

ENVIRONMENTAL MONITORING PLAN

EKALUGAD DEWLINE SITE FOX-C

1.0 INTRODUCTION

Indian and Northern Affairs Canada (INAC) have retained Public Works and Government Services Canada (PWGSC) to complete the remediation program at the abandoned Intermediate DEW Line site at Ekalugad Fjord, Nunavut.

The following tasks will be completed in order to achieve site remediation objectives:

- ❖ Existing site infrastructure will be demolished and the demolition wastes will be segregated into hazardous and non-hazardous materials and disposed of appropriately;
- ❖ Contaminated soil areas, identified during the previous field investigations, will be remediated;
- ❖ All hazardous materials and soil will be disposed of at an off-site licensed disposal facility;
- ❖ Scattered surface debris and partially buried debris at the site is to 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, on this site, will be remediated, as required; and
- ❖ Disturbed areas will be physically restored to and shaped to match the existing terrain.

This document will present a brief description of environmental monitoring that is to be carried out at the site as part of the remediation project as well as the long term monitoring program that will be completed following this project.

2.0 MONITORING DUTIES

Site monitoring will be split between the site engineer, an environmental monitor and the site contractor. Duties of the site engineer will include making sure the contractor adheres to the contract specifications that contain all site remedial activities and to make decisions that may not be addressed within the contract or that require an on-site decision. The environmental monitor will be at site to ensure that all instream work including the installation of culverts and the removal of fuel drums is conducted as per the EPP that was completed for DFO approval.

Section 4.0 details the instream work that is to be conducted at site and the monitoring that will be required from the environmental monitor.

The site contractor is bound by the contract specifications and is responsible for providing the camp, equipment and contract work as is indicated by the specifications unless otherwise indicated by the engineer or the environmental monitor.

3.0 PROJECT TASKS

3.1 Excavation of Impacted Soils

The total volume of soils impacted by hydrocarbon, metals and PCBs are estimated at 1,444 m³. Soils that are only impacted with PHC's will be treated in an on site engineered landfarm facility that will be constructed as part of the remedial activities. Metals and PCB impacted soils will be transported off site to a registered facility for disposal. Ongoing monitoring of these activities will be carried out under the direction of the Site Engineer ("the Engineer").

Soil excavations will remain free of standing water during soil removal, confirmatory sampling and backfilling activities. Transportation of the Tier I F3/F4 contaminated soils from excavation to landfarm will be carried out in such a manner such that no soils or liquid will be spilled during transport.

Excavation will not be permitted within 2m of any watercourse or within 2m of the high water mark of the intertidal zone. The Engineer will co-operate with the Environmental Monitor if any excavation is required within the watercourse. If this is required, the area will be isolated with a coffer dam and pump so that all excavation activity is completed in the dry (as per Barrel Removal EPP).

Excavating equipment will be cleaned prior to mobilization to the next impacted area. Special precautions will be made to ensure the bucket and tracks of the equipment are devoid of soil lumps and particles to avoid tracking of impacted soils through the site. Decontamination of the equipment which comes in direct contact with the contaminated soils will be steam cleaned or cleaned by other means acceptable to the engineer and on site environmental monitor. This will be completed in a secure area capable of containing the waste generated by the washing operation. Any waste soils resulting from the decontamination procedure will be treated as Tier II or hydrocarbon contaminated soil.

Excavated material will be replaced with granular fill, compacted and graded to match the existing ground surface. Backfilling operations will not commence until confirmatory sampling and testing has been completed by the engineer to ensure that the excavation no longer contains impacted soils.

3.2 Erosion Sediment and Drainage Plan

For all excavations at site, the contractor will be submitting a drainage control plan for approval prior to commencing excavation work at the beach and other fisheries sensitive areas that will specifically address the protection of bodies of water adjacent to the excavation and the following:

- ❖ Details of grading work to prevent surface drainage into or out of the excavation areas;
- ❖ Details of erosion control works and materials to be used, including the deployment of silt fencing and containment booms during construction and excavation activities;
- ❖ Work schedule including the sequence and duration of all related work activities;
- ❖ The treatment of site runoff to prevent siltation of the water courses;
- ❖ Dewatering procedures for excavated materials including silt removal procedures prior to discharge;
- ❖ Stabilizing procedures during excavation; and
- ❖ Maintenance of filters and sedimentation traps.

3.3 Confirmatory Sampling

Confirmatory sampling will be carried out on contaminated soil areas. The locations, frequency and method of testing will be determined by the Engineer at site. Soil sampling will be carried out within the perimeter of each contaminated soil excavation and at a depth within the completed excavation area, immediately upon completion of excavation. Criteria used for soils will be the DCC DEW Line Cleanup Criteria for metals and PCBs and the CCME Canadian Wide Standards for PHCs. Any metals, PHCs, or PAHs not covered under DCC or CCME criteria will be dealt with using a site specific risk assessment (SSRA) where required.

3.4 Soil Disposal Requirements

The analytical results for inorganic elements and PCBs can be interpreted using the established DEW Line Cleanup Criteria (DCC). The DCC protocol defines two concentration tiers of soil contamination for metals and polychlorinated biphenyls (PCBs), including Tier I Contaminated Soils, which is either placed in a on-site landfill or buried beneath a minimum of 0.3m of clean fill and Tier II Contaminated Soil, which requires disposal 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) require disposal off-site at a licensed disposal or destruction facility.

For soils contaminated with hydrocarbons, the Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHC) defines criteria for a residential/parkland application for fine grained soil. The generic Tier 1 values were assumed for the residential/parkland uses using the default set of exposure assumptions. Although the Tier I guidelines were developed for a more typical “southern exposure and land uses”, the use of these generic guidelines for the DIAND Intermediate DEW Line Sites is considered suitable.

The contaminated soils at Ekalugad Fox-C have been divided into several categories depending on the type and severity of the contamination. Generally, non-hazardous surface contaminants are covered or excavated.¹

3.5 Landfarm Facilities

3.5.1 Ex-situ Landfarm Operation

The landfarm will be constructed as per the approved engineering drawings. Perimeter berms and trenching for collection system will be constructed. Monitoring wells will be installed at locations as directed by the site engineer once construction of the facility is complete. These wells will be utilized to ensure contaminants are not migrating from the facility. Soils will be tilled and treated with nutrients to accelerate the biodegradation process. Application rates of the nutrients will be based on the results of testing to be carried out by the engineer prior to landfarm operation. Water content of the soil will be kept at approximately 15 per cent and testing will be carried out on a weekly basis. Tilling of the soils and nutrient application will be conducted every 10 days or 5 days if soils are dry (approximately 10 applications). During periods of heavy precipitation, the soils will not be tilled until the soil is considered damp to a depth of 100mm. If the average daily temperature drops below 0°C for a period exceeding 5 days, tilling and nutrient application will be suspended.

3.5.2 In-situ Landfarm Operation

The in-situ landfarm operation will be treated without removing the soils from the site. The soils will be tilled in place and treated with nutrients to accelerate the biodegradation process. Application rates of the nutrients will be based on the results of testing to be carried out by the engineer prior to landfarm operation. Water content of the soil will be kept at approximately 15 per cent and testing will be carried out on a weekly basis. Tilling of the soils and nutrient application will be conducted every 10 days or 5 days if soils are dry (approximately 10 applications). During periods of heavy precipitation, the soils will not be tilled until the soil is considered damp to a depth of 100mm. If the average daily

¹ UMA 2004, Draft Remediation Work Plan

temperature drops below 0°C for a period exceeding 5 days, tilling and nutrient application will be suspended.

3.5.3 Landfarm Closure

Ex-situ Landfarm

Decommissioning of the landfarm will be completed in the second year of remedial work. The successfully treated soils will be consolidated to a maximum depth of 1 metre. The granular materials from the treatment area perimeter berms will be excavated and placed over the consolidated treated soil area. The surface area of the landfarm will be graded including the perimeter trenches to promote surface water run-off.

In-situ Landfarm

The in-situ treated soils will be capped with 300 mm of compacted granular material to provide a cover of the treated soils.

Monitoring Wells

After a final sampling episode of the perimeter wells for both the ex-situ and in-situ facilities, decommissioning of the wells will be completed. The monitoring wells will be filled to within 300mm of the surface with granular bentonite. The bentonite will then be hydrated with a sufficient amount of water to provide an adequate seal throughout the well. The casings will be cut-off to within 300mm of the ground surface and the remaining voids will be backfilled with granular fill.

3.6 Hazardous Waste

3.6.1 Fuel Drums

These items include empty barrels and equipment that have been abandoned on site. A total count of 8380 empty drums were identified at site. The areas beneath the drums will have further sampling conducted once removal has been completed.

All drums are to be inspected by the on site engineer to identify the process for potential opening, sampling, testing and handling of the drums. The inspection will determine signs of deterioration and evidence of spill or other contamination on the top and sides of the drum as well as the surrounding soils.

Areas around the drums will be tested using a Volatile Organic Compound (VOC) instrument prior to movement. If levels exceed 20 per cent Lower Explosive Limit (LEL) as measured by the VOC, all handling will be conducted in accordance with the appropriate sections of the NIOSH guidelines, Nation Fire Code of Canada and the TDGA for flammable and combustible materials.

Disposal of the drum content will be in accordance with the wastewater discharge criteria in Section 4.2 of this report. All contents in excess of the applicable criteria will be packaged in accordance with TDGA regulations and shipped off site for disposal in a registered facility.

All drums will be steamed cleaned to remove any residual products. The drums will then be crushed and shredded prior to disposal in the onsite landfill. The rinsate from the stream cleaning will be tested by the engineer. If concentrations exceed the criteria, the rinsate will be packaged according to TDG regulations and shipped off site for disposal in a registered facility.

3.6.2 Fuel Tanks and Pipelines

The pipelines will be drained and flushed of all potential product prior to dismantling. These pipelines will be cut and disposed of in the landfill. All liquids within the fuel tanks and pipelines will be incinerated at site. Degassing of the tanks will commence under the Petroleum Association for Conservation of the Canadian Environment (PACE). The area will be monitored for vapor build up during degassing. Wastewater will be tested by the engineer and if concentrations exceed the criteria, the wastewater will be packaged according to TDG regulations and shipped off site for disposal in a registered facility.

3.7 Non Hazardous Waste

Approximately 6400m³ of non-hazardous materials are located at the site. These materials will be consolidated into two engineered landfills that are to be constructed at the site.

3.8 Demolition of Structures

Some of the structures to be demolished contain asbestos, lead and PCB containing materials. The contractor and all other personnel on site will be required to abide by all regulations under Labour Canada, NIOSH and the Territorial government.

3.8.1 Asbestos Abatement

There is approximately 60m² of asbestos insulation, 225 lineal metres of asbestos pipe insulation, and 45m² of asbestos tile located on site. The asbestos will be double bagged and placed in the newly constructed on site landfills. A visual inspection of the area of removal will be completed to ensure that all asbestos containing materials have been removed and that no debris is left at site.

3.8.2 PCB Abatement

Prior to the dismantling of the structures and facilities, any loose paint will be removed and placed in polyethylene bags. During dismantling activities, all loose paint and paint particles will be collected by the use of drop clothes and contained within the facility by the use of polyethylene sheets. A control area will be constructed around the area to ensure no paint chips escape into the environment. A visual inspection will be conducted after removal to ensure that all particles and chips were retained within the control area. If there is uncertainty that the PCB materials were not contained, soil sampling will be conducted in the area for confirmation purposes.

PCB materials will be placed in containers registered under the TDGA for transportation and disposal at a licensed facility. All containers will be clearly marked in accordance with the requirements of CEPA and TDGA.

3.9 Engineered Landfills

Two non-hazardous waste (NHW) landfill sites will be designed on the premise that it will contain non-hazardous materials only and will not generate leachate. The NHW design will not be constructed to maintain the contents in a perennially frozen state. An NHW landfill consists of a perimeter berm and granular cover to minimize erosion and infiltration in order to provide long-term stability. A NH landfill is generally established on native ground (stripped of organic matter). No base cover or liner is required.

The materials that are to be disposed of in the NHW landfills include:

- ❖ Tier I contaminated soils;
- ❖ Hydrocarbon contaminated soil, where applicable;
- ❖ Non-hazardous demolition debris;
- ❖ Non-hazardous site debris;
- ❖ Non-hazardous debris/soils excavated from landfills;
- ❖ Creosote timbers wrapped in polyethylene sheeting; and
- ❖ Double-bagged asbestos

3.10 Camp Operations

3.10.1 Site Maintenance

The site will be kept free of the accumulation of waste material and debris. Upon completion of the remedial work, the camp will clean and dispose of all surplus materials, supplies, rubbish and temporary works leaving the site neat and tidy to the requirements of the site engineer and the land use permit.

3.10.2 Waste Water Discharge

Wash water, meltwater collection, rinse water resulting from the cleaning of fuel tanks and pipelines, water from dewatering contaminated soil areas, and/or any other liquid effluent stream shall be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and shall conform the following applicable guidelines:

Parameter	Maximum Allowable Concentration
pH	6 to 9
Oil and Grease	5 mg/L and none visible
Arsenic (total)	100ug/L
Cadmium (dissolved)	10 ug/L
Chromium (total)	100 ug/L
Cobalt (dissolved)	50 ug/L
Copper (dissolved)	200 ug/L
Lead (dissolved)	50 ug/L
Mercury (total)	0.6 ug/L
Nickel (dissolved)	200 ug/L
PCB: discharge to barren area	50 ug/L
PCB: discharge to vegetated area	5 ug/L
Phenols	20 ug/L
Zinc (total)	1000 ug/L

Any liquids not conforming to these guidelines will be treated as hazardous waste materials and disposed of in accordance within the hazardous waste regulations.

3.10.3 Sewage Disposal Requirements

Sewage disposal will comply with the requirements of the Land Use Permit, the Water Licence and the Public Health Act (Nunavut). The temporary lagoon will be located in the away from the following locations:

- ❖ A minimum of 100 m from the construction camp;
- ❖ A minimum of 100 m from drainage paths;
- ❖ A minimum of 450 m from water bodies supporting aquatic life; and
- ❖ Downwind of the construction camp based on the prevailing wind direction.

3.10.4 Spill Contingency Plan

A spill contingency plan will be completed for the site to include all the anticipated volumes of fuel that will be stored at the site for the remedial activities, the method of dispensation and possible maximum volume that could be spilled. Response capabilities will be identified detailing response time, and types and volumes of spills to which the contractor and site engineer can respond. Spills

will be reported immediately to the site engineer and a written report will be submitted within 24 hours of the incident.

3.10.5 Health and Safety Plan

A site specific health and safety plan will be submitted to the PWGSC engineer by the contractor. The HASP must ensure that all requirements under the Nunavut Safety Act, OSHA Regulations, other Authorities with jurisdiction and the Contract Specifications have been addressed.

4.0 INSTREAM WORKS AND MONITORING

4.1 Fisheries

An environmental protection plan (EPP) was completed for Fisheries and Oceans Canada to provide a detailed document indicating the protocol of fuel drum removal and culvert installation. The approved EPP and Letter of Advise from FOC can be found in Appendix A of this report.

Sediment control will be monitored by a qualified environmental monitor to ensure that sediment does not reach levels considered harmful to fish and fish habitat. Sampling of the sediments to ensure there are no impacts in the soils/sediments can be completed in areas of geological formations that would retain contaminants. Soils/sediments characteristic of clay and silt matrices that would typically be found in the alluvial fan deposits along the glacial stream, may have retained contaminants. Soils/sediments characteristic of the river that connects the fjord to the lake are of large granular and cobble nature and do not have retentive qualities, making them highly unlikely to retain contaminants. The velocity of the river is such that erosion of the banks and riverbed is a continual process, thus making any retention of product improbable unless release has been recent such as when the drums are being removed from the riverbed. The EPP has addressed this issue by utilizing booms with silt fencing around the removal area and downstream of the area. A spill kit will also be on site at the area of removal. This kit contains absorbent materials to skim product from the surface of the water if required.

4.1.1 Sampling Floodplain and In Stream

If it is determined that soil/sediment sampling is required in the areas of the fuel drum deposits, the environmental monitor will take samples and complete testing for petroleum hydrocarbons using both an Eagle® and Petroflag® test kits. The Eagle® will be utilized for screening the soils/sediments to determine which of the samples will require a Petroflag® test. It is unlikely that in stream sampling will be conducted at the site due to the geology however, if it is determined that an in stream sample is required, a coffer dam will be constructed around the

proposed sampling area and the sample will be taken in the dry (as indicated in the EPP).

4.2 Erosion of Water Body Banks

The site is located in an area of limited vegetative qualities as the banks of the water bodies consist of glacial till materials. These materials are subject to excessive erosion during spring freshet and heavy rainfalls. Areas of disturbance during the construction activities will be assessed by the on site environmental monitor for erosion and potential sediment control issues. If there are areas of construction disturbance that have the potential to cause excessive erosion (more than what would typically occur) site stabilization prior to the equipment leaving the site will be completed. Site stabilization would consist of protecting exposed surface areas of silty/clay soils with cobble and gravel materials that are native to the area. Areas within the floodplain (outlets of the glacial streams) that consist naturally of silt materials would not require protection. Re-vegetation of these areas is not an option due to the lack of growth at this site.

Part of the remedial works are to re-establish access to the site by stabilizing the access road at areas of erosion. This will stabilize the areas and cause less sediment and erosion of the areas along the river/stream banks. Some of the areas of erosion are caused by either the collapse or improper installation of culverts within the glacial streambed. These obstructions are to be removed and replaced with new culverts for the duration of the construction activities. These culverts will be removed after construction completion to allow the glacial stream to run its natural course.

5.0 POST REMEDIATION LONG TERM MONITORING

The expected duration of remedial activities on site will generally be from July to October. During the winter months, work will cease and equipment and facilities on site will be winterized. Completion of the site remediation and demobilization of the contractors' facilities and equipment is anticipated for 2007. Long term monitoring of the landfills will begin upon completion of the clean up (2008) and will continue for a 25-year period. After 25 years, the monitoring requirements will be re-evaluated.