B

Tables

Table B-1:
Soil Chemical Concentrations - Background Metals

PARAMETER	Soil Criteria	RDL	BACKGROUND 2008				BACKGROUND 2010	BACKGROUND 2012											Background Average	Background Range
Sample Number	Federal		BG08-1	BG08-2	BG08-3	BG08-4	BK-HA10-1	BG-HA12-1	BG-HA12-2	BG-HA12-DUP 1 Duplicate of BG-HA12-2	RDP	BG-HA12-3	BG-HA12-4	BG-HA12-5	BG-HA12-6	BG-HA12-7	BG-HA12-8	BG-HA12-9		
Sample Date	CCME 2007 [1]		22/08/2008	22/08/2008	22/08/2008	22/08/2008	17/08/2010	18/08/2012	18/08/2012	18/08/2012		18/08/2012	18/08/2012	29/08/2012	29/08/2012	29/08/2012	29/08/2012	29/08/2012		
Sample Depth (m)	Residential/ Parkland		0.3	0.4	0.3	0.4	0.1	0.1 - 0.2	0.1 - 0.2	0.1 - 0.2		0.1 - 0.2	0.1 - 0.2	0.1 - 0.2	0.1 - 0.2	0.1 - 0.2	0.1 - 0.2	0.1 - 0.2		
Total Metals (mg/kg)																				
Aluminum (Al)	---	10	---	---	---	---	1700	6200	10000	8700	Acceptable	18000	9100	6300	8400	6500	4400	4500	7618	1700 - 18000
Antimony (Sb)	20	1.0	<0.2	<0.2	<0.2	<0.2	<0.2	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2 - 1
Arsenic (As)	12	1.0	9.7	8.2	7.4	6.1	3	7.3	9.1	9.0	Acceptable	2.5	7.5	17	9.7	13	7.7	6.8	8.3	2.5 - 17
Barium (Ba)	500	10	64	55	78	30	20	39	58	53	Acceptable	130	48	31	44	31	24	26	49	20 - 130
Beryllium (Be)	4	0.40	<1	<1	<1	<1	0.2	0.64	0.94	0.86	Acceptable	<0.40	0.73	0.53	0.45	0.48	<0.40	<0.40	0.74	0.2 - 0.94
Bismuth (Bi)	---	1.0	---	---	---	---	<1	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1
Boron (B)	---	2.0	---	---	---	---	9	22	15	14	Acceptable	2.2	9.5	6.9	12	5.1	6.9	12	10	2.2 - 22
Cadmium (Cd)	10	0.10	<0.5	<0.5	<0.5	<0.5	<0.1	<0.10	0.10	<0.10	Acceptable	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	<0.10	0.21	0.1 - <0.5
Calcium (Ca)	---	50	---	---	---	---	6000	4900	4500	4000	Acceptable	20000	3200	2600	4100	3600	2000	3000	5264	2000 - 20000
Chromium (Cr)	64	1.0	20.4	21.6	23.1	10	5	13	20	18	Acceptable	4.4	18	15	15	12	9.1	9.1	14.2	4.4 - 23.1
Cobalt (Co)	50	1.0	7	8	10	6	4.8	6.8	9.5	8.9	Acceptable	25	8.2	10	4.7	10	6.0	5.5	8.7	4.7 - 25
Copper (Cu)	63	5.0	16	18	19	9	5.7	19	21	20	Acceptable	17	20	28	23	23	20	14	18	5.7 - 28
Iron (Fe)	---	10	---	---	---	---	8700	20000	26000	24000	Acceptable	49000	22000	47000	23000	51000	19000	16000	29700	8700 - 51000
Lead (Pb)	140	1.0	11	10	11	6	5	8.9	12	11	Acceptable	2.1	8.9	11	9.3	9.3	6.5	5.9	8.5	2.1 - 12
Magnesium (Mg)	---	20	---	---	---	---	1600	3300	3800	3400	Acceptable	13000	2900	3100	3000	3200	2500	1800	3782	1600 - 13000
Manganese (Mn)	---	10	---	---	---	---	80	190	230	210	Acceptable	460	210	640	90	670	290	230	300	80 - 670
Mercury (Hg)	6.6	0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	Acceptable	<0.050	<0.050	<0.050	0.064	0.073	<0.050	<0.050	0.052	<0.050 - 0.073
Molybdenum (Mo)	10	0.40	<1	<1	<1	<1	<0.5	0.78	0.96	0.92	Acceptable	<0.40	0.73	1.6	0.93	1.6	0.53	0.54	0.94	<0.4 - 1.6
Nickel (Ni)	50	1.0	16	19	20	11	9.4	16	23	22	Acceptable	13	19	29	15	26	24	15	18	9.4 - 29
Phosphorus (P)	---	20	---	---	---	---	190	370	530	460	Acceptable	2000	360	550	330	710	320	320	558	190 - 2000
Potassium (K)	---	25	---	---	---	---	330	1400	1700	1500	Acceptable	4400	1500	790	2300	640	690	940	1472	330 - 4400
Selenium (Se)	1	0.50	0.7	0.6	0.5	0.2	<0.5	<0.50	<0.50	<0.50	Acceptable	<0.50	<0.50	0.51	0.82	0.51	<0.50	<0.50	0.523	0.2 - 0.82
Silver (Ag)	20	1.0	<1	<1	<1	<1	<0.2	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2 - <1.0
Sodium (Na)	---	50	---	---	---	---	370	4900	1100	920	Acceptable	4100	1100	57	630	130	430	790	1321	57 - 4900
Strontium (Sr)	---	10	---	---	---	---	24	50	74	68	Acceptable	64	47	19	41	20	15	23	40	15 - 74
Tin (Sn)	50	0.30	<5	<5	<5	<5	<5	<0.30	<0.30	<0.30	Acceptable	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<5	<0.3 - <5
Thallium (Tl)	1	1.0	<1	<1	<1	<1	<0.05	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.05 - <1
Uranium (U)	23	1.0	<2	<2	<2	<2	0.41	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2	0.41 - <2
Vanadium (V)	130	1.0	28	33	38	21	13	26	36	33	Acceptable	110	35	49	18	47	21	20	35	13 - 110
Zinc (Zn)	200	10	50	60	70	30	24	44	60	57	Acceptable	32	50	59	48	52	36	38	47	24 - 70

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland

RDL= Reportable Detection Limit

20 = Denotes concentration above guidelines

Table B-2: Soil Chemical Concentrations - Metals

PARAMETER	Soil Criteria			RDL	AEC D: Powerhouse													
Sample Number	Federal	Average Background	Range of Background Concentrations		D1-TP12-1A	D1-TP12-1B	D1-TP12-4A	D1-TP12-4B	DUP-1 (Duplicated of D1-TP12-4B)	RPD	D1-TP12-6	DUP-2 (Duplicated of D1-TP12-6)	RPD	D1-TP12-8A	D1-TP12-8B	D1-TP12-9A	D1-TP12-9B
Sample Date					13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012		13/08/2012	13/08/2012		13/08/2012	13/08/2012	13/08/2012	13/08/2012
Sample Depth (m)	CCME 2007 [1] Residential/ Parkland	2009- 2012	2009- 2012		0.2 - 0.5	0.7 - 1.7	0.3 - 0.8	0.8 - 1.3	0.8 - 1.3		0.1 - 0.8	0.1 - 0.8		0.4 - 0.8	0.8 - 1.2	0.1 - 0.5	0.5 -1.1
Total Metals (mg/kg)																	
Aluminum (Al)	---	7618	1700 - 18000	10	5600	6700	3300	5900	6100	Acceptable	5500	6100	Acceptable	3800	2900	2900	4900
Antimony (Sb)	20	<1.0	<0.2 - 1	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	12	8.3	2.5 - 17	1.0	13		2.6	11	11	Acceptable	12	11	Acceptable	15	11	13	11
Barium (Ba)	500	49	20 - 130	10	39	40	27	27	31	Acceptable	26	26	Acceptable	24	16	21	28
Beryllium (Be)	4	0.74	0.2 - 0.94	0.40	0.42	0.48	<0.40	0.44	0.44	Acceptable	<0.40	0.42	Acceptable	<0.40	<0.40	<0.40	0.46
Bismuth (Bi)	---	<1.0	<1	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0
Boron (B)	---	10	2.2 - 22	2.0	8.5	10	3.1	9.2	10	Acceptable	8.4	7.8	Acceptable	6.4	5.9	2.8	9.6
Cadmium (Cd)	10	0.21	0.1 - <0.5	0.10	0.12	<0.10	<0.10	<0.10	<0.10	Acceptable	<0.10	<0.10	Acceptable	<0.10	<0.10	0.20	0.39
Calcium (Ca)	---	5264	2000 - 20000	50	5800	4900	12000	2900	2500	Acceptable	1800	2000	Acceptable	1700	1500	1400	4200
Chromium (Cr)	64	14.2	4.4 - 23.1	1.0	12	16	4.2	13	13	Acceptable	19	35	Acceptable	8.1	6.0	6.0	20
Cobalt (Co)	50	8.7	4.7 - 25	1.0	9.0	9.5	2.5	7.7	7.2	Acceptable	7.8	8.3	Acceptable	8.0	5.5	6.1	7.4
Copper (Cu)	63	18	5.7 - 28	5.0	26	30	15	14	14	Acceptable	16	15	Acceptable	19	13	26	27
Iron (Fe)	---	29700	8700 - 51000	10	40000	43000	13000	26000	24000	Acceptable	27000	29000	Acceptable	31000	24000	28000	29000
Lead (Pb)	140	8.5	2.1 - 12	1.0	13	11	2.8	8.2	8.4	Acceptable	9.8	8.4	Acceptable	9.9	6.1	15	15
Magnesium (Mg)	---	3782	1600 - 13000	20	3600	3400	9800	2800	2500	Acceptable	2000	2200	Acceptable	1400	1300	1200	2100
Manganese (Mn)	---	300	80 - 670	10	440	420	95	270	250	Acceptable	320	300	Acceptable	310	200	330	320
Mercury (Hg)	6.6	0.052	<0.050 - 0.073	0.050	<0.050	<0.050	<0.050	<0.050	<0.050	Acceptable	<0.050	<0.050	Acceptable	<0.050	<0.050	<0.050	<0.050
Molybdenum (Mo)	10	0.94	<0.4 - 1.6	0.40	1.8	1.2	<0.40	0.99	1.0	Acceptable	1.4	1.5	Acceptable	1.4	1.5	1.5	1.7
Nickel (Ni)	50	18	9.4 - 29	1.0	21	22	6.6	20	20	Acceptable	22	31	Acceptable	18	12	18	23
Phosphorus (P)	---	558	190 - 2000	20	450	560	200	340	340	Acceptable	380	400	Acceptable	410	280	310	420
Potassium (K)	---	1472	330 - 4400	25	890	980	340	1000	1100	Acceptable	1000	970	Acceptable	570	410	300	780
Selenium (Se)	1	0.523	0.2 - 0.82	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	Acceptable	<0.50	<0.50	Acceptable	<0.50	<0.50	0.52	0.73
Silver (Ag)	20	<1.0	<0.2 - <1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0
Sodium (Na)	---	1321	57 - 4900	50	200	230	120	240	210	Acceptable	280	380	Acceptable	88	310	<50	150
Strontium (Sr)	---	40	15 - 74	10	25	27	35	21	23	Acceptable	21	20	Acceptable	16	15	10	27
Thallium (Tl)	1	<5	<0.3 - <5	0.30	<0.30	<0.30	<0.30	<0.30	<0.30	Acceptable	<0.30	<0.30	Acceptable	<0.30	<0.30	<0.30	<0.30
Tin (Sn)	50	<1.0	<0.05 - <1	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	Acceptable	<1.0	<1.0	1.0	1.5
Uranium (U)	23	<2	0.41 - <2	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	130	35	13 - 110	1.0	41	46	9.3	25	24	Acceptable	33	32	Acceptable	27	25	28	31
Zinc (Zn)	200	47	24 - 70	10	52	53	19	40	40	Acceptable	44	48	Acceptable	41	30	65	83

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland

--- = Not analyzed or no criterion/guideline established.

RDL= Reportable Detection Limit

20 = Denotes concentrations above guidelines

Table B-2: Soil Chemical Concentrations - Metals

PARAMETER	Soil Criteria				AEC D: Powerhouse			Delta								Station Creek		Borrow Source	
Sample Number	Federal	Average Background	Range of Background Concentrations	RDL	D1-HA12-1B	DUP-4 (Duplicated of D1-HA12-1B)	RPD	Delta-TP12-1A	Delta-TP12-1B	Delta-TP12-3A	Delta-TP12-3B	Delta-TP12-4	Delta-TP12-6	Delta-TP12-8A	Delta-TP12-8B	SC-TP12-1	SC-TP12-3	Borrow-1	Borrow-2
Sample Date								14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012				
Sample Depth (m)	CCME 2007 [1] Residential/ Parkland	2009- 2012	2009- 2012		0.7 - 0.9	0.7 - 0.9		0.1 - 1.0	1.0 - 1.5	0.1 - 0.5	0.5 - 1.0	0.5 - 1.5	0.1 - 0.6	0.1 - 0.8	0. 8 - 1.0	0.5 - 1.0	0.5 - 1.0	0.1 - 0.2	0.1 - 0.2
Total Metals (mg/kg)																			
Aluminum (Al)	---	7618	1700 - 18000	10	8500	9000	Acceptable	5400	8600	3800	5800	5700	4300	6000	9000	5200	9100	25000	3800
Antimony (Sb)	20	<1.0	<0.2 - 1	1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic (As)	12	8.3	2.5 - 17	1.0	13	13	Acceptable	14	10	11	10	9.9	10	21	14	9.6	10	4.9	16
Barium (Ba)	500	49	20 - 130	10	34	41	Acceptable	20	45	15	40	31	24	35	54	25	38	120	19
Beryllium (Be)	4	0.74	0.2 - 0.94	0.40	0.61	0.72	Acceptable	0.52	0.65	<0.40	0.45	0.49	<0.40	0.46	0.61	0.43	0.70	0.53	0.42
Bismuth (Bi)	---	<1.0	<1	1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	---	10	2.2 - 22	2.0	14	16	Acceptable	8.8	27	8.0	17	24	14	6.5	15	15	18	5.2	3.7
Cadmium (Cd)	10	0.21	0.1 - <0.5	0.10	<0.10	0.10	Acceptable	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Calcium (Ca)	---	5264	2000 - 20000	50	7400	7100	Acceptable	2300	1900	1900	2900	2300	2600	4600	2300	2500	3100	15000	2300
Chromium (Cr)	64	14.2	4.4 - 23.1	1.0	16	18	Acceptable	10	19	7.9	21	13	11	30	21	11	17	11	8.0
Cobalt (Co)	50	8.7	4.7 - 25	1.0	9.6	9.3	Acceptable	11	8.6	6.3	8.3	6.7	6.3	11	8.9	7.7	9.3	25	8.3
Copper (Cu)	63	18	5.7 - 28	5.0	28	39	Acceptable	19	17	19	14	13	10	31	18	38	34	22	13
Iron (Fe)	---	29700	8700 - 51000	10	35000	40000	Acceptable	38000	25000	27000	28000	21000	22000	51000	31000	21000	29000	51000	36000
Lead (Pb)	140	8.5	2.1 - 12	1.0	11	11	Acceptable	8.2	12	10	9.3	9.3	6.4	11	14	7.9	11	4.9	6.6
Magnesium (Mg)	---	3782	1600 - 13000	20	5000	5300	Acceptable	2100	3500	1900	3000	3100	2300	3000	2900	2600	4500	12000	1800
Manganese (Mn)	---	300	80 - 670	10	330	370	Acceptable	340	230	250	360	160	210	550	230	280	280	480	430
Mercury (Hg)	6.6	0.052	<0.050 - 0.073	0.050	<0.050	<0.050	Acceptable	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Molybdenum (Mo)	10	0.94	<0.4 - 1.6	0.40	1.3	1.2	Acceptable	1.4	1.0	1.1	0.97	1.3	1.2	2.4	1.0	0.97	0.91	0.66	0.83
Nickel (Ni)	50	18	9.4 - 29	1.0	29	29	Acceptable	24	22	16	25	17	16	35	23	19	25	26	19
Phosphorus (P)	---	558	190 - 2000	20	430	540	Acceptable	490	470	340	570	350	350	750	500	360	460	1500	690
Potassium (K)	---	1472	330 - 4400	25	1500	1800	Acceptable	780	2000	500	1200	1400	810	860	2000	1100	1800	3400	390
Selenium (Se)	1	0.523	0.2 - 0.82	0.50	0.63	0.58	Acceptable	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	0.53	<0.50	<0.50	<0.50	<0.50
Silver (Ag)	20	<1.0	<0.2 - <1.0	1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sodium (Na)	---	1321	57 - 4900	50	65	100	Acceptable	260	2500	1000	2500	3700	1500	340	800	980	4400	5100	270
Strontium (Sr)	---	40	15 - 74	10	45	53	Acceptable	19	44	17	38	30	21	27	57	25	34	76	17
Thallium (Tl)	1	<5	<0.3 - <5	0.30	<0.30	<0.30	Acceptable	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Tin (Sn)	50	<1.0	<0.05 - <1	1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Uranium (U)	23	<2	0.41 - <2	1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium (V)	130	35	13 - 110	1.0	34	35	Acceptable	32	30	25	24	24	23	53	32	25	29	140	34
Zinc (Zn)	200	47	24 - 70	10	62	67	Acceptable	53	54	34	42	46	35	54	61	46	54	52	43

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland

--- = Not analyzed or no criterion/guideline established.

RDL= Reportable Detection Limit

20 = Denotes concentrations above guidelines

Table B-3: Soil Chemical Concentrations - PHCs and PAH

PARAMETER	Soil Criteria			RDL	AEC D: Powerhouse											
Sample Number	Federal		Provincial		D1-TP12-1A	D1-TP12-1B	D1-TP12-2A	D1-TP12-2B	D1-TP12-3A	D1-TP12-3B	D1-TP12-4A	D1-TP12-4B	DUP-1 Duplicate ot D1-TP12-4B	RPD	D1-TP12-5A	D1-TP12-5B
Sampling Date	Env. Health (non-carcinogenic effects)	Human health (carcinogenic effects)	MOE Table 2[3] Residential / Parkland		13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012		13/08/2012	13/08/2012
Sampling Depth (m)					0.2 - 0.7	0.7 - 1.7	0.2 - 0.4	0.4 -1.3	0.2 -0.5	0.5 - 1.2	0.3 - 0.8	0.8 -1.3	0.3 - 1.3		0.1 - 0.5	0.5 -1.6
BTEX Parameters (mg/kg)																
Benzene	0.03	NC	NA	0.005	0.011	0.011	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.011	<0.0050	Not acceptable	<0.0050	0.013
Toluene	0.37	NC	NA	0.01	0.036	0.023	<0.020	<0.020	<0.020	<0.020	<0.020	0.2	0.16	Acceptable	0.021	0.084
Ethylbenzene	0.082	NC	NA	0.01	0.014	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.12	0.092	Acceptable	0.013	0.6
Xylenes	11	NC	NA	0.02	0.11	0.071	<0.040	<0.040	<0.040	<0.040	<0.040	1	0.9	Acceptable	<0.040	2.7
Petroleum Hydrocarbons (mg/kg)																
F1(C6-C10) - BTEX	NC	30	NC	12	<12	14	<12	<12	<12	<12	16	330	420	Acceptable	22	220
F2 (C10-C16)	NC	150	NC	10	57	1100	<10	<10	14	<10	640	4700	4100	Acceptable	1400	5000
F3 (C16-C34)	NC	300	NC	10	250	61	29	31	<10	<10	41	190	210	Acceptable	360	150
F4 (C34-C50)	NC	2800	NC	10	59	<10	<10	<10	<10	<10	<10	<10	<10	Acceptable	44	11
Chromatogram to baseline at nC50	NC	NC	NC	NA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes
% Moisture	NC	NC	NC	0.1	6.4	8.9	8.7	15	5.3	6.7	6.9	16	17	Acceptable	8.5	16
Polycyclic Aromatics (mg/kg)																
Acenaphthene	0.28	---	7.9	0.0050	<0.0050	<0.0076 (1)	---	---	---	---	<0.0053 (1)	<0.080 (1)	0.11	Acceptable	---	---
Benzo[a]pyrene equivalency	---	5.3		0.10	<0.10	<0.10	---	---	---	---	<0.10	<0.10	<0.10	Acceptable	---	---
Acenaphthylene	320	---	0.15	0.22	<0.0050	<0.0073 (1)	---	---	---	---	<0.0061 (1)	<0.039 (1)	<0.049 (1)	Acceptable	---	---
Acridine	---	---	---	0.010	<0.010	<0.010	---	---	---	---	<0.010	<0.010	0.032	Not acceptable	---	---
Anthracene	2.5	---	0.67	0.0040	<0.0040	<0.0040	---	---	---	---	<0.0040	<0.0040	<0.0040	Acceptable	---	---
Benzo(a)anthracene	6.2	B[a]P	0.5	0.0050	0.0055	<0.0050	---	---	---	---	<0.0050	0.012	0.027	Not acceptable	---	---
Benzo(b&j)fluoranthene	6.2	B[a]P	0.78	0.0050	0.015	0.0085	---	---	---	---	0.0077	0.024	0.049	Acceptable	---	---
Benzo(k)fluoranthene	6.2	B[a]P	0.78	0.0050	<0.0050	<0.0050	---	---	---	---	<0.0050	<0.0086 (1)	<0.011 (1)	Acceptable	---	---
Benzo(g,h,i)perylene	---	B[a]P	6.6	0.0050	0.015	0.010	---	---	---	---	0.0082	0.023	0.035	Acceptable	---	---
Benzo(c)phenanthrene	---	---	---	0.0050	<0.0050	<0.0050	---	---	---	---	<0.0050	<0.0050	<0.0050	Acceptable	---	---
Benzo(a)pyrene	20	B[a]P	0.3	0.0050	0.0051	<0.0050	---	---	---	---	<0.0050	0.0089	0.017	Acceptable	---	---
Benzo[e]pyrene	---	---	---	0.0050	0.012	0.0074	---	---	---	---	0.0059	0.016	0.031	Acceptable	---	---
Chrysene	6.2	B[a]P	7	0.0050	0.0064	<0.0050	---	---	---	---	<0.0050	0.012	0.036	Not acceptable	---	---
Dibenzo(a,h)anthracene	1	B[a]P	0.1	0.0050	<0.0050	<0.0050	---	---	---	---	<0.0050	<0.0050	<0.0050	Acceptable	---	---
Fluoranthene	15.4	---	0.69	0.0050	0.0097	0.0060	---	---	---	---	<0.0050	0.035	0.076	Acceptable	---	---
Fluorene	15.4	---	62	0.0050	<0.0050	<0.011 (1)	---	---	---	---	<0.0075 (1)	<0.090 (1)	<0.11 (1)	Acceptable	---	---
Indeno(1,2,3-cd)pyrene	1	B[a]P	0.38	0.0050	<0.0050	<0.0050	---	---	---	---	<0.0050	0.0077	0.015	Acceptable	---	---
2-Methyl Naphthalene	---	---	0.99	0.0050	0.11	0.15	---	---	---	---	0.038	0.60	1.2	Acceptable	---	---
Naphthalene	0.013	---	0.6	0.0050	0.053	0.080	---	---	---	---	<0.028 (1)	<0.29 (1)	<0.41 (1)	Acceptable	---	---
Phenanthrene	0.046	---	6.2	0.0050	0.021	0.023	---	---	---	---	0.027	0.15	0.33	Acceptable	---	---
Perylene	---	---	---	0.0050	0.088	0.041	---	---	---	---	0.015	0.24	0.28	Acceptable	---	---
Pyrene	7.7	---	78	0.0050	0.017	0.0080	---	---	---	---	<0.0050	0.046	0.090	Acceptable	---	---
Quinoline	---	---	---	0.010	<0.010	<0.16 (1)	---	---	---	---	<0.051 (1)	<0.46 (1)	<0.48 (1)	Acceptable	---	---

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland, coarse grain soils

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in fine-grained surface soils: Protection of Eco Soil Contact from Table 3 - Technical Supplement.

3 = MOE (2011), Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 2 - Full Depth Residential / Parkland Standards for Potable Ground Water.

A = CCME (2004) Benzene, Table 2 - Soil quality guidelines and check values for benzene, Toluene, Ethylbenzene, and Xylenes. Soil ingestion guideline, coarse-grained, surficial soil.

(1) = Raised Minimum Detection Limit due to interference
--- = No Criteria/Not analyzed
NA = Not applicable
RDL= Reportable Detection Limit
20 = Denotes concentration above criteria

Table B-3: Soil Chemical Concentrations - PHCs and PAH

PARAMETER	Soil Criteria			RDL	AEC D: Powerhosue										
Sample Number	Federal		Provincial		D1-TP12-6	DUP-2 Duplicate ot D1-TP12-6	RPD	D1-TP12-7A	D1-TP12-7B	D1-TP12-8A	D1-TP12-8B	D1-TP12-9A	D1-TP12-9B	D1-TP12-10A	D1-TP12-10B	D1-TP12-Geo1
Sampling Date	Env. Health (non-carcinogenic effects)	Human health (carcinogenic effects)	MOE Table 2[3] Residential / Parkland		13/08/2012	13/08/2012		13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012
Sampling Depth (m)					0.1 - 0.8	0.1 - 0.8		0.3 - 0.6	0.6 - 1.5	0.4 - 0.7	0.8 - 1.2	0.2 - 0.5	0.5 - 1.1	0.1 - 0.5	0.5 - 1.0	0.1 - 2.0
BTEX Parameters (mg/kg)																
Benzene	0.03	NC	NA	0.005	0.0093	0.045	Not Acceptable	<0.0050	<0.0050	<0.0050	0.088	<0.0050	<0.0050	0.02	<0.0050	0.019
Toluene	0.37	NC	NA	0.01	0.13	0.18	Acceptable	<0.020	<0.020	<0.020	0.03	0.035	0.073	0.058	0.048	0.16
Ethylbenzene	0.082	NC	NA	0.01	1.5	3.1	Acceptable	<0.010	<0.010	<0.010	1.5	0.018	0.047	0.029	0.025	0.28
Xylenes	11	NC	NA	0.02	13	27	Acceptable	<0.040	<0.040	<0.040	4.6	0.15	1.1	0.16	0.14	5.1
Petroleum Hydrocarbons (mg/kg)																
F1(C6-C10) - BTEX	NC	30	NC	12	630	480	Acceptable	<12	<12	<12	330	350	590	160	89	780
F2 (C10-C16)	NC	150	NC	10	7300	8400	Acceptable	47	<10	16	2800	6800	4700	7700	5200	5900
F3 (C16-C34)	NC	300	NC	10	580	340	Acceptable	81	32	65	2300	780	360	1200	780	280
F4 (C34-C50)	NC	2800	NC	10	11	<10	Acceptable	<10	<10	<10	<10	<10	<10	<10	30	<10
Chromatogram to baseline at nC50	NC	NC	NC	NA	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
% Moisture	NC	NC	NC	0.1	12	15	Acceptable	8.5	19	7.4	15	4.3	14	5	5.3	16
Polycyclic Aromatics (mg/kg)																
Acenaphthene	0.28	---	7.9	0.0050	0.43	<0.58 (1)	Acceptable	---	---	<0.0050	<0.27 (1)	<0.0050	0.25	---	---	---
Benzo[a]pyrene equivalency	---	5.3		0.10	<0.10	<0.10	Acceptable	---	---	<0.10	<0.10	<0.10	<0.10	---	---	---
Acenaphthylene	320	---	0.15	0.22	<0.22 (1)	<0.18 (1)	Acceptable	---	---	<0.0050	<0.088 (1)	<0.12 (1)	<0.12 (1)	---	---	---
Acridine	---	---	---	0.010	0.39	0.16	Not Acceptable	---	---	<0.010	0.16	0.14	0.11	---	---	---
Anthracene	2.5	---	0.67	0.0040	<0.0040	<0.0040	Acceptable	---	---	<0.0040	<0.0040	<0.0040	<0.0040	---	---	---
Benzo(a)anthracene	6.2	B[a]P	0.5	0.0050	0.0081	0.011	Acceptable	---	---	0.0053	0.010	<0.0050	0.012	---	---	---
Benzo(b&j)fluoranthene	6.2	B[a]P	0.78	0.0050	0.017	0.017	Acceptable	---	---	0.013	0.017	0.0066	0.027	---	---	---
Benzo(k)fluoranthene	6.2	B[a]P	0.78	0.0050	<0.0050	<0.0050	Acceptable	---	---	<0.0050	<0.0050	<0.0050	<0.0062 (1)	---	---	---
Benzo(g,h,i)perylene	---	B[a]P	6.6	0.0050	0.013	0.016	Acceptable	---	---	0.012	0.012	<0.0050	0.022	---	---	---
Benzo(c)phenanthrene	---	---	---	0.0050	<0.0050	<0.0050	Acceptable	---	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---
Benzo(a)pyrene	20	B[a]P	0.3	0.0050	<0.0050	0.0057	Acceptable	---	---	<0.0050	0.0059	<0.0050	0.011	---	---	---
Benzo[e]pyrene	---	---	---	0.0050	0.012	0.012	Acceptable	---	---	0.0088	0.010	<0.0050	0.017	---	---	---
Chrysene	6.2	B[a]P	7	0.0050	0.013	0.013	Acceptable	---	---	0.0062	0.0087	0.0061	0.010	---	---	---
Dibenzo(a,h)anthracene	1	B[a]P	0.1	0.0050	<0.0050	<0.0050	Acceptable	---	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---
Fluoranthene	15.4	---	0.69	0.0050	0.049	0.058	Acceptable	---	---	0.011	0.029	0.033	0.044	---	---	---
Fluorene	15.4	---	62	0.0050	<0.57 (1)	0.71	Acceptable	---	---	<0.0050	0.52	<0.28 (1)	<0.43 (1)	---	---	---
Indeno(1,2,3-cd)pyrene	1	B[a]P	0.38	0.0050	<0.0050	<0.0050	Acceptable	---	---	<0.0050	<0.0050	<0.0050	0.0096	---	---	---
2-Methyl Naphthalene	---	---	0.99	0.0050	13 (2)	25 (2)	Acceptable	---	---	0.041	19 (2)	<0.58 (1)	2.9	---	---	---
Naphthalene	0.013	---	0.6	0.0050	4.8	11 (2)	Acceptable	---	---	0.020	9.5	<0.39 (1)	1.0	---	---	---
Phenanthrene	0.046	---	6.2	0.0050	0.53	0.44	Acceptable	---	---	0.054	0.43	0.33	0.50	---	---	---
Perylene	---	---	---	0.0050	0.051	0.084	Acceptable	---	---	0.050	0.096	0.014	0.19	---	---	---
Pyrene	7.7	---	78	0.0050	0.085	0.058	Acceptable	---	---	0.013	0.036	0.041	0.054	---	---	---
Quinoline	---	---	---	0.010	<3.4 (1)	<1.1 (1)	Acceptable	---	---	<0.010	<0.55 (1)	<0.31 (1)	<0.64 (1)	---	---	---

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland, coarse grain soils

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in fine-grained surface soils: Protection of Eco Soil Contact from Table 3 - Technical Supplement.

3 = MOE (2011), Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 2 - Full Depth Residential / Parkland Standards for Potable Ground Water.

A = CCME (2004) Benzene, Table 2 - Soil quality guidelines and check values for benzene, Toluene, Ethylbenzene, and Xylenes. Soil ingestion guideline, coarse-grained, surficial soil.

(1) = Raised Minimum Detection Limit due to interference
--- = No Criteria/Not analyzed
NA = Not applicable
RDL= Reportable Detection Limit
20 = Denotes concentration above criteria

Table B-3: Soil Chemical Concentrations - PHCs and PAH

PARAMETER	Soil Criteria			RDL	AEC D: Powerhouse								Delta			
Sample Number	Federal		Provincial		D1-HA12-1A	D1-HA12-1B	DUP-4 Duplicate ot D1-HA12-1B	RPD	D1-HA12-2	DUP-5 Duplicate ot D1-HA12-2	RPD	D1-HA12-3	Delta-TP12-1A	Delta-TP12-1B	Delta-TP12-2	Delta-TP12-3A
Sampling Date													14/08/2012	14/08/2012	14/08/2012	14/08/2012
Sampling Depth (m)	Env. Health (non-carcinogenic effects)	Human health (carcinogenic effects)	MOE Table 2[3] Residential / Parkland		0.1 - 0.7	0.7 - 0.9	0.7 - 0.9		0.2 - 1.0	0.2 - 1.0		0.2 - 0.7	1.0 - 1.0	1.0 - 1.5	0.5 - 1.0	0.1 - 0.6
BTEX Parameters (mg/kg)																
Benzene	0.03	NC	NA	0.005	<0.0050	0.17	0.16	Acceptable	0.36	0.17	Accpetable	<0.0050	0.0071	<0.0050	8.7	<0.40
Toluene	0.37	NC	NA	0.01	0.48	6.5	7.6	Acceptable	3.2	2	Accpetable	<0.020	0.046	<0.020	0.31	1
Ethylbenzene	0.082	NC	NA	0.01	1.1	9.3	9.9	Acceptable	4.8	3.6	Accpetable	0.055	0.028	<0.010	0.71	0.89
Xylenes	11	NC	NA	0.02	1.5	73	54	Acceptable	29	22	Accpetable	0.12	0.16	<0.040	1.4	3.6
Petroleum Hydrocarbons (mg/kg)																
F1(C6-C10) - BTEX	NC	30	NC	12	4400	3500	1500	Acceptable	1500	530	Not Acceptable	73	1000	17	15	630
F2 (C10-C16)	NC	150	NC	10	40000	19000	13000	Acceptable	12000	7700	Accpetable	1400	5900	820	11	5600
F3 (C16-C34)	NC	300	NC	10	1800	670	430	Acceptable	900	580	Accpetable	180	280	110	46	1500
F4 (C34-C50)	NC	2800	NC	10	<10	<10	<10	Acceptable	290	51	Not Acceptable	12	<10	<10	<10	110
Chromatogram to baseline at nC50	NC	NC	NC	NA	Yes	Yes	Yes	N/A	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes
% Moisture	NC	NC	NC	0.1	17	16	20	Acceptable	21	21	Accpetable	17	15	18	18	6.2
Polycyclic Aromatics (mg/kg)																
Acenaphthene	0.28	---	7.9	0.0050	---	<1.6	1.3	Acceptable	---	---	---	---	<0.14 (1)	<0.027 (1)	---	<0.50 (1)
Benzo[a]pyrene equivalency	---	5.3		0.10	---	0.30	<0.10	Not Acceptable	---	---	---	---	<0.10	<0.10	---	<0.10
Acenaphthylene	320	---	0.15	0.22	---	<0.51	<0.32 (1)	Acceptable	---	---	---	---	<0.075 (1)	<0.014 (1)	---	<0.24 (1)
Acridine	---	---	---	0.010	---	<0.50	0.19	Acceptable	---	---	---	---	0.084	0.013	---	0.15
Anthracene	2.5	---	0.67	0.0040	---	<0.20	<0.043 (1)	Acceptable	---	---	---	---	<0.0040	<0.0040	---	<0.0040
Benzo(a)anthracene	6.2	B[a]P	0.5	0.0050	---	<0.25	0.0060	Acceptable	---	---	---	---	0.0074	0.024	---	0.0087
Benzo(b&j)fluoranthene	6.2	B[a]P	0.78	0.0050	---	<0.25	0.011	Acceptable	---	---	---	---	0.013	0.056	---	<0.015 (1)
Benzo(k)fluoranthene	6.2	B[a]P	0.78	0.0050	---	<0.25	<0.0050	Acceptable	---	---	---	---	<0.0050	<0.012 (1)	---	<0.0050
Benzo(g,h,i)perylene	---	B[a]P	6.6	0.0050	---	<0.25	0.022	Acceptable	---	---	---	---	0.0094	0.060	---	0.012
Benzo(c)phenanthrene	---	---	---	0.0050	---	<0.25	<0.0050	Acceptable	---	---	---	---	<0.0050	<0.0050	---	<0.0050
Benzo(a)pyrene	20	B[a]P	0.3	0.0050	---	<0.25	<0.0050	Acceptable	---	---	---	---	<0.0050	0.022	---	0.0070
Benzo[e]pyrene	---	---	---	0.0050	---	<0.25	0.0096	Acceptable	---	---	---	---	0.0081	0.049	---	0.014
Chrysene	6.2	B[a]P	7	0.0050	---	<0.25	0.0096	Acceptable	---	---	---	---	0.0062	0.023	---	0.0093
Dibenzo(a,h)anthracene	1	B[a]P	0.1	0.0050	---	<0.25	<0.0050	Acceptable	---	---	---	---	<0.0050	0.0062	---	<0.0050
Fluoranthene	15.4	---	0.69	0.0050	---	<0.25	0.022	Acceptable	---	---	---	---	0.035	0.045	---	0.023
Fluorene	15.4	---	62	0.0050	---	1.7	1.0	Acceptable	---	---	---	---	<0.32 (1)	<0.051 (1)	---	<0.82 (1)
Indeno(1,2,3-cd)pyrene	1	B[a]P	0.38	0.0050	---	<0.25	0.0072	Acceptable	---	---	---	---	<0.0050	0.017	---	0.0057
2-Methyl Naphthalene	---	---	0.99	0.0050	---	99	63 (2)	Acceptable	---	---	---	---	3.7	0.53	---	25 (2)
Naphthalene	0.013	---	0.6	0.0050	---	45	32 (3)	Acceptable	---	---	---	---	<0.47 (1)	0.17	---	3.9
Phenanthrene	0.046	---	6.2	0.0050	---	0.77	0.61	Acceptable	---	---	---	---	0.20	0.14	---	0.55
Perylene	---	---	---	0.0050	---	<0.25	0.20	Acceptable	---	---	---	---	0.052	0.30	---	0.064
Pyrene	7.7	---	78	0.0050	---	<0.25	0.073	Not Acceptable	---	---	---	---	0.036	0.069	---	0.035
Quinoline	---	---	---	0.010	---	<7.1	<2.4 (4)	Acceptable	---	---	---	---	<0.55 (1)	<0.12 (1)	---	<1.1 (1)

0.025 0.01

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland, coarse grain soils

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in fine-grained surface soils: Protection of Eco Soil Contact from Table 3 - Technical Supplement.

3 = MOE (2011), Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 2 - Full Depth Residential / Parkland Standards for Potable Ground Water.

A = CCME (2004) Benzene, Table 2 - Soil quality guidelines and check values for benzene, Toluene, Ethylbenzene, and Xylenes. Soil ingestion guideline, coarse-grained, surficial soil.

(1) = Raised Minimum Detection Limit due to interference
--- = No Criteria/Not analyzed
NA = Not applicable
RDL= Reportable Detection Limit
20 = Denotes concentration above criteria

Table B-3: Soil Chemical Concentrations
- PHCs and PAH

PARAMETER	Soil Criteria			RDL	Delta									
Sample Number	Federal		Provincial		Delta-TP12-3B	DUP-3 Duplicate ot Delta-TP12-3B	RPD	Delta-TP12-4	Delta-TP12-5	Delta-TP12-6	Delta-TP12-7	Delta-TP12-8A	Delta-TP12-8B	Delta-TP12-9A	Delta-TP12-9B
Sampling Date					14/08/2012	14/08/2012		14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012	14/08/2012
Sampling Depth (m)	Env. Health (non-carcinogenic effects)	Human health (carcinogenic effects)	MOE Table 2[3] Residential / Parkland		0.6 - 1.5	0.6 - 1.5		0.5 - 1.6	0.3 - 0.8	0.1 - 0.6	0.1 - 0.6	0.1 - 0.8	0.8 - 1.0	0.1 - 1.0	1.0 - 1.3
BTEX Parameters (mg/kg)															
Benzene	0.03	NC	NA	0.005	0.96	0.12	Not Acceptable	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	0.37	NC	NA	0.01	0.032	0.024	Acceptable	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	0.082	NC	NA	0.01	0.2	0.039	Not Acceptable	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes	11	NC	NA	0.02	0.66	0.13	Not Acceptable	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Petroleum Hydrocarbons (mg/kg)															
F1(C6-C10) - BTEX	NC	30	NC	12	79	31	Not Acceptable	<12	<12	<12	<12	<12	<12	<12	<12
F2 (C10-C16)	NC	150	NC	10	590	160	Not Acceptable	14	<10	<10	<10	<10	15	<20	<10
F3 (C16-C34)	NC	300	NC	10	150	76	Acceptable	76	40	21	<10	12	19	<20	14
F4 (C34-C50)	NC	2800	NC	10	10	<10	Acceptable	<10	<10	<10	<10	<10	<10	<20	<10
Chromatogram to baseline at nC50	NC	NC	NC	NA	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
% Moisture	NC	NC	NC	0.1	18	18	Acceptable	17	17	15	9.7	13	17	9.7	20
Polycyclic Aromatics (mg/kg)															
Acenaphthene	0.28	---	7.9	0.0050	<0.052 (1)	---	---		---	<0.0050	---	<0.0050	<0.0050	---	---
Benzo[a]pyrene equivalency	---	5.3		0.10	<0.10	---	---	0.0062	---	<0.10	---	<0.10	<0.10	---	---
Acenaphthylene	320	---	0.15	0.22	<0.022 (1)	---	---	<0.10	---	<0.0050	---	<0.0050	<0.0050	---	---
Acridine	---	---	---	0.010	0.014	---	---	<0.0050	---	<0.010	---	<0.010	<0.010	---	---
Anthracene	2.5	---	0.67	0.0040	<0.0040	---	---	0.025	---	<0.0040	---	<0.0040	<0.0040	---	---
Benzo(a)anthracene	6.2	B[a]P	0.5	0.0050	0.016	---	---	<0.0040	---	0.0083	---	<0.0050	0.0086	---	---
Benzo(b&j)fluoranthene	6.2	B[a]P	0.78	0.0050	0.034	---	---	0.032	---	0.018	---	0.0099	<0.016 (1)	---	---
Benzo(k)fluoranthene	6.2	B[a]P	0.78	0.0050	<0.0079 (1)	---	---	0.058	---	<0.0050	---	<0.0050	<0.0050	---	---
Benzo(g,h,i)perylene	---	B[a]P	6.6	0.0050	0.039	---	---	<0.014 (1)	---	0.022	---	0.013	0.019	---	---
Benzo(c)phenanthrene	---	---	---	0.0050	<0.0050	---	---	0.049	---	<0.0050	---	<0.0050	<0.0050	---	---
Benzo(a)pyrene	20	B[a]P	0.3	0.0050	0.014	---	---	<0.0050	---	0.0086	---	<0.0050	0.0061	---	---
Benzo[e]pyrene	---	---	---	0.0050	0.025	---	---	0.029	---	0.015	---	0.0081	0.010	---	---
Chrysene	6.2	B[a]P	7	0.0050	0.016	---	---	0.036	---	0.0094	---	<0.0050	0.0075	---	---
Dibenzo(a,h)anthracene	1	B[a]P	0.1	0.0050	<0.0050	---	---	0.025	---	<0.0050	---	<0.0050	<0.0050	---	---
Fluoranthene	15.4	---	0.69	0.0050	0.035	---	---	<0.0050	---	0.019	---	0.0094	0.021	---	---
Fluorene	15.4	---	62	0.0050	<0.075 (1)	---	---	0.068	---	0.0072	---	<0.0050	0.0086	---	---
Indeno(1,2,3-cd)pyrene	1	B[a]P	0.38	0.0050	0.011	---	---	0.028	---	0.0077	---	<0.0050	0.0060	---	---
2-Methyl Naphthalene	---	---	0.99	0.0050	2.9	---	---	0.020	---	0.035	---	0.018	0.036	---	---
Naphthalene	0.013	---	0.6	0.0050	0.51	---	---	0.25	---	0.023	---	0.012	0.021	---	---
Phenanthrene	0.046	---	6.2	0.0050	0.13	---	---	0.17	---	0.035	---	0.032	0.047	---	---
Perylene	---	---	---	0.0050	0.32	---	---	0.19	---	0.16	---	0.092	0.26	---	---
Pyrene	7.7	---	78	0.0050	0.050	---	---	0.40	---	0.026	---	0.013	0.034	---	---
Quinoline	---	---	---	0.010	<0.097 (1)	---	---	0.090	---	<0.010	---	<0.010	<0.010	---	---

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland, coarse grain soils

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in fine-grained surface soils: Protection of Eco Soil Contact from Table 3 - Technical Supplement.

3 = MOE (2011), Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 2 - Full Depth Residential / Parkland Standards for Potable Ground Water.

A = CCME (2004) Benzene, Table 2 - Soil quality guidelines and check values for benzene, Toluene, Ethylbenzene, and Xylenes. Soil ingestion guideline, coarse-grained, surficial soil.

(1) = Raised Minimum Detection Limit due to interference
--- = No Criteria/Not analyzed
NA = Not applicable
RDL= Reportable Detection Limit
20 = Denotes concentration above criteria

Table B-3: Soil Chemical Concentrations - PHCs and PAH

PARAMETER	Soil Criteria			RDL	Station Creek						Borrow Source	
Sample Number	Federal		Provincial		SC-TP12-1	SC-TP12-2	SC-TP12-3	DUP-6 Duplicate ot SC-TP12-3	RPD	SC-TP12-4	Borrow-1	Borrow-2
Sampling Date	Env. Health (non-carcinogenic effects)	Human health (carcinogenic effects)	MOE Table 2[3] Residential / Parkland		18/08/2012	18/08/2012	18/08/2012	18/08/2012		18/08/2012	17/08/2012	18/08/2012
Sampling Depth (m)					0.5 - 1.2	0.6 - 1.0	0.5 - 1.4	0.5 - 1.4		0.2 - 1.5	0.1 - 0.2	0.1 - 0.2
BTEX Parameters (mg/kg)												
Benzene	0.03	NC	NA	0.005	<0.0050	<0.0050	<0.0050	<0.0050	Acceptable	<0.0050	<0.0050	<0.0050
Toluene	0.37	NC	NA	0.01	<0.020	<0.020	<0.020	<0.020	Acceptable	<0.020	<0.020	<0.020
Ethylbenzene	0.082	NC	NA	0.01	<0.010	<0.010	<0.010	<0.010	Acceptable	<0.010	<0.010	<0.010
Xylenes	11	NC	NA	0.02	<0.040	<0.040	<0.040	<0.040	Acceptable	<0.040	<0.040	<0.040
Petroleum Hydrocarbons (mg/kg)												
F1(C6-C10) - BTEX	NC	30	NC	12	<12	<12	<12	<12	Acceptable	<12	<12	<12
F2 (C10-C16)	NC	150	NC	10	<10	<10	<10	<10	Acceptable	<10	<10	<10
F3 (C16-C34)	NC	300	NC	10	34	38	39	44	Acceptable	41	10	27
F4 (C34-C50)	NC	2800	NC	10	<10	<10	<10	<10	Acceptable	<10	<10	<10
Chromatogram to baseline at nC50	NC	NC	NC	NA	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes
% Moisture	NC	NC	NC	0.1	17	19	23	22	Acceptable	19	6.9	5.3
Polycyclic Aromatics (mg/kg)												
Acenaphthene	0.28	---	7.9	0.0050	<0.0050	---	<0.0050	---	---	---	<0.0050	<0.0050
Benzo[a]pyrene equivalency	---	5.3		0.10	<0.10	---	<0.10	---	---	---	<0.10	<0.10
Acenaphthylene	320	---	0.15	0.22	<0.0050	---	<0.0050	---	---	---	<0.0050	<0.0050
Acridine	---	---	---	0.010	<0.010	---	<0.010	---	---	---	<0.010	<0.010
Anthracene	2.5	---	0.67	0.0040	<0.0040	---	<0.0040	---	---	---	<0.0040	<0.0040
Benzo(a)anthracene	6.2	B[a]P	0.5	0.0050	0.011	---	0.023	---	---	---	<0.0050	0.0053
Benzo(b&j)fluoranthene	6.2	B[a]P	0.78	0.0050	0.027	---	0.056	---	---	---	<0.0050	0.018
Benzo(k)fluoranthene	6.2	B[a]P	0.78	0.0050	0.0051	---	0.010	---	---	---	<0.0050	<0.0050
Benzo(g,h,i)perylene	---	B[a]P	6.6	0.0050	0.027	---	0.073	---	---	---	<0.0050	0.021
Benzo(c)phenanthrene	---	---	---	0.0050	<0.0050	---	<0.0050	---	---	---	<0.0050	<0.0050
Benzo(a)pyrene	20	B[a]P	0.3	0.0050	0.011	---	0.024	---	---	---	<0.0050	<0.0050
Benzo[e]pyrene	---	---	---	0.0050	0.017	---	0.055	---	---	---	<0.0050	0.012
Chrysene	6.2	B[a]P	7	0.0050	0.014	---	0.041	---	---	---	<0.0050	0.0083
Dibenzo(a,h)anthracene	1	B[a]P	0.1	0.0050	<0.0050	---	<0.0050	---	---	---	<0.0050	<0.0050
Fluoranthene	15.4	---	0.69	0.0050	0.027	---	0.047	---	---	---	<0.0050	0.010
Fluorene	15.4	---	62	0.0050	0.013	---	0.015	---	---	---	<0.0050	<0.0050
Indeno(1,2,3-cd)pyrene	1	B[a]P	0.38	0.0050	0.013	---	0.028	---	---	---	<0.0050	0.0094
2-Methyl Naphthalene	---	---	0.99	0.0050	0.038	---	0.17	---	---	---	<0.0050	0.017
Naphthalene	0.013	---	0.6	0.0050	0.025	---	0.11	---	---	---	<0.0050	0.0072
Phenanthrene	0.046	---	6.2	0.0050	0.057	---	0.16	---	---	---	0.0076	0.026
Perylene	---	---	---	0.0050	0.29	---	0.29	---	---	---	<0.0050	0.062
Pyrene	7.7	---	78	0.0050	0.036	---	0.073	---	---	---	<0.0050	0.014
Quinoline	---	---	---	0.010	<0.010	---	<0.010	---	---	---	<0.010	<0.010

Notes:

1 = CCME (2007), Canadian Environmental Quality Guidelines Summary Table, Soil Quality Guidelines for the Protection of Environmental and Human Health. Residential/Parkland, coarse grain soils

2 = CCME (2008) Canadian-Wide Standards for Petroleum Hydrocarbons in Soil - Table 1, Tier 1 levels for PHCs, Residential / Parkland Use in fine-grained surface soils: Protection of Eco Soil Contact from Table 3 - Technical Supplement.

3 = MOE (2011), Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 2 - Full Depth Residential / Parkland Standards for Potable Ground Water.

A = CCME (2004) Benzene, Table 2 - Soil quality guidelines and check values for benzene, Toluene, Ethylbenzene, and Xylenes. Soil ingestion guideline, coarse-grained, surficial soil.

(1) = Raised Minimum Detection Limit due to interference
--- = No Criteria/Not analyzed
NA = Not applicable
RDL= Reportable Detection Limit
20 = Denotes concentration above criteria

Table B-4: Soil Chemical Concentrations - PHC Fractionation

PARAMETER	RDL	AED D1: Powerhouse 2012			
Sample Number		**D1-TP12-4B**	**D1-TP12-6**	**D1-TP12-Geo1**	**D1-HA12-1B**
Sampling Date		13/08/2012	13/08/2012	13/08/2012	16/08/2012
Sampling Depth (m)		0.8 - 1.3	0.1 - 0.6	0.1 - 2.0	0.7 - 0.9
Petroleum Hydrocarbons (mg/kg)					
F1(C6-C10) - BTEX	12	330	630	780	3500
F2 (C10-C16)	10	4700	7300	5900	19000
F3 (C16-C34)	10	190	580	280	670
F4 (C34-C50)	10	<10	11	<10	<10
Reached Baseline at C50	N/A	Yes	Yes	Yes	Yes
Fractionation					
>C8-C10 Aliphatic	12	360	510	780	3500
C6-C8 Aliphatic	12	<12	16	<12	530
>C8-C10 Aromatic	12	23	130	90	610
>C10 - C12 Aliphatic	5	1200	2200	1700	4800
>C10 - C12 Aromatic	5	210	430	740	3700
>C12 - C16 Aliphatic	10	1400	3200	1500	5900
>C12 - C16 Aromatic	10	310	720	850	3900
>C16 - C21 Aliphatic	10	82	320	120	330
>C16 - C21 Aromatic	10	42	140	82	230
>C21 - C34 Aliphatic	10	<10	30	<10	25
>C21 - C34 Aromatic	10	35	39	34	42
>C34 Aliphatic (up to C50)	10	<10	<10	<10	<10
>C34 Aromatic (up to C50)	10	15	<10	16	<10

PARAMETER	RDL	AED D1: Powerhouse 2012								Station Creek	Borrow Source
Sample Number		**D1-TP12-2**	**D1-TP12-10**	**D1-TP12-Geo 1**	**D1-TP12-Geo 2**	**D1-TP12-Geo 3**	**D1-HA12-1**	**D1-HA12-2**	**D1-HA12-3**	**SC-TP12-2**	**Borrow 1**
Sampling Date		13/08/2012	13/08/2012	13/08/2012	13/08/2012	13/08/2012	16/08/2012	16/08/2012	16/08/2012	17/08/2012	17/08/2012
Sampling Depth (m)		0.2 - 1.3	0.1 - 1.0	0.1 - 2.0	0.1 - 2.0	0.1 - 1.8	0.1 - 0.9	0.2 - 1.0	0.2 - 0.7	0.1 - 1.0	0.1 - 0.2
Physical Properties											
% sand by hydrometer	2	---	---	45	77	81	53	60	39	---	77
% silt by hydrometer	2	---	---	34	12	10	23	24	29	---	11
Clay Content	2	---	---	21	11	9.0	24	16	32	---	12
Texture	N/A	---	---	LOAM	SANDY LOAM	LOAMY SAND	SANDY CLAY LOAM	SANDY LOAM	CLAY LOAM	---	SANDY LOAM
Moisture	0.3	---	---	16	9.9	7.8	18	21	17	---	6.9
Sieve - Pan	0.2	34	2.6	65	16	14	62	52	33	33	20
Sieve - #200 (>0.075mm)	0.2	66	97	35	85	86	38	48	67	67	80
Grain Size	0.2	COARSE	COARSE	FINE	COARSE	COARSE	FINE	FINE	COARSE	COARSE	COARSE

Table B-6: Surface Water Chemical Concentrations
- Background Metals

PARAMETER	Surface Water Criteria		RDL	Background 2009		Background 2012											Background Average	Background Range
Sampling No.	Federal[A]			BG-SW09-1	BG-SW09-2	BG-SW12-1	BG-SW12-2	BG-SW12-DUP1 (of BG-SW12-2)	RPD	BG-SW12-3	BG-SW12-4	BG-SW12-5	BG-SW12-6	BG-SW12-7	BG-SW12-8	BG-SW12-9		
Sampling Date	CCME 2007[1] FWAL	Canadian Drinking Water Quality[2]		15/8/2009	15/8/2009	18/08/2012	18/08/2012	18/08/2012		18/08/2012	18/08/2012	18/08/2012	19/08/2012	19/08/2012	19/08/2012	19/08/2012		
Trace Metals (mg/L)																		
Aluminum (Al)	0.1	0.1**	0.0010	0.816	0.327	4.7	2.7	2.9	Acceptable	2.7	3.1	2.9	0.14	0.19	0.20	0.25	1.74	0.14 - 47
Antimony (Sb)	---	0.006	0.00060	<0.00040	<0.00040	<0.00060	<0.00060	<0.00060	Acceptable	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00582	0.0004-0.0006
Arsenic (As)	0.005	0.01	0.00020	0.00114	0.00085	0.0067	0.0024	0.0024	Acceptable	0.0024	0.0026	0.0036	0.00037	0.00026	0.00025	0.00031	0.00194	0.00025-0.067
Barium (Ba)	---	1	0.010	0.0435	0.0435	0.064	0.044	0.044	Acceptable	0.046	0.047	0.052	0.054	0.054	0.053	0.054	0.050	0.0435-0.064
Beryllium (Be)	---	---	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	Acceptable	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Boron (B)	1500	5	0.020	<0.050	<0.050	0.044	0.036	0.038	Acceptable	0.037	0.039	0.040	0.054	0.055	0.056	0.058	0.046	0.036-0.058
Cadmium (Cd)	0.000018	0.005	0.000005	<0.000050	<0.000050	0.00012	0.000093	0.000096	Acceptable	0.00011	0.00012	0.00013	0.000073	<0.000005	<0.000005	<0.000005	0.000071	<0.000005-0.00013
Calcium (Ca)	---	---	0.30	113	140	120	120	120	Acceptable	120	120	120	210	200	200	200	149	113-210
Chromium (Cr)	---	0.05	0.0010	<0.0050	<0.0050	0.0092	0.0032	0.0034	Acceptable	0.0031	0.0040	0.0044	<0.0010	<0.0010	<0.0010	<0.0010	0.0034	<0.0010-0.0092
Cobalt (Co)	---	---	0.00030	<0.0020	<0.0020	0.014	0.011	0.011	Acceptable	0.012	0.012	0.013	0.0012	<0.00030	0.00031	<0.00030	0.00751	<0.00030-0.014
Copper (Cu)	0.002	1 (AO)	0.00020	0.0027	0.0022	0.020	0.013	0.013	Acceptable	0.014	0.014	0.015	0.0014	0.00075	0.00067	0.00078	0.00813	0.00067-0.02
Iron (Fe)	0.3	0.3 (AO)	0.060	1.3	1.02	15	5.4	5.5	Acceptable	5.4	6.0	8.0	0.32	0.34	0.36	0.43	4.09	0.32-15
Lead (Pb)	0.001	0.01	0.00020	0.00111	0.00059	0.0083	0.0046	0.0044	Acceptable	0.0046	0.0051	0.0057	<0.00020	<0.00020	<0.00020	<0.00020	0.00293	<0.00020-0.0083
Lithium (Li)	---	---	0.020	0.013	0.012	<0.020	<0.020	<0.020	Acceptable	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	8.425	<0.020-0.013
Magnesium (Mg)	---	---	0.20	45.5	55.4	40	39	39	Acceptable	39	40	41	92	91	91	93	58.8	39-93
Manganese (Mn)	---	0.050 (AO)	0.0040	0.0137	0.0108	0.40	0.32	0.33	Acceptable	0.36	0.34	0.37	0.016	0.017	0.019	0.018	0.185	0.0108-0.4
Molybdenum (Mo)	0.073	---	0.00020	<0.0050	<0.0050	0.00087	<0.00020	<0.00020	Acceptable	<0.00020	<0.00020	0.00036	0.00021	<0.00020	<0.00020	<0.00020	0.00107	<0.00020-0.00087
Nickel (Ni)	0.025	---	0.00050	0.0033	0.0036	0.034	0.024	0.024	Acceptable	0.029	0.027	0.029	0.0024	0.0022	0.0022	0.0022	0.0152	0.0022-0.034
Phosphorus (P)	0.035-0.1*	---	0.10	---	---	0.43	0.29	0.22	Acceptable	0.22	0.26	0.37	<0.10	<0.10	<0.10	<0.10	0.22	<0.10-0.43
Potassium (K)	---	---	0.30	3.79	4.55	4.0	3.1	3.1	Acceptable	3.0	3.1	3.4	5.6	5.6	5.7	5.8	4.2	3.0-5.8
Selenium (Se)	0.001	0.01	0.00020	0.002	0.0021	0.00098	0.00091	0.00090	Acceptable	0.00086	0.00086	0.00087	0.0023	0.0023	0.0022	0.0023	0.0015	0.00086-0.0023
Silicon (Si)	---	---	0.10	---	---	7.1	2.7	2.8	Acceptable	3.2	3.0	4.0	0.83	0.83	0.94	1.1	2.65	0.83-7.1
Silver (Ag)	0.0001	---	0.00010	<0.00010	0.00019	<0.00010	<0.00010	<0.00010	Acceptable	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	<0.0001-0.00019
Sodium (Na)	---	200 (AO)	0.50	57.8	69.4	58	57	58	Acceptable	57	59	61	170	170	170	170	96	57-170
Strontium (Sr)	---	---	0.020	---	---	0.38	0.36	0.36	Acceptable	0.37	0.37	0.38	0.82	0.82	0.82	0.83	0.55	0.36-0.83
Sulphur (S)	---	---	0.20	---	---	110	110	120	Acceptable	120	120	120	250	250	250	250	170	110-250
Thallium (Tl)	0.0008	---	0.00020	<0.00010	0.00013	<0.00020	<0.00020	<0.00020	Acceptable	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00019	<0.0001-0.002
Tin (Sn)	---	---	0.0010	<0.050	<0.050	<0.0010	<0.0010	<0.0010	Acceptable	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010-<0.050
Titanium (Ti)	---	---	0.0010	0.0293	0.009	0.090	0.036	0.048	Acceptable	0.036	0.058	0.035	0.0095	0.0057	0.0091	0.011	0.031	0.0057-0.09
Uranium (U)	0.015	0.02	0.00010	0.00088	0.00089	0.0012	0.0010	0.00099	Acceptable	0.0010	0.0010	0.0011	0.0014	0.0014	0.0014	0.0014	0.0011	0.00088-0.0014
Vanadium (V)	---	---	0.0010	0.0037	0.0015	0.024	0.011	0.011	Acceptable	0.012	0.012	0.014	<0.0010	<0.0010	<0.0010	<0.0010	0.0078	<0.0010-0.024
Zinc (Zn)	0.03	5 (AO)	0.0030	0.0069	0.0119	0.16	0.15	0.17	Acceptable	0.20	0.28	0.52	2.4	<0.0030	<0.0030	<0.0030	0.3257	0.0069-2.4

Notes:

1 = Canadian Council of Ministers of the Environment, Summary Table - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL), 2007 Update.

2 = Canadian Council of Ministers of the Environment, Guidelines for Canadian Water Quality Summary Table (Table 4), 2006 Update.

NC= No Criteria

* = Range for Eutrophic conditions

** = Operational Guidance Value for conventional water treatment plant using aluminium-based coagulants.

AO = Aesthetic objective

RDL = Reportable Detection Limit

20 = Denotes exceedances.

Table B-7: Surface Water Chemical Concentrations - PHCs

PARAMETER	Surface Water Criteria			RDL	Delta	
Sample Number	Provincial	Federal			DELTA-W12-1	DELTA-W12-2
Sampling Date	MOE Table 2[1] Potable Groundwater	Interim Groundwater Quality Guidelines[2]	CCME 2007[3] FWAL		14/08/2012	14/08/2012
Petroleum Hydrocarbons (mg/L)						
F1(C6-C10)	1	---	---	0.1	---	---
F1-BTEX		0.81	---	0.1	---	---
F2 (>C10-C16)		1.3	---	0.05	<0.10	<0.10
F3 (C16-C34)		---	---	0.05	<0.10	<0.10
F4 (C34-C50)		---	---	0.05	<0.10	<0.10

Notes:

1 = Ontario Ministry of the Environment, Guideline for Use at Contaminated Sites in Ontario, Table 2 - Full Depth Generic Site Condition Standards in a Potable Ground Water Conditions (2004).

2 = Guidance of Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites. Table 2: Federal Interim Groundwater Quality Guidelines Generic Guidelines for Residential Parkland use, Tier 1, coarse soil (2012).

3 = Canadian Council of Ministers of the Environment, Summary Table - Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FWAL), 2007 Update.

--- = Not analysed or no criterion/guideline established.

20 = Denotes exceedances.

Table B-8: Sediment Chemical Concentrations
- Background Metals

PARAMETER	Sediment Criteria		RDL	Background 2009		Background 2012											Background Average	Background Range
Sample Number	Federal			BG-SED09-1	BG-SED09-2	BG-SED12-1	BG-SED12-2	DUP-1	RPD	BG-SED12-3	BG-SED12-4	BG-SED12-5	BG-SED12-6	BG-SED12-7	BG-SED12-8	BG-SED12-9		
Sample Date	CCME 2002[1] ISQG	CCME 2002[1] PEL		15/8/2009	15/8/2009	18/08/2012	18/08/2012	18/08/2012		18/08/2012	18/08/2012	18/08/2012	19/08/2012	19/08/2012	19/08/2012	19/08/2012		
Total Metals (mg/kg)																		
Aluminum (Al)	---	---	10	---	---	5300	13000	12000	Acceptable	11000	7000	4800	5700	5700	6700	6700	7790	4800-13000
Antimony (Sb)	---	---	1.0	0.63	0.55	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.9	0.55-1
Arsenic (As)	5.9	17	1.0	**29**	**23.8**	9.2	12	12	Acceptable	11	8.0	6.1	9.4	11	10	9.9	12.6	6.1-29
Barium (Ba)	---	---	10	33.5	34	47	67	64	Acceptable	56	42	33	38	38	44	47	45.3	33-67
Beryllium (Be)	---	---	0.40	<1.0	<1.0	0.90	1.2	1.1	Acceptable	1.0	0.76	0.50	0.45	0.44	0.52	0.50	0.78	0.44-1.2
Bismuth (Bi)	---	---	1.0	---	---	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Boron (B)	---	---	2.0	---	---	16	18	17	Acceptable	17	10	8.6	8.6	9.1	10	10	12.43	8.6-18
Cadmium (Cd)	0.6	3.5	0.10	<0.50	<0.50	0.21	0.12	0.12	Acceptable	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.18	0.12-0.21
Calcium (Ca)	---	---	50	---	---	9600	9800	8800	Acceptable	8500	7400	6100	3900	4500	5200	5700	6950	3900-9800
Chromium (Cr)	37.3	90	1.0	21.7	16	17	27	25	Acceptable	23	16	11	12	12	13	13	17	11-27
Cobalt (Co)	---	---	1.0	11.8	13.4	12	12	12	Acceptable	12	10	7.6	6.4	6.5	6.2	5.9	9.1	5.9-13.4
Copper (Cu)	35.7	197	5.0	31.1	37	31	35	34	Acceptable	36	22	20	16	20	27	24	28	16-36
Iron (Fe)	---	---	10	---	---	19000	34000	32000	Acceptable	29000	21000	16000	21000	25000	20000	20000	23700	16000-34000
Lead (Pb)	35	91.3	1.0	15.8	16.8	12	15	14	Acceptable	13	9.8	7.4	8.4	8.7	9.3	9.0	11.6	7.4-16.8
Magnesium (Mg)	---	---	20	---	---	3300	5300	4900	Acceptable	4600	3600	2600	3400	3600	4500	4800	4060	2600-5300
Manganese (Mn)	---	---	10	---	---	200	300	290	Acceptable	280	240	200	180	240	130	130	219	130-300
Mercury (Hg)	0.17	0.486	0.050	0.129	0.158	<0.050	<0.050	<0.050	Acceptable	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.07	<0.050-0.0.158
Molybdenum (Mo)	---	---	0.40	2.9	4.6	1.0	1.6	1.6	Acceptable	1.7	1.2	0.76	0.91	1.0	0.82	0.82	1.58	0.76-4.6
Nickel (Ni)	---	---	1.0	29.9	35.1	28	29	30	Acceptable	33	25	17	18	19	20	19	25	17-35.1
Phosphorus (P)	---	---	20	---	---	380	630	590	Acceptable	560	420	330	290	420	310	320	425	290-630
Potassium (K)	---	---	25	---	---	870	2000	1800	Acceptable	1700	1100	760	1200	1100	1500	1500	1353	760-2000
Selenium (Se)	---	---	0.50	0.99	1.2	<0.50	0.50	<0.50	Acceptable	<0.50	<0.50	<0.50	<0.50	0.52	0.58	0.51	0.61	<0.50-1.2
Silver (Ag)	---	---	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sodium (Na)	---	---	50	---	---	<50	<50	<50	Acceptable	<50	<50	<50	240	230	170	250	223	170-250
Strontium (Sr)	---	---	10	---	---	60	83	76	Acceptable	72	49	37	32	32	42	42	53	32-83
Thallium (Tl)	---	---	0.30	<1.0	<1.0	<0.30	<0.30	<0.30	Acceptable	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.3	<0.30-<1.0
Tin (Sn)	---	---	1.0	<5.0	<5.0	<1.0	<1.0	<1.0	Acceptable	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0-<5.0
Uranium (U)	---	---	1.0	<2.0	<2.0	<1.0	1.0	1.0	Acceptable	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.2	<1.0-1.2
Vanadium (V)	---	---	1.0	98	60.4	34	49	46	Acceptable	41	30	22	25	26	19	18	39	18-98
Zinc (Zn)	123	315	10	65	58	53	76	72	Acceptable	63	48	37	46	51	54	54	56	37-76

Notes:
1 = Canadian Council of Ministers of the Environment, Table 1 - Interim Freshwater Sediment Quality Guidelines (ISQG) for the protection of Aquatic Life, 2002 Update and Probable Effect Level (PEL).
--- = Not analyzed
NC= No criteria
RDL= Reportable Detection Limit
20 = Denotes exceedances for ISQG
20 = Denotes exceedances for ISQG and PEL

Table B-9: Sediment Chemical Concentrations - PHCs

PARAMETER	Sediment Criteria		RDL	Background 2009		APEC D-1: POWERHOUSE LOCATED AT THE MAIN CAMP							
Sample Number	Federal			BG-SED09-1	BG-SED09-2	D1-SED12-1A	D1-SED12-1B	D1-SED12-2A	D1-SED12-2B	D1-SED12-DUP1 (of D1-SED12-2B)	RPD	D1-SED12-3A	D1-SED12-3B
Sampling Date	CCME 2002[1] ISQG	CCME 2002[1] PEL		15/8/2009	15/8/2009	17/08/2012	17/08/2012	17/08/2012	17/08/2012	17/08/2012		17/08/2012	17/08/2012
BTEX Parameters (mg/kg)													
Benzene	---	---	0.005	<0.0050	<0.0050	0.073	0.078	0.92	0.51	1.2	Acceptable	0.05	0.01
Toluene	---	---	0.01	<0.050	<0.050	<0.020	<0.020	0.14	0.067	0.12	Acceptable	0.075	<0.020
Ethylbenzene	---	---	0.01	<0.015	<0.015	0.33	0.79	9.1	5.7	11	Acceptable	0.12	0.018
Xylenes	---	---	0.02	<0.10	<0.10	0.21	0.6	9.4	13	12	Acceptable	0.29	<0.040
Petroleum Hydrocarbons (mg/kg)													
F1(C6-C10)	---	---	5	<10	<10	100	60	1500	1600	2000	Acceptable	<12	<12
F2 (C10-C16)	---	---	5	<20	<20	3000	1200	16000	11000	18000	Acceptable	270	40
F3 (C16-C34)	---	---	5	<20	<20	480	160	1100	630	1400	Acceptable	130	61
F4 (C34-C50)	---	---	5	<20	<20	14	<10	<10	<10	<10	Acceptable	14	<10
Chromatogram to baseline at nC50	---	---	---	Yes	Yes	YES	YES	Yes	Yes	Yes	N/A	Yes	Yes
% Moisture	---	---	0.1	14.1	12.9	26	15	18	15	23	Acceptable	24	23

Notes:

1 = Canadian Council of Ministers of the Environment, Table 1 - Interim Freshwater Sediment Quality Guidelines (ISQG) for the protection of Aquatic Life, 2002 Update and Probable Effect Level (PEL).

--- = Not analyzed / No guidelines

Table B-10: Indoor Air and Vapour Chemical Concentrations - PHCs

Parameter		Indoor Air		Lab RDL	Operation and Mainteance Buildings										
					Old Garage 2012	Old transient Barracks 2012	Building 17 2012	Former Bunkhouse 2012	New Garage 2012	Watertanks 2012	Powerhouse 2012	DUP1	QA/QC Evaluation	Crawlspace 2012	Crawlspace 2 - 2012
Sampling Date		Health Canada[1]	Site Specific Threshold		26/07/2011	26/07/2011	26/07/2011	26/07/2011	26/07/2011	26/07/2011	26/07/2011	26/07/2011		26/07/2011	26/07/2011
Description					24-hour indoor air	24-hour indoor air	24-hour indoor air	24-hour indoor air	24-hour indoor air	24-hour indoor air	24-hour indoor air	Duplicate of Powerhouse 2012		24-hour indoor air beneath the Powerhouse	20 minute indoor air beneath the Powerhouse
BTEX µg/m³	Benzene	**3**	---	1.2	<1.2	<1.2	3.7	<1.2	9.2	<1.2	1.4	1.4	Acceptable	<1.2	<1.2
	Toluene	**760**	---	1.6	16.6	<1.6	17.1	<1.6	105	7.7	20.6	20.8	Acceptable	<1.6	<1.6
	Ethylbenzene	**200**	---	1.6	8.1	<1.6	3.7	<1.6	30.9	2.5	7.1	6.6	Acceptable	<1.6	<1.6
	Total Xylenes	**36**	---	2.2	37.2	2.8	18.6	<2.2	148	12.4	34.5	31.5	Acceptable	<2.2	<2.2
PHCs µg/m³	F1-BTEX - C6-C10 (as Toluene)	10498	**848**	5	101	30.7	121	77.4	774	225	542	542	Acceptable	55.1	<5.0
	F2 - C10-C16 (as Decane)	840	**391**	5	483	53.3	1090	727	1020	186	406	408	Acceptable	56.7	329

Parameter		Indoor Air		Lab RDL	Old Garage VP 2012
Sampling Date		Health Canada[1]	Site Specific Threshold		26/07/2011
Description					Sub-slab vapour, attenuation factor of 0.02
BTEX µg/m³	Benzene	**3**	---	46	<0.92
	Toluene	**760**	---	170	<3.4
	Ethylbenzene	**200**	---	61	4.02
	Total Xylenes	**36**	---	84	11.04
PHCs µg/m³	F1-BTEX - C6-C10 (as Toluene)	10498	**848**	190	1678
	F2 - C10-C16 (as Decane)	840	**391**	190	480

Notes: All units in ug/m³.

1 = Health Canada's Health-Based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for Priority Substances. Using Table 3a (non-carcinogens) for toluene and xylenes and Table 3b (carcinogens) for benzene. Table 3b value divided by 5,000 for 10^{-5} risk approximation.

--- = No criterion/guideline established
ND = Analytical results are below laboratory
NC = Not calculated
RPD = Relative percent difference
RDL = Laboratory detection limit
20 = Denotes guidelines used to determine chemical exceedances
20 = Denotes chemical exceedances

APPENDIX A

Figures

APPENDIX B

Tables

APPENDIX C

Photographs

APPENDIX C

Photographs

PHOTOGRAPHIC RECORD

Client: PWGSC/EC	Background – Blacktop Creek	Project No. 1570-1205
Photo No. 1		
Date: August 18, 2012		
Direction: East		
Description: Background sampling location, Blacktop Creek		

Client: PWGSC/EC	Background – Station Creek	Project No. 1570-1205
Photo No. 2		
Date: August 19, 2012		
Direction: North		
Description: Background sampling location, Station Creek		

PHOTOGRAPHIC RECORD

Client: PWGSC/EC	AEC D – Powerhouse	Project No. 1570-1205
Photo No. 3		
Date: August 13, 2012		
Direction: east		
Description: Location of the three test pits at the top of the slope, west of the Powerhouse. D1-TP12-Geo1 is the closest in the photo.		

Client: PWGSC/EC	AEC D – Powerhouse	Project No. 1570-1205
Photo No. 4		
Date: August 16, 2012		
Direction: South		
Description: Location of the hand augered samples collected at the bottom of the slope, west of Station Creek		

Client: PWGSC/EC	AEC D – Powerhouse	Project No. 1570-1205
Photo No. 5		
Date: August 17, 2012		
Direction: N/A		
Description: Sediment sampling in the drainage pond. Note the large black areas caused by disruption of the sediments. It has a strong hydrocarbon odour.		

Client: PWGSC/EC	Indoor Air Sampling	Project No. 1570-1205
Photo No. 6		
Date: August 15, 2012		
Direction: N/A		
Description: Items of possible interference in the collection of indoor air inside the New Garage		

PHOTOGRAPHIC RECORD

Client: PWGSC/EC	Indoor Air Sampling	Project No. 1570-1205
Photo No. 7		
Date: August 15, 2012		
Direction: N/A		
Description: Inside of Building # 17		

Client: PWGSC/EC	Indoor Air Sampling	Project No. 1570-1205
Photo No. 8		
Date: August 15, 2012		
Direction: N/A		
Description: Collection of 24-hour indoor air sample in Building #17		

Client: PWGSC/EC	Indoor Air Sampling	Project No. 1570-1205
Photo No. 9		
Date: August 15, 2012		
Direction: N/A		
Description: Sub-slab vapour probe, Old Garage		

Client: PWGSC/EC	Delta	Project No. 1570-1205
Photo No. 10		
Date: August 14, 2012		
Direction: East		
Description: Delta sampling locations. Delta-TP12-3 is adjacent to the truck		

Client: PWGSC/EC	Delta	Project No. 1570-1205
Photo No. 11		
Date: August 14, 2012		
Direction: South		
Description: Area where Delta-TP12-8 and 9 were collected		

Client: PWGSC/EC	West of Station Creek	Project No. 1570-1205
Photo No. 12		
Date: August 17, 2012		
Direction: South		
Description: Station Creek sampling area, north of the road near SC-TP12-1.		

Client: PWGSC/EC	West of Station Creek	Project No. 1570-1205
Photo No. 13		
Date: August 17, 2012		
Direction: North		
Description: West of Station Creek sampling area, south of the road. Soil pile of SC-TP12-3 visible along left edge of photograph.		

Client: PWGSC/EC	Borrow Source – Upper Paradise	Project No. 1570-1205
Photo No. 14		
Date: August 17, 2012		
Direction: Southwest		
Description: Upper Paradise, potential borrow source area. Sample Borrow-1 collected here.		

PHOTOGRAPHIC RECORD

Client: PWGSC/EC	Borrow Source – Blacktop Creek	Project No. 1570-1205
Photo No. 15		
Date: August 17, 2012		
Direction: Southeast		
Description: Blacktop Creek borrow source area. Sample Borrow-2 collected here.		

APPENDIX D

Sample Logs

Date:	18-Aug-12	**Soil Sample: BG-HA12-1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Dark brown, sand, some gravel, no odour	GR	BG-HA12-1	0	Metals (0.05 - 0.15)	Blacktop Creek Area	

Date:	18-Aug-12	**Soil Sample: BG-HA12-2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Dark brown, sand, some gravel, no odour	GR	BG-HA12-2	0	Metals (0.05 - 0.15)	Blacktop Creek Area	

Date:	18-Aug-12	**Soil Sample: BG-HA12-3**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Dark brown, sand, some gravel, no odour	GR	BG-HA12-3	0	Metals (0.05 - 0.15)	Blacktop Creek Area	

Date:	18-Aug-12	**Soil Sample: BG-HA12-4**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Dark brown, sand, some gravel, no odour	GR	BG-HA12-4	0	Metals (0.05 - 0.15)	Blacktop Creek Area	

Date:	19-Aug-12	**Soil Sample: BG-HA12-5**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.2	Brown, dry, sand with cobbles	GR	BG-HA12-5	0	Metals (0.05 - 0.2)	Station Creek Area	

Date:	19-Aug-12	**Soil Sample: BG-HA12-6**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Dark brown, dry, sand, no odour	GR	BG-HA12-6	0	Metals (0.05 - 0.15)	Station Creek Area	

Date:	19-Aug-12	**Soil Sample: BG-HA12-7**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Brown, dry, sand, some gravel, no odour	GR	BG-HA12-7	0	Metals (0.05 - 0.15)	Station Creek Area	

Date:	19-Aug-12	**Soil Sample: BG-HA12-8**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Brown, dry, sand, some gravel, no odour	GR	BG-HA12-8	0	Metals (0.05 - 0.15)	Station Creek Area	

Date:	19-Aug-12	**Soil Sample: BG-HA12-9**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Excavation							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Background	0 - 0.15	Light brown, dry, sand with silt, no odour	GR	BG-HA12-9	0	Metals (0.05 - 0.15)	Station Creek Area	

Date:	13-Aug-12	**Soil Sample: D1-TP12-1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Sandy gravel fill with large boulders, dry, light brown	GR	---	---	---	Southwest of the Old Garage	
	0.2 - 0.5	Wood debris, sand, silt with some gravel, dry, light brown		D1-TP12-1A	60	PHCs, BTEX, PAH, Metals (0.2 - 0.7)		
	0.5 - 0.7	Sand, silt with some clay and gravel, wet						
	0.7- 1.7 permafrost	Sand, silt, gravel, wet, light brown, PHC odour		D1-TP12-1B	65	PHCs, BTEX, PAH, Metals (0.7 - 1.7)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Light brown dry sand some gravel		D1-TP12-2A	60	PHCs, BTEX (0.1 - 0.4)	South of the Powerhouse	
	0.2 - 0.4	Brown, silt, sand and some gravel, damp, no odour						
	0.4- 1.3 permafrost	Sand, silt, gravel, wet, light brown, PHC odour		D1-TP12-2B	55	PHCs, BTEX (0.4 - 1.3)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-3**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Light brown sand some gravel, dry	GR	---	---	---	South of the Powerhouse	
	0.1 - 0.3	Light brown sand with gravel, dry		D1-TP12-3A	55	PHCs, BTEX (0.2 - 0.5)		
	0.3 - 1.2	Light brown damp sand some silt						
	1.2 permafrost	Clay layer with silt		D1-TP12-3B	55	PHCs, BTEX (0.5 - 1.2)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-4/DUP-1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.3	Light brown, dry sand gravel fill		D1-TP12-4A	55	PHCs, BTEX, PAH, Metals (0.3-0.8)	South of the Powerhouse	
	0.3 - 0.8	Dark brown, sand, silt and gravel, damp						
	0.8 - 1.3 permafrost	Light grey, sand, silt, clay, strong hydrocarbon odour, damp		D1-TP12-4B/DUP-1	25	PHCs, BTEX, PAH, Metals, Fractionation (0.8 - 1.3)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-5**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Dry light brown sand and gravel fill with cobbles	GR	---	---	---	Northeast of Old Transient Barracks	
	0.1 - 0.5	Light brown sand, trace silt and gravel		D1-TP12-5A	5	PHCs, BTEX (0.1 - 0.5)		
	0.5- 1.6 permafrost	Grey silty clay, strong hydrocarbon odour, wet from 1.3 to 1.6 m due to seep at 1.3 m		D1-TP12-5B	110	PHCs, BTEX (0.5 - 1.6)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-6/DUP-2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Brown, dry, sand and gravel, no odour		---	---	---	East of Old Transient Barracks	
	0.1 - 0.8 Water Infiltration	Light brown sand, silt with cobble, strong hydrocarbon odour, grey clay seam at 0.3 m, test pit stopped due to water infiltration		D1-TP12-6/DUP-2	100	PHCs, BTEX, PAH, Metals, Fractionation (0.1 - 0.8)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-7**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Sand, gravel fill, light brown, dry	GR	---	---	---	Southwest of Building # 17	
	0.2 - 0.3	grey/light brown sand, dry		---	---	---		
	0.3 - 0.6	Light brown sand, some cobbles, hydrocarbon odour		D1-TP12-3A	10	PHCs, BTEX (0.3 - 0.6)		
	0.6 - 1.5 permafrost	Light grey, wet, silt clay, strong hydrocarbon odour		D1-TP12-3B	0	PHCs, BTEX (0.6 - 1.5)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-8**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Light brown, dry sand and gravel fill		---	---	---	Southeast of Building # 17	
	0.2 - 0.4	Light brown sand, silt with gravel, dry, metal pipe at 0.2 m		---	---	---		
	0.4 - 0.7	Light brown sand, dry		D1-TP12-8A	0	PHCs, BTEX, PAH, Metals (0.4 - 0.7)		
	0.7 - 0.8	Grey sand, silt, wet, hydrocarbon odour		D1-TP12-8B	120	PHCs, BTEX, PAH, Metals (0.8 - 1.2)		
	0.8 - 1.2 permafrost	Light brown silty sand, with clay, wet, strong hydrocarbon odour						

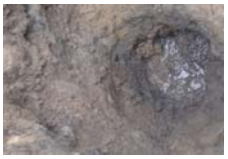
Date:	13-Aug-12	**Soil Sample: D1-TP12-9**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Sand	GR	---	---	---	South of former Bunkhouse	
	0.1 - 0.2	Sand, gravel, debris including glass, metal and ash, oxidized metal residue		D1-TP12-9A	70	PHCs, BTEX, PAH, Metals (0.1 - 0.5)		
	0.2 - 0.5	Sand, gravel, brown, dry, a grey clay seam from 0.2 - 0.4 m with strong hydrocarbon odour						
	0.5- 1.1 permafrost	Sand, gravel, brown, dry		D1-TP12-9B	70	PHCs, BTEX, PAH, Metals (0.5 - 1.1)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-10**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Light brown, dry, sand and gravel fill		---	---	---	Northeast of Former Bunkhouse	
	0.1 - 1.0 Permafrost	Sand, damp, gravel, strong hydrocarbon odour, black seam at 0.4 m		D1-TP12-10A	0	PHCs, BTEX (0.1 - 0.5)		
				D1-TP12-10B	30	PHCs, BTEX (0.5 - 1.0)		

Date:	13-Aug-12	**Soil Sample: D1-TP12-Geo1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Gravel layer, some sand, light brown, dry	GR	D1-TP12-Geo1	120	Moisture, Sieve, Hydrometer, PHC, BTEX, Fractionation (0.1 - 2.0)	West of Powerhouse, at top of slope	
	0.1 - 0.6	Brown, moist, gravel, silts, some sand, some cobbles						
	0.6 - 2.0 permafrost	Brown, silts sand, grey clay with silt, some cobbles, wet, strong hydrocarbon odour						

Date:	13-Aug-12	**Soil Sample: D1-TP12-Geo2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Geotechnical	0 - 0.1	Gravel layer, some sand, light brown, dry	GR	D1-TP12-Geo2	100	Moisture, Sieve, Hydrometer (0.1 - 2.0)	West of Powerhouse, at top of slope	
	0.1 - 2.0 permafrost	Brown gravel with silt and sand, moist, strong hydrocarbon odour						

Date:	13-Aug-12	**Soil Sample: D1-TP12-Geo3**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Geotechnical	0 - 0.1	Gravel layer, some sand, light brown, dry	GR	D1-TP12-Geo3	100	Moisture, Sieve, Hydrometer (0.1 - 1.8)	West of Powerhouse, at top of slope	
	0.1 - 1.8 permafrost	Brown gravel with silt and sand, moist, strong hydrocarbon odour						

Date:	16-Aug-12	**Soil Sample: D1-HA12-1/DUP-4**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Auger							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.01	Light brown sand veneer	GR	D1-HA12-1	---	Moisture, Sieve, Hydrometer (0.1 - 0.9)	West of Powerhouse, at bottom of slope	
	0.01 - 0.9 Water Infiltration	Silty sand, gravel with some clay, large boulders, strong hydrocarbon odour		D1-HA12-1A	180	PHC, BTEX (0.1 - 0.7)		
				D1-HA12-1B/DUP-4	140	PHC, BTEX, PAH, Metals, Fractionation (0.7 - 0.9)		

Date:	16-Aug-12	**Soil Sample: D1-HA12-2/DUP-5**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Auger							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Sand, light brown, dry	GR	---	---	---	West of Powerhouse, at bottom of slope	
	0.2 - 1.0 Water Infiltration	Dark brown sand, with clay, strong hydrocarbon odour, sheen on infiltration water, water seep at 0.8 m		D1-HA12-2/DUP-5	170	Moisture, sieve, hydrometer, PHC, BTEX (0.2 - 0.9)		

Date:	16-Aug-12	**Soil Sample: D1-HA12-3**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Hand Auger							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Light brown, sand, dry	GR	---	---	---	West of Powerhouse, at bottom of slope	
	0.2 - 0.7 Water Infiltration	Dark brown, wet, sandy silt with clay, some cobble, water seep at 0.3 m		D1-HA12-2	90	Moisture, sieve, hydrometer, PHC, BTEX (0.2 - 0.7)		

Date:	14-Aug-12	**Soil Sample: Delta-TP12-1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Light brown sandy gravel, dry	GR	---	---	---	Southwest of Carpentry/Plumbing Shop	
	0.1 - 1.0	Sand with some gravel, hydrocarbon odour		Delta-TP12-1A	40	PHCs, BTEX, PAH, Metals (0.1 - 1.0)		
	1.0- 1.5 permafrost	Silty grey clay with some sand, strong hydrocarbon odour		Delta-TP12-1B	0	PHCs, BTEX, PAH, Metals (1.0 - 1.5)		

Date:	14-Aug-12	**Soil Sample: Delta-TP12-2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.5	Sand, light brown, dry, cobble veneer		Delta-TP12-2	0	PHCs, BTEX (0.1 - 1.0)	South of Building #17 - composite sample collected due to H&S concerns as the test pit walls were not stable	
	0.5 - 1.0 Water infiltration	Sand, gravel, wet, dark brown, faint hydrocarbon odour						

Date:	14-Aug-12	**Soil Sample: Delta-TP12-3/DUP-3**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Sand, gravel fill, light brown, dry	GR	---	---	---	Southwest of Building # 17	N/A
	0.1 - 0.5	Sand with cobbles, light brown, dry, slight hydrocarbon odour		Delta-TP12-3A	370	PHCs, BTEX, PAH, Metals (0.1 - 0.6)		
	0.5 - 0.6	Black ash layer strong hydrocarbon odour						
	0.6 - 1.5 Water infiltration	Grey, silty clay, moist, strong odour, water seep at 1.0 m		Delta-TP12-3B/DUP-3	20	PHCs, BTEX, PAH, Metals (1.0 - 1.5)		

Date:	14-Aug-12	**Soil Sample: Delta-TP12-4**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.1	Sand, gravel fill, light brown, dry	GR	---	---	---	Southwest of Building # 17 - sample collected from pile due to water infiltration. Water infiltration sample Detla-W12-1 collected here	
	0.1 - 1.0	Sand with silty clay, cobbles, brown, moist		Delta-TP12-4	0	PHCs, BTEX, PAH, Metals		
	1.0 - 1.6 Water infiltration	Sand, gravel, trace silty clay, wet						

Date:	14-Aug-12	**Soil Sample: Delta-TP12-5**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.3	Sand and gravel, brown, moist	GR	---	---	---	Southwest of Building # 17 - sample collected from pile due to water infiltration. Water infiltration sample Detla-W12-2 collected here	N/A
	0.3 - 0.8	Clay with sand and gravel, wet, brown		Delta-TP12-5	5	PHCs, BTEX		
	0.8 - 1.6 Water infiltration	Saturated sand with silty clay, brown,						

Date:	14-Aug-12	**Soil Sample: Delta-TP12-6**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.6 Water infiltration	Sand with gravel, trace clay, moist, brown	GR	Delta-TP12-6	0	PHCs, BTEX, PAH, Metals (0.1 - 0.6)	Southwest of sea canisters	

Date:	14-Aug-12	**Soil Sample: Delta-TP12-7**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.6 Water infiltration	River wash stone, sand, large gravel, wet, brown	GR	Delta-TP12-7	0	PHCs, BTEX(0.1 - 0.6)	Southwest of sea canisters	

Date:	14-Aug-12	**Soil Sample: Delta-TP12-8**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.8	Sandy silt with gravel, brown, dry to 0.5 them most to 0.8		Delta-TP12-8A	0	PHCs, BTEX, PAH, Metals (0.1 - 0.8)	South of Drinking Water Reservoir and Road	
	0.8 - 1.0 Water infiltration	Clay layer, sand and silt, wet, water seep at 0.8 m		Delta-TP12-8B	0	PHCs, BTEX, PAH, Metals (0.8 - 1.0)		

Date:	14-Aug-12	**Soil Sample: Delta-TP12-9**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 1.0	Sandy gravel, brown, dry until 0.7, damp until 1.0, water seep at 0.7 m		Delta-TP12-9A	0	PHCs, BTEX (0.1 - 1.0)	South of Drinking Water Reservoir and Road	
	1.0 - 1.3 Water infiltration	Sandy clay, damp, brown		Delta-TP12-9B	0	PHCs, BTEX (1.0 - 1.3)		

Date:	17-Aug-12	**Soil Sample: SC-TP12-1**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL							
Method:	Backhoe							
Location:	Eureka HAWS, NU		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.5	Light brown sand and gravel, some silt, dry Diagonal seam of clay from upper layer at east end of test pit to the bottom of the test pit at the west		SC-TP12-1	55	PHCs, BTEX, PAH, Metals (0.1 - 1.2)	West of Station Creek, north of Road	
	0.5 - 1.2 Permafrost	Light brown, some grey sand, silt and clay						

Date:	17-Aug-12	**Soil Sample: SC-TP12-2**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Method:	Backhoe							
Location:	Eureka HAWS, NU							
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.6	Light brown, sand and gravel, some cobble, dry		SC-TP12-2	30	PHCs, BTEX, Grain size (0.1 - 1.0)	West of Station Creek, south of Road	
	0.6 - 1.0 Water Infiltration	Light grey, sand, silt, clay, wet at 0.6 and saturated at 0.8						

Date:	17-Aug-12	**Soil Sample: SC-TP12-3/DUP-6**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Method:	Backhoe							
Location:	Eureka HAWS, NU							
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.05	dry sand veneer, brown		SC-TP12-3	55	PHCs, BTEX, PAH, Metals (0.1 - 1.4)	West of Station Creek, south of Road	
	0.05 - 1.4 Permafrost	Sand with silt, some clay, wet, light grey						

Date:	17-Aug-12	**Soil Sample: SC-TP12-4**	SAMPLES				COMMENTS	PHOTO
Logged by:	CEL		Type	Sample I.D.	Organic Vapours (ppm)	Analysis & Depth of Sample (m)		
Method:	Backhoe							
Location:	Eureka HAWS, NU							
Issue	Depth (m)	Description						
Petroleum hydrocarbon impacted soil	0 - 0.2	Light brown sand, dry		SC-TP12-4	45	PHCs, BTEX (0.2 - 1.5)	West of Station Creek, south of Road	
	0.2 - 1.5 Permafrost	Grey, wet sand, silt with clay						

Surface Water Data

PARAMETER	Background								
Name of Area									
Sampling No.	BG-SW12-1	BG-SW12-2/ BG-SW12-DUP1	BG-SW12-3	BG-SW12-4	BG-SW12-5	BG-SW12-6	BG-SW12-7	BG-SW12-8	BG-SW12-9
Sampling Date	8/18/2012	8/18/2012	8/18/2012	8/18/2012	8/18/2012	8/19/2012	8/19/2012	8/19/2012	8/19/2012
Area	Blacktop Creek	Blacktop Creek	Blacktop Creek	Blacktop Creek	Blacktop Creek	Station Creek	Station Creek	Station Creek	Station Creek
pH:	7.18	7.80	7.85	7.93	7.95	8.06	8.19	8.27	8.28
Conductivity (mS/cm):	1.13	0.96	1.01	1.09	1.10	1.99	2.01	2.00	2.06
Temperature (˚C):	4.05	4.10	4.44	4.65	4.94	4.15	4.21	4.28	4.51
DO (mg/L):	17.16	16.49	16.02	15.82	15.18	16.82	17.16	16.81	15.34
ORP (mV):	-105.0	-165.0	-140.4	-119.5	-111.1	-122.8	-121.8	-107.4	-102.0

Sediment Data

PARAMETER / Name of Area	Sampling No.	Sampling Date	Sample depth (m)	Sheen (Y/N)	Analysis	Comments
Background	**BG-SED12-1**	18/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-2/BG-SED12-DUP1	18/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-3	18/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-4	18/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-5	18/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-6	19/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-7	19/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-8	19/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
	BG-SED12-9	19/08/2012	0.1	N	Metals	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, no odour, no sheen
AEC D Powerhouse	**D1-SED12-1A**	17/08/2012	0 - 0.15	Y	PHCs	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, stong odour, visible sheen. Black product present.
	D1-SED12-1B		0.15 - 0.30	Y	PHCs	
	D1-SED12-2A	17/08/2012	0 - 0.15	Y	PHCs	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, stong odour, visible sheen. Black product present.
	D1-SED12-2B		0.15 - 0.30	Y	PHCs	
	D1-SED12-3A	17/08/2012	0 - 0.15	Y	PHCs	SAND and GRAVEL - brown, fine to medium, some silt & clay, some cobbles, stong odour, visible sheen.
	D1-SED12-3B		0.15 - 0.30	Y	PHCs	

APPENDIX A

Figures

APPENDIX B

Tables

APPENDIX A

Figures

APPENDIX B

Tables

APPENDIX C

Photographs

APPENDIX C

Photographs

APPENDIX D

Sample Logs

APPENDIX E

Chain Of Custody And Laboratory Analysis

APPENDIX E

Chain Of Custody And Laboratory Analysis

Your P.O. #: 700227219
Your Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your C.O.C. #: 366259-01-01, 366259-02-01, 366259-03-01, 366259-04-01, 366259-06-01

Attention: CATHERINE LEBLANC
FRANZ ENVIRONMENTAL INC.
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z5B8

Report Date: 2012/09/21
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B273445
Received: 2012/08/17, 8:45

Sample Matrix: Soil
Samples Received: 45

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	32	2012/08/19	2012/08/23	AB SOP-00039	CCME, EPA 8260C
BTEX/F1 by HS GC/MS (MeOH extract)	5	2012/08/19	2012/08/24	AB SOP-00039	CCME, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil)	1	2012/08/19	2012/08/22	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	11	2012/08/19	2012/08/23	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	25	2012/08/19	2012/08/24	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Aliphatic and Aromatic Fractions C6-C10	3	2012/08/22	2012/08/31	AB SOP-00039	CCME CWS, RBCA
Aliphatic and Aromatic Fractions C6-C10	3	2012/08/30	2012/08/31	AB SOP-00039	CCME CWS, RBCA
Aliphatic and Aromatic Fractions C10-C50	2	2012/08/22	2012/08/28	CAL SOP-00184	RBCA-CCME
Aliphatic and Aromatic Fractions C10-C50	1	2012/08/27	2012/08/28	CAL SOP-00184	RBCA-CCME
Elements by ICP -Soils	10	2012/08/22	2012/09/14	AB SOP-00042	EPA 200.7
Elements by ICP -Soils	14	2012/08/23	2012/09/14	AB SOP-00042	EPA 200.7
Elements by ICPMS - Soils	10	2012/08/22	2012/08/23	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils	13	2012/08/23	2012/08/23	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils	1	2012/08/23	2012/08/24	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (Ext list)	10	2012/08/22	2012/09/17	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (Ext list)	14	2012/08/23	2012/09/17	AB SOP-00043	EPA 200.8
Moisture	45	N/A	2012/08/21	AB SOP-00002	CCME PHC-CWS
Benzo[a]pyrene Equivalency	19	N/A	2012/08/25	AB SOP-00003	EPA 8270D
Polycyclic Aromatic Hydrocarbons in soil	6	2012/08/22	2012/08/23	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Polycyclic Aromatic Hydrocarbons in soil	11	2012/08/22	2012/08/24	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Polycyclic Aromatic Hydrocarbons in soil	2	2012/08/22	2012/08/25	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Particle Size by Sieve (75 micron)	5	N/A	2012/08/24	AB SOP-00022	SSMA 55.4
Texture by Hydrometer	3	N/A	2012/08/24	AB SOP-00030	SSMA CH55.3
Texture Class	3	N/A	2012/08/24	AB SOP-00030	SSMA CH55.3

* Results relate only to the items tested.

../2

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

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 #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EF8158	EF8160	EF8316	EF8317		EF8318	EF8319	EF8320		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13		2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-1A**	**D1-TP12-1B**	**D1-TP12-2**	**D1-TP12-2A**	**QC Batch**	**D1-TP12-2B**	**D1-TP12-3A**	**D1-TP12-3B**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	6.4	8.9	11	8.7	6099933	15	5.3	6.7	0.30	6099937
Sieve - Pan	%	N/A	N/A	34	N/A	6108211	N/A	N/A	N/A	0.20	
Sieve - #200 (>0.075mm)	%	N/A	N/A	66	N/A	6108211	N/A	N/A	N/A	0.20	
Grain Size	%	N/A	N/A	COARSE	N/A	6108211	N/A	N/A	N/A	0.20	
N/A = Not Applicable											
RDL = Reportable Detection Limit											

Maxxam ID		EF8321	EF8322	EF8323	EF8325	EF8326	EF8327	EF8328	EF8329		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-4A**	**D1-TP12-4B**	**DUP1**	**D1-TP12-5A**	**D1-TP12-5B**	**D1-TP12-6**	**DUP 2**	**D1-TP12-7A**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	6.9	16	17	8.5	16	12	15	8.5	0.30	6099937
RDL = Reportable Detection Limit											

Maxxam ID		EF8330	EF8331	EF8332	EF8333	EF8334		EF8335	EF8336		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		2012/08/13	2012/08/13		
	UNITS	**D1-TP12-7B**	**D1-TP12-8A**	**D1-TP12-8B**	**D1-TP12-9A**	**D1-TP12-9B**	**QC Batch**	**D1-TP12-10A**	**D1-TP12-10B**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	19	7.4	15	4.3	14	6099937	5.0	5.3	0.30	6102614
RDL = Reportable Detection Limit											

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EF8337	EF8338	EF8339	EF8341	EF8342	EF8343	EF8344		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**D1-TP12-GEO1**	**D1-TP12-GEO2**	**D1-TP12-GEO3**	**D1-TP12-10**	**DELTA-TP12-1A**	**DELTA-TP12-1B**	**DELTA-TP12-2**	**RDL**	**QC Batch**
Physical Properties										
% sand by hydrometer	%	45	77	81	N/A	N/A	N/A	N/A	2.0	6111331
% silt by hydrometer	%	34	12	10	N/A	N/A	N/A	N/A	2.0	6111331
Clay Content	%	21	11	9.0	N/A	N/A	N/A	N/A	2.0	6111331
Texture	N/A	LOAM	SANDY LOAM	LOAMY SAND	N/A	N/A	N/A	N/A	N/A	6095242
Moisture	%	16	9.9	7.8	4.9	15	18	18	0.30	6102614
Sieve - Pan	%	65	16	14	2.6	N/A	N/A	N/A	0.20	6108211
Sieve - #200 (>0.075mm)	%	35	85	86	97	N/A	N/A	N/A	0.20	6108211
Grain Size	%	FINE	COARSE	COARSE	COARSE	N/A	N/A	N/A	0.20	6108211
N/A = Not Applicable										
RDL = Reportable Detection Limit										

Maxxam ID		EF8345	EF8346	EF8347	EF8348	EF8349	EF8350	EF8351		
Sampling Date		2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**DELTA-TP12-3A**	**DELTA-TP12-3B**	**DUP 3**	**DELTA-TP12-4**	**DELTA-TP12-5**	**DELTA-TP12-6**	**DELTA-TP12-7**	**RDL**	**QC Batch**
Physical Properties										
Moisture	%	6.2	18	18	17	17	15	9.7	0.30	6102614
RDL = Reportable Detection Limit										

Maxxam ID		EF8352	EF8353	EF8354		EF8355		
Sampling Date		2012/08/14	2012/08/14	2012/08/14		2012/08/14		
	UNITS	**DELTA-TP12-8A**	**DELTA-TP12-8B**	**DELTA-TP12-9A**	**QC Batch**	**DELTA-TP12-9B**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	13	17	9.7	6102614	20	0.30	6102676
RDL = Reportable Detection Limit								

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EF8360	EF8361	EF8362	EF8363	EF8364		
Sampling Date		2012/08/15	2012/08/15	2012/08/15	2012/08/15	2012/08/15		
	UNITS	**PEARL-HA12-1**	**PEARL-HA12-2**	**PEARL-HA12-3**	**PEARL-HA12-4**	**PEARL-DUP1**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.0	7.4	6.3	5.7	5.9	0.30	6102676
RDL = Reportable Detection Limit								

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8158	EF8160	EF8317	EF8318	EF8319	EF8320	EF8321		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-1A**	**D1-TP12-1B**	**D1-TP12-2A**	**D1-TP12-2B**	**D1-TP12-3A**	**D1-TP12-3B**	**D1-TP12-4A**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	57	1100	<10	<10	14	<10	640	10	6104828
F3 (C16-C34 Hydrocarbons)	mg/kg	250	61	29	31	<10	<10	41	10	6104828
F4 (C34-C50 Hydrocarbons)	mg/kg	59	<10	<10	<10	<10	<10	<10	10	6104828
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES	YES	N/A	6104828
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	104	100	103	99	101	103	99	N/A	6104828
N/A = Not Applicable										
RDL = Reportable Detection Limit										

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8322		EF8323	EF8325	EF8326		EF8327		EF8328		
Sampling Date		2012/08/13		2012/08/13	2012/08/13	2012/08/13		2012/08/13		2012/08/13		
	UNITS	**D1-TP12-4B**	**QC Batch**	**DUP1**	**D1-TP12-5A**	**D1-TP12-5B**	**QC Batch**	**D1-TP12-6**	**QC Batch**	**DUP 2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon												
F2 (C10-C16 Hydrocarbons)	mg/kg	4700	6104828	4100	1400	5000	6104828	7300	6104828	8400	10	6104828
F3 (C16-C34 Hydrocarbons)	mg/kg	190	6104828	210	360	150	6104828	580	6104828	340	10	6104828
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	6104828	<10	44	11	6104828	11	6104828	<10	10	6104828
Reached Baseline at C50	mg/kg	YES	6104828	YES	YES	YES	6104828	YES	6104828	YES	N/A	6104828
Hydrocarbons												
>C10 - C12 Aliphatic	mg/kg	1200	6104892	N/A	N/A	N/A		2200	6104892	N/A	5.0	
>C10 - C12 Aromatic	mg/kg	210	6104892	N/A	N/A	N/A		430	6104892	N/A	5.0	
>C12 - C16 Aliphatic	mg/kg	1400	6104892	N/A	N/A	N/A		3200	6104892	N/A	10	
>C12 - C16 Aromatic	mg/kg	310	6104892	N/A	N/A	N/A		720	6104892	N/A	10	
>C16 - C21 Aliphatic	mg/kg	82	6104892	N/A	N/A	N/A		320	6104892	N/A	10	
>C16 - C21 Aromatic	mg/kg	42	6104892	N/A	N/A	N/A		140	6104892	N/A	10	
>C21 - C34 Aliphatic	mg/kg	<10	6104892	N/A	N/A	N/A		30	6104892	N/A	10	
>C21 - C34 Aromatic	mg/kg	35	6104892	N/A	N/A	N/A		39	6104892	N/A	10	
>C34 Aliphatic (up to C50)	mg/kg	<10	6104892	N/A	N/A	N/A		<10	6104892	N/A	10	
>C34 Aromatic (up to C50)	mg/kg	15	6104892	N/A	N/A	N/A		<10	6104892	N/A	10	
Surrogate Recovery (%)												
O-TERPHENYL (sur.)	%	88	6104892	100	94	95	6104828	91	6104892	95	N/A	6104828
DECANE (sur)	%	102	6104892	N/A	N/A	N/A		124	6104892	N/A	N/A	

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8329	EF8330	EF8331	EF8332	EF8333	EF8334	EF8335		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-7A**	**D1-TP12-7B**	**D1-TP12-8A**	**D1-TP12-8B**	**D1-TP12-9A**	**D1-TP12-9B**	**D1-TP12-10A**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	47	<10	16	2800	6800	4700	7700	10	6104828
F3 (C16-C34 Hydrocarbons)	mg/kg	81	32	65	230	780	360	1200	10	6104828
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	<10	10	6104828
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES	YES	N/A	6104828
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	103	102	107	92	104	97	101	N/A	6104828

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8336		EF8337		EF8342	EF8343	EF8344	EF8345		
Sampling Date		2012/08/13		2012/08/13		2012/08/14	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**D1-TP12-10B**	**QC Batch**	**D1-TP12-GEO1**	**QC Batch**	**DELTA-TP12-1A**	**DELTA-TP12-1B**	**DELTA-TP12-2**	**DELTA-TP12-3A**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon											
F2 (C10-C16 Hydrocarbons)	mg/kg	5200	6104845	5900	6104845	5900	820	11	5600	10	6104845
F3 (C16-C34 Hydrocarbons)	mg/kg	780	6104845	280	6104845	280	110	46	1500	10	6104845
F4 (C34-C50 Hydrocarbons)	mg/kg	30	6104845	<10	6104845	<10	<10	<10	110	10	6104845
Reached Baseline at C50	mg/kg	YES	6104845	YES	6104845	YES	YES	YES	YES	N/A	6104845
Hydrocarbons											
>C10 - C12 Aliphatic	mg/kg	N/A		1700	6104892	N/A	N/A	N/A	N/A	5.0	
>C10 - C12 Aromatic	mg/kg	N/A		740	6104892	N/A	N/A	N/A	N/A	5.0	
>C12 - C16 Aliphatic	mg/kg	N/A		1500	6104892	N/A	N/A	N/A	N/A	10	
>C12 - C16 Aromatic	mg/kg	N/A		850	6104892	N/A	N/A	N/A	N/A	10	
>C16 - C21 Aliphatic	mg/kg	N/A		120	6104892	N/A	N/A	N/A	N/A	10	
>C16 - C21 Aromatic	mg/kg	N/A		82	6104892	N/A	N/A	N/A	N/A	10	
>C21 - C34 Aliphatic	mg/kg	N/A		<10	6104892	N/A	N/A	N/A	N/A	10	
>C21 - C34 Aromatic	mg/kg	N/A		34	6104892	N/A	N/A	N/A	N/A	10	
>C34 Aliphatic (up to C50)	mg/kg	N/A		<10	6104892	N/A	N/A	N/A	N/A	10	
>C34 Aromatic (up to C50)	mg/kg	N/A		16	6104892	N/A	N/A	N/A	N/A	10	
Surrogate Recovery (%)											
O-TERPHENYL (sur.)	%	100	6104845	153(1)	6104892	91	102	100	96	N/A	6104845
DECANE (sur)	%	N/A		118	6104892	N/A	N/A	N/A	N/A	N/A	

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Surrogate recovery exceeds acceptance criteria due to matrix interference.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8346	EF8347	EF8348	EF8349	EF8350	EF8351	EF8352		
Sampling Date		2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**DELTA-TP12-3B**	**DUP 3**	**DELTA-TP12-4**	**DELTA-TP12-5**	**DELTA-TP12-6**	**DELTA-TP12-7**	**DELTA-TP12-8A**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon										
F2 (C10-C16 Hydrocarbons)	mg/kg	590	160	14	<10	<10	<10	<10	10	6104845
F3 (C16-C34 Hydrocarbons)	mg/kg	150	76	76	40	21	<10	12	10	6104845
F4 (C34-C50 Hydrocarbons)	mg/kg	10	<10	<10	<10	<10	<10	<10	10	6104845
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES	YES	N/A	6104845
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	104	93	96	87	93	98	86	N/A	6104845

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8353		EF8354		EF8355	EF8361		
Sampling Date		2012/08/14		2012/08/14		2012/08/14	2012/08/15		
	UNITS	**DELTA-TP12-8B**	**RDL**	**DELTA-TP12-9A**	**RDL**	**DELTA-TP12-9B**	**PEARL-HA12-2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	15	10	<20(1)	20	<10	<10	10	6104845
F3 (C16-C34 Hydrocarbons)	mg/kg	19	10	<20(1)	20	14	<10	10	6104845
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	10	<20(1)	20	<10	<10	10	6104845
Reached Baseline at C50	mg/kg	YES	N/A	YES	N/A	YES	YES	N/A	6104845
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	88	N/A	90	N/A	91	89	N/A	6104845

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limit raised based on sample volume used for analysis.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8158		EF8160		EF8321		EF8322		EF8323		
Sampling Date		2012/08/13		2012/08/13		2012/08/13		2012/08/13		2012/08/13		
	UNITS	**D1-TP12-1A**	**RDL**	**D1-TP12-1B**	**RDL**	**D1-TP12-4A**	**RDL**	**D1-TP12-4B**	**RDL**	**DUP1**	**RDL**	**QC Batch**
Polycyclic Aromatics												
Acenaphthene	mg/kg	<0.0050	0.0050	<0.0076(1)	0.0076	<0.0053(1)	0.0053	<0.080(1)	0.080	0.11	0.0050	6104837
Benzo[a]pyrene equivalency	mg/kg	<0.10	0.10	<0.10	0.10	<0.10	0.10	<0.10	0.10	<0.10	0.10	6095180
Acenaphthylene	mg/kg	<0.0050	0.0050	<0.0073(1)	0.0073	<0.0061(1)	0.0061	<0.039(1)	0.039	<0.049(1)	0.049	6104837
Acridine	mg/kg	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	0.032	0.010	6104837
Anthracene	mg/kg	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	6104837
Benzo(a)anthracene	mg/kg	0.0055	0.0050	<0.0050	0.0050	<0.0050	0.0050	0.012	0.0050	0.027	0.0050	6104837
Benzo(b&j)fluoranthene	mg/kg	0.015	0.0050	0.0085	0.0050	0.0077	0.0050	0.024	0.0050	0.049	0.0050	6104837
Benzo(k)fluoranthene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0086(1)	0.0086	<0.011(1)	0.011	6104837
Benzo(g,h,i)perylene	mg/kg	0.015	0.0050	0.010	0.0050	0.0082	0.0050	0.023	0.0050	0.035	0.0050	6104837
Benzo(c)phenanthrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo(a)pyrene	mg/kg	0.0051	0.0050	<0.0050	0.0050	<0.0050	0.0050	0.0089	0.0050	0.017	0.0050	6104837
Benzo[e]pyrene	mg/kg	0.012	0.0050	0.0074	0.0050	0.0059	0.0050	0.016	0.0050	0.031	0.0050	6104837
Chrysene	mg/kg	0.0064	0.0050	<0.0050	0.0050	<0.0050	0.0050	0.012	0.0050	0.036	0.0050	6104837
Dibenz(a,h)anthracene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Fluoranthene	mg/kg	0.0097	0.0050	0.0060	0.0050	<0.0050	0.0050	0.035	0.0050	0.076	0.0050	6104837
Fluorene	mg/kg	<0.0050	0.0050	<0.011(1)	0.011	<0.0075(1)	0.0075	<0.090(1)	0.090	<0.11(1)	0.11	6104837
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	0.0077	0.0050	0.015	0.0050	6104837
2-Methylnaphthalene	mg/kg	0.11	0.0050	0.15	0.0050	0.038	0.0050	0.60	0.0050	1.2	0.0050	6104837
Naphthalene	mg/kg	0.053	0.0050	0.080	0.0050	<0.028(1)	0.028	<0.29(1)	0.29	<0.41(1)	0.41	6104837
Phenanthrene	mg/kg	0.021	0.0050	0.023	0.0050	0.027	0.0050	0.15	0.0050	0.33	0.0050	6104837
Perylene	mg/kg	0.088	0.0050	0.041	0.0050	0.015	0.0050	0.24	0.0050	0.28	0.0050	6104837
Pyrene	mg/kg	0.017	0.0050	0.0080	0.0050	<0.0050	0.0050	0.046	0.0050	0.090	0.0050	6104837
Quinoline	mg/kg	<0.010	0.010	<0.16(1)	0.16	<0.051(1)	0.051	<0.46(1)	0.46	<0.48(1)	0.48	6104837
Surrogate Recovery (%)												
D10-ANTHRACENE (sur.)	%	105	N/A	94	N/A	97	N/A	107	N/A	96	N/A	6104837
D12-BENZO(A)PYRENE (sur.)	%	111	N/A	103	N/A	107	N/A	115	N/A	101	N/A	6104837
D8-ACENAPHTHYLENE (sur.)	%	104	N/A	94	N/A	96	N/A	99	N/A	97	N/A	6104837
TERPHENYL-D14 (sur.)	%	115	N/A	105	N/A	108	N/A	121	N/A	107	N/A	6104837

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8327		EF8328		EF8331		EF8332		EF8333		
Sampling Date		2012/08/13		2012/08/13		2012/08/13		2012/08/13		2012/08/13		
	UNITS	**D1-TP12-6**	**RDL**	**DUP 2**	**RDL**	**D1-TP12-8A**	**RDL**	**D1-TP12-8B**	**RDL**	**D1-TP12-9A**	**RDL**	**QC Batch**
Polycyclic Aromatics												
Acenaphthene	mg/kg	0.43	0.0050	<0.58(1)	0.58	<0.0050	0.0050	<0.27(1)	0.27	<0.0050	0.0050	6104837
Benzo[a]pyrene equivalency	mg/kg	<0.10	0.10	<0.10	0.10	<0.10	0.10	<0.10	0.10	<0.10	0.10	6095180
Acenaphthylene	mg/kg	<0.22(1)	0.22	<0.18(1)	0.18	<0.0050	0.0050	<0.088(1)	0.088	<0.12(1)	0.12	6104837
Acridine	mg/kg	0.39	0.010	0.16	0.010	<0.010	0.010	0.16	0.010	0.14	0.010	6104837
Anthracene	mg/kg	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	6104837
Benzo(a)anthracene	mg/kg	0.0081	0.0050	0.011	0.0050	0.0053	0.0050	0.010	0.0050	<0.0050	0.0050	6104837
Benzo(b&j)fluoranthene	mg/kg	0.017	0.0050	0.017	0.0050	0.013	0.0050	0.017	0.0050	0.0066	0.0050	6104837
Benzo(k)fluoranthene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo(g,h,i)perylene	mg/kg	0.013	0.0050	0.016	0.0050	0.012	0.0050	0.012	0.0050	<0.0050	0.0050	6104837
Benzo(c)phenanthrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo(a)pyrene	mg/kg	<0.0050	0.0050	0.0057	0.0050	<0.0050	0.0050	0.0059	0.0050	<0.0050	0.0050	6104837
Benzo[e]pyrene	mg/kg	0.012	0.0050	0.012	0.0050	0.0088	0.0050	0.010	0.0050	<0.0050	0.0050	6104837
Chrysene	mg/kg	0.013	0.0050	0.013	0.0050	0.0062	0.0050	0.0087	0.0050	0.0061	0.0050	6104837
Dibenz(a,h)anthracene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Fluoranthene	mg/kg	0.049	0.0050	0.058	0.0050	0.011	0.0050	0.029	0.0050	0.033	0.0050	6104837
Fluorene	mg/kg	<0.57(1)	0.57	0.71	0.0050	<0.0050	0.0050	0.52	0.0050	<0.28(1)	0.28	6104837
Indeno(1,2,3-cd)pyrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
2-Methylnaphthalene	mg/kg	13(2)	0.050	25(2)	0.050	0.041	0.0050	19(2)	0.050	<0.58(1)	0.58	6104837
Naphthalene	mg/kg	4.8	0.0050	11(2)	0.050	0.020	0.0050	9.5	0.0050	<0.39(1)	0.39	6104837
Phenanthrene	mg/kg	0.53	0.0050	0.44	0.0050	0.054	0.0050	0.43	0.0050	0.33	0.0050	6104837
Perylene	mg/kg	0.051	0.0050	0.084	0.0050	0.050	0.0050	0.096	0.0050	0.014	0.0050	6104837
Pyrene	mg/kg	0.085	0.0050	0.058	0.0050	0.013	0.0050	0.036	0.0050	0.041	0.0050	6104837
Quinoline	mg/kg	<3.4(1)	3.4	<1.1(1)	1.1	<0.010	0.010	<0.55(1)	0.55	<0.31(1)	0.31	6104837
Surrogate Recovery (%)												
D10-ANTHRACENE (sur.)	%	97	N/A	93	N/A	97	N/A	94	N/A	98	N/A	6104837
D12-BENZO(A)PYRENE (sur.)	%	108	N/A	103	N/A	104	N/A	104	N/A	111	N/A	6104837
D8-ACENAPHTHYLENE (sur.)	%	106	N/A	106	N/A	100	N/A	95	N/A	101	N/A	6104837
TERPHENYL-D14 (sur.)	%	110	N/A	103	N/A	106	N/A	105	N/A	111	N/A	6104837

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference.
(2) - Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8334		EF8342		EF8343			EF8345		
Sampling Date		2012/08/13		2012/08/14		2012/08/14			2012/08/14		
	UNITS	**D1-TP12-9B**	**RDL**	**DELTA-TP12-1A**	**RDL**	**DELTA-TP12-1B**	**RDL**	**QC Batch**	**DELTA-TP12-3A**	**RDL**	**QC Batch**
Polycyclic Aromatics											
Acenaphthene	mg/kg	0.25	0.0050	<0.14(1)	0.14	<0.027(1)	0.027	6104837	<0.50(1)	0.50	6104837
Benzo[a]pyrene equivalency	mg/kg	<0.10	0.10	<0.10	0.10	<0.10	0.10	6095180	<0.10	0.10	6095240
Acenaphthylene	mg/kg	<0.12(1)	0.12	<0.075(1)	0.075	<0.014(1)	0.014	6104837	<0.24(1)	0.24	6104837
Acridine	mg/kg	0.11	0.010	0.084	0.010	0.013	0.010	6104837	0.15	0.010	6104837
Anthracene	mg/kg	<0.0040	0.0040	<0.0040	0.0040	<0.0040	0.0040	6104837	<0.0040	0.0040	6104837
Benzo(a)anthracene	mg/kg	0.012	0.0050	0.0074	0.0050	0.024	0.0050	6104837	0.0087	0.0050	6104837
Benzo(b&j)fluoranthene	mg/kg	0.027	0.0050	0.013	0.0050	0.056	0.0050	6104837	<0.015(1)	0.015	6104837
Benzo(k)fluoranthene	mg/kg	<0.0062(1)	0.0062	<0.0050	0.0050	<0.012(1)	0.012	6104837	<0.0050	0.0050	6104837
Benzo(g,h,i)perylene	mg/kg	0.022	0.0050	0.0094	0.0050	0.060	0.0050	6104837	0.012	0.0050	6104837
Benzo(c)phenanthrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837	<0.0050	0.0050	6104837
Benzo(a)pyrene	mg/kg	0.011	0.0050	<0.0050	0.0050	0.022	0.0050	6104837	0.0070	0.0050	6104837
Benzo[e]pyrene	mg/kg	0.017	0.0050	0.0081	0.0050	0.049	0.0050	6104837	0.014	0.0050	6104837
Chrysene	mg/kg	0.010	0.0050	0.0062	0.0050	0.023	0.0050	6104837	0.0093	0.0050	6104837
Dibenz(a,h)anthracene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	0.0062	0.0050	6104837	<0.0050	0.0050	6104837
Fluoranthene	mg/kg	0.044	0.0050	0.035	0.0050	0.045	0.0050	6104837	0.023	0.0050	6104837
Fluorene	mg/kg	<0.43(1)	0.43	<0.32(1)	0.32	<0.051(1)	0.051	6104837	<0.82(1)	0.82	6104837
Indeno(1,2,3-cd)pyrene	mg/kg	0.0096	0.0050	<0.0050	0.0050	0.017	0.0050	6104837	0.0057	0.0050	6104837
2-Methylnaphthalene	mg/kg	2.9	0.0050	3.7	0.0050	0.53	0.0050	6104837	25(2)	0.050	6104837
Naphthalene	mg/kg	1.0	0.0050	<0.47(1)	0.47	0.17	0.0050	6104837	3.9	0.0050	6104837
Phenanthrene	mg/kg	0.50	0.0050	0.20	0.0050	0.14	0.0050	6104837	0.55	0.0050	6104837
Perylene	mg/kg	0.19	0.0050	0.052	0.0050	0.30	0.0050	6104837	0.064	0.0050	6104837
Pyrene	mg/kg	0.054	0.0050	0.036	0.0050	0.069	0.0050	6104837	0.035	0.0050	6104837
Quinoline	mg/kg	<0.64(1)	0.64	<0.55(1)	0.55	<0.12(1)	0.12	6104837	<1.1(1)	1.1	6104837
Surrogate Recovery (%)											
D10-ANTHRACENE (sur.)	%	98	N/A	97	N/A	101	N/A	6104837	106	N/A	6104837
D12-BENZO(A)PYRENE (sur.)	%	110	N/A	109	N/A	109	N/A	6104837	112	N/A	6104837
D8-ACENAPHTHYLENE (sur.)	%	102	N/A	106	N/A	101	N/A	6104837	107	N/A	6104837
TERPHENYL-D14 (sur.)	%	112	N/A	110	N/A	114	N/A	6104837	116	N/A	6104837

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference.
(2) - Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8346		EF8348		EF8350	EF8352		EF8353		
Sampling Date		2012/08/14		2012/08/14		2012/08/14	2012/08/14		2012/08/14		
	UNITS	**DELTA-TP12-3B**	**RDL**	**DELTA-TP12-4**	**RDL**	**DELTA-TP12-6**	**DELTA-TP12-8A**	**RDL**	**DELTA-TP12-8B**	**RDL**	**QC Batch**
Polycyclic Aromatics											
Acenaphthene	mg/kg	<0.052(1)	0.052	0.0062	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo[a]pyrene equivalency	mg/kg	<0.10	0.10	<0.10	0.10	<0.10	<0.10	0.10	<0.10	0.10	6095240
Acenaphthylene	mg/kg	<0.022(1)	0.022	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Acridine	mg/kg	0.014	0.010	0.025	0.010	<0.010	<0.010	0.010	<0.010	0.010	6104837
Anthracene	mg/kg	<0.0040	0.0040	<0.0040	0.0040	<0.0040	<0.0040	0.0040	<0.0040	0.0040	6104837
Benzo(a)anthracene	mg/kg	0.016	0.0050	0.032	0.0050	0.0083	<0.0050	0.0050	0.0086	0.0050	6104837
Benzo(b&j)fluoranthene	mg/kg	0.034	0.0050	0.058	0.0050	0.018	0.0099	0.0050	<0.016(1)	0.016	6104837
Benzo(k)fluoranthene	mg/kg	<0.0079(1)	0.0079	<0.014(1)	0.014	<0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo(g,h,i)perylene	mg/kg	0.039	0.0050	0.049	0.0050	0.022	0.013	0.0050	0.019	0.0050	6104837
Benzo(c)phenanthrene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Benzo(a)pyrene	mg/kg	0.014	0.0050	0.029	0.0050	0.0086	<0.0050	0.0050	0.0061	0.0050	6104837
Benzo[e]pyrene	mg/kg	0.025	0.0050	0.036	0.0050	0.015	0.0081	0.0050	0.010	0.0050	6104837
Chrysene	mg/kg	0.016	0.0050	0.025	0.0050	0.0094	<0.0050	0.0050	0.0075	0.0050	6104837
Dibenz(a,h)anthracene	mg/kg	<0.0050	0.0050	<0.0050	0.0050	<0.0050	<0.0050	0.0050	<0.0050	0.0050	6104837
Fluoranthene	mg/kg	0.035	0.0050	0.068	0.0050	0.019	0.0094	0.0050	0.021	0.0050	6104837
Fluorene	mg/kg	<0.075(1)	0.075	0.028	0.0050	0.0072	<0.0050	0.0050	0.0086	0.0050	6104837
Indeno(1,2,3-cd)pyrene	mg/kg	0.011	0.0050	0.020	0.0050	0.0077	<0.0050	0.0050	0.0060	0.0050	6104837
2-Methylnaphthalene	mg/kg	2.9	0.0050	0.25	0.0050	0.035	0.018	0.0050	0.036	0.0050	6104837
Naphthalene	mg/kg	0.51	0.0050	0.17	0.0050	0.023	0.012	0.0050	0.021	0.0050	6104837
Phenanthrene	mg/kg	0.13	0.0050	0.19	0.0050	0.035	0.032	0.0050	0.047	0.0050	6104837
Perylene	mg/kg	0.32	0.0050	0.40	0.0050	0.16	0.092	0.0050	0.26	0.0050	6104837
Pyrene	mg/kg	0.050	0.0050	0.090	0.0050	0.026	0.013	0.0050	0.034	0.0050	6104837
Quinoline	mg/kg	<0.097(1)	0.097	<0.010	0.010	<0.010	<0.010	0.010	<0.010	0.010	6104837
Surrogate Recovery (%)											
D10-ANTHRACENE (sur.)	%	103	N/A	101	N/A	102	102	N/A	101	N/A	6104837
D12-BENZO(A)PYRENE (sur.)	%	110	N/A	108	N/A	111	109	N/A	103	N/A	6104837
D8-ACENAPHTHYLENE (sur.)	%	102	N/A	103	N/A	107	106	N/A	101	N/A	6104837
TERPHENYL-D14 (sur.)	%	115	N/A	112	N/A	113	114	N/A	113	N/A	6104837

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EF8158	EF8160	EF8321	EF8322	EF8323	EF8327	EF8328	EF8331		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-1A**	**D1-TP12-1B**	**D1-TP12-4A**	**D1-TP12-4B**	**DUP1**	**D1-TP12-6**	**DUP 2**	**D1-TP12-8A**	**RDL**	**QC Batch**
Elements											
Total Aluminum (Al)	mg/kg	5600	6700	3300	5900	6100	5500	6100	3800	10	6169644
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6170064
Total Boron (B)	mg/kg	8.5	10	3.1	9.2	10	8.4	7.8	6.4	2.0	6169644
Total Calcium (Ca)	mg/kg	5800	4900	12000	2900	2500	1800	2000	1700	50	6169644
Total Iron (Fe)	mg/kg	40000	43000	13000	26000	24000	27000	29000	31000	10	6169644
Total Magnesium (Mg)	mg/kg	3600	3400	9800	2800	2500	2000	2200	1400	20	6169644
Total Manganese (Mn)	mg/kg	440	420	95	270	250	320	300	310	10	6169644
Total Phosphorus (P)	mg/kg	450	560	200	340	340	380	400	410	20	6169644
Total Potassium (K)	mg/kg	890	980	340	1000	1100	1000	970	570	25	6169644
Total Sodium (Na)	mg/kg	200	230	120	240	210	280	380	88	50	6169644
Total Strontium (Sr)	mg/kg	25	27	35	21	23	21	20	16	10	6169644
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109272
Total Arsenic (As)	mg/kg	13	12	2.6	11	11	12	11	15	1.0	6109272
Total Barium (Ba)	mg/kg	39	40	27	27	31	26	26	24	10	6109272
Total Beryllium (Be)	mg/kg	0.42	0.48	<0.40	0.44	0.44	<0.40	0.42	<0.40	0.40	6109272
Total Cadmium (Cd)	mg/kg	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	6109272
Total Chromium (Cr)	mg/kg	12	16	4.2	13	13	19	35	8.1	1.0	6109272
Total Cobalt (Co)	mg/kg	9.0	9.5	2.5	7.7	7.2	7.8	8.3	8.0	1.0	6109272
Total Copper (Cu)	mg/kg	26	30	15	14	14	16	15	19	5.0	6109272
Total Lead (Pb)	mg/kg	13	11	2.8	8.2	8.4	9.8	8.4	9.9	1.0	6109272
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	6109272
Total Molybdenum (Mo)	mg/kg	1.8	1.2	<0.40	0.99	1.0	1.4	1.5	1.4	0.40	6109272
Total Nickel (Ni)	mg/kg	21	22	6.6	20	20	22	31	18	1.0	6109272
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	6109272
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109272
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	6109272
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109272
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109272
Total Vanadium (V)	mg/kg	41	46	9.3	25	24	33	32	27	1.0	6109272
Total Zinc (Zn)	mg/kg	52	53	19	40	40	44	48	41	10	6109272
RDL = Reportable Detection Limit											

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EF8332	EF8333		EF8334	EF8342	EF8343	EF8345		
Sampling Date		2012/08/13	2012/08/13		2012/08/13	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**D1-TP12-8B**	**D1-TP12-9A**	**QC Batch**	**D1-TP12-9B**	**DELTA-TP12-1A**	**DELTA-TP12-1B**	**DELTA-TP12-3A**	**RDL**	**QC Batch**
Elements										
Total Aluminum (Al)	mg/kg	2900	2900	6169644	4900	5400	8600	3800	10	6169644
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	6170064	<1.0	<1.0	<1.0	<1.0	1.0	6170064
Total Boron (B)	mg/kg	5.9	2.8	6169644	9.6	8.8	27	8.0	2.0	6169644
Total Calcium (Ca)	mg/kg	1500	1400	6169644	4200	2300	1900	1900	50	6169644
Total Iron (Fe)	mg/kg	24000	28000	6169644	29000	38000	25000	27000	10	6169644
Total Magnesium (Mg)	mg/kg	1300	1200	6169644	2100	2100	3500	1900	20	6169644
Total Manganese (Mn)	mg/kg	200	330	6169644	320	340	230	250	10	6169644
Total Phosphorus (P)	mg/kg	280	310	6169644	420	490	470	340	20	6169644
Total Potassium (K)	mg/kg	410	300	6169644	780	780	2000	500	25	6169644
Total Sodium (Na)	mg/kg	310	<50	6169644	150	260	2500	1000	50	6169644
Total Strontium (Sr)	mg/kg	15	10	6169644	27	19	44	17	10	6169644
Total Antimony (Sb)	mg/kg	<1.0	<1.0	6109272	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Arsenic (As)	mg/kg	11	13	6109272	11	14	10	11	1.0	6109984
Total Barium (Ba)	mg/kg	16	21	6109272	28	20	45	15	10	6109984
Total Beryllium (Be)	mg/kg	<0.40	<0.40	6109272	0.46	0.52	0.65	<0.40	0.40	6109984
Total Cadmium (Cd)	mg/kg	<0.10	0.20	6109272	0.39	<0.10	<0.10	<0.10	0.10	6109984
Total Chromium (Cr)	mg/kg	6.0	6.0	6109272	20	10	19	7.9	1.0	6109984
Total Cobalt (Co)	mg/kg	5.5	6.1	6109272	7.4	11	8.6	6.3	1.0	6109984
Total Copper (Cu)	mg/kg	13	26	6109272	27	19	17	19	5.0	6109984
Total Lead (Pb)	mg/kg	6.1	15	6109272	15	8.2	12	10	1.0	6109984
Total Mercury (Hg)	mg/kg	<0.050	<0.050	6109272	<0.050	<0.050	<0.050	<0.050	0.050	6109984
Total Molybdenum (Mo)	mg/kg	1.5	1.5	6109272	1.7	1.4	1.0	1.1	0.40	6109984
Total Nickel (Ni)	mg/kg	12	18	6109272	23	24	22	16	1.0	6109984
Total Selenium (Se)	mg/kg	<0.50	0.52	6109272	0.73	<0.50	<0.50	<0.50	0.50	6109984
Total Silver (Ag)	mg/kg	<1.0	<1.0	6109272	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Thallium (Tl)	mg/kg	<0.30	<0.30	6109272	<0.30	<0.30	<0.30	<0.30	0.30	6109984
Total Tin (Sn)	mg/kg	<1.0	1.0	6109272	1.5	<1.0	<1.0	<1.0	1.0	6109984
Total Uranium (U)	mg/kg	<1.0	<1.0	6109272	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Vanadium (V)	mg/kg	25	28	6109272	31	32	30	25	1.0	6109984
Total Zinc (Zn)	mg/kg	30	65	6109272	83	53	54	34	10	6109984
RDL = Reportable Detection Limit										

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EF8346	EF8348	EF8350	EF8352	EF8353	EF8360		
Sampling Date		2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/15		
	UNITS	**DELTA-TP12-3B**	**DELTA-TP12-4**	**DELTA-TP12-6**	**DELTA-TP12-8A**	**DELTA-TP12-8B**	**PEARL-HA12-1**	**RDL**	**QC Batch**
Elements									
Total Aluminum (Al)	mg/kg	5800	5700	4300	6000	9000	15000	10	6169664
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6170064
Total Boron (B)	mg/kg	17	24	14	6.5	15	<2.0	2.0	6169664
Total Calcium (Ca)	mg/kg	2900	2300	2600	4600	2300	13000	50	6169664
Total Iron (Fe)	mg/kg	28000	21000	22000	51000	31000	70000	10	6169664
Total Magnesium (Mg)	mg/kg	3000	3100	2300	3000	2900	10000	20	6169664
Total Manganese (Mn)	mg/kg	360	160	210	550	230	1200	10	6169664
Total Phosphorus (P)	mg/kg	570	350	350	750	500	1300	20	6169664
Total Potassium (K)	mg/kg	1200	1400	810	860	2000	3400	25	6169664
Total Sodium (Na)	mg/kg	2500	3700	1500	340	800	460	50	6169664
Total Strontium (Sr)	mg/kg	38	30	21	27	57	41	10	6169664
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Arsenic (As)	mg/kg	10	9.9	10	21	14	9.8	1.0	6109984
Total Barium (Ba)	mg/kg	40	31	24	35	54	52	10	6109984
Total Beryllium (Be)	mg/kg	0.45	0.49	<0.40	0.46	0.61	0.74	0.40	6109984
Total Cadmium (Cd)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.13	0.10	6109984
Total Chromium (Cr)	mg/kg	21	13	11	30	21	13	1.0	6109984
Total Cobalt (Co)	mg/kg	8.3	6.7	6.3	11	8.9	31	1.0	6109984
Total Copper (Cu)	mg/kg	14	13	10	31	18	170	5.0	6109984
Total Lead (Pb)	mg/kg	9.3	9.3	6.4	11	14	11	1.0	6109984
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	6109984
Total Molybdenum (Mo)	mg/kg	0.97	1.3	1.2	2.4	1.0	0.87	0.40	6109984
Total Nickel (Ni)	mg/kg	25	17	16	35	23	39	1.0	6109984
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	0.67	0.53	<0.50	0.50	6109984
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	6109984
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6109984
Total Vanadium (V)	mg/kg	24	24	23	53	32	170	1.0	6109984
Total Zinc (Zn)	mg/kg	42	46	35	54	61	130	10	6109984
RDL = Reportable Detection Limit									

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EF8361	EF8362	EF8363		EF8364		
Sampling Date		2012/08/15	2012/08/15	2012/08/15		2012/08/15		
	UNITS	**PEARL-HA12-2**	**PEARL-HA12-3**	**PEARL-HA12-4**	**QC Batch**	**PEARL-DUP1**	**RDL**	**QC Batch**
Elements								
Total Aluminum (Al)	mg/kg	11000	11000	12000	6169664	9700	10	6169664
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	6170164	<1.0	1.0	6170164
Total Boron (B)	mg/kg	<2.0	<2.0	<2.0	6169664	<2.0	2.0	6169664
Total Calcium (Ca)	mg/kg	9500	9100	10000	6169664	11000	50	6169664
Total Iron (Fe)	mg/kg	66000	69000	66000	6169664	66000	10	6169664
Total Magnesium (Mg)	mg/kg	7800	7700	8800	6169664	7100	20	6169664
Total Manganese (Mn)	mg/kg	840	880	810	6169664	840	10	6169664
Total Phosphorus (P)	mg/kg	1300	1400	1400	6169664	1300	20	6169664
Total Potassium (K)	mg/kg	2200	2500	2300	6169664	2300	25	6169664
Total Sodium (Na)	mg/kg	380	300	370	6169664	240	50	6169664
Total Strontium (Sr)	mg/kg	27	28	33	6169664	26	10	6169664
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	6109984	<1.0	1.0	6110307
Total Arsenic (As)	mg/kg	3.3	4.1	3.1	6109984	5.3	1.0	6110307
Total Barium (Ba)	mg/kg	36	32	41	6109984	31	10	6110307
Total Beryllium (Be)	mg/kg	0.58	0.57	0.55	6109984	0.56	0.40	6110307
Total Cadmium (Cd)	mg/kg	0.11	0.12	0.10	6109984	0.13	0.10	6110307
Total Chromium (Cr)	mg/kg	20	35	27	6109984	31	1.0	6110307
Total Cobalt (Co)	mg/kg	27	28	28	6109984	30	1.0	6110307
Total Copper (Cu)	mg/kg	200	220	210	6109984	240	5.0	6110307
Total Lead (Pb)	mg/kg	5.5	5.0	4.5	6109984	5.2	1.0	6110307
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	6109984	<0.050	0.050	6110307
Total Molybdenum (Mo)	mg/kg	0.90	0.96	0.83	6109984	1.0	0.40	6110307
Total Nickel (Ni)	mg/kg	22	29	26	6109984	28	1.0	6110307
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	6109984	<0.50	0.50	6110307
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	6109984	<1.0	1.0	6110307
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	6109984	<0.30	0.30	6110307
Total Tin (Sn)	mg/kg	1.0	<1.0	<1.0	6109984	1.1	1.0	6110307
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	6109984	<1.0	1.0	6110307
Total Vanadium (V)	mg/kg	230	210	200	6109984	250	1.0	6110307
Total Zinc (Zn)	mg/kg	170	120	120	6109984	130	10	6110307

RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8158	EF8160	EF8317	EF8318	EF8319	EF8320	EF8321		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**D1-TP12-1A**	**D1-TP12-1B**	**D1-TP12-2A**	**D1-TP12-2B**	**D1-TP12-3A**	**D1-TP12-3B**	**D1-TP12-4A**	**RDL**	**QC Batch**
Volatiles										
(C6-C10)	mg/kg	<12	14	<12	<12	<12	<12	16	12	6099264
Benzene	mg/kg	0.011	0.011	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6099264
Toluene	mg/kg	0.036	0.023	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6099264
Ethylbenzene	mg/kg	0.014	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6099264
Xylenes (Total)	mg/kg	0.11	0.071	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6099264
m & p-Xylene	mg/kg	0.071	0.044	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6099264
o-Xylene	mg/kg	0.041	0.026	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6099264
F1 (C6-C10) - BTEX	mg/kg	<12	14	<12	<12	<12	<12	16	12	6099264
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	101	100	99	100	100	103	98	N/A	6099264
4-BROMOFLUOROBENZENE (sur.)	%	89	93	92	95	91	92	93	N/A	6099264
D10-ETHYLBENZENE (sur.)	%	93	94	96	91	96	95	96	N/A	6099264
D4-1,2-DICHLOROETHANE (sur.)	%	94	94	91	95	94	99	94	N/A	6099264

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8322		EF8323	EF8325	EF8326			EF8327		
Sampling Date		2012/08/13		2012/08/13	2012/08/13	2012/08/13			2012/08/13		
	UNITS	**D1-TP12-4B**	**QC Batch**	**DUP1**	**D1-TP12-5A**	**D1-TP12-5B**	**RDL**	**QC Batch**	**D1-TP12-6**	**RDL**	**QC Batch**
Volatiles											
(C6-C10)	mg/kg	460	6099264	420	22	220	12	6099264	380	12	6099264
Calculated Aliphatic >C8-C10	mg/kg	360	6105770	N/A	N/A	N/A	12		510	12	6105770
Calculated Aliphatic C6-C8	mg/kg	<12	6105770	N/A	N/A	N/A	12		16	12	6105770
Benzene	mg/kg	0.013	6099264	<0.0050	<0.0050	0.013	0.0050	6099264	0.012	0.0050	6099264
Toluene	mg/kg	0.16	6099264	0.16	0.021	0.084	0.020	6099264	0.13	0.020	6128283
Ethylbenzene	mg/kg	0.12	6128283	0.092	0.013	0.60	0.010	6099264	1.5	0.010	6099264
Xylenes (Total)	mg/kg	1.0	6128283	0.90	<0.040	2.7	0.040	6099264	13	0.040	6128283
m & p-Xylene	mg/kg	0.47	6099264	0.36	<0.040	2.4	0.040	6099264	9.0	0.040	6128283
o-Xylene	mg/kg	0.76	6099264	0.54	<0.020	0.22	0.020	6099264	4.3	0.020	6099264
F1 (C6-C10) - BTEX	mg/kg	330	6128283	420	22	220	12	6099264	630	12	6128283
C6-C8	mg/kg	<12	6128283	N/A	N/A	N/A	12		16	12	6128283
>C8-C10	mg/kg	390	6128283	N/A	N/A	N/A	12		640	12	6128283
Aromatic >C8-C10	mg/kg	23	6128283	N/A	N/A	N/A	12		130(1)	24	6128283
Surrogate Recovery (%)											
1,4-Difluorobenzene (sur.)	%	97	6099264	98	102	99	N/A	6099264	101	N/A	6128283
4-BROMOFLUOROBENZENE (sur.)	%	107	6128283	97	95	85	N/A	6099264	100	N/A	6128283
D10-ETHYLBENZENE (sur.)	%	99	6099264	97	98	98	N/A	6099264	79	N/A	6128283
D4-1,2-DICHLOROETHANE (sur.)	%	115	6128283	91	93	91	N/A	6099264	117	N/A	6128283

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

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8328	EF8329	EF8330	EF8331	EF8332	EF8333	EF8334		
Sampling Date		2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13	2012/08/13		
	UNITS	**DUP 2**	**D1-TP12-7A**	**D1-TP12-7B**	**D1-TP12-8A**	**D1-TP12-8B**	**D1-TP12-9A**	**D1-TP12-9B**	**RDL**	**QC Batch**
Volatiles										
(C6-C10)	mg/kg	510	<12	<12	<12	330	350	590	12	6099264
Benzene	mg/kg	0.045	<0.0050	<0.0050	<0.0050	0.088	<0.0050	<0.0050	0.0050	6099264
Toluene	mg/kg	0.18	<0.020	<0.020	<0.020	0.030	0.035	0.073	0.020	6099264
Ethylbenzene	mg/kg	3.1	<0.010	<0.010	<0.010	1.5	0.018	0.047	0.010	6099264
Xylenes (Total)	mg/kg	27	<0.040	<0.040	<0.040	4.6	0.15	1.1	0.040	6099264
m & p-Xylene	mg/kg	18	<0.040	<0.040	<0.040	4.4	0.11	0.73	0.040	6099264
o-Xylene	mg/kg	8.4	<0.020	<0.020	<0.020	0.17	0.041	0.32	0.020	6099264
F1 (C6-C10) - BTEX	mg/kg	480	<12	<12	<12	330	350	590	12	6099264
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	102	98	100	100	100	95	96	N/A	6099264
4-BROMOFLUOROBENZENE (sur.)	%	102	93	92	94	101	109	112	N/A	6099264
D10-ETHYLBENZENE (sur.)	%	98	98	95	99	98	101	101	N/A	6099264
D4-1,2-DICHLOROETHANE (sur.)	%	95	90	91	89	91	88	88	N/A	6099264

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8335		EF8336			EF8337		EF8342		
Sampling Date		2012/08/13		2012/08/13			2012/08/13		2012/08/14		
	UNITS	**D1-TP12-10A**	**QC Batch**	**D1-TP12-10B**	**RDL**	**QC Batch**	**D1-TP12-GEO1**	**QC Batch**	**DELTA-TP12-1A**	**RDL**	**QC Batch**
Volatiles											
(C6-C10)	mg/kg	160	6099264	90	12	6099306	1100	6099306	1000	12	6099306
Calculated Aliphatic >C8-C10	mg/kg	N/A		N/A	12		780	6105770	N/A	12	
Calculated Aliphatic C6-C8	mg/kg	N/A		N/A	12		<12	6105770	N/A	12	
Benzene	mg/kg	0.020	6099264	<0.0050	0.0050	6099306	0.020	6099306	0.0071	0.0050	6099306
Toluene	mg/kg	0.058	6099264	0.048	0.020	6099306	0.16	6099306	0.046	0.020	6099306
Ethylbenzene	mg/kg	0.029	6099264	0.025	0.010	6099306	0.28	6128283	0.028	0.010	6099306
Xylenes (Total)	mg/kg	0.16	6099264	0.14	0.040	6099306	5.1	6128283	0.16	0.040	6099306
m & p-Xylene	mg/kg	0.12	6099264	0.11	0.040	6099306	3.1	6099306	0.12	0.040	6099306
o-Xylene	mg/kg	0.044	6099264	0.037	0.020	6099306	3.0	6099306	0.044	0.020	6099306
F1 (C6-C10) - BTEX	mg/kg	160	6099264	89	12	6099306	780	6128283	1000	12	6099306
C6-C8	mg/kg	N/A		N/A	12		<12	6128283	N/A	12	
>C8-C10	mg/kg	N/A		N/A	12		870	6128283	N/A	12	
Aromatic >C8-C10	mg/kg	N/A		N/A	24		90	6128283	N/A	12	
Surrogate Recovery (%)											
1,4-Difluorobenzene (sur.)	%	102	6099264	86	N/A	6099306	109	6099306	120	N/A	6099306
4-BROMOFLUOROBENZENE (sur.)	%	111	6099264	112	N/A	6099306	107	6128283	109	N/A	6099306
D10-ETHYLBENZENE (sur.)	%	105	6099264	87	N/A	6099306	80	6099306	90	N/A	6099306
D4-1,2-DICHLOROETHANE (sur.)	%	96	6099264	89	N/A	6099306	115	6128283	116	N/A	6099306

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8343	EF8344		EF8345		EF8346	EF8347		
Sampling Date		2012/08/14	2012/08/14		2012/08/14		2012/08/14	2012/08/14		
	UNITS	**DELTA-TP12-1B**	**DELTA-TP12-2**	**RDL**	**DELTA-TP12-3A**	**RDL**	**DELTA-TP12-3B**	**DUP 3**	**RDL**	**QC Batch**
Volatiles										
(C6-C10)	mg/kg	17	27	12	630	12	81	31	12	6099306
Benzene	mg/kg	<0.0050	8.7	0.0050	<0.40(1)	0.40	0.96	0.12	0.0050	6099306
Toluene	mg/kg	<0.020	0.31	0.020	1.0	0.020	0.032	0.024	0.020	6099306
Ethylbenzene	mg/kg	<0.010	0.71	0.010	0.89	0.010	0.20	0.039	0.010	6099306
Xylenes (Total)	mg/kg	<0.040	1.4	0.040	3.6	0.040	0.66	0.13	0.040	6099306
m & p-Xylene	mg/kg	<0.040	0.61	0.040	1.7	0.040	0.17	0.065	0.040	6099306
o-Xylene	mg/kg	<0.020	0.79	0.020	2.0	0.020	0.49	0.065	0.020	6099306
F1 (C6-C10) - BTEX	mg/kg	17	15	12	630	12	79	31	12	6099306
Surrogate Recovery (%)										
1,4-Difluorobenzene (sur.)	%	89	100	N/A	109	N/A	101	104	N/A	6099306
4-BROMOFLUOROBENZENE (sur.)	%	95	99	N/A	131	N/A	94	103	N/A	6099306
D10-ETHYLBENZENE (sur.)	%	85	71	N/A	89	N/A	84	86	N/A	6099306
D4-1,2-DICHLOROETHANE (sur.)	%	100	105	N/A	107	N/A	102	107	N/A	6099306

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Detection limit raised due to matrix interference.

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8348	EF8349	EF8350	EF8351	EF8352		
Sampling Date		2012/08/14	2012/08/14	2012/08/14	2012/08/14	2012/08/14		
	UNITS	**DELTA-TP12-4**	**DELTA-TP12-5**	**DELTA-TP12-6**	**DELTA-TP12-7**	**DELTA-TP12-8A**	**RDL**	**QC Batch**
Volatiles								
(C6-C10)	mg/kg	<12	<12	<12	<12	<12	12	6099306
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6099306
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6099306
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6099306
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6099306
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6099306
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6099306
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	<12	12	6099306
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	90	101	103	115	97	N/A	6099306
4-BROMOFLUOROBENZENE (sur.)	%	98	107	95	95	99	N/A	6099306
D10-ETHYLBENZENE (sur.)	%	86	86	89	94	88	N/A	6099306
D4-1,2-DICHLOROETHANE (sur.)	%	91	106	111	125	104	N/A	6099306

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EF8353	EF8354	EF8355	EF8361		
Sampling Date		2012/08/14	2012/08/14	2012/08/14	2012/08/15		
	UNITS	**DELTA-TP12-8B**	**DELTA-TP12-9A**	**DELTA-TP12-9B**	**PEARL-HA12-2**	**RDL**	**QC Batch**
Volatiles							
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6099306
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6099306
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6099306
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6099306
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6099306
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6099306
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6099306
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6099306
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	98	98	100	99	N/A	6099306
4-BROMOFLUOROBENZENE (sur.)	%	100	99	96	98	N/A	6099306
D10-ETHYLBENZENE (sur.)	%	86	87	86	88	N/A	6099306
D4-1,2-DICHLOROETHANE (sur.)	%	105	103	104	98	N/A	6099306

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
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Package 1	4.0°C

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

General Comments

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

QUALITY ASSURANCE REPORT

			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
6099264	1,4-Difluorobenzene (sur.)	2012/08/23	100	60 - 140	101	60 - 140	101	%				
6099264	4-BROMOFLUOROBENZENE (sur.)	2012/08/23	97	60 - 140	95	60 - 140	92	%				
6099264	D10-ETHYLBENZENE (sur.)	2012/08/23	98	60 - 130	104	60 - 130	107	%				
6099264	D4-1,2-DICHLOROETHANE (sur.)	2012/08/23	92	60 - 140	90	60 - 140	93	%				
6099264	Benzene	2012/08/23	91	60 - 140	94	60 - 140	<0.0050	mg/kg	NC	50		
6099264	Toluene	2012/08/23	88	60 - 140	96	60 - 140	<0.020	mg/kg	NC	50		
6099264	Ethylbenzene	2012/08/23	96	60 - 140	103	60 - 140	<0.010	mg/kg	NC	50		
6099264	m & p-Xylene	2012/08/23	99	60 - 140	105	60 - 140	<0.040	mg/kg	NC	50		
6099264	o-Xylene	2012/08/23	98	60 - 140	103	60 - 140	<0.020	mg/kg	NC	50		
6099264	(C6-C10)	2012/08/23	92	60 - 140	84	60 - 140	<12	mg/kg	NC	50		
6099264	Xylenes (Total)	2012/08/23					<0.040	mg/kg	NC	50		
6099264	F1 (C6-C10) - BTEX	2012/08/23					<12	mg/kg	NC	50		
6099306	1,4-Difluorobenzene (sur.)	2012/08/23	109	60 - 140	104	60 - 140	91	%				
6099306	4-BROMOFLUOROBENZENE (sur.)	2012/08/23	102	60 - 140	100	60 - 140	93	%				
6099306	D10-ETHYLBENZENE (sur.)	2012/08/23	93	60 - 130	107	60 - 130	99	%				
6099306	D4-1,2-DICHLOROETHANE (sur.)	2012/08/23	103	60 - 140	108	60 - 140	98	%				
6099306	Benzene	2012/08/23	84	60 - 140	111	60 - 140	<0.0050	mg/kg	NC	50		
6099306	Toluene	2012/08/23	87	60 - 140	103	60 - 140	<0.020	mg/kg	NC	50		
6099306	Ethylbenzene	2012/08/23	90	60 - 140	114	60 - 140	<0.010	mg/kg	NC	50		
6099306	m & p-Xylene	2012/08/23	84	60 - 140	107	60 - 140	<0.040	mg/kg	NC	50		
6099306	o-Xylene	2012/08/23	89	60 - 140	105	60 - 140	<0.020	mg/kg	NC	50		
6099306	(C6-C10)	2012/08/23	78	60 - 140	72	60 - 140	<12	mg/kg	NC	50		
6099306	Xylenes (Total)	2012/08/23					<0.040	mg/kg	NC	50		
6099306	F1 (C6-C10) - BTEX	2012/08/23					<12	mg/kg	NC	50		
6099933	Moisture	2012/08/21					<0.30	%	0.7	20		
6099937	Moisture	2012/08/21					<0.30	%	5.8	20		
6102614	Moisture	2012/08/21					<0.30	%	3.9	20		
6102676	Moisture	2012/08/21					<0.30	%	2.6	20		
6104828	O-TERPHENYL (sur.)	2012/08/24	96	50 - 130	85	50 - 130	100	%				
6104828	F2 (C10-C16 Hydrocarbons)	2012/08/23	NC	50 - 130	90	70 - 130	<10	mg/kg	6.6	50		
6104828	F3 (C16-C34 Hydrocarbons)	2012/08/23	110	50 - 130	90	70 - 130	<10	mg/kg	22.6	50		
6104828	F4 (C34-C50 Hydrocarbons)	2012/08/23	105	50 - 130	88	70 - 130	<10	mg/kg	NC	50		
6104837	D10-ANTHRACENE (sur.)	2012/08/22	101	50 - 130	103	50 - 130	95	%				
6104837	D12-BENZO(A)PYRENE (sur.)	2012/08/22	105	50 - 130	107	50 - 130	83	%				
6104837	D8-ACENAPHTHYLENE (sur.)	2012/08/22	95	50 - 130	104	50 - 130	98	%				
6104837	TERPHENYL-D14 (sur.)	2012/08/22	112	50 - 130	112	50 - 130	108	%				
6104837	Acenaphthene	2012/08/25	103	50 - 130	97	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Acenaphthylene	2012/08/25	90	50 - 130	97	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Acridine	2012/08/25	77	50 - 130	83	50 - 130	<0.010	mg/kg	NC	50		

Maxxam Job #: B273445
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Sampler Initials: CL

QUALITY ASSURANCE REPORT

			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
6104837	Anthracene	2012/08/25	90	50 - 130	92	50 - 130	<0.0040	mg/kg	NC	50		
6104837	Benzo(a)anthracene	2012/08/25	100	50 - 130	100	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo(b&j)fluoranthene	2012/08/25	89	50 - 130	101	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo(k)fluoranthene	2012/08/25	97	50 - 130	104	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo(g,h,i)perylene	2012/08/25	83	50 - 130	96	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo(c)phenanthrene	2012/08/25	70	50 - 130	106	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo(a)pyrene	2012/08/25	88	50 - 130	91	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Benzo[e]pyrene	2012/08/25	88	50 - 130	100	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Chrysene	2012/08/25	101	50 - 130	101	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Dibenz(a,h)anthracene	2012/08/25	89	50 - 130	97	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Fluoranthene	2012/08/25	100	50 - 130	99	50 - 130	<0.0050	mg/kg	5.5	50		
6104837	Fluorene	2012/08/25	99	50 - 130	97	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Indeno(1,2,3-cd)pyrene	2012/08/25	86	50 - 130	96	50 - 130	<0.0050	mg/kg	NC	50		
6104837	2-Methylnaphthalene	2012/08/25	NC	50 - 130	97	50 - 130	<0.0050	mg/kg	31.7	50		
6104837	Naphthalene	2012/08/25	80	50 - 130	93	50 - 130	<0.0050	mg/kg	NC	50		
6104837	Phenanthrene	2012/08/25	107	50 - 130	98	50 - 130	<0.0050	mg/kg	23.5	50		
6104837	Perylene	2012/08/25	88	50 - 130	98	50 - 130	<0.0050	mg/kg	12.1	50		
6104837	Pyrene	2012/08/25	103	50 - 130	91	50 - 130	<0.0050	mg/kg	3.4	50		
6104837	Quinoline	2012/08/25	NC	50 - 130	96	50 - 130	<0.010	mg/kg	NC	50		
6104845	O-TERPHENYL (sur.)	2012/08/22	77	50 - 130	72	50 - 130	87	%				
6104845	F2 (C10-C16 Hydrocarbons)	2012/08/22	NC	50 - 130	82	70 - 130	<10	mg/kg	6.7	50		
6104845	F3 (C16-C34 Hydrocarbons)	2012/08/22	NC	50 - 130	85	70 - 130	<10	mg/kg	14.5	50		
6104845	F4 (C34-C50 Hydrocarbons)	2012/08/22	100	50 - 130	89	70 - 130	<10	mg/kg	NC	50		
6104892	DECANE (sur)	2012/08/28	110	30 - 130	94	30 - 130	77	%				
6104892	O-TERPHENYL (sur.)	2012/08/28	111	30 - 130	139(1, 2)	30 - 130	70	%				
6104892	>C10 - C12 Aliphatic	2012/08/28	NC	50 - 130	86	70 - 130	<5.0	mg/kg	13.5	40		
6104892	>C12 - C16 Aliphatic	2012/08/28	NC	50 - 130	99	70 - 130	<10	mg/kg	19.5	40		
6104892	>C12 - C16 Aromatic	2012/08/28	NC	50 - 130	128	70 - 130	<10	mg/kg	15.2	40		
6104892	>C16 - C21 Aliphatic	2012/08/28	113	50 - 130	106	70 - 130	<10	mg/kg	21.9	40		
6104892	>C16 - C21 Aromatic	2012/08/28	129	50 - 130	115	70 - 130	<10	mg/kg	4.9	40		
6104892	>C21 - C34 Aliphatic	2012/08/28	110	50 - 130	106	70 - 130	<10	mg/kg	NC	40		
6104892	>C21 - C34 Aromatic	2012/08/28	122	50 - 130	116	70 - 130	<10	mg/kg	NC	40		
6104892	>C10 - C12 Aromatic	2012/08/28					<5.0	mg/kg	30.4	40		
6104892	>C34 Aliphatic (up to C50)	2012/08/28					<10	mg/kg	NC	40		
6104892	>C34 Aromatic (up to C50)	2012/08/28					<10	mg/kg	NC	40		
6108211	Sieve - Pan	2012/08/24							9.6	35	101	97 - 103
6108211	Sieve - #200 (>0.075mm)	2012/08/24							20.8	35	99	92 - 108
6109272	Total Antimony (Sb)	2012/08/23	81	75 - 125	93	75 - 125	<1.0	mg/kg	NC	35		
6109272	Total Arsenic (As)	2012/08/23	91	75 - 125	90	75 - 125	<1.0	mg/kg	0.4	35	109	50 - 150

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
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Sampler Initials: CL

QUALITY ASSURANCE REPORT

			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
6109272	Total Barium (Ba)	2012/08/23	NC	75 - 125	94	75 - 125	<10	mg/kg	3.2	35	109	69 - 131
6109272	Total Beryllium (Be)	2012/08/23	96	75 - 125	93	75 - 125	<0.40	mg/kg	NC	35		
6109272	Total Cadmium (Cd)	2012/08/23	92	75 - 125	91	75 - 125	<0.10	mg/kg	NC	35		
6109272	Total Chromium (Cr)	2012/08/23	NC	75 - 125	92	75 - 125	<1.0	mg/kg	5.0	35	105	41 - 159
6109272	Total Cobalt (Co)	2012/08/23	96	75 - 125	93	75 - 125	<1.0	mg/kg	2.9	35	103	75 - 125
6109272	Total Copper (Cu)	2012/08/23	96	75 - 125	93	75 - 125	<5.0	mg/kg	NC	35	97	72 - 127
6109272	Total Lead (Pb)	2012/08/23	94	75 - 125	94	75 - 125	<1.0	mg/kg	5.5	35	99	54 - 146
6109272	Total Mercury (Hg)	2012/08/23	99	75 - 125	100	75 - 125	<0.050	mg/kg	NC	35		
6109272	Total Molybdenum (Mo)	2012/08/23	100	75 - 125	94	75 - 125	<0.40	mg/kg	4.3	35		
6109272	Total Nickel (Ni)	2012/08/23	99	75 - 125	94	75 - 125	<1.0	mg/kg	1	35	110	61 - 139
6109272	Total Selenium (Se)	2012/08/23	88	75 - 125	89	75 - 125	<0.50	mg/kg	NC	35		
6109272	Total Silver (Ag)	2012/08/23	99	75 - 125	97	75 - 125	<1.0	mg/kg	NC	35		
6109272	Total Thallium (Tl)	2012/08/23	86	75 - 125	92	75 - 125	<0.30	mg/kg	NC	35		
6109272	Total Tin (Sn)	2012/08/23	105	75 - 125	101	75 - 125	<1.0	mg/kg	NC	35		
6109272	Total Uranium (U)	2012/08/23	93	75 - 125	98	75 - 125	<1.0	mg/kg	NC	35		
6109272	Total Vanadium (V)	2012/08/23	NC	75 - 125	95	75 - 125	<1.0	mg/kg	7.9	35	124	50 - 150
6109272	Total Zinc (Zn)	2012/08/23	NC	75 - 125	87	75 - 125	<10	mg/kg	5.0	35	94	72 - 128
6109984	Total Antimony (Sb)	2012/08/23	86	75 - 125	91	75 - 125	<1.0	mg/kg	NC	35		
6109984	Total Arsenic (As)	2012/08/23	93	75 - 125	96	75 - 125	<1.0	mg/kg	1.6	35	114	50 - 150
6109984	Total Barium (Ba)	2012/08/23	NC	75 - 125	95	75 - 125	<10	mg/kg	NC	35	111	69 - 131
6109984	Total Beryllium (Be)	2012/08/23	95	75 - 125	95	75 - 125	<0.40	mg/kg	NC	35		
6109984	Total Cadmium (Cd)	2012/08/23	92	75 - 125	92	75 - 125	<0.10	mg/kg	NC	35		
6109984	Total Chromium (Cr)	2012/08/23	92	75 - 125	95	75 - 125	<1.0	mg/kg	30.6	35	105	41 - 159
6109984	Total Cobalt (Co)	2012/08/23	93	75 - 125	96	75 - 125	<1.0	mg/kg	1.7	35	101	75 - 125
6109984	Total Copper (Cu)	2012/08/23	93	75 - 125	96	75 - 125	<5.0	mg/kg	NC	35	100	72 - 127
6109984	Total Lead (Pb)	2012/08/23	91	75 - 125	94	75 - 125	<1.0	mg/kg	3.2	35	103	54 - 146
6109984	Total Mercury (Hg)	2012/08/23	99	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35		
6109984	Total Molybdenum (Mo)	2012/08/23	95	75 - 125	94	75 - 125	<0.40	mg/kg	NC	35		
6109984	Total Nickel (Ni)	2012/08/23	NC	75 - 125	97	75 - 125	<1.0	mg/kg	10.7	35	109	61 - 139
6109984	Total Selenium (Se)	2012/08/23	94	75 - 125	97	75 - 125	<0.50	mg/kg	NC	35		
6109984	Total Silver (Ag)	2012/08/23	96	75 - 125	97	75 - 125	<1.0	mg/kg	NC	35		
6109984	Total Thallium (Tl)	2012/08/23	86	75 - 125	92	75 - 125	<0.30	mg/kg	NC	35		
6109984	Total Tin (Sn)	2012/08/23	100	75 - 125	97	75 - 125	<1.0	mg/kg	NC	35		
6109984	Total Uranium (U)	2012/08/23	92	75 - 125	98	75 - 125	<1.0	mg/kg	NC	35		
6109984	Total Vanadium (V)	2012/08/23	106	75 - 125	98	75 - 125	<1.0	mg/kg	2.3	35	122	50 - 150
6109984	Total Zinc (Zn)	2012/08/23	NC	75 - 125	94	75 - 125	<10	mg/kg	NC	35	100	72 - 128
6110307	Total Antimony (Sb)	2012/08/24	93	75 - 125	102	75 - 125	<1.0	mg/kg	NC	35		
6110307	Total Arsenic (As)	2012/08/24	99	75 - 125	104	75 - 125	<1.0	mg/kg	6.1	35	121	50 - 150
6110307	Total Barium (Ba)	2012/08/24	NC	75 - 125	99	75 - 125	<10	mg/kg	2.6	35	115	69 - 131

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

QUALITY ASSURANCE REPORT

			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
6110307	Total Beryllium (Be)	2012/08/24	101	75 - 125	102	75 - 125	<0.40	mg/kg	NC	35		
6110307	Total Cadmium (Cd)	2012/08/24	99	75 - 125	103	75 - 125	<0.10	mg/kg	5.1	35		
6110307	Total Chromium (Cr)	2012/08/24	106	75 - 125	102	75 - 125	<1.0	mg/kg	10	35	111	41 - 159
6110307	Total Cobalt (Co)	2012/08/24	97	75 - 125	102	75 - 125	<1.0	mg/kg	9.5	35	109	75 - 125
6110307	Total Copper (Cu)	2012/08/24	98	75 - 125	106	75 - 125	<5.0	mg/kg	NC	35	107	72 - 127
6110307	Total Lead (Pb)	2012/08/24	97	75 - 125	102	75 - 125	<1.0	mg/kg	6.1	35	111	54 - 146
6110307	Total Mercury (Hg)	2012/08/24	98	75 - 125	101	75 - 125	<0.050	mg/kg	NC	35		
6110307	Total Molybdenum (Mo)	2012/08/24	102	75 - 125	101	75 - 125	<0.40	mg/kg	4.1	35		
6110307	Total Nickel (Ni)	2012/08/24	NC	75 - 125	105	75 - 125	<1.0	mg/kg	9.0	35	117	61 - 139
6110307	Total Selenium (Se)	2012/08/24	102	75 - 125	107	75 - 125	<0.50	mg/kg	NC	35		
6110307	Total Silver (Ag)	2012/08/24	100	75 - 125	103	75 - 125	<1.0	mg/kg	NC	35		
6110307	Total Thallium (Tl)	2012/08/24	93	75 - 125	98	75 - 125	<0.30	mg/kg	NC	35		
6110307	Total Tin (Sn)	2012/08/24	107	75 - 125	103	75 - 125	<1.0	mg/kg	NC	35		
6110307	Total Uranium (U)	2012/08/24	96	75 - 125	105	75 - 125	<1.0	mg/kg	NC	35		
6110307	Total Vanadium (V)	2012/08/24	NC	75 - 125	104	75 - 125	<1.0	mg/kg	7.4	35	130	50 - 150
6110307	Total Zinc (Zn)	2012/08/24	NC	75 - 125	107	75 - 125	<10	mg/kg	4.0	35	108	72 - 128
6111331	% sand by hydrometer	2012/08/24							0.5	35	92	80 - 120
6111331	% silt by hydrometer	2012/08/24							0.3	35	109	78 - 122
6111331	Clay Content	2012/08/24							0.4	35	100	75 - 125
6128283	1,4-Difluorobenzene (sur.)	2012/08/31	108	60 - 140	110	60 - 140	98	%				
6128283	4-BROMOFLUOROBENZENE (sur.)	2012/08/31	105	60 - 140	116	60 - 140	100	%				
6128283	D10-ETHYLBENZENE (sur.)	2012/08/31	86	30 - 130	99	30 - 130	85	%				
6128283	D4-1,2-DICHLOROETHANE (sur.)	2012/08/31	119	60 - 140	114	60 - 140	115	%				
6128283	(C6-C10)	2012/08/31	84	60 - 140	91	60 - 140	<12	mg/kg	NC	50		
6128283	Benzene	2012/08/31	91	60 - 140	88	60 - 140	<0.0050	mg/kg	NC	50		
6128283	Toluene	2012/08/31	87	60 - 140	88	60 - 140	<0.020	mg/kg	NC	50		
6128283	Ethylbenzene	2012/08/31	91	60 - 140	96	60 - 140	<0.010	mg/kg	NC	50		
6128283	m & p-Xylene	2012/08/31	84	60 - 140	91	60 - 140	<0.040	mg/kg	NC	50		
6128283	o-Xylene	2012/08/31	84	60 - 140	90	60 - 140	<0.020	mg/kg	NC	50		
6128283	C6-C8	2012/08/31	80	60 - 140	93	60 - 140	<12	mg/kg	NC	50		
6128283	>C8-C10	2012/08/31	134	60 - 140	114	60 - 140	<12	mg/kg	NC	50		
6128283	Aromatic >C8-C10	2012/08/31	135	60 - 140	139	60 - 140	<12	mg/kg	NC	50		
6128283	Xylenes (Total)	2012/08/31					<0.040	mg/kg	NC	50		
6128283	F1 (C6-C10) - BTEX	2012/08/31					<12	mg/kg	NC	50		
6169644	Total Aluminum (Al)	2012/09/14			103	80 - 120	<10	mg/kg	6.0	35	101	75 - 125
6169644	Total Calcium (Ca)	2012/09/14			102	80 - 120	<50	mg/kg	5.4	35	104	77 - 123
6169644	Total Iron (Fe)	2012/09/14			103	80 - 120	<10	mg/kg	4.4	35	110	75 - 125
6169644	Total Magnesium (Mg)	2012/09/14			98	80 - 120	<20	mg/kg	7.7	35	103	75 - 125
6169644	Total Manganese (Mn)	2012/09/14			97	80 - 120	<10	mg/kg	4.4	35	105	75 - 125

Maxxam Job #: B273445
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700227219
Sampler Initials: CL

QUALITY ASSURANCE REPORT

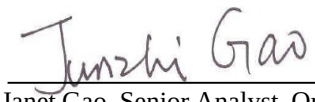
			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6169644	Total Phosphorus (P)	2012/09/14			101	80 - 120	<20	mg/kg	20.3	35	93	89 - 117
6169644	Total Potassium (K)	2012/09/14			99	80 - 120	<25	mg/kg	5.3	35	98	60 - 140
6169644	Total Sodium (Na)	2012/09/14			97	80 - 120	<50	mg/kg	18.3	35	69	60 - 140
6169644	Total Strontium (Sr)	2012/09/14			98	80 - 120	<10	mg/kg	NC	35	97	75 - 125
6169644	Total Boron (B)	2012/09/14			97	80 - 120	<2.0	mg/kg	NC	35		
6169664	Total Aluminum (Al)	2012/09/14			106	80 - 120	<10	mg/kg	0.8	35	106	75 - 125
6169664	Total Calcium (Ca)	2012/09/14			106	80 - 120	<50	mg/kg	0.004	35	110	77 - 123
6169664	Total Iron (Fe)	2012/09/14			106	80 - 120	<10	mg/kg	0.4	35	116	75 - 125
6169664	Total Magnesium (Mg)	2012/09/14			103	80 - 120	<20	mg/kg	0.4	35	109	75 - 125
6169664	Total Manganese (Mn)	2012/09/14			101	80 - 120	<10	mg/kg	0.6	35	111	75 - 125
6169664	Total Phosphorus (P)	2012/09/14			105	80 - 120	<20	mg/kg	1.8	35	98	89 - 117
6169664	Total Potassium (K)	2012/09/14			102	80 - 120	<25	mg/kg	0.7	35	104	60 - 140
6169664	Total Sodium (Na)	2012/09/14			100	80 - 120	<50	mg/kg	1.2	35	84	60 - 140
6169664	Total Strontium (Sr)	2012/09/14			102	80 - 120	<10	mg/kg	NC	35	103	75 - 125
6169664	Total Boron (B)	2012/09/14			101	80 - 120	<2.0	mg/kg	0.7	35		
6170064	Total Bismuth (Bi)	2012/09/17	107	80 - 120	93	75 - 125	<1.0	mg/kg	NC	35		
6170164	Total Bismuth (Bi)	2012/09/17	109	80 - 120	101	75 - 125	<1.0	mg/kg	NC	35		

N/A = Not Applicable
RPD = Relative Percent Difference
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 blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) - Surrogate recovery is outside acceptance criteria. However all analytes recoveries are within acceptance criteria therefore there is no impact on data quality.

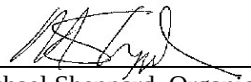
Validation Signature Page

Maxxam Job #: B273445

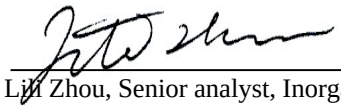
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



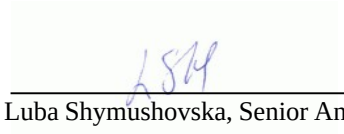
Janet Gao, Senior Analyst, Organics Department



Michael Sheppard, Organics Supervisor



Lili Zhou, Senior analyst, Inorganic department.



Luba Shymushovska, Senior Analyst, Organic Department

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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 Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:		B273445	366259
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North Edmonton AB T5J 1S6	Address:	329 Churchill Ave N, Suite 200 Ottawa ON K1Z5B8	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Project Name:		C#366259-01-01	Julie Clement
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Site #:	EUREKA 1570-1204		
				Sampled By:	Catherine LeBlanc/Christine Aubin		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ___ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

SPECIAL INSTRUCTIONS

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

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission) ☐
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Sieve + Hydrometer	Moisture (soil)	# of Bottles	Comments
1		DI-TP12-1A	Aug 13/12	AM	SOIL	N	N	X		X	X		X				4	Use project # EW699-113372 for the report. Incorrect project # on bottle COCs
2		DI-TP12-1B						X		X	X		X				4	
3		DI-TP12-2							X								1	
4		DI-TP12-2A								X	X						2	
5		DI-TP12-2B								X	X						2	
6		DI-TP12-3A								X	X						2	ARRIVED AT DEPOT: AUG 17 2012 8:45 TEMP: 4.5 3.1
7		DI-TP12-3B		↓						X	X						2	
8		DI-TP12-4A		PM				X		X	X		X				4	
9		DI-TP12-4B						X		X	X	X	X				6	
10		~~DUPLICATE~~ DUP1		↓	↓	↓	↓	X		X	X		X				4	↓

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc	Aug 16/12	16:00	Brandon Young	2012/08/18	09:50	

Laboratory Use Only					
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
		Present		
		Intact		

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

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #: B273445	BOTTLE ORDER #: 366259
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:			
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372	CHAIN OF CUSTODY #: C#366259-02-01	PROJECT MANAGER: Julie Clement
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:			
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Site #:	EUREKA 1570-1204		
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc/Christine Aubin		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ___ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

SPECIAL INSTRUCTIONS:

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Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified).
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Sieve + Hydrometer	Moisture (soil)	# of Bottles	Comments
1		DI-TP12-5A	AUG13	PM	SOIL	N	N			X	X						2	Use Project # EW699-113372 for the report. Incorrect project # on bottle COCs.
2		DI-TP12-5B								X	X						2	
3		DI-TP12-6						X		X	X	X	X				6	
4		DUP 2						X		X	X		X				4	
5		DI-TP12-7A								X	X						2	
6		DI-TP12-7B								X	X						2	
7		DI-TP12-8A						X		X	X		X				4	
8		DI-TP12-8B						X		X	X		X				4	
9		DI-TP12-9A						X		X	X		X				4	
10		DI-TP12-9B						X		X	X		X				4	

0.45 kg

ARRIVED AT DEPOT:
AUG 17 2012
TEMP: 4.5°C

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc	AUG 16/12	16:00	[illegible]	2012/08/16	09:50	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
		Intact		

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

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:		B273445	366259
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:		C#366259-03-01	Julie Clement
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Site #:	EUREKA 1570-1204		
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc/Christine Kuhn		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ___ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

SPECIAL INSTRUCTIONS

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

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified).
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil 12-F4	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Sieve + Hydrometer	Moisture (soil)	# of Bottles	Comments
1		DI-TP12-1DA	AUG13	PM	SOIL	N	N			X	X						2	[illegible] use project # EW699-113372
2		DI-TP12-10B	↓	↓	↓	↓	↓			X	X						2	wrong project # on bottles.
3		DI-TP12-402								X	X	X			X	X	5	
4		DI-TP12-402													X	X	2	
5		DI-TP12-403													X	X	2	8:45 MS
6		DI-TP12-10	AUG13	PM					X								1	
7		Delta-TP12-1A	AUG14	AM				X		X	X		X				4	ARRIVED AT DEPOT: AUG 17 2012 TEMP: 4.5 C
8		Delta-TP12-1B						X		X	X		X				4	
9		Delta-TP12-2								X	X						2	
10		Delta-TP12-3A	↓	↓	↓	↓	↓	X		X	X		X				4	

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc	AUG/16/12	16:00	[signature] Brandon Ramsay	2012/08/18	09:50	

Laboratory Use Only					
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
		Present		
		Intact		

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

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Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #: B273445	BOTTLE ORDER #: 366259
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:			
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372	CHAIN OF CUSTODY #: C#366259-04-01	PROJECT MANAGER: Julie Clement
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:			
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Site #:	EUREKA 1570-1204		
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc / Christine Nolan		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ___ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

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Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW			# of Bottles	Comments
1		Delta-TP12-3B	Aug14	AM	SOIL	N	N	X		X	X		X				4	
2		DUP 3		↓						X	X						2	
3		Delta-TP12-4		PM				X		X	X		X				4	
4		Delta-TP12-5								X	X						2	
5		Delta-TP12-6						X		X	X		X				4	
6		Delta-TP12-7								X	X						2	8:45 pm
7		Delta-TP12-8A						X		X	X		X				4	
8		Delta-TP12-8B						X		X	X		X				4	
9		Delta-TP12-9A								X	X						2	
10		Delta-TP12-9B	↓	↓	↓					X	X						4	

ARRIVED AT DEPOT: AUG 17 2012 TEMP 15.1

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc	Aug 16/12	16:00	[illegible]	2012/08/17	09:50	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
		Present		
		Intact		

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CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
mpany Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #:	BOTTLE ORDER #:
ntact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:		B773445	366259
dress:	10025 Jasper Ave. 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:		C#366259-06-01	Julie Clement
one:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Site #:	EUREKA 1570-1204		
ail:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc/Christian Aubin		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agri/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME Reg. 558 ☐ MISA ☐ PWQO ☐ Other ___ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

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Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

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	PEARL-HA1-1	PM	AUG15	SOIL	N	N	X							1	
	PEARL-HA12-2						X		X	X				3	
	PEARL-HA12-3						X							1	
	PEARL-HA12-4						X							1	
	PEARL-DUP1						X							1	8:45 MS

ARRIVED AT DEPOT:
AUG 17 2012
TEMP: 4.5 3.1

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc	Aug/16/12	16:00	Brandon Ramsay	2012/08/16	09:50	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
		Present		
		Intact		

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

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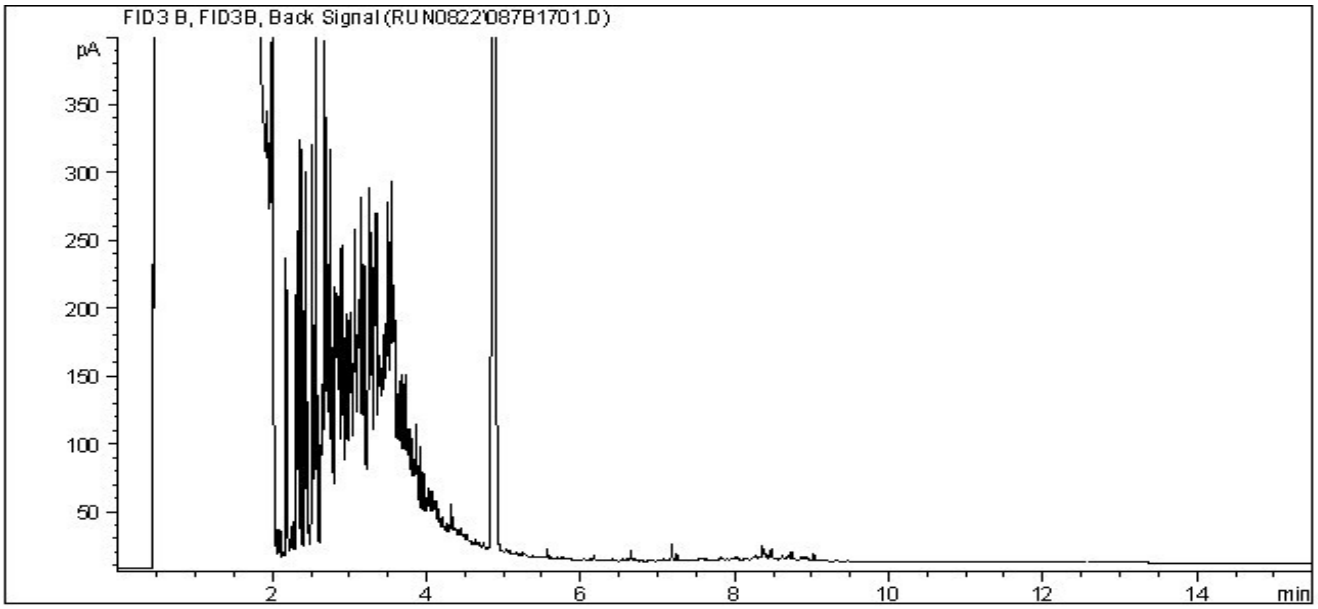
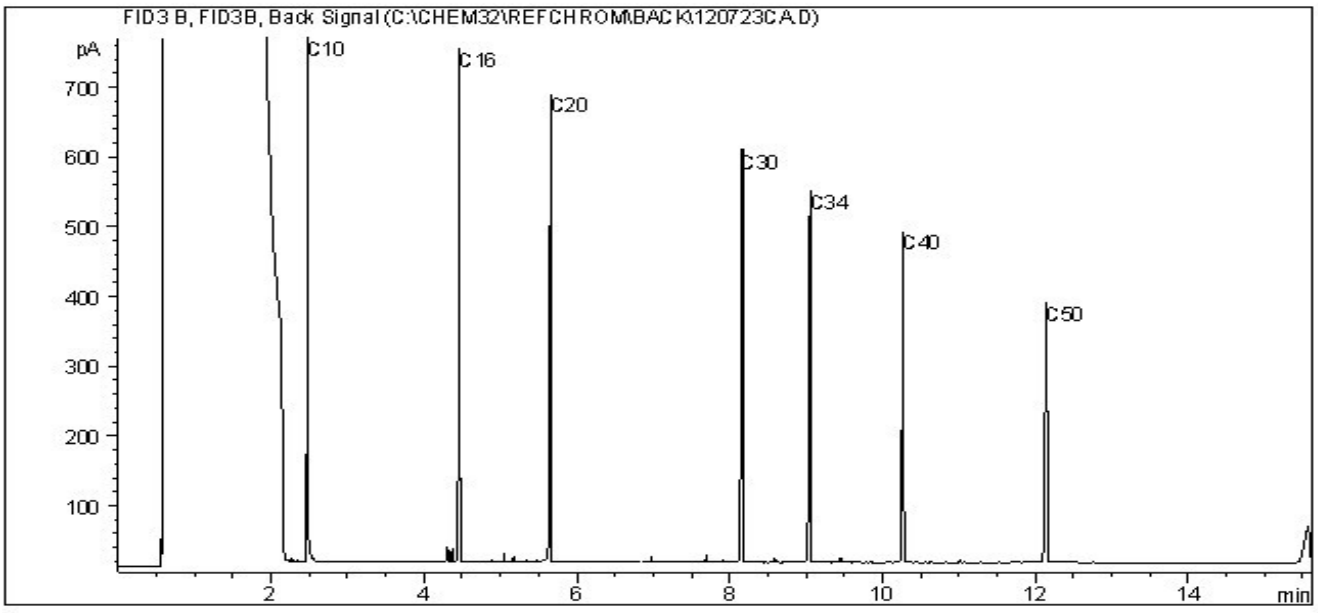
Report Date: 2012/09/21
Maxxam Job #: B273445
Maxxam Sample: EF8322

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-TP12-4B

Aliphatic and Aromatic Fractions C10-C50 Chromatogram



Carbon Range Distribution - Reference Chromatogram



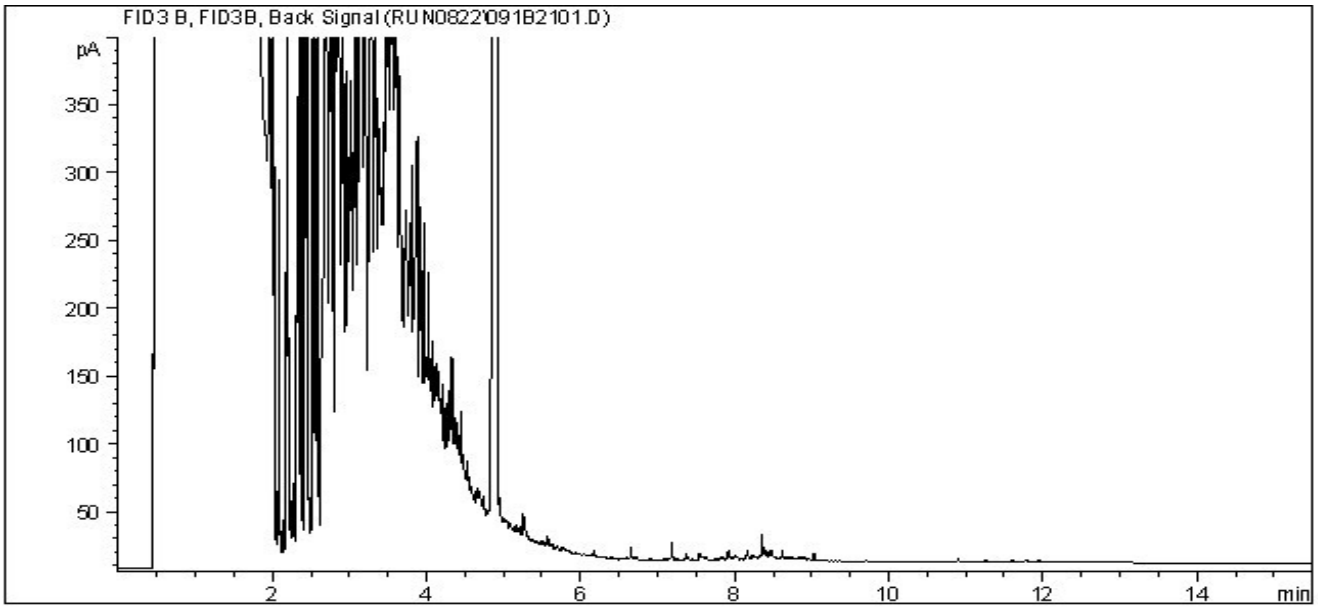
TYPICAL PRODUCT CARBON NUMBER RANGES

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

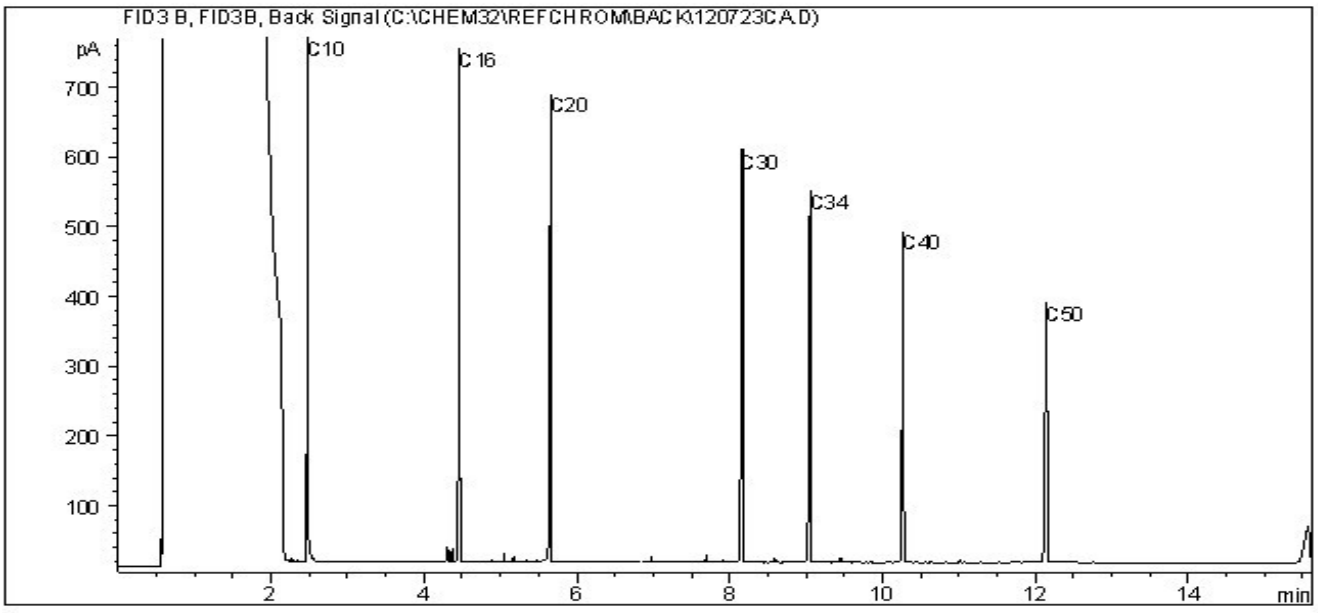
Report Date: 2012/09/21
Maxxam Job #: B273445
Maxxam Sample: EF8327

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-TP12-6

Aliphatic and Aromatic Fractions C10-C50 Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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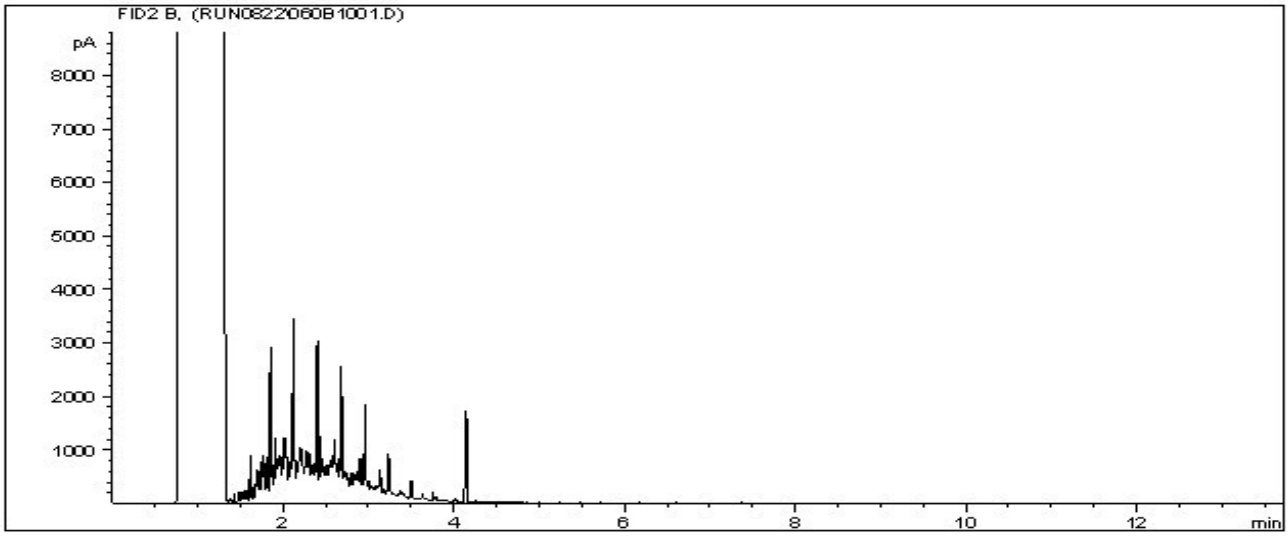
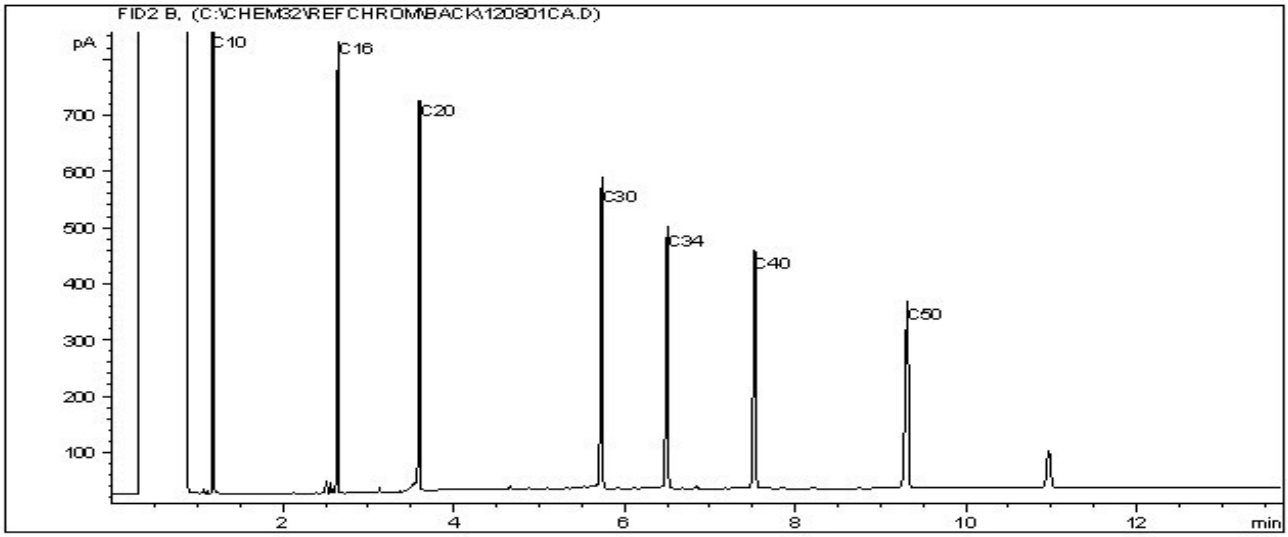
Report Date: 2012/09/21
Maxxam Job #: B273445
Maxxam Sample: EF8337

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-TP12-GEO1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

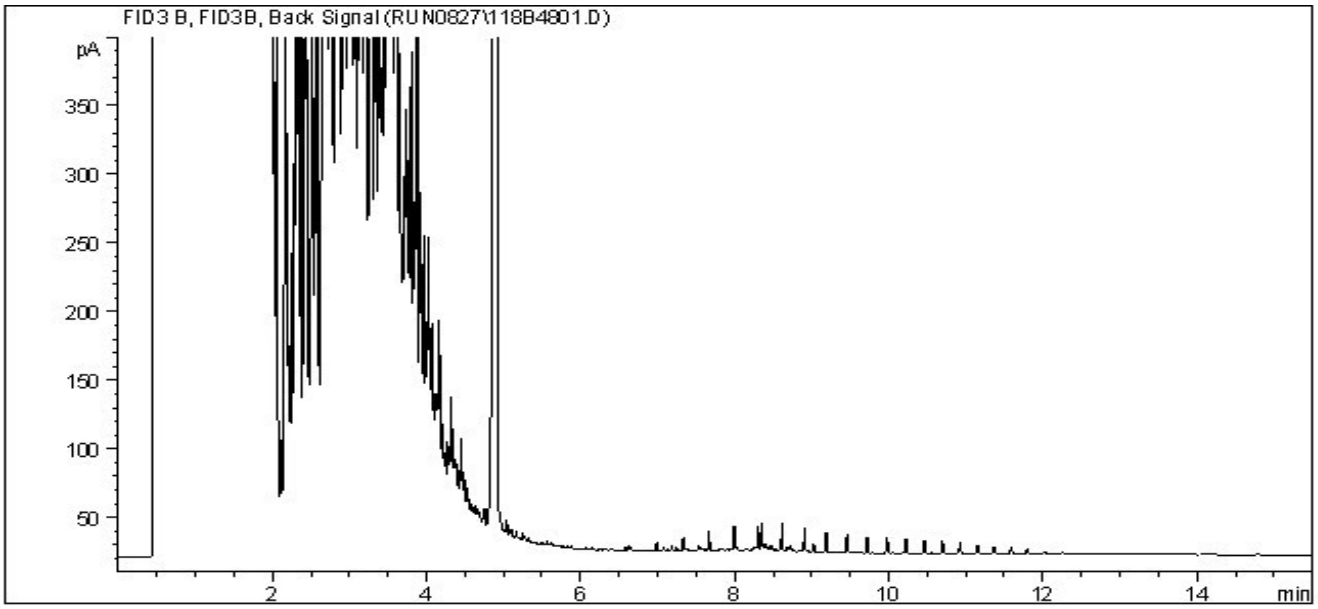
Gasoline:	C4 - C12		Diesel:	C8 - C22	
Varsol:	C8 - C12		Lubricating Oils:	C20 - C40	
Kerosene:	C7 - C16		Crude Oils:	C3 - C60+	

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

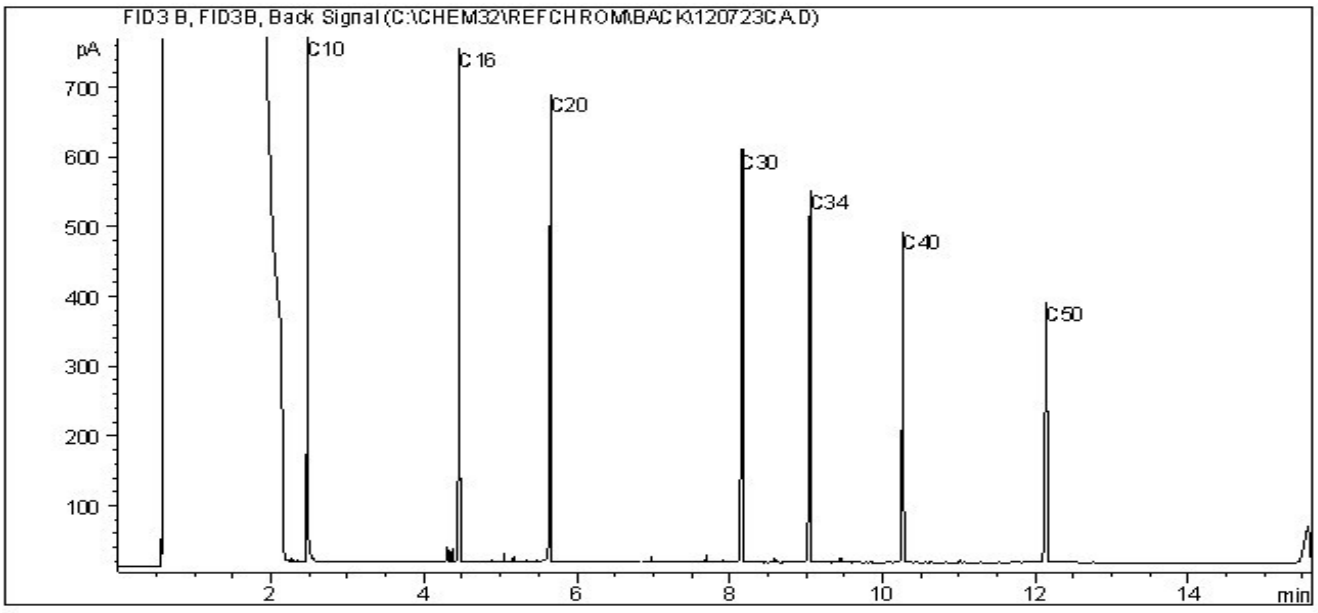
Report Date: 2012/09/21
Maxxam Job #: B273445
Maxxam Sample: EF8337

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-TP12-GEO1

Aliphatic and Aromatic Fractions C10-C50 Chromatogram



Carbon Range Distribution - Reference Chromatogram



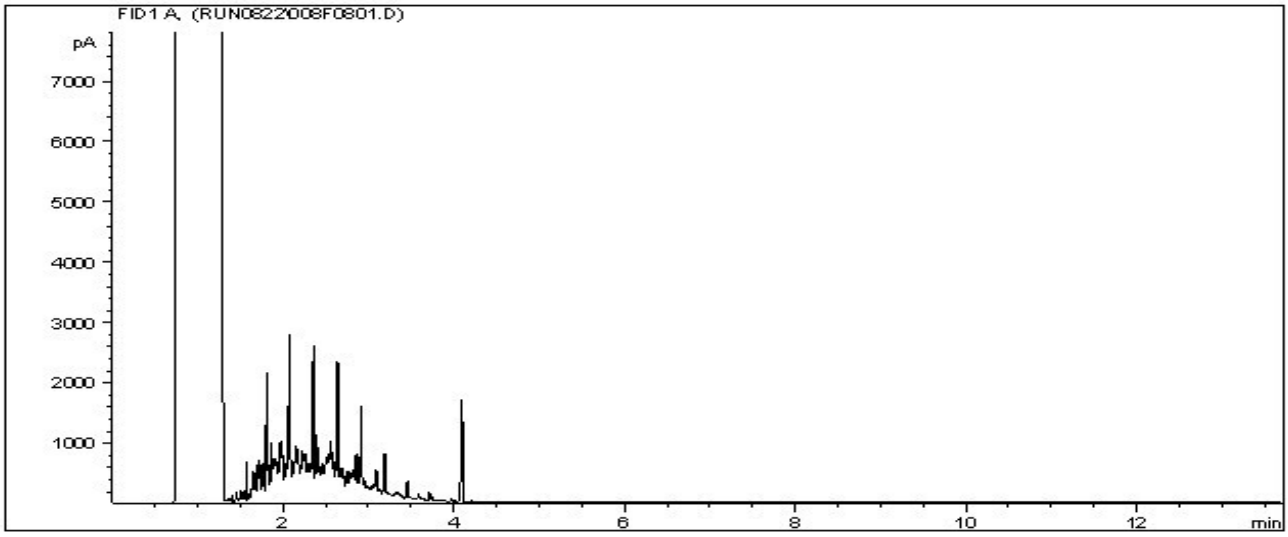
TYPICAL PRODUCT CARBON NUMBER RANGES

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

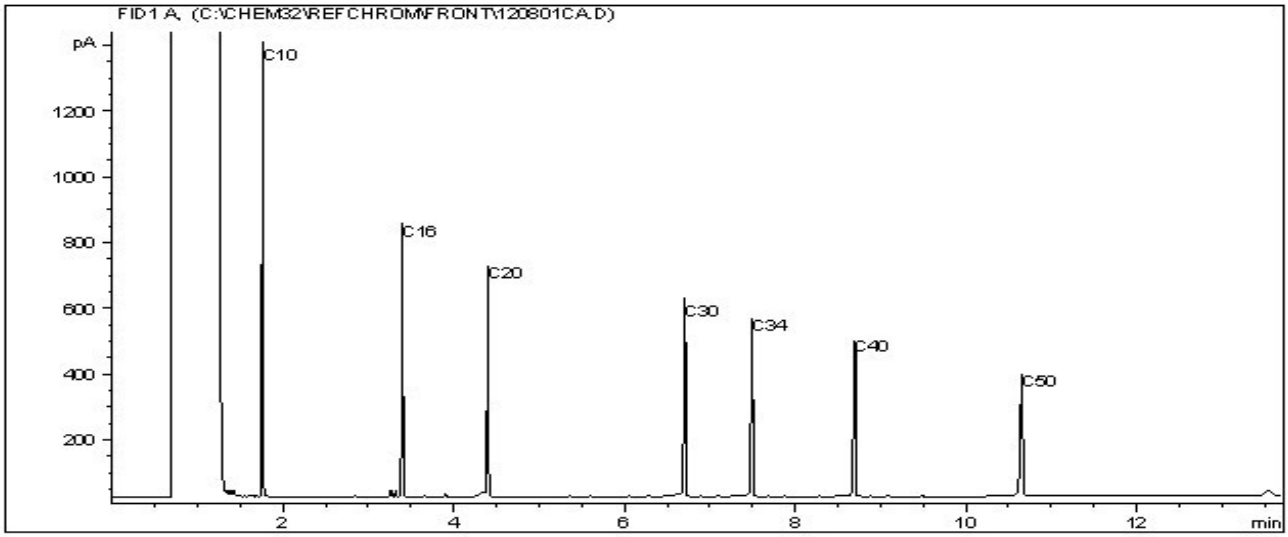
Report Date: 2012/09/21
Maxxam Job #: B273445
Maxxam Sample: EF8337 Lab-Dup

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-TP12-GEO1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



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.

Your Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your C.O.C. #: 366259, 366259-07-01, 366259-08-01, 366259-09-01, 366259-10-01, 366259-12-01

Attention: CATHERINE LEBLANC
FRANZ ENVIRONMENTAL INC.
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z5B8

Report Date: 2012/09/21
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B275357
Received: 2012/08/21, 16:45

Sample Matrix: Soil
Samples Received: 41

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	7	2012/08/23	2012/08/29	AB SOP-00039	CCME, EPA 8260C
BTEX/F1 by HS GC/MS (MeOH extract)	13	2012/08/23	2012/08/30	AB SOP-00039	CCME, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil)	1	2012/08/24	2012/08/25	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil) (1)	19	2012/08/24	2012/08/29	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Aliphatic and Aromatic Fractions C6-C10	1	2012/08/23	2012/08/31	AB SOP-00039	CCME CWS, RBCA
Aliphatic and Aromatic Fractions C6-C10	1	2012/08/31	2012/08/31	AB SOP-00039	CCME CWS, RBCA
Aliphatic and Aromatic Fractions C10-C50	1	2012/08/27	2012/08/28	CAL SOP-00184	RBCA-CCME
Elements by ICP -Soils	26	2012/08/28	2012/09/14	AB SOP-00042	EPA 200.7
Elements by ICPMS - Soils	26	2012/08/28	2012/08/28	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (Ext list)	1	2012/08/08	2012/09/17	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (Ext list)	25	2012/08/28	2012/09/17	AB SOP-00043	EPA 200.8
Moisture	20	N/A	2012/08/24	AB SOP-00002	CCME PHC-CWS
Moisture	21	N/A	2012/08/25	AB SOP-00002	CCME PHC-CWS
Benzo[a]pyrene Equivalency	1	N/A	2012/08/29	AB SOP-00003	EPA 8270D
Benzo[a]pyrene Equivalency (1)	5	N/A	2012/08/30	AB SOP-00003	EPA 8270D
Polycyclic Aromatic Hydrocarbons in soil	1	2012/08/24	2012/08/27	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Polycyclic Aromatic Hydrocarbons in soil (1)	5	2012/08/24	2012/08/29	AB SOP-00003 AB SOP-00036	EPA 3540C/8270D
Particle Size by Sieve (75 micron)	5	N/A	2012/08/28	AB SOP-00022	SSMA 55.4
Texture by Hydrometer	4	N/A	2012/08/28	AB SOP-00030	SSMA CH55.3
Texture Class	4	N/A	2012/08/28	AB SOP-00030	SSMA CH55.3

* Results relate only to the items tested.

(1) This test was performed by Maxxam Edmonton Environmental

../2

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

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

Total cover pages: 2

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EH0198		EH0199	EH0205	EH0207	EH0208	EH0209	EH0210		
Sampling Date		2012/08/16		2012/08/16	2012/08/16	2012/08/16	2012/08/16	2012/08/16	2012/08/16		
	UNITS	**D1-HA12-1**	**QC Batch**	**D1-HA12-1A**	**D1-HA12-1B**	**DUP 4**	**D1-HA12-2**	**DUP 5**	**D1-HA12-3**	**RDL**	**QC Batch**
Physical Properties											
% sand by hydrometer	%	53	6120481	N/A	N/A	N/A	60	N/A	39	2.0	6120481
% silt by hydrometer	%	23	6120481	N/A	N/A	N/A	24	N/A	29	2.0	6120481
Clay Content	%	24	6120481	N/A	N/A	N/A	16	N/A	32	2.0	6120481
Texture	N/A	SNDY CL LO	6108399	N/A	N/A	N/A	SANDY LOAM	N/A	CLAY LOAM	N/A	6108399
Moisture	%	18	6112925	17	16	20	21	21	17	0.30	6114592
Sieve - Pan	%	62	6116606	N/A	N/A	N/A	52	N/A	33	0.20	6116606
Sieve - #200 (>0.075mm)	%	38	6116606	N/A	N/A	N/A	48	N/A	67	0.20	6116606
Grain Size	%	FINE	6116606	N/A	N/A	N/A	FINE	N/A	COARSE	0.20	6116606
N/A = Not Applicable											
RDL = Reportable Detection Limit											

Maxxam ID		EH0211	EH0214	EH0215	EH0216	EH0217	EH0218	EH0219	EH0222		
Sampling Date		2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/18	2012/08/17		
	UNITS	**SC-TP12-1**	**SC-TP12-2**	**SC-TP12-3**	**DUP 6**	**SC-TP12-4**	**BORROW-1**	**BORROW-2**	**D1-SED12-1A**	**RDL**	**QC Batch**
Physical Properties											
% sand by hydrometer	%	N/A	N/A	N/A	N/A	N/A	77	N/A	N/A	2.0	6120481
% silt by hydrometer	%	N/A	N/A	N/A	N/A	N/A	11	N/A	N/A	2.0	6120481
Clay Content	%	N/A	N/A	N/A	N/A	N/A	12	N/A	N/A	2.0	6120481
Texture	N/A	N/A	N/A	N/A	N/A	N/A	SANDY LOAM	N/A	N/A	N/A	6108399
Moisture	%	17	19	23	22	19	6.9	5.3	26	0.30	6114592
Sieve - Pan	%	N/A	33	N/A	N/A	N/A	20	N/A	N/A	0.20	6116606
Sieve - #200 (>0.075mm)	%	N/A	67	N/A	N/A	N/A	80	N/A	N/A	0.20	6116606
Grain Size	%	N/A	COARSE	N/A	N/A	N/A	COARSE	N/A	N/A	0.20	6116606
N/A = Not Applicable											
RDL = Reportable Detection Limit											

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EH0223	EH0224	EH0225	EH0226	EH0227		EH0228	EH0236		
Sampling Date		2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17		2012/08/17	2012/08/18		
	UNITS	**D1-SED-12-1B**	**D1-SED12-2A**	**D1-SED12-2B**	**D1-SED12-DUP1**	**D1-SED12-3A**	**QC Batch**	**D1-SED12-3B**	**BG-SED12-1**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	15	18	15	23	24	6114592	23	28	0.30	6115684
RDL = Reportable Detection Limit											

Maxxam ID		EH0237	EH0238	EH0239	EH0240	EH0241	EH0242	EH0243	EH0244		
Sampling Date		2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18		
	UNITS	**BG-SED12-2**	**BG-SED12-DUP1**	**BG-SED12-3**	**BG-SED12-4**	**BG-SED12-5**	**BG-HA12-1**	**BG-HA12-2**	**BG-HA12-3**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	41	38	36	27	21	15	13	6.8	0.30	6115684
RDL = Reportable Detection Limit											

Maxxam ID		EH0245	EH0252	EH0253	EH0254	EH0255	EH0256		
Sampling Date		2012/08/18	2012/08/18	2012/08/19	2012/08/19	2012/08/19	2012/08/19		
	UNITS	**BG-HA12-DUP1**	**BG-HA12-4**	**BG-SED12-6**	**BG-SED12-7**	**BG-SED12-8**	**BG-SED12-9**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	13	19	23	23	25	25	0.30	6115684
RDL = Reportable Detection Limit									

Maxxam ID		EH0257	EH0258	EH0259		EH0260	EH0261		
Sampling Date		2012/08/19	2012/08/19	2012/08/19		2012/08/19	2012/08/19		
	UNITS	**BG-HA12-5**	**BG-HA12-6**	**BG-HA12-7**	**QC Batch**	**BG-HA12-8**	**BG-HA12-9**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	4.5	15	5.4	6115684	15	16	0.30	6115723
RDL = Reportable Detection Limit									

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EH0199		EH0205		EH0207	EH0208	EH0209	EH0210		
Sampling Date		2012/08/16		2012/08/16		2012/08/16	2012/08/16	2012/08/16	2012/08/16		
	UNITS	**D1-HA12-1A**	**QC Batch**	**D1-HA12-1B**	**QC Batch**	**DUP 4**	**D1-HA12-2**	**DUP 5**	**D1-HA12-3**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon											
F2 (C10-C16 Hydrocarbons)	mg/kg	40000	6126314	19000	6112763	13000	12000	7700	1400	10	6125492
F3 (C16-C34 Hydrocarbons)	mg/kg	1800	6126314	670	6112763	430	900	580	180	10	6125492
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	6126314	<10	6112763	<10	290	51	12	10	6125492
Reached Baseline at C50	mg/kg	YES	6126314	YES	6112763	YES	YES	YES	YES	N/A	6125492
Hydrocarbons											
>C10 - C12 Aliphatic	mg/kg	N/A		4800	6104892	N/A	N/A	N/A	N/A	5.0	
>C10 - C12 Aromatic	mg/kg	N/A		3700	6104892	N/A	N/A	N/A	N/A	5.0	
>C12 - C16 Aliphatic	mg/kg	N/A		5900	6104892	N/A	N/A	N/A	N/A	10	
>C12 - C16 Aromatic	mg/kg	N/A		3900	6104892	N/A	N/A	N/A	N/A	10	
>C16 - C21 Aliphatic	mg/kg	N/A		330	6104892	N/A	N/A	N/A	N/A	10	
>C16 - C21 Aromatic	mg/kg	N/A		230	6104892	N/A	N/A	N/A	N/A	10	
>C21 - C34 Aliphatic	mg/kg	N/A		25	6104892	N/A	N/A	N/A	N/A	10	
>C21 - C34 Aromatic	mg/kg	N/A		42	6104892	N/A	N/A	N/A	N/A	10	
>C34 Aliphatic (up to C50)	mg/kg	N/A		<10	6104892	N/A	N/A	N/A	N/A	10	
>C34 Aromatic (up to C50)	mg/kg	N/A		<10	6104892	N/A	N/A	N/A	N/A	10	
Surrogate Recovery (%)											
O-TERPHENYL (sur.)	%	94	6126314	135(1)	6104892	96	100	97	96	N/A	6125492
DECANE (sur)	%	N/A		87	6104892	N/A	N/A	N/A	N/A	N/A	

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Surrogate recovery is outside acceptance criteria. Sample was run in duplicate with acceptable surrogate recoveries

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EH0211	EH0214	EH0215	EH0216	EH0217	EH0218	EH0219	EH0222		
Sampling Date		2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/18	2012/08/17		
	UNITS	**SC-TP12-1**	**SC-TP12-2**	**SC-TP12-3**	**DUP 6**	**SC-TP12-4**	**BORROW-1**	**BORROW-2**	**D1-SED12-1A**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon											
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	<10	3000	10	6125492
F3 (C16-C34 Hydrocarbons)	mg/kg	34	38	39	44	41	10	27	480	10	6125492
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	<10	<10	14	10	6125492
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES	YES	YES	N/A	6125492
Surrogate Recovery (%)											
O-TERPHENYL (sur.)	%	94	92	90	85	95	100	97	99	N/A	6125492

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EH0223	EH0224	EH0225	EH0226	EH0227	EH0228		
Sampling Date		2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17		
	UNITS	**D1-SED-12-1B**	**D1-SED12-2A**	**D1-SED12-2B**	**D1-SED12-DUP1**	**D1-SED12-3A**	**D1-SED12-3B**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	1200	16000	11000	18000	270	40	10	6125492
F3 (C16-C34 Hydrocarbons)	mg/kg	160	1100	630	1400	130	61	10	6125492
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	14	<10	10	6125492
Reached Baseline at C50	mg/kg	YES	YES	YES	YES	YES	YES	N/A	6125492
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	95	98	102	104	94	85	N/A	6125492

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0205			EH0207		EH0211	EH0215	EH0218	EH0219		
Sampling Date		2012/08/16			2012/08/16		2012/08/17	2012/08/17	2012/08/17	2012/08/18		
	UNITS	**D1-HA12-1B**	**RDL**	**QC Batch**	**DUP 4**	**RDL**	**SC-TP12-1**	**SC-TP12-3**	**BORROW-1**	**BORROW-2**	**RDL**	**QC Batch**
Polycyclic Aromatics												
Acenaphthene	mg/kg	<1.6	1.6	6112653	1.3	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6117459
Benzo[a]pyrene equivalency	mg/kg	0.30	0.10	6111718	<0.10	0.10	<0.10	<0.10	<0.10	<0.10	0.10	6111718
Acenaphthylene	mg/kg	<0.51	0.51	6112653	<0.32(1)	0.32	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6117459
Acridine	mg/kg	<0.50	0.50	6112653	0.19	0.010	<0.010	<0.010	<0.010	<0.010	0.010	6117459
Anthracene	mg/kg	<0.20	0.20	6112653	<0.043(1)	0.043	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	6117459
Benzo(a)anthracene	mg/kg	<0.25	0.25	6112653	0.0060	0.0050	0.011	0.023	<0.0050	0.0053	0.0050	6117459
Benzo(b&j)fluoranthene	mg/kg	<0.25	0.25	6112653	0.011	0.0050	0.027	0.056	<0.0050	0.018	0.0050	6117459
Benzo(k)fluoranthene	mg/kg	<0.25	0.25	6112653	<0.0050	0.0050	0.0051	0.010	<0.0050	<0.0050	0.0050	6117459
Benzo(g,h,i)perylene	mg/kg	<0.25	0.25	6112653	0.022	0.0050	0.027	0.073	<0.0050	0.021	0.0050	6117459
Benzo(c)phenanthrene	mg/kg	<0.25	0.25	6112653	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6117459
Benzo(a)pyrene	mg/kg	<0.25	0.25	6112653	<0.0050	0.0050	0.011	0.024	<0.0050	<0.0050	0.0050	6117459
Benzo[e]pyrene	mg/kg	<0.25	0.25	6112653	0.0096	0.0050	0.017	0.055	<0.0050	0.012	0.0050	6117459
Chrysene	mg/kg	<0.25	0.25	6112653	0.0096	0.0050	0.014	0.041	<0.0050	0.0083	0.0050	6117459
Dibenz(a,h)anthracene	mg/kg	<0.25	0.25	6112653	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6117459
Fluoranthene	mg/kg	<0.25	0.25	6112653	0.022	0.0050	0.027	0.047	<0.0050	0.010	0.0050	6117459
Fluorene	mg/kg	1.7	0.25	6112653	1.0	0.0050	0.013	0.015	<0.0050	<0.0050	0.0050	6117459
Indeno(1,2,3-cd)pyrene	mg/kg	<0.25	0.25	6112653	0.0072	0.0050	0.013	0.028	<0.0050	0.0094	0.0050	6117459
2-Methylnaphthalene	mg/kg	99	0.25	6112653	63(2)	0.050	0.038	0.17	<0.0050	0.017	0.0050	6117459
Naphthalene	mg/kg	45	0.25	6112653	32(3)	0.050	0.025	0.11	<0.0050	0.0072	0.0050	6117459
Phenanthrene	mg/kg	0.77	0.25	6112653	0.61	0.0050	0.057	0.16	0.0076	0.026	0.0050	6117459
Perylene	mg/kg	<0.25	0.25	6112653	0.20	0.0050	0.29	0.29	<0.0050	0.062	0.0050	6117459
Pyrene	mg/kg	<0.25	0.25	6112653	0.073	0.0050	0.036	0.073	<0.0050	0.014	0.0050	6117459
Quinoline	mg/kg	<7.1	7.1	6112653	<2.4(4)	2.4	<0.010	<0.010	<0.010	<0.010	0.010	6117459

RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference.
(2) - Matrix Spike exceeds acceptance limits for 2-Methylnaphthalene due to matrix interference. (Recovery: 3517.NC%, limits 50-130%)

Detection limits raised due to dilution to bring analyte within the calibrated range.
(3) - Matrix Spike exceeds acceptance limits for Naphthalene due to matrix interference. (Recovery: 633.9.NC%, limits 50-130%)

Detection limits raised due to dilution to bring analyte within the calibrated range.
(4) - Matrix Spike exceeds acceptance limits for Quinoline due to matrix interference. (Recovery: -65.6.NC%, limits 50-130%)

Detection limits raised due to matrix interference.

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

SEMIVOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0205			EH0207		EH0211	EH0215	EH0218	EH0219		
Sampling Date		2012/08/16			2012/08/16		2012/08/17	2012/08/17	2012/08/17	2012/08/18		
	UNITS	**D1-HA12-1B**	**RDL**	**QC Batch**	**DUP 4**	**RDL**	**SC-TP12-1**	**SC-TP12-3**	**BORROW-1**	**BORROW-2**	**RDL**	**QC Batch**
Surrogate Recovery (%)												
D10-ANTHRACENE (sur.)	%	100	N/A	6112653	101	N/A	101	100	101	101	N/A	6117459
D12-BENZO(A)PYRENE (sur.)	%	100	N/A	6112653	99	N/A	95	96	101	101	N/A	6117459
D8-ACENAPHTHYLENE (sur.)	%	100	N/A	6112653	96	N/A	92	93	94	94	N/A	6117459
TERPHENYL-D14 (sur.)	%	100	N/A	6112653	110	N/A	106	107	107	108	N/A	6117459

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EH0205	EH0207	EH0211	EH0215	EH0218	EH0219	EH0236	EH0237		
Sampling Date		2012/08/16	2012/08/16	2012/08/17	2012/08/17	2012/08/17	2012/08/18	2012/08/18	2012/08/18		
	UNITS	**D1-HA12-1B**	**DUP 4**	**SC-TP12-1**	**SC-TP12-3**	**BORROW-1**	**BORROW-2**	**BG-SED12-1**	**BG-SED12-2**	**RDL**	**QC Batch**
Elements											
Total Aluminum (Al)	mg/kg	8500	9000	5200	9100	25000	3800	5300	13000	10	6169560
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6170071
Total Boron (B)	mg/kg	14	16	15	18	5.2	3.7	16	18	2.0	6169560
Total Calcium (Ca)	mg/kg	7400	7100	2500	3100	15000	2300	9600	9800	50	6169560
Total Iron (Fe)	mg/kg	35000	40000	21000	29000	51000	36000	19000	34000	10	6169560
Total Magnesium (Mg)	mg/kg	5000	5300	2600	4500	12000	1800	3300	5300	20	6169560
Total Manganese (Mn)	mg/kg	330	370	280	280	480	430	200	300	10	6169560
Total Phosphorus (P)	mg/kg	430	540	360	460	1500	690	380	630	20	6169560
Total Potassium (K)	mg/kg	1500	1800	1100	1800	3400	390	870	2000	25	6169560
Total Sodium (Na)	mg/kg	65	100	980	4400	5100	270	<50	<50	50	6169560
Total Strontium (Sr)	mg/kg	45	53	25	34	76	17	60	83	10	6169560
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122533
Total Arsenic (As)	mg/kg	13	13	9.6	10	4.9	16	9.2	12	1.0	6122533
Total Barium (Ba)	mg/kg	34	41	25	38	120	19	47	67	10	6122533
Total Beryllium (Be)	mg/kg	0.61	0.72	0.43	0.70	0.53	0.42	0.90	1.2	0.40	6122533
Total Cadmium (Cd)	mg/kg	<0.10	0.10	<0.10	<0.10	<0.10	<0.10	0.21	0.12	0.10	6122533
Total Chromium (Cr)	mg/kg	16	18	11	17	11	8.0	17	27	1.0	6122533
Total Cobalt (Co)	mg/kg	9.6	9.3	7.7	9.3	25	8.3	12	12	1.0	6122533
Total Copper (Cu)	mg/kg	28	39	38	34	22	13	31	35	5.0	6122533
Total Lead (Pb)	mg/kg	11	11	7.9	11	4.9	6.6	12	15	1.0	6122533
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	6122533
Total Molybdenum (Mo)	mg/kg	1.3	1.2	0.97	0.91	0.66	0.83	1.0	1.6	0.40	6122533
Total Nickel (Ni)	mg/kg	29	29	19	25	26	19	28	29	1.0	6122533
Total Selenium (Se)	mg/kg	0.63	0.58	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	0.50	6122533
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122533
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	6122533
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122533
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	1.0	6122533
Total Vanadium (V)	mg/kg	34	35	25	29	140	34	34	49	1.0	6122533
Total Zinc (Zn)	mg/kg	62	67	46	54	52	43	53	76	10	6122533
RDL = Reportable Detection Limit											

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EH0238	EH0239	EH0240	EH0241	EH0242	EH0243		EH0244		
Sampling Date		2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18	2012/08/18		2012/08/18		
	UNITS	**BG-SED12-DUP1**	**BG-SED12-3**	**BG-SED12-4**	**BG-SED12-5**	**BG-HA12-1**	**BG-HA12-2**	**QC Batch**	**BG-HA12-3**	**RDL**	**QC Batch**
Elements											
Total Aluminum (Al)	mg/kg	12000	11000	7000	4800	6200	10000	6169560	18000	10	6169560
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6170071	<1.0	1.0	6170071
Total Boron (B)	mg/kg	17	17	10	8.6	22	15	6169560	2.2	2.0	6169560
Total Calcium (Ca)	mg/kg	8800	8500	7400	6100	4900	4500	6169560	20000	50	6169560
Total Iron (Fe)	mg/kg	32000	29000	21000	16000	20000	26000	6169560	49000	10	6169560
Total Magnesium (Mg)	mg/kg	4900	4600	3600	2600	3300	3800	6169560	13000	20	6169560
Total Manganese (Mn)	mg/kg	290	280	240	200	190	230	6169560	460	10	6169560
Total Phosphorus (P)	mg/kg	590	560	420	330	370	530	6169560	2000	20	6169560
Total Potassium (K)	mg/kg	1800	1700	1100	760	1400	1700	6169560	4400	25	6169560
Total Sodium (Na)	mg/kg	<50	<50	<50	<50	4900	1100	6169560	4100	50	6169560
Total Strontium (Sr)	mg/kg	76	72	49	37	50	74	6169560	64	10	6169560
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6122533	<1.0	1.0	6122534
Total Arsenic (As)	mg/kg	12	11	8.0	6.1	7.3	9.1	6122533	2.5	1.0	6122534
Total Barium (Ba)	mg/kg	64	56	42	33	39	58	6122533	130	10	6122534
Total Beryllium (Be)	mg/kg	1.1	1.0	0.76	0.50	0.64	0.94	6122533	<0.40	0.40	6122534
Total Cadmium (Cd)	mg/kg	0.12	0.12	<0.10	<0.10	<0.10	0.10	6122533	<0.10	0.10	6122534
Total Chromium (Cr)	mg/kg	25	23	16	11	13	20	6122533	4.4	1.0	6122534
Total Cobalt (Co)	mg/kg	12	12	10	7.6	6.8	9.5	6122533	25	1.0	6122534
Total Copper (Cu)	mg/kg	34	36	22	20	19	21	6122533	17	5.0	6122534
Total Lead (Pb)	mg/kg	14	13	9.8	7.4	8.9	12	6122533	2.1	1.0	6122534
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	6122533	<0.050	0.050	6122534
Total Molybdenum (Mo)	mg/kg	1.6	1.7	1.2	0.76	0.78	0.96	6122533	<0.40	0.40	6122534
Total Nickel (Ni)	mg/kg	30	33	25	17	16	23	6122533	13	1.0	6122534
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	6122533	<0.50	0.50	6122534
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6122533	<1.0	1.0	6122534
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	6122533	<0.30	0.30	6122534
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6122533	<1.0	1.0	6122534
Total Uranium (U)	mg/kg	1.0	1.0	<1.0	<1.0	<1.0	<1.0	6122533	<1.0	1.0	6122534
Total Vanadium (V)	mg/kg	46	41	30	22	26	36	6122533	110	1.0	6122534
Total Zinc (Zn)	mg/kg	72	63	48	37	44	60	6122533	32	10	6122534
RDL = Reportable Detection Limit											

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EH0245	EH0252	EH0253	EH0254	EH0255		EH0256		
Sampling Date		2012/08/18	2012/08/18	2012/08/19	2012/08/19	2012/08/19		2012/08/19		
	UNITS	**BG-HA12-DUP1**	**BG-HA12-4**	**BG-SED12-6**	**BG-SED12-7**	**BG-SED12-8**	**QC Batch**	**BG-SED12-9**	**RDL**	**QC Batch**
Elements										
Total Aluminum (Al)	mg/kg	8700	9100	5700	5700	6700	6169560	6700	10	6169644
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	6170071	<1.0	1.0	6170164
Total Boron (B)	mg/kg	14	9.5	8.6	9.1	10	6169560	10	2.0	6169644
Total Calcium (Ca)	mg/kg	4000	3200	3900	4500	5200	6169560	5700	50	6169644
Total Iron (Fe)	mg/kg	24000	22000	21000	25000	20000	6169560	20000	10	6169644
Total Magnesium (Mg)	mg/kg	3400	2900	3400	3600	4500	6169560	4800	20	6169644
Total Manganese (Mn)	mg/kg	210	210	180	240	130	6169560	130	10	6169644
Total Phosphorus (P)	mg/kg	460	360	290	420	310	6169560	320	20	6169644
Total Potassium (K)	mg/kg	1500	1500	1200	1100	1500	6169560	1500	25	6169644
Total Sodium (Na)	mg/kg	920	1100	240	230	170	6169560	250	50	6169644
Total Strontium (Sr)	mg/kg	68	47	32	32	42	6169560	42	10	6169644
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	6122534	<1.0	1.0	6122534
Total Arsenic (As)	mg/kg	9.0	7.5	9.4	11	10	6122534	9.9	1.0	6122534
Total Barium (Ba)	mg/kg	53	48	38	38	44	6122534	47	10	6122534
Total Beryllium (Be)	mg/kg	0.86	0.73	0.45	0.44	0.52	6122534	0.50	0.40	6122534
Total Cadmium (Cd)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	6122534	<0.10	0.10	6122534
Total Chromium (Cr)	mg/kg	18	18	12	12	13	6122534	13	1.0	6122534
Total Cobalt (Co)	mg/kg	8.9	8.2	6.4	6.5	6.2	6122534	5.9	1.0	6122534
Total Copper (Cu)	mg/kg	20	20	16	20	27	6122534	24	5.0	6122534
Total Lead (Pb)	mg/kg	11	8.9	8.4	8.7	9.3	6122534	9.0	1.0	6122534
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	6122534	<0.050	0.050	6122534
Total Molybdenum (Mo)	mg/kg	0.92	0.73	0.91	1.0	0.82	6122534	0.82	0.40	6122534
Total Nickel (Ni)	mg/kg	22	19	18	19	20	6122534	19	1.0	6122534
Total Selenium (Se)	mg/kg	<0.50	<0.50	<0.50	0.52	0.58	6122534	0.51	0.50	6122534
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	6122534	<1.0	1.0	6122534
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	6122534	<0.30	0.30	6122534
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	6122534	<1.0	1.0	6122534
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	6122534	<1.0	1.0	6122534
Total Vanadium (V)	mg/kg	33	35	25	26	19	6122534	18	1.0	6122534
Total Zinc (Zn)	mg/kg	57	50	46	51	54	6122534	54	10	6122534
RDL = Reportable Detection Limit										

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		EH0257	EH0258	EH0259	EH0260	EH0261		
Sampling Date		2012/08/19	2012/08/19	2012/08/19	2012/08/19	2012/08/19		
	UNITS	**BG-HA12-5**	**BG-HA12-6**	**BG-HA12-7**	**BG-HA12-8**	**BG-HA12-9**	**RDL**	**QC Batch**
Elements								
Total Aluminum (Al)	mg/kg	6300	8400	6500	4400	4500	10	6169644
Total Bismuth (Bi)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6170164
Total Boron (B)	mg/kg	6.9	12	5.1	6.9	12	2.0	6169644
Total Calcium (Ca)	mg/kg	2600	4100	3600	2000	3000	50	6169644
Total Iron (Fe)	mg/kg	47000	23000	51000	19000	16000	10	6169644
Total Magnesium (Mg)	mg/kg	3100	3000	3200	2500	1800	20	6169644
Total Manganese (Mn)	mg/kg	640	90	670	290	230	10	6169644
Total Phosphorus (P)	mg/kg	550	330	710	320	320	20	6169644
Total Potassium (K)	mg/kg	790	2300	640	690	940	25	6169644
Total Sodium (Na)	mg/kg	57	630	130	430	790	50	6169644
Total Strontium (Sr)	mg/kg	19	41	20	15	23	10	6169644
Total Antimony (Sb)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122534
Total Arsenic (As)	mg/kg	17	9.7	13	7.7	6.8	1.0	6122534
Total Barium (Ba)	mg/kg	31	44	31	24	26	10	6122534
Total Beryllium (Be)	mg/kg	0.53	0.45	0.48	<0.40	<0.40	0.40	6122534
Total Cadmium (Cd)	mg/kg	<0.10	<0.10	<0.10	0.10	<0.10	0.10	6122534
Total Chromium (Cr)	mg/kg	15	15	12	9.1	9.1	1.0	6122534
Total Cobalt (Co)	mg/kg	10	4.7	10	6.0	5.5	1.0	6122534
Total Copper (Cu)	mg/kg	28	23	23	20	14	5.0	6122534
Total Lead (Pb)	mg/kg	11	9.3	9.3	6.5	5.9	1.0	6122534
Total Mercury (Hg)	mg/kg	<0.050	0.064	0.073	<0.050	<0.050	0.050	6122534
Total Molybdenum (Mo)	mg/kg	1.6	0.93	1.6	0.53	0.54	0.40	6122534
Total Nickel (Ni)	mg/kg	29	15	26	24	15	1.0	6122534
Total Selenium (Se)	mg/kg	0.51	0.82	0.51	<0.50	<0.50	0.50	6122534
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122534
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	6122534
Total Tin (Sn)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122534
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	6122534
Total Vanadium (V)	mg/kg	49	18	47	21	20	1.0	6122534
Total Zinc (Zn)	mg/kg	59	48	52	36	38	10	6122534
RDL = Reportable Detection Limit								

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0199			EH0205			EH0207	EH0208	EH0209		
Sampling Date		2012/08/16			2012/08/16			2012/08/16	2012/08/16	2012/08/16		
	UNITS	**D1-HA12-1A**	**RDL**	**QC Batch**	**D1-HA12-1B**	**RDL**	**QC Batch**	**DUP 4**	**D1-HA12-2**	**DUP 5**	**RDL**	**QC Batch**
Volatiles												
(C6-C10)	mg/kg	4500	12	6116566	3600	12	6116566	1500	1600	560	12	6116566
Calculated Aliphatic >C8-C10	mg/kg	N/A			3500	12	6111761	N/A	N/A	N/A		
Calculated Aliphatic C6-C8	mg/kg	N/A			530	12	6111761	N/A	N/A	N/A		
Benzene	mg/kg	<0.0050	0.0050	6116566	0.17	0.050	6128283	0.16	0.36	0.17	0.0050	6116566
Toluene	mg/kg	0.48	0.020	6116566	6.5	0.20	6128283	7.6	3.2	2.0	0.020	6116566
Ethylbenzene	mg/kg	1.1	0.010	6116566	9.3	0.10	6128283	9.9	4.8	3.6	0.010	6116566
Xylenes (Total)	mg/kg	15	0.040	6116566	73	0.040	6128283	54	29	22	0.040	6116566
m & p-Xylene	mg/kg	5.5	0.040	6116566	33	0.40	6128283	33	19	14	0.040	6116566
o-Xylene	mg/kg	10	0.020	6116566	20	0.20	6128283	21	10	7.8	0.020	6116566
F1 (C6-C10) - BTEX	mg/kg	4400	12	6116566	3500	120	6128283	1500	1500	530	12	6116566
C6-C8	mg/kg	N/A			540	120	6128283	N/A	N/A	N/A		
>C8-C10	mg/kg	N/A			4100	120	6128283	N/A	N/A	N/A		
Aromatic >C8-C10	mg/kg	N/A			610	120	6128283	N/A	N/A	N/A		
Surrogate Recovery (%)												
1,4-Difluorobenzene (sur.)	%	124	N/A	6116566	103	N/A	6128283	110	110	104	N/A	6116566
4-BROMOFLUOROBENZENE (sur.)	%	105	N/A	6116566	109	N/A	6128283	87	104	102	N/A	6116566
D10-ETHYLBENZENE (sur.)	%	99	N/A	6116566	73	N/A	6128283	107	109	102	N/A	6116566
D4-1,2-DICHLOROETHANE (sur.)	%	125	N/A	6116566	121	N/A	6128283	114	116	113	N/A	6116566

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0210	EH0211	EH0214	EH0215	EH0216	EH0217		
Sampling Date		2012/08/16	2012/08/17	2012/08/17	2012/08/17	2012/08/17	2012/08/17		
	UNITS	**D1-HA12-3**	**SC-TP12-1**	**SC-TP12-2**	**SC-TP12-3**	**DUP 6**	**SC-TP12-4**	**RDL**	**QC Batch**
Volatiles									
(C6-C10)	mg/kg	73	<12	<12	<12	<12	<12	12	6116566
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6116566
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6116566
Ethylbenzene	mg/kg	0.055	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6116566
Xylenes (Total)	mg/kg	0.12	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6116566
m & p-Xylene	mg/kg	0.12	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6116566
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6116566
F1 (C6-C10) - BTEX	mg/kg	73	<12	<12	<12	<12	<12	12	6116566
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	97	98	96	95	99	98	N/A	6116566
4-BROMOFLUOROBENZENE (sur.)	%	94	97	100	97	99	95	N/A	6116566
D10-ETHYLBENZENE (sur.)	%	101	94	116	107	115	117	N/A	6116566
D4-1,2-DICHLOROETHANE (sur.)	%	91	91	97	94	92	98	N/A	6116566

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0218	EH0219	EH0222	EH0223	EH0224		
Sampling Date		2012/08/17	2012/08/18	2012/08/17	2012/08/17	2012/08/17		
	UNITS	**BORROW-1**	**BORROW-2**	**D1-SED12-1A**	**D1-SED-12-1B**	**D1-SED12-2A**	**RDL**	**QC Batch**
Volatiles								
(C6-C10)	mg/kg	<12	<12	100	61	1500	12	6116566
Benzene	mg/kg	<0.0050	<0.0050	0.073	0.078	0.92	0.0050	6116566
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.14	0.020	6116566
Ethylbenzene	mg/kg	<0.010	<0.010	0.33	0.79	9.1	0.010	6116566
Xylenes (Total)	mg/kg	<0.040	<0.040	0.21	0.60	9.4	0.040	6116566
m & p-Xylene	mg/kg	<0.040	<0.040	0.21	0.60	9.1	0.040	6116566
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.28	0.020	6116566
F1 (C6-C10) - BTEX	mg/kg	<12	<12	100	60	1500	12	6116566
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	100	99	101	102	108	N/A	6116566
4-BROMOFLUOROBENZENE (sur.)	%	98	98	99	110	104	N/A	6116566
D10-ETHYLBENZENE (sur.)	%	120	125	107	102	109	N/A	6116566
D4-1,2-DICHLOROETHANE (sur.)	%	96	96	98	114	112	N/A	6116566

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EH0225	EH0226	EH0227	EH0228		
Sampling Date		2012/08/17	2012/08/17	2012/08/17	2012/08/17		
	UNITS	**D1-SED12-2B**	**D1-SED12-DUP1**	**D1-SED12-3A**	**D1-SED12-3B**	**RDL**	**QC Batch**
Volatiles							
(C6-C10)	mg/kg	1600	2000	<12	<12	12	6116566
Benzene	mg/kg	0.51	1.2	0.050	0.010	0.0050	6116566
Toluene	mg/kg	0.067	0.12	0.075	<0.020	0.020	6116566
Ethylbenzene	mg/kg	5.7	11	0.13	0.018	0.010	6116566
Xylenes (Total)	mg/kg	13	12	0.29	<0.040	0.040	6116566
m & p-Xylene	mg/kg	12	11	0.22	<0.040	0.040	6116566
o-Xylene	mg/kg	1.4	0.24	0.071	<0.020	0.020	6116566
F1 (C6-C10) - BTEX	mg/kg	1600	2000	<12	<12	12	6116566
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	105	110	102	98	N/A	6116566
4-BROMOFLUOROBENZENE (sur.)	%	115	100	91	95	N/A	6116566
D10-ETHYLBENZENE (sur.)	%	126	119	68	90	N/A	6116566
D4-1,2-DICHLOROETHANE (sur.)	%	111	116	91	91	N/A	6116566

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

Package 1	6.3°C

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

General Comments

Sample EH0198-01: SNDY CL LO = SANDY CLAY LOAM

SEMIVOLATILE ORGANICS BY GC-MS (SOIL) Comments

Sample EH0205-01 Polycyclic Aromatic Hydrocarbons in soil: Detection limits raised due to matrix interference.

VOLATILE ORGANICS BY GC-MS (SOIL) Comments

Sample EH0205-01 Aliphatic and Aromatic Fractions C6-C10: Detection limits raised due to sample matrix.

Maxxam Job #: B275357
Report Date: 2012/09/21

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

QUALITY ASSURANCE REPORT

			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
6104892	DECANE (sur)	2012/08/28	110	30 - 130	94	30 - 130	77	%				
6104892	O-TERPHENYL (sur.)	2012/08/28	111	30 - 130	139(1, 2)	30 - 130	70	%				
6104892	>C10 - C12 Aliphatic	2012/08/28	NC	50 - 130	86	70 - 130	<5.0	mg/kg	13.5	40		
6104892	>C12 - C16 Aliphatic	2012/08/28	NC	50 - 130	99	70 - 130	<10	mg/kg	19.5	40		
6104892	>C12 - C16 Aromatic	2012/08/28	NC	50 - 130	128	70 - 130	<10	mg/kg	15.2	40		
6104892	>C16 - C21 Aliphatic	2012/08/28	113	50 - 130	106	70 - 130	<10	mg/kg	21.9	40		
6104892	>C16 - C21 Aromatic	2012/08/28	129	50 - 130	115	70 - 130	<10	mg/kg	4.9	40		
6104892	>C21 - C34 Aliphatic	2012/08/28	110	50 - 130	106	70 - 130	<10	mg/kg	NC	40		
6104892	>C21 - C34 Aromatic	2012/08/28	122	50 - 130	116	70 - 130	<10	mg/kg	NC	40		
6104892	>C10 - C12 Aromatic	2012/08/28					<5.0	mg/kg	30.4	40		
6104892	>C34 Aliphatic (up to C50)	2012/08/28					<10	mg/kg	NC	40		
6104892	>C34 Aromatic (up to C50)	2012/08/28					<10	mg/kg	NC	40		
6112653	D10-ANTHRACENE (sur.)	2012/08/25	89	50 - 130	91	50 - 130	92	%				
6112653	D12-BENZO(A)PYRENE (sur.)	2012/08/25	93	50 - 130	98	50 - 130	94	%				
6112653	D8-ACENAPHTHYLENE (sur.)	2012/08/25	98	50 - 130	101	50 - 130	99	%				
6112653	TERPHENYL-D14 (sur.)	2012/08/25	101	50 - 130	104	50 - 130	106	%				
6112653	Acenaphthene	2012/08/25	95	50 - 130	98	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Acenaphthylene	2012/08/25	100	50 - 130	104	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Acridine	2012/08/25	78	50 - 130	80	50 - 130	<0.010	mg/kg	NC	50		
6112653	Anthracene	2012/08/25	90	50 - 130	95	50 - 130	<0.0040	mg/kg	NC	50		
6112653	Benzo(a)anthracene	2012/08/25	100	50 - 130	103	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo(b&j)fluoranthene	2012/08/25	98	50 - 130	107	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo(k)fluoranthene	2012/08/25	102	50 - 130	103	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo(g,h,i)perylene	2012/08/25	76	50 - 130	79	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo(c)phenanthrene	2012/08/25	98	50 - 130	101	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo(a)pyrene	2012/08/25	94	50 - 130	98	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Benzo[e]pyrene	2012/08/25	91	50 - 130	96	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Chrysene	2012/08/25	98	50 - 130	105	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Dibenz(a,h)anthracene	2012/08/25	85	50 - 130	87	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Fluoranthene	2012/08/25	100	50 - 130	105	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Fluorene	2012/08/25	97	50 - 130	101	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Indeno(1,2,3-cd)pyrene	2012/08/25	84	50 - 130	86	50 - 130	<0.0050	mg/kg	NC	50		
6112653	2-Methylnaphthalene	2012/08/25	102	50 - 130	103	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Naphthalene	2012/08/25	91	50 - 130	93	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Phenanthrene	2012/08/25	94	50 - 130	98	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Perylene	2012/08/25	92	50 - 130	96	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Pyrene	2012/08/25	92	50 - 130	99	50 - 130	<0.0050	mg/kg	NC	50		
6112653	Quinoline	2012/08/25	96	50 - 130	96	50 - 130	<0.010	mg/kg	NC	50		
6112763	O-TERPHENYL (sur.)	2012/08/25	78	50 - 130	94	50 - 130	103	%				
6112763	F2 (C10-C16 Hydrocarbons)	2012/08/25	NC	50 - 130	98	70 - 130	<10	mg/kg	1.6	50		

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QUALITY ASSURANCE REPORT

			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
6112763	F3 (C16-C34 Hydrocarbons)	2012/08/25	NC	50 - 130	103	70 - 130	<10	mg/kg	0.6	50		
6112763	F4 (C34-C50 Hydrocarbons)	2012/08/25	94	50 - 130	101	70 - 130	<10	mg/kg	NC	50		
6112925	Moisture	2012/08/24					<0.30	%	0.8	20		
6114592	Moisture	2012/08/24					<0.30	%	1.4	20		
6115684	Moisture	2012/08/25					<0.30	%	0.8	20		
6115723	Moisture	2012/08/25					<0.30	%	4.8	20		
6116566	1,4-Difluorobenzene (sur.)	2012/08/29	101	60 - 140	105	60 - 140	100	%				
6116566	4-BROMOFLUOROBENZENE (sur.)	2012/08/29	102	60 - 140	102	60 - 140	98	%				
6116566	D10-ETHYLBENZENE (sur.)	2012/08/29	117	60 - 130	128	60 - 130	97	%				
6116566	D4-1,2-DICHLOROETHANE (sur.)	2012/08/29	99	60 - 140	99	60 - 140	94	%				
6116566	Benzene	2012/08/29	93	60 - 140	102	60 - 140	<0.0050	mg/kg	NC	50		
6116566	Toluene	2012/08/29	85	60 - 140	94	60 - 140	<0.020	mg/kg	NC	50		
6116566	Ethylbenzene	2012/08/29	93	60 - 140	101	60 - 140	<0.010	mg/kg	NC	50		
6116566	m & p-Xylene	2012/08/29	91	60 - 140	100	60 - 140	<0.040	mg/kg	NC	50		
6116566	o-Xylene	2012/08/29	95	60 - 140	103	60 - 140	<0.020	mg/kg	NC	50		
6116566	(C6-C10)	2012/08/29	99	60 - 140	91	60 - 140	<12	mg/kg	NC	50		
6116566	Xylenes (Total)	2012/08/29					<0.040	mg/kg	NC	50		
6116566	F1 (C6-C10) - BTEX	2012/08/29					<12	mg/kg	NC	50		
6116606	Sieve - Pan	2012/08/28							15.4	35	101	97 - 103
6116606	Sieve - #200 (>0.075mm)	2012/08/28							13.6	35	97	92 - 108
6117459	D10-ANTHRACENE (sur.)	2012/08/28	102	50 - 130	102	50 - 130	105	%				
6117459	D12-BENZO(A)PYRENE (sur.)	2012/08/28	99	50 - 130	99	50 - 130	103	%				
6117459	D8-ACENAPHTHYLENE (sur.)	2012/08/28	93	50 - 130	95	50 - 130	99	%				
6117459	TERPHENYL-D14 (sur.)	2012/08/28	110	50 - 130	106	50 - 130	111	%				
6117459	Acenaphthene	2012/08/29	NC	50 - 130	93	50 - 130	<0.0050	mg/kg	4.5	50		
6117459	Acenaphthylene	2012/08/29	NC	50 - 130	90	50 - 130	<0.0050	mg/kg	NC (3)	50		
6117459	Acridine	2012/08/29	55	50 - 130	71	50 - 130	<0.010	mg/kg	0.7	50		
6117459	Anthracene	2012/08/29	76	50 - 130	93	50 - 130	<0.0040	mg/kg	NC (3)	50		
6117459	Benzo(a)anthracene	2012/08/29	86	50 - 130	106	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo(b&j)fluoranthene	2012/08/29	83	50 - 130	104	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo(k)fluoranthene	2012/08/29	79	50 - 130	97	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo(g,h,i)perylene	2012/08/29	73	50 - 130	75	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo(c)phenanthrene	2012/08/29	84	50 - 130	106	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo(a)pyrene	2012/08/29	71	50 - 130	85	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Benzo[e]pyrene	2012/08/29	80	50 - 130	102	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Chrysene	2012/08/29	93	50 - 130	116	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Dibenz(a,h)anthracene	2012/08/29	76	50 - 130	61	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Fluoranthene	2012/08/29	82	50 - 130	96	50 - 130	<0.0050	mg/kg	NC	50		
6117459	Fluorene	2012/08/29	NC	50 - 130	95	50 - 130	<0.0050	mg/kg	3.7	50		
6117459	Indeno(1,2,3-cd)pyrene	2012/08/29	85	50 - 130	83	50 - 130	<0.0050	mg/kg	NC	50		

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QUALITY ASSURANCE REPORT

			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
6117459	Phenanthrene	2012/08/29	NC	50 - 130	97	50 - 130	<0.0050	mg/kg	1.1	50		
6117459	Perylene	2012/08/29	83	50 - 130	100	50 - 130	<0.0050	mg/kg	12.6	50		
6117459	Pyrene	2012/08/29	80	50 - 130	94	50 - 130	<0.0050	mg/kg	9.9	50		
6117459	2-Methylnaphthalene	2012/08/29			105	50 - 130	<0.0050	mg/kg	4.3(4)	50		
6117459	Naphthalene	2012/08/29			93	50 - 130	<0.0050	mg/kg	0.3(4)	50		
6117459	Quinoline	2012/08/29			98	50 - 130	<0.010	mg/kg	NC(3)	50		
6120481	% sand by hydrometer	2012/08/28							3.0	35	93	80 - 120
6120481	% silt by hydrometer	2012/08/28							11.8	35	101	78 - 122
6120481	Clay Content	2012/08/28							5.7	35	122	75 - 125
6122533	Total Antimony (Sb)	2012/08/28	88	75 - 125	107	75 - 125	<1.0	mg/kg	NC	35		
6122533	Total Arsenic (As)	2012/08/28	90	75 - 125	98	75 - 125	<1.0	mg/kg	6.5	35	111	50 - 150
6122533	Total Barium (Ba)	2012/08/28	NC	75 - 125	98	75 - 125	<10	mg/kg	0.2	35	102	69 - 131
6122533	Total Beryllium (Be)	2012/08/28	101	75 - 125	105	75 - 125	<0.40	mg/kg	NC	35		
6122533	Total Cadmium (Cd)	2012/08/28	94	75 - 125	100	75 - 125	<0.10	mg/kg	NC	35		
6122533	Total Chromium (Cr)	2012/08/28	NC	75 - 125	99	75 - 125	<1.0	mg/kg	10.1	35	103	41 - 159
6122533	Total Cobalt (Co)	2012/08/28	89	75 - 125	96	75 - 125	<1.0	mg/kg	1.1	35	96	75 - 125
6122533	Total Copper (Cu)	2012/08/28	92	75 - 125	101	75 - 125	<5.0	mg/kg	NC	35	98	72 - 127
6122533	Total Lead (Pb)	2012/08/28	92	75 - 125	100	75 - 125	<1.0	mg/kg	1.7	35	97	54 - 146
6122533	Total Mercury (Hg)	2012/08/28	92	75 - 125	97	75 - 125	<0.050	mg/kg	NC	35		
6122533	Total Molybdenum (Mo)	2012/08/28	95	75 - 125	100	75 - 125	<0.40	mg/kg	NC	35		
6122533	Total Nickel (Ni)	2012/08/28	NC	75 - 125	101	75 - 125	<1.0	mg/kg	2.1	35	105	61 - 139
6122533	Total Selenium (Se)	2012/08/28	87	75 - 125	94	75 - 125	<0.50	mg/kg	NC	35		
6122533	Total Silver (Ag)	2012/08/28	95	75 - 125	102	75 - 125	<1.0	mg/kg	NC	35		
6122533	Total Thallium (Tl)	2012/08/28	93	75 - 125	100	75 - 125	<0.30	mg/kg	NC	35		
6122533	Total Tin (Sn)	2012/08/28	101	75 - 125	105	75 - 125	<1.0	mg/kg	NC	35		
6122533	Total Uranium (U)	2012/08/28	92	75 - 125	103	75 - 125	<1.0	mg/kg	NC	35		
6122533	Total Vanadium (V)	2012/08/28	104	75 - 125	101	75 - 125	<1.0	mg/kg	1.7	35	119	50 - 150
6122533	Total Zinc (Zn)	2012/08/28	NC	75 - 125	97	75 - 125	<10	mg/kg	1.0	35	99	72 - 128
6122534	Total Antimony (Sb)	2012/08/28	91	75 - 125	99	75 - 125	<1.0	mg/kg	NC	35		
6122534	Total Arsenic (As)	2012/08/28	93	75 - 125	93	75 - 125	<1.0	mg/kg	7.9	35	113	50 - 150
6122534	Total Barium (Ba)	2012/08/28	89	75 - 125	93	75 - 125	<10	mg/kg	NC	35	103	69 - 131
6122534	Total Beryllium (Be)	2012/08/28	96	75 - 125	101	75 - 125	<0.40	mg/kg	NC	35		
6122534	Total Cadmium (Cd)	2012/08/28	91	75 - 125	95	75 - 125	<0.10	mg/kg	NC	35		
6122534	Total Chromium (Cr)	2012/08/28	93	75 - 125	94	75 - 125	<1.0	mg/kg	6.9	35	100	41 - 159
6122534	Total Cobalt (Co)	2012/08/28	88	75 - 125	91	75 - 125	<1.0	mg/kg	4.8	35	95	75 - 125
6122534	Total Copper (Cu)	2012/08/28	84	75 - 125	97	75 - 125	<5.0	mg/kg	NC	35	98	72 - 127
6122534	Total Lead (Pb)	2012/08/28	90	75 - 125	97	75 - 125	<1.0	mg/kg	9.2	35	100	54 - 146
6122534	Total Mercury (Hg)	2012/08/28	91	75 - 125	96	75 - 125	<0.050	mg/kg	NC	35		
6122534	Total Molybdenum (Mo)	2012/08/28	92	75 - 125	95	75 - 125	<0.40	mg/kg	NC	35		
6122534	Total Nickel (Ni)	2012/08/28	92	75 - 125	96	75 - 125	<1.0	mg/kg	6.6	35	107	61 - 139

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QUALITY ASSURANCE REPORT

			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
6122534	Total Selenium (Se)	2012/08/28	87	75 - 125	92	75 - 125	<0.50	mg/kg	NC	35		
6122534	Total Silver (Ag)	2012/08/28	93	75 - 125	97	75 - 125	<1.0	mg/kg	NC	35		
6122534	Total Thallium (Tl)	2012/08/28	91	75 - 125	97	75 - 125	<0.30	mg/kg	NC	35		
6122534	Total Tin (Sn)	2012/08/28	96	75 - 125	99	75 - 125	<1.0	mg/kg	NC	35		
6122534	Total Uranium (U)	2012/08/28	92	75 - 125	103	75 - 125	<1.0	mg/kg	NC	35		
6122534	Total Vanadium (V)	2012/08/28	97	75 - 125	96	75 - 125	<1.0	mg/kg	2.6	35	117	50 - 150
6122534	Total Zinc (Zn)	2012/08/28	NC	75 - 125	93	75 - 125	<10	mg/kg	NC	35	99	72 - 128
6125492	O-TERPHENYL (sur.)	2012/08/29	82	50 - 130	87	50 - 130	92	%				
6125492	F2 (C10-C16 Hydrocarbons)	2012/08/29	75	50 - 130	92	70 - 130	<10	mg/kg	NC	50		
6125492	F3 (C16-C34 Hydrocarbons)	2012/08/29	77	50 - 130	94	70 - 130	<10	mg/kg	NC	50		
6125492	F4 (C34-C50 Hydrocarbons)	2012/08/29	75	50 - 130	90	70 - 130	<10	mg/kg	NC	50		
6126314	O-TERPHENYL (sur.)	2012/08/29	88	50 - 130	81	50 - 130	101	%				
6126314	F2 (C10-C16 Hydrocarbons)	2012/08/29	87	50 - 130	94	70 - 130	<10	mg/kg	NC	50		
6126314	F3 (C16-C34 Hydrocarbons)	2012/08/29	89	50 - 130	97	70 - 130	<10	mg/kg	16.4	50		
6126314	F4 (C34-C50 Hydrocarbons)	2012/08/29	83	50 - 130	89	70 - 130	<10	mg/kg	NC	50		
6128283	1,4-Difluorobenzene (sur.)	2012/08/31	108	60 - 140	110	60 - 140	98	%				
6128283	4-BROMOFLUOROBENZENE (sur.)	2012/08/31	105	60 - 140	116	60 - 140	100	%				
6128283	D10-ETHYLBENZENE (sur.)	2012/08/31	86	30 - 130	99	30 - 130	85	%				
6128283	D4-1,2-DICHLOROETHANE (sur.)	2012/08/31	119	60 - 140	114	60 - 140	115	%				
6128283	(C6-C10)	2012/08/31	84	60 - 140	91	60 - 140	<12	mg/kg	NC	50		
6128283	Benzene	2012/08/31	91	60 - 140	88	60 - 140	<0.0050	mg/kg	NC	50		
6128283	Toluene	2012/08/31	87	60 - 140	88	60 - 140	<0.020	mg/kg	NC	50		
6128283	Ethylbenzene	2012/08/31	91	60 - 140	96	60 - 140	<0.010	mg/kg	NC	50		
6128283	m & p-Xylene	2012/08/31	84	60 - 140	91	60 - 140	<0.040	mg/kg	NC	50		
6128283	o-Xylene	2012/08/31	84	60 - 140	90	60 - 140	<0.020	mg/kg	NC	50		
6128283	C6-C8	2012/08/31	80	60 - 140	93	60 - 140	<12	mg/kg	NC	50		
6128283	>C8-C10	2012/08/31	134	60 - 140	114	60 - 140	<12	mg/kg	NC	50		
6128283	Aromatic >C8-C10	2012/08/31	135	60 - 140	139	60 - 140	<12	mg/kg	NC	50		
6128283	Xylenes (Total)	2012/08/31					<0.040	mg/kg	NC	50		
6128283	F1 (C6-C10) - BTEX	2012/08/31					<12	mg/kg	NC	50		
6169560	Total Aluminum (Al)	2012/09/14			101	80 - 120	<10	mg/kg	5.3	35	108	75 - 125
6169560	Total Calcium (Ca)	2012/09/14			100	80 - 120	<50	mg/kg	4.9	35	111	77 - 123
6169560	Total Iron (Fe)	2012/09/14			101	80 - 120	<10	mg/kg	4.4	35	117	75 - 125
6169560	Total Magnesium (Mg)	2012/09/14			97	80 - 120	<20	mg/kg	4.5	35	110	75 - 125
6169560	Total Manganese (Mn)	2012/09/14			95	80 - 120	<10	mg/kg	5.1	35	113	75 - 125
6169560	Total Phosphorus (P)	2012/09/14			100	80 - 120	<20	mg/kg	12.5	35	106	89 - 117
6169560	Total Potassium (K)	2012/09/14			97	80 - 120	<25	mg/kg	4.0	35	105	60 - 140
6169560	Total Sodium (Na)	2012/09/14			95	80 - 120	<50	mg/kg	NC	35	65	60 - 140
6169560	Total Strontium (Sr)	2012/09/14			96	80 - 120	<10	mg/kg	NC	35	104	75 - 125
6169560	Total Boron (B)	2012/09/14			96	80 - 120	<2.0	mg/kg	1.6	35		

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QUALITY ASSURANCE REPORT

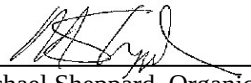
			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
6169644	Total Aluminum (Al)	2012/09/14			103	80 - 120	<10	mg/kg	6.0	35	101	75 - 125
6169644	Total Calcium (Ca)	2012/09/14			102	80 - 120	<50	mg/kg	5.4	35	104	77 - 123
6169644	Total Iron (Fe)	2012/09/14			103	80 - 120	<10	mg/kg	4.4	35	110	75 - 125
6169644	Total Magnesium (Mg)	2012/09/14			98	80 - 120	<20	mg/kg	7.7	35	103	75 - 125
6169644	Total Manganese (Mn)	2012/09/14			97	80 - 120	<10	mg/kg	4.4	35	105	75 - 125
6169644	Total Phosphorus (P)	2012/09/14			101	80 - 120	<20	mg/kg	20.3	35	93	89 - 117
6169644	Total Potassium (K)	2012/09/14			99	80 - 120	<25	mg/kg	5.3	35	98	60 - 140
6169644	Total Sodium (Na)	2012/09/14			97	80 - 120	<50	mg/kg	18.3	35	69	60 - 140
6169644	Total Strontium (Sr)	2012/09/14			98	80 - 120	<10	mg/kg	NC	35	97	75 - 125
6169644	Total Boron (B)	2012/09/14			97	80 - 120	<2.0	mg/kg	NC	35		
6170071	Total Bismuth (Bi)	2012/09/17	111	80 - 120	106	75 - 125	<1.0	mg/kg	NC	35		
6170164	Total Bismuth (Bi)	2012/09/17	109	80 - 120	101	75 - 125	<1.0	mg/kg	NC	35		

N/A = Not Applicable
RPD = Relative Percent Difference
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 blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) - Surrogate recovery is outside acceptance criteria. However all analytes recoveries are within acceptance criteria therefore there is no impact on data quality.
(3) - Detection limits raised due to matrix interference.
(4) - Detection limits raised due to dilution to bring analyte within the calibrated range.

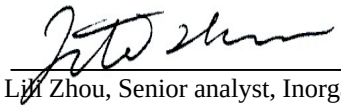
Validation Signature Page

Maxxam Job #: B275357

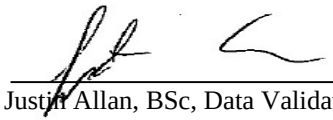
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



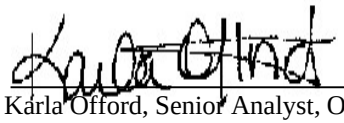
Michael Sheppard, Organics Supervisor



Lili Zhou, Senior analyst, Inorganic department.



Justin Allan, BSc, Data Validation



Karla Offord, Senior Analyst, Organics Department

Validation Signature Page

Maxxam Job #: B275357

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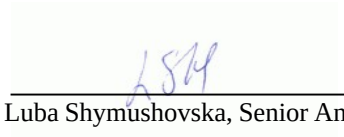

Luba Shymushovska, Senior Analyst, Organic Department

==========

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.

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CHAIN OF CUSTODY RECORD

Page 1 of 5

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #: B275757	BOTTLE ORDER #: 306259
Contact Name:	Edward Domjan	Contact Name:	Catherine Leblanc	P.O. #:			
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North Edmonton AB T5J 1S6	Address:	329 Churchill Ave N, Suite 200 Ottawa ON K1Z5B8	Project #:	EW699-113372		
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Project Name:		CHAIN OF CUSTODY #: C#306259-07-01	PROJECT MANAGER: JAie Clement
Email:	Edward.Domjan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Site #:	EUREKA 1570-1204		
				Sampled By:	Catherine LeBlanc / Christine Tobin		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Ag/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

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Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Grain Size + Hydrometer	Moisture	# of Bottles	Comments
1		DI-HA12-1	AUG16/12	PM	Soil	N	N								X	X	2	
2		DI-HA12-1A								X	X						2	
3		DI-HA12-1B						X		X	X	X	X				6	VERY STRONG ODOUR
4		DUP4						X		X	X		X				4	
5		DI-HA12-2								X	X				X	X	4	
6		DUP5								X	X						2	
7		DI-HA12-3	↓	↓						X	X				X	X	4	ARRIVED AT DEPOT: AUG 21 2012 TEMP: 7.5/7.1 4:45 PM
8		SC-TP12-1	AUG17/12	AM				X		X	X		X				4	
9		SC-TP12-2	AUG17/12	AM					X	X	X						3	
10		SC-TP12-3	AUG17/12	AM	↓	↓	↓	X		X	X		X				4	

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
Catherine LeBlanc Catherine LeBlanc	Aug 20/12	5:00	Jasbirjit Kaur JASBIRJIT KAUR	2012/08/23	16:15				Present	✓	
									Intact	✓	

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

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CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25082	MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:		B795357	306259
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North Edmonton AB T5J 1S6	Address:	329 Churchill Ave N, Suite 200 Ottawa ON K1Z5B8	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Project Name:		C#306259-08-01	Julie Clement
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Site #:	EUREKA 1570-1204		
				Sampled By:	Catherine LeBlanc/Christian Aubin		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Agr/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ COME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

SPECIAL INSTRUCTIONS

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

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ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
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Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	ICP/MS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Grain Size + Hydrometer	Moisture	# of Bottles	Comments
1		DUP6	AUG17/12	AM	SOIL	N	N			X	X						2	
2		SC-TP12-4		↓	↓					X	X						2	
3		Borrow-1		PM	SOIL			X		X	X		X		X	X	5	
4		Borrow-2	AUG18	PM	↓			X		X	X		X				4	
5		SCD12-1A DI-SCD12-1A	AUG17/12	PM	SED					X	X						2	
6		DI-SCD12-1B	↓	↓	↓					X	X						2	Limited Sample.
7		DI-SCD12-2A								X	X						2	ARRIVED AT DEPOT:
8		DI-SCD12-2B								X	X						2	AUG 21 2012 4:45
9		DI-SCD#12-DUP								X	X						2	TEMP: 7.5/7.1
10		DI-SCD12-3A	↓	↓	↓	↓	↓			X	X						2	

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc Catherine LeBlanc	Aug 20/12	8:00	Jasbinjit Kaur JASBINJIT KAUR	2012/08/23	16:15	

Laboratory Use Only				
Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
		Intact		

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

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CHAIN OF CUSTODY RECORD

INVOICE INFORMATION		REPORT INFORMATION (if differs from invoice)		PROJECT INFORMATION		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:			306259
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:		C#306259-09-01	Julie Clement
Phone:	(780)497-3686 Fax (780)982-1887	Phone:	(613)721-0555 Fax (613)721-0029	Site #:	EUREKA 1570-1204		
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc/Christine Nash		

Regulation 153 (2011)	Other Regulations	SPECIAL INSTRUCTIONS
☐ Table 1 ☐ Res/Park ☐ Med/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ Table ___ ☐ For RSC	☒ CCME ☐ Sanitary Sewer Bylaw ☐ Reg. 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ___ ☐ PWQO ☐ Other ___	

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

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☒

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	Grain Size + Hydrometer	Washire	# of Bottles	Comments
1		D1-SED12-3B	AUG17/12	PM	SED	N	N			X	X						2	
2		DUP BH-SED12-1 DUPLICATE OF BH4	AUG18/12	PM	SED			X									1	
3		BH-SED12-2						X									1	
4		BH-SED12-DUP1						X									1	
5		BH-SED12-3						X									1	
6		BH-SED12-4						X									1	
7		BH-SED12-5	↓	↓	↓			X									1	
8		BH-HA12-1			SOIL			X									1	
9		BH-HA12-2						X									1	
10		BH-HA12-3	↓	↓	↓			X									1	

ARRIVED AT DEPOT:
AUG 21 2012
TEMP: 7.5/7.1 4:45 PM

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only			
Catherine LeBlanc Catherine LeBlanc	Aug 20/12	5:00	Jasbir Kaur JASBIR KAUR	2012/08/23	16:15		Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present Intact	Yes / No

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CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:
Company Name: #27434 Public Works & Government Services Can
Contact Name: Edward Domjan
Address: 10025 Jasper Ave. 5th Floor, Telus Tower North
Edmonton AB T5J 1S6
Phone: (780)497-3686 Fax: (780)982-1887
Email: Edward.Domjan@pwgsc-tpsgc.gc.ca

REPORT INFORMATION (if differs from invoice):
Company Name: #14413 Franz Environmental Inc
Contact Name: Catherine Leblanc
Address: 329 Churchill Ave N, Suite 200
Ottawa ON K1Z5B8
Phone: (613)721-0555 Fax: (613)721-0029
Email: cleblanc@franzenvironmental.ca

PROJECT INFORMATION:
Quotation #: B25082
P.O. #:
Project #: EW699-113372
Project Name:
Site #: EUREKA 1570-1204
Sampled By: CatherineLeBlanc/Christa Kyle

Laboratory Use Only:
MAXXAM JOB #: B275357
BOTTLE ORDER #: 364058
CHAIN OF CUSTODY #: CK000259-10-01
PROJECT MANAGER: Julie Clement

Regulation 153 (2011): Table 1 / Table 2 / Table 3 / Table ___ ; Res/Park / Ind/Comm / Agr/Other ; Medium/Fine / Coarse ; Fine RSC
Other Regulations: CCME / Reg. 558 / MISA / PWQO / Other ; Sanitary Sewer Bylaw / Storm Sewer Bylaw / Municipality
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Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Maxxam Field Filtered? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	# of Bottles	Comments
1		BH-HA12-DUP1	Aug15/12	PM	SOIL	N	N	X							1	
2		BH-HA12-4	↓	↓	↓			X							1	
3		BH-SCD12-6	Aug15	PM	SED			X							1	
4		BH-SCD12-7						X							1	
5		BH-SCD12-8						X							1	
6		BH-SCD12-9			↓			X							1	ARRIVED AT DEPOT:
7		BH-HA12-5			SOIL			X							1	AUG 21 2012
8		BH-HA12-6						X							1	TEMP: 7.5/7.1
9		BH-HA12-7						X							1	4:45
10		BH-HA12-8	↓	↓	↓		V	X							1	N.M

*RELINQUISHED BY: (Signature/Print)	Date: (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YYYY/MM/DD)	Time:	# Jars Used and Not Submitted
Catherine LeBlanc Catherine LeBlanc	Aug20/12	5:00	JASBIR JOHAL JASBIR JOHAL	2012/08/23	16:15	

Laboratory Use Only: Time Sensitive | Temperature (°C) on Receipt | Custody Seal Present | Yes | No

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CHAIN OF CUSTODY RECORD

Page 5 of

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #: B275357	BOTTLE ORDER #: 300299
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:			
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North Edmonton AB T5J 1S6	Address:	329 Churchill Ave N, Suite 200 Ottawa ON K1Z5B8	Project #:	EW699-113372	CHAIN OF CUSTODY #: C#306209-12-01	PROJECT MANAGER: Julie Clement
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Project Name:			
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Site #:	EUREKA 1570-1204		
				Sampled By:	Catherine LeBlanc / Christopher Hum		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Ag/Other ☐ Medium/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

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1		BH-HA12-9	AUG 16	PM	SOIL	N	N	X									1	
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		

ARRIVED AT DEPOT:
AUG 21 2012
TEMP: 7.5/7.1 4:45
M.M

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
Catherine LeBlanc Catherine LeBlanc	Aug 20/12	8:00	Jasbirjit Kaur JASBIRJIT KAUR	2012/08/23	16:15				Cooling Seal Intact		

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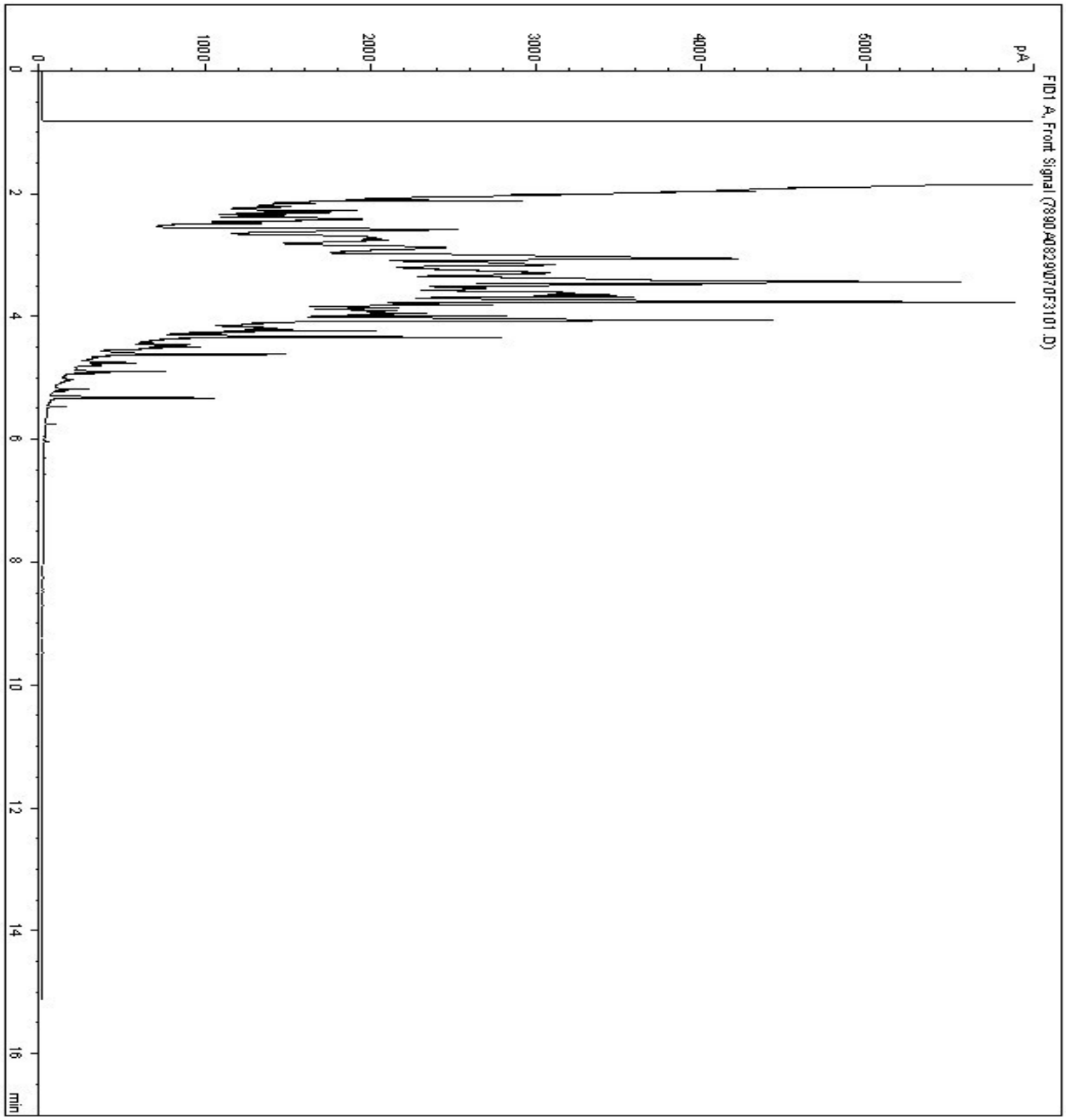
Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0199

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-1A

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890A0829\070F3101.D
Sample Name: EH0199



*** End of Report ***

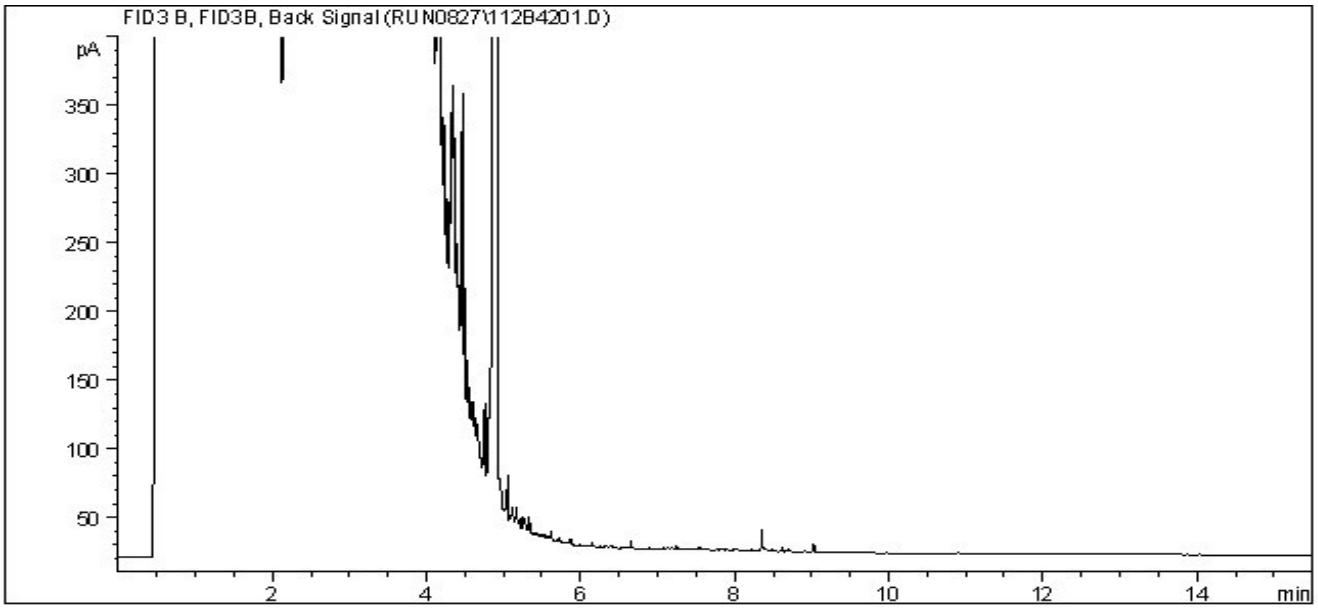
7890A GC 2012/08/30 9:09:04 AM 7890A PK4

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

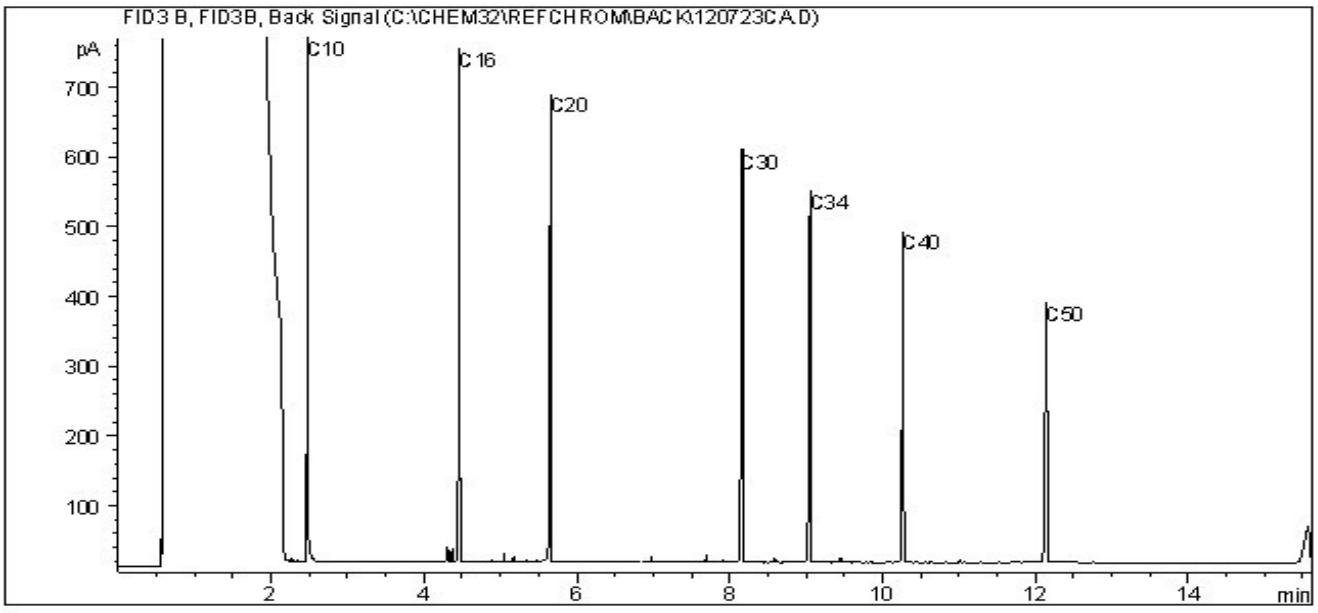
Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0205

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-1B

Aliphatic and Aromatic Fractions C10-C50 Chromatogram



Carbon Range Distribution - Reference Chromatogram



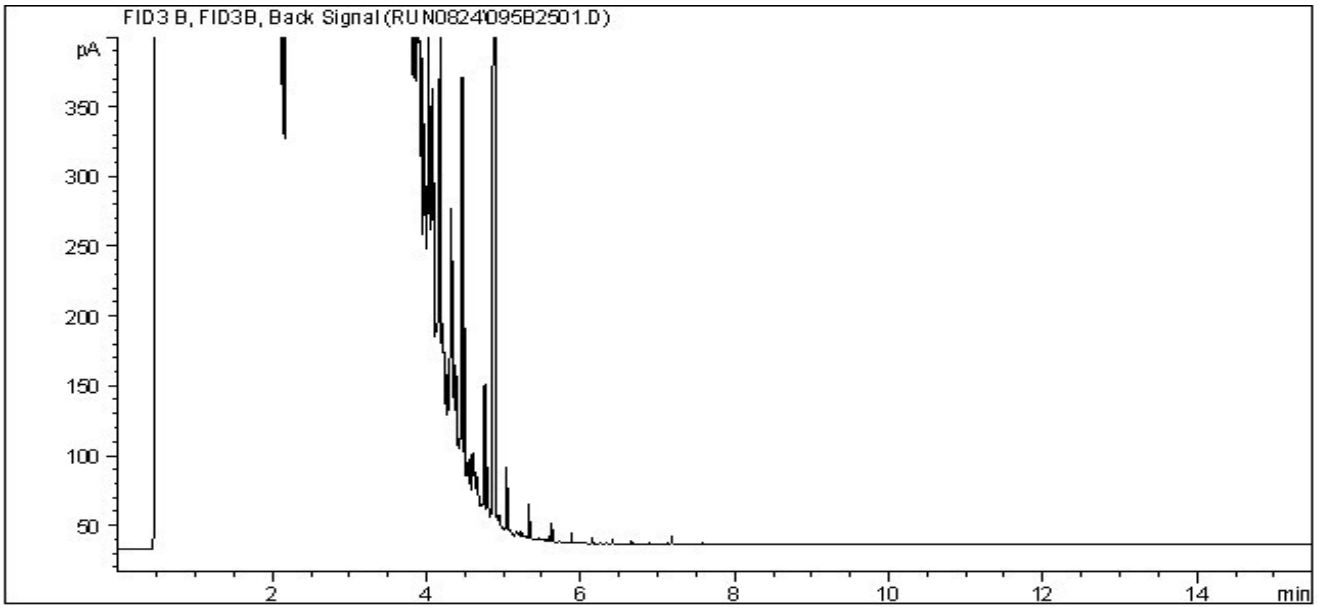
TYPICAL PRODUCT CARBON NUMBER RANGES

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

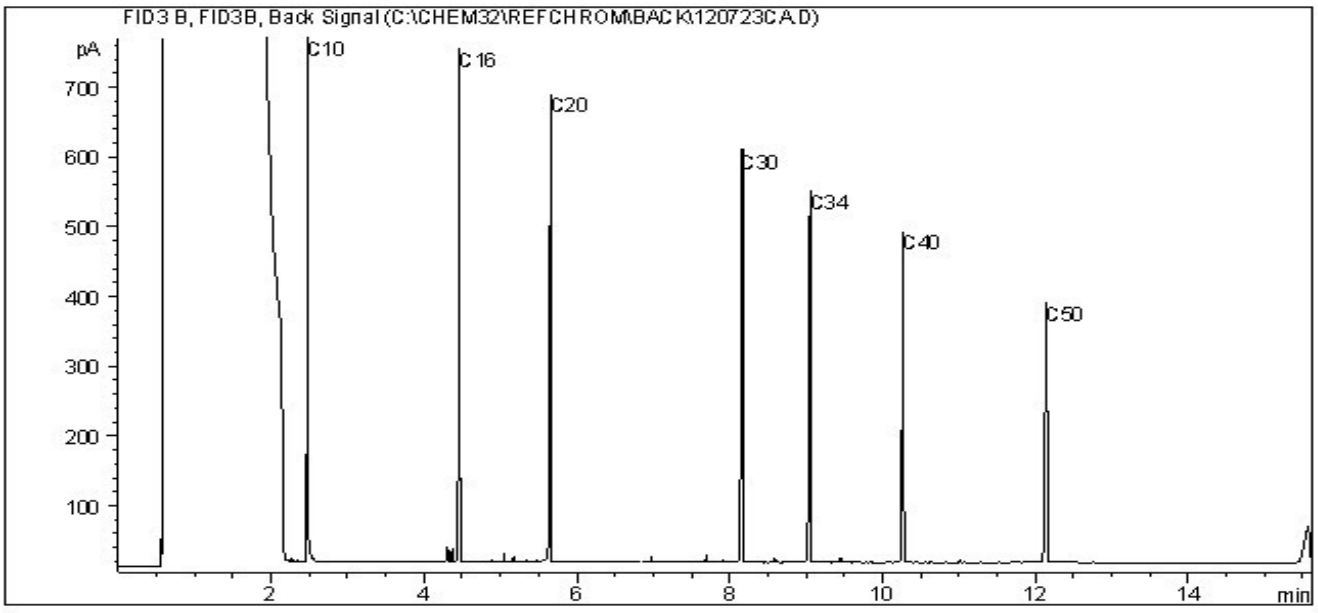
Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0205

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-1B

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



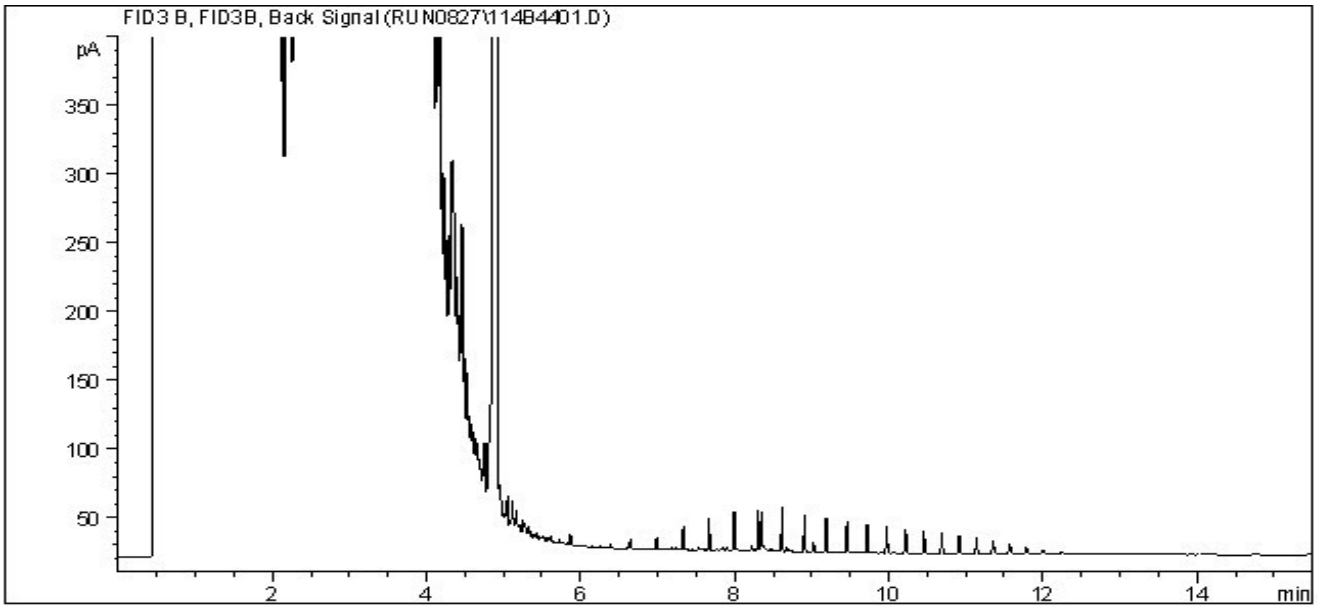
TYPICAL PRODUCT CARBON NUMBER RANGES

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

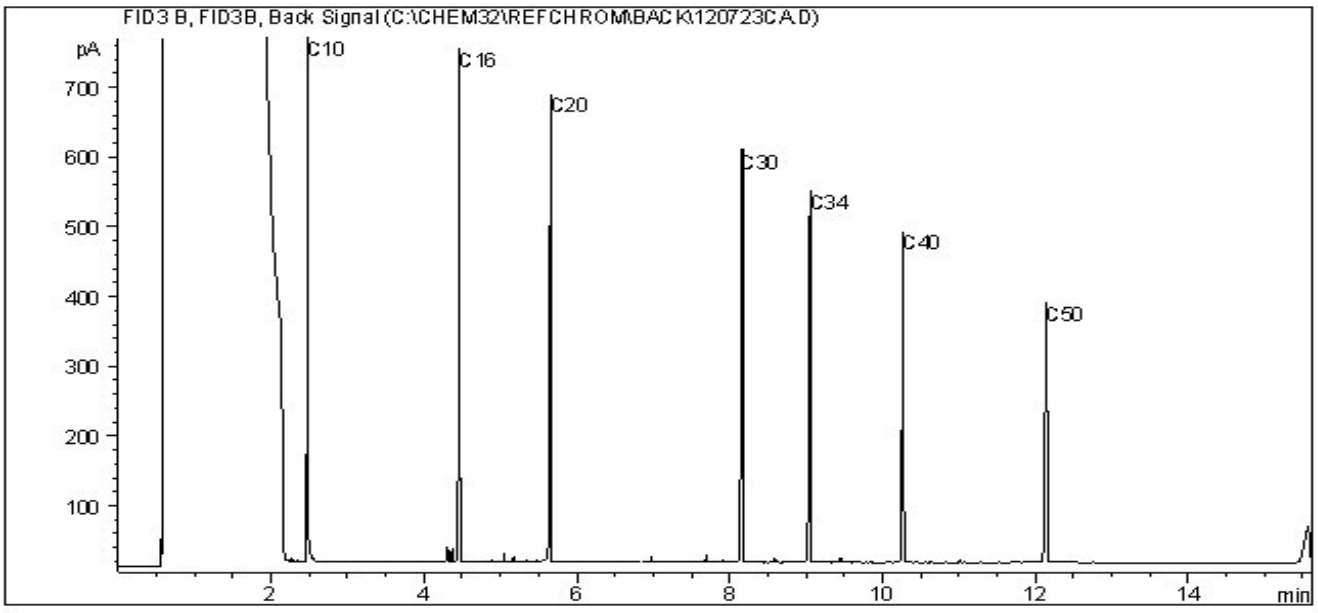
Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0205 Lab-Dup

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-1B

Aliphatic and Aromatic Fractions C10-C50 Chromatogram



Carbon Range Distribution - Reference Chromatogram



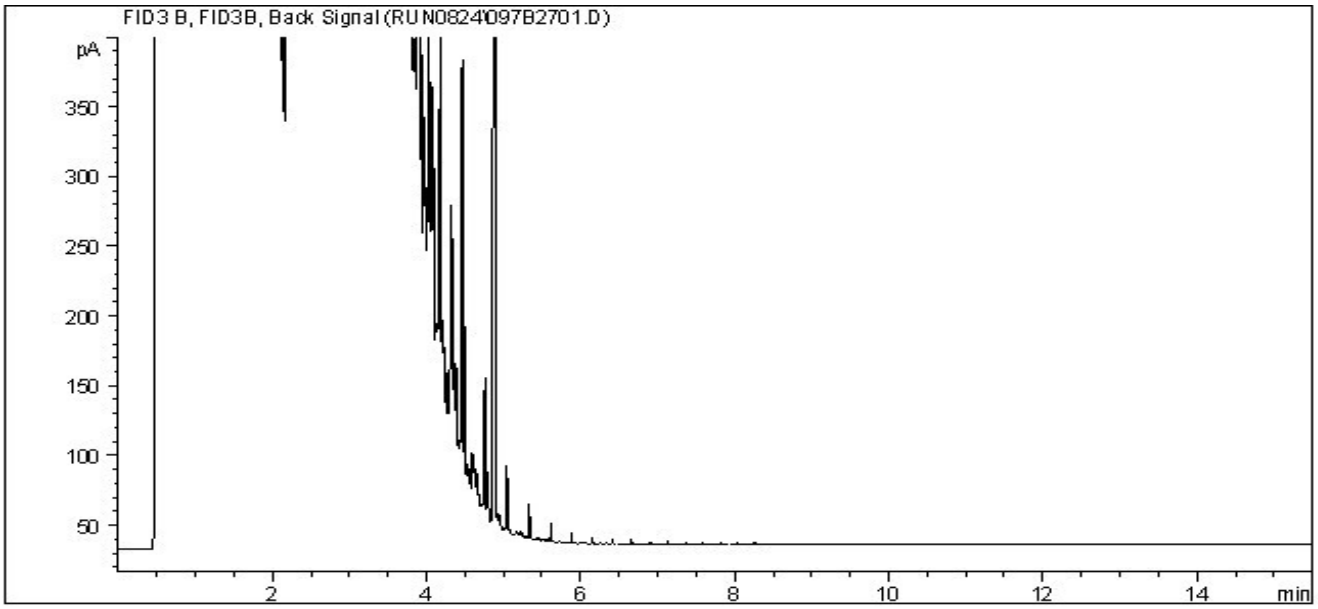
TYPICAL PRODUCT CARBON NUMBER RANGES

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

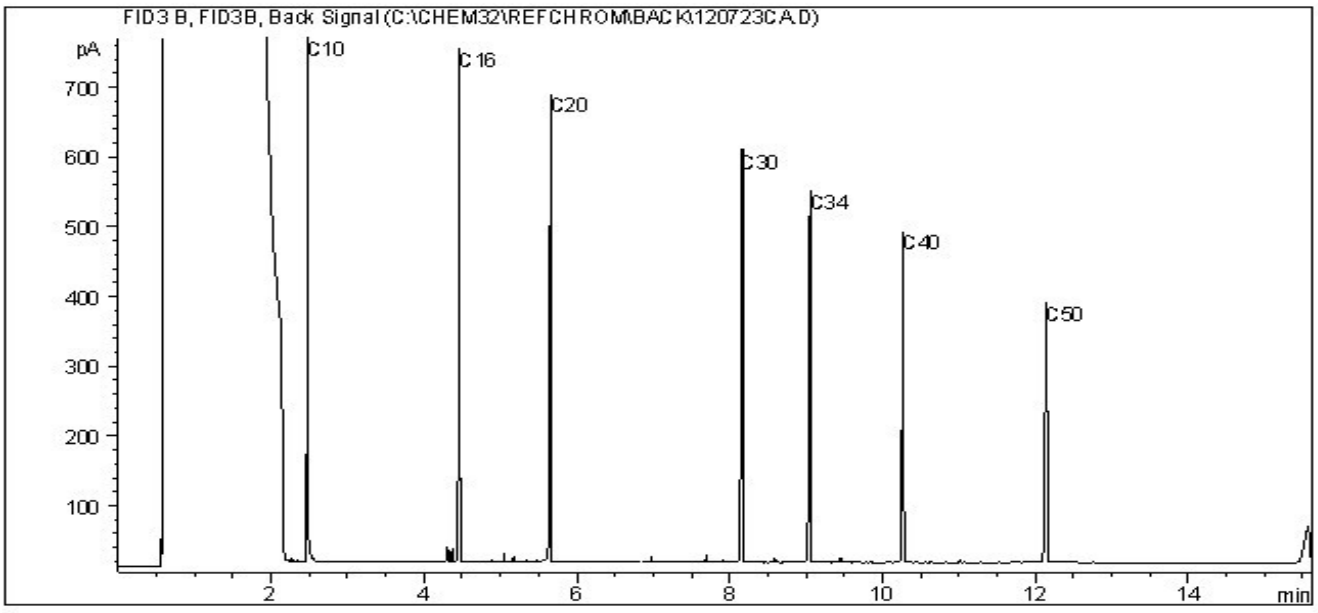
Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0205 Lab-Dup

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-1B

CCME Hydrocarbons (F2-F4 in soil) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

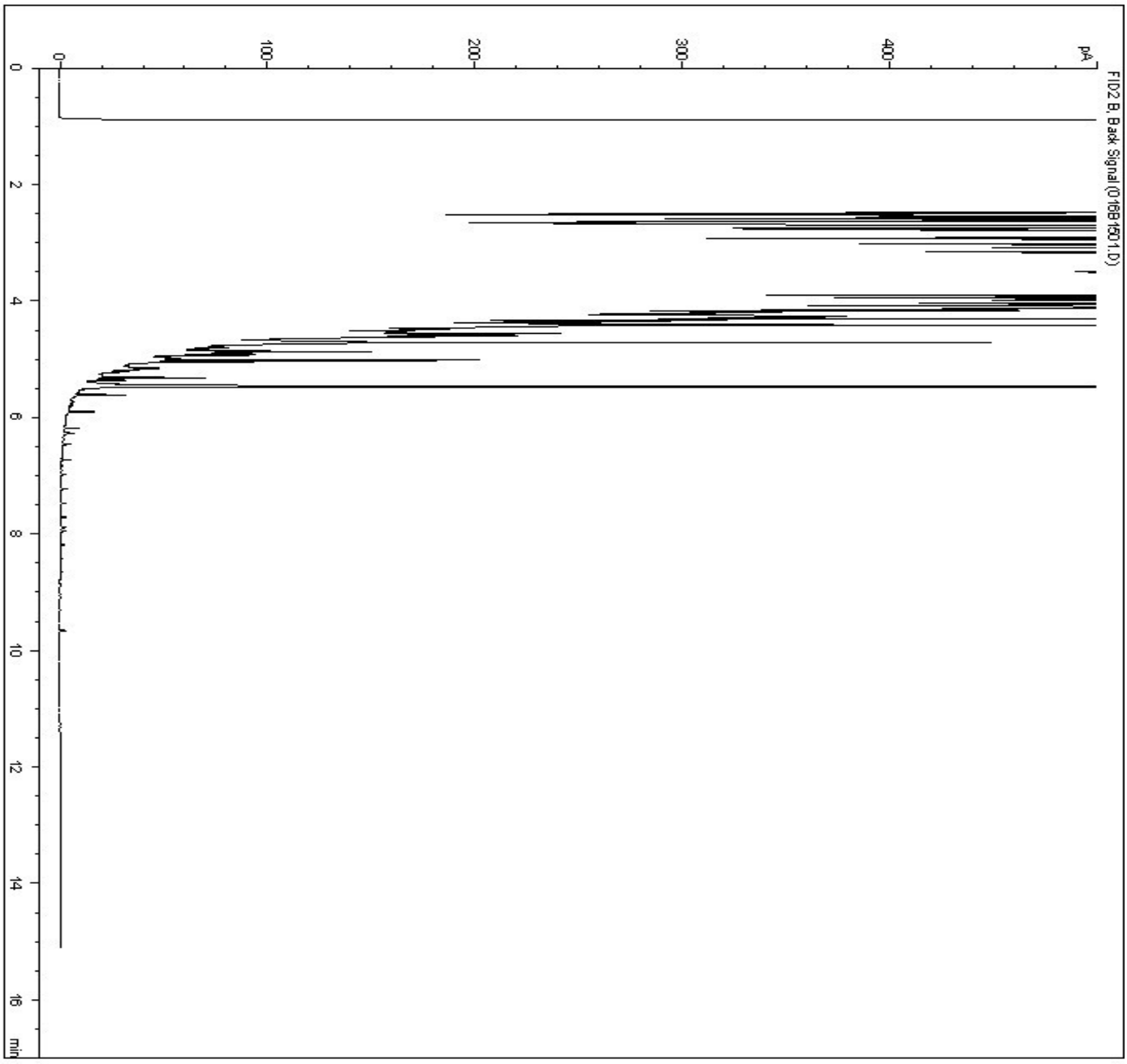
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0207

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: DUP 4

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\016B1501.D
Sample Name: EH0207



*** End of Report ***

Instrument 1 2012/08/30 10:24:13 AM 7890C/LD2

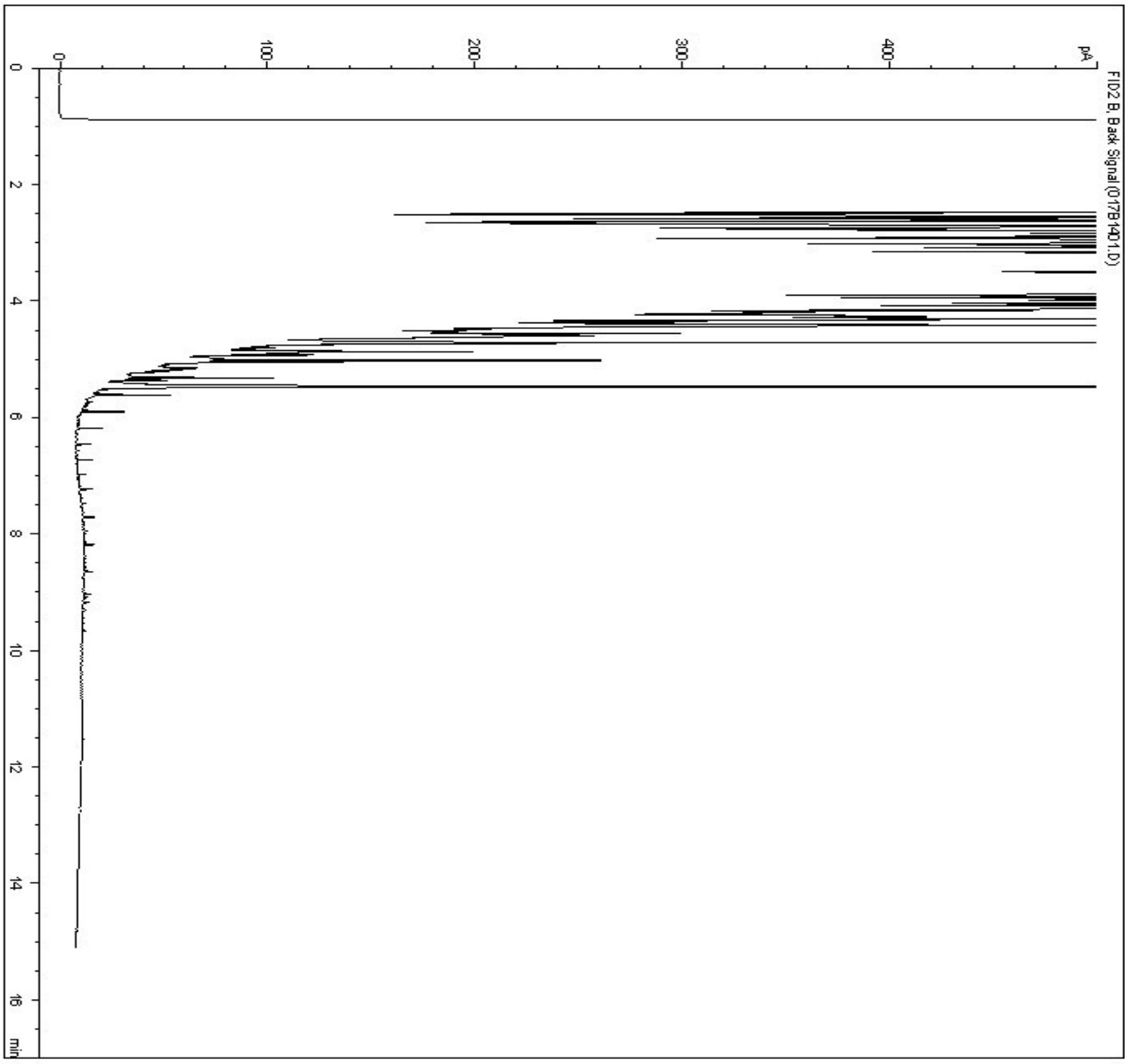
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0208

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\017B1401.D
Sample Name: EH0208



*** End of Report ***

Instrument 1 2012/08/30 10:24:12 AM 7890C/LD2

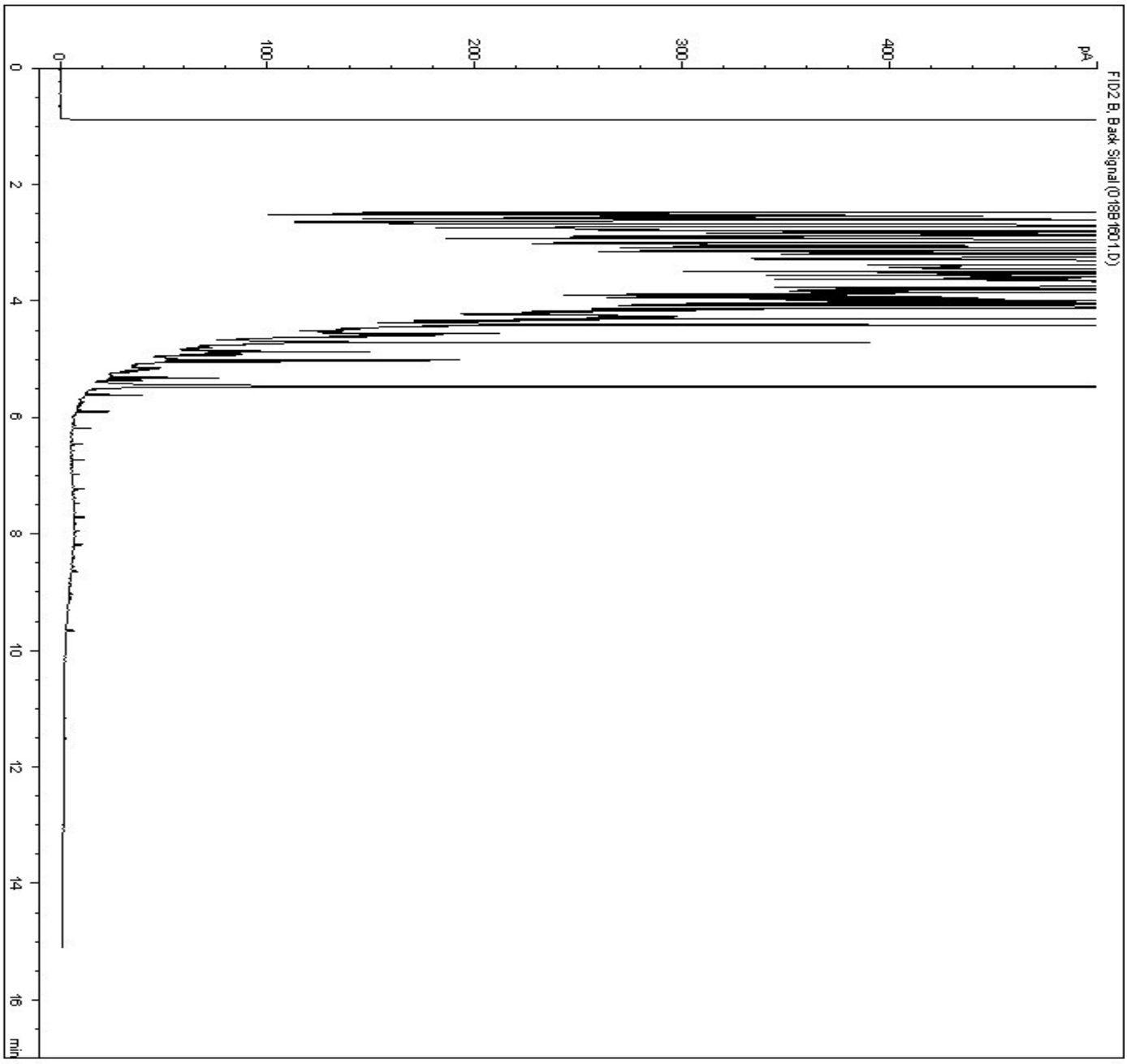
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0209

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: DUP 5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\018B1601.D
Sample Name: EH0209



*** End of Report ***

Instrument 1 2012/08/30 10:24:15 AM 7890C/LD2

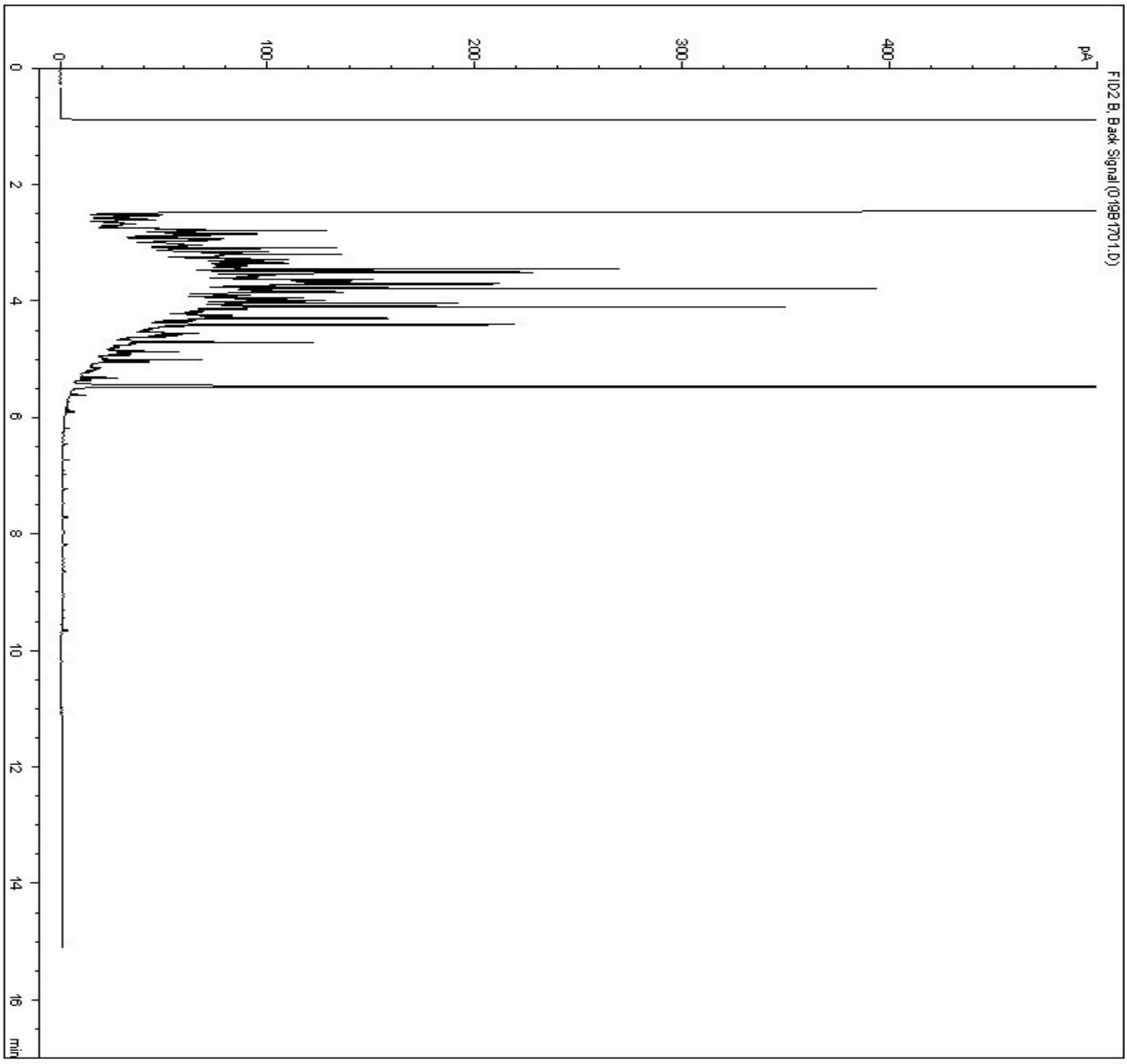
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0210

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-HA12-3

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\019B1701.D
Sample Name: EH0210



*** End of Report ***

Instrument 1 2012/08/30 10:24:16 AM 7890C/LD2

Page 1 of 1

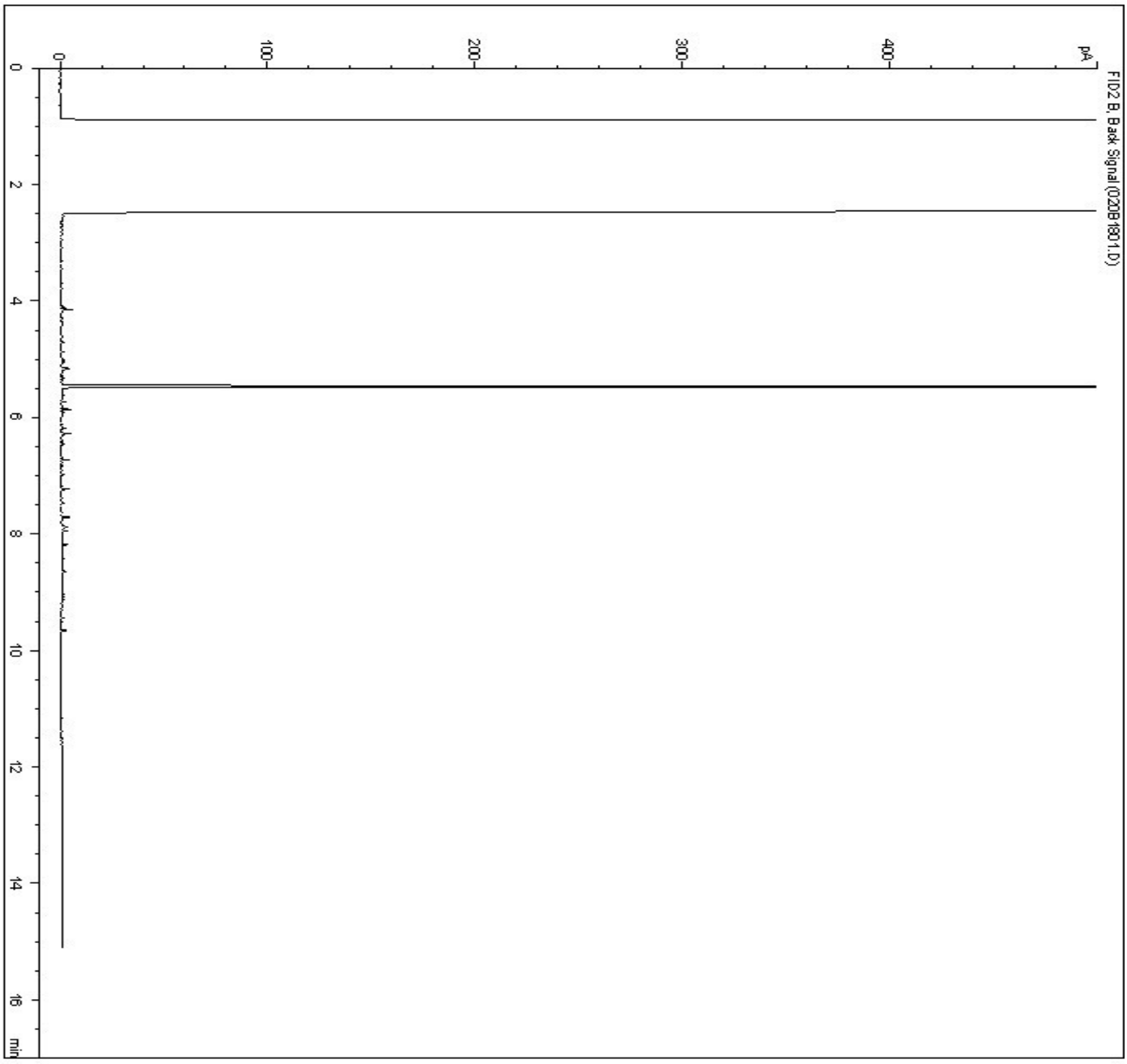
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0211

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: SC-TP12-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\020B1801.D
Sample Name: EH0211



*** End of Report ***

Instrument 1 2012/08/30 10:24:18 AM 7890C/LD2

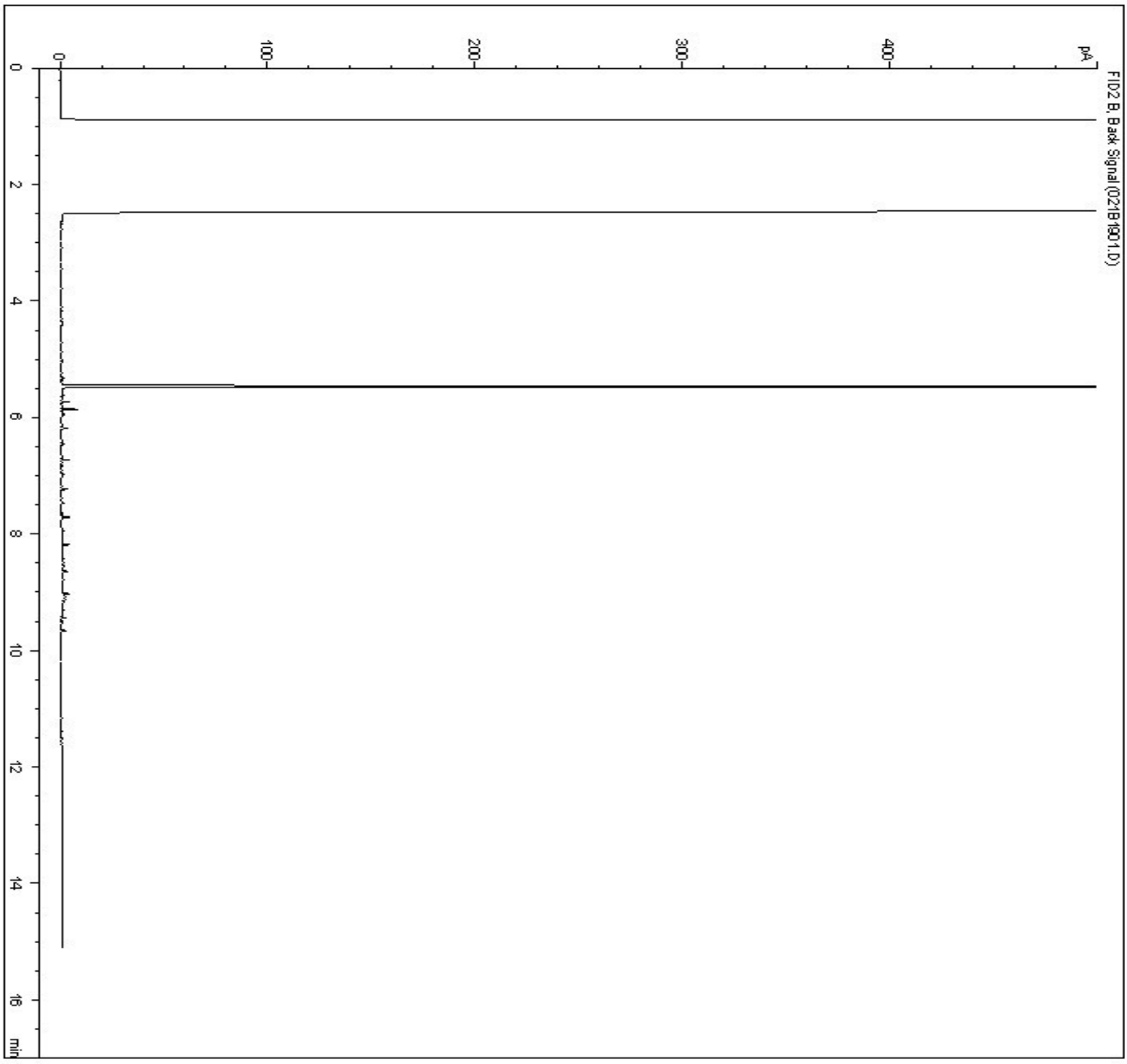
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0214

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: SC-TP12-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\021B1901.D
Sample Name: EH0214



*** End of Report ***

Instrument 1 2012/08/30 10:24:19 AM 7890C/LD2

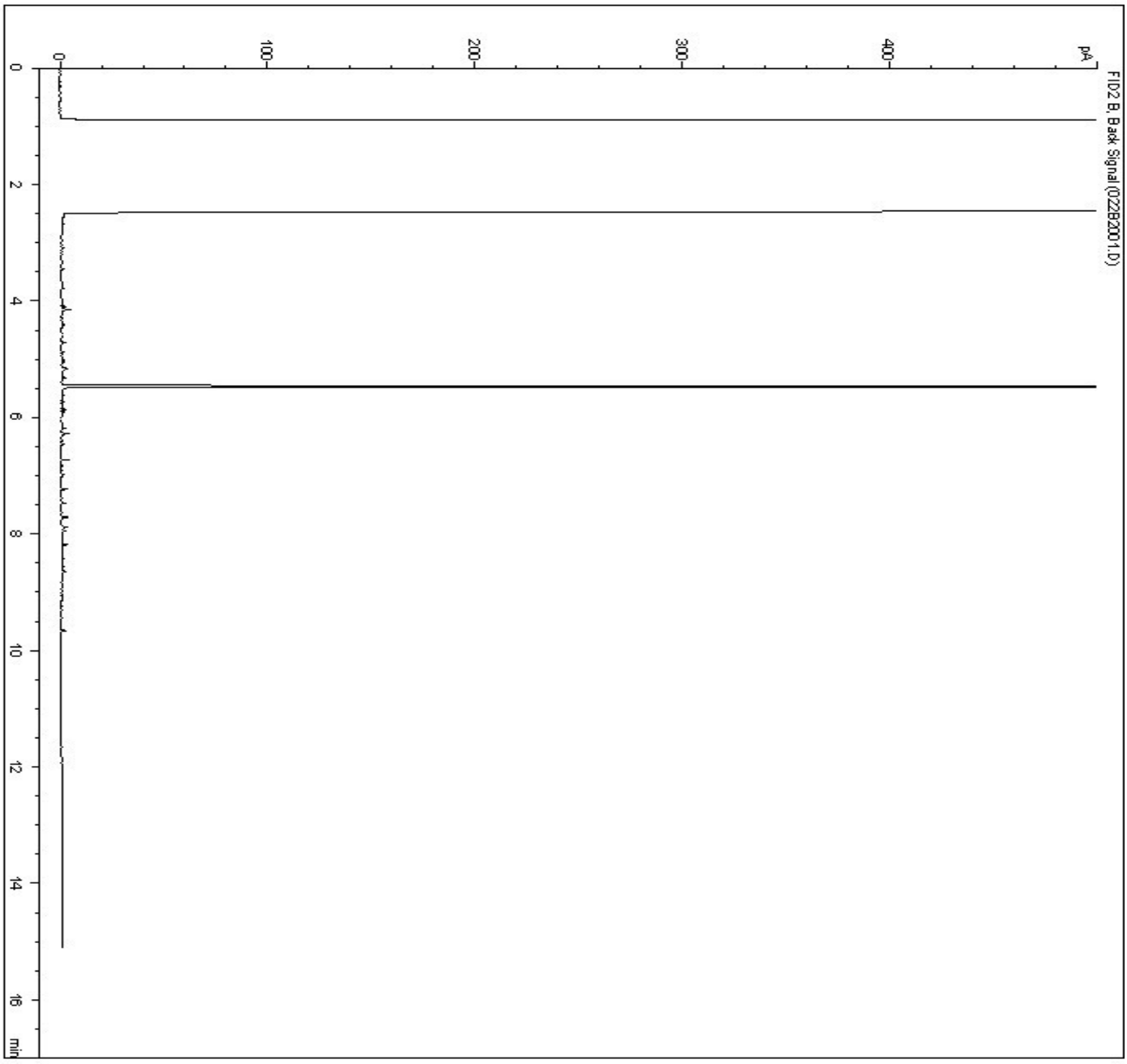
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0215

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: SC-TP12-3

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\022B2001.D
Sample Name: EH0215



*** End of Report ***

Instrument 1 2012/08/30 10:24:21 AM 7890C/LD2

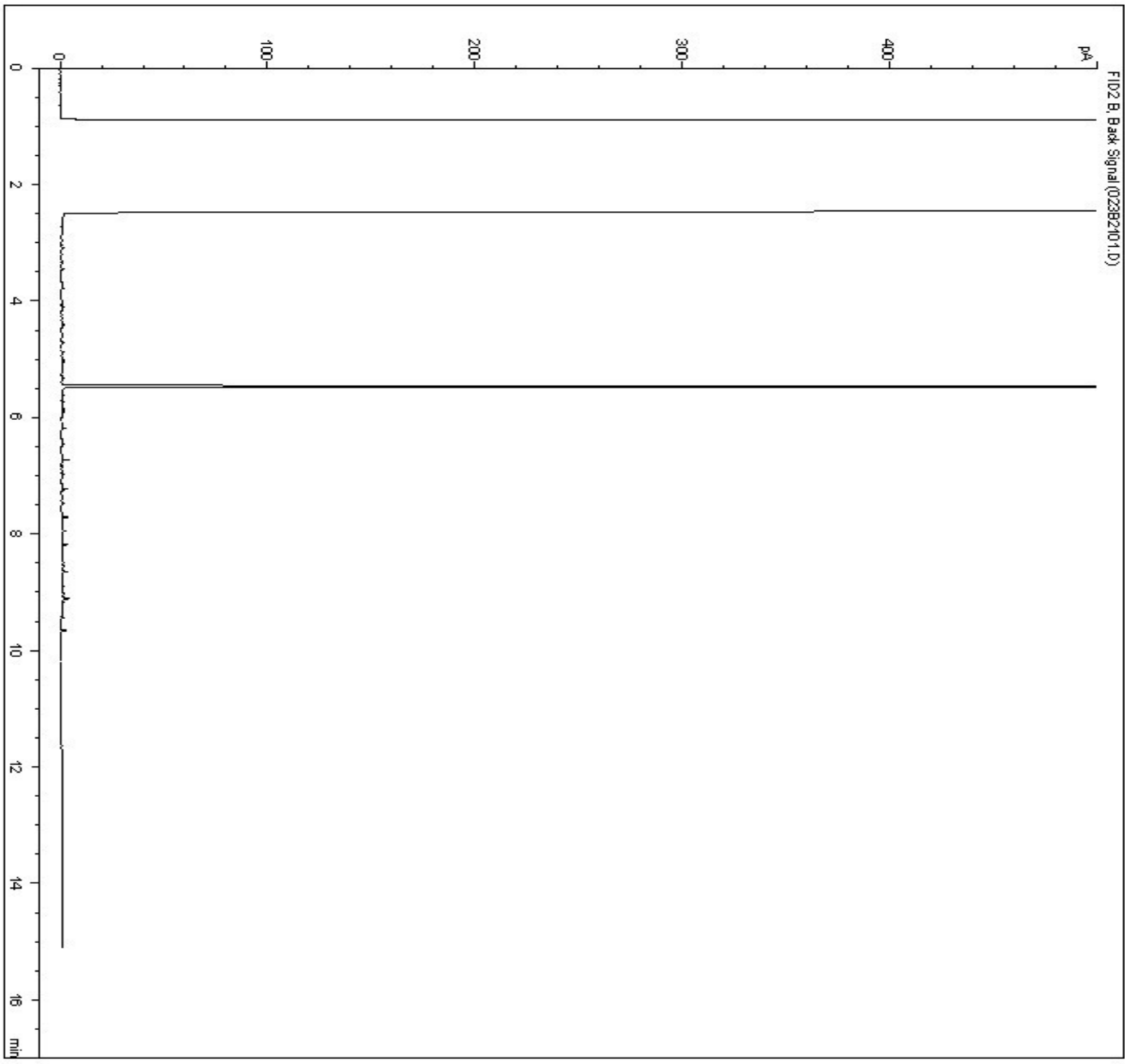
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0216

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: DUP 6

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\023B2101.D
Sample Name: EH0216



*** End of Report ***

Instrument 1 2012/08/30 10:24:22 AM 7890C/LD2

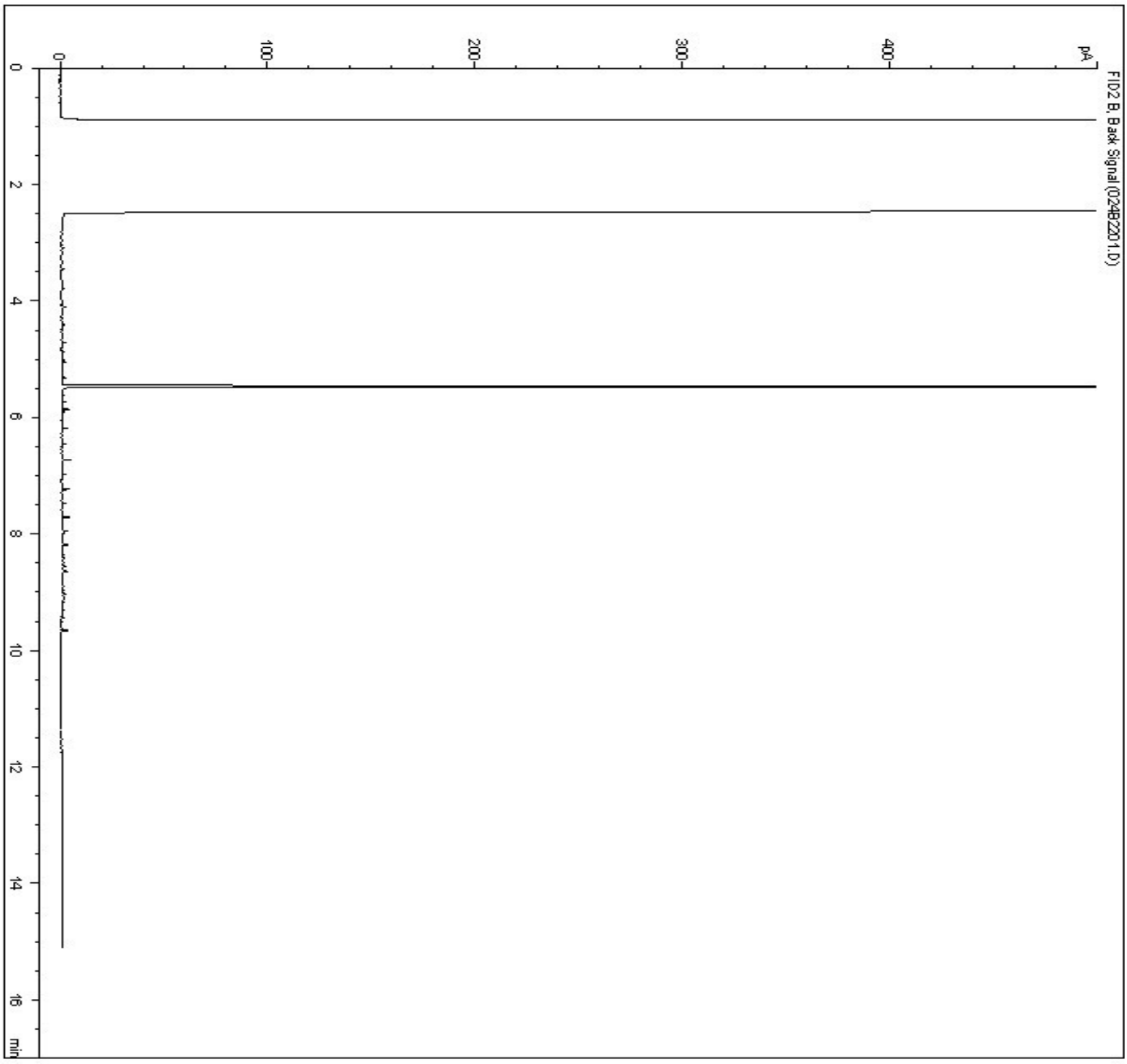
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0217

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: SC-TP12-4

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\024B2201.D
Sample Name: EH0217



*** End of Report ***

Instrument 1 2012/08/30 10:24:24 AM 7890C/LD2

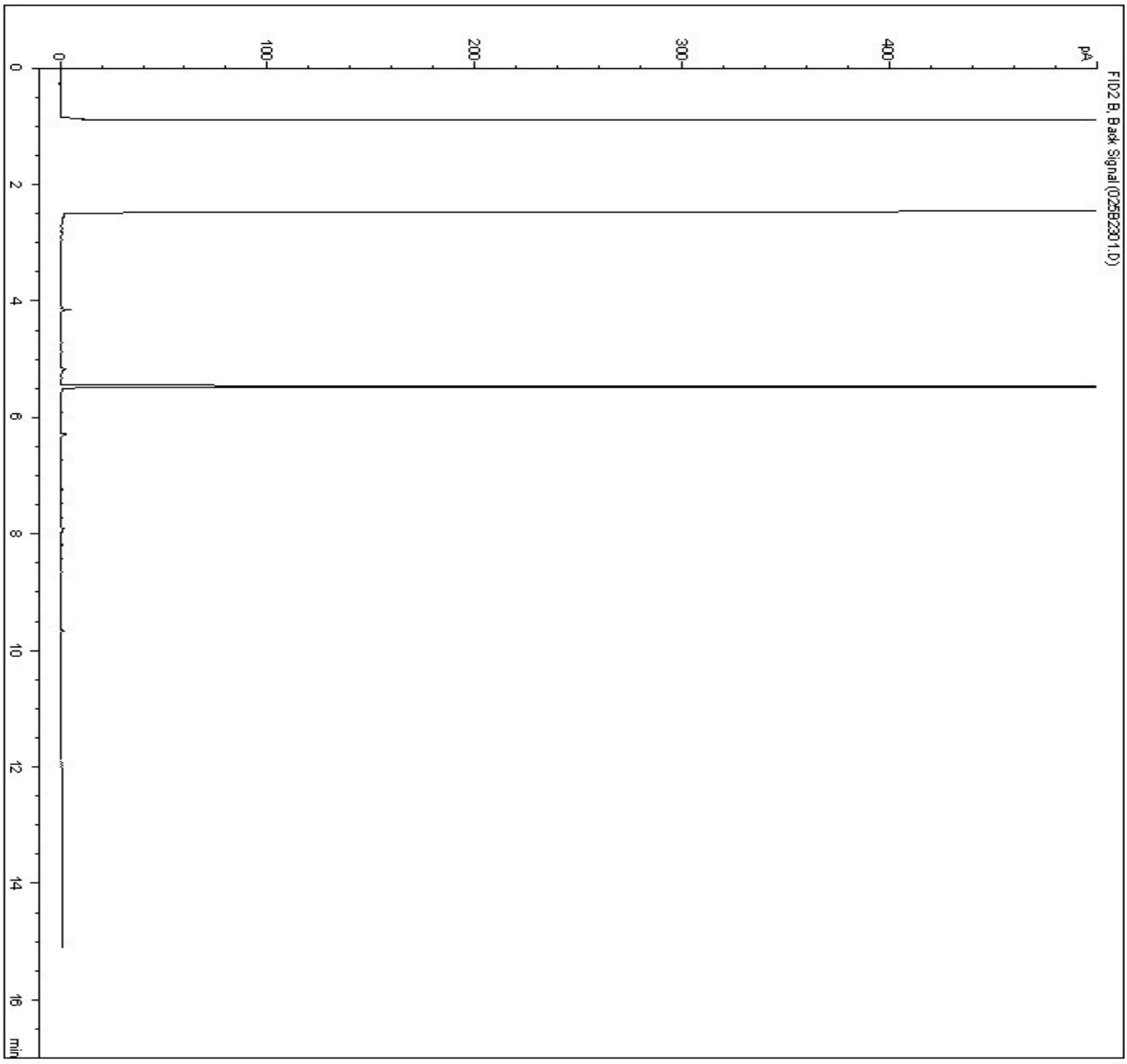
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0218

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: BORROW-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\025B2301.D
Sample Name: EH0218



*** End of Report ***

Instrument 1 2012/08/30 10:24:26 AM 7890C/LD2

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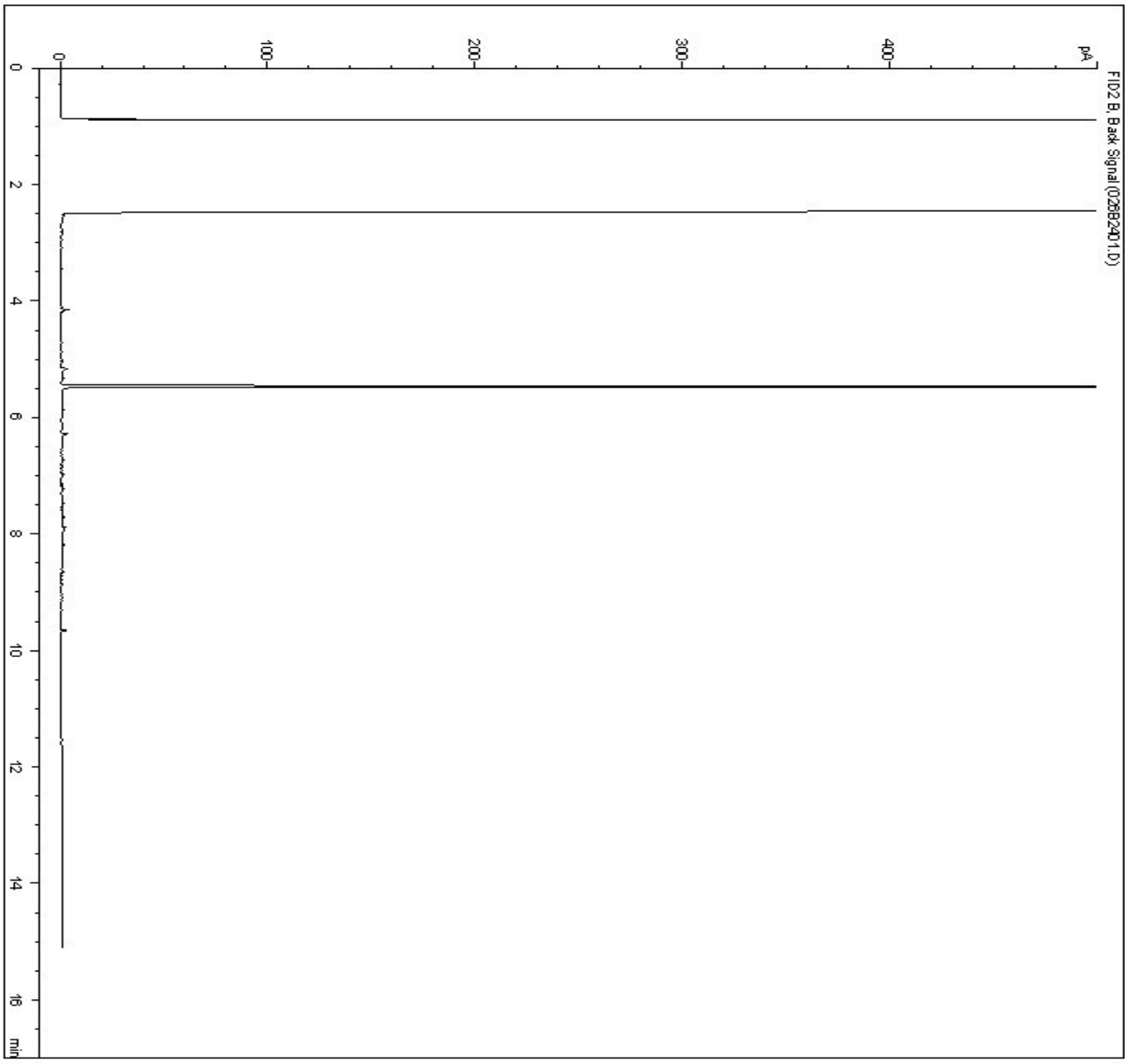
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0219

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: BORROW-2

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\026B2401.D
Sample Name: EH0219



*** End of Report ***

Instrument 1 2012/08/30 10:24:27 AM 7890C/LD2

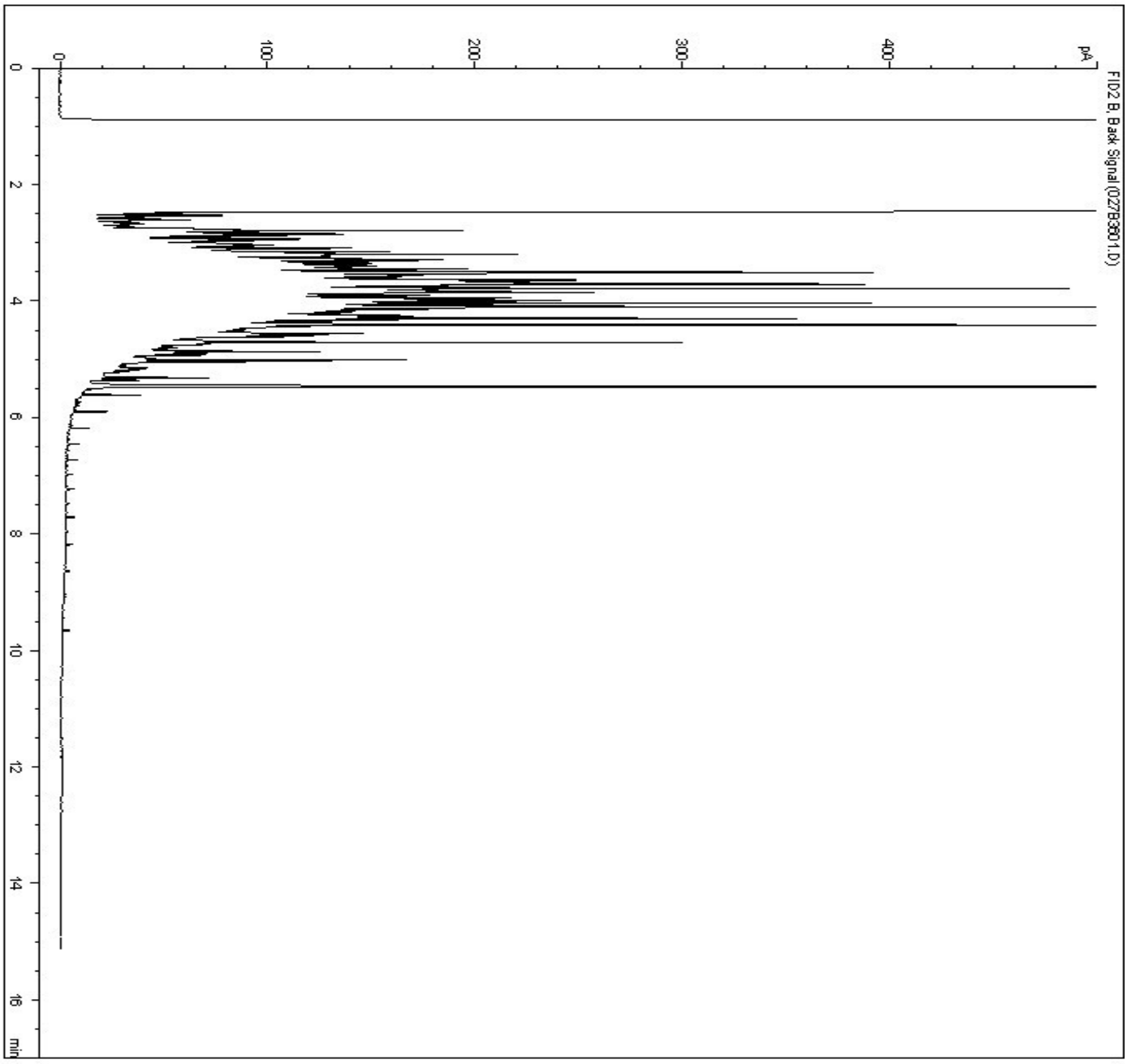
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0222

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-1A

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\027B3601.D
Sample Name: EH0222



*** End of Report ***

Instrument 1 2012/08/30 10:24:46 AM 7890C/LD2

Page 1 of 1

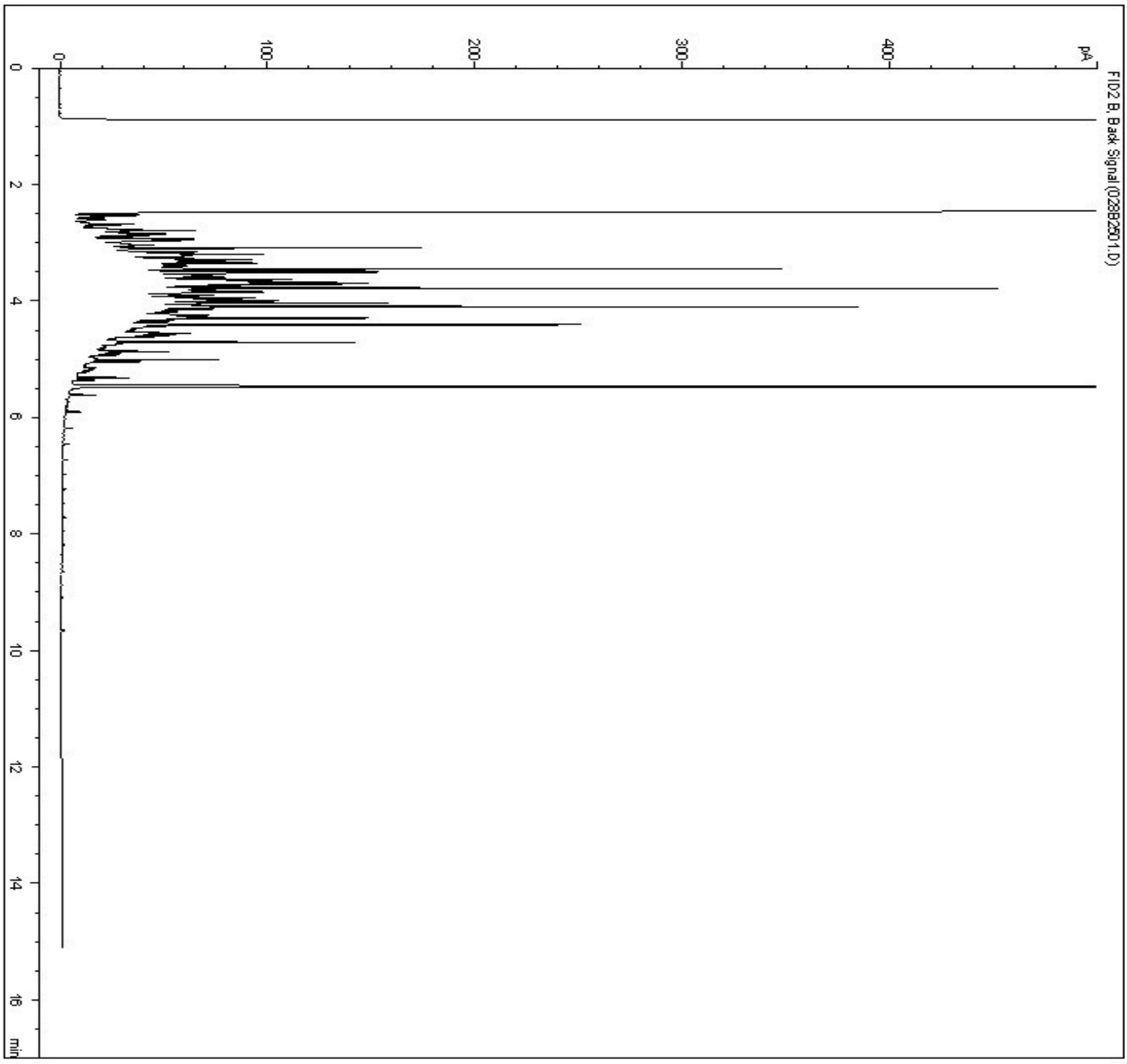
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0223

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED-12-1B

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\028B2501.D
Sample Name: EH0223



*** End of Report ***

Instrument 1 2012/08/30 10:24:29 AM 7890C/LD2

Page 1 of 1

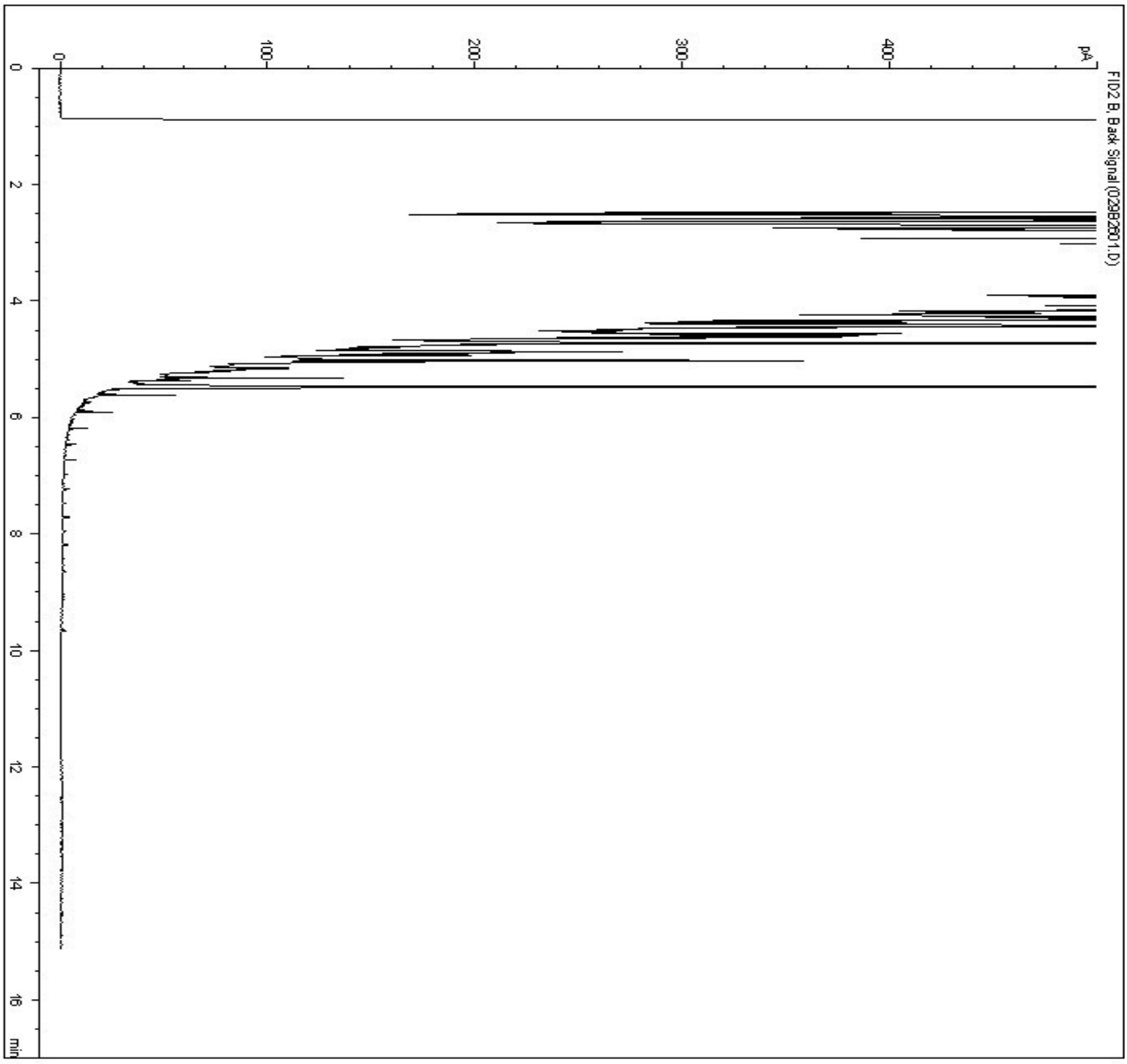
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0224

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-2A

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\029B2601.D
Sample Name: EH0224



*** End of Report ***

Instrument 1 2012/08/30 10:24:30 AM 7890C/LD2

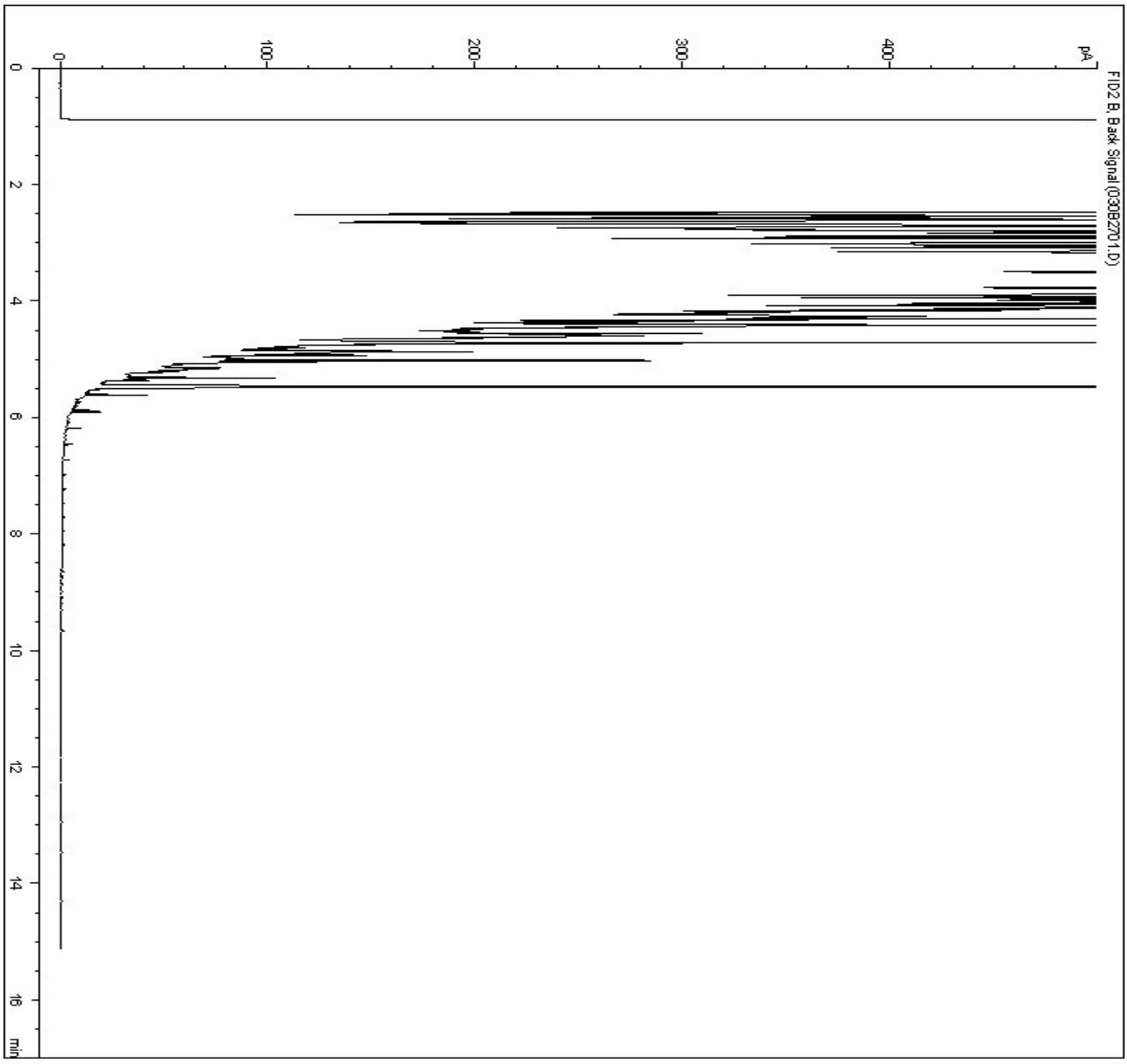
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0225

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-2B

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\030B2701.D
Sample Name: EH0225



*** End of Report ***

Instrument 1 2012/08/30 10:24:32 AM 7890C/LD2

Page 1 of 1

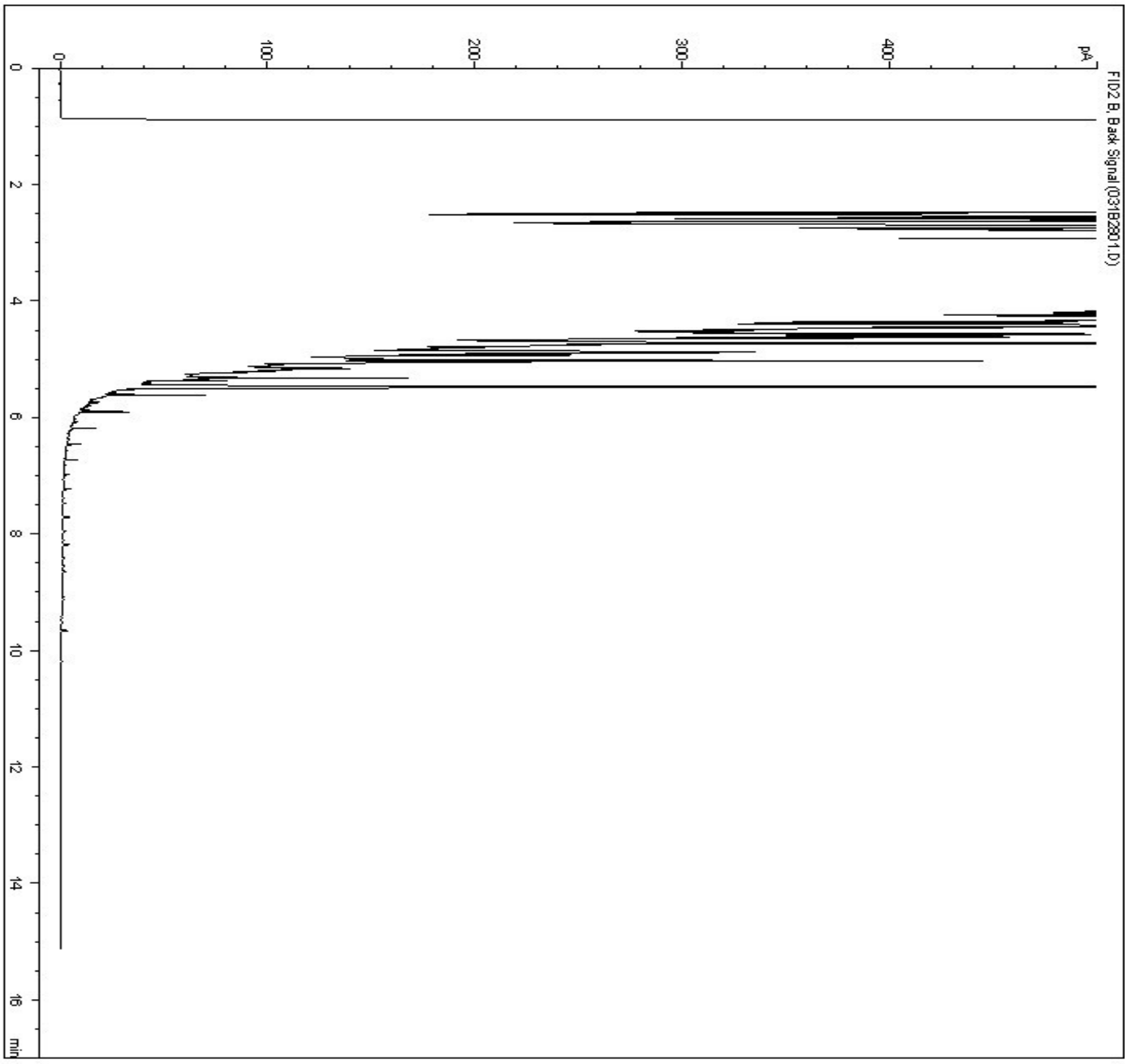
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0226

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-DUP1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\031B2801.D
Sample Name: EH0226



*** End of Report ***

Instrument 1 2012/08/30 10:24:33 AM 7890C/LD2

Page 1 of 1

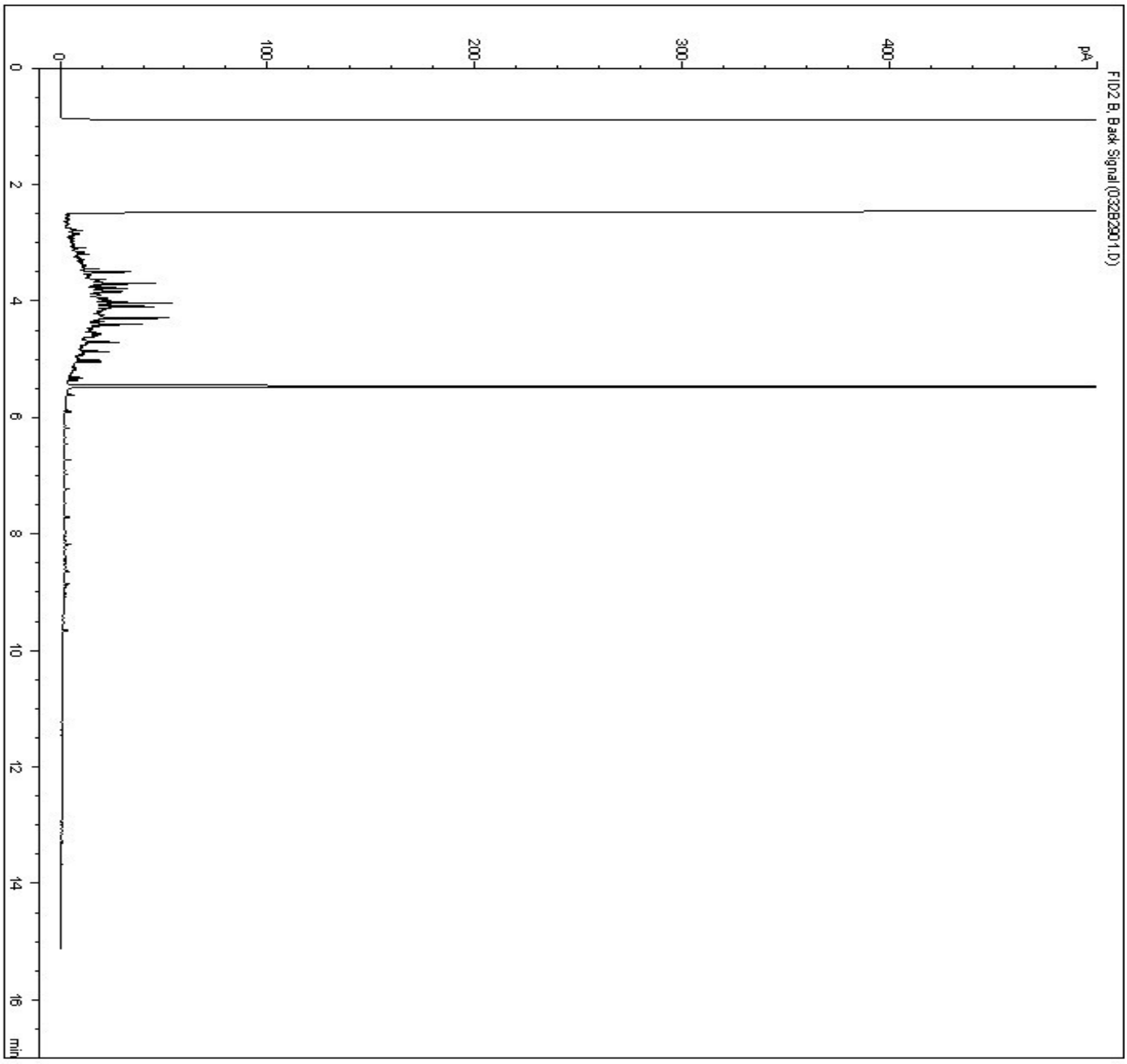
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0227

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-3A

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\032B2901.D
Sample Name: EH0227



*** End of Report ***

Instrument 1 2012/08/30 10:24:35 AM 7890C/LD2

Page 1 of 1

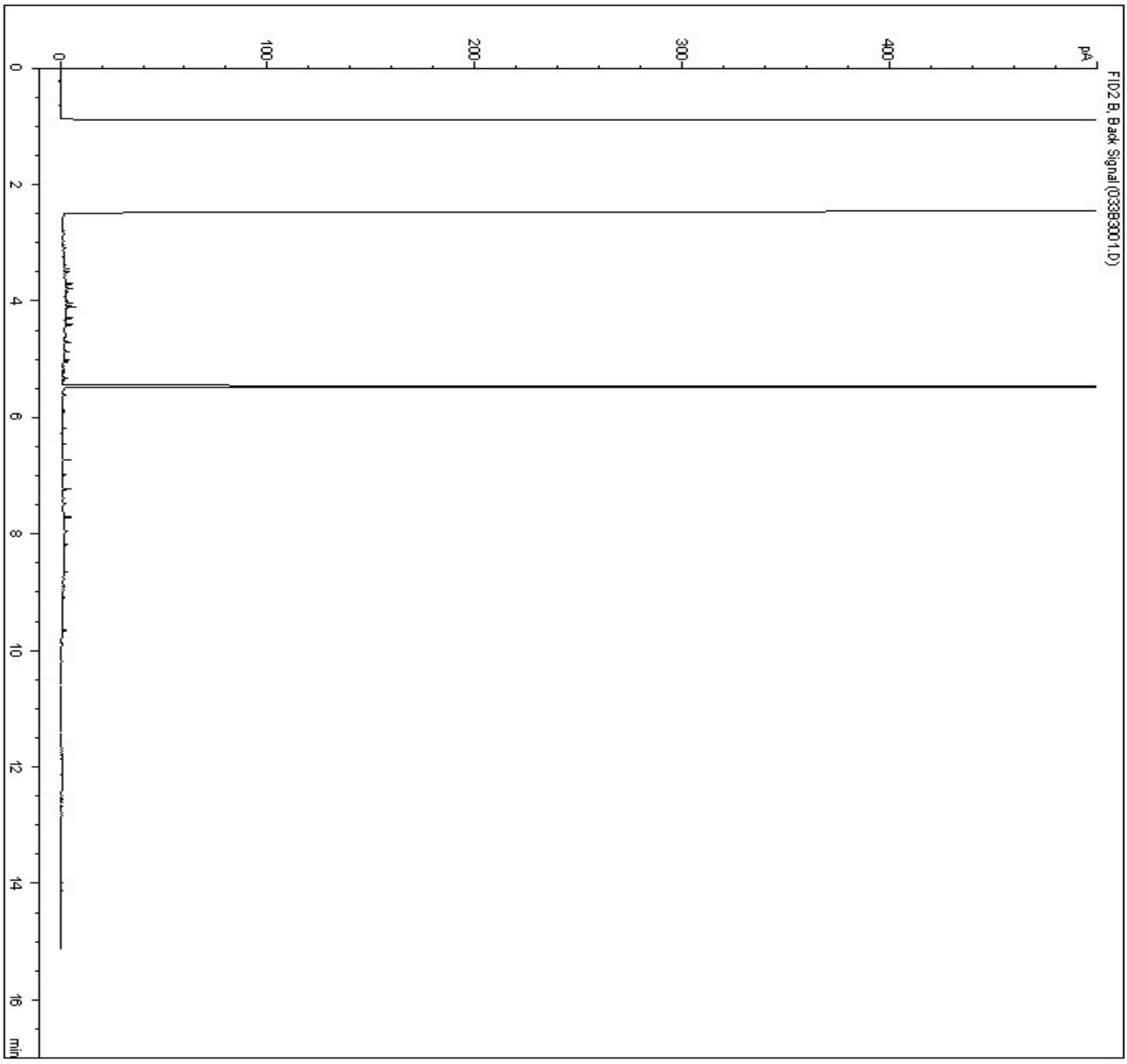
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Report Date: 2012/09/21
Maxxam Job #: B275357
Maxxam Sample: EH0228

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Reference: EUREKA 1570-1204
Client ID: D1-SED12-3B

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Data File C:\CHEM32\1\DATA\7890C0829\7890C0829 2012-08-29 10-07-26\033B3001.D
Sample Name: EH0228



*** End of Report ***

Instrument 1 2012/08/30 10:24:37 AM 7890C/LD2

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

Your Project #: EW699-113372
Site Location: EUREKA 1570-1204

Attention: CATHERINE LEBLANC
FRANZ ENVIRONMENTAL INC.
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z5B8

Report Date: 2012/08/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B275367
Received: 2012/08/21, 16:45

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cadmium - low level CCME (Total)	10	2012/08/23	2012/08/29	AB SOP-00043	EPA 200.8
Elements by ICP - Total	10	2012/08/27	2012/08/29	AB SOP-00042	EPA 200.7
Elements by ICPMS - Total	10	2012/08/27	2012/08/28	AB SOP-00043	EPA 200.8

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

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

Total cover pages: 1

Maxxam Job #: B275367
Report Date: 2012/08/30

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EH0291	EH0296	EH0297	EH0298		
Sampling Date		2012/08/18	2012/08/18	2012/08/18	2012/08/18		
	UNITS	**BG-SW12-1**	**BG-SW12-2**	**BG-SW12-DUP1**	**BG-SW12-3**	**RDL**	**QC Batch**
Low Level Elements							
Total Cadmium (Cd)	ug/L	0.12	0.093	0.096	0.11	0.0050	6111688
RDL = Reportable Detection Limit							

Maxxam ID		EH0299	EH0300	EH0301	EH0302	EH0303	EH0304		
Sampling Date		2012/08/18	2012/08/18	2012/08/19	2012/08/19	2012/08/19	2012/08/19		
	UNITS	**BG-SW12-4**	**BG-SW12-5**	**BG-SW12-6**	**BG-SW12-7**	**BG-SW12-8**	**BG-SW12-9**	**RDL**	**QC Batch**
Low Level Elements									
Total Cadmium (Cd)	ug/L	0.12	0.13	0.073	<0.0050	<0.0050	<0.0050	0.0050	6111755
RDL = Reportable Detection Limit									

Maxxam Job #: B275367
Report Date: 2012/08/30

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EH0291	EH0296	EH0297	EH0298		
Sampling Date		2012/08/18	2012/08/18	2012/08/18	2012/08/18		
	UNITS	**BG-SW12-1**	**BG-SW12-2**	**BG-SW12-DUP1**	**BG-SW12-3**	**RDL**	**QC Batch**
Elements							
Total Aluminum (Al)	mg/L	4.7	2.7	2.9	2.7	0.0010	6120341
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	0.00060	6120341
Total Arsenic (As)	mg/L	0.0067	0.0024	0.0024	0.0024	0.00020	6120341
Total Barium (Ba)	mg/L	0.064	0.044	0.044	0.046	0.010	6119445
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Boron (B)	mg/L	0.044	0.036	0.038	0.037	0.020	6119445
Total Calcium (Ca)	mg/L	120	120	120	120	0.30	6119445
Total Chromium (Cr)	mg/L	0.0092	0.0032	0.0034	0.0031	0.0010	6120341
Total Cobalt (Co)	mg/L	0.014	0.011	0.011	0.012	0.00030	6120341
Total Copper (Cu)	mg/L	0.020	0.013	0.013	0.014	0.00020	6120341
Total Iron (Fe)	mg/L	15	5.4	5.5	5.4	0.060	6119445
Total Lead (Pb)	mg/L	0.0083	0.0046	0.0044	0.0046	0.00020	6120341
Total Lithium (Li)	mg/L	<0.020	<0.020	<0.020	<0.020	0.020	6119445
Total Magnesium (Mg)	mg/L	40	39	39	39	0.20	6119445
Total Manganese (Mn)	mg/L	0.40	0.32	0.33	0.36	0.0040	6119445
Total Molybdenum (Mo)	mg/L	0.00087	<0.00020	<0.00020	<0.00020	0.00020	6120341
Total Nickel (Ni)	mg/L	0.034	0.024	0.024	0.029	0.00050	6120341
Total Phosphorus (P)	mg/L	0.43	0.29	0.22	0.22	0.10	6119445
Total Potassium (K)	mg/L	4.0	3.1	3.1	3.0	0.30	6119445
Total Selenium (Se)	mg/L	0.00098	0.00091	0.00090	0.00086	0.00020	6120341
Total Silicon (Si)	mg/L	7.1	2.7	2.8	3.2	0.10	6119445
Total Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	6120341
Total Sodium (Na)	mg/L	58	57	58	57	0.50	6119445
Total Strontium (Sr)	mg/L	0.38	0.36	0.36	0.37	0.020	6119445
Total Sulphur (S)	mg/L	110	110	120	120	0.20	6119445
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	6120341
Total Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Titanium (Ti)	mg/L	0.090	0.036	0.048	0.036	0.0010	6120341
Total Uranium (U)	mg/L	0.0012	0.0010	0.00099	0.0010	0.00010	6120341
Total Vanadium (V)	mg/L	0.024	0.011	0.011	0.012	0.0010	6120341
Total Zinc (Zn)	mg/L	0.16	0.15	0.17	0.20	0.0030	6120341
RDL = Reportable Detection Limit							

Maxxam Job #: B275367
Report Date: 2012/08/30

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EH0299	EH0300	EH0301	EH0302	EH0303	EH0304		
Sampling Date		2012/08/18	2012/08/18	2012/08/19	2012/08/19	2012/08/19	2012/08/19		
	UNITS	**BG-SW12-4**	**BG-SW12-5**	**BG-SW12-6**	**BG-SW12-7**	**BG-SW12-8**	**BG-SW12-9**	**RDL**	**QC Batch**
Elements									
Total Aluminum (Al)	mg/L	3.1	2.9	0.14	0.19	0.20	0.25	0.0010	6120341
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	<0.00060	0.00060	6120341
Total Arsenic (As)	mg/L	0.0026	0.0036	0.00037	0.00026	0.00025	0.00031	0.00020	6120341
Total Barium (Ba)	mg/L	0.047	0.052	0.054	0.054	0.053	0.054	0.010	6119445
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Boron (B)	mg/L	0.039	0.040	0.054	0.055	0.056	0.058	0.020	6119445
Total Calcium (Ca)	mg/L	120	120	210	200	200	200	0.30	6119445
Total Chromium (Cr)	mg/L	0.0040	0.0044	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Cobalt (Co)	mg/L	0.012	0.013	0.0012	<0.00030	0.00031	<0.00030	0.00030	6120341
Total Copper (Cu)	mg/L	0.014	0.015	0.0014	0.00075	0.00067	0.00078	0.00020	6120341
Total Iron (Fe)	mg/L	6.0	8.0	0.32	0.34	0.36	0.43	0.060	6119445
Total Lead (Pb)	mg/L	0.0051	0.0057	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	6120341
Total Lithium (Li)	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6119445
Total Magnesium (Mg)	mg/L	40	41	92	91	91	93	0.20	6119445
Total Manganese (Mn)	mg/L	0.34	0.37	0.016	0.017	0.019	0.018	0.0040	6119445
Total Molybdenum (Mo)	mg/L	<0.00020	0.00036	0.00021	<0.00020	<0.00020	<0.00020	0.00020	6120341
Total Nickel (Ni)	mg/L	0.027	0.029	0.0024	0.0022	0.0022	0.0022	0.00050	6120341
Total Phosphorus (P)	mg/L	0.26	0.37	<0.10	<0.10	<0.10	<0.10	0.10	6119445
Total Potassium (K)	mg/L	3.1	3.4	5.6	5.6	5.7	5.8	0.30	6119445
Total Selenium (Se)	mg/L	0.00086	0.00087	0.0023	0.0023	0.0022	0.0023	0.00020	6120341
Total Silicon (Si)	mg/L	3.0	4.0	0.83	0.83	0.94	1.1	0.10	6119445
Total Silver (Ag)	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	6120341
Total Sodium (Na)	mg/L	59	61	170	170	170	170	0.50	6119445
Total Strontium (Sr)	mg/L	0.37	0.38	0.82	0.82	0.82	0.83	0.020	6119445
Total Sulphur (S)	mg/L	120	120	250	250	250	250	0.20	6119445
Total Thallium (Tl)	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	6120341
Total Tin (Sn)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Titanium (Ti)	mg/L	0.058	0.035	0.0095	0.0057	0.0091	0.011	0.0010	6120341
Total Uranium (U)	mg/L	0.0010	0.0011	0.0014	0.0014	0.0014	0.0014	0.00010	6120341
Total Vanadium (V)	mg/L	0.012	0.014	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6120341
Total Zinc (Zn)	mg/L	0.28	0.52	2.4	<0.0030	<0.0030	<0.0030	0.0030	6120341
RDL = Reportable Detection Limit									

Maxxam Job #: B275367
Report Date: 2012/08/30

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

Package 1	6.3°C

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

General Comments

Maxxam Job #: B275367
Report Date: 2012/08/30

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Sampler Initials: CL

QUALITY ASSURANCE REPORT

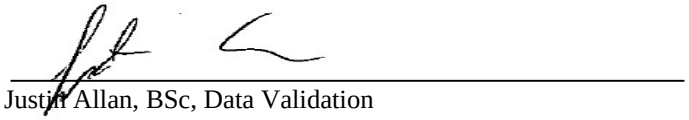
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6119445	Total Barium (Ba)	2012/08/29	93	80 - 120	93	80 - 120	<0.010	mg/L	2.5	20
6119445	Total Boron (B)	2012/08/29	99	80 - 120	99	80 - 120	<0.020	mg/L	NC	20
6119445	Total Calcium (Ca)	2012/08/29	NC	80 - 120	95	80 - 120	<0.30	mg/L	3.4	20
6119445	Total Iron (Fe)	2012/08/29	104	80 - 120	101	80 - 120	<0.060	mg/L	NC	20
6119445	Total Lithium (Li)	2012/08/29	96	80 - 120	95	80 - 120	<0.020	mg/L	NC	20
6119445	Total Magnesium (Mg)	2012/08/29	NC	80 - 120	95	80 - 120	<0.20	mg/L	2.7	20
6119445	Total Manganese (Mn)	2012/08/29	91	80 - 120	93	80 - 120	<0.0040	mg/L	3.7	20
6119445	Total Phosphorus (P)	2012/08/29	99	80 - 120	98	80 - 120	<0.10	mg/L	NC	20
6119445	Total Potassium (K)	2012/08/29	97	80 - 120	96	80 - 120	<0.30	mg/L	2.8	20
6119445	Total Silicon (Si)	2012/08/29	106	80 - 120	101	80 - 120	<0.10	mg/L	2.3	20
6119445	Total Sodium (Na)	2012/08/29	NC	80 - 120	97	80 - 120	0.62, RDL=0.50	mg/L	2.5	20
6119445	Total Strontium (Sr)	2012/08/29	95	80 - 120	95	80 - 120	<0.020	mg/L	2.5	20
6119445	Total Sulphur (S)	2012/08/29					<0.20	mg/L	NC	20
6120341	Total Aluminum (Al)	2012/08/28	NC	80 - 120	105	80 - 120	<0.0010	mg/L	2.1	20
6120341	Total Antimony (Sb)	2012/08/28	98	80 - 120	109	80 - 120	<0.00060	mg/L	NC	20
6120341	Total Arsenic (As)	2012/08/28	95	80 - 120	100	80 - 120	<0.00020	mg/L	1.1	20
6120341	Total Beryllium (Be)	2012/08/28	100	80 - 120	96	80 - 120	<0.0010	mg/L	NC	20
6120341	Total Chromium (Cr)	2012/08/28	91	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20
6120341	Total Cobalt (Co)	2012/08/28	91	80 - 120	100	80 - 120	<0.00030	mg/L	NC	20
6120341	Total Copper (Cu)	2012/08/28	89	80 - 120	101	80 - 120	<0.00020	mg/L	19.2	20
6120341	Total Lead (Pb)	2012/08/28	87	80 - 120	98	80 - 120	<0.00020	mg/L	NC	20
6120341	Total Molybdenum (Mo)	2012/08/28	99	80 - 120	102	80 - 120	<0.00020	mg/L	5.9	20
6120341	Total Nickel (Ni)	2012/08/28	91	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20
6120341	Total Selenium (Se)	2012/08/28	88	80 - 120	92	80 - 120	<0.00020	mg/L	NC	20
6120341	Total Silver (Ag)	2012/08/28	95	80 - 120	104	80 - 120	<0.00010	mg/L	NC	20
6120341	Total Thallium (Tl)	2012/08/28	85	80 - 120	95	80 - 120	<0.00020	mg/L	NC	20
6120341	Total Tin (Sn)	2012/08/28	99	80 - 120	109	80 - 120	<0.0010	mg/L	NC	20
6120341	Total Titanium (Ti)	2012/08/28	96	80 - 120	103	80 - 120	<0.0010	mg/L	NC	20
6120341	Total Uranium (U)	2012/08/28	89	80 - 120	98	80 - 120	<0.00010	mg/L	NC	20
6120341	Total Vanadium (V)	2012/08/28	95	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20
6120341	Total Zinc (Zn)	2012/08/28	94	80 - 120	104	80 - 120	<0.0030	mg/L	NC	20

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
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 to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B275367

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



Justin Allan, BSc, Data Validation

==========

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Maxxam

Maxxam Analytics International Corporation o/a Maxxam Analytics
5740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25082	MAXXAM JOB #: B275367	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:			
Address:	10025 Jasper Ave, 5th Floor, Telus Tower North	Address:	329 Churchill Ave N, Suite 200	Project #:	EW699-113372		
	Edmonton AB T5J 1S6		Ottawa ON K1Z5B8	Project Name:		CHAIN OF CUSTODY #: C#356250-13-01	PROJECT MANAGER: Julie Clement
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Site #:	EUREKA 1570-1204		
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Sampled By:	Catherine LeBlanc/Christine Klein		

Regulation 153 (2011): ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ___ ☐ Res/Park ☐ Ind/Comm ☐ Ag/Other ☐ Med/Fine ☐ Coarse ☐ For RSC

Other Regulations: ☒ CCME ☐ Reg. 558 ☐ MISA ☐ PWQO ☐ Other ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ___

SPECIAL INSTRUCTIONS:

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

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☒
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water? (Y/N)	Metals Field Filtered? (Y/N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	# of Bottles	Comments
1		BG-SW12-1	Aug 8/12	PM	SW	N	N	X							1	
2		BG-SW12-2						X							1	
3		BG-SW12-DUP1						X							1	
4		BG-SW12-3						X							1	
5		BG-SW12-4						X							1	
6		BG-SW12-5						X							1	ARRIVED AT DEPOT: AUG 7 1 ... 2
7		BG-SW12-6	Aug 19/12	PM				X							1	TEMP: 7/5/71 4:45
8		BG-SW12-7						X							1	
9		BG-SW12-8						X							1	
10		BG-SW12-9						X							1	

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
Catherine LeBlanc Catherine Leblanc	Aug 20/12	8:00	Jasbirjit Kaur JASBIRJIT KAUR	2012/08/23	16:15						

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

White: Maxxam Yellow: Client

Your P.O. #: 700228325
Your Project #: EW699-113372
Site Location: EUREKA 1570-1204

Attention: CATHERINE LEBLANC
FRANZ ENVIRONMENTAL INC.
329 CHURCHILL AVE NORTH
SUITE 2000
OTTAWA, ON
CANADA K1Z5B8

Report Date: 2012/08/24

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B273457
Received: 2012/08/17, 8:45

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
CCME Hydrocarbons (F2-F4 in water)	2	2012/08/22	2012/08/22	CAL SOP-00086 AB SOP-00037	EPA3510C/CCME PHCCWS

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Ioana Stoica, Project Manager
Email: IStoica@maxxam.ca
Phone# (403) 291-3077

==========

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

Total cover pages: 1

Maxxam Job #: B273457
Report Date: 2012/08/24

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700228325

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EF8390	EF8403		
Sampling Date		2012/08/14	2012/08/14		
	UNITS	**DELTA-W12-1**	**DELTA-W12-2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	6104545
F3 (C16-C34 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	6104545
F4 (C34-C50 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	6104545
Reached Baseline at C50	mg/L	YES	YES	N/A	6104545
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	91	94	N/A	6104545
N/A = Not Applicable RDL = Reportable Detection Limit					

Maxxam Job #: B273457
Report Date: 2012/08/24

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700228325

Package 1	4.0°C

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

General Comments

Maxxam Job #: B273457
Report Date: 2012/08/24

FRANZ ENVIRONMENTAL INC.
Client Project #: EW699-113372
Site Location: EUREKA 1570-1204
Your P.O. #: 700228325

QUALITY ASSURANCE REPORT

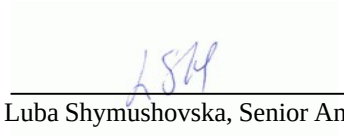
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6104545	O-TERPHENYL (sur.)	2012/08/22	106	50 - 130	106	50 - 130	104	%		
6104545	F2 (C10-C16 Hydrocarbons)	2012/08/22	112	50 - 130	104	70 - 130	<0.10	mg/L	NC	40
6104545	F3 (C16-C34 Hydrocarbons)	2012/08/22	93	50 - 130	93	70 - 130	<0.10	mg/L	NC	40
6104545	F4 (C34-C50 Hydrocarbons)	2012/08/22	76	50 - 130	72	70 - 130	<0.10	mg/L	NC	40

N/A = Not Applicable
RPD = Relative Percent Difference
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 to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B273457

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



Luba Shymushovska, Senior Analyst, Organic Department

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Maxxam Analytics International Corporation o/a Maxxam Analytics

6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free:800-653-6266 Fax:(905) 817-5779 www.maxxam.ca

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#27434 Public Works & Government Services Can	Company Name:	#14413 Franz Environmental Inc	Quotation #:	B25062	MAXXAM JOB #:	BOTTLE ORDER #:
Contact Name:	Edward Domijan	Contact Name:	Catherine Leblanc	P.O. #:		B273457	366259
Address:	10025 Jasper Ave. 5th Floor, Telus Tower North Edmonton AB T5J 1S6	Address:	329 Churchill Ave N, Suite 200 Ottawa ON K1Z5B8	Project #:	EW699-113372	CHAIN OF CUSTODY #:	PROJECT MANAGER:
Phone:	(780)497-3886 Fax: (780)982-1887	Phone:	(613)721-0555 Fax: (613)721-0029	Project Name:		C#366259-05-01	Julie Clement
Email:	Edward.Domijan@pwgsc-tpsgc.gc.ca	Email:	cleblanc@franzenvironmental.ca	Site #:	EUREKA 1570-1204		
				Sampled By:	Catherine LeBlanc / Christine Nhan		

Regulation 153 (2011)

- [ ] Table 1
- [ ] Table 2
- [ ] Table 3
- [ ] Table ___
- [ ] Res/Park
- [ ] Ind/Comm
- [ ] Agri/Other
- [ ] Medium/Fine
- [ ] Coarse
- [ ] For RSC

Other Regulations

- [x] CCME
- [ ] Reg. 558
- [ ] MISA
- [ ] PWQO
- [ ] Other _____
- [ ] Sanitary Sewer Bylaw
- [ ] Storm Sewer Bylaw
- Municipality _____

SPECIAL INSTRUCTIONS

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

Note: For MOE regulated drinking water samples - please use the Drinking Water Chain of Custody Form

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

ANALYSIS REQUESTED (Please be specific):

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: [x]

(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: _____ Time Required: _____ [ ]

Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y / N)	Metals Field Filtered ? (Y / N)	ICPMS metals in soil/sediment	Sieve, 75um	PHC F1 & BTEX in Soil	PHC F2-F4 in Soil	CCME AROMATIC/ALIPHATIC	PAH Compounds in Soil by GC/MS (SIM)	CCME Metals (low Level), total in SW	F2-F4 (water)			# of Bottles	Comments
1		Delta-W12-1	AUG14	PM	Water	N	N								X			2	Irregular sampling container
2		Delta-W12-2	↓	↓	↓	↓	↓								X			2	samples not preserved.
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

ARRIVED AT DEPOT: 8:45
AUG 17 2012
TEMP: 4.5 3.1

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Present	Yes	No
Catherine LeBlanc	12/08/16	16:00	Brandon Ramsay	12/08/18	09:50				Intact		

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

White: Maxxam Yellow: Client

Your P.O. #: 700227219
Your Project #: EW669-113372
Site Location: EUREKA
Your C.O.C. #: 11343

Attention: Catherine Leblanc
Franz Environmental Inc
329 Churchill Ave N, Suite 200
Ottawa, ON
CANADA K1Z5B8

Report Date: 2012/09/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2C7230
Received: 2012/08/21, 10:05

Sample Matrix: AIR
Samples Received: 11

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
BTEX and CCME Compounds in Air(TO-15mod)	3	N/A	2012/08/29	BRL SOP-00304	EPA TO-15mod
BTEX and CCME Compounds in Air(TO-15mod)	8	N/A	2012/08/30	BRL SOP-00304	EPA TO-15mod
Canister Pressure (TO-15)	3	N/A	2012/08/29	BRL SOP-00304	EPA TO-15
Canister Pressure (TO-15)	8	N/A	2012/08/30	BRL SOP-00304	EPA TO-15

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

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Theresa Stephenson, Project Manager
Email: TStephenson@maxxam.ca
Phone# (905) 817-5763

==========

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Total cover pages: 1

Maxxam Job #: B2C7230
Report Date: 2012/09/04

Franz Environmental Inc
Client Project #: EW669-113372
Site Location: EUREKA
Your P.O. #: 700227219

RESULTS OF ANALYSES OF AIR

Maxxam ID		OO1175	OO1176	OO1177		OO1178	OO1179	
Sampling Date		2012/08/15 20:00	2012/08/15 20:05	2012/08/15 20:08		2012/08/15 20:12	2012/08/16 08:36	
COC Number		11343	11343	11343		11343	11343	
	Units	**OLD GARAGE 2012 / SX0299**	**OLD TRANSIENT BARRACKS 2012 / SX0429**	**BUILDING 17 2012 / SX1169**	**QC Batch**	**FORMER BUNKHOUSE 2012 / SX0293**	**NEW GARAGE 2012 / SX0328**	**QC Batch**
Volatile Organics								
Pressure on Receipt	psig	(-3.6)	(-2.2)	(-4.2)	2955114	(-3.7)	(-3.9)	2956434

QC Batch = Quality Control Batch

Maxxam ID		OO1180	OO1181	OO1182	OO1183	OO1184	
Sampling Date		2012/08/16 08:38	2012/08/16 08:35	2012/08/16 08:45	2012/08/16 08:40	2012/08/16 09:25	
COC Number		11343	11343	11343	11343	11343	
	Units	**POWERHOUSE 2012 / SX0145**	**DUP1 / SX0248**	**CRAWLSPACE 2012 / SX0344**	**WATERTANK 2012 / SX0324**	**OLD GARAGE VP 2012 / SX1398**	**QC Batch**
Volatile Organics							
Pressure on Receipt	psig	(-4)	0	0.80	(-2.6)	(-1.3)	2956434

QC Batch = Quality Control Batch

Maxxam ID		OO1185	
Sampling Date		2012/08/16 13:35	
COC Number		11343	
	Units	**CRAWLSPACE 2 - 2012 / SX1395**	**QC Batch**
Volatile Organics			
Pressure on Receipt	psig	(-0.8)	2956434

QC Batch = Quality Control Batch

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Maxxam Job #: B2C7230
Report Date: 2012/09/04

Franz Environmental Inc
Client Project #: EW669-113372
Site Location: EUREKA
Your P.O. #: 700227219

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		OO1175	OO1176	OO1177		OO1178		
Sampling Date		2012/08/15 20:00	2012/08/15 20:05	2012/08/15 20:08		2012/08/15 20:12		
COC Number		11343	11343	11343		11343		
	Units	**OLD GARAGE 2012 / SX0299**	**OLD TRANSIENT BARRACKS 2012 / SX0429**	**BUILDING 17 2012 / SX1169**	**QC Batch**	**FORMER BUNKHOUSE 2012 / SX0293**	**RDL**	**QC Batch**
Volatile Organics								
F1-BTEX, C6-C10 (as Toluene)	ug/m3	101	30.7	121	2955133	77.4	5.0	2956640
F2, C10-C16 (as Decane)	ug/m3	483	53.3	1090	2955133	727	5.0	2956640
Benzene	ug/m3	ND	ND	3.7	2955133	ND	1.2	2956640
Toluene	ug/m3	16.6	ND	17.1	2955133	ND	1.6	2956640
Ethylbenzene	ug/m3	8.1	ND	3.7	2955133	ND	1.6	2956640
Total Xylenes	ug/m3	37.2	2.8	18.6	2955133	ND	2.2	2956640
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	86	88	86	2955133	90		2956640
Bromochloromethane	%	86	86	85	2955133	89		2956640
D5-Chlorobenzene	%	79	82	80	2955133	81		2956640

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2C7230
Report Date: 2012/09/04

Franz Environmental Inc
Client Project #: EW669-113372
Site Location: EUREKA
Your P.O. #: 700227219

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		OO1179	OO1180	OO1181	OO1182		
Sampling Date		2012/08/16 08:36	2012/08/16 08:38	2012/08/16 08:35	2012/08/16 08:45		
COC Number		11343	11343	11343	11343		
	Units	**NEW GARAGE 2012 / SX0328**	**POWERHOUSE 2012 / SX0145**	**DUP1 / SX0248**	**CRAWLSPACE 2012 / SX0344**	**RDL**	**QC Batch**
Volatile Organics							
F1-BTEX, C6-C10 (as Toluene)	ug/m3	774	542	545	55.1	5.0	2956640
F2, C10-C16 (as Decane)	ug/m3	1020	406	408	56.7	5.0	2956640
Benzene	ug/m3	9.2	1.4	1.4	ND	1.2	2956640
Toluene	ug/m3	105	20.6	20.8	ND	1.6	2956640
Ethylbenzene	ug/m3	30.9	7.1	6.6	ND	1.6	2956640
Total Xylenes	ug/m3	148	34.5	31.5	ND	2.2	2956640
Surrogate Recovery (%)							
1,4-Difluorobenzene	%	106	115	116	115		2956640
Bromochloromethane	%	106	115	114	114		2956640
D5-Chlorobenzene	%	98	106	111	110		2956640

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2C7230
Report Date: 2012/09/04

Franz Environmental Inc
Client Project #: EW669-113372
Site Location: EUREKA
Your P.O. #: 700227219

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		OO1183		OO1184		OO1185		
Sampling Date		2012/08/16 08:40		2012/08/16 09:25		2012/08/16 13:35		
COC Number		11343		11343		11343		
	Units	**WATERTANK 2012 / SX0324**	**RDL**	**OLD GARAGE VP 2012 / SX1398**	**RDL**	**CRAWLSPACE 2 - 2012 / SX1395**	**RDL**	**QC Batch**
Volatile Organics								
F1-BTEX, C6-C10 (as Toluene)	ug/m3	225	5.0	83900	190	ND	5.0	2956640
F2, C10-C16 (as Decane)	ug/m3	186	5.0	24000	190	329	5.0	2956640
Benzene	ug/m3	ND	1.2	ND	46	ND	1.2	2956640
Toluene	ug/m3	7.7	1.6	ND	170	ND	1.6	2956640
Ethylbenzene	ug/m3	2.5	1.6	201	61	ND	1.6	2956640
Total Xylenes	ug/m3	12.4	2.2	552	84	ND	2.2	2956640
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	105		114		97		2956640
Bromochloromethane	%	104		112		96		2956640
D5-Chlorobenzene	%	98		107		93		2956640

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2C7230
Report Date: 2012/09/04

Franz Environmental Inc
Client Project #: EW669-113372
Site Location: EUREKA
Your P.O. #: 700227219

GENERAL COMMENTS

Sample OO1184-01: Btexccme
Canister received at -1.3 psig and was pressurized to 10.4 psig, for a 1.9X pressure dilution. A further dilution was prepared resulting in a 38X final dilution. The DL's were adjusted accordingly.

Increased DL for toluene due to possible background.

Results relate only to the items tested.

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Franz Environmental Inc
Attention: Catherine Leblanc
Client Project #: EW669-113372
P.O. #: 700227219
Site Location: EUREKA

Quality Assurance Report

Maxxam Job Number: GB2C7230

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
2955133	LSY	Spiked Blank	1,4-Difluorobenzene	2012/08/29		110	%	60 - 140
			Bromochloromethane	2012/08/29		107	%	60 - 140
			D5-Chlorobenzene	2012/08/29		112	%	60 - 140
			Benzene	2012/08/29		103	%	70 - 130
			Toluene	2012/08/29		105	%	70 - 130
			Ethylbenzene	2012/08/29		105	%	70 - 130
			Total Xylenes	2012/08/29		103	%	70 - 130
		Method Blank	1,4-Difluorobenzene	2012/08/29		99	%	60 - 140
			Bromochloromethane	2012/08/29		96	%	60 - 140
			D5-Chlorobenzene	2012/08/29		93	%	60 - 140
			F1-BTEX, C6-C10 (as Toluene)	2012/08/29	ND, RDL=5.0		ug/m3	
			F2, C10-C16 (as Decane)	2012/08/29	ND, RDL=5.0		ug/m3	
			Benzene	2012/08/29	ND, RDL=1.2		ug/m3	
			Toluene	2012/08/29	ND, RDL=1.6		ug/m3	
			Ethylbenzene	2012/08/29	ND, RDL=1.6		ug/m3	
			Total Xylenes	2012/08/29	ND, RDL=2.2		ug/m3	
2956640	LSY	Spiked Blank	1,4-Difluorobenzene	2012/08/30		114	%	60 - 140
			Bromochloromethane	2012/08/30		110	%	60 - 140
			D5-Chlorobenzene	2012/08/30		117	%	60 - 140
			Benzene	2012/08/30		94	%	70 - 130
			Toluene	2012/08/30		95	%	70 - 130
			Ethylbenzene	2012/08/30		96	%	70 - 130
			Total Xylenes	2012/08/30		95	%	70 - 130
		Method Blank	1,4-Difluorobenzene	2012/08/30		102	%	60 - 140
			Bromochloromethane	2012/08/30		99	%	60 - 140
			D5-Chlorobenzene	2012/08/30		98	%	60 - 140
			F1-BTEX, C6-C10 (as Toluene)	2012/08/30	ND, RDL=5.0		ug/m3	
			F2, C10-C16 (as Decane)	2012/08/30	ND, RDL=5.0		ug/m3	
			Benzene	2012/08/30	ND, RDL=1.2		ug/m3	
			Toluene	2012/08/30	ND, RDL=1.6		ug/m3	
			Ethylbenzene	2012/08/30	ND, RDL=1.6		ug/m3	
			Total Xylenes	2012/08/30	ND, RDL=2.2		ug/m3	
		RPD [OO1185-01]	F1-BTEX, C6-C10 (as Toluene)	2012/08/30	NC		%	25
			F2, C10-C16 (as Decane)	2012/08/30	10.1		%	25
			Benzene	2012/08/30	NC		%	25
			Toluene	2012/08/30	NC		%	25
			Ethylbenzene	2012/08/30	NC		%	25
			Total Xylenes	2012/08/30	NC		%	25

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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 (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B2C7230

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

Maureen Smith, Supervisor, Volatiles

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APPENDIX F

Data Gap Analysis

August 7, 2012 Project 1570-1202

Public Works and Government Services Canada
5th Floor, Telus Plaza North - 10025 Jasper Avenue
Edmonton, AB Canada T5J 1S6

Attention: Edward Domijan, P. Eng.
Senior Environmental Engineer
Environmental Services, Western Region

Dear Mr. Domijan:

RE: Data Gap Analysis – Eureka High Arctic Weather Station (DFRP #07573, ARMS #00546)

SENES Consulting Ltd. (SENES) and Franz Environmental Inc. (FRANZ) are pleased to present the data gap analysis in support of remediation planning at the Eureka High Arctic Weather Station, Nunavut.

This data gap analysis was developed based on:

- the *Terms of Reference, Remediation Planning and Remedial Action Plan, Eureka High Arctic Weather Station, FY 11/12 and 12/13*, prepared by Environment Canada and dated March 2012
- the SENES/FRANZ *Workplan for Supplemental Investigation, Remediation Planning, and Remedial Action Plan, Eureka High Arctic Weather Station*, Nunavut dated June 14, 2012.
- Preliminary development of a detailed remedial action plan (RAP). This preliminary design was only initiated upon contract award on July 12, 2012 and identified some potential additional issues that would need to be addressed in the RAP.

Franz Environmental Inc.
329 Churchill Avenue North
Suite 200,
Ottawa, Ontario K1Z 5B8

SENES Consultants Ltd.
4921-49th Street
3rd Floor – NWT Commerce Place
Yellowknife, NT X1A 3S4

This project was completed under PWGSC Northern Supply Arrangement Agreement Number EW699-100053/002/NCS, Call-up number EW699-123266/001/NCS, and Amendments # 1 and 2.

1.0 BACKGROUND AND PREVIOUS INVESTIGATIONS

In 2008 and 2009, FRANZ was retained by Public Works Government and Services Canada (PWGSC) on behalf of Environment Canada (EC) to complete a Phase III Environmental Site Assessment (ESA) at the Eureka High Arctic Weather Station (HAWS). This work resulted in the following reports, which were reviewed for the data gap analysis.

- *Phase III Environmental Site Assessment Eureka High Arctic Weather Station Nunavut Canada Final Report,* Franz Environmental Inc., March 2009. Prepared for Public Works and Government Services Canada on behalf of Environment Canada ("2008 Phase III ESA"); and
- *Phase III Environmental Site Assessment Eureka High Arctic Weather Station Nunavut Canada Final Report,* Franz Environmental Inc., January 2010. Prepared for Public Works and Government Services Canada on behalf of Environment Canada ("2009 Phase III ESA").

The conclusions of these investigations recommended a site specific risk assessment at five Areas of Environmental Concern (AECs):

- AEC B-2: In-situ Landfarm
- AEC B-3: Suspected Landfill
- AEC D: Powerhouse
- AEC E: Hydrogen Building
- AEC H: Old Maintenance Garage

In 2010, SENES Consultants Ltd. (SENES) and FRANZ were retained to conduct monitoring activities and prepare a Detailed Quantitative Risk Assessment at the Eureka HAWS. The work resulted in the following report which was reviewed for the data gap analysis.

- *Detailed Quantitative Risk Assessment (DQRA), 2010 Monitoring Activities and Remedial Options Analysis,* SENES Consultants Ltd. and Franz Environmental Inc., March 2011. Prepared for Public Works Government Services Canada on behalf of Environment Canada ("2010 DQRA").

The 2010 DQRA identified a potentially unacceptable risk to the 'operations and maintenance worker' receptor identified in the risk assessment. The DQRA also identified potentially unacceptable risks to species of fauna which could come into contact with contaminated soil and sediment. The report stated that "all metals in soil, sediment and surface water are likely

reflective of local conditions, as metal “impacts” were widespread, but no anthropogenic source was apparent”. The 2010 DQRA report also noted that contamination around Building #17 (AEC D) and south of AEC D in the delta area were not fully delineated.

2.0 IDENTIFICATION OF DATA GAPS AND RECOMMENDATIONS

2.1 Background sampling

As indicated above, the 2011 SENES/FRANZ report indicated that metals in soil, sediment and surface water are likely reflective of local conditions, as metals exceedances above guidelines were widespread and, in many cases, in areas where no anthropogenic sources were apparent. In order to add further support to this conclusion, the 2012 field program outlined in includes a comprehensive sampling program for metals in soil, sediment, and surface water. The sampling will take place in areas that are not expected to have been impacted by human activity. These background concentrations should provide an adequate statistical basis to clarify what is “background” and what is “above background” at the site. The additional background sampling program was included in the approved 2012 SENES/FRANZ Workplan of June 14, 2012. Details regarding the background sampling program methodology are included in the separate 2012 SENES/FRANZ Sampling Plan.

2.2 AEC D

The areas around Building #17 in AEC D and the delta were not fully delineated in the previous field programs. A supplemental monitoring program is warranted to include a sampling program at AEC D and the delta to delineate the extent of the impacts. The supplemental sampling program was included in the approved 2012 SENES/FRANZ Workplan. Details regarding the supplemental sampling program methodology are included in the separate 2012 SENES/FRANZ Sampling Plan.

2.3 Indoor Air Sampling

One of the sources of risk to the theoretical ‘operations and maintenance worker’ identified in the DQRA was the vapour inhalation pathway. Volatile contaminants in soil and water can migrate to indoor air, creating increased risks to receptors; however, the models used in risk assessment are conservative, and do not consider many factors that have an impact on vapour intrusion into site buildings. Northern construction techniques and weather conditions add to the uncertainty.

A sampling plan to better quantify the potential risk to on-site operation and maintenance workers through the indoor air inhalation pathway should be completed. Both indoor air and a sub-slab vapour sampling program should will be completed as part of the 2012 field program and were included in the approved 2012 SENES/FRANZ Workplan. Details regarding the indoor air and a sub-slab vapour sampling methodology are included in the separate 2012 SENES/FRANZ Sampling Plan.

2.4 Former Fuel Storage Area (FFSA), west of Station Creek

A former fuel storage area, west of Station Creek, was identified as an area with hydrocarbon impacts in the 2006 Jacques Whitford Ltd. (JW) *HHERA for the Eureka HAWS: Final Report.* While the FFSA is outside the original scope of work outlined in the TOR, the 2006 JW HHERA recommended that Environment Canada should consider removing the impacted soil from this area to prevent the potential migration of the petroleum impacts into the marine environment. If a RAP is to be prepared for the HAWS, all known areas of impacts (including the FFSA) should be ideally included; however, SENES/FRANZ understands that EC does not wish to include the FFSA in the current RAP activities as it is considered the responsibility of another custodial department.

The analytical data collected in support of the JW HHERA was collected in 2006; the report indicates that there were PHC concentrations above the guidelines at that time. Through volatilization and biological degradation, PHCs concentrations in soil typically decrease over time; however this would be less pronounced in a northern environment where cold temperatures will slow down biodegradation processes.

The work at the former fuel storage area was not part of the initial scope of work and was not included in the 2012 SENES/FRANZ Workplan or budget.

If soil from the FFSA is to be included in the remedial action plan, additional samples from this area should ideally be collected to confirm the PHC concentrations observed by JW in 2006; however this is not absolutely necessary as it is unlikely PHC concentrations have changed significantly since 2006 and the impacts were reasonably well delineated. The data from the 2006 JW investigation should be adequate to include the FFSA impacted soils into a RAP, should EC decide to do so later.

2.5 AEC A

AEC A, which consists of nine separate sub-areas, was last assessed in the summer of 2008. The results of the assessment were part of the 2008 Phase III ESA report. Additional sampling at AEC A was not part of the initial scope of work and was not included in the 2012 SENES/FRANZ Workplan or budget.

Three areas within AEC A: AEC-A7 *Ex Situ* Biotreatment Cell, AEC-A8 Contaminated Soil Area, and AEC-A9 Former First Air Lease Area contained soil exhibiting concentrations of PHC parameters above the guidelines. Similar to the former fuel storage area west of Station Creek, if a RAP is to be prepared for the Eureka HAWS, all known areas of impacts should be addressed in the RAP. While it is desirable that soil samples from the three sub-areas of AEC A be collected again to confirm the PHC concentrations, as discussed above regarding the FFSA

soil impacts, PHC concentrations are unlikely to have changed significantly since 2008. The 2008 data, as well as data from previous studies, should be adequate to include AECs A7, A8 and A9 in the RAP. As for the potential presence of metals in soil in other areas it is not expected that these concentrations have changed since 2008, as metals do not degrade to any significant degree. The 2008 data for metals in soil should be considered to be still valid.

2.6 Vertical Delineation of Sediment Impacts

Sediment impacts in the drainage pond from near the road and down slope of the AEC B2 were identified in the previous investigations. The sediment samples were surficial samples and the depth of the PHC impacts is not known. Multi-depth sediment samples could provide more certainty as to the vertical extent of impacted sediment for the RAP. Additional sediment delineation was not part of the initial scope of work and was not included in the 2012 SENES/FRANZ Workplan or budget. SENES/FRANZ proposes to collect multi-depth samples from three locations within the impacted sediment area within the drainage area adjacent to the Powerhouse. Samples will be collected at two depths at three locations to achieve both horizontal and vertical delineation (i.e., 6 + 1 duplicate of BTEX/PHC F1-F4). The effort and cost to do this is considered to be nominal and can be absorbed within the current project budget and lab contingency.

2.7 Sampling for Borrow Source Assessment

As part of the RAP, a borrow source may be required to replace the excavated contaminated material or for land treatment facility (LTF) construction, if that is part of the final RAP. Potential borrow source areas should be identified in the 2012 field program in preparation for the RAP. Identification of potential borrow source areas was not explicitly part of the initial scope of work and was not included in the 2012 SENES/FRANZ workplan or budget; however, identifying borrow sources at Eureka is expected to be relatively low effort and straightforward as there should be ample sources within short distances and it is expected that facility personnel will already have identified borrow source areas that they regularly use. Much of the borrow source assessment will be based on discussions with facility personnel. To confirm the suitability of potential borrow sources, test holes will be excavated at one or two potential granular borrow areas. Soil samples will be collected for geotechnical analysis including water content and particle size distributions, as well as for the contaminants of concern (PHCs, metals). It is anticipated that the effort to collect soil samples will be nominal and the additional laboratory costs will be well within the laboratory contingency.

2.8 Sampling for Slope Stability Evaluation

PHC impacts west of the powerhouse in AEC D are along the top edge of the slope leading towards the drainage pond, and at the base of the slope. As excavating the accessible impacted soil is part of the remedial strategy, the stability of the slope and foundation construction of the powerhouse and adjoining building will be required to determine soil

excavation methodologies for the RAP. While the 2012 SENES/FRANZ workplan included slope stability evaluation and an assessment of acceptable excavation techniques, the preliminary RAP development identified the need for geotechnical tests in this area to support these assessments. Geotechnical sampling for the slope stability was not part of the initial scope of work and was not included in the 2012 SENES/FRANZ Workplan or budget; however, it is anticipated that the additional delineation testing in AEC D that was part of the approved scope will include sampling at least two test locations where these geotechnical samples can be collected. The other two sampling locations at the top of the slope can be completed with nominal additional time. It is expected that the geotechnical analysis can be absorbed within the laboratory contingency.

3.0 CLOSURE

If you have any questions or comments, please contact the undersigned at your convenience.

Sincerely,

SENES Consulting and Franz Environmental Inc.

Catherine LeBlanc, B.Eng.
Engineer-in-Training

Chris Ludwig, M.Eng., P.Eng., PMP
Principal

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APPENDIX G

Sampling Plan

August 7, 2012 Project 1570-1202

Public Works and Government Services Canada
5th Floor, Telus Plaza North - 10025 Jasper Avenue
Edmonton, AB Canada T5J 1S6

Attention: Edward Domijan, P. Eng.
Senior Environmental Engineer
Environmental Services, Western Region

Dear Mr. Domijan:

RE: Sampling Plan – Eureka High Arctic Weather Station (DFRP #07573, ARMS #00546)

SENES Consulting Ltd. (SENES) and Franz Environmental Inc. (FRANZ) are pleased to provide this sampling plan for the Eureka High Arctic Weather Station, Nunavut. This sampling plan was developed based on the document titled *Terms of Reference, Remediation Planning and Remedial Action Plan, Eureka High Arctic Weather Station, FY 11/12 and 12/13*, prepared by Environment Canada and dated March 2012 and the SENES/FRANZ *Workplan for Supplemental Investigation, Remediation Planning, and Remedial Action Plan, Eureka High Arctic Weather Station*, Nunavut dated June 14, 2012. Some additional sampling needs were identified in the data gap analysis, reported separately. This project was completed under PWGSC Northern Supply Arrangement Agreement Number EW699-100053/002/NCS, Call-up number EW699-123266/001/NCS, and Amendment # 1 and 2.

1.0 BACKGROUND AND PREVIOUS INVESTIGATIONS

In the summer of 2010 SENES/FRANZ were retained by Public Works Government and Services Canada (PWGSC) on behalf of Environment Canada (EC) to conduct monitoring activities and prepare a Detailed Quantitative Risk Assessment at HAWS. This work resulted in the following reports, which were reviewed as part of the sampling plan.

- *Detailed Quantitative Risk Assessment (DQRA), 2010 Monitoring Activities and Remedial Options Analysis,* SENES Consultants Ltd. and Franz Environmental Inc., March 2011. Prepared for Public Works Government Services Canada on behalf of Environment Canada (2010 DQRA)

The DQRA determined a potential unacceptable risk to the 'operations and maintenance worker' receptor identified in the risk assessment as well as a number of species of fauna which could possibly come into contact with contaminated soil and sediment. The report also stated that "All metals in soil, sediment and surface water are likely reflective of local conditions, as metal "impacts" were widespread, but no anthropogenic source was apparent". The 2010 DQRA report also noted that contamination around Building #17 (AEC D) and south of AEC D in the delta area were not fully delineated.

2.0 METHODOLOGY

2.1 Soil Sampling

Soil sampling will be conducted by either manual test pitting or with an excavator. Subsurface conditions encountered in the test pits will be logged at the time of excavation. Soil descriptions including approximate grain size, colour, moisture content, stratigraphy, and nature and extent of apparent contamination will be recorded for each unit. Vapour monitoring of the soil samples will be conducted in the field using a combustible gas detector (Eagle RKI, calibrated to hexane with methane elimination prior to use).

These procedures will be followed for soil sampling:

- In areas where contamination by hydrocarbons or solvents is expected, field volatile organic compound (VOC: Gastechtor) monitoring will be conducted throughout the depth of each test pit;
- Subsurface materials will be inspected, described and photographed;
- Representative composite samples will be collected from each soil horizon.

Vapour screening is frequently used to screen soil samples for the presence of volatile organic compounds, including petroleum hydrocarbons, and for selection of samples for subsequent laboratory analysis. Vapour screening involves partially filling a zippered bags with soil samples, then storing them at room temperature to allow headspace vapours to develop and equilibrate. Vapours are then measured using a combustible gas detector (Eagle RKI) calibrated to hexane with methane elimination or a photo-ionization detector (PID).

Once the samples have been collected, the soil will be placed in laboratory supply containers. The containers will be transferred to a cooler with ice to preserve the samples. Samples will subsequently be kept at the appropriate temperature prior to submission to the laboratories. All

sampling equipment will be decontaminated with Alconox prior to the collection of the subsequent sample.

2.2 Sediment Sampling

Sediment samples will be collected using a sediment core sampler or shovel. For each sample collected, a depth measurement, DGPS coordinates, and description of the sediment (including colour, odour, sheens, staining, water depth, grain size, sample recovery, and % natural organic material), the presence of debris, and any unusual characteristics will be recorded. Immediately after collection, the sediment will be transferred into laboratory supplied containers. The bottled sediment samples will be placed into a cooler with ice to minimize biological activity and associated chemical changes. Samples will subsequently be kept at the appropriate temperature prior to submission to the laboratories. All sampling equipment will be decontaminated with Alconox prior to the collection of the subsequent sample.

2.3 Surface Water Sampling

Surface water will be collected directly into laboratory supplied bottles by submerging the bottle under the surface of the water, removing the cap and allowing the bottle to fill, then recapping the bottle. Field parameters including pH, temperature, and conductivity will be measured using hand-held water quality meter, and recorded in field logs for inclusion in the this report. The containers will be transferred to a cooler with ice to preserve the samples. Samples will subsequently be kept at the appropriate temperature prior to submission to the laboratories. All sampling equipment will be decontaminated with Alconox prior to the collection of the subsequent sample.

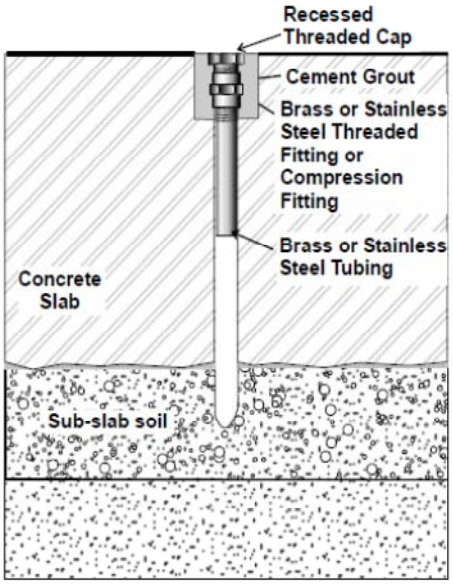
2.4 Indoor Air and Sub-slab Vapour Sampling

Samples will be collected from the breathing zone (i.e., above 1 m from the floor level) using a laboratory supplied 6 L SUMMA® Canisters with a 24-hour mass control value for each of the maintenance buildings (outlined in Table 3-3). Where buildings are raised on piles, a sample will be collected from the crawl space underneath the building where feasible.

Sub-slab samples will be collected to assess the vapour intrusion through the floor slab. Sub-slab vapour samples will be collected by installing vapour probes beneath the floor slab (see Figure 2-1 for installation details). The vapour probes consist of a brass nipple attached to a brass bushing, which is closed at the top with a brass nut. The vapour probes will be installed into the floor slab with a Bosch hammer drill using a 1/2” concrete boring bit. The field assessor will insert the 3/8” brass nipple assembly into the hole and fill the area around the assembly with concrete.

Before sampling, the vapour probes will be purged with Gilair pumps with low-flow attachments. The pumps for sub-slab probes will be calibrated to pump 50 mL/minute. The total purge volume will be three times the volume of the sub-slab sampling probes.

Figure 2-1: Sub-slab Vapour Installation



(From DiGiulio, Dominic; Paul, Cynthia and Mosley, Ron. 2006. *Development of a Sub-Slab Gas Sampling Protocol to Support Assessment of Vapor Intrusion.* United States Environmental Protection Agency.)

The Gilair pumps will be attached to the sampling train with low-density polyethylene (LDPE) t-joints. A ball valve will connect the pumps and the t-joint so that the pumps can be turned off without allowing any ambient air into the sampling train. Samples will be collected in 6 L stainless steel SUMMA® canisters. A sample of air from each vapour probe will be drawn directly from the sample tubing using a laboratory-calibrated valve/flow regulator calibrated for 20 minute sampling. The pre-evacuated SUMMA® canisters will be opened, enabling collection of time-weighted air samples.

Leak testing will be performed during the purge event on the sub-slab vapour sampling systems by covering the sampling apparatus and probe head with a large container (shroud) and allowing helium gas to enter the container. The concentration of helium within the shroud will be monitored using a helium detector. The final concentration of helium in the container will be compared to the helium concentration in the line going towards the sampling pump. If the helium concentration in the sampling line is greater than 10% of the helium detected within shroud, then the lines of the sampling set-up will be checked and the leak test performed again.

By having both indoor air and sub-slab/crawl space samples, the contribution of contamination in soil to indoor air quality can be assessed. Sampling indoor air alone in spaces where petroleum products are used in day to day operations may result in significant detected concentrations which may not necessarily be associated with soil contamination. In areas where breathing zone samples are to be collected, the station staff will be notified of the sampling event and any necessary restrictions required to prevent sample interference. The activities that are to be avoided prior to sampling are outlined in Appendix D of the TOR.

2.5 Quality Assurance/Quality Control

A quality assurance (QA) program is a system of documented procedures to be followed during a process or program, while quality control (QC) is a system of checks and verifications which validate the reliability of a data set. The most important aspect of field QA/QC is that samples are collected, transported, and stored using well documented procedures. The nature of environmental fieldwork is such that, over the course of a large sampling program, small deviations from ideal protocols sometimes occur. It is important that any such occurrences are documented to ensure the integrity of data, which is being used to draw vital conclusions about environmental impact or human health risk. SENES/FRANZ uses properly trained personnel that are well acquainted with the correct and necessary procedures.

The field QA/QC program will consist of the following elements:

- Field staff will follow pre-established FRANZ Standard Operating Procedures (SOPs) for soil, sediment, surface water and air sampling.
- Field staff will complete proper documentation of all aspects of the sampling program that could potentially cause sampling bias. The documentation will include daily field summary sheets, secure filing of field notes, completion of chain-of-custody forms, and memos written when any major deviation from ideal protocol occurs (e.g., an ice-pack melts, a bottle is broken, etc.).
- Field staff will decontaminate soil, sediment and surface water sampling equipment. All sediment sampling equipment in contact with soil/sediments will be cleaned with brushes (to remove soil) prior to each new sample collection.
- At least one blind field duplicate sample for every ten collected soil, groundwater, surface water and sediment samples will be submitted to the contract laboratory. These duplicates will be supplementary to any replicates analyzed as part of the standard lab QA/QC procedures.
- Blind field duplicates and trip spikes (especially for volatile PHCs F1 and BTEX) will also be analysed to ensure accuracy of results.
- Samples will be delivered to the laboratory as soon as possible following the sampling, either directly by our personnel or by courier to ensure that sample holding times are

respected. Samples will immediately be stored in coolers with ice packs to hold the sample temperature at approximately 4°C.

3.0 SAMPLING PROGRAM

3.1 Background Sampling

The objectives of the background sampling plan at the Eureka HAWS are to confirm that "all metals in soil, sediment and surface water are likely reflective of local conditions, as metal "impacts" were widespread, but no anthropogenic source was apparent". It is our opinion that a minimum of 10 samples for each media and contaminant of concern are required to achieve statistical significance and to establish representative background concentrations. It is proposed that soil, sediment, and surface water samples will be collected upgradient of the HAWS main camp area using an ATV to ensure that the samples are collected outside the area of human activity at the weather station. Prior to the samples being collected, the station staff will be consulted to make sure the area where the background samples are collected is outside the areas of regular human activity. Ten samples of each media (soil, sediment and surface water) will be collected and analyzed for metals.

A summary of the supplemental sampling plan is presented in Table 3-1 below.

Table 3-1: Proposed Supplemental Program

Media	Number of Samples	Analysis
Soil	10 + 1 duplicate	Metals and TOC
	3	Grain Size
Sediment	10 + 1 duplicate	Metals and TOC
	3	Grain Size
Surface Water	10 + 1 duplicate	Metals

3.2 Supplemental Main Camp Sampling Program

To ensure a comprehensive remedial strategy is developed, the area surrounding Building #17 (AEC D) and the delta area require additional investigation as they have not been fully investigated and delineated. The chemicals of concern identified in the previous investigation were PHC F1 and F2, and PAHs. Metals and PAHs were tested previously at AEC D, and metals were screened out of the DQRA and ERA; however, SENES/FRANZ is recommending adding these parameters to a select number of samples to confirm that metals and PAHs are not an issue. Two test pit locations will be east of Station Creek to confirm if there are any impact from the former fuel storage area on the west side of Station Creek. A summary of the proposed supplemental sampling plan is presented in Table 3-2 below.

Table 3-2: Preliminary Proposed Supplemental Program

Location	Number of Locations	Number of Samples	Analysis
Building #17	12	24 + 2 duplicate (1 surface (0-0.15 m), 1 deep (0.5-1.0 m) 10 + 1 duplicate	PHC F1 & F2 PAHs (worst case) & metals (composite)
Delta	8	16 + 2 duplicate (1 surface (0-0.15 m), 1 deep (0.5-1.0 m) 10 + 1 duplicate	PHC F1 & F2 PAHs (worst case) & metals (composite)

Soil samples will be collected using a combination of backhoe excavation, where availability of the equipment permits, and hand excavation using a stainless steel shovel.

3.3 Indoor Air Monitoring Program

To assess the risk to operational and maintenance works from soil vapour intrusion in the operation and maintenance buildings, SENES/FRANZ will conduct an indoor air and sub-slab vapour sampling program. A summary of sampling locations for the indoor air monitoring program is presented in Table 3-3 below.

Table 3-3: Proposed Supplemental Program

Location	Number of Samples	Analysis
Pumphouse	2 x 24 hr Summa + 1 duplicate (1 indoor, 1 crawlspace)	BTEX/PHC F1/F2
New Garage	1 x 24 hr indoor Summa 1 x 20 min subslab Summa	BTEX/PHC F1/F2
Old Garage	1 x 24 hr indoor Summa 1 x 20 min subslab Summa	BTEX/PHC F1/F2
Former Bunkhouse	1 x 24 hr indoor Summa 1 x 20 min subslab Summa	BTEX/PHC F1/F2
Building #17	1 x 24 hr indoor Summa 1 x 20 min subslab Summa	BTEX/PHC F1/F2
Old Transient Barracks	1 x 24 hr indoor Summa 1 x 20 min subslab Summa	BTEX/PHC F1/F2

3.4 Summary of Recommended Sampling to Address Data Gap Analysis

The data gap analysis identified the following recommended additional sampling items:

Vertical Delineation of Sediment Impacts. SENES/FRANZ proposes to collect multi-depth samples from three locations within the impacted sediment area in the drainage area adjacent to the Powerhouse. Samples will be collected at two depths at three locations using a sediment core sampler to achieve both horizontal and vertical delineation (i.e., 6 + 1 duplicate of BTEX/PHC F1-F4). The effort and cost to do this is expected to be nominal and can be absorbed within the current project budget and lab contingency.

Potential Borrow Source Sampling: To confirm the suitability of potential borrow sources, test holes will be excavated at one or two potential granular borrow areas identified through discussions with facility personnel. Soil samples will be collected for geotechnical analysis including water content and particle size distribution, as well as the contaminants of concern. It is anticipated that the effort to collect soil samples will be nominal and the additional laboratory costs will be within the laboratory contingency.

Geotechnical Samples for Slope Stability Analysis: PHC impacts west of the powerhouse in AEC D are along the top edge of the slope leading towards the drainage pond, and at the base of the slope. As excavating the accessible impacted soil is part of the expected remedial strategy, the stability of the slope and foundation construction of the powerhouse and adjoining building will be required to determine soil excavation methodologies for the RAP. The 2012 SENES/FRANZ workplan included slope stability evaluation and an assessment of acceptable excavation techniques; however, geotechnical sampling for the slope stability was not part of the initial scope of work. It is anticipated that the additional delineation testing in AEC D that was part of the approved scope will include sampling at least two test locations where these geotechnical samples can be collected. The other two sampling locations at the top of the slope can be completed with nominal additional time. It is anticipated that the additional laboratory costs will be within the laboratory contingency.

4.0 ANALYSIS

4.1 Contract Laboratory and Chemical Analysis

All chemical analysis will be completed by PWGSC's contract laboratory, Maxxam Analytics, a lab certified by the Canadian Association of Environmental Analytical Laboratories (CAEAL). The proposed laboratory program will include verification that the selected analytical methods will have minimum detection limits which are less than the applicable environmental quality criteria or standards on which the numerical comparisons will be based.

4.2 QA/QC Analysis – Field Duplicates

To assess the reliability of the laboratory data, 10% QA/QC samples will be collected for soil, surface water and sediment. One indoor air duplicate sample will also be collected.

For the duplicate, the relative percent difference (RPD) will be 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. The duplicate results were evaluated using criteria developed by Zeiner[1], which draws from several data validation guidelines developed by the United States Environmental Protection Agency. According to these criteria, the RPD for duplicate samples should be less than 20% for aqueous samples, and less than 40% for solid samples. 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'). A full description of the criteria is provided in Table 4-1.

Table 4-1: Criteria for the Evaluation of Duplicate Sample Results

Result A	Result B	Criteria for Acceptable Precision	
		Aqueous (water)	Solid (soil)
Organic			
nd	nd	acceptable precision, no evaluation required	
nd	positive	result B - 0.5 x QL < QL	result B - 0.5 x QL < 2 x QL
positive and > 5 x QL	positive and > 5 x QL	RPD < 20%	RPD < 40%
positive and < or = 5 x QL	positive	|result B - result A| < QL	|result B - result A| < 2 x QL
Inorganic			
nd	nd	acceptable precision, no evaluation required	
nd	positive	result B - IDL < LRL	result B - IDL < 2 x LRL
positive and > 5 x LRL	positive and > 5 x LRL	RPD < 20%	RPD < 40%
positive and < or = 5 x LRL	positive	|result B - result A| < QL	|result B - result A| < 2 x QL

Source: Zeiner, S.T., 1994

Notes:
nd – not detected
QL – quantitation limit
IDL – instrument detection limit
LRL – laboratory reporting limit
RPD – relative percent difference, $\frac{|X_1 - X_2|}{X_{average}} \times 100$

4.3 QA/QC Analysis – Laboratory

Laboratory QA/QC will be provided by the project laboratory, and will be evaluated by SENES/FRANZ. Typically, laboratory QA/QC consists of the techniques outlined in the following

[1] Zeiner, S.T., *Realistic Criteria for the Evaluation of Field Duplicate Sample Results*, Proceedings of Superfund XV, November 29-December 1, 1994, Sheraton Washington Hotel, Washington, D.C.

sections. This discussion is adapted from the Maxxam Analytics QA/QC interpretation guide[2]. All of the following laboratory QA/QC techniques are conducted at a rate of one per twenty field samples, with the exception of surrogate recovery, which is run for every organic sample. This internal laboratory QA/QC testing is part of standard laboratory operating procedures, with the costs borne by the laboratory.

4.3.1 Method Blank

A method blank is a control sample, free of the target parameters and of any substance which may interfere with that analysis. The method blank is processed through the entire analytical method including any extraction, digestion or any other preparation procedure. One method blank is run for every twenty field samples.

The method blank monitors background levels of target analytes introduced by the analytical process. Where concentrations of analytes in the method blank are found above the reportable detection limit, or greater than five times the method detection limit, the laboratory should repeat the analysis for all samples in the batch.

4.3.2 Blank Spike

A blank spike is a laboratory control sample free of target analytes and interferences, which is fortified with a known concentration of target analytes. The blank spike is processed through the entire analytical method including any extraction, digestion or any other preparation procedure. Results are expressed as a percentage recovery.

The blank spike monitors analyte recovery and potential loss during the preparation procedures, and serves to validate the calibration of the instrumentation or technique.

4.3.3 Matrix Spike

A second aliquot from a randomly chosen sample is fortified with a known concentration of target analytes. The sample is processed through the entire analytical method. Results are expressed as a percentage recovery.

The matrix spike evaluates any “matrix effects” caused by sample composition that may affect the recovery of analytes. One example of a matrix effect is the presence of peat in soils which tends to adsorb analytes such as benzene resulting in a poor matrix spike recovery. When matrix spike recoveries are below laboratory-acceptable standards, FRANZ will re-examine other analytical data to determine whether the laboratory analysis underestimates the potential for the presence of contaminants of concern.

[2] Maxxam Analytics. *Environmental QA/QC Interpretation Guide*. June, 2008. Available on request.

4.3.4 Laboratory Duplicate

A laboratory duplicate is a second aliquot from a randomly chosen sample within an analytical batch processed through the entire analytical method. Similarly to the field duplicate, laboratory duplicates are expressed as the Relative Percent Difference between the two results.

The laboratory duplicate evaluates analytical precision and sample homogeneity at the laboratory, in the same way that the field duplicate evaluates the sampling methodology in the field. Values outside laboratory-acceptable limits indicate poor homogenization or problems with analysis.

4.3.5 Certified Reference Material

Certified reference materials are purchased samples that have been certified by a recognized agency to contain specified levels of selected constituents, when measured by specified standard procedures. Results are expressed as a percentage of the design value.

These materials are used for validating the performance of a method including precision, extraction/digestion efficiency. Certified reference materials and matrix spikes provide similar evaluations of laboratory QA/QC and may be substituted for each other.

4.3.6 Surrogate Recovery

Surrogates are compounds that have similar characteristics to analytes of interest but are not normally found in nature. Known surrogate concentrations are added to samples prior to analysis and recoveries are calculated and expressed as a percentage.

Surrogate recovery monitors the efficiency of organic extractions, instrument performance and provides within-run quality control.

4.4 Post-Field Reporting

A brief, memo format, field report will be issued to PWGSC no later than two weeks after the receipt of the analytical results (electronic only). The field report will summarize the activities partaken at the site and an initial comment on the laboratory analytical results.

5.0 CLOSURE

If you have any questions or comments, please contact the undersigned at your convenience.

Sincerely,

SENES Consulting and Franz Environmental Inc.

Catherine LeBlanc, B.Eng.
Engineer-in-Training

Chris Ludwig, M.Eng., P.Eng., PMP
Principal

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