3. PROJECT PLANNING

3.1 Rationale for the Project and Primary Goals

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 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. 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 significantly adverse affects on any one level of the Arctic food chain. Specifically:

- The limited availability of species at any given trophic level leaves little opportunity for another species to offset the effects of the 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 and animal health and safety through the presence of physical hazards.

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 new 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, 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).

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 (UMA, 1991 and ESG, 1993). 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), hydrocarbons and polychlorinated biphenyls (PCB's) pose the greatest threat to the biophysical environment. Therefore, the clean up approach is geared towards removing these contaminants from contact with the environment.

3.2 Evaluation of Alternatives to the Project

The DEW Line facilities at this location are no longer required by the Department of National Defence. Therefore, they 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 and the food chain.

As a project strictly dedicated to the clean up of these military establishments, the range of alternatives to this project is limited in nature. Three alternatives to the clean up of these sites can be identified. The three alternatives are 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 the capital assets themselves and movement off-site. The federal government's continuing operational requirements of these sites (i.e. most sites remain part of the North Warning System) preclude the on-site option from being followed.

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.

DEW Line Clean Up: This alternative involves cleaning up the sites to the criteria in the DEW Line Clean Up Protocol as agreed to in the DND-NTI Cooperation Agreement, Environmental Provisions. The clean up includes removal of contaminated soil, remediation of landfills, removal of debris, demolition of surplus buildings and facilities and grading of the site to as natural a state as practical. The clean up objectives in the agreement are considered to be protective of human health and the environment. As such, this is the chosen clean up alternative.

3.3 Initial Investigations

During the radar upgrade program in the early 1990's, prior to the start of the DEW Line Clean Up, a number of environmental and engineering investigations were conducted at the DEW Line sites. The objectives of these studies were as follows:

- To identify the type of chemical contamination at the sites;
- To determine the possible impact of these contaminants on the Arctic ecosystem, particularly to the food chain; and
- To develop practical environmental clean up strategies appropriate for the Arctic.

The 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: identifying and investigating areas impacted by past waste disposal practices and spills; determining and evaluating remediation alternatives for the waste disposal and spill area 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 carried out in 1989/90 by the Environmental Sciences Group (ESG) at Royal Roads Military College for the Canadian Department of National Defence: This study provided a detailed physical and chemical inventory of the stations and considered the impact of chemical contaminants on 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 use of 200 litre barrels.
- Two studies designed to assess the impact of the historically common practice of disposing debris into the ocean through the 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.
- 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 (PAP) Materials 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 material 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.

3.4 DEW Line Clean Up Protocol

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

- Demolish and remove existing facilities that are not required for the operation of the North Warning System;
- Remove contaminated soils from contact with the Arctic food chain;
- Stabilize existing landfills;
- Clean up surface debris; and
- Physically restore the site to as natural a state as practical.

3.4.1 Protocol Development

In cooperation with several federal departments (Environment Canada, Fisheries and Oceans, Indian and Northern Affairs) and the Government of the Northwest Territories (Renewable Resources and Health departments), DND initially drafted the General Protocol for 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 these sites (Appendix III). 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 has been prepared that outlines the process for dealing with barrels and barrel contents found on the DEW Line sites.

3.4.2 Criteria

The protocol outlined in the DND/NTI Agreement was developed from the results of the biophysical, socio-economic, and engineering site assessments, mediated through the DND/NTI Environmental Working Group – EWG. The DLCU Protocol documents contaminant clean up criteria and specific physical actions that are to be undertaken, which are specific to the DEW Line sites. These criteria have been developed based on existing federal and provincial criteria in conjunction with studies that show the functional relationships and/or pathways for biological uptake 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 or destruction facility.

3.4.3 Environmental Working Group

In 1997, the Department of National Defence and Nunavut Tunngavik Incorporated (NTI) agreed to 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 organisations. Specific tasks that have been assigned to the EWG include:

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

3.5 Final Investigation and Delineation

Prior to the clean up of each site, the Department of National Defence undertakes a final site assessment. The aim of the site visits 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; and,
- To identify areas suitable for the construction of an NHW Landfill and a Tier II soil disposal facility. A description of these facilities is provided in Section 5.