- Removal and placement of hazardous waste material in containers in accordance with the Hazardous Waste regulations. Hazardous waste is segregated and disposed of according to CEPA guidelines.

- Removal, wrapping in plastic, and disposal of creosote treated timbers. Creosote treated timbers must be wrapped in polyethylene sheets before being placed in a NHW landfill. Creosote coated power poles or foundations are to be cut off 300 mm below ground level.

- Removal and disposal of drainage culverts.

- Non-hazardous materials require no special treatment and can be crushed and placed in the NHW landfill.

Demolition debris to be disposed of on-site will be cut into shapes and sizes, which will minimize void space when landfilled. Concrete foundations are largely left intact except where coated with PCB paints. Following the removal of site structures, demolition areas are reshaped or backfilled with granular fill to a height flush with the remaining foundations. All voids or holes that are left by foundation or structure removal are filled with gravel.

4.7 Transportation of Hazardous Materials Offsite

Hazardous materials to be placed in environmental suitable containers at an approved containment facility on-site and removed by sea lift in accordance with Transportation of Dangerous Goods Act.

4.8 General Site Grading

There were numerous additional small areas identified during the field investigations as requiring minor regrading or cover. These areas generally consist of piles of buried or partially buried, non-hazardous debris that may be regraded with gravel.

Areas likely to require regrading include:

- Four landfill areas;
- Tier II Disposal Facility;
- Hydrocarbon treatment areas (for on-site treatment);
- Non-hazardous waste landfill;
- Locations disturbed during demolition;
- Debris and contaminated soil excavation areas;
- Borrow areas for granular material; and
- Locations disturbed by contractor during establishment and operation of clean up camp and equipment storage facilities.

4.9 Contractor Support Activities

- Use of existing beach landing area, airstrip and roads at site for equipment transport, movement and access to work areas.
- Set-up of clean up camp and equipment storage.
- Sewage from the camp will be handled with, at minimum, primary treatment (settling tank and lagoon) and discharged to ground surface. Sewage treatment and disposal will be in accordance with the Land Use Permit and Water Use License.
- Domestic waste to be disposed (as is, or incinerated as specified by the Land Use Permit) in the new Non-Hazardous Waste Landfill.

- Demobilization of clean up camp following end of 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 35 to 50 personnel, 20 pieces of heavy construction equipment and 6 support vehicles.
- Duration of work is anticipated to be approximately 4 months, not including winter shutdown period, over a period of four years.

4.10 Future Activities

There are no future uses/activities associated with this project, outside of the ongoing landfill monitoring program agreed to in the DND/NTI Agreement. The proposed landfill monitoring program is updated after the completion of the clean up program.

5. PROJECT IMPLEMENTATION

5.1 Site Access and Transportation Methods

Offsite activities in support of this project will be in the form of transportation associated with the transport of materials, equipment and personnel to the site. These activities are described below:

- **Air Transport** - most transportation by air is expected to utilize existing commercial and charter services in and out of the site. Depending on the contractor's schedule, minimal use of chartered aircraft will occur at remote sites (i.e. one flight per week using Twin Otter).

- **Sealift Transport** - it is anticipated that contractor will utilize sealift to transport bulk materials and equipment (vehicles, heavy equipment, etc.) to/from CAM-2. This would potentially result in the increase in sealift traffic by one or two sailings per year (one early and one late summer). Otherwise, no additional vessel traffic is anticipated.

- **Land Transport** – it is anticipated that overland transport will be required between the site and boat dock for mobilization/demobilization of materials and equipment.

5.2 Environmental Protection and Contingency Plans

5.2.1 Environmental Protection Plan

The main focus of the project environmental management program during the clean up is based upon site specific Environmental Protection Plans. The requirements outlined in these plans are the end result of the EARPGO/CEAA environmental assessment process, and include those mitigative measures designed to reduce or eliminate potential harmful effects. Disposal methods for solid, liquid or gaseous wastes are shown in this plan. The Environmental Protection Plan for CAM-2 is provided in Appendix II.

5.2.2 Contingency Plans

Contingency plans associated with the clean up of each site are outlined in site specific Environmental Protection Plans. One section of these plans outline generic contingency plans for the prescribed course of action to be followed in the event of fuel or chemical spills, potentially dangerous wildlife encounter and the discovery of heritage resources. These plans will enable persons that encounter a particular contingency situation to maximize the effectiveness of the environmental protection response and meet regulatory requirements for reporting to the appropriate agencies. Associated with this document is the detailed spill response plan, as per the Northwest Territories Water Board Contingency Planning Guidelines. A copy of the Contingency Plan is in Appendix V.

5.3 Clean Up Contract

The following steps outline the contract award procedures:

- A tender package is produced which includes **ALL** of the work to be completed at the site. The tender package will include instructions for the Contractor to attain Minimum Inuit Content (MIC) in his/her workforce, as well as a Minimum Inuit Employment Content (MIEC), as specified in the DND/NTI Economic Agreement.

- The tender award will go 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.

6. DESCRIPTION OF THE ENVIRONMENT

Environmental conditions at CAM-2 were documented by UMA (1991) and UMA and ESG (2001). Those environmental components potentially impacted by, or influencing clean up operations are summarized below. Detailed descriptions of the biophysical environment are given in UMA (1991).

6.1 Geography

CAM-2 is located on a low-lying coastal landscape covered primarily by till reworked by marine waters. Evidence of submergence includes isolated raised beaches in the southern portion of the area and strandlines along the present-day coast. Physiographically, the landscape is undulating to nearly flat and can be divided into three areas: eastern and southern coastal areas and an interior area. The eastern coastal area is at or very near sea level. It stretches inland from 1 km to 3 km and is extensively dissected by channels forming a dendritic drainage pattern. The southern coastal area, which has a more abrupt rise in relief than the eastern coast, is characterized by a series of narrow, elongate strandlines. An active sand spit is present along the southeastern coast. The interior area is characterized by low-lying, poorly drained subdued terrain with beaded streams (numerous, irregularly shaped small ponds interconnected by defined channels). This interior area is partially bisected by a subdued ridge upon which the station facilities are located.

6.2 Geology

CAM-2 is situated on the Northwestern Shield, which is part of the Canadian Shield. Bedrock in the region consists of Phanerozoic limestone and sandstone. The bedrock is generally shallow throughout the site, particularly near the shoreline of Simpson Strait. The shallow bedrock is weathered, fractured and friable.

The Laurentian Ice Sheet covered the region until approximately 8,400 years ago. The entire island was submerged following deglaciation until approximately 5,000 years ago. Gradual isostatic rebound has brought the island to its current elevation.

The low-lying coastal landscape is characterized by a surficial cover of glacial drift and till deposits, which have been submerged and reworked by marine waters. The marine reworked till deposits contain very little fine-grained particles. Below the marine reworked layer, the till becomes silty with a trace of clay. The raised beach ridges and strandlines along the present day coastline is evidence of submergence and gradual isostatic rebound. The beach ridges along Simpson Strait are comprised of angular, bedrock derived materials. The beach ridges along the spit at the south end of the site comprise more rounded gravels and cobbles.

The till covered areas are relatively flat and surrounded by ponds and low-lying, poorly drained areas. The unconsolidated, marine reworked till near the surface contains only a trace amount of fine-grained material. The till at depth is more silty and cohesive, has a higher moisture content and soft to firm in consistency. In undisturbed areas, an organic mat typically overlies the till deposits. Silty till is exposed in some of the old borrow areas where marine reworked soils have been excavated.

The former CAM-2 Station and current SRR facility are situated on a drumlin nearly 2.5 km long. The drumlin is approximately 2 metres higher in elevation than the terrain to the west and up to 8 metres higher than the terrain to the east. The surficial materials were reworked by the ocean when the area was submerged and are primarily coarse-grained sand and gravel with some cobbles, boulders and trace of silt. The material becomes silty with depth.

Raised marine beach ridges are located along Simpson Strait and on the spit at the south end of the site. The topography is characterized by linear strandlines of coarse-grained material. The beach ridges along Simpson Strait are comprised of angular, bedrock derived materials. The beach ridges

along the spit at the south end of the site comprise more rounded gravels and cobbles. The beach ridges are well drained.

A modern marine beach area is located southeast of the Station at M'Clintock Bay. The area is low-lying and less than a few metres above sea level. The soils are predominantly sand with some silt and variable amounts of gravel. The soils are moist to wet near the surface and saturated below. These soils are highly erodable and several surface runoff channels run through the area.

Ice wedge polygons exist in the low-lying till deposits and frost-crack polygons were noted along the drumlin and other raised areas. Minor thaw settlement is evident along the ice wedges in disturbed areas. Depressions up to 0.5 metres deep were noted along the drumlin north of the SRR.

6.3 Flora

This area is typical of low-Arctic tundra and is characterized by a nearly continuous cover of vegetation (less than 20 cm tall), consisting of willow (*Salix arctica*), sedge (*Carex spp.*), mountain avens (*Dryas octopetala*), saxifrage (*Saxifraga spp.*), arctic poppy (*Papaver radicatum*), lousewort (*Pedicularis spp.*), and polar grass (*Arctagrostis latifolia*) on drier, upland sites. Cotton grass (*Eriophorum spp.*), willow (*Salix spp.*), sedges, grasses, and mosses are commonly associated with the moist areas. Marsh ragwort (*Senecio congestus*) was found around the sewage outfall and at brackish sites near the abandoned village archaeological site. Vegetation was relatively green and lush at the sewage outfall and characterized by bistort, grasses, and sedges. On dry, upland sites that had previously been disturbed (such as landfills and roads), *Oxytropus spp.*, willows, grasses and Arctic poppy were common.

6.4 Fauna

6.4.1 Terrestrial Mammals

Very few barren-ground caribou (*Rangifer tarandus pearyi*) were seen during the 2001 site investigation. Neither polar bears (*Ursus maritimus*) nor grizzly bears (*Ursus arctos*) were observed in the study area and any records of observations of these mammals are rare. Arctic fox (*Alopex lagopus*), Arctic hare (*Lepus arcticus andersoni*) and Arctic ground squirrel (*Spermophilus parryii*) were observed both during the 2001 site investigation and previously during operation of the site.

6.4.2 Marine Mammals

Preferred summer habitats and areas of major concentrations of beluga (*Delphinapterus leucas*) and narwhal (*Monodon monoceros*) are north of the study area, adjacent to Prince of Wales and Somerset Islands. Any sightings of belugas or narwhals in the vicinity of Gladman Point would likely represent strays from the Franklin Strait migration route. However, beluga whales have been reported in the entrance to Chantrey Inlet (southwest of King William Island) in August.

The endangered bowhead whale (*Balaena mysticetus*) migrates to 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.

During the open water season (summer), walrus (*Odobenus rosemarus*) concentrate in Lancaster Sound in the vicinity of southwest Devon Island in numbers of less than 400 animals. Walrus are unlikely to be seen in and around Gladman Point since only periodic migrations are made south of Somerset Island.

In general, on South Victoria Island, most seal sightings are ringed seals (*Pusa nispida*) and are hunted regularly during spring and summer. In contrast to the bearded seals (*Erignathus barbatus*), which prefer offshore area of shifting pack-ice, ringed seals are likely to be encountered near shore, in areas

of fast, first-year ice. Ringed seals summer throughout the central Arctic including Victoria Strait and Queen Maud Gulf. Both bearded seals and ringed seals have been reported occurring in the pack ice west of King William Island in August.

6.4.3 Birds

Snowy Owls (*Nyctea scandiaca*), Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*) and Golden Eagle (*Aquila chrysaetos*) are known to occur in the region, but were not observed at the site during the most recent site investigation in 2001. A rough-legged hawk (*Buteo lagopus*) was nesting in a communications billboard at the time of the 2001 site investigation.

Waterfowl are common on a large pond approximately 2 km northwest of the station. Pacific Loon (*Gavia pacifica*) and Red-throated Loon (*G. stellata*) were common at Gladman Point. Tundra Swans (*Cygnus columbianus*), Canada Geese (*Branta Canadensis hutchinsii*), King Eiders (*Somanteria spectabilis*), Oldsquaw (*Clangula hyemalis*) and Lesser Snow Geese (*Chen caerulescens*) were noted at the site.

Shorebirds observed at the site included the following: Lesser Golden Plover (*Pluvialis dominica*); Ruddy Turnstone (*Arenaria interpres*) and Lapland Longspur (*Calcarius lapponicus*). Other birds at the site included Snow Buntings (*Plectrophenax nivalis*), found in disturbed areas around the station and a small colony of Arctic Terns (*Sterna paradisaea*) located at the end of a sand spit on the north side of M'Clintock Bay.

Rock Ptarmigan (*Lagopus mutus*) and sign were common at this site. Glaucous gulls (*Larus hyperboreus*) were common and were frequently observed along the beach. The rare Ivory gull (*Pagophila eburnea*) is not known to nest on Victoria Island. There were infrequent sightings of Parasitic Jaegar (*Stercorarius parasiticus*) and Pomarine Jaegar (*S. pomarinus*). Only long-tailed Jaeger (*S. longicaudus*) appeared to be common during this period. Common Ravens (*Corvus corvax*) were observed near the landfill on several occasions.

6.4.4 Fish

The domestic, commercial and sport fishing activity of southern King William Island has been reviewed by Stewart and Bernier (1983). Arctic char (*Salvelinus alpinus*) are an important food for residents near the project area. Most of the fish is caught by Inuit domestic fisherman for consumption by their families. Between March and December, fisherman from the community of Gjoa Haven fish in coastal waters as far west as Terror Bay. During July and August, gill nets are set along the southern coast of King William Island between Gladman Point and Schwatka Bay. Arctic char, Arctic cicso (*Gadus morhua*) and Arctic cod (*Coregonus autumnalis*) are the main species caught. In late August and early September, Arctic char are netted at river mouths as they return upstream to overwinter in freshwater. Many of these rivers along southern King William Island are fished commercially at this time.

River systems have been the focus of most fisheries research on King William Island, with few published records of marine fish (Stewart and Bernier, 1983).

6.5 Heritage Resources

Two previously recorded sites, a large Inuit village with associated graves and a campsite were revisited during the archaeological reconnaissance. In addition, one newly identified site was recorded. The latter is a historic Inuit camp. The large Inuit camp has already been disturbed by facilities associated with the station.

6.6 Socio-Economic Setting

Gjoa Haven and Cambridge Bay are the closest communities to the site. Gjoa Haven is 80 km to the east and Cambridge Bay is 325 km to the southwest. The closest community with an aircraft charter base and a full range of commercial and public services is Cambridge Bay. Access to CAM-2 is limited to aircraft charter, which typically originate in Cambridge Bay. Ice conditions limit access by water to the period from the beginning of August to the middle of September.

It is expected that, for the short term in particular communities and the longer term (i.e. approximately 20 years), a significant number of person-years of employment will be generated as a result of this project. Additionally, further enhancement of the areas' economy is expected resulting from increased local purchases and use of local businesses. Optimization of Inuit involvement in the clean up is the subject of the Economic Agreement between NTI and DND, and includes minimum levels in the contract for Inuit labour and business participation. This agreement meets the requirements under the Nunavut Land Claims Agreement, and was signed in the fall of 2001. A copy of this agreement is included in Appendix VI.

6.7 Native Land Use

There are no ecological sanctuaries identified in the immediate vicinity of this site; however, the boundary of the Queen Maud Gulf Migratory Bird Sanctuary extends as far east as McLoughlin Bay and Sherman Bay, approximately 100 km southwest of Gladman Point. Inuit from Cambridge Bay, Gjoa Haven, and Taloyoak trap Arctic fox along the coast of Prince William Island during winter. Seals and birds are hunted in the Queen Maud Gulf and Simpson Strait during spring and summer.

6.8 Government Land Use

The CAM-2 site was an auxiliary station within the original DEW Line system. The DEW Line radar/communication facilities at this site were decommissioned and replaced by a Short Range Radar (SRR) in the early 1990s. The CAM-2 site operates as an unmanned station except for a few days each year for maintenance.

6.9 Valued Ecosystem Components

Valued Ecosystem Components (VECs) are detailed in the environmental screening report included with this submission and include:

6.9.1 Physical

- Protection of permafrost soils; and
- Surface water, particularly related to the drinking water supply.

6.9.2 Biological

Tundra habitat including:

- Feeding and nesting areas for birds;
- Feeding areas for herbivores;
- Feeding and calving areas for local wildlife; and
- Local vegetation.

6.9.3 Socio-economic

- Regional employment opportunities;
- Regional business opportunities;
- Regional training opportunities; and
- Hunting and fishing in local area.

6.9.4 Archaeological, Historical and Cultural

- Archaeological sites identified around the station.

7. IDENTIFICATION OF ENVIRONMENTAL EFFECTS

An environmental assessment of the clean up of CAM-2 was completed. As part of this 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 (i.e. bird nesting areas). Through this assessment, Valued Ecosystem Components (VECs) were identified, which include physical, biological, socio-economic, historical or cultural components.

7.1 Value Ecosystem Components vs Project Components

Table 7.1 summarizes the interaction and potential impacts between VECs and the various activities associated with the clean up.

Table 7.1 - Summary of Potential Impacts

VEC	Activity	Description of Impact
Air Quality	Hazardous Materials Removal	The removal of the contaminated soil from the environment will reduce the risk of impacting air quality.
	Site Grading / Borrow Source Development	The extractions of granular materials and grading activities have the potential to create dust and impact air quality.
Soil Quality	Landfill Development/ Landfill Closure	The migration of contaminants from the new landfills has the potential to degrade soil quality if not constructed properly. The closure of the existing landfills will reduce the risk of impacting soil quality.
	Contaminated Soil Disposal/Hazardous Materials Removal	The removal of the contaminated soil and hazardous materials from contact with the environment will improve soil quality.
	Removal and Transport of Hazardous Material, Fuel and Contaminated Soil	The potential exists for accidental release of hazardous materials, contaminated soil and/or fuels could impact soil quality.

VEC	Activity	Description of Impact
	Contractor Support	The operation of the construction camp will include treatment and disposal of waste, and could negatively impact soil quality.
Water Quality	Landfill Development/ Landfill Closure	The migration of leachate from the new landfills and siltation of waterways during construction/closure has the potential to degrade water quality, both surface and active layer water, if not constructed according to the specifications. The development and closure of the landfills has the potential to disrupt drainage at the site.
	Contaminated Soil Disposal / Hazardous Materials Removal	The removal of the contaminated soil and hazardous materials from the environment will reduce the risk of contamination of surface and active layer water.
	Removal and 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.
	Site Grading/Borrow Source Development	Erosion and sedimentation of waterbodies during grading and gravel extraction activities has the potential to negatively impact water quality. Drainage to 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.
	Contractor Support	The operation of the construction camp will include treatment and disposal of waste. The potential exists for waste to impact water quality.
Terrain	Landfill Development	Excavation required for the development of new landfills and closure of existing landfills has the potential to degrade permafrost.
	Landfill Closure / Site Debris Disposal	The development of new landfills and removal of site debris has the potential to disturb the existing terrain.

VEC	Activity	Description of Impact
	Site Regrading	Terrain and drainage will be improved as a result of grading disturbed areas. Previously disturbed areas will blend into the natural environment
	Borrow Source Development	The extraction of granular material will alter the terrain of the borrow area.
	Contractor Support	Movement of contractor's equipment and personnel around the site has the potential to disturb the tundra.
	Contaminated Soil Excavation	The excavation of contaminated soil has the potential to degrade permafrost
Terrestrial Animals	General Clean Up Activities	The use of heavy equipment during the clean up has the potential to disturb wildlife.
	Contaminated Soil Disposal/Hazardous Materials Removal	The removal of hazardous materials and contaminated soil from the environment reduces the risk of exposure to terrestrial animals.
Terrestrial Habitat	Landfill Development	Loss of habitat may occur as a result of the development of the new landfills in previously undisturbed areas.
	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.
	Borrow Source Development	The extraction of granular material will require the disturbance of the ground and has the potential to impact terrestrial habitat.
Aquatic habitat and animals	Landfill Closure	The proximity of the Airstrip landfill to the marine environment has the potential to impact aquatic habitat, thereby affecting aquatic animals, due to sediment or hazardous materials entering the water. The excavation of landfills in close proximity to the ocean would reduce the potential for impact.
	Site Regrading/ Borrow Source Development	The extraction of granular material and grading adjacent to waterbodies (both fresh and marine) has the potential to impact aquatic habitat, and thereby affecting aquatic animals, due to sediment entering the water.

VEC	Activity	Description of Impact
	Contaminated Soil Disposal/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.
	Removal and Transport of Hazardous Material, Fuel and Contaminated Soil	The excavation of contaminated soil from the beach POL area has the potential to degrade the aquatic environment in the event of an accidental release and impact aquatic animals due to close proximity to the marine environment.
	Contractor Support	The transportation to/from the site has the potential to disturb aquatic animals.
Health and Safety	General Clean Up Activities	The excavation of potential hazardous materials from the landfills, the collection and disposal of potential hazardous debris, the removal of hazardous materials from the facilities and the general handling of hazardous materials has the potential to impact health and safety of workers.
	Contaminated Soil Disposal/Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to people.
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.
Land Use	General Clean Up Activities	Clean up activities may disturb traditional land use, i.e. hunting and fishing activities that would occur during the summer months.
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.
Economy	Contractor Support	The contractor will be required to have a minimum Inuit content in the workforce for the clean up. This will provide employment benefits and related economic benefits.

7.2 Impact of the Environment on the Project

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

The DND and NTI have signed DND/NTI Agreement for the Clean Up and Restoration of the DEW Line Sites within the Nunavut Settlement Area outlining the economic provisions. The agreement includes a Minimum Inuit Content (MIC) for the clean up contract and requirements for training, specifically related to the clean up activities. Generally, the contracts for the clean up of DEW Line site include clauses requiring the contractor to maximize Inuit involvement. Inuit involvement in the clean up will include both employment and business (contracting) opportunities.

Typically, labour required for the clean up includes heavy equipment operators and general labourers, as well as environmental and engineering specialists. Other opportunities include cleaning and cooking staff and transportation. Effects from the clean up will be felt primarily by the communities of Cambridge Bay and Gjoa Haven. During the clean up, there will likely be increased employment and business opportunities for members of the community. As the contract for the clean up of CAM-2 has not been awarded, the requirements of the community are not confirmed. It is likely that a temporary self-sufficient construction camp will be established at the site to accommodate the contractor and other personnel.

8. 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);
- Spatial or temporal crowding;
- Growth induction initiated by the project.

8.1 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.

8.1.1 Scoping

Scoping includes the identification of issues of potential concern, VECs that could be affected and boundary setting. The activities considered included the operation of the CAM-2 North Warning System Short Range Radar site.

The spatial boundaries included impacts over a larger (regional) area including the crossing of jurisdictional boundaries. As the landfills will remain on-site, temporal boundaries extended beyond the time frame required to complete the clean up work.

8.1.2 Analysis of effects

The analysis included an evaluation of baseline data and possible effects on VECs. The combined interactions between the clean up activities and future land use and those VECs, which are similar, were identified.

8.1.3 Mitigation Measures

Mitigation measures were identified for project-environment interactions.

8.1.4 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.

8.2 Identification of Mitigation Measures and Residual Impacts

Mitigation measures were identified that would 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 CAM-2 (Appendix II). The EPP forms part of the contract documents and requires all on-site personnel to adhere to the mitigation measures outlined.

Table 8.1 summarizes the mitigation measures identified for the potential adverse environmental impacts detailed above. Taking into account the mitigation measures, the significance or anticipated residual impacts were identified for all potential adverse impacts.

Table 8.1 - Summary of Impacts and Mitigation Measures

Impact	Mitigation Measure	Significance
The extraction of granular materials and grading activities have the potential to create dust and impact air quality.	Implement dust control measures. Only water will be used for dust suppression.	Not significant.
The potential for migration of leachate from the existing and new landfills could degrade soil and water quality.	New facilities do not include hazardous materials. The Tier II facility will incorporate leachate containment, which includes synthetic liner and freezeback of permafrost. Grade landfill cover to promote surface run-off. Site facilities away from natural drainages.	Not significant due to design criteria for landfill development and closure.
The potential exists for accidental release of hazardous materials and contaminated soil. An accidental release would impact the local environment, including soil and water quality.	Implement proper handling, storage and transportation procedures for hazardous materials. All workers to be trained in proper handling procedures for all hazardous materials on-site. Do not store hazardous materials, including fuel, on beach. Follow the spill contingency plans. Ensure all materials and equipment to implement contingency plans are available on-site. Handle all fuel in accordance with Contingency Plan.	Significant impacts are not likely provided mitigation measures are implemented.

Impact	Mitigation Measure	Significance
The operation of the construction camp will include treatment and disposal of waste. The potential exists for waste to impact the environment, including soil and water quality.	Do not dispose of hazardous materials in camp waste system. Disposal of all sewage to be in accordance with applicable regulations and guidelines.	Not significant.
Erosion and sedimentation of waterbodies during grading and gravel extraction activities has the potential to impact water quality.	Prevent siltation by use of berms and/or silt fences. Do not operate equipment within the wetted perimeter. Disturbed areas adjacent to water to be stabilized, if required.	Significant effects not likely provided mitigation measures are implemented.
Excavation required for the development or closure of the landfills and contaminated soil excavation has the potential to degrade permafrost.	Minimize time permafrost is exposed. Minimize surface area of exposed permafrost or active zone.	Not significant.
Disturbance of the terrain and drainage may occur due to extraction of granular material, the development and closure of the landfills, movement of contractor's equipment and personnel around the site and removal of site debris.	Regrade and reshape disturbed areas to match existing terrain and drainage paths. Use existing roads for movement around the site.	Not significant provided mitigation measures are implemented.

Impact	Mitigation Measure	Significance
The use of heavy equipment in various aspects of the clean up including, landfill development and closure, demolition, grading and transportation, will increase noise levels, which has the potential to disturb wildlife. Marine transportation to and from the site has the potential to disturb marine mammals.	Avoid known wildlife colonies or bird nesting areas. Employ minimum distance for transportation activities.	Not significant provided mitigation measures are properly implemented.
Loss of habitat as a result of the development of the new landfills and the extraction of granular material in previously undisturbed areas.	Regrade and reshape the disturbed areas to match existing terrain to facilitate recovery of ecosystem components.	Not significant.
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.	Not significant.
Impact on aquatic habitat due to sediment and/or hazardous materials entering an aquatic environment from activities such as the extraction of granular materials, grading and handling of contaminated soil and other hazardous materials	Implement mitigation measures to prevent deleterious substances from entering the aquatic environment.	Significant effects not likely provided mitigation measures are implemented.
The transportation to/from the site has the potential to disturb aquatic animals.	Follow designated routes and times for shipping activities.	Significant effects not likely provided mitigation measures are implemented.

Impact	Mitigation Measure	Significance
The excavation of hazardous materials from the landfills, the collection and disposal of hazardous debris, the removal of hazardous materials from the facilities, and general handling of hazardous materials has the potential to impact health and safety of workers.	Transportation of any hazardous materials to be in accordance with Transportation of Dangerous Goods Regulations. Develop and implement a comprehensive health and safety plan. Workers are to wear and use appropriate personal protective equipment. Workers to be trained in use of personal protective equipment and proper handling procedure for hazardous materials. Proper procedures for working around heavy equipment to be implemented.	Significant effects not likely provided mitigation measures are implemented.
The presence and movement of people around the site has the potential to disturb archaeological resources in the area.	Clearly mark archaeological resources. Avoid resources. Contact authorities in the event a new resource is discovered or a known resource is disturbed.	Not significant.
Clean up activities may disturb traditional land use, hunting and fishing activities that would occur during the summer months	Contact local hunters and trapper organization to coordinate clean up activities and traditional land use.	Not significant.

9. PUBLIC CONSULTATION PROCESS

As part of the DEW Line Clean Up project, public consultations were carried out in communities across the north since August 1992. In 1992 and 1993, teams from the DND and other federal departments conducted a broad range of public consultation sessions to consult the local residents about the project and to obtain input regarding specific concerns about the work.

9.1 Initial Public Consultation

DND has sought 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 includes two major elements:

- Adequate public notification; and
- Appropriate public consultation.

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 proved useful in identifying public concerns, needs and values before final decisions on courses of action were made.

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

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. Minutes were recorded at each of the meetings and action items passed on to the responsible agencies.

9.1.1 1992 Program

Nine communities were visited in 1992 including: Broughton Island; Clyde River; Igloolik; Hall Beach; Taloyoak (formerly Spence Bay); Kugaruuk (formerly Pelly Bay); Gjoa Haven; Kugluktuk (formerly Coppermine); and Cambridge Bay.

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 DEW Line Clean Up (DLCU) Protocol adopted for the project;
- Provide general information regarding the demolition/disposal of facilities;
- Obtain information regarding public concerns through discussions at the meetings and through questionnaires; and
- Obtain information regarding local labour and contracting capabilities to assist in developing implementation strategies.

A report prepared by the project management team outlined the information provided to the public and summarized questions/concerns that arose during the meetings.

A variety of questions and concerns were raised regarding all aspects of the project; however, almost half of the questions and concerns dealt with employment opportunities and environmental impact and protection. There is a serious desire among the people in the communities to obtain training and to be involved in the clean up of the sites. The issue of environmental impact and protection was expressed as concern about the short and long term impact on the food chain. Perhaps the most serious concerns expressed centred on previous disposal practices, particularly ocean dumping.

The appearance of the sites, particularly those adjacent to communities, was also a concern raised during the meetings. The proposed clean up protocol was generally accepted to be the most practical.

In general, the meetings were well attended, the project team was well received and discussions were wide ranging and lively. People seemed to appreciate the initiative taken by DND to inform the communities regarding the DLCU project and the public provided valuable insights. In some cases, the community expressed unrealistic expectations regarding the economic impact of a one-time project and it was important to correct these.

9.1.2 1993 Program

The same nine communities in the Nunavut Settlement Area visited in 1992 were revisited in May and June 1993. The objectives for this second round of meetings were as follows:

- Update the communities on the current status of the project;
- Present information on the site investigations and the 80% Design Submission for ten DND DEW Line sites studied in 1992;
- Provide clean up protocol information on the remaining 11 DND DEW Line sites surveyed in 1992;

- Present information on the plans for the 21 DEW Line sites; and
- Request suggestions and ideas regarding community concerns with the clean up plans.

The questions and concerns raised by the public were similar in nature to those expressed during the 1992 meetings. Community members were predominantly concerned about employment, business and training opportunities as well as environmental protection and impact to the food chain.

Generally, public concern on the aforementioned issues was alleviated through these consultation sessions.

9.1.3 1994 Program

In 1994, public consultation focused on the involvement of both the territorial government and the recently formed Inuit organisations. Two meetings were held in late 1994 with Nunavut officials in Cambridge Bay (Kitikmeot Inuit Association/Nunavut Tunngavik Incorporated joint meeting and Nunavut Planning Commission).

9.1.4 Pre-Construction Public Consultation

In the summer of 2001, during the delineation investigations for CAM-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 (Nunavut Tunngavik Incorporated (NTI) technical representative) included:

- Discussions with long time residents and community officials, including Hamlet Assistant Senior Administrative Officer and Chairman of Hunters and Trappers Association; and

- Site visit by NTI technical representative with a local community representative.

The local community was able to provide much information on past disposal practices. Concerns and comments were gathered and incorporated into the delineation investigation plans and the clean up plans.

The NTI technical representative and the local representative were on-site during portions of the delineation work. During this time, the NTI technical representative was able to observe the site and note any technical concerns that may have been overlooked by the DND investigation team.

Another meeting in the nearest local community is typically planned for two to three months prior to the start of the construction work to review the program with the local people. It is anticipated there will be a meeting regarding the work at CAM-2 in March or April of 2003.

9.2 DND/NTI Project Review Committee

As part of the Agreement between the Department of National Defence and Nunavut Tunngavik Incorporated (Appendix VI), there will be regularly scheduled meetings between these two organizations. These meetings, which will 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.

10. ABANDONMENT AND DECOMMISSIONING PLAN

The contract documents for the DLCU Project will require the contractor to clean up and remediate the area in which their activities took place. Following the completion of clean up activities, all vehicles and equipment, remaining fuel, supplies, and construction camp are to be removed from the site by the contractor. The construction specifications provide for a percentage of the payment for mobilization/demobilization to be withheld pending a satisfactory withdrawal from the site.

The contractor will be required to arrange for demobilization, which usually coincides with the annual sealift. All provisions of the EPP will be strictly adhered to until the demobilization is complete.

11. MONITORING AND MAINTENANCE PLANS

11.1 Monitoring in Relation to the Environmental Assessment

This monitoring involves a continual on-site review of impact predictions made during the environmental assessment process. The purpose of this monitoring is two fold:

- To confirm the accuracy of impact predictions made if, and when, they occur on-site and to ensure that mitigative action taken is appropriate; and
- To be able to identify impacts that occur on-site that may not have been identified during the assessment process but, none the less, require an appropriate mitigative response.

The results of this on-site assessment will be reviewed on an annual basis as part of the project quality assurance program. Assessment areas and impact predictions requiring adjustment or re-evaluation are identified at this point and an action plan prepared.

11.2 Monitoring in Relation to Environmental Objectives

As part of the overall DLCU program, DND will undertake an extensive multiple year post clean up monitoring program at each site. This monitoring program is contained in the DND/NTI Agreement. The purpose of this program will be to ensure that environmental objectives, particularly those related to landfill remediation, continue to be met. The specific tasks related to the monitoring of each landfill are based on the associated risk. A site specific monitoring plan will be developed upon completion of the clean up.

The EWG will review the results of each monitoring event and provide recommendation to the DND/NTI Steering Committee. In those cases where remediation standards are not being maintained, an engineering and/or other solution will be developed and implemented to rectify the situation.

12. INFORMATION SOURCES

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

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

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

EBA. 2002. *DEW Line Clean Up Project CAM-2 (Gladman Point) DEW Line Site Geotechnical Investigation and Preliminary Landfill Designs.* Prepared by EBA Engineering Consultants Ltd. October 2002.

Environmental Working Group. 2002. *NTI/DND Environmental Working Group Record of Recommendations – Gladman Point (CAM-2), Landfills and Hydrocarbon Contaminated Areas.* Prepared by the Environmental Working Group. July 2002.

Environmental Science Group. 2002. *CAM-2, Gladman Point, Site Remediation Phase One: Investigation, 2001.* Prepared by Royal Military College. Kingston, Ontario, June 2002.

Project Management Office DEW Line Clean Up. 1998b. *Project Description for Nunavut Impact Review Board Clean Up of Fifteen DEW Line Sites in the Nunavut Settlement Area.* Prepared at Defence Construction Canada, Ottawa, Ontario, June 1998.

Nunavut Land Claims Agreement. Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada. July 1993.

UMA. 1991. *Environmental Clean Up Study of 21 DEW Line Sites in Canada. Volume 14.* Prepared by UMA Engineering Ltd., in association with Hardy BBT Limited and Jacques Whitford Group. June 1991.

UMA. 2002. *Specifications for the CAM-2 Gladman Point DEW Line Site – Draft.* Prepared by UMA Engineering Ltd., in association with SGE Acres. November 2002