Long Term Monitoring, 2013
PIN-D, Ross Point, Nunavut

FINAL REPORT

Prepared for:

Aboriginal Affairs and Northern Development Canada
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EXECUTIVE SUMMARY

Franz Environmental Inc. (FRANZ) was retained by Aboriginal Affairs and Northern Development Canada – Nunavut Regional Office (AANDC) to conduct year one long-term monitoring activities at the former Distant Early Warning (DEW) Line site PIN-D. This project was completed under AANDC Standing Offer Number 01-11-6001/5, Call-Up Number 03, File Number 1632-11/01-11-6001/5.

PIN-D, Ross Point, is situated on a mesa 150 metres above sea level and was a typical Intermediate DEW Line site. During operation, the site consisted of a module train, warehouse, garage, Inuit house, Petroleum/Oil/Lubricant (POL) tanks, and a Doppler antenna. In addition to the main site a beach landing area was constructed along with two airstrips and gravel roads linking the various facilities.

In 1985 some of the surface contaminants at PIN-D were cleaned up under a program conducted by Department of National Defence, Environment Canada, and AANDC. The warehouse was also dismantled and the four POL tanks were removed. Further remediation was conducted at the site between 2011 and 2012 and involved the demolition and disposal of buildings, structures and other debris, as well as the cleanup of hazardous materials and contaminated soil. Some of the material from the remediation program was placed in an on-site non-hazardous waste landfill (NHWL), which was completed in 2012.

The 2013 monitoring program was carried out at the site on August 21, 2013. The monitoring program consisted of a visual inspection of the NHWL, active layer water monitoring and natural environment monitoring.

Based on systematic visual observations and measurements, supported with photographic documentation, FRANZ determined that the NHWL is performing as designed, and is containing the enclosed waste. FRANZ observed three minor depressions in the area of the NHWL: one on the eastern side of the surface of the landfill, one in the southwest corner of the landfill at the toe of the berm, and one at the northwest corner of the landfill at the toe of the berm. None of these features are considered to have any significant impact on the integrity or performance of the NHWL.

During remediation, four monitoring wells were installed at the site to allow for active layer water monitoring. During the 2013 monitoring program, FRANZ collected samples from two of the wells; there was insufficient water in the remaining two wells for sample collection. Since this is the first monitoring event for the long-term monitoring plan to be implemented within the first three years at PIN-D, there is insufficient historical or baseline data to compare the results to the

baseline mean as recommended by AANDC's long-term monitoring guidance. The groundwater results from 2013 will form the basis for future standards.

The surrounding areas were also observed and found to be in good condition. A derelict camp area remains at the East Beach Area. Physical evidence, supported by interviews with persons with firsthand knowledge of the site and with a member of the nearby community's Hunters and Trappers Organization, indicates that the area is frequented for caribou and muskox hunting and that a change in harvest numbers has not be observed.

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

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1.0 INTRODUCTION

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 DEW Line site PIN-D, Ross Point, NU. This project was completed under AANDC Standing Offer Number 01-11-6001/5, Call-up Number 3, File Number 1632-11/01-11-6001/5.

This report describes the monitoring activities completed for AANDC at PIN-D and was prepared in accordance with the FRANZ Proposal No. P-4612, dated June 13, 2013, the Call-up Details, dated July 8, 2013 and the Project Initiating Meeting Minutes, dated July 30, 2013.

Throughout this report the AANDC DEW Line site PIN-D will be referred to as "the site."

1.1 Project Objectives

Long term monitoring of the PIN-D site uses a three phased approach; with evaluation of further monitoring requirements to be completed after the completion of each phase. The objective of the 2013 long-term monitoring was to complete Year 1, the first of three planned monitoring events in Phase I of the monitoring program for the PIN-D site, as described in the *PIN-D (Ross Point) Long-Term Monitoring Plan* (AANDC, 2013). Monitoring 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 PIN-D Long-Term Monitoring Plan, dated March 28, 2013, 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, lateral movement, frost action, animal burrows, vegetation, staining, vegetation stress, seepage points, exposed debris, and the condition of wells;
    - 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 compared to those from background samples.
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;
   - Making observations regarding the revegetation of disturbed areas.
5. Preparation of a 2013 monitoring program report.

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

a) Review of PIN-D LTM Plan and the AMSRP;
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 condition at the site;
e) Collection of groundwater and soil samples;
f) Visual inspection, measurement and photo documentation of the site;
g) Interviewing local residents and officials to understand land use and wildlife trends; and
h) Reporting.

2.0 BACKGROUND INFORMATION

2.1 Site Description

PIN-D Ross Point was an Intermediate Distant Early Warning (DEW) Line site, located on the north shore of Johansen Bay overlooking Coronation Gulf, approximately 500 metres from the coast. The nearest communities are Kugluktuk, approximately 185 kilometres to the southwest, and Cambridge Bay, approximately 250 kilometres to the east. The site is located at 68°35'48.74" N, 111°07'3.47" W. The Ross Point site was reserved by the Department of National Defence (DND) in 1956. The PIN-D Intermediate Distant Early Warning (DEW) Line Site was constructed in 1959 and deactivated in 1963.

The site is situated on a mesa 150 metres above sea-level and was typical of Intermediate DEW Line sites. It consisted of a module train, warehouse, garage, Inuit house, Petroleum/Oil/Lubricant (POL) tanks, and a Doppler antenna. In addition to the main site a beach landing area was constructed along with gravel roads linking the various facilities. Two airstrips were constructed at the site. The minor airstrip (~300 metres long) is closest to the station area and oriented northeast-southwest. The main airstrip (~500 metres long) has an approximate east-west orientation and closely approaches the minor airstrip at its eastern end.

The area is characterized by low mesas and hills composed of dolomite and glacial till. The station facilities were constructed on one of the mesas. A steep cliff extends along the southern edge of the station with gentler slopes leading out east and west. A gentle slope to the north leads towards the major airstrip and freshwater lake; access to these areas is provided by a road. The main landfill is located at the west end of the minor airstrip. A second small landfill is located at the top edge of a slope above a small lake at the northeast base of the mesa. There is very little soil at the upper site and, as such, little vegetation. During the investigation it was noted that the lower slopes and depressions contained a fair amount of vegetation; mainly grasses, sedges, and willows. The wildlife typically found in this region includes polar bears, caribou, muskoxen, wolf, arctic fox, snowshoe hare, raven, osprey, shorebirds, seabirds, and waterfowl.

In 1985 some of the surface contaminants at PIN-D were cleaned up under a program conducted by Department of National Defence (DND), Environment Canada (EC), and AANDC. An investigation was conducted in 1994; at that time the module train and garage were still intact but had suffered damage from prolonged weathering. The warehouse had been dismantled down to the concrete base. The four POL tanks (two at the beach and two at the main station) had been removed but the station pumphouse was intact, although the pump had been removed. The pipeline connecting the beach and station tanks was mostly intact and

marked with barrels. The refueling pipeline at the beach was mostly removed but pieces remained.

A remediation project was conducted at the site between 2011 and 2012, which involved the demolition and disposal of buildings, structures and other debris, as well as the cleanup of hazardous materials and contaminated soil. Construction of the NHWL at PIN-D started in 2011 and was completed in August 2012.

The NHWL was designed to contain non-hazardous materials only. It was constructed on native ground with the organic matter stripped and consists of four perimeter berms constructed of granular material. The non-hazardous waste was placed in the landfill in layers consisting of 0.5 metre lifts of waste covered by 0.15 metres of granular fill. Once all the layers were completed a final cover consisting of a minimum of 1.0 metres of granular fill was used to cap the landfill.

The NHWL at PIN-D contains the following types of waste:

- Type A hydrocarbon impacted soil.
- Non-hazardous site debris, such as scrap metal and wood.
- Creosote timbers.
- Double-bagged asbestos.
- Items as detailed above from PIN-E Cape Peel were also disposed of in the PIN-D NHWL. These items were transported from PIN-E to PIN-D for disposal in mid-August 2012.
- Tier 1 contaminated soil (Lead concentration between 200 and 500 ppm and PCB concentrations between 1 and 5 ppm).

2.2 Baseline Soil and Groundwater Data

Remediation at PIN-D was contracted with PIN-E (Cape Peel) and all wastes from both sites were disposed of in the NHWL at PIN-D. During the site remediation (site clean-up) activities at PIN-D, AECOM Canada Ltd. (AECOM) collected baseline soil data to use for comparison during future monitoring events. During the 2011, four monitoring wells (MW1 through MW4) were installed around the perimeter of the NHWL. Baseline groundwater data was not collected in 2011 due to the late season well installation.

Twelve (12) baseline soil samples were collected from the NHWL footprint prior to construction in 2011 and tested for select metals; benzene, toluene, ethylbenzene, xylenes (BTEX); petroleum hydrocarbons (PHCs) and PCBs. The results of the analytical testing showed no exceedances of the DDC DEW Line Cleanup Criteria for Tier I and II in soils (AECOM, 2012). Table 2-1 depicts the baseline soil analytical data for PIN-D's NHWL footprint.

Table 2-1: Baseline Soil Analytical Data from NHWL Footprint

Parameter (mg/kg)	11-0400	11-0401	11-0402	11-0403	11-0404	11-0405	11-0406	11-0407	11-0408	11-0409	11-0410	11-0411	Avg. Conc.	Std. Dev.
Depth (cm)	0-10	0-10	40-50	0-10	40-50	0-10	40-50	0-10	40-50	0-10	40-50	40-50		
As	3	3	3	3	3	1	2	2	12	3	6	6	3.9	2.9
Cd	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Cr	11	9	32	13	16	6	12	19	6	13	12	7	13.0	7.1
Co	ND	1	2	2	3	2	2	2	3	4	2	2	2.3	0.8
Cu	ND	ND	6	5	10	8	8	ND	5	8	ND	ND	7.1	1.9
Pb	14	15	12	9	11	4	8	10	14	13	14	10	11.2	3.2
Ni	7	5	16	8	11	5	7	11	7	9	8	5	8.3	3.2
Zn	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Hg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
F1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
F1-BTEX	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
F2	ND	ND	ND	ND	62	ND	ND	ND	ND	30	42	61	48.8	15.5
F3	ND	ND	ND	ND	63	ND	ND	ND	ND	120	57	62	75.5	29.8
F4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---
Total PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	---	---

Data collected from Appendix B, Table B1 through B3 (AECOM, 2012).
Std. Dev. = Standard Deviation

Environmental Sciences Group (ESG) of the Royal Military College of Canada (RMC) conducted a background geochemical assessment at PIN-D in 2009 (ESG, 2010). The background geochemical assessment was undertaken to establish the natural levels of inorganic elements in the surrounding environment at the site. As a result of ESG's statistical analysis, it was recommended that the DEW Line Cleanup Criteria (DLCC) be used for cadmium and lead as all samples reported non-detectable concentrations. In addition, using the logs of the data and then exponentiating the results for arsenic, cobalt, chromium, nickel and zinc, it yielded extreme outlier values that were below the DLCCs. It is recommended that the DLCC also be used for these elements.

Background concentrations encountered during the geochemical assessment were elevated for copper. Using the logs of the data and then exponentiating the results, it yielded mild outlier values of 80 ppm for Cass Fiord Formation (Cc) and 63 ppm for Neoproterozoic Nelson Head Formation (Nnh), and extreme outlier values of 254 ppm for unit Cc and 221 ppm for unit Nnh, which are above the DLCC. The highest copper concentration found during the ESG geochemical assessment was below both the DLCC and the calculated mild outlier level, it was recommended that the DLCC for copper be used as a reference point and the higher of the two extreme outlier limits, 254 ppm, be used as a site specific control level (ESG, 2010).

Table 2-2 depicts the soil analytical data collected by ESG during their geochemical assessment at PIN-D collected in 2009.

Table 2-2: ESG's Geochemical Assessment Site-Wide Soil Analytical Data

Sample ID	Terrain Unit	Depth (cm)	As (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
DCC Tier I	---	---	---	---	---	---	---	---	200	---
DCC Tier II	---	---	***30***	***5***	***50***	***250***	***100***	***100***	***500***	***500***
09-30960/61	Cc	20	2.1	ND	8.3	21	24	14	ND	24
09-30962	Cc	10	ND	ND	7.6	ND	27	11	ND	20
09-30963	Cc	10	ND	ND	ND	ND	14	6	ND	ND
09-30964	Cc	0	ND	ND	ND	22	34	11	ND	16
09-30965	Cc	0	ND	ND	ND	ND	12	ND	ND	ND
09-30966	Cc	30	ND	ND	7.3	21	26	12	ND	18
09-30967	Cc	10	1.5	ND	5.9	ND	30	8	ND	ND
09-30968	Cc	10	1.3	ND	ND	ND	6.5	7.7	ND	ND
09-30969	Cc	0	ND	ND	ND	ND	ND	ND	ND	ND
09-30970/71	Cc	20	ND	ND	ND	ND	20	ND	ND	ND
09-30972	Cc	10	ND	ND	5.3	ND	21	7.9	ND	ND
09-30973	Cc	10	1.3	ND	ND	ND	29	6.1	ND	ND
09-30974	Cc	10	1.4	ND	ND	ND	25	5.1	ND	19
09-30975	Cc	20	1.5	ND	5.2	ND	19	7.7	ND	ND

Sample ID	Terrain Unit	Depth (cm)	As (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
DCC Tier I	---	---	---	---	---	---	---	---	200	---
DCC Tier II	---	---	***30***	***5***	***50***	***250***	***100***	***100***	***500***	***500***
09-30976	Cc	20	1.2	ND	5.1	ND	17	8	ND	ND
09-30977	Cc	10	ND	ND	5.2	ND	5.9	5.8	ND	17
09-30978	Cc	10	2.3	ND	5.6	ND	18	7.5	ND	ND
09-30979	Cc	10	ND	ND	ND	ND	8.5	ND	ND	ND
09-30980/81	Cc	10	1.4	ND	ND	ND	14	ND	ND	ND
09-30982	Cc	10	ND	ND	ND	ND	10	5.1	ND	ND
09-30983	Cc	0	ND	ND	ND	ND	21	5.4	ND	ND
09-30984	Cc	10	2	ND	5.7	ND	49	10	ND	17
09-30985	Cc	10	ND	ND	ND	ND	6.2	ND	ND	ND
09-30986	Cc	20	ND	ND	ND	ND	8.4	5.3	ND	ND
09-30987	Cc	10	ND	ND	ND	ND	40	ND	ND	ND
09-30988	Cc	10	4	ND	5	ND	12	8	ND	ND
09-30989	Cc	0	2.4	ND	6.8	ND	24	11	ND	17
09-30990/91	Cc	10	ND	ND	ND	ND	5.6	ND	ND	ND
09-30992	Cc	20	1.1	ND	ND	ND	10	ND	ND	ND
09-30993	Cc	10	ND	ND	ND	ND	5.2	5.2	ND	ND
09-30994	Cc	0	ND	ND	ND	ND	16	7.6	ND	ND
09-30995	Cc	10	ND	ND	ND	ND	ND	ND	ND	ND
09-30996	Cc	0	1.1	ND	5.2	ND	26	7.9	ND	ND
09-30997	Cc	0	1.6	ND	5.3	ND	26	9.4	ND	ND
09-30998	Cc	0	ND	ND	ND	ND	12	5.6	ND	16
09-30999	Cc	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31000/01	Cc	0	2.9	ND	8.8	30	26	16	ND	30
09-31002	Cc	10	3.3	ND	ND	ND	16	6.4	ND	ND
09-31003	Cc	10	2.1	ND	5	ND	17	9	ND	ND
09-31004	Cc	10	1.4	ND	ND	ND	16	7.4	ND	ND
09-31005	Nnh	10	1.7	ND	ND	ND	7.3	6.5	ND	ND
09-31006	Nnh	10	1.6	ND	ND	ND	12	6	ND	ND
09-31007	Nnh	10	1.1	ND	ND	ND	15	5.7	ND	ND
09-31008	Nnh	20	ND	ND	ND	ND	5.5	ND	ND	ND
09-31009	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31010/11	Nnh	10	ND	ND	ND	ND	5.3	ND	ND	ND
09-31012	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31013	Nnh	10	1.7	ND	ND	ND	17	7.9	ND	ND
09-31014	Nnh	0	1.2	ND	ND	ND	ND	ND	ND	ND
09-31015	Nnh	0	2.1	ND	5.8	ND	15	8.6	ND	17

Sample ID	Terrain Unit	Depth (cm)	As (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
DCC Tier I	---	---	---	---	---	---	---	---	200	---
DCC Tier II	---	---	***30***	***5***	***50***	***250***	***100***	***100***	***500***	***500***
09-31016	Nnh	10	2.7	ND	ND	ND	13	7.1	ND	18
09-31017	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31018	Nnh	10	2.1	ND	7	ND	23	9.4	ND	17
09-31019	Nnh	10	1.4	ND	ND	ND	18	7.3	ND	ND
09-31020/21	Nnh	0	1.2	ND	ND	ND	10	6.2	ND	ND
09-31022	Nnh	10	1.3	ND	ND	ND	11	5.6	ND	ND
09-31023	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31024	Nnh	10	ND	ND	ND	ND	7.8	ND	ND	16
09-31025	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31026	Nnh	10	1.5	ND	ND	ND	18	7.1	ND	ND
09-31027	Nnh	0	ND	ND	ND	ND	6.2	ND	ND	ND
09-31028	Nnh	0	ND	ND	ND	ND	8.8	5.7	ND	18
09-31029	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31030/31	Nnh	20	ND	ND	ND	ND	10	ND	ND	ND
09-31032	Nnh	20	ND	ND	ND	ND	21	5	ND	ND
09-31033	Nnh	10	ND	ND	ND	ND	14	ND	ND	ND
09-31034	Nnh	0	ND	ND	ND	ND	9	5.5	ND	16
09-31035	Nnh	0	1.1	ND	ND	ND	15	ND	ND	16
09-31036	Nnh	0	ND	ND	ND	ND	6.4	5.1	ND	ND
09-31037	Cc	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31038	Cc	20	2.3	ND	7	24	17	13	ND	22
09-31039	Cc	10	3	ND	9.1	34	18	13	ND	ND
09-31040/41	Cc	0	ND	ND	ND	ND	17	6.2	ND	ND
09-31042	Cc	0	ND	ND	ND	ND	11	ND	ND	19
09-31043	Cc	10	ND	ND	5.8	ND	52	7.4	ND	ND
09-31044	Nnh	0	2.6	ND	6.3	ND	27	9.5	ND	28
09-31045	Nnh	0	1.8	ND	ND	ND	6.5	8.1	ND	ND
09-31046	Nnh	0	ND	ND	ND	ND	6.5	5.9	ND	ND
09-31047	Nnh	20	ND	ND	ND	ND	ND	ND	ND	ND
09-31048	Nnh	0	1.4	ND	9.3	27	16	16	ND	26
09-31049	Nnh	0	ND	ND	ND	ND	ND	5.5	ND	ND
09-31050/51	Nnh	0	ND	ND	ND	ND	ND	ND	ND	ND
09-31052	Nnh	0	2.3	ND	ND	ND	21	ND	ND	ND
09-31053	Nnh	10	1.3	ND	5.8	ND	25	8.9	ND	ND
09-31054	Nnh	20	ND	ND	ND	ND	9	ND	ND	ND
09-31055	Nnh	20	ND	ND	ND	ND	12	5.5	ND	ND

Sample ID	Terrain Unit	Depth (cm)	As (ppm)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Ni (ppm)	Pb (ppm)	Zn (ppm)
DCC Tier I	---	---	---	---	---	---	---	---	200	---
DCC Tier II	---	---	***30***	***5***	***50***	***250***	***100***	***100***	***500***	***500***
09-31056	Nnh	10	ND	ND	ND	ND	5.4	ND	ND	ND
09-31057	Nnh	10	ND	ND	ND	ND	ND	ND	ND	ND
09-31058	Nnh	10	2.9	ND	6.2	ND	23	9.5	ND	ND
09-31059	Nnh	10	1.2	ND	5.9	ND	19	10	ND	ND
Avg. Conc.	---	---	1.8	---	6.4	25.6	16.7	8.0	---	19.4
Std. Dev.	---	---	0.7	---	1.3	5.0	9.5	2.7	---	4.2

Std. Dev. = Standard Deviation

Data collected from Appendix B, Table B-1 (ESG, 2010).

In general, the average concentrations of selected metals were higher site-wide than at the NHWL footprint with exception of arsenic and lead. Lead was reported as non-detectable for all samples collected by ESG in 2009; however, the average concentration for the samples collected at the NHWL was 11.2 mg/kg. Arsenic was reported at marginally higher concentrations at the NHWL (3.9 mg/kg) in comparison to site-wide levels (1.8 mg/kg). Zinc, conversely, reported non-detectable concentrations at the NHWL and average concentration of 19.4 mg/kg site-wide. Table 2-3 compares the average concentrations in soil of selected metals collected site-wide and at the NHWL footprint.

Table 2-3: Average Soil Analytical Results – Site-Wide vs. NHWL Footprint

Parameters	NHWL Footprint		Site Wide	
	Avg. Conc. (mg/kg)	Std. Dev.	Avg. Conc. (mg/kg)	Std. Dev.
As	3.9	2.9	1.8	0.7
Cd	ND	---	ND	
Cr	13	7.1	25	5.0
Co	2.3	0.8	6.4	1.3
Cu	7.1	1.9	16.7	9.5
Pb	11.2	3.2	ND	
Ni	8.3	3.2	8.0	2.7
Zn	ND	---	19.4	4.2

Std. Dev. = Standard Deviation

Data collected from Appendix B, Table B1 through B3 (AECOM, 2012) and Appendix B, Table B-1 (ESG, 2010).

2.3 Previous Monitoring Programs

The 2013 monitoring program at PIN-D was the first (Year 1) of a proposed eight that are scheduled over a 25 year period. To become familiar with the site, FRANZ reviewed the following reports pertaining to the site:

- PIN-D (Ross Point) Long-Term Monitoring Plan, March 28, 2013, Aboriginal Affairs and Northern Development Canada.
- Abandoned Military Site Remediation Protocol, March 2009, Indian and Northern Affairs Canada, Contaminated Sites Program.

3.0 REGULATORY AND OTHER GUIDELINES

There was no groundwater guideline provided in the PIN-D 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 Analytical 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
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 (INAC, 2009)

This is the first monitoring event for the long-term monitoring plan to be implemented within the first three years at PIN-D. Baseline groundwater data was not collected during the remediation at the site. FRANZ does not have sufficient historical or baseline data to obtain meaningful means or standard deviations for comparison to the analytical results obtained during the 2013 monitoring activities.

In May 2010, Environment Canada (EC) under Federal Contaminated Sites Action Plan (FCSAP) released the *Federal Interim Groundwater Quality Guidelines* (FIGQG) for Federal Contaminated Sites. The guidelines were released based on the observed need for federal custodians and others to apply appropriate groundwater guidelines at federal sites. Previously,

a mixture of provincial standards, federal surface water guidelines, and drinking water quality guidelines were applied to groundwater at federal sites. The FIGQGs remove the need for this patchwork of regulations, which were not consistently applied at federal sites. The FIGQGs were updated in November, 2012.

The FIGQGs were not developed with the scientific rigour associated with the CEQGs. Instead, Environment Canada requested the development of guidelines based on a review and evaluation of existing approaches in other jurisdictions.

The FIGQGs follow a tiered framework, consistent with the Canadian Soil Quality Guidelines development through the CCME. The tiers are:

- Tier 1: direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway;
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site; and
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

The FIGQGs are based on the consideration of a number of potential receptors and exposure pathways, including:

- Groundwater transport to surface water at least 10 m from the contamination and subsequent exposure of freshwater and marine life;
- Direct contact of soil organisms with contaminated groundwater;
- Use of groundwater for irrigation water;
- Use of groundwater for livestock watering;
- Groundwater transport to surface water at least 10 m from the contamination and subsequent ingestion by wildlife;
- Migration of contaminant vapours to indoor air and subsequent inhalation by humans; and
- Use of groundwater for human consumption (i.e., drinking water).

The generic guidelines are point estimates of a chemical concentration in groundwater associated with an approximate no- to low-effects level based on toxicological information about the chemical, along with a screening-level evaluation and environmental fate and transport and estimated intake rates, or exposure, by potential receptors. As a result, the Table 1 *Federal Interim Groundwater Quality Guidelines*, *Generic Guidelines for Residential/Parkland Land Use* Tier 1 Lowest Guideline *Values* for coarse grained soil (FIGQG Table 1 Tier 1) were referenced for comparison purposes.

4.0 INVESTIGATIVE METHODOLOGY

The monitoring program was carried out at the PIN-D DEW Line (Ross Point) site on August 21, 2013 by field assessors Julie Dittburner and Kim Krug of Franz Environmental Inc., accompanied by AANDC representative Allison Dunn. Wildlife monitoring services were provided by O.J. Bernhardt of Kugluktuk, NU Hunters and Trappers Association. During the field investigations, weather conditions were overcast, with a light breeze and temperatures around 5 - 10 ^{o}C. The program consisted of the following:

- Completing a health and safety plan;
- Visually observing, measuring and photographically documenting the physical integrity of the landfill;
- Collection of groundwater samples from existing wells (if possible);
- Collection of soil samples (if necessary, as per the PIN-D LTM Plan); 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 and 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 their approval before site activities began. Prior to conducting any work on-site, the plan was distributed and discussed with all personnel involved in the investigative program. A copy of the HASP has been retained on file at FRANZ and at 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 PIN-D Long-Term Monitoring Plan, was completed for the landfill and is found in Table 5-1 through Table 5-3, Section 5. A photographic record was completed to document the condition of the structures and substantiate the visual observations (Appendix C).

The 2013 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. The Trimble files are 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 the 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. Where possible, observations by FRANZ have been compared to previously recorded observations. In addition, FRANZ interviewed the wildlife monitor (O.J. Bernhardt). He has frequented the area with other local families and community members for hunting purposes. He is also acquainted with former site workers with firsthand knowledge. Land uses by humans and wildlife as well as changes in use over previous years by each were discussed.

4.4 Ground Water Sampling

Upon arrival at the PIN-D site, the FRANZ field assessors made an attempt to measure water levels at each of the wells. Using a water level tape, the field assessors found that three of the monitoring wells contained groundwater; the remaining well (MW4) was dry.

A 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. During purging, a YSI 556 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 dissolved metal analyses was field-filtered.

One well (MW1) contained 5 cm of groundwater at the initial measurement of water levels. After an initial purge of the standing water in the well, the well did not recharge and was confirmed to have insufficient volumes for sampling. No sample was collected from this location.

At MW2 and MW3, approximately 1.5 L of water was purged prior to sampling. Attempts were made to stabilize water quality field parameter prior to sampling at each well. MW2 and MW3 were submitted for various analytical parameters: total and dissolved metals, polychlorinated biphenyls (PCBs); petroleum hydrocarbons (PHCs); benzene, toluene, ethylbenzene and total xylenes (BTEX); suspended and dissolved solids; major ions; hardness; pH and conductivity. One duplicate sample was collected from each well. The groundwater samples were collected in laboratory prepared sample bottles appropriate for the specified analyses. The sample for laboratory analysis was stored in laboratory supplied coolers equipped with ice from the time of collection until delivery to the laboratory.

General well conditions were also recorded, and the wells were re-locked using keyed-alike padlocks. Additional details on the groundwater sampling are presented in the groundwater sample records provided in Appendix E.

4.5 Soil Sampling

There were no indications of seepage or significant staining as part of the visual inspection, therefore no soil samples were collected during the 2013 monitoring activities.

4.6 Quality Assurance and Quality Control (QA/QC)

To assess the reliability of the laboratory data, duplicate samples were taken for both groundwater samples collected by FRANZ. For the 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.

Analytical data quality was assessed by submission of the following:

- Groundwater sample MW2 (primary) and DUP1 (duplicate), were analyzed for PHCs.
- Groundwater sample MW3 (primary) and DUP2 (duplicate) were analyzed for PCBs and metals.

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 4-1 below. When both concentrations are less than the MDL, no calculation/evaluation criterion is required.

Table 4-1: 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 Section 5.5 for a discussion on QA/QC results.

5.0 NON-HAZARDOUS WASTE LANDFILL

5.1 Area Summary

The Non-Hazardous Waste Landfill (NHWL) is located along the access road between the Main Station Area and the minor airstrip, at an approximate elevation of 150 m asl. The monitoring of the landfill included visual observations to assess its physical integrity, including evidence for erosion, ponding, frost action, settlement and lateral movement. The surface and the berms of the NHWL are generally graded flat. The slope of the landfill is towards the north, with a minor slope towards the east side.

A groundwater sample was collected from MW2 on the south side of the NHWL and from MW3 on the north side of the NHWL. Due to dry well conditions (MW4) and insufficient sample volumes (MW1) groundwater samples at these locations could not be collected. Soil samples were deemed unnecessary by the FRANZ field assessors and the on-site AANDC representative. 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 (and other areas of the site) has been completed as per the Terms of Reference (Photographs 1 to 48, attached CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix C. The complete photographic record, of full-resolution photographs, is provided in the attached CD-ROM.

5.3 Visual Inspection Report

Monitoring consisted in part of visual observations of the NHWL to assess its physical integrity, by collecting evidence of erosion, ponding, frost action, settlement and lateral movement. A plan view of the NHWL indicating photographic viewpoints, salient observations and locations of ground water monitoring wells can be seen in Figure A-1, Appendix A. The visual monitoring checklist provided in the PIN-D LTM Plan has been completed and pertinent information is summarized in Table 5-3 of this report. Table 5-1 and associated Table 5-2 present the preliminary visual inspection results for the NHWL at PIN-B.

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	N	Not Observed	None

Feature	Presence (Y/N)	Severity Rating	Extent
Drainage Pathway	N	Not Observed	None
Debris Exposure	N	Not Observed	None
Monitoring Well Condition	N	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: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • 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

Three minor depressions were observed in the area of the NHWL. One small depression on the eastern side of the surface of the landfill was noted. This depression appeared to be the result of final grading. Another small depression was noted at the southwest corner of the landfill at the toe of the berm (Photo 38, Appendix C). The final minor depression was observed at the northwest corner of the landfill at the toe of the berm (Photo 42, Appendix C). Both of these appeared to be the result of poor final grading. All three features are considered minor in scale (<1 m diameter and 0.1 m deep) and are not considered to affect landfill integrity.

One pothole was observed at the southeast corner of the toe of the landfill berm. This pothole appears to be a result of grading (Photo 40, Appendix C).

Erosion

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

Frost Action

No indication of frost action was observed in the area of the NHWL.

Evidence of Burrowing Animals

No evidence of a burrowing animal was observed at the NHWL.

Re-establishment of Vegetation

Based on the regional setting of this landfill, full re-establishment of vegetation will likely not occur within the timeframe of the first phase of long term monitoring. Very minor vegetation growth was observed at southeast corner of the landfill at the observed pothole (Photo 40, Appendix C).

Staining

No staining was observed in the area of the NHWL.

Seepage Points

Seepage was not observed during the NHWL inspection.

Debris

Exposed debris was not observed.

Drainage Pathways

No drainage pathways were observed during the NHWL inspection.

Discussion

All physical observations suggest that the NHWL is performing as designed and is containing the enclosed waste. During future monitoring events all depression areas noted at NHWL should be inspected for an increase in size and/or depth.

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

Table 5-3: PIN-D – Ross Point – Visual Monitoring Checklist

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Settlement	A	Toe of berm, southwest corner of the NHWL	1.0	0.25	0.2	<1%	Depression area as a result of final grading. Whole are is poorly graded	Feature appears mechanical. Does not affect the landfill integrity at this point	38/39
Settlement/Pothole	B	Toe of berm, southeast corner of the NHWL	1.0	1.0	0.1	<1%	Pothole, appears to be result of grading, minor vegetation growth	Feature appears mechanical. Does not affect the landfill integrity at this point	40/41
Settlement	C	On toe of berm at northwest corner of NHWL	1.5	0.75	0.1	<1%	Settlement area, minor, appears to be result of final grading	Feature appears mechanical. Does not affect the landfill integrity at this point	42
Settlement	D	On surface of NHWL along east side of landfill	2.5	1.75	0.15	<1%	Minor depression on surface of landfill, appears to be result of grading	Feature appears mechanical. Does not affect the landfill integrity at this point	43

5.4 Analytical Results – Groundwater

As described in section 4.4, two groundwater samples were submitted to Maxxam Analytics in Calgary, Alberta for analyses of petroleum hydrocarbons (PHCs), metals, PCBs and inorganic parameters. Analytical results are discussed below. FRANZ does not have sufficient historical or baseline data to obtain the mean and standard deviations for comparison to the analytical results as suggested in the AMSRP guidance. Analytical results are discussed below.

PHCs

Analytical results for PHCs are shown in Table B-1; Appendix B. Concentrations for all BTEX/PHC parameters were reported below the laboratory detection limit.

Metals

Analytical results for dissolved and total metals in groundwater are shown in Table B-2 and Table B-3; Appendix B. Water sampled from MW2 and MW3 had concentrations of total and dissolved metals for multiple parameters above the laboratory detection limits. The following parameters reported non-detect concentrations in both wells for both total and dissolved metals: beryllium, bismuth, boron, chromium, silver, tin and zirconium. Titanium also reported non-detect concentrations for dissolved metals in both wells and total metals in MW3. Total and dissolved copper reported concentrations that marginally exceeded the FIGQGs. At this time, these concentrations are not an immediate concern; however should be monitored during future sampling events.

PCBs

Analytical results for PCBs in groundwater are shown in Table B-4; Appendix B. Concentrations for all PCB parameters were reported below the laboratory detection limit.

Inorganics

Laboratory analytical results for inorganics are shown in Table B-5; Appendix B. Concentrations of alkalinity (PP as CO_3), carbonate (CO_3), hydroxide (OH), nitrite (N) and dissolved nitrite (NO_3) were reported below the laboratory detection limit. Fluoride (F-) and Orthophosphate (P) was also reported in MW3 below the detection limits. All other inorganics and calculated parameters reported concentrations above the laboratory detection limit.

Laboratory certificates of analyses for the 2013 groundwater samples are provided in Appendix D.

5.5 QA/QC Discussion

In order to obtain the required minimum of 20% duplicate samples, as stipulated in PIN-D LTM Plan, two duplicate groundwater samples were collected during the 2013 monitoring activities.

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 Tables B-1 through B-5, Appendix B.

Both groundwater samples analyzed for PHCs, metals, PCBs and inorganics fell within limits of QA/QC acceptability. 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.

6.0 SURROUNDING AREAS

Some of the outlying areas at the site were observed by foot and by aerial fly over during the site visit.

The access roads and airstrips appeared in good condition. The main Station Area was void of any debris; however evidence of the remediation was prominent with equipment marks and graded areas. Three cement platforms remain that are likely the former foundations of the tower braces. The main Station Area is located on high table lands consisting of bedrock. Very little vegetation was observed at the Station Area as the area is lacking soils to support growth.

The East Beach Area was inspected by foot. This area is at a much lower elevation then the Main Station. Here there is an increase of vegetation growth including mosses and grasses. Remnants of a derelict camp remain. A partially standing ply wood cabin, old camp equipment and caribou antlers were observed (Photos 46 and 47, Appendix C). The access road from this beach area connecting to the airstrip was observed in fair to good condition (Photo 48, Appendix C).

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 of wildlife. The PIN-D 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 observations by Kugluktuk community members, and our wildlife monitor O.J Bernhardt, this site is frequently used for hunting caribou and muskox. As far as Mr. Bernhardt is aware, these are the only animals hunted in the area. The area is not used for fishing. In his opinion, and with discussion with other community members, the number of animals available for harvest has not changed in the past years. As far back as he can remember, the number of animals has remained consistent.

During the site visit, the FRANZ field assessors observed evidence (e.g. scat, tracks, nesting areas, burrows or visual observation) of a number of animals. Wolf, arctic hare and muskox scat was observed. Cranes, a paragon falcon, bunting birds and Canada geese were also visually confirmed and a loon call was heard.

Re-establishment of Vegetation

Based on the regional setting of this site, re-establishment of vegetation is not likely in the near future. Minor growth was observed on south side of the NHWL, at the toe of landfill, during the 2013 monitoring activity (Photo 40, Appendix C).

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 21, 2013. 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

Background Geochemical Assessment of PIN-D, Ross Point, Nunavut. January 2010, Environmental Sciences Group, Royal Military College, Kingston, ON.

PIN-D, Ross Point, Final Interim Construction Summary. April 2012. AECOM Canada Ltd.

PIN-D Ross Point Long Term Monitoring Plan, March 28, 2013, Aboriginal Affairs and Northern Development Canada.

Indian and Northern Affairs Canada. March 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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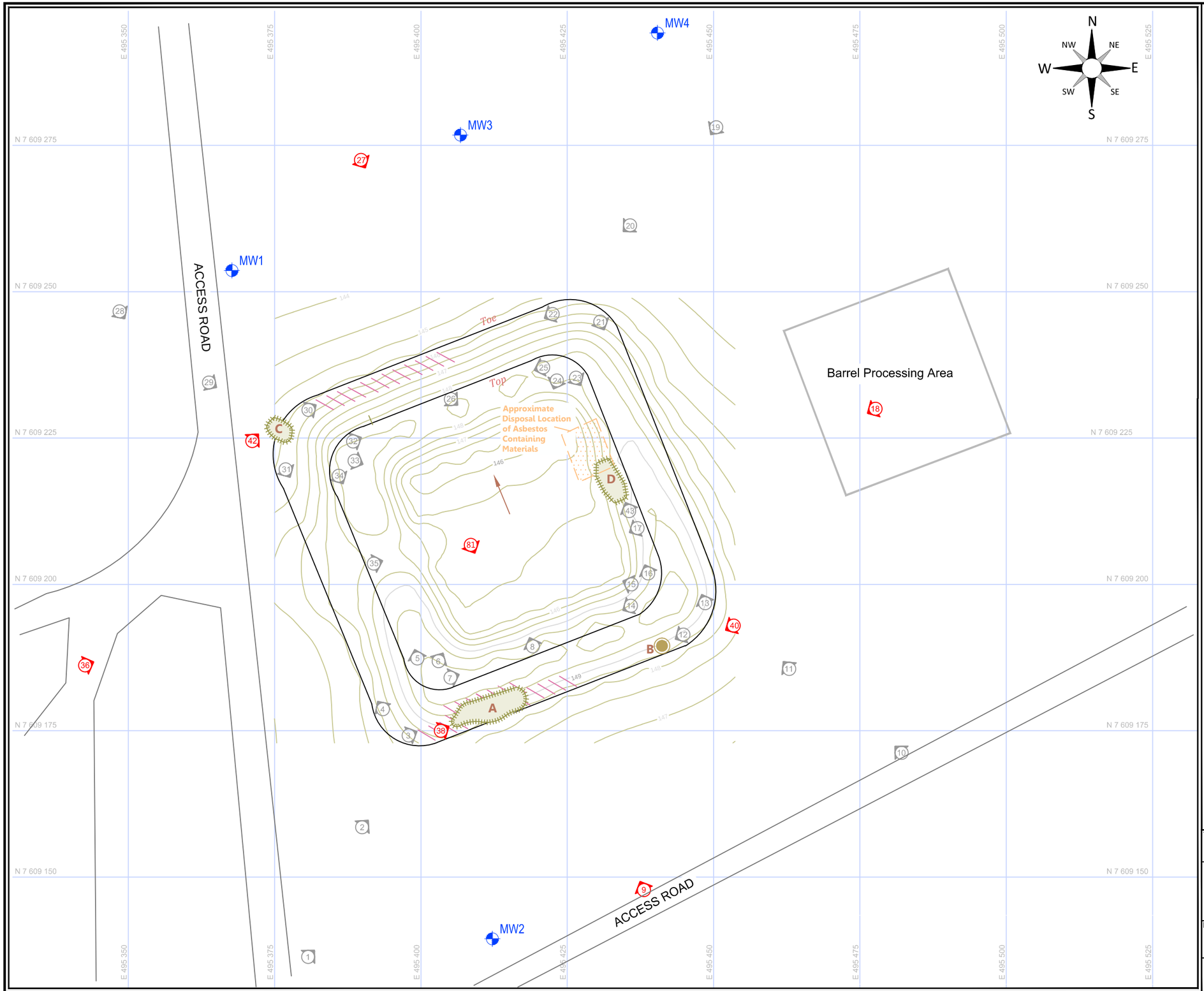
APPENDIX A

Figures



Legend

- MW — Monitoring Well Locations
- 25 — Picture Viewpoint Number
- 8 — Viewpoint Photograph Included in Appendix C
- A — Settlement or Depression
- Pothole
- A — Feature Reference Letter
- Slope Direction
- Poorly graded areas - large marks left by grader

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:
PIN-D
1697-1301

Date:
October 2013

Client:
Aboriginal Affairs and Northern Development Canada

Scale 1:650
20 15 10 5 0 10 20
metres

Figure A-1

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APPENDIX B

Tables

Table B-1
Ground Water Chemical Concentrations - PHCs

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	RDL	MW2-D	DUP1	RPD	MW3-D
Date			21/08/2013	21/08/2013		21/08/2013
BTEX & F1 Hydrocarbons (ug/L)						
Benzene	140	0.40	<0.40	<0.40	NA	<0.40
Toluene	83	0.40	<0.40	<0.40	NA	<0.40
Ethylbenzene	1100	0.40	<0.40	<0.40	NA	<0.40
o-Xylene	NC	0.40	<0.40	<0.40	NA	<0.40
p+m-Xylene	NC	0.80	<0.80	<0.80	NA	<0.80
Total Xylenes	3900	0.80	<0.80	<0.80	NA	<0.80
F1 (C6-C10)	810	100	<100	<100	NA	<100
F1 (C6-C10) - BTEX	NC	100	<100	<100	NA	<100
F2-F4 Hydrocarbons (ug/L)						
F2 (C10-C16 Hydrocarbons)	1300	100	<100	<100	NA	<100
F3 (C16-C34 Hydrocarbons)	NC	200	<200	<200	NA	<200
F4 (C34-C50 Hydrocarbons)	NC	200	<200	<200	NA	<200
Reached Baseline at C50	NA	NA	Yes	Yes	NA	Yes

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

NA = Not Applicable
NC = No Criteria
RDL = Reportable Detection Limit
RPD = Relative Percent Difference

Table B-2
Ground Water Chemical Concentrations - Total Metals

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	RDL	MW2-D	MW3-D	DUP2	Duplicate Evaluation	
			21/08/2013	21/08/2013	21/08/2013	RPD (%)	Acceptable
Metals (µg/L)							
Total Aluminum (Al)	100	0.50	33	21	20	7	Y
Total Antimony (Sb)	2000	0.020	0.027	0.081	0.079	---	Y
Total Arsenic (As)	5	0.020	0.19	0.13	0.11	16	Y
Total Barium (Ba)	500	0.020	39	31	31	2	Y
Total Beryllium (Be)	5.3	0.010	<0.010	<0.010	<0.010	---	Y
Total Bismuth (Bi)	NA	0.0050	<0.0050	<0.0050	0.0050	---	Y
Total Boron (B)	5000	50	<50	<50	<50	---	Y
Total Cadmium (Cd)	0.017	0.0050	0.0080	0.012	0.0090	---	Y
Total Calcium (Ca)	NA	50	23000	68900	62400	10	Y
Total Chromium (Cr)	8.9	0.10	1.5	<0.10	0.15	---	Y
Total Cobalt (Co)	NA	0.0050	0.36	0.19	0.20	7	Y
Total Copper (Cu)	2	0.050	7.3	3.1	3.1	1	Y
Total Iron (Fe)	300	1.0	41	23	19	18	Y
Total Lead (Pb)	2	0.0050	0.13	0.10	0.095	6	Y
Total Lithium (Li)	NA	0.50	1.7	1.4	1.6	---	Y
Total Magnesium (Mg)	NA	50	41100	49200	49600	1	Y
Total Manganese (Mn)	NA	0.050	63	26	27	3	Y
Total Molybdenum (Mo)	73	0.050	1.7	0.79	0.84	6	Y
Total Nickel (Ni)	83	0.020	6.0	1.9	2.0	4	Y
Total Potassium (K)	NA	50	1540	1320	1340	2	Y
Total Selenium (Se)	1	0.040	0.23	0.36	0.33	9	Y
Total Silicon (Si)	NA	100	823	1170	1040	12	Y
Total Silver (Ag)	0.1	0.0050	<0.0050	<0.0050	<0.0050	---	Y
Total Sodium (Na)	NA	50	8180	8090	8210	1	Y
Total Strontium (Sr)	NA	0.050	55	60	59	2	Y
Total Sulphur (S)	NA	3000	40200	70400	70200	0	Y
Total Thallium (Tl)	0.8	0.0020	0.014	0.033	0.033	0	Y
Total Tin (Sn)	NA	0.20	<0.20	<0.20	<0.20	---	Y
Total Titanium (Ti)	100	0.50	1.2	<0.50	<0.50	---	Y
Total Uranium (U)	15	0.0020	4.1	6.9	6.8	2	Y
Total Vanadium (V)	NA	0.20	0.23	<0.20	0.20	---	Y
Total Zinc (Zn)	10	0.10	0.64	0.95	0.81	16	Y
Total Zirconium (Zr)	NA	0.10	<0.10	<0.10	<0.10	---	Y

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

NA = Not Applicable

NC = No Criteria

RPD = Relative Percent Difference

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

Table B-3
Ground Water Chemical Concentrations - Dissolved Metals

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	RDL	MW2-D	MW3-D	DUP2	Duplicate Evaluation	
			21/08/2013	21/08/2013	21/08/2013	RPD (%)	Acceptable
Metals (µg/L)							
Dissolved Aluminum (Al)	100	0.50	28	17	21	18	Y
Dissolved Antimony (Sb)	2000	0.020	0.025	0.086	0.095	---	Y
Dissolved Arsenic (As)	5	0.020	0.15	0.13	0.13	3	Y
Dissolved Barium (Ba)	500	0.020	38	31	31	0	Y
Dissolved Beryllium (Be)	5.3	0.010	<0.010	<0.010	<0.010	---	Y
Dissolved Bismuth (Bi)	NA	0.0050	<0.0050	<0.0050	0.0130	---	N
Dissolved Boron (B)	5000	50	<50	<50	<50	---	Y
Dissolved Cadmium (Cd)	0.017	0.0050	0.013	0.013	0.012	---	Y
Dissolved Calcium (Ca)	NA	50	27100	68500	67500	1	Y
Dissolved Chromium (Cr)	8.9	0.10	<0.10	<0.10	<0.10	---	Y
Dissolved Cobalt (Co)	NA	0.0050	0.37	0.22	0.24	10	Y
Dissolved Copper (Cu)	2	0.050	2.0	2.6	2.9	10	Y
Dissolved Iron (Fe)	300	1.0	1.6	3.7	3.3	---	Y
Dissolved Lead (Pb)	2	0.0050	0.020	0.014	0.033	---	N
Dissolved Lithium (Li)	NA	0.50	1.5	1.7	1.5	---	Y
Dissolved Magnesium (Mg)	NA	50	44100	50300	53300	6	Y
Dissolved Manganese (Mn)	NA	0.050	61	27	29	6	Y
Dissolved Molybdenum (Mo)	73	0.050	1.9	0.77	0.89	15	Y
Dissolved Nickel (Ni)	83	0.020	3.5	1.9	2.2	14	Y
Dissolved Potassium (K)	NA	50	1540	1310	1360	4	Y
Dissolved Selenium (Se)	1	0.040	0.24	0.34	0.33	3	Y
Dissolved Silicon (Si)	NA	100	898	1140	1110	3	Y
Dissolved Silver (Ag)	0.1	0.0050	<0.0050	<0.0050	<0.0050	---	Y
Dissolved Sodium (Na)	NA	50	8700	8250	8640	5	Y
Dissolved Strontium (Sr)	NA	0.050	54	57	58	2	Y
Dissolved Sulphur (S)	NA	3000	4250	68200	74300	9	Y
Dissolved Thallium (Tl)	0.8	0.0020	0.013	0.033	0.034	3	Y
Dissolved Tin (Sn)	NA	0.20	<0.20	<0.20	<0.20	---	Y
Dissolved Titanium (Ti)	100	0.50	<0.50	<0.50	<0.50	---	Y
Dissolved Uranium (U)	15	0.0020	4.4	7.1	7.1	1	Y
Dissolved Vanadium (V)	NA	0.20	0.21	0.23	0.22	---	Y
Dissolved Zinc (Zn)	10	0.10	2.7	2.1	2.3	9	Y
Dissolved Zirconium (Zr)	NA	0.10	<0.10	0.12	0.10	---	Y

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

NA = Not Applicable

NC = No Criteria

RPD = Relative Percent Difference

RDL= Reportable Detection Limit

20 = Exceeds selected guideline.

Table B-4
Ground Water Chemical Concentrations - PCBs

PARAMETER / Sample ID / Date	CCME FIGQGs[1]	RDL	MW2-D	MW3-D	DUP2	RPD
Date			22/08/2013	22/08/2013	22/08/2013	
PCBs (ug/L)						
Aroclor 1016	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1221	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1232	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1242	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1248	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1254	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1260	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1262	NC	0.050	<0.050	<0.050	<0.050	NA
Aroclor 1268	NC	0.050	<0.050	<0.050	<0.050	NA
Total Aroclors	NC	0.050	<0.050	<0.050	<0.050	NA

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

NA = Not Applicable
NC = No Criteria
RDL = Reportable Detection Limit
RPD = Relative Percent Difference

Table B-5
Ground Water Chemical Concentrations - Inorganics

PARAMETER		CCME FIGQGs[1]	RDL	MW2-D	MW3-D	DUP2	Duplicate Evaluation	
Sample ID								
Date				21/08/2013	21/08/2013	21/08/2013	RPD (%)	Acceptable
Inorganics	**Units**							
True Colour	PtCo	NC	20	3.6	3.8	2.7	---	Y
Conductivity	uS/cm	NC	1.0	520	730	730	0	Y
Total Dissolved Solids	mg/L	NC	10	NA	500	490	2	Y
Fluoride (F-)	mg/L	0.12	0.050	0.061	<0.050	<0.050	---	Y
Orthophosphate (P)	mg/L	NC	0.0030	0.0030	<0.0030	0.0032	---	Y
pH	pH	6.5-9	NA	8.01	7.99	7.92	N/A	N/A
Total Suspended Solids	mg/L	NC	0.40	NA	0.5	0.46	0	Y
Alkalinity (PP as CaCO3)	mg/L	NC	0.50	<0.50	<0.50	<0.50	---	Y
Alkalinity (Total as CaCO3)	mg/L	NC	0.50	110	160	160	0	Y
Bicarbonate (HCO3)	mg/L	NC	0.50	130	190	190	0	Y
Carbonate (CO3)	mg/L	NC	0.50	<0.50	<0.50	<0.50	---	Y
Hydroxide (OH)	mg/L	NC	0.50	<0.50	<0.50	<0.50	---	Y
Dissolved Sulphate (SO4)	mg/L	NC	1.0	130	190	200	5	Y
Dissolved Chloride (Cl)	mg/L	120	1.0	22	18	19	5	Y
Nitrite (N)	mg/L	0.060	0.003	<0.0030	<0.0030	0.0050	---	Y
Nitrate (N)	mg/L	13.0	0.003	0.31	1.0	1.0	0	Y
Calculated Parameters								
Hardness (CaCO3)	mg/L	NC	0.50	260	370	390	5	Y
Ion Balance	NA	NC	0.010	1.0	1.0	1.0	0	Y
Dissolved Nitrate (NO3)	mg/L	NC	0.013	1.4	4.6	4.6	0	Y
Nitrate plus Nitrite (N)	mg/L	NC	0.0030	0.31	1.0	1.0	0	Y
Dissolved Nitrite (NO2)	mg/L	NC	0.0099	<0.0099	<0.0099	0.016	---	Y
Total Dissolved Solids	mg/L	NC	10	300	430	450	5	Y

Notes:

1 = Table 1: Federal Interim Groundwater Quality Guidelines, Generic Guidelines for Residential/Parkland Land Use (mg/L), Tier 1, Lowest Guideline for coarse grained soils.

NA = Not Applicable

NC = No Criteria

RDL= Reportable Detection Limit

RPD = Relative Percent Difference

NA = Not Applicable

APPENDIX C

Site Photographs

South side of the NHWL. Viewpoint 9 (Figure A-1; Appendix A). Photograph reference 9 (CD-ROM). Direction photo taken: N

East side of the NHWL. Viewpoint 18 (Figure A-1; Appendix A). Photograph reference 18 (CD-ROM). Direction photo taken: W

North side of the NHWL. Viewpoint 27 (Figure A-1; Appendix A). Photograph reference 27 (CD-ROM). Direction photo taken: S

West side of the NHWL. Viewpoint 36 (Figure A-1; Appendix A). Photograph reference 36 (CD-ROM). Direction photo taken: E

View of grading on surface of NHWL. Viewpoint 35 (Figure A-1; Appendix A).
Photograph reference 35 (CD-ROM). Direction photo taken: E

View of depression on southwest corner of NHWL (Feature D). Also poorly graded. Viewpoint 38 (Figure A-1; Appendix A). Photograph reference 38 (CD-ROM). Direction photo taken: E

View of pothole at southeast corner of the NHWL, minor vegetation growth is evident. Viewpoint 40 (Figure A-1; Appendix A). Photograph reference 40 (CD-ROM). Direction photo taken: N/A

View of depression on northwest corner of NHWL (Feature C). Viewpoint 42 (Figure A-1; Appendix A). Photograph reference 42 (CD-ROM). Direction photo taken: SE

View of muskox scat. Photograph reference 37 (CD-ROM). Direction photo taken: N/A

View of wolf scat. Photograph reference 44 (CD-ROM). Direction photo taken: N/A

View of derelict camp at East Beach Area. Photograph reference 46 (CD-ROM). Direction photo taken: N/A

Caribou antlers and old camp equipment at derelict camp. Photograph reference 47 (CD-ROM). Direction photo taken: N/A

Access road from East Beach Area up to airstrip. Photograph reference 48 (CD-ROM). Direction photo taken: NW

Aerial view of NHWL. Photograph reference 49 (CD-ROM). Direction photo taken: N/A

Table B-1. Picture viewpoint numbers of the NHWL (as depicted in Figure A-1, Appendix A) cross-referenced with picture numbers on attached CD-ROM. Bolded viewpoint and pictures are those that appear in the partial photographic record presented above.

Viewpoint #	Picture #	Viewpoint #	Picture #
1	1	25	25
2	2	26	26
3	3	**27**	**27**
4	4	28	28
5	5	29	29
6	6	30	30
7	7	31	31
8	8	32	32
9	**9**	33	33
10	10	34	34
11	11	**35**	**35**
12	12	**36**	**36**
13	13	37	37
14	14	**38**	**38**
15	15	39	39
16	16	**40**	**40**
17	17	41	41
18	**18**	**42**	**42**
19	19	43	43
20	20	**N/A**	**44**
21	21	N/A	45
22	22	**N/A**	**46**
23	23	**N/A**	**47**
24	24	**N/A**	**48**
---	---	**N/A**	**49**

APPENDIX D

Laboratory Reports and Chain of Custody Forms

(Reports are inclusive of both PIN-D and PIN-B groundwater analysis)

Maxxam

Success Through Science®

Your Project #: 1697-1301
Your C.O.C. #: 427711-03-01

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

Report Date: 2013/09/12

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B375531
Received: 2013/08/22, 16:25

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	4	N/A	2013/08/27	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	4	N/A	2013/08/28	AB SOP-00039	CCME, EPA 8260C
Chloride by Automated Colourimetry	3	N/A	2013/08/29	AB SOP-00020	SSMA 4500 CL- E
Chloride by Automated Colourimetry	1	N/A	2013/08/30	AB SOP-00020	SSMA 4500 CL- E
True Colour	4	N/A	2013/08/27	CAL SOP-00049	SM 2120 C
Conductivity @25C	4	N/A	2013/08/27	AB SOP-00005	SM 2510-B
Fluoride	4	N/A	2013/08/27	AB SOP-00005	SM 4500-F C
CCME Hydrocarbons (F2-F4 in water)	4	2013/08/27	2013/08/28	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	4	N/A	2013/08/28	AB WI-00065	SM 2340B
Hardness Total (calculated as CaCO3) (1)	4	N/A	2013/08/29	BBY7SOP-00002	EPA 6020A
Hardness (calculated as CaCO3) (1)	4	N/A	2013/08/28	BBY7SOP-00002	EPA 6020A
Elements by ICP (Dissolved) Lab Filtered	4	N/A	2013/08/27	AB SOP-00042	EPA 200.7
Ion Balance	4	N/A	2013/08/27	AB WI-00065	SM 1030E
Na, K, Ca, Mg, S by CRC ICPMS (diss.) (1)	4	N/A	2013/08/30	BBY7SOP-00002	EPA 6020A
Elements by ICPMS Low Level (dissolved) (1)	4	N/A	2013/08/29	BBY7SOP-00002	EPA 6020A
Na, K, Ca, Mg, S by CRC ICPMS (total) (1)	4	N/A	2013/08/29	BBY7SOP-00002	EPA 6020A
Elements by ICPMS Low Level (total) (1)	4	N/A	2013/08/29	BBY7SOP-00002	EPA 6020A
Nitrate and Nitrite	4	N/A	2013/08/28	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	4	N/A	2013/08/28	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2013/08/27	AB SOP-00023	SM 4110-B
Polychlorinated Biphenyls	2	2013/08/27	2013/08/27	CAL SOP-00149	EPA 3510C, EPA 8082A
Polychlorinated Biphenyls	2	2013/08/27	2013/08/29	CAL SOP-00149	EPA 3510C, EPA 8082A
pH @25°C (Alkalinity titrator)	4	N/A	2013/08/27	AB SOP-00005	SM 4500-H+B
Orthophosphate by Konelab	4	N/A	2013/08/28	AB SOP-00025	SM 4500-P
Sulphate by Automated Colourimetry	3	N/A	2013/08/29	AB SOP-00018	SM 4500 SO4-E
Sulphate by Automated Colourimetry	1	N/A	2013/08/30	AB SOP-00018	SM 4500 SO4-E
Total Dissolved Solids (Filt. Residue)	3	2013/08/28	2013/08/28	CAL SOP-00074	SM 2540-C
Total Dissolved Solids (Calculated)	4	N/A	2013/08/29	AB WI-00065	SM 1030E
Total Suspended Solids (NFR, low)	3	N/A	2013/08/29	AB SOP-00061	SM 2540-D

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

(1) This test was performed by Maxxam Vancouver

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

Maxxam Job #: B375531
Report Date: 2013/09/12

Encryption Key

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

Carissa Sumka, Project Manager
Email: CSumka@maxxam.ca
Phone# (403) 291-3077

==========

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

Total cover pages: 2

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

AT1 BTEX AND F1-F4 IN WATER (WATER)

Maxxam ID		HH7504	HH7506	HH7507	HH7508		
Sampling Date		2013/08/22	2013/08/22	2013/08/22	2013/08/22		
	UNITS	**MW3-D**	**MW2-D**	**DUP1**	**MW3-B**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	7116412
F3 (C16-C34 Hydrocarbons)	mg/L	<0.20	<0.20	<0.20	<0.20	0.20	7116412
F4 (C34-C50 Hydrocarbons)	mg/L	<0.20	<0.20	<0.20	<0.20	0.20	7116412
Reached Baseline at C50	mg/L	YES	YES	YES	YES	N/A	7116412
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	105	105	100	104	N/A	7116412
Volatiles							
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7117948
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7117948
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7117948
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	<0.80	0.80	7117948
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	0.40	7117948
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	<0.80	0.80	7117948
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	<100	100	7117948
(C6-C10)	ug/L	<100	<100	<100	<100	100	7117948
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	99	102	101	98	N/A	7117948
4-BROMOFLUOROBENZENE (sur.)	%	76	78	74	73	N/A	7117948
D4-1,2-DICHLOROETHANE (sur.)	%	126	128	127	127	N/A	7117948

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

ROUTINE WATER - FILTERED (WATER)

Maxxam ID		HH7504		HH7505		HH7506	HH7508		
Sampling Date		2013/08/22		2013/08/22		2013/08/22	2013/08/22		
	UNITS	**MW3-D**	**QC Batch**	**DUP2**	**RDL**	**MW2-D**	**MW3-B**	**RDL**	**QC Batch**
Calculated Parameters									
Hardness (CaCO3)	mg/L	370	7115445	390	0.50	260	210	0.50	7115445
Ion Balance	N/A	1.0	7115446	1.0	0.010	1.0	1.0	0.010	7115446
Dissolved Nitrate (NO3)	mg/L	4.6	7115448	4.6	0.013	1.4	36	0.013	7115448
Nitrate plus Nitrite (N)	mg/L	1.0	7115449	1.0	0.0030	0.31	8.2	0.0030	7115449
Dissolved Nitrite (NO2)	mg/L	<0.0099	7115448	0.016	0.0099	<0.0099	0.053	0.0099	7115448
Total Dissolved Solids	mg/L	430	7115451	450	10	300	340	10	7115451
Misc. Inorganics									
Conductivity	uS/cm	730	7121041	730	1.0	520	630	1.0	7121041
pH	N/A	7.92	7121043	7.99	N/A	8.01	8.01	N/A	7121043
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	7121037	<0.50	0.50	<0.50	<0.50	0.50	7121037
Alkalinity (Total as CaCO3)	mg/L	160	7121037	160	0.50	110	120	0.50	7121037
Bicarbonate (HCO3)	mg/L	190	7121037	190	0.50	130	150	0.50	7121037
Carbonate (CO3)	mg/L	<0.50	7121037	<0.50	0.50	<0.50	<0.50	0.50	7121037
Hydroxide (OH)	mg/L	<0.50	7121037	<0.50	0.50	<0.50	<0.50	0.50	7121037
Dissolved Sulphate (SO4)	mg/L	190(1)	7130847	200(1)	2.0	130	47	1.0	7129396
Dissolved Chloride (Cl)	mg/L	18	7130839	19	1.0	22	71	1.0	7129391
Nutrients									
Dissolved Nitrite (N)	mg/L	<0.0030	7118830	0.0050	0.0030	<0.0030	0.016	0.0030	7118830
Dissolved Nitrate (N)	mg/L	1.0	7118830	1.0	0.0030	0.31	8.2	0.0030	7118830

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

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

ROUTINE WATER - FILTERED (WATER)

Maxxam ID		HH7504		HH7505		HH7506	HH7508		
Sampling Date		2013/08/22		2013/08/22		2013/08/22	2013/08/22		
	UNITS	**MW3-D**	**QC Batch**	**DUP2**	**RDL**	**MW2-D**	**MW3-B**	**RDL**	**QC Batch**
Elements									
Dissolved Aluminum (Al)	mg/L	<0.040	7120649	<0.040	0.040	<0.040	<0.040	0.040	7120649
Dissolved Barium (Ba)	mg/L	0.026	7120649	0.026	0.010	0.039	0.058	0.010	7120649
Dissolved Boron (B)	mg/L	0.022	7120649	0.022	0.020	<0.020	0.029	0.020	7120649
Dissolved Calcium (Ca)	mg/L	64	7127559	71	0.30	29	42	0.30	7120649
Dissolved Chromium (Cr)	mg/L	<0.010	7120649	<0.010	0.010	<0.010	<0.010	0.010	7120649
Dissolved Iron (Fe)	mg/L	0.090	7120649	0.092	0.060	0.076	<0.060	0.060	7120649
Dissolved Lithium (Li)	mg/L	<0.020	7120649	<0.020	0.020	<0.020	<0.020	0.020	7120649
Dissolved Magnesium (Mg)	mg/L	50	7127559	51	0.20	45	26	0.20	7120649
Dissolved Manganese (Mn)	mg/L	0.018	7120649	0.019	0.0040	0.070	<0.0040	0.0040	7120649
Dissolved Phosphorus (P)	mg/L	<0.10	7120649	<0.10	0.10	<0.10	<0.10	0.10	7120649
Dissolved Potassium (K)	mg/L	1.2	7127559	1.2	0.30	1.5	2.1	0.30	7120649
Dissolved Silicon (Si)	mg/L	0.96	7120649	0.99	0.10	0.78	1.1	0.10	7120649
Dissolved Sodium (Na)	mg/L	8.2	7127559	8.2	0.50	8.6	41	0.50	7120649
Dissolved Strontium (Sr)	mg/L	0.052	7120649	0.053	0.020	0.056	0.066	0.020	7120649
Dissolved Sulphur (S)	mg/L	60	7120649	60	0.20	35	15	0.20	7120649
RDL = Reportable Detection Limit									

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HH7504		HH7505	HH7506		HH7508		
Sampling Date		2013/08/22		2013/08/22	2013/08/22		2013/08/22		
	UNITS	**MW3-D**	**RDL**	**DUP2**	**MW2-D**	**RDL**	**MW3-B**	**RDL**	**QC Batch**
Misc. Inorganics									
Total Dissolved Solids	mg/L	500	10	490	N/A	10	410	10	7121901
Total Suspended Solids	mg/L	0.50(1)	0.50	0.46(1)	N/A	0.46	2.9	0.40	7126554
Anions									
Dissolved Fluoride (F)	mg/L	<0.050	0.050	<0.050	0.061	0.050	0.077	0.050	7121045
Nutrients									
Orthophosphate (P)	mg/L	<0.0030	0.0030	0.0032	0.0030	0.0030	0.0041	0.0030	7125504
Physical Properties									
True Colour	PtCo units	3.8	2.0	2.7	3.6	2.0	6.1	2.0	7121131
N/A = Not Applicable RDL = Reportable Detection Limit (1) - Detection limits raised due to insufficient sample volume.									

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		HH7504	HH7505	HH7506	HH7508		
Sampling Date		2013/08/22	2013/08/22	2013/08/22	2013/08/22		
	UNITS	**MW3-D**	**DUP2**	**MW2-D**	**MW3-B**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1221	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1232	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1242	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1248	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1254	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1260	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1262	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Aroclor 1268	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Total Aroclors	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	7117522
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	98	100	114	107	N/A	7117522
N/A = Not Applicable							
RDL = Reportable Detection Limit							

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		HH7504		HH7505		HH7506		HH7508		
Sampling Date		2013/08/22		2013/08/22		2013/08/22		2013/08/22		
	UNITS	**MW3-D**	**QC Batch**	**DUP2**	**QC Batch**	**MW2-D**	**QC Batch**	**MW3-B**	**RDL**	**QC Batch**
Misc. Inorganics										
Dissolved Hardness (CaCO3)	mg/L	367	7113997	388	7113997	257	7113997	214	0.50	7113997
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	17.3	7122868	20.8	7122868	27.9	7122868	22.4	0.50	7122868
Dissolved Antimony (Sb)	ug/L	0.086	7122868	0.095	7122868	0.025	7122868	0.085	0.020	7122868
Dissolved Arsenic (As)	ug/L	0.134	7122868	0.130	7122868	0.153	7122868	0.225	0.020	7122868
Dissolved Barium (Ba)	ug/L	30.6	7122868	30.6	7122868	38.3	7122868	60.5	0.020	7122868
Dissolved Beryllium (Be)	ug/L	<0.010	7122868	<0.010	7122868	<0.010	7122868	<0.010	0.010	7122868
Dissolved Bismuth (Bi)	ug/L	<0.0050	7122868	0.0130	7122868	<0.0050	7122868	<0.0050	0.0050	7122868
Dissolved Boron (B)	ug/L	<50	7122868	<50	7122868	<50	7122868	<50	50	7122868
Dissolved Cadmium (Cd)	ug/L	0.0130	7122868	0.0120	7122868	0.0130	7122868	0.0130	0.0050	7122868
Dissolved Chromium (Cr)	ug/L	<0.10	7122868	<0.10	7122868	<0.10	7122868	<0.10	0.10	7122868
Dissolved Cobalt (Co)	ug/L	0.218	7122868	0.240	7137476	0.371	7122868	0.110(1)	0.0050	7122868
Dissolved Copper (Cu)	ug/L	2.63	7122868	2.90	7137476	2.02	7122868	4.68	0.050	7122868
Dissolved Iron (Fe)	ug/L	3.7	7122868	3.3	7122868	1.6	7122868	3.4	1.0	7122868
Dissolved Lead (Pb)	ug/L	0.0140	7122868	0.0330	7122868	0.0200	7122868	0.0250	0.0050	7122868
Dissolved Lithium (Li)	ug/L	1.70	7122868	1.47	7122868	1.51	7122868	1.60	0.50	7122868
Dissolved Manganese (Mn)	ug/L	26.8	7122868	28.6	7122868	61.2	7122868	4.61	0.050	7122868
Dissolved Molybdenum (Mo)	ug/L	0.772	7122868	0.894	7122868	1.85	7122868	1.50	0.050	7122868
Dissolved Nickel (Ni)	ug/L	1.86	7122868	2.15	7122868	3.47	7122868	1.88	0.020	7122868
Dissolved Selenium (Se)	ug/L	0.337	7122868	0.328	7122868	0.241	7122868	0.482	0.040	7122868
Dissolved Silicon (Si)	ug/L	1140	7122868	1110	7122868	898	7122868	1300	100	7122868
Dissolved Silver (Ag)	ug/L	<0.0050	7122868	<0.0050	7122868	<0.0050	7122868	<0.0050	0.0050	7122868
Dissolved Strontium (Sr)	ug/L	56.7	7122868	57.6	7122868	53.8	7122868	68.7	0.050	7122868
Dissolved Thallium (Tl)	ug/L	0.0330	7122868	0.0340	7122868	0.0130	7122868	0.0100	0.0020	7122868
Dissolved Tin (Sn)	ug/L	<0.20	7122868	<0.20	7122868	<0.20	7122868	<0.20	0.20	7122868
Dissolved Titanium (Ti)	ug/L	<0.50	7122868	<0.50	7122868	<0.50	7122868	<0.50	0.50	7122868
Dissolved Uranium (U)	ug/L	7.09	7122868	7.14	7122868	4.38	7122868	1.48	0.0020	7122868
Dissolved Vanadium (V)	ug/L	0.23	7122868	0.22	7122868	0.21	7122868	0.34	0.20	7122868
Dissolved Zinc (Zn)	ug/L	2.11(1)	7137476	2.34(1)	7137476	2.72(1)	7137476	18.8	0.10	7122868
Dissolved Zirconium (Zr)	ug/L	0.12	7122868	0.10	7122868	<0.10	7122868	0.33	0.10	7122868
Dissolved Calcium (Ca)	mg/L	68.5	7115757	67.5	7115757	27.1	7115757	40.3	0.050	7115757
Dissolved Magnesium (Mg)	mg/L	50.3	7115757	53.3	7115757	44.1	7115757	26.7	0.050	7115757
Dissolved Potassium (K)	mg/L	1.31	7115757	1.36	7115757	1.54	7115757	2.24	0.050	7115757
Dissolved Sodium (Na)	mg/L	8.25	7115757	8.64	7115757	8.70	7115757	43.2	0.050	7115757
Dissolved Sulphur (S)	mg/L	68.2	7115757	74.3	7115757	42.5	7115757	17.3	3.0	7115757

RDL = Reportable Detection Limit
(1) - Dissolved greater than total. Reanalysis yields similar results.

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		HH7504	HH7505	HH7506	HH7508		
Sampling Date		2013/08/22	2013/08/22	2013/08/22	2013/08/22		
	UNITS	**MW3-D**	**DUP2**	**MW2-D**	**MW3-B**	**RDL**	**QC Batch**
Calculated Parameters							
Total Hardness (CaCO3)	mg/L	375	360	227	196	0.50	7114651
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	20.9	19.5	33.3	26.1	0.50	7122900
Total Antimony (Sb)	ug/L	0.081	0.079	0.027	0.080	0.020	7122900
Total Arsenic (As)	ug/L	0.131	0.112	0.194	0.190	0.020	7122900
Total Barium (Ba)	ug/L	30.5	31.1	39.4	62.7	0.020	7122900
Total Beryllium (Be)	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	7122900
Total Bismuth (Bi)	ug/L	<0.0050	0.0050	<0.0050	<0.0050	0.0050	7122900
Total Boron (B)	ug/L	<50	<50	<50	<50	50	7122900
Total Cadmium (Cd)	ug/L	0.0120	0.0090	0.0080	0.0090	0.0050	7122900
Total Chromium (Cr)	ug/L	<0.10	0.15	1.50	0.11	0.10	7122900
Total Cobalt (Co)	ug/L	0.190	0.204	0.364	0.0450	0.0050	7122900
Total Copper (Cu)	ug/L	3.11	3.08	7.29	4.26	0.050	7122900
Total Iron (Fe)	ug/L	22.8	19.1	40.7	13.8	1.0	7122900
Total Lead (Pb)	ug/L	0.101	0.0950	0.132	0.0500	0.0050	7122900
Total Lithium (Li)	ug/L	1.38	1.63	1.65	1.73	0.50	7122900
Total Manganese (Mn)	ug/L	26.4	27.2	62.9	4.74	0.050	7122900
Total Molybdenum (Mo)	ug/L	0.790	0.842	1.70	1.40	0.050	7122900
Total Nickel (Ni)	ug/L	1.94	2.02	5.98	1.58	0.020	7122900
Total Selenium (Se)	ug/L	0.355	0.325	0.225	0.440	0.040	7122900
Total Silicon (Si)	ug/L	1170	1040	823	1200	100	7122900
Total Silver (Ag)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7122900
Total Strontium (Sr)	ug/L	59.9	58.7	54.5	69.5	0.050	7122900
Total Thallium (Tl)	ug/L	0.0330	0.0330	0.0140	0.0090	0.0020	7122900
Total Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	0.20	7122900
Total Titanium (Ti)	ug/L	<0.50	<0.50	1.19	<0.50	0.50	7122900
Total Uranium (U)	ug/L	6.94	6.80	4.11	1.40	0.0020	7122900
Total Vanadium (V)	ug/L	<0.20	0.20	0.23	0.21	0.20	7122900
Total Zinc (Zn)	ug/L	0.95	0.81	0.64	16.4	0.10	7122900
Total Zirconium (Zr)	ug/L	<0.10	<0.10	<0.10	0.26	0.10	7122900
Total Calcium (Ca)	mg/L	68.9	62.4	23.0	37.7	0.050	7115902
Total Magnesium (Mg)	mg/L	49.2	49.6	41.1	24.8	0.050	7115902
Total Potassium (K)	mg/L	1.32	1.34	1.54	2.11	0.050	7115902
Total Sodium (Na)	mg/L	8.09	8.21	8.18	40.2	0.050	7115902
Total Sulphur (S)	mg/L	70.4	70.2	40.2	16.5	3.0	7115902
RDL = Reportable Detection Limit							

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

Package 1	5.3°C
Package 2	9.7°C

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

Sample HH7504, Elements by ICP (Dissolved) Lab Filtered: Test repeated.
Sample HH7504, Elements by ICPMS Low Level (dissolved): Test repeated.
Sample HH7505, Elements by ICPMS Low Level (dissolved): Test repeated.
Sample HH7506, Elements by ICPMS Low Level (dissolved): Test repeated.

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7116412	O-TERPHENYL (sur.)	2013/08/27	99	50 - 130	109	50 - 130	101	%		
7116412	F2 (C10-C16 Hydrocarbons)	2013/08/27	98	50 - 130	104	70 - 130	<0.10	mg/L	57.7(1)	40
7116412	F3 (C16-C34 Hydrocarbons)	2013/08/27	98	50 - 130	96	70 - 130	<0.20	mg/L	64.4(1)	40
7116412	F4 (C34-C50 Hydrocarbons)	2013/08/27	93	50 - 130	106	70 - 130	<0.20	mg/L	68.5(1)	40
7117522	NONACHLOROBIPHENYL (sur.)	2013/08/27	110	30 - 130	111	30 - 130	101	%		
7117522	Aroclor 1260	2013/08/27	113	30 - 130	111	30 - 130	<0.000050	mg/L	NC	40
7117522	Aroclor 1016	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1221	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1232	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1242	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1248	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1254	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1262	2013/08/27					<0.000050	mg/L	NC	40
7117522	Aroclor 1268	2013/08/27					<0.000050	mg/L	NC	40
7117522	Total Aroclors	2013/08/27					<0.000050	mg/L	NC	40
7117948	1,4-Difluorobenzene (sur.)	2013/08/28	104	70 - 130	111	70 - 130	122	%		
7117948	4-BROMOFLUOROBENZENE (sur.)	2013/08/28	106	70 - 130	104	70 - 130	87	%		
7117948	D4-1,2-DICHLOROETHANE (sur.)	2013/08/28	117	70 - 130	123	70 - 130	127	%		
7117948	Benzene	2013/08/28	90	70 - 130	100	70 - 130	<0.40	ug/L	NC	40
7117948	Toluene	2013/08/28	80	70 - 130	94	70 - 130	<0.40	ug/L	NC	40
7117948	Ethylbenzene	2013/08/28	82	70 - 130	98	70 - 130	<0.40	ug/L	NC	40
7117948	m & p-Xylene	2013/08/28	99	70 - 130	122	70 - 130	<0.80	ug/L	NC	40
7117948	o-Xylene	2013/08/28	98	70 - 130	108	70 - 130	<0.40	ug/L	NC	40
7117948	(C6-C10)	2013/08/28	79	70 - 130	117	70 - 130	<100	ug/L	NC	40
7117948	Xylenes (Total)	2013/08/28					<0.80	ug/L	NC	40
7117948	F1 (C6-C10) - BTEX	2013/08/28					<100	ug/L	NC	40
7118830	Dissolved Nitrite (N)	2013/08/27	99	80 - 120	102	90 - 110	<0.0030	mg/L	7.5	20
7118830	Dissolved Nitrate (N)	2013/08/27	99	80 - 120	104	90 - 110	<0.0030	mg/L	12.8	20
7120649	Dissolved Aluminum (Al)	2013/08/27	98	80 - 120	97	80 - 120	<0.040	mg/L		
7120649	Dissolved Barium (Ba)	2013/08/27	92	80 - 120	92	80 - 120	<0.010	mg/L		
7120649	Dissolved Boron (B)	2013/08/27	94	80 - 120	93	80 - 120	<0.020	mg/L		
7120649	Dissolved Calcium (Ca)	2013/08/27	NC	80 - 120	101	80 - 120	<0.30	mg/L	6.2	20
7120649	Dissolved Chromium (Cr)	2013/08/27	92	80 - 120	92	80 - 120	<0.010	mg/L		
7120649	Dissolved Iron (Fe)	2013/08/27	103	80 - 120	102	80 - 120	<0.060	mg/L	NC	20
7120649	Dissolved Lithium (Li)	2013/08/27	96	80 - 120	95	80 - 120	<0.020	mg/L		
7120649	Dissolved Magnesium (Mg)	2013/08/27	93	80 - 120	95	80 - 120	<0.20	mg/L	5.3	20
7120649	Dissolved Manganese (Mn)	2013/08/27	97	80 - 120	96	80 - 120	<0.0040	mg/L	NC	20
7120649	Dissolved Phosphorus (P)	2013/08/27	101	80 - 120	97	80 - 120	<0.10	mg/L		
7120649	Dissolved Potassium (K)	2013/08/27	94	80 - 120	95	80 - 120	<0.30	mg/L	NC	20
7120649	Dissolved Silicon (Si)	2013/08/27	99	80 - 120	100	80 - 120	<0.10	mg/L		

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7120649	Dissolved Sodium (Na)	2013/08/27	92	80 - 120	93	80 - 120	<0.50	mg/L	6.1	20
7120649	Dissolved Strontium (Sr)	2013/08/27	94	80 - 120	94	80 - 120	<0.020	mg/L		
7120649	Dissolved Sulphur (S)	2013/08/27					<0.20	mg/L		
7121037	Alkalinity (Total as CaCO3)	2013/08/27			92	80 - 120	0.51, RDL=0.50	mg/L	0.7	20
7121037	Alkalinity (PP as CaCO3)	2013/08/27					<0.50	mg/L	NC	20
7121037	Bicarbonate (HCO3)	2013/08/27					0.62, RDL=0.50	mg/L	0.7	20
7121037	Carbonate (CO3)	2013/08/27					<0.50	mg/L	NC	20
7121037	Hydroxide (OH)	2013/08/27					<0.50	mg/L	NC	20
7121041	Conductivity	2013/08/27			99	90 - 110	<1.0	uS/cm	0.1	20
7121043	pH	2013/08/27			100	97 - 102			0.5	5
7121045	Dissolved Fluoride (F)	2013/08/27	93	80 - 120	92	80 - 120	<0.050	mg/L	NC	20
7121131	True Colour	2013/08/27			99	80 - 120	<2.0	PtCo units	NC	20
7121901	Total Dissolved Solids	2013/08/28			99	80 - 120	<10	mg/L	0.8	20
7122868	Dissolved Aluminum (Al)	2013/08/29	103	80 - 120	106	80 - 120	<0.50	ug/L	0.2	20
7122868	Dissolved Antimony (Sb)	2013/08/29	103	80 - 120	101	80 - 120	<0.020	ug/L	NC	20
7122868	Dissolved Arsenic (As)	2013/08/29	103	80 - 120	98	80 - 120	<0.020	ug/L	3.0	20
7122868	Dissolved Barium (Ba)	2013/08/29	NC	80 - 120	96	80 - 120	<0.020	ug/L	1	20
7122868	Dissolved Beryllium (Be)	2013/08/29	96	80 - 120	101	80 - 120	<0.010	ug/L	NC	20
7122868	Dissolved Bismuth (Bi)	2013/08/29	96	80 - 120	96	80 - 120	<0.0050	ug/L	NC	20
7122868	Dissolved Cadmium (Cd)	2013/08/29	100	80 - 120	97	80 - 120	<0.0050	ug/L	NC	20
7122868	Dissolved Chromium (Cr)	2013/08/29	98	80 - 120	98	80 - 120	<0.10	ug/L	NC	20
7122868	Dissolved Cobalt (Co)	2013/08/29	96	80 - 120	99	80 - 120	<0.0050	ug/L	0.9	20
7122868	Dissolved Copper (Cu)	2013/08/29	98	80 - 120	99	80 - 120	<0.050	ug/L	5.7	20
7122868	Dissolved Iron (Fe)	2013/08/29	106	80 - 120	105	80 - 120	<1.0	ug/L	NC	20
7122868	Dissolved Lead (Pb)	2013/08/29	94	80 - 120	99	80 - 120	<0.0050	ug/L	NC	20
7122868	Dissolved Lithium (Li)	2013/08/29	85	80 - 120	98	80 - 120	<0.50	ug/L	NC	20
7122868	Dissolved Manganese (Mn)	2013/08/29	NC	80 - 120	97	80 - 120	<0.050	ug/L	0.2	20
7122868	Dissolved Molybdenum (Mo)	2013/08/29	NC	80 - 120	95	80 - 120	<0.050	ug/L	7.6	20
7122868	Dissolved Nickel (Ni)	2013/08/29	96	80 - 120	100	80 - 120	<0.020	ug/L	4.1	20
7122868	Dissolved Selenium (Se)	2013/08/29	107	80 - 120	98	80 - 120	<0.040	ug/L	7.7	20
7122868	Dissolved Silver (Ag)	2013/08/29	104	80 - 120	84	80 - 120	<0.0050	ug/L	NC	20
7122868	Dissolved Strontium (Sr)	2013/08/29	NC	80 - 120	93	80 - 120	<0.050	ug/L	0.9	20
7122868	Dissolved Thallium (Tl)	2013/08/29	96	80 - 120	104	80 - 120	<0.0020	ug/L	8.7	20
7122868	Dissolved Tin (Sn)	2013/08/29	97	80 - 120	98	80 - 120	<0.20	ug/L	NC	20
7122868	Dissolved Titanium (Ti)	2013/08/29	113	80 - 120	96	80 - 120	<0.50	ug/L	NC	20
7122868	Dissolved Uranium (U)	2013/08/29	NC	80 - 120	102	80 - 120	<0.0020	ug/L	2.8	20
7122868	Dissolved Vanadium (V)	2013/08/29	106	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
7122868	Dissolved Zinc (Zn)	2013/08/29	93	80 - 120	104	80 - 120	<0.10	ug/L		
7122868	Dissolved Boron (B)	2013/08/29					<50	ug/L	NC	20
7122868	Dissolved Silicon (Si)	2013/08/29					<100	ug/L	1.9	20

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7122868	Dissolved Zirconium (Zr)	2013/08/29					<0.10	ug/L	NC	20
7122900	Total Aluminum (Al)	2013/08/29	96	80 - 120	104	80 - 120	<0.50	ug/L	10.8	20
7122900	Total Antimony (Sb)	2013/08/29	101	80 - 120	103	80 - 120	<0.020	ug/L	NC	20
7122900	Total Arsenic (As)	2013/08/29	106	80 - 120	102	80 - 120	<0.020	ug/L	6.8	20
7122900	Total Barium (Ba)	2013/08/29	NC	80 - 120	99	80 - 120	<0.020	ug/L	2.7	20
7122900	Total Beryllium (Be)	2013/08/29	97	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
7122900	Total Bismuth (Bi)	2013/08/29	101	80 - 120	95	80 - 120	<0.0050	ug/L	NC	20
7122900	Total Cadmium (Cd)	2013/08/29	102	80 - 120	99	80 - 120	<0.0050	ug/L	NC	20
7122900	Total Chromium (Cr)	2013/08/29	104	80 - 120	102	80 - 120	<0.10	ug/L	NC	20
7122900	Total Cobalt (Co)	2013/08/29	102	80 - 120	101	80 - 120	<0.0050	ug/L	NC	20
7122900	Total Copper (Cu)	2013/08/29	103	80 - 120	101	80 - 120	<0.050	ug/L	2.4	20
7122900	Total Iron (Fe)	2013/08/29	NC	80 - 120	106	80 - 120	<1.0	ug/L	2.2	20
7122900	Total Lead (Pb)	2013/08/29	97	80 - 120	97	80 - 120	<0.0050	ug/L	9.0	20
7122900	Total Lithium (Li)	2013/08/29	88	80 - 120	96	80 - 120	<0.50	ug/L	NC	20
7122900	Total Manganese (Mn)	2013/08/29	NC	80 - 120	101	80 - 120	<0.050	ug/L	1.5	20
7122900	Total Molybdenum (Mo)	2013/08/29	98	80 - 120	94	80 - 120	<0.050	ug/L	NC	20
7122900	Total Nickel (Ni)	2013/08/29	103	80 - 120	101	80 - 120	<0.020	ug/L	1.7	20
7122900	Total Selenium (Se)	2013/08/29	110	80 - 120	109	80 - 120	<0.040	ug/L	NC	20
7122900	Total Silver (Ag)	2013/08/29	104	80 - 120	86	80 - 120	<0.0050	ug/L	NC	20
7122900	Total Strontium (Sr)	2013/08/29	NC	80 - 120	100	80 - 120	<0.050	ug/L	2.0	20
7122900	Total Thallium (Tl)	2013/08/29	100	80 - 120	99	80 - 120	<0.0020	ug/L	NC	20
7122900	Total Tin (Sn)	2013/08/29	NC	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
7122900	Total Titanium (Ti)	2013/08/29	108	80 - 120	113	80 - 120	<0.50	ug/L	NC	20
7122900	Total Uranium (U)	2013/08/29	99	80 - 120	97	80 - 120	<0.0020	ug/L	NC	20
7122900	Total Vanadium (V)	2013/08/29	109	80 - 120	100	80 - 120	<0.20	ug/L	NC	20
7122900	Total Zinc (Zn)	2013/08/29	103	80 - 120	102	80 - 120	<0.10	ug/L	0.6	20
7122900	Total Boron (B)	2013/08/29					<50	ug/L	NC	20
7122900	Total Silicon (Si)	2013/08/29					<100	ug/L	1.9	20
7122900	Total Zirconium (Zr)	2013/08/29					<0.10	ug/L	NC	20
7125504	Orthophosphate (P)	2013/08/28	97	80 - 120	102	80 - 120	<0.0030	mg/L	NC	20
7126554	Total Suspended Solids	2013/08/29			87	80 - 120	<0.40	mg/L		
7127559	Dissolved Calcium (Ca)	2013/08/29	103	80 - 120	103	80 - 120	<0.30	mg/L	0.03	20
7127559	Dissolved Magnesium (Mg)	2013/08/29	93	80 - 120	106	80 - 120	<0.20	mg/L	0.1	20
7127559	Dissolved Potassium (K)	2013/08/29	92	80 - 120	109	80 - 120	<0.30	mg/L	0.4	20
7127559	Dissolved Sodium (Na)	2013/08/29	118	80 - 120	106	80 - 120	<0.50	mg/L	0.2	20
7129391	Dissolved Chloride (Cl)	2013/08/29	104	80 - 120	101	80 - 120	<1.0	mg/L	NC	20
7129396	Dissolved Sulphate (SO4)	2013/08/29	115	80 - 120	108	80 - 120	<1.0	mg/L	NC	20
7130839	Dissolved Chloride (Cl)	2013/08/30	104	80 - 120	102	80 - 120	<1.0	mg/L	NC	20
7130847	Dissolved Sulphate (SO4)	2013/08/30	108	80 - 120	99	80 - 120	<1.0	mg/L	NC	20
7137476	Dissolved Cobalt (Co)	2013/09/03			105	80 - 120	<0.0050	ug/L		

Maxxam Job #: B375531
Report Date: 2013/09/12

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

QUALITY ASSURANCE REPORT

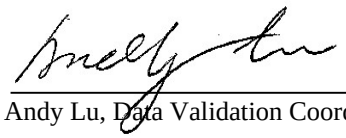
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
7137476	Dissolved Copper (Cu)	2013/09/03			106	80 - 120	<0.050	ug/L		
7137476	Dissolved Zinc (Zn)	2013/09/03			105	80 - 120	<0.10	ug/L		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the 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.

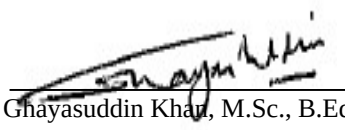
Validation Signature Page

Maxxam Job #: B375531

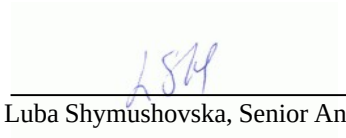
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



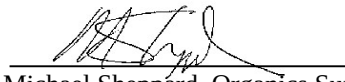
Andy Lu, Data Validation Coordinator



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist



Luba Shymushovska, Senior Analyst, Organic Department



Michael Sheppard, Organics Supervisor

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

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

CHAIN OF CUSTODY RECORD

INVOICE INFORMATION:		REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#10988 Franz Environmental Inc	Company Name:		Quotation #:	B33178	MAXXAM JOB #:	BOTTLE ORDER #: 427711
Contact Name:	Invoices, Lillian & Julie	Contact Name:	Julie Dittburner	P.O. #:			
Address:	329 Churchill Ave N Suite 200 Ottawa ON K1Z 5B8	Address:		Project #:	1697-1301		
Phone:	(613)721-0555 Fax: (613)721-0029	Phone:	Fax:	Project Name:		CHAIN OF CUSTODY #:	PROJECT MANAGER:
Email:	jdittburner@franzenvironmental.com, lellis@franzen	Email:	jdittburner@franzenvironmental.com	Site #:	~~Cambridge Bay, NU~~ PIN-D & PIN-B	C#427711-03-01	Parnian Baber
				Sampled By:			

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

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

SPECIAL INSTRUCTIONS

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

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

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

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

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

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

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Regulated Drinking Water ? (Y/N)	Metals Field Filtered ? (Y/N)	BTEX, F1-F4	CCME Low Level Diss. Metals & Hardness	CCME Low Level Total Metals	Colour, Conductivity & pH	Low Level Polychlorinated Biphenyl (PCB)	Low Level Total Suspended Solids	MAJOR IONS (Cl, F, NO2/NO3, SO4, PO4)	Total Dissolved Solids	# of Bottles	Comments
1		MW3-D	Aug 21/13	PM	GW	N	Y	X	X	X	X	X	X	X	X	12	
2		DUP2	Aug 21/13	PM	GW	N	Y		X	X	X	X	X	X	X	7	
3		MW2-D	Aug 21/13	PM	GW	N	Y	X	X	X	X	X		X		8	-limited sample for F2-F4 & PCBs, gen. chem & major ions.
4		DUP1	Aug 21/13	PM	GW	N	Y	X								4	-limited sample for F2-F4
5		MW3-B	Aug 22/13	PM	GW	N	Y	X	X	X	X	X	X	X	X	12	
6																	
7																	
8																	
9																	
10																	

22-Aug-13 16:25
Parminder Virk
B375531 AD
FL5 INS-0102

RECEIVED IN YELLOWKNIFE
By: [signature]
2013-08-22 16:25
3 6 7
Temp: 10 9 10

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal	Yes	No
J. Dittburner	13/08/22	16:00	Krish Balkaran	13/08/24	09:00			5/5/13 4/4/7	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

2x08-931

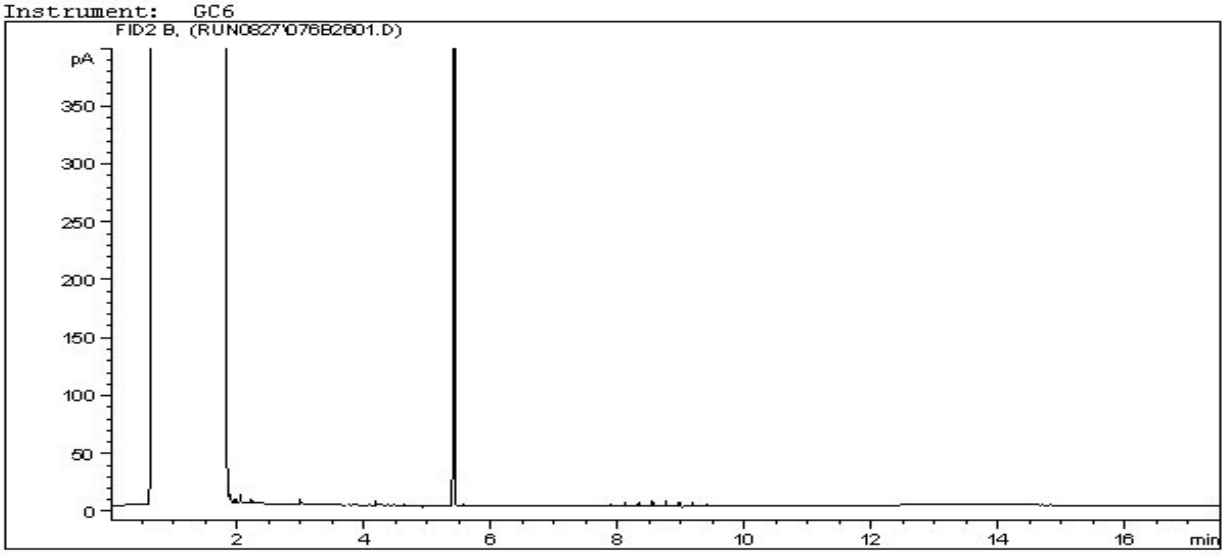
Report Date: 2013/09/12
Maxxam Job #: B375531
Maxxam Sample: HH7504

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

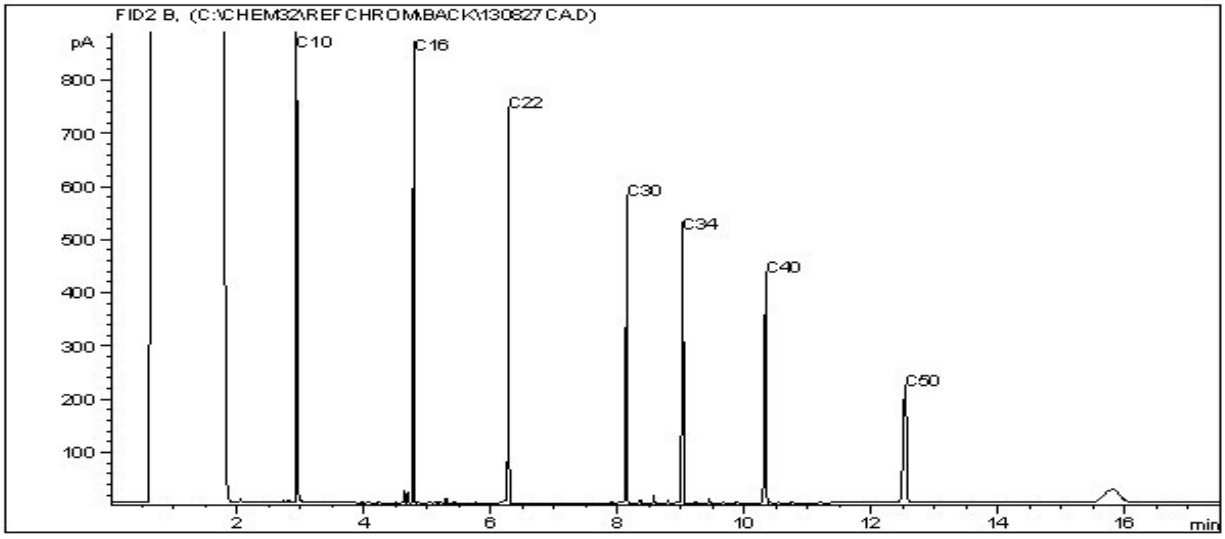
Client ID: MW3-D

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: GC6



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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

Page 1 of 1

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

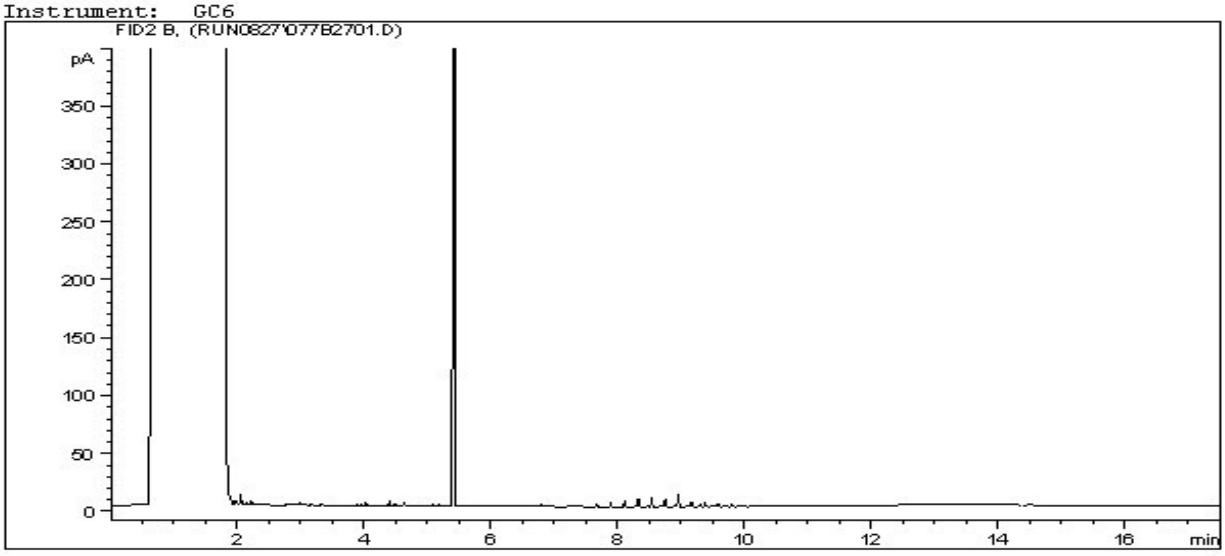
Report Date: 2013/09/12
Maxxam Job #: B375531
Maxxam Sample: HH7506

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

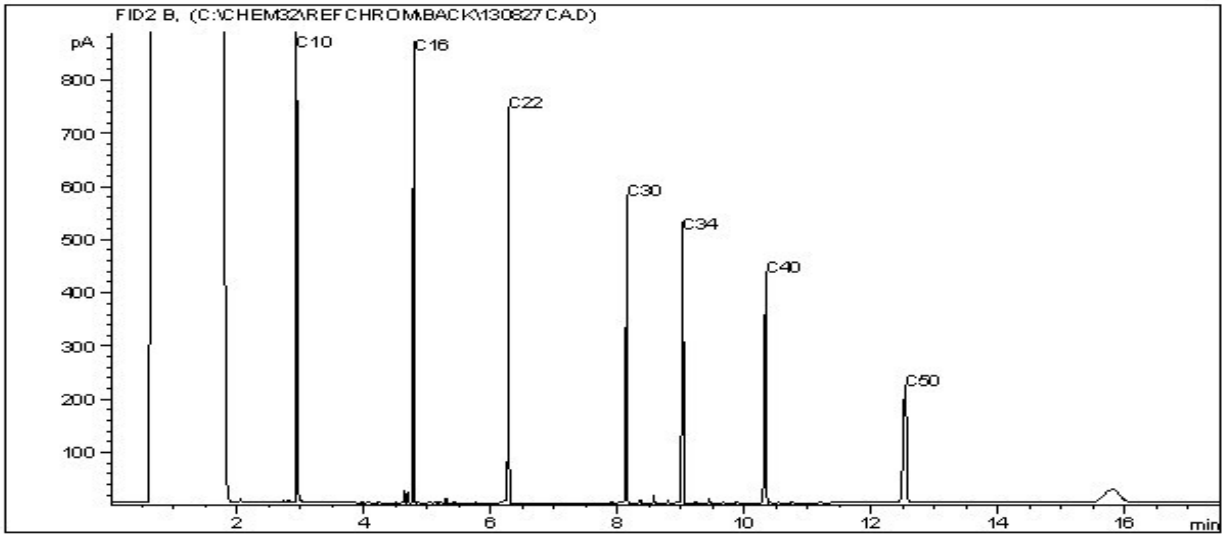
Client ID: MW2-D

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: GC6



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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

Page 1 of 1

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

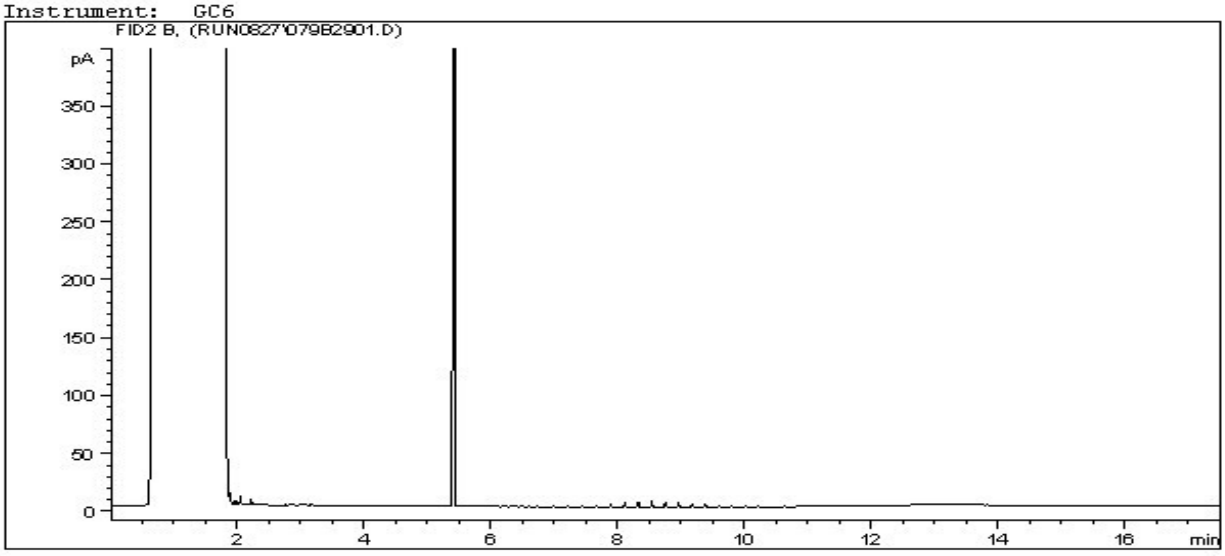
Report Date: 2013/09/12
Maxxam Job #: B375531
Maxxam Sample: HH7507

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

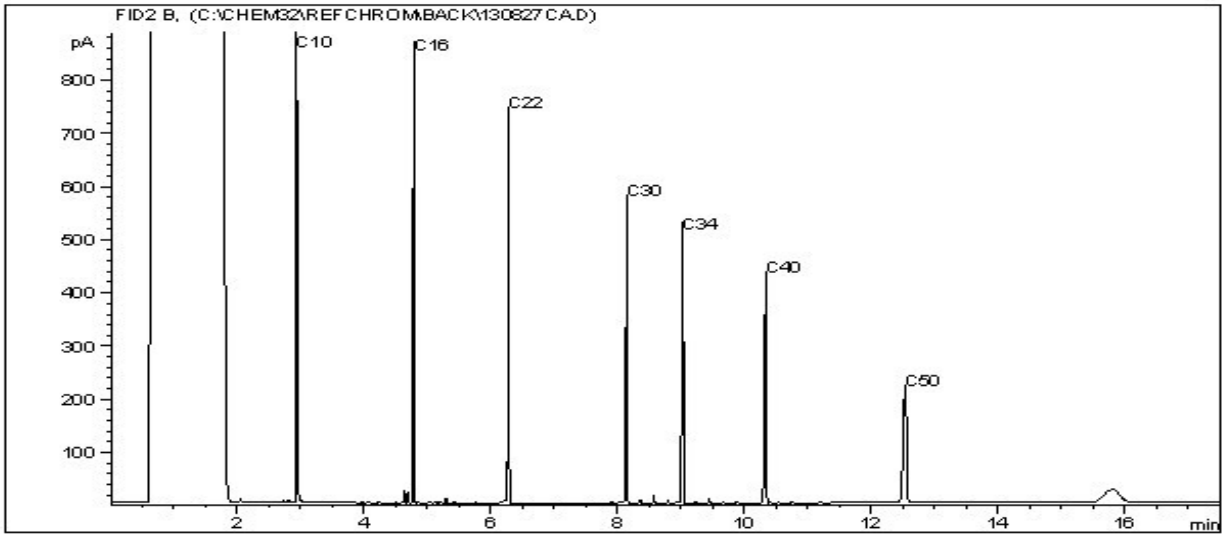
Client ID: DUP1

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: GC6



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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

Page 1 of 1

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

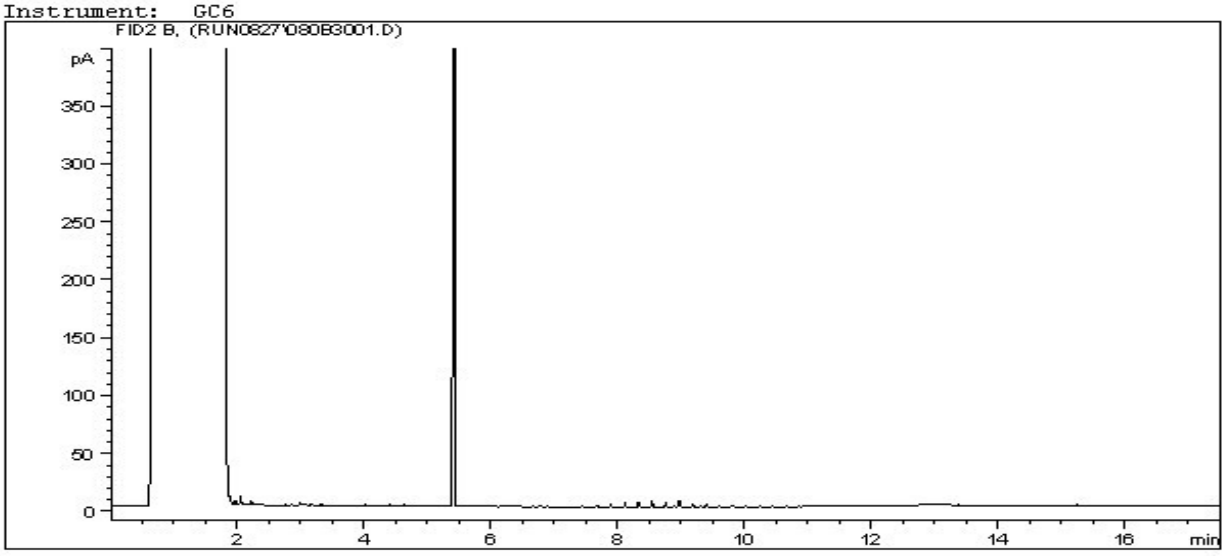
Report Date: 2013/09/12
Maxxam Job #: B375531
Maxxam Sample: HH7508

FRANZ ENVIRONMENTAL INC.
Client Project #: 1697-1301

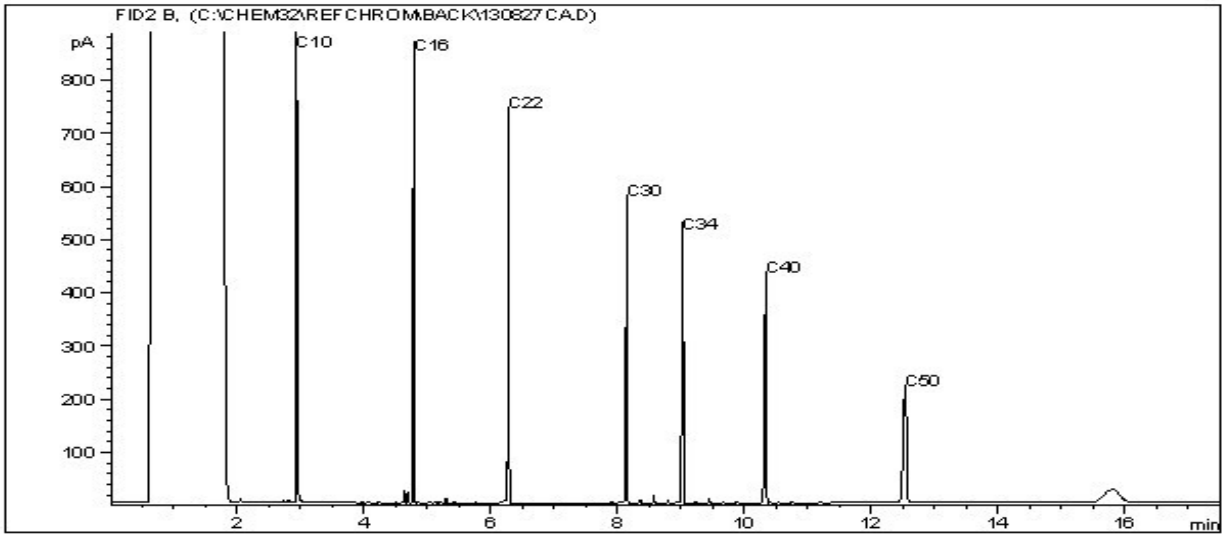
Client ID: MW3-B

CCME Hydrocarbons (F2-F4 in water) Chromatogram

Instrument: GC6



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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

Page 1 of 1

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

APPENDIX E

Field Notes

Groundwater Sampling

Project: AANDC DEW Lines

Franz Personnel: Kim Krug
Weather: 10°C, overcast

Development of Monitoring Wells

Name of Area: PIN - B			Sector:
Date of Sampling:	Day: 21	Month: 08	Year: 2013
Monitoring Well ID:	MW1		
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):			
Sampling Equipment:			

Measured Data

Well Depth (m):	3.042 m
Water Depth (m):	2.964 m
Stick Up (m):	0.580 m

Field Chemistry

Name and # unit:	Readings *	
pH:	1	
	2	
	3	
	4	
	5	
	6	
Temperature (°C):	1	
	2	
	3	
	4	
	5	
	6	
Conductivity (mS/cm):	1	
	2	
	3	
	4	
	5	
	6	
DO:	1	
	2	
	3	
	4	
	5	
	6	
ORP:	1	
	2	
	3	
	4	
	5	
	6	
Turbidity:	1	
	2	
	3	
	4	
	5	
	6	

Sample Analysis	Y/N	# of Bottles	Duplicate Information
PHC			
PCB Total			
VOC			
PAH			
Hardness			
Other			

Comments/ Notes:

- pumped dry at 1:35pm - just under 100mL of water
- checked water level at 2:40pm and well dry.
- NO SAMPLE COLLECTED

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

Groundwater Sampling

Project: ~~2~~ - 1301
16097

Franz Personnel: KK
Weather: 10°C, overcast

Development of Monitoring Wells

Name of Area: PIN-D			Sector:
Date of Sampling:	Day: 21	Month: 08	Year: 2013
Monitoring Well ID:	MW2		
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):			
Sampling Equipment:			

Measured Data

Well Depth (m):	2.960m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	2.391m					
Stick Up (m):	0.455m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1	12:20 7.59	PHC	Y	4 bottles	
	2	12:25 7.80				
	3	12:41 7.98				
	4					
	5					
	6					
Temperature (°C):	1	4.92	PCB Total	Y	1 bottle	
	2	2.71				
	3	2.90				
	4					
	5		VOC			
	6					
Conductivity (mS/cm):	1	0.365				
	2	0.844				
	3	0.312				
	4		PAH			
	5					
	6					
DO: %	1	186.2				
	2	110.2				
	3	106.2	Hardness			
	4					
	5					
	6					
ORP:	1	152.6	metals	Y	2 bottles	
	2	150.7				
	3	146.6	genchem	Y	1 bottle	
	4		Other			
	5					
	6					
Turbidity: Sol	1	0.29				
	2	0.29				
	3	0.26				
	4					
	5					
	6					

-took DUP1 here. for PHCs 4 bottles.

Comments/ Notes:

-pumped 500mL in one go - setting up YSI to try to stabilize parameters. @ 1:55pm
-at 2:25 seemed to be drying up slightly so stopped to let recharge.
-turned back on at 2:36

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

Groundwater Sampling

Project: ~~2680~~ +1301
1697

Franz Personnel: KK
Weather: 10°C, overcast

Development of Monitoring Wells

Name of Area: PIN-D			Sector:
Date of Sampling:	Day: 21	Month: 08	Year: 2013
Monitoring Well ID:	MW3		
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):			
Sampling Equipment:			

Measured Data

Well Depth (m):	2.516m		Sample Analysis	Y/N	# of Bottles	Duplicate Information
Water Depth (m):	2.191m					
Stick Up (m):	0.3606m					
Field Chemistry						
Name and # unit:	**Readings ***					
pH:	1	13:36 ~~13:36~~ 7.80	PHC	Y	5 bottles	
	2	13:41 7.60				
	3	13:46 7.56				
	4	13:51 7.55				
	5					
	6					
Temperature (°C):	1	2.55	PCB Total	Y	2 bottles	
	2	2.26				
	3	1.98				
	4	1.98				
	5					
	6					
Conductivity (mS/cm):	1	0.410	VOC			
	2	0.405				
	3	0.404				
	4	0.404				
	5					
	6					
DO: %	1	108.6	PAH			
	2	69.1				
	3	68.3				
	4	67.9				
	5					
	6					
ORP:	1	169.5	Hardness			
	2	162.3				
	3	158.0				
	4	154.7				
	5					
	6					
Turbidity:	1	0.35	metals gen. chem Other solids	5 bottles		
	2	0.35				
	3	0.35				
	4	0.35				
	5					
	6					

Comments/ Notes:

* Collected DUP2 here for metals solids gen.chem > 5 bottles

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

PCBs - 2 bottles

Groundwater Sampling

Project: ~~2680-130~~ 1697

Franz Personnel: KK
Weather: 10°C, overcast

Development of Monitoring Wells

Name of Area: PND - D			Sector:
Date of Sampling:	Day: 21	Month: 08	Year: 2013
Monitoring Well ID:	MW4		
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):			
Sampling Equipment:			

Measured Data

Well Depth (m):	2.065 m
Water Depth (m):	— dry
Stick Up (m):	0.381 m

Field Chemistry				
Name and # unit:	Readings *			
pH:	1			
	2			
	3			
	4			
	5			
	6			
Temperature (°C):	1			
	2			
	3			
	4			
	5			
	6			
Conductivity (mS/cm):	1			
	2			
	3			
	4			
	5			
	6			
DO:	1			
	2			
	3			
	4			
	5			
	6			
ORP:	1			
	2			
	3			
	4			
	5			
	6			
Turbidity:	1			
	2			
	3			
	4			
	5			
	6			

Sample Analysis	Y/N	# of Bottles	Duplicate Information
PHC			
PCB Total			
VOC			
PAH			
Hardness			
Other			

Comments/ Notes:

may be a little bit of water at the bottom - not frozen

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

1697-1301 PIN-B Ross Pt Aug 21/13

8:00: Left Yellowknife on Air Tindi charter (Twin Otter) enroute to Kuglukttuk.

10:30am: Arrived at Kuglukttuk to refuel and pick up bear monitor OJ Bernadhaut (arranged through HTO)

11:10: Leave Kuglukttuk enroute to PIN-13.

↳ OJ & (B.M) has been to the site before
- he says area is frequently used for hunting grounds.

→ for Caribou & Muskox
- he has not seen any other animals than these.

- OJ also stated that he does not see a decline in numbers, no increase - just same as it has always been.

1697-1301 PIN-B Ross Pt. Aug 21/13

12.15: arrived on site.
Franz (J.D Hilbourner & K. Krug)
AKNDC (A. Dunn)
Tindi (Mike & John)
B.M (OJ Bernhardt)

Purpose: Year 1 of Monitoring
We are going to inspect the integrity of the land fill, and GW ~~monitoring~~ monitoring & sampling of wells)
Soil sampling if required.

- J.D will complete photographic record & any integrity issues/findings
- K.K. will conduct GW sampling using peristaltic pump, YSI meter, & W.L meter.

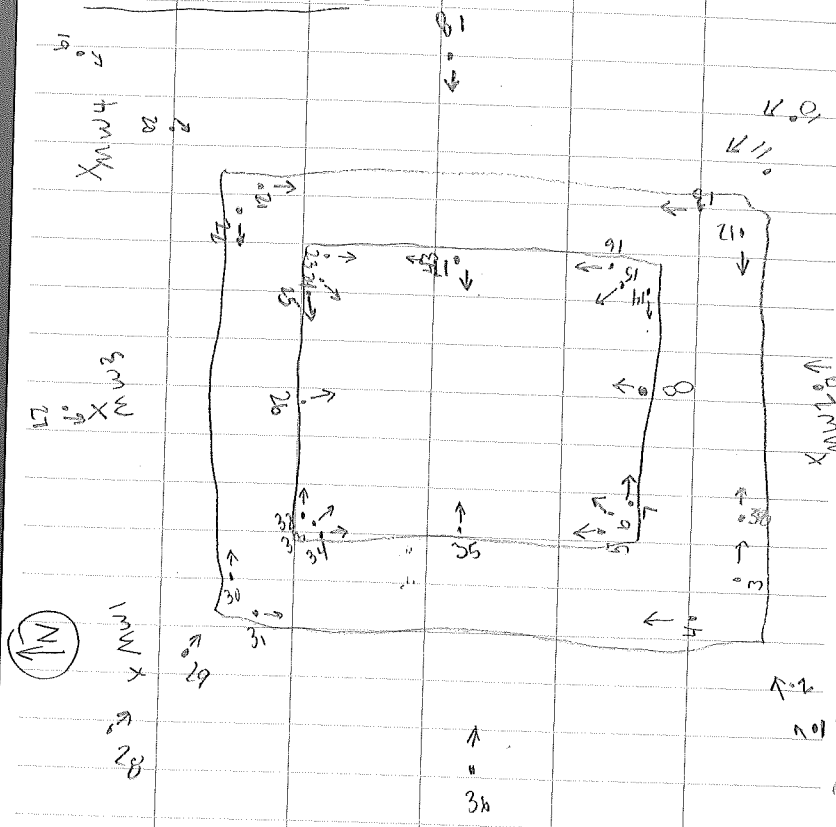
→ will be first year with monitoring.

Wild life sightings - arctic hare ~~scat~~ scat
-wolf scat - muskox scat.
-carcass - sighting - loons - calls
-paragrin falcon-saw hunting birds - visual
- Canada Geese - visual

Rite in the Rain

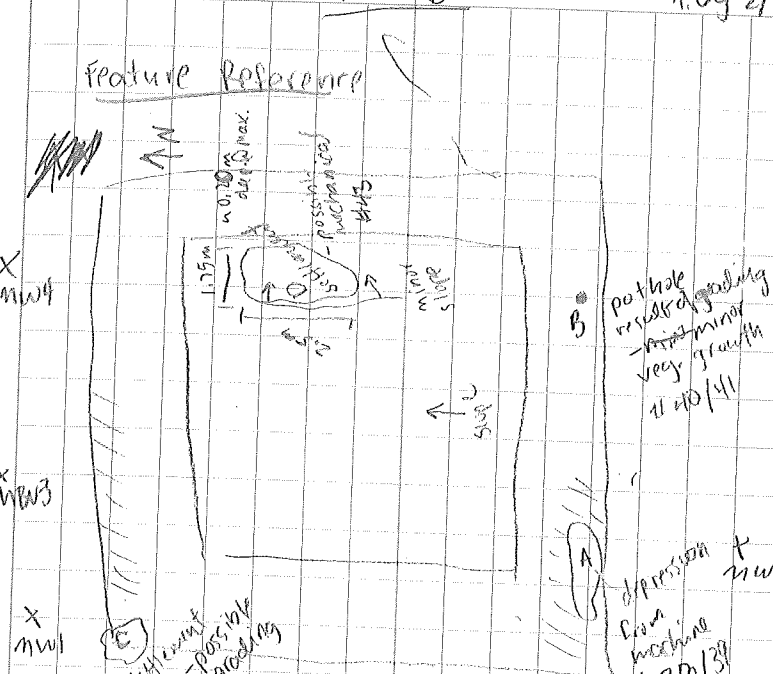
1697-1301 PIN-D Aug 21/13

Photo References



1697-1301 PIN-D Aug 21/13

Feature References



- landfill surface is for most graded flat, minor slope on East side by feature D
- no erosion or seepages observed.
- no stained soils
- ~~snow~~

Rite in the Rain

1697-1301 PIN-D Aug 21/13

GW - MW1 - had 5cm of water, Kim purged dry & did not recharge

MW2 - Sampled for PHCs/BTEX & DUP1 for PHCs
PCB's
metals.

MW3 - PHCs, and metals & PCBs
DUP2 for metals & PCBs
MW4 - well was DRY

- cleaned up

5:30 - off-site to fly back to Kug/Vkrut