Long Term Monitoring, 2011
PIN-B, Clifton Point, Nunavut

FINAL REPORT

Prepared for:

Aboriginal Affairs and Northern Development Canada
Nunavut Regional Office
Iqaluit, Nunavut
X0A 0H0

Prepared by:

Franz Environmental Inc.
329 Churchill Avenue, Suite 200
Ottawa, Ontario
K1Z 5B8
Tel. (613) 721-0555
Fax: (613) 721-0029

Project No. 1697-1101
January 17, 2012

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-B. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01, file number 1632-11/01-11-6001/5.

According to AANDC's Long Term Monitoring Plan, the PIN-B Intermediate DEW Line site was constructed in 1957 and subsequently closed and abandoned in 1963. The site is situated about 1.5 km inland from the coast of Amundsen Gulf (69°12' N, 118° 37' W). The terrain of PIN-B is relatively flat with several ponds and lakes and a maximum elevation of approximately 30 m above sea level. The main facilities at the site were comprised of a five-module building train, a warehouse, a garage, a small house for Inuit staff, a petroleum, oil and lubricants (POL) storage facility with associated distribution system, and a felled radar tower. A non-hazardous waste landfill (NHWL) was constructed at the site between 2009 and 2010. Final remediation activities and the closing of the NHWL were completed August 18, 2010. The NHWL was designed to contain non-hazardous materials only.

The monitoring program was carried out at the PIN-B DEW Line Site on August 12, 2011. The landfill monitoring program consisted of a visual inspection of the Non-Hazardous Waste Landfill (NHWL), active layer water monitoring, soil monitoring (if warranted) and natural environment monitoring.

Based on systematic visual observations and measurements, supported with photographic documentation, it was determined that the NHWL is in excellent condition, is performing as designed, and is containing the enclosed waste. Minor features noted at the NHWL during monitoring include a small animal burrow (likely arctic fox) on the slope of the north corner and two drainage pathways on the southwest and southeast sides. Neither of these features are considered to have any significant impact on the integrity or performance of the NHWL.

The Lake, Beach, Mid- and Upper Station Areas were also observed and found to be in good condition. A small stain (< 1 m^2) was noted at borrow area 6 in the Lake Area. Physical evidence, supported by interviews with persons with firsthand knowledge of the site and from members of the nearby community's Hunters' and Trappers' Organization, indicate that wildlife continue to frequent this site but due to the distance to nearby communities people do not.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 7.0.

TABLE OF CONTENTS

LIST OF FIGURES (Appendix A)

LIST OF TABLES

LIST OF APPENDICES

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-B, Clifton Point, NU. This project was completed under AANDC standing offer number 01-11-6001/5, call-up number 01, file number 1632-11/01-11-6001/5.

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

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

1.1 Project Objectives

Long term monitoring of the PIN-B 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 2011 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-B site, as described in the PIN-B (Clifton Point) Long-Term Monitoring Plan. 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-B Long-Term Monitoring Plan, dated April 15, 2011 (the Plan), was as follows:

1. Visual Monitoring of the Non-Hazardous Waste Landfill (NHWL), including
    - Visually checking the physical integrity of the NHWL and looking for evidence of settlement, erosion, 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 2011 monitoring program report.

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

a) Review of PIN-B 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) Visual inspection, measurement and photo documentation of the site;
f) Interviewing local residents and officials to understand land use and wildlife trends; and
g) Reporting.

2.0 BACKGROUND INFORMATION

2.1 Site Description

According to AANDC's Long Term Monitoring Plan, the PIN-B Intermediate Distant Early Warning (DEW) Line Site was constructed in 1957 and subsequently closed and abandoned in 1963. The site was comprised of a five-module building train, a warehouse, a garage, a small house for Inuit staff, a petroleum, oil and lubricants (POL) storage facility with associated distribution system, and a felled radar tower. In addition to the main station facilities, a cargo handling area was constructed at the beach area. A second POL storage facility was located at this beach area. (PIN-B LTMP, 2011).

Two airstrips were constructed at the site: the primary airstrip approximately 1 km long, located south of the beach area, while the second airstrip was constructed northwest of the main strip with a length of 300 metres. Gravel roads were built linking the airstrip, water supply lake and beaching area to the main station area. A small construction camp was erected during the building of the site facilities but was demolished once construction was completed. The former camp of an Inuit family is located approximately 1.5 km south of the site (PIN-B LTMP, 2011).

A non-hazardous waste landfill (NHWL) was constructed at the site between 2009 and 2010. (Fig. A-2). Final remediation activities were completed and the NHWL was closed on August 18, 2010. The NHWL was designed to contain non-hazardous materials only. It is situated approximately 1.5 km from the shore of Admundsen Gulf. It was constructed on native ground surface (elev. 30 m asl) 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 m lifts of waste covered by 0.15 m of granular fill. The layers were compacted and a final cover consisting of a minimum of 1.0 m of granular fill was used to cap the landfill (PIN-B LTMP, 2011). The NHWL at PIN-B contains the following types of waste:

- F3 and F4 fraction hydrocarbon impacted soil.
- Non-hazardous demolition debris, such as timbers, plywood, and sheet metal.
- Non-hazardous site debris, such as scrap metal and wood.
- Non-hazardous debris/soil excavated from landfills.
- Creosote timbers.
- Double-bagged asbestos.
- Tier 1 contaminated soil (Lead concentration between 200 and 500 ppm and PCB concentrations between 1 and 5 ppm).

The site is not regularly inhabited; wells at the site would tend to freeze due to the presence of permafrost, therefore groundwater is not considered to be used for water supply purposes. The

area has been reported not to be used by hunters and fishermen from the nearby community of Kugluktuk, and is likely to be infrequently visited by persons from other communities in the region. A surface water sample collected from the Drinking Water Lake in 2007 suggests that some chronic inputs of inorganic elements may have occurred over time, however contaminant levels were reported to be low and no significant impacts were identified.

2.2 Previous Monitoring Programs

The 2011 monitoring program at PIN-B was the first 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 DEW Lines sites:

- PIN-B (Clifton Point) Long-Term Monitoring Plan, April 15, 2011, Indian and Northern Affairs Canada.
- Cape Christian Long-Term Monitoring Plan, February 10, 2009, Indian and Northern Affairs Canada.
- FOX-C Ekalugad Fjord Long-Term Monitoring Plan, March 23, 2008, Indian and Northern Affairs Canada.
- Abandoned Military Site Remediation Protocol, March 2009, Indian and Northern Affairs Canada, Contaminated Sites Program.

3.0 INVESTIGATIVE METHODOLOGY

The monitoring program was carried out at the PIN-B DEW Line site on August 12, 2011 by field assessors Ryan Fletcher and Julie Dittburner of Franz Environmental Inc. under the supervision of AANDC representative Charlotte Lamontagne. Wildlife monitoring services were provided by Lakes and Rivers Consulting (Jeremy Hansen and Myles Dillion). During the field investigations, weather conditions were sunny, with a light breeze and mild temperatures (10 - 15 ^{o}C). The program consisted of the following:

- Completing a Health & Safety Plan;
- Visually observing, measuring and photographically documenting the physical integrity of the landfill;
- Collection of ground water samples from existing wells (if possible);
- Collection of soil samples (if necessary, as per the 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.

3.1 Health & Safety Plan

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

A copy of the HASP was presented to AANDC for 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.

3.2 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-B Long-Term Monitoring Plan, was completed for the landfill and is found in Table 4-1 to Table 4-3, Section 4. A photographic record was completed to document the condition of the structures and substantiate the visual observations (Appendix B).

The 2011 visual inspection was conducted with the aid of a Trimble Pro XRT GPS unit to locate features of note and to collect GIS information to be used in report preparation. A detailed data

outlined in the long-term monitoring plan. An SSF file and the data dictionary (Trimble files) is included in the appended CD ROM to be used in future site investigations.

3.3 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.

As part of the investigation, FRANZ representatives contacted the Kugluktuk Angoniatit Association Hunters' and Trappers' as well as a former site worker with first hand knowledge of the PIN-B site (gathered over a nine week period in 2010) to discuss land use by humans and wildlife as well as changes in use over previous years by each.

3.4 Ground Water Sampling

Upon arrival at the PIN-B 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 two of the monitoring wells contained groundwater; the remaining two wells were frozen. To determine whether the water level tape was operating properly, a low-flow peristaltic Geopump with associated LDPE tubing was inserted into each monitoring well. It was confirmed that the two frozen wells did not contain groundwater. The two wells that did contain groundwater were confirmed to have insufficient volumes for groundwater sampling. The level of groundwater and the frozen water, and the casing heights of each well were recorded, but no water samples could be obtained. General well conditions were also recorded, and the wells were re-locked using keyed-alike padlocks.

3.5 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 monitoring activities, as per the 2011 Long-term Monitoring Plan for the site.

4.0 NON-HAZARDOUS WASTE LANDFILL

4.1 Area Summary

The NHWL is located at the Main Station Area, approximately 1.5 km southwest of the Beach Area, at an elevation of 30 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. Groundwater samples were to be collected from the 4 previously installed monitoring wells on each side of the NHWL. Due to frozen well conditions (2 wells) and insufficient sample volumes (2 wells) groundwater samples could not be collected. Soil samples were deemed unnecessary by the FRANZ field assessors and on-site AANDC representative. The visual inspection report, including supporting photos and drawing, is presented in the following pages.

4.2 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 55, attached CD-ROM). Those portions of the record referenced in the body of this document are included in Appendix B. The complete photographic record, of full-resolution photographs, is provided in the attached CD-ROM.

4.3 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-B Long-Term Monitoring Plan has been completed and pertinent information is summarized in Table 4-3 of this report. Table 4-1 and Table 4-2 present the preliminary visual inspection results for the NHWL at PIN-B.

Table 4-1: Preliminary Visual Inspection Report Non-Hazardous Waste Landfill

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

Feature	Presence (Y/N)	Severity Rating	Extent
Overall Landfill Performance	**Acceptable**		

Table 4-2: 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

No indications of settlement or depression areas were observed in the area of the NHWL.

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

Evidence of a burrowing animal was observed in one location on the slope of north corner of the NHWL. It appeared as though an animal had attempted to dig a small burrow and deposited soil to one side, exposing larger cobbles (Photo 45, Appendix B). The volume of this burrow is

estimated at less than 1 m^3. Animal tracks were not observed in the area. The integrity of the NWHL has not been impacted by the burrow.

Re-establishment of Vegetation

Based on the regional setting of this landfill re-establishment of vegetation is not likely to occur within the timeframe of the first phase of long term monitoring. No growth was observed on the top or sides of the landfill.

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

Two drainage pathways were noted during the NHWL inspection. One was observed on the southeast side of the landfill and one on the southwest side. Both drainage pathways appeared to be natural features of the topography in the area (Photo 46 and Photo 47, Appendix B). Erosion does not appear to be taking place in these drainage pathways, therefore the physical integrity of the NHWL has not been impacted.

Discussion

All physical observations suggest that the NHWL is performing as designed and is containing the enclosed waste. Groundwater samples were not taken due to the frozen state of two of the monitoring wells and the insufficient sample volumes in the remaining two wells. Soil samples were not collected given the lack of evidence (e.g. staining) of any anomalies.

Table 4-3 below summarizes the results of the visual inspection.

Table 4-3: PIN-B – Clifton Point – Visual Monitoring Checklist

Checklist Item	Feature Letter	Relative Location	Length (m)	Width (m)	Depth (m)	Extent	Description (Change)	Additional Comments	Photo Reference
Animal Burrow	A	On slope of north corner of the NHWL	0.75	0.25	0.2	<1%	Animal burrowed exposing larger cobbles	Does not affect the landfill integrity at this point	45
Drainage Pathway	B	On southwest side of NHWL, draining in a SW direction towards MW2	25	0.5	0.1	<1%	Minor drainage pathway originating from NHWL, running towards SW	Feature appears natural. Does not affect the landfill integrity at this point	46
Drainage Pathway	C	On southeast side of NHWL, draining in a SE to SW direction towards MW3	24	0.6	0.25	<1%	Drainage pathway originating from the base of the SE side of the NHWL	Feature appears natural. Does not affect the landfill integrity at this point	47

5.0 SURROUNDING AREAS

Station Area

This area lies adjacent to NHWL, and is the site of the former PIN-B Main Station (Fig. A-1). Prior to remediation, this area consisted of a five-module building train, a warehouse, a garage, a Inuit staff house, and a POL storage facility, a felled radar tower, a PCB temporary storage area, and a outdoor wash house. In addition, three borrow source areas (borrow area 1A, 1B, and 4) were identified. Currently, two concrete pads are present in the area (Photo 49, Appendix B). The area has been completely graded and appeared in good condition. No anomalies were observed.

Beach Area

To the north of the NHWL lies the Beach Area (Fig. A-1), in which three distinct dump areas were previously identified, as well as the main 1 km long airstrip. Just north of the airstrip is the site of the former petroleum hydrocarbon contaminated soil treatment area and a small abandoned airstrip, both of which have been re-graded. Three former borrow source areas (borrow area 3, 6 and 7) were also identified at the Beach Area. These re-graded areas appear to be in good condition, with only one minor anomaly (Photo 56, Appendix B): a minor erosion channel, attributed to a natural drainage pathway, was observed on the south side of the active airstrip (Photo 50, Appendix B); it does not have any significant negative impact to the re-graded area. Bird and animal tracks, as well as two eagle nests, were prevalent in this area (Photo 53 through Photo 55, Appendix B).

Station Dump Area

To the northwest of the NHWL, along the west side of the access road, lies the Station West Dump (Fig. A-1). This area contained a small amount of site debris, a treatment lagoon, and a small surface water body (lake). One anomaly was observed: a small stain (area < 1 m^2) along the access road with a slight PHC-like odour was observed. This was likely left by the re-grading machinery (Photo 51, Appendix B); it does not appear connected to the failure or malfunctioning of any former on-site facility.

Construction Camp Area

The Construction Camp Area is located just to the north of the NHWL between the Beach Area and the NHWL (Fig. A-1). This camp was set up and used during the construction of the Station at the site. This area consisted of the camp and associated tents and buildings, two small dump areas and a barrel stockpile and washing area. This area appeared in good condition and no anomalies were observed.

Access Road

The recently constructed road, used to access the Main Station area and NHWL from the airstrip (Beach Area), appeared to be in good condition (Photo 52, Appendix B). An additional trail/partial access road was also observed in good condition connecting the airstrip to the Main Station Area.

Surface Water Bodies

Four freshwater surface water bodies are present at the PIN-B site. The largest of these, located just northwest of the active airstrip, was used as the freshwater supply lake during the active years of the DEW Line site. Impacts to the freshwater surface water bodies were not observed at PIN-B.

6.0 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-B 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 a member of the PIN-B remediation workforce present on-site over a nine week period in 2010, some wildlife species that frequent the site include caribou, snow geese, Canada geese, grizzly bears, ground squirrels, and various birds, evidence of human activities at the site was present but limited, and much was historical. Due to the large distance between the site and the nearest communities, it is not believed to be frequently visited or used by people. Limited human use of the PIN-B site was supported by the Kugluktuk Hunters & Trappers Organization who responded that they and the local conservation office did not recall people from Kugluktuk using the site to hunt or fish recently.

During the site visit, the FRANZ field assessors observed evidence (e.g. scat, tracks, nesting areas, burrows or visual observation) that ravens, Canada geese, caribou, wolverine, black bears and ducks are present on the site. Large raptors, presumed to be eagles, were also observed overhead by the field assessors and the on-site AANDC Departmental Representative. As this was the first year of monitoring, there were no indications of changes to wildlife or human use of the site.

Re-establishment of Vegetation

Based on the regional setting of this site re-establishment of vegetation is not likely in the near future. No growth was observed on any of the re-graded areas during the 2011 monitoring activity.

7.0 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 12, 2011. Due to the nature of the investigation and the limited data available, the assessors cannot warrant against undiscovered environmental liabilities.

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

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

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

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

8.0 REFERENCES

Franz Environmental Inc., March 27, 2009. *Long Term Monitoring, 2009 FOX-C, Ekalugad Fjord, Nunavut.*

Indian and Northern Affairs Canada. April 15, 2011. *PIN-B (Clifton Point) Long-Term Monitoring Plan* (PIN-B LTMP, 2011).

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

Indian and Northern Affairs Canada, March 23, 2008. *FOX-C Ekalugad Fjord Long-Term Monitoring Plan.*

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

9.0 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.

Julie Dittburner, B.Sc., Dipl. Tech.
Field Assessor

Ryan Fletcher, C.Tech., EP
Field Assessor

Kevin McKenna, B.Sc.
Project Manager

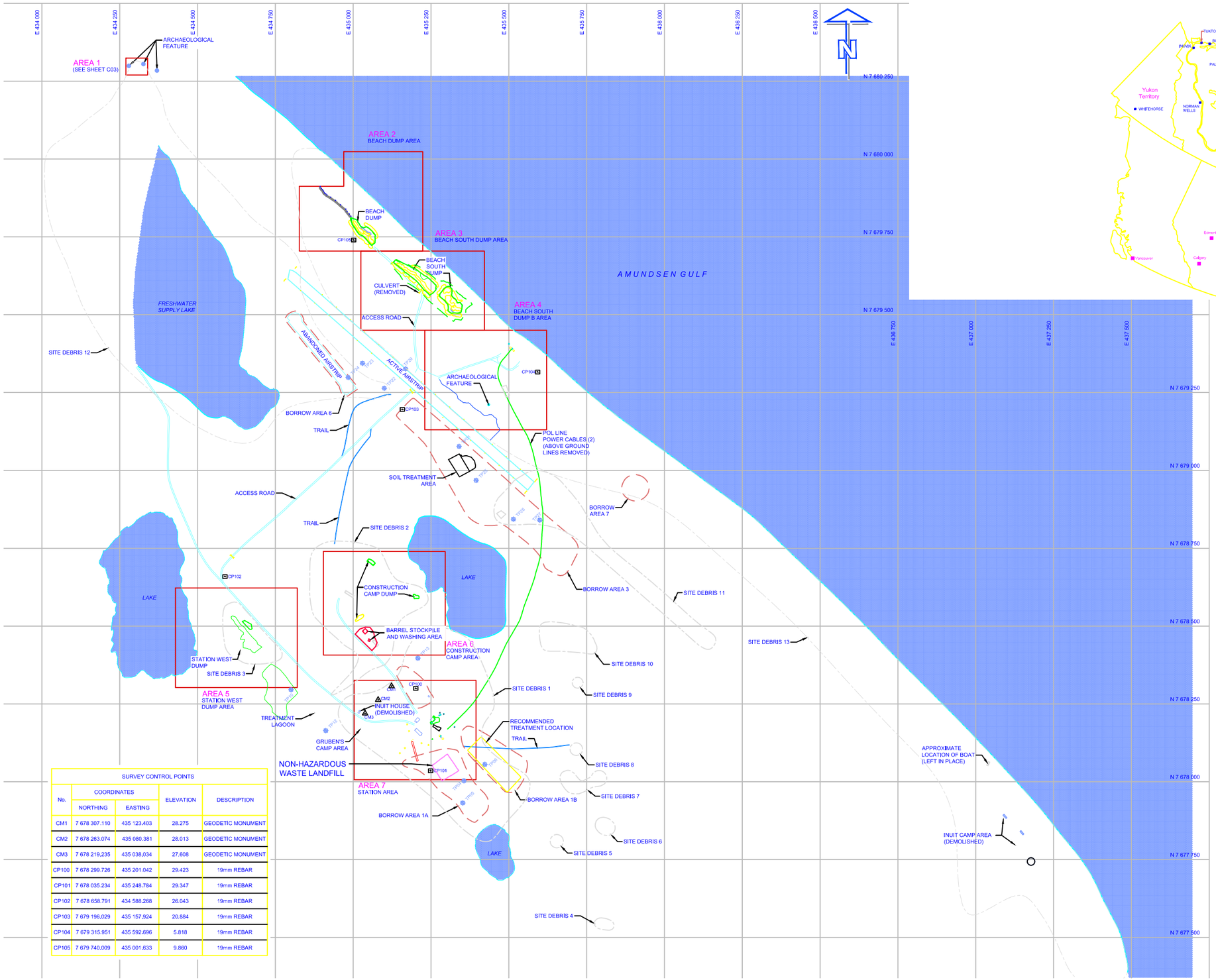
Steve Livingstone, M.Sc., P.Geo.
Principal/Senior Reviewer

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

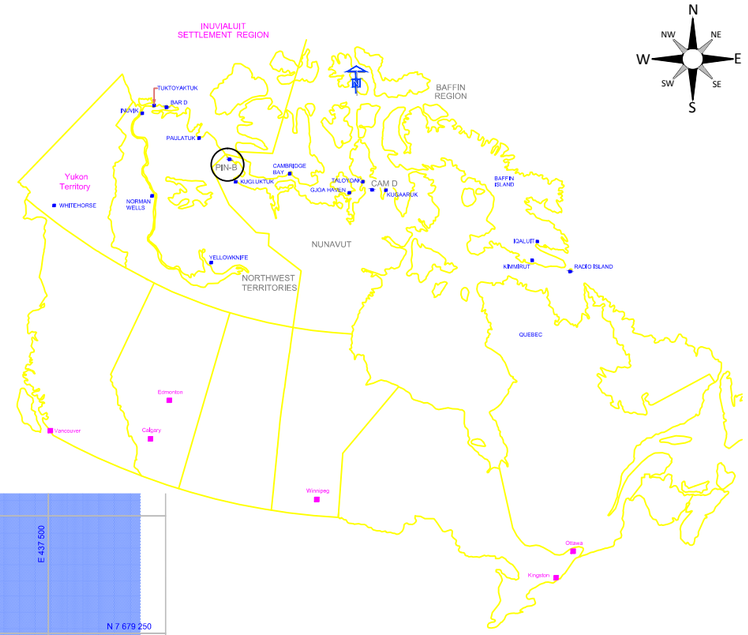
Z:\Projects\2011\1697-1101 INAC Nunavut DEW Line Sites\Reporting\PIN-B\Text\FINAL\PIN-B - Final report.doc

APPENDIX A

Figures



SURVEY CONTROL POINTS				
No.	COORDINATES		ELEVATION	DESCRIPTION
	NORTHING	EASTING		
CM1	7 678 307.110	435 123.403	28.275	GEODETIC MONUMENT
CM2	7 678 263.074	435 080.381	28.013	GEODETIC MONUMENT
CM3	7 678 219.235	435 038.034	27.608	GEODETIC MONUMENT
CP100	7 678 299.726	435 201.042	29.423	19mm REBAR
CP101	7 678 035.234	435 248.784	29.347	19mm REBAR
CP102	7 678 658.791	434 588.268	26.043	19mm REBAR
CP103	7 679 196.029	435 157.924	20.884	19mm REBAR
CP104	7 679 315.951	435 592.696	5.818	19mm REBAR
CP105	7 679 740.009	435 001.633	9.860	19mm REBAR



LEGEND:

- APPROXIMATE EXTENT OF BORROW AREA
- APPROXIMATE EXTENT OF SHORELINE
- ACCESS ROAD
- TRAIL
- EXTENT OF SITE DEBRIS AREAS
- CULVERT
- BODY OF WATER
- TP01 TESTPIT LOCATIONS
- CM1 SURVEY CONTROL MONUMENT
- CP100 SURVEY CONTROL POINTS

Reference:
Figure adopted from SENES Consultants drawing C02, dated February 2011

Title: Overall Site Plan

FRANZ ENVIRONMENTAL INC.
♦ CONSULTING ♦ ENGINEERING ♦TECHNOLOGIES ♦

Project: PIN-B Clifton Point 1697-1101

Date: January 2012

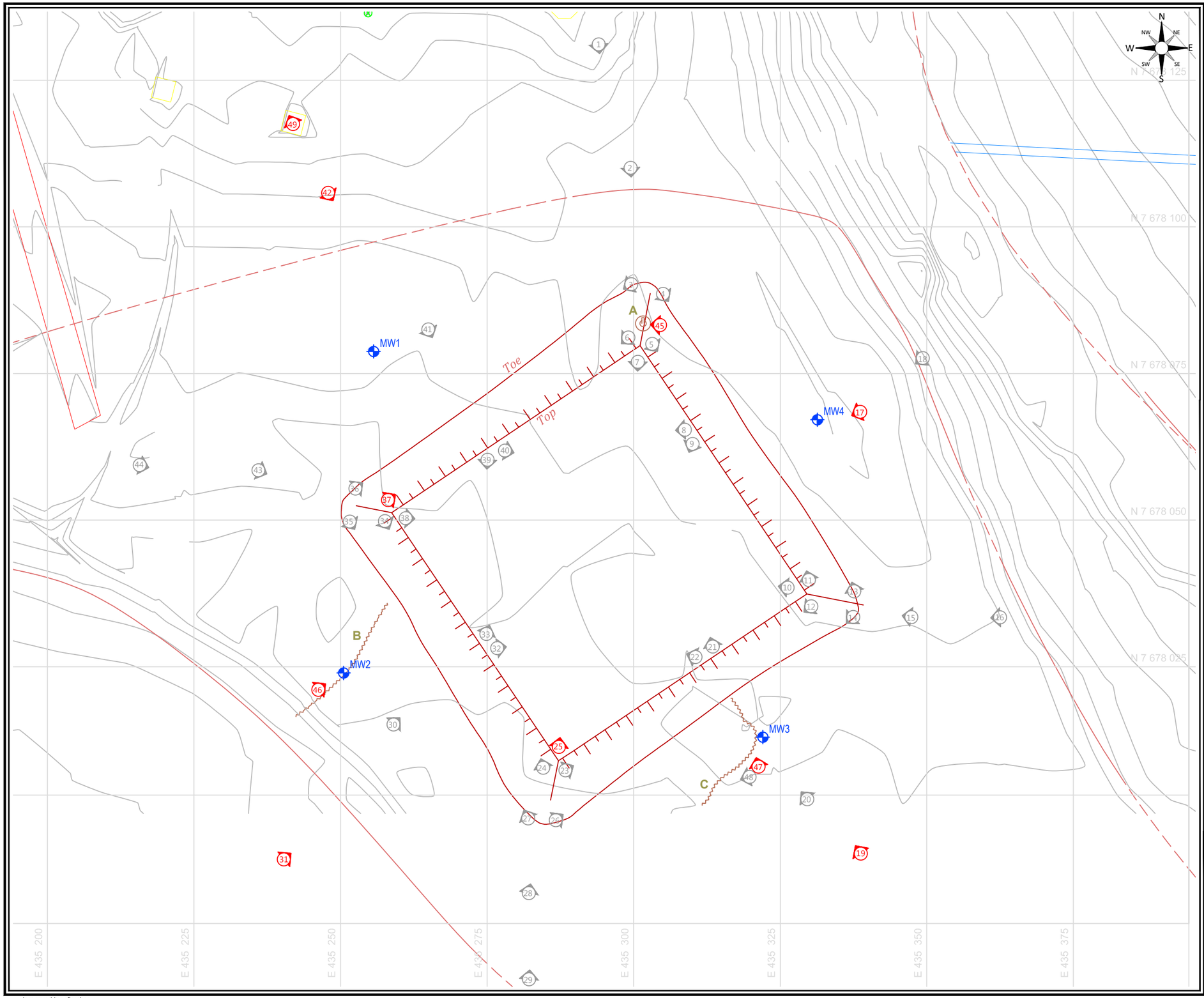
Client: Aboriginal Affairs and Northern Development Canada

1:12,500

Figure A-1

last saved by: rfletcher

Z:\Projects\2011\1697-1101 INAC Nunavut DEW Line Sites\Reporting\PIN-B\Figures\CAD\PIN-B-FIG-1.dwg (layout)



Legend

- MW — Monitoring Well Locations
- 25 — Picture Viewpoint Number
- 25 — Veiwpoint Photograph Included in Appendix B
- A — Erosion/Drainage
- Animal Burrow

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

Reference:
Figure adopted from SENES Consultants drawing C08, dated February 2011

Title: Non-hazardous Waste Landfill

FRANZ ENVIRONMENTAL INC.
CONSULTING ENGINEERING TECHNOLOGIES

Project: PIN-B Clifton Point 1697-1101

Date: January 2012

Client: Aboriginal Affairs and Northern Development Canada

1:650

Figure A-2

last saved by: rfletcher

Z:\Projects\2011\1697-1101 INAC Nunavut DEW Line Sites\Reporting\PIN-B\Figures\CAD\PIN-B-nov-23.dwg (layout)

APPENDIX B

Site Photographs

Northwest side of the NHWL. Monitoring Well 1 in foreground on right hand side. Viewpoint 42 (Figure A-2; Appendix A). Photograph reference 42 (CD-ROM). Direction photo taken: SE

Southwest side of the NHWL. Monitoring Well 2 in foreground on left hand side (arrow). Viewpoint 31 (Figure A-2; Appendix A). Photograph reference 31 (CD-ROM). Direction photo taken: NE

Southeast side of the NHWL. Monitoring Well 3 in foreground at red stakes. Viewpoint 19 (Figure A-2; Appendix A). Photograph reference 19 (CD-ROM). Direction photo taken: NW

Northeast side of the NHWL. Monitoring Well 4 in foreground. Viewpoint 17 (Figure A-2; Appendix A). Photograph reference 17 (CD-ROM). Direction photo taken: SW

View of grading on surface of NHWL. Viewpoint 25 (Figure A-2; Appendix A).
Photograph reference 25 (CD-ROM). Direction photo taken: N

View of grading of slope on northwest side of NHWL. Viewpoint 37 (Figure A-2; Appendix A).
Photograph reference 37 (CD-ROM). Direction photo taken: E

View of an animal burrow near the north corner of the NHWL. Viewpoint 45 (Figure A-2; Appendix A). Photograph reference 45 (CD-ROM). Direction photo taken: SW

View of natural drainage on the southwest side of NHWL. Viewpoint 46 (Figure A-2; Appendix A). Photograph reference 46 (CD-ROM). Direction photo taken: E

View of drainage pathway on the southeast side of NHWL. Viewpoint 47 (Figure A-2; Appendix A). Photograph reference 47 (CD-ROM). Direction photo taken: N

Concrete pad at Main Station Area. Photograph reference 49 (CD-ROM). Direction photo taken: N

View of erosion channel at Beach Area. Photograph reference 50 (CD-ROM). Direction photo taken: SW

Soil staining at Area 7, the Station area, note pen at center for scale. Photograph reference 51 (CD-ROM). Direction photo taken: N/A

View of raptor nest at Construction Camp area. Photograph reference 54 (CD-ROM). Direction photo taken: N/A

View of wolverine tracks at Construction Camp area. Photograph reference 55 (CD-ROM). Direction photo taken: N/A

View of Beach Area re-graded after remediation. Photograph reference 56 (CD-ROM). Direction photo taken: SE

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	29	29
2	2	30	30
3	3	**31**	**31**
4	4	32	32
5	5	33	33
6	6	34	34
7	7	35	35
8	8	36	36
9	9	**37**	**37**
10	10	38	38
11	11	39	39
12	12	40	40
13	13	41	41
14	14	**42**	**42**
15	15	43	43
16	16	44	44
17	**17**	**45**	**45**
18	18	**46**	**46**
19	**19**	**47**	**47**
20	20	48	48
21	21	**49**	**N/A**
22	22	**50**	**N/A**
23	23	**51**	**N/A**
24	24	52	N/A
25	**25**	53	N/A
26	26	**54**	**N/A**
27	27	**55**	**N/A**
28	28	**56**	**N/A**

APPENDIX C

Field Notes

PIN-B MW1

DRY

DTB = 1.76m

Monitoring Well Sampling Record

Site Name:	PIN-B		
Date of Sampling Event:	Aug 12th 2011	Time:	12:40 pm
Names of Samplers:	J. Dirkhuyner		
Landfill Name:	Non-hazardous Waste landfill		
Monitoring Well ID:	PIN-B MW1		
Sample Number:			
Condition of Well:	Good condition		
Measured Data			
Well pipe height above ground (cm)=	0.355m	Casing height =	0.64m
Diameter of well (cm)=	1.5 inches		
Depth of well installation (cm)= (from ground surface)			
Length screened section (cm)=	—		
Depth to top of screen (cm)= (from ground surface)	—		
Depth to water surface (cm)= (from top of pipe)	DRY	Measurement method: (meter, tape, etc)	WL meter
Static water level (cm)= (below ground surface)	—		
Measured well refusal depth (cm)= (i.e. depth to frozen ground)		Evidence of sludge or siltation:	NONE
Thickness of water column (cm)=			
Static volume of water in well (mL)=			
Free product thickness (mm)=	NONE	Measurement method: (meter, paste, etc)	
Purging: (Y/N)	—	Purging/Sampling Equipment:	
Volume Purged Water=			
Decontamination required: (Y/N)			
Number washes:	—		
Number rinses:	—		
Final pH=	—		
Final Conductivity (uS/cm)=	—		
Final Temperature (degC)=	—		

PIN-B MW2

DTW = 1.833m
DTB = 1.880 m

Monitoring Well Sampling Record

Site Name:	PIN-B		
Date of Sampling Event:	Aug 12, 2011	Time:	12:50
Names of Samplers:	J Dittbrenner		
Landfill Name:	Non-hazardous Waste Landfill		
Monitoring Well ID:	PIN-B MW2		
Sample Number:			
Condition of Well:	Good condition.		
Measured Data			
Well pipe height above ground (cm)=	0.450 m	Casing height = 0.515m.	
Diameter of well (cm)=	1.5 inches -		
Depth of well installation (cm)= (from ground surface)	1.880 m		
Length screened section (cm)=	—		
Depth to top of screen (cm)= (from ground surface)	—		
Depth to water surface (cm)= (from top of pipe)	1.833m	Measurement method: (meter, tape, etc)	WL tape
Static water level (cm)= (below ground surface)			
Measured well refusal depth (cm)= (i.e. depth to frozen ground)		Evidence of sludge or siltation:	NONE
Thickness of water column (cm)=	0.053 m		
Static volume of water in well (mL)=			
Free product thickness (mm)=	NONE	Measurement method: (meter, paste, etc)	Interface meter
Purging: (Y/N)		Purging/Sampling Equipment:	
Volume Purged Water=			
Decontamination required: (Y/N)			
Number washes:			
Number rinses:			
Final pH=			
Final Conductivity (uS/cm)=			
Final Temperature (degC)=			

- 1st purge - approx. 200mL purged - will leave & come back after.
- 2nd purge @ 1:50 ~ 10mL purged - almost dry.
- low recharge, not able to sample.

PIN-B
MW3

DTW = 1.385 m
DTB = 1.445 m

Monitoring Well Sampling Record

Site Name:	PIN-B		
Date of Sampling Event:	Aug 17 2011	Time:	1:10 pm
Names of Samplers:	S.D'Hauwer		
Landfill Name:	Non-hazardous waste landfill		
Monitoring Well ID:	PIN-B MW3		
Sample Number:			
Condition of Well:	Good Condition.		
Measured Data			
Well pipe height above ground (cm)=	0.205 m	Top of Casing = 0.605 m	
Diameter of well (cm)=	1.5 inches		
Depth of well installation (cm)= (from ground surface)	1.445 m		
Length screened section (cm)=	—		
Depth to top of screen (cm)= (from ground surface)	—		
Depth to water surface (cm)= (from top of pipe)	1.385 m	Measurement method: (meter, tape, etc)	Interface meter
Static water level (cm)= (below ground surface)			
Measured well refusal depth (cm)= (i.e. depth to frozen ground)		Evidence of sludge or siltation:	NONE
Thickness of water column (cm)=	0.06 m		
Static volume of water in well (mL)=			
Free product thickness (mm)=	NONE	Measurement method: (meter, paste, etc)	Interface meter
Purging: (Y/N)	Y	Purging/Sampling Equipment:	Peristaltic pump + tubing
Volume Purged Water=			
Decontamination required: (Y/N)			
Number washes:			
Number rinses:			
Final pH=			
Final Conductivity (uS/cm)=			
Final Temperature (degC)=			

1st purge = ~400mL purged 1st try - will let sit & come back.

2nd purge @ 2:00pm - total purged ~100mL until dry - low recharge.
- not able to sample.

PIN-B
MW 4

DTW = DRY
DTB = 1.868m

Monitoring Well Sampling Record

Site Name:	PIN-B		
Date of Sampling Event:	Aug 17th, 2011	Time:	1:37 pm
Names of Samplers:	J. Dittmuller		
Landfill Name:	Non-hazardous waste landfill		
Monitoring Well ID:	PIN-B MW4		
Sample Number:	—		
Condition of Well:	Good Condition.		
Measured Data			
Well pipe height above ground (cm)=	0.365m	Top of casing = 0.71m	
Diameter of well (cm)=	1.5 inches		
Depth of well installation (cm)= (from ground surface)	1.868m		
Length screened section (cm)=	—		
Depth to top of screen (cm)= (from ground surface)	—		
Depth to water surface (cm)= (from top of pipe)	DRY	Measurement method: (meter, tape, etc)	interface probe
Static water level (cm)= (below ground surface)	—		
Measured well refusal depth (cm)= (i.e. depth to frozen ground)	—	Evidence of sludge or siltation:	
Thickness of water column (cm)=	—		
Static volume of water in well (mL)=	—		
Free product thickness (mm)=	NONE DRY	Measurement method: (meter, paste, etc)	
Purging: (Y/N)	N	Purging/Sampling Equipment:	
Volume Purged Water=			
Decontamination required: (Y/N)			
Number washes:			
Number rinses:			
Final pH=			
Final Conductivity (uS/cm)=			
Final Temperature (degC)=			