- The community leadership of the various eastern Arctic hamlets and the general public.

Assessment of Environmental Effects

The initial step following the scoping exercise was to undertake a determination of the possible environmental effects of the project. This assessment involves providing a detailed overview of the project, a description of the existing environment (including inventories and ecological processes) and, finally, the identification of project-environment interactions.

The aim of describing the project was to clearly outline the constituent components and activities that were to occur on each of the DEW Line sites. Activities include mobilisation, project layout and design, plans and scheduling, specifics related to each of the activities (i.e., how would contaminated soil be identified, excavated, transported and disposed of), operating procedures, control procedures and demobilisation plans. Detailed data concerning each of the activities (i.e., material volumes) was included with this description.

During the scientific studies described above, the site teams collected all relevant information concerning the existing environment components of the study area. 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 was focused on the location, sensitivity, seasonal presence and abundance of these components. In general, these interactions were shown using a matrix table which are shown in the environmental assessment reports that accompany this submission.

Also included in the assessment of environmental effects were possible impacts relating to socio-economic factors (heritage, culture, archaeological, employment and business opportunities), land use and human health.

During the assessment stage, conclusions were made as to the type of impact (i.e. level of adversity) and its level of significance, based on comments received during public consultation sessions.

Identification of mitigation options

The third stage of the assessment process was to undertake the identification of mitigation measures that would result in a reduction or elimination of likely environmental effects associated with the clean up of each of the sites. In the case of this project, all potential adverse effects were addressed and not simply those deemed to be significantly adverse, the minimum required by assessment legislation. Mitigative actions now form part of the overall project design and planning documentation, which resulted in the Environmental Protection Plan. The requirement for on-site personnel to adhere to these mitigative measures is contractual in nature as the Environmental Protection Plan forms part of the clean up contract.

PART 2 - PROJECT IDENTIFICATION INFORMATION

Project Title

DEW Line Clean Up in the Nunavut Settlement Area

Type of Activity

Construction activities in support of the environmental clean up of 15 DND DEW Line sites in the Nunavut Settlement Area.

Summary of Operation

Scope

The physical and environmental restoration of the DEW sites requires the removal of structures and debris including hazardous material such as batteries, waste oils, asbestos and inorganic elements (principally copper, lead, and zinc) and polychlorinated biphenyls (PCBs). An environmental monitoring program will also be undertaken following the clean up activities.

Background

From 1955 to 1993, the Distant Early Warning System - the DEW Line - provided radar surveillance of the northern approaches to the North American continent. This now inactive chain of radar stations, at approximately 70 degrees latitude, stretches several thousand kilometres across the breadth of the Arctic. The DEW Line originally consisted, in Canada, of 42 sites but was reduced to half this number in 1963. The 21 sites (6 in the Inuvialuit Settlement Region and 15 in the Nunavut Settlement Area), which were decommissioned in the 1960's, are now the responsibility of the Department of Indian Affairs and Northern Development (DIAND).

In March 1985, Canada and the United States agreed to modernise the North American Air Defence System by closing the remaining 21 DND DEW sites and building the North Warning System (NWS). The DEW Line Clean Up (DLCU) focuses on closing out the former DEW Line sites, including the remediation of chemically contaminated soils, the stabilisation of landfill areas and the demolition/burial of surplus infrastructure and debris.

In 1996, the clean up of the FOX-4 Cape Hooper site was the first Nunavut based site to be started and is expected to be completed in the summer of 1998.

Rationale for the project and primary goals

The process of biomagnification, which is defined as positively sloped variation in concentrations through increasingly higher tropic levels of the food chain, is a well-documented phenomenon. The process of biomagnification is a particularly important phenomenon in Arctic

organisms, where, as a result of their dependency on a high fat content in their diets, are extremely sensitive to contamination inputs, especially chlorinated contaminants such as PCBs. In some cases, top carnivore levels of the Arctic food chain (i.e. Polar Bears) may experience a contaminant (i.e. PCB) biomagnification factor in excess of 3×10^9 times when compared to the first order (primary) source of these contaminants, namely sediment and adjacent waters.

The aim of the DEW Line Clean Up Project is to decommission those facilities used by the former DEW Line which have been declared surplus to the requirements of the new North Warning System and to restore the sites to an environmentally safe condition. Environmental restoration includes the setting of remediation objectives that are designed to preclude the continued 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, higher plants and detritus); and

- The remediation of landfills which may serve as a source of water contamination and may enter the lower levels of the marine food chain (i.e. algae).

Given the fragile nature of the highly sensitive Arctic ecosystems, it is important that past anthropogenic activities, such as the operation of the DEW Line, not causes any significantly adverse affects on any one of the trophic levels of the Arctic food chain. The limited availability of species at any given trophic level leaves little opportunity for another species to negate the effects of the loss of another. In addition, negative biological effects (i.e. plant loss) may lead to physical disturbances, such as damage to permafrost.

In anticipation of the close out of the existing DEW Line system, DND sponsored a five year environmental and engineering study of the 15 DND DEW Line sites in Nunavut. The purpose of this study was to ascertain the baseline condition and to propose realistic clean up objectives and strategies. 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) and polychlorinated biphenyls (PCB's) pose the greatest threat to the biophysical environment.

Project Location

The location of each DEW Line site in the Nunavut Settlement Area is shown in Annex B and listed in Annex C. There is no requirement to select alternative sites. There is no special land status that has been designated for this site.

Enclosed with this submission are the 1:50000 NTS topographical maps for each site.

Project Components and Alternatives

Evaluation of Alternatives to the Project

The capability deficiency that has been identified is that DEW Line facilities at these locations no longer required by the Department of National Defence. These facilities therefore pose both a safety hazard and a potential long term source of contaminant input to the sensitive Arctic environment and, as such, must undergo a clean up process that will preclude further input into the environment, in general, and, specifically, the food chain.

As a project strictly dedicated to the clean up of these military establishments, the range of *alternatives to* this project are limited in nature. Two alternatives to the clean up of these sites that can be identified have been rejected or implemented in a limited fashion based on either military operational requirements and/or environmental reasons. These two alternatives were as follows:

Commercial or other Government use of the facilities. This alternative involves the sale of those facilities no longer required by the Department of National Defence to commercial interests. Two possibilities are present, namely on-site commercial development or sale of these capital assets themselves and movement off-site. The federal government, as facility managers, and continuing operational requirements of the se sites (i.e. most sites remain part of the North Warning System) preclude the on-site option from being followed. The Department of National Defence has, however, put up all facilities that can be safely reused up for sale through the federal Crown Assets Disposal Corporation. The transactions of those facilities sold to local or regional interests and subsequent removal off-site have been completed.

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 realised 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.

Description of Planning, Designing, Operation, decommissioning and post-decommissioning phases of the project

As discussed in the section immediately above, DND initiated this project with a number of scientific and engineering investigations to examine the current baseline conditions of the site. The objectives of these studies were as follows:

- to identify the nature and extent of chemical contamination at the sites;
- to determine the possible impact of these contaminants on the Arctic ecosystem in general and the food chain in particular; and
- to develop practical environmental clean up strategies appropriate for the Arctic.

The results of these two studies resulted in the identification of the baseline conditions, principal contaminants and possible impact pathways/effects hypotheses. As a result of these studies, DND has acquired a detailed physical and chemical inventory of all of the DEW Line sites and, in fact, the largest Arctic contaminant database available.

During the radar upgrade program in the early 1990's, a Canadian consultant consortium was initially contracted to carry out an initial environmental clean up study of the DEW Line sites in Canada. The objectives set for this study were to identify and investigate areas impacted by past waste disposal practices and spills. Additionally, the study determined and evaluated remedial action alternatives for these waste disposal and spill areas and for debris arising from the demolition of excess facilities.

This initial study was carried out in accordance with the Canadian Council of Ministers of the Environment's *National Guidelines for Decommissioning Industrial Sites* which uses a six phase approach:

Phase I	Site information assessment
Phase II	Reconnaissance testing program
Phase III	Detailed testing program
Phase IV	Preparation of decommissioning and clean up plans
Phase V	Implementation of decommissioning and clean up plans
Phase VI	Confirmatory sampling and completion reporting

The scope of this initial study was to conduct a screening using Phases I to III and a recommendation of the decommissioning alternatives for Phase IV. Phases V and VI are in the process of being implemented.

The objective of the Phase I review was to familiarise the study team with past site operations and practices. In particular, the review was used to identify the types of chemicals commonly used on the sites, possible spill locations and waste disposal methodologies and locations.