Defence Construction Canada
Project Description and Environmental Screening Report
PIN-2, Cape Young
DEW Line Site Clean Up

Prepared by:

UMA Engineering Ltd doing business as AECOM
2540 Kensington Road NW
Calgary, Alberta T2N 3S3
403.270.9200

Project Number: 0171-142-00-08
Date: 17 October 2008

Disclaimer

© 2008 UMA Engineering Ltd. ALL RIGHTS RESERVED THIS DOCUMENT IS PROTECTED BY COPYRIGHT AND TRADE SECRET LAW AND MAY NOT BE REPRODUCED IN ANY MANNER, OR FOR ANY PURPOSE, EXCEPT BY WRITTEN PERMISSION OF UMA Engineering Ltd."

The attached Report (the "Report") has been prepared by UMA Engineering Ltd. doing business as AECOM ("AECOM") for the benefit of Defence Construction Canada ("Client") in accordance with the agreement between AECOM and Client (the "Agreement").

The information, data, recommendations and conclusions contained in the Report:

- are subject to the budgetary, time and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations")
- represent AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to AECOM which has not been independently verified
- have not been updated
- must be read as a whole and sections thereof should not be read out of such context
- were prepared for the specific purposes described in the Report and the Agreement and must not be used for any other purpose whatsoever

Unless expressly stated to the contrary in the Report or the Agreement, AECOM:

- shall not be responsible for any events or circumstances that may have occurred since the date on which the Report was prepared or for any inaccuracies contained in information that was provided to AECOM
- makes no guarantees or warranties whatsoever, whether express or implied, with respect to the Report or any part thereof, other than that the Report represents AECOM's professional judgement as described above
- shall not be deemed to have represented that the Report or any part thereof is exhaustive or applicable to any specific use other than that described in the Report and the Agreement

Except as required by law or otherwise agreed by AECOM and Client, the Report:

- is to be treated as confidential
- may not be used or relied upon by third parties

Except as described above, AECOM denies any liability in respect of the Report or parts thereof and shall not be responsible for any damages arising from use of the Report or parts thereof.

This Disclaimer is attached to and forms part of the Report.

Revision Log

REVISION	DATE	ISSUE / REVISION DESCRIPTION
1	September 25, 2008	Draft for Review.
2	October 17, 2008	Final Report Issued for Submission

Table of Contents

List of Tables

List of Figures

List of Appendices

1.0 Site Description

1.1 Location

The PIN-2 site is located on the mainland of Nunavut, along the shores of Dolphin and Union Strait. It is approximately 150 km north of Kugluktuk.

1.2 History

PIN-2 was an auxiliary site within the original DEW Line system. The station was constructed in the 1950's as part of the Distant Early Warning (DEW) Line, which provided radar surveillance of the northern approaches to North America. In March 1985, Canada and the United States agreed to modernize the North American Air Defence System by closing the remaining 21 DND DEW Line sites by the early 1990's, and build the North Warning System (NWS). An NWS Short Range Radar (SRR) site was established approximately 8 km southwest of the DEW Line site; however, two 88 m^3 POL tanks associated with the SRR are located at the beach area adjacent to the DEW Line Beach POL area and NWS holds a reserve on the tanks and beach area.

1.3 Project Activities

The purpose of the proposed project is to provide remedy for previous activities that occurred as a result of the operation of the former DEW Line site. Specifically, the clean up is to prevent the release of physical debris and/or contaminants into the environment.

In general, during the construction phase of the clean up, existing facilities no longer required for the operation of the NWS will be demolished. The demolition wastes will be segregated into hazardous and non-hazardous materials and disposed of appropriately. Contaminated soils identified during the field investigations will be excavated and properly disposed of in on-site engineered landfills or at off-site facilities if characterized as hazardous. Scattered surface debris and partially buried debris on-site will also be collected and disposed of. New landfills will be constructed to contain the non-hazardous contaminated soil and demolition waste generated during the clean up. Existing landfills within the site will be remediated, as required. Disturbed areas will be physically restored to a stable condition shaped to match the existing terrain. The detailed work program is provided in Section 5.

1.4 Schedule

PIN-2 underwent a detailed site investigation in 2004, and is scheduled for clean up beginning in 2009 as part of the DLCU project, with completion expected in 2011. Clean up activities are expected to continue through to 2012, depending on the contractors' approach and weather conditions.

The expected duration of annual clean up activities on site will generally be from June to October. During the winter months, work will cease and equipment and facilities on site will be winterized. It is expected that the contractors' workforce and accessory personnel will mobilize to and from the site from nearby northern communities. Long-term monitoring of the landfills will begin once clean up is completed and will continue for a 25-year period. After 25 years, the monitoring requirements are re-evaluated.

2.0 Background Information

2.1 Contact Information

DEW Line Clean Up - Project Management Office
Defence Construction Canada (on behalf of the Director General Environment, Department of National Defence)
Constitution Square, Suite 1720
350 Albert Street
Ottawa, ON K1A 0K3

Contacts regarding this application:
Defence Construction Canada
Mr. Douglas Craig, M.Sc., DLCU Environmental Officer
Tel: 613-998-7288
Fax: 613-998-0468
E-mail: Douglas.Craig@dcc-cdc.gc.ca

AECOM (formerly UMA Engineering Ltd.)
Ms. Eva Schulz, P.Ag., Environmental Scientist
2540 Kensington Road NW
Calgary, AB T2N 3S3
Tel: 403-270-9200
Fax: 403-270-0399
E-Mail: Eva.Schulz@aecom.com

2.2 Lead Authorizing Agencies

The lead agency for this project is the Department of National Defence, represented by the Director General Environment. The management of this project is being provided by Defence Construction 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.

2.3 Environmental Assessment Process

The initial environmental assessment was completed under the Environmental Assessment and Review Process Guidelines Order (EARPGO) and updated in accordance with the requirements of the Canadian Environmental Assessment Agency (CEAA) and the Nunavut Impact Review Board (NIRB), in support of this project. The potential environmental impacts were assessed based on the valued ecosystem components identified during the initial scoping exercise.

The following sections provide a summary of the activities that were undertaken during the completion of the environmental assessment.

2.3.1 Scoping

As a self-directed environmental assessment, the initial step was 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 clean up project itself (i.e., identification of valued ecosystem components).

In scoping the project, clean up activities to be assessed were identified. Possible additional activities were examined using the Canadian Environmental Assessment Agency's "Principal Project/Accessory" test, which is used to determine if other activities demonstrate an interdependent linkage and/or geographical/ecological proximity with the primary clean up.

The assessment scope 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 scope of the project and of the assessment.

Table 1: Project Scope and Assessment

Project	PIN-2 Site Clean Up
EA Trigger	Funding from the Department of National Defence Federal permits required
Scope of principal project	Physical clean up of the PIN-2 site, including: demolition of facilities, removal of waste materials (including hazardous), contaminated soil removal, debris disposal, and construction of landfills and landfarms.
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 is to consider the effects of all project related activities (i.e., those related to the clean up of the site) and associated physical works on both biophysical and socio-economic factors.

The following factors were identified for assessment:

- Evaluation of environmental 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.
- Mitigation measures deemed to be technically and economically feasible.

Interested parties were identified and consulted during the development of the project definition process including:

- 'Expert' federal departments (Environment Canada, Department of Indian Affairs and Northern Development, Government of the Northwest Territories Department of Natural Resources, and Government of the Northwest Territories Department of Health);
- 'Other' federal departments (DND, DCC, Parks Canada);
- Aboriginal organizations (NTI, Nunavut Planning Commission) and the Regional Inuit Associations; and
- Community leadership of the various Arctic hamlets.

Section 4.0 of this Project Description provides a detailed outline of the Public Consultation Process.

2.3.2 Assessment of Environmental Effects

The initial step following the scoping exercise was to determine the possible environmental effects of the project. This assessment involved 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 were to occur at the PIN-2 site. Activities include mobilizations, project layout and design, plan 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 described above, 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.

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 were made as to the type of impact and its level of significance based on scientific judgement and comments received during the public consultation process.

2.3.3 Identification of Mitigation Options

The third stage of the assessment process was identifying mitigation measures that would result in a reduction or elimination of potential environmental effects associated with the clean up of PIN-2. In the case of this project, all potential adverse effects were addressed, not just those deemed to be significantly adverse. Mitigative actions now form part of the overall project design and planning documentation, which resulted in the preparation of an Environmental Protection Plan (EPP) in Section 8.0. The requirements for on-site personnel to adhere to these mitigative measures are part of the clean up contract.

2.3.4 Significance

The environmental assessment considers activities associated with the project 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.

2.4 Regulatory Overview

2.4.1 Introduction

The clean up 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 DND to conduct this work. Throughout all project phases, the project will work in close cooperation with regulatory authorities and compliance will be enforced .

2.4.2 Federal Acts, Regulations and Guidelines

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

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 Temporary PCB Storage Regulations.

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 covers all wildlife species listed as being at risk nationally and their critical numbers.

The **Canada Shipping Act** 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 Water 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 Land Use 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.

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 Act and Regulations 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.

Explosives Act and Regulations define explosives, the permitting requirements needed to use explosive substances, packaging, handling and transporting requirements, and safety requirements.

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 were used as a reference in the development of the DEW Line Clean Up Protocol and contract specifications. These guidelines are identified as reference materials only.

Freshwater Intake End-of-Pipe Fish Screen Guidelines 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 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.

Guidelines for Preparation of Hazardous Material Spill Contingency Plans identify factors that should be considered in the development of hazardous material spill contingency plans and the information that should be incorporated into a comprehensive contingency plan.

Code of Good Practise on Dump Closing or Conversion to Sanitary Landfill at Federal Establishments outlines the guidelines to improve operation and properly close existing dumps. It is intended to promote a consistent approach to the clean up of existing dumps to prevent contamination of water, air, and land and to ensure that the best particular control technology is used.

Code of Good Practise for Used Oil Management in Canada 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, compiled by the Canadian Council of Ministers of the Environment (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 access the degree of contamination at a site.

Canadian Drinking Water Guidelines are also complied by CCME for Canadian Drinking Water Quality and provide criteria for water that are protective of human health and also meet aesthetic objectives.

Technical Guidance on the Land Treatment of Petroleum Hydrocarbon Contaminated Soils at Federal Government Facilities or on Federal Crown Land provide information on the required design parameters for landfarms at federal facilities.

Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils was developed to provide guidance for landfarming.

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

2.4.3 Nunavut and Northwest Territory Acts, Regulations and Guidelines

In addition to the Federal Acts and Regulations identified in Section 2.4.2, the clean up of the PIN-2 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 PIN-2 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

- 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.

2.4.4 List of Approvals, Permits and Licenses Required

The following is a list of permits required for the clean up of the PIN-2 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 clean up of PIN-2. Contact: INAC Land Administration, Iqaluit, NU (T) 867-975-4283.

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 the clean up. 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 clean up of the PIN-2 site. Contact: Nunavut Water Board, Gjoa Haven, NU (T) 867-360-6338.

In addition, the successful contractor may require a number of other permits or license. 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 partial list of these and other requirements is presented in Table 2.

Table 2: Authorizations

Authorization	Authority	Activity to Authorization Applies
Land Use Permit (Crown Lands)	Indian and Northern Affairs Canada	All land use activities on Crown land
Quarry Permit (Crown Lands)	Indian and Northern Affairs Canada	Granular material extraction activities on Crown land
Water Use License	Nunavut Water Board	All water use activities
Archaeological Research Permit	Nunavut Land Claims Agreement Act	Investigation of archaeological sites, mitigation, monitoring
Transportation Permits	Transportation of Dangerous Goods Act	Shipping
Transportation Permits	International Air Transport Association Dangerous Goods Regulations	Air transport
Fishing Licenses	Department of Sustainable Development	Recreational fishing
Firearms Acquisition Certificates/ Firearms License (course required)	RCMP	Use and storage of firearms

2.5 Previous Environmental Assessments

As a federal proponent, the Department of National Defence (DND) is required to conduct an environmental assessment for the clean up of each DEW Line site. As a planning tool, these assessments were drafted in 1994 by DND under the auspices of the Environmental Process Guidelines Order. These assessments were preceded by extensive on-site environmental and engineering investigations completed by the Environmental Sciences Group (ESG) at the Royal Military College and UMA Engineering Ltd. (UMA). The initial investigations, which took place from 1989 to 1994, were used to provide a baseline study of the existing environment (both biological and physical) and ecological pathways and possible transport mechanisms that will exist during the clean up. As well, studies of socioeconomic aspects, in particular a detailed archaeological survey of the sites, were completed during this time. The protection of the food chain from DEW Line contaminants was established as the aim of the clean up. These studies confirmed that physical restoration would involve considerable quantities of materials, including limited quantities of hazardous materials such as waste oil, batteries and asbestos. Conclusions reached by independent analyses indicated that inorganic elements (principally copper, lead and zinc), hydrocarbons and polychlorinated phenols (PCBs) pose the greatest risk to the biophysical environment. Therefore, the clean up approach was geared towards removing these contaminants from contact with the environment.

Subsequent changes to overall project planning have been assessed over time and the assessment document updated. The Environmental Screening Report was updated for 14 of the 15 DEW Line sites in Nunavut (DCC-DLCU, 1998). This report was submitted with the Project Description of the 15 DEW Line sites in the Nunavut Settlement Area to the Nunavut Impact Review Board (NIRB) in June 1998.

In 2004, further investigations were conducted to delineate contaminated areas and obtain environmental and engineering information required to finalize the clean up plans. This information was reviewed and an updated Project Description with an environmental screening report section was prepared.

Other investigations included:

An initial environmental clean up study of the DEW Line sites in Canada carried out on behalf of the United States Air Force by a consortium of Canadian consultants. The objectives for this study included: identification and investigation areas impacted by past waste disposal practises and spills; determining and evaluating remediation alternatives for the waste disposal and spill areas; and developing disposal options for

debris arising from the demolition of DEW Line structures. This study provided information on the presence of hazardous materials, the biophysical environment, facility details, and the existing landfills.

An environmental study of 10 of the 21 sites in 1989/90 for the DND. This study provided a detailed physical and chemical inventory of the stations and considered the impact of the chemical contaminants in the Arctic ecosystem. This study provided information on the debris found on site, contents of landfills, fuel spills, and patterns of contaminant dispersal and impact from the use of drums.

Two studies designed to assess the impact of the historically common practise of disposing debris into the ocean through ice were carried out in 1994 and 1995 by a consortium of several Canadian government departments. These studies concluded that there were no significant chemical effects arising from the presence of debris on the ocean floor. A summary document of this investigation is provided in Appendix E.

During the final site investigations conducted in 1996 at BAR-3, Tuktoyaktuk and PIN-M, Cape Parry, the DND investigation team discovered that the paint on many of the buildings contained PCBs in excess of 50 ppm. PCB amended painted materials (PAP) are defined as material that is coated with PCB amended paint, and has been analyzed and the materials (including the paint) determined to contain PCB concentrations in excess of 50 ppm. These PAP materials are regulated under the Canadian Environmental Protection Act. Currently, the PAP materials cannot be placed in a landfill in the north, and are being packaged and transported to a southern disposal facility for destruction and disposal. Prior to transport, PAP material is being stored temporarily at the site in accordance with the Temporary Storage of PCB Materials Regulations.

2.6 Contract Award Process

The following steps outline the contract award procedures:

- A tender package is produced with includes ALL of the work to be completed at the site during the clean up. A tender package includes instruction for the contractor to attain Minimum Inuit Contractor Content (MICC) in the workforce, as well as Minimum Inuit Employment Content (MIEC), as specified in the DND/NTI Economic Agreement.
- The tender award goes to the most competitive bidder who fulfills all of the requirements as stated in the tender package.
- Once the contract is awarded, the successful contractor can begin plans to start the clean up work.

3.0 Project Planning

3.1 Rationale for the Project and Primary Goals

The aim of the DLCU Project is to decommission those facilities used by the former DEW Line which have been declared surplus to the requirements of the North Warning System and to restore the sites to an environmentally safe condition. Environmental restoration includes setting remediation objectives that are designed to preclude migration of contamination (and hence biomagnification) into the Arctic ecosystem/food chain. To accomplish this, remediation will include:

- The excavation of soils in cases where parameters exceed those that have been set for the project (i.e., believed to cause significant input into the lower levels of the food chain, for example, plants and detritus); and
- The remediation of landfills, which may serve as a source of contamination.

The process of biomagnification is defined as positively sloped variation in concentrations through increasingly higher trophic levels of the food chain. The process of biomagnification is particularly important in Arctic ecosystems, because of the dependency on a high fat content in the diet; organisms are extremely sensitive to contamination inputs, especially chlorinated contaminants such as PCBs. Given the nature of the Arctic ecosystems, it is important that past anthropogenic activities, such as the operation of the DEW Line, not continue to cause any significant adverse effects on any one level of the Arctic food chain. Specifically:

- The limited availability of species at any one given trophic level leaves little opportunity for another species to offset the effects of a loss of another.
- Negative biological effects (i.e., plant loss) may lead to physical disturbances, such as damage to permafrost.
- These unmanned sites pose a risk to human health and safety through the presence of physical hazards.

3.2 Evaluation of Alternatives to the Project

As a project strictly dedicated to the clean up of military establishments, the range of alternatives to the project is limited. Two alternatives to the clean up of these sites can be identified, and are as follows:

Commercial or other Government use of the facilities: This alternative involves the sale of those facilities no longer required by the DND to commercial interests. Two possibilities are present, namely on-site commercial development or sale of the capital assets themselves and movement off-site.

No clean up action (Null alternative): 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.

3.3 DEW Line Clean Up Protocol

The purpose of the DEW Line Clean Up Project is to:

- Demolish and remove existing facilities that are no longer required for the operation of the North Warning System.
- Removal of contaminated soil from contact with the Arctic food chain.
- Stabilize existing landfills.
- Clean up surface debris.
- Physically restore the site to as natural a state as practical.

3.3.1 Protocol Development

In cooperation with several federal and territorial departments, DND originally drafted the General Protocol for the DEW Line Clean Up in 1991. This protocol served as the basis for the DND/NTI Agreement on environmental provisions for the clean up of the sites (see Appendix B). At the time of implementation, there were no established environmental standards for the Arctic. As a result, existing federal guidelines, such as the Interim Canadian Environmental Quality Criteria for Contaminated Sites (1991) were modified to reflect both the sensitivity of the Arctic food chain to ecological processes such as biomagnification and the close dependence of the Inuit on the land for food. In addition, a barrel specific protocol was prepared that outlined the process for dealing with barrels and barrel contents found on the DEW Line sites.

3.3.2 Criteria

The protocol outlined in the DND/NTI Agreement was developed from the results of the biophysical, socio-economic, and engineering site assessments. The DLCU Protocol documents the contaminant clean up criteria and specific physical actions that are to be undertaken, which are specific to the DEW Line sites. These criteria were developed based on existing federal and territorial criteria in conjunction with studies that show the functional relationships and/or pathways for biological uptakes from soil. The resulting protocol defines two concentration tiers of soil contamination. Soil substrates containing Tier I concentrations may be placed in an appropriate on-site landfill, while those soils in excess of the Tier II standard are to be disposed of in a manner that provides additional measures to permanently segregate these contaminants from the Arctic ecosystem. Soils exceeding federal legislative limits (i.e., Canadian Environmental Protection Act and Chlorobiphenyl Regulations) will be disposed of off-site at a licensed disposal facility.

3.3.3 Environmental Working Group

In 1997, the DND and NTI agreed for form an Environmental Working Group (EWG). The EWG is comprised of scientific and technical experts representing both the Inuit (NTI) and DND. The purpose of the EWG is to examine environmental issues related to the DLCU project and to provide recommendations to a joint DND/NTI core group consisting of senior management from both organizations. Specific tasks that have been assigned to the EWG include:

- Development of a landfill risk evaluation matrix.
- Evaluation of recommendations for a post-construction/remediation landfill monitoring program.
- Identification of hydrocarbon clean up requirements.
- Establishment of confirmatory testing protocols.
- Preparation of a list of items suitable for landfilling at the DEW Line sites.

3.4 Final Investigation and Delineation

Prior to the clean up of each site, the DND undertakes a comprehensive final site assessment. The aim of the final investigation is several-fold, including:

- To fully delineate the extent of contaminated areas in order to prepare accurate construction documents.
- To confirm the structural and environmental status of buildings and other facilities that are to be demolished.
- To confirm the baseline environmental conditions at the site prior to implementation.
- To examine existing landfills and identify new landfills to confirm details pertaining to the required remediation strategy.

4.0 Public Consultation Process

As part of the DLCU Project, public consultations were carried out in communities across the north since 1992. In 1992 and 1993, teams from the DND and other federal departments conducted a broad range of public consultation sessions to confer with the local residents about the project and to obtain input regarding specific concerns about the work. Public consultations continue for each site prior to construction.

4.1 Inclusion of Traditional Knowledge

One of the guiding principles of the DLCU project is to ensure the meaningful participation of local residents in both the planning and execution phases. One way of ensuring this is to incorporate traditional knowledge into the site clean up plans. An Inuit representative who is familiar with both the DEW Line site and traditional use of the area is chosen by the Regional Inuit Association to be on-site during the site investigation phase prior to the clean up. The Inuit representative works closely with the EWG to identify Inuit use of the area, wildlife patterns, past activities, and any information relating to dumping, hazardous waste storage, and natural occurrences. This traditional and local knowledge is used to refine clean up activities by including unknown issues or adjusting environmental protection plans.

Additionally, DND and the NTI establish a community DLCU committee to facilitate the flow of local knowledge to the EWG prior to and during each site visit. To accomplish this goal, the EWG visit local communities most affected by each DEW Line site and conduct one on one interviews with a number of residents, the Hamlet Administrative Officer and Mayor, the local Hunters and Trappers Association and other relevant community organizations.

4.2 Initial Public Consultation

DND tried to integrate the views of all interested stakeholders, including individuals or groups, into the decision-making process for the DLCU Project. The approach to public involvement in environmental assessments for this project included two major elements: adequate public notification and appropriate public consultation.

The purpose of public notification is to provide information regarding community meetings, environmental assessment results, site activities and upcoming decisions. Public notification is used mainly for notifying the public of the results of previous environmental assessments and clean up plans.

Public consultation has been used to involve the public in the environmental assessment process through dialogue between northern residents and the project representatives. This dialogue has proven useful in identifying public concerns, needs and values before final decisions on courses of action were made.

Public consultation meetings were held in those communities in the vicinity of DEW Line sites. Briefings to government officials were also held in Iqaluit, Cambridge Bay and Yellowknife. Advertisements and information packages were provided in English as well as Inuktitut and Innuinaqtun. Minutes were recorded at each of the meetings and action items passed on to the responsible agencies.

Various communities were visited in 1992, 1993, and 1994 as part of the public consultation program. The primary objectives of the initial meetings were to:

- Provide general information to the community regarding the status and schedule for the project.
- Provide information regarding the process for closure and clean up of the DEW Line.
- Present environmental information regarding the demolition/disposal of facilities.

- Obtain information regarding public concerns through discussions at the meetings and through questionnaires.
- Obtain information regarding local labour and contracting capabilities to assist in developing implementation strategies.

4.2.1 2004 Site Investigation

In the summer of 2004 during the delineation investigations for PIN-2, further consultation was conducted to ensure local knowledge was collected and incorporated into the final delineation investigations. Local knowledge is important for uncovering location(s) of contamination that had not been previously assessed, as well as information required for completing the Landfill Risk Evaluation Matrix for each landfill site. Involvement of the local community and Inuit representation (NTI) included discussions with long time residents and community officials, including Hamlet Administrative Officers and senior members of the Hunters and Trappers Association; and a site visit by an NTI technical representative with a local community representative.

The NTI technical representative and the local representative were on site during a portion of the site investigation. During this time, the NTI representatives were able to observe the site and note any technical concerns that may have been overlooked by the site investigation team. The local community was able to provide much information on past disposal practises. Concerns and comments were gathered and incorporated into the delineation investigation plans and the clean up plans.

4.2.2 2008 Pre-Construction Consultation

Public consultation meetings regarding the clean up program were held in the communities of Cambridge Bay and Kugluktuk in April 2008. The meetings included a presentation of the proposed clean up plans and design, as well as a question and answer period in which the community's issues and concerns will be heard. Copies of the presentation and questions and answers are provided in Appendix C.

4.3 DND/NTI Project Review Committee

As part of the Agreement between the Department of National Defence and Nunavut Tunngavik Incorporated, there are regularly schedule meetings between these two organizations. These meetings, which involve senior management from both organizations, are designed to provide a regular forum to discuss the clean up program within the Nunavut Settlement Area and to resolve concerns relating to environmental and/or socio-economic issues.

5.0 Implementation & Design/Engineering

The clean up plans and procedures are outlined in the following sections. Selected photographs of the clean up areas at PIN-2 are in Appendix D.

5.1 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.

Ground – existing roads will be used at PIN-2 while on-site.

Barge – the transport of the contractors' equipment and facilities will be by barge in the summer.

5.2 Contractor Support Activities

The following activities will occur on-site to support the clean up work:

- Use of existing airstrip and roads at site for equipment transport, movement and access to work areas.
- Set up of site for camp equipment and storage.
- Set up primary sewage treatment (lagoon) for the camp.
- Development of domestic waste disposal (either as is or incinerated and then landfilled) in the Non-Hazardous Waste Landfill.
- Demobilization of the clean up camp following the end of the project. Vehicle traffic to work areas is to be supported by the existing access roads that traverse the site.
- Labour and equipment requirements are anticipated to include approximately 40-60 personnel, 20 pieces of heavy construction equipment and 6 support vehicles.
- Duration of work is anticipated to be approximately 4 months/year, not including winter shutdown period, over a timeframe of 2 years.

5.3 Development of Borrow Areas

Borrow quantities were investigated as part of the geotechnical field investigation completed by EBA in 1993 and 2004. Five borrow areas have been identified at PIN-2. The definition of the types of granular materials is as follows:

Type 1: Well graded gravel to be used for regrading and erosion protection requirements.

Type 2: Well graded sand and gravel with trace fines, to be used for construction of landfill berms and cover and regrading requirements.

Type 3: Consists of granular pit-run material from identified borrow sources and is generally used for regrading low areas, backfill for contaminated soil and landfill waste excavations, and general site grading requirements.

Type 4: A non-saline, well graded sand and gravel with some fines used for the construction of landfill containment berms and backfill of the key trench excavation for the Tier II Disposal Facility.

Type 5: To be used as an embedment material and protective layer for geomembranes.

Type 6: Consists of clean landfill excavation soils or other sources approved by the Site Engineer, generally consisting of screened stone, gravel or sand in an unfrozen state.

Approximately 267,000 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 Tier II Soil Disposal Facility. Table 3 outlines the borrow areas and potential volumes of granular material to be extracted from each area.

Table 3: Available Granular Material

Borrow Area	Estimated Volume Available (m^3)
South Borrow	100,000
North Borrow	70,000
East Twin Borrow	50,000
Harding River Borrow	32,000
Harding River Plains Borrow	15,000
Total	267,000

5.4 Contaminated Soil Disposal Requirements

All contaminated soil identified at PIN-2 has been divided into one of five categories based on the type and severity of the contamination. Generally, non-hazardous surface contaminants, if less than three square metres, are graded whereas more extensive contaminated soils are excavated. Excavations left by soil removal are backfilled with granular fill. Table 4 outlines the contaminated soil disposal requirements.

Table 4: Contaminated Soil Disposal Requirements

Designation / Co-Designation	Tier I	Tier II	Type A	Type B	Hazardous
None (no co-contaminants)	Non-Hazardous Landfill	Tier II Disposal Facility	Non-Hazardous Landfill	Landfarm	Containerize for off-site transport and disposal by others.
Type A	Non-Hazardous Landfill	Tier II Disposal Facility			Containerize for off-site transport and disposal by others.
Type B	Landfarm	Tier II Disposal Facility			Containerize for off-site transport with hydrocarbon resistant liners for disposal by others.

The locations of the contaminated soil areas are shown on the drawings in Appendix A.

5.5 Contaminated Soil Types

DCC Tier I and Tier II Contaminated Soil: Defined as soils containing concentrations equal to or in excess of any or all of the contaminants listed in Table 5.

Table 5: DCC Tier I and II Criteria

Contaminant	Tier I Criteria (ppm)	Tier II Criteria (ppm)
Arsenic	-	30
Cadmium	-	5
Chromium	-	250
Cobalt	-	50
Copper	-	100
Lead	200	500
Mercury	-	2
Nickel	-	100
Zinc	-	500
PCBs	1	>5 to <50

Hazardous Contaminated Soil: Contaminated soil is classified as hazardous in accordance with the Transportation of Dangerous Goods Act & Regulations.

CEPA Contaminated Soil: Soil containing concentrations of PCBs equal to or in excess of 50 parts per million. Materials contaminated with PCBs at concentration levels equal to or in excess of 50 ppm (mg/kg) are legislated as hazardous materials. Storage, handling, and disposal of PCBs are regulated under the Canadian Environmental Protection Act and the Federal Transportation of Dangerous Goods Act.

Leachable Soil: Soil containing contaminants that when subject to the leachate test prescribed in the TDGA and Regulations, leaches contaminants in excess of the concentration listed in Part V of the regulations. Handling and disposal are regulated under Federal, Territorial, and Provincial Regulations.

Petroleum Hydrocarbons: Hydrocarbon products include those described by laboratory analysis as lubricating oil and grease, fuel oil, diesel and/or gasoline.

Hydrocarbon Contaminated Soil: Soil containing concentrations of Total Petroleum Hydrocarbons (TPH) in concentrations considered to create a risk to the environment (2500 ppm).

Type A Hydrocarbon Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon product present in the soil is determined by laboratory analysis to consist of lubricating oil and grease. For remedial purposes, Type A contaminated soil shall be treated as Tier I contaminated soil containing hydrocarbon contamination.

Type B Contaminated Soil: Hydrocarbon contaminated soil in which the primary petroleum hydrocarbon present in the soil as determined by laboratory analysis consists of fuel oil, and/or diesel, and/or gasoline.

Type B – Tier I Contaminated Soil: Type B contaminated soil containing concentrations of lead between 200 and 500 ppm and PCBs between 1 and <5 ppm. Type B and combinations of DCC Tier I and Type B contaminated soil shall be excavated and treated onsite in a landfarm.

Type B – Tier II Contaminated Soil: Type B contaminated soil consisting of contaminants in excess of DCC Tier II criteria shall be treated as DCC Tier II contaminated soil containing hydrocarbon contamination.

Clean Soil: Soil that has been sampled, analyzed and determined to have contaminant concentrations below DCC Tier I contaminant levels and TPH concentrations less than 2500 ppm.

5.5.1 Tier I Contaminated Soil Disposal Requirements

Soils exceeding Tier I contaminated soil criteria, but not classified as Tier II contaminated soil do not pose a leachate risk and therefore may be disposed of in an on-site, non-hazardous waste (NHW) Landfill. Typical construction of a NHW Landfill consists of gravel perimeter berms surrounding layers of interbedded waste and intermediate cover soil. A layer of granular material, minimum 1 m thick, is placed as final cover for the landfill and graded to promote positive drainage. A more detailed description of a NWH Landfill is provided in Section 5.6.1.

5.5.2 Tier II Contaminated Soil Disposal Requirements

Based on the engineering field surveys conducted at the sites in 1992 and 1993, it became apparent that a potentially large volume of Tier II contaminated soil at the 21 DEW Line sites would require segregation in a manner which precludes their continued contact with the Arctic ecosystem. A number of disposal options/technologies were considered by the DLCU Project Team. Of the options, the most environmentally and economically feasible was determined to be the development of engineered Tier II soil disposal facilities. These facilities utilize a double-containment system consisting of permafrost to limit leachate generation and synthetic liners to prevent migration of contaminants into the surrounding environment. A detailed description of a Tier II Soil Disposal Facility is in Section 5.6.2.

5.5.3 CEPA Contaminated Soil Disposal Requirements

Contaminated soils which contain levels of contaminants in violation of the Canadian Environmental Protection Act (CEPA) and associated regulations are considered hazardous material and will not be placed in the Tier II Soil Disposal Facility. These materials are to be excavated, removed from the site and transported to a licensed disposal facility. Some of these soils may also contain petroleum hydrocarbons, often where lead and PCB contaminants have also occurred as a result of waste oil and/or fuel spills. These hydrocarbons are contained within the soil matrix and do not exist as free liquids which could potentially leach. Leachate testing has also been conducted on the more highly contaminated soil samples as set forth in Ontario Regulation 347. Wastes determined to be leachate toxic under this test are not placed in the Tier II Soil Disposal Facility, but are instead removed from the site to a licensed disposal facility.

5.5.4 Hydrocarbon Contaminated Soil Disposal Requirements

In 1998, the DLCU Protocol was revised to address hydrocarbon contaminated soils at the Nunavut sites under the environmental provisions of the DND/NTI Agreement. Under the amended protocol, hydrocarbon contaminated soil is divided into two types based on common sources at the DEW Line sites. In Type A hydrocarbon contaminated soil, the primary petroleum product present is lubricating oil and grease. Due to the low leachability of this type of hydrocarbon, these soils are generally deemed safe for disposal in a NHW Landfill. Soils where the primary petroleum hydrocarbon contaminant was fuel oil are classified as Type B hydrocarbon contaminated soils. Due to the concern of leachate generation and migration from Type B contaminants, these soils are not placed in the NHW Landfill. Several options for disposing of Type B contaminants have been employed based on location and site specific factors. The most feasible and environmentally sound disposal option is passive land treatment (landfarming). However, due to the lack of hydrocarbon impacted soils at the PIN-2 site, there is no requirement to construct a landfarm. Any impacted soils that may result as part of the landfill and or buried debris excavation will be disposed of in the Tier II Soil Disposal Facility.

5.5.5 Contaminated Soil Volumes

Volumes of contaminated soil to be excavated were calculated using the results from the 2004 site investigation, as summarized in Table 6. The volumes in Table 6 include area specific contingencies, which were rounded to the nearest 100 cubic metres, except in the case of CEPA and hazardous soils, and Type A impacted soils.

Table 6: Contaminated Soil Volume Estimates

Contaminant Designation	Soil Volume (m^3)
Tier I Contaminated Soil	600 (350 from landfill excavation)
Tier II Contaminated Soil	2,600 (450 from landfill excavation)
Type A Hydrocarbons	70
Type B Hydrocarbons	0
CEPA/Hazardous Soil	180 (70 from landfill excavation)
TOTAL	3,450

5.5.6 Selection of Contaminated Soil Disposal Facilities

Site selection of new landfills and/or landfarms must consider a number of factors that impact the ability to achieve the long-term performance and minimize construction cost. Selection of sites considers:

- Geotechnical suitability;
- Accessibility;
- Proximity to work areas; and
- Environmental suitability.

Geotechnical suitability considers topography, soil conditions, natural drainage in the area, depth to bedrock or permafrost, groundwater, and adverse soil conditions that may affect permafrost and potential containment. Environmental considerations include the presence of existing contamination and sensitivity of the receiving environment.

Another environmental concern during the development of these facilities is the possible requirement for use of explosives in some extraction activities. In addition to the obvious danger to human health, other possible impacts could include damage to surrounding areas (including water bodies, environmentally sensitive areas and hazardous material storage facilities) from shock waves and blasting scatter, and the disturbance of nearby wildlife by sudden peak noise levels. Blasting, if required, will be conducted by authorized personnel in accordance with all required permits, licenses and applicable laws and regulations, and as dictated by regulatory authorities.

5.6 Proposed Construction

Several specialized facilities are to be constructed to dispose of waste generated on-site due to the demolition of existing structures, removal of contaminated soil and site debris, and landfill excavation. Only materials exceeding CEPA standards and those deemed hazardous according to TDG Regulations will be disposed of off-site. The new facilities are sites following the completion of the detailed engineering investigation. As new

roads will have to be constructed to access these areas, the contractor may be required to make special provisions to protect any tundra vegetation. It is also assumed that the contractor will have to provide adequate drainage for all excavations.

5.6.1 Non-Hazardous Waste (NHW) Landfill

5.6.1.1 Description

The proposed NHW Landfilll is located near the intersection of the main station access road heading south and the Harding River road, within 100 m of each of these access roads. There was no contamination identified in this area, 40% of the area is covered by vegetation and there is exposed bedrock in several areas, and a ridge along the northeast side of the area.

5.6.2 Construction

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. The NHW Landfill is also not designed to maintain the contents in a perennially frozen state.

The following materials will 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 will consist of perimeter containment berm and granular cover to minimize erosion and infiltration in order to provide long-term stability. The NHW Landfill will be established on native ground, stripped of any organic matter which will 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 exterior berms;
- Placement of Tier I contaminated soil and non-hazardous demolition waste and site debris in the landfill;
- Compaction of landfill debris;
- Placement and compaction of intermediate granular cover in the landfill;
- Placement and compaction of final granular cover 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 further design details of the NHW Landfill, please refer to Drawings 102, 111, 115 and 116 in Appendix A.

5.6.3 Tier II Soil Disposal Facility

5.6.3.1 Description

The proposed location for the Tier II facility is located 300 m west-southwest of the station. There is currently no road access to the area. It is bound on the east side by a linear bedrock ridge. Surface water flow through the area is focused through a poorly defined drainage pathway originating south of the area, traveling north-northwest semi-parallel to the bedrock ridge, with the result that that western edge of the defined area is fairly wet in some places. The closest downgradient surface water body is approximately 600 m to the northwest. Of the bedrock ridge, the ground is generally sloped to the west at a 1-2% grade. Overburden soils are predominantly sand and gravel, with occasional cobbles and boulders. Bedrock refusal was observed between 0.3 to 0.7 m depth throughout the proposed area southwest of the ridge.

5.6.3.2 Construction

The Tier II Soil Disposal Facility is designed to contain contaminated soil exceeding Tier II Criteria. The design of this facility is based on the characteristics of the contaminants in the soils, the geothermal properties of the area, and the local permafrost regime. The design utilizes permafrost as the primary containment barrier. Both the Tier II contaminated soil and the west silty gravel perimeter berms are designed to be continuously frozen. A geothermal analysis was conducted to determine the time required for freezeback of the facility and the long-term geothermal regime of the facility. The thickness of the cover material was calculated to prevent thaw of the contaminated soil, even after 10 consecutive 1 in 100 warm years.

A high density polyethylene (HDPE) liner is placed at the base and side slopes of the facility to provide secondary containment. The liner is chemically compatible with the contaminated soils and will prevent the potential movement of contaminants during the period required for permafrost aggradation. A second HDPE liner is to be placed over the contaminated soils and seamed to the base liner to prevent precipitation from percolating down through the cover fill and into the Tier II contaminated soils. The development and closure of the Tier II facility at PIN-2 will include the following work:

- Construction of exterior berms with saturated silty gravel;
- Supply and installation of HDPE liners;
- Placement of Tier II contaminated soils in the landfill;
- Placement and compaction of intermediate granular cover over the soil;
- Installation of the top HDPE liner;
- Placement and compaction of final granular cover on the landfill;
- Grading to promote drainage away from the landfill, and;
- Supply and installation of thermistor strings and groundwater monitoring wells in and around the landfill.

During construction of this facility, the gradation, moisture content and compaction are monitored to ensure compliance with the design.

It should be noted that water management during key trench construction will not be a concern as the facility is located in an area that is free of debris and soil contamination. Any water encountered will be pumped away from the area, without the requirement for testing.

Further details on the design of the Tier II Soil Disposal Facility, including the height of the perimeter berms, thickness of cover material and location of monitoring wells can be found in Drawings 102, 108, 117 and 118 in Appendix A.

5.7 Landfill Closure and Grading

There are seven landfills identified at PIN-2 that require remediation and closure. The following work will be completed as part of the closure:

- Removal of surface debris and compaction of the surface.
- Supply and installation of geomembranes and geotextiles as shown on the drawings.
- Supply, placement and compaction of additional gravel over the landfills.
- Grading to promote surface water runoff from the landfills, and
- Supply and installation of groundwater monitoring wells and thermistor strings (if required).

5.8 Landfill Excavation

Landfills considered a high potential environmental risk, or those landfills located in close proximity to water bodies are being excavated at the PIN-2 site, which include the Airstrip Landfill (various lobes) and some buried debris locations. Primary landfill excavation includes excavation of all materials to the lateral and vertical extents of the designated landfill area. The depth of the primary landfill excavation extends to competent bedrock or where debris is no longer visible. Secondary landfill excavation includes the excavation of the landfill area beyond the primary landfill excavation limits.

Landfill excavation includes the following:

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

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

During the landfill excavation, the slope stability is to 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 are to be constructed to prevent the release of sediment or deleterious substances into the water. Mitigation measures, as outlined in the EPP are to be implemented immediately.

Any ponded water in the landfill excavation will either be treated or pumped out. Prior to dewatering, a sample will be collected and analysed to ensure it meets the discharge criteria. Any meltwater/groundwater/leachate will be collected at the low point of the excavation. The water will be allowed to settle prior to sampling and testing of the water.

During landfill excavation, a volatile organic compound (VOC) instrument capable of measuring in parts per million (ppm) and Lower Explosive Limit (%LEL) will be used to continuously measure the concentrations of VOCs during landfill excavation operations, and prior to the removal of debris from the landfill.

A full range of clean up and protective equipment will be maintained at the landfill excavation site in the event of a spill. The clean up equipment is to include booms (sorbent and containment), sorbents for cleanup, fire extinguishers for A-B-C fires, overpacks for barrels and contaminated soils, pumps, hand shovels, picks, and

containment barriers such as liner material. Personal protective equipment is to include clothing, protective suites, respirators, etc. to comply with potential emergency conditions and in accordance with NIOSH guidelines.

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

5.9 Description of Existing Landfills

Seven landfills were evaluated during the 2004 site investigation. They are:

- Station West Landfill
- USAF Landfill
- Airstrip Landfill
- Airstrip South Landfill
- Pallet Line West Landfill
- South-East Landfill; and
- South Borrow Landfill

A description of each landfill area is presented in the following sections.

5.9.1 Station West Landfill

The Station West Landfill is located in a disturbed area used for borrow extraction 450 m northwest of the module train and 100 m southwest of the USAF Landfill. There is a minor trail heading southeast from the landfill, but there is no road that connects the landfill to the station area.

Four lobes of debris were identified by geophysical survey: Lobe A (210 m^2), Lobe B (360 m^2), Lobe C (300 m^2), and Lobe D (180 m^2), for a total area of 1,050 m^2.

Lobe A is located along the west side of the beach ridge. Debris exposed in a mounded portion appears to be from the ATCO dormitory. Estimated depths of buried debris are 2 m in the mounded section and 1 m in the flat section.

Lobe B sites in the middle of the beach ridge and has an evenly graded, flat surface. No exposed debris was noted. Some scattered surface debris (tin cans) is visible along the southwest edge of the lobe. Estimated depth of debris is 1.2 m based on depth of bedrock refusal in the vicinity. Drainage away from this lobe is towards the northeast and southwest.

Lobe C is located on the west side of the beach ridge with the toe along the vegetated tundra in the beach trough. A partially buried barrel is present in the mid-section of the lobe, and some partially exposed pipe and large pieces of metal debris were observed in the north section of the lobe. Scattered surface debris (cans, drum lids) is present along the beach ridge slope and at its base, to the west of the lobe. Depth of debris is estimated as 1.0 m based on bedrock depth in the surrounding area.

Lobe D is at the north end of the landfill, on the east side of the beach ridge. The area surrounding this lobe is uneven, with gravel stockpiled to the southeast and west. The lobe itself is partially along the east slope of the gravel pile to the west. No debris is exposed. Grade is about 10% to the northeast towards the beach trough. Depth of debris is estimated as 1.0 m based on depth to bedrock in the vicinity.

The results of the environmental sampling at the Station West Landfill showed no evidence of contamination or contaminant migration. No soil staining was noted at surface and PCB, hydrocarbon and inorganic element levels in downgradient samples were all comparable to site background levels.

The EWG evaluation matrix score for this landfill is 51.5, classifying it as a low potential environmental risk. The contaminant source and pathway components of the score were low. The receptors component score was based on the presence of relatively lush vegetation downgradient of the landfill.

In accordance with the EWG classification and Steering Committee directive, the remediation plan for the Station West Landfill includes the following:

- Removal of surface debris for containerization or disposal in the NHW Landfill; and
- Improving the long-term stability by regrading the surface of the landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades. The total volume of Type 2 granular fill required is approximately 2700 m^3.

See Drawings 102 and 106 in Appendix A for design details.

5.9.2 USAF Landfill

The USAF Landfill, constructed during the closure of the PIN-2 site, was in use at the time of the 1993 investigation. A north cell had been completed and a south cell was in use. It is located 500 m northwest of the main station; with a connecting road to the Station Area. During operation in 1993, it was observed that a liner was being placed over the landfill surface. This is a DIAND permitted landfill, with permit number N92X748.

The landfill is 1,120 m^2 in size and is rectangular in shape with very even sides, and raised approximately 0.5 m above the surrounding grade. Although there are corner posts in place which are intended to define the landfill perimeter, the geophysical survey indicates the debris extends 2-3 m beyond the perimeter at the south end and northwest corner. Depths to bedrock surrounding the landfill are a maximum of 0.5 m and bedrock is exposed at the surface in some areas. The landfill cell may have been excavated into the bedrock which is friable in some areas; therefore, landfill depth is unclear. There was minor surface debris (wood fragments, stapping, electrical plug box) visible within the granular cover and the liner (geomembranes) is visible in some locations. The surface debris is thought to be due to entrainment of surrounding debris during cover placement and not due to debris exposure from landfill contents. Cover consists of sand and gravel and was notably coarser-grained over the southern half of the landfill (second cell).

The landfill is built on a leveled-off bedrock controlled beach ridge, with slight troughs to the northeast and southwest. The surface of the landfill itself and the immediate surrounding area are relatively flat.

Two areas of contaminated soil were detected outside of the landfill perimeter. One contained Tier II arsenic, but was noted to be in an area with iron oxide precipitates in silty sand and gravel. The other sample was collected from an adjacent test pit and also exhibited slightly elevated arsenic levels (but below criteria). The elevated arsenic levels have been considered as naturally occurring.

The total score for the USAF Landfill is 43.5, classifying it as a low potential environmental risk. Contaminant source and pathways components of the evaluation received low scores due to the lack of contaminant source (including minimal surface debris) or evidence for contaminant migration, and the low potential for contaminant transport and source erosion due to low grade and run-off potential. The receptor component received a moderate score, due to the moderate vegetation cover surrounding the landfill.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the USAF Landfill include the following:

- Removal of surface debris for containerization or disposal in the NHW Landfill;
- Cover and regrade the surface of the landfill with a minimum of 0.5 m of Type 2 granular fill. The lower recommendation for surface cover (typically 0.75 m) is based on the presence of the surface liner and the good existing cover.

See Drawings 102 and 106 in Appendix A for design details.

5.9.3 Airstrip Landfill

The Airstrip Landfill is located approximately 600 m north of the station, on the northwest side of the airstrip. Access to the landfill is via the airstrip or the beach landing area northwest of the Beach POL. According to USAF as-built drawings for the station, this area was the designated station dump. The landfill consists of 18 discrete lobes of buried debris (lobes A to R) spread over a large worked area approximately 400 x 900 m. The lobes range in size from 5640 to 40 m^2 for a total combined size of 10,290 m^2. An incinerator bin was present upgradient of Lobe A (the largest lobe) during the 1993 investigation and in historical air photos. Station personnel were observed using a trench, burn and cover method for waste disposal at this location. The southeast limit of the landfill (upgradient) is defined by a steep bedrock-controlled ridge. Ground level drops approximately 5 m from the top of the ridge to the base. Lobes A, B and J are located along the ridge slope, whereas the remainder of the lobes are located within the gently undulating beach strand and trough complex that exists between the base of the ridge and the ocean shoreline. A large low-lying area (about 77,000 m^2) with discontinuous, shallow ponds exists about mid-way between the base of the ridge and the shoreline. Landfill lobes are present to the south, north and east of this pond area.

Soil is primarily coarse-grained, consisting largely of gravel and cobbles. Material is angular and platy, derived from the limestone and dolomite bedrock of the ridge. The coarseness and angularity of the grains is apparent by the steep angle of repose along the ridge and lobes A, B and J. No existing slope stability or erosion issues were noted. Moving away from the ridge towards the pond area, material is slightly finer-grained, frequently with alternating layers of gravel and sand typical of beach deposits. A surface layer of organics exists within the low-lying pond area and is the only location where significant vegetation is present. Bedrock is exposed at surface in the eastern portion of the landfill, southeast of the ponds, between the toe of the ridge and the shoreline.

None of the lobes showed evidence of contaminant migration and eleven of the lobes (B, C, D, F, G, J, L, N, O, P, and Q) had no surface contamination detected.

Lobe A did not show any evidence of contaminant migration; however, it did have two areas containing Type A TPH. One area is at surface, while the other is a depth and also co-contaminated with Tier I PCBs. Both of these areas are considered localized spill areas and not indicative of contaminant migration from the lobe.

Tier II copper, lead and zinc were found within an area of ash and staining just outside of the Lobe E perimeter. These contaminants are localized and not linked to contaminant migration.

Lobe H contains two areas of contaminated soil. One is a black burn area located on the surface of the lobe that contains Type A TPH. The contamination is likely to be a result of fuel from burning operations. The other contaminated soils area is a surface stain located adjacent to the landfill lobe, and contains Type A TPH which is likely the result of an isolated spill.

Lobe I did not show any evidence of contaminant migration; however, there were two sample locations that contained TPH >2500 ppm. One location also tested positive for Tier II PCBs and zinc and requires delineation along the SE edge of the lobe. The stain is located immediately at the toe of the lobe and may extend under the lobe fill. The depth of contamination is expected to be bedrock, which is very near surface at this location.

Lobe K showed no evidence of contaminant migration, but Tier II copper and zinc and Tier I PCBs were detected in one continuous area that requires excavation. The contamination extends partially onto the lobe surface.

Lobe M had three areas of contamination identified: Tier II zinc, Tier I lead, Tier I PCBs and Type A TPH were detected. However, all areas are outside of the lobe perimeter, are associated with surface debris and therefore, not indicative of contaminant migration from the lobe.

A black ash stain was detected approximately 10 m east of Lobe R, with Tier II copper contamination.

Lobes A through Q were evaluated individually because they are sufficiently removed from each other, and had different pathway characteristics. Lobe R did not receive a scoring due to its small size and lack of surface debris. All lobes were classified as low potential environmental risks.

The primary receptor for all lobes is the ocean, but the distance to receptor varies, depending on lobe location. The source component of the evaluation varied for each lobe, dependent on its size, presence of surface debris, and/or presence of surface contamination. The pathway component also varied, primarily due to differences in lobe grade.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the Airstrip Landfill include the following:

- Isolate contaminated soil from potential receptors with excavation of Tier II contaminated soil (approximately 40 m^3) for disposal in the on-site Tier II Disposal Facility.
- Removal of surface debris for containerization or disposal in the NHW Landfill, and
- Improve the long-term stability by regrading the surface of the landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades with some allowance for placing thicker lifts in low areas of the landfill.

See Drawings 102, 104 and 105 in Appendix A for design details.

5.9.4 Airstrip South Landfill

Historical air photos (pre-1985) show a water filled pit within a borrow area southwest of the station and south of the airstrip. The borrow area has been called the East Twin Borrow Area because of a second (twin) road that runs through the borrow area, running roughly parallel to the station access road. The area is also accessed by a road running from the south end of the airstrip which connects with the east twin road. In the 1985 aerial photos, the water filled pit has been backfilled. Ground truthing of the area in 2004 noted a graded area with two small areas of ponded water remaining along the west toe. A heavily worked beach ridge lies to the west of the ponds; numerous large boulders have been piled on the beach ridge during the course of borrow extraction in the area.

A geophysical survey identified an anomaly of buried debris 1,420 m^2 in size. Visually ground truthing of the geophysics suggests that while the majority of the debris appears to be on the east side of the ponds and to the north, some buried debris extends south of the south pond, just beyond the western edge of the pond. Debris also appears to be buried in between the ponds. Grading carried out up the slope of the beach ridge to the west of the north pond also suggests that debris extends at least partly up this side of the ridge. The presence of numerous, large gabbro boulders along the ridge complicates the interpretation of the geophysical survey as they are also magnetic. The final anomaly as shown is considered a conservative estimate for the western perimeter.

The depth of the ponds was determined to be 1.5 m and the depth of buried debris is estimated to be the same. Frozen ground was encountered at a depth of 0.6 to 0.7 m near the east base of the beach ride, while

bedrock was encountered west and north of the landfill, typically at about 1m depth. Groundwater was present in all test pits except for those upgradient, on the beach ridge.

Because the ponds were created by borrow extraction, they are not considered as water body receptors. Immediately west of the south pond, at the base of the ridge, and north of the north pond, the ground was quite wet in August and likely has standing water during spring runoff. The area west and north of the ponds is partially vegetated. There is limited buried debris exposure, with most of the exposure noted north of the north pond (drum, wood, copper pipe). There was also minor surface debris: wood (2x6, plywood), tin cans, copper pipe, soap bottle, jar. A very small lube oil stain was noted east of the south pond.

The anomaly sits on a beach trough. Ground slopes very slightly upwards to the east towards the road (2% grade) and more sharply upwards to the west towards the ridge (10-15%). Any contaminant migration away from the buried debris would therefore be limited.

Tier II copper contamination was detected in an area with surface debris at the northeast corner of the landfill. The contamination was localized and delineated at surface and with depth. It is therefore expected that contaminated soil excavation can be achieved without requiring landfill excavation.

Tier II arsenic was detected downgradient of the landfill. The location was at surface in an area of soil that was rust coloured silty-sand which is similar to other elevated arsenic areas found at the site. The arsenic is therefore considered to be naturally occurring and not an indication of contaminant migration.

The total landfill evaluation score for the Airstrip South Landfill is 60, classifying it as low potential environmental risk. Contaminant source and pathways components of the evaluation received low scores due to the restricted potential for contaminant migration and low quantity of debris exposure. The receptors component also received a low score, due to low receptor sensitivity proximal to the landfill area.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the Airstrip South Landfill include the following:

- Excavation of Tier II contaminated soil (approximately 10 m^3) for disposal in the Tier II Disposal Facility.
- Regrade landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades.
- For landfill regrading, fill placement will need to extend westward from the southwest corner to prevent water accumulation between the ridge and the landfill, and the ponds will require infilling.

See Drawings 102 and 107 in Appendix A for design details.

5.9.5 Pallet Line West Landfill

The Pallet Line West Landfill is about 330 m southwest of the main pallet line for the station. There is a trail from the southwest corner of the pallet line leading to the area. The pallet line itself is located along the Station Access Road, approximately 350 m south of the station. Because of extensive surface debris in the area which complicated interpretation of geophysical anomolies, the final anomaly perimeters for several lobes were defined largely by visual inspection. In particular, the final perimeters for lobes A and B were defined by a review of the contoured geophysical anomaly plot and by observations related to extent of more abundant vegetation on the surface cover; it is common in this type of terrain for vegetation to grow more readily on the surface of areas that have been regraded, presumably because of less compacted surface soil conditions (and potentially more nutrients).

The overall area is very cobbly, with shallow bedrock. Vegetation density is low to moderate and locally more developed near the lobes along the southwest perimeter of the area. Surface debris is common throughout the overall area, and particularly near each of the landfill lobes.

There was no evidence of contamination at lobes E, F, J, K, or L. Lobes B, C, D and I had Tier II levels of copper and lead on the lobe surface or nearby. Lobe A also had Tier II lead. All of the contaminants were restricted to the surface. Slight evidence of contaminant migration was noted at Lobe D; no other lobes showed signs of potential contaminant migration.

Due to their proximity and common pathways and receptor areas, only lobes A, B and C were evaluated together. The remaining lobes were not evaluated as landfills according to EWG classification because of their small sizes and distance from one another. The total score of the Pallet Line West Landfill lobes A, B, C is 64.5, classifying it as a low potential environmental risk. Contaminant source received high scoring due to presence of contaminated soil and surface debris. The pathways and receptors scoring were low because of low potential for contaminant migration and lack of sensitive receptors nearby. The remaining lobes, while classified and evaluated as debris areas, are also discussed below.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the Pallet Line West Landfill include the following:

- Excavation of Tier II contaminated soil (approximately 10 m^3) for disposal in the on-site Tier II Disposal Facility.
- Confirmatory sampling of all Tier II contaminated soil sites.
- Excavation or regrading with a minimum placement of 0.3 m of fill over Tier I contaminated areas.
- Removal of surface debris for containerization or disposal in an on-site engineered landfill.
- Improving the long-term stability by regrading the surface of the landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades with some allowance for placing thicker lifts in low areas of the landfill.

See Drawings 102 and 109 in Appendix A for design details.

5.9.6 South Landfill East

The South Landfill-East is located 1.7 km south-southeast of the main station, 50 m to the east of the station access road, south of the intersection with the Harding River Road. The landfill is irregularly shaped, with a large mounded central portion (raised up to 2 m above the surrounding grade), a smaller mounded area at the west end (about 1.0 m high), and a lower flatter part at the southeast end. The southeast end ties into existing grade which consists of a low beach ridge that has been reworked for landfilling. Two pieces of partially buried metal debris (one of which appears to be a culvert) and some wood were noted in the southeastern section of the landfill. No exposed debris was noted in the central portion. Some partially exposed wood, a barrel, cans and metal strapping were observed at the western portion. Scattered surface debris noted in the overall landfill area consists of rusted tin cans, wood, metal strapping, and copper pipe.

Surface cover consists of gravelly sand. The landfill surface is well vegetated and ground squirrel burrows were common throughout. Ground surrounding the landfill has been largely scraped to bedrock; overburden thickness was measured at 0.5 m in the undisturbed ground southeast of the landfill, but typically less than 0.3m in disturbed ground. Depth of debris is estimated to be 2 m in the central section. Grade varies from 10-15% in the most elevated section of the landfill.

No contamination or evidence of contaminant migration was detected. No surface staining was noted, and contaminant levels were all comparable to background levels.

The South Landfill-East was given a score of 55, classifying it as a low potential risk. Contaminant source and pathway components of the evaluation received low scoring due to low quantities of surface debris, no surface contamination and low potential for contaminant migration away from the landfill. The receptor component scored moderately higher because of vegetation density surrounding the landfill area and because of burrowing animals in the vicinity.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the South Landfill-East include the following:

- Removal of surface debris for containerization or disposal in the Non-Hazardous Waste Landfill; and
- Improving the long term stability by regrading the surface of the landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades.

See Drawings 102 and 111 in Appendix A for design details.

5.9.7 South Borrow Landfill

The South Borrow Landfill is located on the west side of the station access road, at the northern tip of the South Borrow Area. Geophysical survey confirmed the presence of buried debris over an area of 1,060 m^2.

In the vicinity of the landfill, the station access road is built on a beach ridge raised about 3 m above the low-lying tundra to the west. The landfill has been created by pushing debris over the side of the ridge and grading over it. Depth of debris is estimated at 1 m based on surrounding grade and depth of refusal. The tundra downgradient of the landfill is quite wet, with lush vegetation and a thick organic mat. Refusal at frozen ground was found to be very shallow in this area because of the organic cover (0.2 m). There is standing water along the toe, particularly at the southwest and northwest corners. Upgradient and along the beach ridge, refusal was encountered at 1 m.

The downgradient toe of the landfill can be defined visually. Along the west tow (the westernmost 1-2 m), vegetation is well established on the landfill surface, as though the existing organic matter was pushed up over debris as it was being placed. The upgradient edge grades into the beach ridge. The majority of the landfill cover has little to no vegetation and cover consists of the coarse granular material derived from the beach ridge. Average grade across the landfill is about 8%, but the edge of the slope (toe) particularly in the northwest corner, is steeper, but stable. Ground squirrel burrows were noted throughout the cover, and there has also been localized burrowing by a bear in the northwest corner.

Debris exposure along the toe is common (estimated as 20-30%), with less exposure (<5%) moving towards the centre and upgradient edge. Barrels (one barrel almost entirely at surface), angle iron, plywood and large timbers, rebar, and pipe were visible.

Concentrations of copper and nickel downgradient of the South Borrow Landfill were elevated above overall site background concentrations. However, the downgradient terrain at this landfill is much more lush and wet compared to other areas on site. A comparison of environmental data from other areas investigated nearby shows similarly elevated levels of copper and nickel. These levels have therefore been considered natural for this particular area on site and not indicative of contaminant migration.

In accordance with the EWG classification and Steering Committee directive, recommendations for remediation of the South Borrow Landfill include the following:

- Removal of surface debris for containerization or disposal in the Non-Hazardous Waste Landfill; and
- Improving the long-term stability by regrading the surface of the landfill with a minimum of 0.75 m of Type 2 granular fill to match existing grades.

See Drawings 103 and 113 in Appendix A for design details.

5.10 Disposal of Site Debris

Nineteen buried debris areas were identified at PIN-2 during the 2004 site investigation. Buried debris areas are generally characterized as areas covering less than 1000 m^2, or as a larger aggregate area with individual lobes all less than 1000 m^2 in size and sufficiently removed from one another such that the lobes would not

be considered as having a collective impact on the surrounding environment. Debris areas at PIN-2 range in size from 10 m^2 to 870 m^2.

Similar to investigation completed at existing landfill areas, soil samples were collected up and down gradient of the debris areas at surface and depth. Surface samples were also collected at the surface of debris areas, targeting stains or surface debris.

Based on information collected during the site investigation, there was no evidence of contaminant migration associated with any of the debris areas at PIN-2. As such, the recommended remedial strategy for these areas will include:

- Removal of any Tier II contaminated soils (if any) and/or regrading of any Tier I or hydrocarbon contaminated soils;
- Removal of surface debris and where possible, partially buried/embedded debris; and
- Regrading of the surface to provide additional stability and promote positive drainage away from the area.

Where surface contamination was detected, there is the potential that excavation of contaminated soil may not be able to proceed without full or partial debris excavation. Specific instances are discussed below.

Table 7 provides a summary of all debris areas.

Table 7: Debris Areas

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate In-Place Volume (m^3)	Comments
1	101	North Airstrip - piece of orange snow fence - - 501225, 7648185N	100	0.5	
2	101	Harding River -single barrel on edge of riverbed: 497973, 7640253N -partially exposed metal debris, including heat exchanger intermixed with riverbed gravel: 497931, 7640349N	14,000	10	Debris located within river bed, difficult access
3	102	Airstrip North - partially buried 2x4: 501789, 7647730N - barrel: 0501634, 7647705N - barrel lid: 0501589,7647886N - barrel sitting at base of beach ridge - 501941, 7648029N - partially exposed runway marker barrel: 0501553, 7647877N - partially exposed marker barrel, rebar, metal strapping, wood: 0501758, 7647861N	80,000	2	
4	102	Airstrip - partially exposed runway marker barrels, misc metal and wood: 503240, 7646577; 503375, 7646602; 503464, 7646514; 503562, 7646440	17,000	3-4	
5	103	North of Harding River Road - 1 barrel: 502156, 7645173	1,000	0.5	
6	103	North Borrow - buried and partially exposed marker barrels: 503844, 7644178	150	0.5	
7	104, 105	Airstrip Landfill - scattered surface debris, including canvas, wood, domestic debris (cutlery, pots, tea pot, broom), guy wire, metal box, metal cable, siding, strapping, rope, nails, cans, aluminum tent pole, glass, webbing, fox trap, fishing line	300,000	5	Most of surface debris concentrated around pond
8	105	Beach POL - scattered and stockpiled debris, including cut sections of POL pipeline, 2 drums, metal brackets, compressed gas cylinder, sheet of plywood, 4x4, metal sign, metal chest with misc. debris inside (water jug, jerry can, 2 pails - one plastic and one metal, shovels, pipe sections) and small antenna tower.	10,000	10	

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate In-Place Volume (m^3)	Comments
9	106	Station West Landfill - partially exposed metal grating, barrels, pipe and heavy duty metal debris - scattered surface debris including tin cans and drum lids.	5,000	3	
10	106, 108	Old Camp Area - scattered surface and partially buried debris, including wood, metal anchor, wired, misc. metallic debris (small pieces), cloth, cans, strapping, bolts, bungs, rope	100,000	2	Scattered surface debris over very large area, most of debris near perimeter of area shown
11	108	Station South - scattered surface debris, including timbers, misc metal and wood, strapping, cans, metal cable, cloth: 502550, 7646451N	32,000	2	
12	108	Tower Debris Area, Debris Area 14 - partially exposed barrels	23,000	2-3	
13	102, 107	Station Old Pallet Line - scattered surface debris, including timbers, burnt oil filters, cloth, metal chain, plywood, 2x6, 2x4, stain in centre: 502579, 7646235N	2,500	1	
14	107	Hangar - 7 drums stockpiled on apron, partially rusted, six have contents, no labels visible, also small loader blade	500	4	Unknown contents
15	107	Station POL East - partially buried drum, metal cable, wood (pallet pieces) and strapping	3,500	1	
16	107	Airstrip South Landfill - partially exposed drums, wood, copper pipe - scattered surface debris including wood, tin cans, copper pipe, soap bottles and jars.	16,000	2	
17	109	Pallet Line West - scattered surface debris, including tin cans, wood, metal siding, rope, wire, pipe, misc. metal	67,000	3	
18	109, 110	Station South Old Pallet Line - scattered wood, metal sign and post, strapping	10,000	0.5	
19	110	Debris Area 9 - partially exposed barrels, wood, braided cables, light-weight cable, wood, metal strapping, an oil filter and hose.	2,000	2	

Site Debris Area	Drawing Reference	Approximate Location, Description, and Type of Debris to be Removed	Arial Extent (m^2)	Approximate In-Place Volume (m^3)	Comments
20	110	East Twin Debris Area - partially exposed debris including drums, metal cable, metal crank arm and handle, miscellaneous metallic equipment, interior fuel tank and a large wooden cable spool.	4,000	3	
21	111	South Landfill, Southwest Debris Area, Debris Areas 7 and 8 - Scattered surface debris including cans, wood, cloth, small drum or paint cans, strapping, metal coil, metal colander, tap assembly, barrel lid and canvas and rebar	33,000	2	
22	112	North Borrow - scattered tin cans, wood	9,000	0.5	
23	112	N side or road to South Borrow, ~130 m from road - scattered tin cans, garbage can cover, partially buried drum in pile pushed up around large boulder	200	1	very well vegetated, ground squirrel burrows throughout
24	112	830 m south of Harding River Road interchange on S side of road to South Borrow - piece of bar sticking out of side of pile, odd tin can at surface	150	1	
25	112	Harding Road South Buried Debris Area - wood, bolts, nails, glass: 501470, 7642968N	2,000	0.5	
26	103, 113	South Borrow - partially exposed metal debris: 503971, 7643714N - scattered cans, wood: 504007, 7643110N, 503850, 7642971N	175,000	0.5	

5.11 Demolition

A complete inventory of existing infrastructure and site debris was prepared during the 2004 site investigation. Infrastructure identified for demolition and investigated in 2004 was based on NWSO infrastructure drawings. Where required, paint and substrate samples were collected to help in classification of some waste items. In conjunction with the waste inventory and analytical results for demolition waste samples, a summary of non-hazardous demolition material volumes has been developed.

Based on estimates of demolition requirements, landfill or debris area excavation, and site surface debris removal requirements for the PIN-2 site, approximately 4,750 m^3 of non-hazardous waste materials will require disposal in the Non-Hazardous Waste Landfill. The estimated volume of hazardous material requiring containerization and off-site disposal is approximately 500 m^3.

Demolition details are provided on Drawings 201-211 in Appendix A.

5.12 Barrel Disposal Requirements

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified by sampling and analyses. Analytical data obtained for the barrel samples at the site will be compared to the criteria included in Table 8. Barrel contents are identified as organic or aqueous and the concentrations of glycols, alcohols, PCBs, chlorine, cadmium, chromium, and lead are determined. Uncontaminated aqueous phases can be disposed of on the land; uncontaminated organic phases can be incinerated; contaminated aqueous material will be scrubbed free of organic material, and contaminated organic material will be disposed of as hazardous material.

Table 8: Barrel Disposal Requirements

Phase	% Glycols or Alcohols	PCB	Cl	Cd	Cr	Pb	Disposal
Organic	-	<2	<1000	<2	<10	<100	Incineration
Organic	-	>2	>1000	>2	>10	>100	ship south
Aqueous	>2%	>2	>1000	>2	>10	>100	ship south
Aqueous	>2%	<2	<1000	<2	<10	<100	Incineration
Aqueous	<2%	-	-	-	-	-	scrub & discard

Note: All concentrations are in mg/L.

5.12.1 Inspection

All barrels will be inspected to address the following items, which will be recorded and used as a guide prior to opening barrels.

- Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous, i.e., radioactive, explosive, corrosive, toxic or flammable;
- Symbols, words or other marks on the barrel that indicate it contains discarded laboratory chemicals, reagents, or other possibly dangerous materials in small volume containers;
- Signs of deterioration or damage such as corrosion, rust or leaks at seams, rims and V-grooves;
- Evidence of spills or discolouration on the top and sides of the barrel; and
- Signs that the barrel is under pressure, such as bulging or swelling.

Any areas around the barrels that show evidence of holes, rust points, or openings will be tested using a Volatile Organic Compound (VOC) instrument prior to movement of the barrels. If the measured VOC levels exceed 20% of the Lower Explosive Limit (LEL), all handling, storage and transportation operations will be conducted in accordance with the appropriate sections of the National Institute for Occupational Safety and Health (NIOSH) guidelines, National Fire Code of Canada, and the TDGA for flammable and combustible materials.

5.12.2 Opening

If the bungs of a barrel can be readily removed, the barrel will be opened slowly, allowing time for any pressure in the barrel to be released before the bungs are fully removed. If the bungs of a barrel cannot be readily moved, or if the inspection suggests that opening of the barrel may present a special hazard, the barrel will be remotely vented to relieve any internal pressure that may be present prior to opening.

Pressurized barrels are extremely hazardous and will be opened with extreme caution. Only non-sparking equipment will be used. All personnel responsible for opening barrels will be provided with appropriate safety equipment and clothing. All barrels will be opened in accordance with the procedures outlined in the Occupational Safety and Health Administration (OSHA) Code of Federal Regulations Title 29, Part 1910, Section 120 (29 CFR 1910.120) Hazardous Waste Operations and Emergency Response (HAZWOPER).

5.12.3 Sampling and Testing of Barrel Contents

The barrels will be numbered and cross-referenced to sample numbers. The following is a summary of the procedures for sampling and testing barrels.

- Each barrel will be sampled using a dedicated drum thief;
- Barrels with less than a 50 mm depth of liquid contents may be combined with other barrels' contents with similar colour and viscosity prior to sampling;
- Barrel contents are to be consolidated in the MPA;
- Any barrel contents consisting of black oil are NOT to be consolidated; and
- Barrel contents inferred to contain only water based on visual observation will be tested to confirm the presence of glycol and/or alcohol.

5.12.4 Disposal of Barrel Contents

Barrels containing rust and sediment may be shredded and placed in the NHW Landfill. Barrel contents consisting of water with glycol and/or alcohol or organic phases, and meeting the criteria listed in Table 10 may be incinerated on-site or packaged for off-site disposal. The contents of barrels containing water and less than 2% glycol or alcohol will be transferred to an oil-water separator. Small volumes may be agitated with oil-absorbent material to remove any organics. Barrel contents with concentrations of parameters in excess of the criteria in Table 10 will be packaged in accordance with the TDGA regulations and disposed of at a licensed off-site disposal facility.

A leachate extraction test will be completed on the solid residual material resulting from the incineration process. The leachate toxicity of the material will be determined in accordance with the TDGA. Materials found to be non-toxic will be buried in the Tier II Soil Disposal Facility. Toxic materials will be packaged and transported off-site for disposal in accordance with TDGA regulations, as required.

Used oil-absorbent material will be tested to determine treatment and disposal requirements. Oil-absorbent material which meets the criteria in Table 8 will be incinerated. If the criteria are not met, the materials will be packaged in accordance with TDGA regulations, as required, and disposed of off-site at a licensed disposal facility.

5.12.5 Cleaning and Disposal of Barrels

All empty barrels will be steam cleaned to remove any residual oil, wax, tar and other residue adhering to the surface. If a residue remains, a detergent cleaning solution will be applied by spray or brush and allowed to soak for 30 minutes. Barrels will be steam cleaned again after detergent application. Solvents will only be used if the detergent does not adequately remove the residue. The solvent rinsate material will be tested to determine disposal requirements. The steam cleaning rinsate may be recycled and will be directed to an oil-water separator. Oily waste residue may be removed by agitation with an oil-absorbent material to remove organic material. The resulting rinsate will be tested to determine if it meets the discharge criteria. If the rinsate does not meet the discharge criteria, it will be packaged in accordance with TDGA regulations and disposed of off-site at a licensed disposal facility. The used oil-absorbent material and/or oil liquid waste will be disposed of as described in Section 5.12.4. All empty barrels will be crushed or shredded prior to disposal in the NHW Landfill.

5.13 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 9.

Table 9: 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 (by separate contract)
Fuel tank bottom sludges Fuels, lubricating oils, alcohols and glycols	Off-site licensed treatment/disposal facility (by separate contract) 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

5.14 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.

5.15 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. These areas are identified on the drawings provided in Appendix A.

5.16 Future Activities

The site was shut-down in the early 1990's, although there is a North Warning System Long-Range Radar site at the same location. There are no current plans to change this land use. The only planned future activity for this site is the landfill monitoring program, which was agreed to in the DND/NTI Cooperation Agreement.

6.0 Description of the Environment

6.1 Climate

PIN-2 is located 18 masl by the Amundsen Gulf. The mean annual precipitation is 166.1 mm, with 93.6 mm received as rain and 68.4 cm as snow. Most moisture falls from July to November. The mean annual temperature is -12.7 C, with mean monthly maximums and minimums of 10.5 C in July and -30 C in January and February. Mean annual wind speed is 17.9 km/hr. Winds are relatively constant throughout the year and predominantly from the northwest, except in February and October, when winds are westerly and southeasterly, respectively.

6.2 Geology

PIN-2 is situated on the Horton Plain, just west of the northwestern portion of the Canadian Shield at the northern limit of the Interior Plains physiographic province. The site is underlain by sedimentary rocks, dolomites, limestones and shale of Paleozoic age. Bedrock is generally shallow, i.e., less than 1 m below ground surface, except where covered by thicker reworked glacial and/or marine deposits. The bedrock outcrops at several locations within the site.

Based on Quanternary Geology of Canada Maps 1702A and 1703A, it appears that the Laurentide Ice Sheet (during the Late Wisconsinan and Holocene periods) covered the site until about 10,500 years ago. Glacial flow was roughly southeast to northwest, as can be seen in the direction of striations. Upon retreat of the ice sheet, sea level rose, while isostatic rebound of the earth's crust began. The result was that the site was inundated until about 5,000 years ago, when the earth's crust had rebounded enough to bring the site back above sea level.

It is likely that during the retreat of the ice sheet, meltwater streams eroded the till and deposited patches, blankets, mounds and ridges of glaciofluvial deposits, mostly gravel and sand. In some areas, the till was completely removed by meltwater and bedrock was exposed, or later, covered by a veneer of the post-glacial sediments. One of the meltwater corridors is identified south of the station area. The corridor is oriented southeast to northwest. It is defined in the present day topography as a shallow flat-bottom channel with numerous small thermokarst lakes.

Marine transgression further reworked the remaining till and glaciofluvial deposits and/or removed them from over much of the project area. The transgression resulted in the formation of so-called stair-stepped topography that consists of beaches and terraces. The following well to poorly defined topographic benches, which mark stages of the marine transgression, can be distinguished within the mapped area between altitudes 1 and 45 m: modern marine beach, raised recent beach, 1st, 2nd and 3rd marine terraces. The terrain units are described below.

Modern marine beach (1-2 masl) forms a narrow linear bench with flat surface presently affected by the coastal processes (waves and ice hummocks). It stretches along the entire PIN-2 coastline. It is composed predominantly of cobbles, gravel and sand in varying proportions.

Raised recent marine beach (3-4 masl) is a transitional terrace-like landform, which has been recently elevated above the backshore zone. Thus, it is practically beyond the wave and ice pressure action. There are numerous raised beach ridges and ice-pressure ridges on the surface composed of cobbles, gravel and sand in varying proportions. The raised marine beach was identified primarily along the northern and western portions of the PIN-2 coastline.

1st marine terrace (5-10 masl) forms a wide, flat bench along the coast of a small bay and further inland in the central portion of the area. The location of the 1st marine terrace is associated with the former meltwater corridor, which is southeast-northwest oriented. The corridor became a sea channel during the recent transgression. It was modified by wave, current and ice action, and eventually, was in filled with the marine sediments. Two soil complexes were identified within the 1st marine terrace: first complex, which consists of coarse-grained soils (cobbles, gravel, and sand in varying proportions), was identified on the east-northeast side of the former meltwater corridor; and the second complex, which consists of finer-grained soils (gravel, sand and silt in varying proportions) underlies the former meltwater corridor and forms a flat bench, relatively poorly drained, located west of the former meltwater corridor. The surface of the 1st marine terrace is well vegetated by sedges, grasses, mosses and lichens.

2nd marine terrace (15-20 masl) forms a distinct topographic bench within Cape Young with the main station located on its flat surface. The terrace within Cape Young consists of coarse-grained deposits (cobbles, gravel and sand in varying proportions) that comprise individual raised beach ridges and their complexes modified by erosion and frost action. Scarce vegetation is found mostly in low-lying areas and in swales between the Harding River valley and the former meltwater channel. This portion of the terrace is composed dominantly of sand. The surface of the terrace is poorly vegetated. Large areas are exposed to wind action, which is altering the terrace landscape. Characteristic topographic features of Aeolian origin, which were identified at some location, include low sand dunes and sand blowouts.

3rd marine terrace (30-40 masl) forms a wedge-shaped bench, a local topographic high, in the south portion of the project area. Harding River dissects the terrace from southeast to northwest forming a relatively steep southwest-facing terrace slope. The following two soil complexes were identified within the 3rd marine terrace: first, coarse-grained soils (cobbles, gravel and sand in varying proportions) and second, finer grained soils (gravel, sand, silt and clay in varying proportions). Areas underlain by soils of the first complex are poorly vegetated, whereas areas underlain by soils of the second complex are characterized by a well-developed vegetative cover. Glacial till deposits may occur in the base of the terrace cross section.

The Harding River valley contains two distinct topographic benches: a floodplain and 1sr fluvial terrace. It is anticipated that these two accumulative landforms of fluvial origin are composed predominantly of sand.

The entire project area is underlain by continuous permafrost with an active layer that thaws during summer. The excavator was rarely able to penetrate into ice-saturated permafrost soils; therefore, visible ice structure and content could not be described in detail. However, ice-wedge polygons, which were identified on the aerial photographs at two poorly drained low-lying areas within the 1st marine terrace, are indicative of ground ice bodies occurring in some areas of the site. Permafrost-related landforms are common. They include frost boils, which are indicative of finer-grained surficial material (fine sand and silt), thermokarst lakes, patterned ground, etc.

6.3 Flora

Two main vegetation communities exist at Cape Young. Dry, upland sites were characterized by 30 to 60% vegetative cover, which was dominated by lichens (*Dryas sp*.), *Salix sp*. and grasses. Poorly drained, low-lying sites east of the station were 70 to 90% covered in vegetation dominated by sedges, mosses and *Salix sp*. Vegetation in the immediate vicinity of the site was minimal and limited to occasional clumps of grasses, *Salix sp*. and lichens. *Senecio congestus* dominated the 50-70% vegetative cover found around the sewage outfall. This plant is normally associated with such sites and in brackish conditions across the Arctic. *Salix sp*. and grasses also occurred at this location.

6.4 Fauna

6.4.1 Land Mammals

Muskoxen (*Ovibos moschatus*) in this region are from the Great Bear North herd, and in this region are generally found in the wet meadows bordering water bodies during the summer and on wind-swept uplands where snow depths are shallow. Cape Young lies approximately 60 km north of the Rae and Richardson Rivers, which has been recognized as an important concentration area of muskox.

Barren-ground caribou (*Rangifer tarandus groenlandicus*) were observed around the site area during operation and the site investigation. Caribou in this region are known to move northward in early spring after wintering primarily within the boreal forest. The animals in this region are likely part of the Bluenose Herd. The calving grounds are located approximately 100 km west.

Polar bears (*Ursus maritimus*) in this area are within Management Zone H, which includes the Beaufort Sea and Amundson Gulf. Bears are known to inhabit the southern Beaufort during freeze-up and move northward with retreating ice floes during summer. Most maternity denning in the western arctic occurs along the west and south coasts of Banks Island and to a lesser degree on the western peninsulas of Victoria Island. Little denning occurs on the mainland coast. Polar bear encounters at this site are likely rare compared to the eastern DEW Line sites.

Other mammals in the area of the site are arctic fox (*Alopex lagopus*), arctic ground squirrels (*Spermophilus parryii*), collared lemming (*Dicrostonyx torquatus kilangmiutak*) and brown lemming (*Lemmus sibiricus*).

6.4.2 Marine Mammals

The Eastern Arctic population of beluga whales (*Delphinapterus leucas*) migrate westward through Lancaster Sound into Parry Channel from Baffin Bay after ice break up in the spring. At this time, most marine mammals concentrate in the main channel of Lancaster Sound with diminished numbers migrating to Barrow Strait, and few or none penetrating into Viscount Melville Sound. The annual migration route leads into the Franklin Strait and around Prince of Wales Island with periodic migration to King William Island. It has been estimated that 10,000 beluga migrate into west Lancaster Sound, Barrow Strait and Prince Regent Inlet each spring and leave in September following a route along the south coast of Devon Island. Preferred summer habitats and areas of major concentrations of beluga are north of the study area, adjacent to Prince of Wales and Somerset Islands.

In the western arctic, the Beaufort Sea supports a significant population of beluga whales (*Delphinapterus leucas*). There is a major summering area for belugas along the Mackenzie River Delta.

Any sightings of belugas in the vicinity of Cape Young would probably represent strays from either the Franklin Strait migration route or possibly from the Beaufort Sea.

Narwhals (*Monodon monoceros*) are primarily found in the Eastern Arctic and have a similar summer migration route at the beluga, although they may enter Lancaster Sound somewhat later in the spring. Population estimates of narwhals entering Lancaster Sound in May are between 20,000 and 30,000. Any sightings of narwhals in the vicinity of Cape Young would most likely represent strays from the Franklin Strait migration route.

Populations of the rare and endangered bowhead whale (*Balaena mysticetus*) occur in waters of both the eastern and western arctic. The whales of the eastern arctic migrate into Lancaster Sound in June and July. It is unlikely to be encountered in the study area, preferring, like the narwhal, the fiords of northern Baffin Island during the summer.

No whales were observed during the site visit; however, there are anecdotal reports that whales have been sighted during mid-summer.

Due to annual ice conditions in the Central Arctic, most marine mammals either do not penetrate into, or migrate from Lancaster Sound by September prior to freeze-up. An exception are the seals which occur year-round in the region although, depending on the species, there are shifts in distribution in relation to preferred ice habitats. The two most common seal species, bearded (*Erignathus barbatus*) and ringed (*Phoca hispida*) seals, extend southward into Queen Maud Gulf. The less common of the two species, the bearded seal, is known to summer around Jenny Lind Island and the Royal Geographical Society Islands. In general, however, on South Victoria Island, 99% of seal sightings comprise of ringed seals and are hunted regularly during spring and summer. Station personnel reported that seals are sighted in early spring at Cape Young.

In contrast to bearded seals which prefer off-shore area of shifting pack-ice, ringed seals are likely to be encountered nearshore, in areas of fast, first-year ice. Ringed seals summer throughout the Central Arctic, including Victoria Strait and the Queen Maud Gulf. Ringed seals are also common throughout the open water areas of Victoria Strait throughout the winter. During and after spring beak-up, large numbers of ringed seals move into coastal bays for pupping and breeding.

6.5 Avifauna

6.5.1 Raptors

The following raptors are known to occur on Victoria Island and have been spotted periodically at Cape Young.

- Peregrine Falcon (*Falco peregrinus tundrius*)
- Snowy Owl (*Nyctea scandiaca*)
- Golden Eagle (*Aquila chrysaetos*)
- Rough-Legged Hawk (*Buteo lagopus*)
- Gyrfalcon (*Falco rusticolus*)

Cape Young is located 100 km north of the Coppermine River, which contains a relatively high density of nesting raptorial species.

6.5.2 Waterfowl

The following waterfowl have been noted at Cape Young.

- Red-throated Loon (*Gavia stellata*)
- Pacific Loon (*Gavia pacifica*)
- Yellow-billed Loon (*Gavia adamsii*)
- Canada Goose (*Branta Canadensis hutchinsii*)
- Common Eider (*Somateria mollissima*)
- King Eider (*Somateria spectabilis*)
- Red-breasted Merganser (*Mergus serrator*)

6.5.3 Other Avifauna

The following shorebirds have been noted at Cape Young.

- Semipalmated Sandpiper (*Calidris pusilla*)

- Lesser Golden Plover (*Pluvialis dominica*)
- Semipalmated Plover (*Charadrius semipalmatus*)
- Lapland Longspur (*Calcarius lapponicus*)
- Snow Bunting (*Plectrophenax nivalis*)
- Horned Lark (*Eremophila alpestris*)
- Glaucous Gull (*Larus hyperboreus*)
- Parasitic Jaeger (*Stercorarius parasiticus*)
- Long-tailed Jaeger (*Stercoarius longicaudus*)

6.6 Fish

The following fish can be found in the Victoria Island area:

- Arctic char (*Salvelinus alpinus*)
- Lake Trout (*Salvelinus namaycush*)
- Least Cisco (*Coregonus sardinella*)
- Arctic Cisco (*Coregonus autumnalis*)
- Lake Whitefish (*Coregonus clupeaformis*)
- Fourhorn Sculpin (*Myoxocephalus quadricornis*)
- Ninespine Stickleback (*Pungitius pungitius*)

Lake trout is the most common species in many inland, freshwater lakes. Arctic char is fished commercially on Victoria Island.

6.7 Heritage Resources

During the course of the archaeological investigations in 1990 and 2004, a significant quantity of archaeological and heritage resources were identified at PIN-2. Information regarding the features identified by the archaeologist was supplemented by a local elder during the visit of NTI representatives concurrent with the 2004 archaeological investigation. The majority of the features identified are located near the coast and are well-removed from past station operations areas and areas needing remedial action. However, there were some features identified in proximity to areas impacted by station operation. These areas are discussed below.

The Airstrip Landfill, due to its location near the coast, had a number of features identified in its proximity. One feature, the gravesite, was identified as a child's grave and is located approximately 150 m away from the Airstrip Landfill Lobe B. this site must be avoided during construction. Additional resources found at the Airstrip Landfill area are considered recent items and are therefore classified as heritage, not archaeological features. These features do not require avoidance during clean up activities.

The East Twin Borrow Area has two noted resource areas. One is location near the northeast corner of the borrow area, consists of tent rings with associated surface debris. The surface debris was determined to be recent and should be included for debris pick up during the clean up; however, the tent rings must remain intact. The other site is located on the east side of the borrow area, approximately 70 m from Debris Area 9, and consists of Palaeo-Eskimo resources such as tent rings, chert flakes and a small string of hearths. This area is considered significant and must be avoided. Avoidance of both areas is not expected to impede borrow development. This area is also sufficiently removed from Debris Area 9 so as not to impede remediation.

The South Borrow Area has two archaeological areas of significance. One area is located on the southern perimeter and contains a hearth and tent rings. The other site is located 30 metres from the trail on the northeast section. White chert pieces, a white chert endscraper, and a suspected hearth have been identified. Both of these areas require avoidance; however, because they are located at the edge of the borrow area, borrow development will be able to proceed while maintaining the required buffer for resource avoidance.

One significant archaeological feature was identified at the Harding River Borrow Area, situated 250 m east of the Harding River and 70 m north of the access road on the river terrace. There were two tent rings identified here which should be avoided during construction. The features are located near the northeast corner of the identified borrow limits but should not place significant restrictions on borrow source development.

7.0 Identification of Environmental Impacts

An environmental assessment of the clean up of PIN-2 was originally completed in 1998 (FEAI 16705). As part of the assessment, potential interactions between the project components and the environment were identified. The focus of the assessment was on the location, sensitivity, seasonal presence and abundance of these components. Through this assessment, Valued Ecosystem Components (VECs) were identified, which include physical, biological, socio-economic, historical or cultural components. An updated assessment is provided in the following sections.

7.1 Valued Ecosystem Components

Valued Ecosystem Components (VECs) are selected as components of the environment that are valued by society and are used as the basis of the environmental assessment. Potential environmental concerns associated with the project were identified through consultations with interested and expert parties, community meetings and previous project experience. The following VECs were identified:

Physical: Protection of soil and water quality, especially related to permafrost conditions and the drinking water supply.

Biological: Habitat quality and availability including feeding and nesting areas for birds, feeding and calving areas for local wildlife, and hunting and fishing in local areas.

Socio-economic: Regional employment opportunities, regional business opportunities, regional training opportunities, and hunting and fishing in local areas.

Archaeological: Archaeological sites identified around the station and beach areas.

7.2 Impact of the Environment on the Project

The implementation of a clean up project in an Arctic environment such as PIN-2 brings unique logistical issues. The potential exists for delays in the clean up associated with bad weather, which may include work stoppage or delays in the transportation to and from the site of personnel with supplies. Conditions related to the Arctic climate, such as ice and frozen ground may also delay clean up activities. clean up activities which are best completed at maximum thaw may be delayed depending on seasonal climate changes.

The Department of National Defence (DND) and Nunavut Tunngavik Incorporated (NTI) signed the DND/NTI Agreement for the Clean Up and Restoration of the DEW Line sites within the Nunavut Settlement Area outlining the environmental and economic provisions. The agreement includes a Minimum Inuit Employment Content (MIEC) and Minimum Inuit Contractor Content (MICC) for the clean up contract and requirements for training, specifically related to the clean up activities. Generally, the contracts for the clean up for the DEW Line sites includes clauses requiring the contractor to maximize Inuit involvement. Inuit involvement in the clean up includes both employment and business (contracting) opportunities.

Typically, labour required for clean up involves heavy equipment operators, general labourers, as well as environmental and engineering specialists. Other opportunities include cleaning and cooking staff and transportation. The main beneficiaries of the economic input from the clean up will primarily affect the nearby communities of Kugluktuk and Cambridge Bay. As the contract for the clean up of PIN-2 has not yet been tendered or awarded, the requirements of the communities are not confirmed. A temporary, self-sufficient construction camp will be established at the site to accommodate the contractor and other personnel.

7.3 Identification of Cumulative Environmental Effects

Cumulative effects have been 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).
- Spacial or temporal crowding.
- Growth induction initiated by the project.

7.3.1 Analysis of Cumulative Environmental Effects

Four steps in the analysis of the cumulative environmental effects of this project include scoping, analysis of effects, mitigation measures and significance.

Scoping: Scoping include the identification of issues of potential concern, VECs that could be affected and boundary setting. The spacial boundaries include impacts over a larger (regional) area including the crossing of jurisdictional boundaries. As the landfills will remain on site, temporal boundaries extend beyond the time frame required to complete the clean up work.

Analysis of Effects: The analysis include and 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: Mitigation measures are identified for project-environment interactions.

Significance: The interactions are defined as having a low (L), moderate (M), or high (H) probability of occurring. The next step is to determine the likelihood of significant adverse effects, taking into account appropriate mitigation measures.

7.3.2 Identification of Mitigation Measures and Residual Impacts

Mitigation measures are identified that result in a reduction or elimination of likely environmental effects, including potential adverse effects, associated with the clean up. Mitigation measures are outlined in the Environmental Protection Plan (EPP) for PIN-2 (see Section 8.0).

Table 10 provides a summary of the VECs, potential impacts, mitigation measures and overall significance.

Table 10: Project Impacts

VEC	Activity	Description of Impact	Proposed Mitigation Measure	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.	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.	M
Soil Quality	Landfill Development/Landfill Closure	If not constructed properly, contaminants may migrate from the new landfills, potentially degrading soil quality. The closure of the existing landfills will reduce the risk of impacting soil quality.	New facilities will not contain hazardous materials. The Tier II facility incorporates a double leachate containment, which includes a synthetic liner and freezeback of permafrost. The landfill cover is graded to promote surface runoff.	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	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.	M
	Camp Operation	The operation of the construction camp will include treatment and disposal of domestic waste, and could negatively impact soil quality.	Hazardous materials will not be disposed of in the camp waste system. All sewage to be disposed of in accordance with Land Use Permit and Water Use License.	M
Water Quality	Landfill Development/Landfill Closure	If not constructed according to the specifications, leachate may be generated and migrate from the	The Tier II facility incorporates leachate containment, which includes a synthetic liner and freezeback of	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		new landfills during the construction/closure, which has the potential to degrade water quality, both surface and active layer water. The development and closure of the landfills has the potential to disrupt drainage at the site and cause siltation of waterways.	permafrost. The landfill cover is 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.	
	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 EPP measures as necessary.	P
	Removal of Debris in MacBeth River	Sediment release and associated sedimentation of ecologically productive aquatic habitat may occur during removal. Potential inadvertent release of harmful substances such as fuels and lubricating oils when completing removal of debris.	Conduct work when river is frozen. Implement other EPP measures as necessary.	M
	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.	M
	Site Grading/Borrow Source Development	Erosion and sedimentation of waterbodies during grading and gravel extraction activities has the	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		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.	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.	M
Terrain	Landfill Development	Excavation is required for the development of new landfills and closure of existing landfills, which has the potential to degrade permafrost.	Minimize the time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	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.	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.	n/a	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.	M
	Contaminated Soil Excavation	The excavation of contaminated soil has the potential to degrade the permafrost.	Minimize the time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	M
	Camp Operation	Movement of contractor's equipment and personnel around the site has the potential to	Regrade and reshape disturbed areas to match existing terrain and drainage paths.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		disturb the tundra.	Use existing roads for movement around the site wherever possible.	
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.	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	P
Terrestrial Habitat	Landfill Development	Loss of habitat may occur as a result of the development of the new landfills in previously undisturbed areas.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	M
	Facility Demolition	The existing facilities may be used by wildlife as habitat (i.e., nests in structures). The demolition of these facilities has the potential to impact availability of habitat.	Inspect facilities prior to demolition for use by wildlife. Do not demolish while birds are nesting. Contact appropriate wildlife officer for additional guidance to ensure disturbance of wildlife is minimized.	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.	M
Aquatic Habitat and Animals	Landfill Closure	The excavation of high risk landfill areas in close proximity to water bodies removes the potential for impact.	During excavation, 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.	P
	Site Regrading/Borrow Source	The extraction of granular material and grading	Prevent siltation by use of berms and/or silt fences.	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
	Development	adjacent to waterbodies has the potential to impact aquatic habitat, and thereby affect aquatic animals, due to sediment entering the water.	Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water are to be stabilized, if required.	
	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.	P/M
Health and Safety	General Clean Up Activities	The excavation of potentially hazardous materials from the landfills, 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 working around heavy equipment to be implemented.	M
	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	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.	M
Land Use	General Clean Up Activities	Clean up activities may disturb traditional land use,	Contact the local hunters and trappers organization	M

VEC	Activity	Description of Impact	Proposed Mitigation Measure	Overall Significance
		i.e., hunting and fishing activities that would occur during the summer months.	to coordinate clean up activities and traditional land use.	
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	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	P

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

8.0 Environmental Protection Plan

The main focus of the project's environmental protection program during the clean up is based on a site specific Environmental Protection Plan (EPP). The requirements outlined in the EPP are the end result of the environmental assessment process and include the mitigative measures designed to reduce or eliminate potential harmful effects. The EPP for PIN-2 is provided in the following sections.

8.1 Scope and Objectives

The EPP 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-2 site, and details related to environmental inspection responsibilities and procedures.

The protection measures described herein are to 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 DCC Contract Coordinator.

8.2 Environmental Inspection

As part of its general overall commitment to a strategy of environmental protection and quality assurance, DND employs dedicated environmental inspection staff to monitor its own compliance with the EPP and all applicable laws, regulations, permits, guidelines and standards. The environmental inspection staff is a part of the DLCU Project Management Office (PMO). The PMO was formed as per the Terms of Reference of the Memorandum of Understanding between the Director General Environment and Defence Construction Canada (DCC). The DND will be represented at the site by the Contract Coordinator, who will report to the DCC Contract Manager. The contractor will maintain regular contact with the environmental inspection/Quality Assurance team. This will include, but is not limited to:

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

8.3 General Environmental Protection Measures

8.3.1 General

The lands associated with the PIN-2 site have distinctive biophysical characteristics associated with Arctic environments. Potential impacts related to the clean up of the site include degradation of the permafrost regime, disturbance of existing vegetation, uncontrolled erosion, point source contamination, disruption of terrestrial and wildlife populations, and human health impacts. The procedures and requirements provided in this section are intended to be protective of these ecosystem components.

8.3.2 Site Operations

The contractor will establish a construction camp on the site, which will be located in an area with minimal vegetative ground cover. The selected location will 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 is not to be impeded and a distance of at least 30 m from the nearest body of water is to be maintained. Ice-rich substrates will be avoided, where possible. Permafrost will be protected by construction of gravel pads, and/or elevation of heated buildings on wooden structures. Areas containing archaeological resources will be avoided.

Vehicle and mobile equipment travel will be restricted at the site to established roads, stream crossings and work pads unless specifically exempted by the DCC Contract Coordinator. Recreational use of vehicles, including all terrain vehicles (ATVs), is not permitted off the existing road network. Overland movement of equipment and vehicles will be minimized where damage to the vegetation or underlying soils may occur. Following heavy rains, vehicle and heavy equipment use outside of road and work pad areas is not permitted until the soil has drained sufficiently to prevent excessive rutting, and until authorized by the DCC Contract Coordinator.

Mobile equipment and vehicle operators are to yield the right-of-way to wildlife where safe to do so. Vehicles will not be operated in a manner that harasses any species of wildlife. Vehicle and equipment servicing is to 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 is to 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 will be used. Drip trays will be provided and ensure that all storage container outlets are properly sealed after use.

8.3.3 Storage and Handling of Fuel and Other Hazardous Substances

Fuel is to be stored in self-dyking, double-walled containers, or 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 will be avoided. Archaeological resources will also be avoided. Smoking is prohibited within 7.5 m of the fuel storage facility. Appropriate signage will be posted around the fuelling facility. Fuel storage facilities will be inspected once per day for the duration of the project and documentation of the inspection will be maintained. Fire-fighting equipment will be made available for immediate access at each fuel storage facility. All barrels containing fuel and other similar materials will 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 will 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 will be available to all personnel. All fuel spills will be dealt with according to the Spill Contingency Plan (see Section 9.0).

Regular inspections are to be conducted of all machinery hydraulic, fuel and cooling systems and any leaks will be repaired immediately. Emergency spill equipment will 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 are to be removed from the site at the conclusion of the clean up.

8.3.4 Surface Water Management

A water use license will be obtained 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 will not exceed 10% of total water body volume. All water hoses will 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*.

8.3.5 Wastewater Management and Monitoring

DLCU construction 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 (Tier II and Non-Hazardous Waste Facilities) 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 assessments, conducted over the last two decades. The criteria for the wastewater are considered conservative and appropriately protective of the arctic environment.

Wastewater may be temporarily stored in existing tanks while awaiting test results, which are designed for disposal, provided that it is not stored over the winter months. The volume of wastewater storage during any one construction season shall not exceed 50% of the total capacity of the tank, and shall not exceed the available treatment capacity during that construction season. The release of all water must conform to the Construction Wastewater Discharge criteria, listed in Table 11. The basis or background for the choice of each criterion is also listed in the table.

Table 11: 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 will be tested each time prior to discharge. Once it is confirmed that the wastewater meets the discharge criteria, it will 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. 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.

8.3.6 Sewage Effluent Monitoring

The sewage lagoon at PIN-2 will 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 12 below for a summary of the effluent discharge criteria, as provided by the Nunavut Water Board. These criteria were provided for other DEW Line sites and have been adopted as the discharge criteria for the PIN-2 site.

Table 12: 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 stamped by a qualified engineer) requires 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 will be completed every 30 days and prior to discharge.

8.3.7 Domestic Waste Management

Kitchen wastes will be temporarily 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 will be disposed of in the existing site landfills unless otherwise specified.

8.3.8 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 will be maintained. Establishment of new roads off-site is subject to the terms of the land use permit and the approval of the DCC Contract Coordinator. Roads will not be sited within 30 m of any ecologically sensitive areas. Ice-rich soils, especially peatlands, are also to be avoided during road construction. The road bed will b prepared with a sufficient thickness of fill to prevent terrain damage. Culverts, if required, will be installed to maintain natural cross-drainage and prevent ponding. Any culverts installed will be removed from the roads and drainage restored at the end of the clean up operations. Access roads will be monitored for signs of erosion and remedial action will be taken where necessary. Dust suppression, if required, will be maintained with water only.

8.3.9 Stream Crossing and Diversion

The contractor is to adhere to all government regulations, licensing requirements/procedures and inspections, regarding the protection of water quality and stream integrity to prevent destruction of spawning areas. Existing stream crossings will 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 will be prevented using the following procedures:

- Activities adjacent to watercourses will be minimized.
- Cofferdams, silt barriers or other suitable barriers will be installed.
- Equipment is not to be operated in waterways.
- Streambeds are not to be used for borrow material.
- Excavated fill, waste materials and debris will not be disposed of in waterways.

It is not anticipated that any new, additional stream crossings will be required during construction.

8.3.10 Borrow Pit and Quarry 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 will be minimized by using existing borrow areas, roads and building pads where feasible. Use of alternative sources is subject to the approval of the DCC Contract Coordinator 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. In consultation with the DCC Contract Coordinator, a 30 m buffer zone will be marked out prior to commencement of gravel quarrying operations. Organic overburden, if present, will be stripped and stockpiled separately for use in restoring the borrow area. Following excavation, the area will be recontoured to restore natural drainage and overburden will be worked into the recontoured borrow area to prevent erosion. Drainage and run-off control will 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 will be controlled in areas adjacent to the borrow pit to minimize the extent of disturbance. Aggregate will be stockpiled on ice-poor, well drained ground such that surface drainage is not impeded. The stockpile will 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 DCC Contract Coordinator is to be notified, the area of the find avoided, and activities in other areas of the pit restricted until further instructions are received.

Development of additional borrow areas that are not identified on site plans will be at the discretion of the DCC Contract Coordinator and shall meet all siting criteria and permit requirements.

8.3.11 Hazardous Waste Material Processing Areas

A hazardous waste material processing area will be developed for the processing of excavated soils and demolition materials. The hazardous waste material processing area will 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 will be minimized to prevent the spread of potentially hazardous material along the roadways.

8.3.12 Contaminated Soils

The locations of contaminated soil are shown on the drawings in Appendix A. Soils exceeding the criteria established for PIN-2 are to be removed. Disturbance to adjacent areas during excavation of contaminated soil will be minimized. Spillage of material during transportation between the excavation site and the stockpile/treatment location is to be avoided and any spillage will be cleaned up to the satisfaction of the DCC Contract Coordinator. Following excavation, of contaminated soils, equipment will be decontaminated. All workers will 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, as per Part 13 of the DND/NTI Cooperation Agreement – Environmental Provisions.

8.3.13 Landfill Closure and Development

The landfills will be covered with gravel to provide a minimum cover thickness as indicated on the drawings. The landfill areas will be regraded and restored to natural drainage patterns and topography. Geosynthetic liners will be installed at the Tier II Soil Disposal Facility. High risk landfill lobes are being completely excavated and backfilled with granular material. Two new landfills are being constructed, the Non-Hazardous Waste Landfill for the disposal of non-hazardous wastes and debris generated during the clean up of the site and the Tier II Soil Disposal Facility for the disposal of Tier II contaminated soils.

Drainage controls such as diversion ditches and sediment filters will be provided, as required, to prevent runoff from reaching water bodies during closure, remediation and construction of landfills. Monitoring equipment will be installed as shown on the drawings, or as directed by the DCC Contract Coordinator.

8.3.14 Disposal of Site Debris

Site debris will be collected, sorted in to hazardous and non-hazardous materials and disposed of accordingly. The contents of any intact barrels will be tested and disposed of as described in Section 5.12. Workers are to wear appropriate protective clothing when handling potentially hazardous waste material. Off-road activity will be minimized during collection of site debris. The spill contingency plan (Section 9.0) is to be followed in the event of a spill or other emergency.

8.3.15 Demolition of Buildings and Structures

Demolition, sorting, and disposal of hazardous and non-hazardous waste will be carried out in accordance with Sections 5.8, 5.9 and 5.11. All residual debris is to be removed from the site down to grade. Structures will be demolished to the top of the concrete foundation level. Gravel pads and other foundations will be regraded to restore natural drainage patterns and to match adjacent topography.

8.3.16 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 EPP requirements when scheduling arrangements are made or at other appropriate periods prior to the arrival of the aircraft on site.

8.3.17 Handling of Dangerous Goods and Hazardous Waste Materials

Treatment, disposal, and storage of hazardous and non-hazardous waste materials will be in accordance with Section 5.13. Each storage area will be separated from the nearest water body by a 30 m buffer zone.

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 should 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 DND'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.

Notification: The DLCU Environmental Officer will be notified twenty (20) days prior to shipment of any dangerous goods or hazardous materials.

8.3.18 Explosives

The use of explosives is potentially dangerous to human and animal health. If required, the following procedures will 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.
- Blasting is not to be conducted in the vicinity of wildlife populations.
- Blasting is to be restricted to above water and a minimum of 100 m from fish populations.

8.3.19 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 will be stabilized. Gravel access roads required for operation and maintenance may remain. All disturbed areas will be graded to match natural drainage patterns.

8.4 Protection Measures for Valued Environmental Components

This section describes the required protection measures for the valued environmental components identified at the PIN-2 site. These protection measures must be complied with.

8.4.1 Human Health and Safety

Potential hazards to human health and safety are present at the PIN-2 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 will 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 will 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, is not 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.

Personal firearms are not permitted in the construction camp. However, the contractors' site superintendent will keep sufficient weapons (including one for backup or replacement) for defence in the event of a polar bear encounter that threatens human safety. When not in use, all weapons will be locked up as per all applicable legislation and access controlled by the site superintendent or the designate.

8.4.2 Local Economy and Contact with Local Residents

Employment and local business opportunities in the north will be maximized as much as possible. Communication with the local communities of Kugluktuk, Paulatuk and Cambridge Bay will be provided to keep them informed of contracts and significant project developments for which local businesses and individuals may be qualified to work. Regular briefing meetings will be scheduled with all camp personnel to discuss and explain camp rules.

8.4.3 Aesthetic Value

It is anticipated that the clean up activities will have an overall positive effect on the aesthetic value of the PIN-2 site in that redundant buildings and 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.

8.4.4 Surface Water and Fish Habitat

The following applies to work adjacent to waterways:

- Prevent siltation of water bodies 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.
- Avoid areas of known fish congregations during culvert removal and work adjacent to waterways.
- Do not cross streams at or immediately upstream of locations containing fish populations.
- Where possible, conduct in-stream work during low-flow periods.
- 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.

8.4.5 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 removed 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 will be minimized by restricting vehicle and heavy equipment traffic to existing roads and designated work areas unless approved by the DCC Contract Coordinator. Activity in areas adjacent to work areas will also be minimized. Vehicles or heavy equipment will 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 will be installed along access roads, where required. The following measures will be implemented during the site clean up operations to minimize disruption of permafrost:

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

8.4.6 Terrestrial Wildlife

There is always concern over human/wildlife contact at DEW Line 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 will be implemented to prevent human/wildlife conflicts:

- Employ a dedicated wildlife monitor(s) at all times.
- All on-site personnel will be required to be familiar with the contents of “Safety in Bear Country”.
- Wildlife will 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.
- In the event of an unanticipated or unavoidable contact with wildlife, act in accordance with the wildlife encounter contingency plan (Section 8.5). Familiarize all individuals working at or visiting the site with this plan as part of their work site orientation.
- 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 500 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.
- 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.

8.4.7 Avifauna

Disruption of avifauna during the nesting period can result in reproductive failure. For this reason, populations of nesting birds should be avoided during this period. Impacts on these species can be minimized by scheduling disruptive activities outside of the nesting period and by discouraging nesting at work areas.

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 lake September. Work will be scheduled to minimize impacts on these species.

8.4.8 Heritage Resources

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. Many of the sites have been disturbed by previous DEW Line activities. 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 DCC Contract Coordinator.
- Do not disturb the site and cease work in that area until appropriate authorities with the Department of Culture, Language, Elders and Youth (CLEY) are notified.
- 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.

8.5 Wildlife Encounter Contingency Plan

Polar bears are a potential hazard to workers at all times. The situation can be aggravated by the presence of any substance the bear perceives to be food. Dedicated wildlife monitors should be employed at all times during the clean up operations.

All staff should be familiar with bear deterrent procedures and at least one designated staff member should be competent with the camp firearms. Staff should also be familiar with the GNWT "Safety in Bear Country" manual and a reference copy should be available at the site office.

- Operators of vehicles and equipment shall make every effort to avoid encounters with large mammals. Congregations of animals near food or garbage are a potential problem that can be overcome by proper disposal of food wastes. Concentrations of scavenging animals such as foxes and bears increase the risk of diseases and danger to personnel. The following precautions and actions are to be taken:
- The killing of wildlife for any reasons at variance with the Wildlife Act and Regulations is an offence. Coordinate procedures for handling wildlife problems and incidents with the regional Government og Nunavut (GN) wildlife office.
- Advise personnel to maintain watch for bears and other wildlife and immediately report any sightings to the DCC Contract Coordinator. Immediately notify all personnel of the sightings. If the threat of attack is considered significant, assign a full time wildlife monitor to the specific areas of activities at risk.
- Use vehicles, noisemakers and, if necessary, a firearm to frighten the animal away from the site.
- Shoot the animal only if it returns repeatedly, refuses to leave or directly threatens human safety. Killing is considered a last resort. Contact the appropriate wildlife officer and alert them to the problem, if possible. If an animal is to be shot, assign the task to a person familiar and competent with the camp firearm. Wounded or otherwise aggravated animals can be extremely dangerous.
- Report the death of a bear to the DCC Contract Coordinator and the appropriate GN wildlife officer who will issue instructions as to the disposal of the carcass and the formal reporting procedures to be followed.
- Due to the possibility of rabies, shoot any animal that bites a human and retain the carcass intact pending instruction from the appropriate wildlife officer. If possible, notify the wildlife officer before any drastic action is taken. Seek medical advice from the appropriate medical facility for treatment of animal inflicted wounds.

8.6 Heritage Resource Contingency Plan

All archaeological sites at PIN-2 must be avoided during clean up activities. Unrecorded archaeological sites containing such remains as habitation structures, hunting blinds, food caches and graves, and objects such as tools, utensils and butchered animal bone may be inadvertently discovered and disturbed during clean up activities. All site personnel are prohibited from knowingly disturbing any archaeological or other heritage site or collecting any artifacts. Removing artifacts is a criminal offense. In the event of finding heritage resources:

- Cease work in the area immediately, do not remove any artifacts or other associated objects from the site unless their integrity is threatened in any way.
- Mark the site's visible boundaries and avoid the area during clean up activities.

- Report the discovery of the site immediately to the DCC Contract Coordinator and the Department of CLEY by phone or fax and comply with any site protection instruction issued. Do not engage in any excavation activities.
- Prepare reports of any discovery for the respective regulatory authority and the DCC PMO indicating:
- The identity of the person making the discovery.
    - The nature of the material.
    - The nature of the activity resulting in the discovery.
    - The location of the find including a description of the site location, topography, landmarks, etc.
    - A description of the archaeological site including size, features or details visible, supplemented by sketches or photographs.
    - Protection measures instituted.
    - The present location of any heritage removed for safe-keeping.
    - Extenuating circumstances.
- In the event of a discovery of human remains:
    - Advise the DCC PMO of the discovery and they will contact the nearest detachment of the RCMP. The RCMP will make the decision as to whether the territorial coroner or archaeological department should be contacted.
    - Halt all activities around the area of the discovery. Until determine otherwise, the remains should be treated as evidence in a criminal investigation. If the remains are found in the bucket of heavy equipment, the bucket should not be emptied, as physical evidence may be destroyed.
    - Secure the area and designate it as out of bounds to all personnel. Depending on the weather conditions, the human remains should be provided with non-intrusive protection such as a cloth or canvas tarp (non-plastic preferred).
    - Prepare a report, as described in the previous section.

9.0 Spill Contingency Plan

The Spill Contingency Plan (SCP) was prepared for the PIN-2, Cape Young clean up team consisting of members from the clean up contractor (TBD), Defence Construction Canada, Environmental Sciences Group, AECOM, and EBA Engineering Consultants Ltd. The SCP is effective as of January 1, 2009 (exact start date of clean up TBD in 2009), and will be available as a stand-alone document to all team members and will also be posted on-site in the camp.

The clean up is being conducted as part of the DEW Line Clean Up Project, as represented by the Department of National Defence and Defence Construction Canada. To request additional information, or additional copies of the SCP, please contact:

Douglas Craig, M.Sc.
Environmental Officer – DEW Line Clean Up Project
Defence Construction Canada
Constitution Square, Suite 1720
350 Albert Street
Ottawa, ON K1A 0K3

9.1 Introduction

The following contingency plan presents the prescribed course of action to be taken in the case of unanticipated spill events during the clean up of the PIN-2 site. The plans will enable persons in a particular situation to maximize the effectiveness of the environmental protection response and meet all regulatory requirements for reporting to the appropriate authorities.

9.1.1 Scope and Purpose

This plan applies to all activities and facilities pertaining to the construction activities at the PIN-2 site:

The purpose of the plan is to:

- Provide a clear statement of the procedures to be followed in response to all spills;
- Minimize the potential environmental impact of spills by establishing pre-determined action plans;
- Establish a state of preparedness for personnel through a Spill Response Training Program;
- Protect the health and ensure the safety of the personnel involved in the Spill Response activities;
- Provide a reporting network for spills;
- Ensure site restoration through appropriate remedial activities;
- Identify the roles and responsibilities of all parties involved in the Spill Response activities; and
- Identify sufficient personnel, materials and equipment needed to make an adequate response to a spill.

9.2 Site Information

It is estimated that the camp operation will require a combined total of approximately 350,000 litres of diesel and 20,000 litres of gasoline. Fuel is stored in double-walled tanks in a location situated a minimum of 100 metres from any water body or drainage course. Fuel is provided by the contractor.

Spill kits will be located at the fuel storage/handling area operated by the camp. It is anticipated that the camp, and all associated facilities including spill response equipment will be located at the camp area.

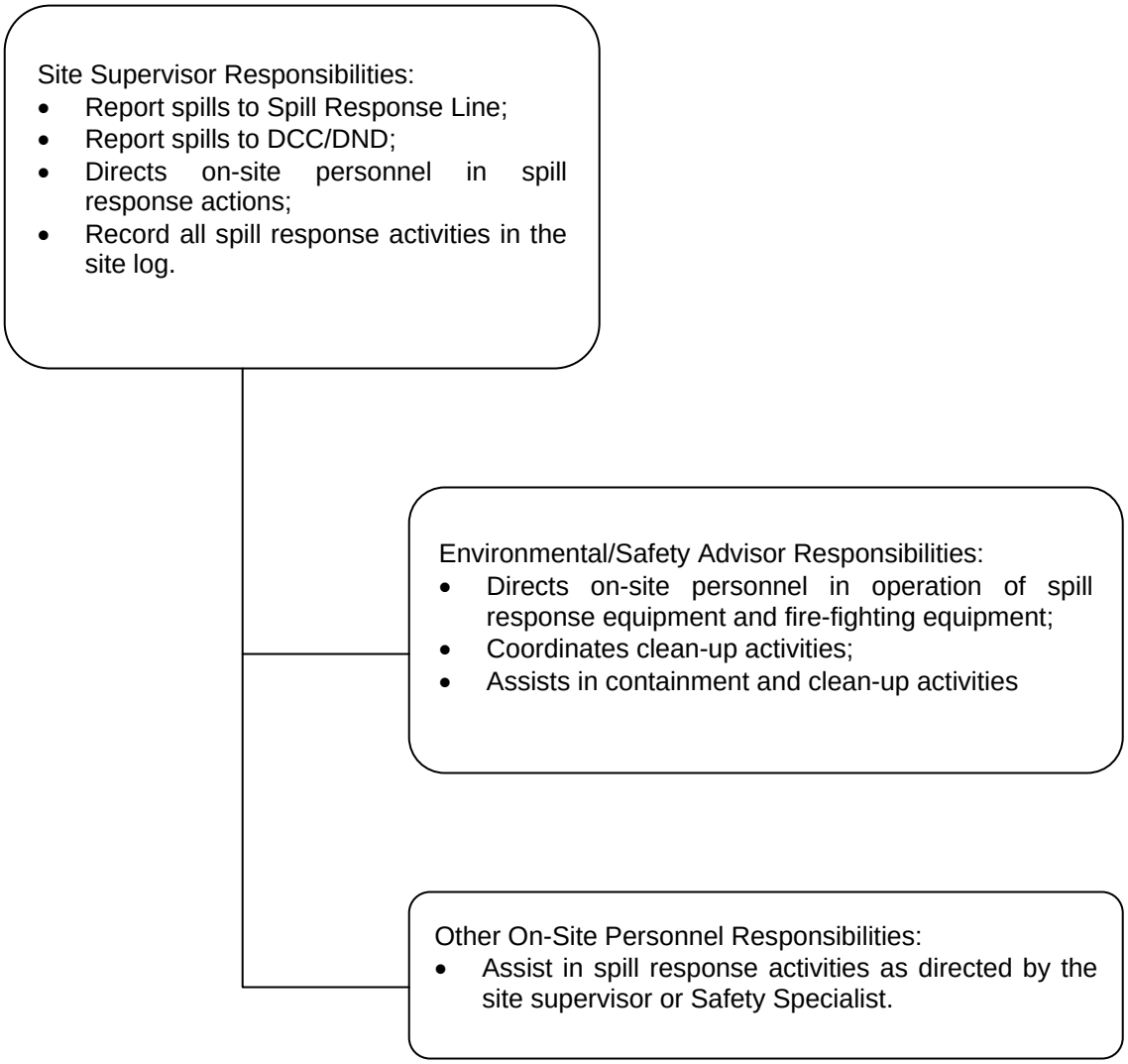
9.3 Response Organization

9.3.1 Roles and Responsibilities

The contractor and all sub-contractors will be involved in spill response actions in the event of a spill during the construction activities at PIN-2. Their roles and responsibilities are described as follows:

- Ensure the response crew members are appropriately trained.
- Practise spill prevention by performing regular maintenance on all fuel systems and by using proper methods for handling of fuel products.
- Provide personnel, materials, and equipment necessary for adequate response to fuel and hazardous material spills.
- Establish communications and verbally report all spills to the DCC Contract Coordinator as soon as practical.
- Isolate and eliminate all ignition sources.
- Ensure safety and security at the spill site.
- Stop or reduce discharge, if it is safe to do so.
- Make every effort to contain the spill by dyking with earth or other barriers on land and containment booms on water.
- Assess potential for fuel/chemical recovery.
- Deploy on-site crews to mobilize pumps, empty 200 litre barrels, hand tools and absorbents to the spill site.
- Hire additional assistance, if required, from northern residents, local communities, and commercial spill response firms.
- If required, request assistance from the DND (through the DCC Contract Coordinator) and the Canadian Coast Guard.
- Follow all guidelines and regulations for disposal of spilled materials, associated debris, contaminated soil and water as established by appropriate government agencies.
- Assess potential terrain and wildlife disturbance, erosion and archaeological site disturbance in any areas to be affected by clean up operations and contact relevant authorities.
- Document all events/actions.
- Report the spill to the Spill Report Line and follow up with a written spill report. This report shall summarize the initial report information; confirmation of spill volume; actions taken; future remediation/monitoring requirements; and a sketch map and/or photographs of the spill area.
- For spills on water, immediately mobilize additional containment and clean up equipment in consultation with Environment Canada, and Fisheries and Oceans Canada if on-site equipment is inadequate. Close isolation valves to stop fuel flow, if required. Deploy light-weight booms and oil absorbent materials to protect environmental resources along the coastline, as applicable. Track the progress of the spill, if of unknown origin.

Figure 1: Emergency Response Team Organization



Telephone, facsimile machines and e-mail are provided to on-site personnel to maintain communications with off-site parties. All on-site personnel are provided with two-way radios for all intra-site communications. Table 13 provides all other contact numbers. NOTE: The telephone and facsimile numbers and the e-mail addresses for the clean up contractor are not available at this time as the contract has yet to be awarded.

Table 13: Spill Contingency Plan - Contact List

Resource	Location	Phone No.
24 Hour Spill Line	NWT/Nunavut	867-920-8130
Environment Canada	24 Hour Emergency Pager	867-766-3737
Government of Nunavut – Environmental Protection	Iqaluit	867-975-5907
Indian and Northern Affairs Canada – Water Resources Inspector	Nunavut Regional Office	867-975-4550
Indian and Northern Affairs Canada – Land Administration Minister	Nunavut Regional Office	867-975-4280
Department of Fisheries and Oceans	Nunavut Regional Office	867-975-8000
Defence Construction Canada (representatives for the Department of National Defence)	Environmental Officer – Douglas Craig	613-998-7288
	Project Manager –Ret. LCol. David Eagles	613-998-9523

9.4 Reporting Procedures

When reporting a spill to the 24 Hour Spill Report Line and completing the Nunavut Spill Report Form, the following information shall be included:

- Date and time of the spill;
- Location of the spill and direction the spill may be moving;
- Name and phone number of a contact person close to the location of the spill;
- Type of contaminant spilled and quantity spilled;
- Cause of the spill;
- Whether the spill is continuing or has stopped;
- Description of the existing containment;
- Action taken to contain, recover, clean up and dispose of spilled material;
- Name, address and phone number of the person reporting the spill; and
- Name of owner or person in charge, management or control of the contaminants at the time of the spill.

The spill report is to be submitted to the spill report line and the INAC Water Resources Officer no later than 30 days after initially reporting the spill to the spill report line. A copy of the NU Spill Report Form is attached. The contact list is provided in Table 13 in Section 9.3.1.

9.5 Action Plan

The following substances could potentially be spilled at the PIN-2 site:

- Diesel fuel
- Gasoline
- Lubricating oils;
- Solvents;

- Alcohols and glycols;
- PCB containing liquids; and
- Heavy metal containing liquids.

9.6 Initial Action

In the event of a spill, protection of human health and safety is paramount. Contamination of personnel involved in a clean up is a real possibility, as is contamination of the surrounding workplace and environment.

The individual discovering a spill shall:

- Warn the people in the immediate vicinity and evacuate if necessary.
- Isolate or remove any ignition sources.
- Identify the spilled material, if possible, and take all safety precautions before approaching it.
- Locate the source of the spill.
- Attempt to stop the leakage and contain the spill, if safe to do so.
- Assess the likely size, extent and condition of the spill.
- Report to the DCC Contract Coordinator the spill location, type of material, volume and extent, status of spill (direction of movement), and prevailing meteorological conditions.
- In the event of a shoreline spill, provide information about the beach location, contaminated area, beach characteristics, and presence of wildlife and archaeological sites that may be threatened.

Once the DCC Contract Coordinator has been contacted and arrives at the spill site, the following actions are to be taken:

- Assess the severity of the spill via direct observation and/or information from communications.
- Deploy equipment and personnel to initiate containment and clean up.
- Prepare the Government of the Northwest Territories Spill Report Form.
- Notify all other pertinent parties, including the DND and other government agencies.

Figure 2 provides the initial response actions to be taken in the event of a spill, and Figures 3 and 4 provide the actions to be taken in the event of a fuel spill on land and on water, respectively.

Figure 2: Initial Response Actions

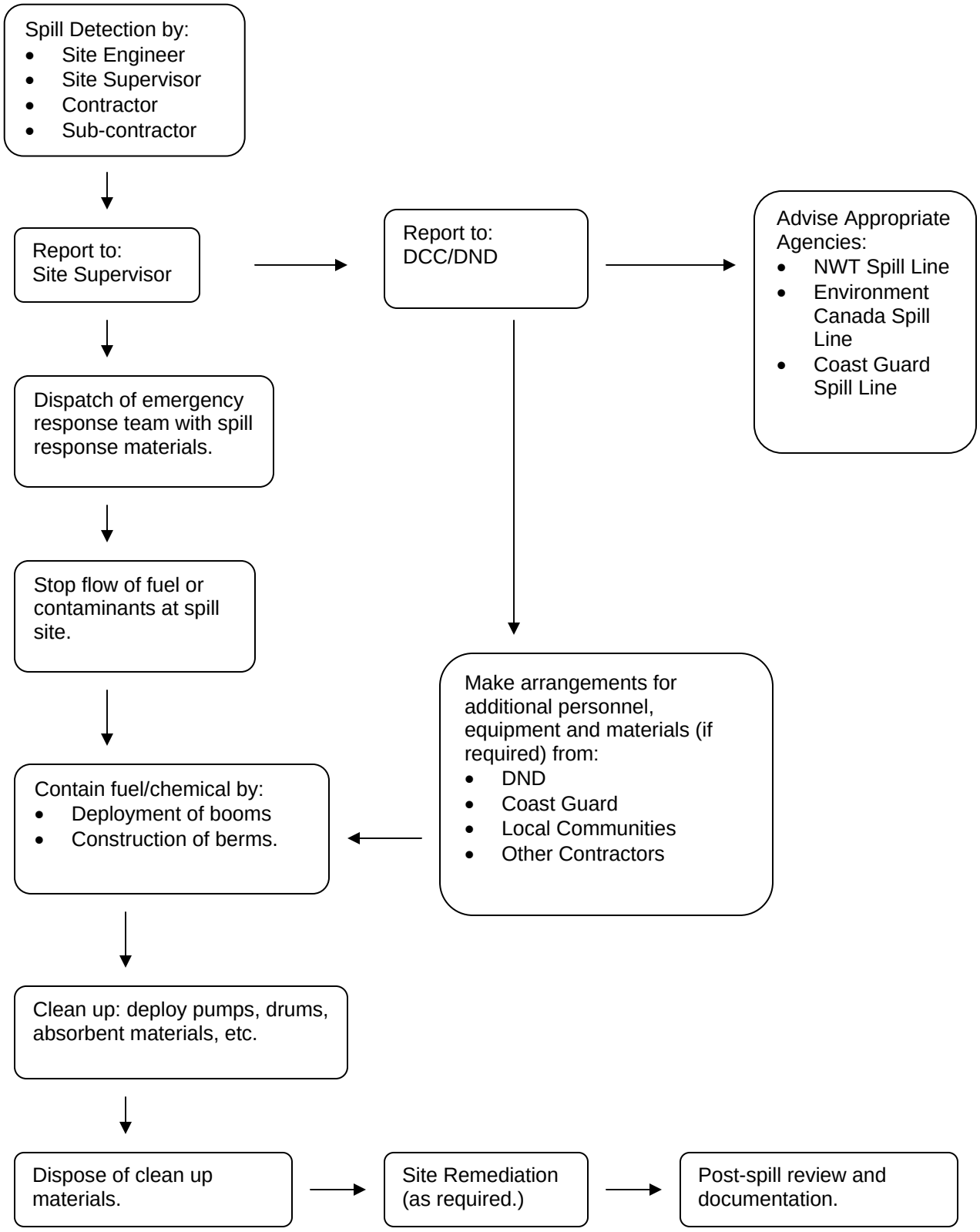


Figure 3: Procedures for Land Spill Response

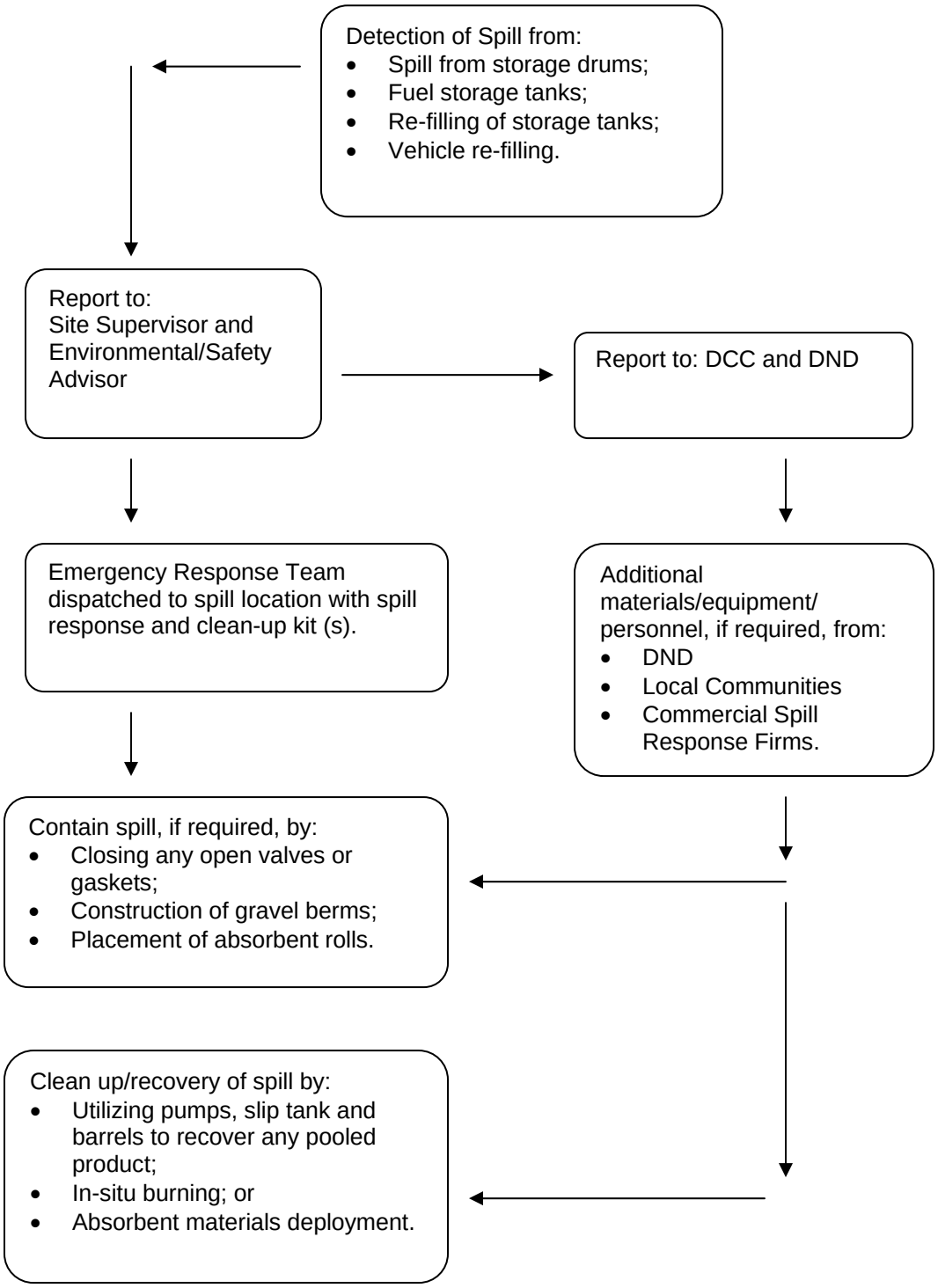
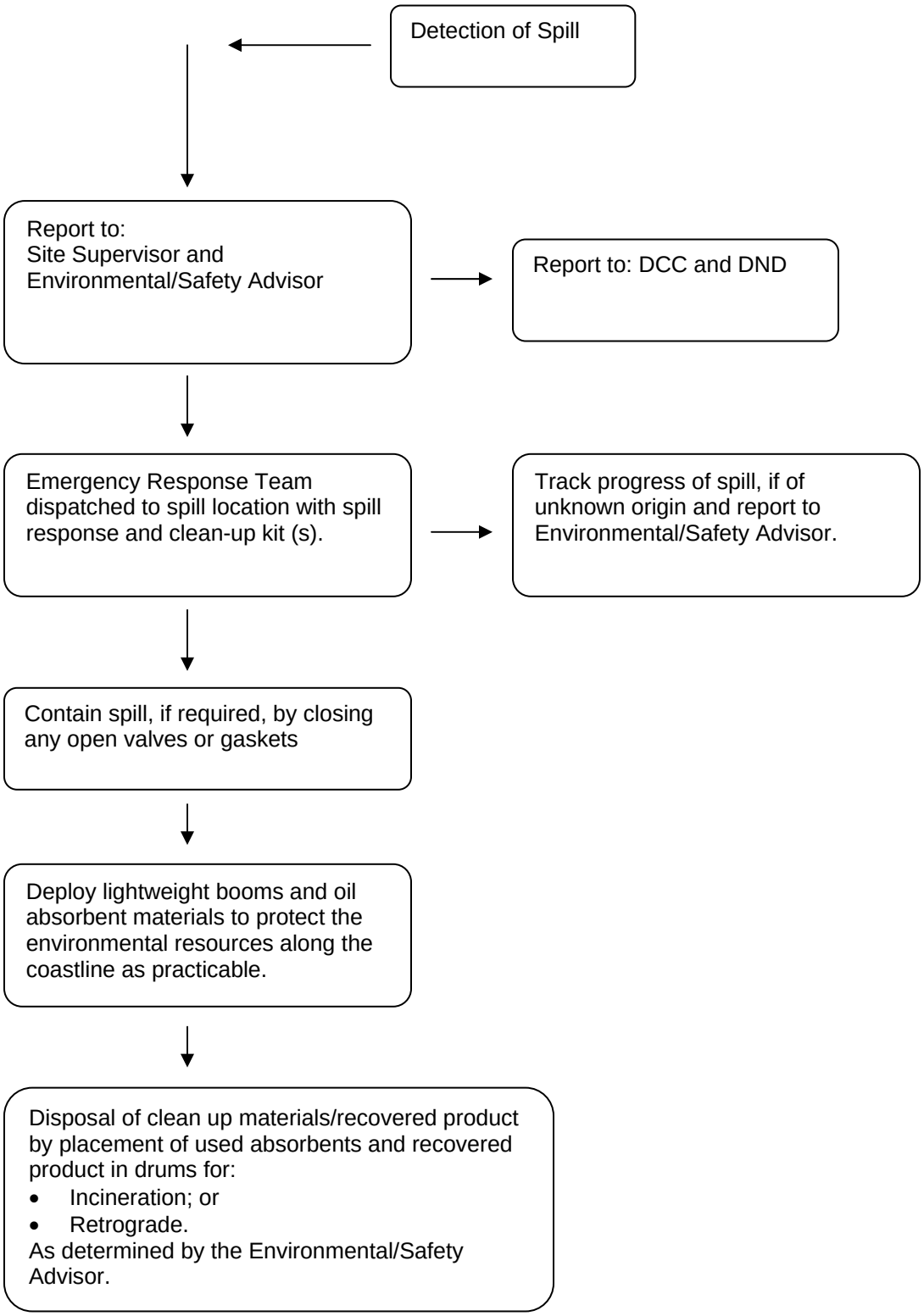


Figure 4: Procedures for Marine Spill Response



9.6.1 General Procedures

The environmental protection measures outlined in the following sections are to be taken by all workers on-site to reduce the chance of environmental impairment due to a spill, release or other incident. The following general clean up procedures shall apply for all spill areas:

- Wear protective clothing as required for handling spills.
- Contain spills on soil or rock by construction of earthen dykes using available material. If soil is not available, place sorbent material or a boom in the path of the spill. As the sorbent barrier becomes saturated, continually replace it. Fuel or other liquids lying in pools, trenches or in specially constructed troughs are to be removed with pumps, buckets or skimmers.
- If the ground is snow-covered, create snow dykes and line with a chemically compatible liner for containment and recovery of liquid.
- For fuels on water, deploy containment booms and recover as much fuel as possible with a work boat and skimmer if the area has less than 1/10 ice cover. If the area is ice infested, burn any fuel spills using igniters.
- Apply sorbents if necessary.
- Assess potential for disturbance of wildlife, fish and archaeological sites by spill or clean up operations and notify the relevant authorities.
- Notify environmental authorities to discuss disposal and clean up options.
- Conduct required clean up operations.
- Assess and appropriately treat any areas disturbed by clean up activities.
- Ensure the site has been completely restored and leave the site only when all work is finalized.

9.6.2 Fuel Storage Areas

In order to prevent spill or accidents at fuel storage areas, the following procedures apply:

- Avoid sites that slope towards waterways or other environmentally sensitive areas, exhibit ponding or flooding, have high groundwater tables, and/or excessive seepage or ice-rich (thaw sensitive) soils.
- Avoid archaeological resources.
- Conduct fuelling and equipment lubrication in a manner that avoids spillage of fuels, oils, greases and coolants. When refuelling equipment, operators are to use leak-free containers, reinforced rip and puncture proof hoses and nozzles, and drip trays. Operators are to be in attendance for the duration of the refuelling operation and are to ensure that all storage container outlets are properly sealed after use.
- Store fuel in self-dyking containers, or position over an impervious liner and surround by an impervious dyke of sufficient height to contain not less than 110% of the capacity of the tank(s).
- Smoking is prohibited within 7.5 metres of the fuel storage facility. Provide appropriate signage.
- Inspect fuel storage facilities at least once each week for the duration of the project. Fire-fighting equipment will be made available for immediate access at each and every fuel storage facility.
- Store all barrels containing fuel and/or other hazardous materials in an elevated position either on their side with the bungs facing the 9 and 3 o'clock position or on pallets, upright, banded and encased in overpack containers.
- All barrels shall be individually identified. The label is to be to industry standards and should provide all information necessary for health and safety, and environmental purposes. Material Safety Data Sheets for all materials maintained in the construction camp will be available for all personnel.

- Treat all waste petroleum products, including used oil filters, as hazardous material and handle and dispose as per the requirements specified in the appropriate regulations.
- Conduct regular inspections of all machinery hydraulic, fuel and cooling systems. Repair leaks immediately.
- Pre-assemble and maintain emergency spill response equipment including at least two fuel pumps, empty 200 litre barrels and absorbent material sufficient to clean up a 1000 litre spill at all permanent fuel storage sites.
- Remove all barrels, redundant fuel storage sites and associated materials and equipment from the site at the conclusion of the work.

9.6.3 Hazardous Material Storage Areas

Hazardous waste materials are wastes or 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 greater than 50 ppm. The hazardous material storage areas will be managed as outlined below:

- Hazardous waste materials may be encountered during sorting of site and demolition debris and during the excavation of the landfills. Collect and sort hazardous materials using equipment suitable for the task.
- Locate the hazardous material processing area a minimum of 100 metres from the nearest archaeological site or water body, on ice poor, well drained soil, and as close to the location of work as possible.
- Control movement of vehicles and equipment between the hazardous materials processing area and work site to prevent the spread of potentially hazardous material along roadways.
- Store hazardous materials so that each storage area is separated from the nearest water body by a 30 metre buffer zone.
- The TDGA and the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* govern the packaging and shipment of hazardous goods within Canada. If shipping out of Canada, Canadian regulations and the regulations of the destination country both apply. Requirements of the IMDGC must be addressed in international waters (i.e., near Greenland).
- Any material classified as hazardous by the TDGA must be accompanied by the appropriate TDGA shipping documents. The documents are to state 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.
- Package all hazardous material in accordance with the TDGA regulations.

NOTE: MSDS and other information on hazardous materials are to be provided by the contractor once the clean up activities begin.

9.7 Potential Safety Hazards

The most significant potential safety hazard related to a fuel spill at the PIN-2 site is the possible soil and water contamination from the spill. The fuel storage area is located away from waterbodies and watercourses to avoid this hazard. Although soil contamination is a real potential hazard, the likelihood is small, spill volumes are small, and finally, any soils contaminated by a potential fuel spill can be cleaned up as part of the construction/clean up of the site.

9.8 Environmental Mapping

The drawings in Appendix A show the overall site plan and the project layout, which identify the locations of site facilities and the work areas. Once the camp is established, the locations of all spill response equipment can be noted and provided to on-site personnel.

Work areas, waterbodies, topography, etc., are also shown on the drawings.

9.9 Resource Inventory

The following equipment is typically found on-site during a clean up program. The exact type of equipment found at the PIN-2 site may vary slightly.

- Pick-up trucks
- Fuel truck
- Excavators
- Bulldozers
- Loaders
- Rock trucks and haul units
- Compaction equipment
- Large spill kits
- Small spill kits
- Generators
- Screening plant
- Crushing plant

All equipment is generally stored at the construction camp/storage area where the camp personnel are stationed. Some equipment may be stored in the area in which the equipment is being used. All vehicles are to be equipped with absorbent materials, drip trays, shovels and disposal bags.

9.10 Training and Exercises

The spill response training program will provide instruction in all aspects of spill response stated in the plan for all on-site personnel. Spill response training will include the following subjects:

- Spill awareness and prevention;
- Methods of detection;
- Storage and distribution systems;
- Storage of products on-site;
- Types of spills and seasonal considerations;
- Reporting procedures and initial responses;
- Spill response kit familiarization;
- Clean up and site remediation methods;
- Occupational health and safety; and
- Post spill review process and documentation.

NOTE: Spill response training is provided by the contractor.

10.0 Abandonment and Decommissioning Plan

The contractor is required to complete the clean up and remediate all of the areas in which their activities took place, as described in this Project Description. Following completion of the clean up activities, all vehicles and equipment, remaining fuel, supplies and construction camp are to be removed from the site by the contractor, which typically coincides with the annual sea-lift.

The following sections provide a summary of the closure activities that will occur at the completion of the clean up at the PIN-2 site.

Contractor Demobilization: Contractor demobilization includes the dismantling and removal from the site of all vehicles and equipment, remaining fuel, supplies and construction camp, clean up of the site, and transportation of labour from the site. Upon removal of the construction camp, the contractor is to grade the area to match the surrounding terrain and to ensure positive drainage. Grading is also done at the sewage lagoon and borrow areas. Existing roads are left as-is.

Demolition: Upon the completion of the demolition work, the contractor is to remove any remaining debris and leave the work site clean. Building sites and all areas affected by demolition work are graded. The areas surrounding remaining concrete and timber foundations are reshaped so that the top of the gravel is flush with the top of the foundation. Any voids or holes in the surface of the foundation are filled with gravel.

Contaminated Soil Excavation: In areas of contaminated soil excavation, the excavations are filled with granular material, compacted and graded to match the existing ground surface.

Landfarm Closure: At the conclusion of landfarm operations, additional granular material is placed to provide a compacted cover. The surface area is graded to a minimum slope of 2-4% to promote surface water run-off. Groundwater wells installed around the perimeter of the landfarm are decommissioned, including backfill with grout.

Non-Hazardous Waste Landfill: A final lift of granular material will be placed, compacted and the surface graded to avoid water ponding and minimize infiltration at the completion of landfill operations. Following completion of the landfill closure, groundwater monitoring wells are installed to facilitate monitoring of the landfill performance.

Tier II Soil Disposal Facility: Placement and compaction of the final cover of the landfill also includes grading to promote drainage away from the landfill. Following closure of the Tier II Soil Disposal Facility, groundwater monitoring wells and thermistor strings are installed to facilitate monitoring of the facility's performance.

11.0 Information Sources

ACIA, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge University Press, 2004.

Canadian Environmental Assessment Agency, *Addressing Cumulative Environmental Effects*. Minister of Supply and Services, 1994.

Canadian Environmental Assessment Agency, *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects*. Minister of Supply and Services, 1994.

Canadian Environmental Assessment Agency, *Responsible Authorities Guide*. Minister of Supply and Services, 1992

Canadian Environmental Assessment Agency. *Incorporating Climate Change Considerations in Environmental Assessment.* Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, 2003.

Defence Construction Canada - DEW Line Clean Up Project, *Project Description for the Nunavut Impact Review Board Clean Up of Fifteen DEW Line Site in the Nunavut Settlement Area*. Defence Construction Canada Project Management Office, 1998.

EBA Engineering Consultants Ltd. *Dew Line Clean Up Project, PIN-2 (Cape Young) Dew Line Site – 2004 Geotechnical Investigation*. 2005.

Environmental Sciences Group. *PIN-2, Cape Young, Nunavut Site Investigation 2004*. 2005.

Jacques Whitford. 2005. *Final Report on DLCU Project Archaeological Mitigation Study at PIN-2, Cape Young, Nunavut.* March 2005.

Nunavut Land Claims Agreement, *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada*, 1993.

Nunavut Water Board (NWB 2004). *Guidelines for Spill Contingency Planning*, Draft, November 2005.

Nunavut Tunngavik Incorporated. 2004. *NTI Technical Representative Report DEW Line Site Cape Young, PIN-2*. October 2004.

UMA Engineering Ltd., *Environmental Clean Up Study of 21 DEW Line Sites in Canada. PIN-2, Cape Young, NWT*. UMA Engineering Ltd., in association with Hardy BBT Limited and Jacques Whitford Group, 1991.

UMA Engineering Ltd., *Preliminary Design Report, PIN-2, Cape Young*. 2006.

UMA Engineering Ltd., *Specifications for the Clean Up of the PIN-2, Cape Young DEW Line Site*. UMA Engineering Ltd., in association with Hatch. 2008.

Appendix A

Drawings

National Defence / Défense nationale

DEW LINE CLEAN UP PROJECT

DRAWING INDEX					
DRAWING No.	TITLE	DRAWING No.	TITLE	DRAWING No.	TITLE
SITING		SITING		STRUCTURAL	
H-C81/1-9101-101	OVERALL SITE PLAN	H-C81/1-9101-113	SOUTH BORROW AREA SITE PLAN	H-C81/1-9101-204	GARAGE PLAN AND SECTION
H-C81/1-9101-102	PROJECT LAYOUT SHEET 1	H-C81/1-9101-114	AIRSTRIP LANDFILL EXCAVATION PLANS	H-C81/1-9101-205	MODULE TRAIN UNITS 1A-25 PLAN
H-C81/1-9101-103	PROJECT LAYOUT SHEET 2	H-C81/1-9101-115	NON-HAZARDOUS WASTE LANDFILL BERM AND FINAL GRADING PLANS	H-C81/1-9101-206	MODULE TRAIN UNITS 1A-25 ELEVATIONS
H-C81/1-9101-104	AIRSTRIP WEST SITE PLAN	H-C81/1-9101-116	NON-HAZARDOUS WASTE LANDFILL CROSS SECTIONS AND DETAIL	H-C81/1-9101-207	RADAR TOWER/RADOME PLAN AND SECTION
H-C81/1-9101-105	AIRSTRIP EAST SITE PLAN	H-C81/1-9101-117	TIER II DISPOSAL FACILITY KEY TRENCH EXCAVATION PLAN & GRADING/INSTRUMENTATION PLAN	H-C81/1-9101-208	HANGAR PLAN AND SECTION
H-C81/1-9101-106	STATION NORTHWEST SITE PLAN	H-C81/1-9101-118	TIER II DISPOSAL FACILITY CROSS SECTION AND DETAIL	H-C81/1-9101-209	POL PUMPHOUSE AND COMMUNICATION DISH PLAN AND ELEVATIONS
H-C81/1-9101-107	STATION EAST AND AIRSTRIP SOUTH SITE PLANS	H-C81/1-9101-119	MISCELLANEOUS DETAILS SHEET 1	H-C81/1-9101-210	WATER AND FUEL TANKS PLAN AND ELEVATIONS
H-C81/1-9101-108	STATION SOUTHWEST SITE PLAN	H-C81/1-9101-120	MISCELLANEOUS DETAILS SHEET 2	H-C81/1-9101-211	AIRSTRIP ANCILLARY FACILITIES STANDARD DETAILS
H-C81/1-9101-109	PALLET LINE WEST SITE PLAN	STRUCTURAL			
H-C81/1-9101-110	EAST TWIN SITE PLAN	H-C81/1-9101-201	STATION AREA DEMOLITION SITE PLAN		
H-C81/1-9101-111	SOUTH CROSSROADS AREA SITE PLAN	H-C81/1-9101-202	AIRSTRIP EAST AREA DEMOLITION SITE PLAN		
H-C81/1-9101-112	NORTH BORROW, HARDING ROAD NORTH AND SOUTH AREAS SITE PLANS	H-C81/1-9101-203	WAREHOUSE PLAN, SECTION AND ELEVATION		

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

PIN-2 CAPE YOUNG TENDER DRAWINGS

UMA | AECOM

HATCH

SEPTEMBER, 2008

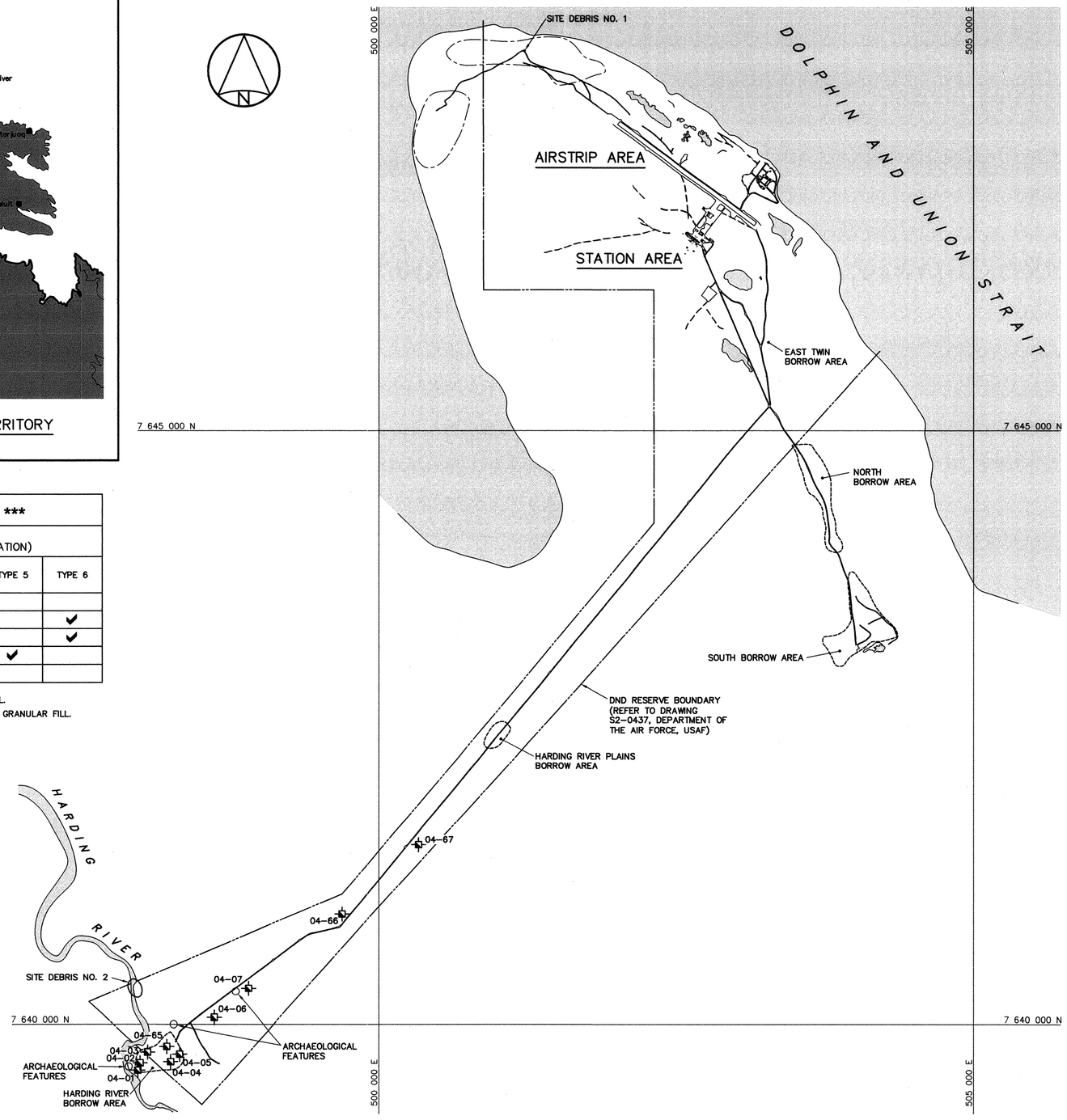
LOCATION OF CAPE YOUNG WITHIN NUNAVUT TERRITORY

N.T.S.

POTENTIAL SOURCES FOR GRANULAR MATERIALS ***

BORROW AREA	GRANULAR TYPE (SEE SECTION 02226 IN SPECIFICATION)					
	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5	TYPE 6
EAST TWIN	✔					
NORTH		✔*	✔			✔
SOUTH		✔*	✔			✔
HARDING RIVER PLAINS					✔	
HARDING RIVER				✔**		

* MATERIAL REQUIRES BLENDING WITH SILT TO PRODUCE TYPE 2 GRANULAR FILL.
** MATERIAL REQUIRES BLENDING WITH SAND AND GRAVEL TO PRODUCE TYPE 4 GRANULAR FILL.
*** REFER TO PIN-2 GEOTECHNICAL REPORT, DATED MARCH 2005.



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT PIN-2, CAPE YOUNG, NUNAVUT, BY THOMSON HERITAGE CONSULTANTS DATED 2004.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. EXISTING ACCESS ROADS MY REQUIRE IMPROVEMENT FOR CONSTRUCTION TRAFFIC.

Legend:

- TEST PIT LOCATION
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE EXTENT OF DEBRIS AREAS
- ARCHAEOLOGICAL FEATURES
- APPROXIMATE LOCATION OF PROPERTY BOUNDARIES
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS — J. R. BERGERON — LICENCE — 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE 300 150 0 300 600 900m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

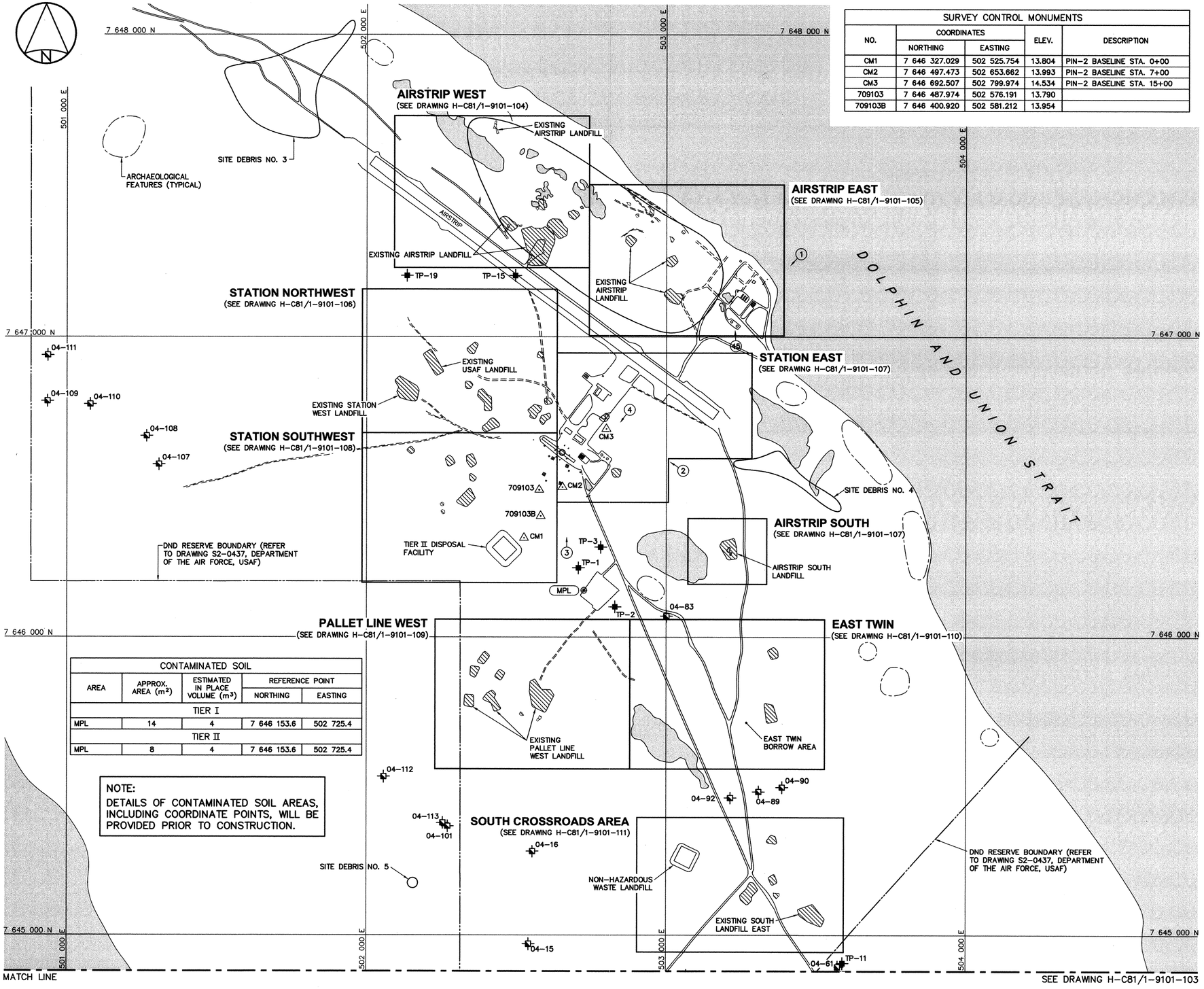
SUBJECT - SUJET

OVERALL SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTH		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-101

Canada



SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 646 327.029	502 525.754	13.804	PIN-2 BASELINE STA. 0+00
CM2	7 646 497.473	502 653.662	13.993	PIN-2 BASELINE STA. 7+00
CM3	7 646 692.507	502 799.974	14.534	PIN-2 BASELINE STA. 15+00
709103	7 646 487.974	502 576.191	13.790	
709103B	7 646 400.920	502 581.212	13.954	

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
MPL	14	4	7 646 153.6	502 725.4
TIER II				
MPL	8	4	7 646 153.6	502 725.4

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT PIN-2, CAPE YOUNG, NUNAVUT, BY THOMSON HERITAGE CONSULTANTS DATED 2004.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.

Legend:

- SURVEY CONTROL MONUMENT
- CONTAMINATED SOIL AREA
- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- PHOTOGRAPHIC VIEWPOINT
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE EXTENT OF DEBRIS AREAS
- EXISTING LANDFILL/ BURIED DEBRIS LOBE
- ARCHAEOLOGICAL FEATURES
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES PROFESSIONAL ENGINEER J.R. BROSKOSKY 7963 NWT/NU
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 100 50 0 100 200 300m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

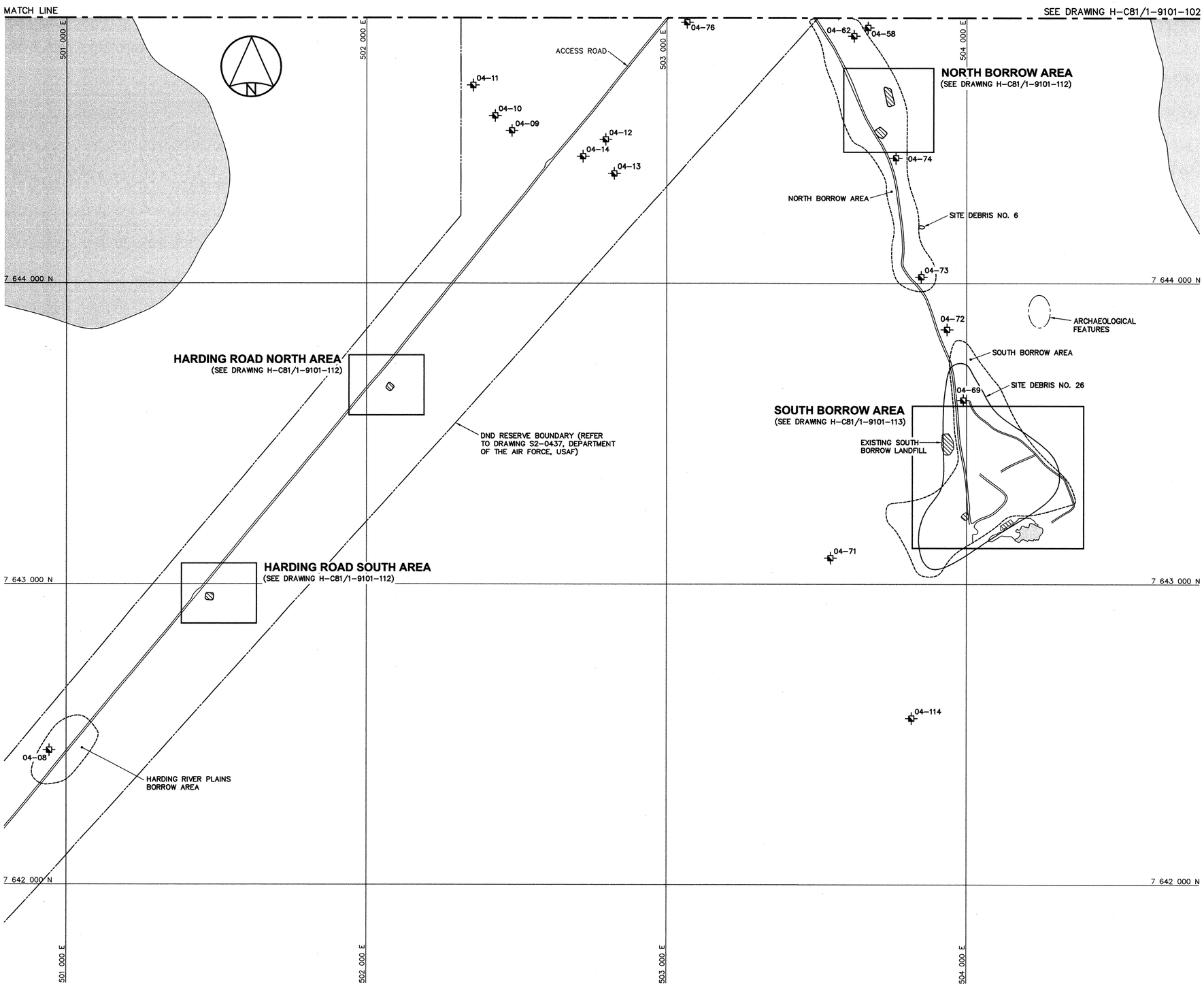
SUBJECT - SUJET

PROJECT LAYOUT
SHEET 1

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-102

Canada



National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ARCHAEOLOGICAL FEATURES LOCATED AS PER ARCHAEOLOGICAL STUDY AT PIN-2, CAPE YOUNG, NUNAVUT, BY THOMSON HERITAGE CONSULTANTS DATED 2004.
4. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
5. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
6. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- APPROXIMATE EXTENT OF BORROW AREAS
- APPROXIMATE EXTENT OF DEBRIS AREAS
- EXISTING LANDFILL/ BURIED DEBRIS LOBE
- ARCHAEOLOGICAL FEATURES
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

NUNAVUT ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 100 50 0 100 200 300m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

SUBJECT - SUJET

PROJECT LAYOUT
SHEET 2

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED / ETUDIE BWF		DES OFF / AGENT CONCEPT
DRAWN / DESSINE LJV		SECT HD / CHEF SECT
CHECKED / VERIFIE KMS/DTM		DES MGR / GEST CONCEPT
COORDINATION RKM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-103

Canada

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
AL	50	15	7 647 323.1	502 626.3
TIER II				
AL	25	18	7 647 392.0	502 629.5

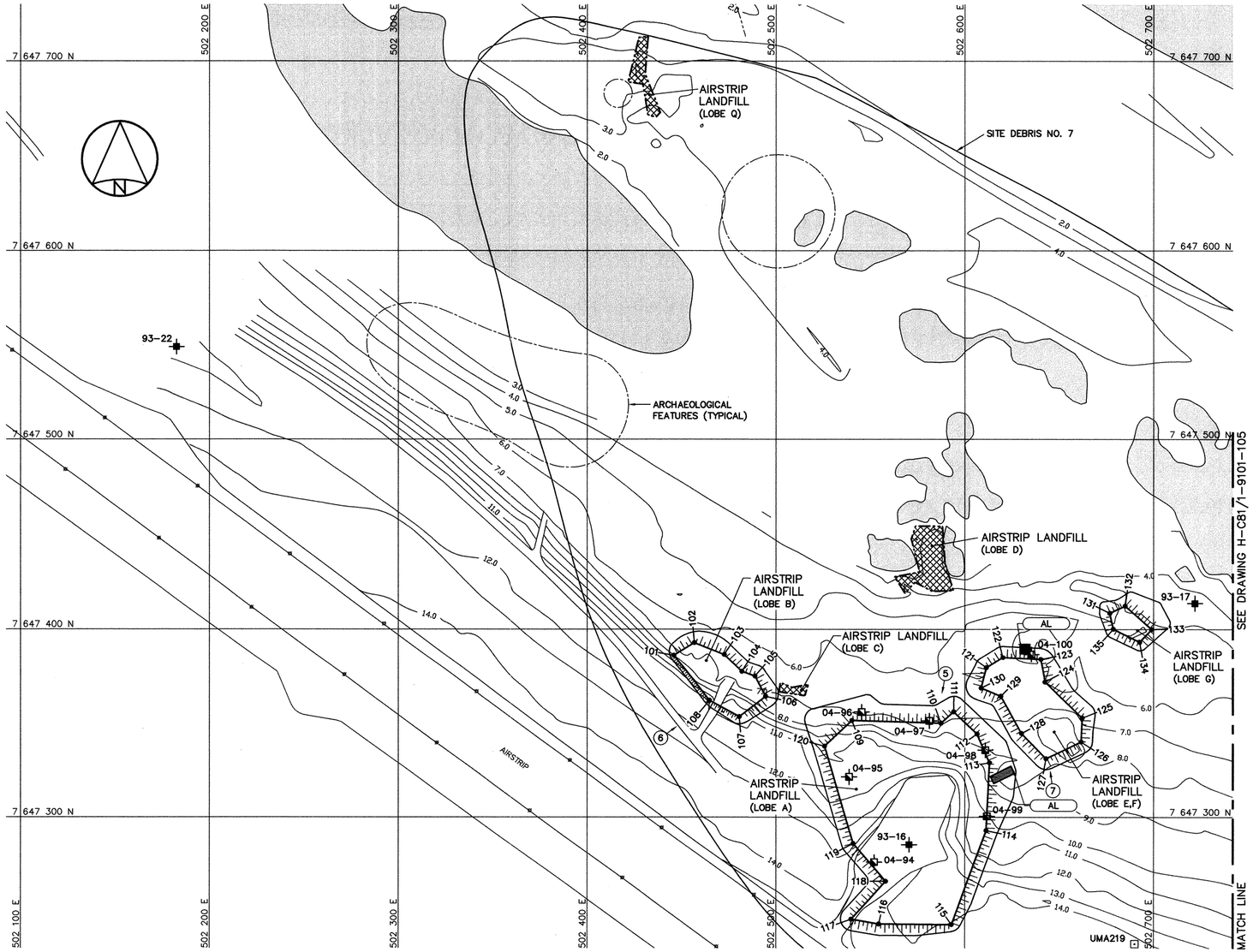
TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
UMA219	7 647 232.179	502 689.970	14.453	19mm REBAR WITH CAP

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

COORDINATE POINTS AIRSTRIP LANDFILL (LOBES A,B,E,F,G) REGRADING		
NO.	NORTHING	EASTING
101	7 647 386.1	502 445.9
102	7 647 392.8	502 456.8
103	7 647 386.5	502 472.6
104	7 647 377.3	502 481.9
105	7 647 374.9	502 488.9
106	7 647 364.3	502 494.6
107	7 647 353.4	502 480.6
108	7 647 362.1	502 464.8
109	7 647 351.5	502 540.3
110	7 647 350.1	502 587.4
111	7 647 356.1	502 594.1
112	7 647 344.3	502 606.5
113	7 647 328.8	502 613.1
114	7 647 292.9	502 611.3
115	7 647 242.5	502 593.0
116	7 647 242.8	502 554.4
117	7 647 245.4	502 539.8
118	7 647 265.4	502 558.1
119	7 647 286.0	502 540.9
120	7 647 337.8	502 525.8
121	7 647 379.4	502 611.5
122	7 647 384.9	502 620.3
123	7 647 384.0	502 640.3
124	7 647 371.8	502 642.5
125	7 647 352.8	502 662.2
126	7 647 340.1	502 661.7
127	7 647 331.1	502 643.0
128	7 647 344.7	502 630.0
129	7 647 364.4	502 619.1
130	7 647 368.7	502 608.7
131	7 647 408.6	502 676.8
132	7 647 412.4	502 685.0
133	7 647 400.0	502 699.0
134	7 647 393.2	502 692.6
135	7 647 400.1	502 678.6

AIRSTRIP LANDFILL

NOTE:
SEE DRAWING H-C81/1-9101-114 FOR DETAILED EXCAVATION PLANS OF THE AIRSTRIP LANDFILL, INCLUDING COORDINATE POINTS.



AIRSTRIP LANDFILL (LOBES A,B,E,F,G): APPROXIMATE AREAS TO BE REGRADED WITH 0.6m TYPE 1 OVER 0.4m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- 106 COORDINATE POINT
- (5) PHOTOGRAPHIC VIEWPOINT
- (ABC) CONTAMINATED SOIL AREA NAME
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- ARCHAEOLOGICAL FEATURES
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES AND NUNAVUT
PERMIT NUMBER P 007
UMA ENGINEERING LTD.
2008-09-30

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER: SITING
DATE: 2008-09-30

SUBJECT - SUJET

AIRSTRIP WEST
SITE PLAN

PRODUCTION		CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	RMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-104

Canada

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
AL	28	13	7 647 333.8	502 890.6
BP	13	4	7 647 057.5	503 221.0
LAS	69	21	7 647 236.7	503 265.5
TIER II				
AL	48	16	7 647 381.3	502 931.9
BP	344	131	7 647 057.3	503 208.5
JP	20	6	7 647 112.0	503 292.4
LWP	30	9	7 647 196.8	502 983.1
HAZARDOUS				
BP–HAZ	175	58	7 647 026.2	503 235.3

AIRSTRIP LANDFILL

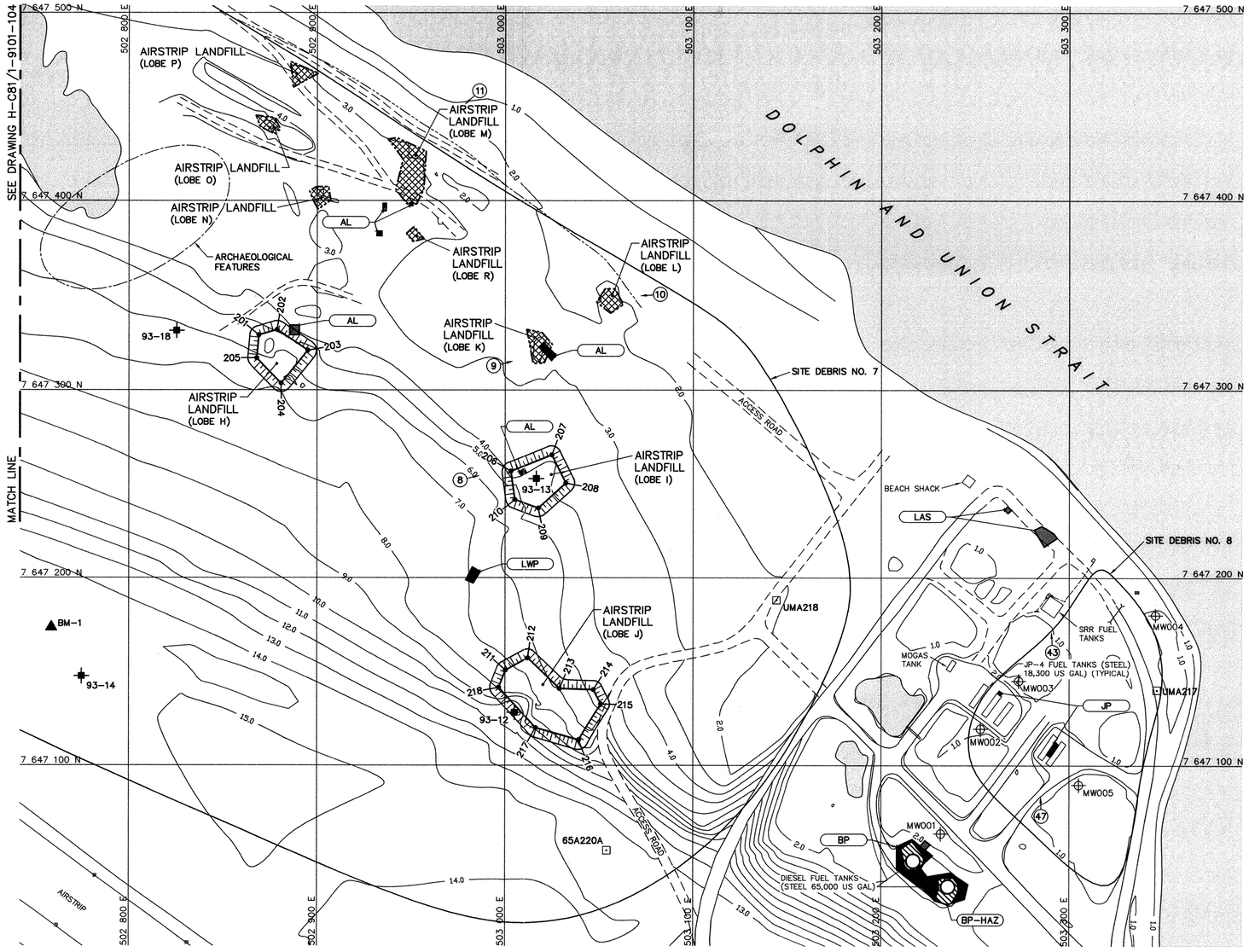
NOTE:
SEE DRAWING H–C81/1–9101–114 FOR DETAILED EXCAVATION PLANS OF THE AIRSTRIP LANDFILL, INCLUDING COORDINATE POINTS.

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
UMA217	7 647 139.402	503 346.637	1.594	19mm REBAR WITH CAP
UMA218	7 647 187.182	503 144.383	2.223	19mm REBAR WITH CAP
65A220A	7 647 055.067	503 054.101	14.499	BRASS CAP

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

COORDINATE POINTS AIRSTRIP LANDFILL (LOBES H,I,J) REGRADING		
NO.	NORTHING	EASTING
201	7 647 328.7	502 869.1
202	7 647 331.6	502 878.9
203	7 647 320.6	502 895.2
204	7 647 303.5	502 881.0
205	7 647 316.6	502 868.0
206	7 647 257.1	503 003.1
207	7 647 265.6	503 024.9
208	7 647 250.8	503 032.4
209	7 647 237.4	503 017.7
210	7 647 242.0	503 005.2
211	7 647 149.9	503 000.2
212	7 647 140.1	503 029.1
213	7 647 140.1	503 029.1
214	7 647 139.5	503 047.1
215	7 647 131.9	503 050.9
216	7 647 113.0	503 039.3
217	7 647 119.1	503 016.3
218	7 647 140.7	502 996.7

AIRSTRIP LANDFILL (LOBES H,I,J): APPROXIMATE AREAS TO BE REGRADED WITH 0.4m TYPE 1 OVER 0.4m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON–HAZARDOUS DEBRIS TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219–1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H–C81/1–9101–120. LOCATIONS TO BE APPROVED BY THE ENGINEER.
9. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED.

Legend:

- TEMPORARY BENCHMARK
- GROUNDWATER MONITORING WELL
- TEST PIT LOCATION (1993)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- HAZARDOUS CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 201 COORDINATE POINT
- (43) PHOTOGRAPHIC VIEWPOINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER
- PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 1)

No.	DATE	REVISION	REVISION	APPR.

2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
SITING	2008–09–30

SUBJECT – SUJET

AIRSTRIP EAST
SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–105

Canada

COORDINATE POINTS STATION WEST LANDFILL REGRADING		
NO.	NORTHING	EASTING
301	7 646 852.7	502 099.8
302	7 646 863.5	502 110.7
303	7 646 831.3	502 165.0
304	7 646 819.3	502 170.3
305	7 646 789.7	502 163.4
306	7 646 789.9	502 148.4
307	7 646 799.5	502 113.1
308	7 646 815.2	502 105.6
309	7 646 830.8	502 112.4

COORDINATE POINTS USAF LANDFILL REGRADING		
NO.	NORTHING	EASTING
310	7 646 941.0	502 194.1
311	7 646 952.9	502 212.4
312	7 646 885.9	502 251.5
313	7 646 876.4	502 234.1

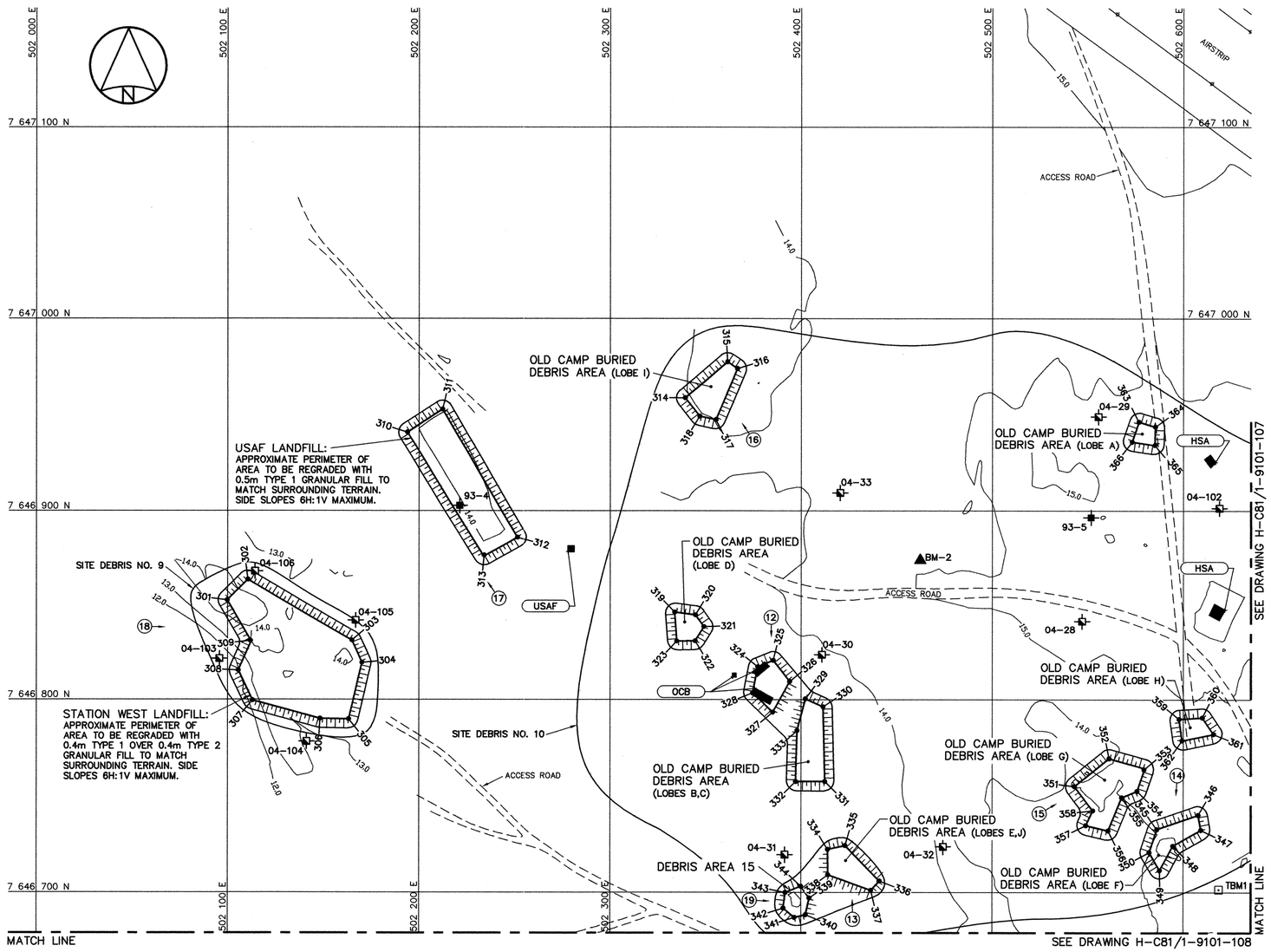
COORDINATE POINTS OLD CAMP BURIED DEBRIS AREA (LOBES A–J) REGRADING		
NO.	NORTHING	EASTING
314	7 646 958.9	502 339.3
315	7 646 977.3	502 361.4
316	7 646 973.9	502 366.6
317	7 646 947.5	502 355.3
318	7 646 949.3	502 346.9
319	7 646 846.4	502 333.8
320	7 646 845.0	502 344.7
321	7 646 838.7	502 349.1
322	7 646 831.0	502 344.5
323	7 646 830.8	502 335.0
324	7 646 817.0	502 377.3
325	7 646 820.5	502 385.5
326	7 646 809.4	502 394.1
327	7 646 793.4	502 385.2
328	7 646 803.5	502 374.7
329	7 646 800.4	502 402.3
330	7 646 796.2	502 411.6
331	7 646 757.2	502 412.5
332	7 646 757.3	502 397.2
333	7 646 783.8	502 397.9
334	7 646 722.2	502 414.0
335	7 646 724.1	502 423.0
336	7 646 705.9	502 441.0
337	7 646 701.1	502 436.6
338	7 646 709.1	502 414.1
339	7 646 697.0	502 404.3
340	7 646 688.3	502 402.4
341	7 646 686.9	502 396.5
342	7 646 691.7	502 390.8
343	7 646 699.9	502 391.8
344	7 646 703.2	502 399.9
345	7 646 732.5	502 586.2
346	7 646 739.9	502 607.7
347	7 646 732.1	502 609.2
348	7 646 724.0	502 594.6
349	7 646 711.5	502 587.6
350	7 646 720.6	502 582.2
351	7 646 754.7	502 543.1
352	7 646 769.1	502 561.2
353	7 646 763.7	502 579.2
354	7 646 752.3	502 575.8
355	7 646 749.0	502 567.7
356	7 646 731.8	502 560.7
357	7 646 734.5	502 549.0
358	7 646 742.2	502 552.7
359	7 646 789.8	502 597.8
360	7 646 790.5	502 610.0
361	7 646 781.9	502 615.8
362	7 646 778.4	502 599.4
363	7 646 946.4	502 576.7
364	7 646 943.8	502 585.3
365	7 646 934.2	502 585.0
366	7 646 935.9	502 573.1

CONTAMINATED SOIL				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER II				
USAF	9	2	7 646 878.3	502 278.1
HSA	79	22	7 646 850.8	502 616.3
OCB	64	16	7 646 811.7	502 364.2

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
TBM1	7 646 701.422	502 618.525	14.398	SPIKE

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

OLD CAMP BURIED DEBRIS AREA (LOBES A–J):
APPROXIMATE AREAS TO BE REGRADED WITH 0.8m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON–HAZARDOUS DEBRIS TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219–1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H–C81/1–9101–120. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- TIER II CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 363 COORDINATE POINT
- (17) PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 8)

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
SITING	2008–09–30

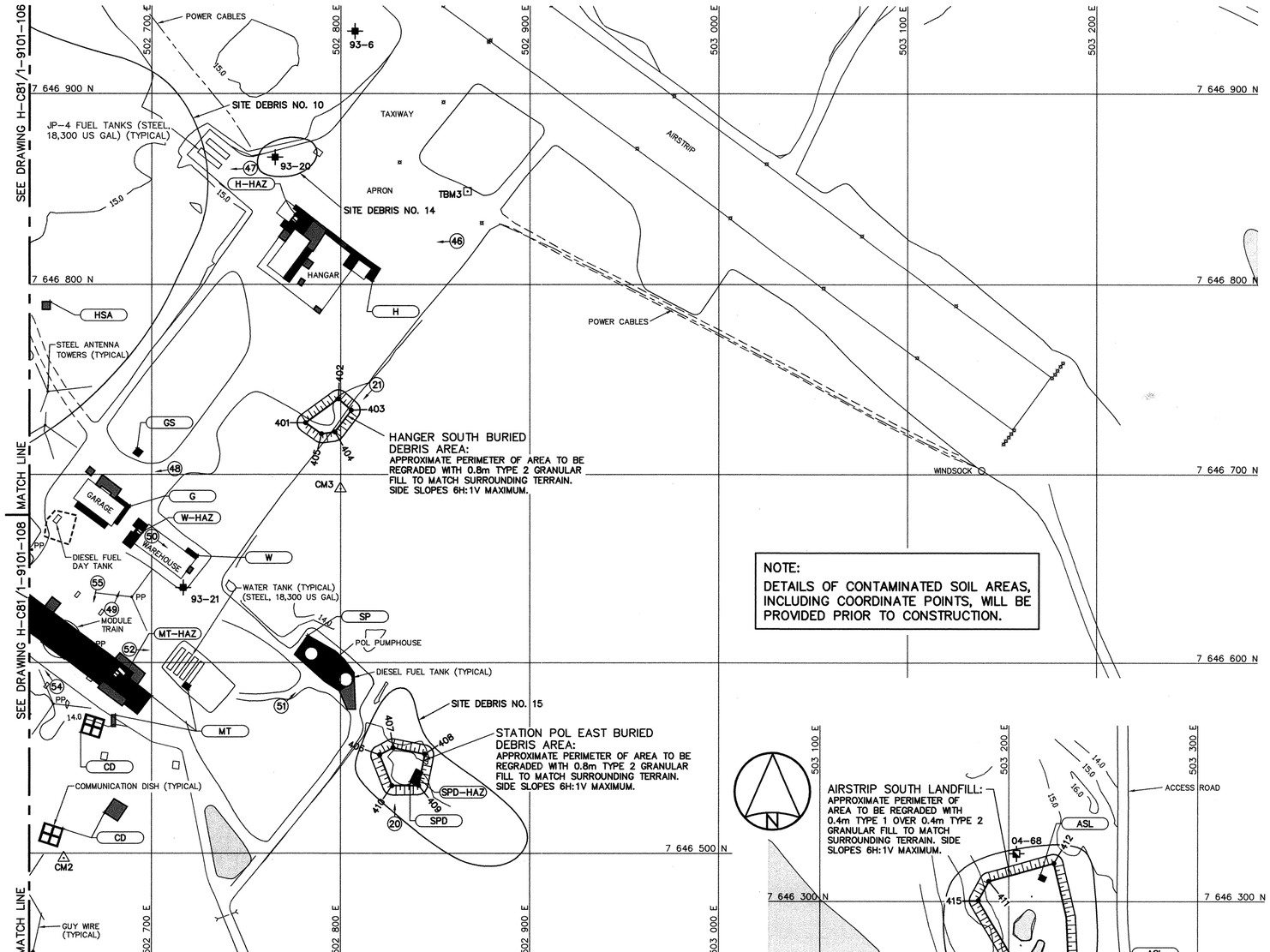
SUBJECT – SUJET

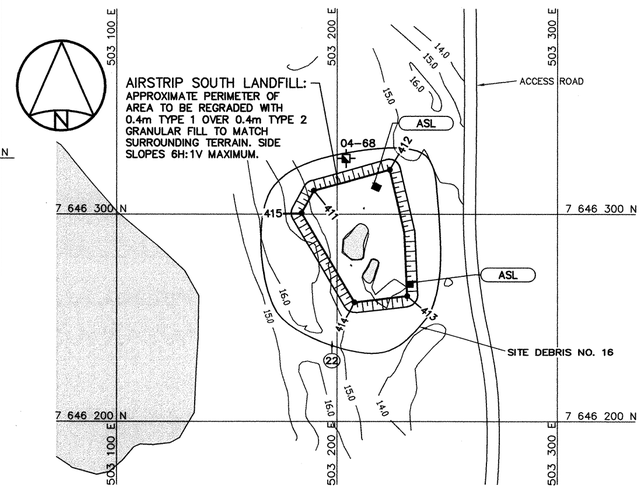
STATION NORTHWEST
SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE RMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–106

Canada





AIRSTRIP SOUTH

COORDINATE POINTS HANGER SOUTH BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
401	7 646 727.5	502 781.5
402	7 646 740.1	502 798.9
403	7 646 734.1	502 805.7
404	7 646 722.5	502 797.0
405	7 646 721.5	502 789.9

COORDINATE POINTS STATION POL EAST BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
406	7 646 551.5	502 820.8
407	7 646 555.2	502 827.8
408	7 646 551.9	502 844.7
409	7 646 535.7	502 841.3
410	7 646 535.5	502 827.2

COORDINATE POINTS AIRSTRIP SOUTH LANDFILL REGRADING		
NO.	NORTHING	EASTING
411	7 646 310.8	503 189.5
412	7 646 320.3	503 224.0
413	7 646 263.2	503 231.4
414	7 646 259.9	503 207.9
415	7 646 259.9	503 207.9
416	7 646 300.6	503 184.0

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT NORTHING	REFERENCE POINT EASTING
TIER I				
HSA	16	5	7 646 791.1	502 646.3
H	166	50	7 646 801.6	502 816.8
G	78	23	7 646 692.2	502 684.0
W	7	2	7 646 649.9	502 722.1
SP	80	24	7 646 649.9	502 722.1
MT	198	59	7 646 594.3	502 696.6
CD	71	21	7 646 524.5	502 687.2
TIER II				
H	319	111	7 646 820.9	502 803.5
GS	12	6	7 646 714.0	502 692.5
G	94	28	7 646 683.3	502 688.8
W	92	29	7 646 656.8	502 724.7
SP	345	120	7 646 614.6	502 782.7
MT	1149	345	7 646 582.8	502 699.9
CD	73	37	7 646 560.5	502 672.4
SPD	24	5	7 646 537.5	502 836.9

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT NORTHING	REFERENCE POINT EASTING
TIER II (CONT'D)				
ASL	12	4	7 646 313.0	503 219.9
HYDROCARBON – TYPE B				
G	213	200	7 646 678.4	502 660.4
HAZARDOUS				
H-HAZ	11	2	7 646 836.3	502 776.1
W-HAZ	9	2	7 646 670.0	502 695.7
MT-HAZ	24	5	7 646 595.1	502 687.1
SPD-HAZ	4	1	7 646 539.4	502 841.6

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES NORTHING	COORDINATES EASTING	ELEV.	DESCRIPTION
CM2	7 646 497.473	502 653.662	13.993	STEEL PLATE
CM3	7 646 692.507	502 799.974	14.534	STEEL PLATE

TEMPORARY BENCHMARKS				
NO.	COORDINATES NORTHING	COORDINATES EASTING	ELEV.	DESCRIPTION
TBM3	7 646 848.360	502 867.079	15.877	IRON BAR

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.

Legend:

- SURVEY CONTROL MONUMENT
- TEMPORARY BENCHMARK
- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- TYPE B CONTAMINATED SOILS
- HAZARDOUS CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 412 COORDINATE POINT
- (22) PHOTOGRAPHIC VIEWPOINT
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: SITING
DATE: 2008-09-30

SUBJECT – SUJET
STATION EAST AND AIRSTRIP SOUTH SITE PLANS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C81/1-9101-107

Canada

BURIED DEBRIS AREA 14
(LOBES A,B,C):
APPROXIMATE AREAS TO BE REGRADED WITH 0.4m TYPE 1 OVER 0.4m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.

TOWER BURIED DEBRIS AREA
(LOBES A,D):
APPROXIMATE AREAS TO BE REGRADED WITH 0.4m TYPE 1 OVER 0.4m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 646 327.029	502 525.754	13.804	STEEL PLATE
709103	7 646 487.974	502 576.191	13.790	BRASS CAP
709103B	7 646 400.920	502 581.212	13.954	BRASS CAP

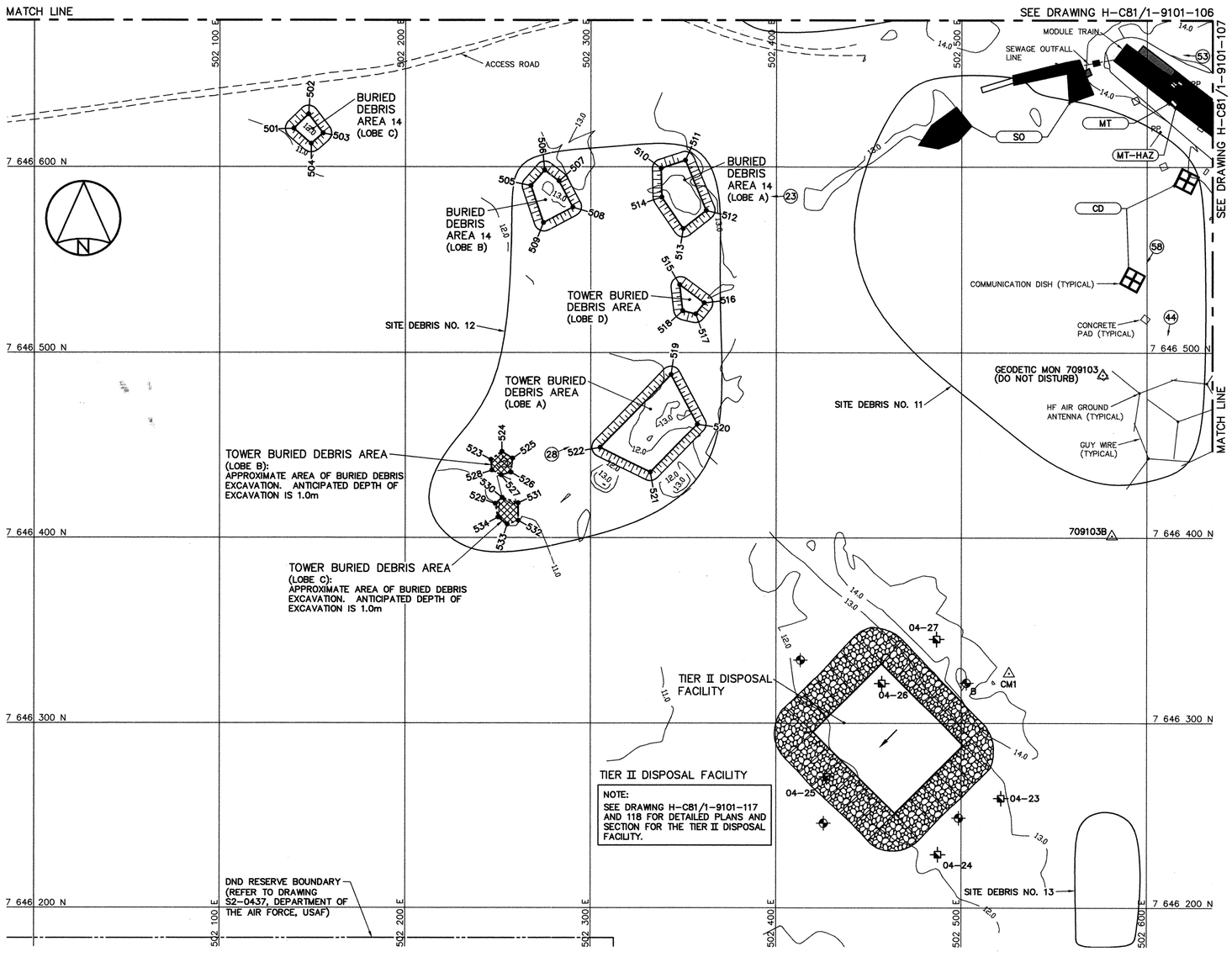
NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

CONTAMINATED SOIL				
AREA NO.	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
MT	100	30	7 646 661.2	502 594.9
SO	10	3	7 646 648.0	502 567.3
TIER II				
MT	832	250	7 646 633.9	502 611.8
SO	699	242	7 646 634.4	502 558.1
CD	73	37	7 646 590.5	502 614.5
HAZARDOUS				
MT-HAZ	34	7	7 646 631.7	502 615.2

COORDINATE POINTS BURIED DEBRIS AREA 14 (LOBES A,B,C) REGRADING		
NO.	NORTHING	EASTING
501	7 646 620.5	502 140.0
502	7 646 628.1	502 147.9
503	7 646 618.0	502 155.7
504	7 646 612.3	502 149.3
505	7 646 590.1	502 267.7
506	7 646 598.3	502 275.1
507	7 646 592.6	502 282.8
508	7 646 578.6	502 290.4
509	7 646 570.2	502 274.5
510	7 646 599.2	502 337.9
511	7 646 603.4	502 351.0
512	7 646 576.8	502 362.3
513	7 646 567.0	502 349.8
514	7 646 584.0	502 338.3

COORDINATE POINTS TOWER BURIED DEBRIS AREA (LOBES A,D) REGRADING		
NO.	NORTHING	EASTING
515	7 646 536.9	502 347.9
516	7 646 527.0	502 361.2
517	7 646 521.0	502 356.6
518	7 646 522.7	502 349.6
519	7 646 488.2	502 343.3
520	7 646 461.3	502 357.5
521	7 646 435.3	502 332.2
522	7 646 448.6	502 305.2

COORDINATE POINTS TOWER BURIED DEBRIS AREA (LOBES B,C) EXCAVATION		
NO.	NORTHING	EASTING
523	7 646 442.1	502 246.3
524	7 646 446.4	502 252.2
525	7 646 442.8	502 257.9
526	7 646 435.2	502 257.0
527	7 646 433.7	502 251.8
528	7 646 436.4	502 246.7
529	7 646 418.3	502 248.6
530	7 646 421.6	502 252.4
531	7 646 418.7	502 260.9
532	7 646 409.3	502 260.9
533	7 646 407.1	502 255.1
534	7 646 411.0	502 250.0



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.

Legend:

- SURVEY CONTROL MONUMENT
- TEMPORARY BENCHMARK
- TEST PIT LOCATION (2004)
- PROPOSED MONITORING WELL LOCATION (3)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- HAZARDOUS CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 512 COORDINATE POINT
- (58) PHOTOGRAPHIC VIEWPOINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES — EXAMINED — 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

SUBJECT - SUJET

STATION SOUTHWEST
SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-108

Canada

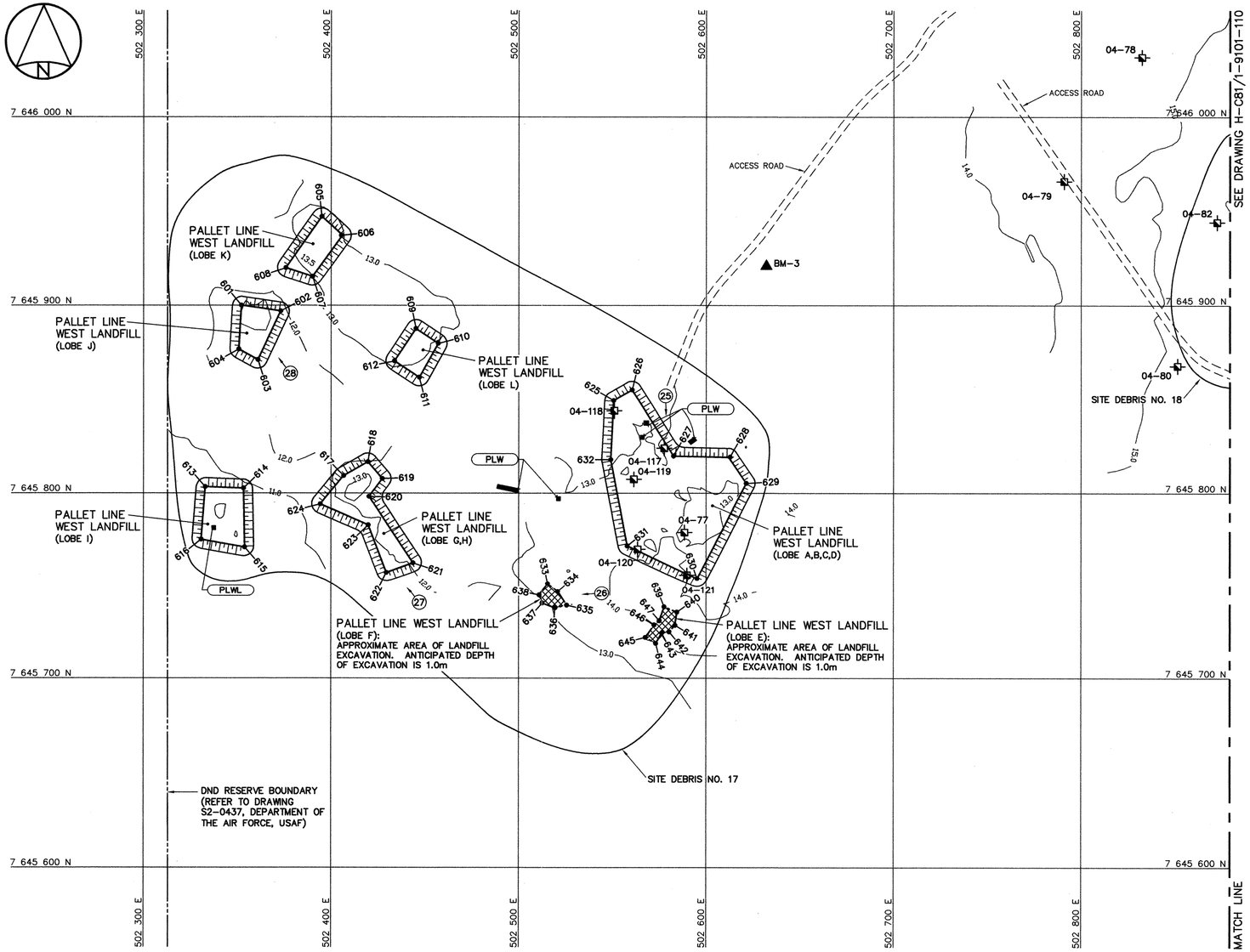
CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER II				
PLW	40	10	7 645 802.2	502 499.8

PALLET LINE WEST LANDFILL
(LOBES A–D, G–L):
APPROXIMATE PERIMETER OF AREA TO BE REGRADED WITH 0.4m TYPE 1 OVER 0.4m TYPE 2 GRANULAR FILL TO MATCH SURROUNDING TERRAIN. SIDE SLOPES 6H:1V MAXIMUM.

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

COORDINATE POINTS PALLET LINE WEST LANDFILL (LOBES A–D, G–L) REGRADING		
NO.	NORTHING	EASTING
601	7 645 900.0	502 352.2
602	7 645 896.9	502 373.2
603	7 645 871.2	502 361.0
604	7 645 876.8	502 350.9
605	7 645 946.9	502 395.1
606	7 645 937.1	502 405.5
607	7 645 915.5	502 390.2
608	7 645 920.1	502 376.0
609	7 645 887.6	502 445.3
610	7 645 879.9	502 457.2
611	7 645 861.9	502 447.1
612	7 645 870.5	502 433.8
613	7 645 803.4	502 333.0
614	7 645 802.6	502 353.4
615	7 645 771.1	502 354.0
616	7 645 775.2	502 330.8
617	7 645 809.3	502 406.8
618	7 645 816.9	502 419.7
619	7 645 807.8	502 427.4
620	7 645 798.2	502 420.3
621	7 645 762.7	502 443.8
622	7 645 757.4	502 429.6
623	7 645 783.1	502 419.9
624	7 645 794.1	502 394.3
625	7 645 849.4	502 550.7
626	7 645 855.1	502 560.5
627	7 645 820.0	502 582.7
628	7 645 819.3	502 612.0
629	7 645 805.3	502 621.4
630	7 645 754.1	502 595.2
631	7 645 771.8	502 558.0
632	7 645 818.0	502 549.2

COORDINATE POINTS PALLET LINE WEST LANDFILL (LOBES E,F) EXCAVATION		
NO.	NORTHING	EASTING
633	7 645 751.0	502 515.6
634	7 645 746.4	502 520.9
635	7 645 739.0	502 525.7
636	7 645 737.6	502 519.5
637	7 645 740.1	502 512.6
638	7 645 744.4	502 511.0
639	7 645 738.1	502 577.7
640	7 645 735.4	502 584.5
641	7 645 728.3	502 583.5
642	7 645 724.9	502 580.3
643	7 645 724.3	502 576.4
644	7 645 718.7	502 573.2
645	7 645 721.9	502 567.6
646	7 645 728.5	502 572.3
647	7 645 730.7	502 575.1



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON–HAZARDOUS DEBRIS TO BE PLACED IN NON–HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219–1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H–C81/1–9101–120. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TEST PIT LOCATION (2004)
- TIER II CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 635 COORDINATE POINT
- (27) PHOTOGRAPHIC VIEWPOINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- BODY OF WATER
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 8)

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES LICENSEE M#(1143) 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
SITING	2008–09–30

SUBJECT – SUJET

PALLET LINE WEST
SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTH		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–109

Canada

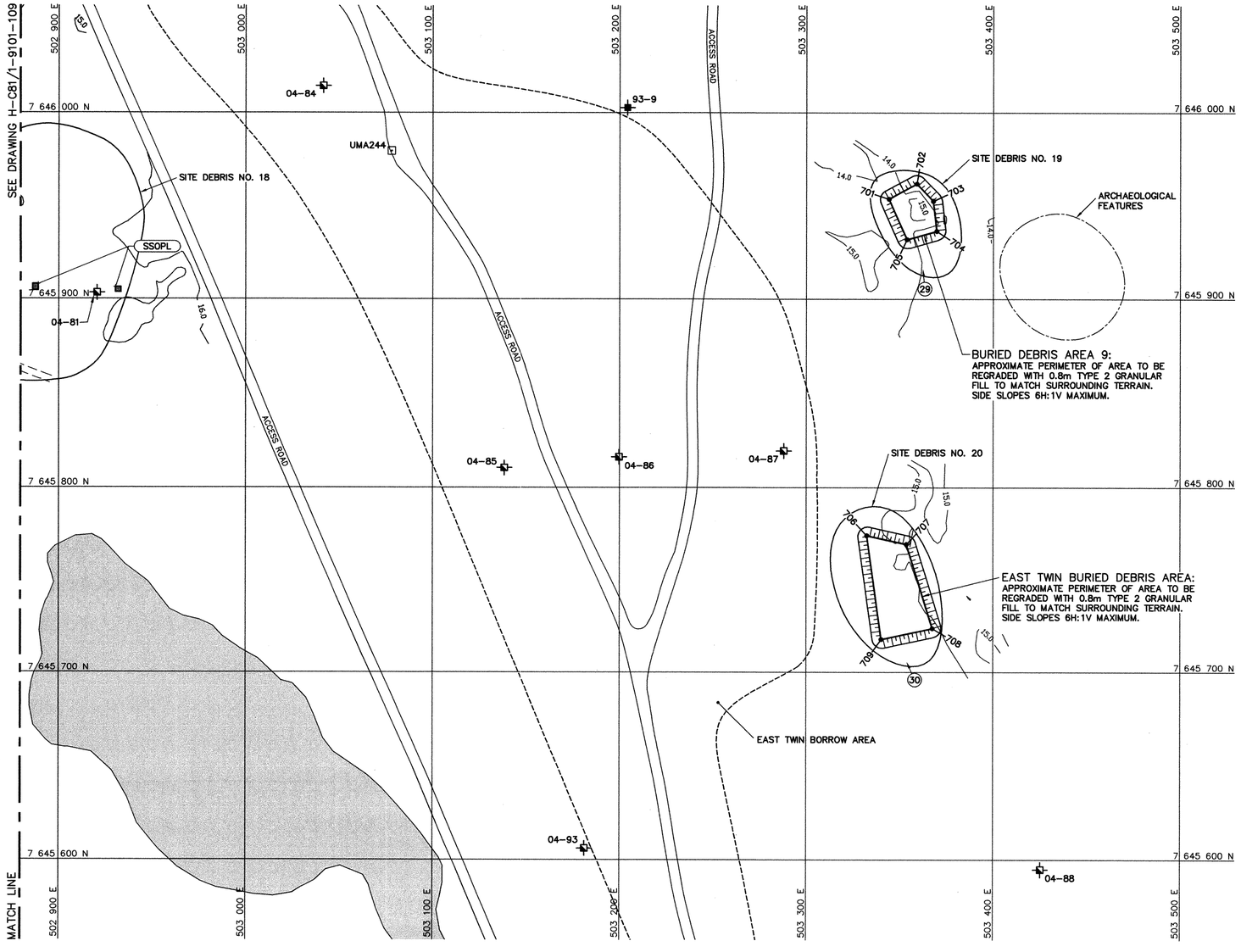
COORDINATE POINTS BURIED DEBRIS AREA 9 REGRADING		
NO.	NORTHING	EASTING
701	7 645 953.5	503 344.2
702	7 645 961.8	503 359.1
703	7 645 952.5	503 367.9
704	7 645 936.5	503 369.8
705	7 645 932.0	503 353.8

COORDINATE POINTS EAST TWIN BURIED DEBRIS AREA REGRADING		
	NORTHING	EASTING
706	7 645 774.4	503 332.4
707	7 645 769.7	503 353.6
708	7 645 724.1	503 367.5
709	7 645 718.2	503 340.2

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
SSOPL	20	6	7 645 907.8	502 889.0

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
UMA244	7 645 979.483	503 078.062	17.772	19mm REBAR AND CAP

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION (1993)
- TEST PIT LOCATION (2004)
- DCC TIER I CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 250 COORDINATE POINT
- (29) PHOTOGRAPHIC VIEWPOINT
- ARCHAEOLOGICAL FEATURES
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS — J.R. BEDKOSKY — LICENSEE — 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

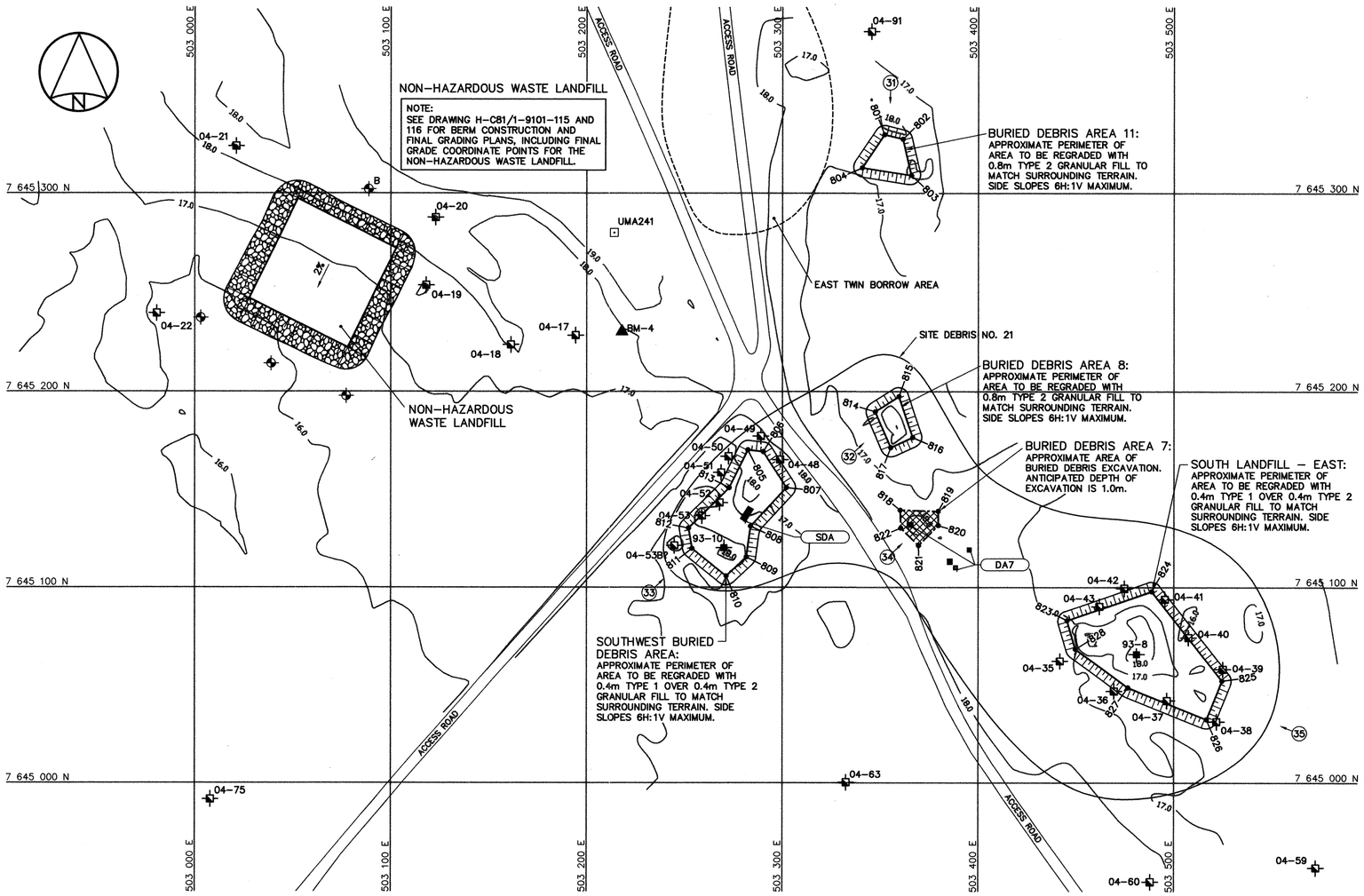
SUBJECT - SUJET

EAST TWIN
SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED / ETUDIE BWF		DES OFF / AGENT CONCEPT
DRAWN / DESSINE LJV		SECT HD / CHEF SECT
CHECKED / VERIFIE KMS/DTM		DES MGR / GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-110

Canada



COORDINATE POINTS BURIED DEBRIS AREA 11 REGRADING		
NO.	NORTHING	EASTING
801	7 645 329.9	503 352.2
802	7 645 327.6	503 361.6
803	7 645 309.1	503 365.9
804	7 645 313.0	503 340.8

COORDINATE POINTS BURIED DEBRIS AREA 8 REGRADING		
NO.	NORTHING	EASTING
814	7 645 189.8	503 347.5
815	7 645 197.4	503 359.6
816	7 645 176.7	503 366.6
817	7 645 171.5	503 355.4

COORDINATE POINTS SOUTH LANDFILL – EAST REGRADING		
NO.	NORTHING	EASTING
823	7 645 083.1	503 445.5
824	7 645 097.4	503 488.6
825	7 645 052.1	503 524.6
826	7 645 032.6	503 516.7
827	7 645 048.7	503 476.6
828	7 645 068.4	503 449.7

COORDINATE POINTS SOUTHWEST BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
805	7 645 170.3	503 282.5
806	7 645 169.4	503 290.3
807	7 645 151.0	503 302.1
808	7 645 131.3	503 283.8
809	7 645 115.5	503 281.7
810	7 645 105.8	503 271.7
811	7 645 119.9	503 253.9
812	7 645 130.3	503 252.2
813	7 645 150.9	503 272.9

COORDINATE POINTS BURIED DEBRIS AREA 7 EXCAVATION		
NO.	NORTHING	EASTING
818	7 645 139.5	503 360.3
819	7 645 139.0	503 379.7
820	7 645 131.7	503 379.7
821	7 645 121.4	503 369.7
822	7 645 130.4	503 360.5

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
UMA241	7 645 280.337	503 214.125	19.780	19mm REBAR WITH CAP

CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
DA7	3	1	7 645 109.1	503 389.3
TIER II				
DA7	11	5	7 645 118.3	503 396.3
SDA	19	6	7 645 133.7	503 281.1

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H-C81/1-9101-120. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- PROPOSED MONITORING WELL LOCATION (3)
- PROPOSED BACKGROUND MONITORING WELL LOCATION (1)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 825 COORDINATE POINT
- (35) PHOTOGRAPHIC VIEWPOINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 8)

No.	DATE	REVISION	REVISION	APPR.

R.E. MERCHANT 1999 NWT/NU 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: SITING
DATE: 2008-09-30

SUBJECT – SUJET

SOUTH CROSSROADS AREA
SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT
DESIGNED ETUDIE BWF	DES OFF AGENT CONCEPT
DRAWN DESSINE LJV	SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM	DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU

DWG. NO. – DESSIN NO.
H-C81/1-9101-111

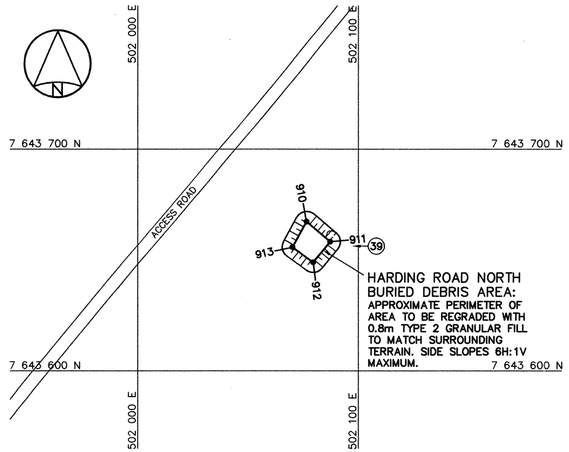
Canada

COORDINATE POINTS NORTH BORROW BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
901	7 644 648.3	503 728.5
902	7 644 643.5	503 743.2
903	7 644 597.4	503 754.6
904	7 644 594.1	503 740.5

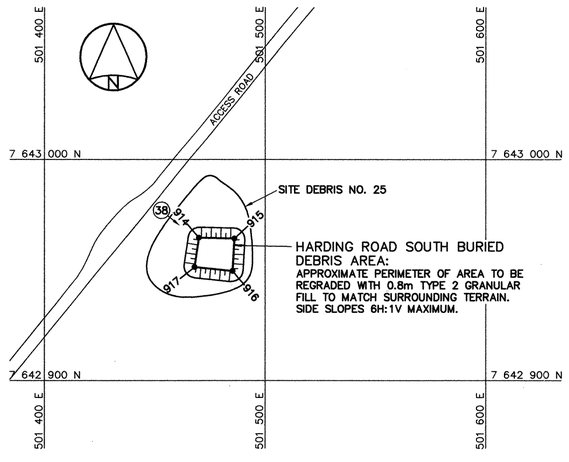
COORDINATE POINTS BURIED DEBRIS AREA 2 REGRADING		
NO.	NORTHING	EASTING
905	7 644 506.1	503 697.9
906	7 644 514.7	503 711.0
907	7 644 499.0	503 729.5
908	7 644 487.3	503 719.1
909	7 644 492.0	503 707.0

COORDINATE POINTS HARDING ROAD NORTH BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
910	7 643 667.7	502 076.5
911	7 643 658.6	502 087.3
912	7 643 649.1	502 079.6
913	7 643 656.1	502 070.2

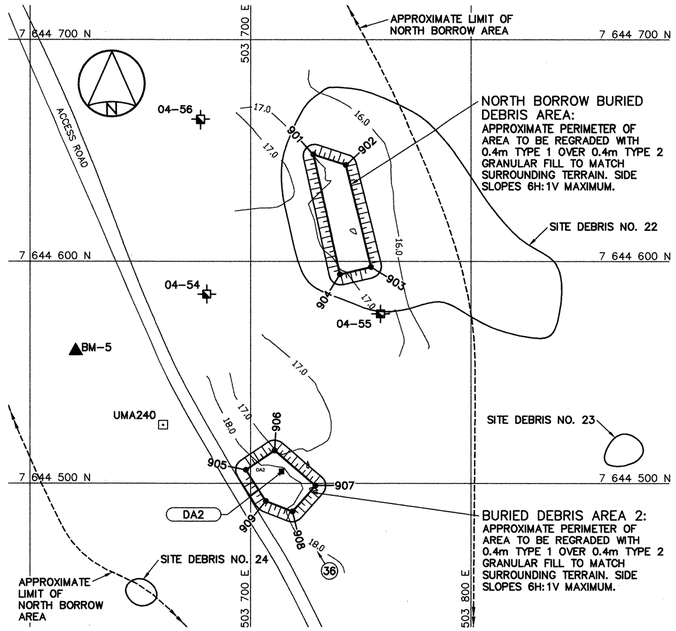
COORDINATE POINTS HARDING ROAD SOUTH BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
914	7 642 964.9	501 470.1
915	7 642 964.5	501 486.1
916	7 642 949.6	501 485.3
917	7 642 951.4	501 468.1



HARDING ROAD NORTH AREA



HARDING ROAD SOUTH AREA



NORTH BORROW AREA

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

CONTAMINATED SOIL				
AREA NAME	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER II				
DA2	3	1	7 644 504.4	503 713.3

TEMPORARY BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
UMA240	7 644 526.544	503 660.398	19.365	19mm REBAR WITH CAP

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H-C81/1-9101-120. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION
- TIER II CONTAMINATED SOILS
- ABC — CONTAMINATED SOIL AREA NAME
- 905 — COORDINATE POINT
- 36 — PHOTOGRAPHIC VIEWPOINT
- ▲ PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 8)

No.	DATE	REVISION	REVISION	APPR.

R. HERPERSKY — NORTHWEST TERRITORIES — PROFESSIONAL ENGINEER
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

SUBJECT - SUJET
NORTH BORROW, HARDING ROAD NORTH AND SOUTH AREAS SITE PLANS

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-112

Canada

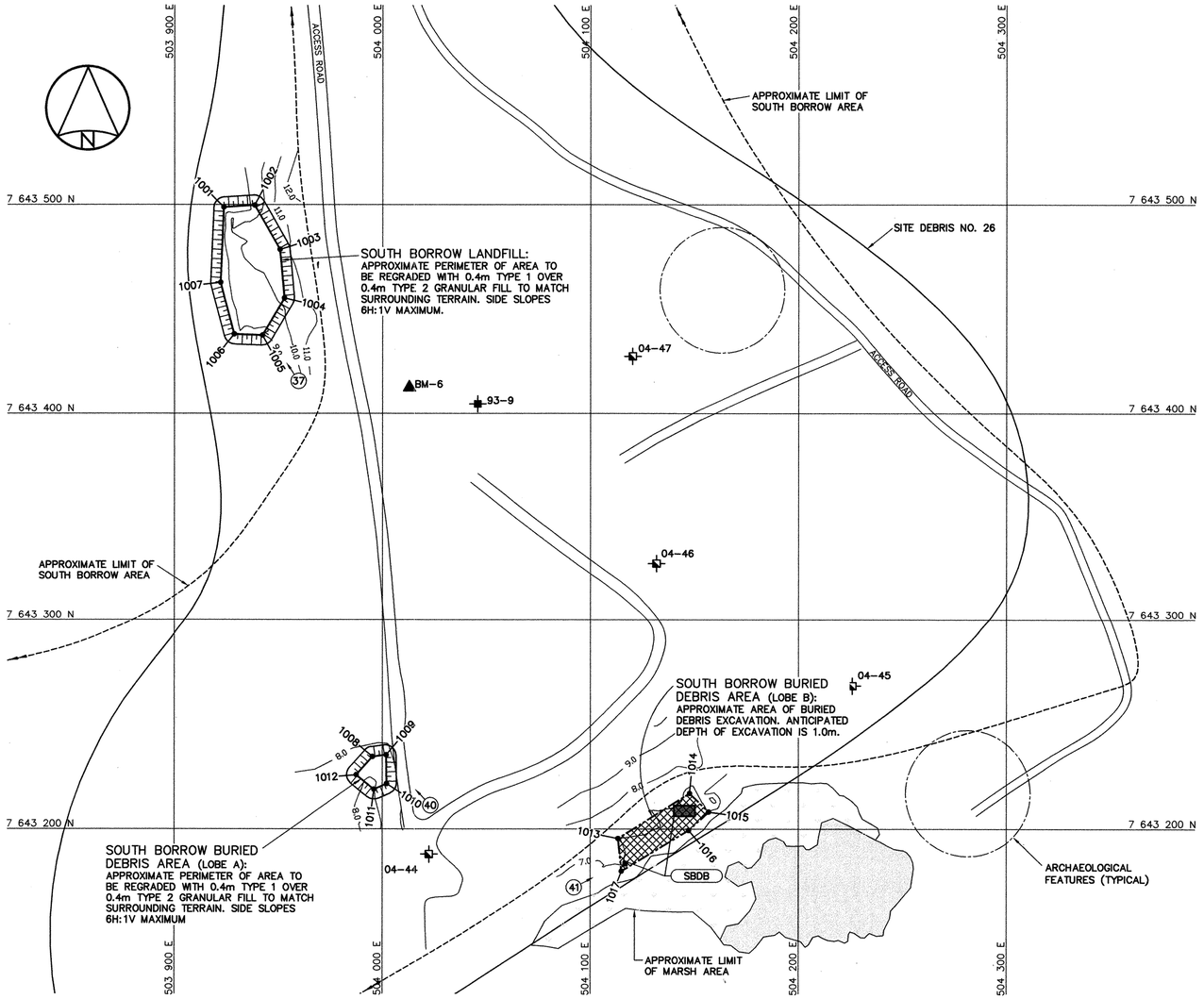
CONTAMINATED SOIL				
AREA	APPROX. AREA (m^2)	ESTIMATED IN PLACE VOLUME (m^3)	REFERENCE POINT	
			NORTHING	EASTING
TIER I				
SBDB	51	26	7 643 206.1	504 140.2
TIER II				
SBDB	3	1	7 643 184.2	504 117.5

NOTE:
DETAILS OF CONTAMINATED SOIL AREAS, INCLUDING COORDINATE POINTS, WILL BE PROVIDED PRIOR TO CONSTRUCTION.

COORDINATE POINTS SOUTH BORROW LANDFILL REGRADING		
NO.	NORTHING	EASTING
1001	7 643 498.7	503 923.8
1002	7 643 499.6	503 938.6
1003	7 643 478.6	503 950.8
1004	7 643 455.4	503 952.9
1005	7 643 437.7	503 942.4
1006	7 643 438.2	503 928.8
1007	7 643 462.7	503 922.2

COORDINATE POINTS SOUTH BORROW BURIED DEBRIS AREA REGRADING		
NO.	NORTHING	EASTING
1008	7 643 234.5	503 995.3
1009	7 643 235.4	504 001.9
1010	7 643 221.6	504 002.1
1011	7 643 218.9	503 996.0
1012	7 643 225.8	503 987.5

COORDINATE POINTS SOUTH BORROW BURIED DEBRIS AREA EXCAVATION		
NO.	NORTHING	EASTING
1013	7 643 195.4	504 113.3
1014	7 643 217.0	504 147.8
1015	7 643 208.1	504 156.9
1016	7 643 199.4	504 147.3
1017	7 643 179.7	504 114.9



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.
6. REGRADED SIDE SLOPES 6H:1V MAXIMUM UNLESS NOTED OTHERWISE.
7. CONTAMINATED SOIL CLASSIFICATIONS ARE BASED ON DISPOSAL REQUIREMENTS.
8. FOR PERMANENT SURVEY CONTROL (BENCHMARK) INSTALLATION DETAIL, SEE DRAWING H-C81/1-9101-120. LOCATIONS TO BE APPROVED BY THE ENGINEER.

Legend:

- TEMPORARY BENCHMARK
- TEST PIT LOCATION (2004)
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- (ABC) CONTAMINATED SOIL AREA NAME
- 1004 COORDINATE POINT
- (37) PHOTOGRAPHIC VIEWPOINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- ARCHAEOLOGICAL FEATURES
- BODY OF WATER
- PROPOSED PERMANENT BENCHMARK LOCATION (1) (SEE NOTE 8)

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE - ECHELLE 20 10 0 20 40 60m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER: SITING
DATE: 2008-09-30

SUBJECT - SUJET
SOUTH BORROW AREA
SITE PLAN

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

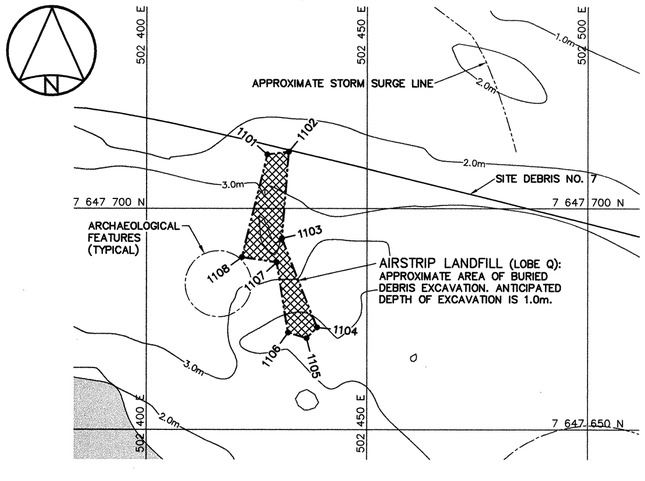
DWG. NO. - DESSIN NO.
H-C81/1-9101-113

Canada

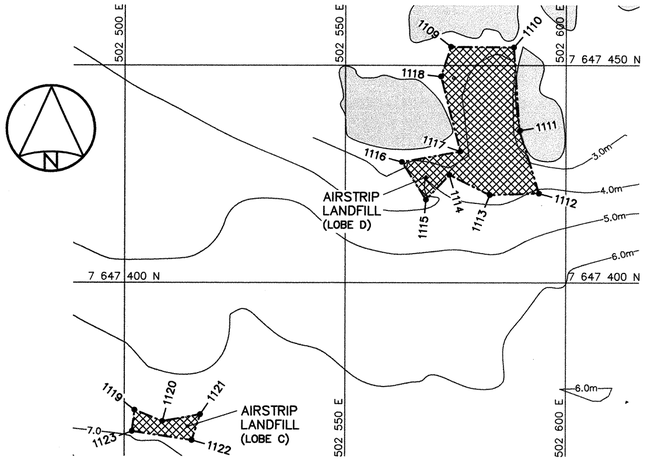
COORDINATE POINTS AIRSTRIP LANDFILL (LOBES C,D,Q) EXCAVATION		
NO.	NORTHING	EASTING
1101	7 647 712.3	502 427.4
1102	7 647 712.9	502 432.2
1103	7 647 693.1	502 430.7
1104	7 647 672.9	502 438.7
1105	7 647 670.4	502 436.3
1106	7 647 671.7	502 432.1
1107	7 647 687.8	502 429.6
1108	7 647 688.9	502 421.7
1109	7 647 454.1	502 573.9
1110	7 647 454.0	502 588.2
1111	7 647 434.8	502 589.5
1112	7 647 420.3	502 593.9
1113	7 647 420.0	502 582.8
1114	7 647 424.5	502 573.6
1115	7 647 418.9	502 568.3
1116	7 647 418.9	502 568.3
1117	7 647 429.9	502 576.1
1118	7 647 447.4	502 571.7
1119	7 647 371.5	502 502.3
1120	7 647 369.0	502 508.6
1121	7 647 370.5	502 517.2
1122	7 647 364.7	502 515.3
1123	7 647 366.7	502 501.8

COORDINATE POINTS AIRSTRIP LANDFILL (LOBES M,N,O,P) EXCAVATION		
NO.	NORTHING	EASTING
1124	7 647 445.4	502 867.6
1125	7 647 444.0	502 877.5
1126	7 647 437.9	502 880.5
1127	7 647 435.3	502 877.5
1128	7 647 439.3	502 869.7
1129	7 647 473.6	502 885.9
1130	7 647 467.6	502 900.6
1131	7 647 460.2	502 887.3
1132	7 647 405.1	502 896.0
1133	7 647 407.3	502 899.6
1134	7 647 407.3	502 906.2
1135	7 647 400.1	502 907.2
1136	7 647 395.3	502 900.5
1137	7 647 432.7	502 937.7
1138	7 647 433.4	502 942.4
1139	7 647 426.1	502 957.9
1140	7 647 406.4	502 956.8
1141	7 647 398.1	502 952.9
1142	7 647 398.2	502 947.7
1143	7 647 406.1	502 941.7
1144	7 647 421.9	502 945.7

COORDINATE POINTS AIRSTRIP LANDFILL (LOBES K,L,R) EXCAVATION		
NO.	NORTHING	EASTING
1145	7 647 382.6	502 947.5
1146	7 647 386.1	502 951.6
1147	7 647 379.7	502 956.9
1148	7 647 378.0	502 951.0
1149	7 647 353.5	503 053.2
1150	7 647 353.3	503 058.4
1151	7 647 345.2	503 062.8
1152	7 647 340.4	503 056.0
1153	7 647 346.3	503 048.5
1154	7 647 331.8	503 011.4
1155	7 647 330.2	503 019.5
1156	7 647 323.9	503 025.1
1157	7 647 314.1	503 020.7
1158	7 647 313.9	503 014.9

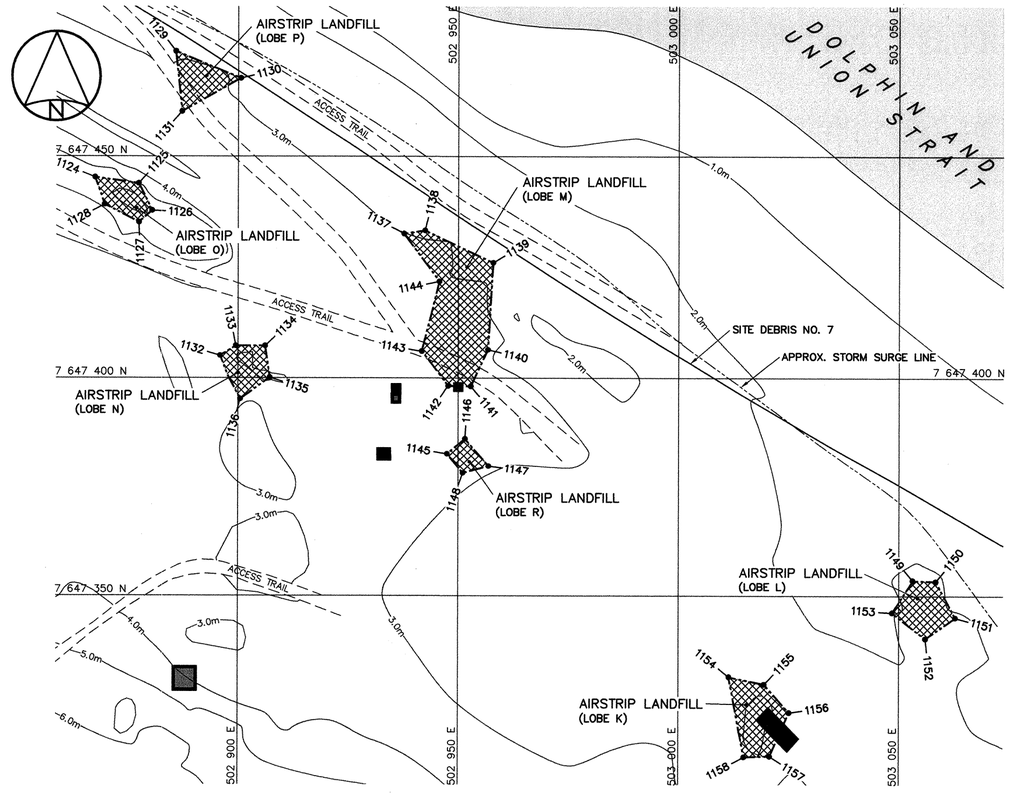


LOBE Q



LOBE C,D

AIRSTRIP LANDFILL (LOBES C,D): APPROXIMATE AREAS OF BURIED DEBRIS EXCAVATION. ANTICIPATED DEPTH OF EXCAVATION IS 1.0m.



LOBE K,L,M,N,O,P,R

AIRSTRIP LANDFILL (LOBES K,L,M,N,O,P,R): APPROXIMATE AREAS OF BURIED DEBRIS EXCAVATION. ANTICIPATED DEPTH OF EXCAVATION IS 1.0m.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL NON-HAZARDOUS DEBRIS TO BE PLACED IN NON-HAZARDOUS WASTE LANDFILL.
4. REFER TO TABLE 02219-1 IN SPECIFICATIONS FOR DESCRIPTION OF DEBRIS AREAS.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

- 1129 COORDINATE POINT
- LANDFILL/BURIED DEBRIS EXCAVATION AREA
- DCC TIER I CONTAMINATED SOILS
- DCC TIER II CONTAMINATED SOILS
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

APEGGA PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF ALBERTA
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 10 5 0 10 20 30m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
SITING	2008-09-30

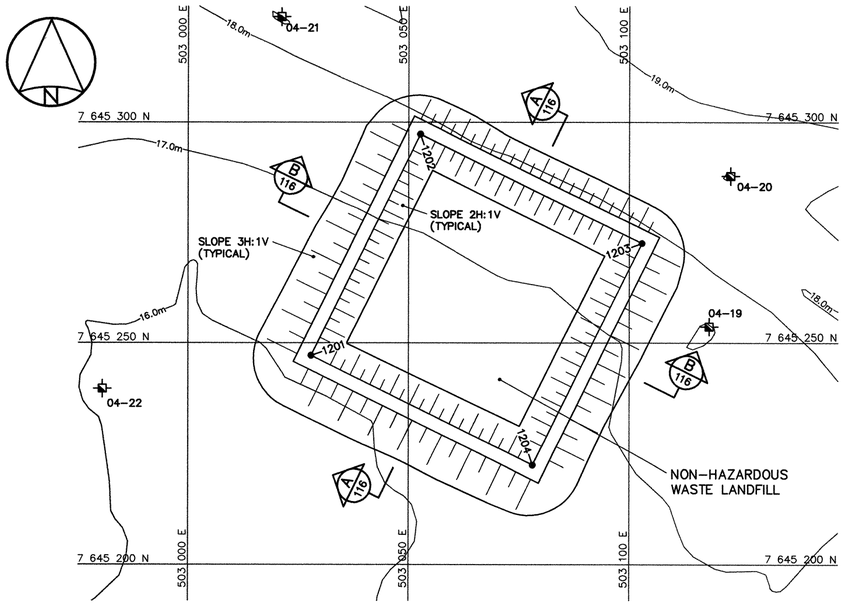
SUBJECT - SUJET

AIRSTRIP LANDFILL
EXCAVATION PLANS

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-CB1/1-9101-114

Canada

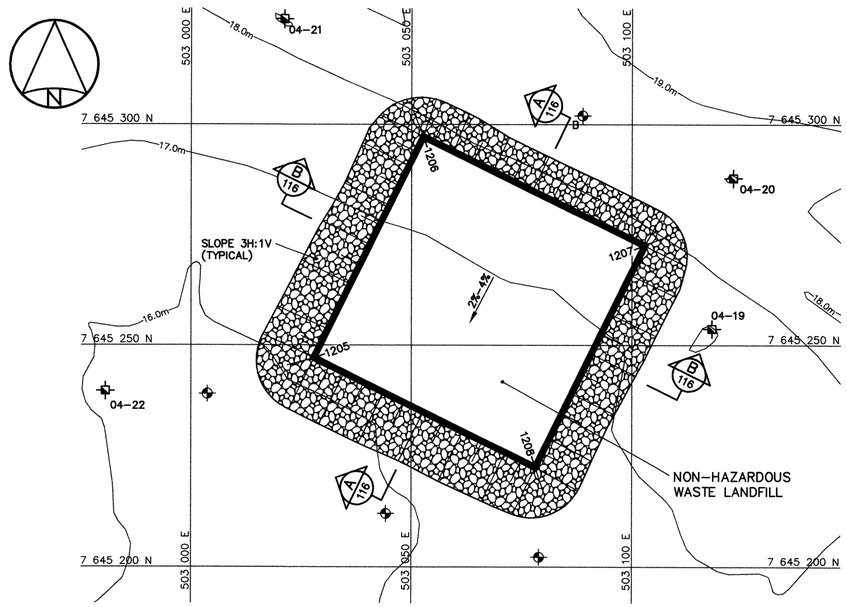


PLAN – BERM CONSTRUCTION

0 10 20 30m

10 5

COORDINATE POINTS NON–HAZARDOUS WASTE LANDFILL BERM CONSTRUCTION			
NO.	NORTHING	EASTING	ELEV.
1201	7 645 247.2	503 027.9	19.25
1202	7 645 297.4	503 052.7	20.25
1203	7 645 272.6	503 102.9	20.25
1204	7 645 222.4	503 078.1	19.25



PLAN – FINAL GRADING

0 10 20 30m

10 5

COORDINATE POINTS NON–HAZARDOUS WASTE LANDFILL FINAL LANDFILL SURFACE			
NO.	NORTHING	EASTING	ELEV.
1205	7 645 247.2	503 027.9	20.25
1206	7 645 297.4	503 052.7	21.25
1207	7 645 272.6	503 102.9	21.25
1208	7 645 222.4	503 078.1	20.25

NOTE:
COORDINATE POINTS AND ELEVATIONS PROVIDED ARE TO THE FINAL GRADE OF THE TYPE 2 GRANULAR FILL CAP PRIOR TO THE PLACEMENT OF THE TYPE 1 GRANULAR FILL ON THE SIDE SLOPES.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE. MINIMUM 2% – MAXIMUM 4%.
4. FOR MONITORING WELL INSTALLATION DETAILS, SEE DRAWING H–C81/1–9101–120. LOCATIONS TO BE APPROVED BY THE ENGINEER.
5. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

- TEST PIT LOCATION (2004)
- 250 COORDINATE POINT
- PROPOSED MONITORING WELL LOCATION (3)
- B PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: SITING

DATE: 2008–09–30

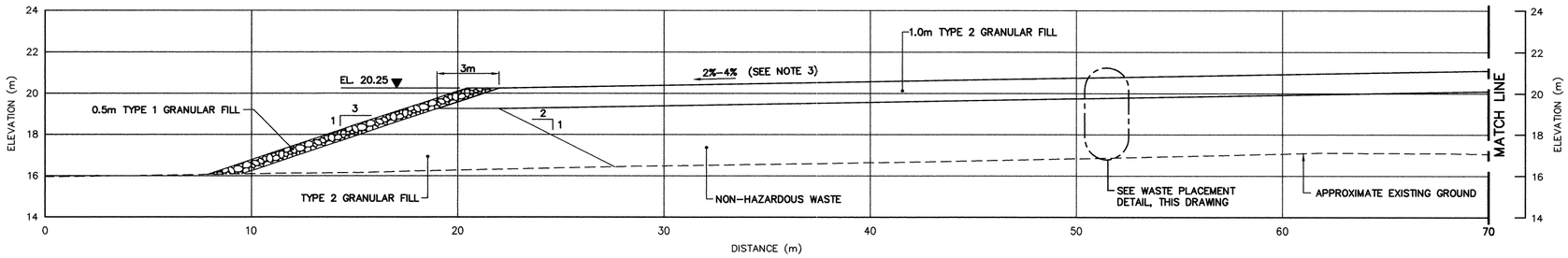
SUBJECT – SUJET

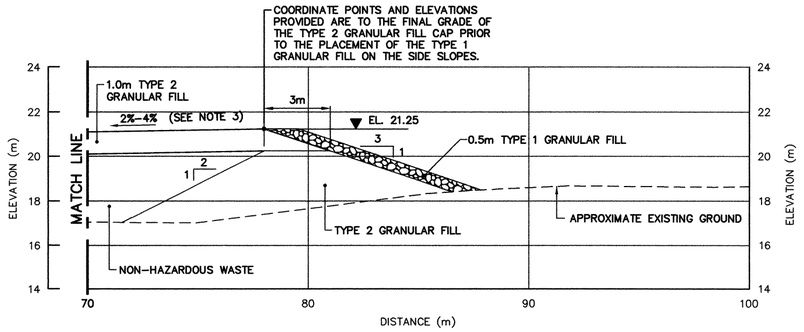
NON–HAZARDOUS WASTE LANDFILL BERM AND FINAL GRADING PLANS

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	KMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO
H–C81/1–9101–115

Canada

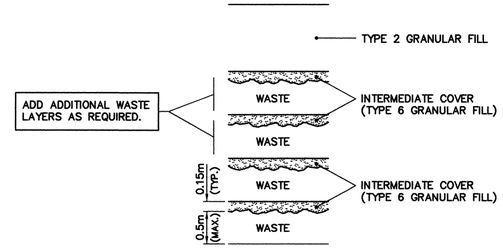




SECTION A 115

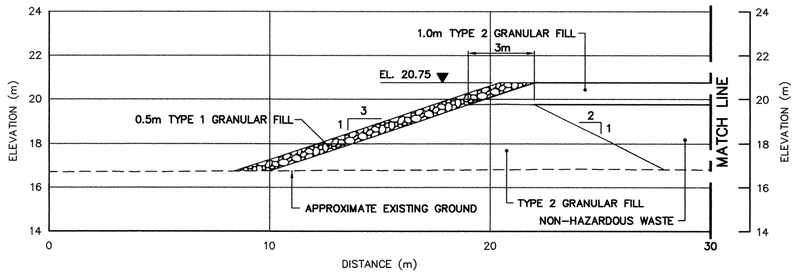
0 2 4 6m

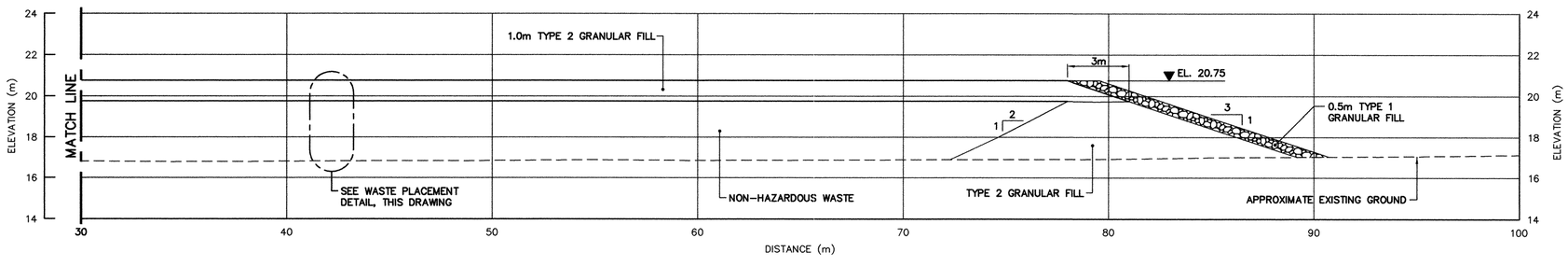
2 1



WASTE PLACEMENT DETAIL

N.T.S.





SECTION B 115

0 2 4 6m

2 1

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE. MINIMUM 2% – MAXIMUM 4%.

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
SITING	2008–09–30

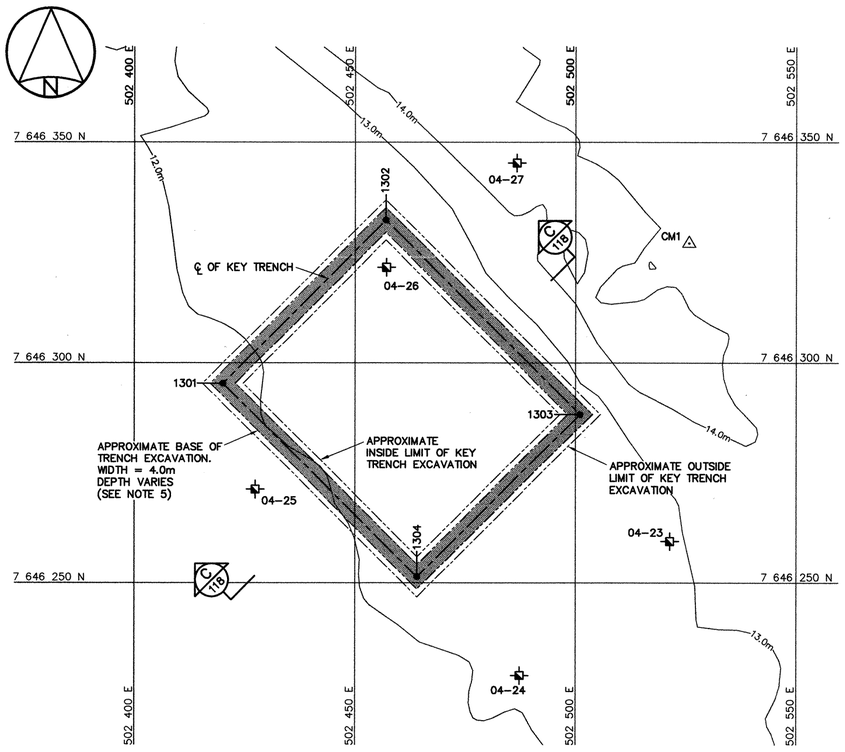
SUBJECT – SUJET

NON–HAZARDOUS WASTE LANDFILL CROSS SECTIONS AND DETAIL

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO
H–C81/1–9101–116

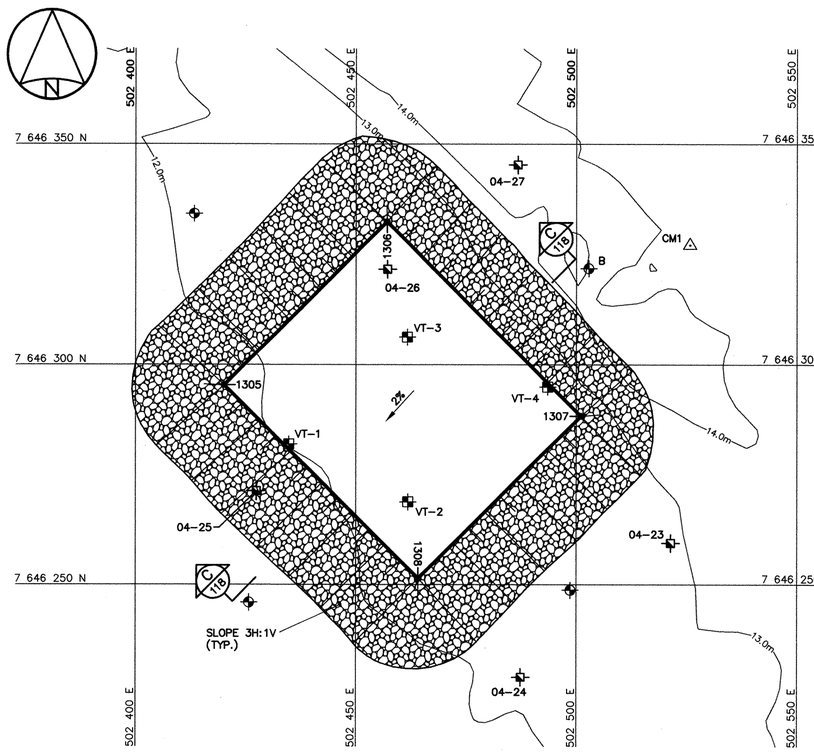
Canada



KEY TRENCH EXCAVATION PLAN

0 10 20 30m

10 5



GRADING/INSTRUMENTATION PLAN

0 10 20 30m

10 5

COORDINATE POINTS KEY TRENCH EXCAVATION		
NO.	NORTHING	EASTING
1301	7 646 295.4	502 420.1
1302	7 646 332.4	502 457.0
1303	7 646 288.3	502 501.1
1304	7 646 251.4	502 464.1

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 646 327.029	502 525.754	13.804	PIN–2 BASELINE STA. 0+00

COORDINATE POINTS FINAL LANDFILL SURFACE			
NO.	NORTHING	EASTING	ELEV.
1305	7 646 295.4	502 420.1	18.55
1306	7 646 332.4	502 457.0	19.30
1307	7 646 288.3	502 501.1	19.30
1308	7 646 251.4	502 464.1	18.55

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. VARIABLE SLOPE ON LANDFILL SURFACE. MINIMUM 2% – MAXIMUM 4%.
4. FOR GROUND TEMPERATURE CABLE INSTALLATION DETAILS, SEE DRAWING H–C81/1–9101–119. EXACT LOCATIONS TO BE FIELD DETERMINED BY THE ENGINEER.
5. EXCAVATE KEY TRENCH TO SOUND BEDROCK (APPROX. 0.6–1.0m). EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE ENGINEER.
6. FOR MONITORING WELL INSTALLATION DETAILS, SEE DRAWING H–C81/1–9101–120. LOCATIONS TO BE APPROVED BY THE ENGINEER.
7. ALL SURFACE DEBRIS IS TO BE REMOVED FROM ALL CONTAMINATED SOIL AREAS AND EXISTING AND NEW LANDFILL AREAS PRIOR TO ANY FILL PLACEMENT OR EXCAVATION TAKING PLACE.

Legend:

- △ CONTROL MONUMENT
- TEST PIT LOCATION (2004)
- 801 COORDINATE POINT
- GROUND TEMPERATURE CABLE INSTALLATION (4)
- PROPOSED MONITORING WELL LOCATION (3)
- B PROPOSED BACKGROUND MONITORING WELL LOCATION (1)

No.	DATE	REVISION	REVISION	APPR.

NWT/NU PROFESSIONAL ENGINEER M. MROSKY 10879 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: SITING | DATE: 2008–09–30

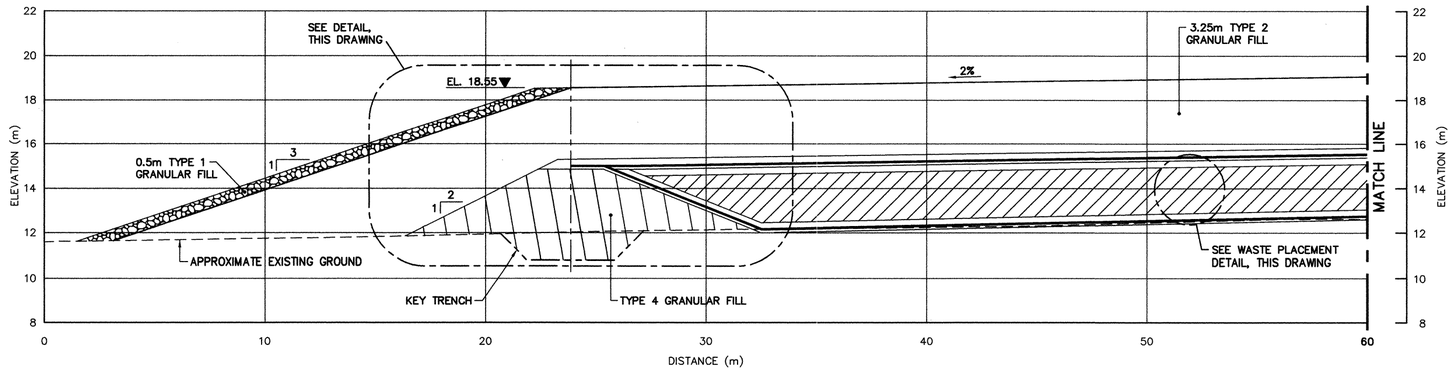
SUBJECT – SUJET:

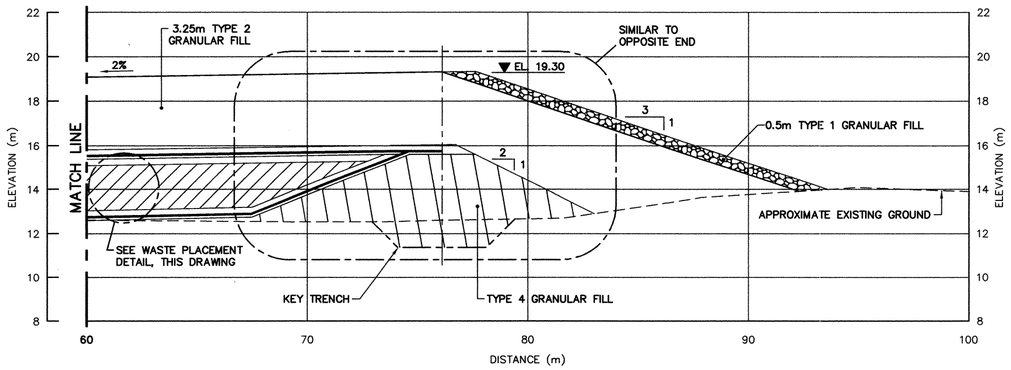
TIER II DISPOSAL FACILITY
KEY TRENCH EXCAVATION PLAN &
GRADING/INSTRUMENTATION PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–117

Canada





SECTION C 117

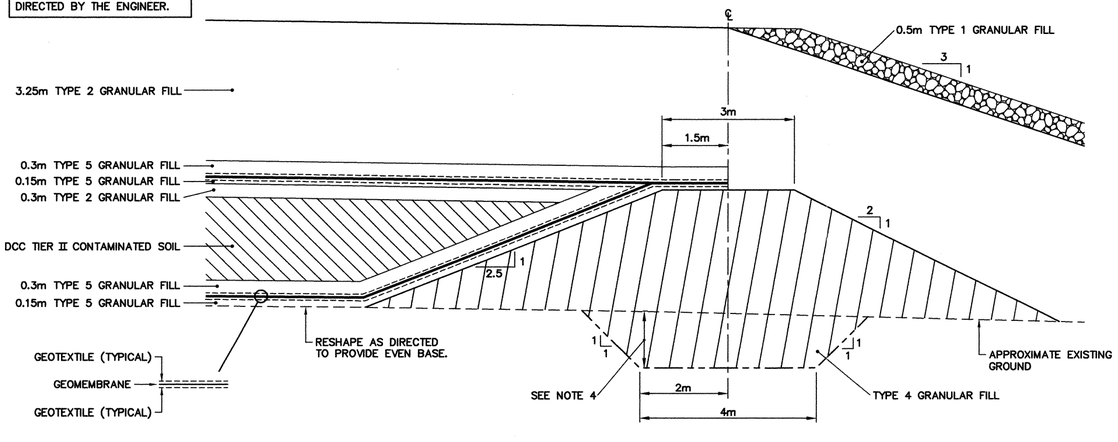
0 2 4 6m

2 1

NOTE:
COVER FINAL LAYER OF TIER II CONTAMINATED SOIL WITH TYPE 6 GRANULAR FILL TO PROVIDE LEVEL SURFACE, AS DIRECTED BY THE ENGINEER.

NOTE:
PROTECT GEOMEMBRANE LINERS DURING INTERIM CONSTRUCTION.

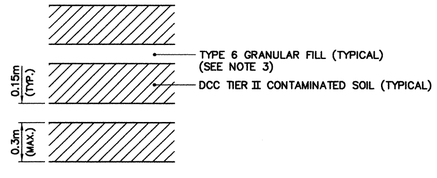
NOTE:
GEOMEMBRANES TO BE WELDED TOGETHER OVER THE TOP OF THE BERM.



DETAIL 1 118

N.T.S.

ADD ADDITIONAL TIER II LAYERS, AS REQUIRED, TO ACHIEVE THE TIER II DISPOSAL FACILITY DESIGN ELEVATIONS.



WASTE PLACEMENT DETAIL

N.T.S.

National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 11N. ELEVATIONS ARE REFERENCED TO MEAN SEA LEVEL, RELATIVE TO GEOID MODEL CANADIAN HT2_0.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. TYPE 6 INTERMEDIATE FILL ONLY REQUIRED FOR LANDFILLING OF ORGANIC OR WET SOILS, AS DIRECTED BY THE ENGINEER.
4. EXCAVATE KEY TRENCH TO SOUND BEDROCK (APPROX. 0.6–1.0m). EXCAVATION DEPTH TO BE FIELD CONFIRMED BY THE ENGINEER.
5. PROTECT GEOMEMBRANE LINERS DURING CONSTRUCTION.
6. TYPE 2 GRANULAR FILL PLACED OUTSIDE OF THE TYPE 4 GRANULAR FILL BERMS TO BE PLACED SIMULTANEOUSLY WITH THE TYPE 4 FILL TO PROVIDE STABILITY AND PROTECTION DURING CONSTRUCTION.
7. COVER FINAL LAYER OF TIER II CONTAMINATED SOIL WITH TYPE 6 GRANULAR FILL TO PROVIDE LEVEL SURFACE, AS DIRECTED BY THE ENGINEER.
8. APPLICATION OF A WATER BENTONITE SLURRY TO THE BASE OF EXCAVATED KEY TRENCH MAY BE REQUIRED FOR MAJORITY OF THE TRENCH.

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: SITING

DATE: 2008–09–30

SUBJECT – SUJET

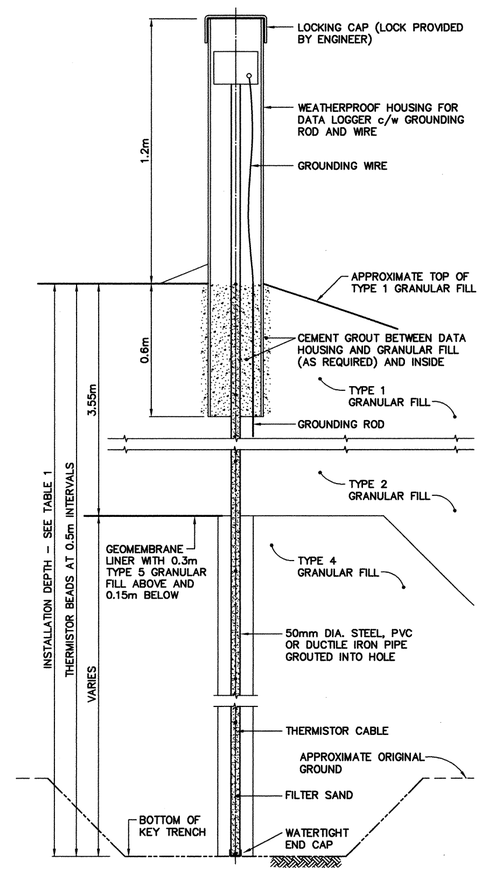
TIER II DISPOSAL FACILITY
CROSS SECTION AND DETAIL

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	KMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–118

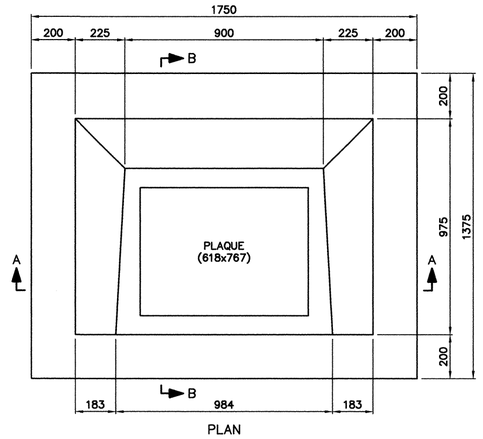
Canada

TABLE 1 VERTICAL THERMISTOR INSTALLATION		
INSTRUMENT No.	APPROXIMATE DEPTH BELOW FINAL GRADE (m)	COMMENTS
TIER II DISPOSAL FACILITY		
VT–1	7.8	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH
VT–2	5.8	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT–3	5.5	INSTALL TO 1.0m ABOVE ELEVATION OF BOTTOM LINER
VT–4	7.7	INSTALL THROUGH CENTERLINE BERM TO INVERT OF KEY TRENCH

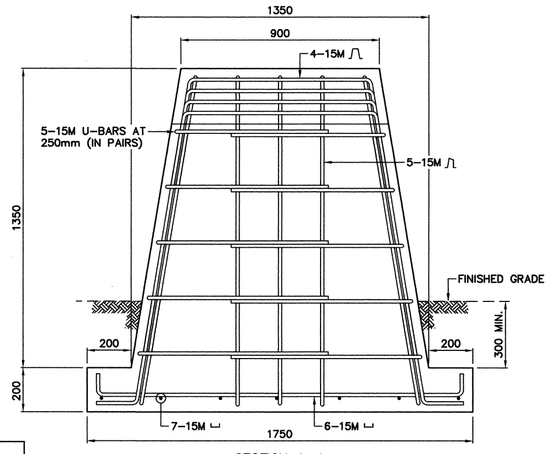


TYPICAL GROUND TEMPERATURE CABLE INSTALLATION

N.T.S.



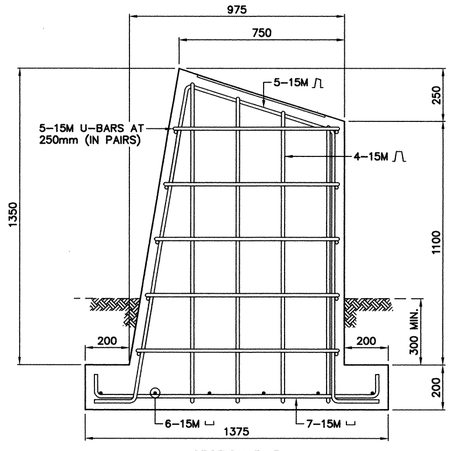
PLAN



SECTION A–A

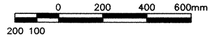
COMMEMORATIVE PLAQUE BASE CONSTRUCTION NOTES:

1. PROVIDE TO SITE ALL EQUIPMENT, MATERIALS, TOOLS, TEMPORARY FORMS AND ASSOCIATED EXCAVATION AND/OR BACKFILL TO CONSTRUCT THE COMMEMORATIVE PLAQUE BASE, INCLUDING 30 MPa CONCRETE AND 15M STEEL REBAR.
2. COMMEMORATIVE PLAQUE BASE CAN BE CONSTRUCTED ON SITE OR PRE–CAST AND DELIVERED TO SITE.
3. OWNER TO SUPPLY COMMEMORATIVE PLAQUE.
4. LOCATION OF COMMEMORATIVE PLAQUE BASE TO BE DETERMINED BY THE ENGINEER.



SECTION B–B

COMMEMORATIVE PLAQUE BASE DETAIL



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. APPROXIMATE LOCATIONS FOR INSTRUMENTATION ARE SHOWN ON THE DRAWINGS. ALL LOCATIONS TO BE FIELD CONFIRMED BY THE ENGINEER.
3. MOUND FILL AROUND CASING TO PROMOTE DRAINAGE AWAY FROM INSTRUMENT.
4. PROVIDE THERMISTOR BEADS AT 0.5m MAXIMUM INTERVALS, INCLUDING ONE AT THE BOTTOM OF THE INSTALLATION AND ONE WITHIN A 0.5m DEPTH FROM FINAL DESIGN SURFACE IN EACH INSTALLATION.

No.	DATE	REVISION	REVISION	APPR.

R.R. WEREDOSKY 10066 PROFESSIONAL ENGINEER NWT/NU
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
SITING	2008–09–30

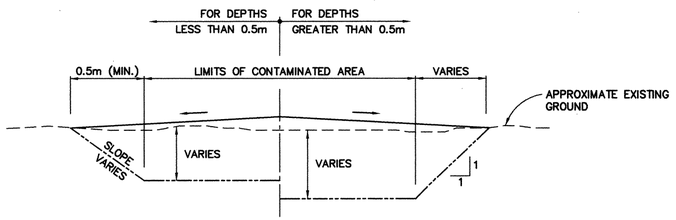
SUBJECT – SUJET

MISCELLANEOUS DETAILS
SHEET 1

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–119

Canada

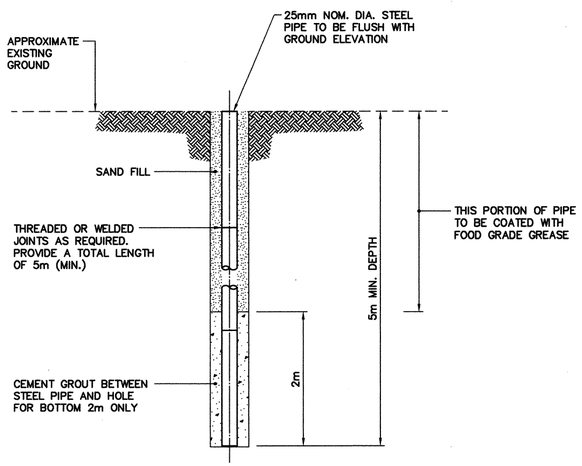


NOTE:

1. MATERIAL TO BE REMOVED: DCC TIER I SOILS TO BE DISPOSED OF IN THE NON-HAZARDOUS WASTE LANDFILL. DCC TIER II SOILS TO BE DISPOSED OF IN THE TIER II SOIL DISPOSAL FACILITY. HYDROCARBON TYPE B SOILS PLACED IN THE LANDFARM AND TREATED.
2. TYPE 3 GRANULAR MATERIAL TO BE PLACED IN EXCAVATION, COMPACTED AND MOUNDED TO 100mm ABOVE GROUND SURFACE TO PROMOTE DRAINAGE, UNLESS NOTED OTHERWISE.

TYPICAL CONTAMINATED SOIL EXCAVATION SECTION

N.T.S.



MINIMUM EMBEDMENT CAN BE REDUCED IF ROCK IS ENCOUNTERED. INSTALLATION TO PENETRATE A MINIMUM OF 2m INTO ROCK.

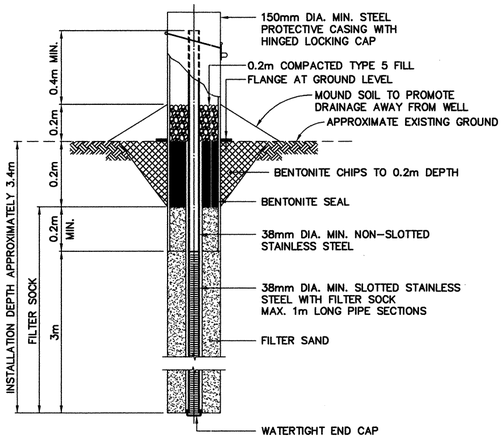
NOTE:
6 PERMANENT SURVEY CONTROL MONUMENTS TO BE INSTALLED. SEE NOTE 2.

TYPICAL PERMANENT SURVEY CONTROL MONUMENT (BENCHMARK)

N.T.S.

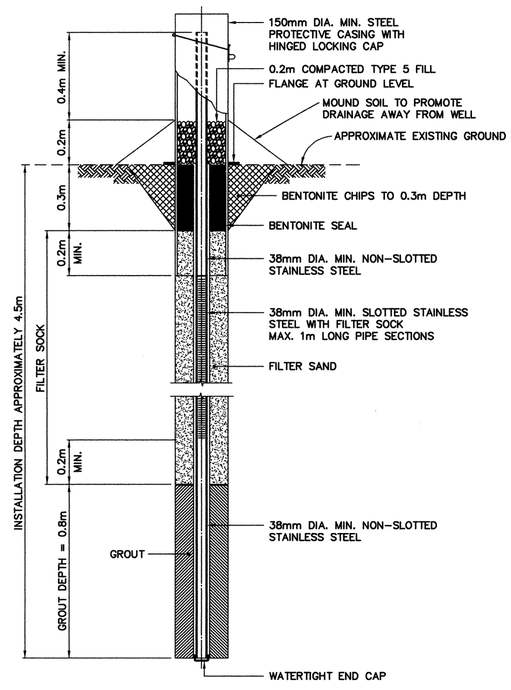
MINIMUM 2.5m OF SCREEN AND 0.5m EMBEDMENT INTO SOUND BEDROCK IF SOUND BEDROCK IS ENCOUNTERED.

NOTE:
8 MONITORING WELLS TO BE INSTALLED. SEE NOTE 2.



TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL

(FOR BEDROCK DEPTH < 0.7m)
N.T.S.



TYPICAL MONITORING WELL/ BACKGROUND MONITORING WELL

(FOR BEDROCK DEPTH > 0.7m)
N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. APPROXIMATE LOCATIONS FOR INSTRUMENTATION AND PERMANENT SURVEY MONUMENTS ARE SHOWN ON THE DRAWINGS. ALL LOCATIONS TO BE FIELD CONFIRMED BY THE ENGINEER.
3. MOUND FILL AROUND CASING TO PROMOTE DRAINAGE AWAY FROM INSTRUMENT.

No.	DATE	REVISION	REVISION	APPR.

NORTHWEST TERRITORIES ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS — 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE - ECHELLE: AS SHOWN

PROJECT - PROJET: PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER: SITING
DATE: 2008-09-30

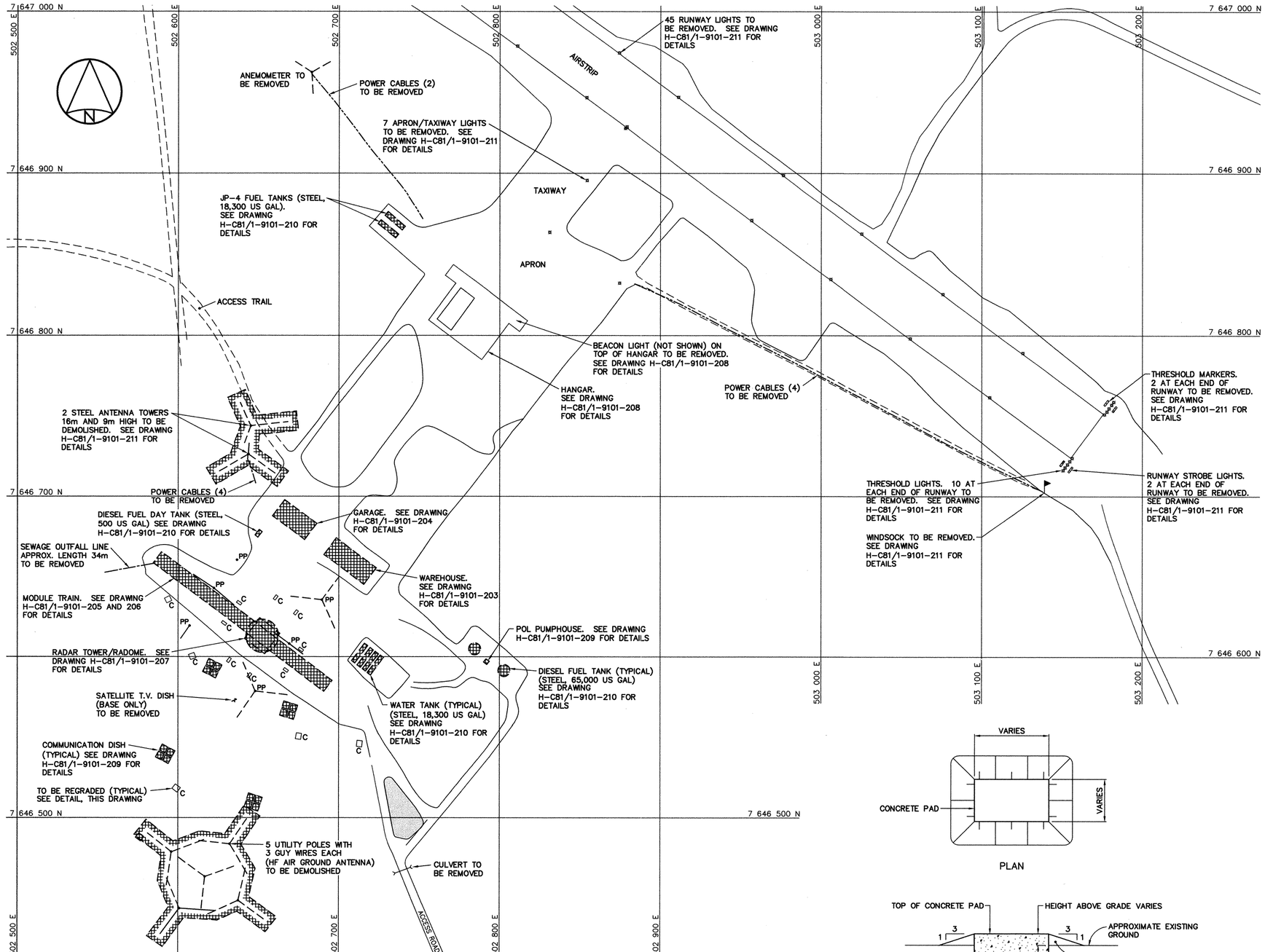
SUBJECT - SUJET:

MISCELLANEOUS DETAILS
SHEET 2

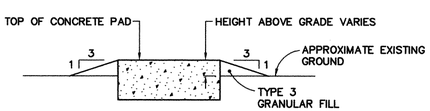
PRODUCTION		CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	KMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED - REVU	

DWG. NO. - DESSIN NO.
H-C81/1-9101-120

Canada



PLAN



SECTION

TYPICAL CONCRETE PAD REGRADING DETAIL

N.T.S.

National Défense / Defence nationale

Headquarters
Quartier général

General Notes:

1. ALL STRUCTURES DESIGNATED FOR DEMOLITION TO BE DEMOLISHED TO TOP OF CONCRETE FOUNDATIONS UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL POLES TO BE REMOVED UNLESS NOTED OTHERWISE.
4. ALL CULVERTS ARE TO BE REMOVED AND DISPOSED OF.
5. ALL ELECTRICAL CABLES AND POL LINES TO BE REMOVED.
6. PROVIDE REGRADING AROUND ALL CONCRETE PADS THAT ARE DESIGNATED TO REMAIN, AS PER TYPICAL DETAIL ON THIS DRAWING.
7. LOCATIONS OF POWER/COMMUNICATION CABLES ARE APPROXIMATE ONLY. SOME ABOVE GROUND CABLES TO BE REMOVED MAY NOT BE SHOWN.

Legend:

- TO BE DEMOLISHED
- C — CONCRETE PAD
- PP — UTILITY POLE TO BE REMOVED
- POWER/COMMUNICATION CABLE
- SEWAGE OUTFALL LINE
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE 20 10 0 20 40 60m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
STRUCTURAL	2008–09–30

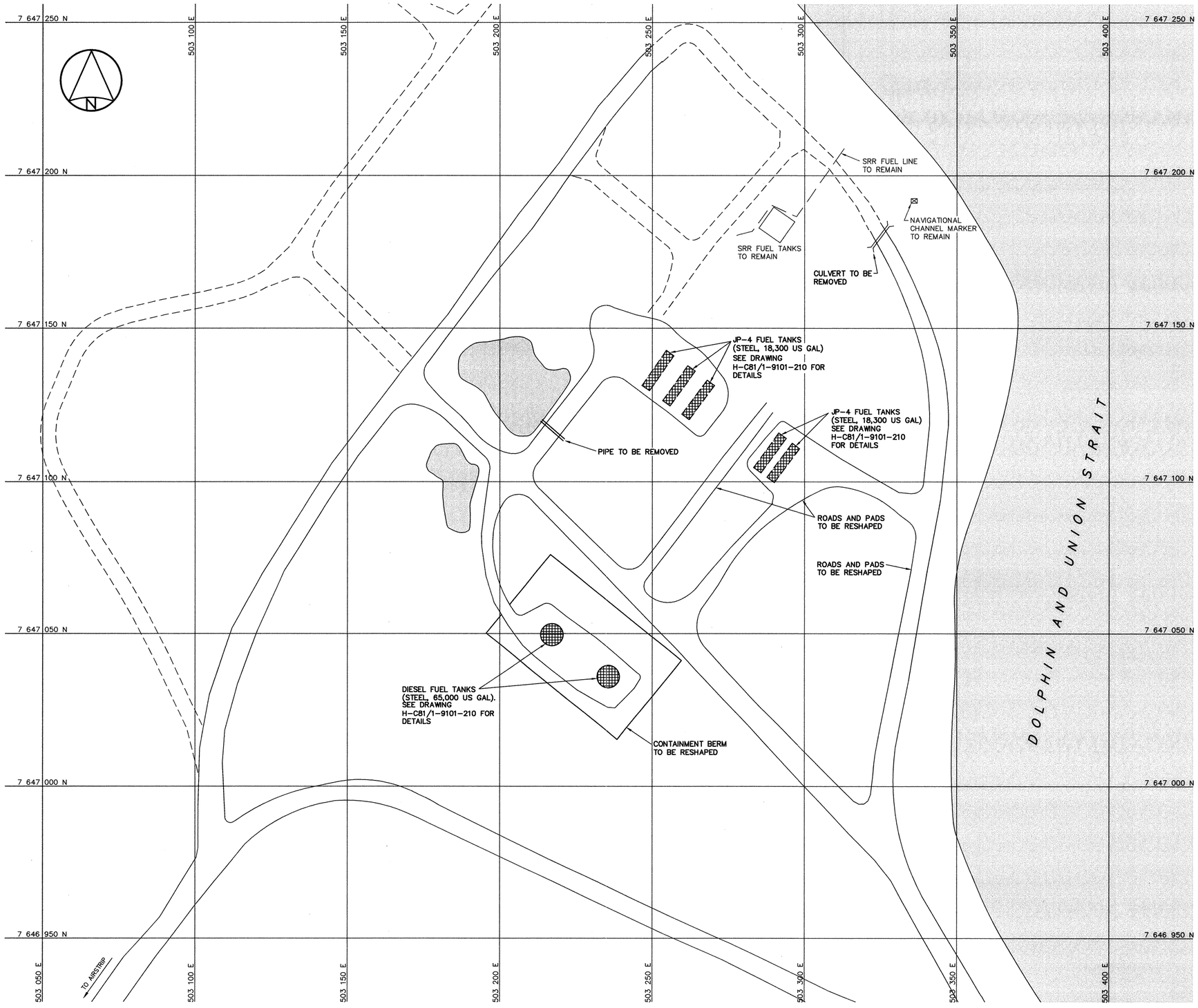
SUBJECT – SUJET

STATION AREA
DEMOLITION SITE PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED / ETUDIE BWF		DES OFF / AGENT CONCEPT
DRAWN / DESSINE LJV		SECT HD / CHEF SECT
CHECKED / VERIFIE KMS/DTM		DES MGR / GEST CONCEPT
COORDINATION ERM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–201

Canada



National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL STRUCTURES DESIGNATED FOR DEMOLITION TO BE DEMOLISHED TO TOP OF CONCRETE FOUNDATIONS UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL POLES TO BE REMOVED UNLESS NOTED OTHERWISE.
4. ALL CULVERTS ARE TO BE REMOVED AND DISPOSED OF.
5. ALL SHORT RANGE RADAR (SRR) FACILITIES ARE CURRENTLY OPERATIONAL AND ARE NOT TO BE DISTURBED.

Legend:

- TO BE DEMOLISHED
- BODY OF WATER

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NWT/NU
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 10 5 0 10 20 30m

PROJECT – PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: STRUCTURAL
DATE: 2008-09-30

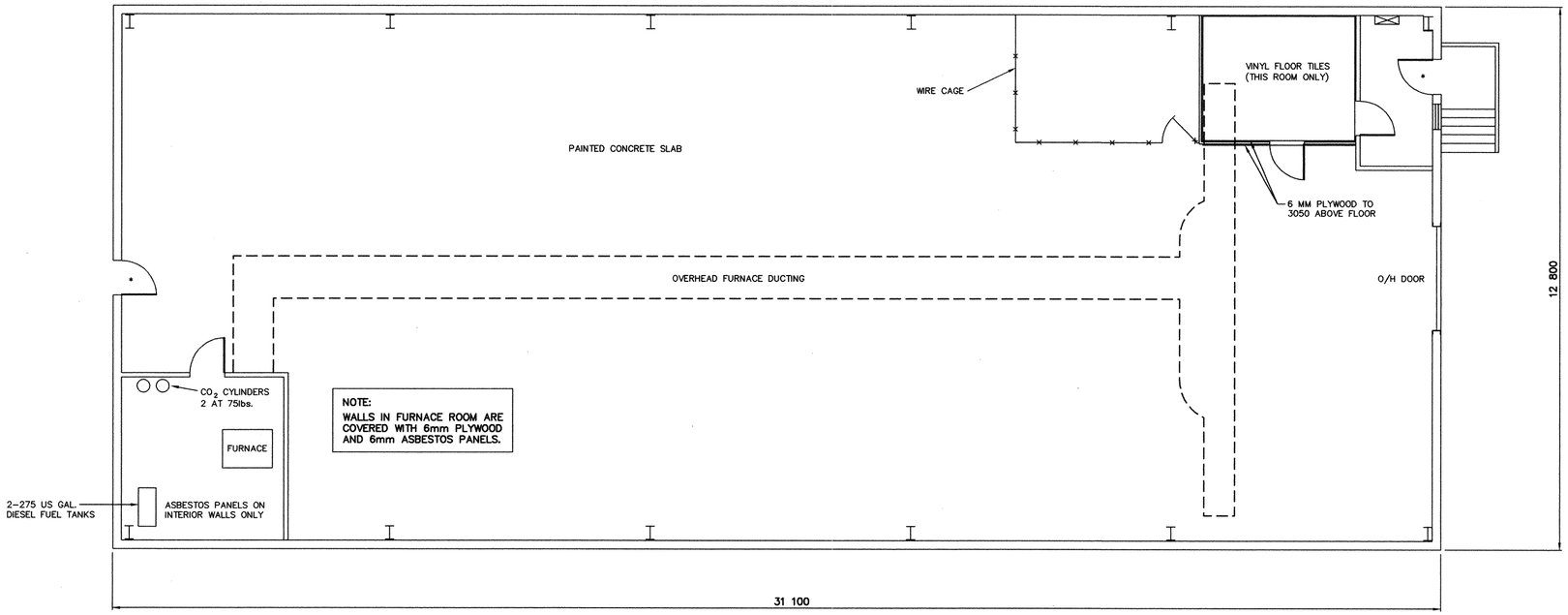
SUBJECT – SUJET

AIRSTRIP EAST AREA
DEMOLITION SITE PLAN

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	KMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RAM	REVIEWED – REVU	

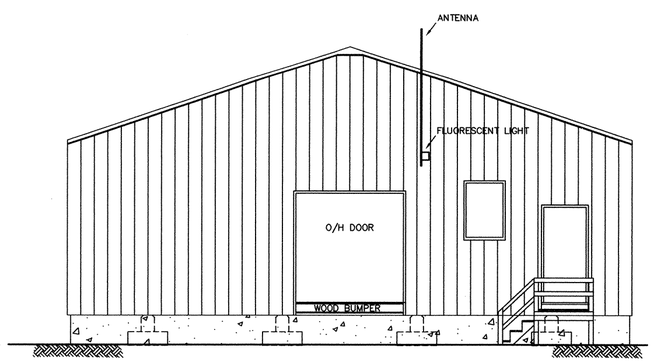
DWG. NO. – DESSIN NO.
H-C81/1-9101-202

Canada



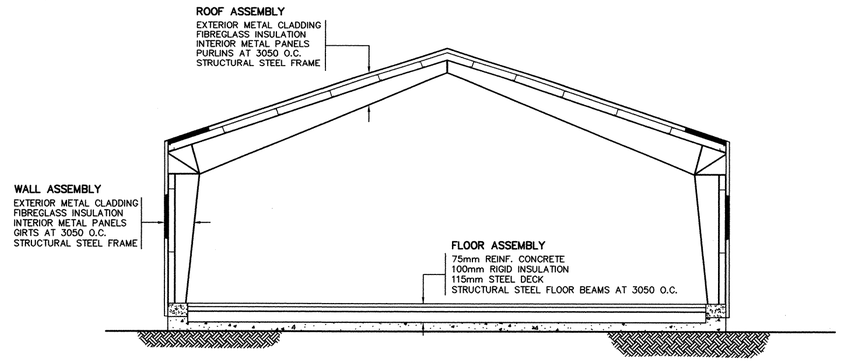
PLAN

COMMENTS
AS SHOWN
LIGHTING-COMBINATION OF FLOURESCENT AND INCANDESCENT
DOORS-*ASBESTOS CORE



ELEVATION

NOTE:
FLOOR ASSEMBLY, CONCRETE COLUMNS AND GRADE BEAM TO BE DEMOLISHED. CONCRETE FOOTINGS TO REMAIN. REGRADE AROUND CONCRETE FOOTINGS AS INDICATED ON TYPICAL CONCRETE PAD REGRADING DETAIL ON DRAWING 201.



SECTION

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ASBESTOS PANELS TO BE REMOVED FROM FURNACE ROOM WALLS.
3. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
4. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE - ECHELLE 1 0.5 0 1 2 3m

PROJECT - PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE - METIER	DATE
STRUCTURAL	2008-09-30

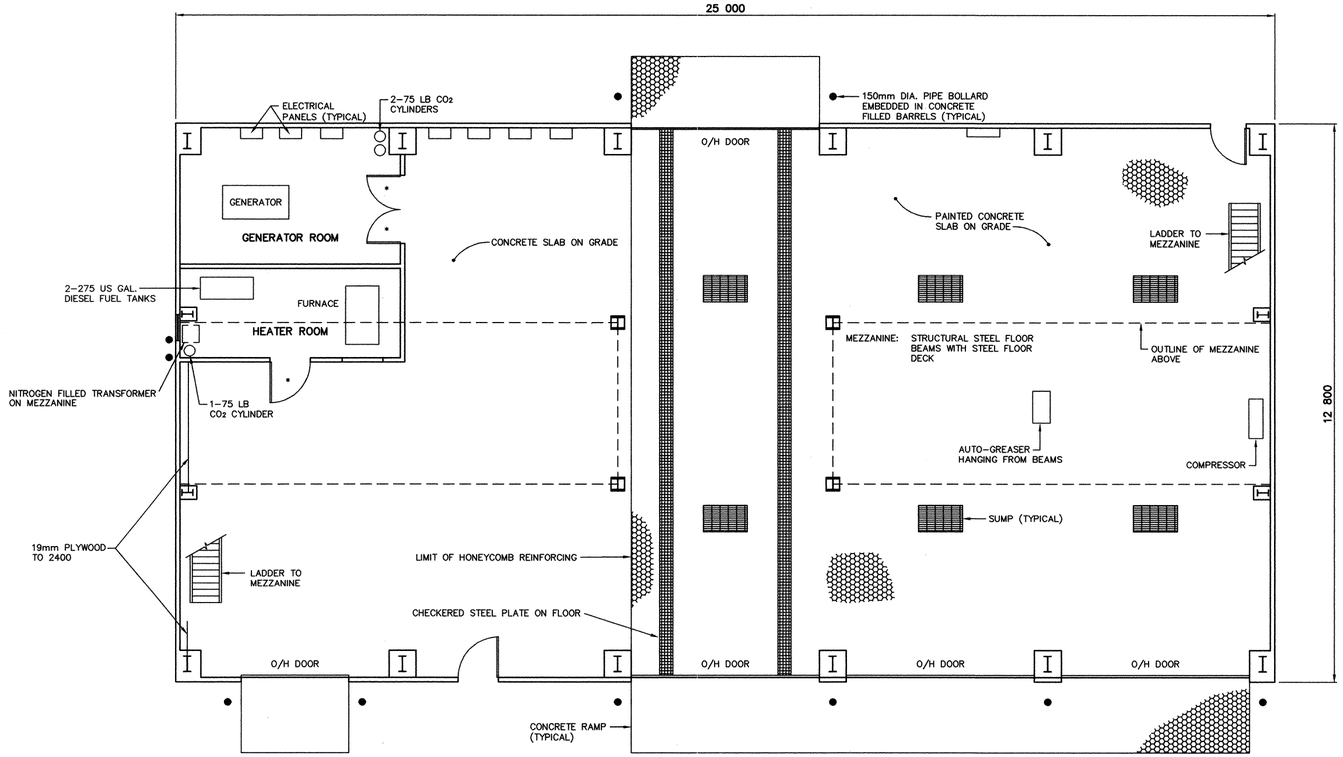
SUBJECT - SUJET

WAREHOUSE
PLAN, SECTION AND ELEVATION

PRODUCTION	CONCURRENCE - ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED - REVU	

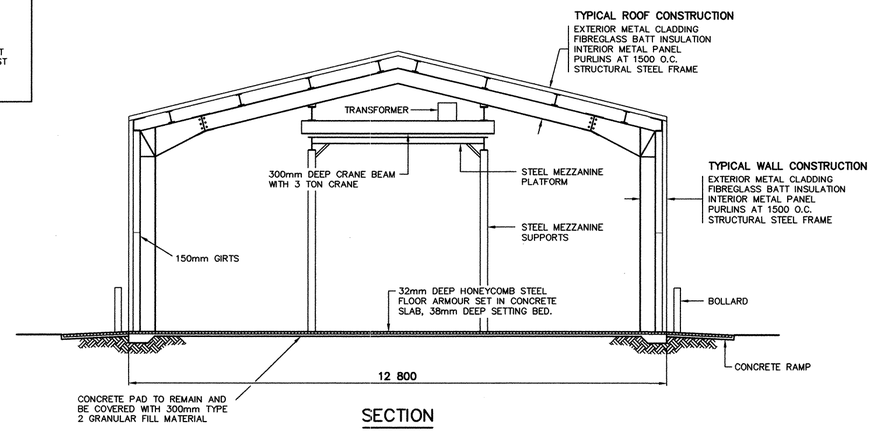
DWG. NO. - DESSIN NO.
H-C81/1-9101-203

Canada



PLAN

COMMENTS
AS SHOWN.
OVERHEAD MECHANICAL DUCTING AND ELECTRICAL LIGHTING.
LIGHTING HEATER AND GENERATOR ROOM–INCANDESCENT GARAGE AREA–MERCURY VAPOUR AND BALLAST MEZZANINE–FLOURESCENT
DOORS–*ASBESTOS CORE



SECTION

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ASBESTOS PANELS TO BE REMOVED FROM FURNACE ROOM WALLS.
3. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
4. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.
5. MECHANICAL EQUIPMENT/DUCTING NOT SHOWN.

No.	DATE	REVISION	REVISION	APPR.

R.E. MERCIER 1417(NU) 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 1 0.5 0 1 2 3m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: STRUCTURAL
DATE: 2008–09–30

SUBJECT – SUJET

GARAGE
PLAN AND SECTION

PRODUCTION		CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE	BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE	LJV		SECT HD CHEF SECT
CHECKED VERIFIE	KMS/DTM		DES MGR GEST CONCEPT
COORDINATION	RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–204

Canada

UNLESS NOTED OTHERWISE:

EACH ROOM CONTAINS (TYPICAL):
1–HEATER (1100x660) (WALL MOUNTED TYPE)
1–ALUMINUM WINDOW (1120x780)

FLOOR CONSTRUCTION (TYPICAL):
CARPET OVER VINYL TILE
6mm PLYWOOD
VINYL TILE
6mm PLYWOOD
19mm PLYWOOD
38x200 FLOOR JOISTS AT 610 O.C. (APPROX.)
200mm THICK INSULATION
6mm PLYWOOD
COPPER MESH
38x89 WOOD STRAPPING AT 1220 O.C.

EXTERIOR WALL CONSTRUCTION (TYPICAL):
EXTERIOR METAL CLADDING
(MODULES 1A & 2 ONLY)
6mm PAINTED PLYWOOD–PAP
COPPER MESH
9mm PLYWOOD
100mm DEEP WOOD STUDS AT 1220 O.C.
WITH HORIZONTAL WOOD BLOCKING
100mm DEEP INSULATION
8mm THICK PLYWOOD
COPPER MESH
6mm PAINTED PLYWOOD–PAP

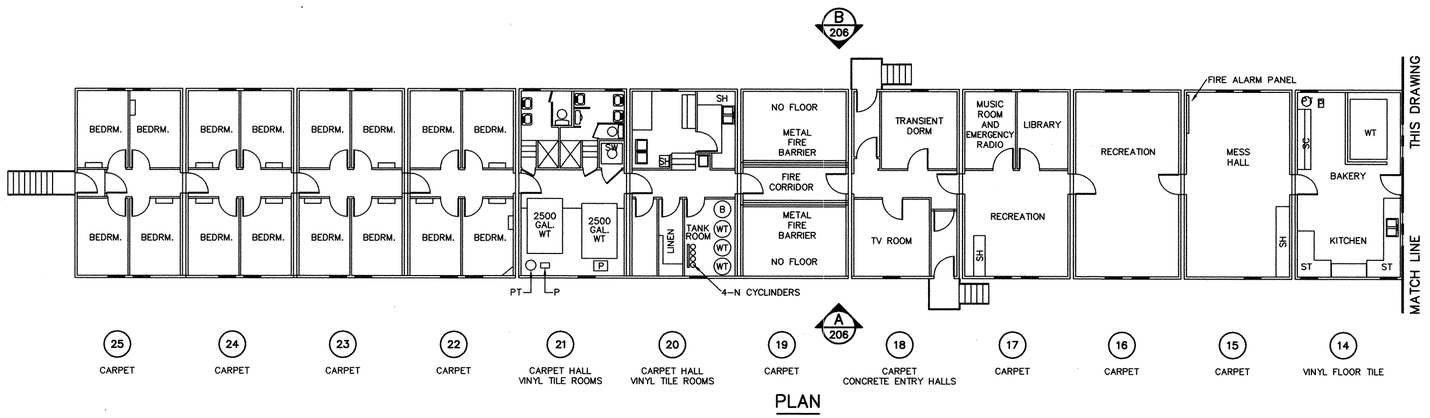
CEILING CONSTRUCTION (TYPICAL):
8mm PAINTED PLYWOOD–PAP
COPPER MESH
19mm THICK PLYWOOD
200mm DEEP WOOD STUDS AT 1220 O.C.
WITH HORIZONTAL WOOD BLOCKING
150mm DEEP INSULATION
6mm PLYWOOD
6mm PAINTED PLYWOOD–PAP
T–BAR TYPE CEILING WITH TILES

INTERIOR WALL PARTITIONS (TYPICAL):
6mm PAINTED PLYWOOD–PAP
WOOD STUDS AT 1220 O.C.
INSULATION
6mm PAINTED PLYWOOD–PAP

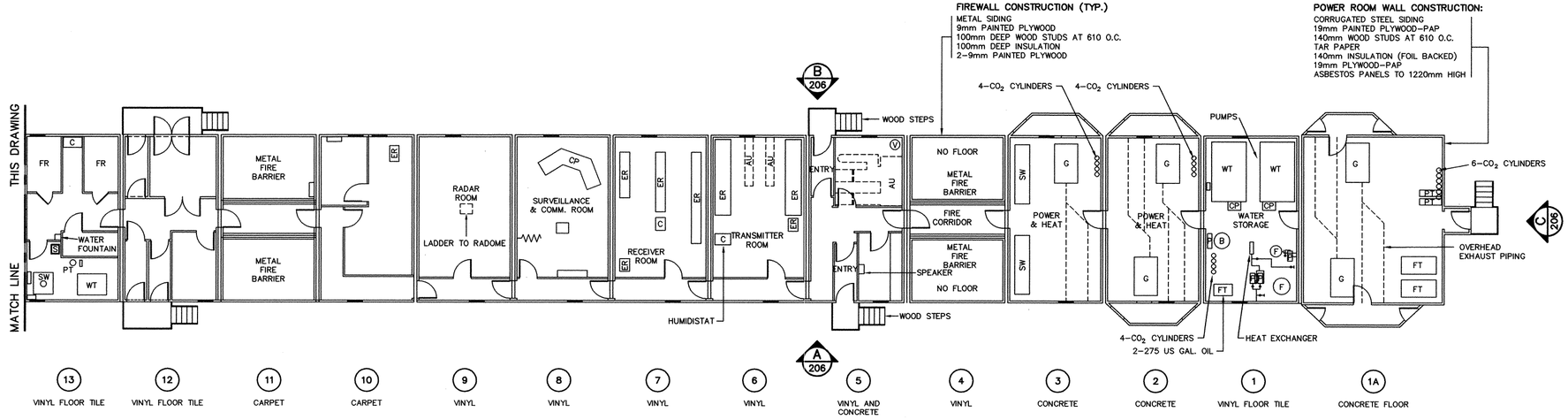
WALL PARTITIONS BETWEEN MODULES (TYPICAL):
8mm PAINTED PLYWOOD–PAP
9mm THICK PLYWOOD
200mm DEEP WALL STUDS WITH INSULATION
8mm THICK PLYWOOD
COPPER MESH
150mm GAP WITH VERMICULITE
COPPER MESH
8mm THICK PLYWOOD
200mm DEEP WALL STUDS WITH INSULATION
9mm THICK PLYWOOD
8mm PAINTED PLYWOOD–PAP

DOORS
ALL DOORS ASBESTOS CORE

TANKS
EACH TANK HAS A MERCURY LEVEL SWITCH (MODULE 1A)



PLAN



PLAN

COMMENTS
TIMBER CRIB FOUNDATION WITH SILL BEAMS. INSULATED PLYWOOD PANEL MODULES, EXCEPT METAL CONSTRUCTION FIRE BARRIER MODULES.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.
4. MECHANICAL EQUIPMENT, DUCTING AND PIPING NOT SHOWN

Legend:

AU –OVERHEAD AIR UNIT
B –BOILER
C –COMPRESSOR
CP –CONTROL PANEL
E –WATER TREATMENT EQUIPMENT
ER –ELECTRICAL RACK
F –FILTER
FT –FUEL TANK
G –GENERATOR
H –HOT WATER TANK
PT –PRESSURE TANK
P –PUMP
PAP –PCB–AMENDED PAINT
RE –REFRIDGERATION EQUIPMENT
RU –REFRIDGERATION UNIT
SC –STEEL CABINETS
SH –SHELVING
SS –STEEL SHELVING
ST –STEEL COUNTERTOPS & CABINETS
SW –SWITCH GEAR
T –VERTICAL TANK
V –VOLTAGE REGULATOR
WS –WOOD SHELVING
WT –WATER TANK

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

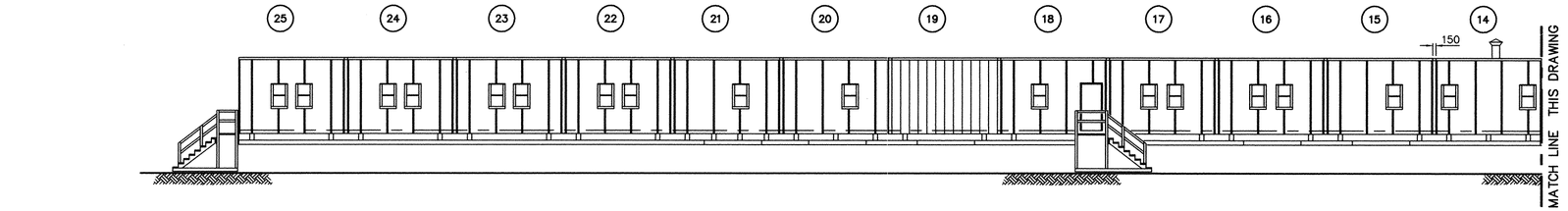
TRADE – METIER: STRUCTURAL
DATE: 2008–09–30

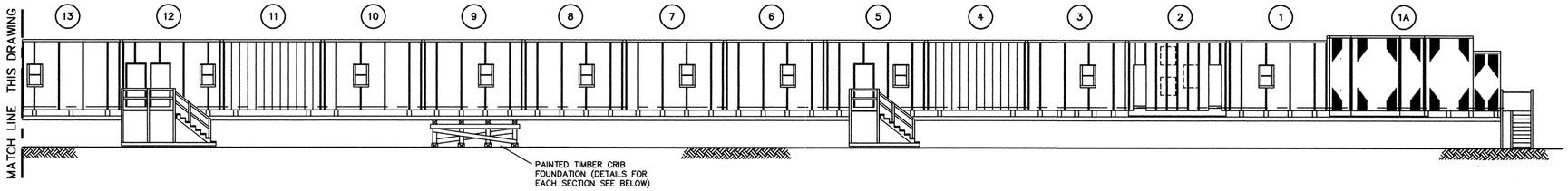
SUBJECT – SUJET
MODULE TRAIN UNITS 1A–25
PLAN

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

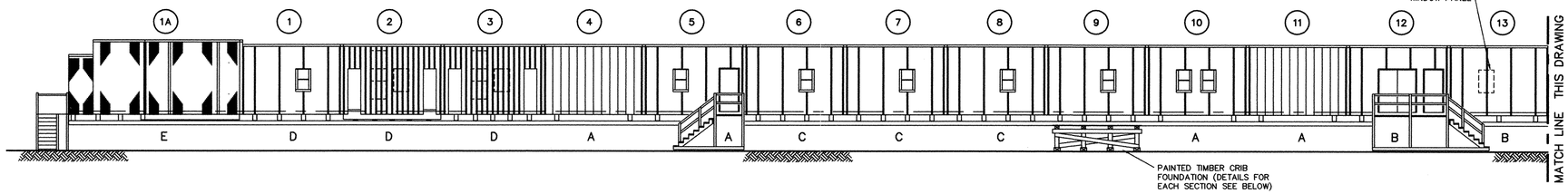
DWG. NO. – DESSIN NO.
H–CB1/1–9101–205

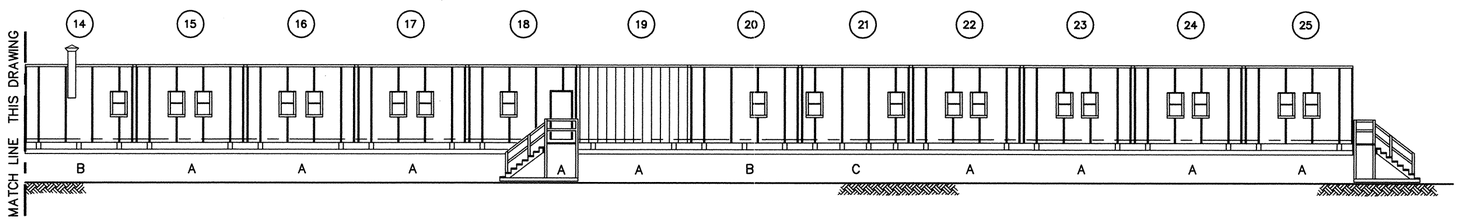
Canada



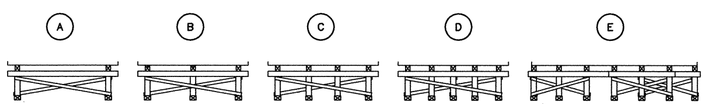


ELEVATION A 205



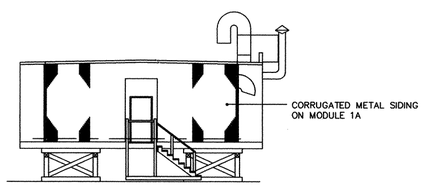


ELEVATION B 205



TIMBER CRIB DETAILS (SEE ABOVE)

COMMENTS
TIMBER CRIB FOUNDATION WITH SILL BEAMS. INSULATED PLYWOOD PANEL MODULES, EXCEPT METAL CONSTRUCTION FIRE BARRIER MODULES.



ELEVATION C 205

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
2. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

PROFESSIONAL ENGINEER NWT/NU 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE 2 1 0 2 4 6m

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
STRUCTURAL	2008–09–30

SUBJECT – SUJET

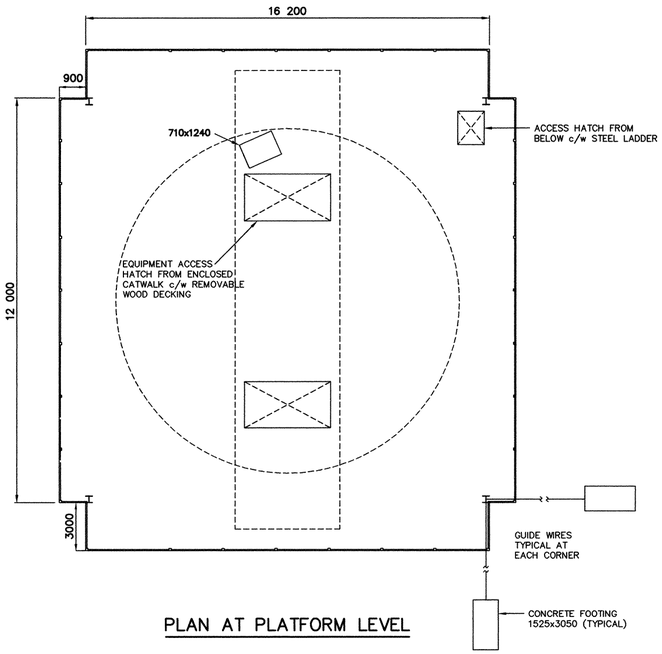
MODULE TRAIN UNITS 1A–25
ELEVATIONS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RAM	REVIEWED – REVU	

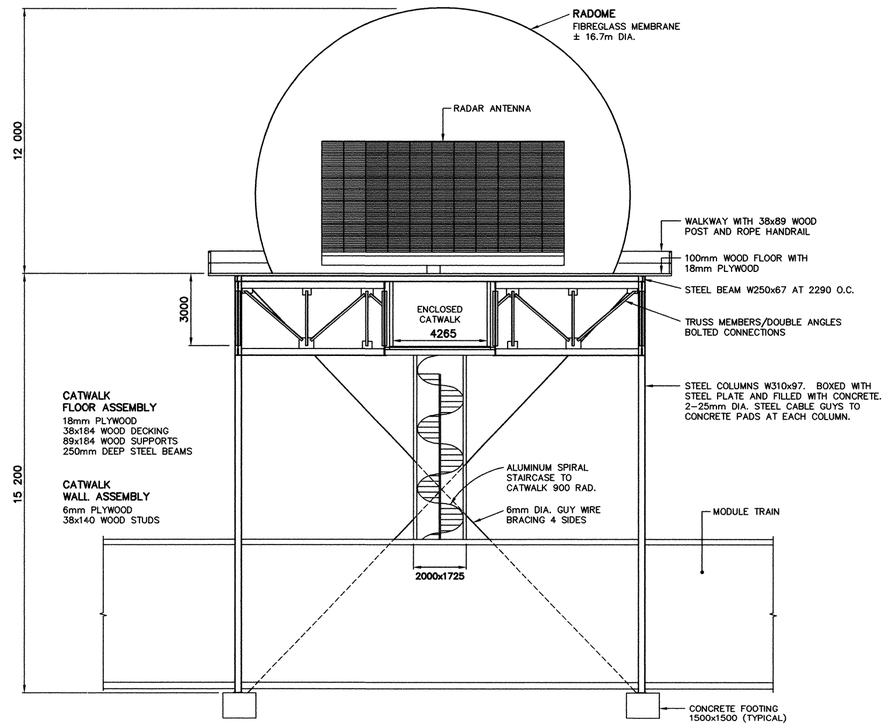
DWG. NO. – DESSIN NO.
H–CB1/1–9101–206

Canada

COMMENTS
RADAR TOWER, RADAR ANTENNA AND RADOME ARE ALL AS SHOWN.
8 TOTAL GUY WIRES APPROX. 15.5m LONG EACH COMPLETE WITH 1525x3050 CONCRETE BLOCK



PLAN AT PLATFORM LEVEL



SECTION

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE

PROJECT – PROJET
PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
STRUCTURAL	2008–09–30

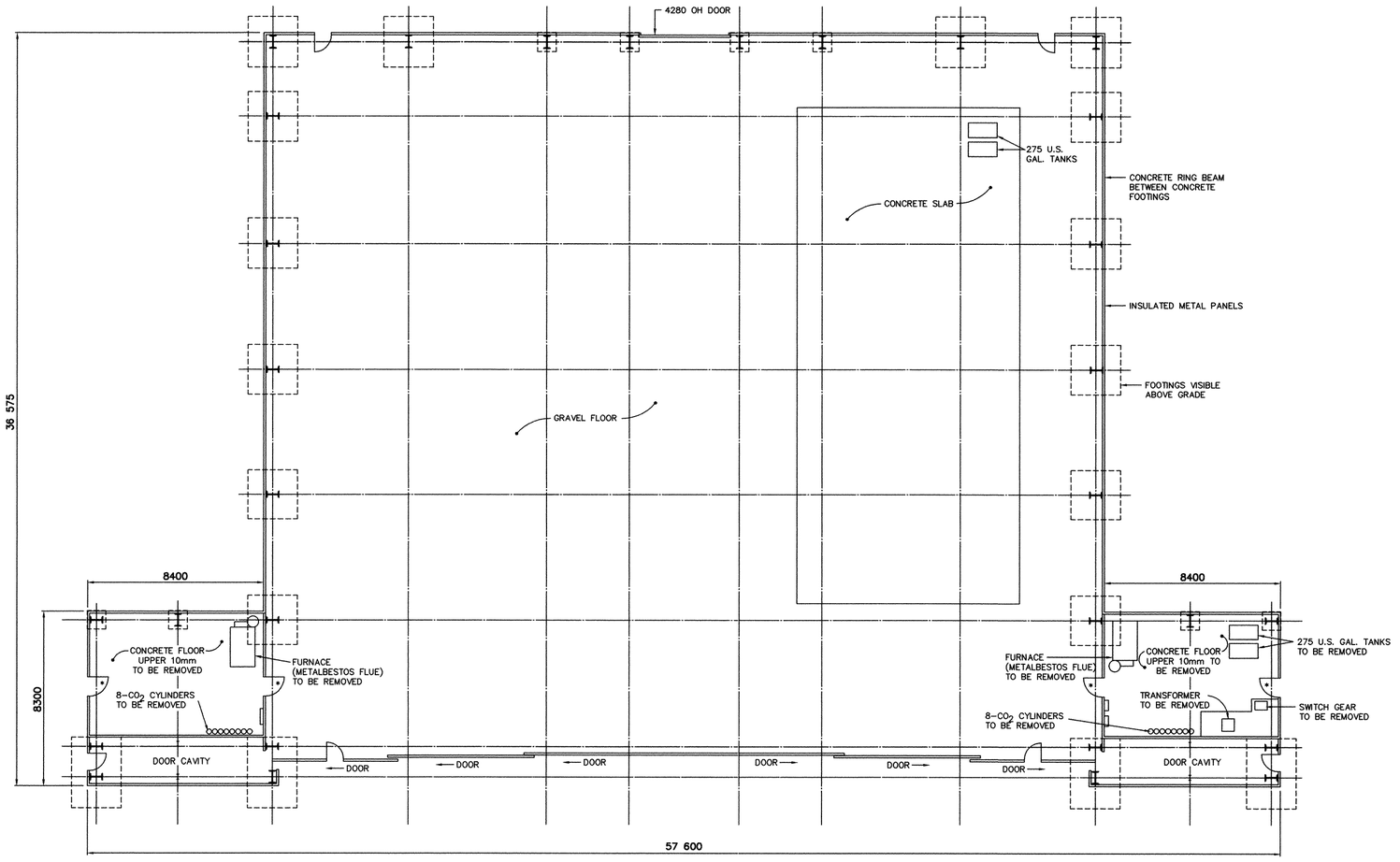
SUBJECT – SUJET

RADAR TOWER/RADOME
PLAN AND SECTION

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–207

Canada



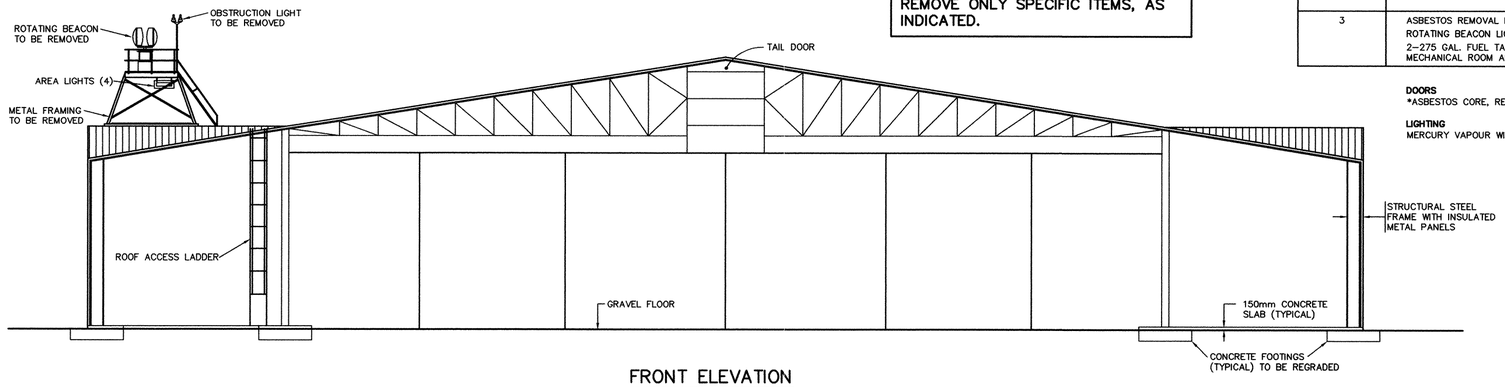
PLAN

HANGAR IS NOT TO BE DEMOLISHED. REMOVE ONLY SPECIFIC ITEMS, AS INDICATED.

BCE NUMBER	COMMENTS
3	ASBESTOS REMOVAL REQUIRED. ROTATING BEACON LIGHTS ON ROOF. 2-275 GAL. FUEL TANKS IN MECHANICAL ROOM AND HANGAR.

DOORS
*ASBESTOS CORE, REMOVE DOORS AND REPL.

LIGHTING
MERCURY VAPOUR WITH BALLASTS



FRONT ELEVATION

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF THE NORTHWEST TERRITORIES
PERMIT TO PRACTICE
UMA ENGINEERING LTD.
PERMIT NUMBER
P 007
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE

PROJECT – PROJET
PIN-2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER	DATE
STRUCTURAL	2008-09-30

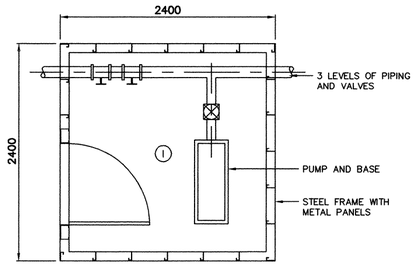
SUBJECT – SUJET

HANGAR
PLAN AND SECTION

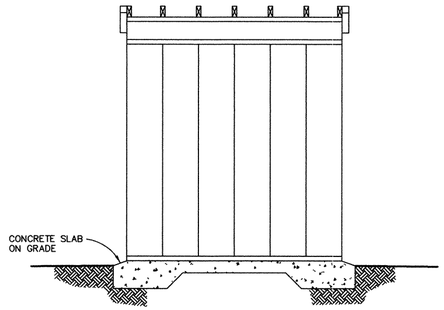
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H-C81/1-9101-208

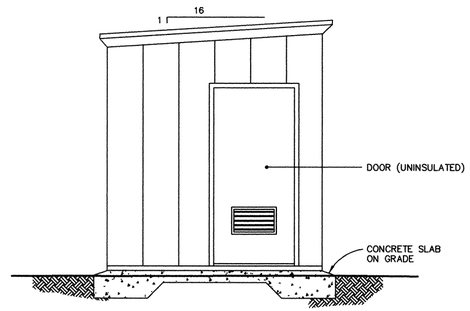
Canada



PLAN



FRONT ELEVATION



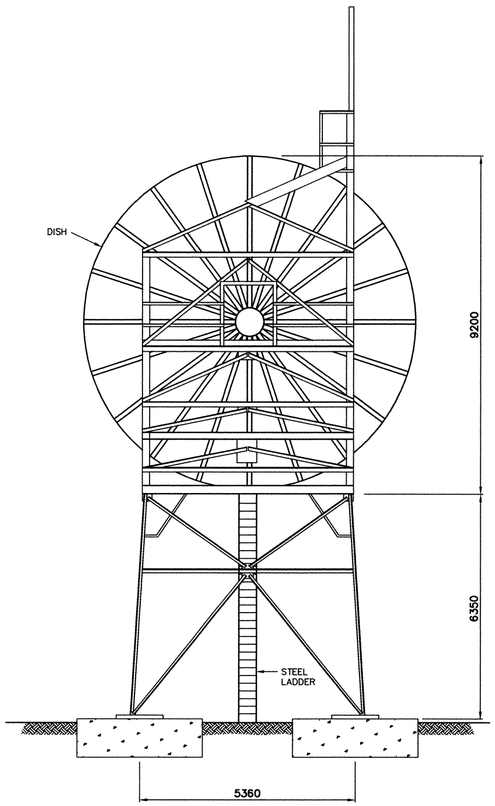
SIDE ELEVATION

COMMENTS
AS SHOWN. PUMP, VALVES AND PIPING INSIDE.

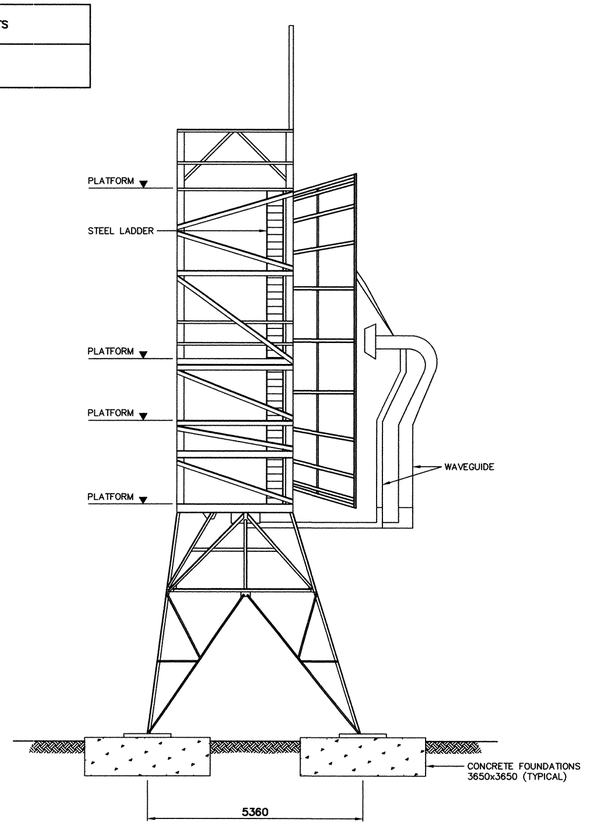
POL PUMPHOUSE

N.T.S.

COMMENTS
4 DISHES, AS SHOWN.



REAR ELEVATION



SIDE ELEVATION

COMMUNICATION DISH

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF MAJOR BUILDING CONTENTS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

R.P. MURPHY LICENSED PROFESSIONAL ENGINEER NWT/NU
2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

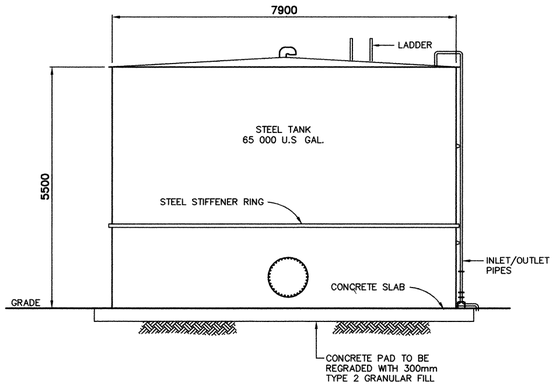
TRADE – METIER: STRUCTURAL
DATE: 2008–09–30

SUBJECT – SUJET:
POL PUMPHOUSE AND COMMUNICATION DISH PLAN AND ELEVATIONS

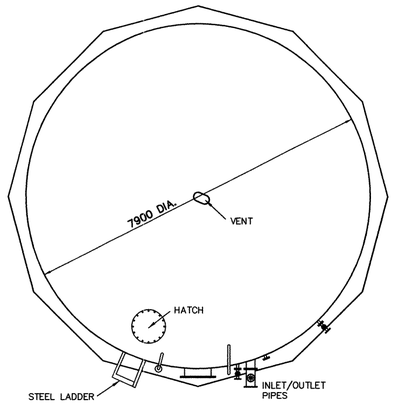
PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–209

Canada



ELEVATION

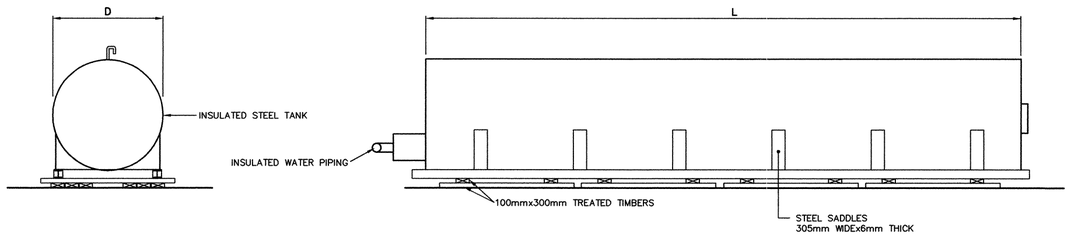


PLAN

DIESEL FUEL TANK

N.T.S.

COMMENTS
65 000 US GALLON CAPACITY (DIESEL) (4 TANKS)



FRONT ELEVATION

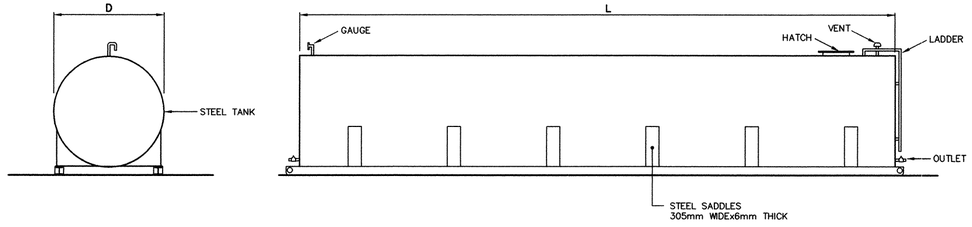
SIDE ELEVATION

WATER TANK

N.T.S.

COMMENTS
18,300 US GALLON CAPACITY (WATER) D=2500mm, L=13 500mm 6–STEEL SADDLES AT 2200mm O.C. TREATED SILL (4 TANKS)

COMMENTS
18,300 US GALLON CAPACITY D=2500mm; L=13 500mm 6–STEEL SADDLES AT 2200mm O.C. (7 TANKS)



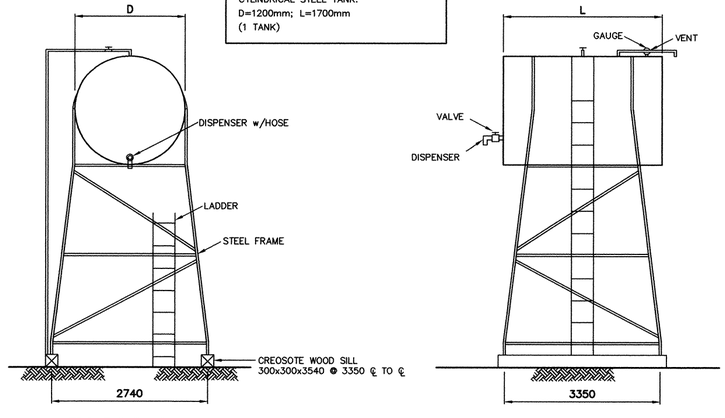
FRONT ELEVATION

SIDE ELEVATION

JP–4 FUEL TANK

N.T.S.

COMMENTS
500 US GALLON CAPACITY CYLINDRICAL STEEL TANK. D=1200mm; L=1700mm (1 TANK)



FRONT ELEVATION

SIDE ELEVATION

ELEVATED FUEL TANK

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF DEMOLITION ITEMS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.
4. REGRADE AROUND CONCRETE PADS AS INDICATED ON TYPICAL CONCRETE PAD REGRADING DETAIL ON DRAWING H–C81/1–9101–201.
5. REMOVE TIMBER FOUNDATIONS.

No.	DATE	REVISION	REVISION	APPR.

R. R. MERCKOSKY — Licensee — NWT/NU — 2008-09-30

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 007
UMA ENGINEERING LTD.

UMA | AECOM — HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: STRUCTURAL
DATE: 2008–09–30

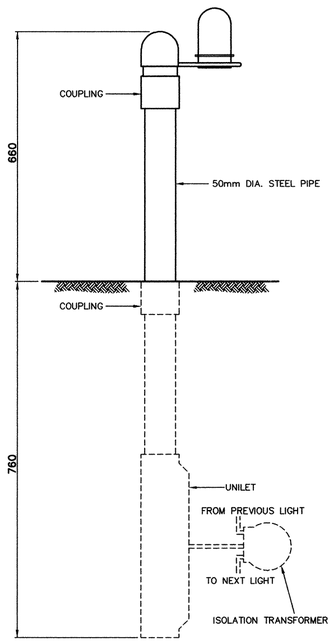
SUBJECT – SUJET:

WATER AND FUEL TANKS
PLAN AND ELEVATIONS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

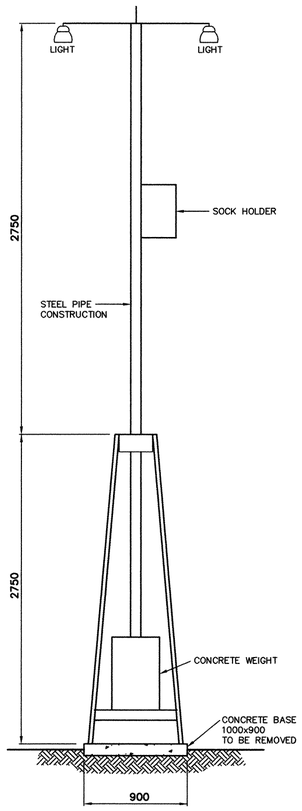
DWG. NO. – DESSIN NO.
H–C81/1–9101–210

Canada



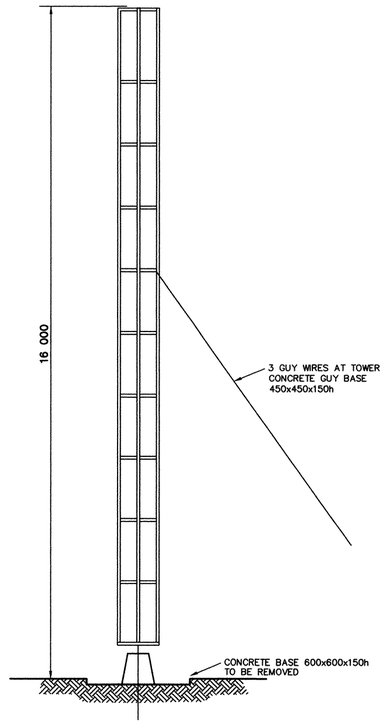
RUNWAY, APRON, THRESHOLD AND TAXIWAY LIGHTS

N.T.S.



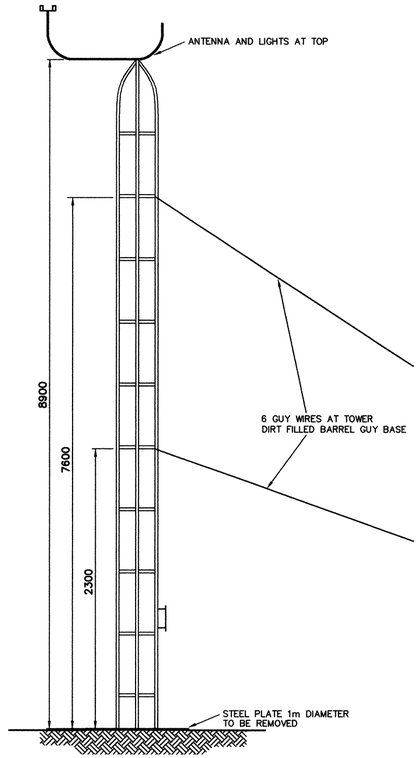
WINDSOCK

N.T.S.



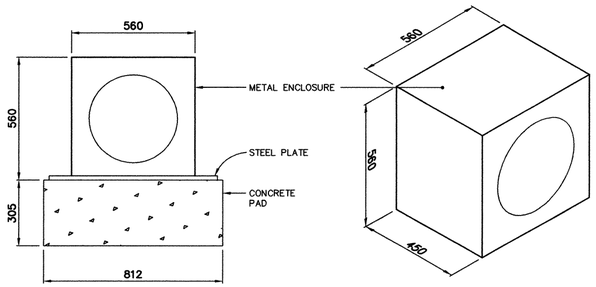
ANTENNA TOWER

N.T.S.



ANTENNA TOWER

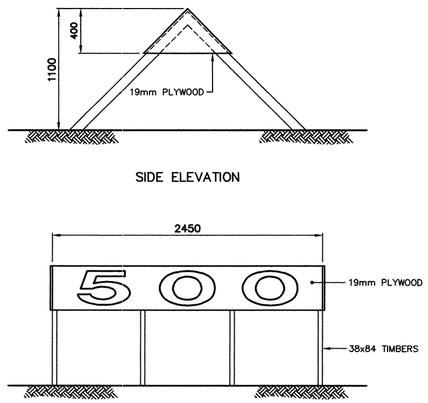
N.T.S.



SECTION ISOMETRIC VIEW

STROBE BEACON LIGHT

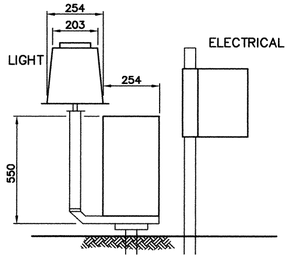
N.T.S.



DISTANCE TO GO OR RUNWAY THRESHOLD MARKERS

N.T.S.

NOTE:
REMOVE APRON, TAXIWAY, AIRSTRIP OR THRESHOLD LIGHT FOUNDATION TO 0.3m BELOW GROUND SURFACE.



SECTION

APRON, TAXIWAY, AIRSTRIP OR THRESHOLD LIGHT

N.T.S.

National Defence / Défense nationale

Headquarters
Quartier général

General Notes:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. REFER TO DEMOLITION TABLES IN SPECIFICATIONS FOR LIST OF DEMOLITION ITEMS.
3. FACILITIES TO BE DEMOLISHED MAY CONTAIN PCB AND LEAD CONTAMINATED PAINT. REFER TO SECTION 02060 OF THE SPECIFICATIONS.

No.	DATE	REVISION	REVISION	APPR.

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER P 007
UMA ENGINEERING LTD.

2008-09-30

UMA | AECOM HATCH

SCALE – ECHELLE: AS SHOWN

PROJECT – PROJET: PIN–2 CAPE YOUNG

DEW LINE CLEAN UP

© COPYRIGHT
HER MAJESTY THE QUEEN IN RIGHT OF CANADA 2008, AS REPRESENTED BY THE MINISTER OF NATIONAL DEFENCE.

TRADE – METIER: STRUCTURAL
DATE: 2008–09–30

SUBJECT – SUJET:
AIRSTRIP ANCILLARY FACILITIES STANDARD DETAILS

PRODUCTION	CONCURRENCE – ASSENTIMENT	
DESIGNED ETUDIE BWF		DES OFF AGENT CONCEPT
DRAWN DESSINE LJV		SECT HD CHEF SECT
CHECKED VERIFIE KMS/DTM		DES MGR GEST CONCEPT
COORDINATION RRM	REVIEWED – REVU	

DWG. NO. – DESSIN NO.
H–C81/1–9101–211

Canada

Appendix B

Cooperation Agreements

AGREEMENT

BETWEEN

NUNAVUT TUNNGAVIK INCORPORATED

AND

HER MAJESTY IN THE RIGHT OF CANADA

AS REPRESENTED BY

THE MINISTER OF NATIONAL DEFENCE

FOR THE CLEAN-UP AND RESTORATION OF

DISTANT EARLY WARNING SITES

WITHIN THE NUNAVUT SETTLEMENT AREA

(Environmental Provisions)

Arthur C. Eggleton
Minister of National Defence

Dated 1 Sep 98

James Eetoolok
1st Vice President
Nunavut Tunngavik Incorporated

Dated 1 Sep 98

AGIKATIGEGUTAOYOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

MINISTAOYOK AGUYAKTULIKIYINI

HALUMAKHIVALEATILOGIN IHOAKHAKHUGILO

TULAEGUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

(AVATILIKINIGUN PIVIKHAKAKVEOYUN)

ARTHUR C. EGGLETON
MINISTAOYOK AGUYAKTILIKIYINI

KANATAOM GAVAMAENI

UVLOANI _____

JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOTALEOM
NUNAVUT TUNNGAVITKUN
TIMIKUTIGIYANI
UVLOANI _____

AGIKATIGEGUTAOYOK

UGUNAGA

NUNAVUT TUNNGAVITKUN TIMIKUTIGIYANIN

UVALO

KOENMIN IHUMAKHUTIVLOGIN KANATAMI

GIVGAKTOKTIGIVLOGO UNA

MINISTAOYOK AGUYAKTULIKIYINI

HALUMAKHIVALEATILOGIN IHOAKHAKHUGILO

TULAEGUYUN IGLUKAKVEN

UGUNANI NUNAVUTMI NUNATAKNIKMI NUNAOYUN

(AVATILIKINIGUN PIVIKHAKAKVEOYUN)

ARTHUR C. EGGLETON
MINISTAOYOK AGUYAKTILIKIYINI

KANATAOM GAVAMAENI

UVLOANI _____

JAMES EETOOLOOK
HIVULIK TUKLEATA
IKHIVAOTALEOM
NUNAVUT TUNNGAVITKUN
TIMIKUTIGIYANI
UVLOANI _____

ᐊᖏᕐᕕᒃ
ᓄᓇᕗᒻ ᑐᓴᕐᓂᐊᖅᑯᓂᒃ
ᐃᓕᓴᐃᓐ
ᑯᐃᓐ ᑭᓱᓕᕆᔨᖏᑦᑐᖅᓯᓂᒃ ᑲᓇᑕ
ᑭᓱᓕᕆᔨᐅᒪᔨᖏᓐᓄᑦᑐᑦ
ᑲᓇᑕᒥᑦ ᐅᓇᓕᕆᔨᓂᖅᐳᑎᓯᖏᓐᓂᒃ ᒪᓂᓕᖏᓱᒃ

ᓄᓇᕗᒻ ᑎᑎᕋᐅᔾᔨᖅᑕᐃᒃ ᓴᓇᓗᒥᖏᕆᔨᖏᑦᑐᒥᓂᖏᓕᖏᓐᓄᑦᓯᓂᒃ
ᐃᓕᓴᓇ ᓄᓇᕗᑦ ᖃᐅᔨᒪ ᐊᑐᕈᒪᓴᕆᔨᖏᑦᑐᒥᓂᖏᓕᖏᓐᓄᑦᓯᓂᒃ
ᓄᓇᕗᖏᑦᑕᕐᕆᐊᕗᑦᑕᐃᒃ ᐃᓇᔨᓪᓗ

(ᐊᐸᑎᓕᓴᕐᓂᐊᖅᑯᓂᒃ ᒪᓕᓴᐃᓐ)

ᐊᖏᕐᕕᒃ ᓂ. ᐃᓴᒧᓕᖅ
ᒪᓂᓕ ᑲᓇᑕᒥᑦ ᑎᓇᕐᑕᖏᓐᓄᑦᓯᓂᒃ

ᑎᓪᓗᒍ

ᓴᐃᒪᓂᖏᑦ ᐃᖏᕐᓂᒃ
ᐊᖏᕐᓂᖏᓐᓄᑦ ᓂᕆᔨᓕᖏᓐ ᑐᓴᕈᓐ
ᓄᓇᕗᒻ ᑐᓴᕐᓂᐊᖅᑯᓂᒃ

ᑎᓪᓗᒍ

PREAMBLE

WHEREAS the Government of Canada (Canada) has modernized the air defences of Canada through a joint USA/Canada project referred to as the North American Air Defence Modernization Project (NAADM);

AND WHEREAS NAADM includes the decommissioning of some of the Distant Early Warning (DEW Line) radar sites and the conversion of others to North Warning System (NWS) radar sites;

AND WHEREAS fifteen DEW Line sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND wishes to undertake an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in all activities that occur within the NSA, including, but not limited to, protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit Firms in business and employment opportunities in the NSA;

AND WHEREAS DND and NTI are voluntarily entering into this Agreement to establish a framework for the decommissioning, remediation and restoration of the DEW Line sites in the NSA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Debris means hazardous and non-hazardous materials of non-natural origin existing on the surface, or visible and partially embedded within one metre of the surface or within two metres of the surface of any water body at low tide and any structures scheduled for demolition

DEW Line sites means the Distant Early Warning Sites listed in paragraph 3.1 below;

DCL means Defence Construction (1951) Limited the designated contracting agent for contracting for the Department of National Defence for the Dew Line Clean-up;

DND means the Crown in the right of Canada represented by the Minister of National Defence or his delegate

Engineered Landfill means a landfill professionally designed to permanently isolate the contents of the landfill from contact with the environment.

Hazardous materials or substances means all materials or substances designated as hazardous under territorial or federal legislation at the time of the clean-up of a particular landfill.

Inuit has the same meaning as in the NLCA;

Inuit Owned Lands has the same meaning as in the NLCA;

Landfill means any area where a concentration of non-hazardous and/or hazardous substances or materials or Debris have been buried;

Minister of National Defence means the Minister of National Defence or his designate

Nunavut Settlement Area has the same meaning as in the NLCA;

Rules means the *Rules and Procedures for the Management of Inuit Owned Lands* adopted by NTI, as amended from time to time,;

Parties means NTI and DND;

Regional Inuit Associations (RIA) means the Qikiqtani Inuit Association, the Kivalliq Inuit Association and the Kitikmeot Inuit Association;

Relevant RIA means the RIA in the region in which a DEW Line site is located;

Work means all the materials, equipment, goods, services, labour, matters and things done or furnished or required to be done or furnished to perform any DEW Line site decommissioning, remediation or restoration activity.

2.0 OBJECTIVES

2.1 The objectives of this Agreement are to establish a broad environmental framework for participation of the Inuit in the clean-up of the DEW Line Sites in the NSA and to achieve cost effective and an environmentally sound DEW Line clean-up as described herein.

2.2 DND and NTI will enter into a corollary agreement with respect to economic benefits for the Inuit and Inuit firms including provisions for training (this agreement may or may not involve regional negotiations).

3.0 GENERAL

3.1 **Scope.** This Agreement relates to the decommissioning, remediation, restoration and related activities of the following DEW Line sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM M - Cambridge Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 4 - Cape Hooper*
FOX 5 - Broughton Island
DYE M - Cape Dyer

* Prior to the signing of this Agreement the clean-up of Cape Hooper (FOX 4) had already begun under a separate set of understandings. Therefore only the post clean-up provisions of this Agreement will apply to this site

3.2 **Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.;

3.3 **Urgency.** The Parties mutually agree to recognize the urgency of the matters dealt with in this Agreement and to perform all required actions as expeditiously as possible.

3.4 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.

3.5 **Inuit Owned Lands.** All use of and access to Inuit Owned lands by DND, Contractors and subcontractors for the purposes of the Work is subject to the NLCA and the Rules, to the extent that the Rules are not inconsistent with the NCLA.

3.6 **Clean-up Schedule.** The commencement and completion of the Work will take place in accordance with the attached Appendix A. The Parties will use their best efforts to adhere to Appendix A.

4.0 Steering Committee

4.1 There shall, during the duration of this Agreement, be a Steering Committee to monitor progress, develop recommendations and suggest alternative solutions for achieving the commitments set forth in this Agreement by:

(a) reviewing progress in achieving the commitments set out in this Agreement;

(b) ensuring that any perceived deficiencies with respect to the Work or to commitments under this Agreement discussed and, where agreed, are expeditiously acted upon;

(c) considering other items of mutual concern, as appropriate;

(d) requesting the Environmental Working Group (EWG), established in accordance with section 7 of this Agreement, to undertake additional study and formulate recommendations to the Steering Committee.

4.2 The Steering Committee shall consist of four members, two to be named by DND and two to be named by NTI. It shall meet at least twice a year and at the request of any Party at mutually agreed upon times and locations. In order to place an item in the agenda, a Party shall provide that item to the other Party not less than ten working days before each scheduled meeting. The Steering Committee shall operate on the basis of unanimous agreement.

4.3 Recommendations agreed to by a majority of the members of the EWG will be incorporated into the site specific plan referred to in section 23 of this Agreement or into the post-clean-up methodology as the case may be. Where either DND or NTI disagree with the EWG recommendations, it will raise the issue at the Steering Committee for discussion in accordance with clause 4.4. If the Environmental Working Group is deadlocked (ie 2-2) on any issue, including scoring of the risk assessment matrix and landfill remediation, the Steering Committee will discuss the situation and attempt, in good faith, to arrive at a consensus. The Parties pursuant to clause 4.5 may, where appropriate, seek independent advice.

4.4 Should unanimous agreement not be reached at the Steering Committee the following approach will be used:

(a) Prior to Clean-up Commencing - the clean-up will not commence until the issue is resolved to the satisfaction of both Parties.

(b) Clean-up has commenced - the clean-up will continue in accordance with the site specific clean-up plan. If the issue is not included in the site specific plan then DND will proceed based on the advice provided by its consultants. DND and NTI will continue to attempt to arrive at a consensus.

In either event, both Parties continue to have the option of involving the provisions of section 5 of this Agreement if unanimous agreement cannot be reached. If unanimous agreement is reached at a later date or there is an arbitration decision which differs from the actions taken by DND, the new decision will be implemented.

4.5 The Steering Committee shall, with the agreement of the members, acting reasonably, invite representatives of Government departments, Inuit organizations, non-governmental organizations, Contractors, Subcontractors and others to provide advice or information as required. If requested by the other Party, DND and NTI agree to provide each other with all relevant scientific and technical information, with the exception of:

- advice to Ministers or Inuit Boards of Directors
- negotiating strategies
- commercially confidential third Party information
- personal information

4.6 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

5.0 ARBITRATION

5.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA, either party may by written demand refer the dispute to arbitration in accordance with the following provisions.

5.2 An arbitration Panel consisting of a single arbitrator who both Parties agree is qualified to arbitrate the question in dispute will render a decision on the dispute. If DND and NTI cannot agree on a single arbitrator then a decision will be render by an Arbitration Panel consisting of three similarly qualified arbitrators, one of whom shall be chosen by NTI, one by DND and the third by the two so chosen, which third arbitrator shall be the chairperson. If within fifteen days of having received a written demand, or such extended time as the parties agree, a party fails to either agree to a single arbitrator or to appoint an arbitrator, or if the two arbitrators appointed by the parties do not agree upon the third arbitrator, then upon written application by either party such third arbitrator shall be appointed by the superior court having jurisdiction in the NSA.

5.3 The arbitration proceedings shall be held within thirty days following the appointment of the Arbitration Panel in a location agreed upon by the Parties or, if the Parties are unable to agree, as determined by the arbitration panel. The timing for the panel hearing may be extended by mutual consent of the Parties, not unreasonably being withheld.

5.4 The arbitration panel shall have jurisdiction to determine all questions of fact, questions of mixed law and fact and to make an award, including interim relief, payment of interest, and costs. If an arbitration panel makes no decision as to costs, each party shall bear its own costs and an equal share of the other costs of the arbitration, including the remuneration and expenses of the arbitration panel.

5.5 The Arbitration Panel shall render a decision, in writing, within thirty days of the completion of the arbitration hearing and state the reasons on which it is based. The decision is final and binding and is not subject to appeal. Pursuant to section 17(3)(b) of the *Federal Court Act*, the Parties agree that the Federal Court Trial Division shall have jurisdiction to review the decision of an arbitration panel on any grounds set out in section 18.1(4) of the *Federal Court Act.*

5.6 Where a party to an arbitration fails to comply with any of the terms of the decision of the arbitration panel, any party to the arbitration may file in the office of the Registrar of the superior court having jurisdiction in the NSA, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgement or order of that court, and is enforceable as such.

5.7 The territorial *Arbitration Act* shall apply in any arbitration under this Agreement to the extent that it is not inconsistent with this Agreement, unless otherwise agreed by the parties.

5.8 The arbitration panel may, on application, allow any to participate in an arbitration as an intervenor, if in the arbitration panel's opinion the interest of that person may be directly affected by the arbitration, and on such terms as the arbitration panel in its discretion may order.

5.9 Unless the parties otherwise agree, the proceedings and Board's decision shall be made public.

6.0 Environmental Risk Assessment Matrix

6.1 All landfills will be scored by the EWG in accordance with the Environmental Risk Assessment Matrix as set out in Appendix B of this Agreement. The construction of this matrix takes into account two conservative assumptions:

- The contents of the landfills are unknown and all potential contaminants (ie substances typically used at DEW Line sites) may be present in the landfill
- If a contaminant comes into contact with receptors, it could have an adverse impact on those receptors regardless of the exposure duration or concentration

6.2 Landfills scoring 105 points or more are classified as potentially high environmental risk (Class A) and will be excavated. Landfills with a score of 100-104 points will be considered on a case by case basis to determine whether they should be excavated or considered as Class B landfills.

6.3 Landfills with a score in the range 75 to 99 points are classified as moderate environmental risk (Class B). An engineered leachate containment system will be provided for these landfills to mitigate against potential environmental risks. The landfill engineers under contract to DCL will take into consideration any suggestion of the EWG regarding the design of the leachate containment facility. In specific cases where an engineered leachate containment system cannot be constructed, the EWG will recommend whether complete excavation or partial excavation with a leachate containment system is required.

6.4 Landfills with scores of 75 or less are classified as low environmental risk (Class C). The remediation approach for these landfills will be the placement of an engineered cover following collecting, sorting, and appropriate disposal of debris where it may impact on the integrity of the landfill. Hazardous debris will be removed and disposed of in accordance with federal regulations. Generally, the final thickness of cover material will be approximately 0.75 metres, but may vary depending on site specific conditions.

6.5 Scores that fall within plus or minus five points of 75 points will be considered on a case by case basis.

6.6 The scoring of Category C: Receptors of the matrix will take into account local/traditional knowledge in accordance with the procedures set out in Section 8 of this Agreement. The primary focus for the collection of local/traditional knowledge will be on the local community and an Inuit representative who is familiar with the DEW site under assessment.

6.7 The scoring of the landfills will take place before the clean-up at that DEW site commences and the site specific clean-up plan is finalized.

7.0 Environmental Working Group

7.1 An Environmental Working Group (EWG) will be established. The EWG will consist of four members, two chosen by each of the Parties. The members will be qualified engineers and/or scientists with expertise in environmental remediation and clean-up in northern climates.

7.2 The EWG will, for each of the landfills prior to the clean-up of that site, be responsible for the scoring of the risk assessment matrix, interpreting the results and recommending a remediation solution in accordance with this Agreement. If a majority of the members of the EWG are in agreement with the EWG recommendations then DND will include these recommendations in its site specific plans which are referred to in section 23 of this Agreement. If the EWG is deadlocked then the issue will be referred to the Steering Committee as per section 4.3 of this Agreement.

7.3 During the monitoring period, the EWG will also examine the results of the monitoring program in accordance with the methodology set out in section 20 of this Agreement and report to the Steering Committee on the results of their investigation. Should changes to the monitoring plan and/or additional remediation be required, the EWG will make recommendations to the Steering Committee on what action should be taken as per section 4.3 of this Agreement.

7.4 The EWG will go on-site during the pre-cleanup delineation phase of the project to assemble information required, including local/traditional knowledge as per section 8 of this Agreement, to score the risk assessment matrix. DND will contribute $10,000 per site to NTI to defray the cost incurred by its EWG members and a community representative selected by the relevant RIA (NTI Representative). DND will also provide the NTI representative transportation

costs whenever the NTI representatives are travelling to a site or to a community with the DND representatives on a DND charter. DND will also provide meals and accommodation for the NTI representative while at the site.

7.5 The EWG will also act as a resource to the Steering Committee and will upon request from the Steering Committee investigate certain matters and produce reports or studies for consideration by the Steering Committee. Both Parties agree to cover the costs of their members of the EWG to undertake such work.

8.0 Local/Traditional Knowledge

8.1 Traditional and local knowledge for use in the scoring of the risk assessment matrix will be collected during the Pre-Cleanup Delineation phase of the DEW Line clean-up project.

8.2 An Inuit representative familiar with the DEW site and traditional use of the area around the site will be chosen by the relevant Regional Inuit Association to be on site during the pre-construction delineation phase of a site clean-up. The Inuit representative will work closely with the EWG to identify Inuit use of the area, wildlife patterns, and past events and occurrences that may have impacted on landfills (i.e. dumping, hazardous waste storage, natural occurrences) in order to assist in the scoring of the matrix.

8.3 DND and NTI will attempt to establish a community DEW Line Clean-up Committee which would facilitate the flow of local knowledge to the EWG prior to, and during, the site visit.

8.4 The EWG will visit the local community (ies) most affected by the DEW site. The EWG will conduct one-on-one interviews with a number of residents and will also meet with the Hamlet Administration Officer and/or the Hamlet Mayor, the local Hunters and Trappers Association, and relevant community organizations to obtain information concerning the traditional use of the area by the community. The Community Land and Resource Committee (CLARC) will be consulted if Inuit Owned Land is affected in any way.

8.5 In anticipation of these community consultations, DND, in consultation with NTI will prepare an information package in English and the relevant Inuit language for

use in the community consultations. The package will include maps of the site and the surrounding area along with sample questions (see Appendix D) that would facilitate discussion.

8.6 DND will provide NTI with at least six months notice regarding the site visit in a given season. Six weeks notice will be provided regarding the dates for the community visit. DND will attempt to arrange the timing for the community consultation to avoid harvest time when members of the community might be on the land. NTI in conjunction with the EWG will arrange the interviews with the various community associations and individuals.

8.7 The EWG will document all information collected during the community consultations. This information will be provided to DND, NTI, the relevant RIA and the host community.

8.8 All information collected from the interviews will be considered during the matrix scoring and will be given equal consideration with conventional scientific knowledge collected during the site visits.

8.9 Prior to the actual clean-up, DND will conduct a community information session to inform the residents of the scope of the Work and other relevant facts. In the case of CAM 4, there will be a community information session during the summer of 1998 at the option of the RIA. For Fox 5, in addition to this community information session, the EWG will be consulting the community of Broughton Island on FOX-5 as part of its work on scoring landfill evaluation matrices, during the summer of 1998 and DND will provide a limited public information session at that time.

9.0 CEPA Soils

9.1 Soils at concentrations exceeding federal regulations (referred to herein as "CEPA" soils) will be removed from the site and disposed of in a licenced facility in accordance with those federal regulations.

10.0 Tier II Soils

10.1 Tier II soils are defined in Appendix E of this Agreement.

10.2 Tier II soils will be excavated and placed in an engineered, lined, containment facility (Tier II Disposal Facility). After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement . A schematic of a Tier II Disposal facility is presented in Appendix K. Tier II soils may also be placed in a similarly engineered cell of a larger landfill. The location of the Tier II Disposal Facility will be selected in order to minimize potential environmental impact in a cost-effective manner. In some cases Tier II soils may be transported from one DEW site to another depending on soil volumes and project economics.

10.3 Confirmatory testing will be conducted in accordance with the methodology outlined in section 13 of this Agreement.

11.0 Tier I Soils

11.1 Tier I Soils are defined in Appendix E of this Agreement.

11.2 Tier I soils will be excavated to a depth of to 30 cm if the soil is located on a flat or gently sloping area such as a gravel pad unless delineation testing indicates a lessor depth of contamination. In such a case, a suitable safety margin will be excavated. Where Tier I soils are located on slopes greater than 3:1 (horizontal:vertical), the contaminated soils will be excavated to a depth of up to 60 cm. After excavation, the area will be backfilled with sufficient clean fill to provide an effective layer over any remaining Tier I soils and to meet the requirement of clause 22 of this Agreement .

11.3 Tier I soils will be placed in a professionally engineered landfill where they may be used as intermediate fill.

11.4 During the pre clean-up delineation phase prior to going to tender for the clean-up, testing to determine the presence or absence of Tier II contaminated soil below the Tier I soils will be conducted.

12.0 Hydrocarbon Soils

12.1 Hydrocarbon contamination will be based initially on the measurement of Total

will investigate areas of concern identified by NTI and/or its representatives who will be on-site during the delineation work. Risk assessment consideration will be given to soils that act as sources of contaminants to nearby aquatic environments even if the contaminants are below the relevant DCC criteria. The method of delineation will follow the grid as set out in Appendix F of this Agreement.

13.2 Confirmatory testing of contaminated areas, other than Tier I soils, will be conducted after contaminated soils have been excavated. Confirmatory testing will be conducted in accordance with the protocol outlined in Appendix F of this Agreement.

13.3 Should there be evidence to suggest that some contaminated areas were missed during the pre clean-up delineation work, these areas will be investigated in accordance with the pre clean-up delineation methodology.

13.4 During the confirmatory testing phase, NTI may assign a qualified observer to the site.

13.5 Appropriate quality assurance measures acceptable to the EWG will be taken to ensure the accuracy of all analytical work in the field or in laboratories.

14.0 Debris

14.1 Debris will be collected and sorted into hazardous and non-hazardous components. Hazardous debris will be disposed of in accordance with Federal regulations. Non-hazardous debris will be buried in a professionally engineered landfill, provided there is a suitable location and sufficient gravel is available. Appendix C contains additional details concerning the destination of collected debris.

14.2 All debris which is attributable to the operation of any DEW site and is within two metres of the surface at low tide or within two metres of the surface of an inland water body will be removed by DND.

15.0 Off Site Contamination and Debris

15.1 Where there is reasonable evidence of additional off site contamination or debris

Petroleum Hydrocarbons (TPH) where the TPH value is greater than or equal to 2500 ppm. Should the soils contain Tier I or Tier II contamination, they will be treated in accordance with the relevant sections of this Agreement. These hydrocarbon areas will be identified on site as part of the pre-construction delineation testing.

12.2 Each contaminated area will be evaluated qualitatively by the EWG using the checklist outlined in Appendix J of this Agreement.

12.3 Where remediation is required, one of the following options will be used:

- aerating the hydrocarbon contaminated soil in place to reduce hydrocarbon contaminant concentrations
- use of hydrocarbon contaminated soil as intermediate fill within an engineered landfill
- landfilling in a Tier II Disposal facility
- bioremediation using a landfarming or bio-pile processes
- soil washing
- other equivalent technologies recommended by the EWG

12.4 Based on site specific conditions, the EWG will recommend the most appropriate of the remediation options outlined in clause 12.3 in accordance with section 4.3 of this Agreement. The appropriateness of the options will take into consideration the environmental sensitivity of the area. Factors which will be considered in the selection of the method are:

- type of contaminant (ie fuel or lubricating oil)
- total volume of hydrocarbon contaminated soils on site (mobilization costs, ability to treat the soil)
- concentration of hydrocarbons within the soil (effectiveness of treatment process)
- type of soil

13.0 Pre Clean-up Delineation and Confirmatory Soil Testing

13.1 A comprehensive pre clean-up delineation program will be designed to ensure that all contaminated soil and contaminated building material will be identified . DND

which, subject to clause 15.2, is attributable to the operation of a nearby DEW site, DND will undertake testing to determine the extent of the contamination in consultation with NTI and remediate the site in accordance with the relevant sections of this Agreement.

15.2 Should the evidence clearly demonstrate that other individuals or organizations have contributed significantly to the contamination or debris, then NTI and DND will endeavour to obtain the third Party (ies) agreement to contribute its pro-rated share of the investigation and clean-up costs before the investigation and clean-up commences. If the third party does not agree to pay their share of the costs, DND has the option, where practical, to clean up its share of the contamination, or in the alternative, waiting until there is third party agreement regarding payment of the investigation and clean-up costs. The investigation and clean-up will be in accordance with the clean-up protocol outlined in this Agreement.

15.3 NTI will endeavour to identify areas of concern prior to the delineation phase of the clean-up.

16.0 PCBs in Paint

16.1 PCBs in paint will be treated in accordance with applicable federal regulations. Changes to these regulations will be dealt with in accordance with section 25.1 of this Agreement.

17.0 Materials Containing Lead-based Paints

17.1 Materials containing lead-based paints will be placed in a professionally engineered landfill. Should regulations or guidelines be issued which direct otherwise, the implementation of this change will be dealt with in accordance section 25.1 of this Agreement.

18.0 Barrels

18.1 The testing and disposal of POL tank sludge, waste oil, petroleum products, antifreezing agents, solvents and barrels will be handled in accordance with the criteria as set out in Appendix G.

19.0 Borrow Material

19.1 DND will attempt to minimize new excavation of borrow materials required for the clean-up activities. Where possible, existing sources of borrow material will be used. All borrow areas will be regraded to match the surrounding topography.

20.0 Monitoring Program

20.1 The monitoring program will identify an actual or potential landfill failure. Remedial action will be undertaken if leachate is present at levels greater than the site specific baseline concentrations at the time of the landfill completion. Action taken as result of the monitoring program will ensure the integrity of the landfills and thereby the health of the Inuit is protected on a continuing basis.

20.2 Following the completion of the clean-up for a site, DND will commence a monitoring program in accordance with Appendix H of this Agreement.

20.3 The monitoring program will have three phases. The objective of each phase are identified in Appendix H.

20.4 Monitoring results will be communicated to both Parties in the form of a comprehensive report.

21.0 Research Proposals

21.1 NTI, on behalf of communities, may raise at the Steering Committee, items, including the need for hydrographic mapping, which could involve the requirement for research and investigation. These proposals will be discussed and evaluated at the Steering Committee. If the Steering Committee decides that the proposals are consistent with the objective of the clean-up which is to protect the environment from contaminants entering the food chain or involve direct DEW site related impacts which could cause significant economic impact, DND will fund the agreed upon research activities.

21.2 Where the proposals are broader in nature and not solely restricted to DND DEW

site activities, DND will support NTI in seeking funding under other Government programs and/or initiatives and may contribute funding to the approved proposals.

21.3 Involvement of the Inuit in the research activities including training and technology transfer will be dealt with in an agreement dealing with economic provisions.

22.0 Site Restoration

22.1 All sites will be regraded to the extent possible to conform to the natural contours. The regrading will pay particular attention to hydrocarbon stained areas and wherever feasible these areas will be regraded so as to improve the aesthetics of the stained area.

23.0 Site Specific Clean-up Plan

23.1 DND will provide NTI with a site specific clean-up plan six months in advance of the clean-up of a particular site. NTI will review the plan to satisfy itself that the plan is in accordance with the requirements as set out in this Agreement. Any items of concern to NTI will be referred to the Steering Committee for resolution in accordance with section 4.3 of the Agreement prior to the issuance of any requests for bids by DCL. DCL, as the representative of the project proponent (DND), will be responsible for preparing all necessary submissions to obtain regulatory approval to proceed with the clean-up activity.

24.0 Liability and Indemnification

24.1 DND acknowledges and agrees that it has continuing responsibility and liability for the integrity of all landfills remaining on site. DND agrees that should there be evidence of potential or actual failure of a landfill, it will investigate the situation pursuant to the monitoring provisions of this Agreement.

24.2 Should there be evidence of contamination at the DEW Line site which exceeds the protocol as set out in this Agreement at the time of the signing of this Agreement and which cannot be attributed to a third Party then DND will undertake the clean-up.

24.3 DND agrees that nothing in this Agreement shall relieve the Crown or its agents either at present or in the future from complying with all applicable federal laws of general application. Changes to territorial law will be referred to the EWG which will make recommendations to the Steering Committee concerning the relevance of these changes to the clean-up.

24.4 DND agrees that it will be a condition of any sale or transfer of any of the lands comprising the DEW Line sites that the purchaser must assume DND's obligations under this Agreement with respect to the lands sold or transferred. It will also be a further condition of any such sale or transfer that the purchaser or transferee shall provide security for the performance of the assumed obligation and shall provide and maintain a letter of credit, surety bond, or other security in a form and amount mutually agreeable to the Parties.

25.0 Amendments

25.1 Should existing federal regulations or guidelines be amended, the EWG will examine the implementation of these changes or amendments taking account the special characteriztics of the Arctic environment and make appropriate recommendations to the Steering Committee in accordance with section 4.3 of this Agreement.

25.2 The Protocol for confirmatory testing may be reviewed and adjusted on a site by site basis provided that a majority of the EWG are in agreement with the changes. Permanent or major changes will require the prior approval of the Steering Committee.

25.3 In the event that either Party wishes to amend the schedule as set out in Appendix A, it will provide the other Party with thirty (30) months written notice. If unforeseen event(s) or a decision by a regulatory body occurs which has a material impact on this schedule, the Parties will review these events and attempt to arrive at a mutually acceptable alternative.

25.4 Both Parties agree to review changes in technology and research studies which may have a bearing on this Agreement and discuss the need for changes resulting from these developments. The Steering Committee may task the EWG to investigate a particular technology pursuant to clause 4.1 (d) of this Agreement.

Recommendations of the EWG will be implemented in accordance with section 4.3.

25.5 If either Party wishes to make other changes to this Agreement, it will provide, in writing, six months notice of proposed changes. Any agreed upon amendments will be executed and attached as an appendix to this Agreement.

25.6 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affects the conduct of a clean-up in progress or one which is scheduled to commence in the near term.

26.0 EWG Reports

26.1 All reports of the EWG will be available to provide additional information and guidance in the implementation of this Agreement. In the event of any conflicts or differences in interpretation of the EWG reports and this Agreement, this Agreement will prevail.

27.0 Notices

27.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (ie Notice) to the other Party, such party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacimile and will be effective upon receipt by the addressee.

27.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

27.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Northwest Territories
X0E 0C0

28.0 **Termination of the Agreement**

28.1 This Agreement will terminate on the later of December 31st, 2008 or when the clean-up work as set out in this Agreement for the sites listed in Appendix A is completed or on such a date agreed to by the Parties in accordance with clause 25.3 of this Agreement.

28.2 Notwithstanding clause 28.1 of this Agreement, monitoring and any necessary remediation in accordance with section 20 of this Agreement will continue for twenty five (25) years after the termination of this Agreement.

28.3 At the end of twenty five years of monitoring following the termination of this Agreement, DND and NTI will negotiate a new agreement to specify the terms of any further monitoring (if required).

Annexes to the Agreement

Appendix A

Clean-up Schedule

Site*		Start Date	Completion Date
CAM M	Cambridge Bay	1998	1999
FOX 5**	Broughton Island	2001	2003
CAM 4**	Pelly Bay	2001	2003
FOX M/CAM 5	Hall Beach/Maclar Inlet	2002	2006
CAM 3	Shepard Bay	2002	2003
DYE M	Cape Dyer	2003	2006
CAM 2	Gladman Point	2003	2004
FOX 2/FOX 3	Longstaff Bluff/Dewar Lakes	2004	2008
CAM 1	Jenny Lind Island	2004	2005
PIN 4	Byron Bay	2005	2006
PIN 3	Lady Franklin Point	2006	2007
PIN 2	Cape Young	2007	2008

* Dates for the Baffin Sites are tentative pending resolution of economic and business issues

** The starting dates for CAM 4 and Fox 5 and the subsequent starting dates could be moved up pending the timing of the PCBs in paint decision by Environment Canada

Appendix B

Environmental Risk Assessment Matrix

Introduction

The matrix has been based on the CCME National Classification System for Contaminated Sites, and adapted to address the particular concerns of the Arctic environment. The matrix is divided into three categories of equal weight: contaminated source, pathways, and receptors. The interaction of these three elements results in environmental risk. Each category is assigned 50 points, which are distributed among several factors. Each of these factors has been made as specific as possible in order to reduce the subjectivity of the matrix to a minimum. In addition, each of the three main categories is assigned a highly subjective "special considerations" factor according to the method described in the CCME Classification System. As it is unlikely that any classification system could address all possible factors, a special considerations factor allows the user to increase or decrease the score "to emphasize important concerns about a site and should be used as an **exception rather than as a rule**" (CCME 1992, p.6-7).

The purpose of the matrix is to evaluate the environmental risk posed by landfills in their current condition and location. It is not suitable for determining the risk posed by a landfill post-closure, as most of the elements in the matrix would not change by the application of a remedial solution. It should also be recognized that monitoring is an integral part of the closure.

The next sections provide guidance to the EWG on the methodology and items to be considered when scoring the matrix. This section is followed by the actual matrix which is to be used in the scoring.

A. Contaminant Source

Five factors were considered under Contaminant Source to describe specific landfills, as follows:

- A.1 Landfill Extent
- A.2 Estimated Depth of Landfill
- A.3 Presence of Leachate
- A.4 Presence of Surface Contaminated Soil
- A.5 Presence of Surface Debris

A.1 Landfill Extent

Landfill areas will be based on the results of geotechnical/geophysical site surveys and visual observations. Those landfills with an area greater than 10,000 square metres will score 10 and those smaller landfills will be scored in proportion to their size relative to 10,000 square metres.

A.2 Estimated Depth

The estimated depth of a landfill is determined by visual inspection of surrounding topographic features. The average depth of the active layer will be used as a qualifier for the description of landfill depth, as this is generally the maximum depth of investigation. The depth of the active layer may range from one to two meters at these sites, depending on material type; therefore an average depth of 1.5 meters was used in the rating. Landfills with estimated depths of greater than 1.5 meters will score 5 and those with estimated depths of less than 1.5 meters will score less.

A.3 Presence of Leachate

Leachate provides evidence of contamination within landfill. Leachate can be defined as the presence of contaminants in water emanating from the landfill, but concentrations may be so low as to be difficult to detect. The presence of leachate can be better determined by the presence of contaminated soil at the toe of the landfill, indicating

chronic low levels of contaminants leaching from the landfill. All types of contaminants in leachate (PCBs, (Polychlorinated Biphenyls) TPH (Total Petroleum Hydrocarbons) or inorganics) are considered to be of equal concern, as indicators of contamination within the landfill.

In the scoring, leachate is considered to be either present or not; no interpolation of the score is used in this category.

A.4 Surface contaminated soil

Within each landfill, there is potentially a source of contamination. The presence of surface contaminated soil, like the presence of leachate, is an indication that the landfill contains contamination. The volume of contaminated soil is not taken into consideration; this provides a conservative approach in that a small amount of contaminated soil can trigger a high score. The presence of Tier II soils will trigger the highest score (15). Based on the hypothesis that each landfill potentially contains contaminants, 5 points are given to this subsection, even if no surface contaminated soils were identified.

A.5 Presence of surface debris

At some landfills surface debris is very extensive, while at others there is almost no debris. Scoring needs to be quantitative; therefore the percentage of the surface area of the landfill that is covered with debris is used as the basis for scoring. A landfill that has surface debris covering more than 50% of its surface receives a full score.

B. Pathways

The primary transport mechanisms for contaminants from the DEW Line landfills are considered to be:

- aerial transport of fine particles; and
- water transport, both as surface water run-off or subsurface water flow.

B.1 Aerial Transport of Contaminants

All contaminants can be transported as particles; windblown debris is not considered in this category, as debris pickup is inherent in any cleanup. Surface contamination or surface expressions of leachate imply the potential for aerial transport. This factor is given a low weight because the quantity of contaminated soil on the surface of a landfill is generally low relative to the quantity of contaminated soil at the site as a whole. In addition, it is anticipated that relative to the effect of water movement, aerial transport contributes less to the transport of contaminants away from a landfill.

B.2 Water Movement

Water movement includes the movement of surface water and subsurface water within the active layer. "Groundwater" is not addressed as an issue separate from surface water as the movement of water within the active layer is subject to the same driving forces as surface water. The intent of this sub-category is to examine factors that affect migration away from the landfill – slope, runoff, extent and type of cover on the landfill, annual precipitation and distance to surface water. Among these factors, topography, runoff potential and proximity to surface water are given the highest weight.

B.2.1 Topography

The degree of the slope on which the landfill is located is one of the major factors contributing to transport of contaminants; the scoring is carried out on a sliding scale. In cases where there are different slopes across the landfill, a weighted average is used.

B.2.2 Cover Material – Depth

The extent to which potential contaminants are available to transport is also dependent on the depth and type of cover material. The potential for leachate generation and correspondingly, leachate migration, is related to the infiltration of water into the landfill. Cover over the landfill helps mitigate infiltration of water into the landfill contents. As the thickness of the landfill cover increases, the likelihood that potential contaminants will be released from the landfill decreases. If the active layer is contained in the cover material above the debris, then the potential for surface water infiltration into the landfill is small; this circumstance is assigned the lowest score.

B.2.3 Cover Material – Type

The erosion potential of a landfill is partly based on the type of cover material. Erosion can eventually lead to the exposure of the landfill contents. Some cover materials are more susceptible to erosion than others; well graded gravels are the least susceptible, and silty materials are the most susceptible. In cases where there is no cover, this factor is assigned the highest score. Where the cover materials consist of a combination of soil types, the scoring should reflect the more conservative or higher score.

B.2.4 Surface Water/Run-Off Potential

This factor aims to describe the destructive potential of water action on the landfill, which could take the form of waves; streams, rivers or lakes; or seasonal drainage. Where there is significant seasonal drainage, the run-off potential is high. "Significant seasonal drainage" is defined as run-off that has the potential to transport large quantities and concentrations of contaminants to surface water courses over a short period of time (CCME 1992, p.23). Significant seasonal drainage also includes consideration of major snow drifting on a landfill.

B.2.5 Precipitation

The amount of precipitation received, either as rain or snow fall, affects the amount of surface water infiltration or run-off. The majority of the DEW Line sites receive less than 500 mm of precipitation annually, with the exception of Cape Dyer. Typically, the amount of precipitation at any site is relatively low; therefore it is unlikely that any single precipitation event would cause significant runoff. This factor is therefore given a relatively low weight.

B.2.6 Distance to Downgradient Perennial Surface Water/Seasonal Drainage Channel

The distance to surface water will affect the probability of contaminants reaching the watercourse. This factor can include streams, seasonal or perennial, running directly through the landfill, or streams and lakes downgradient from the landfill, but it is intended to exclude small ponds with no outflow. On very steep slopes this distance should consider the horizontal distance to the water body rather than the vertical drop. The impact of drainage with respect to contaminant exposure is not considered in this category (it is considered under Receptors); this factor determines whether there is a drainage pathway from the landfill.

C. Receptors

This section addresses the potential for impact on receptors, specifically, aquatic and terrestrial habitats, as well as human exposure. Impact on humans is the primary consideration; however, it should be recognized that impact on humans is implicit in the scoring of factors addressing ecosystem impact. The scoring within each category is to be based on recorded data, as well as local knowledge of the land use in the area, and therefore requires local input.

C.1 Potential Impact on Receiving Freshwater/Marine Habitat

The water body should be selected based on the potential effects on the receiving habitat. In the selection of the receiving water body to be used in the landfill evaluation matrix, consideration must be given to the regional drainage patterns. For example, where the drainage from a landfill is overland (i.e. there is no direct connection between the landfill and the downgradient water body), water bodies beyond 2 kilometers should not be used in the evaluation. This is based on the premise that natural attenuation of any potential contamination will occur with overland flow. Where a direct connection between a landfill and a downgradient water body exists, via a stream or interconnected ponds, the two-kilometre limit should not be used.

C.1.1 Proximity to Receiving Freshwater/Marine Habitat

"Receiving habitat" is considered to be the most potentially impacted significant body of water near the toe of the landfill. The water body may support freshwater or marine life and/or may be used by avifauna and/or terrestrial mammals as a water source. It is not necessarily the seasonal drainage course or perennial water body closest to the landfill toe: This section's objective is to select a habitat which support receptors rather than identify the closest body of water. It is assumed that only habitat downgradient from the landfill is to be considered (given that aerial transport of contaminants to habitat upgradient from the landfill will be addressed by the remediation of contaminated soil).

C.1.2 Estimated Habitat Usage – Freshwater/Marine

This section is scored based on the frequency of usage within the selected receiving water body: the level of biodiversity and the occurrence of calving/spawning should be considered in scoring. It is recognized that freshwater and/or marine wildlife is potentially more at risk compared with terrestrial wildlife or avifauna, which should only be exposed through water ingestion. Thus, when terrestrial wildlife or avifauna is the primary receptor, the score for this factor should fall into the moderate or low category based on the potential frequency of usage. Otherwise, when the selected water body sustains freshwater and/or marine wildlife, the level of biodiversity should be used to evaluate the score. It should be noted that the most conservative approach - in the selection of the receiving water body - must be used when scores from section C.1.1 and C.1.2 are combined. Finally, "Biologically sensitive" areas such as bird sanctuaries and/or endangered, threatened or vulnerable populations should be considered as "special considerations".

C.2 Potential Impact on Receiving Terrestrial Habitat

C.2.1 Extent of Vegetation

Typically the area in which to consider vegetation would include an area 300 m downgradient from the toe of the landfill. The area within this distance is expected to be most susceptible to uptake of contaminants if they are leaching from the landfill, but a larger or smaller area could be considered if site specific conditions warrant it.

C.2.2 Estimated Habitat Usage – Terrestrial/Avifauna

The same criteria as for usage of aquatic habitat are to be applied.

C.3 Potential Human Exposure Through Land Use

C.3.1 Presence/Occupation

This factor addresses strictly dermal exposure and inhalation; consumption of food and water from the area is dealt with in subsequent factors. The risk of dermal exposure or inhalation is much lower when soil is frozen; therefore winter occupation of the site is assigned a low risk. "Summer" in this factor is intended to include the spring, summer and fall periods when the ground is not frozen. Within this factor, the scoring takes into account the likelihood and the duration of contact. In such way, proximity to a community is considered (high likelihood of contact), although proximity to a community does not necessarily trigger a high score if visits are infrequent (low duration of contact).

The likelihood of contact considers proximity to community or to a camp, as well as proximity to "travel routes". The duration of contact considers full time residences (i.e. permanent community for high, summer camp for moderate, winter camp or travel routes as low). Scores may be interpolated between the allocated points, according to the table below.

Table 1-1: Scoring Guide for Section C.3.1

	High Likelihood of Contact	Moderate Likelihood of Contact	Low Likelihood of Contact
High Duration of Contact	8	6	4
Moderate Duration of Contact	6	4	2
Low Duration of Contact	4	2	1

For large DEW Line sites, different parts of the site need to be considered individually, as some areas of the site could be quite far (more than a few kilometres) from the landfill under consideration.

C.3.2 Proximity to Drinking Water Source

Regardless of whether the source is seasonal or perennial, an established community or a summer camp water source located downgradient of the landfill is to be considered in this factor.

C.3.3 Food Consumption

Sedentary organisms are more susceptible to local inputs as their exposure is large if they are downgradient from the landfill. These organisms can include bottom-dwellers such as sculpins, mussels, sea urchins etc., as well as terrestrial vegetation, which can be used for medicinal purposes. This kind of contamination "is quite localized when considered on a broad regional scale" (DIAND 1997, pg. 5). Migratory marine animals may have body burdens of contaminants; these are not directly attributable to local contaminant sources, as the vast majority of organochlorines, for instance, arrive in the Arctic via long range transport.

Caribou living in the general area of DEW Line sites do not have elevated levels of contaminants, since they feed over a very wide area. The Canadian Arctic Contaminant Assessment Report (DIAND, 1997) describes these results in more detail.

It is recognized, however, that sources such as DEW Line sites do contribute contaminants to the Arctic ecosystem. For the purpose of scoring the matrix, therefore, a high consumption of animals from the area surrounding the DEW Line sites has the potential to pose a higher risk than a low consumption, **although in general the risk remains low.**

This factor is divided into two sub-sections, and the score is the sum of the score for each of the two sub-sections.

1.3 Special Considerations

As indicated in the introduction to the matrix (section 1.1), each of the three main categories includes a "*special considerations*" factor. The proposed value of the special considerations factor is a maximum of ten percent of the overall score for each category. It is intended that no circumstance will allow a user to assign a special considerations score that will cause the score for that category to exceed the maximum allotted. To avoid undue bias, it is also suggested that the user should complete the entire evaluation form and score a site before addressing special considerations in the total score.

The Environmental Working Group (EWG) based the landfill risk evaluation matrix on the CCME model which defines three categories: contaminant source, pathways and receptors. Within those three categories, the EWG tried to address all of the possible factors contributing to risk. Recognizing that even a thorough matrix could never address all possible risk factors, special considerations were included to address specific risk factors, which are not general to all of the DEW Line sites.

As noted in the CCME document, the special considerations factor is not intended to be applied on a regular basis, as it addresses very site-specific risk factors. In fact, if the special consideration factor was being consistently applied in the scoring of landfills, it would indicate that the matrix itself was incomplete. Special considerations should be site-specific characteristics that can be documented.

Three examples of how special considerations could be applied are provided to clarify the use of such a classification:

Example 1. Wildlife on site

At Byron Bay, the caribou belong to the Peary herd, an endangered species. It may be that "special considerations" points would be assigned to the Receptors category when endangered, threatened and/or vulnerable species (COSEWIC, 1997) are known to visit the DEW Line landfill.

Example 2. Drinking water

The risk associated with landfill impact on a drinking water source is addressed in section C.3.2. In that section, the distance from a landfill to a known drinking water source, permanent or seasonal, is used as an indicator of the risk that the contaminants in the landfill could have an impact on the drinking water source. If a landfill is close to a drinking water source, then section C.3.2 would be assigned the maximum score (8 points). In the case of Pelly Bay, however, where the landfills are far from the drinking water source and therefore receive a relatively low score in section C.3.2, "special considerations" points may be added to address concerns that the landfills are located in the watershed for the community drinking water supply.

Example 3. Proximity to a community

In the landfill risk evaluation matrix, human exposure to a landfill is measured in the following way: people can spend time at the landfill (potential dermal exposure), they can drink water from an area near the landfill (potential ingestion), they could live very close to landfills (potential exposure through aerial transport) or they could eat animals that feed near the landfill (potential ingestion). These three considerations form section C.3 of the risk evaluation matrix. If a landfill is located near a community, there is a greater likelihood that people will spend time at the landfill than there is for landfills far from a community. It is not necessarily the case, however, that landfills near communities receive frequent visits; therefore, instead of creating a special section addressing proximity to a community, the risk of human exposure (section C.3.1) is more accurately evaluated by measuring time spent at a landfill. In these cases, however, "special considerations" points may be added to the Receptors category to address a community's specific concerns.

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION			
A.	CONTAMINANT SOURCE		Maximum Score
A.1	LANDFILL EXTENT		
	>10 000 m2	10	
	For areas less than 10,000 = Area of Landfill X 10 / 10 000	2-9	
	Minimum Score	1	10
A.2	ESTIMATED DEPTH OF LANDFILL		
	greater than 1.5 m	5	
	less than 1.5 m	2-4	5
A.3	PRESENCE OF LEACHATE		
	Evidence of Leachate	10	
	No Evidence of Leachate	0	10
A.4	PRESENCE OF SURFACE CONTAMINATED SOIL		
	> DCC Tier II Stains	15	
	> DCC Tier I < DCC Tier II. Stains	10	
	Contaminated suspected, no surface contamination noted	5	15
A.5	PRESENCE OF SURFACE DEBRIS AT LANDFILL		
	>50% of surface area	10	
	<50% of surface area, pro-rated	1-9	
	No debris observed	0	10
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - CONTAMINANT SOURCE		*50*

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX FOR LANDFILLS IN THE NUNAVUT REGION			
B.	PATHWAY/TRANSPORT MECHANISMS		Maximum Score
B.1	AERIAL TRANSPORT OF CONTAMINANTS		
	All Landfills Scored as 2 If Surface Soil Contamination (A.4) or leachate (A.3) has been identified		2
B.2	WATER MOVEMENT		
B.2.1	TOPOGRAPHY		
	Steeply Slope (>40 % Grade)	12	
	Sloping (10% to 40% Grade)	4-11	
	Subdued to 10% Slope	2-3	
	Flat (< 3%)	1	12
B.2.2	COVER MATERIALS -DEPTH		
	No to little existing cover	4	
	Greater than 50% exposed/surface debris	3	
	Occasional exposed/surface debris	2	
	Existing cover, minimal debris.	1	
	Cover thickness > average active layer thickness	0	4
B.2.3	COVER MATERIAL - TYPE		
	No cover	5	
	Silty/Sandy Material	4	
	Sandy/Gravel Material	3	
	Gravel Material	1-2	5
B.2.4	SURFACE WATER/RUN-OFF POTENTIAL		
	Very High - evidence of erosion, continuing run-off, or wave action	12	
	High - evidence of erosion, seasonal, widespread, storm waves	10	
	Moderate - % area affected by erosion	3-9	
	Low - no evidence of erosion, slight slopes	1-2	12
B.2.5	PRECIPITATION		
	> 500 mm annual precipitation	5	
	< 500 mm annual precipitation (pro-rated)	1-4	5
B.2.6	DISTANCE TO DOWNGRADIENT PERENNIAL SURFACE/L SEASONAL DRAINAGE CHANNEL		
	0 to 100 m	10	
	100 to 300 m	7-9	
	300 to 1 km	2-6	
	greater than 1 km	1	10
	SPECIAL CONSIDERATIONS		
		+/- 5	
	TOTAL SCORE - PATHWAYS		*50*

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX
FOR LANDFILLS IN THE NUNAVUT REGION

C.	RECEPTORS				Maximum Score
C.1	POTENTIAL IMPACT ON RECEIVING FRESHWATER/MARINE HABITAT				
C.1.1	PROXIMITY TO RECEIVING FRESHWATER/MARINE HABITAT				
	0 to 100 m			6	
	100 to 300 m			4-5	
	300 to 1 km			2-3	
	greater than 1 km			1	6
C.1.2	ESTIMATED HABITAT USAGE - FRESHWATER/MARINE				
	High: High Biodiversity/ High Occurrence/Calving or Spawning Area			5-6	
	Moderate: Moderate Biodiversity, Migratory			3-4	
	Low: Low biodiversity: rare sightings			1-2	6
C.2	POTENTIAL IMPACT ON RECEIVING TERRESTRIAL HABITAT				
C.2.1	Extent of Vegetation				
	Extensive vegetation growth, (80 to 100 % ground cover)			6	
	Moderate vegetation growth (40 to 80% ground cover)			4-5	
	Low vegetation growth (20 to 40% ground cover)			2-3	
	Sparse vegetation (<20% ground cover)			1	6
C.2.2	ESTIMATED HABITAT USAGE - TERRESTRIAL/AVIFAUNA				
	High: High Biodiversity/ High Occurrence/Calving, Denning or Nesting Area			5-6	
	Moderate: Moderate Biodiversity, Migratory			3-4	
	Low: Low biodiversity: rare sightings			1-2	6
C.3	POTENTIAL HUMAN EXPOSURE THROUGH LAND USE				
C.3.1	Presence/Occupation	*likehood of contact*			
	Duration of contact	high	moderate	low	
	High - Numerous visits, summer camp	6	6	4	
	Moderate - occasional summer camp	6	4	2	8
	Low - Infrequent visits or winter camp	4	2	1	
C.3.2	Proximity to Drinking Water Source				
	0 to 100 m			8	
	100 to 300 m			5-7	
	300 to 1 km			2-4	
	greater than 1 km			1	8
C.3.3	Food Consumption				
	High quantity of sedentary organisms - marine & plant life			8	
	Moderate quantity of sedentary organisms - marine & plant life			6	
	Low quantity of sedentary organisms - marine & plant life			4	
	No consumption			0	8
	High quantity of migratory organisms			2	
	Moderate quantity of migratory organisms			1	
	Low quantity of migratory organisms			0.5	
	No consumption			0	2
	SPECIAL CONSIDERATIONS				
				+/-5	
	TOTAL SCORE - RECEPTORS				***50***
	TOTAL SCORE				150

Appendix C
Disposal Requirements For Items Potentially Found At Dew Line Sites

Hazardous materials (as defined by federal or territorial legislation) will not be landfilled at the DEW sites.

The following table includes items that could be found at DEW sites and provides the treatment of these items as part of the clean-up.

Item	Disposal
Waste oil	Treat as per the DLCU Barrel Protocol/GNWT criteria
PCB-containing equipment (e.g. transformers/capacitors)	Treat as per federal regulations
Asbestos	Bag and bury according to GNWT regulations
Sewage-liquid	Treat as per wastewater discharge criteria
Sewage-solid	Treat as soil
Lead and PCB based paints	Treat as per federal regulations
Radioactive tubes	Not suitable for landfill
Scrap metal	Bury in engineered landfill on site
Radar components	Bury in engineered landfill on site
Fuel barrels	Treat as per the DLCU Barrel Protocol/GNWT criteria
Lime	Not suitable for landfill
Antifreeze	Treat as per the DLCU Barrel Protocol/GNWT criteria
Wood	Bury in engineered landfill on site
AVGAS (aviation fuel)	Treat as per the DLCU Barrel Protocol/GNWT criteria
Sulfamic acid	Not suitable for landfill.
Cathode-ray tubes and screens	Bury in engineered landfill on site
Filtron tubes	Not suitable for landfill
Oscillators	Bury in engineered landfill on site
Meters	Not suitable for landfill if PCB- or mercury-containing
Copper wire	Bury in engineered landfill on site
Transmission fluid	Treat as per the DLCU Barrel Protocol/GNWT criteria
1,1,1-trichloroethane	Not suitable for landfill
PBX telephone equipment	Bury in engineered landfill on site
Mercury vapour rectifier tubes	Not suitable for landfill
Paint thinners	Treat as per the DLCU Barrel Protocol/GNWT criteria
Batteries	Not suitable for landfill
Chlorinated hydrocarbons	Treat as per the DLCU Barrel Protocol/GNWT criteria
Corrosion inhibitors	Not suitable for landfill
Lye	Not suitable for landfill
Corrosives	Not suitable for landfill

Item	Disposal
Plastic	Bury in engineered landfill on site
Solvent	Treat as per DLCU Barrel Protocol/GNWT criteria
Dynamite	Not suitable for landfill
RF Interference filters	Bury in engineered landfill on site
Generators	Clean and bury in engineered landfill on site
Scopes	Bury in engineered landfill on site
Vehicles	Clean and bury in engineered landfill
Rubber fuel bladders	Clean and bury in engineered landfill on site
Creosote-treated poles	Bag and bury in engineered landfill on site
Compressed gas cylinders	Vent, puncture and bury in engineered landfill on site
Refrigeration equipment	Recover freon and bury in engineered landfill on site
Paper	Bury in engineered landfill on site

Appendix D

Sample Questions For Community Consultations

Habitat Considerations

- Are there fish/birds/clams in the pond/lake/bay immediately down hill of the landfill?
- Are there many different types of fish/birds/clams in the pond/lake/bay? What species have you observed in that water body?
- Does spawning or nesting occur in the pond/lake/bay?
- Do the animals in the pond/lake/bay stay all year round or are they migratory?
- Have you observed any land animals such as caribou, fox or bear at the DEW Line site? How many? Was the wildlife feeding/calving/nesting/burrowing on site or near a landfill?

Exposure Considerations

- Does the community fish in the pond/lake/bay down hill of the landfill? Where does the community fish?
- Does the community collect clams/sculpins/urchins from the lake/bay?
- Does the community hunt seal, walrus or whales from the bay?
- Does the community pick berries or use the vegetation down gradient of the landfill?
- Does the community hunt at the DEW Line site? What do they hunt?
- How often do the community residents visit the site? Do you camp there seasonally? Where is the camp located?
- Where is drinking water taken from on-site?

Special Considerations

- Is the community aware of this landfill? Are there any special considerations?

Appendix E

Tier I and Tier II
DEW Line Clean-up Criteria

Substance	Units	DCC Tier I	DCC Tier II*
Arsenic	ppm	-	30
Cadmium	ppm	-	5.0
Chromium	ppm	-	250
Cobalt	ppm	-	50
Copper	ppm	-	100
Lead	ppm	200**	500
Mercury	ppm	-	2.0
Nickel	ppm	-	100
Zinc	ppm	-	500
PCB's	ppm	1.0***	5.0

* concentrations exceeding this limits are classified as Tier II Soils except where the concentrations exceed federal regulations (referred to herein as "CEPA" soils)

** concentrations between 200 and 500 ppm are classified as Tier I Soils

*** concentrations between 1.0 and 5.0 ppm are classified as Tier I Soils

Appendix F

Confirmatory Testing Protocol

Confirmatory Testing Grid Sizes

Size of area	Grid size	# Perimeter samples analyzed	# Interior grid samples analyzed
<100 m^2	3x3 m	all	all
>100 m^2, <2500 m^2	6x6 m	50%	40%
>2500 m^2	12x12 m	50%	40%

Where the excavation has an irregular shape, samples from the perimeter of the excavated area are to be collected following the shape of the excavation, rather than the grid if the grid points do not fall on the edge of the excavation.

Samples at the grid intersections will be point samples (as opposed to composite samples from each cell on the grid),to ensure simplicity of sampling and clarity of the result.

Appendix G

Barrel Contents Criteria and Disposal

Introduction

In order to determine the correct disposal method for barrels and their contents, the contents must first be identified. All barrel contents will be sampled and analyzed. Analytical data obtained for the samples collected from barrels located at the site will be compared to the criteria included in Table 1, below. Barrel contents are identified as organic or aqueous and the concentrations of glycols, alcohols, PCBs, chlorine, cadmium, chromium and lead are determined. Uncontaminated aqueous phases can be disposed of on the land; uncontaminated organic phases can be incinerated; contaminated aqueous material should be scrubbed free of organic material; and contaminated organic material should be disposed of as hazardous material.

Table 1: Barrel Protocol Criteria and Disposal Summary

Phase	% glycols or alcohols	PCB	Cl	Cd	Cr	Pb	Disposal
Organic	-	<2	<1000	<2	<10	<100	Incineration
Organic	-	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	>2	>1000	>2	>10	>100	Ship south
Aqueous	>2 %	<2	<1000	<2	<10	<100	Incineration
Aqueous	<2%						Scrub and discard

A. Inspection

1. All barrels are to be inspected to address the following items which shall be recorded and used as a guide prior to opening barrels.

2. Symbols, words, or other marks on the barrel that identify its contents, and/or that its contents are hazardous: e.g. radioactive, explosive, corrosive, toxic, flammable.
3. Symbols, words, or other marks on the barrel that indicate that it contains discarded laboratory chemicals, reagents, or other potentially dangerous materials in small-volume containers.
4. Signs of deterioration or damage such as corrosion, rust, or leaks at seams, rims, and V grooves.
5. Spillage or discoloration on the top and sides of the barrel.
6. Signs that the barrel is under pressure such as bulging and swelling.

B. Sampling

1. Barrels shall not be transported until it has been determined that they are not under pressure, do not leak, and are sufficiently sound for transport.
2. Barrels to be sampled should be set in an upright position, provided that this does not cause them to leak and that it is physically possible.
3. Barrels should only be opened using heavy equipment, according to accepted procedures and under qualified supervision.
4. Once open, barrels will be sampled by personnel wearing proper personal protective gear. Samples of the contents of all barrels shall be extracted using a drum thief.
5. In instances where there are a large number of barrels with obviously similar contents, these can be grouped together and 30 to 40% of the barrels in the group sampled. Barrels containing less than 50 mm of liquid may be combined with compatible material prior to sampling; samples inferred to contain only water on a visual examination shall be tested prior to this consolidation. Barrel contents, which consist of black oil, shall not be consolidated.
6. All barrels shall be clearly numbered using spray paint or other suitable marker. The number on this label should be the only sample coding provided to the laboratory.
7. The barrel locations and barrel sample descriptions should be recorded.
8. Samples should be kept at ambient temperatures and shipped by guaranteed freight to laboratories where they should be kept cold pending analysis.

C. Testing

1. Liquid samples shall be inspected and classified as either containing water or organic materials. Samples thought to contain water shall be analyzed to confirm that they are indeed water, and contain less than 2% glycols or alcohols.
2. The contents of barrels containing organic materials, including aqueous samples which contain more than 2% glycols or alcohols, shall be tested for PCBs, total

chlorine, cadmium, chromium and lead, in addition to identification of the major components e.g. fuel oil, lubricating oil.

3. Contents of barrels which contain two or more phases shall have all phases analyzed; the organic phases as described above and the aqueous phase to ascertain whether it contains less than 2% organic substances. In addition, the aqueous phase shall be tested for any components found in the organic phases above the criteria described below.

D. Disposal of Barrel Contents

1. Barrels containing only rust and sediment shall be treated as empty barrels.
2. Barrel contents comprising water only (less than 2% glycols or alcohols) shall be transferred to an open vessel such as a utility tub or half-barrel and any organic material removed by agitation with a pillow or segment of oil absorbent material. The water may then be discarded on to the ground that is a minimum of 30 meters distance from natural drainage courses. Used oil absorbent material shall be treated as described in below (D.5.).
3. Barrel contents which are composed of water with glycols and/or alcohols or organic phases, and which contain less than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium, and 100 ppm lead, may be disposed of by incineration. Alternatively these contents may be disposed of off-site at a licensed disposal facility. The solid residual material resulting from incineration shall be subjected to a leachate extraction test. Material found to be not leachate toxic shall be disposed of as DCC Tier II contaminated soil. Leachate toxic material shall be treated as hazardous waste and disposed of off-site at a licensed disposal facility.
4. Barrel contents, which contain greater than 2 ppm PCBs, 1000 ppm chlorine, 2 ppm cadmium, 10 ppm chromium or 100 ppm lead shall be disposed of off-site at a licensed disposal facility. Contents may be combined with compatible materials for shipping purposes. Flash points may be required to be determined if they cannot be inferred from the product identification.
5. Used oil absorbent material should be treated as hazardous waste and disposed of off-site at a licensed disposal facility. If it is shown to be uncontaminated with PCBs (< 2 ppm), chlorine (< 1000 ppm), cadmium (< 2 ppm), chromium (< 10 ppm) and lead (< 100 ppm), it may be incinerated on-site.

E. Disposal of Barrels

1. Empty barrels may be crushed or shredded and landfilled on-site as non-hazardous waste after they have been cleaned in an appropriate manner. The barrels shall be

crushed in such a manner so as to reduce their volume by a minimum of 75%. Shredded barrels may be disposed of off-site as recycled metals.

Appendix H

Post Construction Landfill Monitoring Regime

1.0 Types of Landfills

There are four types of landfills that require monitoring:

- New landfills for non-hazardous materials and Tier I soil;
- Landfills to be closed by the addition of granular fill and regraded;
- Landfills to be closed with leachate containment; and
- Tier II soil disposal facilities.

2.0 Monitoring

New landfills are to be constructed for the disposal of non-hazardous demolition wastes, site debris and Tier I soil. These landfills, constructed according to specifications, are considered to pose low potential environmental risks as the contents and placement of the materials in the landfill are known. The monitoring of these landfills will be limited to a visual inspection program to evaluate the stability of the landfill.

Existing landfills that are to be regraded will be monitored for leachate periodically by the collection of soil and/or water samples from test pits at the toe of the landfill, in addition to visual inspection.

For existing landfills that have been classified as moderate potential environmental risk, and proposed Tier II soil disposal areas, the design in both cases is to incorporate a leachate containment system, consisting of synthetic liners (geocomposite clay liners, and/or geomembrane liners) and promotion of permafrost aggradation through the landfill contents. The monitoring program for these landfills will include thermal monitoring of the ground temperatures in and around the landfill, collection and analysis of soil samples, collection and analysis of water from wells around the landfill, and visual inspection.

3.0 Description of Monitoring Components

3.1 Visual Inspection

The physical integrity of the landfill will be inspected and reported using photographs (from the air as well as ground level) and hand drawn sketches. Documented observations should include:

- Signs of damage from settlement, ponding, frost action, erosion, and lateral movement.
- Sloughing of berms, thermal contraction cracks etc.

3.2 Soil and Water Sampling

Soil and water samples, representing background as well as baseline conditions, will be collected. Results of analyses of samples from landfills will be compared to these baseline and background samples as this is indicative of changing environmental conditions at the site.

In general, one monitoring well will be placed upgradient and three will be placed downgradient. This allows the assessment of hydraulic gradient and evaluation of potential impacts. Soil samples will be collected from the toe of the landfill, and will generally be taken from the same locations as the wells. Soil samples at the toe of the landfill reflect chronic input from water and are a very important indicator of leachate.

Soil and water samples will be tested for:

- PCBs (polychlorinated biphenyls);
- TPH (total petroleum hydrocarbons),; and;
- Inorganic elements: arsenic, cadmium, chromium, cobalt, copper, lead, nickel and zinc.

If the landfill is close to a drinking water source and has the potential to have an impact on it, the water samples will be analyzed for the following parameters in addition to the compounds and elements listed above:

- inorganic elements by ICP scan;

- major ions, hardness, and total dissolved solids,; and;
- pH and conductivity.;

The intent of the additional analyses is to provide added information to evaluate the potential impacts related to the landfill, and not necessarily to provide an assessment of the potability of the water source. In this latter case, the results of the analyses of these drinking water samples will be compared to the most current version of Canadian and/or Territorial standards for drinking water for the parameters analysed, in addition to comparison with background and baseline data.

3.3 Thermal Monitoring

As indicated previously, one component of the leachate containment system incorporates aggradation of the permafrost through the landfill contents such that the active layer does not penetrate the waste materials. Geothermal analyses were carried out to predict the length of time for freezeback of the landfill; long-term and short-term thermal regime in the ground; and the depth of the active layer in the cover material. The analyses have shown that it takes several years for the landfill temperatures to equilibrate and stabilize.

A thermal monitoring system provides measurement of sub-surface ground temperatures, which allows comparison to and verification of the predicted ground temperatures. The thermal monitoring system consists of installation of thermistor strings, with "thermistor beads" at select intervals to provide ground temperature profiles at various locations within the landfill. The thermistor strings are attached to automated data-loggers which allow for remote data collection. In general, a minimum of three thermistors will be placed; the actual number will be evaluated on a landfill-specific basis. Thermistor installation will be in accordance with standard engineering practice.

Checklists for the collection of monitoring data are presented in Appendix I.

4.0 Monitoring Frequency

Generally, the post-construction monitoring program would have three phases, each with a different objective.

4.1 Phase I: Monitoring of conditions to confirm that equilibrium is achieved.

During Phase I, sites where leachate containment and/or Tier II soil facilities have been constructed, monitoring will take place on an annual basis, for an estimated period of five years following construction. The five-year term was selected on the basis that ground-temperature thermal regimes at these specific landfills would require three to five years to reach equilibrium.

At other locations, where existing landfills have been regraded and new landfills have been constructed, Phase I monitoring will be carried out on in the first, third and fifth years following construction.

An evaluation of the Phase I data will be carried out at the end of five years to confirm that thermal and chemical equilibrium had been achieved, and that no stability issues have been identified. The Phase I monitoring program may be extended, if required.

4.2 Phase II: Verification of equilibrium conditions established during Phase I.

The monitoring frequency in Phase II be downgraded from Phase I, and be carried out according to the following schedule: year 7, year 10, year 15 and year 25. Year 25 would mark the end of Phase II monitoring.

4.3 Phase III: Monitoring for long term issues such as liner integrity, permafrost stability, and significant storm events.

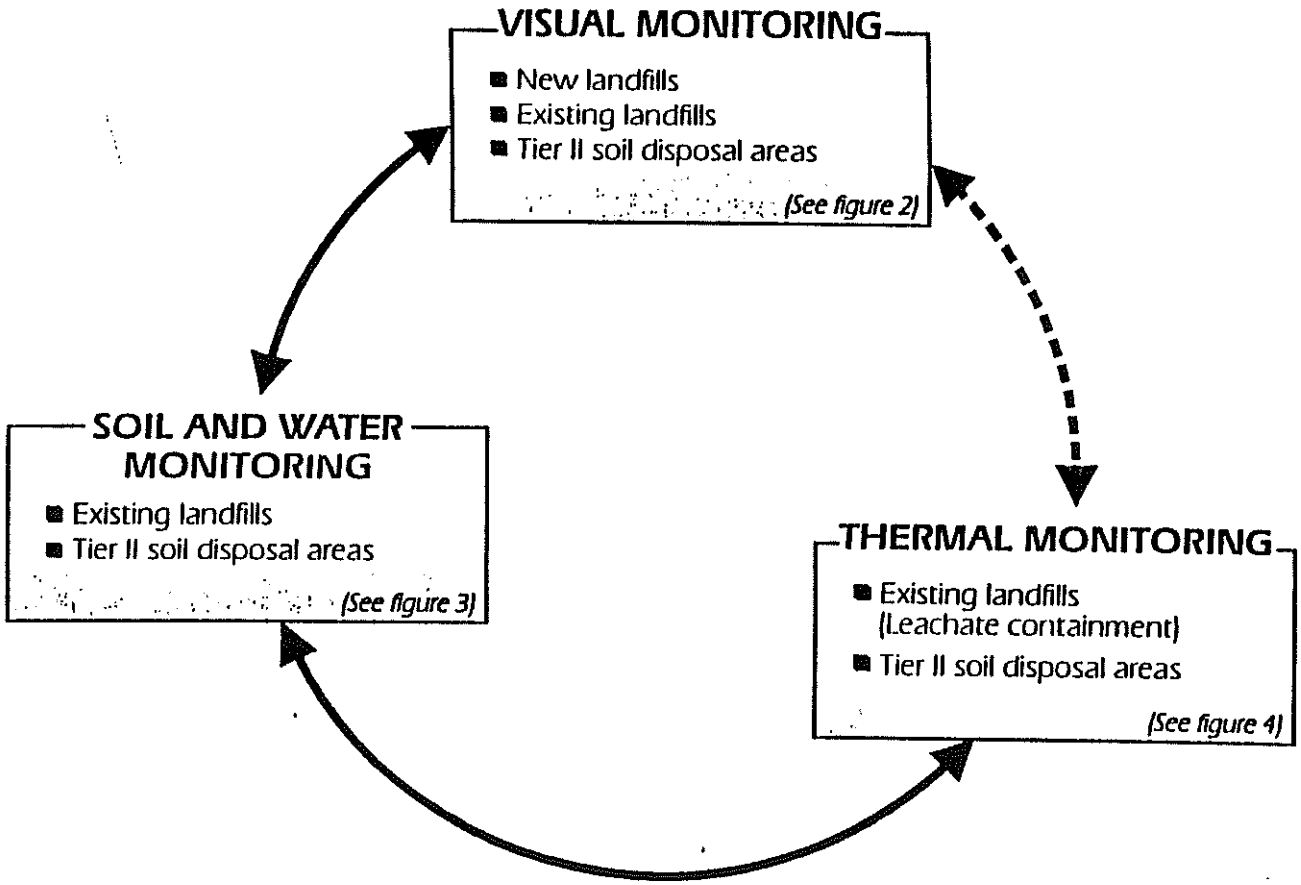
At the end of Phase II, 25 years after implementation of the remedial actions for a given landfill, a major re-evaluation of the monitoring program will be carried out prior to initiating Phase III. It is difficult to predict beyond 25 years how world events and improvements in technology may impact on monitoring requirements. Based on current technology and knowledge, a Phase III program should be implemented at 10 year intervals. The duration of the Phase III program will be estimated at the outset of the program and be subject to re-evaluation as new technologies are developed and new information becomes available.

5.0 Interpreting Monitoring Results

Monitoring results (thermal, chemical and visual) have to be interpreted in concert with one another. An increase in chemical concentrations, for instance, from one year to the next does not necessarily trigger action if there are no other signs of landfill instability. Stability problems would have to be established by a geotechnical engineer with northern experience. Action will be taken based on trends in chemical data rather than isolated results.

Normally, the first step to be taken when a potential problem is identified is to intensify the monitoring program. If a problem has been confirmed, then remedial action will be undertaken.

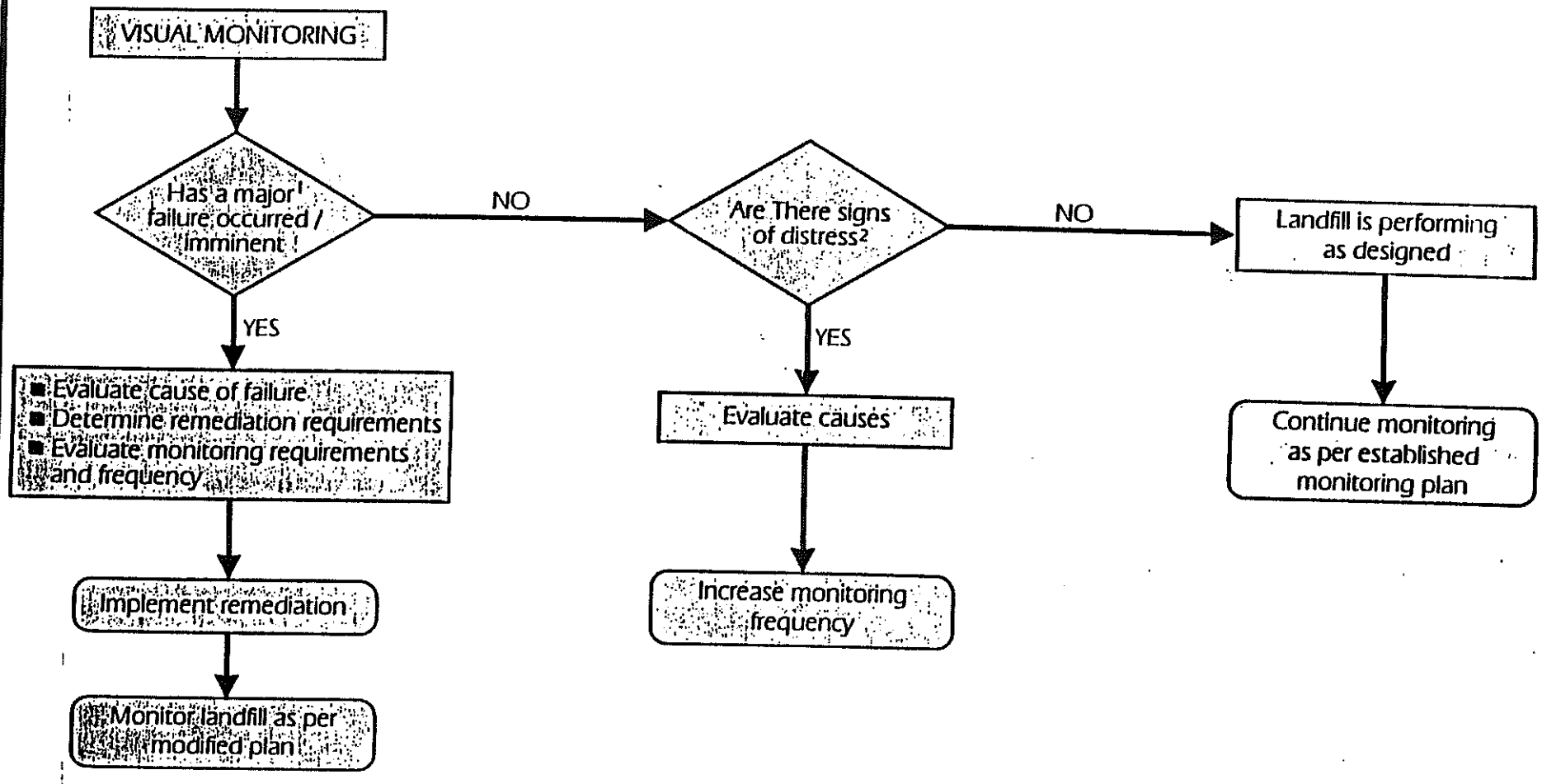
The flowcharts in Figures 1 to 4 illustrates the decision-making process to be applied to monitoring data. The following section outlines actions to be taken if the monitoring program indicates a deficiency in a landfill.



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

SUMMARY FLOW CHART

Figure



Notes:

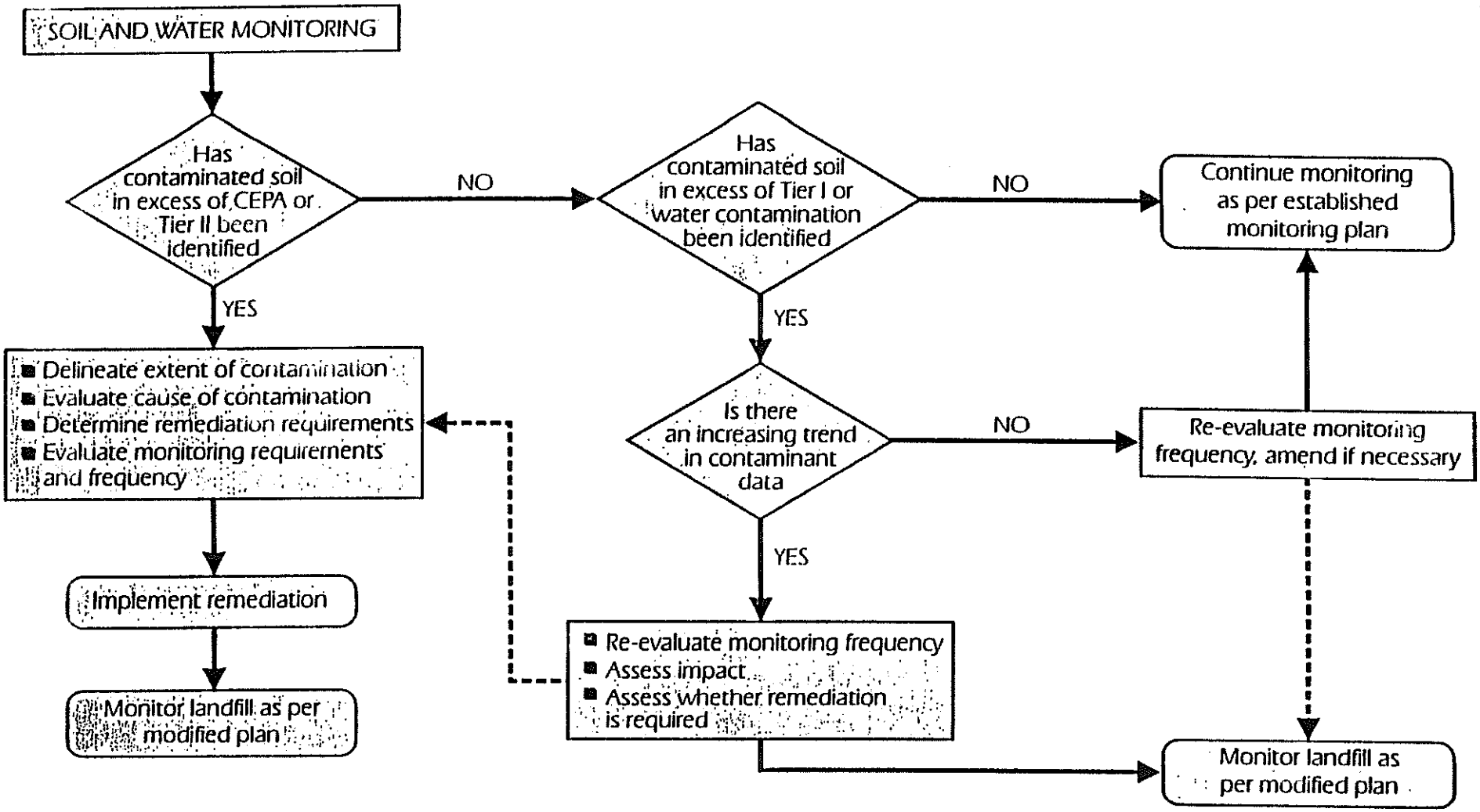
1 Major Failure: significant exposed debris (>25% of surface area) due to erosion, settlement, frost action; berm failure (slope stability)

2 Signs of Distress: Voids due to settlement, ponding on surface, and\or tension cracks, and/or erosion.

DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

VISUAL MONITORING FLOW CHART

Figure

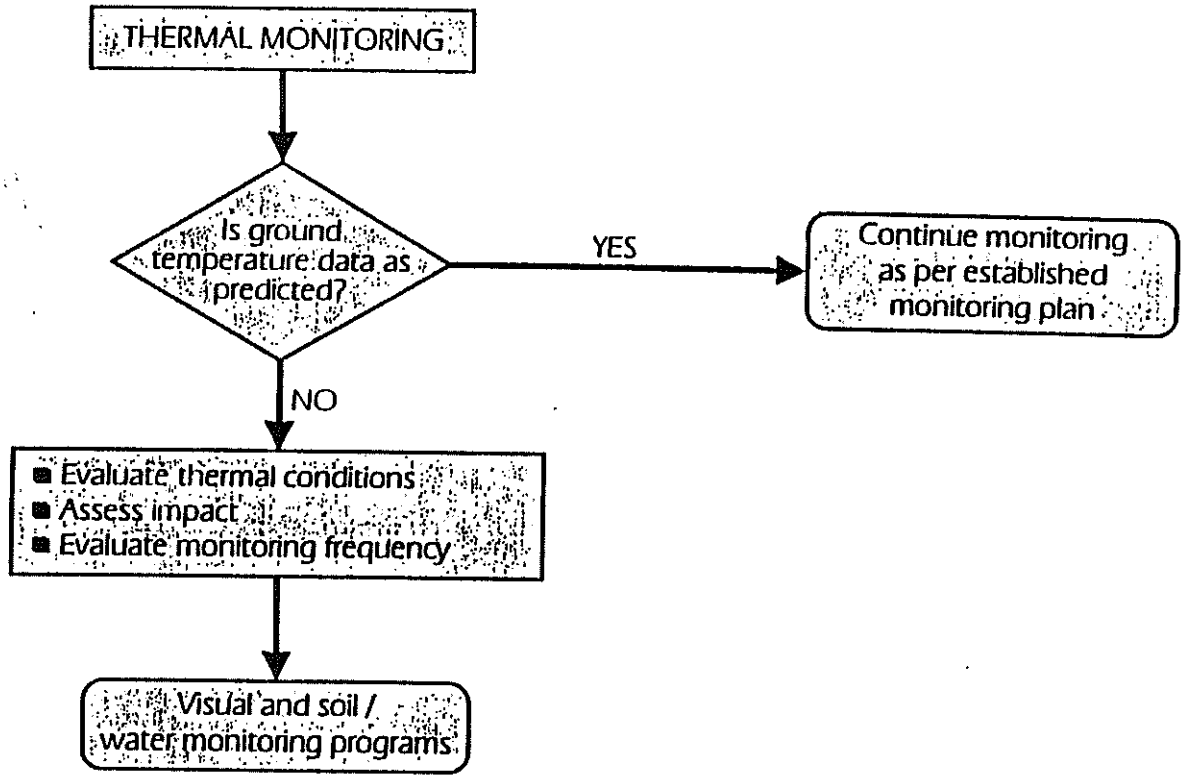


Note:
Water contamination to be evaluated relative to baseline and background concentrations.

DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

SOIL AND WATER MONITORING FLOW CHAR

Figure



DEW Line Clean-Up
Environmental Working Group
LANDFILL MONITORING PROGRAM

THERMAL MONITORING FLOW CHART

Figure

6.0 Impact of Monitoring Results

The possible results and the associated potential mitigation requirements for the landfill monitoring components are described in the following subsections. For all instances, the mitigation requirements are dependent on the severity of the deficiency, and will be assessed by a professional geotechnical engineer with northern engineering design and construction experience. In addition, the assessment and implementation of resulting remediation requirements will be carried out in a staged approach to ensure that the proposed solutions address the specific requirements in a logical and cost effective manner.

6.1 Visual Inspection

If the results of the visual inspection program indicate evidence of significant settlement, ponding, or frost jacking, it may be necessary to implement one or more of the following mitigative measures:

- increase the frequency of the visual monitoring program
- place erosion protection material such as riprap, vegetation mats, etc.
- recompact existing debris material and existing granular material
- place additional granular fill
- regrade, as required, to promote positive drainage away from the deficient landfill area.

It should be noted that settlement of the landfill surface may not necessarily result in failure of the landfill. Settlement (typically differential settlement) that results in ponding and infiltration of surface water could lead to erosion and frost jacking problems.

If the visual monitoring program results indicate evidence of sloughing of landfill perimeter berms and thermal contraction cracks, it may be necessary to implement one or more of the following mitigative measures:

- flatten granular berm slopes
- compact existing granular slopes
- place and compact additional granular fill material

6.2 Soil and Groundwater Monitoring

The results of the soil and groundwater monitoring program will be compared against baseline data established prior to the initial landfill development or remediation program. Results of the analysis of soil and groundwater samples that show decreasing trends of contamination at the perimeter of landfills typically indicate that the implemented landfill remediation has been effective. Conversely, if the results indicate increasing levels of contamination, then it may be necessary to implement one or all of the following:

- Increase the frequency of the monitoring program.
- Carry out a review and evaluation of the nature and extent of the contamination, including the incorporation of the results of the visual monitoring program. The major objective of this evaluation will be to determine the cause of the contaminant migration problem, and in particular to determine if it is the result of ineffective design, material (e.g. liner) failure, improper compaction, selection and use of inadequate granular material, poor grading, etc. This evaluation may require intrusive investigation into and around the landfill.
- Depending on the results of the above, it may be necessary to remove and replace liner material, reconstruct containment berms, etc.
- Assess the requirement to excavate and dispose of the contaminated soil; this would include the delineation of the vertical and areal extent of the contamination.
- Excavate and dispose of contaminated soil and/or excavate all or part(s) of the landfill, as required.

The requirement for the specific scope and extent of remediation, as outlined above, will also incorporate an risk evaluation of the potential impacts of the contamination based on the principles defined in the Landfill Risk Evaluation Matrix. The need for the risk evaluation is predicated on the understanding that not all affected sites pose the same risk to the environment, and consequently remediation requirements will vary.

6.3 Thermal Monitoring

The results of the thermal monitoring program will be compared against the parameters for freezeback that were incorporated into the geothermal design of the landfills. It is important that the overall assessment of these results consider the results of both the visual and soil/groundwater monitoring programs. If the thermal monitoring results indicate ground temperatures that are significantly higher (greater than 2° C) than

predicted during the geothermal analyses carried out as part of the design, then it may be necessary to implement one or more of the following:

- Increase the frequency of the recording and assessment of results from the thermal monitors.
- Establish, based on the results of the soil and groundwater monitoring programs, if groundwater and/or soil contaminant levels beyond the perimeter of the landfill have increased. Incorporate the results of a risk assessment. Assess the impacts, as outlined above, to determine the appropriate remediation requirements.
- If it established that a slower than expected freezeback period has resulted in the migration of contamination beyond the landfill and depending on the results of the above risk assessment, then it may be necessary to implement one or more of the following:

    - determine if the rate of the freezeback progress is continuing, or if freezeback within the landfill has terminated; is at steady-state;
    - excavate and dispose of contaminated soil and/or excavate all or part of the landfill, as required;
    - place additional granular cover material or other insulating material (styrofoam insulation, vegetation) over the landfill to provide an increased insulation barrier over the landfill;
    - reconstruct and/or re-saturate the perimeter berms of the landfill.

Appendix I

Landfill Monitoring Checklist

DEW LINE CLEANUP
LANDFILL MONITORING CHECKLIST

MONITORING PROGRAM

LANDFILL TYPE	Visual	Soil and Water	Thermal
New Landfill (Non-Hazardous Wastes)	X		
Landfill requiring Regrading	X	X	
Landfill requiring Leachate Containment	X	X	X
Tier II Soil Disposal Facilities	X	X	X

SITE: _____

LANDFILL DESIGNATION: _____

LANDFILL TYPE: _____

DATE: _____

MONITORING EVENT NO.: _____

NAME: _____

WEATHER CONDITIONS: _____

VISUAL INSPECTION CHECKLIST

Carry out a visual inspection of the landfill surface, berms, toe of berms and identify potential areas of distress as follows:

1. Settlement:
   - a) Is there differential settlement occurring on the surface?
     - i) low areas or depressions;
     - ii) voids forming
   - b) What is the extent of settlement?
     - i) percent of surface area affected;
     - ii) localized areas or continuous;
     - iii) how deep;
   - c) Where is the settlement occurring?
     - i) near berms, center of facility, etc.
   - d) Explain?
     - i) evidence of significant surface infiltration,
     - ii) water ponding on surface
     - iii) snow drifting

32. Erosion
   - a) Is there erosion occurring on the surface or berms of the landfill?
     - i) preferred drainage channels;
     - ii) sloughing of material;
   - b) What is the extent of erosion?
     - i) percent of surface area affected;
     - ii) localized areas or continuous;
   - c) Where is the erosion occurring?
     - i) along the toe, on the surface, through the berms;
   - d) Explain?
     - i) evidence of significant surface water run-off ;
     - ii) poor material type;

34. Frost Action

a) Is there frost action/damage to the landfill?
   i) exposure of debris due to uplift;
   ii) tension cracking along berms;
   iii) sorting of granular fill;

b) What is the extent of frost action?
   i) percent of surface area affected;
   ii) localized areas or continuous;

c) Where is the cracking, frost heaving occurring?
   i) along the toe, on the surface, through the berms;

d) Explain?
   i) poor material gradation;
   ii) poor compaction;
   iii) high water content, silt content in cover material;

45. Condition of Other Monitoring Instruments:

56. Provide detailed sketch and photographic record of landfill.

PRELIMINARY STABILITY ASSESSMENT

SOIL AND GROUNDWATER MONITORING FIELD CHECKLIST

1. Soil Samples:

Sample No:	
Field Measurements: VOC	
Soil Description:	
Analyses Requested	

2. Water Samples

Sample No: Well No.:	
Field Measurements :	pH Conductivity Temperature
Well Processing	Water level
	Purged well or standing water sampled
	Recovery Rates
Analyses Requested	

Comments:

Additional surface water samples: where, why, describe areas of stressed vegetation

THERMAL MONITORING CHECKLIST

Thermistor Number:
Location:

1. Download data
2. Replace battery pack
3. Check condition of connections and instrumentation
4. Save data to hard-drive and disk,.
5. Relock cap

Appendix J

Hydrocarbon Contamination Checklist

General

Date:

Name of Assessor:

Site Name:

Hydrocarbon Spill/Stain Location:

Hydrocarbon Source

What type of hydrocarbon is present in this stain? Consider the following:

Toxicity (Lubrication Oil, Diesel, Gasoline/Avgas)
Fluidity
Solubility
Volatility

What is the concentration of total petroleum hydrocarbons in parts per million (ppm)? Is it above 2500 ppm?

What is the approximate volume of contaminated soil in cubic metres?

Pathways

1. Is the contaminated soil in a stable location or on a slope?

2. What is the estimated organic matter in the contaminated soil? (ie. <0.1%, <5%, >5%)

3. What is the estimated grain size of the contaminated soil? Consider the following:

   Coarse (D_{50} > 75 micron)
   Fine (D_{50} < 75 micron)

4. What is the distance from the contaminated soil to a marine or freshwater environment?

5. What is the annual precipitation of the site?

6. What is the mean summer temperature?

Potential Impacts on Receptors

1. What is the distance to the nearest down gradient marine or freshwater habitat?

2. Is this a potential or known drinking water source for terrestrial animals or humans?

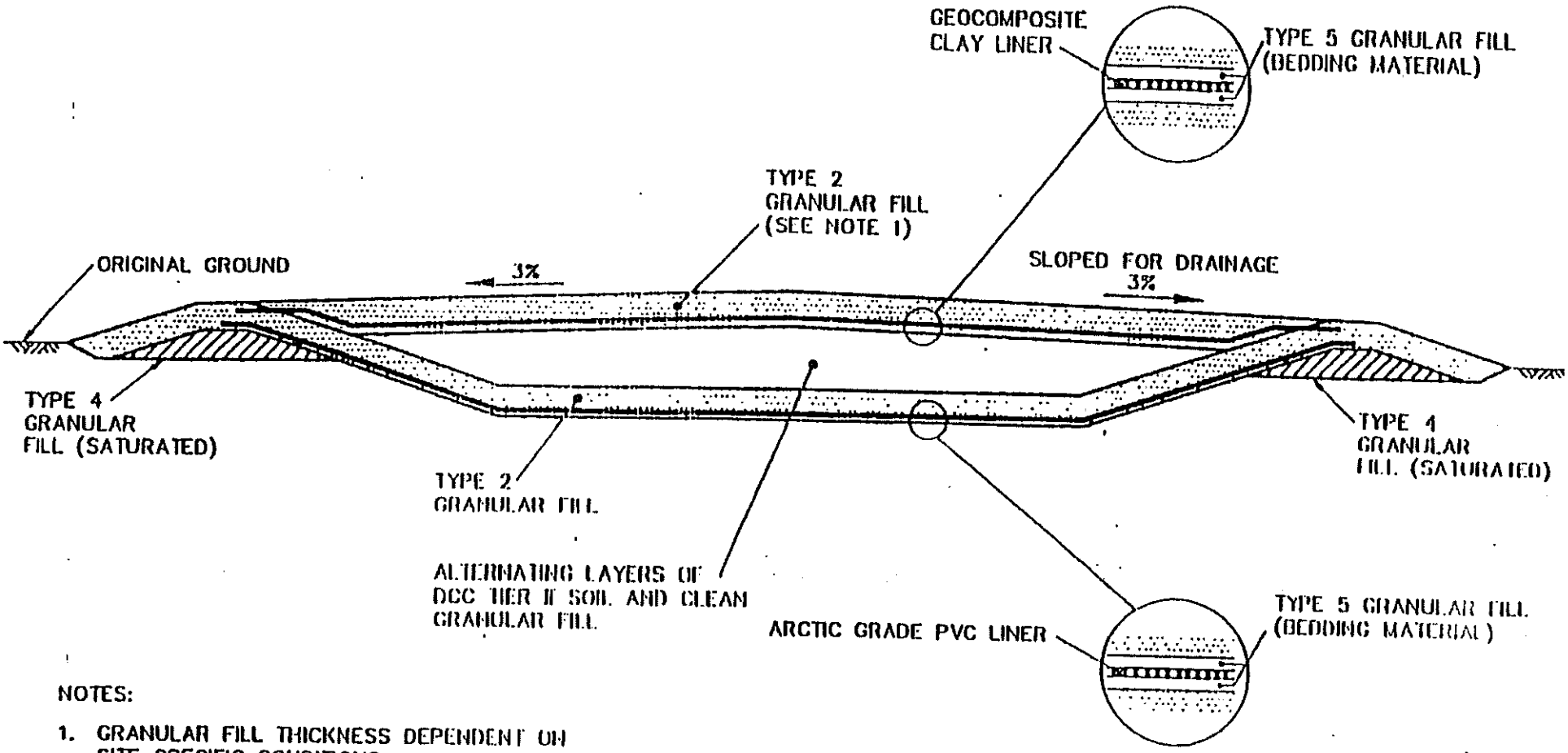
3. What is the down gradient habitat usage? Consider the following:

   Grazing, nesting, denning, spawning, calving
   High, medium, or low number of sitings.
   High, medium or low biodiversity.

4. Is this area visited frequently by humans for hunting, fishing, gathering or camping purposes? What is consumed and from where is it obtained?

Appendix K

Tier II Disposal Facility



NOTES:

1. GRANULAR FILL THICKNESS DEPENDENT ON SITE SPECIFIC CONDITIONS.
2. GRANULAR FILL GRADATIONS ARE SITE SPECIFIC.

UMA

SHE

TIER II DISPOSAL FACILITY

TYPICAL CROSS SECTION

AGREEMENT BETWEEN

Nunavut Tunngavik Incorporated

And

Her Majesty In The Right Of Canada,

Represented By

The Minister Of National Defence

With Respect To Economic Benefits For Inuit

In The Clean-Up And Restoration Of

Distant Early Warning Sites

Within The Nunavut Settlement Area

(NTI-DND Economic Agreement)

CONTENTS

PREAMBLE

WHEREAS fifteen Distant Early Warning (DEW) Line Sites are located on Department of National Defence (DND) reserves within the Nunavut Settlement Area (NSA);

AND WHEREAS DND is undertaking an environmental clean-up of the DEW Line sites, facilities and associated areas;

AND WHEREAS the Inuit and the Federal Government have an interest in protecting the ecosystem integrity and the existing and future well-being of the residents and communities of the NSA and increasing the participation of Inuit and Inuit firms in business and employment opportunities in the NSA;

AND WHEREAS on September 1, 1998 DND and NTI have entered into an agreement to establish a framework for the remediation and restoration of the DEW Line Sites in the NSA;

AND WHEREAS the Parties wish to enter into an agreement addressing the participation of Inuit in the clean-up of DEW Line sites in the Nunavut Settlement Area, in order to achieve a cost-effective and environmentally sound clean up and restoration of DEW Line Sites, which optimises economic benefits and opportunities for Inuit in employment, the provision of goods and services, training and the transfer of technology, in accordance with the *Nunavut Land Claims Agreement* (NLCA), and specifically Article 24 of the NLCA;

NOW THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1.0 DEFINITIONS

Clean-up Contract means a contract entered into by DND's contracting agent and a Contractor for a Site clean-up;

Contractor means the party who has contracted with DND's contracting agent to carry out a Site clean-up;

Contracting Working Group means the working group established under Section 4.2 of the Agreement;

DEW Line Site means one of the Distant Early Warning Sites listed in Section 3.1 below;

DIAND DEW Line Sites means the Distant Early Warning Sites in Nunavut not listed in Sections 3.1 and 3.2;

DND means the Crown in right of Canada represented by the Minister of National Defence or his delegate;

Inuit firm has the same meaning as in the *Nunavut Land Claims Agreement*;

Inuit Firm Registry is the comprehensive list of Inuit firms maintained in accordance with Paragraph 24.7.1 of the *Nunavut Land Claims Agreement;*

MIEC means the Minimum Inuit Employment Content set in accordance with Section 5.0 of this Agreement;

MICC means the Minimum Inuit Content for Contracting set in accordance with Section 6.0 of this Agreement;

NLCA means *Nunavut Land Claims Agreement;*

NTI has the same meaning as "Tungavik" under Section 1.1.1 of the NLCA;

NTI-DND Environmental Agreement means "The Agreement Between Nunavut Tunngavik Incorporated and the Department of National Defence for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area" dated September 1, 1998;

Nunavut Settlement Area has the same meaning as in the *NLCA*;

Parties means Nunavut Tunngavik Incorporated and the Department of National Defence;

Regional Inuit Association means the Kivalliq Inuit Association, the Qikiqtani Inuit Association or the Kitikmeot Inuit Association or their successors;

Representative Occupational Grouping means a category of personnel required for a Site clean-up classified by occupation or type of work to be performed;

Registry has the same meaning as "Inuit Firm Registry";

RIA means "Regional Inuit Association";

Site means a "DEW Line Site" that is, or is projected to be, remediated and restored, as provided for in the NTI-DND Environmental Agreement;

Steering Committee means the Committee established under Section 4.1 of the Agreement;

Subcontractor means a party who contracts with a Contractor or Subcontractor to perform any part of the Contractor's obligations on a Site;

Work means materials and services furnished or provided to perform a clean-up or restoration of a Site.

2.0 OBJECTIVES

2.1 The objectives of this Agreement are as follows:

a) to complement the NTI/DND environmental provisions as set out in the NTI-DND Agreement for the Clean-up and Restoration of DEW Sites Within the Nunavut Settlement Area, 1 Sept. 1998;

b) to further the objectives of Article 24 of the NLCA in relation to the DEW Line Clean-up in the NSA;

c) to achieve an efficient and cost-effective clean-up and restoration of the DEW Line Sites in the NSA;

d) to achieve:

i) increased participation by Inuit firms in business opportunities generated by the clean-up;
ii) improved capacity of Inuit firms to compete for government contracts;
iii) increased employment of Inuit up to a representative level;
iv) increased access by Inuit to career training, on-the-job training, apprenticeship, and other job-related programs, in order to develop a skilled and professional pool of labour available for work on the DEW Line Clean Up in the NSA; and
v) increased opportunities for Inuit to receive training and experience to successfully create, operate and manage businesses in Nunavut;

e) to establish a mechanism whereby successful Contractors fulfill agreed-upon commitments to levels of Inuit participation.

3.0 GENERAL

3.1 **Scope.** This Agreement applies to the Site clean-up at the following DEW Line Sites:

PIN 2 - Cape Young
PIN 3 - Lady Franklin Point
PIN 4 - Byron Bay
CAM 1 - Jenny Lind Island
CAM 2 - Gladman Point
CAM 3 - Shepherd Bay
CAM 4 - Pelly Bay (near Kugaaruk)
CAM 5 - Mackar Inlet
FOX M - Hall Beach
FOX 2 - Longstaff Bluff
FOX 3 - Dewar Lakes
FOX 5 - Broughton Island (near Qikiqtarjuaq)
DYE M - Cape Dyer

3.2 The Parties acknowledge that prior to the signing of this Agreement, the clean-up of Cape Hooper (FOX 4) and Cambridge Bay (CAM M) had been completed. Note that the process for awarding the contracts for the clean-up of Pelly Bay (CAM 4) and Broughton Island (FOX 5) will have started prior to the timelines contemplated in this Agreement.

3.3 **No Precedent.** This Agreement is not to be construed as a precedent for any other activities of DND, Canada or any third party. Nothing in this Agreement shall be interpreted or used to define the rights of the Parties, Canada or any third party in relation to any matter under the NLCA or to interpret any Article of the NLCA except for the purpose of this Agreement.

3.4 **Urgency.** The Parties recognize the urgency of the matters dealt with in this Agreement and agree to perform all required actions as expeditiously as possible.

3.5 **Nunavut Land Claims Agreement.** The Parties recognize and acknowledge their respective obligations to comply with the NLCA in connection with all Work.

3.6 **No Retrospectivity.** This Agreement binds the Parties only with respect to Site clean-ups, including selection of Contractors for Site clean-ups, that have not commenced as of the date of the signing of this Agreement, unless the Parties agree otherwise.

4.0 STEERING COMMITTEE AND CONTRACTING WORKING GROUP

4.1 Steering Committee

4.1.1 The Steering Committee established under Article 4.0 of the NTI-DND Environmental Agreement shall perform the following functions in connection with this Agreement:

a) establish Minimum Inuit Employment Content, under Section 5.10;

b) establish Minimum Inuit Content for Contracting, under Section 6.10;

c) review contract award issues, under Sections 8.3.1, 8.3.3, and 8.3.5 through 8.3.11; and

d) review Contractor's deviation from MIEC and MICC pursuant to Section 12.2;

e) consider other items of mutual concern related to the implementation of this Agreement, raised by either Party.

4.1.2 The Steering Committee may meet either in person or by teleconference.

4.1.3 The Steering Committee shall operate on the basis of consensus.

4.1.4 The Parties each shall be responsible for their respective costs associated with participating in Steering Committee meetings.

4.1.5 The Steering Committee shall establish and make publicly available procedures governing its operations and those of the Contracting Working Group, including, without limitation, conflict of interest, release of information provided to either Party, and procedures for decision-making that ensure fairness and due process to Contractors.

4.2 Contracting Working Group

4.2.1 A Contracting Working Group shall be established, composed of two members appointed by NTI and two members appointed by DND. The working group shall perform the following functions in connection this Agreement:

a) make a recommendation to the Steering Committee on the Minimum Inuit Employment Content (MIEC), under Section 5.8; and

b) make a recommendation to the Steering Committee on the Minimum Inuit Content for Contracting (MICC), under Section 6.8.

4.2.2 The Contracting Working Group shall operate on the basis of consensus.

4.2.3 The Parties each shall be responsible for their respective costs associated with participating in Contracting Working Group meetings.

5.0 MINIMUM INUIT EMPLOYMENT CONTENT

5.1 A Minimum Inuit Employment Content (MIEC) shall be set for each Site.

5.2 The MIEC for a Site is the minimum level of Inuit employment that DND shall require the Contractor to achieve for the clean-up of that Site.

5.3 The MIEC shall be expressed as a percentage, and shall be calculated by dividing the total number of Inuit employed, in person-days, by the total number of persons employed, in person days, for the term of the contract of a Site clean-up. The calculation shall include all on-site and off-site personnel employed by Contractors and Subcontractors. Off-site personnel shall include without limitation:

a) management and support personnel dedicated to the Site clean-up;

b) project management personnel employed by the Contractor;

c) technical or drafting personnel; and

d) expediting, shipping, payroll or accounting personnel.

5.4 The calculation of the MIEC shall not include:

a) project management staff at DND's contracting agent;

b) DND employees; and

c) any consultants contracted by DND or DND's contracting agent for the provision of advice concerning the specifications of the clean-up, contract management or other advice.

5.5 The MIEC shall be within a range of 65-85%.

5.6 Eight months prior to the scheduled commencement of a Site clean-up, DND shall provide NTI with DND's estimates of the types and level of positions that will be required for the conduct of the Site clean-up, in person-days, and broken out by Representative Occupational Grouping. The estimate shall be

provided in the form attached as Annex A.1. Education and skills profiles for Representative Occupational Groupings are listed in Annex B.

5.7 Within two months of the receipt of the information described in Section 5.6, NTI, in consultation with the RIAs, shall provide DND with a projection of the level of Inuit employment for the Site clean-up. The projection will be provided in the form attached as Annex A.2 to this Agreement. NTI's projection will be based on an analysis, for each Representative Occupational Grouping, of the number of Inuit qualified for work on the Site clean-up in relation to the employment opportunities using, to the extent possible, relevant available information on Inuit qualifications and employment.

5.8 Within one month of receipt by DND of the projection under Section 5.7, the Contracting Working Group shall recommend a MIEC for the Site clean-up. In making the recommendation to the Steering Committee for the MIEC, the Contracting Working Group shall take into account, for each Representative Occupational Grouping, the following factors:

a) NTI's projection of Inuit employment;

b) Inuit employment achieved on other DND DEW Line Site clean-ups to date, compared to the MIEC established for the Sites, and on DIAND DEW Line Sites;

c) the results achieved by training and apprenticeship programs for Inuit labour, to date; and

d) the projected impact on the availability of Inuit labour of other projects being undertaken in Nunavut.

5.9 Where the Contracting Working Group, after a reasonable effort, is unable to reach agreement on the MIEC for a Site clean-up, either Party may refer the MIEC to the Steering Committee for resolution.

5.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 5.8 or a referral under Section 5.9 to decide on a MIEC. In the event that the Steering Committee does not reach agreement on a MIEC within two weeks, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.

5.11 The MIEC resulting from a decision of the Steering Committee or arbitrator shall be the MIEC required under Section 5.1.

5.12 The forms used to provide the information required under Section 5.6 and 5.7 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

6.0 MINIMUM INUIT CONTENT FOR CONTRACTING (MICC)

6.1 A Minimum Inuit Content for Contracting (MICC) shall be set for each Site.

6.2 The MICC for a Site is the minimum level of Inuit business participation that DND shall require the Contractor to achieve for the clean-up of that Site.

6.3 The Minimum Inuit Content for Contracting (MICC) for a Site clean-up shall be expressed as a percentage, and shall be calculated by dividing the total dollar value of Inuit contracting content by the total dollar value of the Clean-up Contract. The total dollar value of Inuit contracting content shall be calculated by adding the dollar value of all subcontracts for goods or services to be obtained through, or awarded to Inuit firms, including all labour costs. Where the Contractor is an Inuit firm, the total dollar value of Inuit contracting shall also include the Contractor's share of the Clean-up Contract, which is the total dollar value of the contract minus the dollar value of all subcontracts.

6.4 The MICC shall be within a range of 60-75%.

6.5 Eight months prior to the start of a Site clean-up, DND shall provide NTI with an analysis of categories of contracting opportunities and an estimate of each category's percentage of total value of the Clean-up Contract for the Site clean-up. The analysis shall be in the form provided in Annex A.3.

6.6 Within two months of the receipt of the analysis required under Section 6.5, NTI, in consultation with the RIAs, shall provide to DND a list of Inuit firms that have declared themselves able to perform work on a Site clean-up, listed according to the categories of contracting opportunities identified under Section 6.5.

6.7 NTI shall request Inuit firms to provide corporate resumes to their RIAs that shall include information on relevant capacity and work experience. NTI shall deal with all information provided to it under this section as strictly confidential. DND shall treat all information provided to it by NTI under this section as commercial confidential information. DND shall not release such information unless prior approval is received from the Inuit firm, or DND is required to release such information under the provisions of the *Access to Information Act* and/or the *Privacy Act*.

6.8 The Contracting Working Group shall recommend the MICC for a Site to the Steering Committee within one month of receipt of the list of Inuit firms required under Section 6.6. This recommendation shall take into account the following factors:

a) Inuit firms' capacities;

b) historical data from prior Site clean-ups in Nunavut and the Western Arctic;

c) Site-specific characteristics; and

d) impact of other projects on the availability of Inuit firms.

6.9 In the event that the Contracting Working Group is unable to reach agreement on the MICC, as provided in Section 6.8, either Party may refer the matter to the Steering Committee.

6.10 The Steering Committee shall meet as soon as practicable following a recommendation under Section 6.8 or a referral under Section 6.9 to decide the MICC. In the event that the Steering Committee does not reach agreement on the matter within two weeks of a referral, either Party may refer the matter to Expedited Arbitration, as provided under Section 14.0.

6.11 The MICC resulting from a decision of the Steering Committee or arbitrator shall be the MICC required under Section 6.1 for a Site.

6.12 The form used to provide the information required under Section 6.5 may be modified for a Site clean-up upon the agreement of all members of the Contracting Working Group.

7.0 CONTRACTOR'S INUIT PARTICIPATION PLAN

7.1 DND shall require all companies that either submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract to provide a preliminary Contractor's Inuit Participation Plan (CIPP) that shall include:

a) a description of how the company intends to achieve the MIEC, including, where possible and without limitation:

i) the number, percentage and types of positions, including training positions, that the company proposes to fill with Inuit, in relation to the total number of positions, and the number and percentage of person-days proposed for these positions in relation to total person-days;

ii) the steps the company will take to recruit potential Inuit employees; and

iii) any measures the company has taken or proposes to take to increase Inuit employment, including such things as the details of any Inuit recruitment programs, training or apprenticeship programs, and equivalencies for formal qualifications;

b) where the MIEC is lower than the NTI projection provided to DND under Section 5.7, a description of how the Contractor could achieve the NTI projection for Inuit employment;

c) any other measures for optimizing Inuit employment and training; and

d) a description of how the company intends to achieve the MICC, including, where possible and without limitation the names, address and particulars of any actual or proposed Subcontractors; and the specifics of any actual or proposed contracting arrangements.

7.2 DND shall require all companies that submit a bid on a Clean-up Contract to submit their preliminary Contractor's Inuit Participation Plans in a separate envelope from their tender bid, to DND's contracting agent prior to the closing of bids.

7.3 For all bids for contracts for a Site clean-up, DND or its contracting agent shall:

a) advise bidders that the envelope containing the CIPP shall be opened first; and

b) advise bidders that bids shall be opened only if the CIPP complies fully with the requirements contained in Section 7.1.

7.4 Within three (3) months of DND having provided NTI with the estimates required under Section 5.6 above, NTI, through the Regional Inuit Associations, shall ensure that information regarding Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications, is provided to DND's contracting agent.

7.5 DND's contracting agent shall make the information provided to it under Section 7.4 available to bidders for use by them in the preparation of bids and in finding suitable Inuit labour.

7.6 Upon the written request of the Contractor, DND's contracting agent may approve revisions to the CIPP during the course of a Site clean-up, provided that the Contractor demonstrates to DND's contracting agent that the MIEC and MICC for the Site clean-up will still be achieved.

7.7 In the event that DND's contracting agent approves a revised CIPP under Section 7.6, it shall provide the Steering Committee with the revised CIPP within five (5) working days of its approval. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.0 SELECTION PROCESS FOR CONTRACTOR

8.1 Tender and Contract Documents

8.1.1 In all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract , DND's contracting agent shall identify the following as criteria that a Contractor must comply with in a bid:

a) Minimum Inuit Employment Content (MIEC) established in accordance with Section 5.11;

b) Minimum Inuit Content for Contracting (MICC) established in accordance with Section 6.11; and

c) Submission of a Contractor's Inuit Participation Plan (CIPP) that fully complies with Section 7.1.

8.1.2 DND's contracting agent shall provide a copy of this Agreement in all tender documents issued to companies that submit a bid on a Clean-up Contract or enter into negotiations for a Clean-up Contract, and shall advise such companies in the tender documents that compliance with the provisions of the Agreement by the Contractor and its Subcontractors is mandatory.

8.1.3 DND's contracting agent shall include as a term in all Clean-up Contracts that the Contractor will comply with this Agreement and a term that the Contractor will ensure that any Subcontractors will be bound by and comply with the Agreement, where applicable.

8.2 Solicitation of Interest

8.2.1 DND's contracting agent shall prepare a Solicitation of Interest (SOI) for a Site clean-up. The SOI shall be in English and Inuktitut and shall request Letters of Interest (LOI) to identify firms that are both interested in and capable of performing as the prime Contractor for clean-up of the Site. The SOI shall be distributed Canada-wide through MERX and by mail or by fax to firms on the Registry.

8.2.2 The Solicitation of Interest under subsection 8.2.1 shall have the following characteristics:

a) The type of opportunity will be a *Letter of Interest (LOI);*

b) The region of delivery will be *Nunavut*;

c) The region of opportunity will be *Canada Wide;*

d) The agreement type is *Comprehensive Land Claim Agreement (CLCA).*

8.2.3 DND's contracting agent shall include the following in the SOI:

a) A description of the background, objectives and nature of the clean-up of DND DEW Line Sites;

b) A description of the services to be provided by a Contractor for clean-up of the Site and of the specific capabilities required for a Contractor;

c) A statement that the Site is located in a region where a Comprehensive Land Claim Agreement has been signed;

d) Instructions for the preparation of a response to the Solicitation of Interest;

e) A description of the employment and contracting environment in Nunavut, within the context of the NCLA and the requirements of the NTI-DND Economic Agreement (as per Annex D of this Agreement);

f) A definition of Minimum Inuit Employment Content (MIEC) and the Minimum Inuit Content for Contracting (MICC) and identification of the range for the MIEC and MICC that must be achieved by the Contractor in the Site clean-up;

g) All available values for the MICC and MIEC for previous Clean-up Contracts in Nunavut.

8.2.4 DND's contracting agent shall require that firms responding to the Solicitation of Interest adhere to the following process:

a) Firms shall provide a complete and fully documented LOI in the format prescribed in the SOI.

b) Firms shall provide in a LOI any information or documentation necessary to demonstrate capability to:

i) Provide the services of a Contractor for clean-up of the Site;
ii) Manage and finance a contract as Contractor for clean-up of the Site;
iii) Obtain liability insurance;

c) Each firm's LOI shall contain a statement that the firm understands the requirements to meet the levels for MIEC and MICC for the clean-up of the Site provided for under Sections 5.5 and 6.4 of the Agreement, and is capable of meeting those requirements

8.2.5 DND's contracting agent shall assess the Letters of Interest to determine those firms that have demonstrated their capability to be a Contractor for clean-up of a given Site and based on that assessment shall establish a list of qualified Contractors for that Site.

8.3 Selection Process for a Site Clean-up

8.3.1 Where DND's contracting agent determines under Section 8.2.5 that only one firm is capable of performing the contract for the Site clean-up, the following procedure shall be followed:

(a) DND's contracting agent shall issue an Advance Contract Award Notice (ACAN) indicating its intent to negotiate the contract with the firm;

b) if no valid challenge to the ACAN is received within the time frame provided for in the Treasury Board of Canada Contracting Policy, DND's contracting agent shall negotiate with the firm for the purpose of arriving at a price for the Site clean-up and shall require the firm to submit a CIPP in accordance with the requirements of Section 7.1 above;

c) if negotiations have been successfully completed under Subsection b), above, DND shall make a determination as to whether the price is acceptable, and whether the criteria set forth in Subsections 8.1.1 (a) to (c) have been met;

d) in the event that DND determines under Subsection c) above that the price is acceptable and that the criteria set forth in Subsections 8.1.1 (a) to (c) have been met, DND's contracting agent shall issue a letter of intent to award the contract to the firm;

e) in the event that DND determines under Subsection c) above that the firm has not fully met the criteria set forth in Subsections 8.1.1 (a) to (c), DND shall refer the matter to the Steering Committee and Sections 8.3.7 through 8.3.10 shall apply; and

f) in the event that negotiations under Subsection b) above are not successfully completed, or the price is not acceptable to DND, DND's contracting agent may decline to award the contract to the firm.

8.3.2 Where DND's contracting agent determines under Section 8.2.5 that more than one firm is capable of performing the Clean-up Contract, it may invite bids from the list of firms determined in 8.2.5 in accordance with Section 8.3.3. Where there is a valid challenge to the Advance Contract Award Notice issued in accordance with Section 8.3.1, DND's contracting agent may

invite bids from the sole firm considered capable in Section 8.2.5 plus the firms which have put forward a valid challenge to the ACAN, in accordance with Section 8.3.3.

8.3.3 The process for the tender shall follow the Treasury Board of Canada Contracting Policy, along with the following specific procedures, whereby DND's contracting agent shall:

a) open the envelopes containing the Bidder's CIPP before opening any other part of any bid;

b) with respect to each bidder's CIPP, make a determination as to whether the CIPP meets the criteria set forth in Subsections 8.1.1 (a) to (c) , and open only those bids that in DND's contracting agent's determination meet those criteria;

c) if DND's contracting agent determines that none of the bids meets the criteria set forth in Subsections 8.1.1 (a) to (c), refer the matter to the Steering Committee, which shall determine if the work should be retendered with a revised MIEC and/or MICC;

d) identify the lowest priced of the bids opened under Subsection b) and determine whether the price is acceptable to DND; and

e) if the bid meets the criteria set forth in Subsections 8.1.1 (a) to (c) and the price is acceptable, issue a letter of intent to award the contract, otherwise the contract shall not be awarded.

8.3.4 DND's contracting agent shall require that, within twenty-eight (28) calendar days of a company receiving a letter of intent pursuant to Sections 8.3.1 or 8.3.3, the company shall provide to DND's contracting agent a final CIPP confirming that it is capable of achieving the MICC and MIEC for the Site, and that this final CIPP shall meet the criteria set forth in Subsections 8.1.1 (a) to (c), and shall include, without limitation:

a) documentation evidencing the signing of agreements with Inuit Subcontractors, or the intention to enter into subcontracts with Inuit Subcontractors, if applicable; and

b) a schedule showing a monthly projection of Inuit labour and Subcontractors to be utilized throughout the life of the contract.

8.3.5 DND's contracting agent shall review the final CIPP, including the documentation and schedule provided by the company under Section 8.3.4. In the event that DND's contracting agent determines that the documentation and schedule is adequate to confirm that the bidder can meet the criteria set forth in Subsections 8.1.1 (a) to (c), the contracting agent, acting in good

faith, shall approve the CIPP and may award the Contract to the company. In all other events DND's contracting agent shall either:

a) withdraw the letter of intent; or

b) request a review by the Steering Committee.

8.3.6 DND's contracting agent shall provide the Steering Committee with a copy of the approved CIPP within fifteen (15) days of contract award. DND's contracting agent shall not release commercial confidential information to the Steering Committee without written permission from the Contractor.

8.3.7 In the event that DND's contracting agent requests a review of a contract award under Section 8.3.1, 8.3.3 or 8.3.5, the Steering Committee shall meet to determine whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), and, whether fault for any failure to do so cannot reasonably be placed on that company. The determination of best efforts shall take into account, without limitation:

a) the specific activities of the firm to achieve the elements contained in its preliminary CIPP; and

b) adherence by the firm with the requirements of Section 9.0.

8.3.8 In the event that the Steering Committee fails, within 3 weeks of a matter being referred to it under Section 8.3.1, 8.3.3 or 8.3.5, to agree on whether the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c), the Steering Committee shall refer the matter for decision under the Expedited Arbitration provisions in Section 14.0.

8.3.9 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company failed to make best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault for the failure can reasonably be placed on the company, DND's contracting agent shall withdraw the letter of intent to award the contract.

8.3.10 In the event that the Steering Committee, or arbitrator appointed under Section 14.0, determines that the company has made best efforts to meet the criteria set forth in Subsections 8.1.1 (a) to (c) and that fault cannot reasonably be placed on the company for its failure, the MICC shall be adjusted at the discretion of the Steering Committee or arbitrator in order to allow for the awarding of the contract.

8.3.11 The specific contracting process to be utilized in issuing contracts for monitoring of Sites will be determined by the Steering Committee prior to the preparation of any future contract documents for monitoring of Sites.

9.0 SELECTION PROCESS FOR INUIT SUBCONTRACTORS

9.1 Inuit Firm Registry

9.1.1 NTI shall provide to DND the most current Inuit Firm Registry ("the Registry"). The Registry shall contain a brief description of the equipment, goods or services provided by each Inuit firm, the firm's experience, address and contact name.

9.1.2 The Registry shall be included in all contract solicitation documents.

9.2 Bid Invitations for Subcontracts

9.2.1 DND's contracting agent shall require Contractors who have a letter of intent or who have been awarded the contract, or any Subcontractors, in subcontracting work on a Site clean-up, to invite Inuit firms listed in the Registry that may be capable of performing the proposed subcontracting work, to bid on the proposed subcontracting work.

9.2.2 DND and its contracting agent and Contractors shall be held blameless if Inuit firms that do not appear in the Registry are not solicited under Section 9.2.1.

9.2.3 Nothing in Section 9.2.1 shall prevent a Contractor or Subcontractor from seeking bids from firms not listed in the Registry.

9.2.4 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting work on a Site clean-up, to:

a) include in bid invitations only employment and skills requirements that are essential to the Site clean-up;

b) provide Inuit firms with a minimum of 15 days to respond to a bid invitation, but that in no event shall an Inuit firm have less time to respond than firms not listed in the Registry; and

c) enter into a contract with an Inuit firm if that Inuit firm's bid meets the Contractor's or Subcontractor's requirements, including such criteria as technical compliance and price, if the Contractor or Subcontractor enters into a subcontract for the Work.

9.2.5 All contract documents issued by DND's contracting agent shall require Contractors and Subcontractors, in subcontracting Work on a Site clean-up, to take the following steps in the event that they reject a bid from an Inuit firm

on grounds that it contains minor variances which cause it to be considered not technically compliant or not competitive:

a) provide the Inuit firm that submitted the bid with a written statement of the variances and the grounds for rejection;

b) provide the Inuit firm that submitted the bid the opportunity to revise its bid to address the stated variances and submit another bid within 7 calendar days of the date on which it was notified that the bid was rejected; and

c) enter into a subcontract with the Inuit firm if the new bid meets the Contractor's or Subcontractor's requirements and is less than or equal to the lowest priced bid from non Inuit firms which meet the Contractor's or Subcontractor's requirements; otherwise the contract may be awarded to a firm not listed in the Registry.

9.2.6 DND's contracting agent shall, where a bid has been rejected under Section 9.2.5, require the Contractor or Subcontractor, upon receiving a request in writing, to provide the Inuit firm within thirty (30) calendar days with written reasons why the bid was rejected. Subject to the approval of the Inuit firm, a copy of the reasons shall also be provided to NTI.

10.0 TRAINING

10.1 DND shall provide NTI with $50,000 per Site to assist in meeting the overall objective of achieving a representative level of Inuit employment on DEW Line Site clean-ups through the training of Inuit for clean-up related jobs, for a total of $750,000 for all Sites in Nunavut.

10.2 DND and NTI agree to work jointly to identify additional funding sources for training activities envisioned in Section 10.1.

10.3 Of the $750,000 DND has agreed to provide under Section 10.1, NTI acknowledges that DND has already provided $100,000 in connection with the clean-up of the FOX 4 and CAM M Sites. Of the $650,000 remaining, DND shall make an initial payment of $75,000 to NTI as soon as practical after the signing of this Agreement to fund the development of a comprehensive training plan, schedule and budget.

10.4 The cost of any training positions identified in the plan developed by NTI for on-the-job training at a Site shall be funded from sources other than DND's budget for the Site Clean-up Contract. Cost for such training shall also include administrative costs that may be borne as result of the presence of trainees.

10.5 The training plan, which shall be completed within one year after receipt of funding for the plan, shall set out a schedule for further payments to NTI from DND up to the full amount of $650,000.

10.6 Subject to DND's agreement to the schedule which may be based on reasonable budget considerations, DND shall make payments to NTI in accordance with the schedule completed under Section 10.5. NTI shall provide DND with an updated training plan and budget, outlining the proposed use of funds, prior to each payment.

10.7 The training plan referred to in Section 10.3 shall incorporate both common and site specific elements. The training plan shall include, without limitation, the following elements:

a) an analysis of skills and knowledge requirements for all positions;

b) learning objectives derived from the skills analysis identified in Subsection (a);

c) identification of training resources, including existing and required training programs;

d) development of a detailed plan and schedule for design, delivery and evaluation of orientation and training courses necessary to achieve representative levels of Inuit employment; and

e) development of milestones and performance indicators that will be considered in setting MIEC and MICC under Sections 5.8 and 6.8.

11.0 REPORTING

11.1 DND shall provide to NTI, by December 1 of each year that this Agreement is in effect, a report covering annual and cumulative results by type and level of employment, for each Site clean-up, including:

a) the total number of person days worked by all employees by Representative Occupational Grouping;

b) the total number of person days worked by Inuit, by Representative Occupational Grouping;

c) the percentage of total person days worked by Inuit, by Representative Occupational Grouping; and

d) a list of all contracts for goods, services and labour awarded to Inuit firms and to non-Inuit firms during the year and the dollar value of each of those contracts.

11.2 NTI shall provide DND with a report, by December 1 of each year that this Agreement is in effect, outlining the progress of the training program, the number of Inuit trained as well as the success rate of the program, including:

a) a list of training programs provided under the NTI training plan;

b) the number of hours of training received by Inuit in these programs;

b) the percentage of Inuit who successfully completed the training; and

c) the number of graduates who were subsequently hired by Contractors and Subcontractors.

11.3 DND shall include as a term in all Clean-up Contracts between DND and the Contractor a requirement for the Contractor to submit monthly reports on the Contractor's compliance with the final CIPP or the revised CIPP. DND shall advise NTI within five (5) business days of any deviations below the currently approved CIPP. Either Party may request a meeting of the Steering Committee following such a report. Where DND advises NTI of such a deviation below the CIPP in any two consecutive months, a meeting of the Steering Committee is required to be held pursuant to Section 12.2.

12.0 ENFORCEMENT

12.1 Where, during a Site clean-up, deviation from the approved CIPP or from the CIPP as amended pursuant to Section 7.6 indicate that the MIEC or MICC may not be achieved by the Contractor over the remainder of the Site clean-up, DND or its contracting agent shall advise the Steering Committee within ten (10) working days.

12.2 The Steering Committee, within one week of receiving notice under Section 12.1, shall convene to make a determination as to whether the Contractor is using its best efforts to comply with the MIEC or MICC. The Contractor shall then be required to demonstrate to the satisfaction of the Steering Committee that it has made best efforts to comply with the MIEC or MICC, and that fault for the failure to comply with the MIEC or MICC cannot reasonably be placed on the Contractor.

12.3 Where the Steering Committee does not make the determination required under Section 12.2 within 3 weeks, either Party may refer the matter to arbitration under the Expedited Arbitration provisions in Section 14.0.

12.4 Where the Steering Committee in a determination made under Section 12.2, or arbitrator to which a matter is referred under Section 12.3, determines that the Contractor failed to make best efforts to comply with the MIEC or MICC, and that fault can reasonably be placed on the Contractor for this failure, the

Steering Committee shall so advise DND's contracting agent of their determination or of that of the arbitrator. The Steering Committee or arbitrator may make recommendations on remedial measures to be applied, and DND's contracting agent may, after considering any recommendations by the Steering Committee or arbitrator, apply remedial measures at its sole discretion. DND's contracting agent shall report to the Steering Committee as soon as practicable on the results of the remedial measures applied. Remedial measures shall, to the extent possible, be designed to correct the Contractor's failure to achieve the MICC and/or MIEC, and to provide a disincentive for future failures. DND's contracting agent shall consider the following measures and inform NTI of the actions taken. Measures may include:

a) requiring the Contractor to undertake additional measures to achieve the MIEC or MICC;

b) providing the Contractor with information about specific Inuit or Inuit firms who are known to be available and qualified for employment by the Contractor, and advising the Contractor that further enforcement steps may be taken if the MIEC or MICC are not met;

c) withholding progress payments;

d) issuing a stop work order;

e) charging the Contractor for damages related to a stop work order; or

f) terminating the contract.

12.5 Where the Steering Committee, or arbitrator appointed under Section 14.0 determines that the Contractor made best efforts to achieve the MIEC and MICC through its currently approved CIPP, and that fault cannot reasonably be placed on the Contractor for failing to meet the MIEC or MICC, the Steering Committee, or arbitrator, shall adjust the MIEC or MICC.

12.6 Following an adjustment to the MIEC or MICC under Section 12.5, DND's contracting agent shall thereafter continue to monitor and report on the Contractor's performance as provided for in Section 11.3.

13.0 ARBITRATION

13.1 If DND and NTI disagree on any question of fact or mixed question of law and fact related to the interpretation, implementation or operation of this Agreement, with the exception of any matter within the jurisdiction of the Arbitration Board under the NLCA and of any matter related to provisions of this Agreement mentioned in Section 14.1, either Party may by written demand refer the dispute to arbitration in accordance with the following

14.6 The arbitration proceedings shall be held within two weeks of the appointment of an arbitrator. The arbitration proceedings shall be in a location agreed upon by the Parties, or if the Parties are unable to agree, as determined by the arbitrator. The timing for the hearing may be extended only by the mutual consent of the Parties, acting reasonably.

14.7 The arbitrator shall have all of the powers granted under the Commercial Arbitration Act (Canada) to conduct the arbitration, may compel the attendance of the Parties and any required witnesses and the tendering of any documents or things and dispose of any further matters that arise out of the arbitration decision (if raised by the Parties within five (5) days of the completion of the arbitrator's written decision).

14.8 With respect to any such arbitration:

a) each Party shall bear its own costs and an equal share of the other costs of the arbitration, including remuneration and expenses of the arbitrator;

b) the arbitrator shall have jurisdiction to determine all questions of fact, law, and questions of mixed fact and law and make a determination;

c) all witnesses called to give evidence at the hearing shall be sworn under oath and shall be subject to such examination as the arbitrator determines to be appropriate, and there shall be a court reporter and a formal record of the hearing.

14.9 The arbitrator shall, on application, allow a Contractor or a Subcontractor directly affected by a decision requested of the arbitrator to participate in the expedited arbitration as an intervenor, on such terms as the arbitrator in his or her discretion may order.

14.10 The arbitrator shall render a decision in writing and provide such decision to the Steering Committee within one week of the conclusion of the hearing. The decision shall state the reasons on which it is based. The decision is final and binding, and is not subject to appeal.

14.11 Where a Party to the arbitration fails to comply with any of the terms of the decision of the arbitrator, any Party to the arbitration may file in the office of the Registrar of the Nunavut Court of Justice, a copy of the decision in the prescribed form, whereupon the decision shall be entered in the same way as a judgment or order of the court, and is enforceable as such.

14.12 Unless the Parties otherwise agree, the proceedings and arbitrator's decision shall be made public.

15.0 ENTIRE AGREEMENT

This Agreement and the Annexes hereto shall constitute the entire and sole agreement between the Parties and shall supersede all other communications, negotiations, arrangements and agreements of any nature among them in relation to this Agreement prior to the date of the Agreement.

16.0 SEVERABILITY

If any provision of this Agreement or its application to any person or circumstance shall, to any extent, be invalid and unenforceable, the remainder of this Agreement, or the application of such provisions to persons or circumstances other than those as to which it is held invalid or unenforceable, shall be valid and enforced to the fullest extent permitted by law and be independent of every other provision of this Agreement.

17.0 ENUREMENT

This Agreement shall enure to the benefit of and be binding upon each of the Parties hereto, their respective heirs, legal representatives, successors and permitted assigns.

18.0 APPLICABLE LAW

This Agreement shall be governed by and construed in accordance with the applicable laws of Canada and Nunavut.

19.0 TIME IS OF THE ESSENCE

The Parties acknowledge that time is of the essence of this Agreement.

20.0 PARLIAMENTARY APPROPRIATION

The implementation of the Agreement is subject to there being an appropriation for the contracts for the fiscal year in which any commitment would come in course of payment.

21.0 HOUSE OF COMMONS

No member of the House of Commons shall be admitted to any share or part of this Agreement, or to any benefit arising thereof.

22.0 AMENDMENTS

22.1 If either Party wishes to make changes to this Agreement, it shall provide notice of proposed changes in writing to the other Party. Amendments must be agreed upon by both Parties. Any agreed-upon amendments will be executed and attached as an appendix to this Agreement.

22.2 DND and NTI agree to consider amendments in an expeditious manner, particularly where the proposed amendments directly affect the conduct of a Site clean-up that is in progress or one which is scheduled to commence in the near term.

23.0 NOTICES

23.1 Where any Party is obliged or entitled to give any notice, request, approval, demand, consent, direction or other communication (i.e. Notice) to the other Party, such Party shall first communicate the substance thereof personally or by telephone. However, such Notice shall not be sufficiently given until sent in writing to the addressees at the address below. Any Notice may be personally delivered or sent by registered mail or telefacsimile and will be effective upon receipt by the addressee.

23.2 Notices to DND will be sent to:

Director General Environment
National Defence Headquarters
101 Colonel By Drive
Ottawa, Ontario
K1A 0K2

23.3 Notices to NTI will be sent to:

1st Vice President
Nunavut Tunngavik Incorporated
Box 1041
Cambridge Bay
Nunavut
X0E 0C0

24.0 OFFICIAL LANGUAGES

24.1 The official languages of this Agreement shall be English and Inuktitut. In the case of incompatibility between the two texts, the text of the English version shall prevail.

25.0 TERMINATION OF THE AGREEMENT

25.1 This Agreement will terminate on the later of December 31st , 2008 or when the Clean-Up Work as set out in this Agreement for the Sites listed in Section 3.1 is completed or on such a date agreed to by the Parties in accordance with Section 22.3 of this Agreement.

IN WITNESS HEREOF, the Parties have executed this Agreement.

Nunavut Tunngavik Incorporated

_____
Acting President

_____

_____

Department of National Defence

_____
Minister of National Defence

this _____ day of _____ 2001

ANNEXES TO THE AGREEMENT

ANNEX A: REPORTS

A.1 Format for DND Work Force Estimate (Section 5.6)

Site:
Region:

Occupational Group	Projected Manpower Requirements							
	Year 1		Year 2		Year 3		Overall	
	Positions	Persondays	Positions	Persondays	Positions	Persondays	Positions	Persondays
Project Manager/General Superintendent (Off-site)								
Site Superintendent								
Site Clerk								
Expediter (Off-Site)								
Surveyor								
Surveyor's Assistant								
Service Truck Driver								
Camp Setup Carpenter/ Electrician/Plumber								
Foreman								
Heavy Equipment Operator								
Heavy Equipment Mechanic								
Truck Driver								
Labourer/Scaleperson/Cutter								
Asbestos Labourer								
Hazardous Material Handler								
Cook/Cook's Helper								
Bear Monitor								
Nurse/First Aid								
Other								
Other								
Total:								

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's work force estimate may include additional categories of work not listed, as required.

A.2 Format for NTI Inuit Labour Projection (Section 5.7)

Site:
Region:

Positions Identified	Projected Manpower Requirements (person days)							Projected Inuit Employment (person days)						
	Year 1		Year 2		Year 3		Overall	Year 1		Year 2		Year 3		Overall
	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days	Pos.	Person Days	Pos.	Person Days	Pos.	Person Days	Person Days
Project Management														
Site Superintendent														
Site Clerk														
Expediter														
Surveyor														
Surveyor's Assistant														
Service Truck Driver														
Camp Setup														
Carpenter/Electrician/ Plumber														
Foreman														
Heavy Equipment Operator														
Heavy Equipment Mechanic														
Truck Driver														
Labourer/Scaleperson/Cutter														
Asbestos Labourer														
Hazardous Material Handler														
Cook/Cook's Helper														
Bear Monitor														
Nurse/First Aid														
Other														
Other														
Total Positions														
Projected Inuit Employment									%		%		%	%

Note: The specific Representative Occupational Groupings included in this form may be changed, under Section 5.12, by mutual consent of the Contracting Working Group to reflect variations among Sites.

A.3 DND: Analysis of Contracting Opportunities (Section 6.5)

Site: Region:	
Description	*% of Total Contract Value*
1 Marine Transportation	
2 Commercial Airlines	
3 Local Aircraft Charter	
4 Catering	
5 Small Tools	
6 Camp Supply	
7 Bonds & Insurance	
8 Office Supplies	
9 Communications Equipment	
10 Bear Monitor	
11 Geotextile - Supply & Install	
12 Geomembrane - Supply & Install	
13 Drilling for Instrumentation	
14 Instrumentation	
15 Public Consultation/Translation	
16 Excavate Hazardous/Contaminated Soil	
17 Landfarming	
18 Gravel - Excavate & Place	
19 Excavation	
20 Demolition & Debris	
21 Landfill Excavation	
22 Asbestos Abatement	
23 Project Management and Overhead	
24 Other	
Total	**100%**

Note: The specific Contracting Opportunities included in this form may be changed, under Section 6.12, by mutual consent of the Contracting Working Group to reflect variations among Sites. DND's analysis of contracting opportunities may include other contracting opportunities not listed, as required.

ANNEX B: EDUCATION AND SKILLS PROFILES

Position	Essential Qualifications
Superintendent/Construction Manager	3-5 years directly related project management experience, and substantial (minimum 10 years) construction supervision experience, normally combined with trade certification in one or more relevant trades and/or relevant post-secondary education
Clerk	Previous clerical experience
Expediter	2-3 years experience as expediter for a northern construction company, ideally combined with 2-3 years trade experience in an applicable construction trade
Surveyor Technologists Surveying Assistants	2-3 year college program and trade certification Some related training and/or experience
Service Truck Driver	On–the-job training Driver's license appropriate to class of vehicle
Foreman	3 years supervising similar construction activities
Electrician	Trade certification
Carpenter	Trade certification or 3-5 years on the job experience
Welder	Trade certification
Plumber	Trade certification
Heavy Equipment Operator	5 week certification program Valid driver's license
Heavy Equipment Mechanic	Trade certification or 5 years experience
Small Equipment Mechanic	Trade certification or 3-5 years experience
Truck Driver	Valid driver's license Approved medical certificate 3-4 weeks training
Labourer	On-the-job training; physically fit for the proposed work
Asbestos Labourer	12 hours classroom instruction 12 hours practical instruction
Asbestos Foreman	18 hour training course (following minimum of 2 years of experience as asbestos labourer)

Position	Essential Qualifications
	Certificate from Occupational Health and Safety
Hazardous Materials Handler	5 years + TDG certification through employer
Cooks Cooks Helper	Trade certification or 2 years experience Some related experience
First Aid	Training in appropriate first aid courses
Bear Monitor	Experienced polar bear hunter

Note: This list of qualifications is for the use of the Contracting Working Group in establishing the MIEC This list is not intended for any other use by any third party for any purpose, and DND and NTI are not liable for any use of this list by any third party. Bidders or Contractors are required to establish their own criteria for hiring project staff.

ANNEX C: LIST OF ARBITRATORS

Honourable Roger P. Kerans

Roger F. X. Marentette

Daniel Ish Q.C.

Harvey J. Kirsh

Honourable Lorne O. Clarke

Paul-Emile Chiasson

ANNEX D BUSINESS ENVIRONMENT STATEMENT

The following language shall be included in all Solicitations of Interest prepared and distributed by DND's contracting agent, as described in Section 8.2 of this Agreement:

> One of the principal objectives of The Nunavut Land Claims Agreement is to provide Inuit with means of participating in economic opportunities through government contracting. Article 24 of the NLCA ("Government Contracting") provides full details of the Government of Canada's obligations to fulfill this objective. In the case of DEW Line Clean Up for which the Department of National Defence (DND) has responsibility, NTI and the Government of Canada, as represented by DND, have entered into an Agreement (see Annex XX of the SOI).
>
> The principal mechanism to which NTI and DND have agreed for provision of economic benefit for Inuit is the use of a Minimum Inuit Employment Content (MIEC) and a Minimum Inuit Content for Contracting (MICC). Companies that are invited to submit tenders for the work following this SOI will be informed of the site specific MIEC and MICC. These levels will be set within the following ranges – MIEC (65-85%); MICC (60-75%). Contractors will be required to achieve the MIEC and MICC in the contract, and DND's contracting agent will monitor levels of MIEC and MICC based on a monthly plan submitted by the Contractor.
>
> In the case of the MIEC the Inuit workforce must be made up of Inuit enrolled under the NLCA. Contractors must understand that they may need to recruit a workforce from a number of communities in Nunavut, and that a significant number of the workers have Inuktitut as their first language. DND's contracting agent will provide bidders with a list of Inuit who have indicated their interest in employment in Site clean-ups, including information regarding their work experience and qualifications. This list will be prepared by NTI approximately six months prior to the commencement of the clean-up of a given Site.
>
> In the case of the MICC, Inuit firms used as Subcontractors must be drawn from the Inuit Firm Registry maintained by NTI.

UMA | AECOM

Appendix C

Community Meeting Report

DEW Line Cleanup Project
Cape Young (PIN-2)
Community Meetings

April 22-25, 2008
Cambridge Bay
Kugluktuk

Table of Contents

PIN-2 Community Meetings - Summary

Cambridge Bay, April 22, 2008
Kugluktuk, April 25, 2008

During the week of April 22th, 2008, public meetings were held at Cambridge Bay (April 22nd) and Kuglugtuk (April 25th). The purpose of these meetings was to update the communities on the site work plan for the former PIN-2 DEW Line site at Cape Young starting in the summer of 2010. This document contains a copy of the presentation delivered, the minutes of the meetings, as well as pictures of the events.

The DLCU project team wishes to extend sincere thanks to the office administrators and recreation coordinators in each community who helped to facilitate the refreshment providers, the staff who helped set up and take down the meeting venues, and the interpreters. The provision of a table during the Education Fair in Kugluktuk was much appreciated. We also like to thank the Nunavut Tunngavik Incorporation and the Kitikmeot Inuit Association for their cooperation, in particular Mr. Joe Ohannoak. Warmest thanks to all who attended and assisted with the meetings.

Representatives were:
Steven Poaps, Defence Construction Canada
Dr. Daniela Loock, Environmental Sciences Group
Barry Fedorak, UMA Aecom
Kathleen Francis, Environmental Sciences Group

Brief Agenda for each meeting

1 Introduction
2 Presentation:
  The Project Team and Background Agreements – Steve Poaps (DCC)
  Scientific Summary – Daniela Loock (ESG)
  Construction Summary – Barry Fedorak (UMA)
3 Question and Answer period

During the meetings, the DLCU project team committed to the following actions:

Action: To make copies of the plans and specifications for the cleanup of the PIN-2 DEW Line site available.
Status: Copies have been sent to the municipal offices and the construction association.

Action: To distribute the most recent schedule to clean up the small DEW Line sites under INAC's responsibility to the communities.
Status: The most recent schedule is included with this report.

A CD-ROM with a copy of this report, the presentation and the photos is available.

PIN-2 Community Meeting, Cambridge Bay

Held in the Community Centre April 22, 2008 from 7 – 10 PM
Attendees: 13
Interpreter: Eva Otakiak
Refreshments provided by the Women's Group

Q: Thank you for cleaning up the land and making it safe for the Inuit people. I worked on the DEW Line sites and I'm thankful for organizations like NTI and the DEW Line Clean Up Project who are working together with Inuit leaders to clean up the land around the Kitikmeot region and all across Nunavut. I am happy that you will be doing a thorough job. Cleaning the rivers is the most important, because the fish are moving from the rivers to the lakes and to the ocean, and this is the food we eat.

A: Together we can clean up all the contaminated areas.

Q: Thank you for letting our people know about this clean up project. Thank you for having the written material translated into Inuinnaqtun. I'm getting older now, and I'm thankful that there are people who keep educating the younger generation. The elders know that the garbage in the community is too close to the water. The younger generation needs to think about this.

PIN-2 Community Meeting, Cambridge Bay - Photos

Community meeting

Community Meeting

Community Members

Interpreter Eva Otakiak with community members

Children from the community

Levi Lishultaq and Daniela Loock

Barry Fedorak handing out a door prize to a community member

PIN-2 Community Meeting, Kugluktuk

Held in the Community Centre April 25, 2008 from 7 – 10 PM
Attendees: 32
Interpreter: Mona Tiktalik
Refreshments provided by Brighter Futures

Q: Is the gravel for the landfill caps acquired locally?
A: During the site investigation, we identify sources of gravel in and around the site. All material is acquired locally in accordance with the land use permit.

Q: At the small DIAND site PIN-D, I have seen caribou that died because they were wrapped up in wires and cables from the site. There are a lot of barrels about 14-15 miles up the river. When will they check that place?
A: Barry Fedorak: About a month ago a community meeting was held here regarding another INAC site, PIN-B. Melissa Joy is here this evening, and she is with INAC. I don't know when PIN-D is scheduled for clean up, but we can provide the community with a schedule.

Q: Before the DEW Line clean up, were the animals affected by contamination?
A: Migrating animals would not be affected by the contamination, but they could have been harmed by the wires and debris.

Q: Sometimes the melting snow in spring is brown or yellow. Do you ever test the snow?
A: Small and large sites were investigated in the early 1990's. I cannot tell you about the INAC sites, but the DND sites were not sampled for snow, with the exception of PIN-3. At PIN-3, there was a fire, and snow samples were taken that January. Ash was present near the burn site, but the snow at a distance was clean.

Q: Do the workers wear special protective clothing?
A: Heath and Safety is very important. In our contracts, we insist that the contractor has a full time Health and Safety Advisor on site. We insist on daily, weekly and monthly meetings. All regulations regarding Personal Protective Equipment (PPE) must be followed. All people handling or close to contamination must wear protective clothing, masks, or respirators to protect themselves. At the end of the shift, they remove PPE to de-contaminate themselves.

Q: What do you do with the landfill if it doesn't freeze?
A: Thermistors are installed to measure the temperature for 25 years. The landfills are designed to freeze. If we discover that the landfill is not freezing properly, we would closely monitor it and take steps to correct the situation. It is important to remember that freezing is not the only containment system and the design is safe without it but better with it.

Q: The animals used to be so healthy, and now they are skinny. My husband and I have been very concerned about the animals at PIN-D because the land and water are so contaminated. The caribou drink dirty water and they are exposed to contaminated marine debris. The fish are often sick or dead. Before the DEW Line sites and the mines the animals were really healthy. Now the animals and fish are getting sick. One man ate snow near a mine site and died. I worry that the Inuit people go to the cleaned up sites. They should identify the areas where the landfills are located, and put posts or markers around them. Our country food is important to many Inuit people, because many people depend on hunting for food. They are only cleaning a few sites at a time. PIN-D should be cleaned up early because many people use that area for hunting.

A: Everyone here shares your concern for the animals. The scope here is limited to the DND DEW Line sites. One idea you suggested was to identify the landfills with posts or markers. The way the landfills are designed, the contaminants cannot get out. Hazardous Materials are packaged up and removed from the site. Moderate level contamination is contained in a liner system and buried deep to freeze. There are no contaminants escaping from the landfills. It would be safe to drink the water or eat the snow once the DEW Line Clean Up is done.

Q: I am concerned because the seals are so skinny. Could it be because of ocean dumping? Does anyone test them? In recent years they seem thin and unhealthy.

A: We have not examined the seals, but other scientists have. We sampled sea urchins, char and sculpin around Cambridge Bay. Close to the debris, there were higher levels of lead than further away. The sculpin had higher levels. Mostly there are elevated concentrations of metals from the steel of the submerged barrels. In seals, the concern is PCBs, but that contamination is not only from DEW Line sources.

Q: I don't like seeing those barrels at the bottom of the ocean. When I was young we used to go camping. My dad used to say that you shouldn't throw your empty cans into the ocean because it would make the fish sick. Even though I'm a female, he would tell me about the hunting places. Our people would like to see the garbage removed from the bottom of the ocean. My son caught a seal, and it was white inside the stomach. I told him to take it to the dump because that seal is sick. We want our animals to be healthy again.

A: It is accepted everywhere that dumping in the ocean is bad for the wildlife. Studies have shown that it is safer for wildlife to leave debris already dumped in the ocean where it is, as it has settled and has been covered with sediment. Digging up the items will disturb and disperse the sediments, and will cause more problems by moving them than by leaving them. The DEW Line clean up project will remove objects that are in water up to 2 meters deep as they might be navigational hazards. Items submerged in deeper water will be left behind.

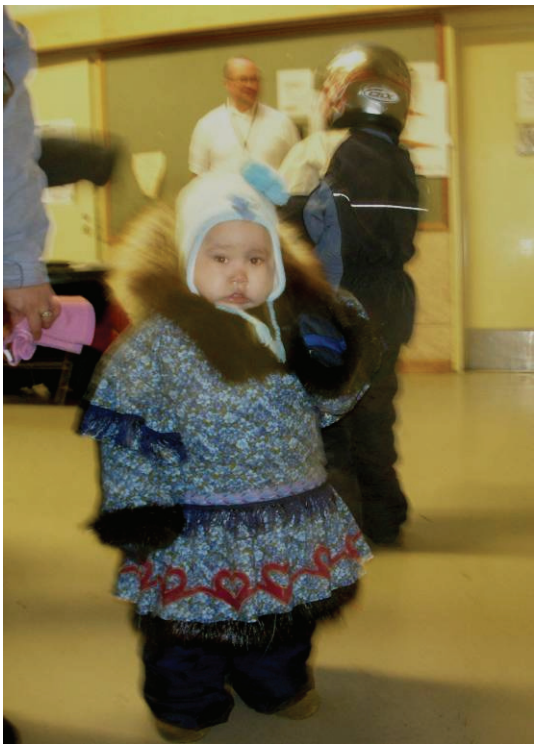
PIN-2 Community Meeting, Kugluktuk - Photos

DLCU Team


Mona Tiktalik (interpreter) and community member

Community Meeting

Community meeting



Children from community

Community members

Annex A

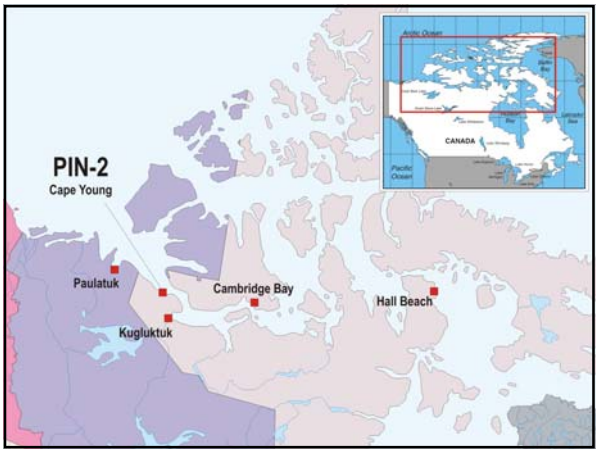
Cape Young (PIN-2)
Community Meetings

Presentation

DEW Line Clean Up Project Community Meetings for PIN-2

Purpose of the Meeting

- To communicate with those who use the land affected by the DEW Line Clean Up Project.
- To relate the scope of the work for the clean up at PIN-2 and any other relevant facts to the local residents.
- Communities for these meetings were chosen in conjunction with the NTI for their potential to be using the land at PIN-2.



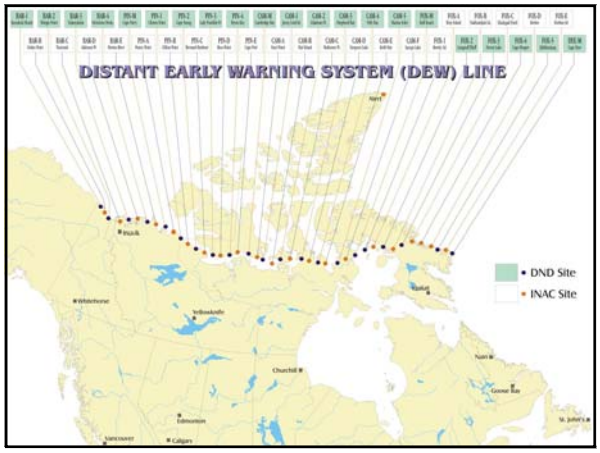
Meeting Outline

- Presentation
- Question and Answer Session
- Draw for Door Prize
- Refreshments and visiting

Feel free to raise your hand and ask questions during the presentation as well!

Presentation Outline

- Provide a brief history of the DEW Line and the DEW Line Clean Up Project.
- Describe past work completed at PIN-2.
- Describe the remediation work to be completed at PIN-2 (2009-2011).
- Listen to any comments, answer any questions and address any concerns that you have about work to be completed at the PIN-2.



Closure of the DEW Line

- **1963:**
  - 21 of the DEW Line Sites were closed (DIAND)
- **1993:**
  - Official closure of the DEW Line (DND)
  - 16 DND DEW Line sites were converted to NWS sites & 5 sites were closed.

All the sites are located within Aboriginal land claim areas. The project is a cooperative project with the Aboriginal People.

DND-NTI Environmental Agreement

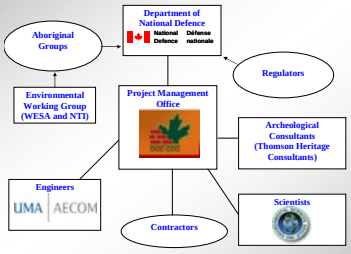
Signed in September 1998

- Return sites to an environmentally safe condition
- Prevent migration of contamination from the sites into the food chain.
- Demolish unused buildings.
- Remediate existing landfills.

Steering Committee & EWG

- Steering Committee will meet regularly and agree on how major elements of the clean up work should be carried out.
- Environmental Working Group (EWG):
  - Equal representation of DND and NTI technical experts.
  - Responsible to collect traditional knowledge.
  - Provides recommendations for cleanup of landfills and hydrocarbon areas in accordance with the DND-NTI environmental agreement.
  - Reviews results of long-term monitoring program.

Who is involved?



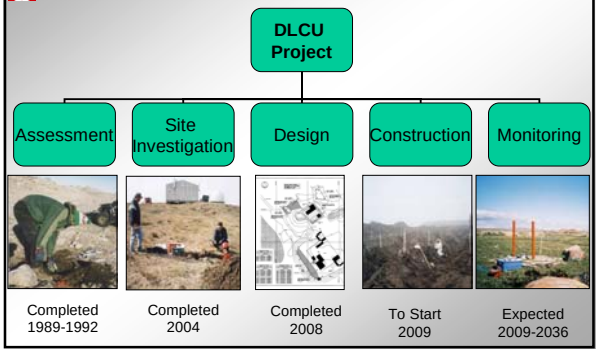
Signing of DND-NTI Economic Agreement in August 2001 in Iqaluit.

DND-NTI Economic Agreement

Economic Capacity in the North:

- Requires Inuit participation in contracts and employment.
- Training allocation of $750,000 for the clean up of Nunavut DEW Line sites in support of the NTI training plan.
- Increased opportunities for Inuit to receive training and experience with the goals to create, operate and manage Inuit-owned businesses in Nunavut.
- Competitive clean up contracts specify minimum Inuit content and participation levels for the clean up work.
- Establishes a mechanism whereby contractors fulfill their agreements on levels of Inuit participation.

Phases of the DLCU Project for PIN-2



1989-1995: Initial Scientific Studies

- Goal was to evaluate the environmental impact of the DEW Line.
- DND sponsored assessments to identify contaminants of concern, environmental impact and persistence.

Over 6000 soil, water and plant samples collected – the first and largest study of its kind!

Historical Practices

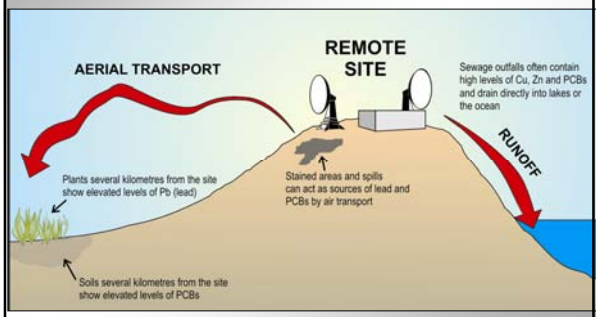
At one time it was common practice (for hamlets, the military and/or industry) in the North to dispose of waste by dumping it into the ocean.

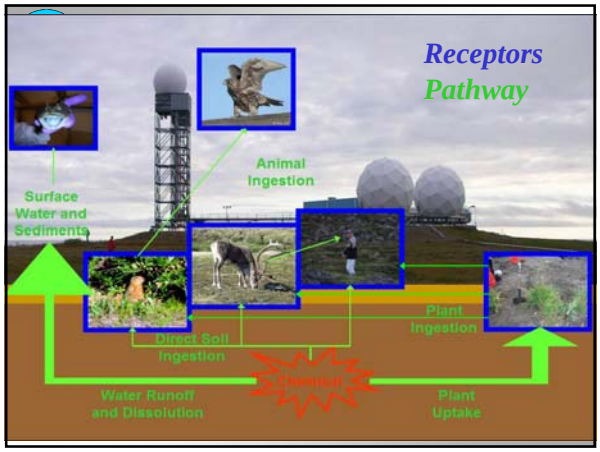
Ocean Disposal Studies

- Two major studies were undertaken by scientists, the government and local residents:
  - 1993: Cambridge Bay
  - 1994: Baffin Island (Iqaluit, Resolution Island, Cape Dyer, Kivitoo)
- Underwater debris (mostly vehicles, empty drums and airplane wreckage) does exist on the bottoms of lakes and the ocean.

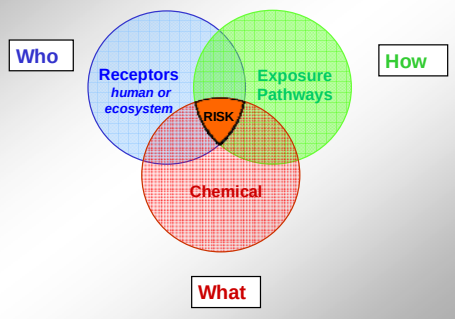
Findings suggest that most of this material is harmless and that it is more important to remove sources from the shore!

DEW Line Sites are sources for contaminants

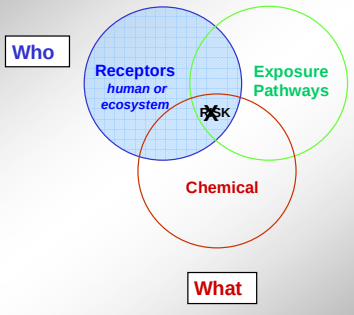




In order for there to be risk, we must be exposed to the contaminant



Eliminating Risk



DEW Line Clean Up Protocol

Consistent protocol for the clean up of all 21 sites under DNDs responsibility.

Eliminate chronic inputs of contaminants into the food chain.

The DEW Line Clean Up Criteria

- **Outlines the following Arctic-specific action levels for contaminants in soil:**

Contaminant	DCC Tier I (Low Level) [ppm]	DCC Tier II (Moderate Level) [ppm]
Arsenic		30
Cadmium		5.0
Chromium		250
Cobalt		50
Copper		100
Lead	200	500
Mercury		2.0
Nickel		100
Zinc		500
PCBs	1.0	5.0

- Soil with fuel and oil spills are removed from areas posing risk to the environment.
- Soils with high levels of contamination are cleaned up as outlined by the Canadian Environmental Protection Act and the Fisheries Act.

Investigation Phase

- Determine the extent of contamination at the site.
- Assess landfills.
- Inventory and test building materials, facilities & debris.
- Includes:
  - Engineering survey,
  - Geophysical survey,
  - Archeological survey, and
  - Traditional knowledge.

How do you know if the site is contaminated?

- Soil samples are collected.
- Analysis is performed to determine the chemical composition and total amount of each chemical present in the soil.
- Results are compared to relevant criteria.

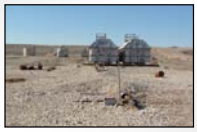
Hangar Area

Landfill Risk Evaluation Process

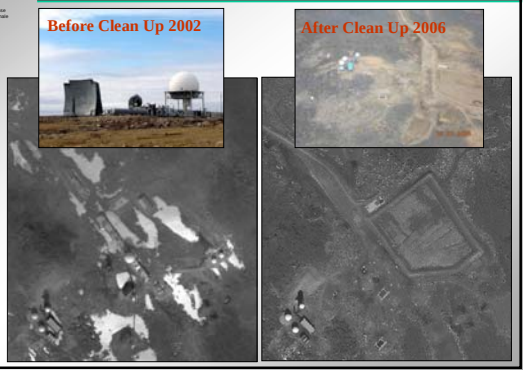
- Landfills are evaluated in a consistent manner: source…pathway…receptors.
- Traditional knowledge about the site is also considered in these evaluations.
- Landfills are classified based on their environmental risk.
- Recommendations for their clean up are made by DND and NTI representatives together … the EWG.

Site Investigation Results

- In comparison to other DEW Line sites, PIN-2 is very clean.
- PCBs, copper, lead, and zinc in soils at landfill and debris areas, the sewage outfall, and close to buildings.
- Fuel and oil stains, copper, lead and zinc in soils at fuel storage facilities.



The Clean Up of a DEW Line Site

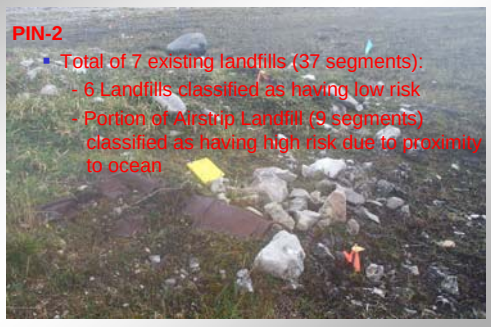


Design & Construction: DEW Line Site Remediation

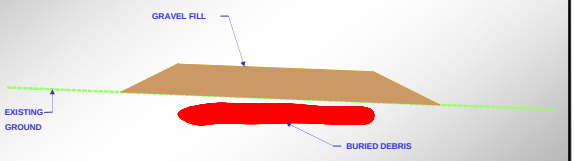
Design & Construction: Remediation of Existing Landfills

PIN-2

- Total of 7 existing landfills (37 segments):
  - 6 Landfills classified as having low risk
  - Portion of Airstrip Landfill (9 segments) classified as having high risk due to proximity to ocean



Design & Construction: Existing Low Risk Landfills



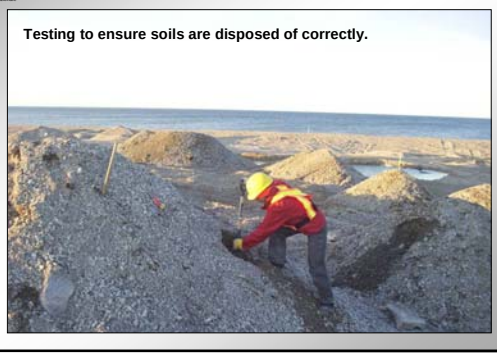
Regrade Design

Design & Construction: Regrading of Existing Low Risk Landfills

Design & Construction: Complete Excavation and Backfill of Existing High Risk Landfills

Construction: Complete Excavation and Backfill of Existing High Risk Landfills

Testing to ensure soils are disposed of correctly.



Design & Construction: Complete Excavation and Backfill of Existing High Risk Landfills

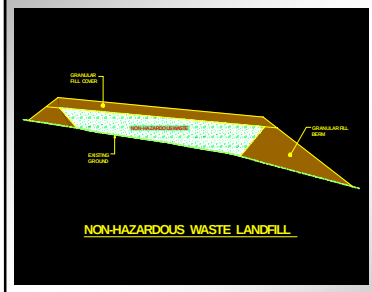
Airstrip Landfill West at FOX-5 Before Remediation

Airstrip Landfill West at FOX-5 After Remediation

Design & Construction: New Non-Hazardous Waste Landfill

For disposal of:

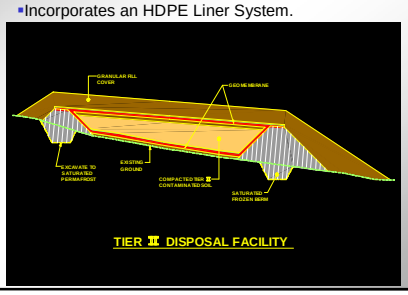
- Non-hazardous demolition materials,
- Non-hazardous debris,
- Low level (Tier I) contaminated soils, and
- Asbestos (double bagged).



Design & Construction: New Non-Hazardous Waste Landfill

Design & Construction: New Northern Disposal Facility

- For disposal of moderately contaminated soils.
- Designed for freeze-back of the contaminated soil.
- Uses frozen, icy berms for containment.
- Incorporates an HDPE Liner System.



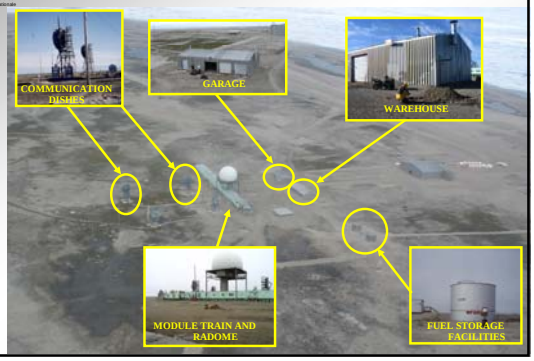
Design & Construction: New Northern Disposal Facility

Design & Construction: Contaminated Soil Excavation & Disposal

Low Level Contamination	Moderate Level Contamination	High Level Contamination
↓	↓	↓
Non-Hazardous Waste Landfill	Northern Disposal Facility	Off-site Disposal

Testing to ensure that all of the contaminated soil has been removed.

Demolition



Design & Construction: Classification and Disposal of Hazardous Waste

- All storage, shipment and disposal of hazardous materials is in accordance to the Transportation of Dangerous Goods Act.
- Placed in Government Approved Containers.
- Shipped Off-Site for Disposal.

Design & Construction: Other Issues and Work

- Regulatory Compliance
- Health and Safety Testing
- Environmental Protection
- Erosion and Sediment Control
- Maintenance of Access Roads
- Protection of Archaeological Features

Landfill Monitoring

- Has two phases:
  - *Phase I: First 5 Years* - Confirmation that landfill is performing as expected.
  - *Phase II: Years 6 to 25* - Confirmation of stable conditions.
- Involves:
  - Visual Assessment for overall stability of the landfill,
  - Measurement of the temperature of the ground, and
  - Collection and analysis of soil and water samples.

Project Schedule for PIN-2

- Solicitation of Interest (SOI) will be advertised starting in May of 2008.
- Contractor's site visit in August 2008.
- Tender period in late 2008 and early 2009.
- Letter of Intent issued to successful contractor to finalize participation plans in early 2009.
- Contract to be awarded later in 2009.
- Mobilization to start in August 2009.
- Clean up activities to occur over 3 years (2009 to 2011).

Final Result of the Clean Up

- Positive impact on wildlife, fish and marine mammals as contamination sources will be removed.
- Removal of safety hazards.
- Economic, employment and training opportunities for area residents.
- Clean up is followed by a 25 year monitoring program for landfills remaining on site.


Thank you for your time.
Are there any questions?

Appendix D

Site Photographs

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	1	Description :	View southwest at PIN-2 Cape Young site, including beach, airstrip and station areas.

Photo :	2	Description :	View north-northwest at airstrip area, including hangar structure (center).

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

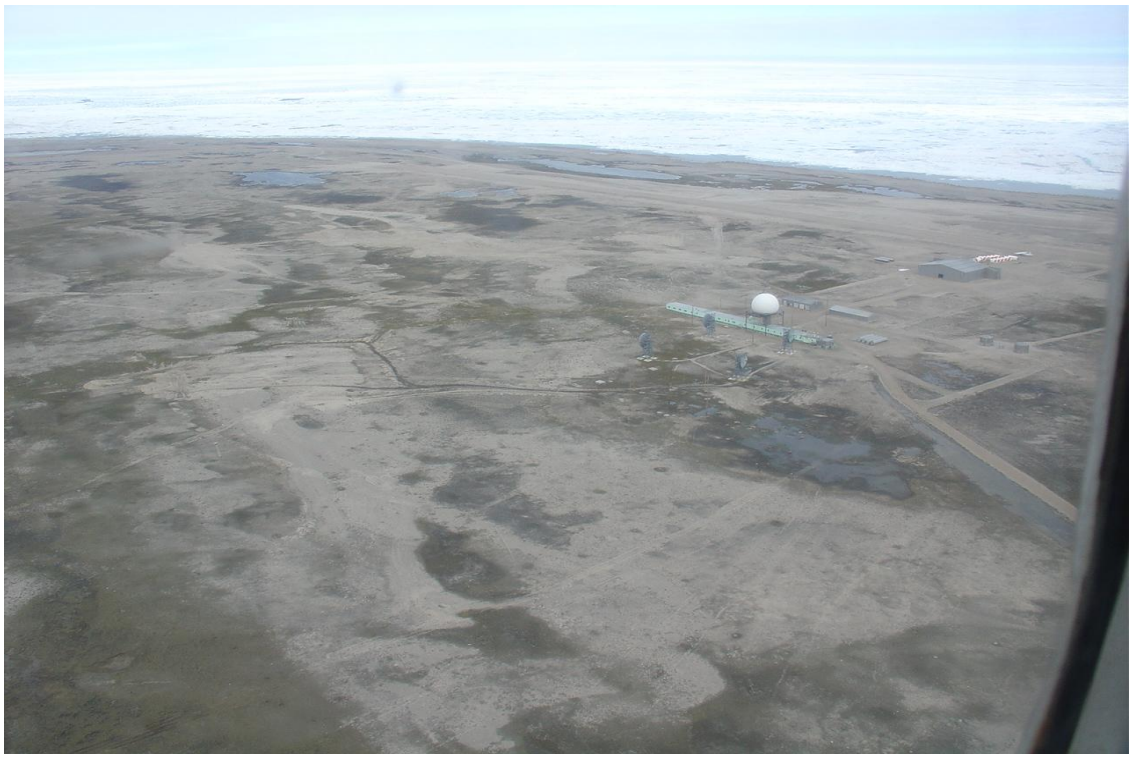


Photo :	3	Description :	View north at station southwest area including the proposed location of the Tier II Disposal Facility.

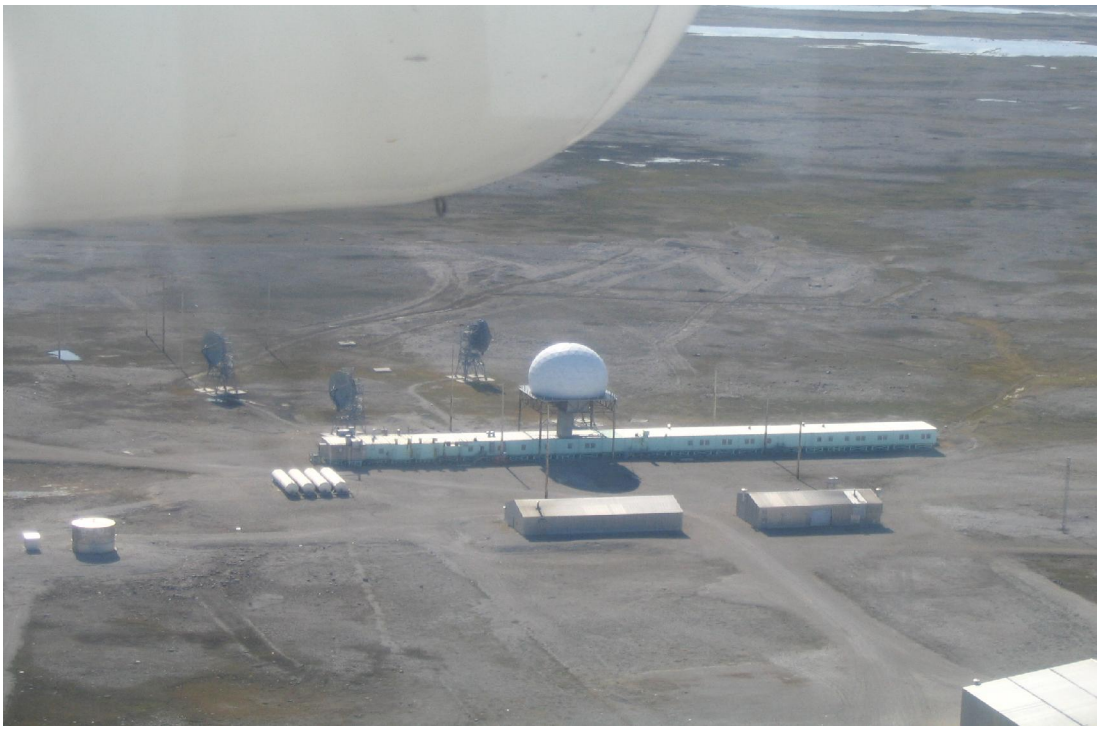


Photo :	4	Description :	View southwest at station area, including warehouse, garage, module train, radome, water tanks and communication dishes.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	5	Description :	View southwest at Airstrip Landfill - Lobe A.

Photo :	6	Description :	View northeast at Airstrip Landfill – Lobe B.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

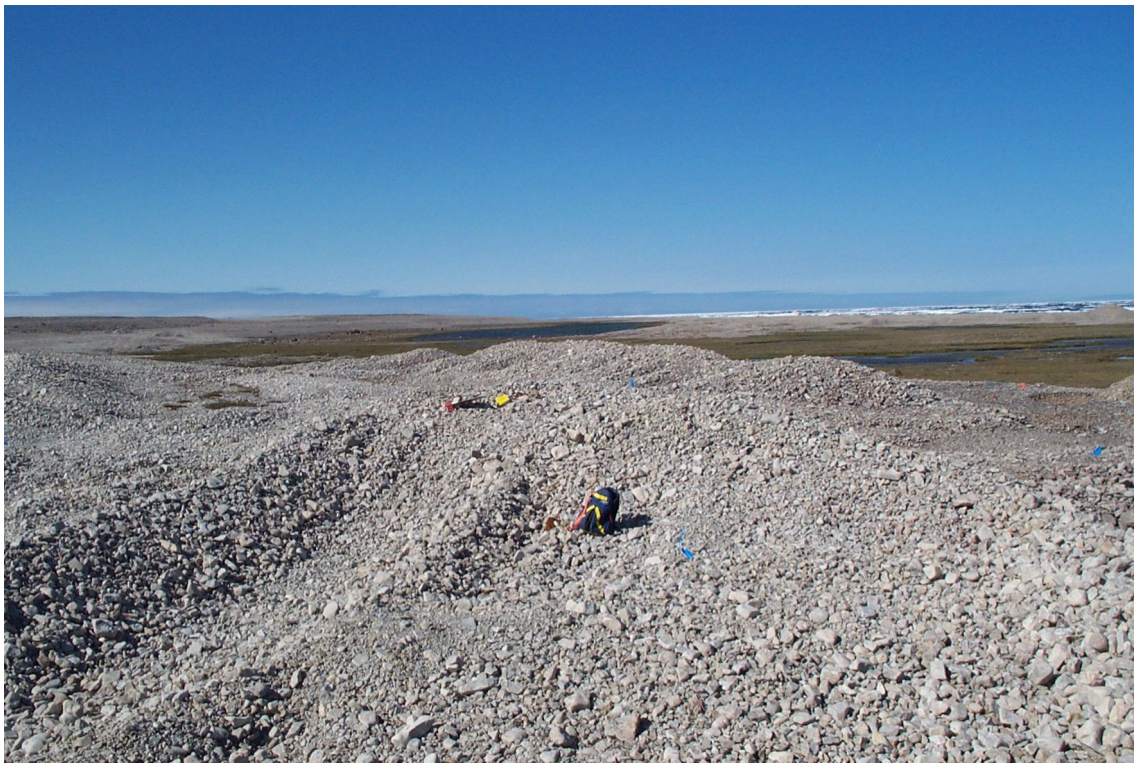


Photo :	7	Description :	View north at Airstrip Landfill – Lobe F.

Photo:	8	Description:	View northeast at Airstrip Landfill – Lobe I.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	9	Description :	View northeast at Airstrip Landfill – Lobe K.

Photo :	10	Description :	View west at Airstrip Landfill – Lobe L.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

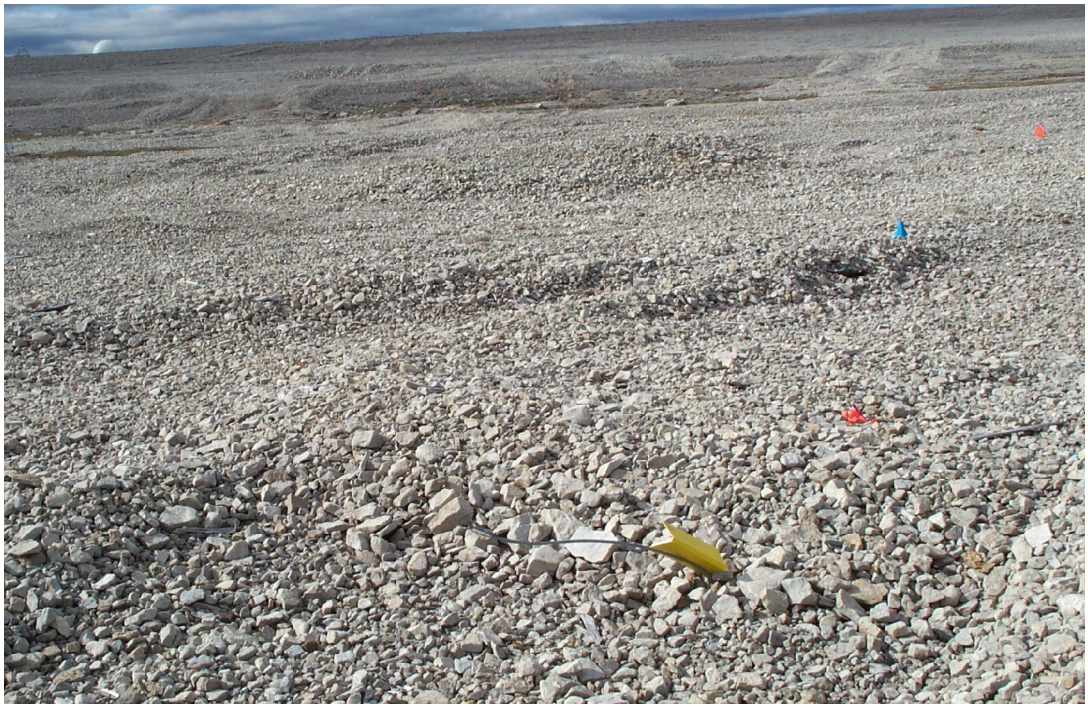


Photo :	11	Description :	View southeast at Airstrip Landfill – Lobe M.

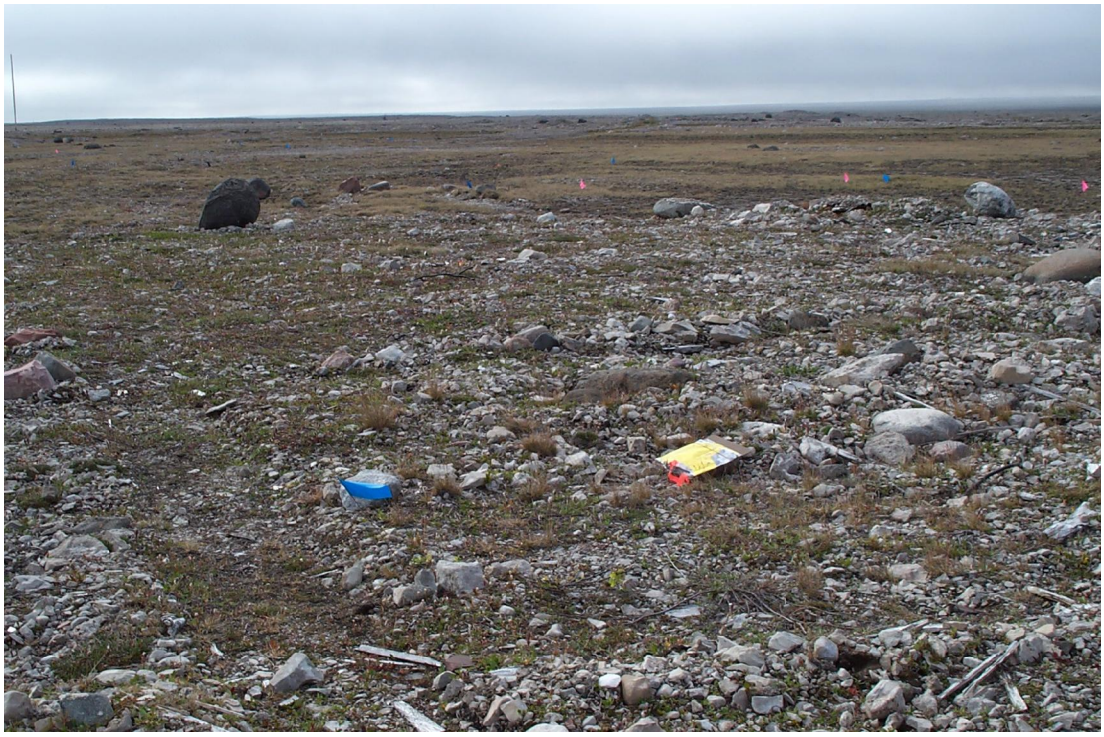


Photo :	12	Description :	View south at Old Camp Debris Area – Lobe B.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	13	Description :	View north at Old Camp Debris Area – Lobe E.

Photo :	14	Description :	View south at Old Camp Debris Area – Lobe F.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	15	Description :	View northeast at Old Camp Debris Area – Lobe G.

Photo :	16	Description :	View northwest at Old Camp Debris Area – Lobe I.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	17	Description :	View northwest at USAF Landfill.

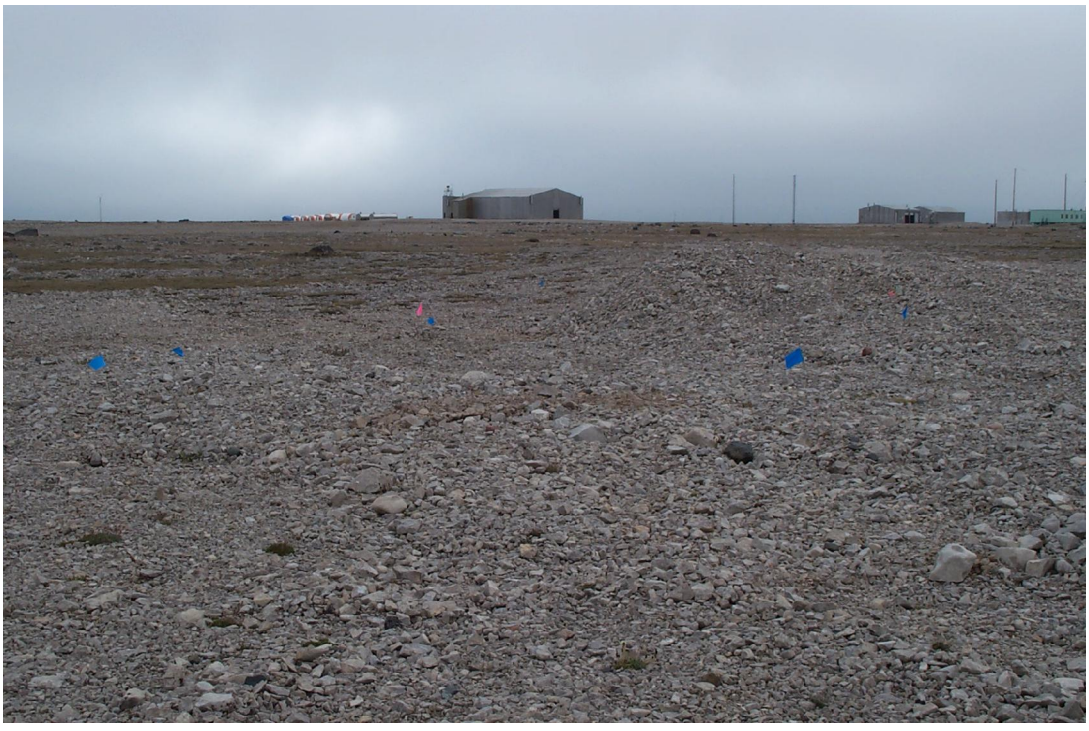


Photo :	18	Description :	View east at Station East Landfill – Lobe A.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	19	Description :	View west at Old Camp Debris Area - Lobes E and J.

Photo :	20	Description :	View north at Station POL Debris Area.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	21	Description :	View southwest at Hangar South Debris Area.

Photo :	22	Description :	View north at Airstrip South Landfill.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	23	Description :	View west at Debris Area 14 – Lobe A.

Photo :	24	Description :	View east-northeast at Tower Debris Area – Lobe A.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	25	Description :	View south at Pallet Line West Landfill – Lobe B-C.

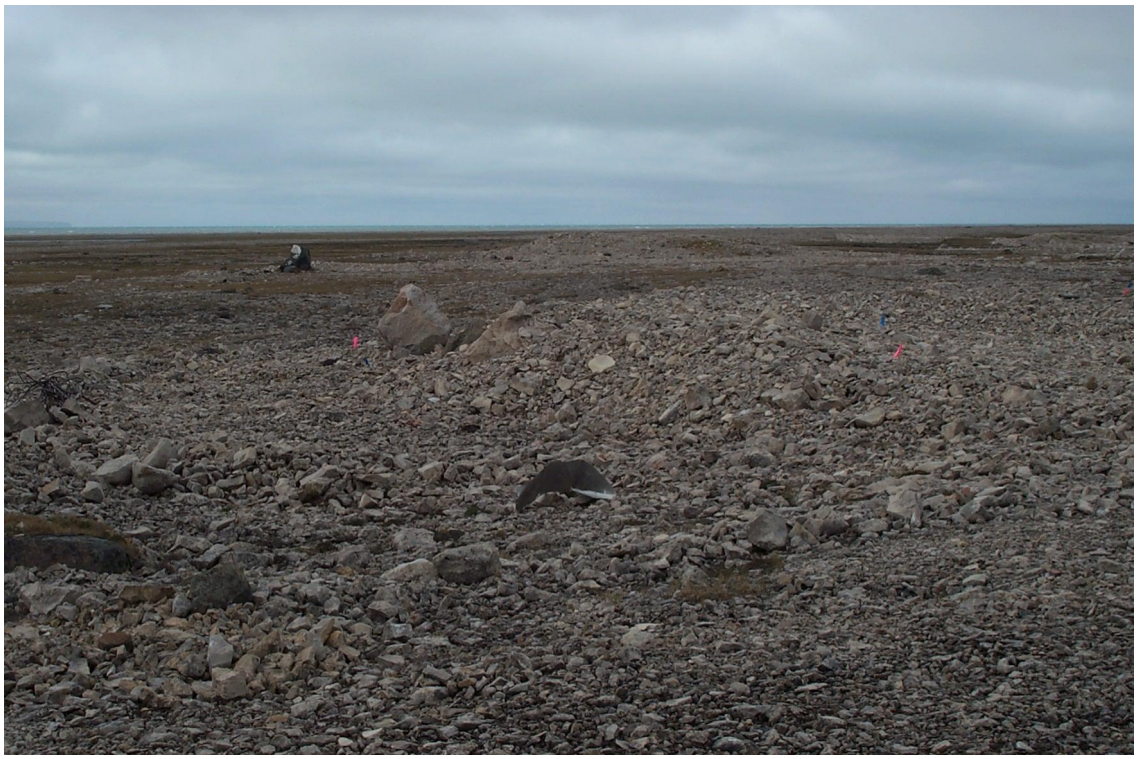


Photo :	26	Description :	View west at Pallet Line West Landfill – Lobe F.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	27	Description :	View northwest at Pallet Line West Landfill – Lobe G.

Photo :	28	Description :	View northwest at Pallet Line West Landfill – Lobe J.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	29	Description :	View north at Debris Area 9.

Photo :	30	Description :	View north-northwest at East Twin Debris Area.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	31	Description :	View south at Debris Area 11.

Photo :	32	Description :	View northeast at Debris Area 8.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	33	Description :	View northeast at Southwest Debris Area.

Photo :	34	Description :	View northeast at Debris Area 7.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	35	Description :	View northwest at South Landfill – East.

Photo :	36	Description :	View northwest at Debris Area 2.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	37	Description :	View northwest at South Borrow Landfill.

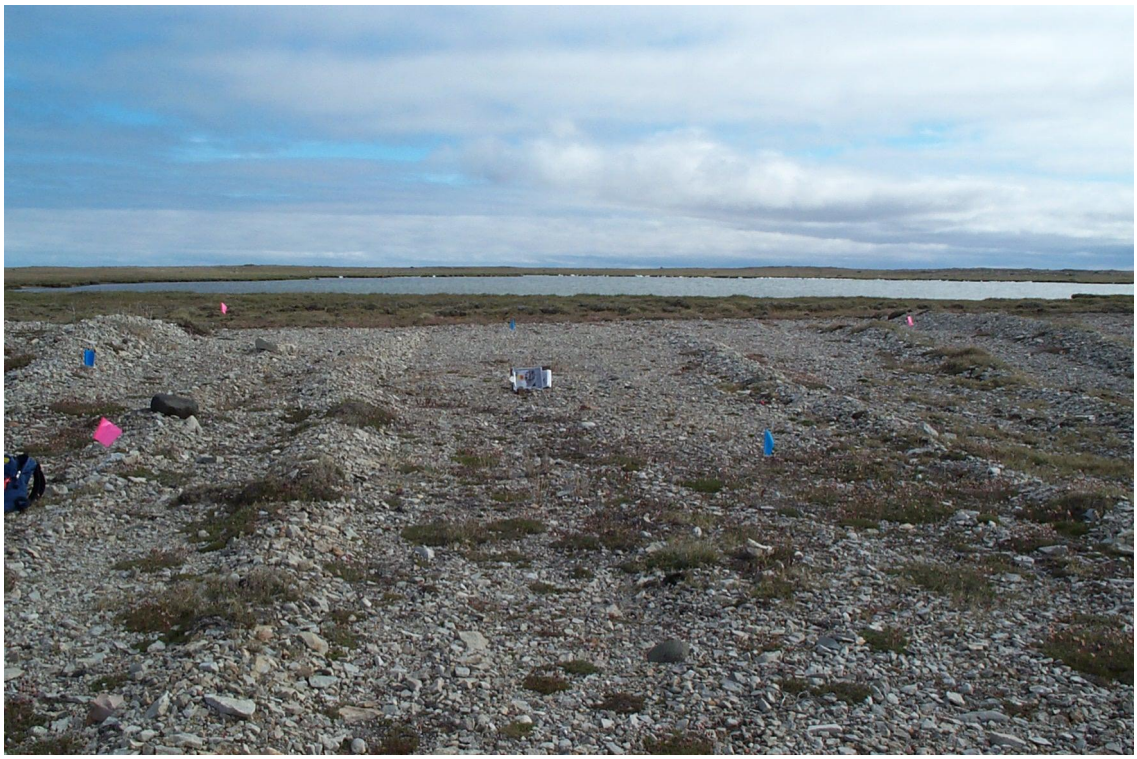


Photo :	38	Description :	View southeast at Harding Road South Debris Area.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	39	Description :	View west at Harding Road North Debris Area.

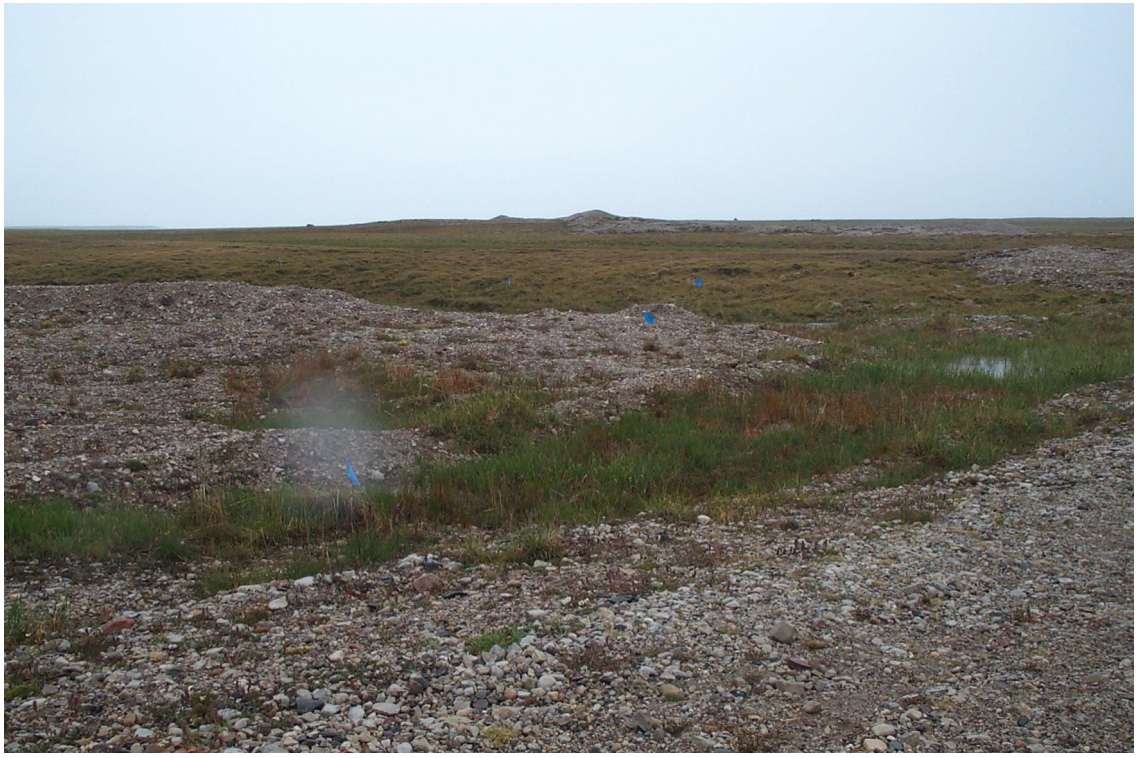


Photo :	40	Description :	View northwest at South Borrow Debris Area – Lobe A.

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	41	Description :	View northeast at South Borrow Debris Area – Lobe B.

Photo :	42	Description :	View north-northwest at Site Debris No. 2 (metal debris in Harding River).

Site Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	43	Description :	View north at Site Debris No. 8 near beach POL area.

Photo :	44	Description :	View south at Site Debris No. 11.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	45	Description :	View north at beach area, including 2-65,000 US gal diesel tanks and 5-18,300 US ga. JP-4 tanks.

Photo :	46	Description :	View west at north side of hangar.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	47	Description :	View west at JP-4 tanks located northwest of hangar.

Photo :	48	Description :	View west at garage.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	49	Description :	View northeast at warehouse.

Photo :	50	Description :	View northwest inside warehouse.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	51	Description :	View northeast at station POL tanks and pumphouse.

Photo:	52	Description:	View east at 18,300 US Gal. water tanks located east of module train.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	53	Description :	View west along north side of module train.

Photo :	54	Description :	View north along south side of module train.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	55	Description :	View north at radar tower/radome.above module train.

Photo :	56	Description :	Fuel tanks and mechanical piping in Module 1A of module train.

Demolition Photographs
Site: PIN-2, Cape Young

UMA | AECOM

Photo :	57	Description :	Electrical components in Module 7 in module train.

Photo :	58	Description :	View southwest at communication dish.

UMA | AECOM

Appendix E

Historic Ocean Disposal Summary

THE ENVIRONMENTAL CONSEQUENCES

of

HISTORIC OCEAN DISPOSAL

in

THE CANADIAN ARCTIC

SUMMARY DOCUMENT

Dr. K. J. Reimer
Professor, Chemistry & Chemical Engineering Department
Director, Environmental Sciences Group
The Royal Military College of Canada
Kingston, Ontario K7K 7B4

Tel: 613-541-6000 x6161
Reimer-k@rmc.ca

December 2002

Background

Many coastal communities in the Canadian Arctic have a recent history that involves the construction and operation of military sites. In particular the Distant Early Warning (DEW) Line and Pole Vault (or Pinegap) Line of radar sites built in the late 1950s, had many ramifications for the Arctic environment (ESG 1991, 1993a, 1993b, 1993c, 1995a, Fletcher, 1990, Grant, 1988).

There are few available records of the activities that took place at the Arctic radar sites prior to 1989. In order to assess possible environmental impact, and to determine appropriate cleanup strategies, it has been necessary to reconstruct a picture of past practices. The Department of National Defence, Indian and Northern Affairs Canada, and Environment Canada sponsored a series of environmental studies of the radar sites and several other military facilities in the Canadian Arctic. These investigations focused on terrestrial contaminant sources and redistribution and the ongoing environmental remediation of the sites (ESG, 1991, 1993a,b,c, 1994a, 1995a).

Among the initial environmental investigations of the radar sites were two studies examining the environmental impact of seabed debris and contaminant input into the marine environment (Bright *et al.*, 1994, ESG 1995b). Government agencies received anecdotal accounts suggesting that debris both from radar sites and northern communities had been directly disposed of into the ocean, either by transport of materials onto the ice or by dumping from ships or barges. The material suspected to have been disposed of in the ocean included large vehicles, and other iron-containing debris. However, ferrous metal debris is considered to be environmentally benign when placed in seawater.

There did not appear to be any motivation for the disposal of smaller hazardous materials (i.e. batteries and PCB-containing equipment) at sea, since in most cases this would require greater effort than the routine disposal of such materials in landfill sites. However, there is extensive evidence for the migration of PCBs or other contaminants from landfills and other contaminated terrestrial areas into marine environments adjacent to many of the radar installations and communities (ESG 1993c, 1995a). PCBs and a small suite of other contaminants tend to biomagnify in marine food webs. Since Arctic marine mammals comprise a substantial proportion of the diets of many Arctic residents, concern was expressed that ocean-dumped debris may impose a negative effect on these important Aboriginal food sources. This concern led to the following two investigations:

Study Sites

1. Cambridge Bay

In 1993, Environment Canada led an investigation into the effects of historical ocean disposal in the marine waters of Cambridge Bay (Bright *et al*., 1994). Cambridge Bay was believed to be a possible worst-case example for the past disposal of debris in the ocean, given its size and location, and anecdotal accounts of extensive dumping from both the adjacent DEW

Line site and the community. In addition, the results of an underwater survey conducted during the spring of 1993 had suggested that electrical components might be present on the seabed.

2. Baffin Region

In 1994, a second investigation of the extent and environmental effects of past ocean disposal took place in the eastern Arctic, in the waters near Iqaluit, Resolution Island, Cape Dyer, and Kivitoo, Nunavut (ESG 1995b, Bright *et al*., 1995). Disposal practices at east coast sites were thought to have differed from Cambridge Bay (central Arctic) due to the difference in terrain. Baffin Island and the Labrador are situated on very rugged terrain with limited access to overburden for the construction of landfills. Reimer *et al*. (1991, 1993) describe several sites where debris and chemical contaminants have been allowed to slide over a cliff and into the ocean (e.g. Cape Hooper, FOX-4). There are also anecdotal suggestions that debris may have been hauled onto the ice (e.g. Cape Dyer, DYE-M).

Objectives

The specific objectives of the ocean disposal studies were to:

- delineate the extent of debris in the sea near the study sites (both communities and military radar stations);
- determine the extent to which contaminants have been released from the debris; and,
- investigate the relative effects on Arctic marine animals of ocean disposal versus shore-based contaminant inputs.

Methods

A combination of methods was used during the two studies. Side-scan sonar was used to detect objects on the seabed. Objects on the seabed were identified on the basis of size, shape, and acoustic reflective characteristics. Once the side-scan sonar had established the position of the objects, temporary buoys were placed at the sites. The objects were subsequently examined in greater detail by SCUBA divers and/or Remote Operated Vehicles (ROVs) equipped with cameras and sector-scan sonar.

Samples of marine sediment, and of bottom-dwelling invertebrates and fish were collected from each of the sites and from background locations for comparison. Sediment and biota samples were analyzed for a large range of possible contaminants. Sediment samples were screened for inorganic elements, PCBs, PAHs. The tissues of a subset of biota were analyzed for inorganic elements, PAHs, PCBs, chlorinated pesticides, and toxaphene (or polychlorinated boranes). Detailed descriptions of collection and analytical methods are provided in by Bright *et al*., 1995.

Results

1. Cambridge Bay

Exhaustive sonar and remotely operated vehicle (video-equipped unmanned submersibles) and diver surveys of the bay revealed the presence of 54 objects or groups of objects, including natural rock outcroppings. A total of 44 of the objects were confirmed to be from dumped material: vehicles, two aircraft, and hundreds of empty barrels dominated the targets at the end of the bay near the DEW Line site; domestic garbage such as a kitchen sink, bedsprings and batteries were found nearer the community. Electronic components were found in only one area, adjacent to the airstrip.

Many of the submerged objects provided a solid substrate for marine life. Chemical analysis for a wide variety of contaminants indicated that the underwater debris did not significantly contribute to contamination in the bay. Shoreline sources of PCBs, both from the DEW Line site and especially the hamlet dump, were much more important. Sculpins (*Myoxocephalus quadricomis*) in the discharge of the community dumps had accumulated significant concentrations of PCBs, but other fish (Greenland Cod and Arctic Char) had much lower accumulations, with levels meeting consumption guidelines. It was concluded that Cambridge Bay was representative of sites in the central and western Arctic and that:

- debris from historical ocean disposal in the central and western Arctic was potentially quite extensive, but chemical contamination from such inputs was insignificant when compared to shoreline runoff;
- cleanup actions should be restricted to land and foreshore areas and not deep waters unless there is persuasive evidence to the contrary.

2. Baffin Region

Detailed searched of the waters adjacent to the Baffin region study sites revealed little debris. No objects were found in Sunneshine Fjord near Cape Dyer, nor near Kivitoo. Two barges and a third structure (either a barge or the remnants of an old causeway) were found in Koojesse Inlet (part of Frobisher Bay). Some isolated metal hull plates were all that remained of a ship that ran aground near Cape Warwick on Resolution Island in 1974. The sonar and photographic records confirmed that all of the areas are subject to extensive ice scouring of the sea floor, which had carried away any debris to deeper water. The absence of underwater debris in most areas investigated in the Baffin Region strongly suggests that past ocean disposal practices are not contributing to the present contamination of the marine environment.

A total of 76 sediment and 44 biological samples were collected during the study. Elevated levels of lead and arsenic were found within one metre of one of the objects found in Koojesse Inlet, near Innuit Head, however, the concentrations dropped to normal five metres away. The analysis of organic contaminants in the surface marine sediment and marine animals (isopods, soft-shelled clams and short-horn sculpins) showed that there is local contamination by

polychlorinated biphenyls (PCBs), near Iqaluit, Resolution Island and Cape Dyer. The inputs were clearly attributable to shoreline, rather than seabed, sources.

Conclusions

Overall, there was no evidence that historical ocean disposal activities at either Cambridge Bay or four sites on eastern Baffin Island have resulted in contaminant inputs to the surrounding marine environment, except within a few metres of an individual metal-containing objects. In contrast, there is substantial evidence that shoreline contaminant sources, including contaminated areas around radar sites and community dumps, are redistributed into the coastal marine environment. This information was communicated to government regulators, to the Hamlet Councils in Cambridge Bay and Iqaluit, the press, and to the Legislative Assembly of the Government of the Northwest Territories. Copies of the study reports (Bright *et al*., 1994 and 1995) were distributed to numerous libraries throughout Canada.

References

Bright, D.A., P. Fortin, S. Harbicht, L. Johnson, S. Parker, and K Reimer, 1994. *Historical Ocean Disposal in the Canadian Arctic: Survey of Materials Disposed in Cambridge Bay and the State of the Marine Environment.* Report prepared for Environment Canada and National Defence.

Bright, D.A., S. Harbricht, L. Johnston, S. Parker, K. Reimer, and S. Solomon. 1995. *Baffin region ocean disposal investigation: seabed debris and contaminant inputs near Iqualuit, Resolution Island, Cape Dyer and Kivitoo*. Royal Military College*, Kingston, Ontario.

Environmental Sciences Group (ESG). 1991. *North warning system environmental study*. Three Volumes. Royal Military College*, Kingston, Ontario, Canada.

Environmental Sciences Group (ESG). 1993a. *Environmental study of abandoned DEW line sites: I. five intermediate sites from the Western and Central Arctic*. Two Volumes. Royal Military College*, Kingston, Ontario, Canada.

Environmental Sciences Group (ESG). 1993b. *Environmental study of eleven DEW line sites*. Three volumes. Royal Military College*, Kingston, Ontario, Canada.

Environmental Sciences Group (ESG). 1993c. *The environmental impact of the DEW line on the Canadian Arctic*. Two Volumes. Royal Military College*, Kingston, Ontario, Canada.

Environmental Sciences Group (ESG) and UMA Engineering LTD. 1995a. *DEW line cleanup: scientific and engineering summary report*. Prepared by ESG and UMA at Royal Military College*, Victoria, B.C. for the Department of National Defence.

Environmental Sciences Group (ESG), 1995b. *Baffin Region Ocean Disposal Investigation: Seabed Debris and Contaminant Inputs near Iqaluit, Resolution Island, Cape Dyer and Kivitoo.* Royal Military College*, Kingston, Ontario, Canada, K7K 7B4.

Fletcher R.J. (1990) *Military radar defense lines of North America: an historical geography*. Polar Record 26(159), 265-276.

Grant, S.D., (1988) *Sovereignty or Security? Government Policy in the Canadian North*, 1936-1950. University of B.C. Press, 385 pp.

*Note: The Environmental Sciences Group (ESG) was located at Royal Roads Military College, Victoria, British Columbia from 1989 to 1995, and now works out of the Royal Military College, Kingston, Ontario.