APPENDIX 6:

PIN-E CAPE PEEL INTERMEDIATE
DISTANT EARLY WARNING (DEW)
LINE SITE REMEDIATION PROJECT

ENVIRONMENTAL SCREENING

Public Works and Government Services Canada

Environmental Assessment Screening Report: PIN-E, Cape Peel Intermediate DEW Line Site

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Project Number:

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Date:

March, 2010

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March 23, 2010

Matthew McElwaine, P.Eng.
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Dear Mr. McElwaine:

Project No: **60114107**

Regarding: **Environmental Assessment Screening Report: PIN-E, Cape Peel Intermediate DEW Line Site**

It is our pleasure to provide Public Works and Government Services Canada with the attached Environmental Assessment Screening FINAL report for the PIN-E, Cape Peel site.

Please contact the undersigned at 780-486-7057 if you have any questions.

Sincerely,
AECOM Canada Ltd.

Nick Oke, M.Sc., P.Chem.
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NO:blb
Encl.

Distribution List

# of Hard Copies	PDF Required	Association / Company Name
3	1	Public Works and Government Services Canada

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
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Executive Summary

PIN-E, Cape Peel is located on the south coast of Victoria Island in Nunavut (69º04'N,107º17'W) on the north shore of the Dease Strait. The nearest community and air charter base is located in Cambridge Bay, 80 km to the east and Yellowknife, where larger charter planes are available, is located approximately 800 km to the south.

The site is scheduled for remediation according to the Indian and Northern Affairs Canada Abandoned Military Site Remediation Protocol (2009). Activities will include: dump remediation; debris removal; contaminated soil remediation; and containerization and off-site removal of hazardous wastes.

Based on the requirements of the Nunavut Land Claim Agreement (NLCA) through the Nunavut Impact Review Board (NIRB) and the Canadian Environmental Assessment Agency (CEAA), the proposed remediation activities must undergo an environmental assessment. A screening of the proposed project is required because there is funding from the Treasury Board of Canada, INAC is a Federal proponent and Federal permits are required.

The remediation of the site will follow the 2010 Remedial Action Plan (RAP) prepared by AECOM. The following is a potential proposed schedule for the remediation of the PIN-E site according to the RAP:

- Source borrow material;
- Construct the landfarm;
- Begin construction of the Non-Hazardous Waste Landfill (NHWL);
- Start dump excavations when the (NHWL) is completed to the extent that some containment is in place (i.e. partial berm construction);
- Excavate Tier I and Type A hydrocarbon soil as soon as the NHWL is constructed;
- Excavate Type B hydrocarbon soil immediately upon landfarm construction;
- Complete barrel sampling at the time of site clean-up to confirm the 2009 findings, particularly for those barrels with contents not identified with a sample label from the 2009 program;
- Collect surface debris; and
- Excavation of Tier II soil can commence as soon as the contractor is on site as it is being containerized and shipped off-site.

The following objectives are to be achieved as part of the remediation of PIN-E:

- To restore the site to meet the environmental objectives established for northern sites;
- To prevent migration of contaminants into the Arctic ecosystem;
- To remove physical hazards for the protection of human health and safety; and
- To implement a cost effective remediation solution.

The remediation of the PIN-E site will have a net positive effect on the environment through the removal of physical hazards such as the debris, the removal and disposal of Tier I and Tier II impacted soils, the engineered landfilling of non-hazardous debris and Tier I impacted soils, the treatment of hydrocarbon impacted soils, and grading of the site to match the existing terrain. Through the implementation of the proposed mitigation and monitoring plans and project design, potential adverse effects of the proposed project will be minimized and no significant adverse residual effects are expected to occur.

Table of Contents

Statement of Qualifications and Limitations
Letter of Transmittal
Distribution List
Executive Summary

page

1. Introduction 1
1.1 Background Information 1
1.1.1 Location 1
1.1.2 History 1
1.2 Previous Reports 1
1.3 Site Description 1
1.3.1 Climate 1
1.3.2 Geology/Geomorphology/Hydrology 2
1.3.3 Vegetation 2
1.3.4 Wildlife 2
1.3.5 Fish 2
1.3.6 Heritage Resources 3

2. Project Rationale 4
2.1 Purpose of the Project 4
2.2 Evaluation of Alternatives to the Project 4

3. Regulatory Overview 5
3.1 Lead Authorizing Agencies 5
3.2 List of Approvals, Permits and Licenses Required 5
3.3 Conformance to Legislation and Policy 6
3.3.1 Federal Acts, Regulations and Guidelines 6
3.3.2 Nunavut and Northwest Territory Acts, Regulations and Guidelines 8

4. Public Concerns 10
4.1 Inclusion of Traditional Knowledge 10
4.2 Public Consultation 10

5. Environmental Assessment 11
5.1 Process 11
5.2 Scoping an Assessment 11
5.3 Identification of Valued Ecosystem Components 12
5.4 Identification of Project-Environment Interactions 12
5.5 Identification of Cumulative Environmental Impacts 13
5.6 Assessment of Project-Environment Interactions 13

6. Project Description 14
6.1 Schedule 14
6.2 Site Access and Transportation Methods 14
6.3 Construction Camp 14
6.4 Development of Borrow Areas 15

6.5 Proposed Construction 16
6.5.1 Non-Hazardous Waste Landfill 16
6.5.2 Landfarm 17
6.5.3 Barrel Disposal Requirements 18
6.5.4 Disposal of Site Debris and Demolition Debris 18
6.6 Contaminated Soil Disposal Requirements 19
6.7 Description of Existing Dumps and Remedial Requirements 20
6.8 Removal of Hazardous Material 21
6.9 Transportation of Hazardous Materials Off-Site 22
6.10 Grading and Addition of Granular Materials 22
6.11 Future Activities 22

7. Proposed Mitigation Measures and Monitoring Programs 23

7.1 Mitigation Plan Objectives 23
7.2 Environmental Inspection 23
7.3 General Operational Procedures for Protection of Valued Ecosystem Components 23
7.3.1 Site Operations 23
7.3.2 Storage and Handling of Fuel and Other Hazardous Substances 24
7.3.3 Surface Water Management 24
7.3.4 Wastewater Management and Monitoring 25
7.3.5 Sewage Effluent Monitoring 26
7.3.6 Domestic Waste Management 26
7.3.7 Road Construction and Maintenance 26
7.3.8 Stream Crossing and Diversion 27
7.3.9 Borrow Pit Development and Operation 27
7.3.10 Hazardous Waste Material Processing Area 27
7.3.11 Contaminated Soils 28
7.3.12 Dump Closure and New Landfill Development 28
7.3.13 Disposal of Site Debris 28
7.3.14 Demolition of Structures 28
7.3.15 Aircraft Movements 28
7.3.16 Handling of Dangerous Goods and Hazardous Waste Materials 28
7.3.17 Explosives 29
7.3.18 Work Site Clean-Up and Abandonment 29
7.4 Specific Protection Measures for Valued Ecosystem Components 29
7.4.1 Human Health and Safety 30
7.4.2 Local Economy and Contact with Local Residents 30
7.4.3 Aesthetic Value 30
7.4.4 Surface Water and Potential Fish Habitat 30
7.4.5 Permafrost Soils 31
7.4.6 Terrestrial Wildlife 31
7.4.7 Avifauna 32
7.4.8 Heritage Resources 32

8. Summary of Project Tasks, Anticipated Impacts, Mitigation Measures, and Significance 34

9. Knowledge Deficiencies 41

10. References 42

List of Tables

Table 1 Meteorology, Precipitation and Temperature profiles at Cambridge Bay, NU 2
Table 2 Other Authorizations 5
Table 3 Project and Scope of the Assessment 11
Table 4 Borrow Source Summary 16
Table 5 Summary of Contaminated Soil Remedial Criteria, Quantities and Disposal Requirements 19
Table 6 Summary of Recommended Dump Remedial Requirements 20
Table 7 Hazardous Waste Material Disposal Requirements 22
Table 8 Construction Wastewater Discharge Criteria 25
Table 9 Sewage Effluent Criteria 26
Table 10 Summary of Project Tasks, Impacts, Mitigation Measures, Residual Impacts and Significance 35

Appendices

Appendix A – Site Figures

1. Introduction

Public Works and Government Services Canada (PWGSC), on behalf of Indian and Northern Affairs Canada (INAC) requested that AECOM prepare an Environmental Assessment (EA) for the proposed remediation of the PIN-E, Cape Peel Intermediate DEW Line Site. The EA will be submitted to the Nunavut Water Board (NWB), the Nunavut Impact Review Board (NIRB) and the federal regulators in Nunavut.

1.1 Background Information

1.1.1 Location

PIN-E is located on the south coast of Victoria Island in Nunavut. The nearest community is Cambridge Bay, located 80 km east of the site. The site is situated on a raised beach, 55 m above sea level, on the north shore of Dease Strait, about 3 km from the coast.

1.1.2 History

PIN-E was reserved by the Department of National Defence (DND) in 1956 for use as a DEW Line Site and was constructed in 1959. The station was typical of all intermediate sites and consisted of a module train, a warehouse, a vehicle garage, an Inuit house, POL tanks and a Doppler antenna. In addition to the main site, a beach landing area was constructed along with gavel roads linking the various facilities. Access to the site is provided by an airstrip and the beach cargo area.

1.2 Previous Reports

A Phase II ESA was completed at PIN-E, Cape Peel, in 1994 by the Environmental Sciences Group (ESG 1995). This investigation was part of a large assessment program looking at multiple DEW Line sites. This study formed the basis for planning the 2009 Phase III ESA.

Two other reports were identified by PWGSC; however, they were not provided for review by AECOM as it was noted they had been substantially summarized in the ESG report. The two other reports were completed by Andzans and Associates (1984) and Environmental Protection, Western and Northern Region (1986).

1.3 Site Description

1.3.1 Climate

The climate at PIN-E includes long cold winters and short mild summers. Average monthly and annual weather data has been measured at a nearby station (Cambridge Bay, Nunavut, 69° 6.483’ N, 105° 8.300’ W, elevation 27.40 m, data from 1971 to 2000, Canadian Climate Normals, Environment Canada) and summarized in the following table.

Table 1 Meteorology, Precipitation and Temperature profiles at Cambridge Bay, NU

Month	Daily Maximum (°C)	Daily Minimum (°C)	Daily Mean (°C)	Extreme Maximum (°C)	Extreme Minimum (°C)	Rainfall (mm)	Snowfall (cm)	Snow at Month-end (cm)
January	-29.3	-36.3	-32.8	7.8	-52.8	0	5.6	22
February	-29.3	-36.6	-33.0	-9.4	-50.6	0	6.4	26
March	-25.7	-33.7	-29.7	-6.1	-48.3	0	7.4	30
April	-16.7	-26.0	-21.4	6.2	-42.8	0.1	7.5	32
May	-5.3	-13.0	-9.2	13.0	-35.0	1.6	9.3	22
June	5.6	-0.8	2.4	23.3	-17.8	9.8	2.8	0
July	12.3	4.6	8.4	28.9	-1.7	21.7	0	0
August	9.4	3.4	6.4	26.1	-8.9	24.5	2.2	0
September	1.9	-2.5	-0.3	15.6	-17.2	11.4	8.9	2
October	-8.1	-14.9	-11.5	6.9	-33.0	0.4	16.2	12
November	-19.3	-26.5	-23.0	0	-42.2	0	9.3	16
December	-26.1	-33.0	-29.6	-4.8	-49.4	0	6.3	20

1.3.2 Geology/Geomorphology/Hydrology

The site is characterized by hummocks, low rolling hills and raised beaches composed of coarse-grained gravel over bedrock.

1.3.3 Vegetation

Vegetation in the Amundsen Gulf Lowlands ecoregion is characterized by a nearly continuous cover of dwarf tundra vegetation, consisting of dwarf birch, willow, northern Labrador tea, *Dryas spp.*, and *Vaccinium* spp. As noted in the 1995 ESG report, the area surrounding the station is well vegetated with willows, sedges and mosses. A detailed list of all vegetation species present is provided in the 1995 ESG report.

1.3.4 Wildlife

Characteristic wildlife of the region includes muskox, caribou, arctic hare, arctic fox, snowy owl, raptors, polar bear, seal, seabirds, and waterfowl. Specific wildlife identified during the 2009 site investigation included herds of muskoxen, arctic fox, seals (at the east beach), ravens, tundra swans, and geese. Caribou droppings were also noted around the site.

1.3.5 Fish

Although a fisheries assessment of the site freshwater lake was not required as part of the scope of work, it is anticipated that based on the water quality assessment, the water chemistry was within the tolerance range for most species common in the area. However, the potential for fish presence in the lake is estimated to be low due the lack of lake connectivity to other water bodies. The following species have been identified in and around Victoria Island: Arctic char, lake trout, Least cisco, Arctic cisco, lake whitefish, fourhorn sculpin, and the ninespine stickleback.

1.3.6 Heritage Resources

An on-site archaeological impact assessment (AIA) of the site was completed by Golder Associates, under a separate contract, at the same time as the Phase III ESA by AECOM in 2009 to identify any artifacts or heritage resources that might be impacted by a remediation program. During the AIA, only those areas of previous or potential disturbance were assessed, including the station area, airstrip, beach, barrel dumps, landfills, existing roads, any other areas of disturbance and potential landfill and landfarm sites. During the assessment, two heritage sites were identified and recorded. In addition to the heritage sites, a land use site consisting of the remains of three Inuit houses and a grave, as well as two modern stone tent rings were observed.

The following is a summary of the two newly identified heritage sites:

NgNj 1: This is a stone feature site that is made up of a single stone cairn that was recorded on an intermediate ridge line. The cairn was recorded on the fourth beach ridge just below the location of the PIN-E DEW Line site. The cairn is made up of at least 14 flat stones with a diameter of 1 m. There was no additional cultural material observed around the stone feature. Although the area just north of the site has been previously disturbed by a bulldozer, the site area has not. The stones also exhibit a lichen patterning that would indicate prolonged exposure and therefore is thought to predate the DEW Line site. This site is considered to be of moderate potential.

NgNj 2: This site is an isolated find consisting of a single modified flake. The flake was surface collected on the second beach ridge approximately 250 m from the water. The flake is made of red quartzite and is relatively large with three flake scars on the dorsal side. The flake appears to be broken, missing the platform, and has been bifacially modified along both lateral edges and distal edge. The distal edge also appears to show signs of having been utilized. No additional cultural material was observed around the site area and four shovel tests were negative for cultural material. Due to the limited cultural assemblage, this site is thought to be of limited significance.

2. Project Rationale

2.1 Purpose of the Project

The purpose of the project is to be consistent with the Federal Contaminated Sites Management Working Group (FCSMWG) objectives with the ultimate goal of creating a positive environmental impact. The FCSMWP objectives are as follows:

- To restore sites to meet the environmental objectives established for northern sites;
- To prevent migration of contaminants into the Arctic ecosystem;
- To remove physical hazards for the protection of human health and safety; and
- To implement a cost effective remediation solution.

To accomplish these objectives, there will be four main areas of activity during the remediation of the PIN-E site. These activities include:

- Dump remediation;
- Hazardous Waste Remediation;
- Non-Hazardous Waste Remediation; and
- Contaminated Soil Remediation.

2.2 Evaluation of Alternatives to the Project

Due to the nature of the site and the location, the range of alternatives to the project is limited. Two alternatives to the remediation of PIN-E were identified, and include:

Commercial or other Government use of the facilities: This alternative involves the sale of those facilities to commercial interests. Two possibilities are present, namely on-site commercial development or sale of the capital assets themselves and movement off-site.

Do Nothing (no clean up action): The second alternative involved examining the environmental impact of maintaining the status quo at the sites. It was quickly realized that failure to address the environmental problems identified during the site investigations could lead to the following:

- Placing the Arctic environment/food chain at risk;
- Possible future legal liabilities for the federal government; and
- Greater clean up costs in the future.

3. Regulatory Overview

3.1 Lead Authorizing Agencies

The proponent for this project is the Department of Indian and Northern Affairs Canada. The management of this project is being provided by Public Works and Government Services Canada. These agencies will be responsible for obtaining permits, except in those cases where the clean up contractor is required to do so by legislation or as part of their contract.

3.2 List of Approvals, Permits and Licenses Required

The following is a list of permits required for the clean-up of the PIN-E site:

Land Use Permit: As per the Territorial Land Use Act and Territorial Land Use Regulations, a Class A permit issued by Indian and Northern Affairs Canada (INAC) is required for the activities associated with the remediation of PIN-E. Contact: INAC Land Administration, Iqaluit, NU (T) 867-975-4283.

Land Use Permit (Inuit-Owned Land): A Land Use Permit (LUP) from the Kitikmeot Inuit Association (KIA) is required to access portions of the PIN-D site located on Inuit Owned Land. The LUP application will include a application for a Certificate of Exemption regarding the fees associated with the Land Use Permit. Contact: KIA Lands Office, Kugluktuk, NU (T) 867-982-3310.

Quarry Permit: As per the Territorial Land Use Act and Territorial Quarrying Regulations, a Quarry Permit(s) issued by INAC is required for the extraction of granular material required for remediation. Contact: INAC Land Administration, Iqaluit, NU (T) 867-975-4283.

Water Use License: As per the Nunavut Land Claims Agreement Act, a water use license issued by the Nunavut Water Board, is required for camp operations and construction activities associated with the remediation of PIN-E. Contact: Nunavut Water Board, Gjoa Haven, NU (T) 867-360-6338.

In addition, the successful contractor may require a number of other permits or licenses. These permits or licenses pertain to the operation and maintenance of the contractors' camp or relate to his/her status as an employer. Examples of these permits include those related to the possession of firearms, day-to-day camp operation and federal/territorial labour codes. A list of these and other requirements is presented in Table 2.

Table 2 Other Authorizations

Authorization	Authority	Activity to Authorization Applies
Archaeological Research Permit	Department of Culture, Language, Elders and Youth, Gov't of Nunavut (Nunavut Land Claims Agreement Act)	Investigation of archaeological sites, mitigation, monitoring
Transportation Permits	Transport Canada (Transportation of Dangerous Goods Act)	Shipping
Transportation Permits	Transport Canada (International Air Transport Association Dangerous Goods Regulations)	Air transport
Fishing Licenses	Department of Fisheries and Oceans	Recreational fishing
Firearms Acquisition Certificates/ Firearms License (course required)	RCMP	Use and storage of firearms

3.3 Conformance to Legislation and Policy

The remediation of the site will comply with all applicable environmental laws, regulations and requirements of Federal, Territorial and other regional authorities, and any permits, approvals, and authorizations that may be required. The contractor is subject to and must comply with all permits and approvals obtained on behalf of and by INAC to conduct this work. Throughout all project phases, project personnel will work in close cooperation with regulatory authorities and compliance will be enforced.

3.3.1 Federal Acts, Regulations and Guidelines

Several Federal Acts, regulations and guidelines affect project activities across all Canadian jurisdictions. The most relevant to the remediation of PIN-E are outlined below:

The **Abandoned Military Site Remediation Protocol** (AMSRP 2009), developed by INAC, provides assessment and remedial guidelines for dumps, disposal of barrel contents, and clean-up criteria for contaminated soil. The protocol also stipulates confirmatory testing requirements during remediation, and post-remediation monitoring requirements for existing dumps and new landfills.

The **Canadian Environmental Protection Act** regulates toxic substances from their production or import, to consumption, storage and disposal. This Act also incorporates, amongst others, the Storage Tank Regulations (SOR/2008-197) and the PCB Regulations (SOR 2008-273).

The **Transportation of Dangerous Goods Act and Regulations** promotes public safety in the transportation of dangerous goods. The Act applies to all handling, offering for transport and transporting of dangerous goods by any means of transport whether or not the goods originate from or are destined for any place or places in Canada.

The **Fisheries Act** protects fish and fish habitat from pollution, harmful alteration, disturbance and destruction, and impediments to fish movement.

The **Arctic Waters Pollution Prevention Act and Regulations** govern development and shipping activity in Arctic waters adjacent to the mainland islands of the Canadian Arctic to ensure the continuing welfare of the residents of the areas, and to protect the ecological balance in water, ice and land areas.

The **Migratory Birds Convention Act** provides for the protection of designated migratory species, their habitats, and the regulated harvest of certain species.

The **Canada Wildlife Act** provides for the involvement of the Government of Canada in cooperative research and management programs involving wildlife species normally the responsibility of provinces or territories. This is particularly relevant to rare and endangered species or species such as the Peary caribou, which seasonally move across various regulatory boundaries.

The **Species at Risk Act** aims to protect wildlife from becoming extinct or lost from the wild, with the objective of helping the numbers recover. The act identifies all wildlife species listed as being at risk nationally and protects populations and their habitats.

The **Canada Shipping Act, 2001** regulates shipping activities under the jurisdiction of Canada. Regulations cover technical standards of operation safety and pollution aspects related to shipping activities in Canadian waters.

The **Navigable Waters Protection Act** pertains to the erection of structures or facilities used to support or impede navigation in waters under the jurisdiction of Canada.

The **Territorial Lands Act** provides the authority for administering and protecting lands under the direct control of the Minister of Indian and Northern Affairs Canada (INAC). The following regulations are pursuant to this Act:

- The **Territorial Lands Regulations** provide regulatory control for maintaining sound environmental practises for any land use activities on Territorial lands. These regulations require that land use permits be issued for such operations as work involving the use of heavy equipment, establishment of camps, use of explosives, and clearing of lines, trails and rights-of-way, including construction of access roads.
- The **Territorial Quarrying Regulations** establish the procedures for extracting Crown-owned limestone, granite, slate, marble, gypsum, loam, marl, gravel, sand, clay or stone from Territorial lands. The regulations specify permits, applications, staking and dimensions of quarries.

The **Nunavut Land Claim Agreement Act** provides for the use, management and conservation of land, water, and resources of Nunavut. It also identifies the need to complete an environmental impact assessment for specific projects.

The **Nunavut Waters and Surface Rights Tribunal Act** provides the Nunavut Water Board with the power to issue water use licenses. The NWB evaluates the potential for detrimental effects occurring because of the use of water or a deposit of waste in water on other users.

Canada Labour Code contains the labour code for all Federal employees or activities on Federal owned or controlled land. Private Provincial or Territorial employees are governed by the Provincial/Territorial Labour Acts, even when working on Federal lands or facilities. The Labour Acts control such things as statutory holidays, maximum work hours and minimum wages.

Atomic Energy Control Act and Regulations describe the packaging requirements and approvals needed for the transportation of radioactive materials.

National Fire Code (NFC) established the standard for fire prevention, fire fighting and life safety in buildings in use, including standards for the conduct of activities causing fire hazards, maintenance of sire safety equipment and egress facilities, standards for fire extinguishers, etc. In addition, the NFC established the standard for prevention, containment and fighting of fires originating outside buildings which may present a hazard to a nearby community, and sets the standards for the storage and handling of dangerous goods, flammable liquids and combustible liquids.

The following guidelines are identified as reference materials, and should be used where appropriate in the final design.

Freshwater Intake End-of-Pipe Fish Screen Guidelines (DFO) provide instructions for the protection of anadromous and resident fish where freshwater is extracted from fish-bearing waters.

National Guidelines for the Landfilling of Hazardous Waste (CCME) is to be used by regulators, designers, owners, and operators of hazardous waste facilities. They cover site selection, design, construction, closure and post-closure care, monitoring and operation. They are intended for new, not existing facilities.

Code of Good Practise for Used Oil Management in Canada (CCME) described environmentally sound options for the handling, storage, collection, transportation, recycling, reuse and disposal of used oils in Canada. It is intended to provide guidance for used oil generators and to regulatory authorities in the formulation of provincial or regional used oil management strategies.

Canadian Environmental Quality Criteria for Contaminated Sites (CCME) provide numerical limits for contaminants in soil and water intended to maintain, improve, or protect environmental quality and human health at contaminated sites. The criteria are intended to provide general technical and scientific guidance to provincial, federal, territorial and non-governmental agencies in the assessment and remediation of contaminated sites across Canada. They serve as benchmarks against which to assess the degree of contamination at a site.

Canadian Drinking Water Guidelines (Health Canada) provide criteria for water that are protective of human health and also meet aesthetic objectives.

The **Canada-Wide Standard for Mercury (CCME)** applies to incineration activities on site.

3.3.2 Nunavut and Northwest Territory Acts, Regulations and Guidelines

In addition to the Federal Acts and Regulations identified in Section 3.3.1, the remediation of the PIN-E site is governed by the following:

Guidelines for the Discharge of Domestic Wastewater in Nunavut, by the Nunavut Water Board, outlines the requirements for water quality effluent from facilities in Nunavut.

Environmental Guidelines for Industrial Waste Discharges establish standards that should be followed when discharging waste from an industrial operation on Commissioners Land or lands administered by municipal governments in Nunavut.

The **Explosives Use Act** provides controls for surface blasting other than for mining purposes.

The **Nunavut Wildlife Act** provides for the protection of wildlife and wildlife habitats as well as regulated harvest of selected species.

The **Nunavut Environmental Protection Act** provides for the protection of the environment from the discharge of contaminants, clean up of contaminants and unsightly premises. In addition, the powers of inspectors as well as offences and penalties are defined. The Act applies only to situations not authorized by other Canadian Acts in the Nunavut Territory. The following guidelines under the Nunavut Environmental Protection Act may be applicable to the clean up of the Cape Peel site:

- Contingency Planning and Spill Reporting;
- Disposal Guidelines for Fluorescent Light Tubes;
- Guideline: Dust Suppression;
- Guidelines for the Management of Waste Asbestos;
- Guideline for the Management of Waste Antifreeze;
- Guideline for the Management of Waste Paint;
- Guideline for the Management of Waste Solvents; and
- Guidelines for the General Management of Hazardous Waste in Nunavut.

The **Nunavut Environmental Rights Act** provides the people of Nunavut the right to access information concerning the release or potential release of contaminants into the environment, and also the right to prevent the release or potential release of contaminants into the environment.

The **Spill Contingency Planning and Reporting Regulations** outline requirements for filing a contingency plan and for reporting spills.

The **Nunavut Fire Prevention Act and Regulations** provides for the regulation of the decommissioning of fuel lines and fuel tanks.

The **Pesticides Act and Regulations** specifies the requirements for use storage, handling and disposal of pesticides.

The **Nunavut Territorial Archaeological Sites Regulations**, pursuant to the Nunavut Act, protects archaeological sites in Nunavut from disturbance and prohibits the removal of archaeological specimens, except under permit.

The **Safety Act: Occupational Health Regulations** outline the health and safety standards to be maintained at workplaces to ensure the health and safety of persons.

Guidelines for the Removal of Materials Containing Friable Asbestos outlines the procedures for the removal of friable asbestos.

4. Public Concerns

4.1 Inclusion of Traditional Knowledge

While in Cambridge Bay, a number of attempts were made through the team's Bear Monitors, Operator and through Kitnuna to contact Elders familiar with the sites; however, many of the Elders were out on the land while the team was in Cambridge Bay. On August 15, 2009, a meeting was arranged at the Kitnuna office to meet with four Elders who were familiar with the area. The Elders were Mr. Tommy Kiloudluk, Mrs. Mary Kiloudluk, Mr. Sammy Anghiatok, and Mr. Allen Kitigon. Attempts were made to contact another two Elders, Mr. Ambrose Akhavigak and Mr. Matthew Nakashook; however, they were unavailable during the time the team was on-site. Mr. Kitigon indicated that some people have camps in and around PIN-E and that they fish and hunt for caribou, seal, muskox and fox. They also mentioned that the area is used for polar bear hunting, although polar bears are typically hunted in areas in the north of Victoria Island. The Elders expressed that they are pleased with the effort being made to clean-up the sites.

4.2 Public Consultation

A public consultation was held in the community of Cambridge Bay on January 26, 2010. The consultation included a presentation by the INAC representative regarding the work conducted as part of the site investigation, and a presentation on the results of the archaeological survey of the site. After the presentations, a question and answer period was completed and recorded. Some concern was expressed regarding leaving some of the lightly contaminated soils in place because the site is used for camping and hunting; however, overall, there were no significant concerns with the proposed clean-up plans.

5. Environmental Assessment

5.1 Process

The Nunavut Land Claim Agreement (NLCA) provides title to the Nunavut Inuit to 350,000 km^2 of land in the eastern Arctic. The agreement established clear rules of ownership and control over land and resources. Article 12 of the NLCA establishes the processes for the screening and review of project proposals on land and marine areas within the Nunavut Settlement Area and the Outer Land Fact Ice Zone. Environmental assessment in Nunavut involves the following two processes:

- The Nunavut Planning Commission (NPC), established under Chapter 11 of the NLCA, is responsible for reviewing project proposals to ensure that the project complies with any applicable approved land use plans. A regional land use plan is in place for the PIN-D site. Where a project proposal conforms to a land use plan, the NPC forwards the project proposal application to NIRB for screening.
- NIRB is responsible for implementing Article 12 of the NLCA, which deals with Development Impacts. This includes conducting environmental and socio-economic impact assessments, using Inuit Qaujimajatuqanit (IQ) and recognized scientific methods to gauge and mitigate potential impacts of project proposals on the Nunavut Settlement Area. The Nunavut Settlement area includes Inuit Owned Lands (IOL), Commissioner's Lands and Crown Lands.

Within Nunavut, INAC regulates land use on Crown Lands, whereas Nunavut Tunngavik Incorporated (NTI) and the regional Inuit Associations regulate subsurface and surface land use on IOL. The Government of Nunavut regulates Commissioner's Lands. The majority of the site activities and locations associated with the remediation of the PIN-E site are located on federal crown land; however, there are several locations, including debris areas, several dumps, the access road to the water supply lake, part of the Airstrip and portions of potential borrow areas that are located on IOL.

5.2 Scoping an Assessment

The initial step in completing an assessment of a project is to conduct a series of social and ecological scoping exercises designed to determine the temporal and spatial boundaries of the assessment and focus the analysis on the environmental issues directly related to the remediation project itself (i.e., identification of valued ecosystem components). In scoping the assessment, remediation activities to be evaluated were identified, including potential additional ancillary activities.

The assessment scope for PIN-E included a determination of the environmental effects to be assessed and the effects that are to be considered in making decisions regarding the project. The following table provides an outline of the project and scope of the assessment.

Table 3 Project and Scope of the Assessment

Project	PIN-E Site Clean Up
Scope of principal project	Physical remediation of the PIN-E site, including: removal of waste materials (including hazardous), contaminated soil removal, debris disposal, construction of landfills and landfarms, and demolition of remaining structures and facilities.
Accessory physical works	Mobilization and demobilization of equipment and personnel, and temporary construction camp set up.
Other undertakings	None.

The scope of the environmental assessment should consider the effects of all project related activities (i.e., those related to the remediation of the site) and associated physical works on both biophysical and socio-economic factors.

The following factors were identified for assessment:

- Evaluation of effects of the project, including those relating to cumulative effects that are likely to result from carrying out this project;
- Project undertakings performed in conjunction with other off-site projects/activities that have been or will be carried out;
- The relative levels of significance;
- Public comments; and
- Mitigation measures deemed to be technically and economically feasible to avoid and mitigate adverse impacts.

As part of an assessment, potential interactions between the project components and the environment need to be identified. Therefore, the focus of the assessment is on the location, sensitivity, seasonal presence and abundance of these components. Through this assessment, Valued Ecosystem Components (VECs) are identified, which include physical, biological, socio-economic, historical or cultural components.

5.3 Identification of Valued Ecosystem Components

Valued Ecosystem Components (VECs) are defined as any part of the environment that is considered important by the proponent, public, scientists, and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern. Potential environmental concerns associated with the project were identified through consultations with interested parties, community meetings and previous project experience. The following VECs were identified:

Physical: soil quality; water quality; air quality; terrain quality; terrestrial habitat; aquatic habitat.

Biological: terrestrial animals; aquatic animals; fish; avifauna.

Social: health and safety; land use; employment; archaeological/heritage resources; aesthetics.

5.4 Identification of Project-Environment Interactions

The environmental assessment considers project activities that could result in adverse environmental effects with consideration given to the likelihood of occurring, while taking into account appropriate mitigation measures. In determining whether there are adverse environmental effects, the following factors are considered:

- Loss of rare or endangered species;
- Reduction in biological diversity;
- Loss of critical/productive habitat;
- Fragmentation or interruption of movement corridors and migration routes;
- Transformation of natural landscapes;
- Discharge or presence of persistent and/or toxic chemicals;
- Toxicity effects on human health; and
- Effects on cultural issues.

5.5 Identification of Cumulative Environmental Impacts

Cumulative effects are defined as changes to the biophysical, social, cultural or economic environments caused by a project component in combination with any on-going, past, or future activities. Cumulative effects can occur as interactions between project components (either from the same or more than one site) and/or between environmental components. Effects can occur in one of four ways:

- Physical or chemical transport mechanisms.
- Nibbling loss (i.e., gradual disturbance).
- Spatial or temporal crowding.
- Growth induction initiated by the project.

Four steps in the analysis of the cumulative environmental effects of this project include scoping, analysis of effects, mitigation measures and significance. **Scoping** includes the spatial identification of issues of potential concern, VECs that could be affected and boundary setting. The spatial boundaries include impacts over a larger (regional) area. As some existing dumps and the Non-Hazardous Waste Landfill will remain on site, temporal boundaries extend beyond the time frame required to complete the clean-up work. The **analysis of effects** includes an evaluation of baseline data and possible effects on VECs. The combined interactions between the clean-up activities and future land use and those VECs which are similar are identified. **Mitigation measures** are identified for project-environment interactions. Finally, the **significance** of the interactions are defined as having a positive (P), negative and non-mitigable (N), negative and mitigable (M), or unknown (U) impact. The next step is to determine the likelihood of significant adverse effects, taking into account appropriate mitigation measures.

5.6 Assessment of Project-Environment Interactions

The next task following a scoping exercise is to determine the possible environmental effects of the project. This assessment involves providing a detailed overview of the project, a description of the existing environment (including inventories and ecological processes) and the identification of project-environment interactions.

The aim of describing the project was to clearly outline the constituent compounds and activities that will occur at the PIN-E site. Activities include mobilization, project layout and design, planning and scheduling, specifics related to each of the site activities (i.e., how would contaminated soil be identified, excavated, transported and disposed), operating procedures and demobilization plans.

During the scientific studies conducted at the site, the relevant information concerning the existing environmental components of the study areas was collected. This information included a description of the physical, biological and social characteristics of the study area, which is provided in Section 1.3 of this report.

Using the information that was obtained on the project and the existing environmental setting, the assessment study determined interactive links between these two components. Particular concern focused on the location, sensitivity, seasonal presence and the abundance of these components. Also included in the assessment of the environmental effects were possible impacts relating to socio-economic factors (heritage, culture, archaeological, employment, and business opportunities), and human health. During the assessment stage, conclusions are made as to the type of impact and its level of significance based on scientific judgement and comments received during the public consultation process.

6. Project Description

6.1 Schedule

Based on the information provided in the Remedial Action Plan prepared by AECOM, it is anticipated that that construction activities could be completed within one clean up season, excluding mobilization. In order to achieve this, it is expected based on the assumption of barge access that the contractor would mobilize to the site in the fall of the previous year.

In order to complete the clean-up of the PIN-E site in one construction season, the anticipated schedule of activities would be as follows:

- Source borrow material;
- Construct the Landfarm;
- Construct the Non-Hazardous Waste Landfill;
- Collect surface debris;
- Excavate dumps and contaminated soil; and
- Excavate Tier II soil. Note: this can be completed at any time during the season as it is being containerized and shipped off-site.

6.2 Site Access and Transportation Methods

Off-site activities in support of this project will be in the form of transportation associated with the movement of materials, equipment and personnel to the site. These activities are described as follows:

Air – transport of personnel to and from the site, and weekly domestic supplies (i.e., food) will be completed using charter aircraft. It is anticipated that the airstrip would remain intact once the clean-up work is completed, with the exception of any culverts or other structures that may have been part of the former DEW Line maintenance program or those that may have been required during the remediation program that will be removed.

Ground – existing roads will be used at PIN-E while on-site. The gravel roads are well elevated and in good condition with the exception of localized areas on the main access road from the Station to the beach where minor erosion channels perpendicular to the road were noted. It is anticipated that the existing roadways would remain intact once the clean-up work is completed, with the exception of any culverts or other structures that may have been part of the former DEW Line maintenance program or those that may have been required during the remediation program, which will be removed.

Barge – the transport of the contractors' equipment and facilities will likely be by barge in the summer. In addition, removal of off-site waste will be carried out by barge.

6.3 Construction Camp

The preferred location for the camp/laydown area is around the location of the pull-put section in Road Section 1, shown on Figure 1. If necessary, the area could be expanded to the north. This area is located near the station area with easy access to the airstrip.

The ultimate location of the camp and associated sewage, grey water, and waste disposal will need to consider the requirements of the Water Use License and Land Use Permit. Typically, the permits require

that all waste disposal locations, including sewage treatment systems and greywater discharge areas, and fuel storage areas be located a minimum of 31 m from the high water mark of any water body or drainage course. In addition, all effluent and wastewater must meet water quality requirements prior to discharge. Sewage lagoons are the typically utilized method for sewage disposal at such sites, and as such, it is expected that a sewage lagoon may be used during camp operation at the PIN-E, Cape Peel site. Of additional consideration for this site, for aesthetic considerations of camp occupants, is that prevailing wind direction is generally consistent with the alignment of the airstrip.

In terms of waste disposal, licenses typically require that camp solid wastes be incinerated on-site, in an approved incinerator facility, and that non-hazardous, non-combustible waste and the ash generated from incineration be disposed of in the on-site Non-Hazardous Waste Facility. Therefore, all non-hazardous wastes will be disposed of on-site and only hazardous wastes and Tier II soil will be shipped off-site.

The only source of water for camp operations, including provision of drinking water, would be Freshwater Lake. Water samples were collected at two locations from the lake during the 2009 Phase III ESA. No significant differences in analytical concentrations were observed between the two samples, and results indicated that the water met drinking water criteria. However, due to the seasonal nature of coliform concentrations in surface water bodies, no coliform samples were collected. If this water body is to be used during construction as the drinking water source, coliform testing will be required on a regular basis throughout the construction season. Analysis and confirmation of all drinking water parameters is recommended to be completed on, at minimum, a monthly basis.

6.4 Development of Borrow Areas

To confirm that sufficient sources of the various granular material types were identified during the Phase III ESA, an estimate of the required granular material volumes was completed for the recommended remedial options discussed above.

Eleven borrow areas were identified and investigated at the PIN-E site in 2009 as part of the geotechnical field investigation. Approximately 481,000 cubic metres of granular material has been sourced for the clean-up. Granular material is required for closure of landfills, upgrading the access roads during construction, backfilling contaminated soil areas and general site grading purposes. Additional granular fill is required for the development of the new Non-Hazardous Waste Landfill and Landfarm. The definition of the types of granular materials is described below while the summary of available borrow material is provided in Table 5.

Type 1: Typically consists of coarse gravel or cobble size material used for erosion protection on finished slopes or within drainage courses.

Type 2: Well graded sand and gravel used for construction of berms and cover. Type 2A consists of very coarse sand and gravel materials.

Type 3: Consists of select material with a maximum particle size of 200 mm and is generally used for general site grading and backfilling excavations.

Type 4: A non-saline, well graded sand and silt with some gravel used for the construction of landfill containment berms and backfill of the key trench excavation for the Tier II Disposal Facility. There is no requirement for this soil type since neither a Tier II Facility or a leachate containment system is being constructed.

Type 5: Consists of rounded particles with a maximum size of 5mm, used for geomembranes bedding. Type 5 material was not encountered on site and if required, would likely be obtained from screening of Type 2 granular fill.

Type 6: Generally consists of gravel or sand in an unfrozen state and free of deleterious material, with a typical maximum particle size of less than 150 mm, with less than 8% of the material, by weight, passing 0.08 mm sieve. Type 6 is used as for intermediate cover within landfills.

Table 4 Borrow Source Summary

Borrow Area	Type	Volume (m^3)	Comments
1	Type 2,3,6	47,000	Undisturbed Area
2	Type 4,3	31,000	Undisturbed Area
3	Type 4,3	13,000	Undisturbed Area
4	Type 4,3	50,000	Undisturbed Area
5	Type 2, 2A, 3	280,000	Undisturbed Area
6	Type 2A,4,3	30,000	Undisturbed Area
7	Type 2A,2, 3, 6	57,000	Undisturbed Area
8	Type 2,3,6	35,000	Undisturbed Area
9	Type 2,3	42,000	Undisturbed Area
10	Type 2,3	40,000	Partly Disturbed Area
11	Type 4,3	60,000	Undisturbed Area

6.5 Proposed Construction

6.5.1 Non-Hazardous Waste Landfill

The NHW Landfill is designed on the premise that it will contain non-hazardous materials only and will not generate leachate. Therefore, it is not necessary to eliminate all moisture migration into and out of the landfill by the use of geosynthetic liners. The NHW Landfill is also not designed to maintain the contents in a perennially frozen state.

The following materials shall be disposed of in the NHW Landfill:

- Tier I and Type A hydrocarbon contaminated soil;
- Non-hazardous demolition debris;
- Non-hazardous site debris;
- Non-hazardous debris and Tier I soils excavated from landfills;
- Creosote treated timbers wrapped in polyethylene sheeting; and
- Double-bagged asbestos.

The NHW Landfill typically consists of a perimeter containment berm and granular cover to minimize erosion and infiltration in order to provide long-term stability. The NHW Landfill shall be established on native ground, stripped of any organic matter, which shall be stockpiled and used in the closure of the landfill. No base cover or liner is required for this landfill. Development and closure of the NHW Landfill includes the following work:

- Construction of perimeter berms from well graded sand and gravel;
- Placement of Tier I contaminated soil, Type A hydrocarbon-impacted soil and non-hazardous demolition waste and site debris in the landfill with a maximum thickness of 3 m;
- Compaction of landfill debris;
- Placement and compaction of intermediate granular cover in the landfill;
- Placement and compaction of final granular cover with a minimum thickness of 1.0 m over the landfill;
- Grading to promote drainage away from the landfill;
- Supply and installation of groundwater monitoring wells in and around the landfill as indicated on the drawings; and
- Survey of the location of asbestos and creosote-treated timbers.

For the proposed location of the NHW Landfill, please refer to the Figures in Appendix A.

6.5.2 Landfarm

A landfarm is to be constructed for the treatment of hydrocarbon impacted soils. Most of the soil is from the Beach POL, with some soil also being excavated from the Station POL Storage Area.

The landfarm shall be located at least 100 metres away from any water body, and in an area free of ponded water. The landfarm has been sited to provide for the convenient access of equipment and shall be at least 300 metres from the construction camp, offices and laboratory. Development, operation and closure of the landfarm involves the following tasks:

- Ground preparation, such as removal of boulders and placement of granular bedding material, to facilitate treatment options, as required;
- Construction and maintenance of roadways required to support treatment operations;
- Construction of exterior berms, drainage ditches/containment areas to collect potential runoff;
- Placement of Type B contaminated soil in the landfarm;
- Specific activities for landfarming operations, including nutrient application, tilling and moisture conditioning;
- Final grading to promote drainage away from the site and to match the surrounding terrain; and
- Closure and removal of all equipment and materials following confirmation that treatment has remediated the contaminated soil.

During the landfarm operation, granular nutrients shall be distributed evenly over the surface of the contaminated soil, at rates that will provide the minimum nitrogen loading. Moisture conditioning of the landfarm shall be conducted as required by application of water spray to maintain optimum water content within the soil.

At the conclusion of the final treatment season, the following tasks shall be completed to close the landfarm:

- Confirmatory testing of the soils to ensure the remediation objectives have been met;
- All granular fill shall be compacted to 95% Maximum Dry Density; and
- Grade the surface of the area, as required, to promote surface water runoff.

For the location of the landfarm facility, please refer to the Figures in Appendix A.

6.5.3 Barrel Disposal Requirements

There were 233 barrels identified at PIN-E during the 2009 assessment. Most of the barrels were concentrated within Barrel Storage Areas A and D, the former station area and along the POL Line, which were used as markers. Almost all of the barrels identified at PIN-E were empty, including those located at the Barrel Storage Areas. Three full barrels of Avgas were located on the north side of the runway adjacent to the access road to the station, and one full barrel was noted between the former Inuit Pad and the station. No barrel samples were collected, as the barrels were either empty; full and marked with the contents; or they were unable to be opened.

According to the AMSRP for barrels, empty barrels shall be crushed and disposed of in an on-site engineered landfill, i.e., the Non-Hazardous Waste Landfill. Any barrels with contents shall be inspected and tested, if necessary, and disposed of appropriately (off-site or incinerated). Once the barrel is empty, is shall be rinsed, crushed and disposed of on-site in the NHW Landfill. The spent rinse liquid shall be tested and disposed of appropriately. Absorbent materials used as part of the cleaning process shall be incinerated if the incineration criteria are met, or disposed of as hazardous material, as required.

6.5.4 Disposal of Site Debris and Demolition Debris

At PIN-E, there are essentially two large scattered debris areas, one of which encompasses the station pad and surrounding area and one which encompasses the area from the east beach shoreline to the location of the former Inuit huts. At the other isolated debris areas, the GPS waypoints were downloaded onto the site plan drawing to generate debris area perimeters. In addition to the identified surface debris areas, all debris within 50 m of existing pads and roadways shall be picked up. Collection of surface debris can proceed upon completion of a suitable starter berm for the NHWL construction.

Hazardous building materials and related components, including asbestos containing materials (ACMs) and PCB wastes will be removed prior to demolition of the structures. ACMs generally include mechanical insulation on pipes and chimneys, transite board, and fire asbestos core doors. ACMs that are painted are to be treated as PCB wastes and containerized separately for off-site disposal. Non-painted ACMs will be double bagged and disposed of in an on-site landfill.

Other hazardous materials, including batteries and potential glycol containing liquids within the building heating systems will be containerized for off-site disposal or recycling in accordance with TDGA requirements. While no PCB-containing equipment or mercury switches were noted during the 2009 investigation, if these materials are identified during clean-up, they will also require containerizing for off-site disposal.

The majority of painted components in the powerhouse module are considered PCB wastes and are regulated under the Canadian Environmental Protection Act (CEPA). Loose and flaking paint is to be removed from all painted surfaces and collected for off-site disposal as PCB waste. Consistent with CEPA and INAC's AMSRP, PCB amended painted material will be containerized in accordance with the TDGA and Regulations, and removed from site. These materials will be transported to a licensed facility for PCB destruction and disposal. The top 25 mm of the garage slab will be removed and packaged as hazardous material for off-site disposal.

Non-hazardous wastes from demolition include unpainted wood and metal construction materials and concrete in foundations following surface paint removal. Painted structural materials with PCB paint concentrations less than 50 mg/kg can be disposed of in an on-site landfill following removal of any loose

or flaking paint. If cutting torches will be used to dismantle structural steel components, paint must be removed from the surface in the locations to be cut.

6.6 Contaminated Soil Disposal Requirements

Table 6 below provides a summary of contaminated soil remedial criteria and volumes identified during the Phase III ESA. Volumes estimated to arise from dump excavations have also been noted, as these volumes have also been considered for evaluation of contaminated soil disposal options below. The total volumes noted below combine the volumes from these two sources, with the volume derived from dump excavation estimates noted in parentheses below.

Table 5 Summary of Contaminated Soil Remedial Criteria, Quantities and Disposal Requirements

Contaminant Designation	Description	Soil Volume (m3)
Tier I Contaminated Soil	Soils containing concentrations of any or all contaminants listed as follows: Lead ..... 200 to 499 ppm PCBs ..... 1 to <5 ppm	86 (78 from dump excavations)
Tier II Contaminated Soil	Soils containing concentrations equal to or greater than any or all contaminants listed as follows: Arsenic..... 30 ppm Cadmium ..... 5 ppm Chromium ..... 250 ppm Cobalt ..... 50 ppm Copper..... 100 ppm Lead ..... 500 ppm Mercury..... 2 ppm Nickel..... 100 ppm Zinc..... 500 ppm PCBs ..... >5 ppm;<50 ppm	92 (84 from dump excavations)
Type A Hydrocarbons	Soils contaminated with hydrocarbons consisting primarily of oil and grease at concentrations equal to or greater than: TPH ..... 20,000 ppm	-
Type B Hydrocarbons	Soils contaminated with hydrocarbons consisting primarily of fuel oil, and/or diesel, and/or gasoline, with concentrations equal to or greater than the following concentrations (applies to all depths): Beach POL Area (within 30 m of water body): F1-F2 fraction..... 330 ppm Station Area: Impacts 0-0.5 m ..... 2500 ppm Impacts > 0.5 m ..... 5000 ppm	1955 (1460 within 30 m of water body)

The specified remedial requirements under the INAC AMSRP are as follows:

- ***Tier I soil:*** excavate and place in an on-site engineered landfill or cap in place under 0.3 m of clean fill in a stable condition;
- ***Tier II soil:*** excavate and dispose of in an on-site Tier II Facility, or containerize for off-site disposal;
- ***Type A hydrocarbons:*** excavate and place in an on-site engineered landfill or scarify surficial stains that meet PHC criteria; and
- ***Type B hydrocarbons:*** in-situ or ex-situ treatment to reduce environmental risk to meet guidelines. Note that disposal in the Tier II Facility is only considered appropriate if concentrations are sufficiently low that there are no concerns for inhibiting freezing of contents and/or with free-product development, which could compromise the liner integrity at the facility.

6.7 Description of Existing Dumps and Remedial Requirements

Table 7 summarizes the anticipated remedial requirements for dumps at PIN-E. Where the remediation option is excavation, waste segregation during excavation is required to separate hazardous and non-hazardous waste. Non-hazardous waste can be disposed of in the Non-Hazardous Waste Landfill on-site. Hazardous waste will require off-site disposal and must be segregated based on PCB-containing waste (for disposal at a licensed PCB disposal facility), or other hazardous waste, which can be disposed of in a licensed Hazardous Waste Landfill. Tier II impacted soils shall be excavated, packaged and shipped off-site for disposal. Soil shall be separated from debris during excavation, and stockpiled in such a manner to allow sampling and classification according to the contaminant criteria outlined under the INAC AMSRP. Soil that does not exceed any contaminant criteria may be used for backfilling excavations, but based on the difficulty with removing small pieces of debris during waste segregation, this soil should be used for intermediate fill and not be used for surface backfilling.

Table 6 Summary of Recommended Dump Remedial Requirements

Dump	Size (m^2) and Depth (m)	Dump Classification	Remediation Plan
Lobe L Dump	66 0.7	Class A	Excavation
Lobe M Dump	67 1.5	Class A	Excavation
Lobe N Dump	109 0.7	Class C	Regrade
Lobe O Dump	122 0.7	Class A	Excavation
Lobe P Dump	316 0.7	Class C	Regrade
Lobe Q Dump	112 1.0	Class A	Excavation
Lobe R Dump	502 1.5	Class C	Excavate contaminated soil and surface debris collection, then regrade.
Lobe S Dump	374 0.7	Class C	Surface debris collection, then regrade.
Lobe T Dump	1791 0.7	Class C	Surface debris collection, then regrade.
Lobe V Dump	30 0.5	Class A	Excavation
Lobe W Dump	13 0.5	Class A	Excavation

Dump	Size (m^2) and Depth (m)	Dump Classification	Remediation Plan
Lobe X Dump	388 0.7	Class A	Excavation
Lobe Y Dump	230 0.7	Class C	Surface debris collection, then regrade
Lobe Z Dump	316 0.7	Class C	Surface debris collection, then regrade

Dumps considered a high potential environmental risk, or those dumps located in close proximity to water bodies shall for excavated at the PIN-E site. Primary dump excavation includes excavation of all materials to the lateral and vertical extents of the designated dump area. The depth of the primary dump excavation typically extends to competent bedrock or where debris is no longer visible. Secondary dump excavation includes the excavation of the dump area beyond the primary dump excavation limits.

Dump excavation includes the following tasks:

- Installation/construction of erosion, drainage and sediment control, as required;
- Development of the dump survey grid;
- Excavation of all waste materials from the dump;
- Removal of all surface debris from the dump area; and
- The development, operation, closure and removal of a Material Processing Area (MPA).

Once excavated, the dump wastes are transported to the MPA for sorting into hazardous and non-hazardous components. Soil excavated from the dump shall be sorted into the contaminated soil classifications, based on the results of sampling and analysis. Clean soil/gravel is placed in the excavated dump area, once all confirmatory samples have been collected and analysed. The dump area shall then reshaped to match the existing terrain.

During the dump excavation, the slope stability shall be inspected and maintained. When excavating in the vicinity of a drainage course or a body of water, silt fences, floating silt curtains and/or containment berms shall be constructed to prevent the release of sediment or deleterious substances into the water.

At the completion of work in the area, sediment and erosion controls shall be removed from the water bodies. At the conclusion of the dump excavation, all sediment, erosion and drainage control measures shall be removed from the worksite.

6.8 Removal of Hazardous Material

“Hazardous” waste materials are defined as waste materials that are designated as ‘hazardous’ under Nunavut or Federal legislation; or as ‘dangerous goods’ under the Transportation of Dangerous Goods Act (TDGA). The Canadian Environmental Protection Act (CEPA) regulates material containing PCBs at concentrations greater than 50 ppm. Specific hazardous materials may include: batteries, asbestos, fuel tank bottom sludges, solvents, PCB-containing fluids, fuels and lubricating oils, alcohols and glycols, and heavy metal contaminated liquids. Disposal requirements of these hazardous waste materials are presented in Table 8.

Table 7 Hazardous Waste Material Disposal Requirements

Hazardous Waste Material	Disposal Requirement
Batteries Heavy metal contaminated organic liquids Liquids containing organic compounds with chlorine concentrations >1000 ppm Liquids containing organic compounds with PCB concentrations >2 ppm and <50 ppm	Off-site licensed treatment/disposal facility
Fuel tank bottom sludges Fuels, lubricating oils, alcohols and glycols	Off-site licensed treatment/disposal facility **OR** On-site incineration in accordance with the contract specifications
Liquids and solids containing organic compounds with PCB concentration >50 ppm	Off-site licensed treatment and disposal facility

6.9 Transportation of Hazardous Materials Off-Site

Hazardous materials are placed in environmentally suitable containers (typically lined and braced sea-cans) at an approved containment facility on-site. A storage area is established and registered with Environment Canada. The hazardous materials are removed by sea-lift in accordance with the TDGA Regulations.

6.10 Grading and Addition of Granular Materials

There are numerous areas identified that require grading and possible addition of granular materials. These areas generally consist of piles of buried or partially buried non-hazardous debris that will be covered with additional granular material and shaped to blend in with the natural terrain and promote positive drainage.

6.11 Future Activities

The site was shut-down in the mid 1960's, and there are no current land use plans in place at this site.

7. Proposed Mitigation Measures and Monitoring Programs

An important part of the assessment process involves identifying mitigation measures that would result in a reduction or elimination of potential environmental effects associated with the remediation of PIN-E. In the case of this project, all potential effects were addressed, not just those deemed to be significantly adverse. The proposed mitigative actions described herein shall form part of the overall project design and planning documentation.

Details of the remediation verification and post-remediation long-term monitoring are provided in the 2010 Remedial Action Plan completed by AECOM and are not included in this report.

7.1 Mitigation Plan Objectives

The mitigation plan provides a description of the general environmental protection measures required to minimize or avoid potential adverse effects, a description of protection measures required for specific valued environmental components at the PIN-E site, and details related to environmental inspection responsibilities and procedures.

The protection measures described herein should be implemented by the contractor to minimize or avoid adverse environmental impacts. These procedures are considered appropriate for known and anticipated situations and conditions. However, should certain procedures or protection measures prove impractical, imprudent or insufficient in field situations, appropriate modifications or substitutions will be proposed by field personnel and then reviewed and approved by the Proponents' Representative on-site.

7.2 Environmental Inspection

As part of its general overall commitment to a strategy of environmental protection and quality assurance, INAC employs dedicated environmental inspection staff to monitor its own compliance with the mitigation plan and all applicable laws, regulations, permits, guidelines and standards. INAC will be represented at the site by an Proponents' Representative, who will report to the PWGSC Project Manager. Communications will include, but not be limited to:

- Attendance at regular meetings as scheduled with the inspector;
- Immediately reporting concerns over any aspect of the mitigation plan; and
- Immediately reporting any spills or other event that may have an effect on human or environmental health and/or safety.

7.3 General Operational Procedures for Protection of Valued Ecosystem Components

The procedures and requirements provided in the following sections are intended to be protective of the Valued Ecosystem Components (VECs) identified at the PIN-E site.

7.3.1 Site Operations

The contractor will likely establish a construction camp on the site, which shall be located in an area with minimal vegetative ground cover. The selected location shall be in an area that is as close as practical to the main area(s) of clean up and where possible, on an existing gravel pad or former borrow area.

Surface drainage shall not be impeded and a distance of at least 30 m from the nearest body of water shall be maintained. Permafrost shall be protected by construction of gravel pads, and/or elevation of heated buildings on wooden structures. Areas containing archaeological resources need to be avoided in accordance with the recommendations in the Archaeological Impact Assessment.

Vehicle and mobile equipment travel shall be restricted at the site to established roads, stream crossings and work pads unless specifically exempted by the Proponents' Representative. Recreational use of vehicles, including all terrain vehicles (ATVs), shall not permitted off the existing road network. Overland movement of equipment and vehicles shall be minimized where damage to the vegetation or underlying soils may occur. Rubber tired vehicles and wide-turning radii shall be used to minimize disturbance to tundra. Following heavy rains, vehicle and heavy equipment use outside of road and work pad areas shall not be permitted until the soil has drained sufficiently to prevent excessive rutting.

Mobile equipment and vehicle operators are to yield the right-of-way to wildlife where safe to do so, and shall not be operated in a manner that harasses any species of wildlife. Vehicle and equipment servicing shall be performed in designated areas only, where special care can be taken to contain, handle, and dispose of maintenance fluids, parts and waste. Fuelling and lubrication of equipment shall be conducted in a manner that avoids spillage of fuels, oils, greases and coolants. When refueling equipment, leak-free containers and reinforced rip and puncture proof hoses and nozzles shall be used. Drip trays shall also be provided and ensure that all storage container outlets are properly sealed after use.

7.3.2 Storage and Handling of Fuel and Other Hazardous Substances

All fuel storage containers shall be compliant with the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (CEPA SOR/2008-197). Fuel shall be stored at a minimum, in self-dyking, double-walled containers or be in containers positioned over an impervious liner and surrounded by an impervious dyke of sufficient height to contain not less than 110% of the capacity of the tank. Sites that slope towards waterways or other environmentally sensitive areas, exhibiting ponding or flooding, or have high groundwater tables, excessive seepage, or ice-rich (thaw sensitive) soils shall be avoided, as must archaeological resources. Smoking is prohibited within 7.5 m of the fuel storage facility. Appropriate signage shall be posted around the fuelling facility. Fuel storage facilities shall be inspected once per day for the duration of the project and documentation of the inspection maintained. Fire-fighting equipment shall be made available for immediate access at each fuel storage facility. All barrels containing fuel and other similar materials need to be stored in an elevated position either on their side with the bungs facing the 9 and 3 o'clock positions, or on pallets, in an upright position. All barrels shall be individually identified with all information necessary for health and safety, and environmental purposes. Material Safety Data Sheets for all chemicals and fuels stored in the construction camp need to be available to all personnel.

Regular inspections shall be conducted of all machinery hydraulic, fuel and cooling systems and any leaks will be repaired immediately. Emergency spill equipment shall be pre-assembled and stored at all permanent fuel storage sites and work areas, including at least two fuel pumps, empty 200 litre barrel and absorbent material sufficient to clean up a 1000 litre spill. All barrels, redundant fuel storage facilities and associated materials and equipment need to be removed from the site at the conclusion of the clean up.

7.3.3 Surface Water Management

A water use license is required from the Nunavut Water Board for the development of potential water sources. All conditions of the license must be complied with. Water withdrawals must not endanger fish or drawdown the water level so as to adversely affect fish habitat. Water withdrawal rates shall not

exceed 10% of total water body volume. All water hoses need to be equipped with a mesh size of 2.5 mm or less to prevent the intake of fish as per the *Freshwater Intake End-of-Pipe Fish Screen Guidelines*.

7.3.4 Wastewater Management and Monitoring

Remediation activities generate wastewater from dewatering activities including contact water from landfill and contaminated soil excavations, new landfill operation, and contaminated soil treatment areas. Water management on-site is the Contractors' responsibility. However, given the nature of the Arctic terrain, site logistics, and support, climate and weather makes the mitigation of discharge water a challenging task. Contact water associated with landfill and contaminated soil excavations, the operation of new landfills and landfarms potentially contain a number of constituents of concern.

The parameters selected for the monitoring plan are based on and are a reflection of the types of contaminants found at the sites during the environmental assessment. The criteria for the wastewater are considered conservative and appropriately protective of the arctic environment.

Wastewater may be temporarily stored while awaiting test results, provided that it is not stored over the winter months. The volume of wastewater storage during any one construction season shall not exceed the available treatment capacity during that construction season. See Table 9 below for a summary of the typical wastewater discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 8 Construction Wastewater Discharge Criteria

Parameter	Criteria (µg/L)
pH	6-9 pH units
Oil & Grease	5000
Arsenic (total)	100
Cadmium (dissolved)	10
Chromium (dissolved)	100
Cobalt (dissolved)	50
Copper (dissolved)	200
Lead (dissolved)	50
Mercury (total)	0.6
Nickel (dissolved)	200
PCB (total)*	1000
Zinc (total)	500

**In respect of application to a road surface.*

The collected wastewater needs to be tested each time prior to discharge. Once it is confirmed that the wastewater meets the discharge criteria, it can be released onto the ground in an area that is at least 30 metres from natural drainage courses and 100 metres from fish-bearing waters.

The locations of the discharge areas will vary, depending on the work areas. For example, the barrel cleaning operations are typically located within the hazardous materials processing area, which is determined by the contractor. Wastewater that collects at contaminated soil excavations and landfill excavations is typically sampled and treated in place. In areas where the volume of wastewater is significant and affects the progression of work, the wastewater may be recirculated. For example, wastewater occurring during landfill excavation would be sampled and recirculated over the landfill surface.

7.3.5 Sewage Effluent Monitoring

The sewage management system at PIN-E will likely be a simple facultative system where treatment is achieved by the natural degradation of organic substances or biogeochemical activity. Aerobic or anaerobic micro-organisms digest the organic solids and utilize the released energy and nutrients in the effluent to grow and increase in numbers, which in turn accelerates the process. In this type of system, aerobic respiration is the most complete and efficient degrader of organic solids and therefore the most important element in a stable and healthy biological treatment process. This method of treatment within the Arctic environment, combined with relatively short effluent retention times requires good management to achieve the desired level of treatment prior to discharge. See Table 10 below for a summary of the effluent discharge criteria, as provided by the Nunavut Water Board for other abandoned military sites.

Table 9 Sewage Effluent Criteria

Parameter	Criteria
pH	6-9 pH units
Oil & Grease	No visible sheen
Biological Oxygen Demand	120 mg/L
Total Suspended Solids	180 mg/L
Faecal Coliforms	10,000 CFU/dL

In order to maximize the performance of the system, the specifications (which are to be stamped by a qualified engineer) will require sewage lagoons to have sufficient volume to accommodate 100% of the camp water consumption for the duration of the construction season. Each of the two cells will hold 50% of the seasonal flow, to a maximum depth of 1.0 m. The required effluent volume per lagoon can be calculated as follows:

Effluent volume per lagoon = (200 litres/person/day) x (number of people) x (construction duration days) x 50%

Effluent monitoring must be completed prior to discharge.

7.3.6 Domestic Waste Management

Kitchen wastes shall be stored in metal, animal-proof containers to prevent scavenging of waste by wildlife and to reduce scattering of debris prior to daily incineration. All residual kitchen wastes and other non-hazardous wastes shall be disposed of in the existing site landfills unless otherwise specified.

7.3.7 Road Construction and Maintenance

Existing roads and trails provide access to most sources of granular materials. Emphasis on the preservation of the permafrost regime, vegetation patterns, existing surface drainage patterns, water quality and stream flows shall be maintained. Establishment of new roads off-site is subject to the terms of the land use permit and the approval of the Proponents' Representative. New roads shall be located at least 30 m from any water bodies or water courses. Ice-rich soils, especially peatlands, shall also be avoided during road construction. The road bed shall be prepared with a sufficient thickness of fill to prevent terrain damage. Culverts, if required, shall be installed to maintain natural cross-drainage and prevent ponding. Any culverts installed need to be removed from the roads and drainage restored at the end of the clean up operations. Access roads shall be monitored for signs of erosion and remedial action taken where necessary. Dust suppression, if required, can be maintained with water only.

7.3.8 Stream Crossing and Diversion

The contractor must adhere to all government regulations, licensing requirements/procedures and inspections regarding the protection of water quality and stream integrity. Existing stream crossings shall be utilized as required. Authorizations for any additional works employed are the responsibility of the contractor.

In the event a stream crossing is required, siltation of waterways and disruption of streambeds shall be prevented using the following procedures:

- Minimize activities adjacent to watercourses;
- Install cofferdams, silt barriers or other suitable barriers;
- Do not operate equipment in waterways;
- Do not use streambeds for borrow material; and
- Do not dispose of excavated fill, waste materials and debris in waterways.

7.3.9 Borrow Pit Development and Operation

Environmental protection measures must be implemented for the purpose of minimizing the impact of development and extraction activities on surface drainage patterns, water quality, soil erosion, and in some cases, wildlife or fish. The number of borrow areas opened shall be minimized by using existing borrow areas, roads and building pads where feasible. Use of alternative sources is subject to the approval of the Proponents' Representative and acquisition of a quarry permit. All terms and conditions of the quarry permit are to be complied with, including the recontouring/reclamation of the borrow area and site clean up prior to site abandonment.

Borrow areas must be located at least 30 m from the nearest water body providing potential fish habitat, and other sensitive resources. A 30 m buffer zone should be marked out prior to commencement of gravel quarrying operations. Organic overburden, if present, shall be stripped and stockpiled separately for use in restoring the borrow area. Following excavation, the area needs to be recontoured to restore natural drainage and the overburden worked into the recontoured borrow area to prevent erosion. Drainage and run-off control needs to be provided using diversion ditches and sediment filters, as required, to prevent sediment laden run-off from reaching water bodies.

During aggregate extraction, vehicle and equipment operations shall be controlled in areas adjacent to the borrow pit to minimize the extent of disturbance. Aggregate shall be stockpiled on ice-poor, well drained ground such that surface drainage is not impeded. The stockpile shall be located in an area that is a minimum of 30 metres from archaeological resources, water bodies, and other sensitive resources. If archaeological features or artifacts are encountered during borrow pit operations, the Proponents' Representative is to be notified, the area of the find avoided, and activities in other areas of the pit restricted until further instructions are received.

7.3.10 Hazardous Waste Material Processing Area

A hazardous waste material processing area needs to be developed for the processing of excavated soils. The hazardous waste material processing area shall be located a minimum of 30 m from any archaeological site or water body, on ice poor, well drained soil, and as close to the location of work as practical. Movement of vehicles and equipment between the hazardous material processing area and work site shall be minimized to prevent the spread of potentially hazardous material along the roadways.

7.3.11 Contaminated Soils

Soils exceeding the criteria established for INAC abandoned military sites, including PIN-E, are to be removed. Disturbance to adjacent areas during excavation of contaminated soil shall be minimized. Spillage of material during transportation between the excavation site and the stockpile/treatment location is to be avoided and any spillage shall be cleaned up to the satisfaction of the Proponents' Representative. Following excavation of contaminated soils, equipment shall be decontaminated. All workers need to wear appropriate protective clothing/equipment when handling contaminated soil. A program of sampling and confirmatory testing of specific contaminated areas will be carried out as part of the clean-up program.

7.3.12 Dump Closure and New Landfill Development

The existing dumps will be covered with gravel to provide a minimum cover thickness as indicated on the drawings. The dump areas will be regraded and restored to natural drainage patterns and topography. High risk dumps are being completely excavated and backfilled with granular material.

One new landfill is being constructed, the Non-Hazardous Waste Landfill, for the disposal of non-hazardous wastes and debris generated during the clean up of the site.

Drainage controls such as diversion ditches and sediment filters may need to be provided, as required, to prevent runoff from reaching water bodies during closure, remediation and construction of dumps.

7.3.13 Disposal of Site Debris

Site debris shall be collected, sorted into hazardous and non-hazardous materials and disposed of accordingly. Workers need to wear appropriate protective clothing when handling potentially hazardous waste material. Off-road activity shall be minimized during collection of site debris.

7.3.14 Demolition of Structures

All residual debris is to be removed from the site down to grade. Structures shall be demolished to the top of the concrete foundation level. Gravel pads and other foundations shall be regraded to restore natural drainage patterns and to match adjacent topography.

7.3.15 Aircraft Movements

It is anticipated that fixed wing chartered aircraft will be used to transport personnel, perishable supplies and some construction materials and equipment to and from the site. Charter pilots will be advised to maintain an altitude of at least 610 m and preferably 1000 m above ground or water when passing over the site. Low level flights to observe or photograph wildlife will not be permitted. Charter aircraft pilots will be informed of all applicable mitigation plan requirements when scheduling arrangements are made or at other appropriate periods prior to the arrival of the aircraft on site.

7.3.16 Handling of Dangerous Goods and Hazardous Waste Materials

Packaging: The Transportation Dangerous Goods Act (TDGA) and Regulations govern the packaging and shipment of dangerous goods within Canada. If shipping out of Canada, Canadian regulations and the regulations of the destination country both apply. Requirements of the International Marine Dangerous Goods Code (IMDGC) must be addressed in international waters. Any material classified by

the TDGA must be accompanied by the appropriate shipping documents. The documents must include: the shipper, the receiver and all carriers involved in the transport of the shipment. Non-hazardous materials are also to be accompanied by a document indicating ownership and responsibility of the receiver. The contractor shall refer to the TDGA and regulations for more details regarding shipping document requirements. All dangerous goods will be packaged in accordance with the TDGA.

Waste manifests will be initiated for each shipment, specifying a unique reference number and INAC's waste generator number to accompany the shipment to the final destination. Any waste of unknown TDGA hazard will be tested to determine whether any transport hazard exists according to the regulations. Any substance that is considered hazardous will be packaged under the TDGA in accordance with the regulations and the national standard *Performance Packaging for Transportation of Dangerous Goods*. The TDGA regulations specify the packaging requirements for dangerous or hazardous goods according to risk.

Labeling: Each item will be labeled and placarded according to its hazard class and division. A label or placard design is unique to each classification. Large containers will be placarded as defined by the class and division with the TDGA product identification number clearly defined. The product identification number is indicated by the substance name in the regulations.

7.3.17 Explosives

The use of explosives is potentially dangerous to human and animal health. If required, the following procedures should apply:

- Obtain all necessary permits and licenses;
- Handle, transport, store and use explosives and all other related material in accordance with all applicable laws, regulations and orders of regulating authorities;
- Electric detonation methods are prohibited;
- Restrict use of explosives to authorized and certified/licensed personnel who have been trained in their use;
- Minimize defacement of landscape features and other surrounding objects controlling the scatter of blasted material beyond the cleared working area;
- Minimize shock or instantaneous peak noise levels;
- Prevent blasting scatter from reaching fuel or hazardous substance storage locations. A minimum distance of 300 m in rocky terrain and 1000 m in the presence of metal is required; and
- Do not conduct blasting in the vicinity of wildlife populations.

7.3.18 Work Site Clean-Up and Abandonment

The contractor must comply with all terms and conditions of the water use license and the land use permit. All temporary buildings, fuel barrels, vehicles, equipment, waste materials and surplus materials will be removed from the site following completion of the work. All large earthworks slopes shall be stabilized. Gravel access roads required for operation and maintenance may remain. All disturbed areas shall be graded to match natural drainage patterns.

7.4 Specific Protection Measures for Valued Ecosystem Components

This section describes the required protection measures for the valued environmental components identified at the PIN-E site.

7.4.1 Human Health and Safety

Potential hazards to human health and safety are present at the PIN-E site in the form of hazardous materials and contaminated soil, unpredictable weather conditions and wildlife encounters. Hazardous material and contaminated soil have the potential to enter water bodies and the food chain, and thereby affect vegetation, fish, wildlife and the health of people who travel, hunt and fish in these areas. Site debris may present a physical hazard to people traveling through these locations.

All necessary precautions shall be taken when handling and transporting hazardous material and contaminated soil to ensure that the materials do not come into contact with site personnel. Site workers need to wear protective clothing when handling hazardous materials. All site personnel working on or in the vicinity of the clean up operations must be trained in, made aware of, and adhere to the requirements of the Workplace Hazardous Materials Information System (WHMIS) program.

Outdoor recreation activities of the site personnel have the potential to adversely affect nearby fish, wildlife and heritage resources. Subject to camp rules and the requirements of territorial fishing licenses and regulations, staff may be permitted to leave the site for recreational purposes. However, recreational use of vehicles, including ATVs, shall not be permitted off of the existing road network. Normal precautions for Arctic travel include: provisions for rapidly changing weather conditions, tactics for possible polar bear and other wildlife encounters, filing a trip plan, first aid kit, a survival kit and insect repellent.

7.4.2 Local Economy and Contact with Local Residents

Employment and local business opportunities in the north should be maximized as much as possible. Regular briefing meetings shall be scheduled with all camp personnel to discuss and explain camp rules.

7.4.3 Aesthetic Value

It is anticipated that the clean up activities will have an overall positive effect on the aesthetic value of the PIN-E site in that redundant structures will be demolished, and all disturbed areas (landfills, debris piles, sewage outfall and borrow pits) will be restored as closely as possible to their original appearance. Construction personnel are to ensure that their activities do not contribute to any degradation of the local environment.

7.4.4 Surface Water and Potential Fish Habitat

The following shall apply to work adjacent to waterways:

- Prevent siltation of water bodies potentially supporting fish by the use of berms or silt fences as required, and by minimizing activities adjacent to watercourses;
- Do not operate equipment in waterways;
- Do not use streambeds for borrow material;
- Do not dispose of excavated fill, waste material or debris in waterways;
- Where possible, conduct in-stream work during low-flow periods, in late winter before spring freshet or after mid-August; and
- When removing culverts, slope banks to conform to the grade of the adjacent stream bank, as applicable. If required, stabilize the bank using erosion resistant material.

Recreational fishing shall not be permitted except in compliance with the applicable federal and territorial regulations and guidelines.

7.4.5 Permafrost Soils

Ice-rich soils are common in areas that have vegetation cover and are thus susceptible to permafrost degradation. The top layer provides a protective thermal barrier that prevents permafrost degradation. These soils are susceptible to erosion due to their fine texture. Erosion removes the thermal protection and causes permafrost degradation. Vehicle and equipment traffic, and soil excavation can disturb the surface layer and degrade the permafrost. Disturbance to permafrost soils needs to be minimized by restricting vehicle and heavy equipment traffic to existing roads and designated work areas unless approved by the Proponents' Representative. Activity in areas adjacent to work areas shall also be minimized. Vehicles or heavy equipment shall not be operated off-road following heavy rain or melting snow until the soil has dried sufficiently to prevent excess rutting. Appropriate drainage and erosion control structures shall be installed along access roads, where required. The following measures shall be implemented during the site clean up operations to minimize disruption of permafrost:

- Facilities such as work camps and storage areas shall be located such that they do not impede surface drainage or result in ponding;
- Gravel pads shall be constructed and used to protect ice-rich soil from thermal or physical damage;
- Disturbance during excavations shall be minimized;
- Excavated areas shall be backfilled promptly with granular fill, upon receipt of confirmatory samples;
- Development of new borrow areas shall be minimized;
- Materials shall not be stored directly on unprotected ground surfaces;
- Disturbed areas shall be regraded to restore natural drainage patterns; and
- Any rutting that occurs and impedes local drainage or exposes permafrost in ice-rich soils shall be repaired to the satisfaction of the Proponents' Representative.

7.4.6 Terrestrial Wildlife

There is always concern over human/wildlife contact at Arctic sites. This could include harassment by project personnel causing disruption of activities such as calving, breeding, nesting and rearing, all of which may take place on the site proper.

The following procedures shall be implemented to prevent human/wildlife conflicts:

- Employ a dedicated wildlife monitor(s) at all times;
- All on-site personnel shall be required to be familiar with the on-site bear safety training for all workers;
- Wildlife may not be fed, injured or harassed by site personnel;
- Do not disturb birds nesting on site;
- Vehicle and aircraft movements shall conscientiously avoid all known populations of wildlife or areas known to be frequented by known populations of wildlife;
- Do not attempt to chase, catch, divert, follow or otherwise harass wildlife by aircraft, vehicle or on foot;
- Control refuse and make it inaccessible to bears and other scavengers;
- Equipment and vehicles shall yield to wildlife, where possible;
- Except in the vicinity of the airfield, advise charter aircraft pilots not to fly at elevations lower than 610, and preferably 1000 metres above ground or water;

- In the event that wildlife is spotted from the air, aircraft shall not make descents for observations or photography;
- Domestic or wild pets are not allowed in camps with the exception of controlled watchdogs; and
- Project personnel shall not be permitted to possess personal firearms. The only firearms allowed on site shall be for protection from bears and shooting of animals exhibiting aberrant behavior. The firearms shall be controlled by the contractors' site superintendent.

7.4.7 Avifauna

Disruption of avifauna during the nesting period can result in reproductive failure. For this reason, populations of nesting birds shall be avoided during this period. Impacts on these species shall be minimized by removing any nests before they become active, discouraging nesting at work areas and scheduling disruptive activities outside of the nesting period. Based on the observations during the 2009 site investigation and the lack of buildings (where most avifauna at northern sites make nests) scheduled for demolition at the PIN-E site, it is not anticipated that work scheduling will be required.

The arrival of avifauna at specific locations in the Arctic is influenced by weather conditions and a number of other factors. Inclement weather or a delayed spring melt may delay arrival by several weeks. In general, however, the chronology of arrival, nesting and departure is relatively consistent. Typically within two weeks of arrival, nesting commences and continues for one to two months until the young leave the nest. Following this, the birds feed in preparation for the fall migration and depart by mid to late September.

7.4.8 Heritage Resources

The former DEW Line sites are often located in areas which have been seasonally settled or visited by Inuit over the past 1000 years, by their Paleo-Eskimo predecessors for as many as 3000 years before the Inuit, and by Europeans and Euro Canadians over the past four centuries. Archaeological sites and recent camps and cemeteries exhibiting evidence of the presence of the former occupants have been found on or adjacent to all of the DEW Line sites. The traditional and scientific value of heritage resources is greatly diminished if they are disturbed or moved. Archaeological sites in Nunavut are protected by law, and disturbance of these sites and collection of specimens is prohibited except under the terms of an archaeological research permit.

In the event that heritage resources are discovered during clean up activities, the following procedures apply:

- Report the discovery immediately to the Proponents' Representative;
- Cease work in that area and notify the appropriate authorities with the Department of Culture, Language, Elders and Youth (CLEY);
- Reports of all archaeological finds shall include:
    - The identity of the person making the discovery;
    - A description of the site, including topography, landmarks, etc.;
    - The nature of the activity resulting in the discovery;
    - A description of the archaeological site, including size, features, or visible details, supplemented by sketches or photographs;
    - Actions currently undertaken to protect the archaeological features; and
    - Any extenuating circumstances.

- Do not resume activities in the vicinity of the find until confirmations and direction from the Department of CLEY is received.

These mitigation measures were identified because they will result in a reduction or elimination of likely environmental effects, including potential adverse effects, associated with the clean up.

8. Summary of Project Tasks, Anticipated Impacts, Mitigation Measures, and Significance

Table 10 provides a summary of the anticipated impacts to the identified VECs based on the project tasks and includes proposed mitigation measures and the overall significance of the impacts.

Table 10 Summary of Project Tasks, Impacts, Mitigation Measures, Residual Impacts and Significance

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
Air Quality	Hydrocarbon Contaminated Soil Removal/Landfarming	Air quality may be impacted by the removal of hydrocarbon-contaminated soils and landfarming.	None. Impact is minimal and short-term.	None. Once the impacted soil has been removed, the potential for a residual impact is removed.	N
	Site Grading/Borrow Source Development	The extraction of granular materials and grading activities has the potential to create dust and impact air quality.	Implement dust control measures. Only water will be used for dust control.	None.	M
	Vehicle, Incinerator and Camp Infrastructure (furnaces, generators) Emissions	Operation of the camp and associated equipment will result in emissions that could negatively impact air quality.	Use appropriate furnace filters, do not leave vehicles and equipment running unnecessarily. Impacts occur over the short-term.	None.	M
Soil Quality	Landfill Development/Dump Closure	If not constructed properly, contaminants may migrate from the new landfills, potentially degrading soil quality. The closure of the existing dumps will reduce the risk of impacting soil quality.	New facilities will not contain hazardous materials. The landfill/dump cover is graded to promote surface runoff.	The new landfills and existing dumps that are not being excavated may need maintenance work in the future as they are intended to remain on site for the foreseeable future.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of the contaminated soil and hazardous materials from contact with the environment will improve soil quality.	n/a	Improved soil quality and reduced potential for future adverse effects.	P
	Transport of Hazardous Material, Fuel and Contaminated Soil	The potential exists for accidental release of hazardous materials, contaminated soil and/or fuels during transport, which could impact soil quality.	Proper handling, storage, and transportation procedures for hazardous materials to be implemented as per TDGA regulations. All workers to be trained in proper handling procedures for all hazardous materials on-site. Workers to follow the spill contingency plans. All materials and equipment to implement contingency plans to be available on-site.	None.	M
	Camp Operation	The operation of the construction camp will include treatment and disposal of	Hazardous materials will not be disposed of in the camp waste system.	None.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
		domestic waste, and could negatively impact soil quality.	All sewage to be disposed of in accordance with Land Use Permit and Water Use License.		
Water Quality	Landfill Development/Dump Closure	If not constructed according to the specifications, leachate may be generated and migrate from the new landfills during the construction, which has the potential to degrade water quality, both surface and active layer water. The development and closure of the existing dumps has the potential to disrupt drainage at the site and cause siltation of waterways.	New facilities will not contain hazardous materials. Landfill/dump covers are graded to promote surface runoff. New facilities are sited away from waterbodies and drainage courses so that drainage is not interrupted. Prevent siltation by use of berms and/or silt fences.	The new landfills and existing dumps that are not being excavated may need maintenance work in the future and they are intended to remain on site for the foreseeable future. As such, even though mitigation measures will be implemented, there may be future impacts to water quality.	M
	Contaminated Soil and Hazardous Materials Removal	Removal of the contaminated soil and hazardous materials from the environment will reduce the risk of contamination to the surface and active layer water.	Prevent sediments from entering waterbodies by use of berms and/or silt fences. Implement other environmental protection measures as necessary.	Reduced potential for future adverse effects.	P
	Transport of Hazardous Material, Fuel and Contaminated Soil	The potential exists for accidental release of hazardous materials, contaminated soil, and/or fuels. An accidental release could impact water quality.	Proper handling, storage, and transportation procedures for hazardous materials to be implemented as per TDGA regulations. All workers to be trained in proper handling procedures for all hazardous materials on-site. Workers to follow the spill contingency plans. All materials and equipment to implement contingency plans to be available on-site. Implement mitigation measures to prevent deleterious substances from entering the aquatic environment.	None.	M
	Site Grading/Borrow Source Development	Erosion and sedimentation of waterbodies during grading and gravel extraction activities	Prevent siltation by use of berms and/or silt fences. Do not operate equipment	None.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
		has the potential to negatively impact water quality. Drainage will be improved as a result of grading disturbed areas. The extraction of granular material will alter the terrain of the borrow area and has the potential to disturb drainage.	within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required. Site to be graded upon completion to promote positive drainage and to match the existing terrain as much as practical.		
	Camp Operation	The operation of the construction camp will include treatment and disposal of waste. The potential exists for waste to impact water quality.	Hazardous materials not to be disposed of in the camp waste system. All sewage to be disposed of in accordance with Land Use Permit and Water Use License.	None.	M
Terrain Quality	Landfill Development	Excavation is required for the development of new landfills and closure of existing dumps, which has the potential to degrade permafrost.	Minimize the time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Although the permafrost may be disturbed, it is anticipated once the work is completed, permafrost depth will be restored.	M
	Landfill Development/Debris Disposal	The development of new landfills and removal of site debris has the potential to disturb existing terrain.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to match worked areas to the existing terrain and drainage paths, it is unlikely to be exact, and will likely take significant time for the area to blend into the undisturbed terrain.	M
	Site Regrading	Terrain and drainage will be improved as a result of grading disturbed areas. Previously disturbed areas will blend into the natural environment.	All structures implemented either during the operation of the site or as part of the remediation will be removed to restore natural surface drainage patterns.	Positive residual impact	P
	Borrow Source Development	The extraction of granular material will alter the terrain of the borrow areas.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to match worked areas to the existing terrain and drainage paths, it is unlikely to be exact, and will likely take significant time for the area to blend into the undisturbed terrain.	M
	Contaminated Soil Excavation	The excavation of contaminated soil has the	Minimize the time permafrost is exposed.	Although the permafrost may be disturbed, it is	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
		potential to degrade the permafrost.	Minimize surface area of exposed permafrost or active zone.	anticipated once the work is completed, permafrost depth will be restored.	
	Camp Operation	Movement of contractor's equipment and personnel around the site has the potential to disturb the tundra.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site wherever possible.	Although every effort will be made to limit movement to existing roads, the Arctic tundra is quite sensitive and it may take significant time for the disturbed area to recover.	M
Terrestrial Animals	General Clean Up Activities	The use of heavy equipment during the clean up has the potential to disturb wildlife.	Avoid areas of known wildlife colonies or bird nesting areas. Employ minimum distance requirements for transportation activities around the site.	None. The work is seasonal, short-term and temporary.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of hazardous materials and contaminated soil from the environment reduces the risk of exposure to terrestrial animals.	n/a	Reduced potential for future adverse effects.	P
Terrestrial Habitat	Landfill Development	Loss of habitat may occur as a result of the development of the new landfills in previously undisturbed areas.	The proposed landfill areas have little to no vegetation present; therefore, the disturbed areas are to be regraded and reshaped to match the existing terrain to facilitate recovery of ecosystem components.	The landfills are permanent and therefore the impact will remain. However, once the landfill is completed the disturbed area will be available to wildlife.	M
	Facility Demolition (Inuit Huts)	The existing facilities may be used by wildlife as habitat. The demolition of these facilities has the potential to impact availability of habitat.	Inspect facilities prior to demolition for use by wildlife. Contact appropriate wildlife officer for additional guidance to ensure disturbance of wildlife is minimized.	None.	M
	Borrow Source Development	The extraction of granular material will disturb the ground and has the potential to impact terrestrial habitat.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	Although every effort will be made to match the disturbed area to the existing terrain, the Arctic tundra is quite sensitive and it may take significant time for the disturbed area to recover.	M
Aquatic Habitat and Animals	Dump Closure/Excavation	The excavation of high risk dump areas in close proximity	During excavation, implement mitigation measures to	Reduced potential for future adverse effects.	P

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
		to water bodies removes the potential for impact.	prevent deleterious substances from entering the aquatic environment. Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.		
	Site Regrading/Borrow Source Development	The extraction of granular material and grading adjacent to waterbodies has the potential to impact aquatic habitat, and thereby affect aquatic animals, due to sediment entering the water.	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.	None.	M
	Contaminated Soil and Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from areas close to waterbodies reduces the risk of exposure to aquatic animals. The excavation of contaminated soils from the beach POL area has the potential to degrade the aquatic environment in the event of an accidental release and impact aquatic animals in close proximity to the aquatic environment.	Implement mitigation measures to prevent deleterious substances from entering the aquatic environment. Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.	Reduced potential for future adverse effects.	P/M
Health and Safety	General Clean Up Activities	The excavation of potentially hazardous materials from the dumps, the collection and disposal of potentially hazardous debris, the removal of hazardous materials from the facilities and the general handling of hazardous materials has the potential to impact the health and safety of workers.	Transportation of any hazardous materials is to be in accordance with the TDGA Regulations. Workers must wear and use appropriate personal protective equipment. Workers are to be trained in the use of personal protective equipment and proper handling procedures for hazardous materials. Proper procedures for	None.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Residual Impact	Overall Significance
			working around heavy equipment to be implemented.		
	Contaminated Soil and Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to people.	n/a	None.	P
Archaeological	General Clean Up Activities	The presence and movement of people around the site has the potential to disturb the archaeological resources identified around the site.	Clearly mark and avoid all archaeological resources. Contact authorities in the event a new resource is discovered or a know resource is disturbed.	None.	M
Land Use	General Clean Up Activities	Clean up activities may disturb traditional land use, i.e., hunting and fishing activities that would occur along the coastal areas during the summer months; although it has been noted the area is no longer used.	Contact the local hunters and trappers organization to coordinate clean up activities and traditional land use, if applicable.	None.	M
Aesthetics	General Clean Up Activities	Generally, the clean up will improve the aesthetics of the site by removing unsightly debris and restoring the site to a more natural state.	n/a	Site is restored to a more natural state and therefore is more aesthetically pleasing.	P
Economy	Contractor Support	The contractor will be required to have a minimum Inuit content in the workforce for clean up. This will provide employment benefits and related economic benefits.	n/a	Greater number of trained Inuit workers.	P

- *P – Positive*
- *N – Negative and non-mitigable*
- *M – Negative and mitigable*
- *U - Unknown*

9. Knowledge Deficiencies

Certain details of the project have been assumed based on knowledge of historical practices during clean up projects of this kind and will not be finalized until final remedial plans are developed by a successful contractor. Typically, these plans relate to:

- Mobilization and demobilization schedule;
- water and wastewater treatment design;
- camp size, design, and location;
- construction schedule; and
- contaminated soil remediation processes;

Details relating to the final design, its impacts and any necessary mitigation measures will be finalized following the selection of a remediation contractor and the submission of their detailed project plans.

10. References

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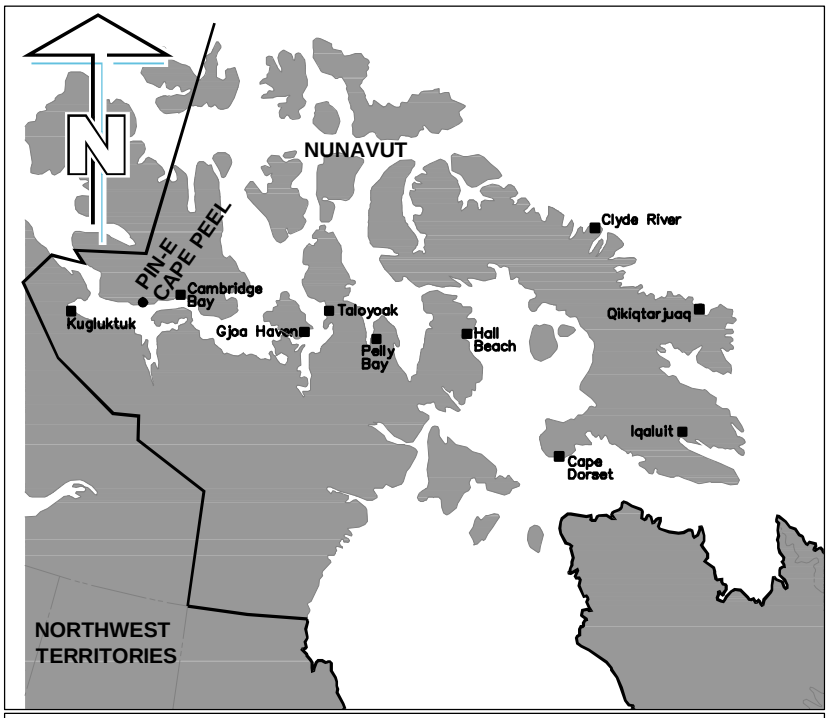
Appendix A

Site Figures



LOCATION OF CAPE PEEL WITHIN NUNAVUT TERRITORY

IMAGE SOURCE: GOOGLE EARTH
UTM ZONE 14W NAD83

0 250 500 m
SCALE 1:25000 (APPROX.)

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Site Location

AECOM

Figure 1.0

GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

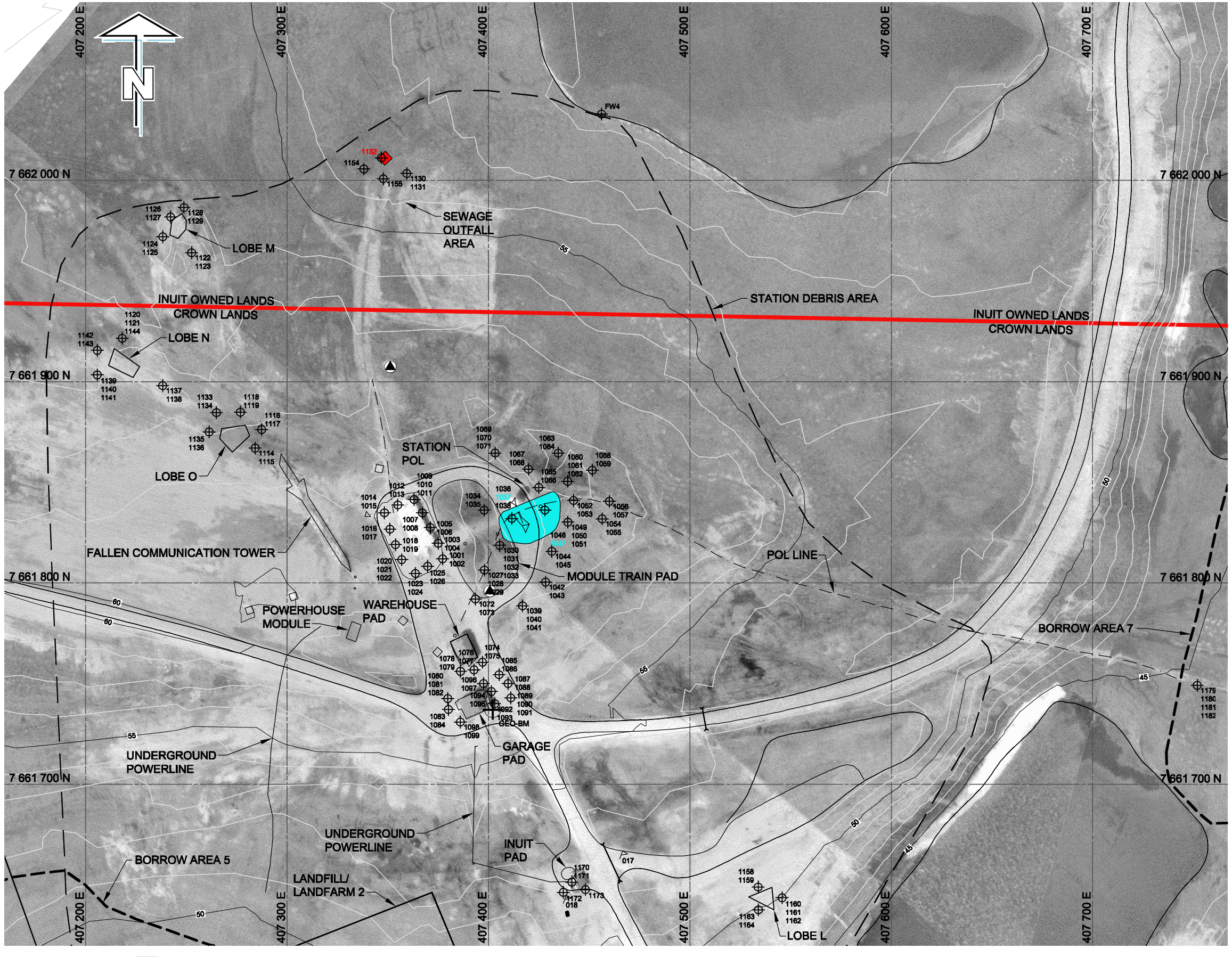
- POTENTIAL BORROW AREAS
- PROPOSED LANDFILL/ LANDFARM AREAS
- DEBRIS AREAS
- CULVERT
- SITE GRID (500m INTERVAL)
- TESTPIT LOCATION
- SAMPLE LOCATION
- WAYPOINTS

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

PIN-E Site Plan

AECOM

Figure 2.0



GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- POTENTIAL BORROW AREAS
- PROPOSED LANDFILL/ LANDFARM AREAS
- DEBRIS AREAS
- CULVERT
- WAYPOINTS
- SAMPLE LOCATION
- TIER II
- TYPE B
- CONTROL POINT
- GEODETIC BENCHMARK
- TIER II ESTIMATED AREA OF CONTAMINATION
- TYPE B ESTIMATED AREA OF CONTAMINATION

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Station Area

AECOM

Figure 3.0

GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- WAYPOINTS
- SAMPLE LOCATION
- CONTROL POINT
- GEODETIC BENCHMARK

406 600 E
406 700 E
406 800 E
406 900 E
407 000 E
407 100 E
7 662 200 N
7 662 100 N
7 662 000 N
7 661 900 N
YELLOW TANK
LOBE Q
GEO-BM
ACCESS ROAD
INUIT OWNED LANDS
CROWN LANDS
009
1145 1146 1147 1148 1149 1150 1151 1152 1153 1156 1157
55
60

0 15 30 m SCALE 1:1500

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Lobe Q

AECOM

Figure 4.0

GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- POTENTIAL BORROW AREAS
- PROPOSED LANDFILL/ LANDFARM AREAS
- 000 WAYPOINTS
- SAMPLE LOCATION

406 600 E
406 700 E
406 800 E
406 900 E
407 000 E
407 100 E
7 661 800 N
7 661 700 N
7 661 600 N
FRESHWATER LAKE
WEST WATER SUPPLY ROAD
INUIT OWNED LANDS
CROWN LANDS
BORROW AREA 11
BORROW AREA 10
BORROW AREA 5
BARREL STORAGE AREA A
LANDFILL/ LANDFARM 1
LOBE P
1174
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
010
55
50

0 15 30 m SCALE 1:1500

AECOM

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Lobe P and Barrel Storage Area

Figure 5.0

GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- POTENTIAL BORROW AREAS
- PROPOSED LANDFILL/ LANDFARM AREAS
- SAMPLE LOCATION

407 900 E
408 000 E
408 100 E
408 200 E
408 300 E
408 400 E
7 662 000 N
7 661 900 N
7 661 800 N
EAST BEACH ROAD
LOBE T
LOBE S
LOBE R
BORROW AREA 7
LANDFILL ROAD
LANDFILL/ LANDFARM 4
INUIT OWNED LANDS
CROWN LANDS

0 15 30 m
SCALE 1:1500

AECOM

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Landfill Road Area

Figure 6.0

B SIZE 11" x 17" (279.4mm x 431.8mm)

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ISS/REV: B

AECOM FILE NAME:

GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- POTENTIAL BORROW AREAS
- DEBRIS AREAS
- WAYPOINTS
- SAMPLE LOCATION
- TIER I
- TYPE A
- TYPE B
- CONTROL POINT
- TIER I ESTIMATED AREA OF CONTAMINATION
- TYPE B ESTIMATED AREA OF CONTAMINATION

409 100 E
409 200 E
409 300 E
7 661 600 N
7 661 500 N
7 661 400 N
7 661 300 N
7 661 200 N
7 661 100 N
LOBE Y
BARREL STORAGE AREA D
ROAD
BEACH POL
REMAINING BARRELS AT STORAGE AREA B AND C
LOBE X
LOBE W
LOBE V
BORROW AREA 1
FORMER INUIT HUTS
BEACH
DEASE STRAIT

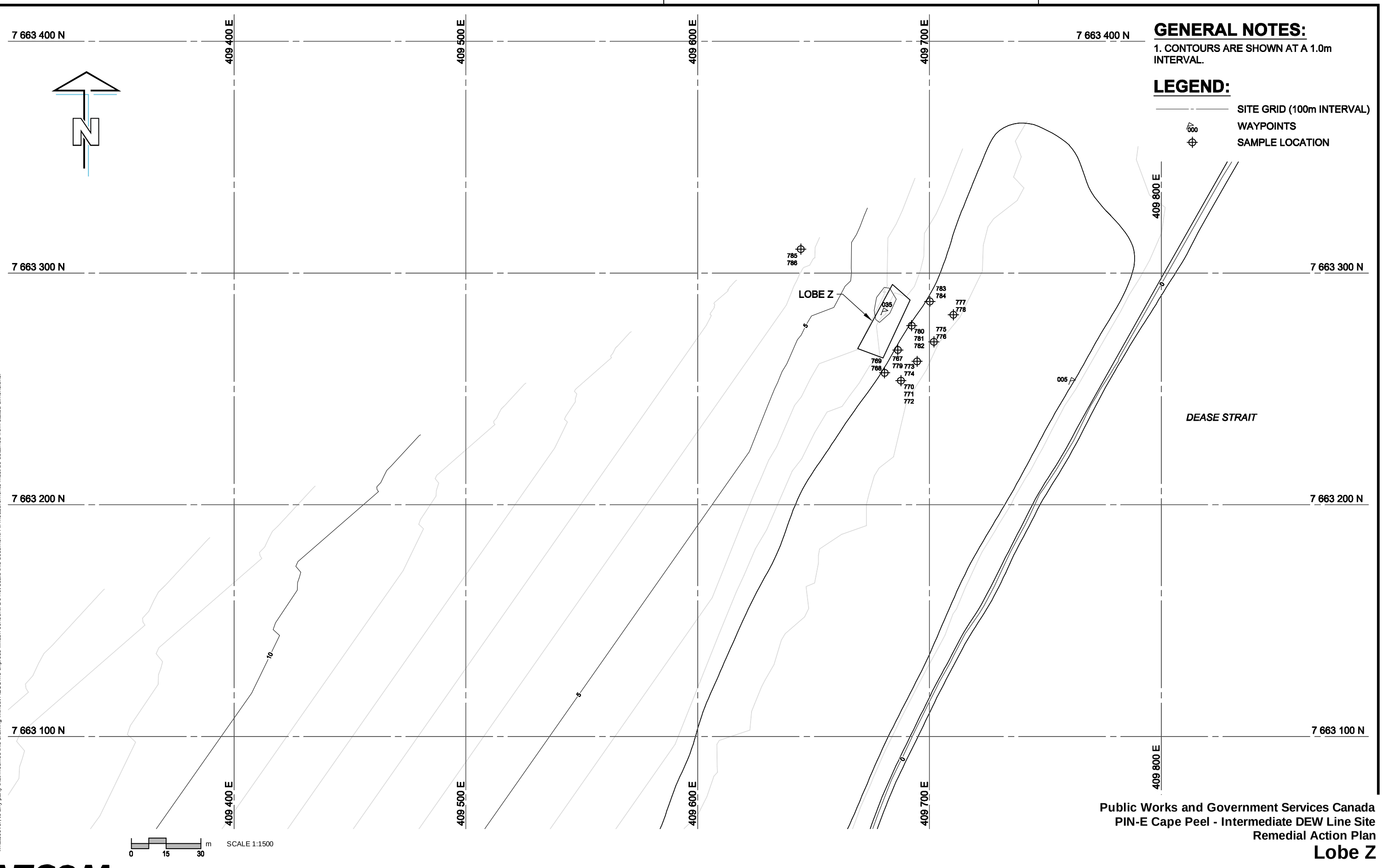
0 15 30 m SCALE 1:1500

Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

East Beach Area

AECOM

Figure 7.0



GENERAL NOTES:

1. CONTOURS ARE SHOWN AT A 1.0m INTERVAL.

LEGEND:

- SITE GRID (100m INTERVAL)
- WAYPOINTS
- SAMPLE LOCATION

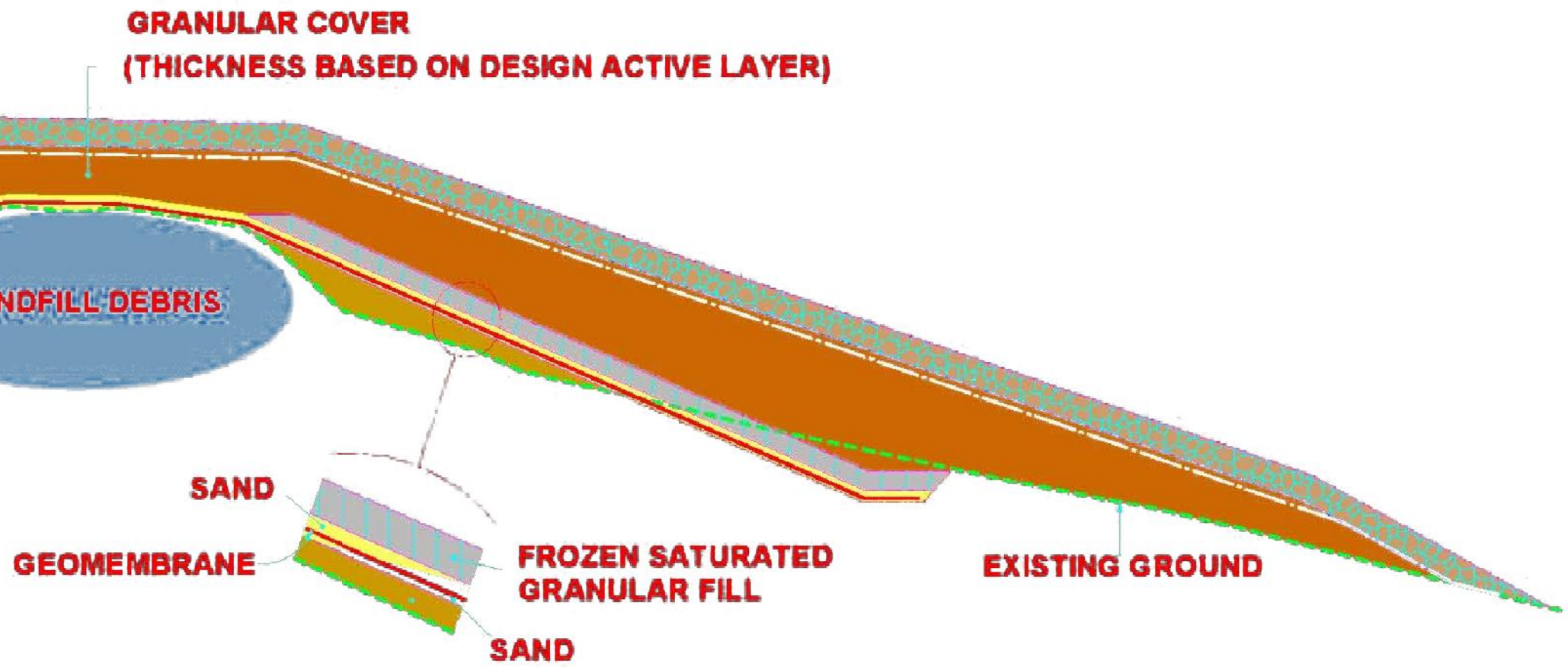
Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Lobe Z

AECOM

Figure 8.0

RÉVISION: A
AECOM FILE NAME: 2977-393-01_01-B-F009_RA.dwg Saved By: de leona PLOT: 09/12/21 11:21:14 AM A SIZE 8.5" x 11" (215.9mm x 279.4mm)



Public Works and Government Services Canada
PIN-E Cape Peel - Intermediate DEW Line Site
Remedial Action Plan

Leachate Containment Cross-Section

AECOM

Figure 9.0