# Long Term Monitoring, 2011
# Cape Christian, Nunavut

**FINAL REPORT**

Prepared for:

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Project No. 1697-1101
January 17, 2012

## EXECUTIVE SUMMARY

FRANZ Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada (AANDC) to conduct the first of eight long-term monitoring events planned at the former Long Range Navigation (LORAN) communication station, Cape Christian. Monitoring of the site is to be delivered in three phases over the next 25 years, as prescribed by AANDC's Cape Christian Long-Term Monitoring Plan. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01, file number 1632-11/01-11-6001/5.

The Cape Christian site is situated on a lowland costal bluff located on the northeast coast of Baffin Island about 16 km northeast of the Hamlet of Clyde River, Nunavut. The site was a former US Coast Guard Long Range Navigation communication station constructed and operated between 1954 and 1974 when it was abandoned. A remediation project led by AANDC was conducted between 2008 and 2011. Hazardous wastes were removed from the site, buildings were demolished and, site debris was collected. All non hazardous debris, demolition waste and contaminated soils were placed in a non-hazardous waste landfill (NHWL) constructed on-site.

Monitoring efforts were conducted on August 24, 2011 while based out of Clyde River. The landfill monitoring program consisted of a visual inspection of the NHWL. In addition, the natural environment was monitored; physical evidence and anecdotal evidence and information suggest that wildlife and local hunters continue to frequent this site, primarily due to its proximity to Clyde River.

Overall, physical observations suggest that the NHWL is in very good condition and performing as designed to contain the enclosed waste. Minor areas of settlement were observed near the landfill to the north and east, and some minor settlement was also noted at the toe of landfill along the north, south, and west sides. These settlement areas ranged from about 5 $m^2$ to 85 $m^2$. Two sink holes (0.8 $m^3$ and 1.6 $m^3$) were observed near the NHWL along the west side, and minor settlement cracks were observed near the northwest corner of the NHWL. The settlement features noted are considered to be of little consequence at the present time.

In addition to physical observations, FRANZ collected soil and groundwater samples to assess the performance of the NHWL. Analytical results for soil samples collected in the vicinity of the NHWL satisfy applicable guidelines for contaminants of potential concern at the site. As no historical groundwater data was available, concentrations of contaminants of concern in groundwater samples were compared to the average concentration from the four wells.

The road leading to the Cape Christian LORAN site was in poor condition with large ruts filled with standing water. The site is only accessible by all terrain vehicle, as damage from machinery and weathering has rendered the road impassable by traditional road vehicles.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 10.0.

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## 1.0 INTRODUCTION

Franz Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada – Nunavut Regional Office (AANDC) to conduct long-term monitoring activities at the former Long Range Navigation (LORAN) communication station at Cape Christian. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01; file number 1632-11/01-11-6001/5.

This report describes the monitoring activities completed for AANDC at Cape Christian and was prepared in accordance with the FRANZ Proposal No. P-3756, dated June 30, 2011, the Call-up Details, dated July 11, 2011 and the Project Initiating Meeting Minutes, dated July 19, 2011.

Throughout this report the AANDC LORAN site Cape Christian will be referred to as "the Site".

### 1.1 Project Objectives

The objective of the 2011 Long-Term Monitoring (LTM) was to complete the first-year monitoring program at the Cape Christian site as described in the Cape Christian LTM plan. This included visual observations, chemical analyses (where warranted and possible) and interviews with members of the nearby community knowledgeable of local activities at the site to determine the condition of the natural environment and whether the site infrastructure is performing as designed.

### 1.2 Scope of Work

The scope of work as described in the 2009 Cape Christian LTM plan was as follows:

1. Visual Monitoring of the Non-Hazardous Waste Landfill (NHWL), including
   - Visually checking the physical integrity of the NHWL and looking for evidence of settlement, erosion, frost action, animal burrows, vegetation, staining, vegetation stress, seepage points, exposed debris, and the condition of wells; and
   - Taking photographs to document the condition of the NHWL and substantiate the recorded observations.
2. Active Layer Water Monitoring, including
   - The collection of samples from the 4 monitoring wells installed around the NHWL. These samples were to be analysed and the results compiled in table form for future comparison.
3. Soil Monitoring (as required)
   - Soil sampling was to be limited to locations where seepage or staining was identified as part of the visual inspection.

4. Natural Environment Monitoring, including
   - The collection of direct and indirect evidence of wildlife presence and activity; and
   - Making observations regarding the re-vegetation of disturbed areas.
5. Preparation of a 2011 monitoring program report.

The following tasks were assessed as necessary to fulfill the scope:

a) Review of the Cape Christian LTM Plan and the AANDC Abandoned Military Site Remediation Protocol;
b) Preparation of a health and safety plan;
c) Preparation of a sampling plan for soil and groundwater;
d) Collection of water level data and observation of monitoring well conditions at the site;
e) Visual inspection, measurement, and photo documentation of the site;
f) Interviewing local residents and officials to understand land use and wildlife trends; and
g) Reporting.

## 2.0 BACKGROUND INFORMATION

### 2.1 Site Description

According to AANDC's Cape Christian LTM plan, from 1954 to 1974, the United States Coast Guard operated a Long Range Navigation (LORAN) communications station at the Cape Christian site. The station was comprised of five (5) buildings: the main station, garage, hazmat building, terminal building, and the survival hut. Six (6), Aboveground Storage Tanks (AST) (102,600L each) with associated piping for fuel transfer and storage were also part of the station infrastructure. In addition, a number of barrels containing various petroleum, oils, lubricants (POL), and other chemicals were also supplied to the station during its years of operation. Used barrels were buried or partially buried at the site.

The site was abandoned in 1975 without decommissioning. While some remedial works were carried out at the site by different federal and provincial government teams, after it was abandoned, there were still significant environmental concerns at the site, prompting remediation by AANDC. AANDC led the remediation of the site between 2008 and 2011. The remediation involved removal and off-site disposal of hazardous materials, demolition of buildings and structures, excavation of non-hazardous metals and petroleum hydrocarbon contaminated soils, and clean-up of other site debris All of the non-hazardous wastes were placed in a non-hazardous waste landfill (NHWL) constructed on-site for that purpose.

The NHWL was constructed at the site between 2009 and 2010, and was closed in 2010. It was designed to contain non-hazardous materials. Based on reference to the 1:5000 basemap topographic contour lines as viewed on the INAC spatial database, GeoViewer v1.0.49, the landfill is situated at approximately 25 m asl. AMSRP generic design plans for NHWLs describe construction on natural ground surface with the organic matter stripped, and consisting of four perimeter berms constructed of granular material. It is assumed that the non-hazardous waste at Cape Christian was placed in the landfill in layers consisting of 0.5 m lifts of waste covered by 0.15 m of granular fill, that the waste layers were compacted, and that a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill, as per the AMSRP. The cap of the NHWL at Cape Christian was armoured with large cobble and boulders to provide additional protection against weathering. The NHWL contains the following:

- Tier I contaminated soil (i.e., soil with lead content up to 500 parts per million (ppm) and PCB content up to 5 ppm)
- Petroleum hydrocarbon fractions F3 and F4 contaminated soil
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal
- Non-hazardous site debris, such as scrap metal and wood
- Non-hazardous debris/soil excavated from landfills
- Creosote timbers

- Double-bagged asbestos

The site is not regularly inhabited; in addition, wells at the site would tend to freeze due to the presence of permafrost, therefore groundwater is not considered to be used for water supply purposes. The area is reported to be used by hunters and fishermen. Interviews with residents of the nearby hamlet of Clyde River suggest that hunting is still popular in the area. Fishing and whaling in the area are considered good.

## 2.2 Previous Monitoring Programs

The 2011 monitoring program was the first of the proposed monitoring schedule for the site.

The post construction landfill monitoring frequency will follow the schedule recommended in the INAC AMSRP (2009). The three phases recommended by the protocol are:

- Phase I: years 1, 3 and 5.
- Phase II (*if required*): Years 7, 10, 15 and 25
- Phase III (*if required*): beyond 25 years

The monitoring program will conclude if after Phase I monitoring (5 years post remediation) an evaluation of the program confirms that there are no stability or environmental issues. Otherwise, monitoring will continue into Phase II. (i.e., up to 25 years post remediation). Another evaluation will be conducted at the end of 25 years to determine if monitoring should be concluded or enter phase III. If required, the Phase III monitoring requirements will be determined based on results of the previous monitoring program evaluations.

To become familiar with the site, FRANZ reviewed the following reports pertaining to the LORAN and DEW Lines sites:

- Cape Christian Long-Term Monitoring Plan, February 10, 2009, AANDC (Formerly INAC); and
- Abandoned Military Site Remediation Protocol, December 2009, Indian and Northern Affairs Canada (now AANDC), Contaminated Sites Program.

# 3.0 REGULATORY AND OTHER GUIDELINES

## 3.1 Guideline Review

Where guidelines were developed, criteria presented in the Abandoned Military Sites Remediation Protocol (AMSRP), Volume I – Main Report (INAC, 2009) were used to compare both soil and groundwater analytical results. Federal and select provincial guidelines were applied where site-specific criteria were absent and/or were less strict than the federal and provincial standards.

Soil analytical results were compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines, specifically the *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CSQGs) and the *Canada-Wide Standards for Petroleum Hydrocarbons in Soil* (CWS-PHC). These guidelines are applied to most federal contaminated sites. The guidelines are numerical limits intended to maintain, improve or protect environmental quality and human health at contaminated sites. They are derived using toxicological data and aesthetic considerations.

The CSQGs (CCME, 1999) are a subsection of the Canadian Environmental Quality Guidelines. The CSQGs are derived to approximate a no- to low- effect level (or threshold level) based only on scientific data, including toxicology, fate, and behaviour. The CSQGs are based on direct contact, ingestion, and inhalation toxicity data, and were developed to protect receptors exposed indirectly to contaminants of concern. Fact sheets are provided for 32 compounds. The benzene, toluene, ethylbenzene and xylenes fact sheets were used to obtain regulatory criteria for this report.

The CWS-PHC (CCME, 2008a) provide criteria for petroleum hydrocarbons in soil. These numerical standards are based on the assessment and consistent management of risks posed to humans, plants, animals and environmental processes under four common land uses (agricultural, residential/parkland, commercial and industrial). Under Tier 1 of the CWS, specific numerical levels are presented for the four land uses, two soil textures (coarse and fine) and the four defined petroleum hydrocarbon fractions (F1 ($nC_6$-$nC_{10}$); F2 ($nC_{10}$-$nC_{16}$); F3 ($nC_{16}$-$nC_{34}$) and F4 ($nC_{34}$+)).

The CWS-PHC also include the option to generate Tier 2 levels where site-specific information indicates that site conditions exist that modify human or ecological exposure to PHC contamination. Such conditions may alter risks significantly relative to the generic conditions that were used to derive Tier 1 levels. A third tier in the CWS-PHC involves developing site-specific cleanup levels and management options using general and site-specific information gathered by conducting a risk assessment.

The Cape Christian former LORAN site is a federal site located on land owned by the Municipality of Clyde River and is therefore exempt from territorial regulation; however, the future disposition of the site may make it subject to territorial environmental guidelines. Because the Nunavut environmental guidelines are based on the work of the CCME, the federal and territorial guidelines often coincide.

The governing guideline for soil at contaminated sites in Nunavut is the *Environmental Guideline for Contaminated Site Remediation* (EGCSR), published by the Government of Nunavut in March, 2009. The criteria for Petroleum Hydrocarbons (PHC) in soil are found in Section 2.4, and are adapted from the CCME's CWS-PHC. The criteria for other compounds in soil are found in Table A-4 of Appendix 4 of the EGCSR, and are obtained from the CSQGs, published in the *Canadian Environmental Quality Guidelines* (CCME, 1999, updated 2007). The criteria are numerical limits intended to maintain, improve or protect environmental quality and human health at contaminated sites. Because the EGCSR is based on federal standards and has been updated recently, FRANZ does not anticipate discrepancies between the federal standards applied to the site and the Nunavut guidelines.

## 3.2 Groundwater

There were no groundwater guidelines provided in the Cape Christian LTM plan. In the absence of site-specific guidelines, the AMSRP guidance on post-construction monitoring indicates that "comparison to background and baseline values is recommended." The AMSRP provides the following table for the assessment of analytical data in groundwater.

Table 3-1: Groundwater Assessment

| Geochemical Assessment | Acceptable | Marginal | Significant | Unacceptable |
|---|---|---|---|---|
| Groundwater concentrations within average ± three standard deviations or within analytical variability | Performing as expected | | | |
| Increasing trend in contaminant data over 2 or more successive monitoring events (variation in excess of average ± three standard deviations or analytical variability) | | Low risk of failure | | |
| Groundwater concentrations in excess of three times average baseline concentrations in more than one monitoring event | | | Moderate risk of failure | |
| **Where applicable**, surface water concentrations in excess of surface water quality guidelines for the protection of aquatic life | | | | Failure |

| Geochemical Assessment | Acceptable | Marginal | Significant | Unacceptable |
|---|---|---|---|---|
| **Required Actions** | Monitor as per schedule | Increase monitoring frequency. Monitor surface water quality, if applicable, in downgradient water bodies within 300 m. | Assess causes of increasing contaminant concentrations. Evaluate whether remediation is required. | Assess cause of contaminant concentrations. Develop remedial plan. Implement remedial plan. |

This table is reproduced from AMSRP Chapter 11, Table 4.2

Since this is the first year for the long-term monitoring plan to be implemented at Cape Christian, FRANZ does not have any historical or baseline data to obtain the mean and standard deviations for comparison to the analytical results obtained in during the 2011 monitoring activities presented in this report. Instead, the average concentration of each parameter was calculated using the results from all of the wells sampled, as has been done at other DEW line sites lacking post construction baseline data. The duplicate was not included in the average calculation. If the result was a non-detect, it was converted to the detection limit for the purpose of the average calculation.

### 3.3 Soil

The soil standards or guidelines adopted for this evaluation are as follows:

- Abandoned Military Sites Remediation Protocol (AMSRP), Volume I – Main Report (INAC, 2009).
- *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* (CCME, 1999, with updates) for residential/parkland use, including fact sheets for benzene, toluene, ethylbenzene, and xylenes. Non-potable groundwater is stipulated and coarse grain material is assumed based on a 2009 grain-size analysis, field observation (generally sandy material) as well as for conservative reasons – being that coarse grain criteria are more stringent than those applied to fine grain.
- *Canada-Wide Standards for Petroleum Hydrocarbons in Soil* (CCME, 2008a) - Tier 1 Residential/Parkland, coarse-grained soil, non-potable groundwater.

As a preliminary and conservative determination of protection of human health and the environment at the site, Tier 1 levels of the CWS are applied to all analytical results where site specific values are not specified. The appropriate levels are presented with the laboratory analytical data in tables. The rationale for the selection of the appropriate criteria is discussed below.

*BTEX Compounds*

For the BTEX compounds specifically, the CSQGs were used to determine the appropriate pathway-specific guidelines. For benzene, for example, the 2004 update was used, with the following assumptions:

- Residential/Parkland land use
- Coarse-grained soils
- $10^{-5}$ acceptable incremental risk
- With applicable guidelines the most conservative of:
  - Soil dermal contact guideline
  - Soil ingestion guideline
  - Eco soil contact

The groundwater check (drinking water) pathway was excluded, as groundwater in the area of Cape Christian is not used as a source of potable water. With its exclusion, the most conservative guideline for benzene applicable at the site is related to the protection of the pathway for the inhalation of indoor air (slab on grade), at 0.095 mg/kg; however, there are no buildings near the NHWL. The most conservative remaining guideline is therefore the ecological soil contact guideline, at 31 mg/kg. A similar process was used to determine the most conservative applicable guideline value for toluene, ethylbenzene and xylenes.

*Petroleum Hydrocarbons*

For petroleum hydrocarbons, the CWS-PHC was used to determine the appropriate pathway-specific guidelines. Pathway-specific guidelines can be found in the CWS-PHC Technical Supplement (CCME, 2008c).

## 4.0 INVESTIGATIVE METHODOLOGY

The monitoring program was carried out at the Cape Christian LORAN site on August 24, 2011. During the field investigations, weather conditions consisted of rainy periods, drizzle and light wind with temperatures between 3 and 4 degrees Celsius. The program consisted of the following:

- Completing a Health & Safety kick-off meeting;
- Visually observing and photographically documenting the physical integrity of the landfill;
- Collection of ground water samples from existing wells;
- Collection of soil samples; and
- Gathering information through first hand observation as well as through knowledgeable persons regarding local wildlife and human activity.

The field investigation procedures are described below.

### 4.1 Health & Safety Plan

Before commencing with site activities, a site-specific health and safety plan (HASP) was developed. The HASP identified and provided mitigative actions for potential physical and chemical hazards associated with the monitoring work. The HASP also contained a listing of emergency contact numbers and provided protocols to follow in the event of an emergency.

A copy of the HASP was presented to AANDC for review and approval before site activities began. This plan was distributed and discussed with all personnel involved in the investigative program prior to conducting any work on-site. A copy of the HASP has been retained on file at FRANZ and in the AANDC Nunavut Regional Office.

### 4.2 Visual Inspections

The physical integrity of the NHWL and surrounding areas were assessed using systematic visual observations and empirical measurements to record evidence of erosion, ponding, frost action, settlement and lateral movement of the landfill. A visual monitoring checklist, presented in the LTM plan, was completed for the landfill. A photographic record was completed to document the condition of the structures and substantiate the visual observations. A portion of this photographic record appears in Appendix F; and is presented in its entirety on the accompanying CD ROM.

The 2011 visual inspection was conducted with the aid of a Trimble Pro XRT GPS unit to locate features of note and to collect GIS information to be used in report preparation A detailed data dictionary (Trimble file) was created prior to the site visit to capture all required information as outlined in the long-term monitoring plan. An SSF file and the data dictionary (Trimble files) is included in the appended CD ROM to be used in future site investigations.

## 4.3 Wildlife Survey

FRANZ made observations of the natural environment at the time of the site visit and recorded these observations in field notes. Observations included direct sightings of wildlife, other evidence of wildlife (e.g., droppings, tracks, feathers/fur), wildlife activities (migrating, nesting, etc.), numerical estimates of wildlife, and vegetation observations.

As part of the investigation, a FRANZ representative interviewed people knowledgeable about surrounding areas. Land uses by humans and wildlife, as well as changes in use over previous years by each, were discussed and pertinent information is documented in this report.

## 4.4 Sampling

The groundwater and soil sampling methodology conformed to guidance provided in the following documents:

- CCME EPC-NCS62E *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites - Volume I: Main Report*, Dec 93 (CCME catalogue - http://www.ccme.ca/assets/pdf/pn_1101_e.pdf);
- CCME EPC-NCS66E *Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites - Volume II: Analytical Method Summaries*, Dec 93 (CCME catalogue - http://www.ccme.ca/assets/pdf/pn_1103_e.pdf);
- INAC *Cape Christian Long-Term Monitoring Plan* (INAC, 2009); and
- INAC *Abandoned Military Site Remediation Protocol*, Contaminated Sites Program (INAC, 2009).

### 4.4.1 Groundwater Sampling

Groundwater present in the active layer was sampled from the four monitoring wells installed around the NHWL. A Geopump brand peristaltic pump was used to purge the monitoring wells prior to sample collection. Wells were purged of three well volumes except where poor recharge rates made it necessary to sample sooner or not at all. During purging, a Horiba U-22 water quality meter was calibrated and used to measure in situ field parameters including temperature, conductivity, dissolved oxygen, turbidity, pH and oxidation-reduction potential. Sampling took place when these parameters stabilized. Water samples submitted for total metals analyses were not field-filtered.

A summary of the samples that were collected and submitted for laboratory analysis during the groundwater sampling activities is provided in Table 4-1 below. Groundwater sample logs are included in Appendix C.

Table 4-1: Summary of groundwater sample collection near the NHWL.

| Sample | Analytical Parameters |
|---|---|
| MW-1 | - total and dissolved metals<br>- PCBs<br>- petroleum hydrocarbon fractions F1-F4 and BTEX<br>- inorganics (major ions, TDS, TSS, colour, pH, conductivity) |
| CEL-1* | |
| MW-2 | |
| MW-3 | |
| MW-4 | |

Note: * indicates a blind field duplicate of the sample listed directly above.

All samples were collected in laboratory prepared sample bottles appropriate for the specified analyses. Water samples for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Additional details on the groundwater sampling are presented in the groundwater sample records provided in Appendix C.

### 4.4.2 Test Pitting and Soil Sampling

Soil sampling was completed by manual test pitting. Three test pits, identified as CC1, CC2, and CC3 were manually advanced in the vicinity of the NHWL in areas of suspected staining. The background sample, CC4 was collected approximately 220 m southeast of the NHWL.

Test pitting was performed using a shovel, which was decontaminated with Alconox between sample collections. Surface soil samples were collected at a maximum depth of 0.15 m. Soil samples were collected from each test pit and placed in laboratory prepared jars for chemical analyses. Discrete soil samples and blind duplicates were collected as grab samples using disposable nitrile gloves for each sample. Fresh, sterile gloves were used at each sample location. Soil stratigraphy was logged and photos taken before backfilling the test pits with excavated soil.

A total of five soil samples were collected and submitted for laboratory analysis for petroleum hydrocarbons (PHCs) fractions F1-F4 and benzene, toluene, ethylbenzene and xylenes (BTEX) as well as metals and polychlorinated biphenyls (PCBs). One field duplicate sample (D1) was analyzed for QA/QC purposes. Professional judgment and visual observations were used to select the locations sampled and submitted for laboratory analysis. Samples submitted for laboratory analysis were stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

Test pit locations are indicated on Figure A-1; Appendix A and additional details on the soil samples collected are presented in the test pit logs provided in Appendix C.

### 4.5 Quality Assurance and Quality Control

Field personnel employed FRANZ's Quality Assurance/Quality Control (QA/QC) protocols, including appropriate techniques for soil sampling, sample storage, shipping and handling, as well as collection of duplicates. Additional discussion of QA/QC methodology is provided in Appendix E.

#### 4.5.1 Field

Soil samples collected for potential laboratory analysis were placed in polyethylene bags and laboratory prepared 125 mL glass jars fitted with screw-tight Teflon-lined lids. Groundwater samples were collected from monitoring wells and placed in a variety of appropriately sized and prepared laboratory vessels. Sample numbers were clearly marked on the containers. The soil jars and water bottles were filled to capacity with minimum headspace and stored in coolers with cold packs to moderate temperature fluctuations during transport to the laboratory. To prevent cross contamination, samples were collected with fresh nitrile gloves. Where soil samples were impossible to obtain by hand, a stainless steel trowel or shovel was used and decontaminated between samples.

As a quality control measure, one soil and one groundwater blind field duplicate samples were collected and analyzed for PHC fractions F1-F4, BTEX, metals and PCBs. The water samples were also analyzed for colour, pH, conductivity, total dissolved solids and major ions.

The samples were transported to the project laboratory accompanied by a Chain of Custody form. Copies of the Chain of Custody forms are provided in Appendix D.

#### 4.5.2 Laboratory

To assess the reliability of the laboratory data, duplicate samples were taken for approximately every five samples collected by FRANZ. One blind field duplicates were collected in the soil sampling program, and one blind field duplicate was collected in the groundwater sampling program.

For soil duplicates, FRANZ personnel generated the duplicate samples by alternately placing approximately 50 percent of the sample volume into the primary sample container and then placing the same amount into the duplicate container. Similarly, for duplicated water samples, field staff placed aliquots of approximately 50 percent of the container volume into each container until both containers were filled.

Analytical data quality was assessed by submission of the following:

- Soil samples CC3 (primary) and D1 (soil duplicate), were analyzed for petroleum hydrocarbons (PHC), polychlorinated biphenyls (PCBs) and metals.
- Groundwater samples MW-1 (primary) and CEL-1 (water duplicate) were analyzed for PHC, PCBs, metals, conductivity, pH, colour and temperature.

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

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

where: $X_1$ and $X_2$ 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 United States Environmental Protection Agency (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 (or method detection limit - MDL). Alternative criteria are used to evaluate duplicate pairs where one or both of the results are less than five times the MDL, or where one or both of the results is less than the MDL (i.e. nd or 'not-detected'). The alternative criteria used for the evaluation of the data, adapted from Zeiner (1994), are presented in Table 4-2 below. When both concentrations are less than the MDL, no calculation/evaluation criterion is required.

Table 4-2: 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 (MDL) or Reportable Detection Limit (RDL) in lieu of the Quantitation Limit (QL), the Instrument Detection Limit (IDL) and/or Laboratory Reporting Limit (LRL).

**Notes:**

nd – not detected

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

1. When result reported was less than half the quantitation limit, half the limit was used in the equation.

The precision is considered acceptable when the evaluation criteria are met or when both results are below the MDL. When the evaluation criteria are not satisfied, the following apply:

- nd vs. positive – unacceptable precision: the positive result is considered an estimate and the nd result is considered inconclusive.
- Positive vs. positive – unacceptable precision: the results are considered an estimate.

Refer to Appendix E for a discussion on QA/QC results.

### 4.6 Laboratory Analytical Program

Soil and groundwater samples were sent to Maxxam Analytics in Ottawa, Ontario for chemical analyses of the target compounds previously identified. Maxxam is certified by the Canadian Association for Laboratory Accreditation, Inc. (CALA) and has an internal QA/QC protocol. The laboratory QA/QC documentation is provided with the analytical report and was reviewed by FRANZ as part of the QA/QC protocol. The laboratory Certificates of Analysis and Chain of Custody forms are presented in Appendix D.

# 5.0 NON-HAZARDOUS WASTE LANDFILL (NHWL)

## 5.1 Area Summary

The NHWL is located in the Lower Site Landfill Area, between the Beach and Lake Areas of the Cape Christian LORAN site. Monitoring of the landfill included visual observations to assess its physical integrity including evidence of erosion, ponding, frost action, settlement and lateral movement. Groundwater was collected at locations up- and downgradient of the NHWL. Soil samples were collected in areas of staining near the NHWL and one background sample was collected for comparison purposes. The visual inspection report, including supporting photos and drawing, is presented in the following pages.

## 5.2 Photographic Record

The photographic record of the NHWL has been completed as per the Statement of Work (Photographs 1 to 76; CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix F. The complete record of full-resolution photographs is provided in the attached CD-ROM.

## 5.3 Visual Inspection Report

Monitoring consisted of visual observations and empirical measurements of the NHWL to assess its physical integrity. Evidence of erosion, ponding, frost action, settlement and lateral movement were investigated. A plan view of the NHWL indicating photographic viewpoints, observed salient features, and locations of ground water monitoring wells is presented in Figure A-1; Appendix A. The visual monitoring checklist provided in the Cape Christian LTM plan has been completed and is included in Table 5-3 of this report. Table 5-1 and Table 5-2 present the preliminary visual inspection results for the NHWL at Cape Christian.

Table 5-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill

| Feature | Presence (Y/N) | Severity Rating | Extent |
|---|---|---|---|
| Settlement | Y | Acceptable | Occasional |
| Erosion | N | Not Observed | None |
| Frost Action | N | Not Observed | None |
| Animal Borrows | N | Not Observed | None |
| Vegetation | N | Not Observed | None |
| Staining | N | Not Observed | None |
| Vegetation Stress | N | Not Observed | None |
| Seepage / Ponded Water | Y | Acceptable | Occasional |
| Debris Exposure | N | Not Observed | None |
| Monitoring Well Condition | Y | Good condition - Acceptable | |
| **Overall Landfill Performance** | **Acceptable** | | |

Table 5-2: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill - Definitions

| **Performance / Severity Rating** | **Description** |
|---|---|
| Acceptable | Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement. |
| Marginal | Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate. |
| Significant | Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent. |
| Unacceptable | Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include:<br>• Debris exposed in erosion channels or areas of differential settlement.<br>• Liner exposed.<br>• Slope failure. |
| | |
| **Extent** | **Description** |
| Isolated | Singular feature |
| Occasional | Features of note occurring at irregular intervals/locations |
| Numerous | Many features of note, impacted less than 50% of the surface area of the landfill |
| Extensive | Impacting greater than 50% of the surface area of the landfill |

Settlement

There were six areas of minor settlement observed at the toe of the landfill (see Features A, C, E, G, H, and K, Figure A-1; Appendix A). Three of these areas (A, G, and K) also had orange staining. Feature E did not contain ponded water, but the soil was fully saturated. These settlement areas do not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Six areas of ponded water were observed near the NHWL: Two were adjacent to the toe of the NHWL (see Features J and O, Figure A-1; Appendix A and Photographs 65 and 73 to 75; CD-ROM); three of these areas (see Features L, M, and N, Figure A-1; Appendix A and Photographs 67 to 72; CD-ROM) are likely the result of the equipment used to construct the NHWL. Water was pooled in what appear to be tracks left by the heavy equipment; though these three features are not believed to be the result of settlement, they are noted for comparison to future observations. A final area of depression has occurred northeast of NHWL in a drainage area with vegetation. The depression contained ponded water (see Feature I, Figure A-1; Appendix A and Photographs 63 and 64; CD-ROM).

These settlement and ponding areas do not appear to impact the structure of the landfill, or be a result of other impacts to the landfill structure.

Some minor settlement cracks were observed near the northwest corner of the NHWL (see Feature B, Figure A-1; Appendix A and Photographs 52 to 53; CD-ROM). Two sinkholes were observed near the toe of the NHWL (see Features D and F, Figure A-1; Appendix A and Photographs 55 and 59; CD-ROM). Neither of the sinkholes contained water during the site visit despite the rainy conditions.

There were no areas of settlement observed on the top the NHWL; however several areas of ponded water and saturated soils were observed on top of the landfill cap (see discussion on Page 18 for further details).

Erosion

No evidence of erosion was observed in the area of the NHWL.

Frost Action

Some minor cracking was observed surrounding the landfill on the native soils suggesting some minor frost action outside of the landfill extents. No evidence of any frost action on the landfill or the landfill berms was observed.

Evidence of Burrowing Animals

No evidence of burrowing animals was observed in the area of the NHWL.

Re-establishment of Vegetation

Based on the regional setting of this landfill and the very course materials used to construct the landfill cap, reestablishment of vegetation is likely to take a significant amount of time. No growth was observed on the top or sides of the landfill.

Staining

Several areas of orange staining were observed in the area surrounding the landfill (see Photographs 60, 61, and 63 to 75, CD-ROM). Soil was collected from around Features L, N, and O where the staining was observed. Similar orange staining was observed in areas away from the landfill and a soil sample was collected as a reference (see Photograph 76, CD-ROM).

Seepage Points

One potential seepage point was observed at the southwest corner of the NHWL. This feature was identified as feature E and did not contain any evidence of staining or product seepage from the landfill. This feature contained fully saturated soil. Feature E may alternatively be a

result of settlement, and is noted under that heading, but is also listed under this observation heading to track progress in future monitoring assessments.

Exposed Debris

No exposed debris was observed in the area of the NHWL.

Discussion

The features noted under this heading are currently considered to be of little consequence to the physical integrity of the NHWL. All physical observations indicate that the NHWL is performing as designed and is containing the enclosed waste. Care should be taken during future monitoring events to observe the condition of Feature E at the southwest corner of the NHWL for further evidence of settlement or potential seepage.

Although the overall performance of the landfill is presently considered acceptable, it was noted during the visual inspection that the grading of the landfill cap was poor, inconsistent, and did not appear to maintain a consistent grade. It was also observed that the landfill cap consisted of many different particle sizes (i.e., small cobbles to fines) and that, in many instances, the fines are being eroded away and washed into the voids created by the larger particles. The inconsistent grading and particle size selection has lead to many small undulations on the cap that may trap rain and melt water, potentially increasing the volume of water infiltration into the center of the landfill each year. This potential increase in water infiltration, over time, may cause excessive erosion, possible settlement issues, and potential seepage issues around the landfill perimeter in subsequent years.

Table 5-3 below summarizes the results of the visual inspection.

Table 5-3: Cape Christian – Visual Monitoring Checklist

| Checklist Item | Feature Letter | Relative Location | Length (m) | Width (m) | Depth (m) | Extent | Description (Change) | Additional Comments | Photo Reference |
|---|---|---|---|---|---|---|---|---|---|
| Settlement | A | 8 m south of the northwest corner of the NHWL | 22.7 | 0.8 | 0.02 | <1% | Ponded water with staining | Area of ponded water had orange staining | 51 |
| Settlement | B | 15 m south of the northwest corner of the NHWL | 11.8 | 0.03 | 0 | <1% | Minor settlement cracks | | 52-53 |
| Settlement | C | 23 m south of the northwest corner of the NHWL | 8.9 $m^2$ | | | <1% | Ponded water at toe of NHWL | | 54 |
| Settlement | D | 22 m south of the northwest corner of the NHWL | 0.8 $m^3$ | | | <1% | Sinkhole | Volume calculated using maximum depth | 55 |
| Settlement | E | Southwest corner of the NHWL | 66.4 $m^2$ | | | <1% | Possible seepage area | Fully saturated soil | 56-58 |
| Settlement | F | Southwest corner of the NHWL | 1.6 $m^3$ | | | <1% | Sinkhole | Volume calculated using maximum depth | 59 |
| Settlement | G | 6 m east of the southwest corner of the NHWL | 35.4 $m^2$ | | | <1% | Ponded water at toe of NHWL with staining | | 60-61 |
| Settlement | H | Northeast corner of the NHWL | 45.6 $m^2$ | | | <1% | Standing water, localized low point | | 62 |
| Settlement | I | 11 m northeast of the northeast corner of the NHWL | 14.6 $m^2$ | | | <1% | Drainage area with staining | Area of vegetation | 63-64 |
| Settlement | J | 20 m west of the northeast corner of the NHWL | 4.9 $m^2$ | | | <1% | Ponded water with staining | | 65 |
| Settlement | K | 13 m east of the northeast corner of the NHWL | 7.2 $m^2$ | | | <1% | Ponded water with staining | | 66 |
| Settlement | L | 22 m east of the northeast corner of the NHWL | 18.2 $m^2$ | | | <1% | Ponded water with staining may be due to equipment tracks | Soil sample CC2 collected from this area | 67-68 |
| Settlement | M | 32 m east of the northeast corner of the NHWL | 38.4 $m^2$ | | | <1% | Ponded water with staining may be due to equipment tracks | | 69-70 |
| Settlement | N | 15 m east of the southwest corner of the NHWL | 27.7 $m^2$ | | | <1% | Ponded water with staining may be due to equipment tracks | Soil sample CC1 collected from this area | 71-72 |
| Settlement | O | 21 m east of the southeast corner of the NHWL | 85.2 $m^2$ | | | <1% | Ponded water with staining | Soil sample CC3/D1 collected from this area | 73-75 |

## 5.4 Analytical Results – Groundwater Samples

As described in section 4.4.1, a total of five groundwater samples (four samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of petroleum hydrocarbons (PHCs), metals, PCBs and inorganic parameters. Analytical results are discussed below. The AMSRP Chapter 11 "Post-Construction Monitoring," suggests that analytical results be compared to the mean of previous data. The AMSRP indicates that where groundwater concentrations are within the range of the average ± three standard deviations, the landfill is performing acceptably. Historical analytical information was not available as this was the first round of long-term monitoring. Results were compared to the average of the parameter concentration of all the wells, not including the duplicate sample Should AANDC make additional (baseline) analytical data for the monitoring wells at Cape Christian available, Franz will include this data in future statistical analyses to increase the robustness of ground water monitoring analytical results interpretation.

*PHCs*

Concentrations for all parameters were below laboratory reportable detection limits (see Table B-1; Appendix B). The average concentrations were not calculated as all parameters were below the detection limit.

*Metals*

Total and dissolved metals concentrations in water sampled from MW-1 were all below the detection limit with the exception of arsenic, copper, and nickel. All metals parameters from MW-1 had concentrations below the average. (see Table B-2; Appendix B).

Water sampled from MW-2 had concentrations above the detection limit for total and dissolved arsenic, cadmium, cobalt, copper, nickel, and zinc. Total lead was also above the detection limit. The concentration of total and dissolved cobalt, copper, nickel, and zinc were above the average concentrations for those parameters, as were total arsenic and cadmium. All other metals concentrations were below the average (see Table B-2; Appendix B).

Water sampled from MW-3 had concentrations above the detection limit for total and dissolved cadmium, cobalt, copper, nickel, and zinc. Total chromium and total lead concentrations were also above the detection limit. Dissolved cadmium, total chromium, and total and dissolved copper concentrations were above the average (see Table B-2; Appendix B). All other metals concentrations were below the detection limit.

Water sampled from MW-4 had concentrations of cadmium, copper, nickel, and zinc above the detection limit (see Table B-2; Appendix B). The concentration of dissolved cadmium was above the average. All other metals concentrations were below the detection limit.

*PCBs*

The PCBs concentrations for all samples were below the detection limit (see Table B-3; Appendix B). Average concentrations and standard deviations were not calculated as all parameters were below the detection limit.

*Inorganics*

Water sampled from MW-1 had conductivity, total dissolved solids, fluoride, dissolved sulphate, and dissolved chloride concentrations above the average. All other parameters were below the average concentration (see Table B-4; Appendix B).

Water sampled from MW-2 had colour, conductivity, total dissolved solids, total suspended solids, and dissolved chloride above the average concentration. The pH of water in MW-2 was also lower than the pH of water from the other wells. Concentrations of all other parameters were below the average (see Table B-4; Appendix B).

Water sampled from MW-3 had concentration of total suspended solids, nitrate, and nitrate + nitrite above the average concentration. All other parameters were below the average concentration (see Table B-4; Appendix B).

Water sampled from MW-4 had dissolved sulphate above the average concentration. All other parameters were below the average concentration (see Table B-4; Appendix B).

Laboratory certificates of analyses for the 2011 groundwater samples are provided in Appendix D.

## 5.5 Analytical Results – Soil Samples

As described in section 4.4.2, a total of five soil samples (four samples plus one blind duplicate) were submitted to Maxxam Analytics in Ottawa, Ontario for analyses of PHCs, metals and PCBs. Analytical results are discussed below.

*PHCs*

Laboratory analytical results and selected provincial standards and federal guidelines for PHCs are shown in Table B-5; Appendix B. As shown in the table, most soil PHC concentrations were below the reportable detection limit. PHCs which were detected in samples were limited to the F2 and F3 fractions, with concentrations well below the selected standards and guidelines applied to the site.

*Metals*

Laboratory analytical results and selected federal and site specific criteria for metals are shown in Table B-6; Appendix B. As shown in the table, concentrations satisfied the guideline criteria applied to the site.

*PCBs*

Laboratory analytical results and selected federal guidelines for PCBs are shown in Table B-7; Appendix B. Neither provincial nor site-specific guidelines exist for PCBs and federal guidelines provide a criterion for total PCBs only. As shown in the table, concentrations satisfied the guideline criterion applied to the site.

Laboratory certificates of analyses for the 2011 soil samples are provided in Appendix D.

## 6.0 SURROUNDING AREAS

Due to poor weather conditions (rain), difficulty accessing the site, and time restraints on site, only a limited inspection of outlying areas on site could be observed during the 2011 monitoring event.

The road from Clyde River to Cape Christian was in poor condition with deep ruts filled with mud and standing water.

Areas surrounding the landfill site were visually scarred from the remediation activities of previous years and this past summer. The areas directly surrounding the landfill site were mostly void of vegetation due to the fore mentioned remediation activities. A low drainage area was present directly south of the landfill site and contained some flowing water, which eventually terminated at the ocean shoreline.

One building remained intact to the southeast of the landfill site and is presumed to act as an emergency shelter for trappers and hunters frequenting the area. Evidence of all terrain vehicle traffic was observed in the form of tracks on the roadways and tundra on-site, as well as on surrounding lands.

## 7.0 NATURAL ENVIRONMENT

Information regarding the natural environment was gathered directly through observation, and indirectly through consultation with knowledgeable local persons in order to better understand the presence and temporal change in human and wildlife use of the site. The Cape Christian Long-Term Monitoring Plan recommends monitoring the following parameters:

- Wildlife sightings
- Other evidence of recent presence of wildlife (e.g. droppings, tracks)
- Wildlife activity (e.g. nesting, migration)
- Qualitative assessment of relative numbers versus previous years
- Revegetation of disturbed areas versus previous years

Wildlife and Human Activity

According to Esa Qillaq, a community member of Clyde River, human activities at the site usually consist of hunting of ptarmigans, polar bear (depending on quota) and seals. Hunting for bowhead whales and narwhal occur along the coast. Only one or two wolves are in the area ever year and it was over three years ago since one was caught. Caribou are rare in the area. In the spring, geese are in the area.

During the site visit, the FRANZ field assessors observed evidence (e.g. scat, tracks or visual observation) that ravens, Canada geese, polar bears and ducks are present on the site.

Re-establishment of Vegetation

Based on the regional setting of this site and material used on the site, reestablishment of vegetation is likely to take a significant amount of time. No growth was observed on any of the regraded areas.

## 8.0 LIMITATIONS

This report has been prepared exclusively for Aboriginal Affairs and Northern Development Canada. Any other person or entity may not rely upon the report without express written consent from Aboriginal Affairs and Northern Development Canada.

Any use, which a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Franz Environmental Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Some of the information presented in this report was provided through existing documents and interviews. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, Franz Environmental Inc., in certain instances, has been required to assume that the information provided is accurate.

The conclusions presented represent the best judgment of the assessors based on current environmental standards and on the site conditions observed on August 24, 2011. Due to the nature of the investigation and the limited data available, the assessors cannot warrant against undiscovered environmental liabilities.

Should additional information become available, Franz Environmental Inc. requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

There is no warranty, expressed or implied that the work reported herein has uncovered all potential environmental liabilities, nor does the report preclude the possibility of contamination outside of the areas of investigation. The findings of this report were developed in a manner consistent with a level of care and skill normally exercised by members of the environmental science and engineering profession currently practicing under similar conditions in the area.

A potential remains for the presence of unknown, unidentified, or unforeseen surface and sub-surface contamination. Any evidence of such potential site contamination would require appropriate surface and sub-surface exploration and testing.

If new information is developed in future work (which may include excavations, borings, or other studies), Franz Environmental Inc. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

## 9.0 REFERENCES

Indian and Northern Affairs Canada, February 10, 2009. *Cape Christian Long-Term Monitoring Plan*

Indian and Northern Affairs Canada. December 2009. *Abandoned Military Site Remediation Protocol*, Contaminated Sites Program.

## 10.0 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,

**Franz Environmental Inc.**

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Distribution: Addressee (1 papers, 1 electronic)
FRANZ (1 electronic)

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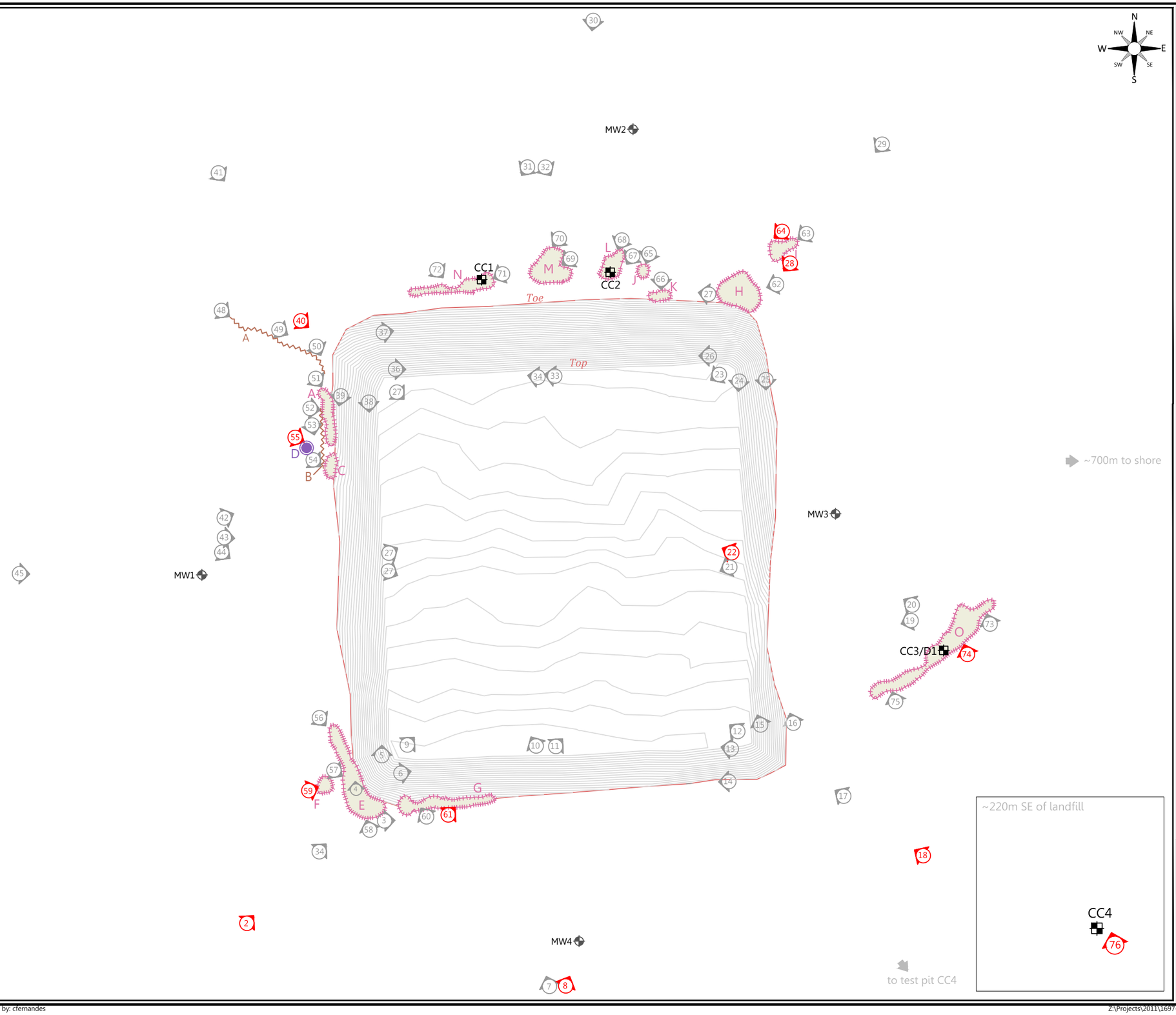
# APPENDIX A

## Figures




## Legend

- MW — Monitoring Well Locations
- TP — Test Pit Locations
- 25 — Picture Viewpoint Number
- 8 — Viewpoint Photograph Included in Appendix F
- A — Staining or Seepage
- Sinkhole
- Settlement
- A — Feature Reference Letter

Note:
Picture numbers refer to photograph names as they appear on the attached cd-rom.

Title: Non-Hazardous Waste Landfill

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: Cape Christian 1697-1101

Date: January 2012

Client: Aboriginal Affairs and Northern Development Canada

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Figure A-1

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# APPENDIX B

## Tables

# Table B-1
## Ground Water Chemical Concentrations - PHCs



| PARAMETER / Sample ID / Date | Upper Limit of Acceptability[1] | RDL | MW-1 | CEL-1 | Duplicate Evaluation | | | MW-2 | MW-3 | MW-4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 | 24/08/2011 | 24/08/2011 |
| **BTEX & F1 Hydrocarbons (ug/L)** | | | | | | | | | | |
| Benzene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | Y | <0.2 | <0.2 | <0.2 |
| Toluene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | Y | <0.2 | <0.2 | <0.2 |
| Ethylbenzene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | Y | <0.2 | <0.2 | <0.2 |
| o-Xylene | Not Available | 0.2 | <0.2 | <0.2 | A | --- | Y | <0.2 | <0.2 | <0.2 |
| p+m-Xylene | Not Available | 0.4 | <0.4 | <0.4 | A | --- | Y | <0.4 | <0.4 | <0.4 |
| Total Xylenes | Not Available | 0.4 | <0.4 | <0.4 | A | --- | Y | <0.4 | <0.4 | <0.4 |
| F1 (C6-C10) | Not Available | 25 | <25 | <25 | A | --- | Y | <25 | <25 | <25 |
| F1 (C6-C10) - BTEX | Not Available | 25 | <25 | <25 | A | --- | Y | <25 | <25 | <25 |
| **F2-F4 Hydrocarbons (ug/L)** | | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | Not Available | 100 | <100 | <100 | A | --- | Y | <100 | <100 | <100 |
| F3 (C16-C34 Hydrocarbons) | Not Available | 100 | <100 | <100 | A | --- | Y | <100 | <100 | <100 |
| F4 (C34-C50 Hydrocarbons) | Not Available | 100 | <100 | <100 | A | --- | Y | <100 | <100 | <100 |
| Reached Baseline at C50 | Not Applicable | | Yes | Yes | NC | NC | NC | Yes | Yes | Yes |

Notes:

1 = Upper Limit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-8, using mean of previous sampling rounds +3 standard deviations. Previous results for BTEX are insufficient to provide upper limits.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

**20** = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

## Table B-2
## Ground Water Chemical Concentrations - Metals

| PARAMETER / Sample ID / Date | Upper Limit of Acceptability[1] | Lowest RDL | MW-1 | CEL 1 | Duplicate Evaluation | | | MW-2 | MW-3 | MW-4 | Average Concentration |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 | 24/08/2011 | 24/08/2011 | |
| **Metals (ug/L)** | | | | | | | | | | | |
| Dissolved Arsenic (As) | Not Available | 1 | 1 | 1 | D | --- | Y | 1 | <1 | <1 | 1 |
| Total Arsenic (As) | Not Available | 1 | 1 | 2 | D | --- | N | 2 | <1 | <1 | 1 |
| Dissolved Cadmium (Cd) | Not Available | 0.1 | <0.1 | <0.1 | A | --- | Y | 0.1 | 0.6 | 0.7 | 0.4 |
| Total Cadmium (Cd) | Not Available | 0.1 | <0.1 | <0.1 | A | --- | Y | 0.3 | 0.1 | 0.1 | 0.2 |
| Dissolved Cobalt (Co) | Not Available | 0.5 | <0.5 | <0.5 | A | --- | Y | 72 | 0.5 | <0.5 | 24.3 |
| Total Cobalt (Co) | Not Available | 0.5 | <0.5 | <0.5 | A | --- | Y | 85 | 3.4 | <0.5 | 29.6 |
| Dissolved Chromium (Cr) | Not Available | 5 | <5 | <5 | A | --- | Y | <5 | <5 | <5 | <5 |
| Total Chromium (Cr) | Not Available | 5 | <5 | <5 | A | --- | Y | <5 | 7 | <5 | 6 |
| Dissolved Copper (Cu) | Not Available | 1 | 1 | 1 | D | --- | Y | 5 | 4 | 2 | 3 |
| Total Copper (Cu) | Not Available | 1 | 1 | 1 | D | --- | Y | 11 | 14 | 3 | 7 |
| Dissolved Nickel (Ni) | Not Available | 1 | 3 | 2 | D | --- | N | 56 | 3 | 2 | 16 |
| Total Nickel (Ni) | Not Available | 1 | 2 | 3 | D | --- | N | 60 | 7 | 3 | 18 |
| Dissolved Lead (Pb) | Not Available | 0.5 | <0.5 | <0.5 | A | --- | Y | <0.5 | <0.5 | <0.5 | <0.5 |
| Total Lead (Pb) | Not Available | 0.5 | <0.5 | <0.5 | A | --- | Y | 1.5 | 3.5 | <0.5 | 1.5 |
| Dissolved Zinc (Zn) | Not Available | 5 | <5 | <5 | A | --- | Y | 130 | 10 | 8 | 38 |
| Total Zinc (Zn) | Not Available | 5 | <5 | <5 | A | --- | Y | 120 | 38 | 5 | 42 |

Notes:

1 = Upper LImit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-9, using mean of previous sampling rounds +3 standard deviations.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

# Table B-3
## Ground Water Chemical Concentrations - PCBs



| PARAMETER / Sample ID / Date | Upper Limit of Acceptability[1] | RDL | MW-1 | CEL 1 | Duplicate Evaluation | | | MW-2 | MW-3 | MW-4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 | 24/08/2011 | 24/08/2011 |
| **PCBs (ug/L)** | | | | | | | | | | |
| Aroclor 1016 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1221 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1232 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1242 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1248 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1254 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1260 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1262 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Aroclor 1268 | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |
| Total PCB | Not Available | 0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 | <0.05 | <0.05 |

Notes:

1 = Upper LImit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-8, using mean of previous sampling rounds +3 standard deviations. There have been no historical detections of PCB components, indicating that results within sampling variance are acceptable.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

**Table B-4**
**Ground Water Chemical Concentrations - Inorganics**



| PARAMETER | | Groundwater Criteria | Lowest RDL | MW-1 | CEL 1 | Duplicate Evaluation | | | MW-2 | MW-3 | MW-4 | Average Concentration |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample ID | | Upper Limit of Acceptability[1] | | | | | | | | | | |
| Date | | | | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 | 24/08/2011 | 24/08/2011 | |
| **Inorganics** | **Units** | | | | | | | | | | | |
| Colour | TCU | Not Available | 2 | 6 | 6 | D | --- | Y | 350 | 7 | 6 | 92 |
| Conductivity | umho/cm | Not Available | 1 | 1500 | 1500 | C | 0 | Y | 1890 | 179 | 703 | 1068 |
| Total Dissolved Solids | mg/L | NC | 10 | 1070 | 1060 | C | 1 | Y | 1440 | 128 | 802 | 860 |
| Fluoride (F-) | mg/L | NC | 0.1 | 0.3 | 0.3 | D | --- | Y | <0.1 | 0.1 | 0.2 | 0.2 |
| Orthophosphate (P) | mg/L | NC | 0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 | <0.01 | <0.01 | <0.01 |
| pH | pH | Not Available | NC | 7.82 | 7.86 | C | 1 | Y | 6.50 | 7.30 | 7.54 | 7.29 |
| Total Suspended Solids | mg/L | NC | 1 | 6 | 5 | D | --- | N | 14 | 9 | 3 | 8 |
| Dissolved Sulphate (SO4) | mg/L | NC | 10 | 50 | 50 | D | --- | Y | 20 | 11 | 63 | 36 |
| Dissolved Chloride (Cl) | mg/L | NC | 1 | 300 | 300 | C | 0 | Y | 490 | 23 | 120 | 233 |
| Nitrite (N) | mg/L | NC | 0.01 | <0.01 | <0.01 | A | --- | Y | 0.01 | <0.01 | <0.01 | 0.01 |
| Nitrate (N) | mg/L | NC | 0.1 | 0.2 | 0.2 | D | --- | Y | <0.1 | 1 | <0.1 | 0.4 |
| Nitrate + Nitrite | mg/L | NC | 0.1 | 0.2 | 0.2 | D | --- | Y | <0.1 | 1 | <0.1 | 0.4 |

Notes:

1 = Upper LImit of Acceptability is determined as described in Report Section 3.2. Upper limits of acceptability are calculated from Table B-8, using mean of previous sampling rounds +3 standard deviations.

* = See Quality Assurance and Quality Control section for scenario rationale.

NC = No Criteria

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

## Table B-5
## Soil Chemical Concentrations - PHCs

| PARAMETER | Federal | | RDL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | | | | **CC1** | **CC2** | **CC3** | **D1** | **Duplicate Evaluation** | | | **CC4** |
| **Date** | **CCME [1] Residential/ Parkland** | **CWS for PHC in Soil (<1.5m)[2]** | | 24/08/2011 | 24/08/2011 | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 |
| **Depth (m)** | | | | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | | | | 0 - 0.15 |
| **BTEX & F1 Hydrocarbons (ug/g)** | | | | | | | | | | | |
| Benzene | **31** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | Y | <0.02 |
| Toluene | **75** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | Y | <0.02 |
| Ethylbenzene | **55** | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | Y | <0.02 |
| o-Xylene | NC | NC | 0.02 | <0.02 | <0.02 | <0.02 | <0.02 | A | --- | Y | <0.02 |
| p+m-Xylene | NC | NC | 0.04 | <0.04 | <0.04 | <0.04 | <0.04 | A | --- | Y | <0.04 |
| Total Xylenes | **95** | NC | 0.04 | <0.04 | <0.04 | <0.04 | <0.04 | A | --- | Y | <0.04 |
| F1 (C6-C10) | NC | NC | 10 | <10 | <10 | <10 | <10 | A | --- | Y | <10 |
| F1 (C6-C10) - BTEX | NC | **30** (210) | 10 | <10 | <10 | <10 | <10 | A | --- | Y | <10 |
| **F2-F4 Hydrocarbons (ug/g)** | | | | | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | NC | **150** (150) | 10 | 30 | 12 | <10 | <10 | A | --- | Y | <10 |
| F3 (C16-C34 Hydrocarbons) | NC | **300** (300) | 10 | 19 | 21 | 21 | 18 | D | --- | Y | <10 |
| F4 (C34-C50 Hydrocarbons) | NC | **2800** (2800) | 10 | <10 | <10 | <10 | <10 | A | --- | Y | <10 |
| Reached Baseline at C50 | N/A | N/A | N/A | Yes | Yes | Yes | Yes | NC | NC | NC | Yes |

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

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

*= See Quality Assurance and Quality Control section for scenario rationale.

N/A = Not applicable

NC = No Criteria

RDL= Reportable Detection Limit

**20** = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

## Table B-6
## Soil Chemical Concentrations - Metals

| PARAMETER | Federal | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | **CCME[1] Residential/ Parkland** | **CCME[2] Human Health Ingestion (H) / Eco Soil Contact (E)** | **INAC DEW Line Cleanup Criteria, Tier II** | **RDL** | **CC1** | **CC2** | **CC3** | **D1** | **Duplicate Evaluation** | | | **CC4** |
| **Date** | | | | | 24/08/2011 | 24/08/2011 | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 |
| **Depth (m)** | | | | | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | | | | 0 - 0.15 |
| **Metals (ug/g)** | | | | | | | | | | | | |
| Arsenic (As) | **12** | 12H 17E | 30 | 1 | <1 | <1 | <1 | <1 | A | --- | Y | <1 |
| Cadmium (Cd) | 10 | NC | **5** | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | A | --- | Y | <0.1 |
| Cobalt (Co) | 50 | NC | **50** | 0.1 | 3.1 | 4.1 | 1.8 | 1.9 | C | 5 | Y | 3.0 |
| Chromium (Cr) | **64** | 220H 64E | 250 | 1 | 24 | 35 | 10 | 11 | C | 10 | Y | 38 |
| Copper (Cu) | **63** | 1100H 63E | 100 | 0.5 | 3.8 | 4.3 | 3.2 | 3 | C | 6 | Y | 1.1 |
| Nickel (Ni) | **50** | 50E | 100 | 0.5 | 4.2 | 5.2 | 2.5 | 2.6 | D | --- | Y | 4 |
| Lead (Pb) | **140** | 140H 300E | 500 | 1 | 3 | 3 | 2 | 2 | D | --- | Y | 2 |
| Zinc (Zn) | **200** | 200E | 500 | 5 | 15 | 17 | 9 | 10 | D | --- | Y | 7 |
| Mercury (Hg) | 6.6 | 6.6H 12E | **2** | 0.05 | <0.05 | <0.05 | <0.05 | <0.05 | A | --- | Y | <0.05 |
| **Physical Properties** | | | | | | | | | | | | |
| Moisture (%) | NC | NC | NC | 0.2 | 17.0 | 15.0 | 17 | 16 | C | 6 | Y | 17.0 |

Notes:

1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 1. Canadian Soil Quality Guidelines, Residential / Parkland Use, coarse-grained soils.

2 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0, Table 2. Human health soil ingestion and Eco Soil Contact.

* = See Quality Assurance and Quality Control section for scenario rationale.

N/A = Not applicable

NC = No Criteria

RDL= Reportable Detection Limit

**20** = Guideline selected for CAM-F DEW Line landfills.

20 = Exceeds selected guideline.

**Table B-7**
**Soil Chemical Concentrations - PCBs**

| PARAMETER | Federal | INAC DEW Line Cleanup Criteria, Tier II | RDL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample ID** | | | | **CC1** | **CC2** | **CC3** | **D1** | **Duplicate Evaluation** | | | **CC4** |
| **Date** | **CCME[1] Residential/ Parkland** | | | 24/08/2011 | 24/08/2011 | 24/08/2011 | 24/08/2011 | Scenario* | RPD (%) | Acceptable | 24/08/2011 |
| **Depth (m)** | | | | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | 0 - 0.15 | | | | 0 - 0.15 |
| **Polychlorinated Biphenyls (ug/g)** | | | | | | | | | | | |
| Aroclor 1262 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1016 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1221 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1232 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1242 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1248 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1254 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1260 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Aroclor 1268 | NC | NC | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |
| Total PCB | **1.3** | 50 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | A | --- | Y | <0.01 |

Notes:
1 = CCME (2007), Canadian Soil Quality Guidelines, Update 7.0
*= See Quality Assurance and Quality Control section for scenario rationale.
NC = No Criteria
RDL= Reportable Detection Limit
20 = Exceeds selected guideline.

# APPENDIX C

## Test Pit Logs and Monitoring Well Sampling Records

| Date: | 24-Aug-11 | **Test Pit: CC1** | | | |
|---|---|---|---|---|---|
| Logged by: | RF | | | | |
| Method: | Hand Excavation | | | | |
| Location: | Cape Christian | | Type | Analysis & Depth of Sample (m) | COMMENTS |
| Issue | Depth (m) | Description | | | |
| Orange Staining | 0 - 0.15 | Fine to course sand and gravel, some organics, orange staining, no odour, moist to wet | GR | PHCs, Metals, PCBs | |

| Date: | 24-Aug-11 | **Test Pit: CC2** | | | |
|---|---|---|---|---|---|
| Logged by: | RF | | | | |
| Method: | Hand Excavation | | | | |
| Location: | Cape Christian | | Type | Analysis & Depth of Sample (m) | COMMENTS |
| Issue | Depth (m) | Description | | | |
| Orange Staining | 0 - 0.15 | Fine to course sand and gravel, some organics, orange staining, no odour, moist to wet | GR | PHCs, Metals, PCBs | |

| Date: | 24-Aug-11 | **Test Pit: CC3** | | | |
|---|---|---|---|---|---|
| Logged by: | RF | | | | |
| Method: | Hand Excavation | | | | |
| Location: | Cape Christian | | Type | Analysis & Depth of Sample (m) | COMMENTS |
| Issue | Depth (m) | Description | | | |
| Orange Staining | 0 - 0.15 | Fine to course sand and gravel, some organics, orange staining, no odour, moist to wet | GR | PHCs, Metals, PCBs | Duplicate D1 collected here |

| Date: | 24-Aug-11 | **Test Pit: CC4** | | | |
|---|---|---|---|---|---|
| Logged by: | RF | | | | |
| Method: | Hand Excavation | | | | |
| Location: | Cape Christian | | Type | Analysis & Depth of Sample (m) | COMMENTS |
| Issue | Depth (m) | Description | | | |
| Background | 0 - 0.15 | Fine to course sand and gravel, some organics, orange staining, no odour, moist to wet | GR | PHCs, Metals, PCBs | |

**Groundwater Sampling**

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

## Development of Monitoring Wells

| | | | |
|---|---|---|---|
| Name of Area: NHWL | | | Sector: |
| Date of Sampling: | Day: 24 | Month: 08 | Year: 2011 |
| Monitoring Well ID: | MW-1 | | |
| Coordinates of Well | Easting: | | Northing: |
| | GPS unit: | | WP #: |
| Type of Well: | **Stick Up** | Drive Point | |
| Condition of Well: | **Good** | Broken Casing | Bailer stuck in well |
| | Waterra tubing stuck in well | | Missing Cap |
| Volume Purged (L): | 2 L | | |
| Sampling Equipment: | Geopump brand persistaltic pump and Horiba U-22 water quality meter | | |

**Measured Data**

| | |
|---|---|
| Well Depth (m): | 1.65 |
| Water Depth (m): | 0.99 |
| Stick Up (m): | 0.58 |

**Field Chemistry**

| Name and # unit: | | Readings * |
|---|---|---|
| pH: | 1 | 7.01 |
| | 2 | 7.19 |
| | 3 | 7.24 |
| | 4 | 7.29 |
| | 5 | 7.34 |
| | 6 | 7.38 |
| | 7 | 7.40 |
| Temperature (◦C): | 1 | 2.66 |
| | 2 | 2.60 |
| | 3 | 2.61 |
| | 4 | 2.55 |
| | 5 | 2.53 |
| | 6 | 2.49 |
| | 7 | 2.45 |
| Conductivity (mS/cm): | 1 | 1.99 |
| | 2 | 1.80 |
| | 3 | 1.68 |
| | 4 | 1.65 |
| | 5 | 1.61 |
| | 6 | 1.62 |
| | 7 | 1.63 |
| DO: | 1 | 0.53 |
| | 2 | 0 |
| | 3 | 0 |
| | 4 | 0 |
| | 5 | 0 |
| | 6 | 0 |
| | 7 | 0 |
| ORP: | 1 | -122 |
| | 2 | -145 |
| | 3 | -150 |
| | 4 | -149 |
| | 5 | -143 |
| | 6 | -138 |
| | 7 | -133 |
| Turbidity: | 1 | 18.6 |
| | 2 | 15.0 |
| | 3 | 14.9 |
| | 4 | 14.1 |
| | 5 | 13.7 |
| | 6 | 13.0 |
| | 7 | 13.1 |

| Sample Analysis | Y/N | # of Bottles | Duplicate Information |
|---|---|---|---|
| PHC | Y | 13 | CEL-1 |
| PCB Total | Y | | CEL-1 |
| Total Metals | Y | | CEL-1 |
| Dissolved Metals | Y | | CEL-1 |
| General | Y | | CEL-1 |
| Other | | | |

**Comments/ Notes:**

**(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize**

**Groundwater Sampling**

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

## Development of Monitoring Wells

| | | | |
|---|---|---|---|
| Name of Area: NHWL | | | Sector: |
| Date of Sampling: | Day: 24 | Month: 08 | Year: 2011 |
| Monitoring Well ID: | MW-2 | | |
| Coordinates of Well | Easting: | | Northing: |
| | GPS unit: | | WP #: |
| Type of Well: | **Stick Up** | Drive Point | |
| Condition of Well: | **Good** | Broken Casing | Bailer stuck in well |
| | Waterra tubing stuck in well | | Missing Cap |
| Volume Purged (L): | 2 L | | |
| Sampling Equipment: | Geopump brand persistaltic pump and Horiba U-22 water quality meter | | |

**Measured Data**

| | |
|---|---|
| Well Depth (m): | 1.52 |
| Water Depth (m): | 0.64 |
| Stick Up (m): | 0.56 |

**Field Chemistry**

| Name and # unit: | | Readings * |
|---|---|---|
| pH: | 1 | 6.27 |
| | 2 | 6.41 |
| | 3 | 6.42 |
| | 4 | 6.20 |
| | 5 | 6.21 |
| | 6 | 6.20 |
| | 7 | |
| Temperature (◦C): | 1 | 2.28 |
| | 2 | 2.29 |
| | 3 | 2.11 |
| | 4 | 1.58 |
| | 5 | 1.57 |
| | 6 | 1.58 |
| | 7 | |
| Conductivity (mS/cm): | 1 | 2.04 |
| | 2 | 1.99 |
| | 3 | 1.97 |
| | 4 | 2.25 |
| | 5 | 3.04 |
| | 6 | 2.94 |
| | 7 | |
| DO: | 1 | 0.2 |
| | 2 | 0 |
| | 3 | 0 |
| | 4 | 1.48 |
| | 5 | 0 |
| | 6 | 0 |
| | 7 | |
| ORP: | 1 | -33 |
| | 2 | -56 |
| | 3 | -55 |
| | 4 | -13 |
| | 5 | -28 |
| | 6 | -28 |
| | 7 | |
| Turbidity: | 1 | 32.1 |
| | 2 | 27.8 |
| | 3 | 29.8 |
| | 4 | 30.1 |
| | 5 | 39.1 |
| | 6 | 32.7 |
| | 7 | |

| Sample Analysis | Y/N | # of Bottles | Duplicate Information |
|---|---|---|---|
| PHC | Y | 13 | |
| PCB Total | Y | | |
| Total Metals | Y | | |
| Dissolved Metals | Y | | |
| General | Y | | |
| Other | | | |

**Comments/ Notes:**

Tried to dup here but ran out of water. Duplicated not submitted to lab.
Purged Dry

**(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize**

**Groundwater Sampling**

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

## Development of Monitoring Wells

| | | | |
|---|---|---|---|
| Name of Area: NHWL | | | Sector: |
| Date of Sampling: | Day: 24 | Month: 08 | Year: 2011 |
| Monitoring Well ID: | MW-3 | | |
| Coordinates of Well | Easting: | | Northing: |
| | GPS unit: | | WP #: |
| Type of Well: | **Stick Up** | Drive Point | |
| Condition of Well: | **Good** | Broken Casing | Bailer stuck in well |
| | Waterra tubing stuck in well | | Missing Cap |
| Volume Purged (L): | 0.5 | | |
| Sampling Equipment: | Geopump brand persistaltic pump and Horiba U-22 water quality meter | | |

**Measured Data**

| | |
|---|---|
| Well Depth (m): | 1.75 |
| Water Depth (m): | 1.62 |
| Stick Up (m): | 0.56 |

**Field Chemistry**

| Name and # unit: | | Readings * |
|---|---|---|
| pH: | 1 | 6.72 |
| | 2 | 6.74 |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| Temperature (◦C): | 1 | |
| | 2 | 1.56 |
| | 3 | 1.30 |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| Conductivity (mS/cm): | 1 | 0.234 |
| | 2 | 0.232 |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| DO: | 1 | 9.19 |
| | 2 | 5.70 |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| ORP: | 1 | 230 |
| | 2 | 212 |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |
| Turbidity: | 1 | 172 |
| | 2 | 175 |
| | 3 | |
| | 4 | |
| | 5 | |
| | 6 | |
| | 7 | |

| Sample Analysis | Y/N | # of Bottles | Duplicate Information |
|---|---|---|---|
| PHC | Y | 13 | |
| PCB Total | Y | | |
| Total Metals | Y | | |
| Dissolved Metals | Y | | |
| General | Y | | |
| Other | | | |

**Comments/ Notes:**

Pumped dry

**(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize**

**Groundwater Sampling**

Project: 1697-1101

Franz Personnel: CEL & MD
Weather: Rain/4°C

## Development of Monitoring Wells

| | | | |
|---|---|---|---|
| Name of Area: NHWL | | | Sector: |
| Date of Sampling: | Day: 24 | Month: 08 | Year: 2011 |
| Monitoring Well ID: | MW-4 | | |
| Coordinates of Well | Easting: | | Northing: |
| | GPS unit: | | WP #: |
| Type of Well: | **Stick Up** | Drive Point | |
| Condition of Well: | **Good** | Broken Casing | Bailer stuck in well |
| | Waterra tubing stuck in well | | Missing Cap |
| Volume Purged (L): | 2 L | | |
| Sampling Equipment: | Geopump brand persistaltic pump and Horiba U-22 water quality meter | | |

**Measured Data**

| | |
|---|---|
| Well Depth (m): | 1.78 |
| Water Depth (m): | 1.33 |
| Stick Up (m): | 0.39 |

**Field Chemistry**

| Name and # unit: | | Readings * |
|---|---|---|
| pH: | 1 | 5.69 |
| | 2 | 2.84 |
| | 3 | 5.96 |
| | 4 | 5.99 |
| | 5 | 6.12 |
| | 6 | |
| | 7 | |
| Temperature (◦C): | 1 | 3.25 |
| | 2 | 2.84 |
| | 3 | 2.80 |
| | 4 | 2.94 |
| | 5 | 3.04 |
| | 6 | |
| | 7 | |
| Conductivity (mS/cm): | 1 | 0.48 |
| | 2 | 0.42 |
| | 3 | 0.41 |
| | 4 | 0.41 |
| | 5 | 0.44 |
| | 6 | |
| | 7 | |
| DO: | 1 | 9.68 |
| | 2 | 9.44 |
| | 3 | 7.23 |
| | 4 | 8.46 |
| | 5 | 8.35 |
| | 6 | |
| | 7 | |
| ORP: | 1 | 285 |
| | 2 | 278 |
| | 3 | 272 |
| | 4 | 262 |
| | 5 | 246 |
| | 6 | |
| | 7 | |
| Turbidity: | 1 | 22.8 |
| | 2 | 17.8 |
| | 3 | 78.9 |
| | 4 | 16.6 |
| | 5 | 17.5 |
| | 6 | |
| | 7 | |

| Sample Analysis | Y/N | # of Bottles | Duplicate Information |
|---|---|---|---|
| PHC | Y | 13 | |
| PCB Total | Y | | |
| Total Metals | Y | | |
| Dissolved Metals | Y | | |
| General | Y | | |
| Other | | | |

**Comments/ Notes:**

**(*) Field Chemistry Readings should be taken every 30 seconds until parameters stabilize**

# APPENDIX D

## Laboratory Reports and Chain of Custody Forms

Your Project #: 1697-1101
Your C.O.C. #: 27401201, 274012-01-01

**Attention: Catherine LeBlanc**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2011/09/13**
This report supersedes all previous reports with the same Maxxam job number

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B1D2533**
**Received: 2011/08/29, 18:00**

Sample Matrix: Water
# Samples Received: 3

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | 3 | N/A | 2011/09/06 | CAM SOP-00463 | SM 4500 Cl E |
| Colour | 3 | N/A | 2011/09/01 | CAM SOP-00412 | APHA 2120 |
| Conductivity | 3 | N/A | 2011/08/31 | CAM SOP-00448 | SM 2510 |
| Petroleum Hydro. CCME F1 & BTEX in Water | 3 | N/A | 2011/09/01 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Water | 3 | 2011/08/31 | 2011/09/01 | CAM SOP-00316 | CCME Hydrocarbons |
| Fluoride | 3 | 2011/08/31 | 2011/08/31 | CAM SOP-00448 | APHA 4500FC |
| Mercury (low level) | 1 | 2011/08/31 | 2011/08/31 | CAM SOP-00453 | EPA 7470 |
| Mercury (low level) | 2 | 2011/09/02 | 2011/09/02 | CAM SOP-00453 | EPA 7470 |
| Dissolved Metals by ICPMS | 2 | N/A | 2011/09/06 | CAM SOP-00447 | EPA 6020 |
| Dissolved Metals by ICPMS | 1 | N/A | 2011/09/07 | CAM SOP-00447 | EPA 6020 |
| Total Metals Analysis by ICPMS | 3 | N/A | 2011/09/08 | CAM SOP-00447 | EPA 6020 |
| Nitrate (NO3) and Nitrite (NO2) in Water | 3 | N/A | 2011/09/01 | CAM SOP-00440 | SM 4500 NO3I/NO2B |
| Polychlorinated Biphenyl in Water | 3 | 2011/08/31 | 2011/09/01 | CAM SOP-00309 | SW846 8082 |
| pH | 3 | N/A | 2011/08/31 | CAM SOP-00448 | SM 4500H |
| Orthophosphate | 3 | N/A | 2011/09/06 | CAM SOP-00461 | SM 4500 P-F |
| Sulphate by Automated Colourimetry | 3 | N/A | 2011/09/06 | CAM SOP-00464 | EPA 375.4 |
| Total Dissolved Solids | 3 | N/A | 2011/09/02 | CAM SOP-00428 | APHA 2540C |
| Low Level Total Suspended Solids | 3 | N/A | 2011/08/31 | CAM SOP-00428 | SM 2540D |

## Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

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

../2

Franz Environmental Inc
Client Project #: 1697-1101

Maxxam Job #: B1D2533
Report Date: 2011/09/13



* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: JClement@maxxam.ca
Phone# (613) 274-3549

==========

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 #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | KS3332 | | KS3333 | KS3334 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | 2011/08/24 | | |
| | **Units** | **MW 2** | **RDL** | **MW 3** | **MW 4** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | | |
| Colour | TCU | 350 | 8 | 7 | 6 | 2 | 2600569 |
| Conductivity | umho/cm | 1890 | 1 | 179 | 703 | 1 | 2600471 |
| Total Dissolved Solids | mg/L | 1440 | 10 | 128 | 802 | 10 | 2601612 |
| Fluoride (F-) | mg/L | <0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 2600472 |
| Orthophosphate (P) | mg/L | <0.01 | 0.01 | <0.01 | <0.01 | 0.01 | 2602453 |
| pH | pH | 6.50 | | 7.30 | 7.54 | | 2600465 |
| Total Suspended Solids | mg/L | 14 | 1 | 9 | 3 | 1 | 2600012 |
| Dissolved Sulphate (SO4) | mg/L | 20 | 1 | 11 | 63 | 1 | 2602454 |
| Dissolved Chloride (Cl) | mg/L | 490 | 5 | 23 | 120 | 1 | 2602452 |
| Nitrite (N) | mg/L | 0.01 | 0.01 | <0.01 | <0.01 | 0.01 | 2600446 |
| Nitrate (N) | mg/L | <0.1 | 0.1 | 1.0 | <0.1 | 0.1 | 2600446 |
| Nitrate + Nitrite | mg/L | <0.1 | 0.1 | 1.0 | <0.1 | 0.1 | 2600446 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KS3332 | | KS3333 | | | KS3334 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | | | 2011/08/24 | | |
| | **Units** | **MW 2** | **RDL** | **MW 3** | **RDL** | **QC Batch** | **MW 4** | **RDL** | **QC Batch** |
| **Metals** | | | | | | | | | |
| Mercury (Hg) | ug/L | <0.01 | 0.01 | <0.01 | 0.01 | 2602563 | 0.01 | 0.01 | 2599825 |
| Dissolved Aluminum (Al) | ug/L | 50 | 5 | 54 | 5 | 2605513 | 140 | 5 | 2605513 |
| Total Aluminum (Al) | ug/L | 580 | 5 | 7800 | 5 | 2607496 | 210 | 5 | 2607496 |
| Dissolved Antimony (Sb) | ug/L | <0.5 | 0.5 | <0.5 | 0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Antimony (Sb) | ug/L | <0.5 | 0.5 | <0.5 | 0.5 | 2607496 | <0.5 | 0.5 | 2607496 |
| Dissolved Arsenic (As) | ug/L | 1 | 1 | <1 | 1 | 2605513 | <1 | 1 | 2605513 |
| Total Arsenic (As) | ug/L | 2 | 1 | <1 | 1 | 2607496 | <1 | 1 | 2607496 |
| Dissolved Barium (Ba) | ug/L | 46 | 2 | 3 | 2 | 2605513 | 25 | 2 | 2605513 |
| Total Barium (Ba) | ug/L | 58 | 2 | 57 | 2 | 2607496 | 27 | 2 | 2607496 |
| Dissolved Beryllium (Be) | ug/L | <0.5 | 0.5 | <0.5 | 0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Beryllium (Be) | ug/L | <0.5 | 0.5 | <0.5 | 0.5 | 2607496 | <0.5 | 0.5 | 2607496 |
| Dissolved Boron (B) | ug/L | 37 | 10 | 26 | 10 | 2605513 | 63 | 10 | 2605513 |
| Total Boron (B) | ug/L | 38 | 10 | 32 | 10 | 2607496 | 69 | 10 | 2607496 |
| Dissolved Cadmium (Cd) | ug/L | 0.1 | 0.1 | 0.6 | 0.1 | 2605513 | 0.7 | 0.1 | 2605513 |
| Total Cadmium (Cd) | ug/L | 0.3 | 0.1 | 0.1 | 0.1 | 2607496 | 0.1 | 0.1 | 2607496 |
| Dissolved Chromium (Cr) | ug/L | <5 | 5 | <5 | 5 | 2605513 | <5 | 5 | 2605513 |
| Total Chromium (Cr) | ug/L | <5 | 5 | 7 | 5 | 2607496 | <5 | 5 | 2607496 |
| Dissolved Cobalt (Co) | ug/L | 72 | 0.5 | 0.5 | 0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Cobalt (Co) | ug/L | 85 | 0.5 | 3.4 | 0.5 | 2607496 | <0.5 | 0.5 | 2607496 |
| Dissolved Copper (Cu) | ug/L | 5 | 1 | 4 | 1 | 2605513 | 2 | 1 | 2605513 |
| Total Copper (Cu) | ug/L | 11 | 1 | 14 | 1 | 2607496 | 3 | 1 | 2607496 |
| Dissolved Iron (Fe) | ug/L | 55000 | 100 | <100 | 100 | 2605513 | <100 | 100 | 2605513 |
| Total Iron (Fe) | ug/L | 68000 | 100 | 6900 | 100 | 2607496 | <100 | 100 | 2607496 |
| Dissolved Lead (Pb) | ug/L | <0.5 | 0.5 | <0.5 | 0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Lead (Pb) | ug/L | 1.5 | 0.5 | 3.5 | 0.5 | 2607496 | <0.5 | 0.5 | 2607496 |
| Dissolved Molybdenum (Mo) | ug/L | 3.5 | 0.5 | 1.7 | 0.5 | 2605513 | 4.0 | 0.5 | 2605513 |
| Total Molybdenum (Mo) | ug/L | 2.7 | 0.5 | 2.0 | 0.5 | 2607496 | 4.2 | 0.5 | 2607496 |
| Dissolved Nickel (Ni) | ug/L | 56 | 1 | 3 | 1 | 2605513 | 2 | 1 | 2605513 |
| Total Nickel (Ni) | ug/L | 60 | 1 | 7 | 1 | 2607496 | 3 | 1 | 2607496 |
| Dissolved Selenium (Se) | ug/L | <2 | 2 | <2 | 2 | 2605513 | <2 | 2 | 2605513 |
| Total Selenium (Se) | ug/L | <2 | 2 | <2 | 2 | 2607496 | <2 | 2 | 2607496 |
| Dissolved Silver (Ag) | ug/L | <0.1 | 0.1 | <0.1 | 0.1 | 2605513 | <0.1 | 0.1 | 2605513 |
| Total Silver (Ag) | ug/L | <0.1 | 0.1 | <0.1 | 0.1 | 2607496 | <0.1 | 0.1 | 2607496 |
| Dissolved Thallium (Tl) | ug/L | <0.05 | 0.05 | <0.05 | 0.05 | 2605513 | <0.05 | 0.05 | 2605513 |
| Total Thallium (Tl) | ug/L | 0.09 | 0.05 | 0.21 | 0.05 | 2607496 | <0.05 | 0.05 | 2607496 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KS3332 | | KS3333 | | | KS3334 | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | | | 2011/08/24 | | |
| | **Units** | **MW 2** | **RDL** | **MW 3** | **RDL** | **QC Batch** | **MW 4** | **RDL** | **QC Batch** |
| Dissolved Titanium (Ti) | ug/L | <5 | 5 | <5 | 5 | 2605513 | <5 | 5 | 2605513 |
| Total Titanium (Ti) | ug/L | 29 | 5 | 620 | 30 | 2607496 | 8 | 5 | 2607496 |
| Dissolved Uranium (U) | ug/L | 0.9 | 0.1 | 1.3 | 0.1 | 2605513 | 2.8 | 0.1 | 2605513 |
| Total Uranium (U) | ug/L | 0.5 | 0.1 | 1.7 | 0.1 | 2607496 | 2.9 | 0.1 | 2607496 |
| Dissolved Zinc (Zn) | ug/L | 130 | 5 | 10 | 5 | 2605513 | 8 | 5 | 2605513 |
| Total Zinc (Zn) | ug/L | 120 | 5 | 38 | 5 | 2607496 | 5 | 5 | 2607496 |

## POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

| Maxxam ID | | KS3332 | KS3333 | KS3334 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | 2011/08/24 | 2011/08/24 | | |
| | **Units** | **MW 2** | **MW 3** | **MW 4** | **RDL** | **QC Batch** |
| **PCBs** | | | | | | |
| Aroclor 1016 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1221 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1232 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1242 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1248 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1254 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1260 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1262 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1268 | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| Total PCB | ug/L | <0.05 | <0.05 | <0.05 | 0.05 | 2600738 |
| **Surrogate Recovery (%)** | | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 35 | 33 | 35 | | 2600738 |
| Decachlorobiphenyl | % | 98 | 103 | 109 | | 2600738 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## O'REG 153 PETROLEUM HYDROCARBONS (WATER)

| Maxxam ID | | KS3332 | KS3333 | | KS3334 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | 2011/08/24 | | 2011/08/24 | | |
| | **Units** | **MW 2** | **MW 3** | **QC Batch** | **MW 4** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | | | |
| Benzene | ug/L | <0.20 | <0.20 | 2601412 | <0.20 | 0.20 | 2601412 |
| Toluene | ug/L | <0.20 | <0.20 | 2601412 | <0.20 | 0.20 | 2601412 |
| Ethylbenzene | ug/L | <0.20 | <0.20 | 2601412 | <0.20 | 0.20 | 2601412 |
| o-Xylene | ug/L | <0.20 | <0.20 | 2601412 | <0.20 | 0.20 | 2601412 |
| p+m-Xylene | ug/L | <0.40 | <0.40 | 2601412 | <0.40 | 0.40 | 2601412 |
| Total Xylenes | ug/L | <0.40 | <0.40 | 2601412 | <0.40 | 0.40 | 2601412 |
| F1 (C6-C10) | ug/L | <25 | <25 | 2601412 | <25 | 25 | 2601412 |
| F1 (C6-C10) - BTEX | ug/L | <25 | <25 | 2601412 | <25 | 25 | 2601412 |
| **F2-F4 Hydrocarbons** | | | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/L | <100 | <100 | 2600673 | <100 | 100 | 2600648 |
| F3 (C16-C34 Hydrocarbons) | ug/L | <100 | <100 | 2600673 | <100 | 100 | 2600648 |
| F4 (C34-C50 Hydrocarbons) | ug/L | <100 | <100 | 2600673 | <100 | 100 | 2600648 |
| Reached Baseline at C50 | ug/L | YES | YES | 2600673 | YES | | 2600648 |
| **Surrogate Recovery (%)** | | | | | | | |
| 1,4-Difluorobenzene | % | 100 | 98 | 2601412 | 101 | | 2601412 |
| 4-Bromofluorobenzene | % | 98 | 97 | 2601412 | 99 | | 2601412 |
| D10-Ethylbenzene | % | 99 | 98 | 2601412 | 102 | | 2601412 |
| D4-1,2-Dichloroethane | % | 104 | 102 | 2601412 | 104 | | 2601412 |
| o-Terphenyl | % | 120 | 117 | 2600673 | 119 | | 2600648 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## Test Summary

**Maxxam ID** KS3332 **Collected** 2011/08/24
**Sample ID** MW 2 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2602452 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Colour | SPEC | 2600569 | N/A | 2011/09/01 | CHRISTINE PHAM |
| Conductivity | COND | 2600471 | N/A | 2011/08/31 | YOGESH PATEL |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2601412 | N/A | 2011/09/01 | LINCOLN RAMDAHIN |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600673 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |
| Fluoride | F | 2600472 | 2011/08/31 | 2011/08/31 | YOGESH PATEL |
| Mercury (low level) | CVAA | 2602563 | 2011/09/02 | 2011/09/02 | LAWRENCE CHEUNG |
| Dissolved Metals by ICPMS | ICP/MS | 2605513 | N/A | 2011/09/06 | KEVIN COMERFORD |
| Total Metals Analysis by ICPMS | ICP/MS | 2607496 | N/A | 2011/09/08 | GRACE BU |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2600446 | N/A | 2011/09/01 | BERNARD ANTWI |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |
| pH | PH | 2600465 | N/A | 2011/08/31 | YOGESH PATEL |
| Orthophosphate | AC | 2602453 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Sulphate by Automated Colourimetry | AC | 2602454 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Total Dissolved Solids | SLDS | 2601612 | N/A | 2011/09/02 | TEJPRATAP MISHRA |
| Low Level Total Suspended Solids | SLDS | 2600012 | N/A | 2011/08/31 | SUBHASHCHANDRA PATEL |

**Maxxam ID** KS3333 **Collected** 2011/08/24
**Sample ID** MW 3 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2602452 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Colour | SPEC | 2600569 | N/A | 2011/09/01 | CHRISTINE PHAM |
| Conductivity | COND | 2600471 | N/A | 2011/08/31 | YOGESH PATEL |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2601412 | N/A | 2011/09/01 | LINCOLN RAMDAHIN |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600673 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |
| Fluoride | F | 2600472 | 2011/08/31 | 2011/08/31 | YOGESH PATEL |
| Mercury (low level) | CVAA | 2602563 | 2011/09/02 | 2011/09/02 | LAWRENCE CHEUNG |
| Dissolved Metals by ICPMS | ICP/MS | 2605513 | N/A | 2011/09/07 | KEVIN COMERFORD |
| Total Metals Analysis by ICPMS | ICP/MS | 2607496 | N/A | 2011/09/08 | GRACE BU |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2600446 | N/A | 2011/09/01 | BERNARD ANTWI |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |



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Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## Test Summary

| | | | | | |
|---|---|---|---|---|---|
| pH | PH | 2600465 | N/A | 2011/08/31 | YOGESH PATEL |
| Orthophosphate | AC | 2602453 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Sulphate by Automated Colourimetry | AC | 2602454 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Total Dissolved Solids | SLDS | 2601612 | N/A | 2011/09/02 | TEJPRATAP MISHRA |
| Low Level Total Suspended Solids | SLDS | 2600012 | N/A | 2011/08/31 | SUBHASHCHANDRA PATEL |

**Maxxam ID** KS3333 Dup **Collected** 2011/08/24
**Sample ID** MW 3 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Mercury (low level) | CVAA | 2602563 | 2011/09/02 | 2011/09/02 | LAWRENCE CHEUNG |

**Maxxam ID** KS3334 **Collected** 2011/08/24
**Sample ID** MW 4 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2602452 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Colour | SPEC | 2600569 | N/A | 2011/09/01 | CHRISTINE PHAM |
| Conductivity | COND | 2600471 | N/A | 2011/08/31 | YOGESH PATEL |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2601412 | N/A | 2011/09/01 | LINCOLN RAMDAHIN |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600648 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |
| Fluoride | F | 2600472 | 2011/08/31 | 2011/08/31 | YOGESH PATEL |
| Mercury (low level) | CVAA | 2599825 | 2011/08/31 | 2011/08/31 | LAWRENCE CHEUNG |
| Dissolved Metals by ICPMS | ICP/MS | 2605513 | N/A | 2011/09/06 | KEVIN COMERFORD |
| Total Metals Analysis by ICPMS | ICP/MS | 2607496 | N/A | 2011/09/08 | GRACE BU |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2600446 | N/A | 2011/09/01 | BERNARD ANTWI |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |
| pH | PH | 2600465 | N/A | 2011/08/31 | YOGESH PATEL |
| Orthophosphate | AC | 2602453 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Sulphate by Automated Colourimetry | AC | 2602454 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Total Dissolved Solids | SLDS | 2601612 | N/A | 2011/09/02 | TEJPRATAP MISHRA |
| Low Level Total Suspended Solids | SLDS | 2600012 | N/A | 2011/08/31 | SUBHASHCHANDRA PATEL |

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## Test Summary

| | | | |
|---|---|---|---|
| **Maxxam ID** | KS3334 Dup | **Collected** | 2011/08/24 |
| **Sample ID** | MW 4 | **Shipped** | |
| **Matrix** | Water | **Received** | 2011/08/29 |

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600648 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |



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Maxxam Job #: B1D2533
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| | |
|---|---|
| Package 1 | 8.0°C |
| Package 2 | 9.7°C |

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

**GENERAL COMMENTS**

Cooler custody seal was present and intact.

Revised Report: Cobalt added under Total and Dissolved Metals. 13-Sep-11

Sample KS3332-01: Results for dissolved uranium are greater than total uranium. The results have been confirmed by re-analysis.

Sample KS3333-01: All sample bottles contained visual sediment, which was included in the analysis as per the Protocol for Analytical Methods Use in the Assesment of Properties under part XV.1 of the Environmental Protection Act.

Results for dissolved cadnium are greater than total cadnium. The results have been confirmed by re-analysis.

Sample KS3334-01: Results for dissolved cadnium are greater than dissolved cadnium. The results have been confirmed by re-analysis.

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2599825 | Mercury (Hg) | 2011/08/31 | 105 | 80 - 120 | 87 | 80 - 120 | 0.01, RDL=0.01 | ug/L | NC | 25 | | |
| 2600012 | Total Suspended Solids | 2011/08/31 | | | | | <1 | mg/L | 4.1 | 25 | 97 | 85 - 115 |
| 2600446 | Nitrite (N) | 2011/09/01 | 110 | 80 - 120 | 104 | 85 - 115 | <0.01 | mg/L | NC | 25 | | |
| 2600446 | Nitrate (N) | 2011/09/01 | 101 | 80 - 120 | 96 | 85 - 115 | <0.1 | mg/L | NC | 25 | | |
| 2600471 | Conductivity | 2011/08/31 | | | | | <1 | umho/cm | 0 | 25 | 102 | 85 - 115 |
| 2600472 | Fluoride (F-) | 2011/08/31 | 96 | 80 - 120 | 103 | 80 - 120 | <0.1 | mg/L | NC | 20 | | |
| 2600569 | Colour | 2011/09/01 | | | 99 | 85 - 115 | <2 | TCU | NC | 25 | | |
| 2600648 | o-Terphenyl | 2011/09/01 | 116 | 30 - 130 | 115 | 30 - 130 | 113 | % | | | | |
| 2600648 | F2 (C10-C16 Hydrocarbons) | 2011/09/01 | 104 | 60 - 130 | 100 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600648 | F3 (C16-C34 Hydrocarbons) | 2011/09/01 | 107 | 60 - 130 | 102 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600648 | F4 (C34-C50 Hydrocarbons) | 2011/09/01 | 111 | 60 - 130 | 106 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600673 | o-Terphenyl | 2011/09/01 | 119 | 30 - 130 | 118 | 30 - 130 | 113 | % | | | | |
| 2600673 | F2 (C10-C16 Hydrocarbons) | 2011/09/01 | 103 | 60 - 130 | 101 | 60 - 130 | <100 | ug/L | 0.6 | 50 | | |
| 2600673 | F3 (C16-C34 Hydrocarbons) | 2011/09/01 | NC(1) | 60 - 130 | 106 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600673 | F4 (C34-C50 Hydrocarbons) | 2011/09/01 | 111 | 60 - 130 | 109 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600738 | 2,4,5,6-Tetrachloro-m-xylene | 2011/09/01 | 30 | 30 - 130 | 47 | 30 - 130 | 42 | % | | | | |
| 2600738 | Decachlorobiphenyl | 2011/09/01 | 97 | 30 - 130 | 96 | 30 - 130 | 91 | % | | | | |
| 2600738 | Aroclor 1260 | 2011/09/01 | 99 | 30 - 130 | 84 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Total PCB | 2011/09/01 | 99 | 30 - 130 | 84 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1016 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1221 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1232 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1242 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1248 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1254 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1262 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1268 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2601412 | 1,4-Difluorobenzene | 2011/09/01 | 99 | 70 - 130 | 101 | 70 - 130 | 98 | % | | | | |
| 2601412 | 4-Bromofluorobenzene | 2011/09/01 | 98 | 70 - 130 | 100 | 70 - 130 | 99 | % | | | | |
| 2601412 | D10-Ethylbenzene | 2011/09/01 | 97 | 70 - 130 | 100 | 70 - 130 | 96 | % | | | | |
| 2601412 | D4-1,2-Dichloroethane | 2011/09/01 | 104 | 70 - 130 | 102 | 70 - 130 | 102 | % | | | | |
| 2601412 | Benzene | 2011/09/01 | 88 | 70 - 130 | 86 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | Toluene | 2011/09/01 | 90 | 70 - 130 | 92 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | Ethylbenzene | 2011/09/01 | 92 | 70 - 130 | 95 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | o-Xylene | 2011/09/01 | 93 | 70 - 130 | 94 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | p+m-Xylene | 2011/09/01 | 91 | 70 - 130 | 93 | 70 - 130 | <0.40 | ug/L | | | | |
| 2601412 | F1 (C6-C10) | 2011/09/02 | 78 | 70 - 130 | 93 | 70 - 130 | <25 | ug/L | NC | 40 | | |
| 2601412 | Total Xylenes | 2011/09/01 | | | | | <0.40 | ug/L | | | | |
| 2601412 | F1 (C6-C10) - BTEX | 2011/09/02 | | | | | <25 | ug/L | NC | 40 | | |
| 2601612 | Total Dissolved Solids | 2011/09/02 | | | | | <10 | mg/L | 0.6 | 25 | 98 | 90 - 110 |

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2602452 | Dissolved Chloride (Cl) | 2011/09/06 | NC | 75 - 125 | 105 | 80 - 120 | <1 | mg/L | 0.2 | 20 | | |
| 2602453 | Orthophosphate (P) | 2011/09/06 | 98 | 75 - 125 | 102 | 80 - 120 | <0.01 | mg/L | NC | 25 | | |
| 2602454 | Dissolved Sulphate (SO4) | 2011/09/06 | NC | 75 - 125 | 101 | 80 - 120 | <1 | mg/L | 0.5 | 25 | | |
| 2602563 | Mercury (Hg) | 2011/09/02 | 109 | 80 - 120 | 103 | 80 - 120 | <0.01 | ug/L | NC | 25 | | |
| 2605513 | Dissolved Aluminum (Al) | 2011/09/02 | 103 | 80 - 120 | 94 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Antimony (Sb) | 2011/09/02 | 111 | 80 - 120 | 99 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Arsenic (As) | 2011/09/02 | 103 | 80 - 120 | 96 | 80 - 120 | <1 | ug/L | 1.3 | 20 | | |
| 2605513 | Dissolved Barium (Ba) | 2011/09/02 | 97 | 80 - 120 | 97 | 80 - 120 | <2 | ug/L | 4.7 | 20 | | |
| 2605513 | Dissolved Beryllium (Be) | 2011/09/02 | 100 | 80 - 120 | 93 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Boron (B) | 2011/09/02 | 99 | 80 - 120 | 94 | 80 - 120 | 13, RDL=10 | ug/L | 4.8 | 20 | | |
| 2605513 | Dissolved Cadmium (Cd) | 2011/09/02 | 110 | 80 - 120 | 99 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Chromium (Cr) | 2011/09/02 | 111 | 80 - 120 | 94 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Cobalt (Co) | 2011/09/02 | 108 | 80 - 120 | 92 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Copper (Cu) | 2011/09/02 | 109 | 80 - 120 | 93 | 80 - 120 | <1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Iron (Fe) | 2011/09/02 | 111 | 80 - 120 | 97 | 80 - 120 | <100 | ug/L | 3.8 | 20 | | |
| 2605513 | Dissolved Lead (Pb) | 2011/09/02 | 98 | 80 - 120 | 96 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Molybdenum (Mo) | 2011/09/02 | 111 | 80 - 120 | 100 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Nickel (Ni) | 2011/09/02 | 108 | 80 - 120 | 92 | 80 - 120 | <1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Selenium (Se) | 2011/09/02 | 104 | 80 - 120 | 95 | 80 - 120 | <2 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Silver (Ag) | 2011/09/02 | 54(2, 3) | 80 - 120 | 94 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Thallium (Tl) | 2011/09/02 | 98 | 80 - 120 | 96 | 80 - 120 | <0.05 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Titanium (Ti) | 2011/09/02 | 114 | 80 - 120 | 96 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Uranium (U) | 2011/09/02 | 104 | 80 - 120 | 100 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Zinc (Zn) | 2011/09/02 | 111 | 80 - 120 | 95 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2607496 | Total Aluminum (Al) | 2011/09/08 | 109 | 80 - 120 | 101 | 85 - 115 | 8, RDL=5 | ug/L | 5.5 | 20 | | |
| 2607496 | Total Antimony (Sb) | 2011/09/08 | 114 | 80 - 120 | 106 | 85 - 115 | <0.5 | ug/L | | | | |
| 2607496 | Total Arsenic (As) | 2011/09/08 | 100 | 80 - 120 | 98 | 85 - 115 | <1 | ug/L | 1.3 | 20 | | |
| 2607496 | Total Barium (Ba) | 2011/09/08 | 96 | 80 - 120 | 97 | 85 - 115 | <2 | ug/L | | | | |
| 2607496 | Total Beryllium (Be) | 2011/09/08 | 100 | 80 - 120 | 100 | 85 - 115 | <0.5 | ug/L | | | | |
| 2607496 | Total Boron (B) | 2011/09/08 | NC | 80 - 120 | 96 | 85 - 115 | <10 | ug/L | | | | |
| 2607496 | Total Cadmium (Cd) | 2011/09/08 | 103 | 80 - 120 | 102 | 85 - 116 | <0.1 | ug/L | NC | 20 | | |
| 2607496 | Total Chromium (Cr) | 2011/09/08 | 107 | 80 - 120 | 104 | 85 - 115 | <5 | ug/L | NC | 20 | | |
| 2607496 | Total Cobalt (Co) | 2011/09/08 | 104 | 80 - 120 | 104 | 85 - 115 | <0.5 | ug/L | | | | |
| 2607496 | Total Copper (Cu) | 2011/09/08 | 98 | 80 - 120 | 103 | 85 - 115 | <1 | ug/L | NC | 20 | | |
| 2607496 | Total Iron (Fe) | 2011/09/08 | 109 | 80 - 120 | 107 | 85 - 115 | <100 | ug/L | | | | |
| 2607496 | Total Lead (Pb) | 2011/09/08 | 94 | 80 - 120 | 97 | 85 - 115 | <0.5 | ug/L | NC | 20 | | |
| 2607496 | Total Molybdenum (Mo) | 2011/09/08 | 112 | 80 - 120 | 99 | 85 - 115 | <0.5 | ug/L | | | | |
| 2607496 | Total Nickel (Ni) | 2011/09/08 | 100 | 80 - 120 | 104 | 85 - 115 | <1 | ug/L | 0.8 | 20 | | |
| 2607496 | Total Selenium (Se) | 2011/09/08 | 99 | 80 - 120 | 101 | 85 - 115 | <2 | ug/L | | | | |
| 2607496 | Total Silver (Ag) | 2011/09/08 | 95 | 80 - 120 | 97 | 85 - 115 | <0.1 | ug/L | NC | 20 | | |

Maxxam Job #: B1D2533
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2607496 | Total Thallium (Tl) | 2011/09/08 | 94 | 80 - 120 | 97 | 85 - 115 | <0.05 | ug/L | | | | |
| 2607496 | Total Titanium (Ti) | 2011/09/08 | 112 | 80 - 120 | 106 | 85 - 115 | <5 | ug/L | | | | |
| 2607496 | Total Uranium (U) | 2011/09/08 | 108 | 80 - 120 | 106 | 85 - 115 | <0.1 | ug/L | | | | |
| 2607496 | Total Zinc (Zn) | 2011/09/08 | 95 | 80 - 120 | 104 | 85 - 115 | <5 | ug/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.
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) - The recovery in the matrix spike was not calculated (NC), spike level <2 X native concentration.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(3) - The recovery was below the lower control limit. This may represent a low bias in some results for flagged analytes.



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

# Validation Signature Page

**Maxxam Job #: B1D2533**

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

CRISTINA CARRIERE, Scientific Services

MEDHAT RISKALLAH, Manager, Hydrocarbon Department

MAMDOUH SALIB, Analyst, Hydrocarbons

ALINA SEGAL, Manager Main Lab - Organics

==========

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



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

IMMEDIATE TEST

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

29-Aug-11 18:00
JULIE CLEMENT
B1D2533
VPA ENV-789

Page 1 of 1

| INVOICE INFORMATION: | | REPORT INFORMATION (if differs from invoice): | | PROJECT INFORMAT | |
|---|---|---|---|---|---|
| Company Name: | #10988 Franz Environmental Inc | Company Name: | | Quotation #: | B14919 |
| Contact Name: | Invoices, Lillian & Catherine | Contact Name: | Catherine LeBlanc | P.O. #: | |
| Address: | 329 Churchill Ave N Suite 200 | Address: | | Project #: | 1697-1101 |
| | Ottawa ON K1Z 5B8 | | | Project Name: | |
| Phone: | (613)721-0555 Fax: (613)721-0029 | Phone: | Fax: | Site #: | |
| Email: | cleblanc@franzenvironmental.com; lellis@franzenvi | Email: | cleblanc@franzenvironmental.com | Sampled By: | |

C#274012-01-01

Lab Use Only:
BOTTLE ORDER #: 274012
PROJECT MANAGER: JULIE CLEMENT

**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:** Std quote

*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) | Anions/pH/Conductivity/Color | Dissolved Metals by ICPMS | Mercury (low level) | PHC F1-F4 & BTEX in water | Polychlorinated Biphenyl in Water | Total Metals Analysis by ICPMS | TSS & TDS | | | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | MW2 | Aug24 | PM | GW | | X | X | X | X | X | X | X | X | | | 13 | |
| 2 | | MW3 | ↓ | ↓ | ↓ | | X | X | X | X | X | X | X | X | | | 13 | |
| 3 | | MW4 | ↓ | ↓ | ↓ | | X | X | X | X | X | X | X | X | | | 13 | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | REC'D IN OTTAWA |

| *RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | # Jars Used and Not Submitted |
|---|---|---|---|---|---|---|
| Ryan Flutch | Aug 25/11 | | Josh Freeman | 2011/08/29 | 18:00 | |

**Laboratory Use Only**

| Time Sensitive | Temperature (°C) on Receipt | Custody Seal | Yes | No |
|---|---|---|---|---|
| | 8/8/8 | 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
DAVID CHAN 2011/08/30 10:50

8/9/8°C 8/9/10°C 10/9/10

Maxxam

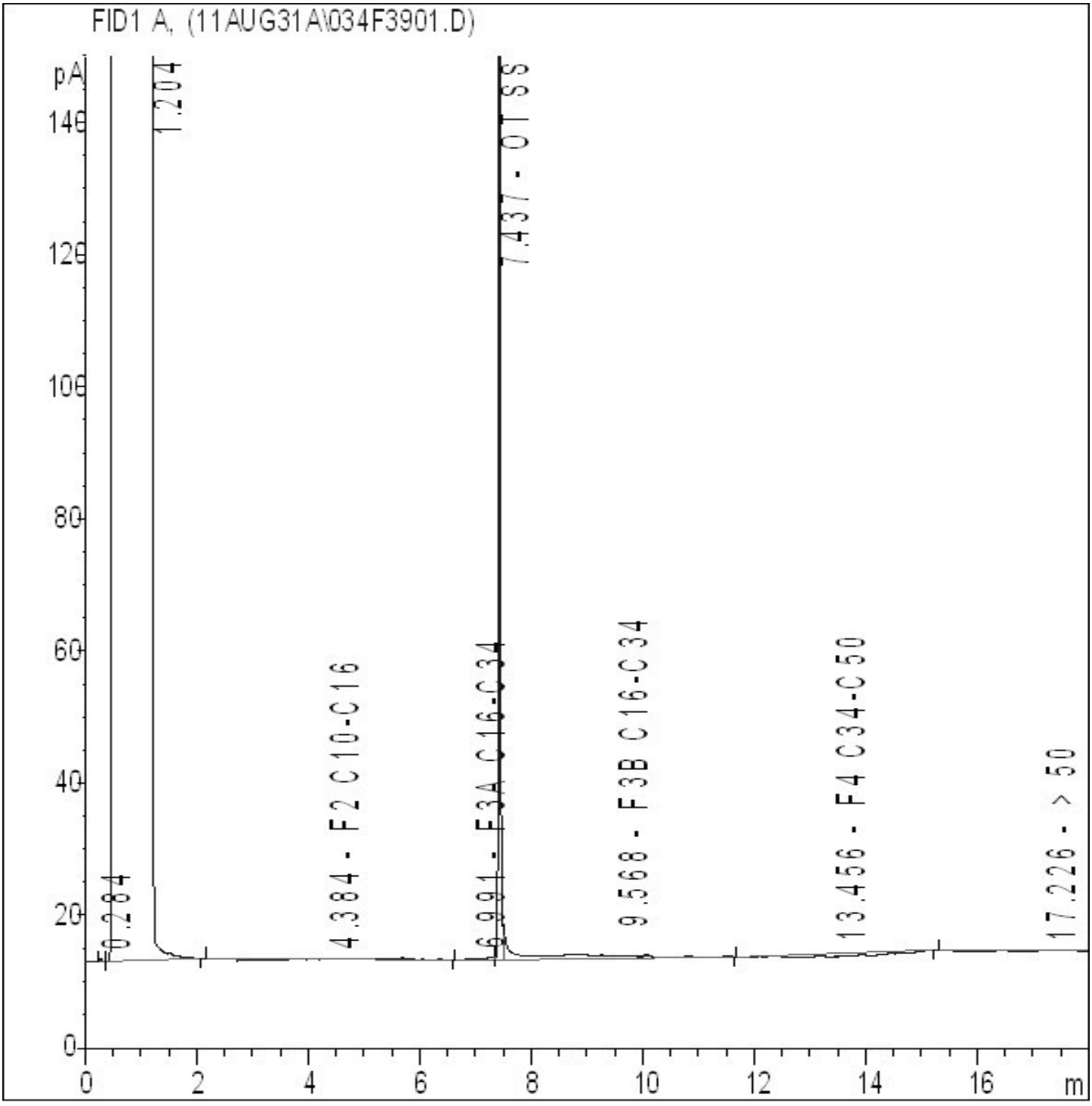
Success Through Science®

Report Date: 2011/09/13
Maxxam Job #: B1D2533
Maxxam Sample: KS3332

Franz Environmental Inc
Client Project #: 1697-1101

Client ID: MW 2

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

Maxxam

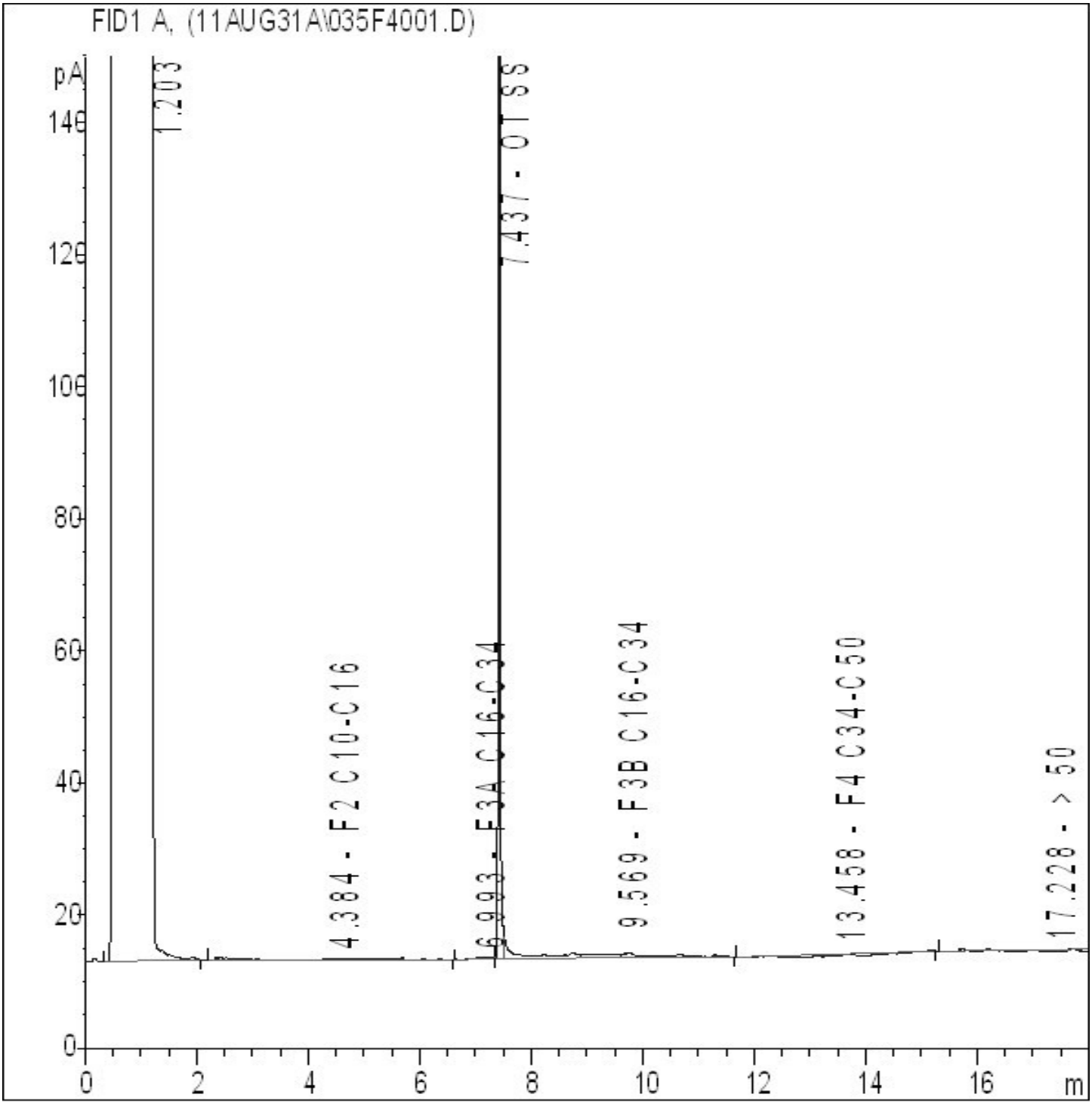
Success Through Science®

Report Date: 2011/09/13
Maxxam Job #: B1D2533
Maxxam Sample: KS3333

Franz Environmental Inc
Client Project #: 1697-1101

Client ID: MW 3

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

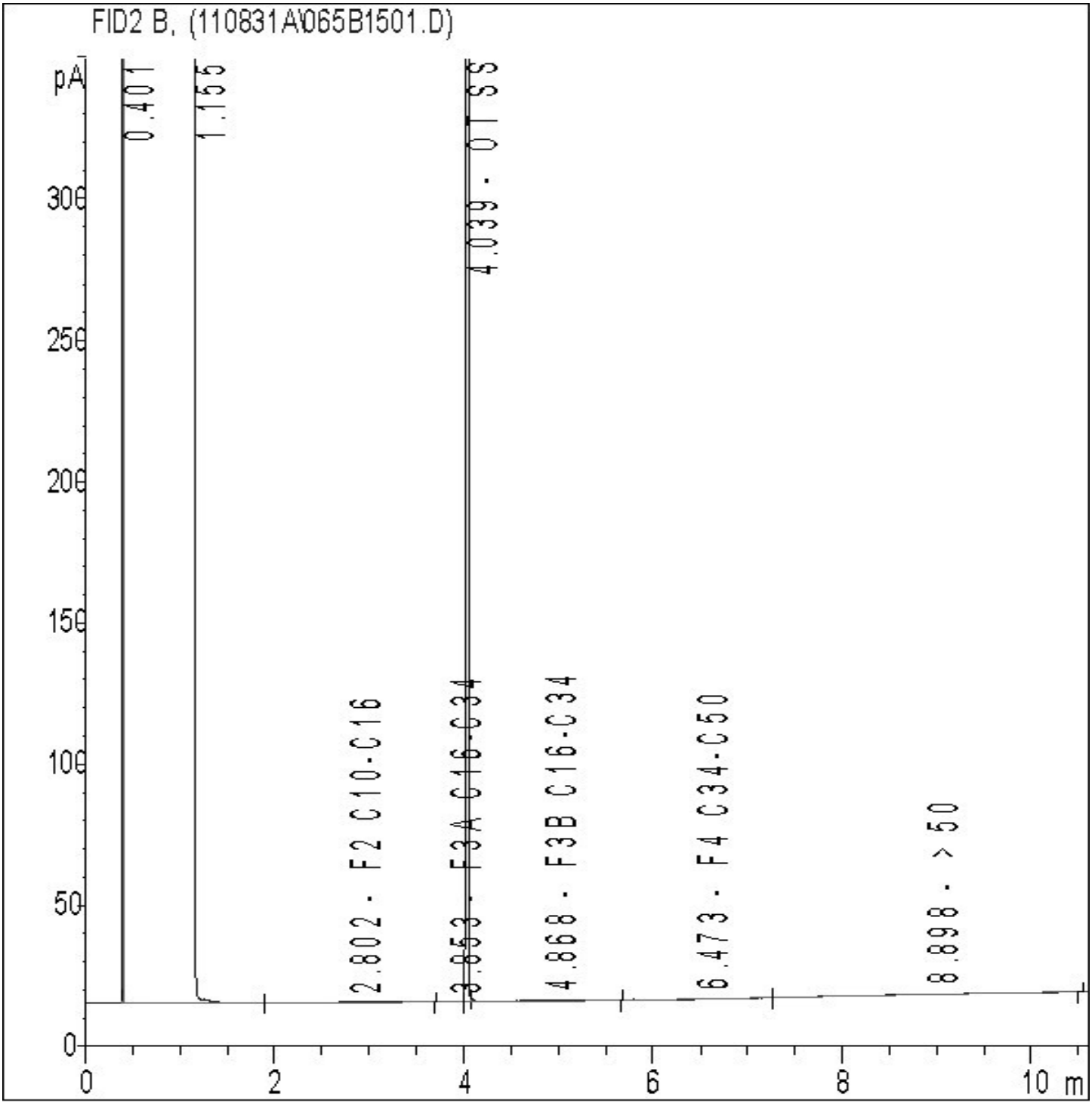
Success Through Science®

Report Date: 2011/09/13
Maxxam Job #: B1D2533
Maxxam Sample: KS3334

Franz Environmental Inc
Client Project #: 1697-1101

Client ID: MW 4

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

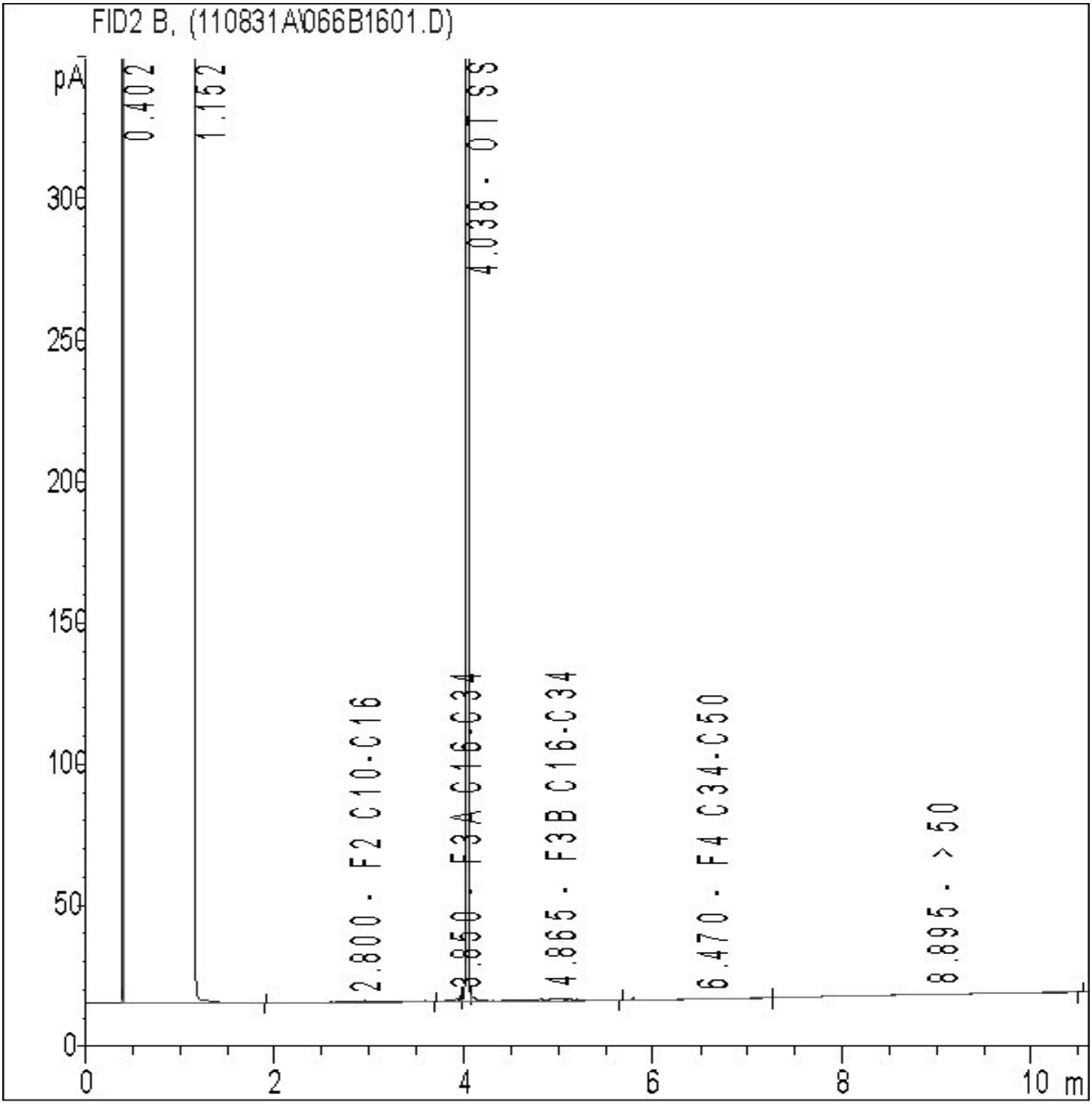
Success Through Science®

Franz Environmental Inc
Client Project #: 1697-1101

Report Date: 2011/09/13
Maxxam Job #: B1D2533
Maxxam Sample: KS3334 Lab-Dup

Client ID: MW 4

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

Your Project #: 1697-1101
Your C.O.C. #: 27401202, 274012-02-01

**Attention: Catherine LeBlanc**
Franz Environmental Inc
329 Churchill Ave N
Suite 200
Ottawa, ON
K1Z 5B8

**Report Date: 2011/09/13**
This report supersedes all previous reports with the same Maxxam job number

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B1D2546**
**Received: 2011/08/29, 18:00**

Sample Matrix: Water
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Method Reference |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | 1 | N/A | 2011/09/02 | CAM SOP-00463 | SM 4500 Cl E |
| Chloride by Automated Colourimetry | 1 | N/A | 2011/09/06 | CAM SOP-00463 | SM 4500 Cl E |
| Colour | 2 | N/A | 2011/09/01 | CAM SOP-00412 | APHA 2120 |
| Conductivity | 2 | N/A | 2011/08/31 | CAM SOP-00448 | SM 2510 |
| Petroleum Hydro. CCME F1 & BTEX in Water | 1 | N/A | 2011/09/01 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydro. CCME F1 & BTEX in Water | 1 | N/A | 2011/09/02 | CAM SOP-00315 | CCME CWS |
| Petroleum Hydrocarbons F2-F4 in Water | 2 | 2011/08/31 | 2011/09/01 | CAM SOP-00316 | CCME Hydrocarbons |
| Fluoride | 2 | 2011/08/31 | 2011/08/31 | CAM SOP-00448 | APHA 4500FC |
| Mercury (low level) | 1 | 2011/08/31 | 2011/08/31 | CAM SOP-00453 | EPA 7470 |
| Mercury (low level) | 1 | 2011/09/02 | 2011/09/02 | CAM SOP-00453 | EPA 7470 |
| Dissolved Metals by ICPMS | 2 | N/A | 2011/09/06 | CAM SOP-00447 | EPA 6020 |
| Total Metals Analysis by ICPMS | 2 | N/A | 2011/09/06 | CAM SOP-00447 | EPA 6020 |
| Nitrate (NO3) and Nitrite (NO2) in Water (1) | 2 | N/A | 2011/09/01 | CAM SOP-00440 | SM 4500 NO3I/NO2B |
| Polychlorinated Biphenyl in Water | 2 | 2011/08/31 | 2011/09/01 | CAM SOP-00309 | SW846 8082 |
| pH | 2 | N/A | 2011/08/31 | CAM SOP-00448 | SM 4500H |
| Orthophosphate | 1 | N/A | 2011/09/02 | CAM SOP-00461 | SM 4500 P-F |
| Orthophosphate | 1 | N/A | 2011/09/06 | CAM SOP-00461 | SM 4500 P-F |
| Sulphate by Automated Colourimetry | 1 | N/A | 2011/09/02 | CAM SOP-00464 | EPA 375.4 |
| Sulphate by Automated Colourimetry | 1 | N/A | 2011/09/06 | CAM SOP-00464 | EPA 375.4 |
| Total Dissolved Solids | 2 | N/A | 2011/09/02 | CAM SOP-00428 | APHA 2540C |
| Low Level Total Suspended Solids | 2 | N/A | 2011/08/31 | CAM SOP-00428 | SM 2540D |

## Remarks:

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at

Franz Environmental Inc
Client Project #: 1697-1101

Maxxam Job #: B1D2546
Report Date: 2011/09/13



Maxxam Analytics for three weeks from receipt of data or as per contract.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

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

JULIE CLEMENT, Ottawa Customer Service
Email: JClement@maxxam.ca
Phone# (613) 274-3549

==========

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 #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## RESULTS OF ANALYSES OF WATER

| Maxxam ID | | KS3389 | | KS3390 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | | |
| | **Units** | **MW 1** | **QC Batch** | **CEL 1** | **RDL** | **QC Batch** |
| **Inorganics** | | | | | | |
| Colour | TCU | 6 | 2600569 | 6 | 2 | 2600569 |
| Conductivity | umho/cm | 1500 | 2600471 | 1500 | 1 | 2600471 |
| Total Dissolved Solids | mg/L | 1070 | 2601612 | 1060 | 10 | 2601612 |
| Fluoride (F-) | mg/L | 0.3 | 2600472 | 0.3 | 0.1 | 2600472 |
| Orthophosphate (P) | mg/L | <0.01 | 2602453 | <0.01 | 0.01 | 2600718 |
| pH | pH | 7.82 | 2600465 | 7.86 | | 2600465 |
| Total Suspended Solids | mg/L | 6 | 2600012 | 5 | 1 | 2600012 |
| Dissolved Sulphate (SO4) | mg/L | 50 | 2602454 | 50 | 1 | 2600719 |
| Dissolved Chloride (Cl) | mg/L | 300 | 2602452 | 300 | 5 | 2600710 |
| Nitrite (N) | mg/L | <0.01 | 2600446 | <0.01 | 0.01 | 2600446 |
| Nitrate (N) | mg/L | 0.2 | 2600446 | 0.2 | 0.1 | 2600446 |
| Nitrate + Nitrite | mg/L | 0.2 | 2600446 | 0.2 | 0.1 | 2600446 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KS3389 | | KS3390 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | | |
| | **Units** | **MW 1** | **QC Batch** | **CEL 1** | **RDL** | **QC Batch** |
| **Metals** | | | | | | |
| Mercury (Hg) | ug/L | 0.01 | 2599825 | <0.01 | 0.01 | 2602563 |
| Dissolved Aluminum (Al) | ug/L | 27 | 2605513 | 28 | 5 | 2605513 |
| Total Aluminum (Al) | ug/L | 49 | 2606043 | 55 | 5 | 2606043 |
| Dissolved Antimony (Sb) | ug/L | <0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Antimony (Sb) | ug/L | <0.5 | 2604619 | <0.5 | 0.5 | 2604619 |
| Dissolved Arsenic (As) | ug/L | 1 | 2605513 | 1 | 1 | 2605513 |
| Total Arsenic (As) | ug/L | 1 | 2604619 | 2 | 1 | 2604619 |
| Dissolved Barium (Ba) | ug/L | 14 | 2605513 | 15 | 2 | 2605513 |
| Total Barium (Ba) | ug/L | 16 | 2604619 | 17 | 2 | 2604619 |
| Dissolved Beryllium (Be) | ug/L | <0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Beryllium (Be) | ug/L | <0.5 | 2604619 | <0.5 | 0.5 | 2604619 |
| Dissolved Boron (B) | ug/L | 120 | 2605513 | 120 | 10 | 2605513 |
| Total Boron (B) | ug/L | 130 | 2604619 | 130 | 10 | 2604619 |
| Dissolved Cadmium (Cd) | ug/L | <0.1 | 2605513 | <0.1 | 0.1 | 2605513 |
| Total Cadmium (Cd) | ug/L | <0.1 | 2604619 | <0.1 | 0.1 | 2604619 |
| Dissolved Chromium (Cr) | ug/L | <5 | 2605513 | <5 | 5 | 2605513 |
| Total Chromium (Cr) | ug/L | <5 | 2604619 | <5 | 5 | 2604619 |
| Dissolved Cobalt (Co) | ug/L | <0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Cobalt (Co) | ug/L | <0.5 | 2606043 | <0.5 | 0.5 | 2606043 |
| Dissolved Copper (Cu) | ug/L | 1 | 2605513 | 1 | 1 | 2605513 |
| Total Copper (Cu) | ug/L | 1 | 2604619 | 1 | 1 | 2604619 |
| Dissolved Iron (Fe) | ug/L | 1000 | 2605513 | 1000 | 100 | 2605513 |
| Total Iron (Fe) | ug/L | 950 | 2604619 | 1000 | 100 | 2604619 |
| Dissolved Lead (Pb) | ug/L | <0.5 | 2605513 | <0.5 | 0.5 | 2605513 |
| Total Lead (Pb) | ug/L | <0.5 | 2604619 | <0.5 | 0.5 | 2604619 |
| Dissolved Molybdenum (Mo) | ug/L | 11 | 2605513 | 12 | 0.5 | 2605513 |
| Total Molybdenum (Mo) | ug/L | 13 | 2604619 | 13 | 0.5 | 2604619 |
| Dissolved Nickel (Ni) | ug/L | 3 | 2605513 | 2 | 1 | 2605513 |
| Total Nickel (Ni) | ug/L | 2 | 2604619 | 3 | 1 | 2604619 |
| Dissolved Selenium (Se) | ug/L | <2 | 2605513 | <2 | 2 | 2605513 |
| Total Selenium (Se) | ug/L | <2 | 2604619 | <2 | 2 | 2604619 |
| Dissolved Silver (Ag) | ug/L | <0.1 | 2605513 | <0.1 | 0.1 | 2605513 |
| Total Silver (Ag) | ug/L | <0.1 | 2604619 | <0.1 | 0.1 | 2604619 |
| Dissolved Thallium (Tl) | ug/L | <0.05 | 2605513 | <0.05 | 0.05 | 2605513 |
| Total Thallium (Tl) | ug/L | <0.05 | 2604619 | <0.05 | 0.05 | 2604619 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KS3389 | | KS3390 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | | 2011/08/24 | | |
| | **Units** | **MW 1** | **QC Batch** | **CEL 1** | **RDL** | **QC Batch** |
| Dissolved Titanium (Ti) | ug/L | <5 | 2605513 | <5 | 5 | 2605513 |
| Total Titanium (Ti) | ug/L | <5 | 2604619 | <5 | 5 | 2604619 |
| Dissolved Uranium (U) | ug/L | 1.3 | 2605513 | 1.3 | 0.1 | 2605513 |
| Total Uranium (U) | ug/L | 1.7 | 2604619 | 2.0 | 0.1 | 2604619 |
| Dissolved Zinc (Zn) | ug/L | <5 | 2605513 | <5 | 5 | 2605513 |
| Total Zinc (Zn) | ug/L | <5 | 2604619 | <5 | 5 | 2604619 |

## POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

| Maxxam ID | | KS3389 | KS3390 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | 2011/08/24 | | |
| | **Units** | **MW 1** | **CEL 1** | **RDL** | **QC Batch** |
| **PCBs** | | | | | |
| Aroclor 1016 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1221 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1232 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1242 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1248 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1254 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1260 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1262 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Aroclor 1268 | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| Total PCB | ug/L | <0.05 | <0.05 | 0.05 | 2600738 |
| **Surrogate Recovery (%)** | | | | | |
| 2,4,5,6-Tetrachloro-m-xylene | % | 33 | 37 | | 2600738 |
| Decachlorobiphenyl | % | 96 | 103 | | 2600738 |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



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Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## O'REG 153 PETROLEUM HYDROCARBONS (WATER)

| Maxxam ID | | KS3389 | KS3390 | | |
|---|---|---|---|---|---|
| Sampling Date | | 2011/08/24 | 2011/08/24 | | |
| | **Units** | **MW 1** | **CEL 1** | **RDL** | **QC Batch** |
| **BTEX & F1 Hydrocarbons** | | | | | |
| Benzene | ug/L | <0.20 | <0.20 | 0.20 | 2601412 |
| Toluene | ug/L | <0.20 | <0.20 | 0.20 | 2601412 |
| Ethylbenzene | ug/L | <0.20 | <0.20 | 0.20 | 2601412 |
| o-Xylene | ug/L | <0.20 | <0.20 | 0.20 | 2601412 |
| p+m-Xylene | ug/L | <0.40 | <0.40 | 0.40 | 2601412 |
| Total Xylenes | ug/L | <0.40 | <0.40 | 0.40 | 2601412 |
| F1 (C6-C10) | ug/L | <25 | <25 | 25 | 2601412 |
| F1 (C6-C10) - BTEX | ug/L | <25 | <25 | 25 | 2601412 |
| **F2-F4 Hydrocarbons** | | | | | |
| F2 (C10-C16 Hydrocarbons) | ug/L | <100 | <100 | 100 | 2600648 |
| F3 (C16-C34 Hydrocarbons) | ug/L | <100 | <100 | 100 | 2600648 |
| F4 (C34-C50 Hydrocarbons) | ug/L | <100 | <100 | 100 | 2600648 |
| Reached Baseline at C50 | ug/L | YES | YES | | 2600648 |
| **Surrogate Recovery (%)** | | | | | |
| 1,4-Difluorobenzene | % | 100 | 101 | | 2601412 |
| 4-Bromofluorobenzene | % | 101 | 99 | | 2601412 |
| D10-Ethylbenzene | % | 102 | 98 | | 2601412 |
| D4-1,2-Dichloroethane | % | 104 | 103 | | 2601412 |
| o-Terphenyl | % | 114 | 119 | | 2600648 |

RDL = Reportable Detection Limit
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Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## Test Summary

**Maxxam ID** KS3389 **Collected** 2011/08/24
**Sample ID** MW 1 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2602452 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Colour | SPEC | 2600569 | N/A | 2011/09/01 | CHRISTINE PHAM |
| Conductivity | COND | 2600471 | N/A | 2011/08/31 | YOGESH PATEL |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2601412 | N/A | 2011/09/01 | LINCOLN RAMDAHIN |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600648 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |
| Fluoride | F | 2600472 | 2011/08/31 | 2011/08/31 | YOGESH PATEL |
| Mercury (low level) | CVAA | 2599825 | 2011/08/31 | 2011/08/31 | LAWRENCE CHEUNG |
| Dissolved Metals by ICPMS | ICP/MS | 2605513 | N/A | 2011/09/06 | KEVIN COMERFORD |
| Total Metals Analysis by ICPMS | ICP/MS | 2606043 | N/A | 2011/09/07 | HUA REN |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2600446 | N/A | 2011/09/01 | BERNARD ANTWI |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |
| pH | PH | 2600465 | N/A | 2011/08/31 | YOGESH PATEL |
| Orthophosphate | AC | 2602453 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Sulphate by Automated Colourimetry | AC | 2602454 | N/A | 2011/09/06 | DEONARINE RAMNARINE |
| Total Dissolved Solids | SLDS | 2601612 | N/A | 2011/09/02 | TEJPRATAP MISHRA |
| Low Level Total Suspended Solids | SLDS | 2600012 | N/A | 2011/08/31 | SUBHASHCHANDRA PATEL |

**Maxxam ID** KS3389 Dup **Collected** 2011/08/24
**Sample ID** MW 1 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Total Metals Analysis by ICPMS | ICP/MS | 2604619 | N/A | 2011/09/06 | HUA REN |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |



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Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## Test Summary

**Maxxam ID** KS3390 **Collected** 2011/08/24
**Sample ID** CEL 1 **Shipped**
**Matrix** Water **Received** 2011/08/29

| Test Description | Instrumentation | Batch | Extracted | Analyzed | Analyst |
|---|---|---|---|---|---|
| Chloride by Automated Colourimetry | AC | 2600710 | N/A | 2011/09/02 | DEONARINE RAMNARINE |
| Colour | SPEC | 2600569 | N/A | 2011/09/01 | CHRISTINE PHAM |
| Conductivity | COND | 2600471 | N/A | 2011/08/31 | YOGESH PATEL |
| Petroleum Hydro. CCME F1 & BTEX in Wat | HSGC/MSFD | 2601412 | N/A | 2011/09/02 | LINCOLN RAMDAHIN |
| Petroleum Hydrocarbons F2-F4 in Water | GC/FID | 2600648 | 2011/08/31 | 2011/09/01 | ZHIYUE (FRANK) ZHU |
| Fluoride | F | 2600472 | 2011/08/31 | 2011/08/31 | YOGESH PATEL |
| Mercury (low level) | CVAA | 2602563 | 2011/09/02 | 2011/09/02 | LAWRENCE CHEUNG |
| Dissolved Metals by ICPMS | ICP/MS | 2605513 | N/A | 2011/09/06 | KEVIN COMERFORD |
| Total Metals Analysis by ICPMS | ICP/MS | 2606043 | N/A | 2011/09/07 | HUA REN |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 2600446 | N/A | 2011/09/01 | BERNARD ANTWI |
| Polychlorinated Biphenyl in Water | GC/ECD | 2600738 | 2011/08/31 | 2011/09/01 | ALICIA RAHAMAT |
| pH | PH | 2600465 | N/A | 2011/08/31 | YOGESH PATEL |
| Orthophosphate | AC | 2600718 | N/A | 2011/09/02 | DEONARINE RAMNARINE |
| Sulphate by Automated Colourimetry | AC | 2600719 | N/A | 2011/09/02 | DEONARINE RAMNARINE |
| Total Dissolved Solids | SLDS | 2601612 | N/A | 2011/09/02 | TEJPRATAP MISHRA |
| Low Level Total Suspended Solids | SLDS | 2600012 | N/A | 2011/08/31 | SUBHASHCHANDRA PATEL |

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

| | |
|---|---|
| Package 1 | 8.0°C |
| Package 2 | 9.7°C |

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

**GENERAL COMMENTS**

Cooler custody seal was present and intact.

All sample bottles contained visual sediment, which was included in the analysis as per the Protocol for Analytical Methods Use in the Assesment of Properties under part XV.1 of the Environmental Protection Act.

Revised Report: Cobalt added under Total and Dissolved Metals. 13-Sep-11



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Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2599825 | Mercury (Hg) | 2011/08/31 | 105 | 80 - 120 | 87 | 80 - 120 | 0.01, RDL=0.01 | ug/L | NC | 25 | | |
| 2600012 | Total Suspended Solids | 2011/08/31 | | | | | <1 | mg/L | 4.1 | 25 | 97 | 85 - 115 |
| 2600446 | Nitrite (N) | 2011/09/01 | 110 | 80 - 120 | 104 | 85 - 115 | <0.01 | mg/L | NC | 25 | | |
| 2600446 | Nitrate (N) | 2011/09/01 | 101 | 80 - 120 | 96 | 85 - 115 | <0.1 | mg/L | NC | 25 | | |
| 2600471 | Conductivity | 2011/08/31 | | | | | <1 | umho/cm | 0 | 25 | 102 | 85 - 115 |
| 2600472 | Fluoride (F-) | 2011/08/31 | 96 | 80 - 120 | 103 | 80 - 120 | <0.1 | mg/L | NC | 20 | | |
| 2600569 | Colour | 2011/09/01 | | | 99 | 85 - 115 | <2 | TCU | NC | 25 | | |
| 2600648 | o-Terphenyl | 2011/09/01 | 116 | 30 - 130 | 115 | 30 - 130 | 113 | % | | | | |
| 2600648 | F2 (C10-C16 Hydrocarbons) | 2011/09/01 | 104 | 60 - 130 | 100 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600648 | F3 (C16-C34 Hydrocarbons) | 2011/09/01 | 107 | 60 - 130 | 102 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600648 | F4 (C34-C50 Hydrocarbons) | 2011/09/01 | 111 | 60 - 130 | 106 | 60 - 130 | <100 | ug/L | NC | 50 | | |
| 2600710 | Dissolved Chloride (Cl) | 2011/09/02 | NC | 75 - 125 | 106 | 80 - 120 | <1 | mg/L | 0.3 | 20 | | |
| 2600718 | Orthophosphate (P) | 2011/09/02 | 97 | 75 - 125 | 100 | 80 - 120 | <0.01 | mg/L | NC | 25 | | |
| 2600719 | Dissolved Sulphate (SO4) | 2011/09/02 | NC | 75 - 125 | 97 | 80 - 120 | <1 | mg/L | 0.8 | 25 | | |
| 2600738 | 2,4,5,6-Tetrachloro-m-xylene | 2011/09/01 | 30 | 30 - 130 | 47 | 30 - 130 | 42 | % | | | | |
| 2600738 | Decachlorobiphenyl | 2011/09/01 | 97 | 30 - 130 | 96 | 30 - 130 | 91 | % | | | | |
| 2600738 | Aroclor 1260 | 2011/09/01 | 99 | 30 - 130 | 84 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Total PCB | 2011/09/01 | 99 | 30 - 130 | 84 | 30 - 130 | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1016 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1221 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1232 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1242 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1248 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1254 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1262 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2600738 | Aroclor 1268 | 2011/09/01 | | | | | <0.05 | ug/L | NC | 40 | | |
| 2601412 | 1,4-Difluorobenzene | 2011/09/01 | 99 | 70 - 130 | 101 | 70 - 130 | 98 | % | | | | |
| 2601412 | 4-Bromofluorobenzene | 2011/09/01 | 98 | 70 - 130 | 100 | 70 - 130 | 99 | % | | | | |
| 2601412 | D10-Ethylbenzene | 2011/09/01 | 97 | 70 - 130 | 100 | 70 - 130 | 96 | % | | | | |
| 2601412 | D4-1,2-Dichloroethane | 2011/09/01 | 104 | 70 - 130 | 102 | 70 - 130 | 102 | % | | | | |
| 2601412 | Benzene | 2011/09/01 | 88 | 70 - 130 | 86 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | Toluene | 2011/09/01 | 90 | 70 - 130 | 92 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | Ethylbenzene | 2011/09/01 | 92 | 70 - 130 | 95 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | o-Xylene | 2011/09/01 | 93 | 70 - 130 | 94 | 70 - 130 | <0.20 | ug/L | | | | |
| 2601412 | p+m-Xylene | 2011/09/01 | 91 | 70 - 130 | 93 | 70 - 130 | <0.40 | ug/L | | | | |
| 2601412 | F1 (C6-C10) | 2011/09/02 | 78 | 70 - 130 | 93 | 70 - 130 | <25 | ug/L | NC | 40 | | |
| 2601412 | Total Xylenes | 2011/09/01 | | | | | <0.40 | ug/L | | | | |
| 2601412 | F1 (C6-C10) - BTEX | 2011/09/02 | | | | | <25 | ug/L | NC | 40 | | |
| 2601612 | Total Dissolved Solids | 2011/09/02 | | | | | <10 | mg/L | 0.6 | 25 | 98 | 90 - 110 |
| 2602452 | Dissolved Chloride (Cl) | 2011/09/06 | NC | 75 - 125 | 105 | 80 - 120 | <1 | mg/L | 0.2 | 20 | | |

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2602453 | Orthophosphate (P) | 2011/09/06 | 98 | 75 - 125 | 102 | 80 - 120 | <0.01 | mg/L | NC | 25 | | |
| 2602454 | Dissolved Sulphate (SO4) | 2011/09/06 | NC | 75 - 125 | 101 | 80 - 120 | <1 | mg/L | 0.5 | 25 | | |
| 2602563 | Mercury (Hg) | 2011/09/02 | 109 | 80 - 120 | 103 | 80 - 120 | <0.01 | ug/L | NC | 25 | | |
| 2604619 | Total Antimony (Sb) | 2011/09/06 | 102 | 80 - 120 | 105 | 85 - 115 | <0.5 | ug/L | NC | 20 | | |
| 2604619 | Total Arsenic (As) | 2011/09/06 | 95 | 80 - 120 | 98 | 85 - 115 | <1 | ug/L | NC | 20 | | |
| 2604619 | Total Barium (Ba) | 2011/09/06 | 94 | 80 - 120 | 99 | 85 - 115 | <2 | ug/L | 6.8 | 20 | | |
| 2604619 | Total Beryllium (Be) | 2011/09/06 | 94 | 80 - 120 | 98 | 85 - 115 | <0.5 | ug/L | NC | 20 | | |
| 2604619 | Total Boron (B) | 2011/09/06 | 94 | 80 - 120 | 97 | 85 - 115 | <10 | ug/L | 6.3 | 20 | | |
| 2604619 | Total Cadmium (Cd) | 2011/09/06 | 99 | 80 - 120 | 105 | 85 - 116 | <0.1 | ug/L | NC | 20 | | |
| 2604619 | Total Chromium (Cr) | 2011/09/06 | 89 | 80 - 120 | 95 | 85 - 115 | <5 | ug/L | NC | 20 | | |
| 2604619 | Total Copper (Cu) | 2011/09/06 | 91 | 80 - 120 | 98 | 85 - 115 | 1, RDL=1 | ug/L | NC | 20 | | |
| 2604619 | Total Iron (Fe) | 2011/09/06 | 93 | 80 - 120 | 97 | 85 - 115 | <100 | ug/L | 8.8 | 20 | | |
| 2604619 | Total Lead (Pb) | 2011/09/06 | 95 | 80 - 120 | 100 | 85 - 115 | <0.5 | ug/L | NC | 20 | | |
| 2604619 | Total Molybdenum (Mo) | 2011/09/06 | 100 | 80 - 120 | 105 | 85 - 115 | <0.5 | ug/L | 4.5 | 20 | | |
| 2604619 | Total Nickel (Ni) | 2011/09/06 | 90 | 80 - 120 | 95 | 85 - 115 | <1 | ug/L | NC | 20 | | |
| 2604619 | Total Selenium (Se) | 2011/09/06 | 96 | 80 - 120 | 102 | 85 - 115 | <2 | ug/L | NC | 20 | | |
| 2604619 | Total Silver (Ag) | 2011/09/06 | 92 | 80 - 120 | 98 | 85 - 115 | <0.1 | ug/L | NC | 20 | | |
| 2604619 | Total Thallium (Tl) | 2011/09/06 | 95 | 80 - 120 | 99 | 85 - 115 | <0.05 | ug/L | NC | 20 | | |
| 2604619 | Total Titanium (Ti) | 2011/09/06 | 92 | 80 - 120 | 96 | 85 - 115 | <5 | ug/L | NC | 20 | | |
| 2604619 | Total Uranium (U) | 2011/09/06 | 100 | 80 - 120 | 102 | 85 - 115 | <0.1 | ug/L | 5.3 | 20 | | |
| 2604619 | Total Zinc (Zn) | 2011/09/06 | 95 | 80 - 120 | 102 | 85 - 115 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Aluminum (Al) | 2011/09/02 | 103 | 80 - 120 | 94 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Antimony (Sb) | 2011/09/02 | 111 | 80 - 120 | 99 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Arsenic (As) | 2011/09/02 | 103 | 80 - 120 | 96 | 80 - 120 | <1 | ug/L | 1.3 | 20 | | |
| 2605513 | Dissolved Barium (Ba) | 2011/09/02 | 97 | 80 - 120 | 97 | 80 - 120 | <2 | ug/L | 4.7 | 20 | | |
| 2605513 | Dissolved Beryllium (Be) | 2011/09/02 | 100 | 80 - 120 | 93 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Boron (B) | 2011/09/02 | 99 | 80 - 120 | 94 | 80 - 120 | 13, RDL=10 | ug/L | 4.8 | 20 | | |
| 2605513 | Dissolved Cadmium (Cd) | 2011/09/02 | 110 | 80 - 120 | 99 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Chromium (Cr) | 2011/09/02 | 111 | 80 - 120 | 94 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Cobalt (Co) | 2011/09/02 | 108 | 80 - 120 | 92 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Copper (Cu) | 2011/09/02 | 109 | 80 - 120 | 93 | 80 - 120 | <1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Iron (Fe) | 2011/09/02 | 111 | 80 - 120 | 97 | 80 - 120 | <100 | ug/L | 3.8 | 20 | | |
| 2605513 | Dissolved Lead (Pb) | 2011/09/02 | 98 | 80 - 120 | 96 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Molybdenum (Mo) | 2011/09/02 | 111 | 80 - 120 | 100 | 80 - 120 | <0.5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Nickel (Ni) | 2011/09/02 | 108 | 80 - 120 | 92 | 80 - 120 | <1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Selenium (Se) | 2011/09/02 | 104 | 80 - 120 | 95 | 80 - 120 | <2 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Silver (Ag) | 2011/09/02 | 54(1, 2) | 80 - 120 | 94 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Thallium (Tl) | 2011/09/02 | 98 | 80 - 120 | 96 | 80 - 120 | <0.05 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Titanium (Ti) | 2011/09/02 | 114 | 80 - 120 | 96 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2605513 | Dissolved Uranium (U) | 2011/09/02 | 104 | 80 - 120 | 100 | 80 - 120 | <0.1 | ug/L | NC | 20 | | |

Maxxam Job #: B1D2546
Report Date: 2011/09/13

Franz Environmental Inc
Client Project #: 1697-1101

## 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 |
| 2605513 | Dissolved Zinc (Zn) | 2011/09/02 | 111 | 80 - 120 | 95 | 80 - 120 | <5 | ug/L | NC | 20 | | |
| 2606043 | Total Aluminum (Al) | 2011/09/07 | 79(1) | 80 - 120 | 96 | 85 - 115 | <5 | ug/L | NC | 20 | | |
| 2606043 | Total Cobalt (Co) | 2011/09/07 | 92 | 80 - 120 | 94 | 85 - 115 | <0.5 | ug/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.
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) - The recovery was below the lower control limit. This may represent a low bias in some results for flagged analytes.



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

## Validation Signature Page

**Maxxam Job #: B1D2546**

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

BRAD NEWMAN, Scientific Specialist

CRISTINA CARRIERE, Scientific Services

MEDHAT RISKALLAH, Manager, Hydrocarbon Department

MAMDOUH SALIB, Analyst, Hydrocarbons



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# Validation Signature Page

**Maxxam Job #: B1D2546**

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

ALINA SEGAL, Manager Main Lab - Organics

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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.



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# CHAIN OF CUS

29-Aug-11 18:00
JULIE CLEMENT
B1D2546
VPA ENV-789



e Only:

BOTTLE ORDER #: 274012

PROJECT MANAGER: JULIE CLEMENT

C#274012-02-01

| INVOICE INFORMATION: | | REPORT INFORMATION (if differs from invoice): | | PROJECT INFORMATION: | |
|---|---|---|---|---|---|
| Company Name: | #10988 Franz Environmental Inc | Company Name: | | Quotation #: | B14919 |
| Contact Name: | Invoices, Lillian & Catherine | Contact Name: | Catherine LeBlanc, Andrew Henderson | P.O. #: | |
| Address: | 329 Churchill Ave N Suite 200 Ottawa ON K1Z 5B8 | Address: | | Project #: | 1697-1101 |
| | | | | Project Name: | |
| Phone: | (613)721-0555 Fax: (613)721-0029 | Phone: | Fax: | Site #: | |
| Email: | cleblanc@franzenvironmental.com; lellis@franzenvi | Email: | cleblanc@franzenvironmental.com | Sampled By: | RF/CL |

**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 ___

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

SPECIAL INSTRUCTIONS: See quote

*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) | Anions/pH/Conductivity/Color | Dissolved Metals by ICPMS | Mercury (low level) | PHC F1-F4 & BTEX in water | Polychlorinated Biphenyl in Water | Total Metals Analysis by ICPMS | TSS & TDS | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | MW1 | Aug24 | PM | GW | | N | X | X | X | X | X | X | X | 13 | |
| 2 | | CEL1 | " | " | GW | | N | X | X | X | X | X | X | X | 13 | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | REC'D IN OTTAWA |
| 10 | | | | | | | | | | | | | | | | |

| *RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time: | # Jars Used and Not Submitted |
|---|---|---|---|---|---|---|
| Ryan Fletcher | Aug 25/11 | | Josh Freeman | 2011/08/29 | 18:00 | |

**Laboratory Use Only**

| Time Sensitive | Temperature (°C) on Receipt | Custody Seal | Yes | No |
|---|---|---|---|---|
| | 8/8/8 | 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
DAVID CHAN 2011/08/30 10:50 8/9/8°C 8/9/10°C

10/9/10

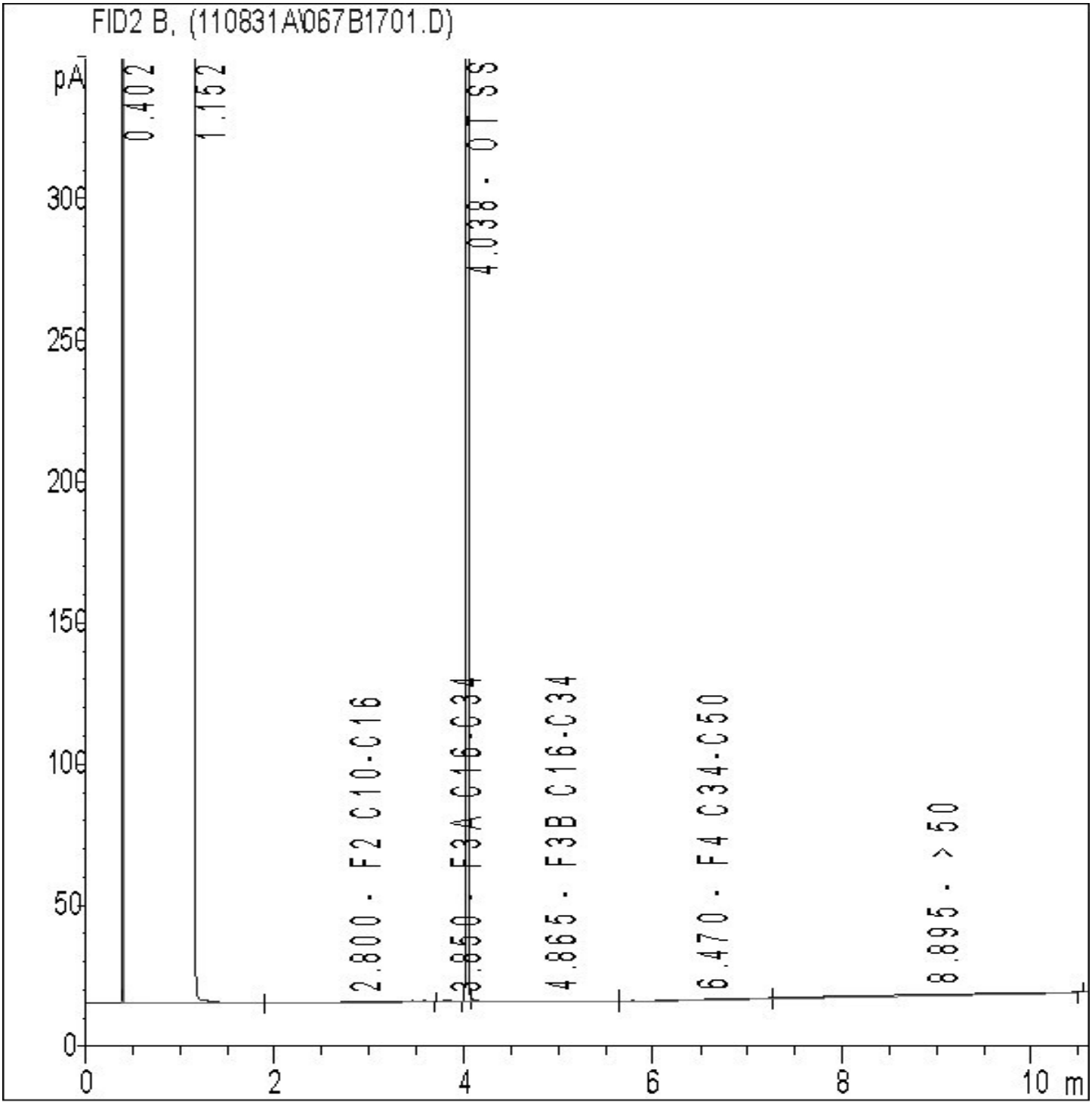
Success Through Science®

Franz Environmental Inc
Client Project #: 1697-1101

Report Date: 2011/09/13
Maxxam Job #: B1D2546
Maxxam Sample: KS3389

Client ID: MW 1

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

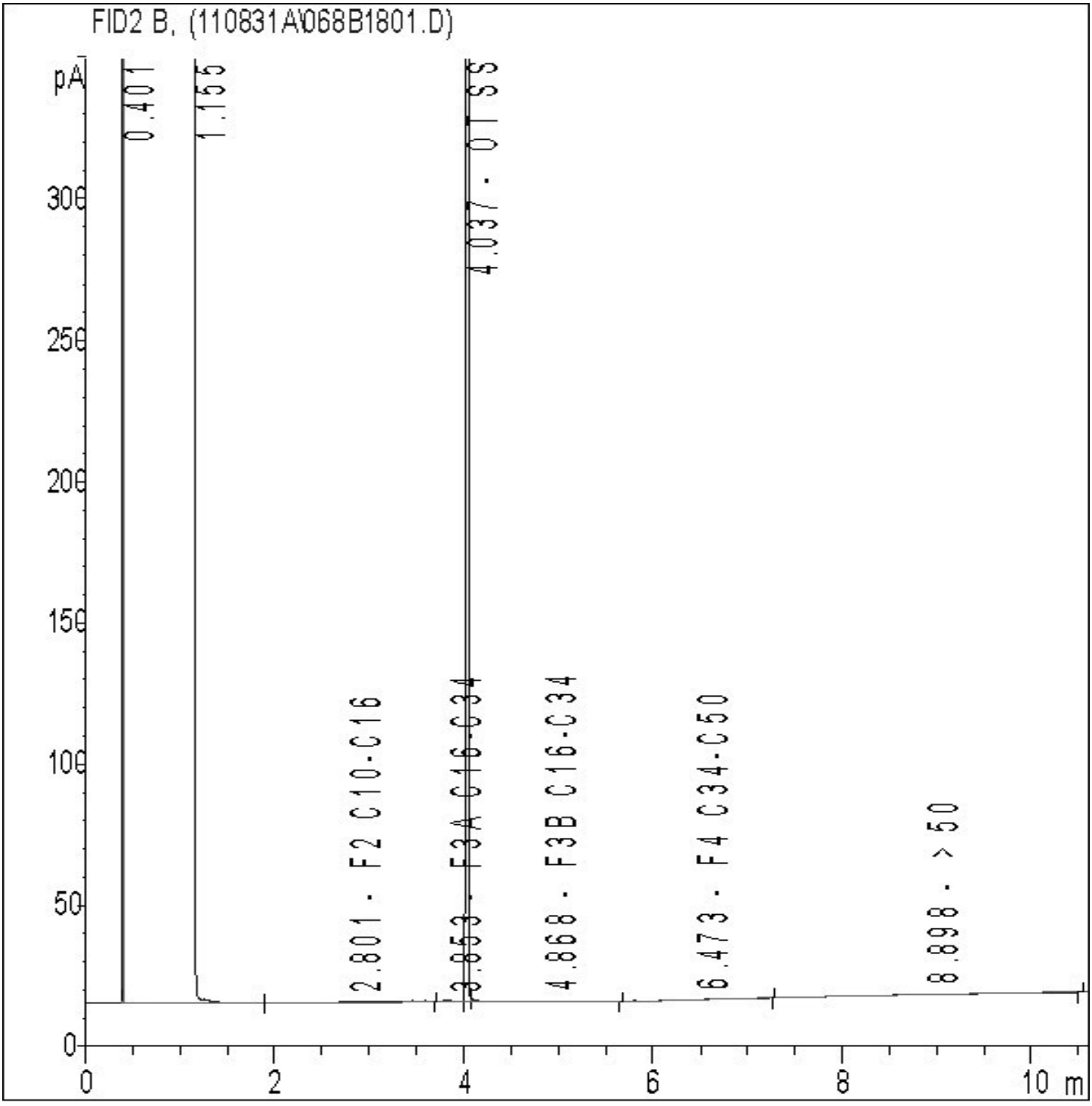
Success Through Science®

Franz Environmental Inc
Client Project #: 1697-1101

Report Date: 2011/09/13
Maxxam Job #: B1D2546
Maxxam Sample: KS3390

Client ID: CEL 1

**Petroleum Hydrocarbons F2-F4 in Water Chromatogram**




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

# APPENDIX E

# QA/QC Discussion

In order to obtain the required minimum of 20% duplicate samples, as stipulated in LTM plan, one duplicate soil sample and one duplicate groundwater sample were collected at the site in 2011. Analytical results for submitted samples and their duplicate pairs were compared to provide an indication of the precision of both the field sampling and laboratory analyzing methods. Results are presented along with chemical data in Appendix B, while the methodology is discussed in section 4.5.

All groundwater and soil samples analyzed for PHCs, metals, PCBs and inorganics fell within limits of QA/QC acceptability with the exception of the groundwater sample MW06-04 and AH-1 for Total Suspended Solids (TSS), total and dissolved nickel, and total arsenic. The samples exceeded the acceptable range for “Case D” samples as outlined in Table 4-2. The difference between the two concentrations for all parameters was exactly equal to the RDL, which is the margin of error on such a reading.

The internal laboratory quality control for analyses meets acceptability criteria. Therefore based on both laboratory and field QA/QC results, the data is reliable for its intended use. Laboratory QA/QC results are included in the laboratory certificates of analyses provided in Appendix D.

# APPENDIX F

# Site Photographs

Southwest corner of the NHWL. Viewpoint 2 (Figure A-1; Appendix A). Photograph reference 2 (CD-ROM). Direction photo taken: NE

Southeast corner of the NHWL. Viewpoint 17 (Figure A-1; Appendix A). Photograph reference 17 (CD-ROM). Direction photo taken: NW

Northeast corner of the NHWL. Viewpoint 28 (Figure A-1; Appendix A). Photograph reference 28 (CD-ROM).
Direction photo taken: SW

Northwest corner of the NHWL. Viewpoint 40 (Figure A-1; Appendix A). Photograph reference 40 (CD-ROM).
Direction photo taken: SE

Top of the NHWL. Note the undulations of the cap. Viewpoint 22 (Figure A-1; Appendix A). Photograph reference 22 (CD-ROM). Direction photo taken: W

Sinkhole near the northwest corner of the NHWL. Viewpoint 55 (Figure A-1; Appendix A). Photograph reference 55 (CD-ROM). Direction photo taken: E

Sinkhole near the southwest corner of the NHWL. Viewpoint 59 (Figure A-1; Appendix A). Photograph reference 59 (CD-ROM). Direction photo taken: NE

Ponded water with staining along the toe of NHWL near the southwest corner. Viewpoint 61 (Figure A-1; Appendix A). Photograph reference 61 (CD-ROM). Direction photo taken: NE

Drainage area with staining and vegetation near the northeast corner of the NHWL. Viewpoint 64 (Figure A-1; Appendix A). Photograph reference 64 (CD-ROM). Direction photo taken: SW

Ponded water with staining near the north side of the NHWL. Soil sample CC2 collected from this area. Viewpoint 68 (Figure A-1; Appendix A). Photograph reference 68 (CD-ROM). Direction photo taken: S

Ponded water with staining near the east side of the NHWL. Soil sample CC3/D1 collected from this area. Viewpoint 74 (Figure A-1; Appendix A). Photograph reference 74 (CD-ROM). Direction photo taken: N

Background soil sampling location. Soil sample CC4 collected from this area. Viewpoint 76 (Figure A-1; Appendix A). Photograph reference 76 (CD-ROM). Direction photo taken: N

Groundwater sampling at MW-4. Viewpoint 8 (Figure A-1; Appendix A). Photograph reference 8 (CD-ROM).
Direction photo taken: NE

Table F-1. Picture viewpoint numbers of the NHWL (as depicted in Figure A-1, Appendix A) cross-referenced with picture numbers on attached CD-ROM.

| Viewpoint # | Picture # | Viewpoint # | Picture # | Viewpoint # | Picture # |
|---|---|---|---|---|---|
| 1 | 1 | **28** | **28** | **55** | **55** |
| **2** | **2** | 29 | 29 | 56 | 56 |
| 3 | 3 | 30 | 30 | 57 | 57 |
| 4 | 4 | 31 | 31 | 58 | 58 |
| 5 | 5 | 32 | 32 | **59** | **59** |
| 6 | 6 | 33 | 33 | 60 | 60 |
| 7 | 7 | 34 | 34 | **61** | **61** |
| **8** | **8** | 35 | 35 | 62 | 62 |
| 9 | 9 | 36 | 36 | 63 | 63 |
| 10 | 10 | 37 | 37 | **64** | **64** |
| 11 | 11 | 38 | 38 | 65 | 65 |
| 12 | 12 | 39 | 39 | 66 | 66 |
| 13 | 13 | **40** | **40** | 67 | 67 |
| 14 | 14 | 41 | 41 | **68** | **68** |
| 15 | 15 | 42 | 42 | 69 | 69 |
| 16 | 16 | 43 | 43 | 70 | 70 |
| **17** | **17** | 44 | 44 | 71 | 71 |
| 18 | 18 | 45 | 45 | 72 | 72 |
| 19 | 19 | 46 | 46 | 73 | 73 |
| 20 | 20 | 47 | 47 | **74** | **74** |
| 21 | 21 | 48 | 48 | 75 | 75 |
| **22** | **22** | 49 | 49 | **76** | **76** |
| 23 | 23 | 50 | 50 | | |
| 24 | 24 | 51 | 51 | | |
| 25 | 25 | 52 | 52 | | |
| 26 | 26 | 53 | 53 | | |
| 27 | 27 | 54 | 54 | | |

**Note:**

Numbers in **bold** appear in Appendix B.

# APPENDIX G

# Field Notes

Cape Chinshan
FRANZ: COL, MD
Aug 24/11
Overcast 4 C

Horiba calibration

| pH | temp | Cond | orp | Turb | DO |
|---|---|---|---|---|---|
| 4.11 | 14.41 | 469 | 302 | 4.6 | 9.25 |
| 4.00 | 14.15 | 451 | 309 | 0 | 10.22 |

MW-4

| Time | 12:15 | 12:18 | 12:22 | 12:25 | 12:30 |
|---|---|---|---|---|---|
| pH | 5.69 | 5.84 | 5.96 | 5.99 | 6.12 |
| cond | 0.476 | 0.414 | 0.408 | 0.409 | 0.440 |
| Turb | 22.8 | 17.8 | 78.9 | 46.6 | 17.5 |
| DO | 9.68 | 9.44 | 7.23 | 8.46 | 8.35 |
| Temp | 3.25 | 2.84 | 2.90 | 2.94 | 3.04 |
| orp | 285 | 278 | 272 | 262 | 246 |

@ 12:19 water level was 1.44 cm
@ 12:24 - 1.43
12:33 - 1.41

DTW = 1.33 DTB = 1.78
Stick-up = 0.39
PUMP = 2L

LEVEL

Prints: Polar Bear & Dog.

| | pH | Cond | Turb | DO | Temp | ORP |
|---|---|---|---|---|---|---|
| 12:30 | 6.25 | 0.460 | 42.3 | 8.46 | 3.09 | 227 |
| 12:38 | 6.33 | 0.490 | 13.7 | 9.30 | 3.16 | 218 |

- Purge 2 2L

MW3

| | pH | Con | Turb | Do | Temp | orp |
|---|---|---|---|---|---|---|
| 13:55 | 6.72 | 0.234 | 172 | 9.19 | 1.56 | 230 |
| 13:59 | 6.74 | 0.232 | 174 | 5.70 | 1.30 | 212 |

Pumped dry @ 14:02 purge 0.5L

DTW = 1.62 Stick up = 0.56

DTB = 1.75

MW2 + Dup1

| | pH | Con | Turb | Do | Temp | ORP |
|---|---|---|---|---|---|---|
| ~~14:31~~ | | | | | | |
| 14:32 | 6.27 | 2.04 | 32.1 | 0.20 | 2.28 | -33 |
| 14:34 | 6.41 | 1.99 | 27.8 | 0 | 2.29 | -56 |
| 14:36 | 6.42 | 1.97 | 29.8 | 0 | 2.11 | -55 |
| 14:39 | 6.20 | 2.25 | 30.1 | 1.48 | 1.58 | -73 |
| 14:41 | 6.21 | 3.01 | 39.1 | 0 | 1.57 | -78 |
| 14:43 | 6.20 | 2.94 | 32.7 | 0 | 1.5% | -2% |

Pumped dry @ Purged 2L

→ Mercury & dissolved metals

→ Mercury only dup

DTW = 0.64 Stick = 0.56

DTB = 1.52

MW 1 + Dup 1

| | pH | cond | Turb | do | Temp | Orp |
|---|---|---|---|---|---|---|
| 15:11 | 7.01 | 1.99 | 18.6 | 0.33 | 2.66 | -127 |
| 15:13 | 7.19 | 1.80 | 15.0 | 0 | 2.60 | -145 |
| 15:15 | 7.24 | 1.68 | 14.9 | 0 | 2.61 | -150 |
| 15:17 | 7.29 | 1.65 | 14.0 | 0 | 2.55 | -149 |
| 15:19 | 7.34 | 1.61 | 13.7 | 0 | 2.53 | -143 |
| 15:21 | 7.38 | 1.62 | 13.0 | 0 | 2.49 | -138 |
| 15:23 | 7.40 | 1.63 | 13.1 | 0 | 2.45 | -133 |

DTW = 0.99 Stick up = 0.58

DTB = 1.65

Purged ~ 2L

* DUP HERE did not continue with dupe @ MW-2 due to lack of water

LEVEL