Formerly Used Defense Sites Program

DECISION DOCUMENT

NUVAGAPAK POINT DEW LINE STATION, ALASKA

Hazardous, Toxic, and Radioactive Waste (HTRW) Project #F10AK0009-03

FUDS ID: F10AK0009

August 2013

U.S. Army Corps of Engineers, Alaska District
Environmental and Special Programs Branch
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EXECUTIVE SUMMARY

This Decision Document presents the selected remedy for the Nuvagapak Point Distant Early Warning (DEW) Line Station FUDS, Alaska. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It also meets State of Alaska Department of Environmental Conservation (ADEC) requirements for cleanup of petroleum, oil, and lubricants (POL) contaminated sites. This decision is based on the Administrative Record file for the site and was chosen in consultation with the ADEC.

The Nuvagapak Point DEW Line Station is located on the North Slope of Alaska, along the shore of the Beaufort Sea. The site is also within the Arctic National Wildlife Refuge. The closest community is Kaktovik, Alaska, about 30 miles to the northwest. The USACE has been conducting investigations and restoration activities at the Nuvagapak DEW Line Station site since 1985. Historical remedial activities include various site investigations between 1985 and 2007, and removal actions in 1994 (hazardous and non-hazardous debris), 2000 (building demolition, debris/equipment, selective petroleum soil removal), and 2012-2013 (contaminated soil). The remaining contaminants of concern include polychlorinated biphenyls (PCBs) and petroleum hydrocarbons.

USACE has selected Soil Bioremediation and Off-Site PCB Disposal, as the remedy for the contaminated soils at the Nuvagapak Point DEW Line Station. Other alternatives considered were no action, land use controls, capping, on-site disposal, and offsite treatment/ disposal. The selected remedy includes planning, equipment mobilization/demobilization, constructing and operating a soil bioremediation treatment cell for petroleum contaminated soil, transporting PCB contaminated soil and concrete for offsite disposal, restoring excavated areas through regrading and/or revegetation, and decommissioning the treatment cell once petroleum hydrocarbon concentrations are below cleanup levels. The present worth cost of the selected remedy is $2,734,341. Long term management of the site will not be necessary, since contaminated materials will be removed and/or remediated to below applicable cleanup levels. Land use will be unrestricted after successful completion of the selected remedial action. Since no CERCLA hazardous substances, pollutants, or contaminants will remain above levels which allow for unlimited use and unrestricted exposure, a five year review is not required.

TABLE OF CONTENTS

Page

1.0 PART 1: DECLARATION 1
1.1 Site Name and Location 1
1.2 Statement of Basis and Purpose 1
1.3 Assessment of Site 1-2
1.4 Description of Selected Remedy 3-4
1.5 Statutory Determinations....................4
1.6 DD Data Certification Checklist 5
1.7 Authorizing Signature 5

2.0 PART 2: DECISION SUMMARY 6
2.1 Site Name, Location, and Brief Description 6
2.2 Site History and Enforcement Activities....................7
2.3 Community Participation 7-8
2.4 Scope and Role of Response Action 8-9
2.5 Site Characteristics.................... 9-10
2.5.1 Site Overview....................10
2.5.2 Site Investigations.................... 10-11
2.5.2.1 Dump Site D....................11
2.5.2.2 AST Pad Area 12-13
2.5.2.3 Composite Building 14-15
2.5.2.4 Shop Area.................... 15-16
2.5.2.5 Grid Area (Debris Pile A) 16
2.5.3 Types and Quantities of Contaminated Media....................17
2.5.4 Conceptual Site Models 17
2.6 Current and Potential Future Site and Resource Uses.................... 17-18
2.7 Summary of Site Risks.................... 18-19
2.8 Remedial Action Objectives (RAOs)....................20
2.9 Description of Alternatives 20-22
2.10 Comparative Analysis of Alternatives 22-23
2.10.1 Overall Protection of Human Health and the Environment....................23
2.10.2 Compliance with ARARs 24
2.10.3 Short-Term Effectiveness 24-25
2.10.4 Long-Term Effectiveness....................25
2.10.5 Reduction in Toxicity, Mobility, or Volume 25
2.10.6 Implementability....................26
2.10.7 Cost 26
2.10.8 State Acceptance....................26
2.10.9 Community Acceptance.................... 26-27
2.11 Principal Threat Waste 27
2.12 Selected Remedy.................... 27-29
2.13 Statutory Determinations.................... 29-30

TABLE OF CONTENTS

2.13.1 Protection of Human Health and the Environment....30
2.13.2 Compliance with ARARs 30
2.13.3 Cost-Effectiveness 30-31
2.13.4 Use of Permanent Solutions....31
2.13.5 Preference for Treatment as a Principal Element 31
2.14 Documentation of Significant Changes....31

3.0 PART 3: RESPONSIVENESS SUMMARY....31
3.1 Stakeholder Comments and Lead Agency Responses 32-33

PART 4: REFERENCES....34

TABLES

1 Comparison of Highest Detected COC Concentrations and Cleanup Levels
2 Estimated Volume of Petroleum- and PCB-Contaminated Soil and Concrete
3 Summary of Exposure Media, Exposure Pathways, and COCs
4 Substantive Oral Comments Received During Public Meeting

FIGURES

1 Location and Vicinity Map
2 Site Map and Study Areas
3 Estimated Areas of Soil and Concrete Exceeding Cleanup Levels
4 Human Health Conceptual Site Model
5 Ecological Conceptual Site Model

APPENDICES

A Cumulative Risk Evaluations
B Cost Summary for Selected Remedy
C Applicable or Relevant and Appropriate Requirements

DECISION DOCUMENT
NUVAGAPAK POINT DEW LINE STATION, ALASKA

1.0 PART 1: DECLARATION

This Decision Document (DD) has been prepared by the U.S. Army Corps of Engineers (USACE) to document the selected remedial action for the Nuvagapak Point Distant Early Warning (DEW) Line Station (Nuvagapak).

1.1 Site Name and Location

Nuvagapak is within the North Slope Borough approximately 30 miles southeast of Kaktovik, Alaska (Figure 1). The site is within the Arctic National Wildlife Refuge (ANWR).

1.2 Statement of Basis and Purpose

This Decision Document (DD) presents the selected remedy for Nuvagapak, which was chosen in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Contingency Plan (NCP). This decision is based on the Administrative Record file for this site. Petroleum, oil, and lubricants (POL) contaminated sites fall under the CERCLA petroleum exclusion and are therefore being addressed under the Defense Environmental Restoration Program (DERP), as authorized in United States Code (USC), Title 10, Section 2701, et seq.. The DERP provides authority to clean up petroleum contamination when it may pose an imminent and substantial endangerment to public health, welfare or the environment. The proposed response action meets the State of Alaska Department of Environmental Conservation (ADEC) requirements for cleanup of petroleum-contaminated sites. Alaska's Site Cleanup Rules (18 AAC 75 Article 3 Oil and Other Hazardous Substances Pollution Control) are risk-based and indicative of when an imminent and substantial endangerment to the public health or welfare or the environment has been mitigated.

Detailed information supporting the selected remedial action is contained in the Administrative Record for this site, located at the U.S. Army Corps of Engineers, Alaska District Office on Joint Base Elmendorf-Richardson, Alaska and the information repository in Kaktovik, Alaska.

1.3 Assessment of Site

This Decision Document provides an overview of the Nuvagapak Point DEW Line Station. It summarizes the site description, previous investigations and remedial activities, risk evaluation, and the selected remedial action. This document also explains the rationale for selecting the action and is consistent with the regulations contained in the State of Alaska Administrative Code 18 AAC 75, Article 3.

Soil, sediment, and surface water samples collected during the various investigations were analyzed for fuels, fuel components, solvents, semivolatile organic compounds, polychlorinated biphenyls (PCBs), pesticides, and metals to determine if there was any hazardous contamination at the site. Levels of contaminants were screened using State [Alaska Department of Environmental Conservation (ADEC)] cleanup levels and Environmental Protection Agency (EPA) risk and cleanup levels. Sediment and surface water were determined to only have contamination within acceptable levels. USACE identified two types of contaminants that present an unacceptable risk. The only hazardous substance that can be remediated under CERCLA was PCBs. Final cleanup levels for PCBs in surface soil and concrete at Nuvagapak DEW Line Station have been determined and established by applicable and relevant or appropriate requirements (ARARs). Also in need of remediation were petroleum hydrocarbons that present an imminent and substantial endangerment. Petroleum hydrocarbons include both gasoline-range organics (GRO) and diesel-range organics (DRO). The petroleum contamination will be cleaned up consistent with Alaska's Site Cleanup Rules.

The cleanup levels for CERCLA hazardous substances found at the site are based on applicable state requirements promulgated in Alaska Administrative Code (18 AAC 75.341(c), Table B1). The cleanup levels for petroleum hydrocarbons are based on ADEC Method 1 and 2 cleanup levels (18 Alaska Administrative Code [AAC] 75 Tables A2 and B2), which are protective of human health and the environment, and allow unrestricted land use and access. These cleanup levels are also intended to be protective of wildlife resources at the site. This document also explains the rationale for selecting the action and is consistent with the regulations contained in the State of Alaska Administrative Code 18 AAC 75, Article 3.

Table 1 lists the soil and concrete COCs, the highest detected concentrations, and their cleanup levels. Figure 2 shows the study areas listed in this table.

Table 1 – Comparison of Highest Detected COC Concentrations and Cleanup Levels

Study Area	Contaminant of Concern	Highest Detected Concentration	Cleanup Level by Exposure Pathway	Source of Cleanup Level
Dump Site D soil	DRO	26,000 mg/kg J	200 mg/kg	ADEC Method 1[a]
AST Pad soil	GRO	2,600 mg/kg J	1,400 mg/kg (ingestion/inhalation)	ADEC Method 2[b]
Composite Building soil	PCBs	6.3 mg/kg	1 mg/kg (direct contact)	ADEC Method 2[b]
Composite Building Slab concrete	PCBs	*	1 mg/kg	ADEC Method 2[c]
Shop Area soil	PCBs	4.9 mg/kg	1 mg/kg (direct contact)	ADEC Method 2[b]
Debris Pile A soil (Grid Area)	DRO	21,000 mg/kg J	12,500 mg/kg (ingestion/inhalation)	ADEC Method 2[b]

Notes:
* Contamination determined using process-knowledge.
J Positively identified but estimated value
mg/kg milligrams per kilogram
[a] ADEC Method 1 cleanup level is applied to soil that may be subject to coastal erosion.
[b] Method 2 is applied to soil not susceptible to erosion.
[c] ADEC soil cleanup level for PCBs is also being applied to concrete.

Dump Site E, also referred to as the Kogotpak River Landfill, is a study area within the Nuvagapak Point DEW Line Station (see Figure 1). The Kogotpak River Landfill is not described further in this DD because it is the subject of a separate non-time critical removal action (ref. Action Memorandum, September 2010) which began in August 2012 and when complete, should result in the removal of COCs exceeding ADEC cleanup levels.

The response action selected in this DD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy

The USACE has selected Soil Bioremediation and Off-Site Polychlorinated Biphenyls (PCB) Disposal, as the Selected Remedy. The Selected Remedy involves excavating and treating the petroleum-contaminated soil on-site by soil bioremediation, removing and disposing PCB-contaminated soil and concrete at an off-site facility, and site restoration. Site restoration would consist of regrading the ground surface where excavation occurred on the gravel pad, and revegetating areas where excavation occurred in tundra. The areas to be addressed include Dump Site D, the Aboveground Storage Tank (AST) Pad, Composite Building, Debris Pile A, and Shop Area (Figure 3).

The primary steps for Alternative 6 include:

- project planning;
- mobilize personnel, equipment, and infrastructure needs;
- construct a soil bioremediation treatment cell in an acceptable location on the gravel pad;
- excavate petroleum-contaminated soil exceeding cleanup levels and place into treatment cells;
- excavate PCB-contaminated soil and concrete exceeding cleanup levels;
- demobilize personnel, equipment, infrastructure, and PCB wastes;
- treat petroleum-contaminated soil;
- transport, by barge, the PCB-contaminated soil and concrete for off-site disposal;
- restore the excavated contaminated soil areas through regrading and/or revegetation;
- decommission the soil bioremediation treatment cell once GRO and DRO concentrations are below cleanup levels; and
- close the site with No Further Action, Cleanup Complete status.

Alternative 6 was selected as the Selected Remedy because it best meets the remedial action objectives (RAOs) to prevent human exposure to COCs in soil and concrete; transport of COCs from their source areas; and risk to wildlife. The Selected Remedy uses on-site treatment of petroleum-contaminated soil and off-site disposal of PCB-contaminated soil and concrete as the most cost-effective way to meet RAOs and achieve site closure.

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate (ARARs) (for CERCLA hazardous substances), will meet ADEC cleanup standards for petroleum hydrocarbons, is cost-effective, and uses permanent solutions to the extent practicable. Petroleum-contaminated media are excluded from regulation under CERCLA. However, the Department of Defense (DOD) can remediate releases of petroleum where the release poses an imminent and substantial endangerment to the public health or welfare or to the environment per 10 USC 2701(b)(2). The petroleum release at the Nuvagapak Point DEW Line Station creates an imminent and substantial endangerment to public health or welfare or to the environment.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of contaminants as a principal element through treatment). Petroleum-contaminated soil will be treated on site, resulting in permanent reduction in toxicity.

The selected remedy will result in no CERCLA hazardous substances, pollutants, or contaminants remaining on-site above levels that would not allow for unlimited use and unrestricted exposure; therefore, a five-year review will not be required for this remedial action.

1.6 DD Data Certification Checklist

The following information is included in the Declaration and Decision Summary sections of this DD. Additional information can be found in the Administrative Record file for this site.

- Chemicals of concern and their respective concentrations (Section 1.3);
- Baseline risk represented by the chemicals of concern (Section 2.7);
- Cleanup levels established for chemicals of concern and the basis for these levels (Section 1.3);
- How source materials constituting principal threats are addressed (Section 2.11);
- Current and reasonably anticipated future land use assumptions used in the assessment of risk (Section 2.6; groundwater is not considered an exposure medium at this site);
- Potential land use that will be available at the site as a result of the Selected Remedy (Section 2.12; groundwater is not considered an exposure medium at this site);
- Estimated capital, annual operation and maintenance (O&M), and total present work costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.10); and
- Key factor(s) that led to selecting the remedy (Section 2.12).

1.7 Authorizing Signature

This Decision Document presents the selected remedial action of excavation and bioremediation at the Nuvagapak DEW Line Station Formerly Used Defense Site (FUDS). This Decision Document will be incorporated into the Administrative File for the site which is available for public review. The U.S. Army Corps of Engineers is the lead agency under the Defense Environmental Restoration Program at the Nuvagapak DEW Line Station Formerly Used Defense Site (F10AK0009), and has developed this Decision Document under CERCLA. This document, presenting a selected remedy with a present worth cost estimate of $2.7 million, is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, Subject: Policies for Staffing and Approving Decision Documents, and to Engineer Regulation 200-3-1, Formerly Used Defense Sites Program Policy.

Christine A. Godfrey
Acting Chief, Environmental Division
Directorate of Military Programs

2.0 PART 2: DECISION SUMMARY

The purpose of this section is to provide an overview of the site characteristics, alternatives evaluated, and the analysis of those options. It also identifies the Selected Remedy and explains how the remedy fulfills statutory and regulatory requirements.

2.1 Site Name, Location, and Brief Description

The Nuvagapak Point DEW Line Station is on Alaska's North Slope approximately 30 miles southeast of Kaktovik, Alaska.

Latitude: 69.8894
Longitude: -142.3042
ADEC File Number: 380.38.004
CERCLIS ID: AK9143600196
Operable Unit: Not applicable

The site is an archived CERCLA site and is not on the National Priorities List (NPL); site assessment and remediation activities are being conducted and funded by the USACE under the FUDS program. The USACE is the lead agency for FUDS related activities. The ADEC is the lead regulatory agency. The U.S. Fish and Wildlife Service (USFWS) is the Federal Land Manager for this property.

The Nuvagapak Point DEW Line station was an installation of the DOD under the jurisdiction of the Department of the Air Force until August 10, 1965, when jurisdiction was passed to the Department of the Navy. The Navy filed a Notice of Intent to Relinquish on February 11, 1970. The site acreage was selected for inclusion into ANWR on December 2, 1980; transfer to the Bureau of Land Management and USFWS became effective on March 28, 1985. Management control was given to the USFWS on March 28, 1985.

From 1953 until 1962, the former Nuvagapak Point DEW Line Station was used as a radar defense facility. Original site improvements consisted of a composite building, shop building, warehouse, a 240-foot-tall radio tower, various storage sheds, a fuel pipeline, and a fuel-storage system consisting of a pump house and ASTs. Most structures have been removed. The gravel pad and airstrip remain, as does a concrete foundation for the former Composite Building.

2.2 Site History and Enforcement Activities

The sources of contamination at Nuvagapak were ASTs, fuel-transfer piping, drums, transformers, and dump sites used during station operation. Contamination resulted from spills and leaks from containers used during operations, and from containers, equipment, and dump areas left at the Station until removal during remedial actions in 1994 and 2000. The dumps comprise surface debris that has been buried by sediment or tidal movement; there are no landfills at the Station. Contaminated media that remain at Nuvagapak include gravel-pad soil, concrete, tundra soil, and pond water.

Between 1985 and 2007, the USACE led several investigations to evaluate environmental contamination at the site. USACE conducted a removal action in 1994 to remove the structures on the site, and a remedial action in 2000 to remove hazardous material, debris, and petroleum-contaminated soil. Pipelines at the site have been cleaned or removed. Even after these actions were completed, some contaminated soil, sediment, and surface water remained. USACE conducted additional studies in 2003 and 2007 to determine the extent of the contamination remaining. As a result of the investigations, contaminants including, but not limited to, petroleum hydrocarbons and PCBs were detected in soil and surface water at the station.

No enforcement activities have occurred at the site; the ADEC has reviewed USACE activities at the site.

2.3 Community Participation

Community participation included preparing a Proposed Plan (PP), conducting a public meeting in Kaktovik, Alaska, distributing fact sheets and other informational outreach, and soliciting comments from interested parties. The Kaveolook School library in Kaktovik houses a project information repository.

The PP (*Formerly Used Defense Sites Program, Proposed Plan, Nuvagapak Point Distant Early Warning Line Station, February 2012*) is part of the administrative record for this project. The PP was made available to government agencies and the general public for review and comment during the public comment period, March 15 to April 16, 2012.

A public meeting was held in Kaktovik on March 21, 2012. This meeting was advertised in the *Fairbanks Daily News-Miner* (March 10 and March 17, 2012), and the (Kaktovik) *Arctic Sounder* (March 8 and March 15, 2012). The meeting was staffed by representatives of Shannon & Wilson, the USACE, ADEC, and HDR Alaska. The meeting consisted of presentations by Shannon & Wilson and the USACE describing the site history and contaminants, proposed cleanup alternatives, site location, the remedial investigation/feasibility study (RI/FS) process, and how the public can be involved.

Prior to the public meeting, the PP was also introduced through a fact sheet designed to announce the upcoming public meeting, provide project information, describe the contaminants of concern and cleanup objectives, outline the alternatives and their evaluation criteria, and solicit comments. The fact sheet was mailed on March 6 to all post office box holders in Kaktovik. The fact sheet was also mailed to agencies, and copies were taken to the public meeting for additional distribution. Throughout this process, the public has been encouraged to comment on the preferred alternative and to offer their views on future land use.

2.4 Scope and Role of Response Action

The Nuvagapak Point DEW Line Station is considered a single site for the purposes of the overall cleanup plan. The overall strategy for site remediation is to remove sources of contamination from the site, address COCs, and achieve site closure that allows for unrestricted future site use.

Two removal actions and one remedial action have already been conducted at the site. No structures remain at the site but several discrete areas of contaminated soil and concrete are present around the site; these will be addressed by the Selected Remedy described in this DD.

Previous response actions undertaken by the USACE at Nuvagapak included:

- 1994 Removal Action: Hart Crowser, under contract to the USACE, conducted a removal action at the Nuvagapak Point site in 1994. Its objective was to remove hazardous and nonhazardous materials from the site, including:
  - shop building and foundation demolition debris;
  - miscellaneous steel and concrete;
  - asbestos-containing materials;
  - batteries and miscellaneous hazardous debris;
  - POL liquids; and
  - lead- and petroleum-contaminated soil.
- 2000 Remedial Action: EMCON, under contract to the USACE, performed a remedial action at Nuvagapak in 2000 to demolish and remove from the site those buildings, equipment, and debris remaining after the previous removal action. Site activities included:
  - hazardous material abatement;
  - building demolition;

    - miscellaneous debris and equipment removal;
    - selective petroleum-contaminated soil removal;
    - soil and waste sampling and analysis;
    - site restoration; and
    - off-site transportation and disposal of wastes.

- 2012-2013 Removal Action: Marsh Creek, LLC, under contract to the USACE, conducted a non-time critical removal action at the Kogotpak River Landfill, or Dump Site E. The purpose was to address risk to human health and the environment from potential migration of PCB-contaminated soil into the river due to shoreline erosion of the uncontrolled former dumpsite and debris disposal area. Site activities included:
    - incidental debris removal;
    - PCB- and lead-contaminated soil removal;
    - soil sampling and analysis; and
    - off-site transportation and disposal of wastes.

The Selected Remedy documented in this DD is intended to be the final step in the overall cleanup strategy, and is expected to result in site closure with unrestricted future land use. The purpose of the Selected Remedy is to remove COCs in soil and concrete. The planned sequence of actions describe in this DD include:

- prepare planning documents, obtain permits for off-site activities;
- mobilize camp and equipment to the site by barge;
- construct the petroleum-contaminated soil treatment cell(s);
- excavate petroleum-contaminated soil and place it in the cell(s) for treatment;
- excavate PCB-contaminated soil and concrete and prepare for shipment to off-site disposal facility;
- demobilize camp, transport PCB-contaminated materials for off-site disposal;
- return to site to periodically monitor the petroleum-contaminated soil treatment process until contaminant concentrations are below cleanup levels; and
- decommission treatment cell(s).

2.5 Site Characteristics

2.5.1 Site Overview

Nuvagapak is on a low coastal plain with elevations of approximately 10 feet to 15 feet above sea level along Beaufort Lagoon. It is a remote site with no support infrastructure. The DEW Line Station facilities were constructed on gravel pads on top of and surrounded by tundra; the facilities have been demolished but the gravel pads remain. The gravel pad and surrounding tundra comprise the approximately 20-acre site. Many shallow tundra ponds are adjacent to or near the site. The tundra areas and shallow ponds are designated as jurisdictional wetlands according to the National Wetlands Inventory map for Demarcation Point (D-3), Alaska. The gravel pad and airstrip are considered uplands. Dump Site D lies within a designated wetlands acreage.

Nuvagapak Point site lies within the Arctic National Wildlife Refuge, under the jurisdiction of the U.S. Fish and Wildlife Service. The Arctic National Wildlife Refuge is home to some of the most diverse wildlife in the arctic including 42 fish species, 37 land mammals, eight marine mammals, and more than 200 migratory and resident bird species. A variety of migratory birds utilize the coastal plain, including Nuvagapak point, during the summer breeding season.

Beaufort Lagoon supports habitat for a diverse range of biota, benthic and pelagic organisms. The site is within federally-designated critical habitat for the threatened species, polar bear. According to a biological opinion by the U.S. Fish and Wildlife Service, the selected remedy could affect critical habitat of the polar bear. Barrier islands of the site are also designated as critical habitat areas, and inland areas of the site are designated as terrestrial denning critical habitat. Polar bears utilize the coast as a travel corridor during summer. The site is within a "no disturbance zone" for critical habitat areas. Coastal erosion has been documented along the shoreline adjacent to the Nuvagapak site and contaminated areas of the site are at risk of eroding into the sea.

The local geology is typical of Alaska's northern coastal plain, consisting of a surface layer of organic-rich soil and arctic vegetation underlain with a mixture of permanently frozen sand, silt, and gravel. Surface soil typically thaws to a depth of 18 inches to 24 inches in summer. Groundwater is present in the shallow layer of soil which thaws in the summer. Shoreline erosion is an ongoing natural process that threatens portions of the site, including some areas with contaminated soil. There are no known Alaska Native cultural resources at Nuvagapak Point DEW Line Station.

Site-specific factors that may affect response actions at the site include its remote location and the relatively short summer field season. The site's remoteness and absence of infrastructure creates logistical challenges to constructing and maintaining a camp and performing the response action. The Arctic coastal region has a relatively short summer season, and the petroleum-contaminated soil treatment cell(s) will be frozen for much of the year.

2.5.2 Site Investigations

The USACE conducted site characterization activities on seven occasions between 1985 and 2007, variously collecting samples of soil, sediment, and surface water. They targeted areas suspected to be contaminated, as well as conducting grid sampling. Based on a review of these site characterization events, the USACE proposes to conduct remedial actions at five areas around the site. Figure 3 shows these locations, which are described below:

2.5.2.1 Dump Site D

Dump Site D is recommended for cleanup due to DRO concentrations in soil exceeding ADEC Method 1 cleanup levels, and the potential for ongoing coastal erosion to advance through this area. Dump Site D (also referred to as Drum Dump D) is in tundra north of the gravel pad. The tundra is considered jurisdictional wetlands. The site was used as a drum cache that may have also served as a drum-staging and-crushing operations area. No removal actions or remedial actions have been performed at this area, and very little debris is visible in site photographs.

The USACE performed a shoreline-erosion evaluation to estimate erosion rates along the northern shore of Nuvagapak Point by comparing the shoreline profile from an orthorectified 1987 aerial photograph to shoreline location measurements made in 2007 using a global positioning system (GPS). They estimated shoreline erosion of 49 feet to 110 feet over 20 years, equating to an erosion rate of about 2.5 feet to 5.5 feet per year.

Dump Site D was first investigated in 1989, which found petroleum hydrocarbon contamination in the soil and water. It was investigated again in 2003 and 2007.

Up to 13 ponds are in this area, some of which are occasionally dry. Solid samples collected from a pond, whether water was present or not, were designated as sediment during the original investigations. It is not clear what distinguishes these samples from others in the area designated as soil. The ADEC has clarified this media is considered soil, based on the ephemeral nature of the ponds. Because of coastal erosion at this location and the potential for erosion to advance through this area, the ADEC has determined Method 1 soil cleanup levels for petroleum hydrocarbons should be applied.

Seven soil samples were collected from the Dump Site D area in 2003, and twenty in 2007. Five of the soil samples collected 2007 were only analyzed for arsenic, in an effort to evaluate naturally occurring arsenic levels. Soil samples from this area were generally collected near the ground surface (0 inches to 6 inches below ground surface, or bgs).

One surface-water sample was collected from a tundra pond in 2003. Eight surface water samples were collected from tundra ponds in 2007. All DRO and residual range organics (RRO) results for samples collected during the 2007 RI are qualitative and biased low because of the silica-gel-cleanup analytical method.

DRO was detected in soil in this area at concentrations exceeding its ADEC Method 1 cleanup level in five of seven samples (maximum detected [MDC] 34,000 mg/kg) collected in 2003 and in fourteen of fifteen samples (MDC 22,000 JL mg/kg) collected in 2007. The "J" designates an estimated analyte concentration due to potential biases; data possibly exhibiting a high bias may be flagged "JH," and data exhibiting a low bias may be flagged "JL." Arsenic was detected in soil at concentrations exceeding its ADEC cleanup level in six of the eight samples (MDC; 150 JH mg/kg) for which it was analyzed.

Various petroleum hydrocarbons, polynuclear aromatic hydrocarbons (PAHs), and VOCs were detected in surface water in 2003 and 2007, but none at concentrations exceeding their respective comparison criteria. USACE noted in their summary report a hydrocarbon-based sheen could be generated by pushing a shovel into the bottom sediments of most ponds at Dump Site D.

Based on this review and evaluation of sampling data from the Dump Site D area, further remedial action is recommended due to DRO concentrations in soil exceeding ADEC Method 1 cleanup levels, and the potential for ongoing coastal erosion to advance through this area.

The area of DRO-contaminated soil is estimated to be approximately 270 feet by 100 feet, to an assumed depth of 2.5 feet bgs, equating to an estimated 2,500 cubic yards (cy) of in-place soil. There is a high degree of uncertainty regarding the areal extent and volume of contaminated soil at this location.

2.5.2.2 AST Pad Area

The AST Pad area includes the former pump house, fuel storage tanks, and pipeline supports north of the Composite Building. A tundra pond about 40 feet west of the edge of the gravel pad is included in this area. The generator building south of the pump house is also included in this area for the purpose of discussion in this report. The ASTs were removed in 1994; the fuel pump house and pipeline supports were removed in 2000. The USACE excavated approximately 26 tons of petroleum-contaminated soil from two locations in this area in 2000: the former POL-storage tank site and the adjacent pump-house building. The intent of this excavation "was to remove the most grossly contaminated surface soil both vertically and horizontally and to mitigate contamination from migrating and potentially impacting organic material underneath the gravel pad areas."

The USACE first investigated this area in 1989, collecting six soil and two surface-water samples; and later collected post-excavation samples in 2000. The AST Pad area was further investigated in 2003 and 2007, with soil samples collected from the gravel pad, and sediment and surface water samples collected from the adjacent tundra pond. The 2003 and 2007 samples were collected from test pits or hand-augered soil borings at depths of approximately 4 feet bgs.

GRO and xylenes were detected in soil above their respective ADEC Method 2 cleanup levels in two soil samples in 2000; GRO had a MDC of 2600 mg/kg and xylenes had an MDC of 290 mg/kg. Xylenes were again detected in soil above ADEC Method 2 cleanup levels in 2003 (MDC; 238 mg/kg) and 2007 (MDC; 107 J mg/kg). The VOCs 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene exceeded ADEC Method 2 cleanup levels in the 2007 samples with MDCs of 180 J mg/kg and 59 J mg/kg, respectively.

The USACE collected two sediment and two surface-water samples from the tundra pond adjacent to the AST area. Various PAHs were detected in both sediment samples at concentrations exceeding National Oceanic and Atmospheric Administration (NOAA) sediment quick reference table (SQuiRT) Threshold Effects Levels (TEL) and Upper Effects Threshold (UET) levels. Lead also exceeded its SQuiRT TEL in the 2007 sample at an MDC of 73.6 J mg/kg. None of the detected compounds exceeded ADEC Method 2 cleanup levels.

Water samples collected from the pond contained GRO (15,000 micrograms per liter, or µg/L), DRO (21,000 µg/L), and lead (35 µg/L) at concentrations above ADEC groundwater-cleanup levels, and total aromatic hydrocarbons (TAH; 4,316 µg/L) and total aqueous hydrocarbons (TAqH; 4,374 µg/L) above water-quality standards.

A generator building about 70 feet south of the pump house was the subject of a removal action in 1994. The USACE removed a pile of batteries and excavated nearly 1 ton of lead-contaminated soil from the generator building area. It is unclear whether the building itself was removed in 1994 or 2000. Two soil samples were collected following excavation in 1994 for analysis for lead; one soil sample was collected in 2000 for a suite of analyses. The 1994 sample results were not reported, but the analytical results for the 2000 sample do not suggest the need for further remedial action for lead.

Based on the presence of GRO and related compounds in the soil at concentrations exceeding ADEC Method 2 cleanup levels, further remedial measures are recommended at the AST Pad area.

Gravel-pad soil in the vicinity of the 2000 Excavation Area 1, with GRO and VOC concentrations exceeding cleanup levels, is presumed to be the primary source of contamination in the adjacent pond. Remedial measures directed at contamination in the gravel pad are expected to indirectly result in improved water and sediment quality in the pond.

The area of petroleum-contaminated soil is estimated to be 15 feet by 15 feet, and up to 4 feet deep, but with an assumed average depth of 2 feet bgs, equating to an estimated 17 cy of in-place soil. There is a low-to-moderate degree of uncertainty regarding the areal and vertical extent and volume of contaminated soil.

2.5.2.3 Composite Building

The Composite Building housed the main living quarters and station generator during the Nuvagapak Point DEW Line Station operation. The Composite Building was demolished in 2000, although the concrete portion of the foundation was left intact and remains at the site.

Soil-excavation activities were conducted at the Composite Building in 1994, when the USACE removed about 7.5 tons of petroleum-contaminated soil from a small area at the building's southeastern corner. POL compounds were detected in post-excavation confirmation sampling in this area but at concentrations below current cleanup levels.

Soil around the Composite Building area was investigated further in 2000, 2003, and 2007; the latter two investigations were for PCBs only, focusing on the western portion of the building's north side. These samples were generally collected at the ground surface (0 inches to 6 inches bgs) but one of the 2007 samples was collected at a depth of 1.5 feet to 2 feet bgs.

One water sample was collected in 2003 from a tundra pond about 50 feet south of the building.

The data reviewed for the RI/FS indicated the concrete pad has not been sampled for PCBs, but since there were PCBs found on and near the pad, the pad will have absorbed the contaminant and is included to be remediated. It is not uncommon for concrete to be a medium of concern at sites with a Composite Building. Based on the presence of PCBs in soil immediately adjacent to the concrete and process knowledge, it is presumed concrete from the Nuvagapak Point Composite Building is contaminated above the ARAR.

PCBs were detected in soil around the Composite Building in 2000 (MDC; 4.6 mg/kg), 2003 (MDC; 5.41 mg/kg), and 2007 (MDC; 6.3 JL mg/kg), at concentrations exceeding the ADEC Method 2 cleanup level of 1 mg/kg. Detectable concentrations of petroleum hydrocarbons, metals, and VOCs were reported in samples collected in 1994 and 2000, but none at levels exceeding the comparison criteria.

Results of analysis of water samples collected from the tundra pond show lead (94 µg/L) and pentachlorophenol (6.1 J µg/L) in 2000, and bis-(2-chloroethyl)ether (3.5 µg/L) in 2003, exceeding their respective comparison criteria. The 2003 sample was also analyzed for lead to confirm the 2000 results; the USACE reported the lead concentration decreased from 94 µg/L to 0.40 µg/L between 2000 and 2003.

Because of the presence of PCBs in the soil at concentrations exceeding the ARAR, additional remedial measures are recommended at the Composite Building area.

The area of PCB-contaminated soil is estimated to be 40 feet by 40 feet to an assumed depth of 2 feet bgs, equating to an estimated 120 cy in-place soil. There is a moderate degree of uncertainty regarding the areal extent and volume of contaminated media.

2.5.2.4 Shop Area

The Shop Building was a 30-foot by 40-foot structure in the southeastern portion of the main gravel pad. It was described as being “built upon a heavily reinforced concrete pad which sat on top of a heavily reinforced wood floor and wood piling foundation.” This structure, including the foundation, was demolished during the 1994 removal action. The USACE excavated about 50 tons of petroleum-contaminated soil from underneath the shop building after its removal. A tundra pond is southeast of the pad, which previous reports suggest receives surface-water drainage from the shop building area.

Four soil samples were collected from around the shop in 1989, two of which contained PCBs at 2.6 and 4.9 mg/kg, exceeding the ADEC Method 2 cleanup level. The 1994 petroleum-contaminated soil excavation appears to have included this sampling area, but the samples were not analyzed for PCBs.

Four soil samples were collected from this area in 1994, and four in 2000 (including one in the immediate vicinity of the former shop). Two surface-water samples were collected from the adjacent pond, one each in 2000 and 2003. Petroleum hydrocarbons and metals were detected in soil in the 1994 samples; petroleum hydrocarbons, VOCs, semi-volatile organic compounds (SVOCs), metals, and PCBs were detected in the 2000 samples. This review of these data found none exceeded the comparison criteria.

Bis-(2-ethylhexyl)phthalate was the only analyte detected in the 2000 water sample, and was reported at a concentration exceeding its NOAA SQuiRT comparison criterion but not its ADEC Method 2 cleanup level. Other petroleum hydrocarbons, VOCs, and SVOCs were detected in the 2003 water sample but none exceeded their respective comparison criteria. The USACE observed a sheen on surface water in the pond southeast of the shop area when a shovel was pushed into the bottom sediments.

The cumulative risk evaluation for soil and water in the Shop Building area found a cancer risk of 2 x 10^{-5} and a non-carcinogenic hazard index of 0. The cancer risk is attributable to PCBs in the soil.

Based on this review and evaluation of sampling data from the Shop Building area, this area is recommend for further remedial action. PCB-contaminated soil remains above the ARAR.

2.5.2.5 Grid Area (Debris Pile A)

The Grid area, so called because of the random-sampling grid established during the 2000 remedial action, is in the north-central portion of the main gravel pad. Two small ponds are on the gravel pad in this area. Debris Pile A and Drum Dump C were also in this area. Other structures including a bunkhouse, wooden sheds, and concrete anchors for the station's radio tower, were also in this area. Debris and drums were removed from the area during the 1994 removal action; approximately 31 tons of petroleum-contaminated soil were excavated from two locations and removed from the site (Debris Pile A and Drum Dump C). The remaining structures and concrete tower anchors were removed during the 2000 removal action.

The USACE performed field screening with a photoionization detector to characterize surface soil in the central pad area, and established a grid approximately 300 feet by 300 feet, with 20-foot centers. The field-screening effort was performed on a random-sampling basis to guide the selection of soil sample locations. The USACE identified approximately 13 distinct locations of potentially petroleum-contaminated soils based on field-screening results exceeding 10 parts per million (ppm), but collected characterization soil samples from only eight of these locations.

Five soil samples were collected from the central pad area in 1994, 12 in 2000, and seven in 2003. Two surface-water samples were collected in 2000, one from each of the small ponds.

DRO exceeded its ADEC Method 2 cleanup level in one sample in 1994 (16,900 mg/kg) and one sample in 2003 (21,000 J mg/kg). Both of these samples were collected in the vicinity of the former Debris Pile A. Other petroleum hydrocarbons, metals, PCBs, VOCs, and SVOCs detected in samples did not exceed the comparison criteria.

While concentrations of petroleum hydrocarbons, VOCs, SVOCs, and metals were detected in water samples collected from the ponds, only lead exceeded its most stringent comparison criterion. Lead did not exceed its ADEC groundwater-cleanup level.

Petroleum hydrocarbons are not included in the cumulative risk calculations, per ADEC guidance. The non-cancer hazard index for petroleum hydrocarbons is 2, which exceeds the ADEC risk criteria of 1.

Based on this review and evaluation of sampling data from the central pad Grid area, excavation of petroleum-contaminated soil exceeding the ADEC cleanup level at Debris Pile A is recommended.

2.5.3 Types and Quantities of Contaminated Media

Table 2 presents the quantities of contaminated media present at each study area at Nuvagapak.

Table 2. Estimated Volume of Petroleum- and PCB-Contaminated Soil and Concrete

Location	COC		Assumed Dimensions	Assumed Average Thickness (ft)	Calculated Surface Area (ft^2)	Calculated In-Place Volume (cy)	Excavated volume (cy)	Weight (tons)
	POL	PCB						
Dump Site D	X		270 ft by 100 ft	2.5	27,000	2,355	2,826	3,768
AST Pad	X		15 ft by 15 ft	2	225	17	20	27
Composite Bldg Soil		X	50 ft by 50 ft	2	2,500	185	222	296
Composite Bldg Concrete		X	15 ft by 20 ft	0.2	300	2	3	4
Shop Area		X	15 ft by 15 ft	2	225	17	20	27
Grid Area/Debris Pile A	X		15 ft by 40 ft	2	600	44	53	71
				Total POL soil	27,825	2,416	2,900	3,866
				Total PCB soil	2,725	202	242	323
				Total PCB concrete	300	2	3	4
				Total	**30,550 sf**	**2,620 cy**	**3,140 cy**	**4,190 tons**

Notes: ft feet
sf square feet
cy cubic yards

2.5.4 Conceptual Site Models

Human health and ecological conceptual site models (CSMs) are presented in Figure 4 and Figure 5, respectively.

2.6 Current and Potential Future Site and Resource Uses

The site is uninhabited; the closest community is the village of Kaktovik, with a population of 287. The site is used intermittently for subsistence activities, USFWS camps, and recreational uses. The site is accessible by boat in the summer, snowmachine in the winter, and helicopter or fixed-wing airplane year-round (using an unmaintained airstrip). Nuvagapak Point lies within the Arctic National Wildlife Refuge. The site is situated along the Beaufort Sea and the coastline is actively eroding and encroaching on the contaminated areas. Beaufort Lagoon supports habitat for a diverse range of biota, benthic and pelagic organisms. Coastal erosion has been documented along the shoreline adjacent to the Nuvagapak site and contaminated areas of the site are at risk of eroding into the sea. Site erosion has already caused PCBs and petroleum hydrocarbons in soil from Dump Site E to migrate offsite.

Future site uses are expected to remain consistent with current uses.

2.7 Summary of Site Risks

The response action selected in this DD is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

This section presents an overview of the risks associated with the current and future use of the site. Risks were evaluated separately for human health and wildlife at the site. A discussion of potential risks at the site and the risk evaluation process is in the RI/FS report. The results of cumulative risk evaluations for each of the sites recommended for cleanup are discussed in Section 2.5.2 and presented in Appendix A of this DD.

Although Nuvagapak does not support a year-round residential population, visitors use the site for subsistence, recreational, or research activities.

People who could be exposed to COCs include subsistence harvesters and consumers from Kaktovik, recreational users visiting the ANWR, and other visitors. In the future, construction workers or other visitors who may occupy the site in support of resource-development activities may also be exposed. Several exposure scenarios for these current and potential future receptors were identified:

- incidental soil ingestion and skin contact of contaminants from soil;
- breathing outdoor air;
- drinking surface water; and
- eating wild foods.

The human health conceptual site model shows current and potential future site users may be exposed to contaminants exceeding acceptable levels. A cumulative risk evaluation of contaminants detected at Nuvagapak found that cancer risk exceeded 1 in 100,000 in soil at the Composite Building and Shop Area. Calculated noncarcinogenic risks exceeded the risk criterion (the hazard index was greater than l) at the AST Pad. Appendix A presents cumulative risk evaluation summary tables for the AST area, Composite Building, Shop Area, and Grid Area (including Debris Pile A).

A screening-level ecological risk assessment conducted at Nuvagapak Point DEW Line Station compared contaminant concentrations detected at the site to published ecological risk-based levels ERBLs. The purpose of this assessment was to identify whether contaminants were present at concentrations that could affect bird and small mammal species known to live in Arctic coastal areas. The assessment found that concentrations of various contaminants exceeded their ERBLs in soil and sediment for the common redpoll, Lapland longspur, northern pintail, ruddy turnstone, brown lemming, least weasel, and tundra shrew.

The polar bear was not subjected to the ecological screening process; however, it was included in the ecological CSM with several complete exposure pathways to site contaminants.

Based on the results of the ecological screening for all other species, it was accepted the polar bear would be adequately protected by ADEC Method 2 cleanup levels. The effect of lead on waterfowl was also of concern, limited to potential nesting areas (i.e., tundra, not gravel pad). Lead did not exceed ERBLs at the Nuvagapak site. ERBLs will not be used as cleanup levels for Nuvagapak.

Table 3 summarizes the COCs and exposure media and pathways for those areas at Nuvagapak proposed for remediation.

Table 3 – Summary of Exposure Media, Exposure Pathways, and COCs

Study Area	Exposure Medium	Exposure Pathway	COCs
Dump Site D	Soil	Ingestion, dermal contact	DRO
AST Pad and AST Pond	Soil, surface water	Ingestion, dermal contact	GRO
Composite Building	Surface soil, concrete	Ingestion, dermal contact	PCBs
Shop Area	Surface soil	Ingestion, dermal contact	PCBs
Debris Pile A (Grid Area)	Surface soil	Ingestion, dermal contact	DRO

The ADEC, USACE, and USFWS determined that site remediation to ADEC Method 1 cleanup levels in tundra soil at Dump Site D, and Method 2 cleanup levels in other areas, would be protective of bird and mammal receptors as well as humans. These agencies also accepted, based on the results of ecological screening for the other species screened, that the polar bear would be adequately protected by site remediation to ADEC Method 2 cleanup levels.

Removal of COCs to cleanup levels would allow unrestricted use by humans (site visitors, subsistence users), and wildlife. No buildings or water wells are present, and none are anticipated to be constructed in the future. Groundwater is not considered an exposure medium of concern because there is only groundwater above the permafrost.

2.8 Remedial Action Objectives (RAOs)

The RAOs for the Nuvagapak Point DEW Line Station are to:

- Prevent human ingestion/direct contact with soil and concrete having COCs (PCBs, GRO, and DRO) exceeding their cleanup levels.
- Prevent human inhalation of COCs posing an excess cancer risk.
- Prevent transport of COCs from their source area.
- Prevent ecological risk.

The selected remedy will achieve the RAOs by removal and treatment of contaminated soil and concrete to reduce PCB, GRO, and DRO contamination to ADEC cleanup levels:

PCBs	1 mg/kg (soil and concrete)
GRO	1,400 mg/kg (soil)
DRO	200 mg/kg (tundra soil subject to erosion) or 12,500 mg/kg (gravel pad soil)

The cleanup level for DRO in tundra soil at Dump Site D is lower than in gravel soil on the main pad. This is because the shoreline north of Dump Site D has been eroding. Stricter cleanup standards apply for soil that may erode into the ocean. Water in the AST Pond exceeds cleanup levels for GRO, DRO, and several petroleum-related chemicals, and has been observed to have a sheen, which is a violation of ADEC water-quality criteria. The corrective actions described in this DD do not directly address surface water; cleanup of the adjacent soils should result in improvement in water quality. Surface water quality will be monitored by sampling during the removal action and when the biocell is sampled.

2.9 Description of Alternatives

This section describes the remedial alternatives developed, screened, and evaluated during the FS process.

Alternative 1: No Action — Alternative 1 is required under CERCLA to provide a baseline for comparing remedial alternatives. Under this alternative, no cleanup action would be conducted. The ADEC and USFWS have stated this is not an acceptable alternative.

Alternative 2: Land Use Controls (LUCs) — This alternative would involve establishing land use controls, such as placing signs and instituting land-use restrictions, thereby limiting site access and restricting excavations or other soil disturbance. Alternative 2 would not involve any containment, treatment, or disposal-oriented cleanup. This alternative will restrict future land use that might result in exposure to contamination and could be effective at reducing exposure to contaminated media for people who heed the warning signs, but would not be effective at reducing exposure for wildlife, nor preventing transport of COCs from their source areas. LUCs would not be effective in containing PCBs. It would be difficult to implement and maintain at a remote site. The USFWS stated they would not accept alternatives that depend upon the integrity of land use controls. USFWS would not agree to placement of signs on their property; the recording of land use restrictions conflicts with their agency mission. Approximately three months would be required for planning and deed restriction implementation. Site work consisting of installing informational signs would require three days. The alternative would not directly address RAOs. While not prohibiting such excavation, any work involving contaminated soil or concrete would need to be conducted in accordance with 18 AAC 75.325-.390, Site Cleanup Rules. Long-term monitoring requirements would consist of 5-year site reviews.

Alternative 3: Capping — This alternative consists of physical isolation of contaminant sources at the site by construction of barriers such as soil caps, which are engineering controls to eliminate exposure. This alternative would restrict future land use in the capped areas. The total estimated area to be capped is 30,550 square feet. Approximately one month of site work would be required to construct the caps, and RAOs would be met upon completion of the cap construction. In order to be effective in the long-term, the caps must remain in good condition and be repaired if they degrade or are damaged. This requires a long-term site review and maintenance commitment. Long-term monitoring requirements would consist of 5-year site reviews.

Alternative 4: On-site Disposal — Contaminated soil would be excavated and placed in an on-site monofill (a landfill dedicated to one type of material). A permit would be required to construct and operate a landfill and would restrict future land use in the monofill area. Approximately 2,900 cy of petroleum-contaminated soil, and 245 cy PCB-contaminated soil and concrete, would be excavated and placed in the monofill. Approximately one month of site work would be required to construct the monofill, and RAOs would be met upon completion of the monofill construction. This alternative uses the engineering control of landfilling to eliminate exposure. In order to be effective in the long-term, the monofill must remain in good condition and be repaired if it degrades or is damaged. This requires a long-term site review and maintenance commitment. Long-term monitoring requirements would consist of 5-year site reviews.

Alternative 5: Off-site Treatment/Disposal — This alternative would involve the excavation of contaminated soils, sediment, and concrete for off-site treatment/disposal at an approved facility. The off-site treatment technology would be thermal destruction of the petroleum-contaminated soil, presumably at a facility in the Fairbanks area. No proven treatment technology exists for PCBs, which would be placed in a permitted facility in the 48 contiguous states. This alternative requires off-site treatment and disposal facilities. Approximately 2,900 cy of petroleum-contaminated soil, and 245 cy PCB-contaminated soil and concrete, would be excavated and transported off-site for disposal. Approximately one month of site work would be required to excavate and transport the contaminated soil, sediment, and concrete, and RAOs would be met upon completion of the site work. Future land use would not be restricted. Once successfully completed, this alternative would not require long-term monitoring.

Alternative 6: Soil Bioremediation and Off-Site PCB Disposal — Petroleum-contaminated soil would be excavated and placed in an open biocell. Treatment would be achieved through a combination of enhanced natural biological processes and volatilization. PCB-contaminated soil and concrete would be transported off-site for disposal at a permitted facility in the 48 contiguous states. Approximately 2,900 cy petroleum-contaminated soil would be excavated and placed in an on-site treatment cell. Approximately 245 cy PCB-contaminated soil and concrete would be excavated and transported off-site for disposal. The excavation, soil bioremediation treatment cell construction for petroleum-contaminated soil, and off-site transportation and disposal of PCB-contaminated soil and concrete would require approximately one month. It is estimated petroleum-contaminated soil in the soil bioremediation treatment cell could achieve RAOs in two years. Treatment will be considered complete when DRO concentrations are below 12,500 mg/kg if post-treatment soil is to be spread on the gravel pad, or 200 mg/kg if post-treatment soil is to be spread on tundra. Future land use would be restricted in the treatment cell areas during their operation. Once successfully completed, this alternative would not require long-term monitoring.

2.10 Comparative Analysis of Alternatives

The USACE uses nine evaluation criteria from CERCLA to compare cleanup alternatives and to choose the preferred cleanup alternative. The nine criteria are divided into three categories, threshold (Criteria 1 and 2), balancing (Criteria 3, 4, 5, 6, and 7), and modifying (Criteria 8 and 9). A cleanup alternative must meet the threshold criteria in order to be considered further. The balancing criteria are used to compare one alternative to another. State and community acceptance of a proposed remedial action or, modifying criteria, are important elements in selecting a cleanup alternative and were evaluated during the public review of the Proposed Plan.

1. **Overall Protection of Human Health and the Environment** - Does the alternative protect the health and safety of humans, animals, and plants?
2. **Compliance with ARARs** - Does the alternative meet all established ARARs (for CERCLA hazardous substances only) or risk-based cleanup levels for petroleum hydrocarbons?

3. **Long-Term Effectiveness and Permanence** - How long will it take to complete cleanup? What is the long-term risk at the site? Are the contaminants permanently removed or destroyed?
4. **Reduction of Toxicity, Mobility, or Volume through Treatment** - How well does the alternative treat contamination?
5. **Short-Term Effectiveness** - Could humans, animals, or plants be harmed when performing the work? Would the alternative reduce the site risks in the short term?
6. **Implementability** - Is the alternative easily constructed, maintained, and/or enforced?
7. **Cost** - Is the alternative cost-effective?
8. **State Acceptance –** Has State acceptance been assessed throughout the RI/FS and PP process?
9. **Community Acceptance –** Has USACE reviewed and considered all comments received during the public comment period?

2.10.1 Overall Protection of Human Health and the Environment

Risks to human health and the environment posed by contaminants present at Nuvagapak were determined based on their meeting or exceeding cleanup levels. The initial development and screening of alternatives provided a range of remedies to address those risks. These remedies were developed under the assumption the site will be visited and may be occupied by workers, and supports a variety of ecological receptors; the remedies are weighted towards those that do not include restrictions on future site uses. The alternatives are directed at addressing contaminants in soil.

The no-action alternative (Alternative 1) is not protective of human health or ecological receptors. Its inclusion in the FS process follows EPA guidance and serves as a point of comparison against which other alternatives may be evaluated. Alternative 2 would not include any site work, relies on LUCs to limit potential exposure, and would leave contaminant concentrations at current levels until natural attenuation reduces the levels over time.

Alternative 3 would control exposure by placing a cap over the PCB-contaminated soils exceeding the ARAR. This alternative would be more effective than Alternative 1 in preventing exposure to contaminated soil; however, this alternative would require administrative controls to restrict future site uses and maintain the cap.

Alternative 4 would result in the removal of the contaminated soil from the ground; the containment cell would reduce the potential for exposure and redistribution of the contaminants. Alternative 4 relies on the integrity of the cover to function properly.

Alternative 5 would remove petroleum and PCB-contaminated soils exceeding the RAOs for off-site treatment/disposal. This alternative would be most protective in preventing exposure to contaminated soils, and once successfully implemented, would eliminate the need for future land-use restrictions or monitoring.

Alternative 6 would remove and treat petroleum- contaminated soil by on-site landfarming, and remove PCB-contaminated soil and concrete for off-site treatment/disposal. Risk of exposure to petroleum-contaminated soil would remain throughout the duration of the treatment process. Once successfully implemented, Alternative 6 would be as protective in preventing exposure to contaminated soil as Alternative 5.

2.10.2 Compliance with ARARs

Alternatives 1 and 2 would leave PCB-contaminated soils on-site, where they would be accessible to site users and available for potential contaminants transport, and would not comply with the chemical-specific ARAR for PCBs. LUCs do not meet the ARAR for PCBs, since contaminated soil would be left at the surface and not covered with a cap. Because Alternatives 1 and 2 do not meet the threshold criteria of overall protectiveness and compliance with ARARs, they are not eligible for selection as a final remedy.

Action or location-specific ARARs can be met for each alternative through the project planning and design process. Alternative 2 would have limited site work, consisting of placing warning signs around the site and periodically maintaining those signs. Soil caps or containment or treatment cells (Alternatives 3, 4, and 6) can be designed to optimally protect site visitors and ecological receptors from direct contact with contaminated soil. Long-term maintenance and deed restriction requirements for caps covering PCB remediation wastes are likely to be unacceptable to the landowner. Site work should be done in a manner protective of area wildlife and permissible within the boundaries of ANWR. Excavation activities (Alternatives 4, 5, and 6) may be subject to limits on access (e.g., driving on tundra).

2.10.3 Short-Term Effectiveness

Alternatives 1 would not have any short-term effectiveness because remedial action would not be taken. Alternative 2, depending on the nature of the LUC could effectively remove human exposure but would be ineffective with regards to ecological concerns and of little or no use with wildlife. Alternative 3 would have minimal short-term impacts because little or no contaminated soil would be handled during construction of a cap. Alternatives 4, 5, and 6 would have short-term impacts resulting from excavation and handling of PCB-contaminated soil, resulting in disturbance to tundra areas at Dump Site D. Impacts from any site activities would be reduced by the use of appropriate worked clothing and safety equipment.

The time required to complete Alternatives 4 and 5 is expected to be brief, with site activities taking less than a month. The treatment time required for Alternative 6 is dependent upon concentrations of petroleum constituents in soil to be treated, soil geochemistry, weather conditions, and other variables. For the purpose of this evaluation, it is assumed treatment time would extend over two summer field seasons. Administrative procedures such as remedial design and contaminated soil transportation and disposal would require additional time.

2.10.4 Long-Term Effectiveness

Alternatives 1 and 2 would not be effective in reducing overall long-term risk except by the gradual natural attenuation of the organic contaminants. LUCs could be designed to allow for future site construction and excavation by the property owner or others, provided proper precautions are taken to avoid contaminated areas or ensure contaminated media are properly managed. The long-term effectiveness of Alternatives 3 and 4 would depend largely on the integrity and effectiveness of the soil cap constructed over the contaminated soils. Dump Site D is subject to coastal or river erosion, likely to adversely affect the long-term effectiveness of the cap. With proper maintenance, the cap used would be effective in eliminating exposure pathways. Alternatives 5 and 6 would best meet goals for long-term effectiveness. Alternative 5, contaminants of concern would be removed from the site to meet remedial action objectives. Depending on the selected treatment or disposal site, contaminated soils could remain at a permitted disposal facility, although under controlled conditions. With Alternative 6, petroleum-contaminated soil would be treated on site until concentrations were below RAOs, and PCB-contaminated media would be removed from the site.

2.10.5 Reduction in Toxicity, Mobility, or Volume

Alternatives 3, 4, 5, and 6 include site-work components that would reduce or eliminate exposure to petroleum- and PCB-contaminated soils. Alternatives 3 and 4 would protect against exposure to contaminated soil, but would require restrictions be placed on future site uses to ensure cap integrity is not compromised. Reductions in contaminant concentrations would rely on natural processes. The potential for coastal erosion at Dump Site D makes capping an unsuitable alternative for this area. Alternatives 5 and 6 would achieve the greatest reduction in risk to human health and ecological receptors by treating soil to below cleanup levels or removing those soils from the site. A request for No Further Action to the ADEC could be made upon successful implementation of this alternative. Alternatives 1 and 2 would have no effect on the toxicity, mobility, or volume of contaminants; the only reductions would occur by natural attenuation.

2.10.6 Implementability

Alternative 1 would require no implementation because it involves no remedial action. Alternative 2 would require no site work but would focus on administrative procedures to reduce potential exposures. Alternatives 3, 4, 5, and 6 could be implemented using available construction equipment and materials readily shipped to the site from Deadhorse. The portions of the site affected by these alternatives are accessible to construction equipment, although experience indicates seasonal conditions should be taken into consideration when performing site work. None of the alternatives would prohibit future remedial action.Alternatives 4, 5, and 6 would require a similar level of effort to conduct the field operations. However, Alternative 4 would require a greater future level of effort to ensure the cap remains viable and enforce future site-use restrictions, and Alternative 6 would require frequent site visits to rototill and sample the treatment cells. Successful completion of Alternatives 5 and 6 would not require future efforts.

2.10.7 Cost

Alternatives 1 and 2 are the lowest cost alternatives ($0 and $110,000, respectively), but they provide the least protection to the potential receptors. Because Alternatives 1 and 2 do not meet the threshold criteria of overall protectiveness and compliance with ARARs, they are not eligible for selection as a final remedy. Alternatives 3 and 4 provide greater levels of protection at moderate costs ($1,535,000 and $1,780,000, respectively); however, the contaminants remain on-site and the future effectiveness of the processes relies on maintenance of the caps or containment cell. Alternative 5 has the highest cost ($6,350,000) but achieves the greatest reduction in concentrations of COCs at the site. Alternative 6 offers similar overall protection of human health and the environment as Alternative 5 but at a lower cost ($2,735,000).

2.10.8 State Acceptance

State acceptance has been gauged through agency reviews of the RI/FS and Proposed Plan. Section 3.0 of this DD presents the responsiveness summary describing public involvement activities. Alternatives 3 and 4 were least acceptable to the agencies, whereas Alternatives 5 and 6 met the state preference for alternatives that result in removal of contaminants above cleanup levels from the site.

2.10.9 Community Acceptance

Community acceptance has been gauged through public outreach during development of the RI/FS and Proposed Plan. Section 3.0 of this DD presents the responsiveness summary describing public involvement activities. Alternatives 3 and 4 were least acceptable to the public, whereas Alternatives 5 and 6 met the community preference for alternatives that result in removal of contaminants above cleanup levels from the site.

Alternatives 1 and 2 do not meet the threshold criteria and are not eligible for selection. Alternative 3 represented a balance between implementation challenges and long-term protectiveness. Alternative 4 would leave contaminants on-site in a containment cell and require long-term maintenance, whereas Alternative 5 would remove contaminants exceeding cleanup levels from the site and would not incur long-term costs. The high cost to implement Alternative 5 is balanced by community desire to eliminate exposures through soil removal. Alternative 6 meets the goal of achieving site closure with no long-term maintenance or site review requirements and its moderate cost. This alternative achieves site cleanup through on-site treatment of petroleum-contaminated soil, and off-site disposal of PCB-contaminated soil and concrete. Site closure could be achieved once on-site treatment reduces petroleum concentrations to below cleanup levels.

2.11 Principal Threat Waste

The NCP stipulates a preference for treatment to reduce principal threats posed by a site wherever practicable. Principal threat wastes are generally considered to be those source materials that are highly toxic or highly mobile which cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Non-mobile contaminated source material of low to moderate toxicity and low toxicity source materials generally will not constitute a principal threat waste. Following the EPA guidance *A Guide to Principal Threat and Low Level Threat Wastes, OSWER 9380.3-06FS, November 1991*, the contaminants at Nuvagapak are not considered principal threat wastes.

2.12 Selected Remedy

The USACE has selected Soil Bioremediation and Off-Site PCB Disposal as the Selected Remedy. The Selected Remedy involves excavating and treating the petroleum-contaminated soil on-site by soil bioremediation, removing and disposing PCB-contaminated soil and concrete at an off-site facility in the 48 contiguous states, and site restoration. Site restoration would consist of regrading the ground surface where excavation occurred on the gravel pad, and revegetating areas where excavation occurred in tundra. The areas to be addressed include the Dump Site D, the AST Pad, Composite Building, Debris Pile A, and Shop Area.

Key factors that led to selecting this remedy were that it reduces COC concentrations to below cleanup levels, eliminates human health and ecological exposure pathways, can manage changes in the actual quantity of petroleum-contaminated soil requiring treatment without significant changes in cost, is acceptable to ADEC and USFWS, and allows for unrestricted future site use.

The primary steps for the Selected Remedy include:

- prepare work plans describing the contractor's approach to site cleanup;
- delineate the areas to be excavated;
- build the soil bioremediation treatment cell in an acceptable location on the gravel pad;
- excavate petroleum-contaminated soil exceeding cleanup levels;
- treat the petroleum-contaminated soil using nutrient augmentation and periodic rototilling;
- transport the PCB-contaminated soil and concrete for off-site disposal;
- restore the excavated contaminated soil areas through regrading and/or revegetation; and
- decommission the soil bioremediation treatment cell once GRO and DRO concentrations are below cleanup levels.

There are two main factors that could affect the progress of this alternative: quantity of contaminated material requiring treatment or disposal, and length of time needed to treat the petroleum-contaminated soil. The quantity of contaminated soil and concrete could be different than the current estimate. A change in the quantity of petroleum-contaminated soil would not have a significant effect on cost; the size of the on-site soil bioremediation treatment area can be easily changed to match the amount of soil needing treatment. A change in the quantity of PCB-contaminated soil or concrete would have a greater effect on cost, since those materials need to be transported to the nearest road system then trucked to a disposal facility in the 48 contiguous states. If the amount of PCB-contaminated material needing to be disposed off-site doubled, the total cost of the alternative would increase by about 12 percent.

If the time required to treat petroleum-contaminated soil to below cleanup levels takes longer than expected, there will be increased costs related to actively managing the soil bioremediation treatment cell. These include additional trips to the site to rototill the soil, add nutrients or water if needed, and collect samples to check contaminant levels. Each additional year added to the time needed to treat the soil could add about five percent to the project cost. This alternative would be considered complete when soil sampling shows COC concentrations are below cleanup levels. The USACE proposes to calculate remediation rates based on sampling at the end of the second year, if concentrations remain above cleanup levels to demonstrate treatment effectiveness. The methods used to assess when COC concentrations in the treatment cells are below cleanup levels will be established in project work plans developed as part of the corrective action planning process. If COC concentrations remain above RAOs after five years, the USACE will reevaluate the remedial action to determine whether continued biotreatment would be effective or an alternative action is warranted.

The expected outcome of this alternative is permanent removal of COCs above cleanup levels and unrestricted use of the site without long-term maintenance obligations. Its cost is least sensitive to changes in volumes of contaminated materials to be treated.

ADEC agrees that Alternative 6 will comply with state regulation when properly executed. USFWS agrees with the USACE's selection of Alternative 6 as the Selected Remedy for treating petroleum- and PCB-contaminated soil and concrete at Nuvagapak.

Based on information currently available, USACE believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. USACE expects the Selected Remedy to satisfy the following statutory requirements of CERCLA §121(b):

1) be protective of human health and the environment;
2) comply with Applicable or Relevant and Appropriate Requirements (or justify a waiver);
3) be cost-effective;
4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
5) satisfy the preference for treatment as a principal element.

A detailed cost summary for the Selected Remedy is presented in Appendix B. The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file or a DD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

2.13 Statutory Determinations

Under CERCLA and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs, are cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

As noted in Section 1.5 of this DD, petroleum contaminated media are excluded from regulation under CERCLA. However, the DOD can remediate releases of petroleum where the release poses an imminent and substantial endangerment to the public health or welfare or to the environment per 10 USC 2701(b)(2). The petroleum release at the Nuvagapak Point DEW Line Station creates an imminent and substantial endangerment.

2.13.1 Protection of Human Health and the Environment

Bioremediation and Off-Site PCB Disposal was chosen as the Selected Remedy because it best meets the RAOs to prevent human exposure to COCs in soil and concrete; transport of COCs from their source areas; and risk to wildlife. The expected outcome of this remedy is permanent removal of COCs above cleanup levels and unrestricted use of the site without long-term maintenance obligations. Its cost is least sensitive to changes in volumes of contaminated materials to be treated.

2.13.2 Compliance with ARARs

Tables of ARARs (for CERCLA hazardous substances only) and risk-based cleanup levels (for petroleum hydrocarbons) are presented in Appendix C. The selected remedy meets the chemical-specific ARARs by removing CERCLA hazardous substances (e.g., PCBs) that exceed cleanup levels from the site. In addition, the selected remedy meets the risk-based cleanup levels for petroleum hydrocarbons.

Action-specific and location-specific ARARs can be met by the selected remedy through the project planning and design process. The bioremediation treatment cells can be designed to optimally protect site visitors and ecological receptors from direct contact with contaminated soil. Excavation activities can be implemented in a manner protective of site workers but they may be subject to limits on access (e.g., driving on tundra). The selected remedy includes transportation and off-site disposal processes that can be addressed with proper planning.

Site work should be done in a manner protective of area wildlife and permissible within the boundaries of ANWR.

2.13.3 Cost-Effectiveness

The cost of the selected remedy is estimated to be $2,734,341, of which capital costs are estimated to be $2,447,607 for engineering, excavation, treatment cell construction, and site restoration. Petroleum-contaminated soil treatment is estimated to cost $286,734 over the course of two summer field seasons. Potential for cost escalation is considered moderate, and could occur if volumes of soil and/or concrete requiring treatment or disposal exceed estimates, or the duration of petroleum-contaminated soil treatment exceeds estimates. Given the large volume of petroleum-contaminated soil, on-site treatment is a less-costly alternative to off-site treatment or disposal, which would require shipping by barge to Prudhoe Bay then by truck to either Fairbanks or Anchorage. The relatively small quantity of PCB-contaminated soil and concrete does not justify on-site treatment.

2.13.4 Use of Permanent Solutions

The technology used in landfarming petroleum-contaminated soil at North Slope sites has been demonstrated at other sites. This remedy is effective over the long term in that the identified risks will be eliminated through the treatment and removal action. Once the petroleum-contaminated soil treatment is complete, PCB-contaminated media have been disposed off-site, and tundra-excavation areas revegetated, no contaminants exceeding cleanup levels will remain at the site.

2.13.5 Preference for Treatment as a Principal Element

By treating the petroleum-contaminated soil by landfarming, the Selected Remedy addresses principal threats posed by the site through the use of treatment technologies. By using treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied.

2.14 Documentation of Significant Changes

The Proposed Plan for the Nuvagapak Point DEW Line Station was released for public comment on March 16, 2012. The Proposed Plan identified Alternative 6, Soil Bioremediation and Off-Site PCB Disposal, as the Preferred Alternative for site remediation. The USACE reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

3.0 PART 3: RESPONSIVENESS SUMMARY

3.1 Stakeholder Comments and Lead Agency Responses

The ADEC and USFWS have been involved with the Nuvagapak Point DEW Line Station project throughout the development of the RI/FS report, PP, public involvement activities, and this DD. ADEC agrees that the selected remedy of Bioremediation and Off-Site PCB Disposal will comply with state regulation when properly executed. USFWS agrees with the USACE’s selection of Bioremediation and Off-Site PCB Disposal as the remedy for treating petroleum- and PCB-contaminated soil and concrete at Nuvagapak.

After the Proposed Plan was released, a public comment period was held from March 15 to April 16, 2012. A public meeting was held in Kaktovik, Alaska on March 21, 2012, at the Qargi Community Center. Several concerns were raised during the public meeting regarding remediation at the Nuvagapak DEW Line Station. Most of the questions and comments were not significant or relevant to the content of the Proposed Plan or the USACE preferred alternative. Attendees discussed previous cleanup efforts, effects of the contaminants on wildlife and subsistence, and USACE plans for the two sites. Many comments focused on other sites in the vicinity of Kaktovik which are unrelated to Collinson or Nuvagapak Points. Most comments were supportive of the proposed alternative and had particular interest in possible jobs provided by the cleanup, as well as prospects for the area's future. A full transcript of the public meeting, is available separately (HDR Alaska, 2012).

A summary of significant oral comments relevant to the Proposed Plans and the USACE preferred alternative for site cleanup is shown in Table 4.

TABLE 4. SUBSTANTIVE ORAL COMMENTS RECEIVED DURING PUBLIC MEETING

Transcript Page, Line Number	Participant Name	Question/Comment	Response
65, 24	Clarice Akootchook	Participant stated a preference for Alternative 5; asked why contaminants would be left on-site.	Alternative 6, the USACE's preferred Alternative, would result in no contaminants left on site; upon disposal or treatment the contaminants would meet Applicable or Relevant and Appropriate Requirements for PCBs and risk-based cleanup levels for petroleum hydrocarbons. Alternative 5 was not selected based on the higher cost and preference for selecting a remedy that uses treatment as a primary element. Alternative 6 is also least sensitive to potential increases in quantity of petroleum soil encountered during implementation of the remedy.
75, 23	George Tagarook	Participant stated approval of Alternative 6.	No response required.

One written comment was received during the public comment period. The commenter described their experience visiting the site since 1995 and suggested a Kaktovik-based workforce should be considered when planning site remedial activities. The commenter generally felt the cleanup project might provide needed jobs to the community. The complete written comment is shown below.

Comment #1:
Collinson Point, west of Kaktovik, known as Barter Island. This area on the coast 35 miles of southwest is an area where harvest food on the land and sea as far as Flaxmanof Island, we would spend some days out on the land where we harvest fish and caribou, whale or seals. I been in the area for or seen how it change at least since '95, Distant Early Warning been around

for years and still today I have seen each site for many years, even east of from the Canadian border. I have been employed by clean up crew before, that was interesting to have been employed. We had our own crew, we did the job well done back in the 90's. Still today these sites are still there where the road and gravel pads are still today. We also build the unmanned sites into Canada Northwest Territories, that was awesome job. I remember the site at Bar-A when it used to be open, I find these sites helpful threw the many many years of service, where safety was needed or help was needed back when there were these sites was built. They did provide a lot of work to operate at a wide wide range of service threw out Alaska and Canada. Bar-A known as Nuvagapak Point is another area where gravel roads are still visible today, pads, runway. I can remember the site been there still today, but when I seen it was the big long tower was down. I said when I seen it remembering it was been long tower laying down on the ground. I find these area would be good to clean up to provide employment for village or at least go into 2013 summer to continue cleanup projects were to provide work that would be awesome.

USACE Response: A preference for local hire can be expressed to the selected contractor, but is not mandatory.

PART 4: REFERENCES

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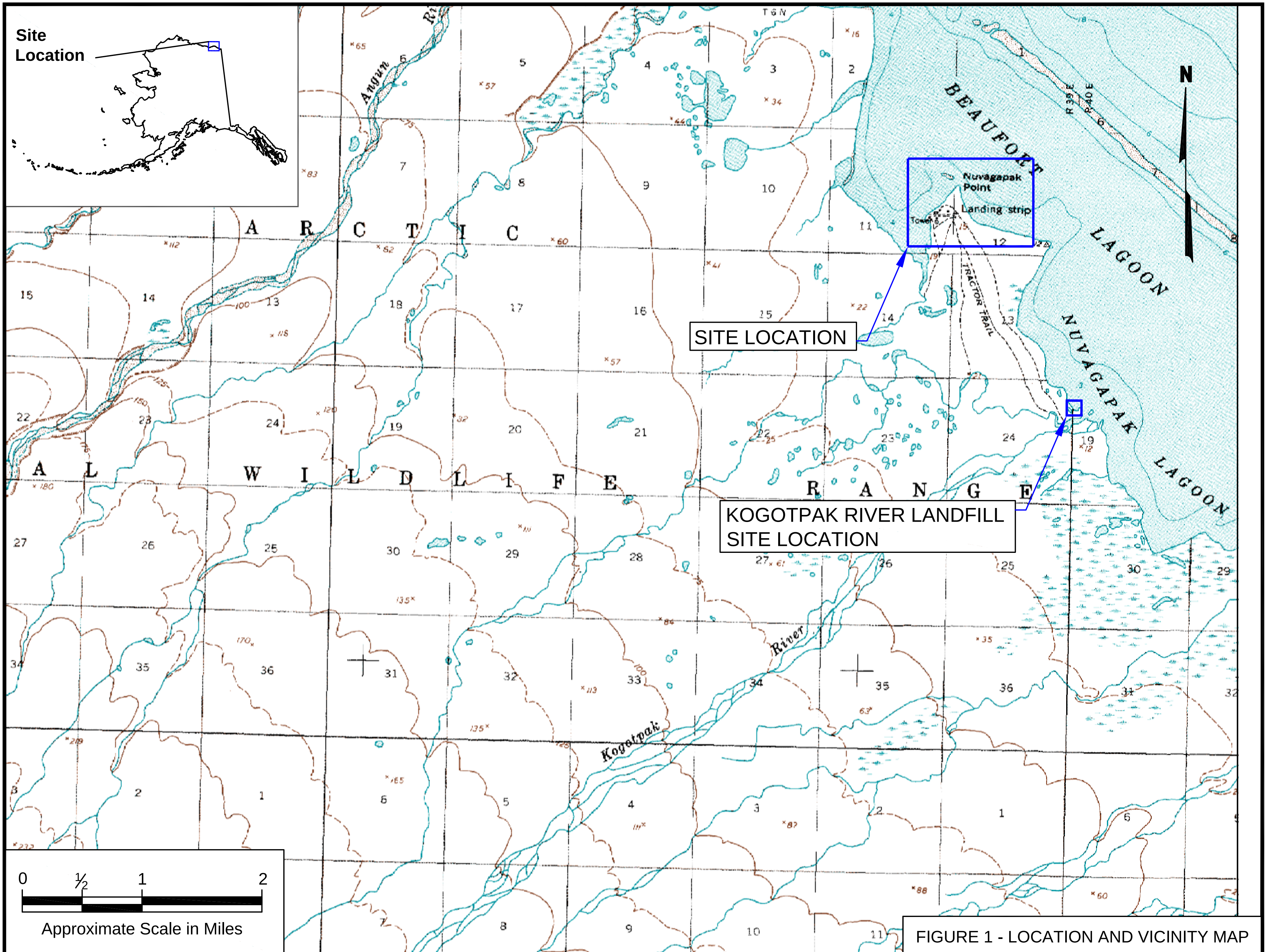


FIGURE 1 - LOCATION AND VICINITY MAP

Notes:
Aerial photo date: August 1987.
The Kogotpak River landfill study area is approximately 2 miles southeast of Nuvagapak pad. THE STRUCTURES AND DEBRIS SHOWN ON THIS PHOTO ARE NO LONGER PRESENT.

FIGURE 2 - SITE MAP AND STUDY AREAS

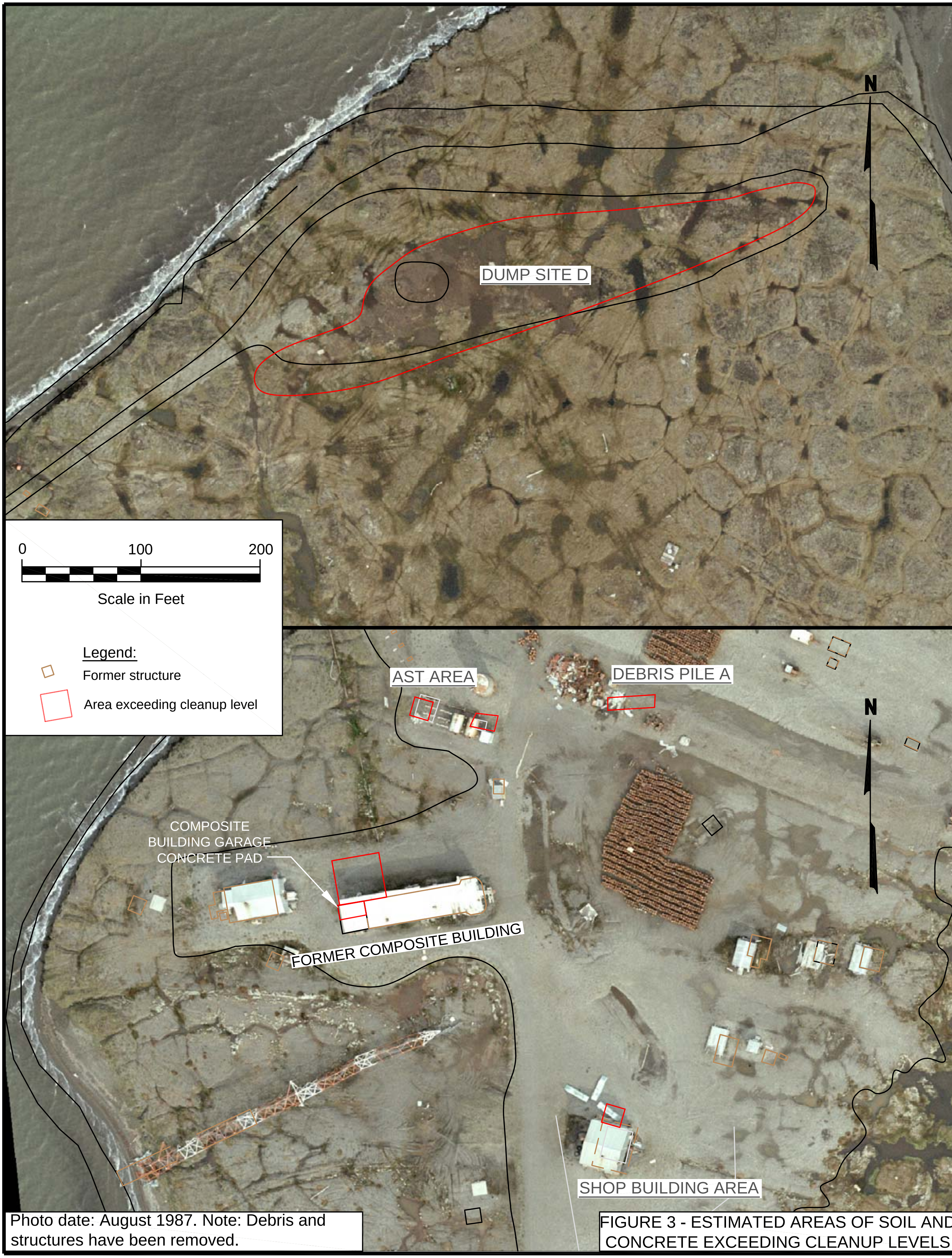


Photo date: August 1987. Note: Debris and structures have been removed.

FIGURE 3 - ESTIMATED AREAS OF SOIL AND CONCRETE EXCEEDING CLEANUP LEVELS

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: NUVAGAPAK POINT DEW LINE STATION

Completed By: ______________________________

Date Completed: ______________________________

***Instructions:* Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media / Transport Mechanisms

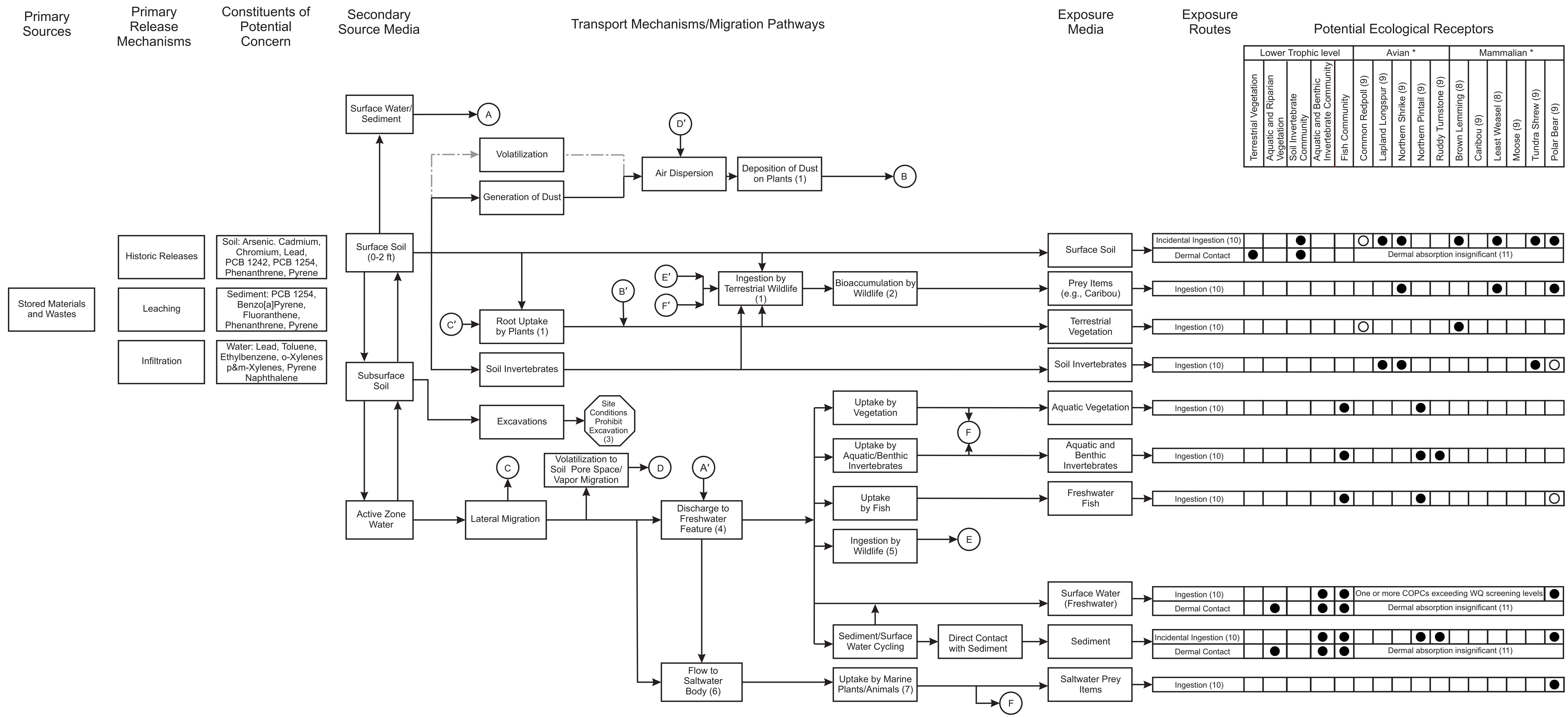
Media	Transport Mechanisms	
☑ Surface Soil (0-2 ft bgs)	Direct release to surface soil	check soil
	✓ Migration to subsurface	check soil
	☐ Migration to groundwater	check groundwater
	✓ Volatilization	check air
	✓ Runoff or erosion	check surface water
	✓ Uptake by plants or animals	check biota
	☐ Other (list):________	
☑ Subsurface Soil (2-15 ft bgs)	Direct release to subsurface soil	check soil
	☐ Migration to groundwater	check groundwater
	✓ Volatilization	check air
	☐ Uptake by plants or animals	check biota
	☐ Other (list):________	
☐ Ground-water	Direct release to groundwater	check groundwater
	☐ Volatilization	check air
	☐ Flow to surface water body	check surface water
	☐ Flow to sediment	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):________	
☑ Surface Water	Direct release to surface water	check surface water
	✓ Volatilization	check air
	✓ Sedimentation	check sediment
	✓ Uptake by plants or animals	check biota
	☐ Other (list):________	
☑ Sediment	Direct release to sediment	check sediment
	☐ Resuspension, runoff, or erosion	check surface water
	✓ Uptake by plants or animals	check biota
	☐ Other (list):________	

Exposure Media / Exposure Pathway/Route / Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	✓ Incidental Soil Ingestion			C/F	F	C/F		
	✓ Dermal Absorption of Contaminants from Soil			C/F	F	C/F		
	✓ Inhalation of Fugitive Dust			C/F	F	C/F		
☐ groundwater	☐ Ingestion of Groundwater							
	☐ Dermal Absorption of Contaminants in Groundwater							
	☐ Inhalation of Volatile Compounds in Tap Water							
☑ air	✓ Inhalation of Outdoor Air			C/F	F	C/F		
	☐ Inhalation of Indoor Air							
	✓ Inhalation of Fugitive Dust			C/F	F	C/F		
☑ surface water	✓ Ingestion of Surface Water			C/F	F	C/F		
	✓ Dermal Absorption of Contaminants in Surface Water			C/F	F	C/F		
	☐ Inhalation of Volatile Compounds in Tap Water							
☑ sediment	✓ Direct Contact with Sediment			C/F	F	C/F		
☑ biota	✓ Ingestion of Wild or Farmed Foods			C/F	F	C/F	C/F	

FIGURE 4 - HUMAN HEALTH CONCEPTUAL SITE MODEL

Revised, 10/01/2010



Notes:

1. Plants may include berries, grasses, and other vegetation consumed by wildlife.
2. Animals may include bear, ptarmigan, caribou, ducks, geese, moose, and other species.
3. The presence of permafrost prohibits excavation at the site. Buildings and other structures are typically constructed aboveground.
4. Freshwater features may include bogs, wetlands, tundra ponds, small lakes, streams, and/or rivers.
5. Wildlife that are part of the freshwater food web include caribou, moose, bear, snowy owl, geese, and ducks.
6. Saltwater body may include estuarine lagoons or Beaufort Sea.
7. Marine animals may include fish, mammals, mollusks, and crustaceans.
8. This receptor may be present at the site year-round.
9. This receptor may be an occasional site visitor (migratory) and may be present part of the year.
10. Ingestion exposures:
    - upper-trophic species: exceeding ERBLs (URS, Risk Evaluation Report: Alaska North Slope Radar Installation Sites, October 2007),
    - lower-trophic species: exposure pathway likely complete.
11. Dermal contact exposures:
    - upper-trophic species: ADEC Policy Guidance on Developing CSMs, 11/30/2005, p.31 "Dermal exposure of terrestrial wildlife usually considered to be minor due to protection provided by fur and feathers,"
    - lower-trophic species: assume direct exposure.

Key

- Potential Migration Pathway
- Exposure Pathway Considered Incomplete
- Release/Transport Does Not Occur or is Minimal
- Exposure Pathway Complete
  * Defined as exceeding screening level
- Exposure Pathway Potentially Complete but Insignificant
- Exposure Pathway Incomplete
- F Connect to F′
- F′ Connect from F

FIGURE 5 - ECOLOGICAL CONCEPTUAL SITE MODEL

APPENDIX A

CUMULATIVE RISK EVALUATIONS

Table A-1
AST Pad and Pipeline Supports Area Cumulative Risk Calculations -- Soil and Surface Water
Nuvagapak Point DEW Line Station, Alaska

COPC	Highest Detected Site Concentration	RBC[2]	Units	Site Concentration/ RBC	Risk at Site Concentration [3,4]
Carcinogens: Inhalation Risk[1]					
Naphthalene	37	42	mg/kg	0.881	8.8E-06
				Total	**8.8E-06**
Carcinogens: Water Ingestion Risk[1]					
Benzene	0.0064	0.015	mg/L	0.427	4.3E-06
Methylene chloride	0.0035	0.11	mg/L	0.032	3.2E-07
				Total	**4.6E-06**
				Carcinogenic Cumulative Risk	**1E-05**
COPC	**Highest Detected Site Concentration**	**RBC[2]**	**Units**	**Site Concentration/ RBC**	**HQ at Site Concentration [4,5]**
Noncarcinogens: Direct contact[1]					
Toluene	38	11,000	mg/kg	0.0035	0.00
Xylenes	290	27,000	mg/kg	0.0107	0.01
1,2,4-Trimethylbenzene	180	6,800	mg/kg	0.0265	0.03
1,3,5-Trimethylbenzene	59	6,800	mg/kg	0.0087	0.01
Naphthalene	37	1,900	mg/kg	0.0195	0.02
				Total	**0.07**
Noncarcinogens: Inhalation[1]					
Toluene	38	30,400	mg/kg	0.0013	0.00
Xylenes	290	800	mg/kg	0.3625	0.36
1,2,4-Trimethylbenzene	180	74	mg/kg	2.4324	2.4
1,3,5-Trimethylbenzene	59	64	mg/kg	0.9219	0.92
Naphthalene	37	180	mg/kg	0.2056	0.21
				Total	**3.9**
Noncarcinogens: Water Ingestion Risk[1]					
Benzene	0.0064	0.15	mg/L	0.0427	0.04
Toluene	0.2	2.9	mg/L	0.0690	0.07
Ethylbenzene	0.23	3.7	mg/L	0.0622	0.06
Xylenes	5.1	7.3	mg/L	0.6986	0.70
Methylene chloride	0.0035	2.2	mg/L	0.0016	0.00
Naphthalene	0.096	0.73	mg/L	0.1315	0.13
1,2,4-trimethylbenzene	0.66	1.8	mg/L	0.3667	0.37
1,3,5-trimethylbenzene	0.24	1.8	mg/L	0.1333	0.13
				Total	**1.5**
				Noncarcinogenic Hazard Index	**5**

Notes:

[1] Methodology and risk-based concentration (RBC) followed Cumulative Risk Guidance (ADEC 2008)

[2] RBC is for Arctic Zone; data from Cumulative Risk Guidance (ADEC 2008)

[3] Risk at site concentration = (site concentration/RBC) x 10^{-5}

[4] Carcinogenic cumulative risk and cumulative Hazard Index are rounded to one significant figure; individual carcinogenic risks and hazard indices are rounded to two significant figures (ADEC 2008, page 11)

[5] HQ at site concentration = (site concentration/RBC) x 1

Abbreviations:

COPC	Contaminant of Potential Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter

Table A-1
AST Pad and Pipeline Supports Area Cumulative Risk Calculations -- Soil and Surface Water
Nuvagapak Point DEW Line Station, Alaska

COPC	Highest Detected Site Concentration	RBC[2]	Units	Site Concentration/ RBC	HQ at Site Concentration [4,5]
	HI	Hazard Index for noncarcinogenic risk			
	HQ	Hazard Quotient for noncarcinogenic risk			
	RBC	risk-based concentration			
	N/A	No effects through the specified exposure route			

Conclusions:

1-Calculated risk does not exceed carcinogenic screening criterion (carcinogens > 1 x 10-5) for soil and water.

2-Calculated risk exceeds Hazard Index screening criterion (HI > 1) for both soil and water.

Table A-2
Composite Building Area Cumulative Risk Calculations -- Soil and Surface Water
Nuvagapak Point DEW Line Station, Alaska

COPC	Highest Detected Site Concentration	RBC[2]	Units	Site Concentration/ RBC	Risk at Site Concentration [3,4]
Carcinogens: Direct contact[1]					
Arochlor 1254	5.41	3.8	mg/kg	1.424	1.4E-05
				Total	**1.4E-05**
Carcinogens: Inhalation Risk[1]					
Arochlor 1254	5.41	25	mg/kg	0.216	2.2E-06
				Total	**2.2E-06**
Carcinogens: Water Ingestion Risk[1]					
Chloromethane	0.0051	0.066	mg/L	0.077	7.7E-07
Pentachlorophenol	0.0061	0.0071	mg/L	0.859	8.6E-06
bis-2-ethylhexyl ether	0.0035	0.00077	mg/L	4.545	4.5E-05
				Total	**5.5E-05**
				Carcinogenic Cumulative Risk	**7E-05**
COPC	**Highest Detected Site Concentration**	**RBC[2]**	**Units**	**Site Concentration/ RBC**	**HQ at Site Concentration [4,5]**
Noncarcinogens: Direct contact[1]					
Naphthalene	5.30	1900	mg/kg	0.00	0.00
				Total	**0.00**
Noncarcinogens: Inhalation[1]					
Naphthalene	5.30	180	mg/kg	0.03	0.03
				Total	**0.03**
Noncarcinogens: Water Ingestion Risk[1]					
Pentachlorophenol	0.0061	1.1	mg/L	0.01	0.01
				Total	**0.01**
				Noncarcinogenic Hazard Index	**0**

Notes:

[1] Methodology and risk-based concentration (RBC) followed Cumulative Risk Guidance (ADEC 2008)

[2] RBC is for Arctic Zone; data from Cumulative Risk Guidance (ADEC 2008)

[3] Risk at site concentration = (site concentration/RBC) x 10^{-5}

[4] Carcinogenic cumulative risk and cumulative Hazard Index are rounded to one significant figure; individual carcinogenic risks and hazard indices are rounded to two significant figures (ADEC 2008, page 11)

[5] HQ at site concentration = (site concentration/RBC) x 1

Abbreviations:

COPC	Contaminant of Potential Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
HI	Hazard Index for noncarcinogenic risk
HQ	Hazard Quotient for noncarcinogenic risk
RBC	risk-based concentration
N/A	No effects through the specified exposure route

Conclusions:

1-Calculated risk exceeds carcinogenic screening criterion (carcinogens > 1 x 10-5) for both soil and water.

2-Calculated risk does not exceed Hazard Index screening criterion (HI > 1) for soil or water.

Table A-3
Grid Area Cumulative Risk Calculations -- Soil and Surface Water
Nuvagapak Point DEW Line Station, Alaska

COPC	Highest Detected Site Concentration	RBC[2]	Units	Site Concentration/RBC	Risk at Site Concentration [3,4]
Carcinogens: Direct contact[1]					
Benzene	2.0	200	mg/kg	0.010	1.0E-07
TCE	0.1	28	mg/kg	0.004	4.3E-08
				Total	**1.4E-07**
Carcinogens: Inhalation Risk[1]					
Benzene	2.0	17	mg/kg	0.118	1.2E-06
TCE	0.12	0.85	mg/kg	0.141	1.4E-06
				Total	**2.6E-06**
				Carcinogenic Cumulative Risk	**3E-06**
COPC	**Highest Detected Site Concentration**	**RBC[2]**	**Units**	**Site Concentration/RBC**	**HQ at Site Concentration [4,5]**
Noncarcinogens: Direct contact[1]					
Benzene	2.0	550	mg/kg	0.00	0.00
TCE	0.120	41	mg/kg	0.00	0.00
				Total	**0.01**
Noncarcinogens: Inhalation[1]					
Benzene	2.0	170	mg/kg	0.01	0.01
TCE	0.120	160	mg/kg	0.00	0.00
				Total	**0.01**
Noncarcinogens: Water Ingestion Risk[1]					
di-n-butyl-phthalate	0.003	3.7	mg/L	0.00	0.00
				Total	**0.00**
				Noncarcinogenic Hazard Index	**0**

Notes:

[1] Methodology and risk-based concentration (RBC) followed Cumulative Risk Guidance (ADEC 2008)

[2] RBC is for Arctic Zone; data from Cumulative Risk Guidance (ADEC 2008)

[3] Risk at site concentration = (site concentration/RBC) x 10^{-5}

[4] Carcinogenic cumulative risk and cumulative Hazard Index are rounded to one significant figure; individual carcinogenic risks and hazard indices are rounded to two significant figures (ADEC 2008, page 11)

[5] HQ at site concentration = (site concentration/RBC) x 1

Abbreviations:

COPC	Contaminant of Potential Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
HI	Hazard Index for noncarcinogenic risk
HQ	Hazard Quotient for noncarcinogenic risk
RBC	risk-based concentration
N/A	No effects through the specified exposure route

Conclusions:

1-Calculated risk does not exceed screening criteria (carcinogens > 1x10-5 and/or HI >1.0).

Table A-4
Shop Area Cumulative Risk Calculations -- Soil and Surface Water
Nuvagapak Point DEW Line Station, Alaska

COPC	Highest Detected Site Concentration	RBC[2]	Units	Site Concentration/RBC	Risk at Site Concentration [3,4]
Carcinogens: Direct contact[1]					
Arochlor 1254	4.9	3.8	mg/kg	1.289	1.3E-05
				Total	**1.3E-05**
Carcinogens: Inhalation Risk[1]					
Arochlor 1254	4.9	25	mg/kg	0.196	2.0E-06
				Total	**2.0E-06**
Carcinogens: Water Ingestion Risk[1]					
Chloromethane	0.0072	0.066	mg/L	0.109	1.1E-06
bis-2-ethyl hexyl phthalate	0.0012	0.061	mg/L	0.020	2.0E-07
				Total	**1.3E-06**
				Carcinogenic Cumulative Risk	**2E-05**
COPC	**Highest Detected Site Concentration**	**RBC[2]**	**Units**	**Site Concentration/RBC**	**HQ at Site Concentration [4,5]**
Noncarcinogens: Water Ingestion Risk[1]					
bis-2-ethyl hexyl phthalate	0.0012	0.73	mg/L	0.00	0.00
				Total	**0.00**
				Noncarcinogenic Hazard Index	**0**

Notes:

[1] Methodology and risk-based concentration (RBC) followed Cumulative Risk Guidance (ADEC 2008)

[2] RBC is for Arctic Zone; data from Cumulative Risk Guidance (ADEC 2008)

[3] Risk at site concentration = (site concentration/RBC) x 10^{-5}

[4] Carcinogenic cumulative risk and cumulative Hazard Index are rounded to one significant figure; individual carcinogenic risks and hazard indices are rounded to two significant figures (ADEC 2008, page 11)

[5] HQ at site concentration = (site concentration/RBC) x 1

Abbreviations:

COPC	Contaminant of Potential Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
HI	Hazard Index for noncarcinogenic risk
HQ	Hazard Quotient for noncarcinogenic risk
RBC	risk-based concentration
N/A	No effects through the specified exposure route

Conclusions:

1-Calculated risk exceeds screening criteria (carcinogens > 1x10-5) for soil.

APPENDIX B

COST SUMMARY FOR SELECTED REMEDY

Table B-1
Alternative 6 - Landfarming, Off-site Disposal
Nuvagapak Point DEW Line Station, Alaska

This response action involves construction of an on-site treatment cell for POL-contaminated soil and off-site disposal of PCB-contaminated media.

MOBILIZATION (Year 1)				
Personnel, Equipment & Materials	**Number**	**Rate**	**Subtotal**	
Fairbanks to Barrow	6 People - 1 way	$450	$2,700	
Frontier Flying Charter - 6 people from Barrow to Nuvagapak (turbo caravan @ $1,350/hour or $3,000/trip)	1 round trip	$3,000	$3,000	
Trucking - Fairbanks to Prudhoe Bay dock (Materials and Supplies)	2 loads	$4,500	$9,000	
Trucking - Prudhoe Bay to Prudhoe Bay dock (Heavy Equipment)	7 loads	$350	$2,450	
Remote Camp Mobilization - Prudhoe to Site	1 lump sum (LS)	$2,500	$2,500	
Remote Camp Mobilization - Fairbanks to Prudhoe	1 LS	$18,607	$18,607	
			15% Fee	**$5,739**
			Total	**$43,996**
Barging	**Daily Rate**	**Days**	**Subtotal**	
550-ton barge - Loading @ Prudhoe Bay	$20,000	1	$20,000	
550-ton Barge - Prudhoe to Nuvagapak (25-hour run time)	$20,000	1	$20,000	
550-ton Barge - Unloading @ Nuvagapak	$20,000	1	$20,000	
550-ton Barge - Nuvagapak to Prudhoe Bay (25-hour run time)	$20,000	1	$20,000	
Note: Assume barge has other work along northern coast of Alaska				
			Total	**$80,000**
HAZWOPER Labor *(Assist with barge unloading and camp setup, 7 days)*	**Hourly Rate**	**Hours (travel, barge unloading, assist with camp setup)**	**Subtotal**	
4 each Operators (84-hour work week each)	$153	336	$51,563	
1 each Laborer (84-hour work week)	$128	84	$10,778	
Note: Davis Bacon wages				
G&A/OH/Profit applied for a multiplier to the base rate of 2.52			*Total*	**$62,341**
Hourly rate = average for 40hr ST and 44hr OT				
Equipment Standby & Onsite Support for Mob	**Monthly Rate (160 hrs unless noted)**	**Months**	**Subtotal**	
1 each Cat D6N LGP bulldozer w/ winch	$9,360	0.25	$2,340	
1 each Cat 930G loader w/ forks and material-handling arm	$7,225	0.25	$1,806	
1 each Cat 312L excavator w/ ripper bucket	$5,630	0.25	$1,408	
1 each Cat 725 articulated dump truck	$11,500	0.25	$2,875	
1 each Tundra 1500 rig heater 1.35M BTU	$8,500	0.25	$2,125	
2 each Polaris Ranger	$4,000	0.5	$2,000	
1 each 50 kW generator (XQ 60) unlimited hours	$3,750	0.25	$938	
1 each service truck	$5,930	0.25	$1,483	
1 each 5,000-gallon fuel tank w/pump station	$1,800	0.25	$450	
Spare ground engaging parts for heavy equipment	$3,500	1	$3,500	
6-cubic-yard trash dumpster	$150	1	$150	
			15% Fee	**$2,861**
Note: Assume equipment available in Prudhoe Bay for rent			*Total*	**$21,935**
			Mobilization Task Total	**$208,271**

Table B-1
Alternative 6 - Landfarming, Off-site Disposal
Nuvagapak Point DEW Line Station, Alaska

Alternative 6 (continued)

POL SOIL REMOVAL AND PLACEMENT IN TREATMENT CELL (Year 1)				
HAZWOPER Labor - 2,900 loose cubic yards/3,866 tons of POL soil to excavate and place in treatment cell = 14 days or 2 weeks	**Hrly Rate**	**Hours**	**Subtotal**	
4 each Operators (12-hour work day each for 11 days)	$153	576	$88,393	
1 each Laborer (12-hour work day for 12 days)	$128	144	$18,477	
Revegetation: 2 each Laborer (12-hour work day for 4 days)	$128	96	$12,318	
Note: Davis Bacon wages				
G&A/OH/Profit applied for a multiplier to the base rate of 2.52			Total	**$119,187**
Hourly rate = average for 40hr ST and 44hr OT				
Equipment	**Monthly Rate (160 hrs unless noted)**	**Months**	**Subtotal**	
1 each Cat D6N LGP bulldozer w/ winch	$9,360	1	$9,360	
Cat 930G loader w/ forks and material-handling arm @ $7,225/month each	$14,450	1	$14,450	
2 each Cat 312L excavator w/ ripper bucket @ $5,630/month each	$11,260	1	$11,260	
1 each Cat 725 articulated dump truck	$11,500	1	$11,500	
1 ea Tundra 1500 rig heater 1.35M BTU	$8,500	1	$8,500	
4 each Polaris Ranger	$8,000	1	$8,000	
1 each 50 kW generator (XQ 60) unlimited hours	$3,750	1	$3,750	
1 each service truck	$5,930	1	$5,930	
1 each 10,000-gallon fuel tank w/ pump station	$3,500	1	$3,500	
27-cubic-yard trash dumpster	$500	1	$500	
Note - 14 days forecast but 1 month rent used to cover additional hours for overtime			*15% Fee*	**$11,513**
			Total	**$88,263**
Materials & Supplies	**Quantity**	**Cost Each**	**Extended**	
Diesel Fuel	10,000	$5	$45,000	
Geotextile	20,000 sq ft	$40,000	$40,000	
Erosion Blanket	20,000 sq ft	$40,000	$40,000	
Revegetation seed mixture	50 lb	$200	$200	
Safety Fencing	LS	$1,000	$1,000	
Decon Supplies	LS	$1,000	$1,000	
Personal Protective Equipment	LS	$1,000	$1,000	
Safety Vests	LS	$150	$150	
Hard Hats	LS	$100	$100	
Oil and Grease	LS	$2,500	$2,500	
Chains, Shackles, Lifting Straps	LS	$1,250	$1,250	
Spill Kits	2	$2,000	$2,000	
Duck Ponds	9	$250	$2,250	
Shovels, Rakes	6	$30	$180	
Equipment Tarps & Trunks (heating)	2	$340	$680	
			15% Fee	**$20,597**
			Total	**$157,907**
Camp Costs				
Daily Camp Rental	14	$950	$13,300	
Field Labor	14	$1,333	$18,656	
			15% Fee	**$4,793**
			Total	**$36,749**
			POL-Contaminated Soil Removal Task Total	**$402,105**

Table B-1
Alternative 6 - Landfarming, Off-site Disposal
Nuvagapak Point DEW Line Station, Alaska

Alternative 6 (continued)

PCB SOIL REMOVAL AND OFF-SITE DISPOSAL (Year 1)

HAZWOPER Labor *(242 loose cubic yards/323 tons of PCB soil to excavate & bag = 4 days)*	**Hourly Rate**	**Hours**	**Subtotal**	
4 each Operators (12-hour work day each for 3 days)	$153	144	$22,098	
1 each Laborer (12-hour work day for 3 days)	$128	36	$4,619	
Note: Davis Bacon wages			*Total*	**$26,717**
G&A/OH/Profit applied for a multiplier to the base rate of 2.52				
Hourly rate = average for 40hr ST and 44hr OT				

Equipment	**Monthly Rate (160 hrs unless noted)**	**Months**	**Subtotal**	
1 each Cat D6N LGP bulldozer w/ winch	$9,360	0.25	$2,340	
Cat 930G loader w/ forks and material-handling arm @ $7,225/month each	$14,450	0.25	$3,613	
2 each Cat 312L excavator w/ ripper bucket @ $5,630/month each	$11,260	0.25	$2,815	
1 each Cat 725 articulated dump truck	$11,500	0.25	$2,875	
1 ea Tundra 1500 rig heater 1.35M BTU	$8,500	0.25	$2,125	
4 each Polaris Ranger	$8,000	0.25	$2,000	
1 each 50 kW generator (XQ 60) unlimited hours	$3,750	0.25	$938	
1 each service truck	$5,930	0.25	$1,483	
1 each 10,000-gallon fuel tank w/ pump station	$3,500	0.25	$875	
27-cubic-yard trash dumpster	$500	0.25	$125	
4 days planned, equipment rental for 1 week to cover extended hours			*15% Fee*	**$2,878**
			Total	**$22,066**

Materials & Supplies	**Quantity**	**Cost Each**	**Extended**	
Diesel Fuel	3,500	$5	$15,750	
			15% Fee	**$2,363**
			Total	**$18,113**

Camp Costs				
Daily Camp Rental	4	$950	$3,800	
Field Labor	4	$1,333	$5,330	
			15% Fee	**$1,370**
			Total	**$10,500**

PCB Soil Disposal	**Quantity**	**Cost**	**Subtotal**	
Barge Unloading @ Prudhoe Bay onto trucks	242	$10	$2,420	
Transportation - Prudhoe Bay to Arlington, Oregon (per CY)	242	$800	$193,600	
Disposal Fee - Non-TSCA PCB contaminated soil (per CY)	242	$47	$11,374	
			15% Fee	**$31,109**
			Total	**$238,503**
			PCB-Contaminated Soil Removal Task Total	**$315,898**

Table B-1
Alternative 6 - Landfarming, Off-site Disposal
Nuvagapak Point DEW Line Station, Alaska

Alternative 6 (continued)

TAKEDOWN & DEMOBILIZATION (Year 1)

Personnel, Equipment & Materials	**Number**	**Rate**	**Subtotal**		
Fairbanks to Barrow	6 People - 1 way	$450	$2,700		
Frontier Flying Charter - 6 people Barrow to Nuvagapak (turbo caravan @ $1,350/hr or $3,000/trip)	1 round trip	$3,000	$3,000		
Trucking - Fbks to Prudhoe Bay Dock (Materials and Supplies)	2 loads	$4,500	$9,000		
Trucking - Prudhoe Bay Dock to Prudhoe Bay (Heavy Equip.)	7 loads	$350	$2,450		
Heavy Equipment Environmental Fees (oil and antifreeze change outs)	9	$50	$450		
Remote Camp Demobilization - Site to Prudhoe Bay	1 LS	$2,500	$2,500		
Remote Camp Demobilization & 1 Time Fees - Prudhoe Bay to Fbks	1 LS	$18,607	$18,607		
6-cubic-yard trash dumpster - disposal fee	1	$250	$250		
				15% Fee	**$5,844**
				Total	**$44,801**
Barging	**Daily Rate**	**Days**	**Subtotal**		
550-ton Barge - Prudhoe Bay to Nuvagapak (25 hours run time)	$20,000	1	$20,000		
550-ton Barge - Loading at Nuvagapak	$20,000	2	$40,000		
550-ton Barge - Nuvagapak to Prudhoe Bay (25 hours run time)	$20,000	1	$20,000		
550-ton Barge - Unloading @ Prudhoe Bay	$20,000	2	$40,000		
Note: Assume barge has other work along northern coast of Alaska					
				Total	**$120,000**
Labor (Assist with barge loading and camp takedown, 7 days)	**Hrly Rate**	**Hours**	**Subtotal**		
4 each Operators (84-hour work week each)	$153	336	$51,563		
1 each Laborer (84- hour work week)	$128	84	$10,778		
Note: Davis Bacon wages					
G&A/OH/Profit applied for a multiplier to the base rate of 2.52				*Total*	**$62,341**
Hourly rate = average for 40hr ST and 44hr OT					
Equipment Standby & Onsite Support for Demob	**Monthly Rate (160 hrs unless noted)**	**Months**	**Subtotal**		
1 each Cat D6N LGP bulldozer w/ winch	$9,360	0.25	$2,340		
Cat 930G loader w/ forks and material-handling arm @ $7225/month each	$14,450	0.25	$3,613		
2 each Cat 312L excavator w/ ripper bucket @ $5630/month each	$11,260	0.25	$2,815		
1 each Cat 725 articulated dump truck	$11,500	0.25	$2,875		
1 ea Tundra 1500 rig heater 1.35M BTU	$8,500	0.25	$2,125		
4 each Polaris Ranger	$8,000	0.25	$2,000		
1 each 50 kW generator (XQ 60) unlimited hours	$3,750	0.25	$938		
1 each service truck	$5,930	0.25	$1,483		
1 each 10,000-gallon fuel tank w/ pump station	$3,500	0.25	$875		
27-cubic-yard trash dumpster	$500	0.25	$125		
				15% Fee	**$2,878**
Note: Assume equipment available in Prudhoe Bay for rent				*Total*	**$22,066**
				Demobilization Task Total	**$249,207**

Table B-1
Alternative 6 - Landfarming, Off-site Disposal
Nuvagapak Point DEW Line Station, Alaska

Alternative 6 (continued)

POL SOIL TREATMENT (Years 1 and 2)				
Cost per site visit [Rototill treatment cells once per week, June through August, two summers (24 weeks total)]				
Personnel, Equipment & Materials	**Number**	**Rate**	**Subtotal**	
Frontier Flying Charter - 2 people from Barrow to Nuvagapak (turbo caravan @ $1,350/hour or $3,000/trip)	1 round trip	$3,000	$3,000	
HAZWOPER Labor	**Hourly Rate**	**Hours**	**Subtotal**	
1 each Operator (10-hour work day)	$153	10	$1,535	
1 each Laborer (10-hour work day)	$128	10	$1,283	
Note: Davis Bacon wages			*Per-visit total*	**$5,818**
G&A/OH/Profit applied for a multiplier to the base rate of 2.52			*24 visits total*	**$139,625**
Hourly rate = average for 40hr ST and 44hr OT				
Equipment *(3 months/summer season, 2 seasons)*	**Monthly Rate (160 hrs unless noted)**	**Months**	**Subtotal**	
1 each John Deere 4500 tractor with rototiller attachment	$9,360	6	$56,160	
1 each service truck	$3,000	6	$18,000	
1 each 1,000-gallon fuel tank w/ pump station	$1,500	6	$9,000	
5-cubic-yard trash dumpster	$250	6	$1,500	
			15% Fee	**$12,699**
			Total	**$97,359**
Materials & Supplies	**Quantity**	**Cost Each**	**Extended**	
Diesel Fuel	1,000	$5	$5,000	
			15% Fee	**$750**
			Total	**$5,750**
Barging *(one mob, one demob per season, two seasons)*	**Daily Rate**	**Days**	**Subtotal**	
550-ton barge - Loading @ Prudhoe Bay	$2,000	1	$2,000	
550-ton Barge - Prudhoe to Nuvagapak (25-hour run time)	$20,000	1	$20,000	
550-ton Barge - Unloading @ Nuvagapak	$2,000	1	$2,000	
550-ton Barge - Nuvagapak to Prudhoe Bay (25-hour run time)	$20,000	1	$20,000	
Note: Assume barge has other work along northern coast of Alaska				
			Total	**$44,000**
			POL-Contaminated Soil Treatment Task Total	**$286,734**

Capital Cost Subtotal	**$1,462,215**
Project Management (10 percent)	$146,221
Remedial Design (12 percent)	$175,466
Construction Management (15 percent)	$219,332
Design Contingency (25 percent)	$365,554
Bid Contingency (25 percent)	$365,554
TOTAL ESTIMATED PROBABLE COST OF ALTERNATIVE 6	**$2,734,341**

* - see Alternative 2 for explanation of periodic cost assumptions

APPENDIX C

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
RISK-BASED CLEANUP LEVELS

Table C-1
Applicable or Relevant and Appropriate Requirements (for CERCLA hazardous substances)
Nuvagapak Point DEW Line Station, Alaska

ARARs	Citation or Reference	Requirements	Comments and Analysis/Rationale for Decision
Alaska State Regulations			
Oil and Hazardous Substances Pollution Control Regulations	18 AAC 75.341(c), Table B1	Regulations establishing discharge reporting, cleanup, and disposal requirements for oil and other hazardous substances. Provides cleanup standard for soil.	These regulations provide applicable soil cleanup standards for CERCLA hazardous substances (PCBs only).
Federal Regulations			
Endangered Species Act of 1973	50 CFR 17.31	Establishes requirements, with respect to any threatened wildlife, that it is unlawful for any person to take any such species within the United States. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.	Endangered, threatened, and/or species of special concern are known to utilize critical habitat designated on-site. The polar bears (threatened) range includes the site and spectacled eiders (threatened) are known to nest in coastal locations.
Marine Mammal Protection Act	16 USC 1372, Section 102(a)(2)(A)	Provides for the protection and management of marine mammals and their products. Includes walruses, polar bears, sea otters, whales, porpoises, seals, and sea lions. Primary authorities are the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.	Remedial actions cannot impair protected species. Designated critical habitat area for polar bears includes the Nuvagapak Point site.
Wildlife Refuge Protection	16 USC 668dd(c)	On National Wildlife Refuge Systems, requirement states that no person shall disturb, injure, cut, burn, remove, destory, or possess any real or personal property of the US, including natural growth, in any area of the System; or take or possess any fish, bird, mammal, or other wild vertebrate or invertebrate animals or part or nest or egg thereof within any such area; or enter, use, or otherwise occupy any such area for any purpose; unless such activities are performed by persons authorized to manage such area, or unless such activities are permitted either under subsection (d) of this section or by express provision of the law, proclamation.	The Nuvagapak DEW Line Station is within the Arctic National Wildlife Refuge.
The Migratory Bird Treaty Act	16 USC 703	Law makes it unlawful to take, kill, or possess any migratory bird or any part, nest, or eggs of any such bird.	The coastal plain area of the Arctic National Wildlife Reguge, including Nuvagapak Point, is used for summer breeding and visitation by a variety of migratory birds. Common species resident to, migrating through, or breeding on the coastal plain include the greater white-fronted goose, snow goose, ross's goose, brant, tundra swan, northern pintail, king eider, common eider, long tailed duck, red-breasted merganser, american golden-plover, ruddy turnstone, semipalmated sandpiper, red-necked phalarope, glaucous gull, arctic tern, pomarine jaeger, and long-tailed jaeger.

Table C-2
Risk-Based Cleanup Levels (for petroleum hydrocarbons)
Nuvagapak Point DEW Line Station, Alaska

Cleanup Levels	Citation or Reference	Requirements	Comments and Analysis/Rationale for Decision
Alaska State Regulations			
Oil and Hazardous Substances Pollution Control Regulations	18 AAC 75.341(b), Table A1 and 18 AAC 75.341(c), Table B2	Regulations establishing discharge reporting, cleanup, and disposal requirements for oil and other hazardous substances. Provides cleanup standard for soil.	Specifies risk-based cleanup levels for diesel and gasoline range organics which will be used to determine mitigation of imminent and substantial endangerment for petroleum hydrocarbons as authorized by DERP.
Water Quality Standards	18 AAC 70.020(b)	Specifies the water quality criteria that may not be exceeded in a waterbody as a result of human actions. For petroleum hydrocarbons, the standard of control is runoff may not cause a visible sheen upon the surface of the water.	Runoff from excavation areas may not cause or contribute to a violation of the water quality standards.