EPA/ROD/R10-00/034
2000

EPA Superfund
Record of Decision:

ADAK NAVAL AIR STATION
EPA ID: AK4170024323
OU 02
ADAK, AK
03/31/2000

FORMER ADAK NAVAL COMPLEX
DECLARATION OF THE RECORD OF DECISION, OPERABLE UNIT A

SITE NAME AND LOCATION

Operable Unit A
Adak Naval Complex
Adak Island, Alaska

STATEMENT OF BASIS AND PURPOSE

Naval Air Facility Adak was placed on the National Priorities List (NPL) in 1994. Adak was divided into two operable units (OUs), OU A and OU B.

This Record of Decision (ROD) presents the selected remedial actions for OU A at the former Adak Naval Complex on Adak Island, Alaska. OU A comprises 58 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites and 128 petroleum sites covered by the State-Adak Environmental Restoration Agreement (SAERA). Issues regarding ordnance explosives will be addressed in a separate ROD, which will be for OU B. The 58 OU A CERCLA sites are separated into the following categories:

C No-further-action sites
C Institutional-control-only sites
C Industrial sites
C Landfills

Also included under the CERCLA discussion are major OU A water bodies adjacent to or downgradient of the CERCLA terrestrial sites, as well as the downtown groundwater area.

The petroleum sites are separated into the following categories:

- No-further-action sites
- Free-product-removal sites
- Monitored natural attenuation sites
- Soil removal sites

This ROD was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); 42 United States Code (USC) Section 9601 et seq.; and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU A.

The State of Alaska concurs with the selected remedies.

The following information is included in Sections 6 through 10 of this Record of Decision. Additional information can be found in the Administrative Record file for this site. <r00>

- Chemicals of concern (COCs) and their respective concentrations

- Baseline risk represented by the COCs

- Cleanup levels established for COCs and the basis for the levels

- Current and future land and groundwater use assumptions used in the baseline risk assessment and ROD

- Land and groundwater use that will be available at the site as a result of the Selected Remedy

- Estimated capital, operation, and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected

- Decisive factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria)

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the CERCLA and petroleum sites, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health and welfare or to the environment. Removal actions and interim remedial actions have already taken place at numerous CERCLA and all petroleum sites.

DESCRIPTION OF THE SELECTED REMEDIES

This OU is addressing numerous sources of contamination to soils, surface water, sediments, and groundwater. The selected remedies reduce risk through removal and treatment, or containment, and institutional controls.

The major components of the selected remedy for the CERCLA sites (including the OU A water bodies and downtown groundwater) include the following:

- Excavation and treatment by thermal desorption of contaminated sediments and soils

- Recycling of treated sediment and soils as daily cover material at the on-island Roberts Landfill

- Placement of a soil cover over SWMU 4

- Institutional controls to prohibit unacceptable exposure to hazardous substances left on site

- Monitoring of groundwater for benzene, toluene, ethylbenzene, xylenes, diesel-range organics (DRO), gasoline-range organics (GRO), bis(2-ethylhexyl)phthalate, methylene chloride, tetrachloroethene, trichloroethene, lead, and natural recovery parameters

- Monitoring of aquatic biota for polychlorinated biphenyls (PCBs)

The major components of the selected remedy for the petroleum sites include the following:

- Removal and treatment of petroleum-contaminated soils to meet 18 AAC 75 requirements

- Recycling of treated soils as daily cover material at the on-island Roberts Landfill

- Monitored natural attenuation of petroleum chemicals in soil and groundwater

- Free-product recovery to the maximum extent practicable as an interim remedial measure, followed by an evaluation of remedial alternatives to achieve final cleanup per the focused feasibility study (FFS) to achieve final cleanup levels under 18 AAC 75 for soils and groundwater

- Institutional controls to minimize the potential for direct contact, to restrict groundwater use, and/or to restrict excavation until remedial objectives have been met

STATUTORY DETERMINATION

Each selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost effective. Each remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element was not met for all sites. Treatment will be included as part of the remedy for SWMU 17, South Sweeper Creek, and the 12 soil removal petroleum sites.

Because these remedies will result in hazardous substances remaining at some source areas above health-based levels, a review will be conducted within 5 years after commencement of remedial action to ensure that the remedies continue to provide adequate protection of human health and the environment.

RECORD OF DECISION
FORMER ADAK NAVAL COMPLEX, ADAK ISLAND, ALASKA
OPERABLE UNIT A

Signature sheet for the foregoing Record of Decision for the Operable Unit A final action at Adak Naval Complex, Adak Island, Alaska, between the United States Navy, the United States Environmental Protection Agency, and the State of Alaska Department of Environmental Conservation.

Captain Michael Conaway Civil Engineer Corps-USN Commanding Officer Engineering Field Activity, Northwest	Date

RECORD OF DECISION
FORMER ADAK NAVAL COMPLEX, ADAK ISLAND, ALASKA
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Chuck Clarke Regional Administrator Region 10 U.S. Environmental Protection Agency	Date

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FORMER ADAK NAVAL COMPLEX, ADAK ISLAND, ALASKA
OPERABLE UNIT A

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____ ____________________

Lynn Tomich Kent — Date
Manager, Contaminated Sites Remediation Program
Division of Spill Prevention and Response
Alaska Department of Environmental Conservation

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ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ADCRA	Alaska Department of Community and Regional Affairs
AIMD	Aircraft Intermediate Maintenance Detachment
ARAR	applicable or relevant and appropriate requirement
ARC	Adak Reuse Corporation
AST	aboveground storage tank
avgas	aviation gasoline
BCP	BRAC cleanup plan
BCT	BRAC Cleanup Team
BECT	BRAC Environmental Cleanup Team
bgs	below ground surface
BMP	Best Management Practices
BRAC	Base Closure and Realignment Act
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTU	British thermal unit
C	Celsius
CDAA	Circular Disposed Antenna Array
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CFU	colony-forming units
CLEAN	Comprehensive Long-Term Environmental Action Navy
cm	centimeter
CNS	central nervous system
COC	chemical of concern
COPC	chemical of potential concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CRP	community relations plan
CSF	cancer slope factor
CSO	Caretaker Site Office
CTO	contract task order
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyidichloroethylene
DDESB	U.S. Department of Defense Explosives Safety Board
DDT	dichlorodiphenyltrichloroethane

ABBREVIATIONS AND ACRONYMS (Continued)

DEC	Department of Environmental Conservation (State of Alaska)
DEM	downgradient exposure medium
D/F	dioxins/furans
DoD	Department of Defense
DRMO	Defense Reutilization Marketing Office
DRO	diesel-range organics
EBS	environmental baseline survey
EE/CA	engineering evaluation/cost analysis
EFA NW	Engineering Field Activity, Northwest
EPA	U.S. Environmental Protection Agency
FFA	Federal Facilities Agreement
FFCA	Federal Facilities Compliance Agreement
FFS	focused feasibility study
FOST	Finding of Suitability to Transfer
FS	feasibility study
ft	foot
g	gram
GCI	General Communications, Inc.
GI	gastrointestinal
GRA	general response action
GRO	gasoline-range organics
GSE	Ground Support Equipment
HEAST	Health Effects Assessment Summary Tables
HEPD	high explosive point detonating
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
hr	hour
IAS	initial assessment study
ICMP	institutional controls management plan
IEUBK	Integrated Exposure Uptake Biokinetic
IRIS	Integrated Risk Information System
IRM	interim remedial measure
IRR	investigation-related removal
JP-5	jet petroleum No. 5
kg	kilogram

ABBREVIATIONS AND ACRONYMS (Continued)

L	liter
LOAEL	lowest observed adverse effects level
LOEC	lowest observed effects concentration
log K_{ow}	log octanol-water partition coefficient
Loran	long-range navigation
LRA	Local Redevelopment Authority
LTTD	low-temperature thermal desorption
MAUW	modified advanced underwater weapons
MCL	maximum contaminant level
µg	microgram
mg	milligram
MLLW	mean lower low water
NACIP	Navy Assessment and Control of Installation Pollutants
NAF	Naval Air Facility
NAVFAC	Naval Facility
Navy	U.S. Navy
NBS	National Biological Service
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NMCB	Naval Mobile Construction Battalion
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effects level
NOEC	no observed effects concentration
NORPAC	North Pacific
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NSGA	Naval Security Group Activity
NTU	nephelometric turbidity unit
OB/OD	open burn/open detonation
OSHA	Occupational Safety and Health Administration
OU	operable unit
O/W	oil/water separator
P/A	pesticides/Aroclors
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene

ABBREVIATIONS AND ACRONYMS (Continued)

POL	petroleum oil and lubricants
ppm	parts per million
PSE	preliminary source evaluation
RAB	Restoration Advisory Board
RAC	remedial action criteria
RAO	remedial action objective
RBSC	risk-based screening concentration
RCRA	Resource Conservation and Recovery Act
RFA	remedial facility assessment
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
ROICC	resident officer in charge of construction
RPD	relative percent difference
RRO	residual-range organics
SA	source area
SAERA	State-Adak Environmental Restoration Agreement
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	site inspection
SOP	standard operating procedure
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAC	The Aleut Corporation
TBC	to be considered
TCDD	tetrachlorodibenzo-p-dioxin
TCE	trichloroethene
TEF	toxicity equivalency factor
TFB	Tank Farm B
TFC	Tank Farm C
TIN	total inorganics
TPH	total petroleum hydrocarbons
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
UCL	upper confidence level

ABBREVIATIONS AND ACRONYMS (Continued)

URS	URS Consultants, Inc. (now URS Greiner, Inc.)
URSG	URS Greiner, Inc. (formerly URS Consultants, Inc.)
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
VEP	vapor extraction point
VOC	volatile organic compound
WAC	Washington Administrative Code

FORMER ADAK NAVAL COMPLEX
RECORD OF DECISION

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Adak Island is located approximately 1,300 air miles southwest of Anchorage, Alaska, in the Aleutian Island chain (Figure 1-1). Its geographic position is 176E45'W longitude and 51E45'N latitude. At 280 square miles, it is the largest of the Andreanof group of the Aleutian Islands.

The former U.S. Navy base occupied 76,800 acres on the northern half of the island and closed operationally on March 31, 1997. The U.S. Fish and Wildlife Service (USFWS) manages the southern portion (117,265 acres) of the island, which is a designated wilderness area within the Alaska Maritime National Wildlife Refuge system.

The developed portion of Adak is limited to the northern half of the island (Figure 1-2). The Adak Naval Complex (hereafter referred to as the former base) had two main developed areas: Naval Air Facility (NAF) Adak and Naval Security Group Activity (NSGA). Land uses at NAF Adak, located in the developed "downtown" area, include the airfield, port facilities, and light industrial, administrative, commercial/recreational, and residential areas.

NSGA is located approximately 5 miles north of NAF Adak, at the northwestern corner of Clam Lagoon. NSGA ceased all operations in 1995. The structures and road system remain, but the area is not inhabited by service personnel. The primary land uses during operations at the facility included light industrial, administrative, and residential facilities. An antenna field (known as the "dinosaur cage") and transmission facility to the west of the main complex were demolished in 1996, and only the empty structure of the transmission facility remains.

Land transfer agreements are being negotiated among the Navy, U.S. Department of the Interior, and The Aleut Corporation (TAC). Once the negotiations are concluded, there is a strong possibility that a community of families will live in the existing downtown housing units. Based on the latest reuse plan for Adak (ASCG 1998), future land uses are expected to be generally similar to current land uses. Land use for Adak is shown on Figure 1-3.

Adak Island experiences a polar maritime climate characterized by persistently overcast skies, high winds, frequent and often violent storms, and a narrow range of temperature fluctuation throughout the year. Adak is located in the region of the polar front, the zone of convergence between temperate westerly winds (which actually blow from the southwest at this latitude) and the polar easterly winds. In the area of the Aleutian Islands, this interface of air masses creates a semipermanent low-pressure zone, particularly strong in winter, which generates the frequent low-pressure (cyclonic) storms characteristic of the North Pacific region.

Weather on the island can be very localized; fog, low ceilings, precipitation, and clear weather are all possible within a distance of a few miles. Storms develop during all seasons; however, the most frequent and severe storms occur in the winter.

The average total annual precipitation for Adak Island (as measured at the airport) is about 60 inches, most of which falls as rain in the lower elevations. Average monthly precipitation varies from a low of about 3 inches during June and July to a high of 7 to 8 inches during November and December. Snowfall averages over 100 inches a year at sea level.

Vegetation on Adak Island is classified as maritime tundra. The maritime tundra of Adak Island is treeless and typified by low-growing grasses, forbs, and shrubs. Ferns are conspicuous, and mosses and lichens are common on the ground surface. Plants form communities and associations of communities based on soil characteristics, moisture regime, elevation, topography, aspect, and exposure.

The terrestrial vegetation of Adak Island is composed primarily of perennial species that grow close to the ground and form rather continuous monotonous stands (Amundsen 1985). Vegetative reproduction is the normal method of propagation. Most species die back to the ground level following the brief growing season (May through September) and overwinter as bulbs, corms, tubers, and rhizomes. However, a few plants such as crowberry (*Empetrum nigrum*) and alpine azalea (*Loiseleuria procumbens*) are evergreen and provide food for animals throughout the year.

Until the land transfer is complete, the Adak Reuse Corporation is leasing the downtown Adak area (Figure 1-3) and facilities from the Navy under lease number N4425598RP00T20. As of March 1999, approximately 300 people including families are living on Adak in the Sandy Cove housing area.

The northern half of Adak consists of seven drainage basins (Figure 1-4). Elevations range from sea level to approximately 3,870 feet at Mount Moffett.

Adak Island consists of primarily volcanic and some sedimentary rocks with a relatively thin mantle of unconsolidated material (generally less than 10 feet) covering much of the bedrock. Only the downtown area is known to have a thick sequence of unconsolidated material (greater than 100 feet). Surficial deposits across the island were formed primarily by three geologic processes: glaciation, volcanic activity, and erosion and deposition. The northern region of Adak is dominated by the remnants of three volcanoes.

The hydrogeology of northern Adak Island is limited by the low permeability of native surface materials and bedrock, steep slopes, and discontinuity of sporadically located permeable horizons. Most undisturbed areas are mantled by tephra (ash) deposits. Combined with steep slopes, these conditions offer little opportunity for infiltration. Additionally, the combination of a thin mantle of unconsolidated material over poorly jointed bedrock results in groundwater that is intermittent and not laterally extensive. The most notable exceptions are laterally extensive flat areas with permeable overburden, including disturbed areas (e.g., downtown Adak).

Groundwater levels are generally 5 to 20 feet below land surfaces in different areas within the downtown area (URS 1995f). Water levels in wells typically vary 0 to 2 feet during different seasons. Water table responses to tidal fluctuations are most apparent near tidally affected surface water bodies such as Kuluk Bay, Sweeper Cove, and South Sweeper Creek. Effects in groundwater levels can be seen within a couple hundred feet of the surface water body. During the 1994 groundwater study, the maximum water level change caused by tidal influence was 1.3 feet (URS 1995f).

Surface water from upland lakes has historically been the source of drinking water on the island. Groundwater has never been used as a resource on Adak Island. A groundwater study (URS 1995f) that evaluated geologic materials for potential sources of potable water described geologic material in terms of three categories of water-bearing capacity (the ability of a material to contain and transmit water): high, moderate, and low.

Materials with high water-bearing capacity are likely to yield sufficient groundwater to a well to provide at least a low, sustained flow during pumping; water supply for domestic use could probably be supported in such areas. The Moffett Creek area in the Andrew Lake drainage basin and most of downtown are considered to have high water-bearing capacity. Potential saltwater intrusion in response to pumping of groundwater may preclude the use of groundwater as a source of potable water, particularly along the shoreline. After the completion of remedial actions, the aquifer below the downtown area away from the shoreline could be used as a potable water source.

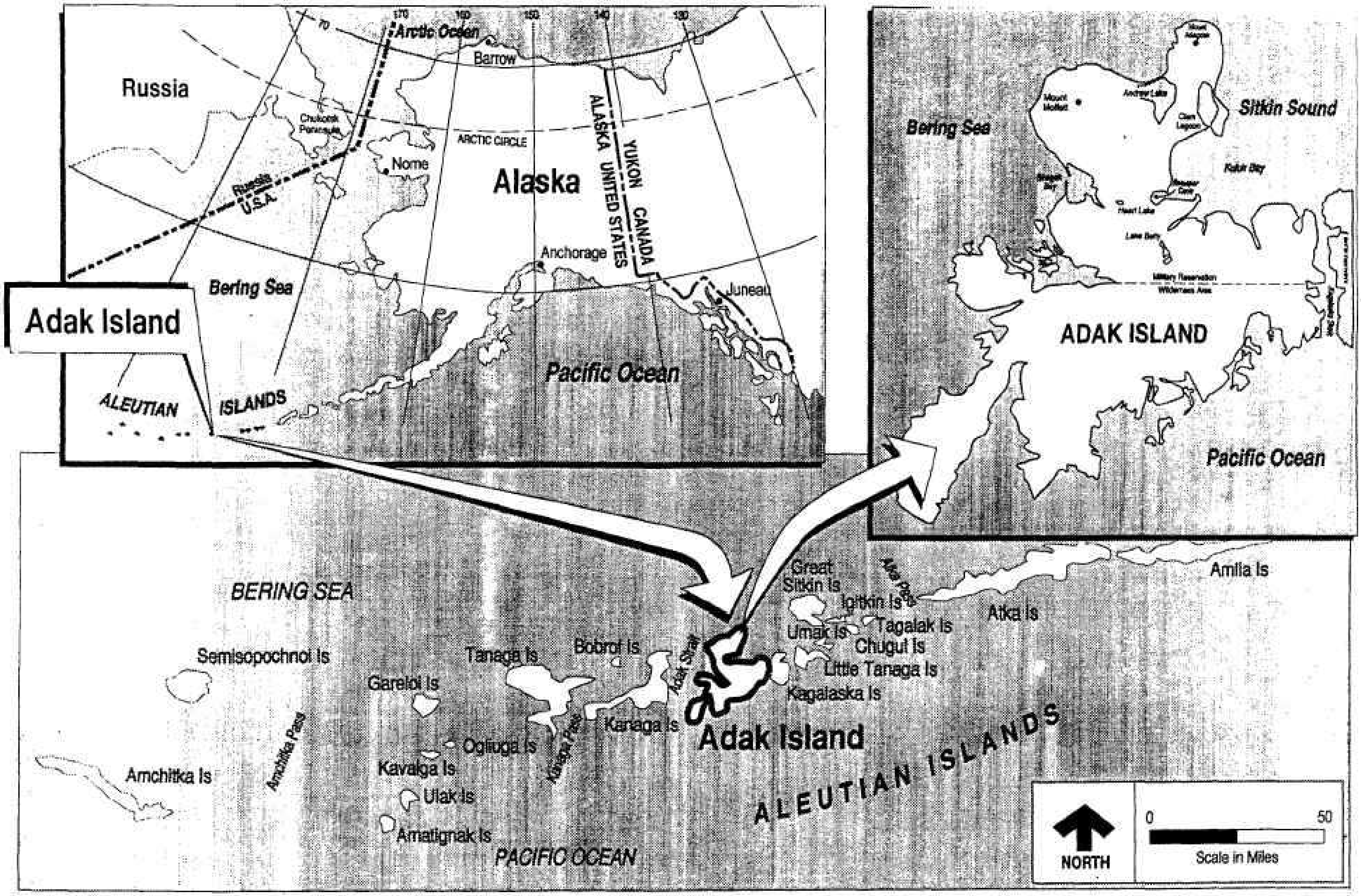
Materials with moderate water-bearing capacity are generally more heterogeneous and contain localized zones of permeable materials. Small water quantities could be produced over sustained periods, potentially supporting a domestic water supply. Areas with moderate water-bearing capacity include the uplands northwest of the airport runways, the southern flank of Mount Adagdak, and the uplands west of Andrew Lake exclusive of the Moffett Creek drainage area.

Materials with low water-bearing capacity are, in general, unlikely to produce a sustained yield of well water. Areas with low water-bearing capacity include the upland west and south of Sweeper Cove and the area west of Clam Lagoon.

Threatened and endangered species and critical habitats are present on Adak. The bald eagle is classified as threatened in most of the contiguous United States, but not in Alaska. The Steller's sea lion was classified as endangered in June 1997; a rookery on the southwest end of the island is considered critical habitat. The Aleutian Canada goose, a threatened species, does not nest on Adak Island but occasionally stops there during its spring and fall migrations. As for plants, the Aleutian shield fern is listed as endangered, and the flanks of Mount Reed are considered critical habitat for this fern.

Wetlands constitute approximately 20 to 30 percent of the former military base. In the island's uplands, there are numerous large lakes and standing water bodies and their respective drainages. Approximately 10 CERCLA and 15 petroleum sites contain or are within designated wetlands based on wetland maps of Adak (SCS 1990). Much of the downtown area was a former lagoon that was filled soon after the military began operations on the island. Some creeks in the downtown area are tidally influenced and thus vary between freshwater and saltwater conditions. Numerous kelp beds around Adak offer habitat for sea otters. Many of the sites are within drainage basins that support anadromous fish runs (e.g., South Sweeper Creek and Trout Creek). Removal actions have been completed at many of these sites.

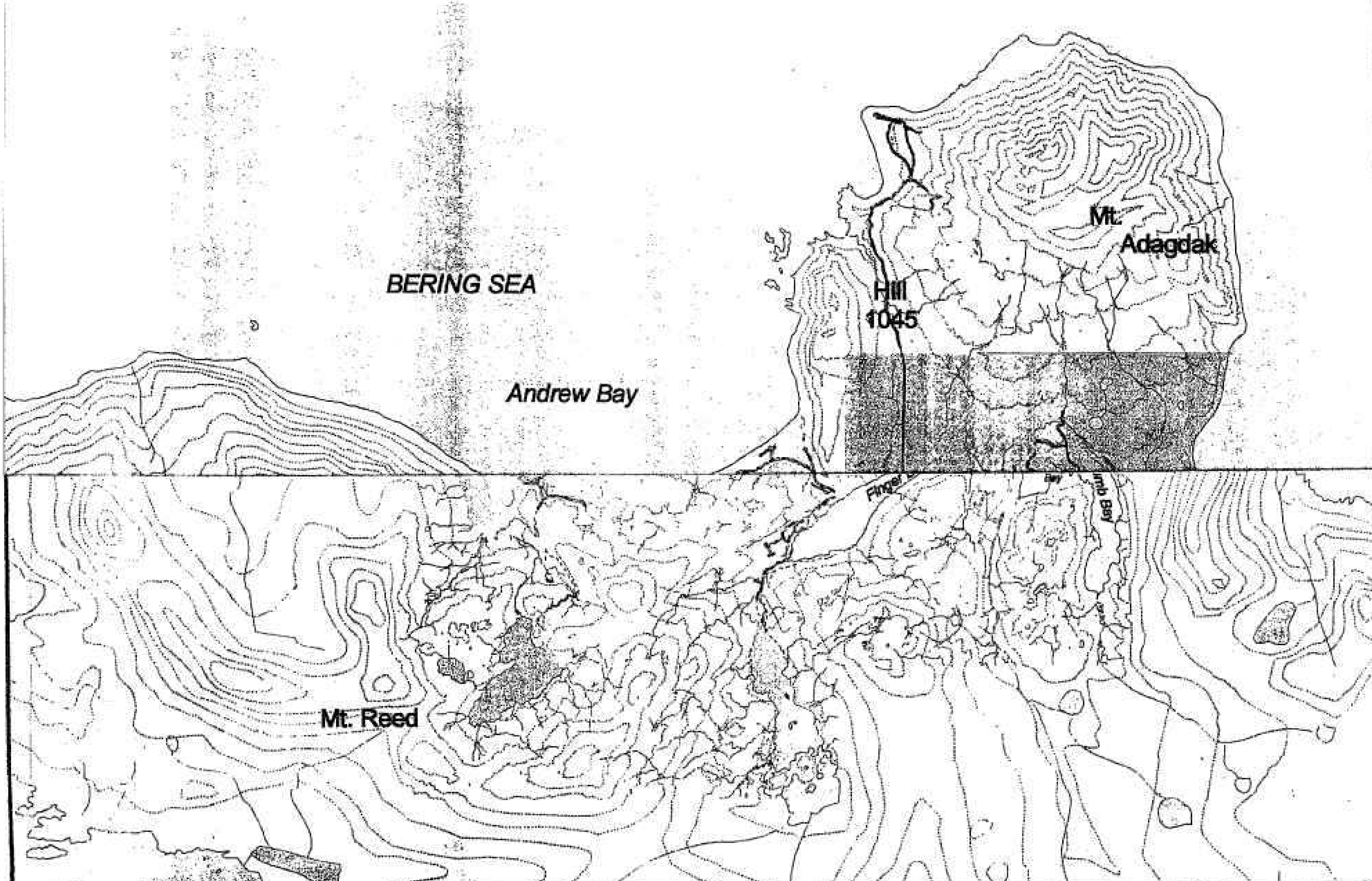
The former military base contains three National Register of Historic Places resources. The first resource is the Adak Army Base and Adak Naval Operating Base National Historic Landmark. It is listed on the National Register. Considered a historic site, it has several listed areas and eight structures listed as contributing elements, but has no defined boundary. The second resource is the Adak World War II Cultural Landscape Historic District. It has been determined eligible, but has not been submitted for formal listing. This resource has a defined boundary and 30 structures plus several manmade landscape structures listed as contributing features. The third resource is the Bering Chapel, which is considered individually eligible for the Register.



CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 1-1
Location Map, Adak Island, Alaska

CTO 0214
RECORD OF DECISION
OU A
Adak Island, AK



CLEAN

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

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0 2000 4000 6000 Feet

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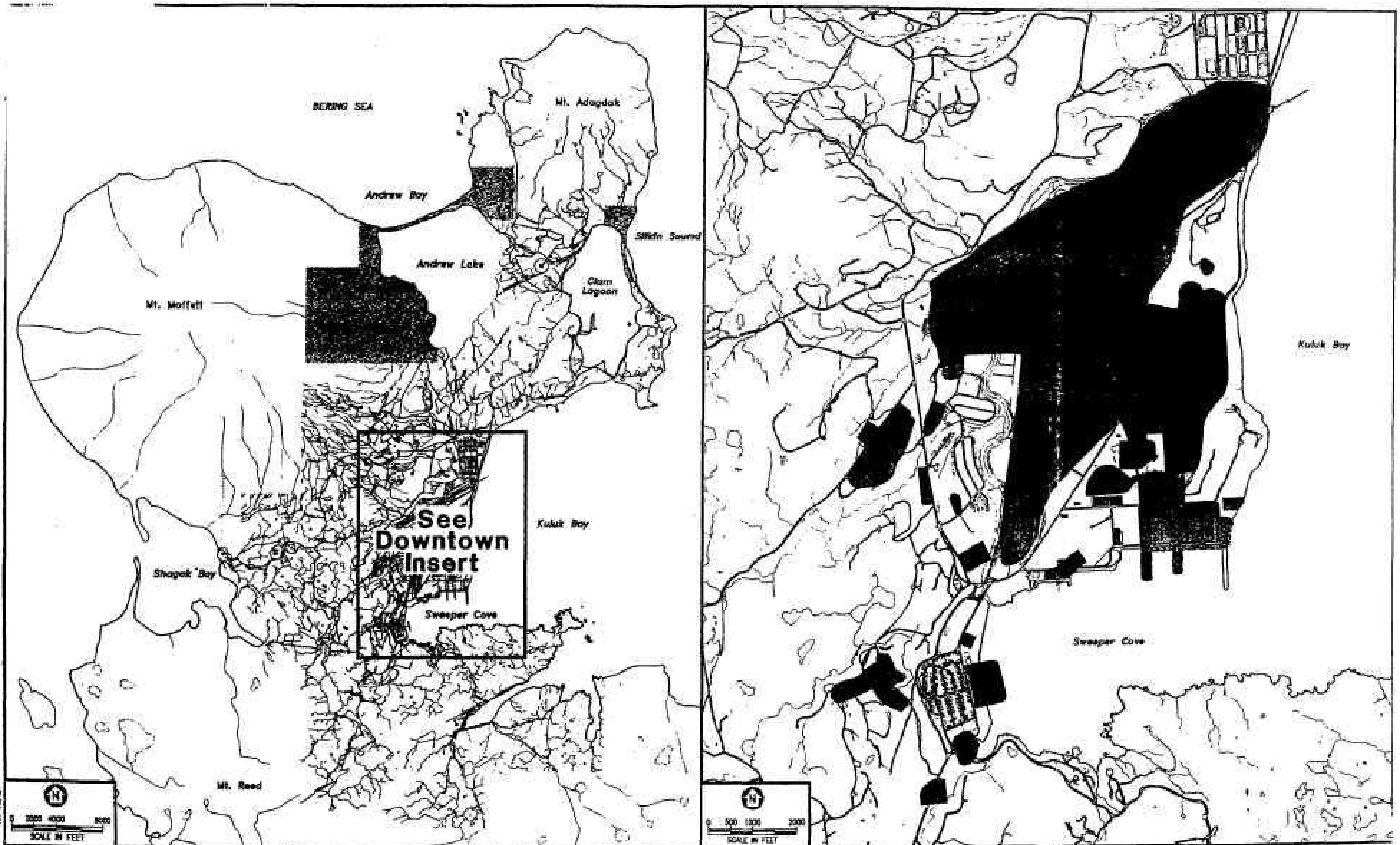
Figure 1-2
Developed Area of Northern Adak Island

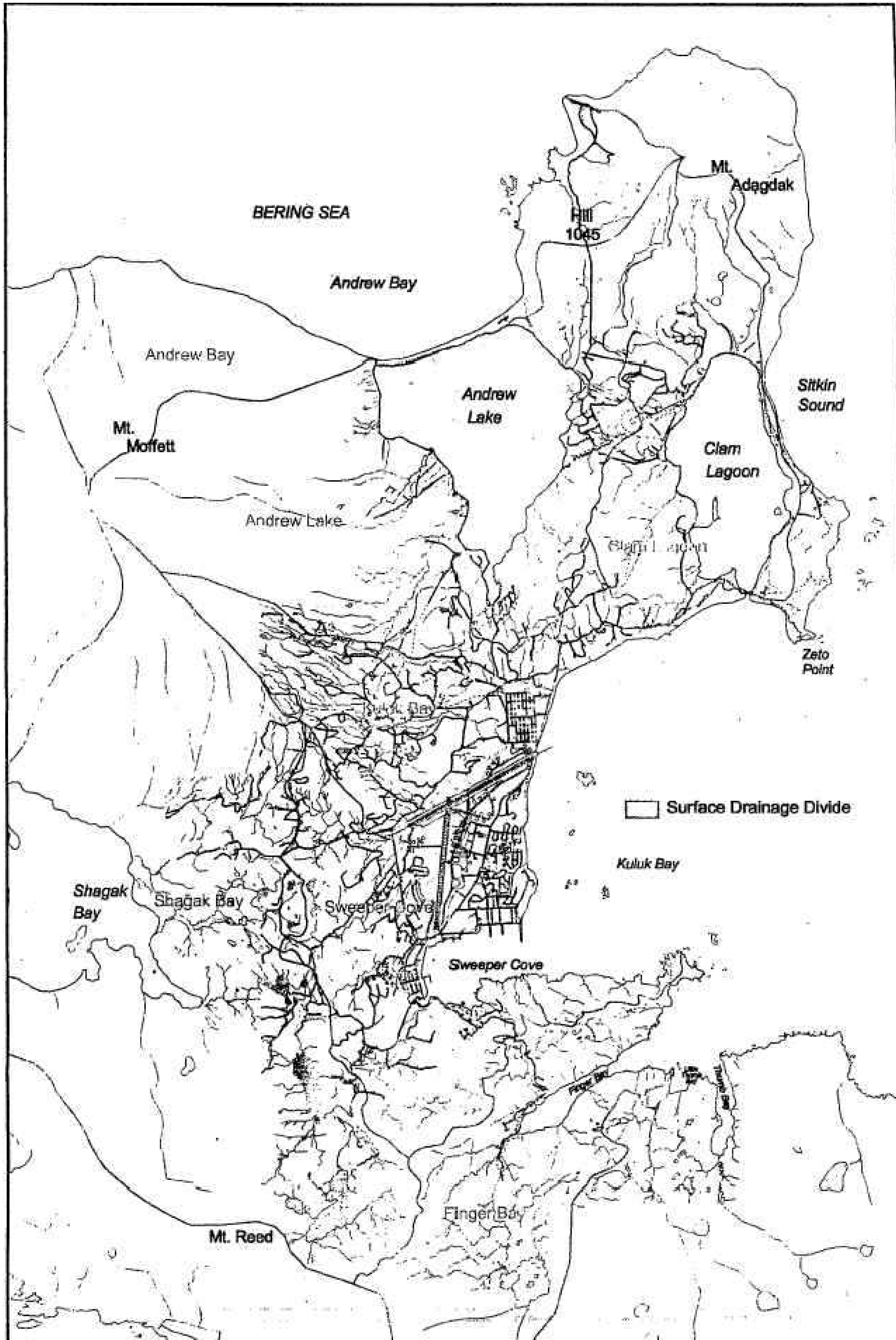
CTO 214
RECORD OF DECISION
OU A
Adak Island, AK



LEGEND

- Industrial/Commercial
- Residential
- Navy Ordnance Zones
- Recreational

CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	CTO 0214 RECORD OF DECISION OU A Adak Island, AK	Scale as Shown	**Figure 1-3 Land Use on Adak Island**



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	1:60000	**Figure 1-4** **Drainage Basins on Northern Adak Island**	CTO 214 RECORD OF DECISION OU A Adak Island, AK

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SITE HISTORY

On March 3, 1913, President Taft established the Aleutian Island National Refuge under Executive Order 1733. In 1980 the name of the refuge was changed to the Alaska Maritime National Wildlife Refuge. Public Land Order 1949 on August 19, 1959, withdrew approximately 61,000 acres on the northern half of the island for military use by the Department of the Navy.

Many years before the military's arrival, Adak Island was used by an indigenous people known as the Aleuts. The island was unoccupied in 1942 when the U.S. Army arrived to take offensive action against Japanese forces occupying Attu and Kiska Islands. During World War II, the military occupation forces numbered approximately 100,000 troops. After World War II, the military installation was transferred to the U.S. Air Force and in 1950 became a Naval complex.

Facilities currently in use include the airfield and support facilities; port facilities, including a tank farm fueling facility; and light industrial, administrative, commercial, recreational, and residential areas. NAF Adak was operationally closed on March 31, 1997, as a result of being included on the 1995 base closure list under the Base Closure and Realignment Act (BRAC). Since March 31, 1997, the Naval Facilities Engineering Command through Engineering Field Activity, Northwest (EFA NW) has been responsible for caretaker operation of the former base. The population on Adak consisted of a few hundred military personnel the year before the base operationally closed. As of March 1999, approximately 300 people reside on Adak. EFA NW is conducting oversight of the environmental cleanup.

Parts of the military reservation have been used for landfills, vehicle and aircraft maintenance and repair sites, fuel facilities (with associated tanks and piping), a minefield, military and nonmilitary firing ranges, and ammunition and ordnance disposal sites. In addition, all materials necessary to support the operation of NAF Adak were stored and used on the property, including potentially hazardous substances such as pesticides, solvents, transformer oil, and paints.

2.2 IDENTIFICATION AND INVESTIGATION OF POTENTIALLY CONTAMINATED SITES

In 1986, an initial assessment study (IAS) was conducted on Adak as the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) Program. Thirty-two sites were examined during the IAS. In 1989, a site inspection (SI) was completed in which 19 sites were evaluated. In 1990, a Resource Conservation and Recovery Act (RCRA) remedial facility assessment (RFA) was completed by the U.S. Environmental Protection Agency (EPA), which identified and gathered information on potentially contaminated sites. A total of 68 sites, which includes the 19 sites identified in the SI, were identified in the RFA.

The Federal Facilities Compliance Agreement (FFCA) of 1990 between the EPA and the Navy was the initial agreement governing cleanup on Adak. The FFCA governs RCRA sites. The FFCA currently covers three site closures:

- Solid Waste Management Unit (SWMU) 24, Hazardous Waste Storage Facility
- Source Area (SA) 77, Fuels Facility Refueling Dock, Small Drum Storage Area
- Metals Landfill Waste Pile, a small area within SWMU 13, Metals Landfill

Closure at these sites is complete. Portions of SWMU 24 and SA 77 were also evaluated under the State-Adak Environmental Restoration Agreement (SAERA), described below.

NAF Adak was proposed for the National Priorities List (NPL) in October 1992 and formally listed in May 1994. The Federal Facilities Agreement (FFA), which became effective in November 1993, specified the remedial action process to be completed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Table 2-1 lists all SWMUs and SAs covered by the FFA. This list of 84 SWMUs and SAs includes the 68 sites in the RFA, 5 sites transferred from the original list of sites in the FFCA, and 11 new sites. Preliminary source evaluations (PSEs) were required for a majority of nonpetroleum sites. Sites and water bodies warranting further study were evaluated in the remedial investigation/feasibility study (RI/FS) (URSG 1997c). The RI/FS identified the extent of contamination, assessed risk from chemical exposure, and evaluated remedial alternatives for ites with unacceptable risks. When warranted, contaminated sites were remediated as interim actions.

The FFA stated that petroleum-related contaminated sites, such as those containing underground storage tanks (USTs) and leaking underground fuel lines, would be evaluated under a separate two-party agreement between the Navy and the State of Alaska. This agreement—SAERA—was signed in April 1994 and amended in August 1996. Table 2-1 includes all sites addressed under SAERA. Under SAERA, site assessments and/or evaluations were required for petroleum-affected sites. The purpose of SAERA is to execute the assessment, containment, monitoring, and remediation of affected soil and groundwater at sites with petroleum oil and lubricants (POL) and leaking USTs. Section 5 of the SAERA document outlines the process of a combined ROD for final decisions for CERCLA and SAERA sites. It is expected that SAERA will be amended so that future petroleum site cleanup decision documents will be between the Alaska Department of Environmental Conservation (DEC) and the Navy.

Figure 2-1 shows the locations of CERCLA sites. Figure 2-2 shows the locations of petroleum sites, keyed to the numbers in Table 2-2. Because of the large number of petroleum sites, listing them by site name on a map would excessively clutter the map and make it unreadable. Therefore, all site maps referring to petroleum sites are coded with a numeric designator (from 1 to 128), and the corresponding table with a key to these numbers is referenced on the figure.

During the evaluation process at 28 CERCLA sites, the Navy performed removal actions as listed in Table 2-3. Most of these actions were primarily incidental to investigation, such as removing drums or debris. Some of the actions were more significant (i.e., covering a landfill) and required the completion of an interim action ROD or an engineering evaluation/cost analysis (EE/CA) and an action memorandum.

An interim action ROD (URS 1995e) was signed in May 1995 so that an interim remedial action could be taken at SWMU 11 (Palisades Landfill) and SWMU 13 (Metals Landfill). Interim remedial actions at SWMU 11 included constructing small interceptor ditches, covering 6 acres of the landfill, establishing vegetation on the cover, implementing institutional controls, and conducting a monitoring program. These interim remedial actions were completed in June 1996 (Nugget 1997). The original proposed interim remedial action for Palisades Landfill included rerouting Palisades Creek; however, additional data collection and analysis were determined to be appropriate before this effort was undertaken (Stryker 1996). Five subsequent sampling events (August and November 1996, February and May 1997, and June 1998) were completed at Palisades Landfill; sampling included surface water from Palisades Creek. The results from these sampling events indicated the presence of bis(2-ethylhexyl)phthalate (detected only in February 1997), aluminum, iron, lead, and nickel in the water above either the federal or state maximum contaminant levels (MCLs) or the federal ambient water quality criteria. The bis(2-ethylhexyl)phthalate detection was limited to only one of five sampling events. The inorganics reported in the surface water are likely due to the presence of metal debris in the landfill. The results of the sampling showed that there is no adverse impact to the creek from the landfill and that rerouting of the creek was unnecessary. Additionally, the U.S. Fish and Wildlife Service was opposed to rerouting the creek because existing habitat in the creek would be destroyed. Actions at SWMU 13 included evaluating a shoreline debris removal, constructing small interceptor ditches, covering 17 acres of the landfill, establishing vegetation on the cover, installing monitoring wells for a monitoring program, and implementing institutional controls.

An EE/CA was completed for SWMU 67 and Site 16A (the soil stockpile within SWMU 16) in 1996 (URS 1996e). This document characterized the sites, identified the removal objectives, evaluated the alternatives for removal action, and determined the best alternative. The only substance targeted for the removal action was polychlorinated biphenyls (PCBs) in soil. The removal was documented in an action memorandum (URS 1997). The 1997 removal action involved off-island disposal of 96 cubic yards of PCB-contaminated soil (concentrations above

50 mg/kg) from Site 16A at a TSCA-permitted landfill. Additionally, 943 cubic yards of stockpiled soils (PCB concentration below 50 mg/kg) from Site 16A were spread over the 1-acre SWMU 67 site. A multilayered cap was then placed over the site; soils remaining at SWMU 67 had PCB concentrations below 25 mg/kg. The cost of this removal action is shown in Table 2-3.

2.3 INVESTIGATION OF ORDNANCE MATERIALS IN DOWNTOWN ADAK

The Navy investigated the downtown area to evaluate the potential presence of ordnance materials there. Because of the historical military use of the island, there is a potential for encountering ordnance materials in the downtown area. Most of the ordnance materials that were discovered are believed to have been retrieved from other areas and brought into downtown as souvenirs. The downtown area was never used for ordnance disposal or range activities. During the execution of ordnance materials investigations in the downtown Adak area, which covered more than 2,400 acres, ordnance-related items were discovered at seven locations.

None of these items were in a fired and fuzed condition and therefore did not meet the criteria for unexploded ordnance. Based on the location and condition of the items, they were properly characterized as either ordnance or ordnance explosive scrap. Since some of these items did contain explosive or incendiary material, they did have the potential to cause injury if mishandled or to release hazardous substance into the environment. However, in their discovered state, the items did not pose an immediate threat to the general public. Full clearance was not considered necessary at this time based on the downtown area's unexploded ordnance (UXO) characterization and the fact that downtown has been occupied for more than 50 years without significant incident. A detailed description of the ordnance materials investigations in downtown Adak follows.

The downtown area was divided into Priority I, II, and III areas for investigation, as shown in Figure 2-3. Work plans for executing ordnance investigations were reviewed and approved by the Naval Ordnance Center and Department of Defense Explosives Safety Board. The investigation was performed in 1997 and 1998 in six phases: historical records/archive search, physical survey, surface clearance, geophysical investigation, grid/anomaly selection, and intrusive investigation.

2.4 SITE CLOSURE

In October 1995, the closure of the former base became law under the Base Closure and Realignment Act (BRAC). Typically, when military bases such as NAF Adak are closed under BRAC, a Local Redevelopment Authority (LRA) is formed to develop a plan and implement reuse. In the case of NAF Adak, although BRAC laws and regulations related to reuse do not apply because of the wildlife refuge status of the property, they were used as a guide to planning for the possibility of reuse. A generalized flow chart of the base closure and reuse process is provided in Figure 2-4.

In 1995, the State of Alaska, through the Alaska Department of Community and Regional Affairs (ADCRA), established an LRA that consisted of stakeholders with potential reuse interest in Adak. The first conceptual reuse plan, prepared for the LRA in 1996 by Tryck Nyman Hayes, Inc., presented three reuse scenarios—low use, middle use, and high use (Tryck Nyman Hayes, Inc. 1996). This plan concluded that reuse was not likely to be economically viable.

Certain participants in the reuse planning process took issue with that conclusion and sought state recognition of a new LRA to proceed with further reuse planning. Accordingly, the Adak Reuse Corporation (ARC) was established to take the role of the LRA. The Tryck Nyman Hayes plan was refined in a plan prepared for ARC by Economic Research Associates (ERA 1998), which was released in December 1997 and revised in May 1998. The revised plan included a fourth reuse scenario (recommended by ARC) that described an initial activity level that is closer to the medium-use scenario and projected a permanent population of between 150 and 250 residents. A “revised final” plan was prepared for ARC by ASCG Consultants and released in August 1998 (ASCG 1998).

The Navy closed operations on Adak on March 31, 1997. A caretaker contract awarded by the Navy commenced on April 1, 1997, to maintain base facilities and continue providing services to support environmental cleanup, including billeting, food, water and wastewater, fuel, power, heating, and airport operations. The caretaker contract will extend through 1999. Currently, approximately 200 contractor personnel are living and working on Adak, conducting caretaker operations and environmental cleanup. Dependent family members of contractor employees are authorized to reside on Adak pursuant to an interim lease agreement between the Navy and ARC.

Land transfer agreements are being negotiated among the Navy, U.S. Department of the Interior, and The Aleut Corporation (TAC). Once the negotiations are concluded, there is a strong possibility that a community of families will live in the existing downtown housing units. Based on the latest (August 1998) reuse plan for Adak, future land uses are expected to be generally similar to current land uses. The current land use consists of a combination of residential, recreational, and commercial/industrial use (Figure 1-3).

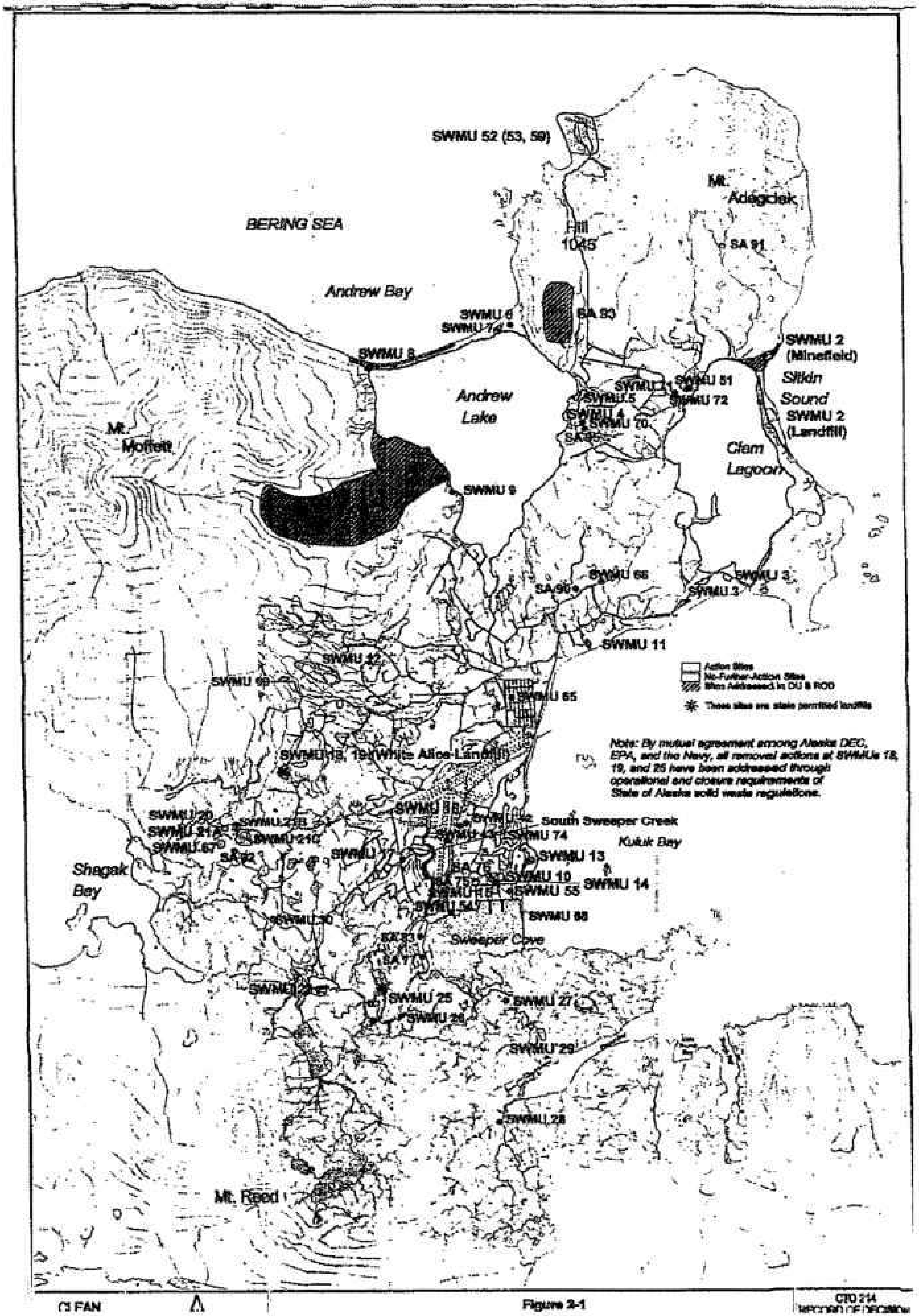
“Fast-track” environmental cleanup is being conducted on Adak as a result of decisions made by the Navy, EPA, and Alaska DEC, who together make up the BRAC Cleanup Team (BCT). Basewide reuse planning under the purview of the Department of Defense (DoD) and the Navy includes an environmental baseline survey (EBS) and completion of a BRAC cleanup plan (BCP). The purpose of the BCP is to document cleanup decisions and cleanup acceleration methods selected by the BCT. The BCT makes decisions on the environmental cleanup and writes and implements the BCP.

The BCT works with the Project Team. The Project Team, which includes technical advisors and stakeholders, is made up of representatives of the Navy, EPA, Alaska DEC, and USFWS who work in partnership under a chartered agreement. USFWS, the landowner, plays a key role in the partnership because the property remains a wildlife refuge. The three-member BCT and the Project Team together are the BRAC Environmental Cleanup Team (BECT), a consensual decisionmaking forum.

Parallel with the work of the BCT and BECT is the work of the Adak Restoration Advisory Board (RAB), a group of interested citizens who advise the Navy on decisions concerning cleanup on Adak.

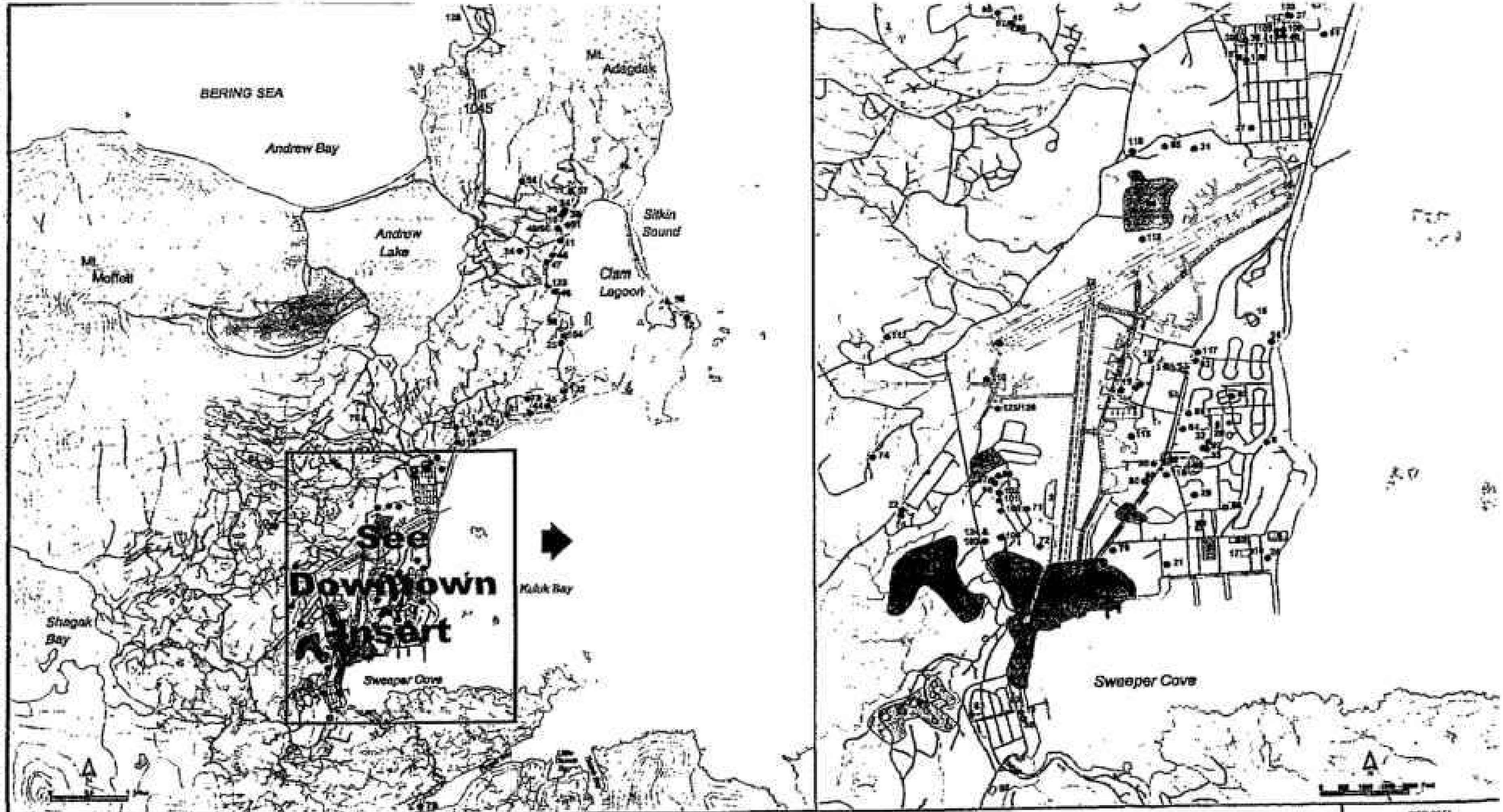
A Biological Technical Assistance Group (BTAG) was also established to review documents and information generated about Adak and to make recommendations concerning the nature of future work. The BTAG consists of technical representatives from the Navy, USFWS, EPA, Alaska DEC, the National Oceanic and Atmospheric Administration (NOAA), and the National Biological Service (NBS).

Upon a Finding of Suitability to Transfer (FOST), property disposal and reuse can be implemented (Figure 2-4).



CLEAN

Figure 2-1

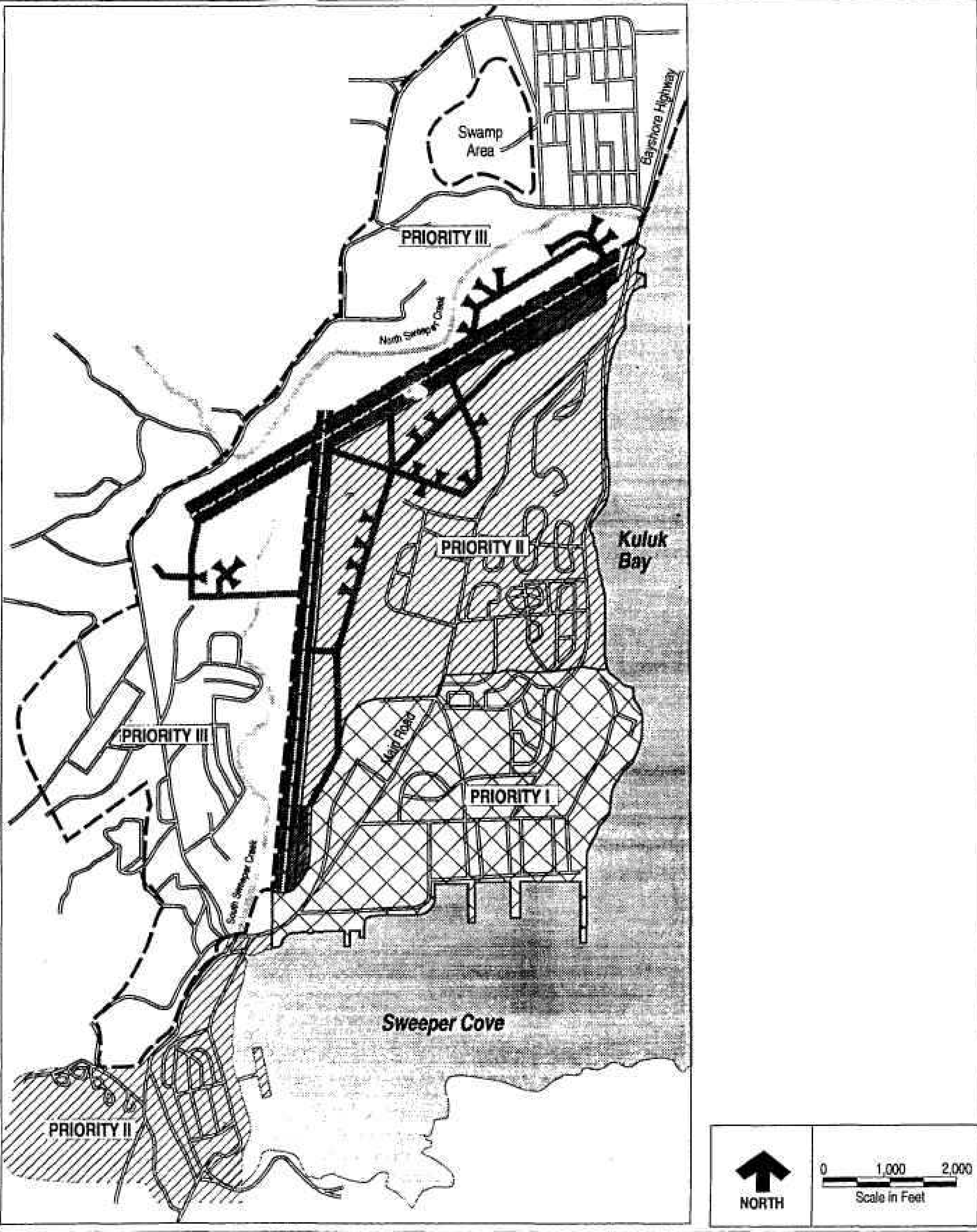


CLEAN

Action Sites
No Further Action Sites
73 Map Key Number for Site
Note: For a key of site names, see Table 2-2

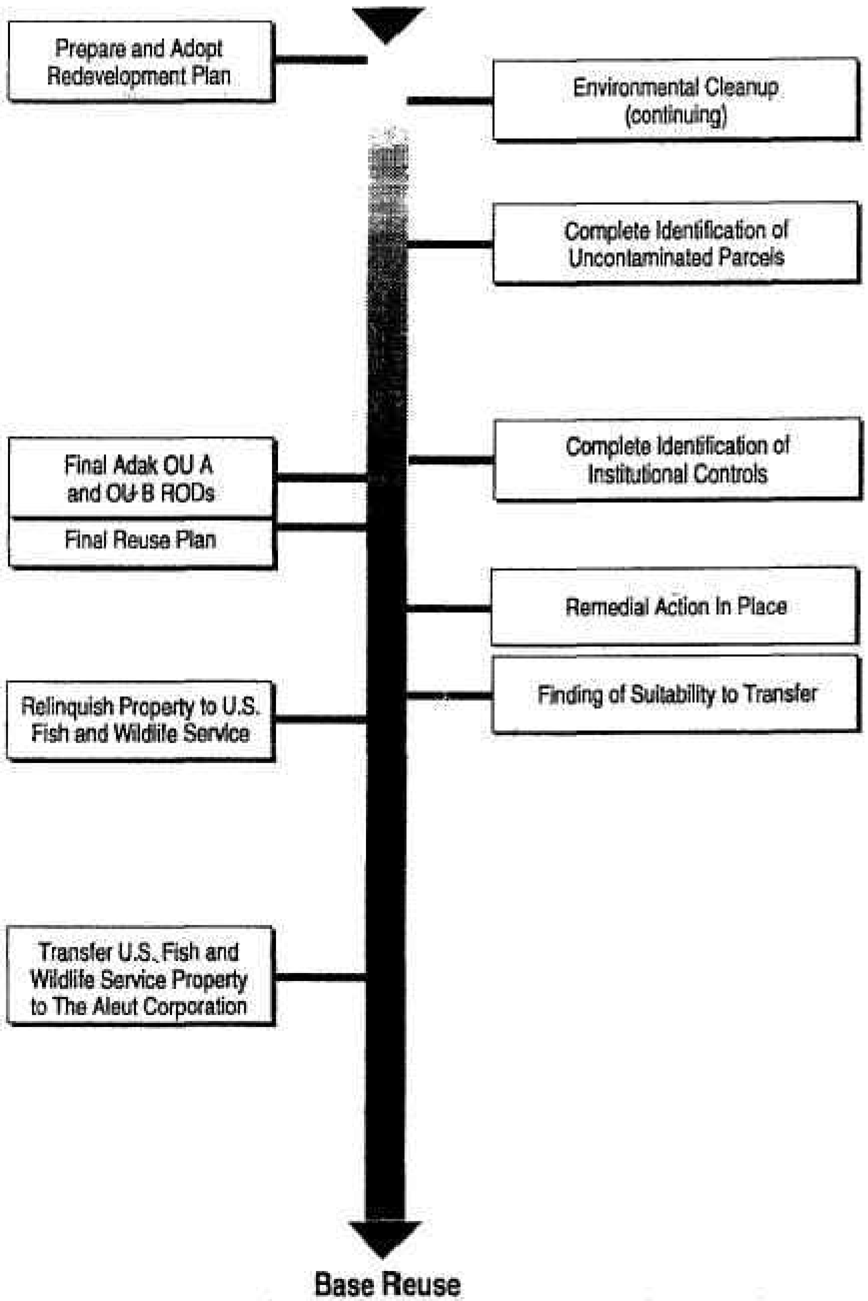
Figure 2-2
Locations of Petroleum Sites
Adak Island, Alaska

CTO 0214
RECORD OF DECISION
OU A
Adak Island, AK



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	Figure 2-3 Priority Areas for Ordnance Intrusive Sampling in Downtown Area, Adak	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

533204810-102a-060899



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 2-4** **Flow Chart** **Base Closure and Reuse for Adak**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

533214810-41-000889

Table 2-1
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under
1	Andrew Lake Waste Ordnance Demolition Range[c] (a.k.a. Andrew Lake OB/OD and Range)	CERCLA and SAERA
2	Causeway Landfill and Minefield[c]	CERCLA
3	Clam Lagoon Landfill	CERCLA
4	South Davis Road Landfill	CERCLA
5	North Davis Road Landfill	CERCLA
6	Andrew Lake Drum Disposal Area 1	CERCLA
7	Andrew Lake Drum Disposal Area 2	CERCLA
8	Andrew Lake Landfill and Shoreline[c]	CERCLA
9	Black Powder Club	CERCLA
10	Old Baler Building	CERCLA
11	Palisades Landfill	CERCLA
12	Quartermaster Road Debris Disposal Area (a.k.a. Quartermaster Site)	SAERA
13	Metals Landfill	CERCLA and RCRA
14	Old Pesticide Disposal Area (a.k.a. Old Pesticide Storage and Disposal Area)	CERCLA and SAERA
15	Future Jobs/DRMO (Former Hazardous Waste Storage)	CERCLA and SAERA
16	Former Firefighting Training Area (including SWMUs 32 and 33)	CERCLA
17	Power Plant 3 Area (including SWMUs 36-40 and 63) (a.k.a. Power Plant 3)	CERCLA and SAERA
18	South Sector Drum Disposal Area (now part of White Alice Landfill)	DEC-SW and CERCLA
19	Quarry Metal Disposal Area (now White Alice Landfill)	DEC-SW and CERCLA
20	White Alice/Trout Creek Disposal Area	CERCLA
21A	White Alice Upper Quarry	CERCLA
21B	White Alice Lower Quarry	CERCLA
21C	White Alice East Disposal Area	CERCLA
22	Avgas Drum Storage Area South of Tank Farm A (a.k.a. Avgas Drum Storage Area South of Tank Farm A)	SAERA
23	Heart Lake Drum Disposal Area	CERCLA
24	Hazardous Waste Container Storage Facility (a.k.a. Hazardous Waste Storage Facility)	RCRA and SAERA
25	Roberts Landfill	DEC-SW and CERCLA
26	Mitt Lake Drum Disposal Area	CERCLA
27	Lake Leone Drum Disposal Area	CERCLA
28	Lake Betty Drum Disposal Area	CERCLA
29	Finger Bay Landfill	CERCLA
30	Magazine 4 Landfill	CERCLA
31	Runway 18-36 Aviation Gas Drum Disposal	SAERA
34	Steam Plant 4 Used Oil Storage Area (a.k.a. Steam Plant 4 Used Oil AST)	SAERA
35	GSE Used Oil Tank (a.k.a. Ground Support Equipment Building)	SAERA
41	Ground Support Equipment (GSE) Used Oil Storage Area	SAERA

Table 2-1 (Continued)
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under
42	GSE Steam Clean Oil/Water Separator	CERCLA
43	AIMD Acid Battery Storage Area	CERCLA
44	AIMD Used Oil Storage Area	SAERA
45	Sewage Treatment Plant (including SWMUs 46, 47, 48, 49, and 50) (a.k.a. Sewage Treatment Plant Petroleum Contamination)	SAERA
51	NSGA Transportation Bldg. 10354 Waste Storage Area	CERCLA
52	Former Loran Station (including SWMUs 53 and 59)	CERCLA
54	NMCB Battery Storage	CERCLA
55	Public Works Transportation Department Waste Storage Area	CERCLA and SAERA
56	Public Works Transportation Department Storage Tank	SAERA
57	Refueling Dock Oil/Water Separator (a.k.a, Fuels Facility Refueling Dock)	SAERA
59	NSGA 10348 JP-5 Tank (a.k.a. Heating Plant 6)	SAERA
60	Tank Farm A	SAERA
61	Tank Farm B	SAERA
62	Housing Area Fuel Leak (a.k.a. New Housing Fuel Leak)	SAERA
64	Tank farm D	SAERA
65	Contractor's Camp Fire/Demolition Site	CERCLA
66	Palisades Lake PCB Spill	CERCLA
67	White Alice PCB Spill Site	CERCLA
68	New Pesticide Storage Area (no evaluation done)	CERCLA
69	Ski Lodge Waste Pile	CERCLA
70	Davis Road Asphalt Drums	CERCLA
71	NSGA Fueling Facility	CERCLA
72	NSGA Transportation Building 10354	CERCLA
73	NSGA OH/Water Separator (a.k.a. Heating Plant 6)	SAERA
74	Old Batch Facility	CERCLA and SAERA
75	Asphalt Storage Area	CERCLA
76	Old Line Shed Building	CERCLA
77	Fuel Division Area Drum Storage (a.k.a. Fuels Facility Refueling Dock, Small Drum Storage Area)	RCRA and SAERA
78	NSGA Building USTs (a.k.a. Old Transportation Building)	SAERA
79	Main Road Pipeline (a.k.a. Main Road Pipeline, North End [MRP-MW 15) and South End)	SAERA
80	Steam Plant 4 USTs (a.k.a. Stearn Plant 4)	SAERA
81	NSGA Gun Turret Hill USTs (a.k.a. Gun Turret Hill)	SAERA
82	NSGA P80, P81 USTs (a.k.a. P-80/P-81 Buildings)	SAERA
83	Former Chiefs Club Station (no evaluation done)	CERCLA
84	Sand Shed	SAERA
85	New Baler Building	SAERA

Table 2-1 (Continued)
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under
86	Old Happy Valley Child Care Center	SAERA
87	Old Zeto Point Wizard Station	SAERA
88	NSGA P70 Energy Generator (a.k.a. P-70 Energy Generator)	SAERA
89	Tank Farm C	SAERA
90	Husky Road Landfill (no evaluation done)	CERCLA
91	Airplane Crash Sites	CERCLA
92	Waste Ordnance Pile (Fin Field)	CERCLA
93	World War II Mortar Impact Area[c]	CERCLA
94	Chemical Weapons Disposal Area	CERCLA
95	Transformer Disposal Area	CERCLA
96	NORPAC Hill Debris Site	SAERA
97	Generator Debris Site	SAERA
None[d]	Sweeper Cove	CERCLA
	South Sweeper Creek	CERCLA
	Clam Lagoon	CERCLA
	Andrew Lake	CERCLA
	Kuluk Bay	CERCLA
	Administration Building (UST 30004-A)	SAERA
	Amulet Housing, Well AMW-706 Area	SAERA
	Amulet Housing, Well AMW-709 Area	SAERA
	Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	SAERA
	Armory (UST 10311-A)	SAERA
	Artillery Battalion USTs ART-1 and ART-2)	SAERA
	ASR-8 Facility (UST 42007-B)	SAERA
	Bering Chapel (UST 42090-A)	SAERA
	Boy Scout Camp, South Haven Lake (UST BS-2)	SAERA
	Boy Scout Camp, West Haven Lake (UST BS-1)	SAERA
	CDAA Complex (USTs 10580 and 10654)	SAERA
	Clam Road Truck Fill Stand	SAERA
	Cold Storage Facility (AST T- 1440)	SAERA
	Contractor's Camp Burn Pad	SAERA
	Contractor's Pad UST T- 1706 (Navy Pad)	SAERA
	Drum Disposal Area at Tank Farm D	SAERA
	Elementary School (UST 42017-A)	SAERA
	Finger Bay Quonset Hut (UST FBQH- 1)	SAERA
	Former Power Plant Building (T-1451)	SAERA
	GCI Compound (UST GCI-1)	SAERA
	Girl Scout Camp (UST GS-1)	SAERA
	Housing Area (Arctic Acres)	SAERA
	Housing Outfall Area (Sandy Cove)	SAERA

Table 2-1 (Continued)
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under
	Kuluk Housing (UST HST-6C)	SAERA
	Kuluk Recreation Center (UST 30034)	SAERA
	Line Crew Building (USTs 2776, 2776-B, and 2776-C)	SAERA
	Loran Station (USTs V149A, V149B, and V149C)	SAERA
	MAUW Compound (UST 24000-A)	SAERA
	MAUW Compound (UST 24032-B)	SAERA
	McDonalds UST	SAERA
	Medical Center (UST 27088)	SAERA
	Mount Moffett Power Plant 5 (Used Oil AST)	SAERA
	Mount Moffett Power Plant 5 (Used Oil Pit)	SAERA
	Mount Moffett Power Plant 5 (USTs 10574 through 10577)	SAERA
	Mount Moffett Tower (Mogas AST and Used Oil AST)	SAERA
	NAVFAC Compound (USTs 20052 and 20053)	SAERA
	Navy Exchange Building (UST 30026)	SAERA
	Navy Exchange Building (UST 30027-A)	SAERA
	Navy Exchange Building (UST 30033)	SAERA
	New Roberts Housing (UST HST-7C)	SAERA
	New Transportation Building (O/W 10644)	SAERA
	New Transportation Building (UST 10590)	SAERA
	New Transportation Building (UST 10591)	SAERA
	NMCB Building Area T-1416 Expanded Area	SAERA
	NMCB Building (UST T-1416-A)	SAERA
	NORPAC Hill Seep Area	SAERA
	NSGA Filling Station, Mogas and JP-5 ASTs	SAERA
	Officer Hill and Amulet Housing (UST 31047-A)	SAERA
	Officer Hill and Amulet Housing (UST 31049-A)	SAERA
	Officer Hill and Amulet Housing (UST 31050-A)	SAERA
	Officer Hill and Amulet Housing (UST 31051-A)	SAERA
	Officer Hill and Amulet Housing (UST 31052-A)	SAERA
	Officer Hill and Amulet Housing (UST 31053-A)	SAERA
	Old Fuel Truck Shop (UST 10520-A)	SAERA
	Old Fuel Truck Shop (UST 10520-B)	SAERA
	Pantograph Pad (UST RT-1)	SAERA
	Pumphouse 5 Area	SAERA
	Quarters A	SAERA
	ROICC Contractor's Area (UST ROICC-5)	SAERA
	ROICC Contractors Area (UST ROICC-6)	SAERA
	ROICC Contractor's Area (UST ROICC-7)	SAERA
	ROICC Contractor’s Area (UST ROICC-8)	SAERA
	ROICC Warehouse (UST ROICC-1)	SAERA

Table 2-1 (Continued)
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

SWMU or SA No.[a]	Site Name[b]	Listed or Investigated Under
	ROICC Warehouse (UST ROICC-2)	SAERA
	ROICC Warehouse (UST ROICC-3)	SAERA
	ROICC Warehouse (UST ROICC-4)	SAERA
	Runway 5-23 Avgas Valve Pit	SAERA
	Sewage Lift Station 10 (UST 42483-A)	SAERA
	Sewage Lift Station 11 (UST 42484-A)	SAERA
	Shack 0-52 (UST O-52)	SAERA
	Shack 0-69 (UST B)	SAERA
	South Avgas Pipeline at North Sweeper Creek	SAERA
	South of Runway 18-36 Area	SAERA
	Tanker Shed (UST 42494)	SAERA
	Telephone Exchange Building (UST 10324-A)	SAERA
	Telephone Substation T-100 (UST T-100-B)	SAERA
	TFB to TFC Pipeline—Area A	SAERA
	TFB to TFC Pipeline—Area B	SAERA
	TFB to TFC Pipeline—Area C	SAERA
	TFB to TFC Pipeline—Area D	SAERA
	TFB to TFC Pipeline—Area E (Truck Fill Stand)	SAERA
	TFB to TFC Pipeline—Area F	SAERA
	TFB to TFC Pipeline—Area G	SAERA
	TFC to NSGA Pipeline—Area A	SAERA
	TFC to NSGA Pipeline—Area B	SAERA
	TFC to NSGA Pipeline—Area C	SAERA
	TFC to NSGA Pipeline—Area D	SAERA
	TFC to NSGA Pipeline—Area E (Truck Fill Stand)	SAERA
	USGS (NOAA) Building (USTs NOAA-A, -C, and -D)	SAERA
	Yakutat Hangar (UST T-2039-A)	SAERA
	Yakutat Hangar (USTs T-2039-B and T-2039-C)	SAERA

[a]Sites are listed first by SWMU or SA number, then by water body, then by alphabetical petroleum site name.
[b]First name shown is name under CERCLA; alternative name (a.k.a. __________) is name under SAERA.
[c]SWMUs 1, 2 (minefield), and 8 and SA 93 will be evaluated in the OU B process.
[d]SWMU or SA numbers were assigned only to sites in the Federal Facilities Agreement.

Notes:
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DEC-SW - Alaska Department of Environmental Conservation Solid Waste Regulation
DRMO - Defense Reutilization Marketing Office
GCI - General Communication, Inc.

Table 2-1 (Continued)
CERCLA and Petroleum Sites Listed or Evaluated on Adak Island

GSE - ground support equipment
JP-5 - jet petroleum No. 5
Loran - long-range navigation
MAUW - modified advanced underwater weapons
NAVFAC - Naval Facility
NMCB - Naval Mobile Construction Battalion
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
OB/OD - open burn/open detonation
O/W - oil/water separator
PCB - polychlorinated biphenyl
RCRA - Resource Conservation and Recovery Act
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C
USGS - U.S. Geological Survey
UST - underground storage tank

Table 2-2
Petroleum Site Key

Map Key Number[a]	Site Name
1	SWMU 22, Avgas Drum Storage South of Tank Farm A
2	SWMU 31, Runway 18-36 Aviation Gas Drum Disposal
3	SWMU 34, Steam Plant 4 Used Oil AST
4	SWMU 41, Ground Support Equipment (GSE) Used Oil Storage Area
5	SWMU 44, AIMD Used Oil Storage Area
6	SWMU 45, Sewage Treatment Plant Petroleum Contamination (including SWMUs; 46-50)
7	Boy Scout Camp, South Haven Lake (UST BS-2)
8	Housing Outfall Area (Sandy Cove)
9	McDonalds UST
10	NSGA Filling Station, Mogas and JP-5 ASTs
11	TFC to NSGA Pipeline—Area E (Truck Fill Stand)
12	SA 81, Gun Turret Hill
13	SA 84, Sand Shed
14	SA 85, New Baler Building
15	SA 96, NORPAC Hill Debris Site
16	SWMU 35, Ground Support Equipment Building
17	SWMU 55, Public Works Transporation Department Waste Storage Area
18	SWMU 56, Public Works Transportation Department Storage Tank
19	SWMU 57, Fuels Facility Refueling Dock
20	SWMU 74, Old Batch Facility
21	Administration Building (UST 30004-A)
22	Armory (UST 10311-A)
23	Artillery Battalion (USTs ART-1 and ART-2)
24	CDAA Complex (USTs 10580 and 10654)
25	Clam Road Truck Fill Stand
26	Cold Storage Facility (AST T-1440)
27	Contractor's Pad UST T- 1706 (Navy Pad)
28	Drum Disposal Area at Tank Farm D
29	Elementary School (UST 42017-A)
30	Line Crew Building (USTs 2776, 2776-B, and 2776-C)
31	MAUW Compound (UST 24032-B)
32	Navy Exchange Building (UST 30026)
33	Navy Exchange Building (UST 30033)
34	New Transportation Building (O/W 10644)
35	New Transportation Building (UST 10590)
36	New Transportation Building (UST 10591)
37	Old Fuel Truck Shop (UST 10520-B)
38	ROICC Contractor's Area (UST ROICC-5)

Table 2-2 (Continued)
Petroleum Site Key

Map Key Number[a]	Site Name
39	ROICC Contractor's Area (UST ROICC-6)
40	ROICC Warehouse (UST ROICC-1)
41	ROICC Warehouse (UST ROICC-4)
42	Sewage Lift Station 11 (UST 42484-A)
43	Shack O-69 (UST B)
44	TFB to TFC Pipeline—Area E (Truck Fill Stand)
45	TFB to TFC Pipeline—Area F
46	TFC to NSGA Pipeline—Area A
47	TFC to NSGA Pipeline—Area C
48	TFC to NSGA Pipeline—Area D
49	SA 73, Heating Plant 6 (combined with SWMU 58)
50	SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area
51	SA 78, Old Transportation Building
52	SA 79, Main Road Pipeline, North End (MRP-MW15) and South End
53	SA 80, Steam Plant 4
54	SA 82, P-80/P-81 Buildings
55	SA 86, Old Happy Valley Child Care Center
56	SA 87, Old Zeto Point Wizard Station
57	SA 88, P-70 Energy Generator
58	SA 89, Tank Farm C
59	SA 97, Generator Debris Site
60	SWMU 1, Andrew Lake OB/OD and Range
61	SWMU 12, Quartermaster Site
62	SWMU 14, Old Pesticide Storage and Disposal Area
63	SWMU 15, Future Jobs/DRMO
64	SWMU 17, Power Plant 3
65	SWMU 24, Hazardous Waste Storage Facility
66	SWMU 58, Heating Plant 6 (combined with SA 73)
67	SWMU 60, Tank Farm A
68	SWMU 61, Tank Farm B
69	SWMU 62, New Housing Fuel Leak
70	SWMU 64, Tank Farm D
71	Amulet Housing, Well AMW-706 Area
72	Amulet Housing, Well AMW-709 Area
73	Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)
74	ASR-8 Facility (UST 42007-B)
75	Bering Chapel (UST 42090-A)
76	Boy Scout Camp, West Haven Lake (UST BS-1)
77	Contractor's Camp Burn Pad

Table 2-2 (Continued)
Petroleum Site Key

Map Key Number[a]	Site Name
78	Finger Bay Quonset Hut (UST FBQH-1)
79	Former Power Plant Building (T-1451)
80	GCI Compound (UST GCI-1)
81	Girl Scout Camp (UST GS-1)
82	Housing Area (Arctic Acres)
83	Kuluk Housing (UST HST-6C)
84	Kuluk Recreation Center (UST 30034)
85	MAUW Compound (UST 24000-A)
86	Medical Center (UST 27088)
87	Mount Moffett Power Plant 5 (Used Oil AST)
88	Mount Moffett Power Plant 5 (Used Oil Pit)
89	Mount Moffett Power Plant 5 (USTs 10574 through 10577)
90	Mount Moffett Tower (Mogas AST and Used Oil AST)
91	NAVFAC Compound (USTs 20052 and 20053)
92	Navy Exchange Building (UST 30027-A)
93	New Roberts Housing (UST HST-7C)
94	NMCB Building Area (UST T-1416-A (combined with Expanded Area, listed below)
95	NMCB Building Area, T-1416 Expanded Area (combined with UST-T-1416-A, listed above)
96	NORPAC Hill Seep Area
97	Officer Hill and Amulet Housing (UST 31047-A)
98	Officer Hill and Amulet Housing (UST 31049-A)
99	Officer Hill and Amulet Housing (UST 31050-A)
100	Officer Hill and Amulet Housing (UST 31051-A)
101	Officer Hill and Amulet Housing (UST 31052-A
102	Officer Hill and Amulet Housing (UST 31053-A)
103	Old Fuel Truck Shop (UST 10520-A)
104	Pumphouse 5 Area
105	Quarters A
106	ROICC Contractor’s Area (UST ROICC-7)
107	ROICC Contractor’s Area (UST ROICC-8)
108	ROICC Warehouse (UST ROICC-2)
109	ROICC Warehouse (UST ROICC-3)
110	Runway 5-23 Avgas Valve Pit
111	Sewage Lift Station 10 (UST 42483-A)
112	Shack O-52 (UST O-52)
113	South Avgas Pipeline at North Sweeper Creek
114	South of Runway 18-36 Area

Table 2-2 (Continued)
Petroleum Site Key

Map Key Number[a]	Site Name
115	Tanker Shed (UST 42494)
116	Telephone Exchange Building (UST 10324-A)
117	Telephone Substation T- 100 (UST T- 100-B)
118	TFB to TFC Pipeline—Area A
119	TFB to TFC Pipeline—Area B
120	TFB to TFC Pipeline—Area C
121	TFB to TFC Pipeline—Area D
122	TFB to TFC Pipeline—Area G
123	TFC to NSGA Pipeline—Area B
124	USGS (NOAA) Building (USTs NOAA-A, -C, and -D)
125	Yakutat Hangar (UST T-2039-A)
126	Yakutat Hangar (USTs T-2039-B and T-2039-C)
127	Loran Station (USTs V149A, V149B, and V149C)
128	Pantograph Pad (UST RT-1)

[a]Map key numbers correspond to locations shown in Figure 2-2.

Notes:
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
DRMO - Defense Reutilization Marketing Office
GCI - General Communications, Inc.
GSE - ground support equipment
JP-5 -jet petroleum No. 5
Loran - long-range navigation
MAUW - modified advanced underwater weapons
NAVFAC - Naval Facility
NMCB - Naval Mobile Combat Battalion
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
OB/OD - open bum/open detonation
O/W - oil/water separator
ROICC - resident officer in charge of construction
SA - source area
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C

Table 2-2 (Continued)
Petroleum Site Key

USGS - U.S. Geological Survey
UST - underground storage tank

Table 2-3
Completed Removal Actions at CERCLA Sites to Date

Site No.	Completed Removal Action	Basis for Action	Cost[a]
SWMU 2	Cleared ordnance materials in minefield in 1998	Time-critical removal action	$1,106,000
SWMU 4	Place soil cover over landfill in 1998	OU A ROD	$455,000
SWMU 7	Removed drums and contaminated soil in 1994	IRR	$104,000
SWMU 11[b]	Recontoured sites, placed cover on upper portion of landfill, and revegetated site in 1996	Interim action ROD	$2,300,000
SWMU 13[b]	Recontoured sites, placed cover on upper portion of landfill, and revegetated site in 1996	Interim action ROD	$3,800,000
SWMU 15	Removed surface soil and debris in 1992	IRR	$560,000
SWMU 16	Removed and treated burn pit soils in 1996 and disposed of PCB-contaminated soil off island in 1997	IRR (1996) and EE/CA (1997)	$210,000
SWMU 17	Removed and treated soil and installed recovery trench in 1996	EE/CA	$348,000
SWMU 18	Closed landfill under Alaska DEC solid waste regulations in 1998	18 AAC 60	$800,000
SWMU 19	Closed landfill under Alaska DEC solid waste regulations in 1998	18 AAC 60	Included with SWMU 18
SWMU 20	Removed drums and soil containing PCBs in 1992	EE/CA	$1,119,000
SWMU 21A	Removed surface soil containing PCBs in 1992	IRR	Included in SWMU 20 costs
SWMU 23	Removed empty drums and a tank from the site in 1994	IRR	$104,000
SWMU 24	Removed waste containers in 1995 (estimated)	IRR	$96,000
SWMU 25	Landfill closure process is being completed under Alaska DEC solid waste regulations (pending)	18 AAC 60	$2,750,000
SWMU 26	Removed drums from concrete slab between 1980 and 1982	IRR	Not available
SWMU 27	Removed drums and covered sediment in 1997	IRR	$239,000
SWMU 28	Removed drums and solid material that had spilled out of the drums	IRR	Not available
SWMU 29	Removed drums from a stream in 1996	IRR	$104,000
SWMU 43	Removed batteries in 1992 (estimated)	IRR	$1,000
SWMU 51	Removed batteries in 1993	IRR	$1,000
SWMUs 52, 53. and 59	Removed batteries, containers, and other debris in 1990	IRR	$150,000
SWMU 67	Placed cover and impermeable geotextile membrane over the PCB-contaminated area in 1997	EE/CA	$1,900.000
SWMU 69	Removed petroleum-affected soil, rubble, and debris in 1994 (estimated)	IRR	$10,000
SWMU 70	Removed drums in 1991 (estimated)	IRR	$5,000

Table 2-3 (Continued)
Completed Removal Actions at CERCLA Sites to Date

Site No.	Completed Removal Action	Basis for Action	Cost[a]
SWMU 74	Removed surface soil and placed cover on soil in 1998	IRR	$572,000
SA 92	Removed soil and bomblets containing napalm in 1995	IRR	$144,000
SA 95	Removed transformer and sediment in 1994	IRR	$104,000

[a] Cost for removal actions may also include investigation costs.
[b] Actions taken at those sites were interim *remedial* actions and not *removal* actions.

Notes:
AAC - Alaska Administrative Code
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DEC - Department of Environmental Conservation (State of Alaska)
EE/CA - engineering evaluation/cost analysis
IRR - investigation-related removal
OU - operable unit
PCB - polychlorinated biphenyl
ROD - Record of Decision
SA - source area
SWMU - solid waste management unit

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

As required by CERCLA 113(k), the Navy maintains an Administrative Record at EFA NW in Poulsbo, Washington. The Navy also maintains an Information Repository at the University of Alaska Library in Anchorage, Alaska. Additionally, a large number of documents regarding the study and cleanup process are available to individuals on Adak, at the Caretaker Site Office (CSO) on Adak. The decisions made in this ROD for Operable Unit A are based on information contained in the Administrative Record.

A Restoration Advisory Board (RAB) was formed in 1996 to advise the Navy on decisions concerning cleanup on Adak. Individuals interested in becoming members of the RAB filled out an application. All applicants were accepted as RAB members. The group originally consisted of approximately 45 interested private citizens and representatives of various organizations, but in early 1998 consisted of 18 members. The RAB meets monthly and has had the opportunity to review reports and provide comments to the Navy. Organizations that have participated in RAB meetings are listed in Table 3-1. Recently, with the establishment of on-island permanent residents and families, an Adak Community Council has been formed and is represented on the RAB. The Aleut community is represented on the RAB and has been involved in the development of the Adak cleanup. A member of TAC has been the RAB co-chair since the RAB's inception. In addition, a member of the Aleutian/Pribilof Island Association and other Aleut community members have been active participants in the RAB.

A Proposed Plan for interim remedial actions at SWMUs 11 and 13 was made available to the public in April 1994. Open house meetings were held in Anchorage and on Adak on May 9, 1994, and May 11, 1994, respectively. The public comment period for these proposed actions was from April 9 to May 29, 1994. The interim action ROD for SWMUs 11 and 13 was signed in March 1995.

Two Proposed Plans—one for CERCLA sites and one for petroleum sites—were released to the public on January 19, 1998 (U.S. Navy 1998a, 1998b). The Proposed Plans and public meetings were advertised in the *Anchorage Daily News* on January 14 and February 10, 1998. Approximately 400 copies of the Proposed Plans were made available at public meetings, at RAB meetings, through a mailing list, at the CSO, in the Administrative Record at EFA NW in Poulsbo, and in the Information Repository at the University of Alaska Library in Anchorage. Open houses and public meetings were held at the Westcoast International Hotel in Anchorage on February 12, 1998, and on Adak at the elementary school on February 25, 1998. A Navy representative presented the Proposed Plans, and representatives from the Navy, EPA, and Alaska DEC answered questions.

The public comment period on the Proposed Plans was from January 19 to March 4, 1998. Comments received during the comment period are summarized and addressed in the Responsiveness Summary in Appendix B of this OU A ROD. Public comments that affected the selection of remedies and further investigations are discussed in Section 12.

The public expressed concern with PCB contamination on Adak. After receiving public comments, the Navy further investigated South Sweeper Creek sediments for PCB concentrations in early 1998. Pursuant to this ROD, the Navy has removed and disposed of PCB-contaminated sediments in South Sweeper Creek in 1999.

Ordnance materials were also a major public concern. Unexploded ordnance on Adak is known to exist at SWMUs 1, 2 (causeway minefield portion only), and 8; at SA 93 the only ordnance materials found were mortar fins. The Navy has conducted ordnance materials surveys and intrusive sampling in the downtown area (see Section 2.3). The Navy completed clearance of the SWMU 2 minefield in the fall of 1998 and is evaluating other potential ordnance materials areas. A separate operable unit, OU B, has been created specifically to address ordnance materials on Adak, and another ROD will be produced for ordnance material sites after investigations are completed and remedial actions are evaluated.

The public's concerns about contamination in the marine environment are being addressed by periodic sampling of mussel and fish tissues. The potential for the presence of uranium on Adak was evaluated as part of the radiological survey after the public raised the issue. The survey (RASO 1998) concluded that no radiation risks were found on Adak.

Table 3-2 lists past public and BTAG meetings, newsletters, and fact sheets, together with the meeting or publication dates.

Table 3-1
Adak Restoration Advisory Board Participants

Government Agencies	Community Groups or Business
Agency for Toxic Substances and Disease Registry	Adak Community Council
Alaska Department of Community and Regional Affairs	Adak Region School District
Alaska Department of Environmental Conservation (DEC)	Adak Reuse Corporation (ARC)
	Alaska Community Action on Toxics
Alaska Department of Natural Resources	Alaska Maritime Agencies
Alaska National Guard	Aleutian/Pribilof Island Association
Federal Aviation Administration	Bering Sea Tax Service
National Oceanic and Atmospheric-Administration	Greenpeace
State of Alaska Department of Transportation	Kendrick Business Services
U.S. Army Corps of Engineers	Kiwanis
U.S. Department of Defense Explosives Safety Board	Laborer’s Local 341
U.S. Environmental Protection Agency (EPA)	Rubini and Reeves
U.S. Fish and Wildlife Service (USFWS)	Samson Tug and Barge
U.S. Housing and Urban Development	Sierra Club
U.S. Navy	The Aleut Corporation (TAC)

Table 3-2
Community Relations Publications and Meetings, Adak Cleanup Operations

Publication or Activity	Date
Publications	
Community Relations Plan (CRP)	August 1993
Fact Sheet: Naval Complex Adak	April 1993
Fact Sheet: Proposed Plan for Interim Remedial Action at Palisades and Metals Landfills	April 1994
Fact Sheet: Federal Facilities Agreement (FFA) and Risk Assessment Future Land Use Plan	April 1994
Updated CRP	September 1994
Newsletter: Naval Complex Adak	September 1994
Fact Sheet: Interim Remedial Actions at Two Landfills at Naval Air Facility (NAF), Adak	January 1995
Fact Sheet: Removal Action at Source Area 92 (Fin Field)	April 1995
Updated CRP	May 1995
Community Profile, Adak Island	June 1995
Press Release: Local Base Transition Coordinator Named	July 1995
Updated CRP	September 1995
Flyer: The Navy Invites You to Join the Adak Restoration Advisory Board	December 1995
Newsletter: Naval Complex Adak, NAF Adak Set to Close January 1988, Fast-Track Cleanup Process Under Way	February 1996
Fact Sheet: Construction Begins in May to Recover Petroleum Product From SWMU 17, Near Kuluk Bay	May 1996
Fact Sheet: Palisades Landfill	May 1996
Fact Sheet: Environmental Cleanup Work Starting at Metals Landfill	May 1996
Updated CRP	December 1996
Action Memorandum, Site 16A and SWMU 67 (Public Comment)	August 1997
PCB Fact Sheet for SWMU 16, 16A, 67	September 1997
Proposed Plans for Cleanup Actions at CERCLA and Petroleum Sites	January 1998
Fact Sheet: Creation of Separate OU for Adak Ordnance Sites	August 1998
Meetings	
FFA Party Representatives Meet With Community	May 1993
Overview of Adak Environmental Program and CRP Comments—Anchorage	April 1993
Overview of Adak Environmental Program and CRP Comments—Adak	April 1993
Anchorage Open House—SWMUs 11 and 13	May 1994
Adak Open House-SWMUs 11 and 13	May 1994
Cleanup Open House	May 1994
Biological Technical Assistance Group Meeting	March 1994 March 1995 March 1996 April 1997 April 1998
Scoping Meeting for Closure of NAF Adak	July1995
Adak, Reuse Planning Committee Meeting	September 1999

Table 3-2 (Continued)
Community Relations Publications and Meetings, Adak Cleanup Operations

Publication or Activity	Date
Restoration Advisory Board Meeting	January 1996[b]
Summit Meeting of Adak Decisionmakers (in Anchorage)	February 1966
Summit Meeting of Adak Decisionmakers (in Anchorage)	September 1996
Public Meeting for Proposed Plans (in Anchorage and Adak)	February 1998

[a]Monthly meetings as of summer 1996
[b]Monthly meetings as of January 1996

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CRP - Community Relations Plan
FFA - Federal Facilities Agreement
NAF - Naval Air Facility
OU - operable unit
PCB - polychlorinated biphenyl
SWMU - solid waste management unit

4.0 SCOPE AND ROLE OF INVESTIGATION OF OPERABLE UNIT A

Adak consists of two operable units: OU A and OU B. OU A includes CERCLA and petroleum sites. OU B deals with ordnance explosives sites.

In 1995, an interim action ROD for two sites in OU A was signed. Interim actions at SWMU 11 (Palisades Landfill) and SWMU 13 (Metals Landfill) were taken after the interim action ROD was signed.

A total of 180 sites were evaluated for OU A. The FFA listed 84 SWMUs and SAs that needed to be evaluated. A total of 128 petroleum sites were evaluated under SAERA. The number of CERCLA sites plus petroleum sites does not equal 212 because some sites although listed under CERCLA, were evaluated as petroleum sites; a few were evaluated under both SAERA and CERCLA. All sites are listed in Table 2-1.

4.1 ENVIRONMENTAL INVESTIGATIONS AND CLEANUP

Environmental studies began on Adak in 1986 with the initial assessment study performed by the Navy and culminated in 1998 with the CERCLA RI/FS, the focused feasibility study (FFS) for the petroleum sites, and other evaluations. A generalized process for environmental evaluations on Adak is shown in Figure 4-1. The site cleanup strategy was to address contamination at individual terrestrial sites through site assessments for the petroleum sites and preliminary source evaluations (PSEs) for the CERCLA sites. A PSE is a process that identifies whether a site poses an unacceptable risk to public health or the environment by evaluating existing data and, if necessary, additional data collected during the PSE. After the PSEs, some CERCLA sites required additional sampling as part of the RI/FS. All CERCLA sites in the FFA were carried into the RI/FS. After the site assessments, petroleum sites were evaluated in the FFS. Removal actions and interim remedial actions at CERCLA sites (Table 2-3) were completed prior to the completion of this ROD. Removal actions were also completed at 128 petroleum sites prior to the completion of this ROD.

The main purposes of the studies were as follows:

- To comply with RCRA at regulated units (1986 studies only)
- To collect information about the nature and extent of chemical releases at the sites
- To identify and characterize risks to human health and the environment
- To evaluate remedial alternatives for sites with unacceptable risks

Based on the PSEs, four downgradient water bodies-Sweeper Cove and South Sweeper Creek, Andrew Lake, Clam Lagoon, and Kuluk Bay—required detailed investigation as part of the RI/FS. The basis for including them in the evaluation was concern about potential impacts from contaminants migrating from terrestrial sites in the associated drainage basins.

The purpose of this ROD for OU A is to summarize the selection of final remedial actions under CERCLA and SAERA for the sites and water bodies at Adak.

4.2 NO-FURTHER-ACTION SITES

No action is required at 33 CERCLA sites (including 2 water bodies) and 82 petroleum sites, as discussed below. Table 4-1 lists the no-further-action (NFA) CERCLA sites; Table 4-2 lists the NFA petroleum sites.

4.2.1 CERCLA Sites

For the 33 CERCLA sites, no further action is necessary for one of the following reasons:

1. Chemical concentrations at the site were less than risk-based screening concentrations (RBSCs). At 25 sites, chemical concentrations were less than the human health and ecological RBSCs or there was no evidence of contamination. RBSCs were based on EPA default and Adak-specific exposure assumptions at risk levels of 1×10^{-7} and hazard quotients (HQs) of 0.1. Fish ingestion RBSCs were based on a risk level of 1×10^{-6}. (See Section 6 for a description of risk assessment methodology.)

2. Chemical concentrations exceeded RBSCs, but impacts were determined to be minimal. This was the situation at three sites for one or more of the following reasons:

   - The current and future land use assumption indicated that chemical levels would cause no unacceptable potential risks to human health. For the residential scenario, all hazard indexes (HIs) were less than 1.0 and cancer risks were less than 1×10^{-5}. (See Section 6 for a description of site risks and risk assessment methodology.)

   - The impacted area represents a small portion of habitat used by animals living in the area, and therefore does not present a significant risk of chemical exposure

3. Interim actions performed at the site decreased the risk to acceptable levels. This was the case for five sites.

4. Little or no ecological risk is expected for receptors in Clam Lagoon. The Clam Lagoon HI value of 62, shown in Table 4-1, likely overestimates the ecological risks. Although some small, individual chemical risks and one bioassay exceedance were identified for Clam Lagoon, a linkage between chemicals at upland source areas and target receptors was not defined in the RI/FS. No appreciable risks were identified in blue mussels, sand lance, and rock sole from Clam Lagoon based on tissue residues. No individual sediment chemicals have a hazard quotient greater than 1.0 at any station.

5. Chemicals in Andrew Lake are believed to pose no significant ecological risk to ecological receptors. The Andrew Lake HI value of 9.0 shown in Table 4-1 is associated with Dolly Varden. No individual chemical reported in Andrew Lake had a hazard quotient greater than 1.0.

4.2.2 Petroleum Sites

No action is required for 82 petroleum sites because each passed either the initial screening using Alaska DEC's Method One Level A criteria per the draft version of 18 AAC 75 (ADEC 1997a) or were estimated to have potential site-specific risks of less than 1×10^{-5}, developed for the FFS.

Two of these 82 sites have been added since the Proposed Plan was released. The Pantograph Pad and Loran Station UST sites were discovered during 1998 and evaluated using Alaska DEC's 18 AAC 75 Method Four criteria (ADEC 1999). On the basis of the evaluations, these sites require no further action.

Initial Screening

Petroleum sites at Adak initially underwent two levels of screening. They were first screened using Alaska DEC Method One Level A criteria in 18 AAC 75 (ADEC 1997a). Sites with petroleum concentrations in soil that fell below the Method One Level A thresholds of the regulation were considered "clean."

Screening with Alaska DEC Criteria

The sites that were not eliminated in the initial screening step were compared against Alaska DEC supplemental criteria (ADEC 1997b). These criteria were developed to focus attention on the most problematic sites by screening out sites in a quantitative manner consistent with the 1997 draft version of the 18 AAC 75 regulations. For a site to pass the supplemental screening and be designated NFA, it had to meet the following criteria:

- Have no free product
- Be more than 200 feet from downgradient surface water (downgradient exposure medium)
- Have gasoline-range organic (GRO) and diesel-range organic (DRO) concentrations in site soil samples that fall below the maximum concentrations listed in Table 4-3

Free-Product Criterion. If free product was identified at the site, the site could not be designated NFA. If no free product was observed, the site was compared against the other criteria described below.

Distance to Downgradient Surface Water. If the site is within 200 feet of downgradient surface water, it could not be designated NFA. This criterion is based on potential exposure of ecological receptors.

DRO and GRO Concentrations. If concentrations of petroleum products in soil remaining in place exceeded Alaska DEC supplemental screening levels, the site could not be designated NFA. For each site, the highest surface and subsurface soil concentrations of DRO and GRO for soil remaining in place were compared to threshold screening levels proposed by Alaska DEC. Table 4-3 illustrates the threshold levels that correspond to different land use scenarios,

Since the issuance of the Proposed Plan, the draft version of 18 AAC 75 was promulgated on January 22, 1999 (ADEC 1999). Sites that were initially considered NFA based on the Alaska DEC supplemental criteria were evaluated through site-specific risk assessments consistent with 18 AAC 75. These risk assessments are presented in the *Addendum to the Final Focused Feasibility, Study for Petroleum Sites* (URSG 1999a). The results of the risk assessments supported the previous decision of NFA for 82 sites. These 82 NFA petroleum sites, listed in Table 4-2, are not retained for further evaluation in this ROD.

As shown in Table 4-2, 6 sites were initially categorized NFA by SAERA; 5 additional sites met 18 AAC 75 Method One criteria, and 56 sites met 18 AAC 75 Method Four criteria and were thus designated NFA. For sites under “Tephra Geology With No Continuous Groundwater Pathway” listed in Table 4-2, NFA is appropriate because soil contamination is below the ingestion and inhalation concentrations of 18 AAC 75 and no groundwater is present. For sites under "Isolated Soil Location Where Cleanup More Harmful than NFA," historical sampling at a few locations (typically 1 or 2 out of 50 to 100 locations) marginally exceeded 18 AAC 75 levels for DRO in soil. At these locations extensive vegetative cover is now reestablished, Given that the previous actions demonstrate that most of the mass and the highest chemical concentrations have been removed, the vegetative cover is clearly reestablished, and access to remove minor amounts of residual soil contamination would destroy the reestablished vegetation, NFA is considered appropriate for this limited number of sites.

Evaluation of Former Free-Product Sites

After free product has been removed from a site to the maximum extent practicable, the site will be evaluated under the FFS process to determine the most appropriate method to achieve final cleanup goals.

4.3 SITES REQUIRING FURTHER ACTION

All sites discussed in this section require some form of action, whether it is institutional controls, monitoring, or active remediation. Table 4-4 lists each site that did not meet the requirements for no further action and provides the rationale for why the site requires further action.

Remedial action is required for 23 CERCLA sites for one or more of the following reasons:

- Ecological risk is unacceptable. This means that the HI is higher than 1.0 for the site and there is significant concern about impacts to the environment. (Risk values for all action sites are provided in Section 6 of this ROD.)

- Potential human health risk (greater than 1×10^{-5}) for subsistence fishers is unacceptable. This applies only to water bodies.

- Potential human health risk (greater than 1×10^{-5}) for residents is unacceptable. This means that the risks would be unacceptable for a person living on the site for 30 years.

Ecological and human health risk estimates are provided for each action site in the risk assessment section of this ROD (Section 6).

SWMUs 11 (Palisades Landfill) and 13 (Metals Landfill) were included in an interim action ROD that specified the placement of a cover over the landfills, monitoring, and institutional controls. Covers have been placed on these sites as an interim remedial action. This ROD for OU A is selecting the interim action as a final remedy. The capping, monitoring, and institutional control actions done under the interim action ROD were evaluated and determined to be protective. The northern edge of SWMU 13 apparently has been partially eroded by winter ocean storms. The Navy is evaluating the best methods to stop the erosion and to protect this area from future storms.

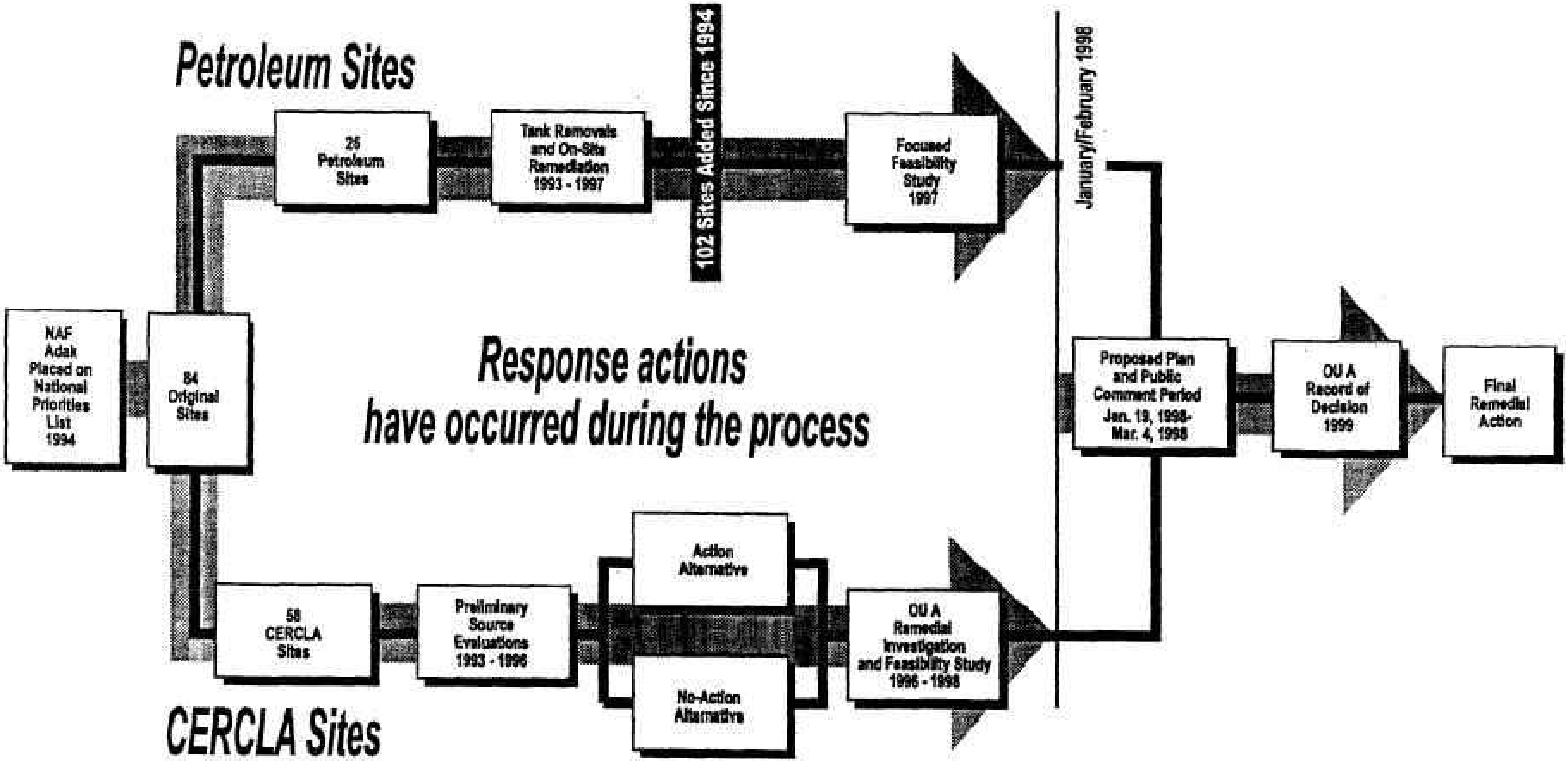
The recently closed White Alice Landfill (SWMUs 18 and 19) and SWMU 25 (the operating Roberts Landfill, which will be closed within 1 year) are permitted under State of Alaska solid waste regulations (18 AAC 60). This ROD selects the capping of SWMUs 18 and 19 (already completed) and SWMU 25 with monitoring and institutional controls as a final action. The selected remedy complies with 18 AAC 60 and the permit requirements for closure of these sites. These actions are consistent with presumptive remedies for landfills under OSWER Directive 9355.0-67FS (U.S. EPA 1996a).

Remedial action is required for 46 petroleum sites. The 23 CERCLA sites and 46 petroleum sites do not add up to 66 sites in Table 4-4 because 3 sites (SWMUs 14, 15, and 17) require further action under both CERCLA and SAERA. Of the 46 petroleum sites that were retained:

- 14 sites were retained due to the presence of petroleum free product on groundwater.
- 32 sites were retained due to the presence of petroleum constituents in groundwater and/or soil that require further action.

4.4 DOWNTOWN GROUNDWATER

Investigations of sites in the downtown area show that contaminants in groundwater come from known and unknown sources. CERCLA and petroleum sites that have impacted groundwater are addressed in this ROD. Most of the sources are from petroleum sites. Tank and soil removals have occurred at 50 sites in the downtown area. Free product remains in the ground at nine sites. These sites are a focus of concern and have active recovery systems in place to capture free product. The protection of downgradient surface water is a critical part of the cleanup actions selected in this ROD.



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	**Figure 4-1** **Generalized Process for Environmental Evaluations on Adak**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

052199

Table 4-1
No-Further-Action CERCLA Sites

Site No.	Site Name	Human Health Risk (Unrestricted Use) and Rationale	Ecological Risk (Hazard Index) and Rationale
SWMU 3	Clam Lagoon Landfill	Screened out based on preliminary evaluation of sample results.	Screened out based on preliminary evaluation of sample results.
SWMU 5	North Davis Road Landfill	Screened out based on preliminary evaluation of sample results.	Screened out based on preliminary evaluation of sample results.
SWMU 6	Andrew Lake Drum Disposal Area 1	None. No chemicals found above criteria.	None. No chemicals found above criteria.
SWMU 7	Andrew Lake Drum Disposal Area 2	1×10^{-6} 0.65 (noncancer, incremental)	3.2 Drums and some soil removed.
SWMU 9	Black Powder Club	None. Estimated lead levels are below criteria.	None calculated.
SWMU 12	Quartermaster Road Debris Disposal Area	Deferred to SAERA.	Deferred to SAERA.
SWMU 21B	White Alice Lower Quarry	Screened out based on preliminary evaluation of sample results.	Screened out based on preliminary evaluation of sample results.
SWMU 21C	White Alice East Disposal Area	Screened out based on preliminary evaluation of sample results.	Screened out based on preliminary evaluation of sample results.
SWMU 26	Mitt Lake Drum Disposal Area	None calculated. Chemical concentrations below levels of concern.	None calculated. After drums removed, chemical concentrations below levels of concern.
SWMU 27	Lake Leone Drum Disposal Area	2×10^{-7} <0.01 (noncancer)	Drums removed and sediment covered to eliminate ecological exposure.
SWMU 28	Lake Betty Drum Disposal Area	None calculated. No evidence of contamination after drums removed based on visual inspection and historical record review.	None calculated. No evidence of contamination after drums removed based on visual inspection and historical record review.
SWMU 30	Magazine 4 Landfill	None. No observed sources at the site based on sampling and subsurface investigations.	None. No observed sources at the site based on sampling and subsurface investigations.
SWMU 42	GSE Steam Clean Oil/Water Separator	None calculated. No evidence of contamination based on visual inspection and historical record review.	None calculated. No evidence of contamination based on visual inspection and historical record review.
SWMU 43	AIMD Acid Battery Storage Area	None calculated. No evidence of contamination based on visual inspection and historical record review.	None calculated. No evidence of contamination based on visual inspection and historical record review.
SWMU 51	NSGA Transportation Bldg, 10354 Waste Storage Area	None calculated. Screened out based on sampling and modeling results.	None calculated. No evidence of contamination based on visual inspection. Screened out based on sampling and modeling results.
SWMU 54	NMCB Battery Storage	None calculated. No evidence of contamination based on visual inspection and historical record review.	None calculated. No evidence of contamination based on visual inspection and historical record review.
SWMU 65	Contractor's Camp Fire/Demolition Site	None. No chemicals found above criteria.	None. No chemicals found above criteria.
SWMU 66	Palisades Lake PCB Spill	Screened out based on preliminary evaluation of sample results.	Screened out based on preliminary evaluation of sample results.
SWMU 68	New Pesticide Storage Area	No action under FFA based on site visit and available information.	No action under FFA based on site visit and available information.
SWMU 69	Ski Lodge Waste Pile	None calculated. No evidence of contamination based on visual inspection and historical record review.	None calculated. No evidence of contamination based on visual inspection and historical record review.

Table 4-1 (Continued)
No-Further-Action CERCLA Sites

Site No.	Site Name	Human Health Risk (Unrestricted Use) and Rationale	Ecological Risk (Hazard Index) and Rationale
SWMU 70	Davis Road Asphalt Drums	None calculated. No evidence of contamination based on visual inspection and historical record review.	None calculated. No evidence of contamination based on visual inspection and historical record review.
SWMU 71	NSGA Fueling Facility	No action under FFA based on site visit and available information.	No action under FFA based on site visit and available information.
SWMU 72	NSGA Transportation Building 10354	No evidence of contamination in building based on visual inspection. (USTs evaluated were for SA 78, which is a SAERA site.)	No evidence of contamination in building based on visual inspection. (USTs evaluated were for SA 78, which is a SAERA site.)
SWMU 74	Old Batch Facility	Minimal residual risk because asphaltic material was removed and clean cover placed.	<1 Cleanup completed in August 1998.
SA 75	Asphalt Storage Area	1×10^{-6} <0.01 (noncancer)	2.0 Minimal impact.
SA 83	Former Chiefs Club Station	No action under FFA based on site visit and available information.	No action under FFA based on site visit and available information.
SA 90	Husky Road Landfill	No action under FFA based on site visit and available information.	No action under FFA based on site visit and available information.
SA 91	Airplane Crash Sites	None calculated. No evidence of contamination based on visual inspection.	None calculated. No evidence of contamination based on visual inspection.
SA 92	Waste Ordnance Pile (Fin Field)	9×10^{-7} <0.01 (noncancer)	23 Ordnance and soil removed.
SA 94	Chemical Weapons Disposal Area	None calculated. No evidence of contamination based on visual inspection and extensive historical record search.	None calculated. No evidence of contamination based on visual inspection and extensive historical record search.
SA 95	Transformer Disposal Area	8×10^{-6} <0.01 (noncancer)	17 Transformer and sediment removed.
None	Clam Lagoon*	5×10^{-7} <0.03 (noncancer)	62 Minimal impact.
None	Andrew Lake*	1×10^{-6} <0.2 (noncancer)	9.0 Minimal impact.
Total no-further-action CERCLA sites: 33			

*Exposure for these sites is based on recreational fishing.

Notes:
Risk-based screening concentrations that were used to calculate human health and ecological risks are based on EPA and Adak-specific exposure assumptions. These assumptions are described in Section 6.
AIMD - Aircraft Intermediate Maintenance Detachment
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
FFA - Federal Facilities Agreement
GSE - ground support equipment
NMCB - Naval Mobile Construction Battalion
NSGA - Naval Security Group Activity
PCB - polychlorinated biphenyl
SA - source area
SAERA - State-Adak Environmental Restoration Agreement
SWMU - solid waste management unit
UST - underground storage tank

Table 4-2
No-Further-Action Petroleum Sites

Original NFA Sites Listed in SAERA Agreement
SWMU 22, Avgas Drum Storage Area South of Tank Farm A
SWMU 31, Runway 18-36 Aviation Gas Drum Disposal
SWMU 34, Steam Plant 4 Used Oil AST
SWMU 41, Ground Support Equipment (GSE) Used Oil Storage Area
SWMU 44, AIMD Used Oil Storage Area
SWMU 45, Sewage Treatment Plant Petroleum Contamination (including SWMUs 46 through 50)
NFA Based on 18 AAC 75 Method One Criteria
Boy Scout Camp, South Haven Lake (UST BS-2)
Housing Outfall Area (Sandy Cove)
McDonalds UST
NSGA Filling Station, Mogas and JP-5 ASTs
TFC to NSGA Pipeline—Area E (Truck Fill Stand)
NFA Based on 18 AAC 75 Method Four Criteria
Administration Building (UST 30004-A)
Armory (UST 10311-A)
Artillery Battalion (USTs ART-1 and ART-2)
CDAA Complex (USTs 10580 and 10654)
Clam Road Truck Fill Stand
Cold Storage Facility (AST T-1440)
Contractor's Pad UST T-1706 (Navy Pad)
Drum Disposal Area at Tank Farm D
Elementary School (UST 42017-A)
Kuluk Housing (UST HST-6C)
Kuluk Recreation Center (UST 30034)
Line Crew Building (USTs 2776, 2776-B, and 2776-C)
MAUW Compound (UST 24032-B)
Medical Center (UST 27088)
Navy Exchange Building (UST 30026)
Navy Exchange Building (UST 30033)
New Transportation Building (O/W 10644)
New Transportation Building (UST 10590)
New Transportation Building (UST 10591)
Officer Hill and Amulet Housing (UST 31050-A)
Officer Hill and Amulet Housing (UST 31051-A)
Officer Hill and Amulet Housing (UST 31053-A)
Old Fuel Truck Shop (UST 10520-A)
Old Fuel Truck Shop (UST 10520-B)
Pantograph Pad (UST RT-1)
Pumphouse 5 Area

Table 4-2 (Continued)
No-Further-Action Petroleum Sites

NFA on 18 AAC 75 Method Four Criteria (Continued)
ROICC Contractor's Area (UST ROICC-5)
ROICC Contractor's Area (UST ROICC-6)
ROICC Warehouse (UST ROICC-1)
ROICC Warehouse (UST ROICC-4)
SA 81, Gun Turret Hill
SA 84, Sand Shed
SA 85, New Baler Building
SA 86, Old Happy Valley Child Care Center
SA 87, Old Zeto Point Wizard Station
SA 89, Tank Farm C
Sewage Lift Station 10 (UST 42483-A)
Sewage Lift Station 11 (UST 42484-A)
Shack O-69 (UST B)
SWMU 1, Andrew Lake OB/OD and Range
SWMU 24, Hazardous Waste Storage Facility
SWMU 35, Ground Support Equipment Building
SWMU 55, Public Works Transportation Department Waste Storage Area
SWMU 56, Public Works Transportation Department Storage Tank
SWMU 57, Fuels Facility Refueling Dock
SWMU 64, Tank Farm D
TFB to TFC Pipeline—Area B
TFB to TFC Pipeline—Area E (Truck Fill Stand)
TFB to TFC Pipeline—Area F
TFC to NSGA Pipeline—Area A
TFC to NSGA Pipeline—Area B
TFC to NSGA Pipeline—Area C
TFC to NSGA Pipeline—Area D
Telephone Exchange Building (UST 10324-A)
Telephone Substation T-100 (UST T-100-B)
USGS (NOAA) Building (USTs NOAA-A, -C, and -D)
Tephra Geology With No Continuous Groundwater Pathway
Bering Chapel (UST 42090-A)
Loran Station (USTs V149A, V149B, and V149C)
Mount Moffett Power Plant 5 (Used Oil AST)
Mount Moffett Power Plant 5 (Used Oil Pit)
Mount Moffett Tower (Mogas AST and Used Oil AST)
SA 96, NORPAC Hill Debris Site
SA 97, Generator Debris Site
Shack O-52 (UST O-52)
SWMU 12, Quartermaster Site

Table 4-2 (Continued)
No-Further-Action Petroleum Sites

Isolated Soil Location Where Cleanup More Harmful Than NFA
South Avgas Pipeline at North Sweeper Creek
TFB to TFC Pipeline—Area A
TFB to TFC Pipeline—Area C
TFB to TFC Pipeline—Area D
TFB to TFC Pipeline—Area G
Remedial Action Completed
SWMU 74, Old Batch Facility

Notes:
Two sites—the Pantograph Pad UST and the Loran Station USTs—were referred to the petroleum release site evaluation process during 1998 and 1999.

AAC - Alaska Administrative Code
AIMD - Aircraft Intermediate Maintenance Detachment
AST - aboveground storage tank
avgas - aviation gasoline
CDAA - circular disposed antenna array
GSE - ground support equipment
JP-5 -jet petroleum No. 5
Loran - long-range navigation
MAUW - modified advanced underwater weapons
mogas - motor vehicle gasoline
NFA - no further action
NOAA - National Oceanic and Atmospheric Administration
NORPAC - North Pacific
NSGA - Naval Security Group Activity
O/W - oil/water separator
ROICC - resident officer in charge of construction
SA - source area
SAERA - State-Alaska Environmental Restoration Agreement
SWMU - solid waste management unit
TFB - Tank Farm B
TFC - Tank Farm C
USGS - U.S. Geological Survey
UST - underground storage tank

Table 4-3
Maximum DRO and GRO Concentrations in Surface and Subsurface Soils for Three Future Site Uses

Site Use	Maximum DRO Concentration (mg/kg)		MaximumGRO Concentration (mg/kg)	
	Surface	Subsurface	Surface	Subsurface
Residential[a]	1,250 (0-2 ft bgs)	5,000 (>2 ft bgs)	140 (0-2 ft bgs)	1,400 (>2 ft bgs)
Industrial[a]	5,000 (0-1 ft bgs)	12,500 (>1 ft bgs)	500 (0-1 ft bgs)	1,400 (>1 ft bgs)
Recreational	12,500 (0-1 ft bgs)	12,500 (>1 ft bgs)	1,400 (0-1 ft bgs)	1,400 (>1 ft bgs)

[a]Both within and outside of reuse areas

Notes:
bgs - below ground surface
DRO - diesel-range organics
ft - foot
GRO - gasoline-range organics
mg/kg - milligram per kilogram

Table 4-4
CERCLA and Petroleum Sites Requiring Further Evaluation

Site Number	Site Name	Rationale
SWMU 2	Causeway Landfill	Need to keep landfill cover intact.
SWMU 4	South Davis Road Landfill	Environmental risk is unacceptable.
SWMU 10	Old Baler Building	Human health risk for residents is unacceptable.
SWMU 11	Palisades Landfill	Need to keep landfill cover intact.
SWMU 13	Metals Landfill	Need to keep landfill cover intact.
SWMU 14	Old Pesticide Storage and Disposal Area	Concentrations exceeded 18 AAC 75 criteria.
SWMU 15	Future Jobs/DRMO	Concentrations exceeded 18 AAC 75 criteria.
SWMU 16	Former Firefighting Training Area	Human health risk for residents is unacceptable. Ecological risk is unacceptable.
SWMU 17	Power Plant 3	Environmental risk is unacceptable; free product is present.
SWMU 18	South Sector Drum Disposal Area (now part of White Alice Landfill)	Need to keep landfill cover intact.
SWMU 19	Quarry Metal Disposal Area (now White Alice Landfill)	Need to keep landfill cover intact.
SWMU 20	White Alice/Trout Creek Disposal Area	Human health risk for residents is unacceptable.
SWMU 21A	White Alice Upper Quarry	Human health risk for residents is unacceptable. Ecological risk is unacceptable.
SWMU 23	Heart Lake Drum Disposal Area	Human health risk for residents is unacceptable. Ecological risk is unacceptable.
SWMU 25	Roberts Landfill	Need to keep landfill cover intact.
SWMU 29	Finger Bay Landfill	Need to keep landfill cover intact.
SWMUs 52, 53, 59	Former Loran Station	Human health risk for residents is unacceptable. Ecological risk is unacceptable.
SWMU 55	Public Works Transportation Department Waste Storage Area	Human health risk for residents is unacceptable.
SWMU 58	Heating Plant 6 (combined with SA 73)	Free product is present.
SWMU 60	Tank Farm A	Concentrations exceeded 18 AAC 75 criteria.

Table 4-4 (Continued)
CERCLA and Petroleum Sites Requiring Further Evaluation

Site Number	Site Name	Rationale
SWMU 61	Tank Farm B	Human health risk for residents is unacceptable.
SWMU 62	New Housing Fuel Leak	Free product is present.
SWMU 67	White Alice PCB Spill Site	Human health risk for residents is unacceptable. Ecological risk is unacceptable.
SA 73	Heating Plant 6 (combined with SWMU 58)	Free product is present.
SA 76	Old Line Shed Building	Human health risk for residents is unacceptable.
SA 77	Fuels Facility Refueling Dock, Small Drum Storage Area	Concentrations exceeded 18 AAC 75 criteria.
SA 78	Old Transportation Building	Free product is present.
SA 79	Main Road Pipeline, North End (MRP-MW15) and South End	Concentrations exceeded 18 AAC 75 criteria.
SA 80	Steam Plant 4	Free product is present.
SA 82	P-80/P-81 Buildings	Free product is present.
SA 88	P-70 Energy Generator	Free product is present.
—	Amulet Housing, Well AMW-706 Area	Concentrations exceeded 18 AAC 75 criteria.
—	Amulet Housing, Well AMW-709 Area	Concentrations exceeded 18 AAC 75 criteria.
—	Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	Concentrations exceeded 18 AAC 75 criteria.
—	ASR-8 Facility (UST 42007-B)	Concentrations exceeded 18 AAC 75 criteria.
—	Boy Scout Camp, West Haven Lake (UST BS- 1)	Concentrations exceeded 18 AAC 75 criteria.
—	Contractor's Camp Burn Pad	Concentrations exceeded 18 AAC 75 criteria.
—	Finger Bay Quonset Hut (UST FBQH-l)	Concentrations exceeded 18 AAC 75 criteria.
—	Former Power Plant Building (T-1451)	Concentrations exceeded 18 AAC 75 criteria.
—	GCI Compound (UST GCI-l)	Free product is present.
—	Girl Scout Camp (UST GS-1)	Concentrations exceeded 18 AAC 75 criteria.

Table 4-4 (Continued)
CERCLA and Petroleum Sites Requiring Further Evaluation

Site Number	Site Name	Rationale
—	Housing Area (Arctic Acres)	Concentrations exceeded 18 AAC 75 criteria.
—	Kuluk Bay	Potential human health risk for subsistence fishers is unacceptable.
—	MAUW Compound (UST 24000-A)	Concentrations exceeded 18 AAC 75 criteria.
—	Mount Moffett Power Plant 5 (USTs 10574 through 10577)	Concentrations exceeded 18 AAC 75 criteria.
—	NAVFAC Compound (USTs 20052 and 20053)	Concentrations exceeded 18 AAC 75 criteria.
—	Navy Exchange Building (UST 30027-A)	Concentrations exceeded 18 AAC 75 criteria.
—	New Roberts Housing (UST HST-7C)	Concentrations exceeded 18 AAC 75 criteria.
—	NMCB Building Area, T-1416 Expanded Area	Free product is present.
—	NMCB Building (UST T-1416-A)	Concentrations exceeded 18 AAC 75 criteria.
—	NORPAC Hill Seep Area	Free product is present. Petroleum sheen observed on surface water.
—	Officer Hill and Amulet Housing (UST 31047-A)	Concentrations exceeded 18 AAC 75 criteria.
—	Officer Hill and Amulet Housing (UST 31049-A)	Concentrations exceeded 18 AAC 75 criteria.
—	Officer Hill and Amulet Housing (UST 31052-A)	Concentrations exceeded 18 AAC 75 criteria.
—	Quarters A	Concentrations exceeded 18 AAC 75 criteria.
—	ROICC Contractor's Area (UST ROICC-7)	Concentrations exceeded 18 AAC 75 criteria.
—	ROICC Contractor's Area (UST ROICC-8)	Concentrations exceeded 18 AAC 75 criteria.
—	ROICC Warehouse (UST ROICC-2)	Concentrations exceeded 18 AAC 75 criteria.
—	ROICC Warehouse (UST ROICC-3)	Concentrations exceeded 18 AAC 75 criteria.
—	Runway 5-23 Avgas Valve Pit	Concentrations exceeded 18 AAC 75 criteria.
—	South of Runway 18-36 Area	Free product is present.

Table 4-4 (Continued)
CERCLA and Petroleum Sites Requiring Further Evaluation

Site Number	Site Name	Rationale
—	South Sweeper Creek	Potential human health risk for subsistence fishers is unacceptable. Environmental risk is unacceptable.
—	Sweeper Cove	Potential human health risk for subsistence fishers is unacceptable.
—	Tanker Shed (UST 42494)	Free product is present.
—	Yakutat Hangar (UST T-2039-A)	Free product is present.
—	Yakutat Hangar (USTs T-2039-B and T-2039-C)	Concentrations exceeded 18 AAC 75 criteria.
Total further evaluation sites: 66		

Notes:
SWMUs 1, 2 (the minefield portion), and 8 and SA 93 will be evaluated in the ROD for OU B.
AAC - Alaska Administrative Code
AST - aboveground storage tank
avgas - aviation gasoline
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DRMO - Defense Reutilization Marketing Office
GCI - General Communications, Inc.
Loran - long-range navigation
MAUW - modified advanced underwater weapons
NAVFAC - Naval Facility
NMCB - Naval Mobile Construction Battalion
NORPAC - North Pacific
PCB - polychlorinated biphenyl
ROICC - resident officer in charge of construction
SA - source area
SWMU - solid waste management unit
UST - underground storage tank
— no site number assigned

5.0 SITE CHARACTERISTICS

This section provides a summary of the site and water body characterizations performed during CERCLA and SAERA investigations at Adak. Section 5.1 begins with a discussion on how chemicals of potential concern (COPCs) are selected, followed by an overview of the site characterizations performed at individual CERCLA-investigated sites and water bodies. The information presented includes a summary of investigative sampling performed for each site and a brief discussion of COPCs. (A statistical summary of COPCs, by medium, is provided in Appendix A.) For downtown groundwater, analytical results are compared to maximum contaminant levels (MCLs) and final State of Alaska criteria (18 AAC 75). A summary of petroleum site characteristics is presented in Section 5.2. Finally, the two State of Alaska-permitted landfills (Roberts and White Alice Landfills) are described in Section 5.3.

Information regarding risk estimates, evaluation of the risk drivers (or chemicals of concern [COCs]), and media of concern are presented in Section 6.

5.1 CERCLA SITES

This section summarizes COPC selection for the CERCLA sites and then, based on these COPCs, discusses the site characterizations performed for CERCLA sites and the findings. The section includes the following:

- A discussion of the COPC selection process for CERCLA-regulated sites
- A discussion of site characteristics and scope of the field investigation for each site
- A table showing numbers of samples collected at each site, by medium
- Tables listing COPCs by site and medium
- Figures and tables showing the COPCs for the water bodies
- Figures showing the MCL exceedances for downtown groundwater

In addition, Appendix A provides tables listing COPCs identified at each site, by medium.

5.1.1 Identification of Chemicals of Potential Concern

Data evaluated during the PSE process and the RI were used to identify COPCs (URS 1995a, 1995b, 1996a; URSG 1997c). This section summarizes the selection of COPCs for the individual CERCLA sites and downgradient water bodies. The data for the sites listed in this section are summarized in Appendix A.

The individual site and water body COPCs were identified based on exceedance of risk-based screening concentrations (RBSCs) and, in the case of inorganics, exceedances of natural background concentrations. The maximum detected chemical concentration in a given environmental medium was compared to the RBSC during the COPC selection process. Derivation of the RBSCs and detailed explanation of the COPC screening process are provided in the final PSE-2 guidance document (URS 1996c) and the final RI/FS management plan (URS 1996b). The exposure parameters used to derive the RBSCs are provided in Tables 6-1 and 6-2. Derivations of soil and groundwater background concentrations are described in the final background study report (URS 1995c). Derivations of sediment and fish tissue background concentrations are described in the final RI/FS management plan (URS 1996b); a more detailed discussion of the dietary study is provided in a technical memorandum in support of the RI/FS (URS 1996d). A detailed description of exposure parameters is provided in Section 6.1.1.

The RBSCs for soil, groundwater, and surface water were based on EPA default residential exposure assumptions. Since default residential exposure assumptions are not available for sediments, sediment concentrations for individual sites were compared to soil RBSCs; sediment concentrations in the receiving water bodies were compared to RBSCs developed for the subsistence fisher scenario. Fish tissue RBSCs were based on a combination of EPA default residential values and dietary studies of representative coastal Alaskan communities.

Ecological COPCs were evaluated for individual sites based on comparison to Adak ecological RBSCs (developed for the Adak PSE-2 evaluation). Explanation of the derivation of these RBSCs is provided in the final PSE-2 guidance document (URS 1996c). COPC selection was not performed for the water bodies; ecological risk in the water bodies was evaluated in a different manner. Details of the ecological risk for the water bodies are described in Section 6.2.

The human health COPCs are presented by drainage basin for all individual sites and water bodies that were retained for further action in the FS and Proposed Plan. Ecological COPCs for individual sites are also presented in this section. The COPCs are presented in tabular form for each sampled medium (soil, sediment, groundwater, surface water, biota) in Appendix A.

Sweeper Cove Basin

Seven CERCLA sites and two downgradient water bodies were retained for further evaluation in the Sweeper Cove drainage basin:

- SWMU 10, Old Baler Building
- SWMU 14, Old Pesticide Disposal Area
- SWMU 15, Future Jobs/DRMO
- SWMU 16, Former Firefighting Training Area

- SWMU 17, Power Plant 3
- SWMU 55, Public Works Transportation Department Waste Storage Area
- SA 76, Old Line Shed Building
- Sweeper Cove
- South Sweeper Creek

Section 5.1.2 discusses the terrestrial sites, and Section 5.1.3 discusses the two downgradient water bodies.

Kuluk Bay Basin

Two landfills and one downgradient water body were retained for further evaluation:

- SWMU 13, Metals Landfill
- SWMU 11, Palisades Landfill
- Kuluk Bay

Section 5.1.2 discusses SWMUs 11 and 13. Human health risks in Kuluk Bay were addressed in an independent risk assessment (URSG 1997a), and the results were included in the Adak RI/FS. Section 5.1.3 briefly discusses Kuluk Bay.

Clam Lagoon Basin

Two CERCLA sites were retained for further action in the Clam Lagoon drainage basin:

- SWMU 2, Causeway Landfill portion only
- SWMU 2, Causeway Minefield

Section 5.1.2 discusses SWMU 2, the landfill portion. The ROD for OU B will address the minefield portion of SWMU 2.

Andrew Lake Basin

Three CERCLA sites were retained for further action in the Andrew Lake drainage basin:

- SWMU 1, Andrew Lake Waste Ordnance Demolition Range
- SWMU 4, South Davis Road Landfill
- SA 93, World War II Mortar Impact Area

Section 5.1.2 discusses the non-ordnance site (SWMU 4). The OU B ROD will address SWMU 1 and SA 93.

Andrew Bay Basin

Two CERCLA sites were retained for further action in the Andrew Bay drainage basin:

- SWMU 52 (includes SWMUs 53 and 59), Former Loran Station
- SWMU 8, Andrew Lake Landfill and Shoreline

Section 5.1.2 discusses the non-ordnance site (SWMU 52). The OU B ROD will address SWMU 8.

Shagak Bay Drainage Basin

Four CERCLA sites were retained for further action in the Shagak Bay drainage basin:

- SWMU 20, White Alice/Trout Creek Disposal Area
- SWMU 21A, White Alice Upper Quarry
- SWMU 23, Heart Lake Drum Disposal Area
- SWMU 67, White Alice PCB Spill Site

Section 5.1.2 discusses these four sites.

Finger Bay Drainage Basin

Only one CERCLA site was retained for further action in the Finger Bay drainage basin:

- SWMU 29, Finger Bay Landfill

Section 5.1.2 discusses SWMU 29.

5.1.2 Characteristics of Individual Sites

Twenty-one individual sites were retained for further evaluation under CERCLA following the PSEs. In addition, four downgradient water bodies were forwarded for an FS evaluation following the remedial investigation (RI). These sites are listed in Table 5-1 with reference to previous investigations, and their locations are displayed on Figure 5-1. Each site is briefly described in this section. Sample quantities collected at individual sites and water bodies are listed in Table 5-2. COPCs are listed by matrix in Tables 5-3 through 5-6. Statistical summaries of the COPCs are included in Appendix A.

Downtown Sites

The downtown sites are within the area commonly referred to as downtown Adak, which comprises the populated area of Adak, the airport, the docks, and all support facilities. Since the closure of NSGA (north of downtown), no one lives outside the downtown area. Eight downtown sites were retained for further evaluation under CERCLA:

- SWMU 10, Old Baler Building
- SWMU 13, Metals Landfill
- SWMU 14, Old Pesticide Disposal Area
- SWMU 15, Future Jobs/DRMO
- SWMU 16, Former Firefighting Training Area
- SWMU 17, Power Plant 3
- SWMU 55, Public Works Transportation Department Waste Storage Area
- SA 76, Old Line Shed Building

Each site is characterized below.

SWMU 10, Old Baler Building. This site was used as a facility for processing and baling domestic refuse. It is located in downtown Adak, about 1,200 feet from Sweeper Cove (Figure 5-1). The site is a flat, open area with a concrete foundation pad where the baler building once stood. Prior to the 1950s the building was used as an auto repair shop and living quarters; it was converted for use as the municipal waste baling facility in the 1950s and was demolished in 1992. The site comprises an area of about 1½ acres.

Eleven surface soil samples were collected during the 1992 site investigation and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs, pesticides, and inorganics. The site was retained for further evaluation in the RI/FS because COPCs were detected in the surface soil. The COPCs are listed in Tables 5-3 and 5-4.

Human health COPCs in soil included Aroclor 1260, carcinogenic polycyclic aromatic hydro-carbons (cPAHs), beryllium, and arsenic. Ecological COPCs added copper, lead, silver, and zinc.

SWMU 13, Metals Landfill. Metals Landfill is located immediately southeast of downtown Adak and is bounded by Monument Hill to the west and Kuluk Bay to the east (Figure 5-1). The landfill received wastes consisting of, but not limited to, construction debris, metal debris, and scrap vehicles. The total volume of waste and soil in Metals Landfill is approximately 400,000 cubic yards.

Metals Landfill was used from the 1940s until about 1989. In 1970, restrictions were placed on the types of materials that could be disposed of in the landfill. A sludge press was installed at the sewage treatment plant in 1988. Dewatered sewage sludge was disposed of on the southeastern end of the landfill.

In the summer of 1996, Metals Landfill was closed per the CERCLA Record of Decision for the interim remedial action (URS 1995e). Closure included evaluation and removal of shoreline debris, surface water erosion controls, a landfill cap, a vegetative cover, institutional controls for access and land use, and long-term monitoring. The cap and related remedial work were completed in 1997.

The analytical data used in the ecological risk assessment of Metals Landfill described in the Kuluk Bay ecological risk assessment (URSG 1997a) were collected between August 1995 and November 1996. Data were analyzed for sediment samples from 18 locations, three blue mussel samples collected in May 1996 (before the remedial action construction activities), three blue mussel samples collected in November 1996 (after the construction activities), five rock sole fillet composite samples, five whole-body rock sole composite samples, and one surface water sample. PCBs (hazard quotient = 1.38) were the only chemical identified with a hazard quotient greater than 1.0; PCBs were above the hazard quotient in only one sediment sample—a duplicate sample from one sampling station offshore of Metals Landfill. Rock sole data were collected only in conjunction with the Kuluk Bay risk assessment and were not collected during postconstruction monitoring at Metals Landfill. The blue mussel data from both Palisades Landfill (SWMU 11) and Metals Landfill (SWMU 13) were pooled for mean and reasonable maximum exposure (RME) concentration calculations during the Kuluk Bay risk assessment (URSG 1997a). A reanalysis of the May to November 1996 Metals Landfill blue mussel data indicated that eight inorganics (arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc) had the potential to pose ecological risks. Cadmium, chromium, and lead are of most concern based on the elevated concentrations of these inorganics in the mussel samples collected during the postconstruction monitoring.

All blue mussel data collected after November 1996 in the vicinity of Metals Landfill are postconstruction monitoring data and were not used during the Kuluk Bay ecological risk assessment (URSG 1997a).

Sampling related to the landfill closure at Metals Landfill occurred from 1996 to 1998 and included collection of surface water, groundwater, blue mussel tissue, and rock sole tissue samples. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganics. Quarterly groundwater monitoring was conducted to evaluate the potential for releases. The number of samples collected during the investigation totaled 100 and are listed in Table 5-2. A summary of the results of the postremediation monitoring is presented in Table 5-7.

SWMU 14, Old Pesticide Disposal Area. This site consists of a currently vacant property located in the downtown area about 1,500 feet from Sweeper Cove (Figure 5-1). The site includes the foundation of former Building 1471. The site is a flat, open area covering about 0.9 acre. Building 1471 was used from 1950 to 1987 for handling a variety of pesticides. The building was also used as a motor vehicle filling station from about 1950 to 1985.

During the 1995 site investigation (URS 1996a), groundwater, subsurface soil, and surface soil were sampled and analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganics. The number of samples collected during the investigation totaled 45 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because COPCs were detected in all three sample media (Tables 5-3 and 5-4). Surface and subsurface soil COPCs consisted of Aroclor 1260 and cPAHs. Groundwater COPCs consisted predominantly of VOCs. Downtown groundwater is discussed separately as a downgradient water body in Section 5.1.3.

SWMU 15, Future Jobs/DRMO. This site was previously used to store construction materials, paint, solvents, transformers, petroleum and lubricant compounds, and other materials. The site, located between two warehouses near the dock facilities on Sweeper Cove (Figure 5-1), is 3½ acres, rectangular, flat, and fenced and comprises compact gravel with concrete and asphalt paved areas. It was operated from the 1950s until 1992. A removal action was conducted in 1992 to remove chemically affected soils. Approximately 252 cubic yards of surface soil were removed from the site (URS 1996a).

During site investigations from 1992 to 1995, groundwater, subsurface soil, surface soil, and sediment samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The number of samples collected during the investigations totaled 246 and are listed in Table 5-2. A PSE-2 evaluation was performed on the site using postremoval analytical results.

The site was retained for further evaluation in the RI/FS because COPCs were detected in all four sample media (Table 5-3). Surface soil, subsurface soil, and sediment COPCs included Aroclor 1260 and cPAHs. Groundwater COPCs were tetrachloroethene and trichloroethene. Downtown groundwater is discussed separately as a downgradient water body in Section 5.1.3.

SWMU 16, Former Firefighting Training Area. This site was used for firefighter training from 1970 to 1989. It was included in the CERCLA investigations because petroleum, waste oil, and solvents were ignited on site during training exercises. The site was cleared of training materials in 1992. It encompasses an abandoned hardstand off of former Taxiway E, near the west end of Runway 5-23 (Figure 5-1) and comprises an area of about 4 acres. A preinvestigation removal action was performed on the site in 1989. During this removal action ponded surface water was removed from the burn pads, and the soil berms that created the burn pits were graded into stockpiles and capped. Later, in 1996, the stockpiles were removed and treated by thermal desorption.

During site investigations from 1992 to 1997, groundwater, subsurface soil, surface soil, surface water, and sediment samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The number of samples collected totaled 319 and are listed on Table 5-2. A PSE-2 evaluation was performed on the site using postremoval analytical results.

As a result of the PSE-2 investigation and recommendations, a limited soil removal action was performed on this site during the summer of 1996. The removal action included removal of a stockpile of PCB-laden soil from one of the paved areas and removal of surface soils in the area where the highest PCB concentrations were detected. Total volume of the stockpile was estimated at 1,040 cubic yards. Total volume of removed surface soils was approximately 250 to 275 cubic yards. A 1 mg/kg cleanup level was used. Aroclor 1260 was the only PCB detected. Although not all confirmatory samples contained less than 1 mg/kg PCBs, the PCB-affected soil was covered with clean fill to eliminate the direct exposure pathway. The removed surface soil from SWMU 16 was disposed of off island. Results of confirmatory sampling are presented in Table 5-8.

The former soil stockpile material was placed at SWMU 67 (White Alice PCB Spill Site), which was subsequently capped, as described later in this section. SWMU 16 risks were reevaluated for postremoval conditions in the RI/FS. The postremoval conditions are provided in Section 6 of this document.

SWMU 17, Power Plant 3. This site is the current power-generating facility for Adak Island. It is adjacent to Yakutat Creek in the central portion of NAF Adak (Figure 5-2). The site was segregated into a number of areas of potential concern for the purpose of investigation:

- The waste oil pond
- The north pond
- The bulk storage waste oil tank

- Two former oil/water separators (O/W 1, which served the power plant floor sumps, and O/W 2, which received discharge from unknown sources)
- Two temporary drum accumulation areas (Area 1, north of the power plant, and Area 2, southeast of the plant)
- The power plant tank farm
- The seepage area along the slope below the power plant
- A Quonset hut once used to store transformers
- The dry cleaning facility
- Stained areas within the ditches along both sides of Akutan Way

The site location is provided in Figure 5-1. The general locations of areas of concern are shown in Figure 5-2; individual areas of concern are described below.

Waste Oil and North Ponds. The waste oil and north ponds are located in depressions on the east and northeast sides of Power Plant 3. The waste oil pond is roughly 130 feet long and 25 feet wide. Surface water is impounded by a concrete check dam on the outfall ravine at the southwest end of the pond. No natural or artificial barriers separate the bottom of the pond from the subsurface.

The north pond is a disturbed, graded gravel area approximately 200 feet northeast from Power Plant 3 and downgradient of the power plant tank farm. It is not actually a pond; rather, it is a depression where surface water sometimes accumulates. The north pond historically received runoff from O/W 2 and from the powerhouse sanitary sewer cleanout. Both sources were rerouted to the sanitary sewer downgradient of the pond. Currently, the pond's only water sources are overland flow and seepage. The north pond area was dry during summer 1995 field activities.

Bulk Storage Waste Oil Tank. Used oil is stored in bulk at SWMU 17 in a 10,300-gallon AST resting on a concrete pad along the power plant east wall. The used oil provides fuel for the powerhouse boiler. The site occupies less than 1,000 square feet. Stained soil from previous spills were observed at this site (SAIC 1991). The stained soil and gravel were removed and disposed of off island in the spring of 1994 and replaced with clean soil and gravel.

O/W 1. **O/W 1** was located upgradient from and immediately northwest of the waste oil pond. It served the floor sumps in the power plant, a drain outside a rollup door to a section of the power plant where parts are cleaned, and a drain in the berm surrounding the power plant tank farm. The separator has been removed and drainage was rerouted to the sanitary sewer. No soil was removed when the separator was removed. The adjacent soil surface is exposed, with isolated patches of grass. Petroleum staining was observed on the ground surface around O/W 1 during the June 1994 site walk (URS 1994), and oil was spilling from the separator during site activities in the summer of 1995.

O/W 2. This separator was located along Akutan Way on a northeast-facing slope. It was about 100 feet north and downgradient of the power plant tank farm. The mechanical separator, installed in 1979, received oily water from a pipe emerging from the hillside immediately west of it. The source of the oily water has not been determined. The separator has been removed and drainage was rerouted to the sanitary sewer. Staining from petroleum and oxidized metal is present downgradient of the separator. No soil was removed when the separator was removed.

Drum Accumulation Area 1. Drum Accumulation Area 1 consists of two concrete pads that were used for chemical and fuel handling. They are located immediately north of Power Plant 3 and south of the three horizontal aboveground storage tanks (ASTs) that serve the power plant. The concrete pads are unbermed and slope slightly to the northwest. The north pad contains Building 10285 and an oil/water separator. The south pad covers about 50 percent of the area and has a fenced enclosure signed for chemical storage. There are no official records of the chemicals that were handled or stored.

Drum Accumulation Area 2. Drum Accumulation Area 2 occupies approximately 100, 000 square feet on the topographic bench east of Power Plant 3 and the dry cleaning facility. The ground surface is covered with gravel. There is no visual evidence of spills, although photographs taken in 1991 show staining on the ground.

Although there are no official records available of the exact types and quantities of wastes handled and temporarily stored in this area, a number of drums containing oily rags (presumably from the powerhouse) were stored here in 1994. Paints, caustics, and flammable liquids reportedly were stored here in the past (SAIC 1991).

Power Plant Tank Farm. The power plant tank farm consists of five ASTs located north of Power Plant 3. Three of the five ASTs were closed in 1998. The two operating ASTs contain JP-5 (a jet fuel) from the aboveground pipeline that fuels the power plant. There were also three vaulted day tanks (located in the power plant basement), which were removed in 1996.

Hillside Drainage/Seepage Area. The hillside drainage/seepage area is east of the power plant and downhill from Drum Accumulation Area 2. The seepage area is on a southeast-facing, steeply sloping hillside, which is covered with a variety of low-lying vegetation. Seepage occur along an approximately 40,000-square-foot area running northeast-by-southwest, which roughly contours the hillside at 44 feet above mean lower low water (MLLW).

Discharge pipelines to the waste oil pond were historically present in the north end of this area. The power plant sump outfall discharged immediately southeast of and upgradient from the waste oil pond prior to being rerouted to an oil/water separator; localized staining has been noted below this outfall. In addition, emergency pumps for high groundwater beneath the floor of the power plant formerly discharged the water on the southwest slope, but the outfall for the pumps was rerouted to the south, past the waste oil pond, so that the water drains directly toward Yakutat Creek.

Quonset Hut. There is anecdotal evidence that the aboveground Quonset hut, located approximately 750 feet northeast of Power Plant 3, was used to service transformers. The structure occupies approximately 1,250 square feet and rests on a petroleum-stained wooden floor that has been blackened by fire and partially burned. The adjacent surrounding ground is covered with grass. Hydrocarbon staining was observed inside the Quonset hut and in a ditch next to and southeast of the site during the June 1994 site walk (URS 1994).

Dry Cleaning Facility. The 50,000-square-foot dry cleaning facility, located immediately south of Power Plant 3, operated continuously from 1968 until its closure in the 1990s. The solvent tetrachloroethene (PCE) is used in dry cleaning operations. Stains were observed on the dock where drums of chemicals and wastes were stored in 1990. However, no evidence of staining was observed on the ground surface.

Akutan Way and Amulet Way Ditches. During the summer of 1995 field investigation, petroleum stains and stressed vegetation were observed along the roadside ditches of Akutan Way, which runs past Power Plant 3. Approximately 1 month later, petroleum seeps were discovered in the ditches.

In October 1995, during a routine inspection, the NAF Environmental Department discovered that petroleum had seeped to the surface on the west side of Akutan Way and had traveled with surface water for approximately 200 feet, to a pipe-and-dike collection berm (earthen barrier) located 10 feet from a stormwater collection basin. During a period of heavy rain and high winds, the berm had overflowed and a sheen of petroleum was flowing into the storm sewer and draining into South Sweeper Creek.

Visually stained soil was removed from the ditches downgradient of the berms in October 1995 to prevent any further migration of petroleum with stormwater and the potential for direct exposure. Approximately 110 cubic yards of soil was excavated from the ditches on the northwest and southeast sides of Akutan Way and was treated using thermal desorption. A subsequent detailed investigation of the area surrounding these areas resulted in subsequent product recovery.

During site investigations from 1990 to 1998, groundwater, subsurface soil, surface soil, surface water, and sediment samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The number of samples collected during the investigations totaled 328 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because numerous human and ecological COPCs were detected in surface soil, subsurface soil, sediment, groundwater, and surface water (Tables 5-3 and 5-4).

SWMU 55, Public Works Transportation Department Waste Storage Area. This site is located between two warehouses near the Sweeper Cove dock (Figure 5-1). It consists of a graded gravel open area with a small (about 700-square-foot) steel shed at one end. The site was historically used for vehicle maintenance and product storage, including storage of flammable materials. New oil, hydraulic and transmission fluids, and other vehicle-care products were also stored inside of and adjacent to the steel shed. The site comprises an area of about 0.7 acre.

During the site investigation in 1995, groundwater, subsurface soil, surface soil, and sediment samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The number of samples collected during the investigation totaled 54 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because human health COPCs were detected in groundwater, surface soil, and sediment (Table 5-3). These included Aroclor 1260 in soil and sediment, arsenic and beryllium in sediment, and tetrachloroethene in surface soil and groundwater. No ecological COPCs were identified.

SA 76, Old Line Shed Building. The site is a 2-acre, rectangular open area with a concrete foundation pad surrounded by gravel (Figure 5-1). At the time of the investigation, the site was used to stockpile gravel. Historically, the site was used for office space, line crew living quarters, and storage space for a variety of materials. The structure was removed after it was damaged in a 1982 storm and rendered uninhabitable.

During the site investigation in 1992, 10 surface soil and 10 groundwater samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The site was retained for further evaluation in the RI/FS because human health and ecological COPCs were detected in surface soil and human health COPCs were detected in groundwater (Tables 5-3 and 5-4). The only groundwater COPCs that were identified were total inorganics. However, these may have been due to high turbidity in the sample because no elevated dissolved inorganics were identified. Surface soil human health COPCs included Aroclor 1260, cPAHs, arsenic, beryllium, and lead. Cobalt, copper, 4-methylphenol, and zinc were also identified as ecological COPCs.

Remote Sites

The terminology "remote sites" refers to sites that are located in areas outside of the populated or commonly used area of Adak Island. These sites are:

- SWMU 2, Causeway Landfill
- SWMU 4, South Davis Road Landfill
- SWMU 11, Palisades Landfill
- SWMU 20, White Alice/Trout Creek Disposal Area
- SWMU 21A, White Alice Upper Quarry
- SWMU 23, Heart Lake Drum Disposal Area
- SWMU 29, Finger Bay Landfill
- SWMUs 52, 53, 59, Former Loran Station
- SWMU 67, White Alice PCB Spill Site

Currently the total population of Adak resides and, for the most part, works in the area referred to as downtown. In most cases, the remote sites would probably not be visited except by vehicle, and some of the sites cannot be reached during inclement weather. Therefore, these sites are likely to be visited only on a sporadic basis by recreational users.

Based on site investigations, these nine sites were considered to require further evaluation in the RI/FS. Each site is characterized below.

SWMU 2, Causeway Landfill. This is the site of a former 2- to 3-acre landfill that was operated from the mid-1950s to the early 1960s. The landfill is about 4 to 6 feet thick. It is located about 7 miles from downtown on the eastern side of Clam Road on a narrow strip of land separating Clam Lagoon from Sitkin Sound (Figure 5-1). The landfill reportedly received waste materials that included sanitary trash, construction debris, scrap equipment, and other refuse generated by NSGA. Site features are generally flat, with a predominantly cobble and gravel surface cover.

During site investigations in 1994 through 1997, groundwater, subsurface soil, marine sediment, freshwater sediment, and surface water samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, ordnance compounds, total petroleum hydrocarbon (TPH), and inorganics. The numbers of samples collected during the investigations totaled 35 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because COPCs were detected in groundwater and subsurface soil (Tables 5-5 and 5-6). Subsurface soil COPCs consisted predominantly of Aroclors and cPAHs, and three inorganics. It should be noted that the subsurface soil samples were collected from within the landfill debris and that there would be no exposure to this soil, provided the landfill cover remains intact. Only three groundwater COPCs were identified (1,3-dinitrobenzene, arsenic, and manganese). These groundwater samples were collected from within the landfill, which would not be considered a viable source of drinking water.

SWMU 4, South Davis Road Landfill. This is the site of a former 3-acre landfill that was operated from the early to late 1940s. It is believed to have been closed with a soil and rock cover in the late 1940s. The former landfill is on the eastern shore of Andrew Lake, about 3 miles north of downtown (Figure 5-1). It is believed to be filled with construction debris and waste generated by the construction and subsequent demolition of Albert Mitchell Airfield, which used to occupy the area between Andrew Lake and Clam Lagoon. Site features generally consist of a flat rocky surface, with a small stream, some wet depressions, and various grasses.

During the 1994 site investigation, groundwater, subsurface soil, sediment, and surface water samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The number of samples collected during the investigation totaled 30 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because COPCs were detected in groundwater, subsurface soil, and sediment (Tables 5-5 and 5-6).

SWMU 11, Palisades Landfill. Palisades Landfill, located about 2/3 of a mile north of downtown Adak, was used as the primary disposal area for all of Adak Island from the 1940s to about 1970. The 6-acre landfill covers portions of the coastal uplands adjacent to Kuluk Bay and part of the ravine, which opens immediately to the bay. The ravine is about 1,200 feet long, 5 to 300 feet wide, and 5 to 150 feet deep, with a small stream (Palisades Creek) running through it. Wastes within the landfill include, but are not limited to, sanitary trash, construction waste, and scrap vehicles. About 80,000 to 100,000 cubic yards of solid waste are located in the landfill.

During the evaluation of Palisades Landfill, sediments, surface water, and mussel tissue samples were collected. These samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The quantities of samples collected during the investigations totaled 112 and are listed in Table 5-2. Based on the findings of the investigations, the site was recommended for a presumptive cap in an interim action ROD (URS 1995e). The cap was completed in 1996.

The analytical data used in the ecological risk assessment of Palisades Landfill described in the Kuluk Bay ecological risk assessment (URSG 1997a) were collected between May and November of 1996. One sediment and two blue mussel samples were collected before construction activities started at Palisades Landfill, and one sediment and two blue mussel samples were collected after construction. Antimony (hazard quotient = 1.85) was the only chemical identified with a hazard quotient greater than 1.0 in sediment. Rock sole data were collected only in conjunction with the Kuluk Bay risk assessment and were not collected during postconstruction monitoring. The blue mussel data from both Palisades Landfill and Metals Landfill were pooled for mean and RME concentration calculations during the Kuluk Bay risk assessment (URSG 1997a). A reanalysis of the May to November 1996 Palisades Landfill blue mussel data indicated that seven inorganics (arsenic, cadmium, chromium, copper, lead, nickel, and zinc) had the potential to pose ecological risks. Copper and chromium had the largest potential to pose ecological risks based on the elevated concentrations of these two inorganics in the mussel samples collected during postconstruction monitoring.

All blue mussel data collected after November 1996 in the vicinity of Palisades Landfill are postconstruction monitoring data and were not used during the Kuluk Bay ecological risk assessment (URSG 1997a).

The site continues to undergo periodic monitoring. A summary of the results of postremediation monitoring are presented in Table 5-9.

SWMU 20, White Alice/Trout Creek Disposal Area. This 11½-acre site occupies a hillside and floodplain area below the former White Alice complex about 2 miles west of downtown (Figure 5-1). The site consists of two distinct topographic environments: (1) a steep northwest-facing hillside, approximately 200 feet wide and 500 feet long, covered with native vegetation and debris, and (2) a portion of the heavily vegetated, marshy Trout Creek floodplain, at the base of the hillside. It was originally investigated because several 55-gallon drums and other debris (apparently originating from the closure of the White Alice facility in the 1980s) were disposed of on the hillside and in the valley below. A removal action was conducted in 1992 to remove about 100 55-gallon drums and various other debris. About 7 cubic yards of PCB-affected soils were also removed.

During site investigations from 1990 to 1995, subsurface soil, surface soil, sediment, and surface water samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The quantities of samples collected during the investigations totaled 168 and are listed in Table 5-2, A PSE-2 evaluation was conducted using postremoval analytical results.

The site was retained for further evaluation in the RI/FS because COPCs were detected in surface soil, subsurface soil, and surface water (Tables 5-5 and 5-6). Surface soil COPCs included Aroclor 1260, cPAHs, copper, lead, and zinc. Aroclor 1260 was identified as an ecological COPC in subsurface soil. One detected concentration of silver in surface water was screened as a COPC, although this is believed to be an anomaly.

SWMU 21A, White Alice Upper Quarry. This 3-acre site is an abandoned quarry along the access road to the former White Alice radar array facility, located about 2 miles west of downtown Adak (Figure 5-1). The site was evaluated under CERCLA because drums of PCB-containing oil were disposed of in the area and PCBs were identified in the soil at SWMU 21A. Although there are no formal records to confirm this, anecdotal information indicates that during demolition of the White Alice facility (1980 to 1982), drums containing transformer oil were disposed of at (or in the vicinity of) SWW 21A. A removal action was conducted in 1992 to remove 780 cubic yards of PCB-affected soils. A 20-mil liner and soil cover were placed over areas of residual PCBs to minimize direct exposure to and possible migration of residual PCB. The soils under the cover contained concentrations of less than 2 mg/kg. Removed soils were disposed of beneath the SWMU 67 cap. A PSE-1 evaluation was conducted using postremoval analytical results.

During the site investigations from 1990 to 1995, 74 surface soil samples were collected and analyzed for Aroclor 1260. The site was retained for further evaluation in the RI/FS because Aroclor 1260 was identified as a human health and ecological COPC in surface soil (Tables 5-5 and 5-6). No other COPCs were identified at this site.

SWMU 23, Heart Lake Drum Disposal Area. This site is located in an undeveloped field about 2 miles southwest of downtown Adak (Figure 5-1). It occupies a hillside between two small unnamed lakes less than ½ mile from Heart Lake. The site, 8 acres of a grassy open field, was apparently used to dispose of about 20 drums and one storage tank in the 1940s. The original contents of the drums are unknown. When they were removed in 1994, all the drums and the storage tank were empty, and no evidence of releases was observed.

Previous site investigations are documented in the PSE-2 Batch 1 report (URS 1995b), During investigations from 1994 to 1997, surface soil and sediment samples were collected and analyzed for VOCs, SVOCs, PCBs, and inorganics. The quantities of samples collected during the investigation total 15 and are listed in Table 5-2. The site was retained for further evaluation in the RI/FS because COPCs were identified in surface soil and sediment (Tables 5-5 and 5-6). Site risk was reevaluated during the RI/FS using additional site data. COPCs identified in the RI/FS are listed in Tables 5-5 and 5-6. COPCs in surface soil included Aroclor 1260, benzo(a)pyrene, arsenic, lead, manganese, and zinc. Arsenic, beryllium, cadmium, lead, manganese, nickel, zinc, and bis(2-ethylhexyl)phthalate were identified as sediment COPCs.

SWMU 29, Finger Day Landfill. SWMU 29 is located about ½ mile south of Sweeper Cove and 1,800 feet north of Finger Bay, adjacent to Finger Bay Road (Figure 5-1). It is situated in a low-lying area at the base of a hill. The hill slope forms the east boundary of the site. The areal extent of the landfill is about 6.7 acres; the average surface elevation is about 100 feet above MLLW. A perennial stream is located near the north boundary of the landfill; smaller intermittent streams are located both on and adjacent to the landfill.

The depth of the landfill is about 5 to 10 feet. It was reportedly used for waste disposal between 1972 and 1975. The materials placed in it include, but are not limited to, municipal and industrial refuse and construction debris.

During the 1994 site investigation, groundwater, subsurface soil, and sediment samples were collected on site and downgradient. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. The quantities of samples collected during the investigation totaled 38 and are listed in Table 5-2.

The site was retained for further evaluation in the RI/FS because COPCs were detected in groundwater, subsurface soil, and sediment (Tables 5-5 and 5-6). In addition, during the RI/FS, approximately 17 15-gallon drums were removed from an adjacent creek. Subsequently, sediment samples were collected from the creek and evaluated in the RI/FS.

COPCs in soil and sediment were dominated by cPAHs and Aroclors. Inorganic COPCs were also infrequently observed. Only four COPCs (benzene, dissolved antimony, total beryllium, and manganese) were identified in groundwater samples collected from within the landfill. It should be noted, however, that the subsurface soil and groundwater samples were collected within the landfill debris. Assuming that the landfill cover is not disturbed, contact with the debris is unlikely. Also, since the only groundwater on the site is within the landfill, it is not viable that groundwater from this site would be used as a water supply.

SWMUs 52, 53, 59, Former Loran Station. The former Loran (long-range navigation) Station is located on a northwest-facing promontory along the Bering Sea coastline on the northwest flank of Mount Adagdak (Figure 5-1). The station, which consists of three buildings in varying stages of disrepair, occupies a bench on a promontory about 150 feet above MLLW. In addition to the buildings, there are two debris disposal areas, one along the western slope below the building bench and the other on the northern slope accessed by a higher road. There are no other developments within about a mile radius of the site. The station is about 6½ miles from downtown Adak, and roads to the site have not been maintained for several years.

The site was constructed between 1948 and 1950 to support Naval and Coast Guard navigation, and the station was closed in 1979. It was proposed for investigation under CERCLA because debris, including radio equipment, was left in the buildings after closure and additional debris was disposed of on the western and northern slopes. Debris and unused hazardous material were removed from the site in 1990 and 1991 during the initial site investigations. In addition, two 10,000-gallon JP-5 tanks and one 10,000-gallon gasoline tank were removed from the site.

During site investigations from 1990 to 1995, surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganics. The quantities of samples collected during the investigations totaled 62 and are listed in Table 5-2. A PSE-2 evaluation was conducted using data collected in 1995.

The site was retained for farther evaluation in the RI/FS because COPCs were detected in surface soil (Tables 5-5 and 5-6). These COPCs were predominantly Aroclors and cPAHs. Elevated arsenic also contributed to human health risk. The inorganics copper, lead, silver, and zinc were detected at elevated concentrations in various surface soil locations and were identified as ecological COPCs. SVOCs were occasionally identified as human or ecological COPCs in soil.

SWMU 67, White Alice PCB Spill Site. This site is a former military communications complex located about 2 miles west of downtown Adak (Figure 5-1). It is situated on a flattened hilltop about 595 feet above MLLW. It consists of three building foundations and abandoned concrete pads surrounded by graded gravel. Given the relative elevation and the lack of vegetation and structures, the site does not provide any valuable habitat.

The White Alice complex, constructed in 1956, consisted of large transmitting and receiving dish antennas. The site was dismantled between 1980 and 1982. During demolition, PCB-containing oil was spilled throughout the complex. Thus, the site was selected for investigation and remediation under CERCLA.

During investigations performed from 1990 to 1997, 257 surface soil and 37 subsurface soil samples were collected and analyzed for PCBs and other chemical classes. Several COPCs were identified in soil and sediment but PCBs dominated in both prevalence and risk. Based on the results of the investigations and the estimated risk associated with PCB, a multilayered cap was placed on this site as a removal action. An evaluation presented in the RI/FS considered postcapping conditions and residual PCB concentrations beyond the cap (URSG 1997c). The site and extent of the cap are illustrated in Figure 5-3. Based on the findings of the postremoval evaluation presented in the Adak RI/FS, the site is considered adequately remediated because the removal action reduced the potential for a release of Aroclors and was protective of human and ecological receptors. These findings are presented in Section 6.

5.1.3 Characteristics of Downgradient Water Bodies

In addition to the individual sites discussed in Section 5.1.2, four downgradient water bodies were investigated under CERCLA and recommended for further evaluation for remedial action:

- Sweeper Cove
- South Sweeper Creek
- Kuluk Bay
- Downtown Groundwater

These water bodies were evaluated as individual sites because each is believed to constitute a downgradient endpoint for multiple and/or nonpoint sources. Because they are source endpoints and because of the mobile nature of the water bodies, it is believed that each would be better evaluated as one cohesive unit rather than as a smaller subunit of individual source areas. The scope of the site characterizations and the physical and chemical characteristics are presented in the following subsections.

Sweeper Cove

Sweeper Cove (Figure 5-4), the central water body of downtown Adak, includes most of the waterfront and all the water transportation facilities—the dock, the fuel pier, and the small boat harbor. The port facilities have been in operation since World War II. In addition, Sweeper Cove is hydraulically downgradient of most of downtown via drainage from South Sweeper Creek and groundwater seepage.

Several CERCLA- and SAERA-investigated source areas upgradient of Sweeper Cove were found to have COPCs in various environmental media. Therefore, Sweeper Cove was selected to be investigated as a downgradient water body. During the 1996 RI/FS field investigation a total of 37 sediment, water, and tissue samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganics. Sample quantities are listed in Table 5-2.

Sampling locations are shown in Figure 5-4. Based on the results of this sampling effort, human health COPCs were identified in surface water and animal tissue (Table 5-10). The COPCs were predominantly identified in rock sole and mussel tissue; Aroclor 1260 was the predominant COPC.

A summary of ecological risk can be found in Section 6.

South Sweeper Creek

South Sweeper Creek is the principal drainage feature for downtown Adak, collecting most of the area's surface runoff and groundwater seepage. In addition, water collected in the runway canals (diversionary structures that provide drainage and dewatering for the airport) is discharged to lower South Sweeper Creek via a pair of pumps. Therefore, South Sweeper Creek was evaluated in the RI/FS as a downgradient water body.

Samples were collected from South Sweeper Creek under three separate CERCLA investigations: the PSE-2 Batch 2 investigation of SWMU 16 (URS 1996a), the RI/FS (URSG 1997c), and a supplemental risk evaluation of lower South Sweeper Creek (URSG 1998b). A total of 71 sediment samples were collected from 52 locations, 10 Dolly Varden tissue samples were collected, and 14 surface water samples were collected (Table 5-2). All samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and inorganics. Sampling locations are shown on Figure 5-5. From the RI/FS (URSG 1997c) and the supplemental risk evaluation (URSG 1998b), human health COPCs were identified in sediment, surface water, and fish tissue (Table 5-10).

Aroclor 1260 is the most prevalent COPC in sediments and fish tissue. Carcinogenic polycyclic aromatic hydrocarbons—benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indent(1,2,3-cd)pyrene—were detected in 24 percent or fewer of the sediment sampling locations during the supplemental risk evaluation. The maximum concentration for any cPAH in the most recent sampling round was 0.93 mg/kg. Figures 5-6 and 5-7 display the areal extent of Aroclor 1260 and cPAHs, respectively, in South Sweeper Creek sediments. As shown in these two figures, although Aroclor 1260 and cPAHs were occasionally detected at low concentrations in samples taken from the confluence of Yakutat Creek to the lower portion of South Sweeper Creek, the majority of concentrations at levels of concern are from a relatively small area just above the mouth of South Sweeper Creek. Pentachlorophenol was identified at only 1 of the 54 sample locations.

A summary of ecological risk can be found in Section 6.

Kuluk Bay

Kuluk Bay is located east of downtown. It is a large, dynamic marine water body that is open to the Bering Sea (Figure 5-8). Sweeper Cove opens into Kuluk Bay, and the eastern component of downtown groundwater and surface water drains to the bay.

In 1997 a risk assessment was prepared for Kuluk Bay to quantitatively evaluate the potential human and ecological risks from contaminants in marine sediment, surface water, and biota. This risk assessment was also used to evaluate the suitability of the interim remedial actions performed at SWMUs 11 and 13, described earlier in this section. Sample analytical results collected at these two SWMUs were used in the risk assessment. Locations of samples collected and used in this risk assessment are shown in Figure 5-8. COPCs were detected in marine sediments, marine water, rock sole tissue, and blue mussel tissue (Table 5-2). The COPCs for Kuluk Bay are listed in Table 5-10. Results of the risk assessment are discussed in Section 6.

Only two human health COPCs, beryllium and lead, were identified in sediment. Antimony and cadmium were identified as COPCs in surface water. Aroclor, heptachlor, lead, selenium, vanadium, and zinc were identified as COPCs in fish tissue. Four organics (Aroclor 1254, dieldrin, benzoic acid, and 4-methylphenol) and six inorganics (arsenic, beryllium, cadmium, copper, lead, and selenium) were identified as COPCs in blue mussels.

The ecological COPCs shown in Table 5-10 were selected based on conservative criteria and were used as the initial starting point for the ecological risk assessment. A summary of ecological risk can be found in Section 6.

Downtown Groundwater

“Downtown groundwater” is defined really as the relatively high-permeability, high-yield groundwater unit in the general vicinity of downtown Adak. Groundwater in this area is considered the only groundwater resource within OU A that has sufficient yield to be potentially viable as a drinking water source. In the areas outside of downtown, the subsurface conditions are dominated by low-hydraulic-conductivity volcanic soil and rock, with little to no groundwater yield.

Groundwater has not been used as a potable source on Adak. Surface water has historically been used to supply drinking water to the Adak population. Because of the existing high-quality surface water supply system, there is no planned future use of groundwater. In 1943 when the military created the downtown area, they filled in an extensive saltwater marsh and lagoon with beach and dune sand. This area of fill and native materials forms the groundwater-bearing unit for downtown Adak. Saltwater intrusion exists near the shoreline and along South Sweeper Creek.

Based on 17 of the 18 criteria in 18 AAC 75.350, groundwater on Adak is unlikely to be considered a drinking water source in the future. However, the yield of the groundwater-bearing unit is sufficient for potential limited domestic use of groundwater. Therefore, under 18 AAC 75.350(2)(A), the groundwater in the downtown area cannot be ruled out as a potential future source of drinking water.

Although downtown groundwater was evaluated in the risk estimates for a number of individual sites, it constitutes a single downgradient water body in terms of remedial alternatives. Physically, chemically, and hydraulically, it constitutes a single, continuous, chemically affected matrix. Like other downgradient water bodies considered on Adak, it is affected by multiple sources and/or nonpoint sources. In many cases, the influences of these sources overlap, and a chemical effect observed in the groundwater may not be individually attributable to single sites. Figure 5-9 shows the extent of the downtown groundwater area. Former and existing monitoring wells located in the downtown area are also displayed, with associated data.

Currently the Navy is operating petroleum free-product recovery systems in the downtown area. Hundreds of source removals to remove tanks and chemically affected soil from petroleum and CERCLA sites were conducted in the downtown area to eliminate potential releases to groundwater.

In this section, the nature and extent of elevated chemical concentrations are evaluated in terms of federal MCLs. Concentrations of DRO and GRO in groundwater are compared to State of Alaska 18 AAC 75 criteria for *groundwater not considered a drinking water source*. Therefore, 10 times the concentrations in Table C of Alaska 18 AAC 75 were used for comparison. (Table C is included as Table 7-5 in this ROD.) The most recent chemical results for each analyte from each monitoring well in the downtown area were compared to MCLs. Exceedances are presented in Table 5-11. Based on this screening, it is observed that most exceedances occurred with organic compounds, particularly benzene, toluene, ethylbenzene, and xylenes (BTEX) and tetrachloroethene. Some exceedances of DRO and GRO were also noted. Figure 5-10 illustrates the locations of organic compound exceedances.

Although several exceedances of total inorganics were observed, exceedances of dissolved inorganics were noted at only three locations (one of which was a natural background sampling location). Therefore, it is believed that the total inorganic concentrations are affected by high turbidity. The following subsections discuss the exceedances by analytical method class.

Volatile Organic Compounds. Based on screening results (Table 5-11), only seven VOCs were detected at concentrations exceeding MCLs. Of these, cis-1,2-dichloroethene exceeded its MCL at only two locations. Methylene chloride was detected in four locations at concentrations exceeding its MCL at relatively low concentrations (6 to 18 µg/L), compared to its MCL of 5 µg/L. In addition, methylene chloride is a common laboratory contaminant, so it may have been an artifact of analysis.

Benzene, ethylbenzene, and toluene were detected frequently at concentrations that exceeded MCLs. Figures 5-11 through 5-13 illustrate detected concentration distributions of these chemicals in the downtown area. As these figures show, benzene exceedances are relatively widespread. However, the figures also indicate that most exceedances are within or adjacent to petroleum free-product areas. Only six scattered exceedances are noted outside free-product areas. Specifically, three of these exceedances are in the areas of Tank Farms A and B. The other three are scattered widely in the general downtown area.

Exceedances of ethylbenzene and toluene were noted only occasionally in the downtown groundwater (Figures 5-12 and 5-13). Ethylbenzene was measured at six locations at concentrations ranging from 720 to 1,900 µg/L, exceeding its MCL of 700 µg/L. Toluene was measured at four locations at concentrations ranging from 1,100 to 4,400 µg/L, compared to its MCL of 1,000 µg/L. Like benzene, these exceedances were typically at or adjacent to petroleum free-product areas.

Tetrachloroethene exceeded its MCL at five locations (Figure 5-14). These exceedances are all located in the warehouse area of downtown, in the vicinity of SWMUs 14, 15, and 55, with the exception of one exceedance downgradient of Power Plant 3 (SWMU 17). Each exceedance was an isolated location and no exceedances were observed in adjacent wells. Therefore, it was concluded that these exceedances were sporadic and do not represent a continuous plume.

Trichloroethene exceeded its MCL at three locations: two locations in the vicinity of the NMCB Building and one location at SWMU 15. The measured concentrations ranged from 12 to 39 µg/L, compared to the trichloroethene MCL of 5 µg/L.

Petroleum Hydrocarbons. Exceedances of the Alaska DEC groundwater screening criteria for DRO and GRO (where groundwater is not a drinking water source) are listed in Table 5-11 and are illustrated on Figures 5-15 and 5-16. Both DRO and GRO exceeded criteria only occasionally in groundwater. DRO exceeded screening criteria at 11 locations; GRO exceeded screening criteria at 7 locations. As illustrated on the figures, most exceedances were either within or adjacent to a free-product area.

Semivolatile Organic Compounds. Six SVOC exceedances were noted in the downtown area (Figure 5-17), and as was noted for other organic compounds, virtually all exceedances were located in the vicinity of free-product areas or at SWMUs 14 or 55, in the warehouse area of downtown.

Inorganics. Although total inorganic exceedances were noted at 17 locations (2 of which were background wells), only 3 dissolved inorganic exceedances were noted. Therefore, it is believed that the total inorganic results may have been affected by elevated turbidity in the samples. It should also be noted that no exceedances have been measured since 1995 (in most cases, since 1993).

Total lead was measured at elevated levels in 15 wells; however, dissolved lead was measured at elevated concentrations at only 1 location (Table 5-11). Lead has a low solubility under ambient conditions. The only other dissolved inorganic measured at a concentration exceeding its MCL was antimony, and one of the two exceedances was at a background station.

Summary of Groundwater Characterization. Based on groundwater screening comparisons, most exceedances were observed with VOCs, particularly benzene. The majority of exceedances were in the vicinity of free-product plumes. Among those not in an area of free product, the majority were in the downtown warehouse area, near SWMUs 14, 15, and 55. Therefore, in terms of downtown groundwater, independent of free-product remediation issues, the only significant area of MCL or 18 AAC 75 exceedances appear to be the downtown warehouse area.

5.2 PETROLEUM SITES

Cleanup actions consisting of the removal of tanks, pipes, and/or petroleum-affected soil were undertaken for all petroleum sites in this ROD. Of the 128 petroleum sites evaluated in the petroleum FFS, 6 were categorized for no further action by SAERA. Five additional sites met 18 AAC 75 Method One Level A criteria (ADEC 1997a) and were considered clean. The remaining 117 sites were screened against Alaska DEC supplemental criteria (ADEC 1997b) and final 18 AAC 75 criteria (ADEC 1999). Site-specific risk assessments consistent with 18 AAC 75 Method Four indicate that 56 sites pose no unacceptable risk (cumulative risk less than 1×10^{-5}); therefore, they require no further action. Fifteen additional sites have been determined to require no further action by agreement of the Alaska DEC (see Section 4.2 for explanation). The remaining 46 sites require further action and are listed in Table 5-12. Figure 5-18 shows the location of each of the 46 sites. Detailed descriptions of all the petroleum sites are contained in the final focused feasibility study document (URSG 1998a).

Figures 5-19 and 5-20 describe the petroleum concentrations as a function of the reasonable maximum concentration at each site. The reasonable maximum concentration represented by a site as a whole is called the reasonable maximum exposure (RME) concentration. It is equal to the 95 percent upper confidence limit on the mean (95% UCL) or to the maximum, whichever is less. These RME concentrations are used to characterize the individual site DRO and GRO concentrations because 18 AAC 75 regulations indicate that this value should be used to evaluate each site by comparing the RME to screening concentrations.

Figure 5-19 shows DRO concentrations in soil. Concentrations are displayed in ranges based on 18 AAC 75 Method Two cleanup levels. DRO was detected in surface and/or subsurface soil at 44 of the further action sites. RME concentrations at two of the sites fall below the cleanup level for protection of groundwater. An additional 27 sites have RME concentrations below the cleanup level based on incidental ingestion. All but 7 of the 44 sites have RME concentrations below the cleanup level based on inhalation.

Figure 5-20 shows GRO concentrations in soil. Like the DRO in Figure 5-19, GRO concentrations are displayed in ranges based on 18 AAC 75 cleanup levels. GRO was detected in soil at 37 of the petroleum further action sites. RME concentrations at 26 of these sites are below the Method Two cleanup level for protection of groundwater. All but three of the RME concentrations are below the cleanup level based on ingestion or inhalation.

5.3 STATE-PERMITTED LANDFILLS

Two landfills were operated on Adak under State of Alaska solid waste regulations (18 AAC 60):

- SWMU 25, Roberts Landfill
- SWMUs 18 and 19, White Alice Landfill

The closure plans for Roberts and White Alice Landfills satisfy the requirements of the presumptive remedy for municipal and military landfills (U.S. EPA 1993, 1996a). Both landfills are included in this OU A ROD as final documentation.

5.3.1 SWMU 25, Roberts Landfill

Roberts Landfill is the last permitted landfill to be operated on Adak. It is located on a hilltop west of downtown (Figure 5-1). The landfill has operated since the 1980s and is being closed according to Alaska solid waste regulations. Closure activities, which began in April 1997, include placing a low-permeability soil cover over the landfill, grading and contouring, implementing access restrictions, installing surface water/erosion controls, placing a vegetative cover, securing adjacent bunkers filled with asbestos materials, maintaining the cover, periodic monitoring, and institutional controls for land use.

Historical sampling at Roberts Landfill has consisted of four quarterly rounds and two annual rounds of sampling at four monitoring wells and five surface water seeps. Sampling was initiated in 1996 and is ongoing. Analytical results from these sampling rounds were compared to Alaska water quality standards (18 AAC 70). The monitoring results, summarized in Table 5-13, show periodic exceedances of chromium, copper, and lead. Monitoring of groundwater and seeps will continue during operations and as part of postclosure permit requirements to evaluate the effectiveness of closure activities and the need for additional postclosure actions.

In 1997 a white precipitate substance was sampled at an outfall drain downgradient of the landfill to evaluate whether the substance was due to a potentially toxic leachate. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, inorganics, and sulfur. Results of these analyses indicated that detected inorganic and organic concentrations were below levels of concern. Therefore, no further action was required.

5.3.2 SWMUs 18 and 19, White Alice Landfill

White Alice Landfill is located in an abandoned quarry about 2 miles west of downtown (Figure 5-1). The site lies on a relatively flat area, 440 feet above MLLW. Surface water runoff from the site drains toward Trout Creek, about 750 feet to the west.

The landfill site encompasses 9.2 acres. The actual landfill portion encompasses about 1.6 acres; however, the areal extent of refuse is believed to be about 2.5 acres because some soil excavated for the landfill pit contained debris. The landfill contained predominantly wood debris in one half and asbestos in the other. It was closed and covered per State of Alaska regulations in 1997. Closure entailed placement of a soil cover over the landfill, grading and contouring, surface water/erosion controls, access restrictions, and installation of a vegetative cover per Alaska solid waste landfill closure requirements.

Historical sampling at White Alice Landfill has involved periodic groundwater and surface water sampling conducted since 1996. Six rounds of samples were collected from two groundwater and three surface water locations. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and total inorganics. Analytical results were compared to Alaska water quality standards (18 AAC 70). Based on this comparison, no exceedances have been observed during the periodic sampling. Therefore, no unacceptable risk to humans or the environment associated with this landfill has been identified. A summary of monitoring results is provided in Table 5-14.

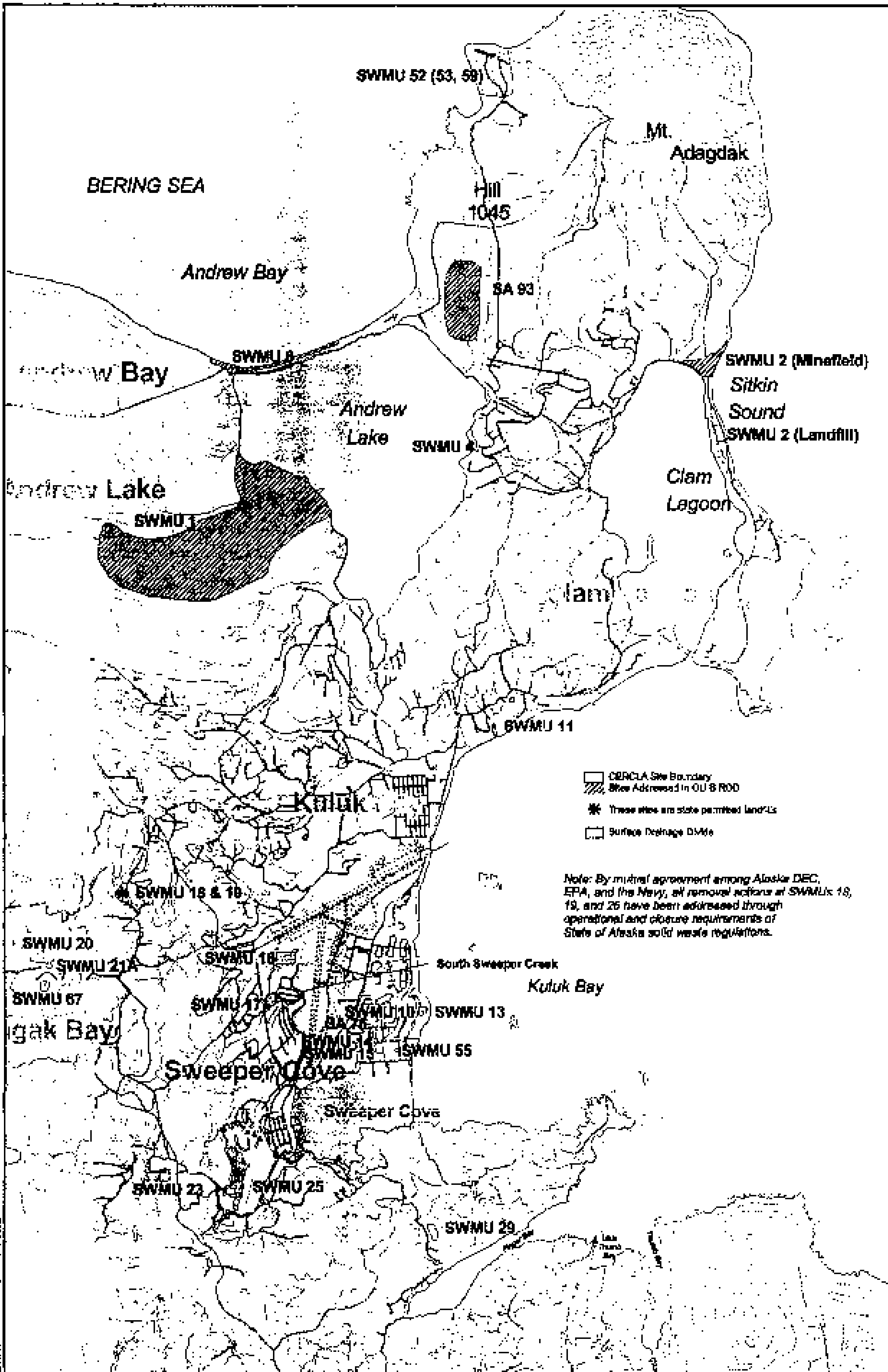


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Figure 5-1
CERCLA Sites Retained for Further Action

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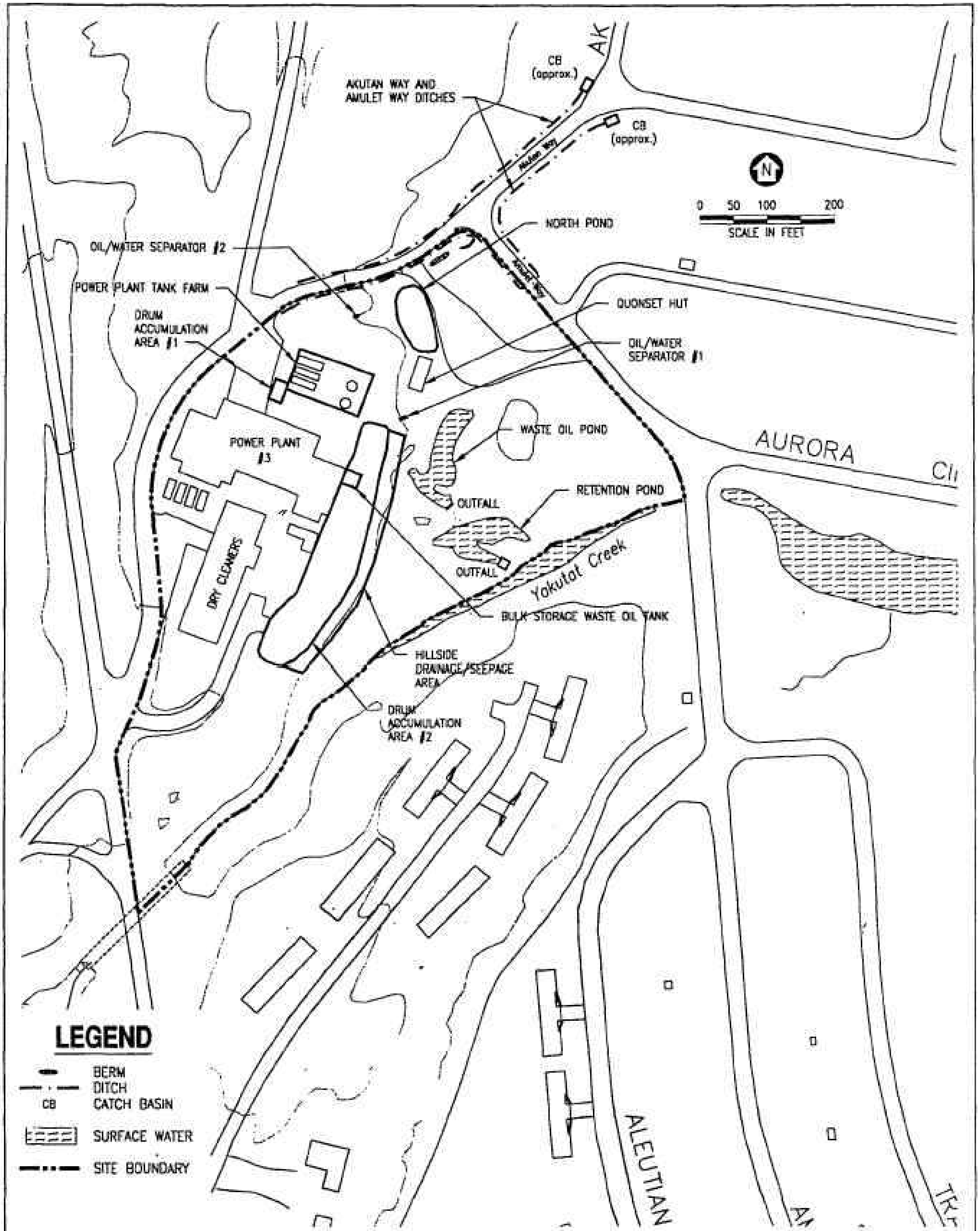
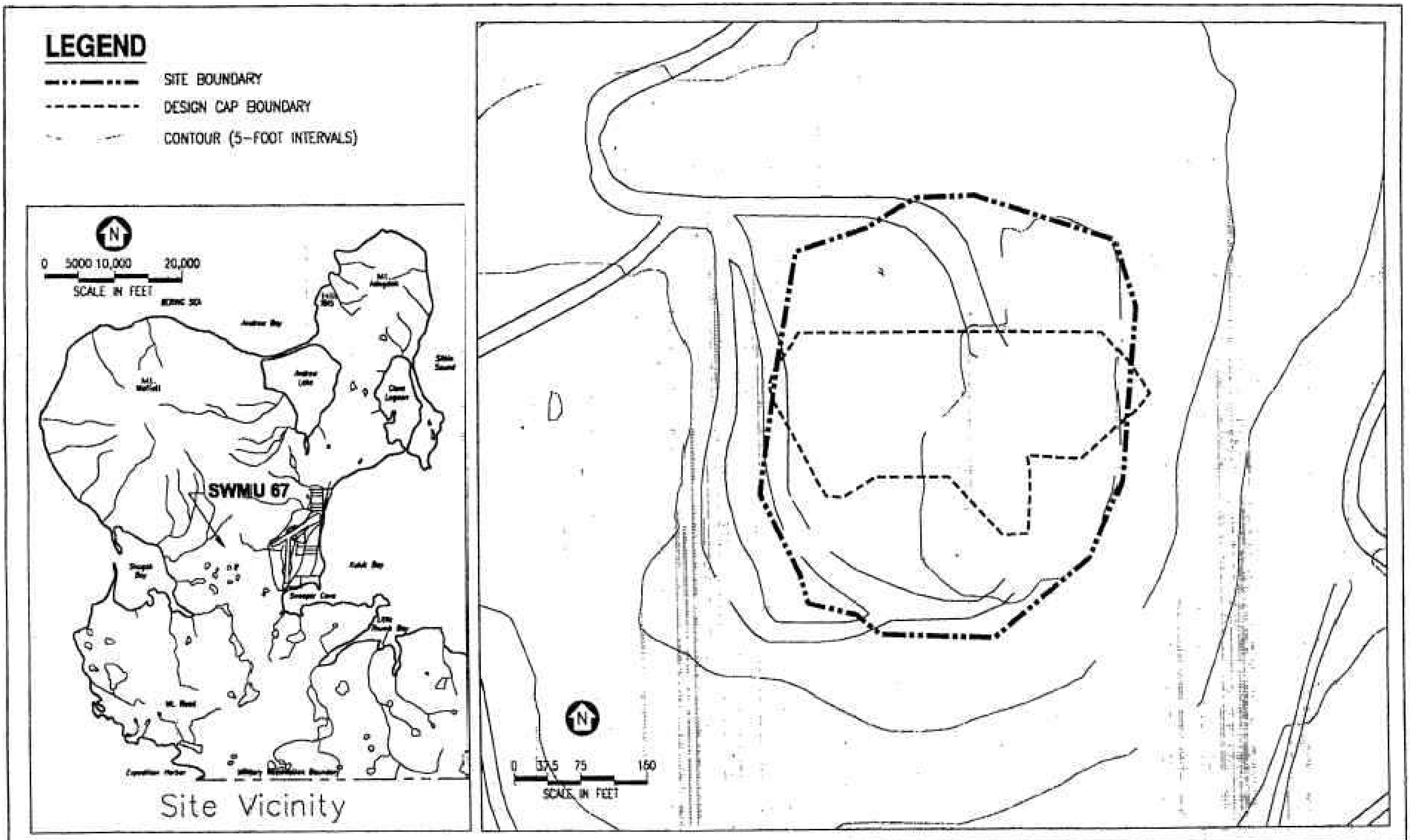


CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	SCALE: AS NOTED	**Figure 5-2** **Site Map** **SWMU 17**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	SCALE: AS NOTED	**Figure 5-3 Site Location Map and Extent of Cap SWMU 67**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

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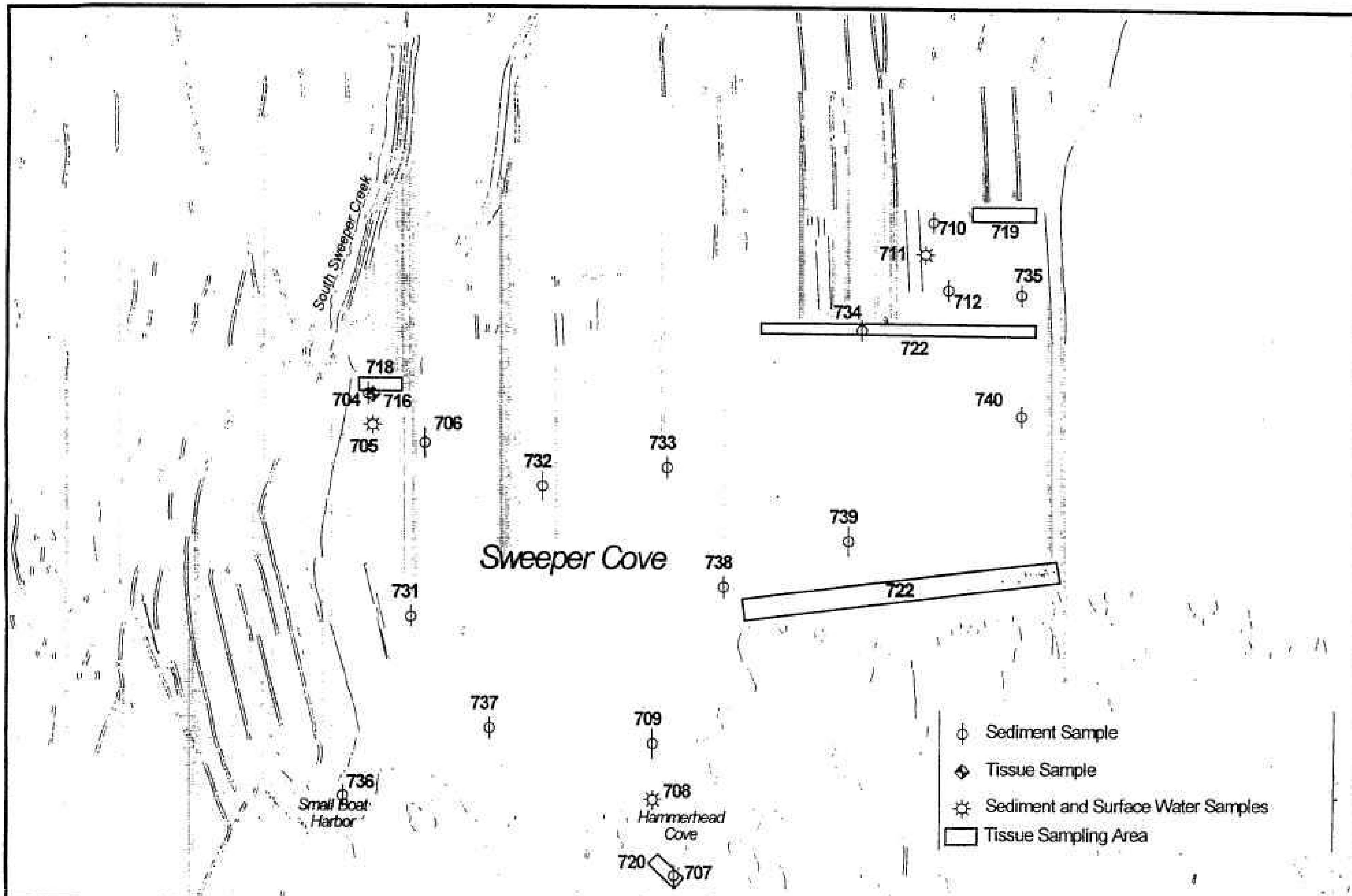

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Figure 5-4
Sweeper Cove Sampling Locations

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Adak Island, AK

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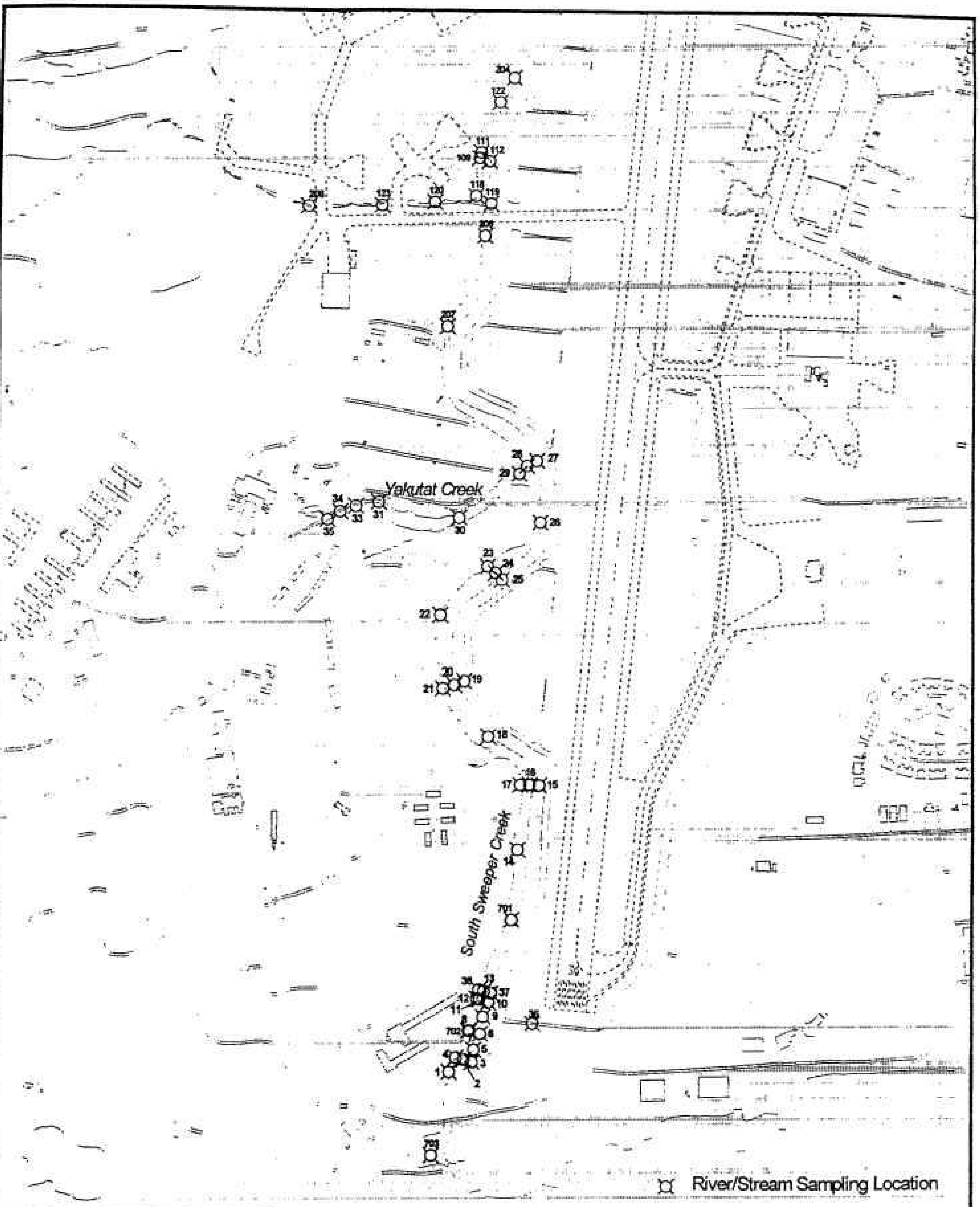

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Figure 5-5
South Sweeper Creek Sampling Locations

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OU A
Adak Island, AK

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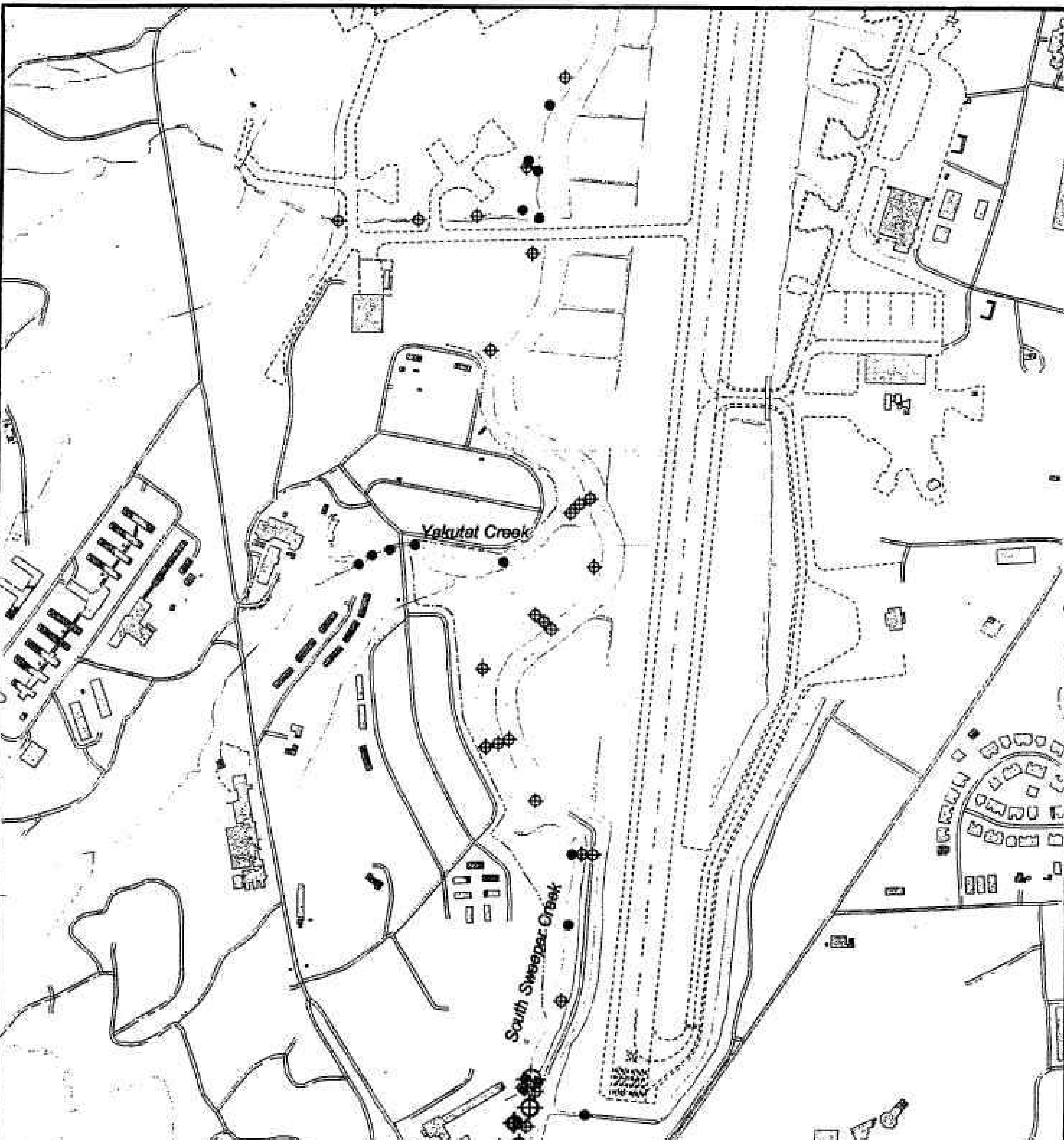

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Figure 5-6
Aroclor 1260 in Sediments
South Sweeper Creek

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OU A
Adak Island, AK

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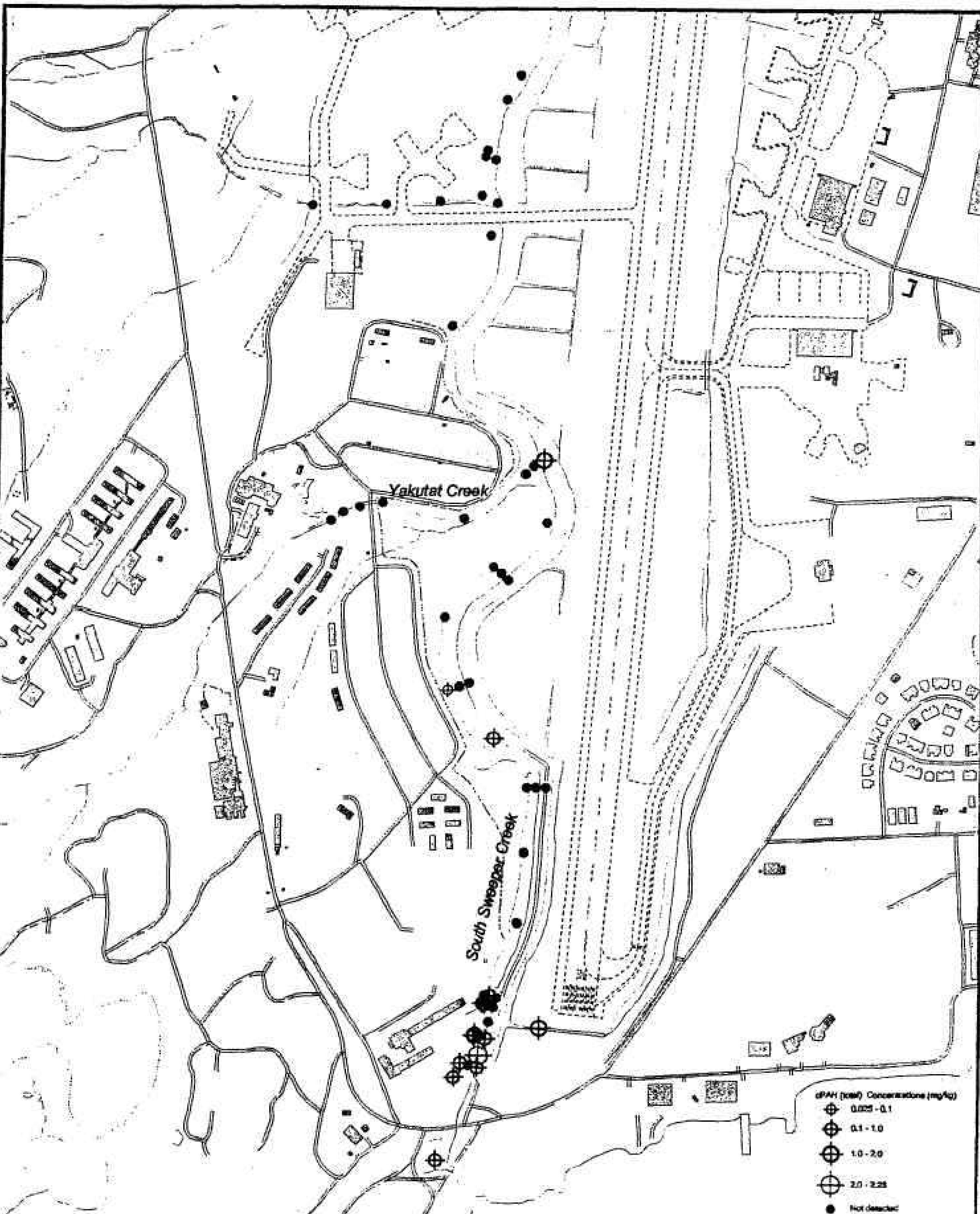

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

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Figure 5-7
cPAHs in Sediments
South Sweeper Creek

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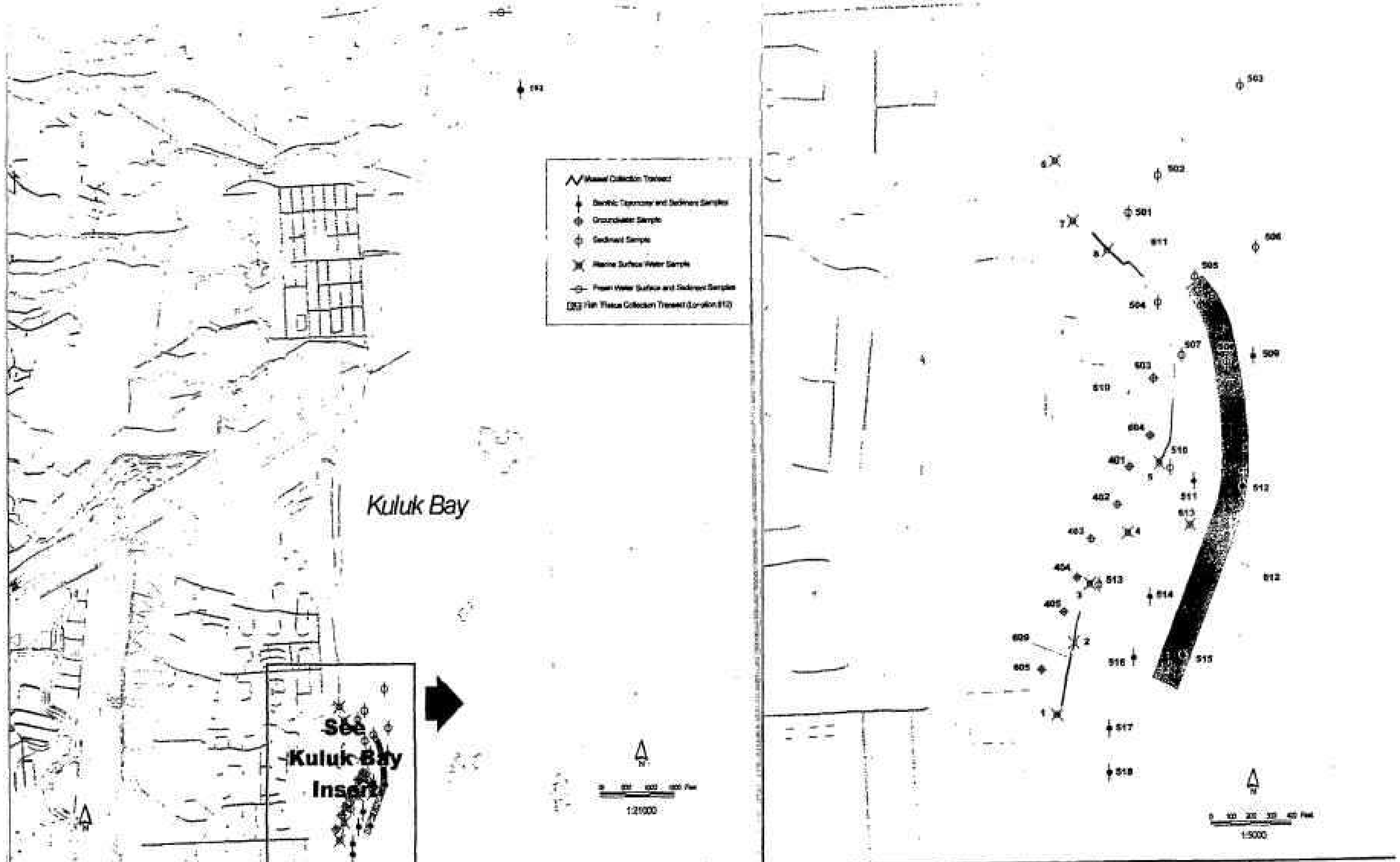
Adak Island, AK



CLEAN	Scale as Shown	Figure 5-8 Kuluk Bay Sampling Locations	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

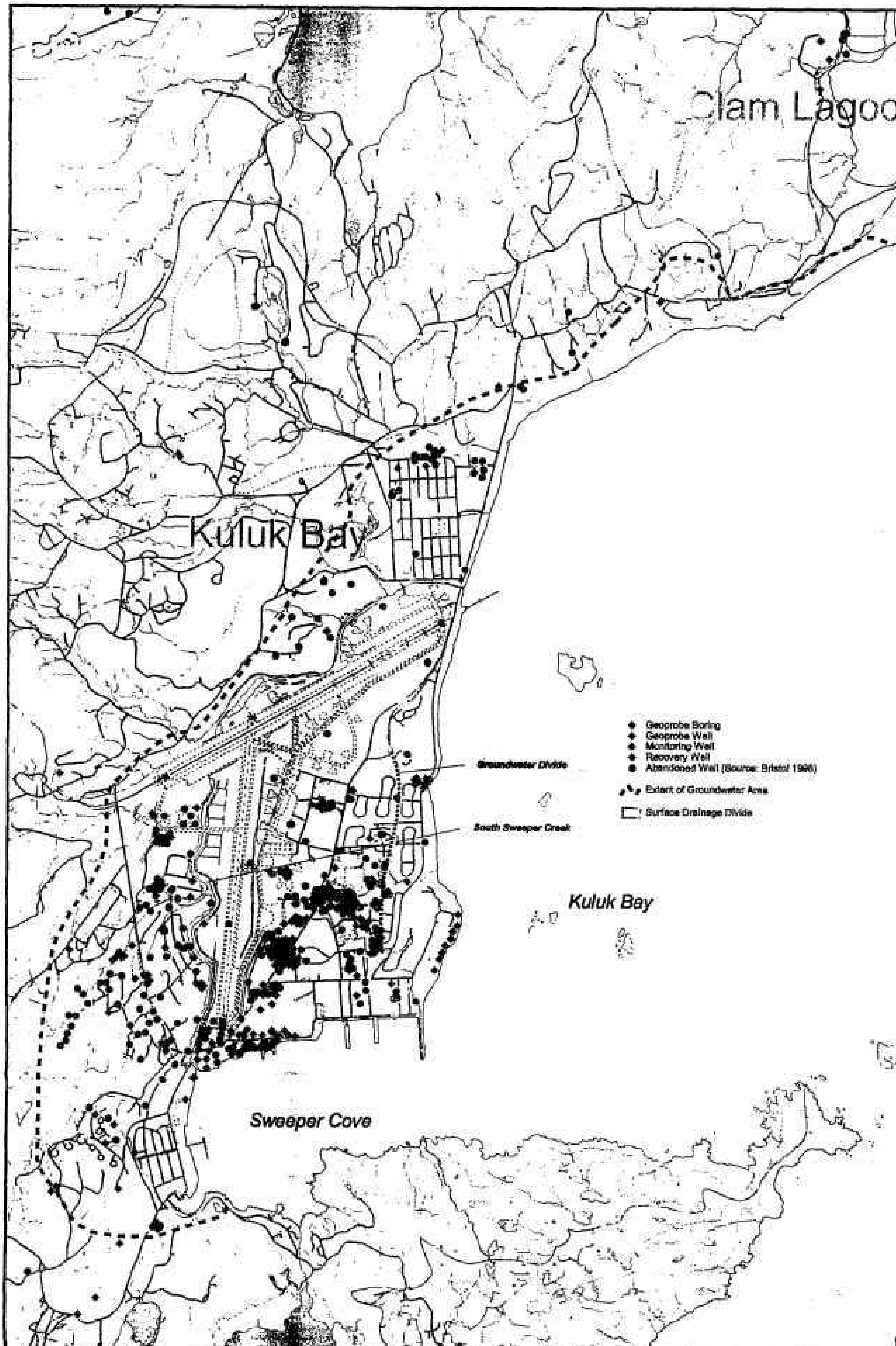


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Figure 5-9
Extent of the Downtown Groundwater Area and Downtown Monitoring Well Locations

CTO 214
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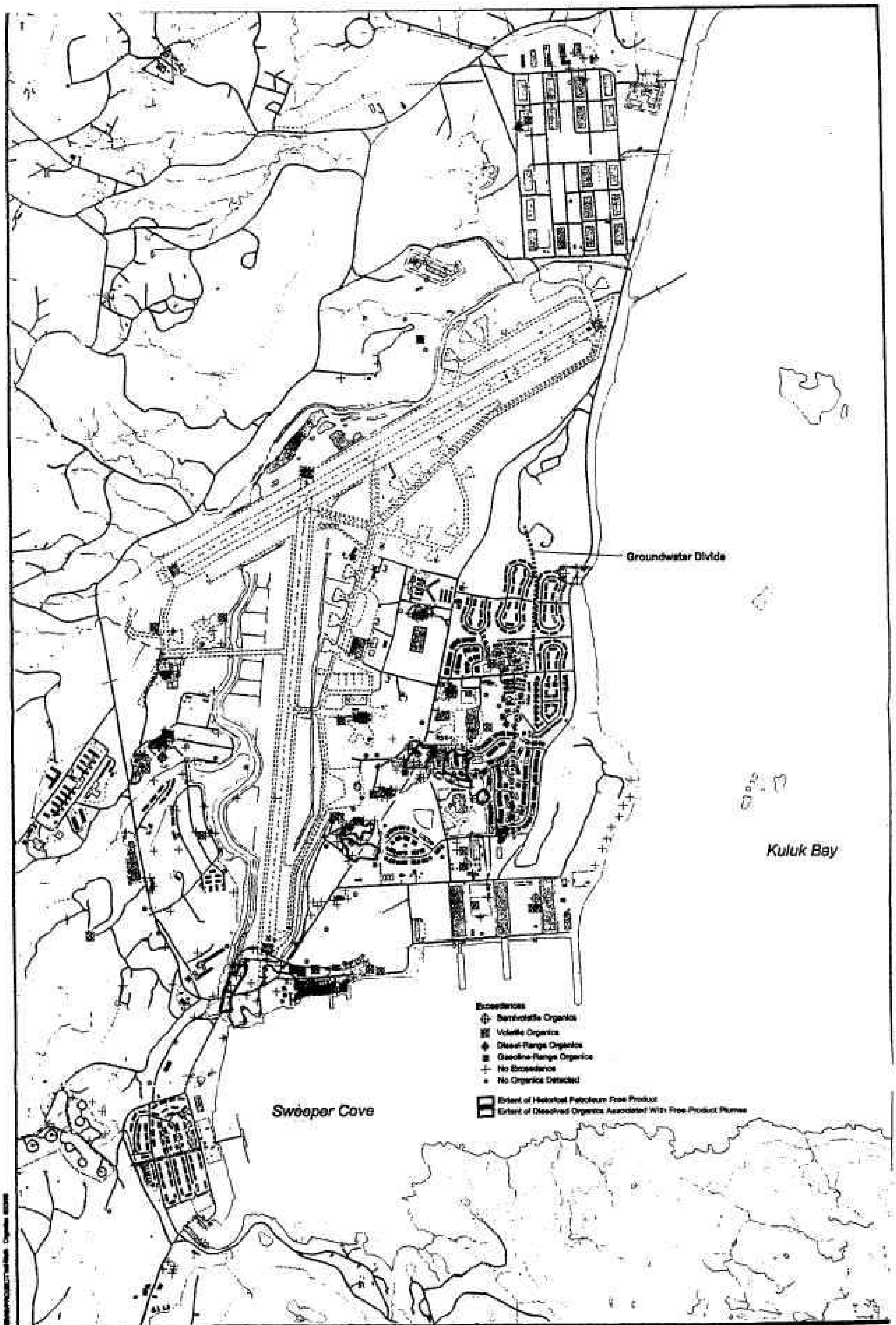

Figure 5-10
Organics Concentrations in Groundwater Exceeding Federal MCLs and State Criteria

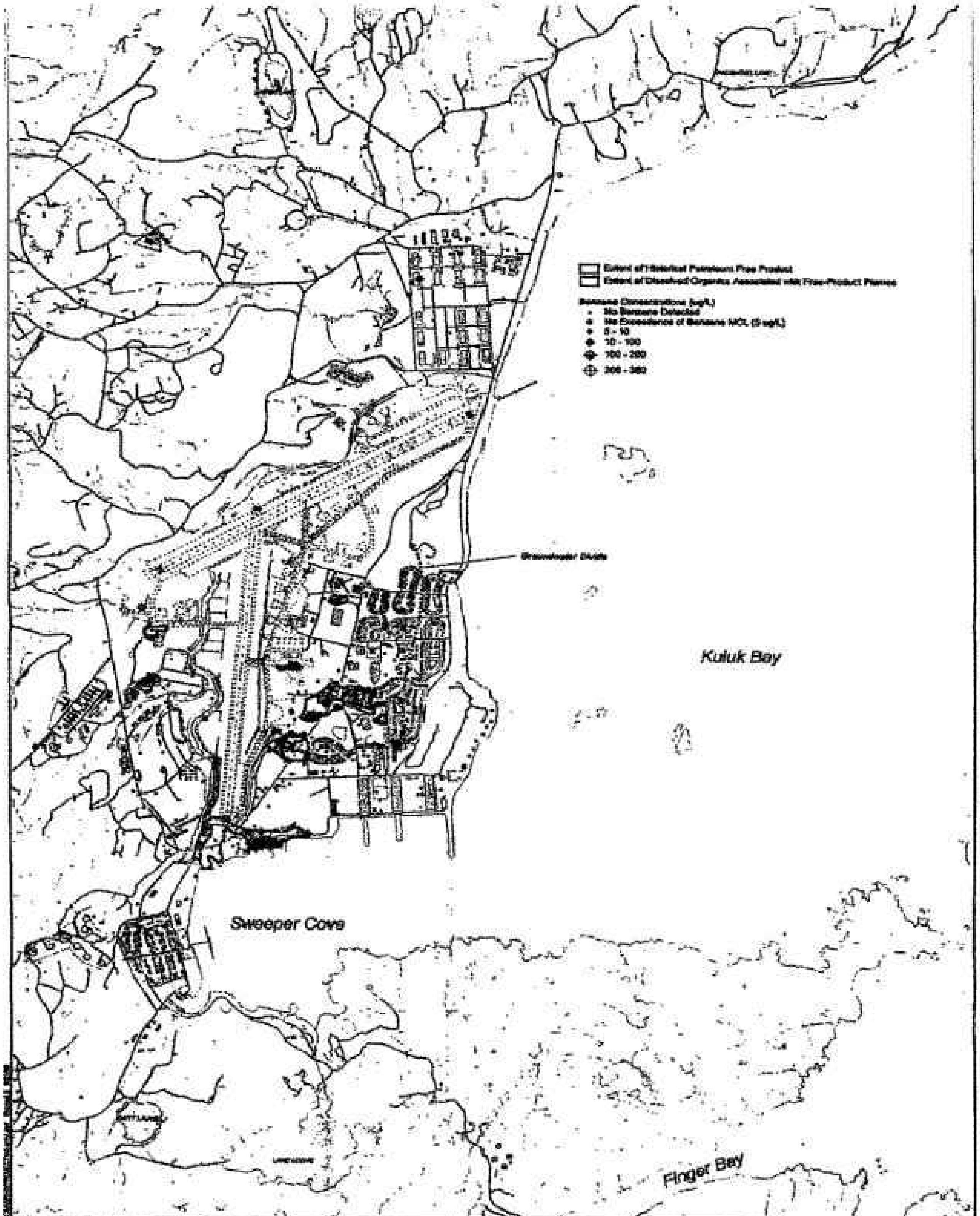

Figure 5-11
Benzene Concentrations in Groundwater Exceeding Federal MCL

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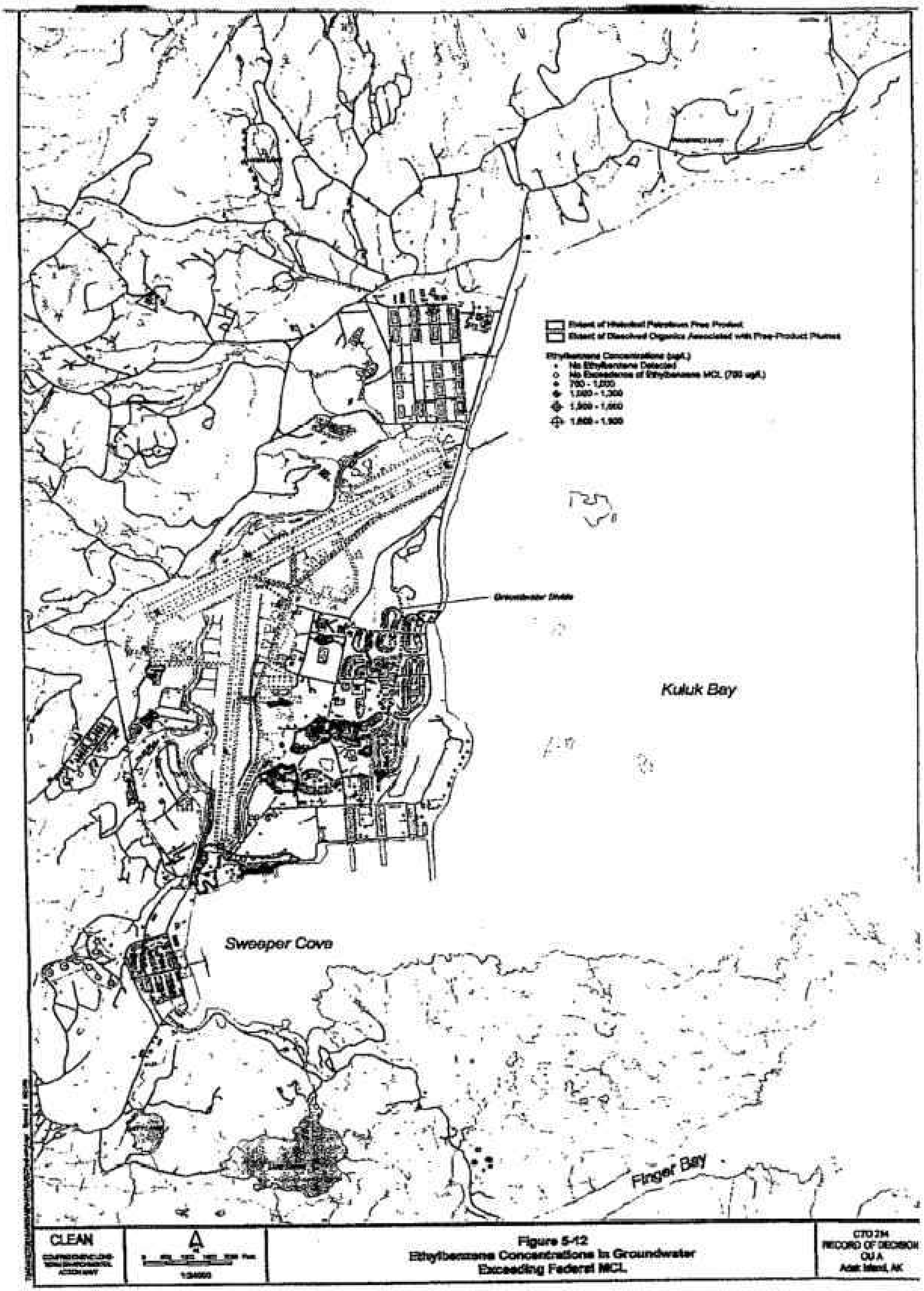

Figure 5-12
Ethylbenzene Concentrations in Groundwater Exceeding Federal MCL

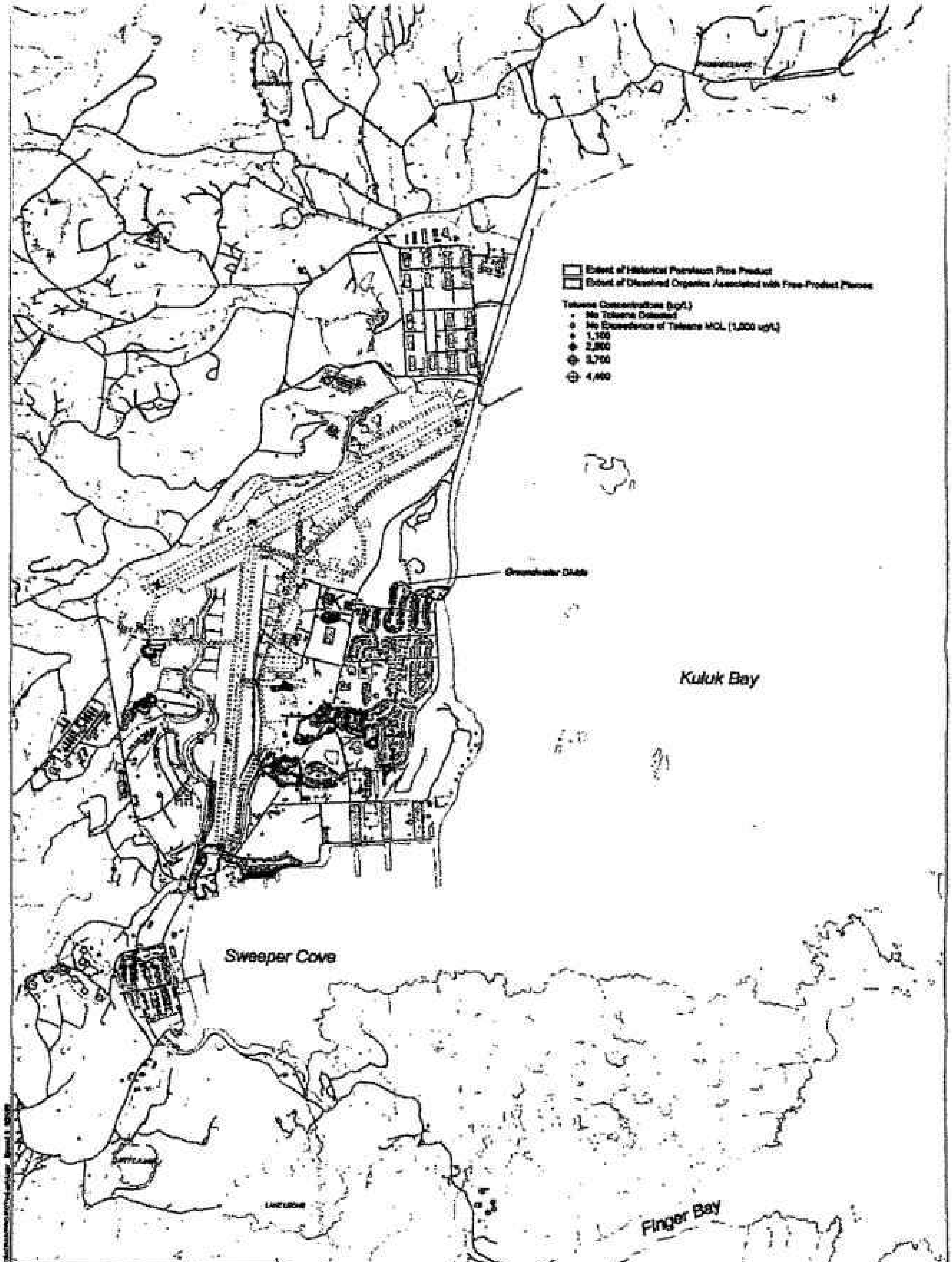

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Figure 5-13
Toluene Concentrations in Groundwater Exceeding Federal MCL

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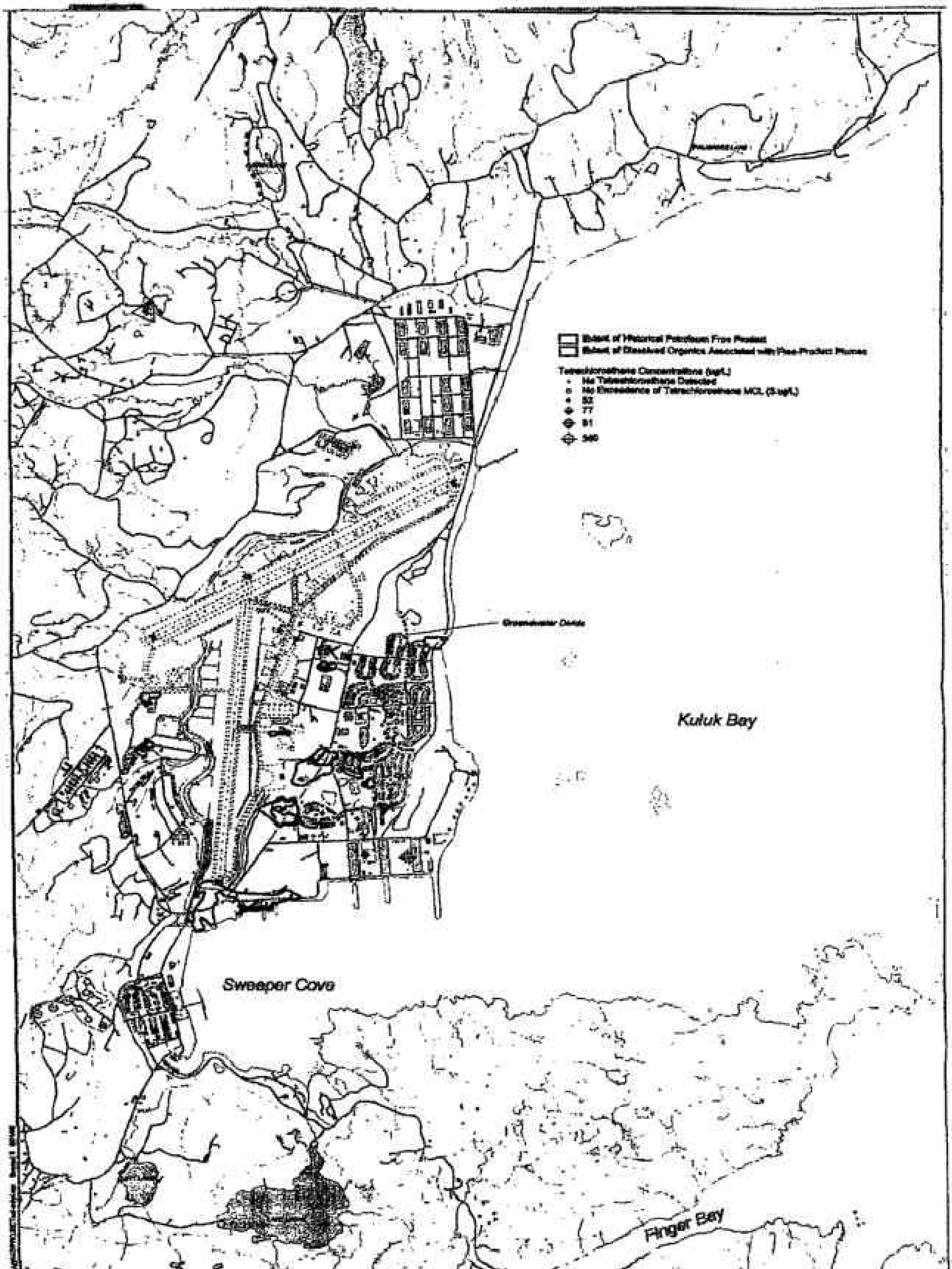
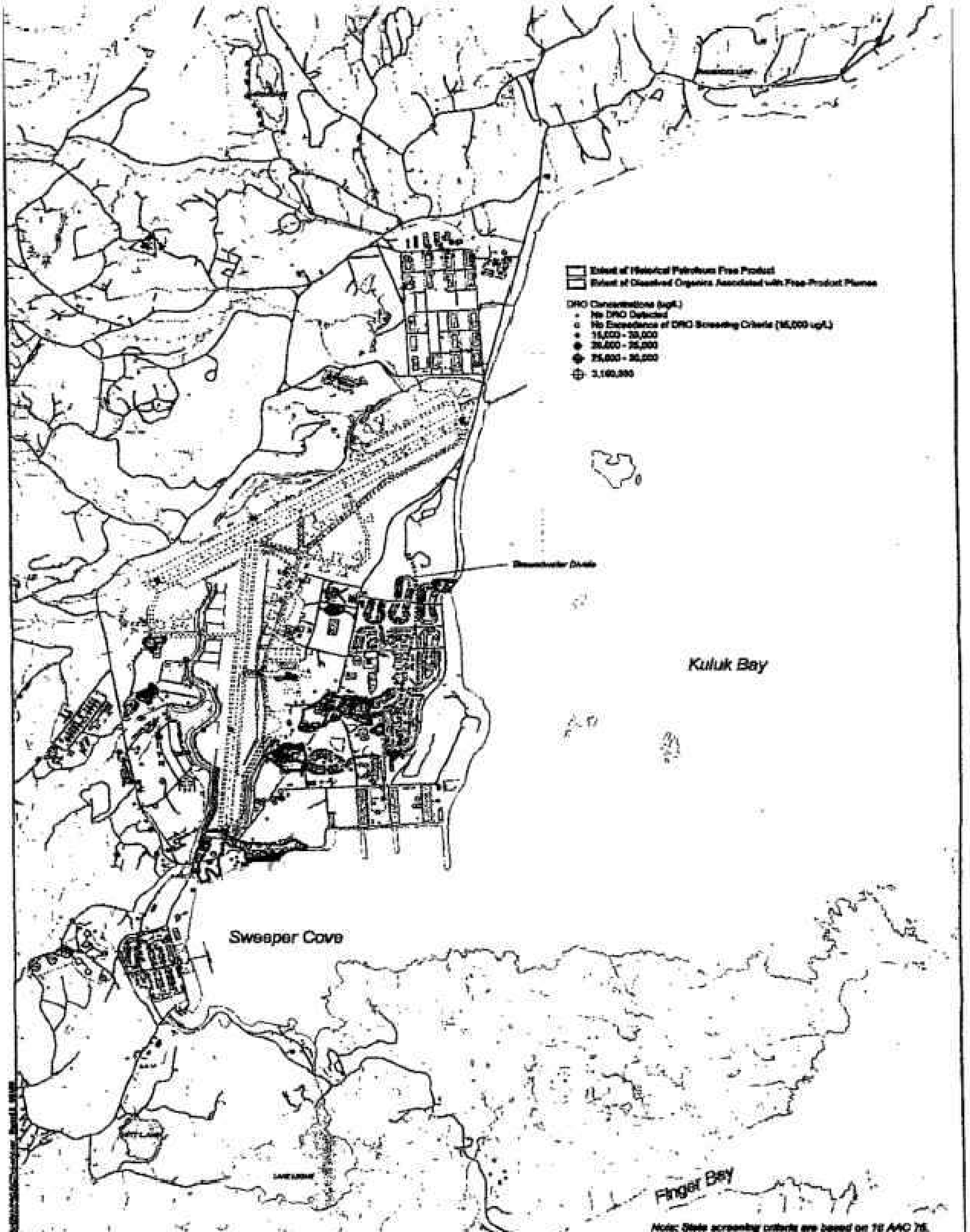
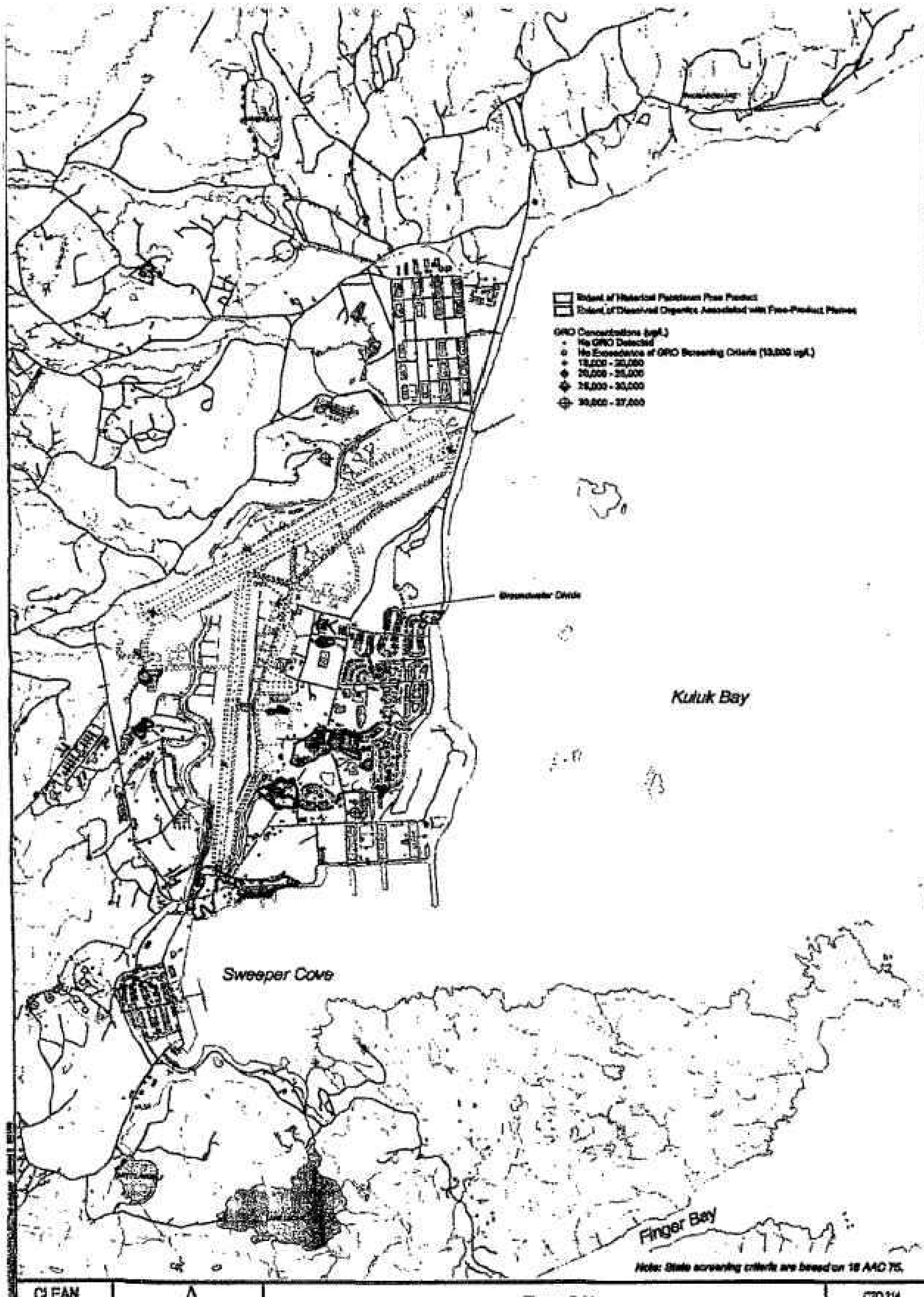
Adak Island, AK



CLEAN	1:24000	**Figure 5-14** **Tetrachloroethene Concentrations in Groundwater Exceeding Federal MCL**	CTO 214 RECORD OF DECISION OU A Adak Island, AK



CLEAN	1:24000	**Figure 5-15** **DRO Concentrations in Groundwater Exceeding State Screening Criteria**	CTO 214 RECORD OF DECISION OU A Adak Island, AK



CLEAN	1:24000	Figure 5-16 GRO Concentrations in Groundwater Exceeding State Screening Criteria	CTO 214 RECORD OF DECISION OU A Adak Island, AK

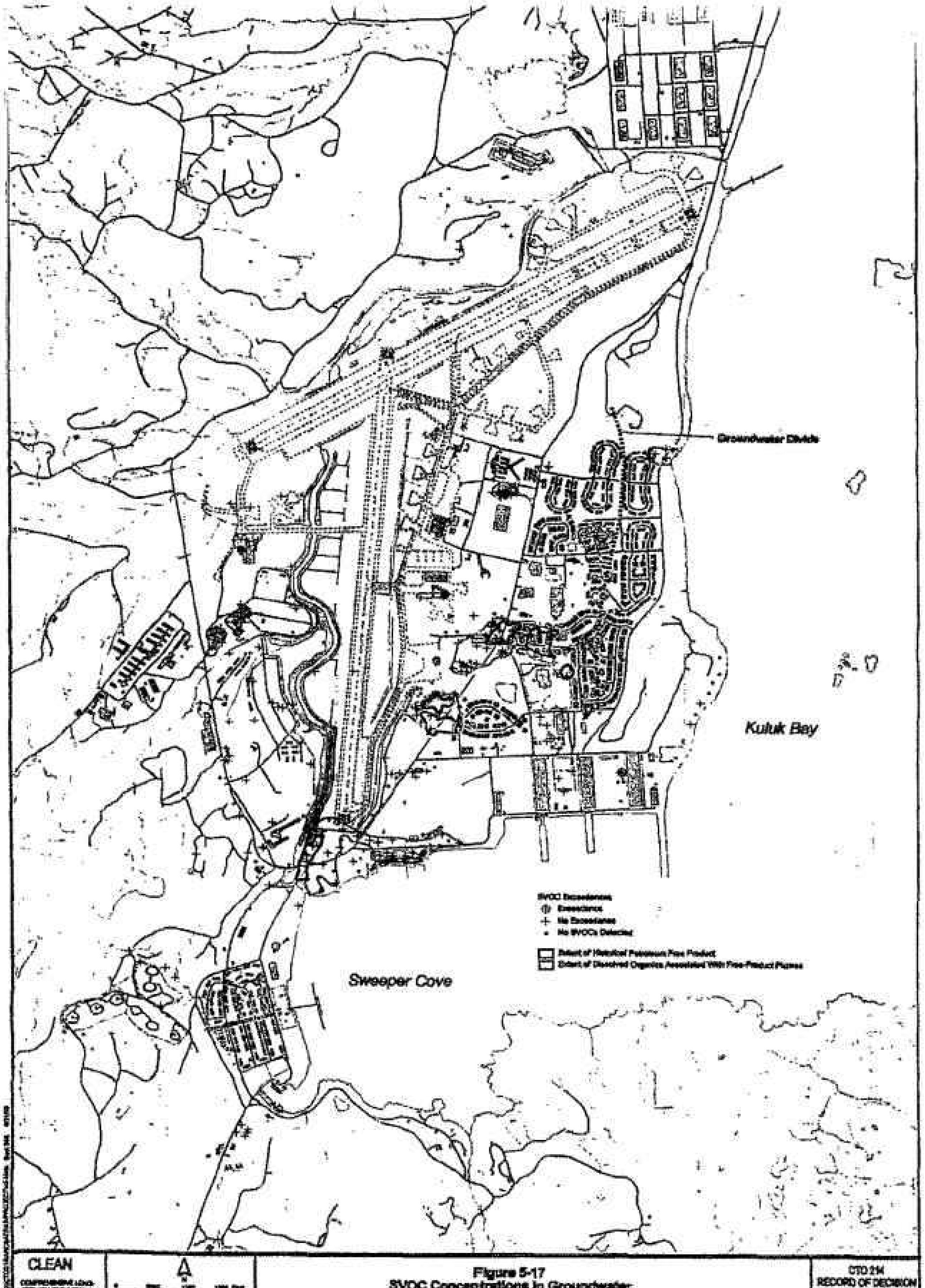


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Figure 5-17
SVOC Concentrations in Groundwater Exceeding Federal MCLs

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Adak Island, AK

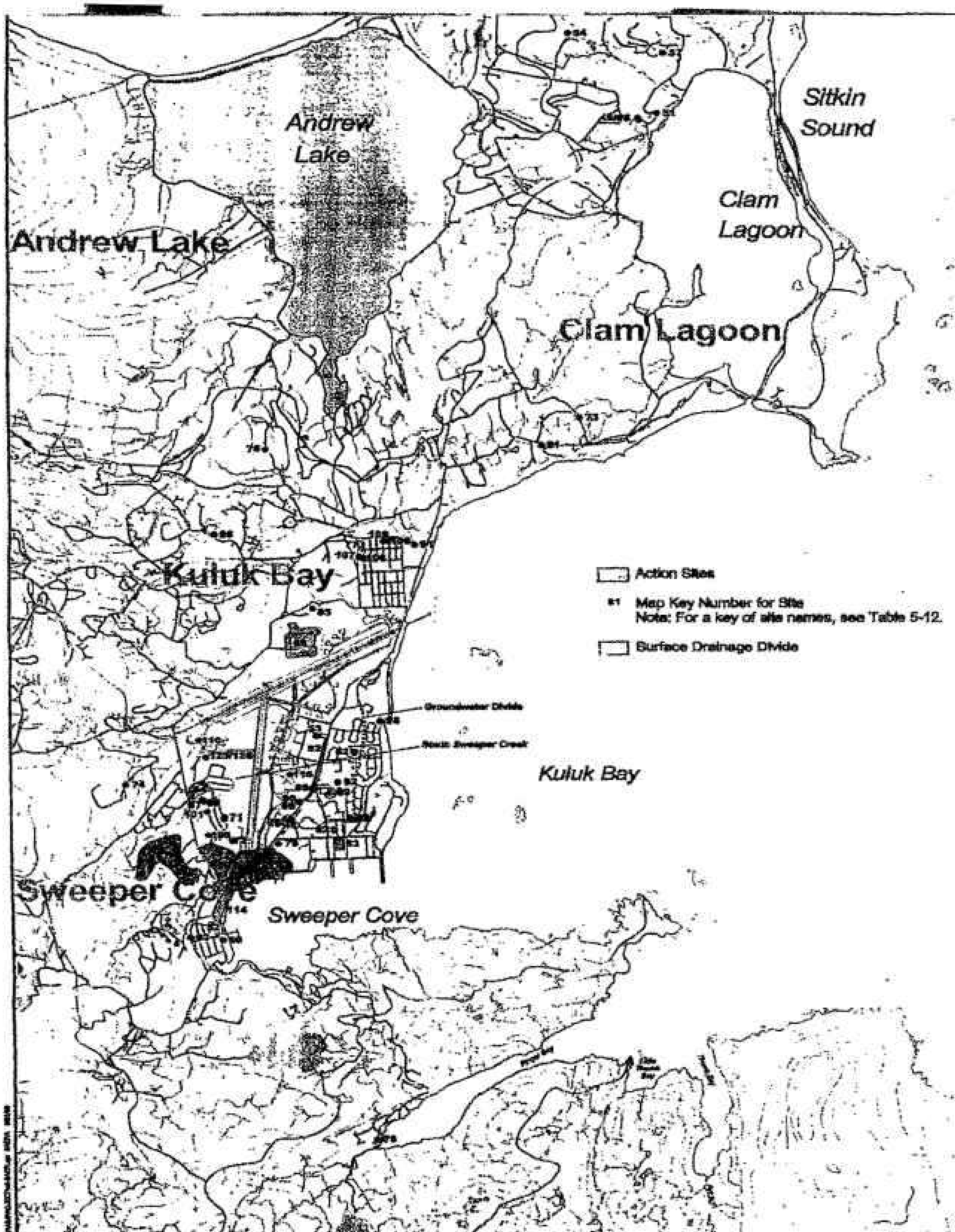

Figure 5-18
Petroleum Sites Retained for Further Action

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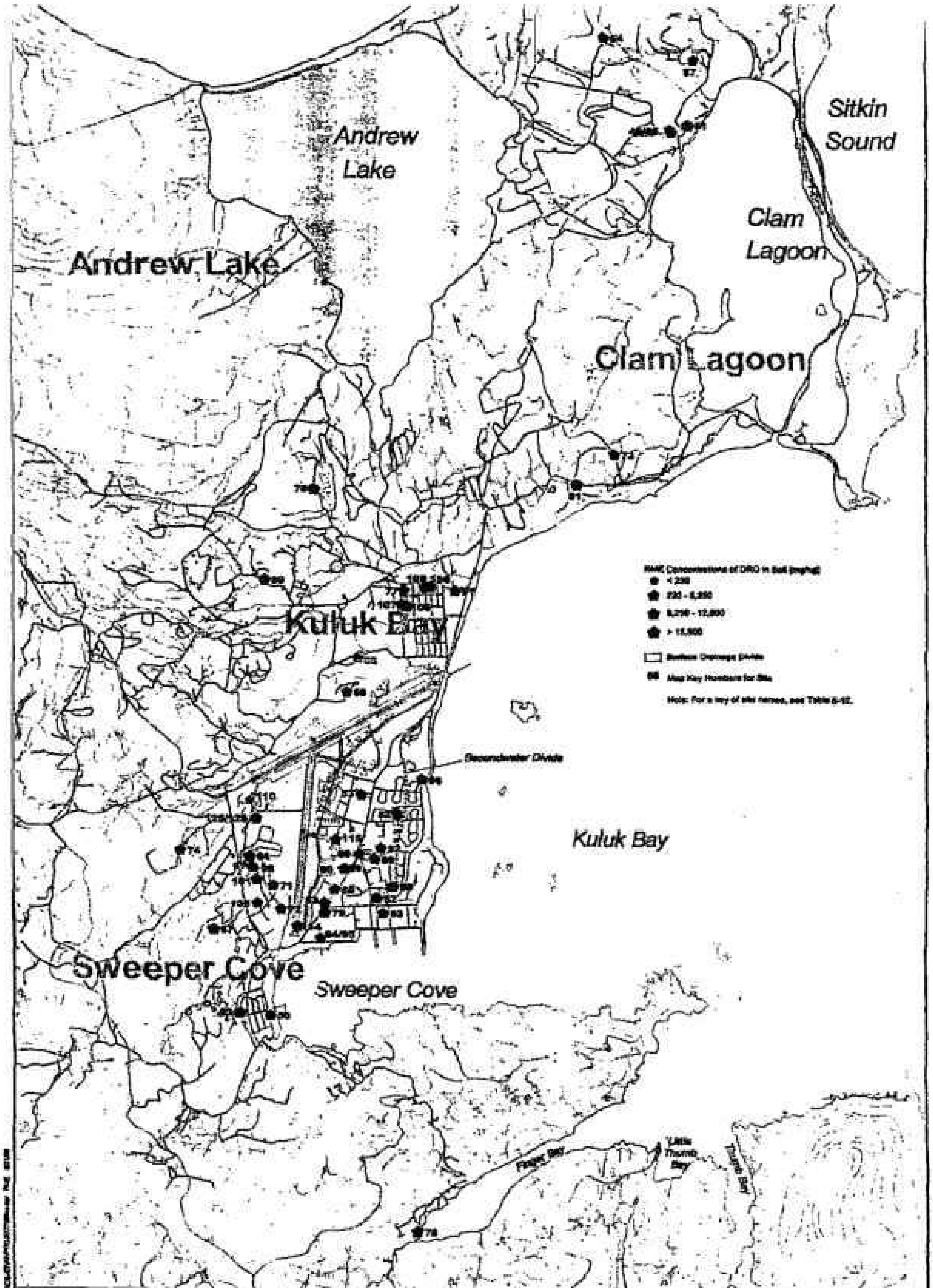

Figure 5-19
RME Concentrations of DRO in Soil for
Petroleum Sites Retained for Further Action

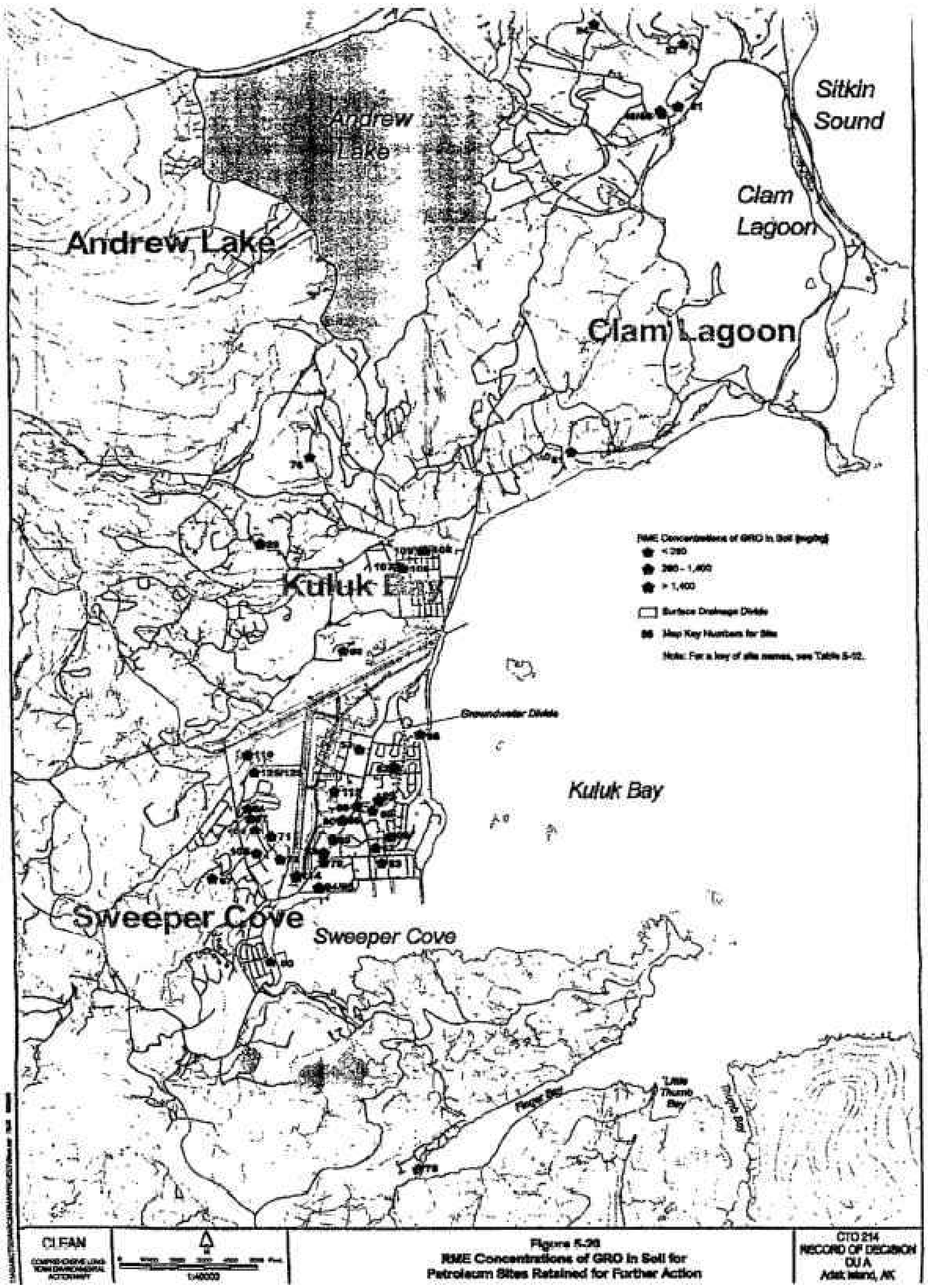

Figure 5.26
RME Concentrations of GRO in Soil for Petroleum Sites Retained for Further Action

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Adak Island, AK

Table 5-1
CERCLA Sites and Water Bodies Retained for Further Evaluation in the OU A RI/FS

Site Designation	Site Name	Report Reference
Terrestrial Sites		
SWMU 1[a]	Andrew Lake Waste Ordnance Demolition Range	URS 1996a; URSG 1997c
SWMU 2	Causeway Landfill	URS 1995b; URSG 1997c
SWMU 2[a]	Causeway Minefield	URS 1995b; URSG 1997c
SWMU 4	South Davis Road Landfill	URS 1995b; URSG 1997c
SWMU 8[a]	Andrew Lake Landfill and Shoreline	URS 1996a; URSG 1997c
SWMU 10	Old Baler Building	URS 1995a
SWMU 11	Palisades Landfill	URS 1995e; URSG 1997c
SWMU 13	Metals Landfill	URS 1995e; URSG 1997c
SWMU 14	Old Pesticide Disposal Area	URS 1996a; URSG 1997c
SWMU 15	Future Jobs/DRMO	URS 1996a
SWMU 16	Former Firefighter Training Area	URS 1996a; URSG 1997c
SWMU 17	Power Plant 3	URS 1996a; URSG 1997c
SWMU 20	White Alice/Trout Creek Disposal Area	URS 1996a
SWMU 21A	White Alice Upper Quarry	URS 1995a
SWMU 23	Heart Lake Drum Disposal Area	URS 1995b; URSG 1997c
SWMU 29	Finger Bay Landfill	URS 1995b; URSG 1997c
SWMUs 52, 53, 59	Former Loran Station	URS 1996a
SWMU 55	Public Works Transportation Department Waste Storage Area	URS 1996a
SWMU 67	White Alice PCB Spill Site	URS 1996a; URSG 1997c
SA 76	Old Line Shed Building	URS 1995a
SA 93[a]	World War II Mortar Impact Area	URS 1994; URSG 1997c
Downgradient Water Bodies		
—	Sweeper Cove	URSG 1997c
—	South Sweeper Creek	URSG 1997c
—	Kuluk Bay	URSG 1997c
—	Downtown Groundwater	URSG 1997c

[a] These sites are considered possible ordnance sites and will be addressed in a separate OU B ROD.

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DRMO - Defense Reutilization Marketing Office
Loran - long-range navigation
OU - operable unit
PCB - polychlorinated biphenyl
RI/FS - remedial investigation/feasibility study
SA - source area
SWMU - solid waste management unit
— - not applicable

Table 5-2
Sample Quantities Collected During the CERCLA Investigations

Site	Medium									
	Surface Soil	Subsurface Soil	Sediment		Groundwater	Surface Water	Tissue			
			Freshwater	Marine			Rock Sole	Dolly Varden	Mussel	Worm
Individual										
SWMU 2, Causeway Landfill	—	9	7	10	8	1	—	—	—	—
SWMU 4, South Davis Road Landfill	—	6	17	—	5	2	—	—	—	—
SWMU 10, Old Baler Building	11	—	—	—	—	—	—	—	—	—
SWMU 11, Palisades Landfill	—	11	46	7	4	37	—	—	7	—
SWMU 13, Metals Landfill	—	—	—	—	82	1	10[a]	—	7	—
SWMU 14, Old Pesticide Disposal Area	13	27	—	—	5	—	—	—	—	—
SWMU 15, Future Jobs/DRMO	108	76	13	—	49	—	—	—	—	—
SWMU 16, Former Firefighting Training Area	116	85	22	—	75	21	—	—	—	—
SWMU 17, Power Plant 3	59	58	49	—	125	37	—	—	—	—
SWMU 20, White Alice/Trout Creek Disposal Area	69	64	18	—	—	17	—	—	—	—
SWMU 21A, White Alice Upper Quarry	74	—	—	—	—	—	—	—	—	—
SWMU 23, Heart Lake Drum Disposal Area	5	—	10	—	—	—	—	—	—	—
SWMU 29, Finger Bay Landfill	—	10	10	—	18	—	—	—	—	—
SWMUs 52, 53, 59, Former Loran Station	59	3	—	—	—	—	—	—	—	—
SWMU 55, Public Works Transportation Department Waste Storage Area	32	10	7	—	5	—	—	—	—	—
SWMU 67, White Alice PCB Spill Site	257	37	—	—	—	—	—	—	—	—

Table 5-2 (Continued)
Sample Quantities Collected During the CERCLA Investigations

Site	Medium									
	Surface Soil	Subsurface Soil	Sediment		Groundwater	Surface Water	Tissue			
			Freshwater	Marine			Rock Sole	Dolly Varden	Mussel	Worm
Individual Sites (continued)										
SA 76, Old Line Shed Building	10	—	—	—	10	—	—	—	—	—
Downgradient Water Bodies										
Sweeper Cove	—	—	—	19	—	3	10	—	3	2
South Sweeper Creek	—	—	71	—	—	14	—	10	—	—
Kuluk Bay	—	—	—	27[b]	—	1	10[c]	—	11[d]	—

[a] 5 fillets, 5 whole body
[b] 20 samples of subtidal sediment (18 samples analyzed for VOCs and 5 samples analyzed for dioxins and furans) and 7 samples of intertidal sediment as listed for SWMU 11
[c] 5 rock sole fillet and 5 whole body samples
[d] Some analytes had 10 samples; some analytes had 12 samples; most analytes had 11 samples

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DRMO - Defense Reutilization Marketing Office
Loran - long-range navigation
SA - source area
SWMU - solid waste management unit
VOC - volatile organic compound
— - not applicable

Table 5-3
Human Health Chemicals of Potential Concern at Downtown CERCLA Sites

Site	Medium					
	Surface Soil	Subsurface soil	Sediment	Groundwater	Surface Water	Biota
SWMU 10, Old Baler Building	Aroclor 1260 Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Beryllium Chrysene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA
SWMU 14, Old Pesticide Disposal Area	Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	Aroclor 1260 Benzo(a)pyrene	NA	Bromodichloromethane Chloroform Ethybenzene bis(2-Ethylhexyl)phthalate Lead (dissolved, total) Tetrachloroethene Thallium(total) Toluene	NA	NA
SWMU 15, Future Jobs DRMO	2,3,7,8-TCDD (TEF) Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	2,3,7,8-TCDD (TEF) Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	Tetrachloroethene Trichloroethene	NA	NA
SWMU 16, Former Firefighting Training Area	Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Tetrachloroethene	Aroclor 1260 Tetrachloroethene Thallium	Aroclor 1260	1,2-Dichloroethene Benzene Aroclor 1260	No COPCs	NA

Table 5-3 (Continued)
Human Health Chemicals of Potential Concern at Downtown CERCLA Sites

Site	Medium					
	Surface Soil	Subsurface soil	Sediment	Groundwater	Surface Water	Biota
SWMU 17, Power Plant 3	Aroclor 1254 Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Nickel Vanadium	Aroclor 1260 Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Beryllium Vanadium	Aroclor 1254 Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Copper Dibenz(a,h)anthracene bis(2-Ethylhexyl)phthalate Indeno(1,2,3-cd)pyrene Lead Nickel Vanadium Zinc	Aroclor 1254 Aroclor 1260 Antimony (total) Barium (total) Benzene Beryllium (total) Cobalt (total) Copper (total) Dibenzofuran Ethybenzene bis(2-Ethylhexyl)phthalate Lead (total) Manganese (dissolved, total) 2-Methylnaphthalene Napthalene Nickel (total) n-Nitrosodiphenylamine Selenium (total) Thallium (total) Toluene Vanadium (total) Xylenes	Aroclor 1260 Arsenic Barium Beryllium Cadmium Chloroform Chromium Cobalt Copper bis(2-Ethylhexyl)phthalate Lead Manganese Mercury 4-Methylphenol Nickel Silver Tetrachloroethene Thallium Vanadium Xylenes Zinc	NA
SWMU 55, Public Works Transportation Department Waste Storage Area	Aroclor 1260 Tetrachloroethene	No COPCs	Aroclor 1260 Arsenic Beryllium	Tetrachloroethene	NA	NA

Table 5-3 (Continued)
Human Health Chemicals of Potential Concern at Downtown CERCLA Sites

Site	Medium					
	Surface Soil	Subsurface soil	Sediment	Groundwater	Surface Water	Biota
SA 76, Old Line Shed Building	Aroclor 1260 Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Beryllium Chrysene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Lead	NA	NA	Antimony (total) Arsenic (total) Barium (total) Beryllium (total) Copper (total) Lead (total) Manganese (total) Mercury (total) Nickel (total) Vanadium (total) Zinc (total)	NA	NA

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COPC - chemical of potential concern
DRMO - Defense Reutilization Marketing Office
NA - not analyzed
SA - source area
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TEF - toxicity equivalency factor

Table 5-4
Ecological Chemicals of Potential Concern at Downtown CERCLA Sites

Site	Medium					
	Surface Soil	Subsurface soil	Sediment	Groundwater	Surface Water	Biota
SWMU 10, Old Baler Building	Aroclor 1260 Copper Lead Silver Zinc	NA	NA	NA	NA	NA
SWMU 14, Old Pesticide Disposal Area	No COPCs	No COPCs	NA	NA	NA	NA
SWMU 15, Future Jobs DRMO	No COPCs	No COPCs	No COPCs	NA	NA	NA
SWMU 16, Former Firefighting Training Area	4-Methylphenol Aroclor 1260 Lead Nickel Xylenes Zinc	Aroclor 1260 Nickel Thallium	Aroclor 1260 Methylene chloride Nickel	NA	NA	NA
SWMU 17, Power Plant 3 O/W 1 and Quonset Hut	Aroclor 1260 Cobalt Copper Lead Manganese Nickel Zinc	Acetone	NA	NA	NA	NA
SWMU 17, Power Plant 3 Hillside Seepage Area	Aroclor 1254 Aroclor 1260 Lead Nickel Zinc	Aroclor 1260	NA	NA	NA	NA
SWMU 17, Power Plant 3 Lower Wetlands	NA	No COPCs	NA	NA	NA	NA

Table 5-4 (Continued)
Ecological Chemicals of Potential Concern at Downtown CERCLA Sites

Site	Medium					
	Surface Soil	Subsurface soil	Sediment	Groundwater	Surface Water	Biota
SWMU 17, Power Plant 3 Power Plant Tank Farm and Drum Accumulation Area 1	Aroclor 1260	Aroclor 1260 Arsenic Cobalt Copper Lead Manganese Nickel Xylenes Zinc	NA	NA	NA	NA
SWMU 17, Power Plant 3 Dry Cleaners and Drum Accumulation Area 2	NA	Acetone Aroclor 1260 Cobalt Copper Nickel Zinc	NA	NA	NA	NA
SWMU 17, Power Plant 3 Yakutat Creek	NA	NA	Aroclor 1260 Copper bis-(2-Ethylhexyl)phthalate Fluoranthene Manganese Mercury 2-Methylnaphthalene Naphthalene	NA	Mercury	NA

Table 5-4 (Continued)
Ecological Chemicals of Potential Concern at Downtown CERCLA Sites

	Medium					
Site	**Surface Soil**	**Subsurface soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
SWMU 17, Power Plant 3 Retention Pond	NA	NA	Acenaphthene Anthracene Aroclor 1260 Chrysene Copper Dibenz(a,h)anthracene Fluoranthene Fluorene Lead Manganese Mercury 2-Methylnaphthalene Nickel Phenanthrene Pyrene Zinc	NA	Copper Iron Lead Mercury Zinc	NA
SWMU 17, Power Plant 3 North Area	Aroclor 1254 Aroclor 1260 Cobalt Lead Nickel Zinc	Aroclor 1260 Benzene	NA	NA	NA	NA

Table 5-4 (Continued)
Ecological Chemicals of Potential Concern at Downtown CERCLA Sites

	Medium					
Site	**Surface Soil**	**Subsurface soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
SWMU 17, Power Plant 3 Waste Oil Pond	NA	NA	Acenaphthene Anthracene Antimony Aroclor 1254 Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(k)fluroanthene Cadmium Chromium Chrysene Copper bis(2-Ethylhexyl)phthalate Fluoranthene Fluorene Lead Mercury Naphthalene Nickel Phenanthrene Pyrene Xylenes Zinc	NA	No COPCs	NA
SWMU 55, Public Works Transportation Department Waste Storage Area	No COPCs	No COPCs	No COPCs	No COPCs	NA	NA
SA 76, Old Line Shed Building	Aroclor 1260 Cobalt Copper Lead 4-Methylphenol Zinc	NA	NA	NA	NA	NA

Table 5-4 (Continued)
Ecological Chemicals of Potential Concern at Downtown CERCLA Sites

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COPC - chemical of potential concern
DRMO - Defense Reutilization Marketing Office
NA - not analyzed
SA - source area
SWMU - solid waste management unit

Table 5-5
Human Health Chemicals of Potential Concern at CERLA Sites Outside of Downtown

Site	Medium					
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water	Biota
Clam Lagoon Drainage Basin						
SWMU 2, Causeway Landfill	NA	2,3,7,8-TCDD (TEF) Aroclor 1248 Aroclor 1254 Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Indeno(1,2,3-cd)pyrene Lead n-Nitrosodi-n-propylamine	No COPCs	1,3-Dinitrobenzene Arsenic (dissolved, total) Manganese (dissolved, total)	No COPCs	NA
Andrew Lake Drainage Basin						
SWMU 4, South Davis Road Landfill	NA	2,3,7,8-TCDD (TEF) Aroclor 1254 Aroclor 1260 Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b,k)fluoranthene Lead	Aroclor 1254 Aroclor 1260 Manganese	Antimony (total) Copper (total) Lead (total) Manganese (dissolved, total) Zinc (dissolved, total)	No COPCs	NA
Andrew Bay Drainage Basin						
SWMUs 52, 53, 59, Former Loran Station	Antimony Aroclor 1254 Aroclor 1260 Arsenic Benzo(a)pyrene Dibenz(a,h)anthracene 1,4-Dichlorobenzene bis-(2-Ethylhexyl)phthalate Indeno(1,2,3-cd)pyrene Lead Zinc	No COPCs	NA	NA	NA	NA

Table 5-5 (Continued)
Human Health Chemicals of Potential Concern at CERCLA Sites Outside of Downtown

Site	Medium					
	Surface Soil	**Subsurface Soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
Shagak Bay Drainage Basin						
SWMU 20, White Alice Trout Creek Disposal Area	Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Aroclor 1260 Lead	NA	No COPCs	NA	No COPCs	NA
SWMU 21, White Alice Upper Quarry	Aroclor 1260	NA	NA	NA	NA	NA
SWMU 23, Heart Lake Drum Disposal Area	Aroclor 1260 Arsenic Benzo(a)pyrene Manganese	NA	Arsenic Beryllium Manganese	NA	NA	NA
SWMU 67 White Alice PCB Spill Site	Aroclor 1232 Aroclor 1248 Aroclor 1260	Aroclor 1248 Aroclor 1260 Benzo(a)anthracene Benzo(b)fluoranthene Hexachlorobenzene Manganese Antimony	Aroclor 1254 Aroclor 1260	NA	NA	NA
Finger Bay Drainage Basin						
SWMU 29, Finger Bay Landfill	NA	2,3,7,8-TCDD(TEF) Antimony Aroclor 1254 Aroclor 1260 Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Lead Thallium	Aroclor 1260 Arsenic Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Beryllium Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene	Benzene Antimony (dissolved) Beryllium (total) Manganese (dissolved total)	NA	NA

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COPC - chemical of potential concern
Loran - long-range navigation

Table 5-5 (Continued)
Human Health Chemicals Of Potential Concern at CERCLA Sites Outside of Downtown

NA - not analyzed
PCB - polychlorinated biphenyl
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TEF - toxicity equivalency factor

Table 5-6
Ecological Chemicals of Potential Concern at CERCLA Sites Outside of Downtown

Site	Medium					
	Surface Soil	**Subsurface Soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
Clam Lagoon Drainage Basin						
SWMU 2, Causeway Landfill	NA	Aroclor 1248 Aroclor 1254 Copper Lead 4-Methylphenol 2,3,7,8-TCDD(TEF) Zinc	No COPCs	NA	No COPCs	NA
Andrew Lake Drainage Basin						
SWMU 4, South Davis Road Landfill	NA	Aroclor 1254 Aroclor 1260 Arsenic Copper Lead Nickel 2,3,7,8-TCDD(TEF) Zinc	Aroclor 1254 Aroclor 1260 Lead Manganese Zinc	NA	No COPCs	NA
Andrew Bay Drainage Basin						
SWMUs 52, 53, 59, Former Loran Station	Aroclor 1254 Aroclor 1260 Copper 2,4-Dimethylphenol Lead 4-Methylphenol Silver Zinc	No COPCs	NA	NA	NA	NA
Shagak Bay Drainage Basin						
SWMU 20, White Alice Trout Creek Disposal Area	Aroclor 1260 Copper Lead Zinc	Aroclor 1260	No COPCs	NA	Silver	NA

Table 5-6 (Continued)
Ecological Chemicals of Potential Concern at CERCLA Sites Outside of Downtown

Site	Medium					
	Surface Soil	**Subsurface Soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
Shagak Bay Drainage Basin (Continued)						
SWMU 21A, White Alice Upper Quarry	Aroclor 1260	NA	NA	NA	NA	NA
SWMU 23, Heart Lake Drum Disposal Area	Lead Manganese Zinc	NA	Cadmium bis-(2-Ethylhexy)phthalate Lead Manganese Nickel Zinc	NA	NA	NA
SWMU 67, White Alice PCB Spill Site	Aroclor 1232 Aroclor 1260	Acetone 1,2,4-Trichlorobenzene Hexachlorobenzene Aroclor 1248 Aroclor 1260 Cobalt Lead Nickel Manganese Zinc	Aroclor 1254 Aroclor 1260	NA	NA	NA
Finger Bay Drainage Basin						
SWMU 29, Finger Bay Landfill	NA	Aroclor 1254 Aroclor 1260 Cobalt Copper Lead Manganese 4-Methylphenol 2,3,7,8-TCDD(TEF) Zinc	Anthracene Aroclor 1260 Fluoranthene Fluorene Manganese Phenanthrene Pyrene Zinc	NA	NA	NA

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COPC - chemical of potential concern
Loran - long-range navigation

Table 5-6 (Continued)
Ecological Chemicals of Potential Concern at CERCLA Sites Outside of Downtown

NA - not analyzed
PCB - polychlorinated biphenyl
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TEF - toxicity equivalency factor

Table 5-7
Postremediation Monitoring Results for SWMU 13, Metals Landfill

Chemical	Number of Samples	Number of Detects	Concentration (µg/L)		
			Minimum	Maximum	Average
Volatile Organic Compounds in Groundwater					
1,1,1-Trichloroethane	23	3	0.13	0.24	0.203
1,1-Dichloroethane	23	14	0.13	6	1.85
1,2,4-Trichlorobenzene	7	2	0.15	1.6	0.155
1,2-Dichlorobenzene	23	2	0.46	0.51	0.485
1,2-Dichloroethane	23	1	0.2	0.2	0.2
1,3-Dichlorobenzene	23	4	0.22	2.1	1.56
1,4-Dichloroebenzene	23	3	11	13	12.3
BTEX (total)	24	3	0.74	1	0.9
Benzene	24	3	0.74	1	0.9
Carbon disulfide	23	2	2.1	6	4.05
Chlorobenzene	23	3	17	20	18
Chloroethane	23	3	5.2	6.4	5.87
Chloromethane	23	1	3.7	3.7	3.7
Methylene chloride	23	1	0.15	0.15	0.15
Tetrachloroethene	23	2	0.54	0.75	0.645
Trichloroethene	23	12	0.15	3.8	0.968
Vinyl chloride	23	1	0.11	0.11	0.11
cis-1,2-Dichloroethene	23	9	0.19	1.5	0.738
tran-1,2-Dichloroethene	23	1	0.11	0.11	0.11
Semivolatile Organic Compounds in Groundwater					
Di-n-octylphthalate	16	2	4	12	8
bis(2-Ethylhexyl)phthalate	16	4	0.9	6	2.48
Total Inorganics in Groundwater					
Aluminum	24	13	34.8	53,400	4,420
Antimony	24	4	0.13	1.2	0.483
Arsenic	24	12	0.41	36.3	5.18
Barium	24	21	1.2	201	20
Beryllium	24	1	0.57	0.57	0.57
Calcium	24	24	6.300	269,000	46,100
Chromium	24	4	4.4	26.6	11.5
Cobalt	24	2	4.6	20.4	12.5
Copper	24	10	2.1	114	16.2
Iron	24	20	15.1	29,800	4,080
Lead	24	1	9.1	9.1	9.1
Magnesium	24	24	3,960	728,000	54,300
Manganese	24	22	1.7	4,540	775
Mercury	24	5	0.12	0.22	0.156
Nickel	24	1	15.1	15.1	15.1

Table 5-7 (Continued)
Postremediation Monitoring Results for SWMU 13, Metals Landfill

Chemical	Number of Samples	Number of Detects	Contraction (µg/L)		
			Minimum	Maximum	Average
Total Inorganics in Groundwater (Continued)					
Potassium	24	24	3,920	214,000	21,600
Selenium	24	15	0.67	104	10.2
Sodium	24	24	45,100	5,500,000	403,000
Thallium	24	2	0.43	1.1	0.765
Vanadium	24	3	3.6	90.3	33.1
Zinc	24	12	4.3	86.8	13.6
Dissolved Inorganics in Groundwater					
Aluminum	16	6	34.8	410	140
Antimony	16	4	0.19	1.2	0.513
Arsenic	16	7	0.38	3.6	2.12
Barium	16	12	1.2	59.8	13.5
Calcium	16	16	5,860	93,500	32,800
Chromium	16	1	6.4	6.4	6.4
Cobalt	16	1	4.7	4.7	4.7
Copper	16	5	3	11.1	5.48
Iron	16	12	15.1	14,900	3,090
Magnesium	16	16	3,770	91,500	23,100
Manganese	16	14	1.7	3,850	746
Potassium	16	16	3,920	67,500	14,000
Selenium	16	10	0.78	8.3	2.37
Sodium	16	16	45,100	824,000	182,000
Thallium	16	1	0.69	0.69	0.69
Vanadium	16	2	2.8	3.6	3.2
Zinc	16	9	4.5	10.5	7.11

Notes:
BTEX - benzene, toluene, ethylbenzene, xylenes
µg/L - micrograms per liter
SWMU - solid waste management unit

Table 5-8
Confirmatory Sampling Results at SWMU 16, Former Firefighting Training Area

Chemical	Sample Location Within Excavated Area							
	316	317	318	319	320	321	322	323
Aroclor 1016	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	ND	ND	5.9	5.7	ND	3.3	ND	3.6

Notes:
Results are in milligrams per kilogram (mg/kg).
ND - not detected. Detection limits were below the cleanup level of 1 mg/kg.
SWMU - solid waste management unit

Table 5-9
Postremediation Monitoring Results for SWMU 11, Palisades Landfill

Chemical	Number of Samples	Number of Detects	Contraction (mg/kg)		
			Minimum	Maximum	Average
Semivolatile Organic in Blue Mussel Tissue					
Benzoic acid	2	1	0.1 U	1.72 J	0.885
Di-n-butyl phthalate	2	2	0.1 J	0.2 J	0.15
LPAH (total)	2	2	0.006	0.022	0.014
Naphthalene	2	1	0.002 J	0.02 U	0.006
Phenanthrene	2	2	0.004. J	0.022	0.013
Pesticides and Aroclors in Blue Mussel Tissue					
beta-BHC	2	1	0.009 J	0.002 U	0.00095
Inorganic in Blue Mussel Tissue					
Aluminum	2	2	76	102	89
Antimony	2	2	0.005	0.006	0.0055
Arsenic	2	2	1.53	1.57	1.55
Barium	2	2	0.2	0.203	0.2015
Cadmium	2	2	0.434 J	0.535 J	0.485
Calcium	2	2	887	1,390	1,139
Chromium	2	2	0.39 J	0.76 J	0.575
Cobalt	2	2	0.071	0.076	0.0735
Copper	2	2	1.05	1.17	1.11
Iron	2	2	179	179	179
Lead	2	2	0.189 J	0.243 J	0.216
Magnesium	2	2	673 J	740 J	707
Manganese	2	2	2.49	2.51	2.5
Mercury	2	2	0.02 J	0.02 J	0.02
Nickel	2	2	0.44	0.55	0.495
Potassium	2	2	1,790	1,880	1,835
Selenium	2	2	0.4 J	0.5 J	0.45
Silver	2	2	0.003	0.004	0.0035
Sodium	2	2	5,060	5,920	5,490
Thallium	2	2	0.002 J	0.002 J	0.002
Vanadium	2	2	0.71	0.85	0.78
Zinc	2	2	19.4 J	25 J	22.2

Notes:
BHC - benzene hexachloride
J - estimated concentration
LPAH - low molecular-weight polycyclic aromatic hydrocarbons
mg/kg - milligrams per kilogram
U - undetected at the concentration shown

Table 5-10
Human Health and Ecological Chemicals of Potential Concern for Downgradient Surface Water Bodies

Site	Medium					
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water	Biota
Human Health Chemicals of Potential Concern						
Sweeper Cove	NA	NA	Lead	NA	Antimony	**Rock Sole**: Aroclor 1260 Antimony Arsenic Cadmium Lead Mercury **Blue Mussel:** Aroclor 1260 Arsenic Cadmium
South Sweeper Creek	NA	NA	Benzo(a)pyrene Aroclor 1016 Aroclor 1248 Aroclor 1254 Aroclor 1260	NA	Antimony	**Dolly Varden:** Aroclor 1260 Cadmium Dieldrin
Kuluk Bay	NA	NA	Beryllium Lead	NA	Antimony Cadmium	**Rock Sole:** Aroclor 1254 Heptachlor Lead Selenium Vanadium Zinc **Blue Mussel:** 4-Methylphenol Aroclor 1254 Arsenic Benzoic acid Beryllium Cadmium Copper Dieldrin Lead Selenium

Table 5-10 (Continued)
Human Health and Ecological Chemicals of Potential Concern for Downgradient Surface Water Bodies

Site	Medium					
	Surface Soil	**Subsurface Soil**	**Sediment**	**Groundwater**	**Surface Water**	**Biota**
Ecological Chemicals of Potential Concern						
Sweeper Cove	NA	NA	COPCs not selected			
South Sweeper Creek	NA	NA	COPCs not selected			
Kuluk Bay	NA	NA	Antimony 2-Butanone Carbon disulfide Cobalt Endrin ketone PCBs Picric acid Vanadium	NA	Barium Cadmium	**Rock Sole:** 4,4'-DDD 4,4'-DDE 4,4'-DDT Aroclor 1254 Aroclor 1260 Benzoic acid Endrin Arsenic Barium Cadmium Chromium Cobalt Lead Selenium Vanadium

Table 5-10 (Continued)
Human Health and Ecological Chemicals of Potential Concern for Downgradient Surface Water Bodies

Site	Medium					
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water	Biota
Ecological Chemicals of Potential Concern (Continued)						
Kuluk Bay (Continued)						**Blue Mussel:** 4,4'-DDD 4,4'-DDE 4,4'-DDT Aroclor 1254 Benzoic acid Benzo(a)anthracene Heptachlor 4-Methylphenol Naphthalene Phenanthrene Arsenic Barium Cadmium Chromium Cobalt Copper Lead Nickel Selenium Vanadium

Notes:
COPC - chemical of potential concern
DDD - dichlorodiphenyldichloroethane
DDE - dichlorodiphenyldichloroethylene
DDT - dichlorodiphenyltrichloroethane
PCB - polychlorinated biphenyl
NA - not analyzed

Table 5-11
Chemical Concentrations in Downtown Groundwater Equaling or Exceeding MCLs and State of Alaska Screening Criteria

Site Name	Location ID	Sample Date	Analyte	Concentration (µg/L)	Screening Concentration (µg/L)*
Volatile Organic Compounds					
GCI Compound (UST GCI-l)	204	18-Sep-96	Benzene	5	5
	203	7-Aug-98	Benzene	13	5
	202	6-Oct-97	Benzene	21	5
	201	28-Oct-97	Benzene	22	5
	210	15-Oct-97	Benzene	36	5
	207	17-Sep-96	Benzene	130	5
Housing Area (Arctic Acres)	890	12-Aug-98	Benzene	7	5
NMCB Building Area, T-1416 Expanded Area	300	18-Jun-97	Benzene	6	5
	452	20-Jul-98	Benzene	13	5
	302	8-Jul-97	Benzene	14	5
	812	18-Jul-98	Benzene	14	5
	461	3-May-97	Benzene	16	5
	475	8-Jul-97	Benzene	17	5
	201	1-Aug-98	Benzene	20	5
	453	9-Jun-97	Benzene	33	5
	301	5-Jul-97	Benzene	36	5
	813	18-Jul-98	Benzene	48	5
	818	18-Jul-98	Benzene	57	5
	463	2-May-97	Benzene	61	5
	497	11-Jun-97	Benzene	130	5
	817	18-Jul-98	Benzene	200	5
	489	13-Oct-97	Benzene	220 J	5
	474	6-Sep-98	Benzene	300	5
	493	13-Jul-97	Benzene	360	5
ROICC Contractor's Area (UST ROICC-8)	151	17-Oct-96	Benzene	25	5
Runway 5-23 Avgas Valve Pit	100	8-Aug-98	Benzene	16	5
SA 80, Steam Plant 4	32	8-Oct-97	Benzene	7	5
South of Runway 18-36 Area	217	20-Oct-97	Benzene	25 J	5
SWMU 60, Tank Farm A	6	11-Jul-98	Benzene	6	5
	51	9-Aug-98	Benzene	7	5
SWMU 61, Tank Farm B	200	9-Aug-98	Benzene	120	5
SWMU 62, Housing Area Fuel Leak	752	5-Nov-97	Benzene	5	5
	517	14-Oct-97	Benzene	6 J	5
	652	8-Nov-97	Benzene	7	5
	107	14-Jan-98	Benzene	21	5
	617	7-Dec-96	Benzene	97	5
	751	5-Nov-97	Benzene	180	5
	631	10-Nov-97	Benzene	250	5
Tanker Shed (UST 42494)	310	28-Jul-97	Benzene	5	5
	282	9-Dec-96	Benzene	8	5
	175	16-Oct-96	Benzene	9	5
	317	10-Aug-98	Benzene	19	5
	275	10-Nov-96	Benzene	23	5
	304	8-Jul-98	Benzene	31	5

Table 5-11 (Continued)
Chemical Concentrations in Downtown Groundwater Equaling or Exceeding MCLs and State of Alaska Screening Criteria

Site Name	Location ID	Sample Date	Analyte	Concentration (µg/L)	Screening Concentration (µg/L)*
Volatile Organic Compounds (Continued)					
Tanker Shed (Continued)	176	22-Oct-97	Benzene	38	5
	290	12-Oct-97	Benzene	45	5
	276	10-Nov-96	Benzene	100	5
Yakutat Hangar (USTs T-2039-A, T-2039-B, and T-2039-C)	244	24-Oct-96	Benzene	5	5
	253	13-Nov-96	Benzene	6	5
NMCB Building Area, T-1416 Expanded Area	474	3-Jun-98	cis-1,2-Dichloroethene	400	70
SWMU 16, Former Firefighting Training Area	33	22-Oct-90	cis-1,2-Dichloroethene	96	70
NMCB Building Area, T-1416 Expanded Area	489	13-Oct-97	Ethylbenzene	1,100 J	700
SWMU 61, Tank Farm B	200	9-Aug-98	Ethylbenzene	1,300	700
SWMU 62, Housing Area Fuel Leak	751	5-Nov-97	Ethylbenzene	720 J	700
	107	14-Jan-98	Ethylbenzene	730	700
	752	5-Nov-97	Ethylbenzene	1,900 J	700
SWMU 14, Old Pesticide Disposal Area	201	12-Aug-98	Ethylbenzene	790	700
NMCB Building Area, T-1416 Expanded Area	474	6-Sep-98	Methylene chloride	8 J	5
SWMU 74, Old Batch Facility	473	22-Aug-92	Methylene chloride	6 J	5
SWMU 17, Power Plant 3	1	9-Aug-95	Methylene chloride	6 J	5
SWMU 55, Public Works Transportation Department Waste Storage Area	123	5-Aug-95	Methylene chloride	18 J	5
SWMU 14, Old Pesticide Disposal Area	200	31-Jul-95	Tetrachloroethene	52	5
SWMU 15, Future Jobs/DRMO	8	6-Aug-95	Tetrachloroethene	77	5
SWMU 17, Power Plant 3	300	10-Nov-96	Tetrachloroethene	52	5
SWMU 55, Public Works Transportation Department Waste Storage Area	120	5-Aug-95	Tetrachloroethene	81	5
	123	5-Aug-95	Tetrachloroethene	360	5
SWMU 61, Tank Farm B	200	9-Aug-98	Toluene	4,400	1,000
SWMU 62, Housing Area Fuel Leak	107	14-Jan-98	Toluene	1,100	1,000
	752	5-Nov-97	Toluene	3,700	1,000
SWMU 14, Old Pesticide Disposal Area	201	12-Aug-98	Toluene	2,600	1,000
NMCB Building Area T-1416 Expanded Area	474	6-Sep-98	Trichloroethene	12 J	5
	817	18-Jul–98	Trichloroethene	18	5
SWMU 15, Future Jobs/DRMO	8	6-Aug-95	Trichloroethene	39	5
Semivolatile Organic Compounds					
SA 80, Steam Plant 4	31	4-Nov-96	Benzo(a)anthracene	0.120	0.100
NMCB Building Area, T- 1416 Expanded Area	474	6-Sep-98	Benzo(a)anthracene	0.400	0.100
SWMU 14, Old Pesticide Disposal Area	202	31-Jul-95	bis(2-Ethylhexyl)phthalate	7	6
SWMU 17, Power Plant 3	50	10-Aug-95	bis(2-Ethylhexyl)phthalate	9	6
	37	12-Aug-95	bis(2-Ethylhexyl)phthalate	610 J	6
SWMU 55, Public Works Transportation Department Waste Storage Area	125	5-Aug-95	bis(2-Ethylhexyl)phthalate	8	6

Table 5-11 (Continued)
Chemical Concentrations in Downtown Groundwater Equaling or Exceeding MCLs and State of Alaska Screening Criteria

Site Name	Location ID	Sample Date	Analyte	Concentration (µg/L)	Screening Concentration (µg/L)*
Petroleum Hydrocarbons					
NMCB Building area, T-1416 Expanded Area	818	18-Jul-98	DRO	15,700	15,000
	475	8-Jul-97	DRO	16,000	15,000
	497	11 Jun-97	DRO	18,000	15,000
SWMU 62, Housing Area Fuel Leak	757	12-Feb-97	DRO	16,000 J	15,000
	750	5-Feb-97	DRO	18,000	15,000
	641	23-Jan-97	DRO	19,000 J	15,000
	572	17-Feb-97	DRO	23,000	15,000
	644	23-Jan-97	DRO	23,000	15,000
	517	14-Oct-97	DRO	3,150,000 J	15,000
SWMU 17, Power Plant 3	37	11-Jan-97	DRO	30,000	15,000
Tanker Shed (UST 42494)	317	10-Aug-98	DRO	15,000 J	15,000
GCI Compound (UST GCI-1)	210	15-Oct-96	GRO	14,000	13,000
NMCB Building Area, T-1416 Expanded Area	486	23-Mar-97	GRO	13,000 J	13,000
	817	18-Jul-98	GRO	13,000	13,000
	201	1-Aug-98	GRO	15,000	13,000
SWMU 61, Tank Farm B	200	9-Aug-98	GRO	37,000	13,000
SWMU 62, Housing Area Fuel Leak	752	5-Nov-97	GRO	37,000 J	13,000
SWMU 14, Old Pesticide Disposal Area	201	12-Aug-98	GRO	32,000	13,000
Dissolved Inorganics					
Natural Background Areas	303	17-Aug-94	Antimony	6 J	6.2
SWMU 55, Public Works Transportation Department Waste Storage Area	125	3-Aug-95	Antimony	15	6.2
SWMU 14, Old Pesticide Disposal Area	201	31-Jul-95	Lead	82	15
Total Inorganics					
Natural Background Areas	302	17-Aug-94	Cadmium	6	5
	301	17-Aug-94	Cadmium	8	5
Amulet Housing, Well AMW-706	705	29-Aug-93	Lead	58	15
	707	30-Aug-93	Lead	69	15
	706	29-Aug-93	Lead	70	15
	711	31-Aug-93	Lead	77	15
Amulet Housing, Well AMW-709	708	30-Aug-93	Lead	28	15
	709	30-Aug-93	Lead	56	15
Former Power Plant Building (T-1451)	105	12-Oct-92	Lead	20	15
GCI Compound (UST GCI-1)	109	6-Nov-92	Lead	17	15
	113	22-Oct-92	Lead	20	15
	264	6-Nov-92	Lead	23	15
	220	6-Nov-92	Lead	160	15
	190	6-Nov-92	Lead	240	15
	160	6-Nov-92	Lead	440	15
SA 76, Old Line Shed Building	10	2-Mar-93	Lead	32	15
SWMU 14, Old Pesticide Disposal Area	201	31-Jul-95	Lead	86	15
	201	31-Jul-95	Thallium	3	2

[a]Screening concentration is based on federal MCL or 18 AAC 75 criteria for groundwater not considered a drinking water source, whichever is lower.

Table 5-11 (Continued)
Chemical Concentrations in Downtown Groundwater Equaling or Exceeding MCLs and State of Alaska Screening Criteria

Notes:
AAC - Alaska Administrative Code
avgas - aviation gasoline
DRMO - Defense Reutilization Marketing Office
DRO - diesel-range organics (TPH—diesel)
GCI - General Communications, Inc.
GRO - gasoline-range organics (TPH—gasoline)
J - estimated concentration
MCL - maximum contaminant level
NMCB - Naval Mobile Construction Battalion
µg/L - micrograms per liter
ROICC - resident officer in charge of construction
SA - source area
SWMV - solid waste management unit
TPH - total petroleum hydrocarbons
UST - underground storage tank

Table 5-12
Petroleum Sites Requiring Further Action

Map Key Number[a]	Site Name
49	SA 73, Heating Plant 6 (combined with SWMU 58)
50	SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area
51	SA 78, Old Transportation Building
52	SA 79, Main Road Pipeline, North End (MRP-MW15) and South End
53	SA 80, Steam Plant 4
54	SA 82, P-80/P-81 Buildings
57	SA 88, P-70 Energy Generator
62	SWMU 14, Old Pesticide Storage and Disposal Area
63	SWMU 15, Future Jobs/DRMO
64	SWMU 17, Power Plant 3
66	SWMU 58, Heating Plant 6 (combined with SA 73)
67	SWMU 60, Tank Farm A
68	SWMU 61, Tank Farm B
69	SWMU 62, New Housing Fuel Leak
71	Amulet Housing, Well AMW-706 Area
72	Amulet Housing, Well AMW-709 Area
73	Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)
74	ASR-8 Facility (UST 42007-B)
76	Boy Scout Camp, West Haven Lake (UST BS-1)
77	Contractor's Camp Burn Pad
78	Finger Bay Quonset Hut (UST FBQH-1)
79	Former Power Plant Building (T-1451)
80	GCI Compound (UST GCI-1)
81	Girl Scout Camp (UST GS-1)
82	Housing Area (Arctic Acres)
85	MAUW Compound (UST 24000-A)
89	Mount Moffett Power Plant 5 (USTs 10574 through 10577)
91	NAVFAC Compound (USTs 20052 and 20053)
92	Navy Exchange Building (UST 30027-A)
93	New Roberts Housing (UST HST-7C)
94	NMCB Building Area (UST T-1416-A) (combined with Expanded Area, listed below)
95	NMCB Building Area, T- 1416 Expanded Area (combined with UST-T-1416-A, listed above)
96	NORPAC Hill Seep Area
97	Officer Hill and Amulet Housing (UST 31047-A)
98	Officer Hill and Amulet Housing (UST 31049-A)
101	Officer Hill and Amulet Housing (UST 31052-A)
105	Quarters A
106	ROICC Contractor's Area (UST ROICC-7)
107	ROICC Contractor’s Area (UST ROICC-8)

Table 5-12 (Continued)
Petroleum Sites Requiring Further Action

Map Key Number[a]	Site Name
108	ROICC Warehouse (UST ROICC-2)
109	ROICC Warehouse (UST ROICC-3)
110	Runway 5-23 Avgas Valve Pit
114	South of Runway 18-36 Area
115	Tanker Shed (UST 42494)
125	Yakutat Hangar (UST T-2039-A)
126	Yakutat Hangar (USTs T-2039-B and T-2039-C)

[a]Map key numbers correspond to location numbers shown in Figure 5-18.

Notes:
AST - aboveground storage tank
avgas - aviation gasoline
DRMO - Defense Reutilization Marketing Office
GCI - General Communications, Inc.
MAUW - modified advanced underwater weapons
NAVFAC - Naval Facility
NMCB - Naval Mobile Combat Battalion
NORPAC - North Pacific
ROICC - resident officer in charge of construction
SA - source area
SWMU - solid waste management unit
UST - underground storage tank

Table 5-13
Summary of Periodic Monitoring at SWMU 25, Roberts Landfill

Analyte Name	Quality Tested	Quantity Detected	Maximum Detected Concentration (µg/L)	Quantity Exceeding Criteria	Screening Concentration[a] (µg/L)	Background Concentration (µg/L)
Volatile Organic Compounds						
1,2-Dichloroethane	22	1	0.72	NA	NA	NA
2-Butanone	18	2	30	NA	NA	NA
2-Chloroethyl vinyl ether	11	1	65	NA	NA	NA
4-Methyl-2-pentanone	22	2	33	NA	NA	NA
Acetone	18	2	160	NA	NA	NA
Chloroform	22	1	0.86	NA	NA	NA
Chloromethane	22	6	44	NA	NA	NA
Isobutyl alcohol	11	2	94	NA	NA	NA
Methylene chloride	22	2	1.4	NA	NA	NA
Total Inorganics						
Aluminum	8	8	3,530	NA	NA	18,000
Arsenic	22	7	5.9	0	360	13.3
Barium	22	22	760	NA	NA	54.4
Beryllium	8	1	0.35	0	4	0.67
Cadmium	22	7	2.7	0	3.9	8.3
Calcium	22	22	90,000	NA	NA	46,500
Chromium	22	4	489	0	1,700	9.4
Cobalt	8	4	17	NA	NA	46 U
Copper	22	14	2,220	NA	NA	69.5
Iron	22	22	428,000	NA	NA	11,400
Lead	22	4	53.7	2	15	11.80
Magnesium	22	22	195,000	NA	NA	19,000
Manganese	22	22	7,980	NA	NA	746
Mercury	22	5	0.26	0	2.4	0.1 U
Nickel	8	2	6.3	0	1,400	36.2 U
Potassium	22	19	16,900	NA	NA	4,120
Selenium	22	1	2	NA	NA	0.87
Silver	22	1	3.5	0	4.1	8.4 U
Sodium	22	22	27,600	NA	NA	25,300
Zinc	22	17	934	1	120	320

[a]18 AAC 70 Water Quality Standards, as specified in solid waste disposal permit No. 9425-BA006

Notes:
Only detected chemicals are listed.
µg/L - micrograms per liter
NA - not available or not applicable
SWMU - solid waste management unit
U - undetected at concentration shown

Table 5-14
Summary of Periodic Monitoring at SWMUs 18 and 19, White Alice Landfill

Analyte Name	Quality Tested	Quantity Detected	Maximum Detected Concentration (µg/L)	Quantity Exceeding Criteria	Screening Concentration[a] (µg/L)	Background Concentration (µg/L)
Volatile Organic Compounds						
2-Butanone	10	2	18	NA	NA	NA
2-Chloroethyl vinyl ether	6	2	41	NA	NA	NA
4-Methyl-2-pentanone	12	2	20	NA	NA	NA
Acetone	11	3	100	NA	NA	NA
Carbon disulfide	12	1	0.57	NA	NA	NA
Chloromethane	12	4	25	NA	NA	NA
Isobutyl alcohol	6	2	55	NA	NA	NA
Total Inorganics						
Aluminum	4	2	9,110	NA	NA	18,000
Arsenic	12	5	10.2	0	360	13.3
Barium	12	9	26.7	NA	NA	54.4
Cadmium	12	1	0.2	0	3.9	8.3
Calcium	12	12	19,700	NA	NA	46,500
Chromium	12	2	8.6	0	1,700	9.4
Cobalt	4	1	5	NA	NA	46 U
Copper	12	3	17.7	NA	NA	69.5
Iron	12	11	17,200	NA	NA	11,400
Lead	12	5	2.8	NA	NA	11.80
Magnesium	12	12	9,100	NA	NA	19,000
Manganese	12	12	590	NA	NA	746
Nickel	4	1	5.4	0	1,400	36.2 U
Potassium	12	10	2,090	NA	NA	4,120
Selenium	12	2	3	NA	NA	2 U
Sodium	12	12	31,500	NA	NA	25,300
Vanadium	4	1	68.5	NA	NA	73.1
Zinc	12	8	20.1	1	120	320

[a]18 AAC 70 Water Quality Standards, as specified in solid waste disposal permit No. 9425-BA007

Notes:
Only detected chemicals are listed.
µg/L - micrograms per liter
NA - not available or not applicable
SWMU - solid waste management unit
U - undetected at concentration shown

6.0 SUMMARY OF CERCLA SITE RISK ANALYSES

This section summarizes the human health and ecological risk analyses performed on CERCLA sites across the former Naval base. COPC selection was described in Section 5. This section provides additional details regarding the risk-based analyses of the sites.

6.1 HUMAN HEALTH RISKS

The objective of the Adak baseline human health risk assessments (HHRA) was to evaluate risks to current or future human receptors from chemical impacts at individual sites or downgradient water bodies on Adak. The results of the HHRA identify chemicals of potential concern and possible exposure pathways that may require remedial action.

Risk analyses were performed for each of the individual CERCLA sites as part of the PSE process (URS 1995a, 1995b, 1996a). In these documents, cumulative risk was calculated for possible Adak residential, recreational, or occupational receptor scenarios. The purpose of the water body HHRAs was to evaluate risk to human receptors who would be involved in activities at these downgradient environments. Receptor scenarios considered for the water bodies included the subsistence fisher and recreational fisher. (Note that the "fisher" harvests shellfish as well as fish.)

The need for an HHRA was evaluated for a water body if there was at least one possible source area within its drainage. This evaluation was presented in the RI/FS management plan (URS 1996b).

Risk assessments were not considered necessary for a water body if it did not meet the set of evaluation criteria presented in the final RI/FS management plan (URS 1996b). The criteria to evaluate whether an HHRA was necessary for each water body were the following:

- **Source.** Were individual CERCLA sites containing COPCs present within the drainage basin for the downgradient water body?

- **Release Mechanisms.** Were migration pathways complete from the source area(s) to the downgradient water body?

- **Accumulation Points**. Was there a reasonable likelihood of significant chemical accumulation at the water body? (Physical and chemical data for migration pathways used to model chemical accumulation at individual sites were needed to support this likelihood.)

- **Data Gaps.** Were there no significant data gaps present in the information necessary to evaluate the preceding three criteria? (Data gaps that precluded evaluation of these three criteria required further site evaluation and a risk assessment, if warranted.)

Additional scenarios considered in the scope of the risk assessments (URS 1995d) included exposure to multiple sites and the effects of commingling groundwater plumes. Three potential multiple-site exposure scenarios were evaluated:

- Potential exposure to soil across adjacent sites
- Potential exposure to windborne particulates and volatile organic chemicals across adjacent sites
- Potential exposure to contaminants in converging groundwater plumes

For three of the water bodies, it was concluded that these scenarios did not increase the potential risk to humans; thus, none of these water bodies warranted further evaluation in the RI/FS. These water bodies are:

- Andrew Bay
- Shagak Bay
- Finger Bay

Risk assessments were completed for downgradient water bodies considered to have been chemically impacted by basewide activities. These water bodies are:

- Sweeper Cove
- South Sweeper Creek
- Kuluk Bay
- Clam Lagoon
- Andrew Lake

6.1.1 Exposure Assessment

The exposure assessment quantifies human exposure to COPCs in media at the individual sites and in water bodies. This quantification was accomplished by identifying the exposure media, the potentially exposed populations (based on historical, current, and possible future land uses), and the routes of exposure and by quantifying human intake of COPCs via these exposure pathways.

Five human exposure scenarios were developed based on historical, current, and possible future land use:

- Current or future residential
- Current or future worker (occupational)
- Current or future multi-activity recreational
- Current or future recreational fisher
- Future subsistence fisher

Development of these scenarios is described in the final Adak RI/FS management plan (URS 1996b). The first three scenarios (residential, occupational, and recreational) were developed for evaluation of exposure to the individual sites and are based on historical use of the island since military occupation in 1942. The two fishing scenarios are based on a subpopulation that may spend a large percentage of its time fishing, either for recreation or for subsistence. These scenarios were developed to evaluate exposure to the receiving water bodies and to account for the possibility that future land use may be associated with commercial fishing and/or a native community.

In addition to the receptors, the exposure media for each of the receptors were selected. These represent the media to which each receptor population could be exposed to and from which chemical intake is expected. For each combination of receptor and exposure media, exposure assumptions were developed. These assumptions (ordered by receptor and exposure medium) are summarized in Tables 6-1 and 6-2. The exposure assumptions were based on a combination of EPA Region 10 default values (U. S. EPA 1991a) and site- or region-specific parameters. For instance, there is no EPA default for fish consumption rates, so the value is based on an upper-bounds estimate from dietary studies for coastal Alaskan communities (Anderson et al. 1995, George and Bosworth 1988, NOAA 1994). The fish consumption rate used in the subsistence risk assessment (126 grams per day) is very close to the recently adopted Alaska DEC guideline of 129 grams per day for subsistence risk assessments.

The actual concentration to which a person is potentially exposed is called the exposure point concentration. The exposure point concentration is different for each medium (groundwater, sediment, soil, etc.) and chemical. Exposure point concentrations are calculated from the analytical data that were collected for each site or water body.

The exposure point concentrations are expressed as a reasonable maximum exposure (RME), defined as the highest plausible concentration to which a person is exposed at a site. The RME is an upper-bound concentration, designed to be higher than the concentration to which the majority of individuals are exposed (i.e., most people would be exposed to concentrations lower than the RME). The RME concentration was calculated as the lesser of the maximum detected concentration or the 95 percent upper confidence limit on the arithmetic mean concentration.

In calculating exposure point concentrations, a value of one-half the sample quantitation limit was used for samples in which the COPC was not detected. This procedure is intended to avoid underestimating risk. Since nondetected values could be present at a concentration that is below the detection limit, but above zero, selecting one-half the quantitation limit provides a reasonable estimate of the concentration.

Estimates of potential human intake of chemicals for each exposure pathway were calculated by combining exposure point concentrations with pathway-specific exposure assumptions.

6.1.2 Toxicity Assessment

A toxicity assessment of the COPCs was conducted to quantify the relationship between the magnitude of exposure and the likelihood or severity of adverse effects (i.e., dose-response assessment). The toxicity assessment also weighed the available evidence regarding the potential for chemicals to have adverse effects on exposed individuals (i.e., hazard identification).

Toxicity values are used to express the dose-response relationship and are developed separately for carcinogenic (cancer) effects and noncarcinogenic (noncancer) health effects. The primary sources for toxicity values were EPA's Integrated Risk Information System (IRIS) database and Health Effects Assessment Summary Tables (HEAST). Toxicity values are provided in Table 6-3.

Toxicity values for carcinogenic effects are referred to as cancer slope factors (CSFs). CSFs have been developed by the EPA for estimating excess lifetime cancer risks associated with exposure to potential carcinogens. CSFs are expressed in units of $(\text{mg/kg-day})^{-1}$ and are multiplied by the estimated daily intake rate for a potential carcinogen to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The upper bound reflects the conservative estimate of risks calculated from the CSF. This approach is intended to make underestimation of the actual cancer risk highly unlikely.

Toxicity values for noncancer effects are termed reference doses (RfDs). RfDs are expressed in units of mg/kg-day and are estimates of acceptable lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of COPCs are compared with the RfD to assess risk.

Because of the unique toxicity characteristics of lead, the EPA does not currently provide a toxicity value for it. As an alternative to the traditional risk assessment approach, the EPA has published recommended acceptable levels for lead. The lead soil action level was developed using the Integrated Exposure Uptake Biokinetic (IEUBK) model for child exposure. This level is 400 mg/kg for soil and 15 µg/L for drinking water. Detected lead concentrations were compared to these levels to evaluate whether there was a potential risk due to lead exposure. If the detected concentrations were below these levels, it was concluded that there was not significant risk. If lead concentrations exceeded these levels, further evaluation was necessary. The MCL comparison was presented in Section 5. Sites where lead is a COPC in soil are listed in Tables 5-3 and 5-5.

Petroleum is a complex mixture of hydrocarbons, many of which can contribute to a detectable TPH concentration. The EPA has not published a toxicity value for TPH in IRIS or HEAST. Therefore, risk associated with TPH releases at CERCLA sites on Adak were evaluated based on individual chemical constituents of petroleum mixtures, including BTEX, PAHs, and lead.

6.1.3 Human Health Risk Characterization

A risk characterization was performed on each of the individual CERCLA sites and at selected downgradient water bodies to estimate the likelihood of adverse health effects to potentially exposed populations. The risk characterization combines the information developed in the exposure assessment and toxicity assessment to calculate potential risks. Because of fundamental differences in the mechanisms through which carcinogens and noncarcinogens act, risks were characterized separately for cancer and noncancer effects.

Noncancer Risks

The potential for adverse noncancer effects of a single COPC in a single medium is expressed as a hazard quotient (HQ), which is calculated by dividing the average daily chemical intake derived from the COPC concentration in the medium by the RfD for the chemical. The RfD is a dose below which no adverse health effects are expected to occur.

By adding the HQs for all COPCs within a medium and across all media to which a given receptor population may reasonably be exposed, a hazard index (HI) can be calculated. The HI represents the combined effects of all the potential exposures that may occur for the exposure scenario being evaluated. If the HI is less than 1.0, adverse noncancer health effects are unlikely. If the HI for a common endpoint is greater than 1.0, adverse health effects for one or more receptor populations may occur.

Cancer Risks

For carcinogens (cancer-causing chemicals), risks were estimated as the incremental probability of an individual developing cancer over his or her lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk was calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{CSF}$$

where:

Risk	=	a unitless probability of an individual developing cancer (for instance, a risk of 1×10^{-5} represents a 1 in 100,000 probability)
CDI	=	chronic daily intake average over a 70-year lifetime (mg/kg-day)
CSF	=	cancer slope factor $(\text{mg/kg-day})^{-1}$

An incremental lifetime cancer risk of 1×10^{-6} indicates that as a reasonable maximum estimate, an individual has a 1 in 1,000,000 chance of developing cancer as a result of exposure to the COPCs at the site over a 70-year lifetime under the specific exposure conditions at the site. The EPA recommends, in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), an acceptable target range for cancer risk of 1×10^{-6} to 1×10^{-4} or CERCLA sites. The State of Alaska under 18 AAC 75 requires that the cumulative effect of potential carcinogenic risks be less than or equal to 1×10^{-5}.

Results

Table 6-4 summarizes the estimated cancer risks and HIs for affected media at the sites and water bodies that were retained in this ROD for further action. It also presents the cumulative risks and HIs for individual receptor scenarios. Risk evaluations were performed for the Adak residential, recreational, and occupational receptor scenarios in all affected media for each of the individual CERCLA sites. The downgradient water bodies were evaluated for two scenarios: the current recreational fisher, which describes risk to a resident living on Adak for 5 years, and the future subsistence fisher, which describes risks to residents who spend their entire life on Adak.

Risk estimates have been developed for 15 sites and 3 water bodies. The following paragraphs summarize the individual site risks. A more detailed risk summary with the various exposure scenarios is provided in Table 6-4.

Table 6-5 gives the chemical risk drivers for the residential scenario for each site; the water bodies' risk drivers are for the subsistence and recreational fisher, as applicable. These data were derived from the PSE reports (URS 1995a, 1995b, 1996a) and the RI/FS (URSG 1997c). The table also shows land use, media of concern, chemical concentrations, chemical-specific and cumulative risks, and RBSC and ARAR values.

Human health risks greater than 1 in 100,000 (1 x 10^{-5}) for carcinogens and a hazard index of greater than 1.0 (noncarcinogens) are discussed below by site. All but one of the risk values for the terrestrial sites are based on a residential exposure scenario. This assumption was conservative because the land use in all of these sites is either industrial or recreational.

SWMU 10. There is a total cancer risk of 6 x 10^{-5} from Aroclor 1260 and indeno(1,2,3-cd)pyrene in surface soils

SWMU 14. The total cancer risk of 2 x 10^{-5} at this site is attributable to benzo(a)pyrene in soil. In groundwater the carcinogenic risk is 2 x 10^{-5} due to PCE. The residential risk scenario for groundwater exposure assumes development of the shallow aquifer below the site as a source of domestic water, an unlikely event. Note that SWMU 14 is currently zoned industrial.

SWMU 15. A cumulative carcinogenic risk of 4 x 10^{-5} is from Aroclor 1260 and TCDD (dioxin) in soil. The carcinogenic risk from PCE in groundwater is 3 x 10^{-5}. This site is currently zoned industrial.

SWMU 16. In groundwater, Aroclor 1260 provides a carcinogenic risk of 4 x 10^{-5}. It was detected in only 1 of 35 samples analyzed and has not been detected since 1990.

SWMU 17. The cumulative cancer risk from soil exposure is 3 x 10^{-5}, with the risk driver being Aroclor 1260. In groundwater the total cancer risk is 1 x 10^{-4}, with Aroclor 1254 and beryllium being the main risk drivers. The cumulative HI is 17, represented by thallium (10), whose risk is almost an order of magnitude higher than that from either manganese or antimony.

The residential exposure scenario was retained for this site because of its proximity to housing units, though development of the largely industrial area for residential use is unlikely.

In surface water, the cancer risk is from Aroclor 1260 (detected in 2 of 38 sample analyses) and the inorganics arsenic and beryllium. Arsenic represents the highest risk (2 x 10^{-4}). The noncarcinogenic risk is measured as a cumulative hazard index of 28, with the greatest driver being unfiltered manganese.

Under a recreational scenario, the HI from surface water exposure is 15, with manganese (unfiltered) contributing most of the risk (13). The recreational scenario was retained because the site contains several ponds and is adjacent to Yakutat Creek. Currently fishing is prohibited in the freshwater streams in downtown Adak but could be resumed in the future.

SWMU 55. For groundwater, the only COC with a cancer risk is PCE (1×10^{-4}). Virtually all the risk associated with the site is due to ingestion and inhalation of PCE in groundwater.

Future residential use is unlikely at the site because it is located in the middle of the industrial area of downtown Adak, near the dock. Exposure to groundwater could occur if a production well were constructed at the site, an unlikely event given past land use patterns at Adak.

SA 76. Arsenic and indeno(1,2,3-cd)pyrene in surface soil result in a cumulative cancer risk for that exposure pathway of 9×10^{-5}. The site is located in the central industrial area of downtown Adak.

Sweeper Cove. Cancer risks and non-cancer hazards were below a level of concern for a recreational seafood harvester consuming fish and shellfish from Sweeper Cove. Cancer risks and non-cancer hazards were above a level of concern for the subsistence seafood harvester consuming fish and shellfish from Sweeper Cove. The cancer risk for the subsistence seafood harvester was primarily due to Aroclor 1260 (cancer risk is 6×10^{-4}) and arsenic (cancer risk is 9×10^{-4}) and the non-cancer hazard was primarily due to antimony (HI is 3), arsenic (HI is 5), and cadmium (HI is 2). Risk and hazard estimates to subsistence seafood harvester used upper-bound intake assumptions that may overestimate risk. Arsenic naturally occurs at high levels in marine organisms leading to an overestimation of risk (see Section 6.1.4 Uncertainty Analysis for details).

South Sweeper Creek. For the consumption of fish (Dolly Varden) in the subsistence fisher scenario, the total cancer risk is 2×10^{-4}, with Aroclor 1260 as the main risk driver. Note, however, that it is estimated that South Sweeper Creek would support subsistence fishing only 2 to 4 years before the resource would be depleted (URSG 1997c).

SWMU 2—Landfill. In subsurface soil at the SWMU 2 landfill there is cumulative cancer risk of 1×10^{-5}. The contributing COCs are semivolatile organic compounds, Aroclors, and TCDD, but no individual chemical poses a risk greater than $1 \times 10^{-5.}$

The residential scenario was included because the site could be developed for residential use, although this is very unlikely because of its location on the narrow bar between Clam Lagoon and Sitkin Sound. Also, the scenario assumes that the landfill cover will be removed or disturbed to expose the subsurface soils.

SWMU 4. Total cancer risk is 5×10^{-5} for the subsurface soil pathway, with arsenic as the risk driver. The maximum arsenic concentration in subsurface soil at the site (7 mg/kg) is within one order of magnitude of the low end of the background range (2 mg/kg).

Residential development at SWMU 4, the South Davis Road Landfill, is unlikely because of its distance from downtown, its poor road access, and the lack of support services. However, the residential scenario has been retained because vehicles can access the site and cabins are located in the general vicinity.

SWMU 52 (53, 59). The cumulative cancer risk at the former Loran Station is 5×10^{-5} with surface soil exposure. COCs are arsenic and benzo(a)pyrene (detected in only 1 sample of 36 analyzed). Future residential use at the site is possible but unlikely due to the site's remote location, poor road conditions, exposure to weather, and lack of utilities.

SWMU 21A. Total cancer risk is 1×10^{-5} based on exposure to Aroclor 1260 in soil.

SWMU 23. Arsenic contributes 97 percent of the cumulative risk of 1×10^{-5} in surface soil. It is likely that the presence of arsenic at this concentration is due to natural causes, since the maximum detected value of 10 mg/kg is well below the maximum background value of 80 mg/kg for arsenic (URSG 1997c).

The HI for the site is 7, with manganese consisting of nearly all the noncancer risk for surface soil. However, only two samples were collected and analyzed for manganese, and these samples came from areas impacted by rusted metal debris in a small area and may not be representative of risk across the site (URSG 1997c).

The site is unlikely to support residential development after base closure because of its topography (marshy lowlands and sloping terrain) and remoteness. However, because there is vehicle access to the site, the residential scenario has been retained for SWMU 23.

Kuluk Bay. Cancer risks and non-cancer hazards were below a level of concern for a recreational seafood harvester consuming fish and shellfish from Kuluk Bay. Cancer risks and non-cancer hazards were above a level of concern for the subsistence seafood harvester consuming fish and shellfish from Kuluk Bay. The cancer risk for the subsistence seafood harvester was primarily due to Aroclor 1254 (cancer risk is 5×10^{-5}) and arsenic (cancer risk is 6×10^{-5}) and the non-cancer hazard was primarily due to Aroclor 1254 (HI is 4). Risk and hazard estimates to subsistence seafood harvester used upper-bound intake assumptions that may overestimate risk and arsenic naturally occurs at high levels in marine organisms leading to an overestimation of risk (see Section 6.1.4 Uncertainty Analysis for details).

SWMU 29. Cancer risk is 3×10^{-5} in the surface soil pathway based primarily on exposure to Aroclor 1254.

Although there is access to the SWMU 29 landfill and a cabin and Quonset hut are nearby, residential development at this location is unlikely due to its remoteness, lack of utilities, and prior use. The residential scenario has been retained to maintain the conservatism of the risk assessment.

6.1.4 Uncertainty Analysis

A number of assumptions were made in characterizing the sites and water bodies at Adak, in identifying COPCs, and in estimating risk. There are uncertainties associated with the assessment that may lead to overestimation or underestimation of risks. Some of these uncertainties are described in the following bullets.

Assumptions That May Overestimate Risk

- HIs and cancer risks are assumed to be additive, even though chemicals may affect different target organs and have different mechanisms of action. Therefore, cumulative risk calculations may overestimate risk.

- Cancer slope factors and reference doses are upper-bound limits that are likely to overestimate the potential for adverse health effects.

- RME concentrations are upper-bound limits or maximum concentrations and probably overestimate actual exposure concentrations.

- Some of the samples were collected in or near areas expected to be directly impacted by releases. Such focused sampling is expected to bias the chemical results high and may overestimate the media RMEs and site risk.

- All human health RBSCs for soil and sediment are based on low target risk levels (cumulative risk = 1×10^{-7}; HQ = 0.1) to account for possible multiroute exposure and synergistic effects. For many COPCs, however, the routes of exposure other than ingestion are unlikely to be significant. Therefore, use of these low RBSCs may result in selection of more COPCs, which would result in a higher risk estimate.

- The assumed exposures for both residential and recreational scenarios are significantly higher than what is actually expected to occur, based on Adak history during military use and climate. For example, the ingestion rate of 100 mg/day is the upper-bound limit for *total* incidental ingestion by an adult. The scenarios in

- C this study assume that all of the ingested soil would originate in the areas impacted by COPCs.

- C Domestic use of groundwater, though evaluated, is considered unlikely at Adak.

- C Residential exposure scenarios are considered viable for all but one of the CERCLA sites discussed in this section. However, some of these sites are remote and have limited access. Given the quantity of existing available housing on Adak, which is well in excess of the current population, it is considered highly unlikely that these remote sites will be converted to residential land use. Therefore, the risk associated with this sites may be overestimated.

- C The subsistence fisher exposure scenario assumes that a future receptor would use one of the water bodies for about 50 percent of his/her subsistence for a 30-year duration. Given the limited fish resources in South Sweeper Creek and the competition with other subsistence fishers and resident wildlife, it is unlikely that resources from South Sweeper Creek could be sustained for that period of time. Therefore, risk associated with this scenario at South Sweeper Creek is probably overestimated.

- C Arsenic is a naturally occurring inorganic chemical that is found at naturally high concentrations in marine organisms. In addition, most of the arsenic found in marine organisms occurs in a non-toxic organic form. A large proportion of the arsenic measured in rock sole and mussels collected from Sweeper Cove and Kuluk Bay was also found in samples collected from the reference area. The background concentration of arsenic in blue mussels was 1.2 mg/kg while the mean concentration was 1.4 mg/kg in Sweeper Cove and 2.06 mg/kg in Kuluk Bay. The background concentration of arsenic in rock sole fillets was 5.5 mg/kg and the mean concentration was 5.01 mg/kg in Sweeper Cove. Therefore, risks from arsenic through the seafood consumption pathway may be overestimated.

- C The subsistence fisher exposure scenario assumes that a future receptor would focus on species most impacted by COPCs (i.e., bottomfish and shellfish). Subsistence use patterns for indigenous Alaska populations suggest that these species would not be important parts of a subsistence diet on Adak. Therefore, risk associated with the water bodies is probably overestimated.

- C The intake parameters used in the subsistence fisher exposure scenario are considered conservatively high. For instance, the ingestion rate is derived primarily from dietary studies at locations where subsistence hunting and fishing is necessary to survive as a community (i.e., there are few commercial alternatives). It is believed that on Adak, other commercial ventures would be pursued and subsistence fishing would be supplemented by other activities. In addition, the scenario assumes that local fishing would account for all subsistence activities. In actuality, it is believed that. off-island commercial fishing and caribou hunting would supplement local fishing. Therefore, the upper-bound subsistence intake assumptions may overestimate risk.

Assumptions That May Underestimate Risk

- The most conservative human health scenario is based on a resident living on Adak Island for 15 years. If a residential scenario assumed an exposure duration of 60 years instead of 15 years, the calculated risk would increase proportionally. For example, if the residential cumulative cancer risk was 2.0×10^{-6} assuming an exposure duration of 15 years, the risk would be 8.0×10^{-6} for 60 years of exposure.

- It is assumed that there are no unidentified pathways or receptors. Additions to either of these categories may increase potential risk.

- It is assumed that all COPCs were identified. If additional COPCs are identified, potential risk could increase.

- There is a possibility that the uncertainty associated with nondetected chemicals could affect the site evaluations.

- RBSCs are not available for all detected chemicals. If these chemicals pose a risk that has not been identified, the actual total risk would be underestimated.

- Noncarcinogenic toxicity values are not available for PCBs, although some forms of PCBs may have noncarcinogenic impacts. Therefore, if PCBs are present at a site, the HI may be underestimated.

Assumptions That May Overestimate or Underestimate Risk

- Using one-half the detection limit to represent the concentration of an undetected chemical may overestimate or underestimate the RME concentration. However, RME concentrations are upper-bound limits or maximum concentrations and probably overestimate actual exposure concentrations. Therefore, the soil RME values are expected to be biased high.

- Synergistic or antagonistic actions of multiple chemical exposures are not considered.

- With respect to the groundwater transport pathway, some source and hydrologic assumptions were made that may have overestimated or underestimated actual conditions.

- At sites where random sampling over a large area occurred, there is some uncertainty regarding the representativeness of the sample results in characterizing the site. The actual site concentrations may be higher or lower than the measured concentrations. Therefore, risk may be underestimated or overestimated.

- The Aroclor cancer slope factors used in the risk estimates were developed using commercial mixtures. However, environmental processes (e.g., metabolism or degradation) produce changes in Aroclor mixtures that are released into the environment, which may increase or decrease the ability of a mixture to elicit a toxic response. Therefore, using slope factors based on commercial mixtures may overestimate or underestimate risk.

6.2 ECOLOGICAL RISKS

As part of the final RI/FS, an ecological risk assessment was performed to characterize risks to ecological receptors in surface water bodies potentially affected by contaminants migrating from known source areas, as well as to receptors potentially exposed to chemicals when foraging across multiple source areas. The ecological risk assessment was performed using methodologies consistent with EPA guidance (U.S. EPA 1996d, 1996e, 1995, and 1992) and the *Tri-Service Procedural Guidelines for Ecological Risk Assessments* (Wentsel et al. 1996) for risk assessors working at military facilities.

The ecological risk assessment process at the former base on Adak included the following stages:

1. Collection and analysis of field data for use in site assessments and the risk assessment

2. Characterization of site contamination

3. Identification of ecological COPCs

4. Identification of ecological assessment endpoints, measurement endpoints, and target ecological receptors

5. Preparation of conceptual site models and testable hypotheses describing how site contaminants might affect target receptors

6. Computation of COPC concentrations in exposure media and selected target receptors

7. Derivation of toxicity endpoints for the target receptors

8. Estimation of COPC doses to selected target receptors

9. Characterization of risks to target receptors

10. Analysis of uncertainties and their effects on the identified risks

11. Comparison of predicted risks to site-specific ecological measurements to interpret the ecological significance of measured site contaminants

Stages 1 through 6 correspond to the problem formulation phase of the ecological risk assessment paradigm of EPA (U.S. EPA 1992). Stages 7 and 8 correspond to the analysis phase of the ecological risk assessment paradigm, while the remaining stages comprise the risk characterization phase of the paradigm. The 11 stages were sometimes performed concurrently, primarily to fill previously identified data gaps and needs.

6.2.1 Hazard Identification

Potential ecosystem stressors were initially identified by reviewing chemicals of concern at SWMUs within the drainage basins of the large receiving water bodies on Adak (URS 1996a, 1995a). Most of the terrestrial source areas of contamination to aquatic and marine systems are in the watersheds of one of the large drainages: South Sweeper Creek, Sweeper Cove, Kuluk Bay, Clam Lagoon, and Andrew Lake. With the exception of Andrew Lake and the freshwater portions of South Sweeper Creek, the receiving waters are marine systems.

Chemicals that potentially pose ecological risks included a number of inorganics, chlorinated pesticides, PCBs, PAHs, and petroleum products. Some of these chemicals, such as mercury, PCBs, and several of the chlorinated pesticides, were believed to have a potential to biomagnify in receptors in the higher trophic levels of the Adak terrestrial and aquatic food webs.

6.2.2 Biological and Physical Characterization of Areas Evaluated

Terrestrial sites received the most attention during the PSE-1 and PSE-2 site evaluations. The RI/FS for OU A at Adak evaluated ecological risks to marine and freshwater biota from ingestion of chemically affected surface water, sediment, and prey. Evaluation of ecological risks to terrestrial receptors in the RI/FS was limited to an evaluation of risks to species that foraged at multiple SWMUs, using an assumption that a receptor would not spend its entire lifetime within the boundaries of any single SWMU.

Ecological risks from organic chemicals in soil at the individual SWMUs were evaluated by using food web models for birds ingesting contaminated soil and prey that live within the contaminated soil of individual SWMUs. Ecological risks from inorganic chemicals in soil were evaluated by comparing measured site concentrations to soil screening concentrations that are protective of plants and soil-dwelling invertebrates. Risks from contaminated sediments were evaluated at a few SWMUs. Individual SWMU evaluations assumed that the ecological receptor of concern spent its entire lifetime within the boundaries of the individual sites.

Terrestrial ecosystems in the vicinity of most SWMUs can be characterized as maritime tundra, with vegetation consisting of a variety of grasses and forbs. The tundra on Adak can be subdivided into alpine and maritime tundra with no permafrost. No trees are native to Adak, although several small stands of introduced trees are present. A number of the SWMUs themselves are partially or completely contained within unvegetated or artificial habitats. The artificial habitats generally contain substrates of gravel, crushed stone, or sand. Buildings or pavement are present on many SWMUs.

The most abundant bird on the terrestrial portions of Adak is the Lapland longspur. Song sparrows, bald eagles, and ptarmigan are also commonly observed. The three terrestrial mammals found on Adak (Norway rat, Arctic fox, and caribou) are all introduced species.

The endangered Aleutian Canada goose occasionally stops to rest and forage on Adak during spring and fall migrations and may visit Andrew Lake. The endangered Aleutian shield fern (*Polystichum aleuticum*) is found at two locations on Adak, neither of which is in the developed portions of the island.

South Sweeper Creek, Sweeper Cove, Clam Lagoon, and Andrew Lake were the focus of the aquatic portion of the RI/FS ecological risk assessment (URSG 1997c). The Kuluk Bay ecological risk assessment results were reported separately (URSG 1997a). The Clam Lagoon and Andrew Lake ecological risk evaluations resulted in recommendations of no further action, as shown on Table 4-1. Therefore, this summary focuses on the three remaining water bodies: South Sweeper Creek, Sweeper Cove, and Kuluk Bay. As was the case for the human health risk assessment, Finger Bay, Andrew Bay, and Shagak Bay were evaluated in the final RI/FS management plan (URS 1996b) and were determined not to require ecological risk assessments.

Within the aquatic and marine habitats of the receiving water bodies, sediment-associated benthic or epibenthic biota and organisms that feed on sediment-associated biota are at the greatest risk from chemical contamination due to their potential exposure to the higher concentrations of chemicals in sediment relative to concentrations in the overlying water. Much of the information regarding the species potentially exposed to contaminants is equally applicable to Sweeper Cove, Clam Lagoon, and Kuluk Bay.

Sweeper Cove and Kuluk Bay are both arms of the Bering Sea. Sweeper Cove is a 448-acre inlet surrounded by land on the north, west, and south and is thus more protected from wind and currents than is the larger Kuluk Bay, which is bounded by land to the west and south. With the exception of small sandy beaches at some locations, notably near the mouth of South Sweeper Creek, Sweeper Cove has a rocky intertidal zone. The shorelines of Kuluk Bay are a mixture of rocky and sandy beaches separated by rocky intertidal zones.

South Sweeper Creek contains a variety of habitats, from fresh water in its upper reaches to estuarine and tidally influenced at its mouth. Both Sweeper Cove and Kuluk Bay contain extensive kelp beds. Benthic invertebrates include a number of polychaete, bivalve, and echinoderm species. Blue mussels are common in rocky intertidal zones throughout Adak. Sea urchins, sea cucumbers, and sand dollars are all common echinoderm species. Common fish species include several species of flatfish (rock sole, starry flounder, Pacific halibut). Other fish species, such as sand lance and Pacific cod, are found in appropriate habitats throughout the various marine systems. Several salmonid species (Dolly Varden, coho and pink salmon) utilize South Sweeper Creek.

The two most commonly observed marine mammals are sea otter and harbor seal, which are observed throughout the marine environment of Adak. Minke and orca whales and Steller's sea lions have been observed in Sweeper Cove. The following birds are year-round residents: mallard, Aleutian green-winged teal, greater scaup, harlequin duck, red-breasted merganser, rock sandpiper, pelagic cormorant, glaucous-winged gull, pigeon guillemot, and marbled murrelet.

Dolly Varden is the most common fish species in both Andrew Lake and South Sweeper Creek. Anadromous pink and coho salmon also use South Sweeper Creek. Three-spine stickleback and coast range sculpin are also common in streams and Andrew Lake. Kokanee and a landlocked population of coho salmon are also found in Andrew Lake.

6.2.3 Ecological Receptor and Endpoint Identification

The final target ecological receptors and ecological assessment and measurement endpoints were selected in consultations between the Navy and the regulatory agencies during a series of Biological Technical Assistance Group (BTAG) meetings, conference calls, and written correspondence. The target ecological receptors selected for evaluation during the ecological risk assessment were the following:

Lacustrine environment (receptors that reside in or feed within lakes):

Benthic community—macroinvertebrates
Predatory pelagic fish —Dolly Varden
Piscivorous bird—Arctic tern

Fluvial environment (receptors that reside in or feed within streams):

Benthic community—macroinvertebrates
Predatory pelagic fish—Dolly Varden
Piscivorous bird—Arctic tern

Nearshore marine environment:

Benthic community—macroinvertebrates
Intertidal community—blue mussel
Bottom-dwelling fish—sand lance, rock sole
Benthivorous bird—rock sandpiper
Piscivorous bird—pelagic cormorant
Marine mammals—sea otter, harbor seal

Biota exposed to multiple sites:

Aquatic sites—Aleutian green-winged teal
Terrestrial sites—peregrine falcon

Terrestrial biota exposed to individual SWMUs:

Herbivorous birds—song sparrow
Insectivorous birds—Lapland longspur
Carnivorous birds—common raven

Measurement endpoints generally consisted of comparing chemical concentrations in environmental media (sediment, surface water) or target receptors (fish, benthic invertebrates) to toxicity reference values derived from a variety of sources. The toxicity reference values corresponded to either the lowest observed effects concentration (LOEC), no observed effects concentration (NOEC), or concentrations protective of a defined percentile of receptors.

Terrestrial receptors and the food chain model measurement endpoints were based on comparisons of estimated ingested doses of chemicals to ingested dose toxicity reference values. A series of sediment toxicity tests with three species of benthic invertebrates were also performed on sediments of Sweeper Cove and Clam Lagoon.

6.2.4 Chemicals of Potential Concern Selection

Identification of COPCs focuses the ecological risk assessment on those chemicals most likely to cause risks to organisms. COPC selections were made for individual environmental media (sediment, aquatic biota tissues, surface water) or exposure scenario (food chain models). For media other than sediments, COPC selection used a conservative screen to eliminate chemicals of low concern from the detailed evaluations of the risk characterization and uncertainty analyses. For sediments, risks were evaluated on an individual sampling station basis.

A chemical was chosen as a COPC by use of the following five criteria:

1. The chemical was detected in at least 5 percent of the samples analyzed.

2. The maximum detected concentration of an inorganic chemical exceeded the background concentration of the chemical.

3. For both organic and inorganic chemicals, the maximum detected concentration exceeded the RBSC for that chemical.

4. For tissues used in food chain modeling, an organic chemical with a log octanol-water partition coefficient (log K_{OW}) greater than or equal to 4.0 was considered a COPC to evaluate food chain biomagnification.

5. A chemical was retained as a COPC if an RBSC could not be found for that chemical.

Twenty chemicals (6 inorganics, 10 PAHs, and 4 other SVOCs) were identified as COPCs in sediments of Sweeper Cove and South Sweeper Creek. No sediment chemicals in Clam Lagoon or Andrew Lake exceeded their respective RBSCs. Barium, beryllium, and 4-chloro-3-methylphenol were retained as sediment COPCs in either Clam Lagoon or Andrew Lake because no RBSCs have been established for these chemicals.

Eleven groups of aquatic biota tissues were evaluated to identify COPCs. The groups of tissues were polychaetes, blue mussels, and rock sole from Sweeper Cove, Dolly Varden from South Sweeper Creek; blue mussel, polychaetes, rock sole, and sandlance from Clam Lagoon; Dolly

Varden from Andrew Lake; and blue mussels and rock sole from Kuluk Bay. Most of the identified COPCs were 1 of 12 inorganics, with cadmium (a COPC in 8 of the 11 groups), and vanadium (9) most commonly identified as COPCs. Arsenic, chromium, and zinc were identified as COPCs in 6 of the 11 aquatic biota tissue groups. Nickel, lead, cobalt, barium, selenium, copper, and antimony were identified as COPCs in 4 or fewer of the 11 biotic groups. Twenty organic chemicals (two phthalates, nine pesticides/Aroclors, seven PAHs, and two other SVOCs) were identified as COPCs in at least one of the aquatic species evaluated. Adrin (five) and bis(2-ethylhexyl)phthalate (three) were the most commonly identified organic COPCs. Diethylphthalate, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor 1254, and benzoic acid were identified two times as COPCs, while endosulfan sulfate, endrin, heptachlor, Aroclor 1260, acenaphthene, fluoranthene, naphthalene, benzo(a)anthracene, phenanthrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and 4-methylphenol were identified as COPCs in one tissue group. Polychlorinated biphenyls (PCBs) were not identified as a COPC to any of the aquatic biota species, but were identified as a COPC to the bird and mammal receptors listed in Section 6.2.3. PCBs were retained as a wildlife COPC to ensure that potential ecological risks from the ability of some PCB congeners to biomagnify through a food web were evaluated.

Food chain modeling utilized the same COPC list as was determined for the aquatic biota species, with the addition of several detected organic compounds whose log K_{OW} exceeded 4.0. These organic chemical COPCs included PCBs, several chlorinated pesticides, and three phthalate compounds.

Copper, the only chemical in surface water that exceeded federal marine ambient water quality criteria, was retained as a COPC in Sweeper Cove and South Sweeper Creek. Barium and vanadium in Sweeper Cove and barium, vanadium, xylenes, and 2-methylnaphthalene were retained as surface water COPCs in South Sweeper Creek due to the absence of RBSCs for these compounds.

For individual terrestrial sites, COPCs were selected by comparing site chemical concentrations in soil and sediment to risk-based screening concentrations found in the PSE guidance document (URS 1996c). The individual site COPCs are presented in Section 5.

6.2.5 Risk Characterization

A quantitative risk assessment was performed for all target receptors and chemicals for which toxicity reference values were available. The risk assessment was performed only for complete exposure pathways by which target receptors could be exposed to COPCs. Risk characterizations were presented as HQ, calculated as the chemical concentration in a sample (or dose to a receptor) divided by a toxicity reference value. HQs for individual chemicals were summed to provide an overall HI for each site. Exposure point concentrations were termed the RME concentration, which was calculated as either the lower of the 95 percent upper confidence limit of the mean sample concentration or the maximum detected concentration.

At the completion of the detailed exposure and toxicity assessments and risk characterization phases of the ecological risk assessment, the COPCs for each receptor and environmental medium may be defined as chemicals of concern (COCs.) COCs represent site-specific risk drivers that cause exceedance of acceptable risk thresholds for ecological receptors exposed to contaminated media at a site. COCs may differ from COPCs at a given site because COPC selection is based on conservative exposure and toxicity assumptions for receptors exposed to site contaminants, whereas COC selection is based on site-specific exposure and toxicity scenarios, which may reduce or eliminate the receptor exposure to the toxicity of site contaminants assumed during COPC selection.

The following paragraphs describe the identified ecological risks by drainage basin, and then by environmental medium or target receptor within each drainage.

Sweeper Cove

Sediment. Four sampling stations in Sweeper Cove had an HI that exceeds 10: Stations 706, 710, 711, and 731 (Figure 6-1). The largest HI was 21 at Station 710. Other station HIs ranged between 0.31 and 8.1. Fourteen of the 19 Sweeper Cove sediment sampling stations had no chemicals with individual HQs greater than 1.0, although only 3 of these stations (Stations 704, 734, 735) had HIs that were also less than 1.0. PAH compounds accounted for most of the individual chemicals with HQs greater than 1.0. PCBs, with a concentration of 0.444 mg/kg, had an HQ of 3.4 at Station 707, the only Sweeper Cove station with a PCB HQ exceeding 1.0. Inorganics had very low HQs, with only antimony (two stations) and nickel (one station) having HQs greater than 1.0.

Sediment toxicity tests disclosed significant adverse effects in amphipods at three stations (710, 711, 712), all of which are in the pier area in the northeast corner of Sweeper Cove. Adverse effects to polychaetes were observed in one of two field replicates from Station 712, but not at any other stations. Adverse effects to blue mussel larvae were observed at two stations, one (706) near the mouth of South Sweeper Creek, and the other (739) in the central basin of the cove.

Correlations between sediment chemistry and toxicity test results found significant correlations only between sediment chemistry and the amphipod test results. Three PAH compounds and bis(2-ethylhexyl)phthalate were the only sediment chemicals that correlated with amphipod mortality.

The use of both sediment chemistry comparisons to toxicity reference values and sediment toxicity test results to identify potential ecological risks to benthic biota serves to reduce the uncertainty of the risk assessment conclusions. With the exception of Stations 710, 711, and 712, the three stations in the northeast corner of Sweeper Cove with both elevated hazard indices and amphipod mortality, there is no statistically apparent relationship between Sweeper Cove sediment chemistry and the response of any of the three organisms used during sediment toxicity testing.

Aquatic Biota. Comparison of tissue residues in polychaetes, blue mussels, and rock sole to toxicity reference values and the toxicological literature on tissue residues associated with adverse effects resulted in a determination that zinc residues in polychaetes (zinc RME concentration of 47.6 mg/kg and HQ = 2.4) and blue mussels (zinc RME concentration of 37.3 mg/kg and HQ = 1.9) have a small potential to pose adverse ecological risks. Arsenic residues in rock sole (arsenic RME concentration of 7.44 mg/kg and HQ = 1.5) also have a small potential to pose adverse ecological risks.

Surface Water. No chemicals in surface water are believed to pose any ecological risks to marine biota. Copper, with a maximum concentration of 12 µg/L, had a maximum HQ of 4.0, but its concentration range is well within the naturally occurring copper concentrations found in uncontaminated estuaries throughout the world.

Food Chain Models. HQs for the rock sandpiper, pelagic cormorant, sea otter, and harbor seal were less than 1.0, suggesting no risks to these target ecological receptors.

South Sweeper Creek

Sediment. HIs of 0.73, 45, and 1.4 were observed at three sediment sampling locations within South Sweeper Creek. A PCB HQ of 42 based on 5.46 mg/kg total PCBs was responsible for nearly all of the HI at the station where the HI was 45. Butylbenzylphthalate was the only other individual chemical with an HQ greater than 1.0 in South Sweeper Creek.

Adverse effects were observed on blue mussel larval development exposed to sediments from all three stations in South Sweeper Creek where toxicity tests were performed. Neither the amphipod or polychaete toxicity tests showed any adverse effects from any location in South Sweeper Creek.

Aquatic Biota. Four chemicals pose ecological risks to Dolly Varden. Lead (RME concentration of 2.02 mg/kg and HQ = 32) was determined to have a significant potential to pose ecological risk. Arsenic (RME concentration of 3.18 mg/kg and HQ = 2), cadmium (RME concentration of 0.236 mg/kg and HQ = 5.6), and zinc (RME concentration of 35.1 mg/kg and HQ = 1.8) have a small potential to pose adverse risks.

Food Chain Models. No chemicals have HQs greater than 1.0 for the arctic tern, suggesting there is no ecological risk to this receptor.

Kuluk Bay

Sediment. No chemicals were determined to pose significant ecological risks to benthic biota exposed to sediments (URSG 1997a). Antimony (maximum concentration of 3.7 mg/kg) and PCBs (maximum concentration of 0.18 mg/kg) were the only chemicals that had HQs greater than 1.0 (HQ < 1.5), which was at only 1 of 20 sediment sampling stations.

Aquatic Biota. Chromium (RME concentration of 4.64 mg/kg and HQ = 26), copper (RME concentration of 20 mg/kg and HQ = 6.7), and lead (RME concentration of 1.21 mg/kg and HQ =19) were detected in blue mussels at higher concentrations than they were in mussels from either Sweeper Cove or Clam Lagoon. The elevated chromium and copper concentrations were associated with a single sampling event offshore of Palisades Landfill (URSG 1997a). Cadmium (RME concentration of 0.082 mg/kg and HQ = 2.0) is the only chemical that has a small potential to pose ecological risks to rock sole (URSG 1997a).

Food Chain Models. HQs for the pelagic cormorant, sea otter, and harbor seal were less than 1.0, suggesting no risk to these receptors (URSG 1997a).

Individual Terrestrial Site Evaluations

Due to the large number of individual SWMUs, the identified chemicals posing unacceptable ecological risk are presented in a table rather than in text. Table 6-6 presents the ecological risk by media for each site and the chemicals contributing to the total hazard index. As shown in the table, 12 of the 15 terrestrial sites evaluated for their potential ecological risk during the PSE process were found to have soil, sediment, or both with an HI exceeding 1.0; these sites were evaluated in the feasibility study (URSG 1997c). The COCs most commonly identified as having a potential to pose unacceptable ecological risks were PCBs, zinc, lead, copper, and nickel. Table 6-7 presents the ecological risk drivers responsible for the unacceptable risk. This table also shows media of concern, chemical concentrations, chemical-specific and cumulative risks, and RBSC and ARAR values.

Multiple Terrestrial Site Evaluation

No individual chemicals had HQs greater than 1.0 for either the Aleutian green-winged teal or peregrine falcon. HIs for these two species were also less than 1.0, indicating that the Aleutian green-winged teal and peregrine falcon are not at risk from site-related chemicals.

6.2.6 Uncertainty Analysis

The largest uncertainty in the ecological risk assessment was the interpretation of risks from naturally occurring concentrations of inorganics that exceed toxicity reference values. As risks from naturally occurring background concentrations cannot be attributed to chemical releases from CERCLA sites, it was important to separate naturally occurring risks from site-related risks (U.S. EPA 1998, p. 62). This separation was done with incremental risk calculations. Incremental risk is defined as that portion of the total risk attributed to chemical concentrations that exceed naturally occurring background concentrations. The explicit assumption in this approach was that biota are adapted to their natural environment, even if they contain what may be considered elevated inorganic concentrations in other parts of the world or in laboratory studies.

The State of Alaska does not support the reported findings of the Adak Island background study (URS 1995c). Several inorganics were reported at concentrations that exceed the highest detected background level.

Using the same procedures used to assess ecological risks to aquatic biota in Sweeper Cove and South Sweeper Creek, Clam Lagoon, Andrew Lake, and Kuluk Bay, the following HIs were calculated for aquatic biota collected from background stations:

Receptor	HI
Blue mussel	47
Marine polychaetes	40
Sand lance	25
Rock sole	11
Dolly Varden	7.8

After evaluation of the uncertainty regarding naturally occurring levels of inorganics, the final conclusions of the ecological risk assessment were that the most significant potential risks were to benthic invertebrates in South Sweeper Creek and Sweeper Cove, Dolly Varden trout in South Sweeper Creek, and blue mussels and rock sole in Kuluk Bay. PCBs are the COC to benthic biota in South Sweeper Creek, PAHs are the COCs to benthic biota in Sweeper Cove, and lead and cadmium are COCs to Dolly Varden trout in South Sweeper Creek. Chromium, copper, and lead are COCs to blue mussels from Kuluk Bay, while cadmium is a COC to rock sole from Kuluk Bay.

Numerous other factors of the ecological risk assessment have uncertainty associated with them. These uncertainties are described in Table 6-8.

6.2.7 Summary of Ecologically Significant Risks

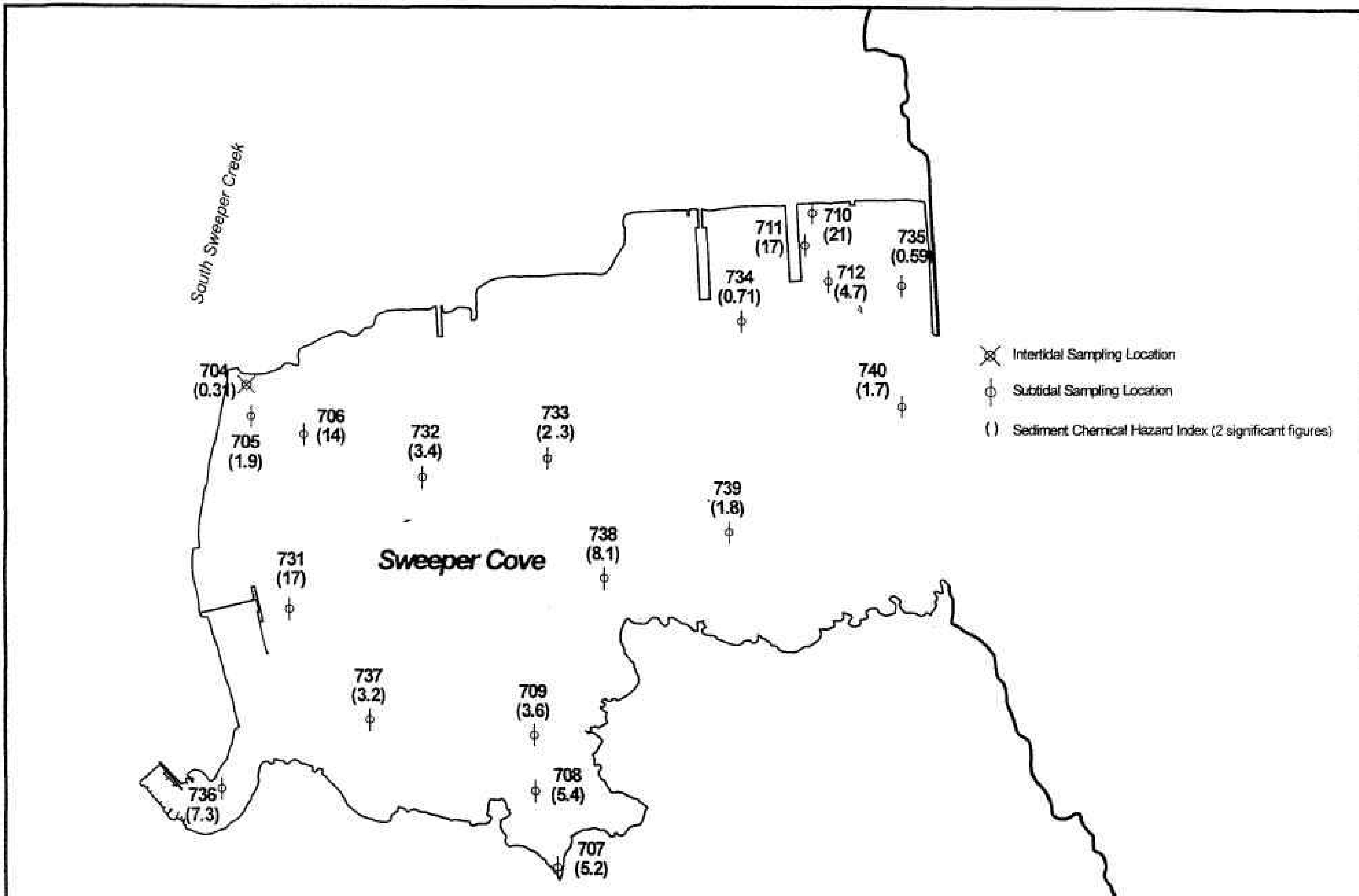
Ecologically relevant endpoints "reflect important characteristics of the system and are functionally related to other endpoints" (U.S. EPA 1992). Certain major categories of organisms (such as primary producers, forage species, and keystone predators) and ecosystem processes (such as primary production and nutrient cycling) are generally considered ecologically relevant. The guidance document for the derivation of EPA's ambient water quality criteria (Stephan et al. 1985) considers mortality, reproduction, and growth as ecologically relevant measures of toxicity.

Using the above guidelines to define ecological relevance and using a weight of evidence approach to assess the ecological relevance of all risks identified in the risk characterization phase of the ecological risk assessment, significant ecological risks are limited to benthic and epibenthic biota in Sweeper Cove and South Sweeper Creek, Dolly Varden in South Sweeper Creek, and blue mussels and rock sole in Kuluk Bay.

Although PCBs can and do biomagnify to high concentrations in terrestrial and marine bird and mammal species, results of the food chain modeling indicated that PCBs do not pose significant ecological risks to terrestrial receptors. Food chain modeling performed in the Adak RI/FS indicated that for all terrestrial wildlife and marine mammal species evaluated, all individual chemical HQs were less than 1.0, indicative of no significant ecological risks to wildlife species. This analysis included the evaluation of risk to wildlife that potentially become exposed to contaminants at multiple sites (i.e., all 29 SWMUs for which chemical data are available). Under the more conservative exposure assumptions used in the PSE evaluations (i.e., a receptor spends its entire life within the boundaries of an individual SWMU), risks to terrestrial wildlife species were identified. Remedial actions at SWMUs 4, 16, and 27 and SA 95 were undertaken as a result of the individual site ecological risk assessment findings.

The absence of ecologically significant risks to the higher trophic level birds and mammals may appear somewhat at odds with the findings of unacceptable human health risks from consumption of Adak resident fish. This apparent inconsistency is likely due to the evaluation of both carcinogenic and noncarcinogenic risks from PCBs and arsenic in the human health risk assessment, but only noncarcinogenic risks in the ecological risk assessment. Carcinogens are assumed to have no threshold concentration below which an increased incidence of cancer occurs, whereas noncarcinogens are assumed to have a dose below which no adverse effects are observed. Human health and ecological risk toxicity reference values are generally different for any given chemical, which also contributes to different interpretations of the risk posed by a chemical residue in biota. This difference in interpreting risks from the same residue or dose of a chemical accounts for the different conclusions of the human health and ecological risk assessments.

Every terrestrial site with an HI greater than 1.0 was evaluated in the feasibility study (URSG 1997c) to define ecologically significant risks.



CLEAN COMPREHENSIVE LONG TERM ENVIRONMENTAL ACTION NAVY	1:12000	**Figure 6-1** **Sediment Sampling Station Hazard Indices** **Sweeper Cove**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

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Table 6-1
EPA Region 10 Standard Default and Adak-Specific Exposure Parameters Used for Individual CERCLA Sites

Medium and Intake Route	Parameter	Unit	Age Group	EPA Default Residential Values	Adak-Specific Values		
					Residential	Recreational	Occupational
Soil (ingestion)	Exposure frequency	days/year	Adult	350	194[a]	38[b]	250
			Child	350	194[a]	38[b]	NA
	Ingestion rate	milligrams/day	Adult	100	100	100	50
			Child	200	200	NA	NA
Soil (inhalation of particulates)	Exposure frequency	days/year	NA	350	194[a]	38[b]	250
	Inhalation rate	cubic meters/day	NA	20	20	20	20
Sediment (ingestion)	Exposure frequency	days/year	Adult	350	194[a]	38[b]	NA
	Ingestion rate	milligrams/day	Adult	100	32.5[c]	32.5[c]	NA
Groundwater (ingestion)	Exposure frequency	days/year	NA	350	350	NA	NA
	Ingestion rate	liters/day	NA	2	2	NA	NA
Groundwater (inhalation)	Exposure frequency	days/year	NA	350	350	NA	NA
	Exposure time	hours/day	NA	24	0.25[d]	NA	NA
	Inhalation rate	cubic meters/hour	NA	0.625	0.625[d]	NA	NA
All	Exposure duration	year	NA	30 (Adult 24; Child 6)	15 (Adult 9; Child 6)[e]	5	5
	Body weight	kilogram	Adult Child	70 15	70 15	70 NA	70 NA
	Averaging time Carcinogenic Noncarcinogenic	day	 NA NA	 25,550 10,950	 25,550 5,475	 25,550 1,825	 25,550 1,825

Table 6-1 (Continued)
EPA Region 10 Standard Default and Adak-Specific Exposure Parameters
Used for Individual CERCLA Sites

[a]The Adak residential exposure frequency (194 days per year) is based on the assumption that, because of the typical weather conditions on Adak, daily exposure (7 days per week) to soil would occur 5 months per year and less frequent exposure (2 days per week) would occur during the remaining 7 months per year. In addition, it is assumed that a person takes a 2-week vacation (or is otherwise off island) each year.
[b]The recreational exposure frequency (38 days per year) assumes that Adak residents may visit chemically affected sites for recreational activities once per week during the 5 warmer months and once every 2 weeks during the 7 colder months.
[c]The Adak residential and recreational ingestion rate (32.5 mg/kg) for sediment is derived by multiplying the soil ingestion rate of 100 mg/kg by ratio of the national average time spent swimming (2.6 hours per day) and the assumed total time of recreational exposure (8 hours per day).
[d]The exposure time for inhalation of volatiles from groundwater assumes that inhalation exposure would occur during showering and washing (national upper bounds = 15 minutes per day). The inhalation rate is estimated as 0.625 cubic meter per hour, which is equal to the EPA default indoor inhalation rate of 15 cubic meters per day divided by 24 hours.
[e]The residential exposure duration (15 years) is based on a demographic survey and information regarding the length of time workers have historically been employed on island. It is intended to be an upper-bound estimate, based on historical data. In addition, it assumes that the receptor is age 0 to 15 (possibly a dependent of an on-island worker).

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
EPA - U.S. Environmental Protection Agency
NA - not applicable

Table 6-2
Exposure Parameters for Sweeper Cove, South Sweeper Creek, and Kuluk Bay

Pathway	Exposure Parameter	Unit	Receptor Population	
			Current and Future Recreational Fisher	Future Subsistence Fisher
Incidental ingestion of sediment	Ingestion rate	mg/day	32.5[a]	100
	Exposure frequency	days/year	38[a]	183[b]
	Exposure duration	year	5	30
	Conversion factor	kg/mg	1×10^{-6}	1×10^{-6}
	Body weight	kg	70	70
	Averaging time (noncarc)	day	1,825	10,950
	Averaging time (carc)	day	25,550	25,550
Dermal contact with sediment	Contact rate	mg/cm²	1	1
	Exposure frequency	days/year	38[a]	183[b]
	Skin surface area	cm²	312[c]	312[c]
	Exposure duration	year	5	30
	Permeability coefficient	unitless	Chemical-specific	Chemical-specific
	Conversion factor	kg/mg	1×10^{-3}	1×10^{-3}
	Body weight	kg	70	70
	Averaging time (noncarc)	day	1,825	10,950
	Averaging time (carc)	day	25,550	25,550
Dermal contact with surface water	Exposure frequency	days/year	38[a]	183[b]
	Skin surface area	cm²	312	312
	Exposure time	hr/day	2[d]	8[d]
	Exposure duration	year	5	30
	Permeability coefficient	cm/hr	Chemical-specific	Chemical-specific
	Conversion factor	L/cm³	1×10^{-3}	1×10^{-3}
	Body weight	kg	70	70
	Averaging time (noncarc)	day	1,825	10,950
	Averaging time (carc)	day	25,550	25,550
Ingestion of fish	Ingestion rate	g/day	118.1	126
	Fraction ingested	unitless	1	1
	Exposure frequency	days/year	38[a]	365
	Exposure duration	year	5	30
	Conversion factor	kg/g	1×10^{-3}	1×10^{-3}

Table 6-2 (Continued)
Exposure Parameters for Sweeper Cove, South Sweeper Creek, and Kuluk Bay

Pathway	Exposure Parameter	Unit	Receptor Population	
			Current and Future Recreational Fisher	Future Subsistence Fisher
Ingestion of fish (Continued)	Body weight	kg	70	70
	Averaging time (noncarc)	day	1,825	10,950
	Averaging time (carc)	day	25,550	25,550
Ingestion of shellfish	Ingestion rate	g/day	1.1	26
	Fraction ingested	unitless	1	1
	Exposure frequency	days/year	38[a]	365
	Exposure duration	year	5	30
	Conversion factor	kg/g	1×10^{-3}	1×10^{-3}
	Body weight	kg	70	70
	Averaging time (noncarc)	day	1,825	10,950
	Averaging time (carc)	day	25,550	25,550

[a]Adak PSE-2 Batch 2 value (URS 1996a)
[b]Assumes subsistence fisher fishes every other day
[c]Average surface area of hands and feet combined (U.S. EPA 1989)
[d]Recreational exposure time assumes an average of 2 hours/day direct contact with surface water while recreationally harvesting fish or shellfish (best professional judgement). Subsistence exposure time assumes a reasonable maximum of 8 hours/day direct contact with surface water while harvesting fish or shellfish (best professional judgement).

Notes:
All values are EPA Region 10 default values unless otherwise specified
carc - carcinogenic
cm - centimeter
g - gram
hr - hour
kg - kilogram
L - liter
mg - milligram
noncarc - noncarcinogenic

Table 6-3
Toxicity Values (Reference Doses and Cancer Slope Factors) for Chemicals of Potential Concern at Sites and Water Bodies

Chemical	Oral RfD (mg/kg-day)	Affected Tissue, Process, or System	Inhalation RfD (mg/kg-day)	Affected Tissue, Process, or System	Source	Carcinogen Weight of Evidence[a]	Oral CSF $(mg/kg\text{-}day)^{-1}$	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Source
cis-1,2-Dichloroethene	1.00E-02	Blood	—	—	HEAST 1994	D	—	—	—
trans-1,2-Dichloroethene	2.00E-02	Blood	—	—	HEAST 1994		—	—	—
1,3-Dinitrobenzene	1.00E-04	Spleen	—	—		D	—	—	IRIS 1995
1,4-Dichlorobenzene	—	—	— (2.29 E-01)	—	U.S. EPA 1996b	C	2.40E-02	2.3E-01 (—)	HEAST 1994 IRIS 1995
2,3,7,8-TCDD	—	—	—	—	—	B2	1.50E+05	1.50E+05	HEAST 1994
2,4-Dinitrotoluene	2.00E-03	CNS	—	—	IRIS 1995	B2	— (6.8E-01)[b]	—	U.S. EPA 1996b
2,6-Dinitrotoluene	1.00E-03	CNS	—	—	HEAST 1994	B2	— (6.8E-01)[b]	—	U.S. EPA 1996b
2-Methylnaphthalene	4.00E-02	Weight	—	—	U.S. EPA 1996b		—	—	—
4,4'-DDE	—	—	—	—		B2	3.40E-01	—	IRIS 1995
Antimony	4.00E-04	Blood	—	—	IRIS 1994		—	—	
Aroclor 1016	— (7.0E-05)	—	—	—	IRIS 1995	B2	7.70E+00[c]	—	IRIS 1995
Aroclor 1232	NV		NV		—		NV	NV	—
Aroclor 1248	NV (—)		NV (—)		IRIS 1995		NV (7.70E+00)[c]	NV (—)	IRIS 1995
Aroclor 1254	— (2.0E-05)	—	—	—	IRIS 1995	B2	7.70E+00[c]	—	IRIS 1995
Aroclor 1260	—	—	—	—	—	B2	7.70E+00[c]	—	IRIS 1995
Arsenic	3.00E-04	Skin	—	—	IRIS 1994	A	1.75E+00 (1.50E+00)	1.50E+01 (1.51E+01)	IRIS 1994 IRIS 1995
Barium	7.00E-02	Blood	1.00E-04 1.43E-04	Develop-ment	IRIS 1994 IRIS 1995		—	—	—
Benzene	—	—	—	—	—	A	2.90E-02	2.90E-02	IRIS 1994

Table 6-3 (Continued)
Toxicity Values (Reference Doses and Cancer Slope Factors)
for Chemicals of Potential Concern at Sites and Water Bodies

Chemical	Oral RfD (mg/kg-day)	AffectedTissue, Process, or System	Inhalation RfD (mg/kg-day)	Affected Tissue, Process, or System	Source	Carcinogen Weight of Evidence[a]	Oral CSF $(mg/kg\text{-}day)^{-1}$	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Source
Benzo(a)anthracene	—	—	—	—	—	B2	7.3E+00 (7.30E-01)	6.10E+00 (6.1E-01)	- -
Benzo(a)pyrene	-	—	—	—	—	B2	7.30E+00	6.1E+00	- -
Benzo(b)fluoranthene	- -	—	—	—	—	B2	7.3E+00 (7.30E-01)	6.10E+00	IRIS 1995/ U.S. EPA 1996b
Benzo(k)fluoranthene	—	—	—	—	—	B2	7.30E+00 (7.30E-02)	6.10E+00 (—)	IRIS 1993 U.S. EPA 1996b/ IRIS 1995
Beryllium	5.00E-03	—	—	—	IRIS 1994	B2	4.30E+00	8.40E+00	IRIS 1994
bis(2-Ethylhexyl)phthalate	2.00E-02	Liver	—	—	IRIS 1994	B2	1.40E-02	—	IRIS 1994
Cadmium, food water	1.00E-03	Kidney	5.00E-04	—	IRIS 1994	B1	—	—	- -
Bromodichloromethane	2.00E-02	Liver	—	—	IRIS 1995	C	8.40E-02	—	IRIS 1995
Chloroform	1.00E-02	Liver	—	—	IRIS 1995	B2	6.10E-03	8.10E-02	IRIS 1995
Chromium III	1.00E+00	—	—	—	IRIS 1994		—	—	—
Chromium VI	5.00E-03	—	—	—	IRIS 1994	A	—	4.20E+01	IRIS 1994
Chrysene	—	—	—	—	—	B2	7.3E+00 (7.30E-03)	6.10E+00 (6.1E-03)	IRIS 1993 U.S. EPA 1996b
Cobalt	6.00E-02	—	8.60E-05	Lung	Poirier 1992/ U.S. EPA 1996b		—	—	—
Copper	3.70E-02	GI system	—	—	IRIS 1995	D	—	—	
Dibenz(a, h)anthracene	—	—	—	—		B2	7.30E+00	6.10E+00	U.S. EPA 1996b
Dibenzofuran	1.00E-03 (4.00E-03)	—	—	—	U.S. EPA 1996b	D	—	—	—
Dieldrin	5.00E-05	Liver	—	—	IRIS 1994	B2	1.60E+01	1.60E+01 (1.61E+01)	IRIS 1994 IRIS 1995

Table 6-3 (Continued)
Toxicity Values (Reference Doses and Cancer Slope Factors)
for Chemicals of Potential Concern at Sites and Water Bodies

Chemical	Oral RfD (mg/kg-day)	AffectedTissue, Process, or System	Inhalation RfD (mg/kg-day)	Affected Tissue, Process, or System	Source	Carcinogen Weight of Evidence[a]	Oral CSF (mg/kg-day)$^{-1}$	Inhalation CSF (mg/kg-day)$^{-1}$	Source
4-Amino-2,6-dinitrotoluene	NV (1.00E-03)[d]		NV (—)		HEAST 1995		NV (6.80E-01)[b]	NV (—)	U.S. EPA 1996b
Ethylbenzene	1.00E-01	Liver	2.86E-01	Develop- ment	IRIS 1994		—	—	—
Hexachlorobenzene	8.00E-04	Liver	—	—	IRIS 1994	B2	1.60E+00	1.60E+00 (1.61E+00)	IRIS 1994 IRIS 1995
Indeno(1,2,3-c,d)pyrene	—	—	—	—	—	B2	7.30E+00 (7.30E-01)	6.10E+00 (6.1E-01)	IRIS 1993 U.S. EPA 1996b
Lead	— (NA)	CNS	— (NA)	CNS	—	B2	— (NA)	— (NA)	- -
Manganese, food	1.40E-01	CNS	1.10E-04	Lung	IRIS 1994	D	—	—	—
Manganese, water	5.00E-03 (4.67E-02)	CNS	1.10E-04 (1.43E-05)	Lung	IRIS 1994 IRIS 1995		—	—	—
Mercury	3.00E-04	Kidney	8.58E-05	CNS	U.S. EPA 1996b		—	—	—
N-Nitrosodi-n-propylamine	—	—	—	—		B2	7.00E+00	—	IRIS 1995
N-Nitrosodiphenylamine	—	—	—	—		B2	4.90E-03	—	IRIS 1995
Naphthalene	4.00E-02	Weight	—	—	U.S. EPA 1996b	D	—	—	—
Nickel (as refinery dust)	—	—	—	8.40E-01			—	8.40E-01	
Nickel (as soluble salts)	2.00E-02	Weight	—	—	IRIS 1994		—	—	—
Selenium	5.00E-03	CNS	—	—	IRIS 1994		—	—	—
Silver	5.00E-03	Skin	—	—	IRIS 1994		—	—	—
Tetrachloroethene	1.00E-02	Liver	—	—	IRIS 1995	B2	5.10E-02 (5.20E-02)	6.30E-04 (2.03E-03)	IRIS 1995 U.S. EPA 1996b
Thallium, soluble salts	8.00E-05	Liver	—	—	IRIS 1994		—	—	—
Toluene	2.00E-01	Liver	1.14E-01	CNS	IRIS 1994		—	—	—

Table 6-3 (Continued)
Toxicity Values (Reference Doses and Cancer Slope Factors)
for Chemicals of Potential Concern at Sites and Water Bodies

Chemical	Oral RfD (mg/kg-day)	AffectedTissue, Process, or System	Inhalation RfD (mg/kg-day)	Affected Tissue, Process, or System	Source	Carcinogen Weight of Evidence[a]	Oral CSF $(mg/kg\text{-}day)^{-1}$	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Source
Trichloroethene	NV (6.00E-03)	 —	NV (—)	—	 U.S. EPA 1996b		NV (1.1E-02)	NV (6.00E-03)	U.S. EPA 1996b
Vanadium	7.00E-03	—	—	—	IRIS 1994		—	—	—
Xylenes (total)	2.00+00	Weight	—	—	IRIS 1994		—	—	—
Zinc	3.00E-01	Blood	—	—	—		—	—	—

[a]EPA weight of evidence:
- A - human carcinogen
- B1 - probable human carcinogen—limited human data available
- B2 - probable human carcinogen—sufficient evidence in animals and inadequate or no evidence in humans
- C - possible human carcinogen
- D - not classified as a human carcinogen

[b]Toxicity value for dinitrotoluene mixtures
[c]Toxicity value for total polychlorinated biphenyls, based on Aroclor 1260
[d]Toxicity value for 2,6-dinitrotoluene

Notes:
The exponential notation presented for risk values was used to conserve space and avoid using superscripts. Examples of equal values presented in different notations are: 7E-08 equals 7×10^{-8} and 3E-05 equals 3×10^{-5}.
Toxicity values are the same for PSE Batch 1 and 2 sites unless a second value is provided parenthetically. Values in parentheses correspond to values for Batch 2 sites.
For a given chemical, sources on first line apply only to values that did not change between Batch 1 and Batch 2. Sources provided on second line apply only to values that changed for Batch 2 sites.
When two sources are provided, separated by a slash, the first source is for the oral toxicity factor and the second is for the inhalation toxicity factor.
- - - No value is available; sources were checked and did not contain a value or source of value was undocumented.
CNS - central nervous system
CSF - cancer slope factor
DDE - dichlorodiphenyldichloroethylene
EPA - Environmental Protection Agency
GI - gastrointestinal
HEAST - Health Effects Assessment Summary Tables

Table 6-3 (Continued)
Toxicity Values (Reference Doses and Cancer Slope Factors)
for Chemicals of Potential Concern at Sites and Water Bodies

IRIS - Integrated Risk Information System
mg kg-day - milligrams per kilogram per day
NA - not analyzed
NV - no value determined
RfD - reference dose
TCDD - tetrachlorodibenzo-p-dioxin

Table 6-4
Summary of Estimated Human Health Risks for CERCLA Sites (Based on Adak-Specific Scenarios) by Drainage Basin

Site	Medium	Chemical Classes of COPCs	Subsistence Fisher		Recreational Fisher		Residential		Recreational		Occupational	
			Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Sweeper Cove Basin												
SWMU 10	SS	SVOC, P/A, TIN	—	—	—	—	6E-05	0.07	9E-07	<0.01	3E-06	0.01
SWMU 14	GW	VOC, SVOC, TIN	—	—	—	—	2E-05	2.1	—	—	—	—
	SL	SVOC, P/A	—	—	—	—	2E-05	—	—	—	1E-06	—
	Total		—	—	—	—	**4E-05**	**2.1**	—	—	**1E-06**	—
SMWU 15	GW	VOC, TIN	—	—	—	—	3E-05	0.4	—	—	—	—
	SD	SVOC, P/A D/F	—	—	—	—	7E-08	<0.01	7E-08	<0.01	—	—
	SL	SVOC, P/A, D/F	—	—	—	—	4E-05	<0.01	6E-07	<0.01	2E-06	<0.01
	Total		—	—	—	—	**7E-05**	**0.4**	**7E-07**	—	**2E-06**	—
SWMU 16	GW	TIN	—	—	—	—	4E-05	—	—	—	—	—
	SD	P/A	—	—	—	—	—	—	3E-10	—	—	—
	SS	VOC, SVOC, P/A	—	—	—	—	—	—	5E-07	<0.01	1E-06	<0.01
	Total		—	—	—	—	**4E-05**	—	**5E-07**	—	**1E-06**	—
SWMU 17	GW	VOC, SSVOC, P/A, TIN	—	—	—	—	1E-04	17	—	—	—	—
	SD	VOC, SVOC, P/A, TIN	—	—	—	—	1E-07	<0.01	1E-07	<0.01	—	—
	SW	VOC, SVOC, P/A, TIN	—	—	—	—	3E-04	28	1E-06	15	—	—
	SL	VOC, P/A, TIN	—	—	—	—	3E-05	0.3	2E-07	0.01	1E-06	0.04
	Total		—	—	—	—	**4E-04**	**45**	**3E-07**	**0.01**	**—**	**0.04**
SWMU 55	GW	VOC	—	—	—	—	1E-04	1	—	—	—	—
	SD	P/A, TIN	—	—	—	—	9E-04	<0.01	9E-08	<0.01	—	—
	SL	VOC, P/A	—	—	—	—	8E-08	<0.01	1E-08	<0.01	4E-08	<0.01
	Total		—	—	—	—	**1E-04**	**1**	**1E-07**	**—**	**4E-08**	**—**

Table 6-4 (Continued)
Summary of Estimated Human Health Risks for CERCLA Sites (Based on Adak-Specific Scenarios) by Drainage Basin

Site	Medium	Chemical Classes of COPCs	Subsistence Fisher		Recreational Fisher		Residential		Recreational		Occupational	
			Cancer Risk	**Hazard Index**	**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**	**Cancer Risk**	**Hazard Index**
Sweeper Cove Basin (Continued)												
SA 76	SS	SVOC, TIN, P/A	—	—	—	—	9E-05	0.6	1E-06	0.0	4E-06	0.08
Sweeper Cove	Rock Sole	P/A, TIN	1E-03	8	1E-05	0.4	—	—	—	—	—	—
	Blue Mussel	P/A, TIN	5E-05	0.7	3E-08 ~~5E-05~~	<0.01	—	—	—	—	—	—
	SW	TIN	—	0.9	—	<0.01	—	—	—	—	—	—
	Total		**1E-03**	**10**	**1E-05**	**0.4**	—	—	—	—	—	—
South Sweeper Creek	MS	P/A	4E-06	0.1	2E-08	<0.01	—	—	—	—	—	—
	SW ~~MW~~	TIN	—	<0.01	—	<0.01	—	—	—	—	—	—
	Dolly Varden	P/A, TIN	2E-04	2	2E-06	0.06	—	—	—	—	—	—
	Total		**2E-04**	**2**	**2E-06**	**0.06**	—	—	—	—	—	—
Clam Lagoon Basin												
SWMU 2 (Landfill)	SB	SVOC, P/A, TIN, D/F	—	—	—	—	1E-05	0.08	—	—	5E-07	0.01
Andrew Lake Basin												
SWMU 4	SB	SVOC, P/A, TIN, D/F	—	—	—	—	5E-05	0.4	—	—	2E-06	0.05
	SD	SVOC, P/A, TIN	—	—	—	—	1E-08	<0.01	1E-08	<0.01	—	—
	Total		—	—	—	—	5-E-05	0.4	1E-08	—	2E-06	0.05
Andrew Lake Basin												
SWMU 52 (53, 59)	SS	SVOC, P/A, TIN	—	—	—	—	5E-05	0.6	7E-07	0.1	2E-06	0.2

Table 6-4 (Continued)
Summary of Estimated Human Health Risks for CERCLA Sites (Based on Adak-Specific Scenarios)
by Drainage Basin

Site	Medium	COPCs	Subsistence Fisher		Recreational Fisher		Residential		Recreational		Occupational	
			Risk	**Index**	**Risk**	**Index**	**Risk**	**Index**	**Risk**	**Index**	**Risk**	**Index**
Shagak Bay Basin												
SWMU 20	SS	P/A	—	—	—	—	2E-05	<0.01	2E-07	<0.01	8E-07	<0.01
SWMU 21A	SL	~~SVOC~~, P/A, ~~TIN~~	—	—	—	—	1.4E-05	—	4E-07	—	2.5E-07	—
SWMU 23	SD	TIN	—	—	—	—	7E-08	<0.01	7E-08	<0.01	—	—
	SS	P/A, TIN, SVOC	—	—	—	—	1E-05	7	3E-07	0.3	6E-07	0.3
	Total						**1E-05**	**7**	**3E-07**	**0.3**	**6E-07**	**0.3**
SWMU 67	SD	P/A	—	—	—	—	—	—	4E-08	—	—	—
	SS	P/A	—	—	—	—	—	—	7E-06	—	2E-06	—
	Total		—	—	—	—	—	—	**7E-06**	—	**2E-06**	—
Kuluk Bay Basin												
Kuluk Bay	MS	TIN	2E-07	<0.01	2E-09	<0.01	—	—	—	—	—	—
	SW	TIN	—	1	—	0.05	—	—	—	—	—	—
	Rock Sole	P/A, TIN	5E-05	4	5E-07	0.3	—	—	—	—	—	—
	Blue Mussel	SVOC, P/A, TIN	7E-05	2	4E-08	<0.01	—	—	—	—	—	—
	Total		**1E-04**	**7**	**5E-07**	**0.35**	—	—	—	—	—	—
Finger Bay Basin												
SWMU29	SD	SVOC, P/A, TIN	—	—	—	—	7E-08	<0.01	7E-08	<0.01	—	—
	SB	SVOC, P/A, TIN, D/F	—	—	—	—	3E-05	0.6	—	—	2E-06	0.1
	Total						**3E-05**	**0.6**	**7E-08**	**<0.01**	**2E-06**	**0.1**

Table 6-4 (Continued)
Summary of Estimated Human Health Risks for CERCLA Sites (Based on Adak-Specific Scenarios) by Drainage Basin

Notes:

The exponential notation presented for risk values was used to conserve space and avoid using superscripts. Examples of equal values presented in different notations are: 7E-08 equals 7×10^{-8} and 3E-05 equals 3×10^{-5}.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COPC - chemical of potential concern
D/F - dioxins/furans
GW - groundwater
MS - marine sediment
PA - pesticides/Aroclors
P A - source area
SB - subsurface soil
SD - freshwater sediment
SL - soil
SS - surface soil
SVOC - semivolatile organic compounds
SW - surface water
SWMU - solid waste management unit
TIN - total inorganics
VOC - volatile organic compounds
— not applicable

Table 6-5
Human Health Risk Drivers for CERCLA Sites

Site	Current and Future Land Use	Medium of Concern	Exposure Scenario for Elevated Risk	Chemical	Cancer Risk	Total Cancer Risk	HQ	HI	RME	Max. Conc.	RBSC	ARAR
Sweeper Cove Basin												
SWMU 10	IND	SS	Residential	Indeno(1,2,3-cd)pyrene	2E-05	6E-05	—	<1	0.32	0.32	0.00194	9
				Aroclor 1260	3E-05		—		5.27	12	0.0184	1
SWMU 14	IND	GW	Residential	PCE	2E-05	2E-05	<1	2.1	52	52	3.27	5
				Thallium (T)	NC		1		3.15	3.3	0.292	2
		SL	Residential	Benzo(a)pyrene	1E-05	2E-05	—	—	2.83	12	0.0194	0.9
SWMU 15	IND	GW	Residential	PCE	3E-05	3E-05	<1	<1	132	410	3.27	5
		SL	Residential	Aroclor 1260	2E-05	4E-05	—	<1	4.09	40	0.0184	1
				2,3,7,8-TCDD (TEF)	1E-05		—		1.2E-04	1.3E-04	9.5E-07	[a]
SWMU 16	IND	GW	Residential	Aroclor 1260	4E-05	4E-05	—	—	0.8	0.8	0.0222	0.5
SWMU 17	IND	GW	Residential	Arcolor 1254	2E-05	1E-04	<1	17	0.361	0.97	0.0222	0.5
				Antimony (T)	NC		2		22.8	51.9	1.46	6
				Beryllium (T)	5E-05		<1		1.78	10	0.0396	4
				Manganese (T)	NC		2		3,110	12,100	170.5	—
				Thallium (T)	NC		10		27.1	300	0.292	2
				Vanadium (T)	NC		1		342	2,080	25.6	260
		SW	Residential	Aroclor 1260	4E-05	3E-04	—	2.4	0.51	1.4	0.0221	0.014
				Beryllium (T)	3E-05		<1		2.21	10.8	0.0396	4
		SL	Residential	Aroclor 1260	1E-05	3E-05	—	<1	1.4	13	0.0184	1
SWMU 55	IND	GW	Residential	PCE	1E-04	1E-04	1	1	360	360	3.27	5
SA 76	IND	SS	Residential	Indeno(1,2,3-cd)pyrene	3E-05	9E-05	—	<1	0.522	1.1	0.00194	9
				Arsenic	5E-05		—		39	98.5	0.081	4.5

Table 6-5 (Continued)
Human Health Risk Drivers for CERCLA Sites

Site	Current and Future Land Use	Medium of Concern	Exposure Scenario for Elevated Risk	Chemical	Cancer Risk	Total Cancer Risk	HQ	HI	RME	Max. Conc.	RBSC	ARAR
Sweeper Cove	—	Rock Sole Fillet	Subsistence Fisher	Aroclor 1260	5E-04	1E-03	—	8	0.306	0.341	0.000168	—
				Antimony	NC		2		0.0399	0.0536	0.0222	—
				Arsenic	9E-04		4		7.32	8.09	0.000864	—
				Cadmium	NC		1		0.737	1.15	0.0566	—
		Rock Sole Fillet	Recreational Fisher	Arsenic	9.56E-05	1E-05	<1	<1	7.32	8.09	0.000864	—
		Blue Mussel	Subsistence Fisher	Aroclor 1260	1E-05	5E-05	—	<1	0.0384	0.0396	0.000168	—
				Arsenic	4E-05		<1		1.57	1.6	0.000864	—
South Sweeper Creek	—	Dolly Varden Fillet	Subsistence Fisher	Aroclor 1260	2E-04	2E-04	—	2	0.127	0.149	0.000168	—
				Cadmium	NC		2		0.885	1.39	0.0556	—
Clam Lagoon Basin												
SWMU 2 (Landfill)	REC	SB	Residential	No risk drivers with >1E-05 risk		1E-05	—	<1	—	—	—	—
Andrew Lake Basin												
SWMU 4	REC	SB	Residential	Arsenic	3E-05	5E-05	<1	<1	24.2	24.2	0.081	4.5
Andrew Bay Basin												
SWMU 52 (53, 59)	REC	SS	Residential	Benzo(a)pyrene	1E-05	5E-05	—	<1	2.26	2.26	0.0194	0.9
				Arsenic	2E-05		<1		17.1	99.3	0.081	4.5
Shargak Bay Basin												
SWMU 20	REC	SS	Residential	Aroclor 1260	2E-05	2E-05	—	<1	3.06	33	0.0184	1

Table 6-5 (Continued)
Human Health Risk Drivers for CERCLA Sites

Site	Current and Future Land Use	Medium of Concern	Exposure Scenario for Elevated Risk	Chemical	Cancer Risk	Total Cancer Risk	HQ	HI	RME	Max. Conc.	RBSC	ARAR
SWMU 21A	REC	SL	Residential	Aroclor 1260	1.4E-05	1.4E-05	—	—	0.43	1.6	0.0184	1
SWMU 23	REC	SS	Residential	Arsenic	1E-05	1E-05	—	7	9.22	10	0.081	4.5
				Manganese	NC		6		91,200	96,200	1,419	—
Kuluk Bay Basin												
Kuluk Bay	—	Rock Sole Fillet	Subsistence Fisher	Aroclor 1254	5E-05	5E-05	2.9	4	0.033	0.043	0.00017	—
		Blue Mussel	Subsistence Fisher	Arsenic	6E-05	7E-05	<1	2[b]	4.06	2.58	0.0049	—
		SW	Subsistence Fisher	No risk drivers with HQ >1	NC	<1E-05	<1	1[b]	—	—	—	—
Finger Bay Basin								—				
SWMU 29	REC	SB	Residential	Aroclor 1254	1E-05	3E-05	<1	<1	2.51	3.6	0.0184	1

[a] Under 18 AAC 75, Table B1, the soil cleanup level for dioxin is to be determined on a site-specific basis.

[b] No risk drivers with an HQ > 1 for this pathway.

Notes:

The exponential notation presented for risk values was used to conserve space and avoid using superscripts. Examples of equal values presented in different notations are:

7E0-8 equals 7×10^{-8} and 3E-05 equals 3×10^{-5}.

ARAR - applicable or relevant and appropriate requirement

CERCLA - Comprehensive Environmental Responses, Compensation, and Liability Act

GW - groundwater (concentrations in µg/L)

HI - hazard index

HQ - hazard quotient

Table 6-5 (Continued)

Human Health Risk Drivers for CERCLA Sites

IND - industrial

NC - no cancer risks for this chemical

PCE - tetrachlorethene

RBSC - risk-based screening concentration

REC - recreational

RME - reasonal maximum exposure concentration

SA - source area

SB - subsurface soil (concentrations in mg/kg)

SL - soil (surface and subsurface soil, concentrations in mg/kg)

SS - surface soil (concentrations in mg/kg)

SW - surface water (concentrations µg/L)

SWMU - solid waste management unit

(T) - total; unfiltered phase

TCDD - tetrachlorodibenzo-p-dioxin

TEF - toxicity equivalency factor

— not applicable or not available

Table 6-6
Summary of Estimated Ecological Risks for CERCLA Sites by Drainage Basin

Site	Medium	Chemicals of Potential Concern	Hazard Index
Sweeper Cove Basin			
SWMU 10	SS	Aroclor 1260, copper, lead, silver, zinc	59
SWMU 14	—	No COPCs	—
SWMU 15	—	No COPCs	—
SWMU 16	SD	Aroclor 1260, methylene chloride, nickel	5
	SB	Aroclor 1260, nickel, thallium	4
	SS	4-Methylphenol, Aroclor 1260, lead, nickel, xylenes, zinc	27
SWMU 17 O/W 1 and Quonset Hut	SS	Aroclor 1260, cobalt, copper, lead, manganese, nickel, zinc	28
	SB	Acetone	2
SWMU 17 Hillside Seepage Area	SS	Aroclor 1254, Aroclor 1260, lead, nickel, zinc	50
	SB	Aroclor 1260	3
SWMU 17 Lower Wetlands	—	No COPCS	—
SWMU 17 Power Plant Tank Farm and Drum Accumulation Area 1	SS	Aroclor 1260	10
	SB	Aroclor 1260, arsenic, cobalt, copper, lead, manganese, nickel, xylenes, zinc	8
SWMU 17 Dry Cleaners and Drum Accumulation Area 2	SB	Acetone, Aroclor 1260, cobalt, copper, nickel, zinc	52
SWMU 17 Yakutat Creek	SW	Mercury	7
	SD	Aroclor 1260, copper, bis(2-ethylhexyl)phthalate, fluoranthene, fluorene, manganese, mercury, 2-methylnaphthalene, naphthalene	251
SWMU 17 Retention Pond	SW	Copper, iron, lead, mercury, zinc	160
	SD	Acenaphthene, anthracene, Aroclor 1260, chrysene, copper, dibenz(a,h)anthracene, fluoranthene, florene, lead, manganese, mercury, 2-methylnaphthalene, nickel, phenanthrene, pyrene, zinc	59
SWMU 17 North Area	SS	Aroclor 1254, Aroclor 1260, cobalt, lead, nickel, zinc	15
	SB	Aroclor 1260, benzene	3
SWMU 17 Waste Oil Pond	SD	Acenaphthene, anthracene, antimony, Aroclor 1254, Aroclor 1260, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, cadmium, chromium, chrysene, copper, bis(2-ethylhexyl)phthalate, fluorathene, fluorene, lead, mercury, naphthalene, nickel, phenanthrene, pyrene, xylenes, zinc	110
	SW	No COPCs	—

Table 6-6 (Continued)
Summary of Estimated Ecological Risks for CERCLA Sites
by Drainage Basin

Site	Medium	Chemical of Potential Concern	Hazard Index
Sweeper Cove Basin (Continued)			
SWMU 55	—	No COPCs	—
SA 76	SS	Aroclor 1260, cobalt, copper, lead, 4-methylphenol, zinc	11
Clam Lagoon Basin			
SWMU 2 (Landfill)	SB	Aroclor 1248, Aroclor 1254, copper, lead, 4-methylphenol, 2,3,7,8-TCDD (TEF), zinc	85
Andrew Lake Basin			
SWMU 4	SB	Aroclor 1254, Aroclor 1260, arsenic, copper, lead, nickel, 2,3,7,8-TCDD (TEF), zinc	130
	SD	Aroclor 1254, Aroclor 1260, lead, manganese, zinc	22
Andrew Bay Basin			
SWMU 52 (53, 59)	SS	Aroclor 1254, Aroclor 1260, copper, 2,4-dimethylphenol, lead, 4-methylphenol, silver, zinc	260
Shagak Bay Basin			
SWMU 20	SS	Aroclor 1260, copper, lead, zinc	42
	SB	Aroclor 1260	160
	SW	Silver	29
SWMU 21A	SL	Aroclor 1260	28
SWMU 23	SD	Cadmium, bis(2-ethylhexyl)phthalate, lead, manganese, nickel, zinc	51
	SS	Lead, manganese, zinc	92
SWMU 67	SD	Aroclor 1254, Aroclor 1260	68
	SS	Aroclor 1232, Aroclor 1260	86
Finger Bay Basin			
SWMU 29	SD	Anthracene, Aroclor 1260, fluoranthene, fluorene, manganese, phenanthrene, pyrene, zinc	26
	SB	Aroclor 1254, Aroclor 1260, cobalt, copper, lead, manganese, 4-methylphenol, 2,3,7,8-TCDD (TEF), zinc	170

Table 6-6 (Continued)
Summary of Estimated Ecological Risks for CERCLA Sites by Drainage Basin

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COPC - chemical of potential concern
O/W - oil/water separator
SA - source area
SB - subsurface soil
SD - freshwater sediment
SL - soil
SS - surface soil
SW - surface water
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TEF - toxicity equivalency factor
— - not applicable

Table 6-7
Ecological Risk Drivers for CERCLA Sites by Drainage Basin[a]

Site	Future Land Use	Medium of Concern	Ecological Risk Driver	HQ[b]	HI	RME	Max. Conc.	RBSC	ARAR
Sweeper Cover Basin									
SWMU 10	IND	SS	Aroclor 1260	59	59	5.27	12	0.09	NA
SWMU 16	IND	SS	Aroclor 1260	15	27	1.39	5.8	0.09	NA
SWMU 17, O/W 1 and Quonset Hut	IND	SS	Nickel	13	28	323	497	25	NA
SWMU 17, Hillside Seepage Area	IND	SS	Aroclor 1260	42	50	3.77	13	0.09	NA
SWMU 17, Power Plant Tank Farm and Drum Accumulation Area 1	IND	SS	Aroclor 1260	10	10	0.88	0.88	0.09	NA
SWMU 17, Dry Cleaners and Drum Accumulation Area 2	IND	SB	Aroclor 1260	45	52	4.04	5.7	0.09	NA
SWMU 17, Yakutat Creek	IND	SD	Aroclor 1260	181	251	0.907	2.9	0.005	NA
			Copper	70		213	560	70	NA
			Fluorene	15		0.512	0.93	0.035	NA
			2-Methylnaphthalene	31		2.02	2.8	0.065	NA
SWMU 17, Retention Pond	IND	SW	Iron	16	160	15,700	15,700	1,000	1,000
			Lead	14		45.3	47.5	3.2	2.5
			Mercury	107		1.28	1.3	0.012	0.77
			Zinc	17		1,860	2,160	110	120
		SD	Acenapthalene	22	659	3.3	3.3	0.15	NA
			Aroclor 1260	380		1.9	2.2	0.005	NA
			Fluorene	107		3.76	4	0.035	NA

Table 6-7 (Continued)
Ecological Risk Drivers for CERCLA Sites by Drainage Basin[a]

Site	Future Land Use	Medium of Concern	Ecological Risk Driver	HQ[b]	HI	RME	Max. Conc.	RBSC	ARAR
Sweeper Cover Basin (Continued)									
SWMU 17, Retention Pond (Continued)		SD	Mercury	19		2.79	3.3	0.15	NA
			2-Methylnaphthalene	97		6.3	6.3	0.065	NA
SWMU 17, North Area	IND	SS	No driver with HQ > 10		15	NA	NA	NA	NA
SWMU 17, Waste Oil Pond	IND	SD	Acenaphthalate	19	110	2.9	2.9	0.15	NA
			Antimony	400		0.03	12	12	NA
			Aroclor 1260	144		0.722	1.1	0.005	NA
			bis-(2-Ethylhexyl) phthalalate	21		10	10	0.47	NA
			Fluorene	343		12	12	0.035	NA
			Lead	20		711	3,020	35	NA
			Mercury	12		1.84	3.6	0.15	NA
			Phenanthrene	49		11	11	0.225	NA
			Pyrene	16		5.7	5.7	0.35	NA
SA 76	IND	SS	No driver with HQ > 10		11	NA	NA	NA	NA
South Sweeper Creek	—	SD	Aroclor 1260	185	201	5.455	5.455	0.13	NA
		Dolly Varden	Lead	32	45	2.02	2.65	0.064 (TSC)	NA
Clam Lagoon Basin									
SWMU 2 (Landfill)	REC	SB	2,3,7,8-TCDD (TEF)	18	85	3.5E-05	3.5E-05	2E-06	NA
			Lead	36		1,210	2,730	34	NA

Table 6-7 (Continued)
Ecological Risk Drivers for CERCLA Sites by Drainage Basin[a]

Site	Future Land Use	Medium of Concern	Ecological Risk Driver	HQ[b]	HI	RME	Max. Conc.	RBSC	ARAR
Andrew Lake Basin									
SWMU 4	REC	SD	No driver with HQ > 10		22	NA	NA	NA	NA
		SB	2,3,7,8-TCDD (TEF)	25	126	5E-05	5E-05	2E-06	NA
			Lead	31		1,040	1,040	34	NA
			Zinc	44		2,970	3,150	67	NA
Andrew Bay Basin									
SWMU 52 (53 59)	REC	SS	2,4-Dimethylphenol	21	262	9.65	17.7	0.47	NA
			4-Methylphenol	191		9.55	14.38	0.05	NA
			Lead	14		465	4,422	34	NA
			Zinc	23		1,550	15,156	67	NA
Shagak Bay Basin									
SWMU 20	REC	SS	Aroclor 1260	31	42	3.1	33	0.09	NA
		SB	Aroclor 1260	110	160	10.5	89	0.09	NA
		SW	Silver	29	29	3.49	7	0.12	3.4
SWMU 21A	REC	SL	Aroclor 1260	28	28	2.5	2.5	0.09	NA
SWMU 23	REC	SD	Manganese	36	51	16,400	20,900	460	NA
		SS	Manganese	76	92	91,200	96,200	1,200	NA
			Zinc	13		883	1,020	67	NA
SWMU 67	REC	SD	Aroclor 1260	65	68	0.325	0.42	0.13	NA
		SS	Aroclor 1260	78	86	7.05	11	0.09	NA

Table 6-7 (Continued)
Ecological Risk Drivers for CERCLA Sites by Drainage Basin[a]

Site	Future Land Use	Medium of Concern	Ecological Risk Driver	HQ[b]	HI	RME	Max. Conc.	RBSC	ARAR
Finger Bay Basin									
SWMU 29	REC	SD	Aroclor 1260	10	26	0.0479	0.085	0.005	NA
		SB	Aroclor 1254	28	172	2.51	3.6	0.09	NA
			Aroclor 1260	15		1.35	2.8	0.09	NA
			Lead	33		1,130	2,350	34	NA
			4-Methylphenol	23		1.14	2	0.05	NA
			2,3,7,8-TCDD (TEF)	39		7.8E-05	7.8E-05	2E-06	NA
			Zinc	23		1,520	3,050	67	NA

[a]Only pathways with total HI > 10 for ecological risk are shown. See Table 6-6 for complete list of pathways evaluated.
[b]HQ (or HI) < 1.0 not expected to pose an adverse risk to wildlife
HQ (or HI) between 1 and 10 poses a possible risk to wildlife
HQ (or HI) > 10 poses a probable risk to wildlife

Notes:
The exponential notation presented for risk values was used to conserve space and avoid using superscripts. Examples of equal values presented in different notations are:
7E0-8 equals 7×10^{-8} and 3E-05 equals 3×10^{-5}.
ARAR - applicable or relevant and appropriate requirement
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
HI - hazard index
HQ - hazard quotient
IND - industrial
NA - not applicable or not available
O/W - oil/water separator
RBSC - risk-based screening concentration

Table 6-7 (Continued)
Ecological Risk Drivers for CERCLA Sites by Drainage Basin[a]

REC - recreational
RME - reasonable maximum exposure concentration
SA - source area
SB - subsurface soil (concentrations in mg/kg)
SD - sediment (concentrations in mg/kg)
SL - soil (surface and subsurface soil, concentrations in mg/kg)
SS - surface soil (concentrations in mg/kg)
SW - surface water (concentrations in µg/L)
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TEF - toxicity equivalency factor
TSC - tissue screening concentration

Table 6-8
Uncertainty Factors in the Ecological Risk Assessment

Uncertainty Factor	Direction of Uncertainty	Comment
Use of conservative exposure scenarios	Will overestimate risk	Intent of using RME tissue residues in risk assessment is to be protective of biota and minimize effect of uncertainties that underestimate risk.
Use of small fish to assess ecological risk	May overestimate or underestimate risk	Small fish are generally more sensitive to toxic effects of chemicals than are older fish; large fish may bioaccumulate a higher dose of chemical than younger fish.
Unavailability of toxicity reference values for some chemicals	Will underestimate risk	Some site risks may be unquantifiable due to lack of TRVs.
Chemical concentration in water assumed constant for derivation of tissue screening concentrations	Will overestimate risk	Does not take into account bioavailability of chemicals and likelihood of variable exposure concentrations.
Focus of risk assessment is on chemicals that were analyzed and detected	Will underestimate risk	Chemicals not detected or not analyzed for may contribute to risks.
Exposure to chemicals unrelated to the site not considered	Will underestimate total risks; may overestimate calculated risks if non-site-related chemicals were accumulated by biota	Multiple sources of contaminants are known for Adak, including global source.
Hazard index calculation	May overestimate or underestimate risk	Synergistic or antagonistic effects of site chemicals are not addressed; different chemicals have different, nonadditive modes of toxic action and toxicological endpoints; adaptation by ambient biota to toxicants not accounted for in laboratory-derived TRVs.
Hazard quotient calculation	May overestimate or underestimate risks	Direction of effect depends on accuracy with which TRVs describe the response of biota to chemicals.
Sample collection locations	May overestimate or underestimate risks	Locations may not be representative of locations with either extremely elevated or low chemical concentrations, affecting the exposure point concentrations.
Bioconcentration factor selection	May overestimate or underestimate risks	Risks to high lipid content biota (>3%) may be overestimated; risks to low lipid content biota may be underestimated.

Table 6-8 (Continued)
Uncertainty Factors in the Ecological Risk Assessment

Uncertainty Factor	Direction of Uncertainty	Comment
Use of LOAELs instead of NOAELs as TRVs	May underestimate risk for sensitive species; no effects on risk for most species	Most available ecological TRVs are LOAELs, not NOAELs.
Analytical chemistry variability	May overestimate or underestimate risks	Inorganic analyses within 35% RPD of each other may be equivalent.
Endocrine system disruption	No effect or may underestimate risk	Residues associated with endocrine system disruption not yet defined, no risk assessment methodology available to quantify effect.
Non-site-associated chemicals, non-chemical toxicity modifiers	Will overestimate risks	Ammonia, hydrogen sulfide, and sediment particle size may be responsible for some observed adverse effects in sediment toxicity tests, overstating risks from site chemicals.
Surrogate species selection	May overestimate or underestimate risks	Surrogate species may not represent the sensitivity to chemicals of some resident species.
Food chain model exposure scenarios	May overestimate or underestimate risks	Assuming harbor seals and birds forage in only one water body overestimates exposure to site chemicals, as these species have home ranges larger than any one receiving water body. Assuming receptors prey exclusively on one type of prey may overestimate or underestimate risks, depending on how representative prey chemical concentrations are of concentrations in all species that make up the diet of the predator.

Notes:
LOAEL - lowest observed adverse effects level
NOAEL - no observed adverse effects level
RME - reasonable maximum exposure
RPD - relative percent difference
TRV - toxicity reference value

7.0 SITES REQUIRING REMEDIATION AND REMEDIAL ACTION OBJECTIVES

This section describes the process that was used for identifying which sites required further action and what site characteristics triggered the response. In addition, the remedial action objectives are identified for CERCLA sites where exceedances of regulatory standards need to be addressed or where potential risks to human health or ecological receptors were determined (see Section 6). This section also describes the remedial action objectives for petroleum sites that require some additional actions (see Section 5).

7.1 CERCLA SITES

7.1.1 Identification of Sites for Further Consideration

This section summarizes environmental characteristics of each designated terrestrial and aquatic site at the former Naval base. After considering the results of environmental investigations, remedial activities completed to date, and the results of human health and ecological risk assessments, this section concludes with a list of sites to be addressed along with COCs and exposure pathways of concern.

Except for those sites with petroleum impacts addressed under the SAERA process and those sites determined to require no additional action under CERCLA, all remaining Adak sites were subjected to a two-phased screening process to identify sites and environmental media requiring detailed evaluation. Phase 1 screening involved evaluating sites in relation to calculated risks, whereas Phase 2 screening considered site characteristics and environmental setting that affect remedial evaluation. The specifics of the site and media screening are provided in the RI/FS for OU A (URSG 1997c).

Phase 1 Screening

Phase 1 screening utilized the results of the human health and ecological risk assessments described in the previous section and summarized in Tables 6-4 and 6-6, respectively. Sites and environmental media not exceeding acceptable risk threshold criteria were eliminated from further consideration since they do not pose unacceptable risks to human health or the environment. Results of this phase of screening were evaluated in terms of risk assessment results for each site and impacted environmental media within the site. Screening criteria were summarized for the following conditions: the projected future land use for each site, the impacted environmental media evaluated in the risk assessment, the chemical classes of COPCs driving the calculated risks, and the calculated risks for ecological receptors and various human health scenarios.

Generally, no land use category higher than the current use was assumed for future land use, which is consistent with projected future reuse scenarios. Aquatic sites, however, were evaluated for subsistence fishing, which constitutes a higher land use than current recreational or industrial uses. None of the terrestrial sites addressed in the FFA are currently used for residential purposes. Hence, protection of human health was considered sufficient based on industrial or recreational land use scenarios, whichever is more appropriate to the site conditions. However, as indicated later in this subsection, institutional controls are employed to ensure that higher land use would not occur in the future at sites presenting excessive adverse risk to human health.

Human health and ecological risks were calculated in previous risk assessments for each exposure scenario and pathway contributing risk. Human health risks were evaluated, where applicable, based on industrial (occupational) or recreational land use. Risk thresholds for a site receptor include risk from background concentrations (i.e., representing total risks) consistent with the risk assessment.

The acceptable risk thresholds used in the first phase of site screening were as follows:

Human Health Risk:	Cancer risk = 1×10^{-6} HI = 1.0
Ecological Risk:	HI = 1.0

Remedial action is generally not warranted under CERCLA where the cumulative human health carcinogenic risk at a site, based on the reasonable maximum exposure for both current and future land use, is less than 1×10^{-6} and the noncarcinogenic HI is less than 1.0. Remedial action is generally considered when risks exceed 1×10^{-4} or the HI is greater than 1.0. Calculation of ecological risk entails a larger degree of uncertainty and use of conservative assumptions. An HI of 1.0 was considered to indicate a possibly adverse impact and was selected as an acceptable risk threshold. If these thresholds were exceeded, sites were retained for Phase 2 screening.

Phase 2 Screening

Phase 2 screening evaluated sites where risks exceeded the thresholds established in the first phase of screening. The screening criteria developed for this phase involved comparing site characteristics and environmental setting in relation to the propensity for calculated risks to realistically prevail at a site sufficient to pose an adverse risk to human health or the environment. Factors considered during this phase were:

- Exposure pathways Future land use
- Future land use

- Distribution of chemical concentrations
- Magnitude and frequency of chemical concentrations
- Receptor populations
- Remedial actions already taken
- Potential habitat damage associated with remedial activities
- Magnitude of risks above the acceptable threshold
- Impact of factors causing overestimation or underestimation of risks
- Other site factors

The Phase 2 screening results were compiled. These results included the basis for the screening decision as related to the future land use, the specific impacted environmental medium, the type of receptor, and the chemical classes of the COPCs that drive the calculated risks. The screening decision was based on whether the site and environmental medium would be retained for development of remedial action criteria as a result of one or more of the factors listed above.

Summary of Screening

Tables 7-1 and 7-2 show the sites that were retained from the screening process. Table 7-1 presents those sites that require remedial action and were retained for development of remedial action criteria (Section 7.1.2) and detailed evaluation based on the results of the screening process. The sites listed in Table 7-1 are those retained for active remediation measures and do not include sites that will be subject to institutional controls only. The table lists the chemical classes of the chemicals of concern (COCs) and exposure pathways presenting adverse risk. COCs represent the risk drivers causing the exceedance of acceptable risk thresholds for a given site, impacted environmental medium, and receptors.

Table 7-2 presents those sites that require implementation of institutional controls and that otherwise were determined to not pose significant risk nor exceed principal applicable or relevant and appropriate requirements (ARARs). Sites in this group typically require that the land use category not change and that certain land use restrictions, access restrictions, or site monitoring be imposed. These sites are considered for institutional controls that include disclosure of site conditions to future property owners.

As a result of the screening process, the sites described below were retained for development of remedial action criteria and remedial alternatives.

SWMU 4. At SWMU 4, subsurface soil presents potential adverse risk to ecological receptors. An inspection of SWMV 4 in the summer of 1997 indicated that insufficient cover material was placed at the site. Receptors of concern for subsurface soil are birds, invertebrates, and plants. Birds are subject to adverse risk from dioxin compounds and PCB compounds via ingestion of prey and associated particles of subsurface soil. Invertebrates are subject to adverse risk from inorganics via ingestion of subsurface soil and direct dermal contact. Plants are subject to adverse risk from inorganics via root uptake.

SWMU 17. Because of SWMU 17's complex nature, various historical studies were reviewed to effectively conduct the screening process. SWMU 17 is a relatively large site with a variety of physical features and various potential chemical sources. Chemically affected environmental media include surface soils, subsurface soils, freshwater sediments, surface water, and groundwater. Predominant site features include two ponds, a creek, and wetlands. The site has multiple uses including power generation, fuel storage, used oil storage, and dry cleaning. Historically, the site has had additional uses such as drum storage and transformer maintenance activities.

As a result of the physical and chemical composition, the site and existing data were parceled into zones for purposes of focused screening and eventual development of alternatives. Analytical data used to determine risks for the entire SWMU were used to calculate risks for each environmental medium of concern in each of the zones. The zones are shown in Figure 5-2 and are described as follows, along with the impacted environmental media:

- Oil/water separator 1 (O/W 1) and Quonset hut (surface soil, subsurface soil)
- Hillside seepage area (surface soil, subsurface soil)
- Lower wetlands (subsurface soil)
- Power plant tank farm and Drum Accumulation Area 1 (surface soil, subsurface soil)
- Dry cleaners and Drum Accumulation Area 2 (subsurface soil)
- Yakutat Creek (surface water, freshwater sediments)
- Retention pond (surface water, freshwater sediments)
- North area (surface water, freshwater sediments, surface soil, subsurface soil)
- Waste oil pond (surface water, freshwater sediments, subsurface soil)

Risk associated with human exposure to soils throughout SWMU 17 was estimated below the thresholds described in phase I screening for all scenarios except residential. Residential cancer risk due to exposure to soils was estimated $3x10^{-5}$. However, the current and most likely future exposure scenario for Power Plant No. 3 is Occupational.

Risk associated with human consumption of groundwater is estimated to exceed the cancer risk threshold of 10^{-6} and the HI of 1. Groundwater is not currently used as a drinking water source on Adak Island. Petroleum free product has also been observed on the groundwater in the northern portion of the SWMU 17 area. Petroleum issues associated with this site are addressed in Section 7.2.

Calculated ecological risks would exceed an HI of 1.0 for ecological exposure to soils in the north area, the area around O/W 1 and the Quonset hut, and in the area of the hillside seep. However, ecological risks were calculated based on very conservative risk-based screening criteria, and no measured chemical concentrations present significant adverse risks considering the following:

- This site is not considered good terrestrial habitat because it is industrial and site activities frequently disturb the ground surface in nonsaturated areas.
- The areas with measured concentrations of chemicals in soils and the site itself are small relative to available habitat elsewhere on Adak.
- In areas where concentrations of inorganics were measured in excess of levels considered protective of plant development, no indications of stressed vegetation have been observed.

The potential for elevated ecological risk due to exposure to sediments was previously estimated in Yakutat Creek (Table 6-6). However, recent sampling results (URS 1998) indicates that the organic chemical drivers (Aroclor 1260, fluorene, and 2-methylnaphthalene) have attenuated to concentrations below analytical detection limits. The inorganic risk driver, copper, was detected within the range of natural background. Similarly, estimated human health risks associated with Yakutat Creek were below the phase 1 screening levels. Therefore, Yakutat Creek is not considered to present adverse risks.

Past sampling and evaluation has indicated potential adverse ecological risk from the north area surface water and sediment. However, these media are no longer considered to present adverse risks because the oil/water seeparator in the area was removed and related discharge was rerouted.

Freshwater sediments and surface water present potential adverse risk to ecological receptors. Sediments in the waste oil pond (and adjacent surface soil) and sediments in the retention, pond containing inorganics, SVOCs, and PCB compounds expose benthic infauna to adverse risk via ingestion of food and sediment and direct dermal contact. Surface water in the retention pond presents adverse risk to birds when they ingest inorganics in the water or when they come in direct dermal contact with inorganics in the water.

Water Bodies. In Kuluk Bay and Sweeper Cove, fish and shellfish present potential adverse risk to future subsistence fishers because of inorgarrics and PCB compounds in tissues. Adverse ecological risk exists for benthic infauna exposed to marine sediments containing SVOCs via ingestion of food and sediments and by direct dermal contact. Fish, benthic invertebrates, birds, and marine mammals are also exposed to adverse risk from ingestion of food containing elevated levels of inorganics.

In South Sweeper Creek, adverse ecological risk exists for benthic infauna exposed to freshwater sediments containing PCB via ingestion of food and sediments and by direct dermal contact. Fish are also exposed to adverse risk from ingestion of food containing inorganics.

Institutional Control Sites. Thirteen sites were evaluated for institutional controls that would maintain current land use. For these sites it was determined that no unacceptable risk was posed under existing land use but that institutional controls were required to prevent residential land use. The sites that fall into this category include SWMUs 2, 10, 14, 15, 16, 20, 21A, 23, 29, 52 (including 53 and 59), 55, and 67, and SA 76. The basis for retaining sites for institutional controls, the remedial action objectives to be achieved, and the principal ARARs affected are shown in Table 7-2. Certain land use and access restrictions will be applied as described in Section 10.

Two landfill sites not included in Table 7-2 were also retained for application of institutional controls: SWMUs 11 and 13. Institutional controls are warranted at these two landfills for the future protection of human health and the environment. The interim actions of placing a cover over the SWMU 11 and 13 landfills and subsequent monitoring are an adequate and final remedy because the cover material prevents direct exposure of debris and surface soil to humans and ecological receptors, and monitoring will verify that there are no downgradient impacts.

7.1.2 Remedial Action Criteria

Remedial action criteria were developed for CERCLA sites to evaluate whether remedial actions are necessary. These criteria include remedial action objectives (RAOs), action levels, and general response actions (GRAs). RAOs indicate where remedial actions may be needed and what they should accomplish. Action levels provide targets to develop and evaluate remedial response alternatives in terms of specific chemical concentrations for individual environmental media. The action levels are used to determine the areal extent and volume of impacted environmental media.

GRAs are generic categories of remedial actions that are appropriate for accomplishing RAOs for a particular environmental medium.

RAOs, action levels, and GRAs proposed for all affected sites are established for a particular environmental medium and risk scenario to be protective of human health and the environment and comply with the listed ARARs. The exposure route is specified in addition to action levels so that protectiveness can be achieved by preventing exposures (e.g., by containment or institutional controls) as well as by cleaning up or reducing concentrations of chemicals in the environmental media of concern. For each established RAO, the following information is specified:

- Exposure routes and receptors of concern
- COCs for each impacted environmental medium
- Acceptable concentration for each chemical exposure of concern (i.e., an action level)

The remedial action criteria for CERCLA sites are presented in Table 7-3. These criteria were developed based on applicable risk scenarios for which impacted environmental media, exposure pathways, and COCs were identified during the phased screening process. Subsequent screening of remedial technologies and the development of remedial alternatives depend on the remedial action criteria established in Table 7-3.

Remedial action criteria do not include cleanup levels (levels that must be met to achieve cleanup). Cleanup levels are presented in Section 10.

Action Levels

Action levels are chemical-specific concentrations that are based on promulgated regulatory standards, such as state and federal MCLs for drinking water and other ARARs, or are risk-based values as the result of site-specific risk assessments where no numerical ARARs are available. Exceedances of these chemical-specific concentrations are used to decide whether remedial alternatives need to be evaluated for a site. If these chemical-specific concentrations are not exceeded at a site under current conditions, then no action is required. However, if an action level is exceeded for one or more chemical in any medium, remedial alternatives are evaluated. These action levels are listed in Table 7-3.

Human health action levels were based on EPA risk assessment guidance and EPA default and Adak-specific exposure parameters consistent with the Adak exposure scenarios described in

Section 6. 1. Human health action levels for ingestion of tissue from Kuluk Bay and Sweeper Cove were based on a cancer risk level of 1×10^{-5}.

Ecological action levels were based predominantly on Adak ecological RBSCs developed for the PSE-2 process and described in the final PSE-2 guidance document (URS 1996c). In some cases, promulgated chemical-specific values were identified at lower values than the Adak ecological RBSCs. In such cases, these promulgated values were used as the action levels. Action levels for protection of ecological receptors were based on a risk level of HQ = 1.0. They were derived from the following sources for various types of environmental media:

- **Surface Water.** Surface water action levels were derived from the federal ambient water quality criteria.

- **Subsurface Soil and Surface Soil.** In general, soil action levels were based on ecological RBSCs documented in the PSE-2 guidance document (URS 1996c), with some modifications based on agency comments.

- **Freshwater and Marine Sediments.** Action levels for sediments were derived from Washington State sediment management standards minimum cleanup levels (WAC 173-204-520).

- **Tissues.** Action levels for tissues were derived from procedures given in recent publications (Shephard 1998, 1995). These studies develop tissue screening concentration values for assessing ecological risks to chemical residues in aquatic biota.

Areas of Impacted Environmental Media

Based on the establishment of RAOs for each site, chemically impacted environmental media can be further described in terms of areal extent, depth, and volume. In this context, calculations were performed to support the evaluation of containment, removal, treatment (in situ or ex situ), or disposal alternatives. Estimates were based on the characteristics of the impacted environmental medium, the source of chemical impacts, site type, and the chemical class of the COCs. Material quantities were then expressed in terms of areal extent and material volume estimates, which are described below.

To provide a basis for developing remedial alternatives, an initial estimation was made of the extent of chemically affected media to which the GRAs may be applied. Volumes of impacted environmental media were calculated for those sites where GRAs entail excavation, treatment, and/or disposal. Areal extents were defined for those sites where GRAs entail institutional controls and containment. Figures 7-1 through 7-5 show the areas of the impacted environmental media for each site and identify the chemical classes affecting each medium.

Remedial Action Objectives

RAOs indicate the objectives to be accomplished by remedial actions. These objectives are stated in terms of environmental or human health protection (or both) for a particular impacted environmental medium. Tables 7-2 and 7-3 provide the RAOs for each site and the impacted environmental medium. The RAOs from these tables are summarized as follows:

- SWMU 4—Prevent ingestion of and contact with impacted subsurface soils and food by birds and invertebrates and uptake by plants.
- SWMU 17—In the waste oil pond, prevent uptake of and contact with impacted freshwater sediments by benthic infauna.
- SWMU 17—In the retention pond, prevent uptake of and contact with impacted freshwater sediments by benthic infauna and impacted surface water by birds.
- Sweeper Cove—Prevent ingestion of impacted fish and shellfish by subsistence fishers for the protection of human health.
- South Sweeper Creek—Prevent uptake of and contact with impacted freshwater sediments by benthic infauna. Allow natural recovery processes to reduce chemical concentration in prey tissues to below acceptable levels over time.
- Kuluk Bay—Prevent ingestion of impacted fish and shellfish by subsistence fishers for the protection of human health.
- Institutional Control Sites—For SWMUs 2, 10, 14, 15, 16, 20, 21A, 23, 29, 52 (including 53 and 59), 55, and 67 and SA 76, maintain existing land use and implement engineering controls including groundwater monitoring at SWMUs 14, 15, and 55 and SA 76.

7.2 PETROLEUM SITES

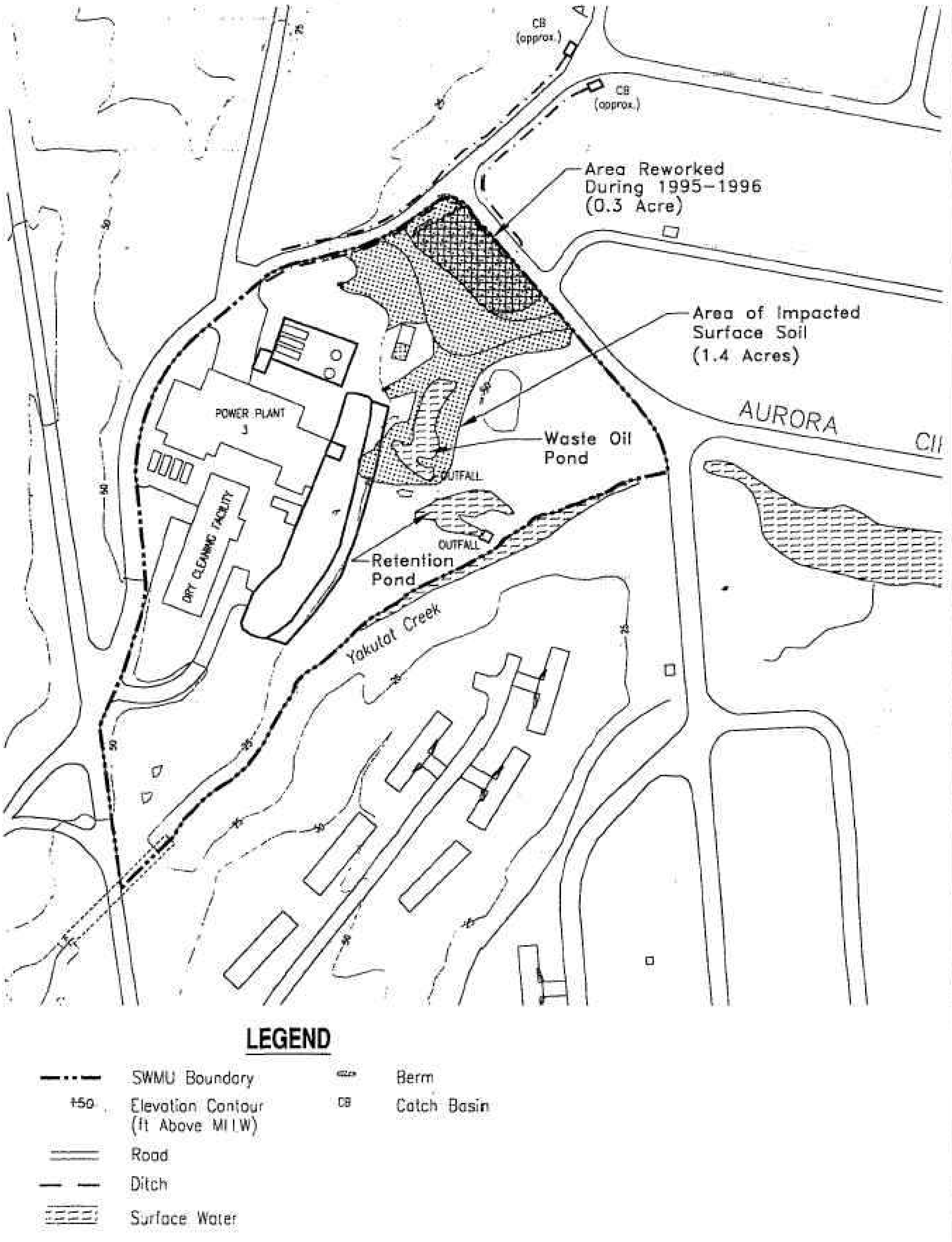
7.2.1 Identification of Sites for Further Consideration

As shown in Table 4-2, 82 sites were determined to require no further action. Table 7-4 presents a summary of the 46 petroleum sites that were identified for further action and the rationale for retaining them.

7.2.2 Remedial Action Criteria

Remedial action criteria for media impacted by petroleum releases are based on 18 AAC 75 (ADEC 1999). Remedial action criteria were developed for petroleum sites and site types. These criteria include RAOs, action levels, and GRAs. RAOs indicate where remedial actions may be needed and what they should accomplish. Action levels provide targets to develop and evaluate remedial response alternatives in terms of DRO and GRO concentrations in a specific environmental medium. GRAs are generic categories of remedial actions that are appropriate, either individually or in combinations, for accomplishing RAOs for a particular medium. GRAs establish the starting point for development of remedial alternatives.

Table 7-4 presents the RAOs and GRAs. RAOs were limited to four categories: reduction of petroleum concentrations in soil, reduction of volume of petroleum free product, mitigation of potential for downgradient migration, and reduction of potential for direct exposure. Action levels for soil and groundwater, presented in Table 7-5, are based on the Alaska DEC 18 AAC 75 criteria for soils and groundwater. These levels are also used for cleanup levels at petroleum sites.



CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 7-1
Extent of Impacted Soil for Power Plant 3 Area SWMU 17

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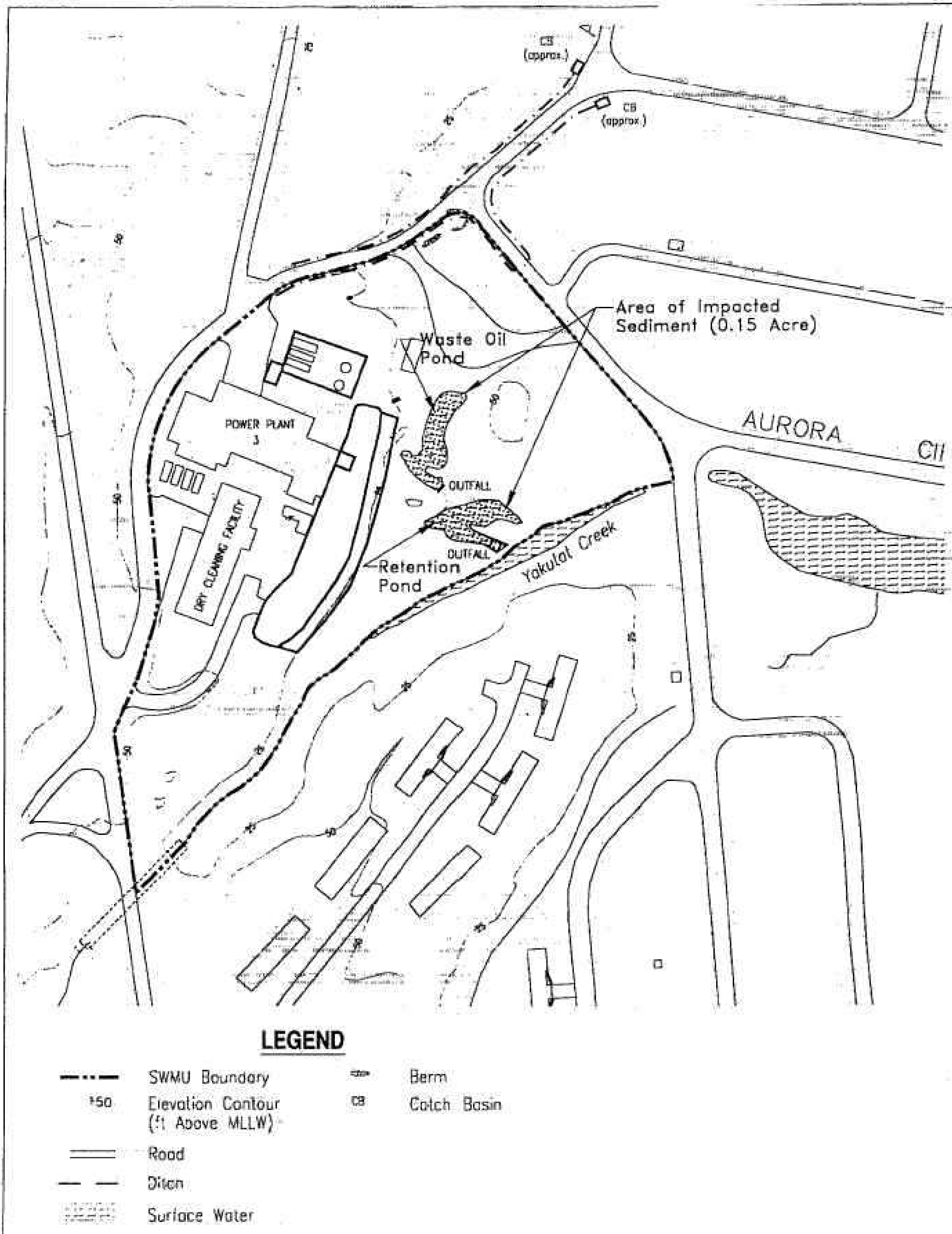
Adak Island, AK



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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 7-2
Extent of Impacted Sediment for Power Plant 3 Area
SWMU 17

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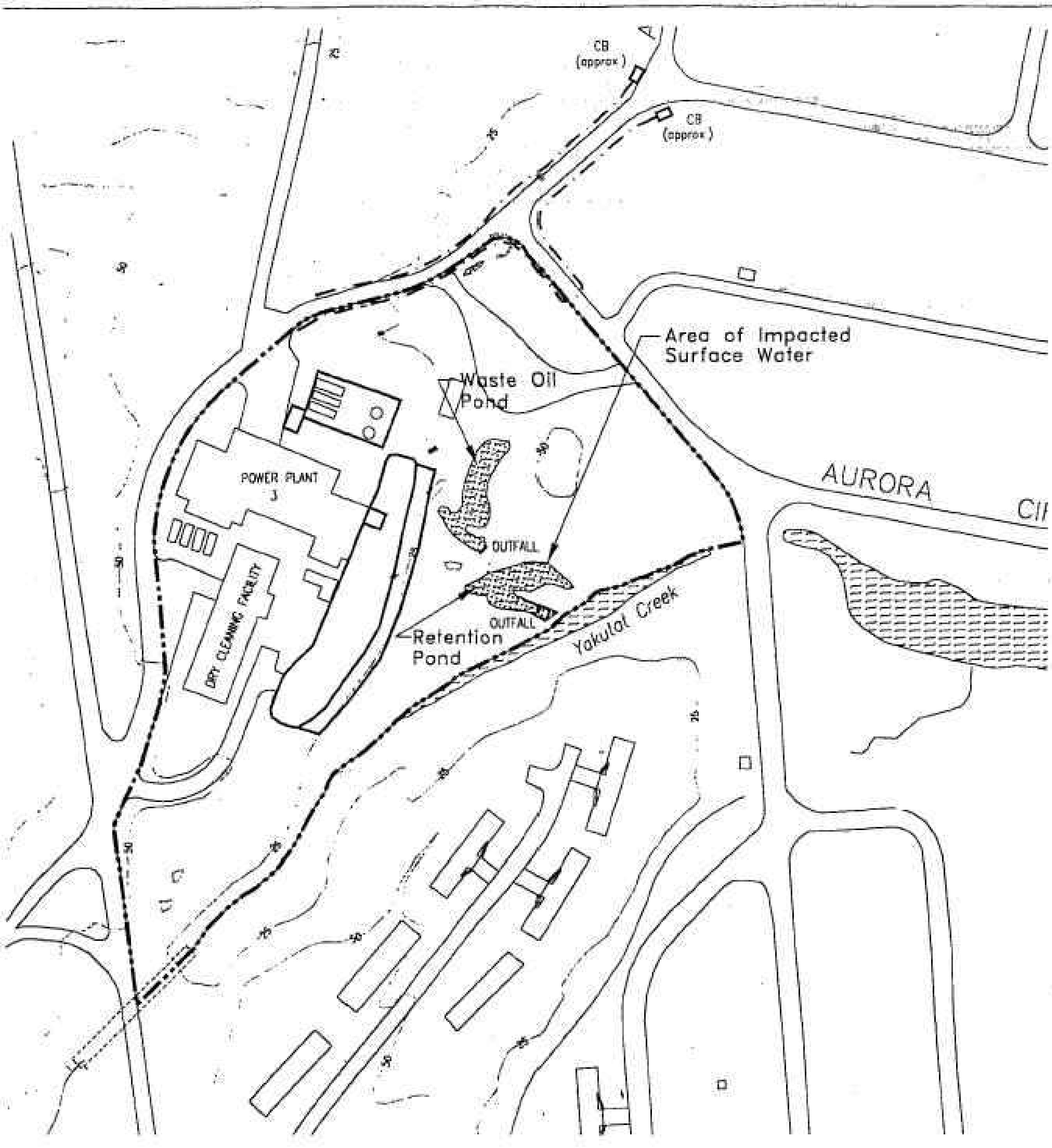
OU A
Adak Island, AK



LEGEND

—··—	SWMU Boundary		Berm
150	Elevation Contour (ft Above MLLW)	CB	Catch Basin
	Road		
— —	Ditch		
	Surface Water		

CLEAN
COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

0 50 100 200
SCALE IN FEET

Figure 7-3
Extent of Impacted Surface Water for Power Plant 3 Area SWMU 17

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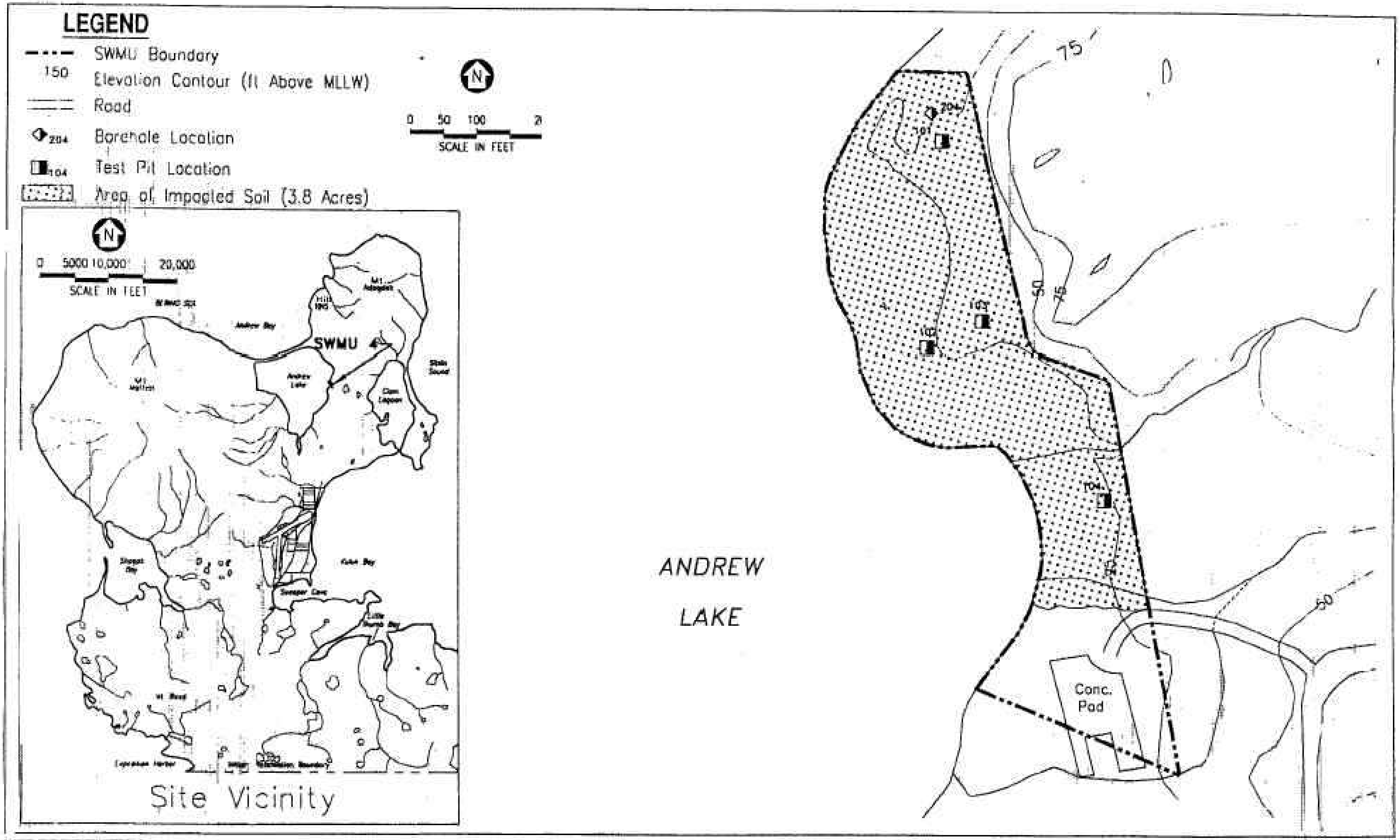
Adak Island, AK



CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY	SCALE: AS NOTED	**Figure 7-4** **Location and Extent of Impacted Soil for South Davis Road Landfill** **SWMU 4**	CTO 0214 RECORD OF DECISION OU A Adak Island, AK

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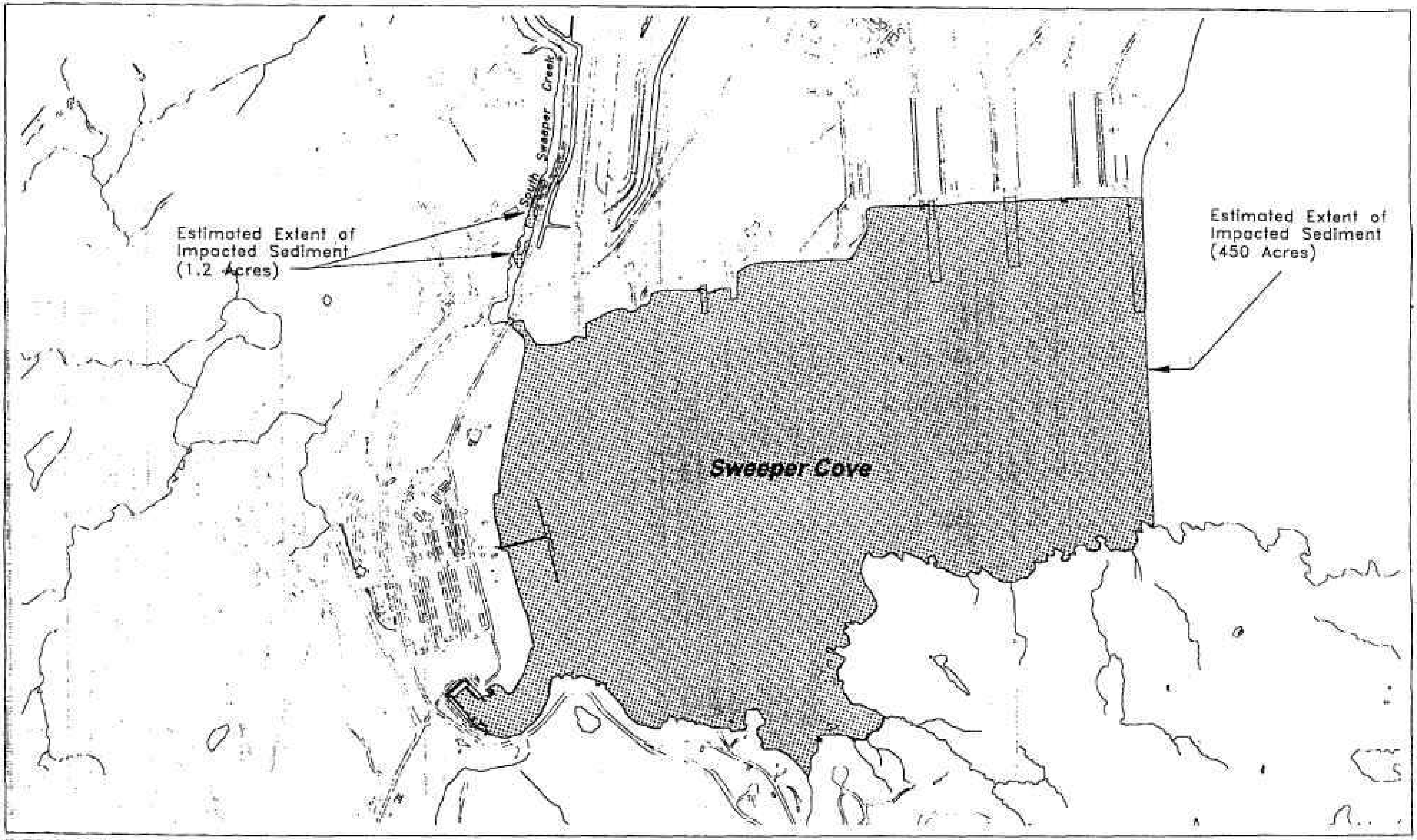

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

Figure 7-5
Location and Extent of Impacted Sediment in South Sweeper Creek and Sweeper Cove

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Table 7-1
CERCLA Sites That Require Remedial Action (Excluding Institutional-Control-Only Sites)

Site Designation	Site Type	Future Land Use	Impacted Environmental Medium/Receptor	Chemical Classes of COCs	Exposure Pathways of Concern	
					Human Health	Ecological
SWMU 4	LF	REC	SB/eclogical Birds: organics Invertebrates: inorganics Plants: inorganics	TIN, D/F, P/A	NA	Ingestion of food, soil Dermal contact Root uptake HI = 130
SWMU 17 (Retention Pond)	P/W	IND	SD/ecological Benthic infauna	P/A, SVOC, TIN	NA	Ingestion of food, sediment Dermal contact HI = 59
			SW/ecological Birds	TIN	NA	Ingestion of water Dermal contact HI = 160
SWMU 17 (Waste Oil Pond)	P/W	IND	SD/ecological Benthic infauna	TIN, SVOC, P/A	NA	Ingestion of food, sediment Dermal contact HI = 110
Kuluk Bay	RWB	NA	TI/human Subsistence fisher exposure	TIN, P/A	Ingestion of bottom fish and shellfish HI = 7 CR = 1×10^{-4}	NA
Sweeper Cove	RWB	NA	TI/human Subsistence fisher exposure	TIN, P/A	Ingestion of fish and shell fish HI = 11 CR = 1×10^{-4}	NA

Table 7-1 (Continued)
CERCLA Sites That Require Remedial Action (Excluding Institutional-Control-Only Sites)

Site Designation	Site Type	Future Land Use	Impacted Environmental Medium/Receptor	Chemical Classes of COCs	Exposure Pathways of Concern	
					Human Health	Ecological
South Sweeper Creek	RWB	NA	SD/ecological Benthic infauna	P/A	NA	Ingestion of food, sediment Direct contact HI = 200
			TI/ecological Fish	TIN		Ingestion of food HI = 45

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
COC - chemicals of concern
CR - carcinogenic risk
D/F - dioxins/furans
HI - hazard index
IND - industrial
LF - landfill
NA - not applicable
P/A - pesticides/Aroclors
P/W - product/waste storage area
REC - recreational
RWB - receiving water body
SB - subsurface soil
SD - freshwater sediment
SVOC - semivolatile organic compounds
SW - surface water
SWMU - solid waste management unit
TI - tissue
TIN - total inorganics

Table 7-2
CERCLA Sites That Require Institutional Controls Due to Adverse Risk[a]

Site Designation	Impacted Environmental Media and Potentially Threatened Receptors	Postremoval[b] Site Risk			Remedial Actions to Date	Remedial Action Objectives and Principal ARARs
		Human Health		Ecological		
		Cancer	Noncancer			
SWMU 2—Landfill	Ecological exposure to subsurface soil.	1 x 10^{-5}	0.08	85	A soil cover was placed over portions of the site after disposal practices ceased.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 10	Human health exposure to surface soil.	6 x 10^{-5}	0.07	59	None.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 14	Human health exposure to soil and groundwater.	4 x 10^{-5}	2	NC	None.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375) Federal MCLs (40 CFR 141) AK Groundwater Cleanup Levels (18 AAC 75.345)
SWMU 15	Human health exposure to soil and groundwater.	7 x 10^{-5}	0.4	NC	Potentially impacted construction materials, debris, and soils were sampled and disposed of as appropriate.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375)
SWMU 16	Human health and ecological exposure to soil.	4 x 10^{-5}	<0.01	27	Impacted soils, sludges, and surface water from the burn pits were treated or disposed of.	Maintain existing land use category and implement engineering controls. AK Institutionals Controls (18 AAC 75.375)
SWMU 20	Human health and ecological exposure to soil.	2 x 10^{-5}	<0.01	160	Drums and soil were removed and disposed of.[c]	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 21A	Human health and ecological exposure to soil.	1 x 10^{-5}	NC	28	Soil was removed and residual impacted soil was covered with an impervious cover system.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 23	Human health and ecological exposure to soil. Ecological exposure to sediments.	1 x 10^{-5}	7	92	Drums and tank were removed.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 29	Ecological exposure to subsurface soil and sediments.	3 x 10^{-5}	0.6	170	A soil cover was placed over portions of the site after disposal practices ceased.	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)

Table 7-2 (Continued)
CERCLA Sites That Require Institutional Controls Due to Adverse Risk[a]

Site Designation	Impacted Environmental Media and Potentially Threatened Receptors	Postremoval[b] Site Risk			Remedial Actions to Date	Remedial Action Objectives and Principal ARARs
		Human Health		Ecological		
		Cancer	Noncancer			
SWMU 52 (53, 59)	Human health and ecological exposure to soil and debris.	5×10^{-5}	0.6	260	Hazardous materials were removed and underground storage tanks were decommissioned.[d]	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SWMU 55	Human health exposure to groundwater.	1×10^{-4}	1	NC	None.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375) Federal MCLs (40 CFR 141) AK Groundwater Cleanup Levels (18 AAC 75.345)
SWMU 67	Human health and ecological exposure to soil.	7×10^{-6}	NC	86	Impacted soils were left in place beneath an impermeable cover system.[e]	Maintain existing land use category and implement engineering controls. AK Institutional Controls (18 AAC 75.375)
SA 76	Human health exposure to soil and groundwater. Ecological exposure to soil.	9×10^{-5}	0.6	11	None.	Maintain existing land use category and implement engineering controls including groundwater monitoring. AK Institutional Controls (18 AAC 75.375)

[a] Adverse risk based on residential exposure.
[b] Postremoval does not apply to SWMUs 10, 14, 55, and 76.
[c] Data indicate a small volume (less than 7 cubic yards) of soil containing Aroclors remains at the site. However, inaccessibility of the impacted soil and high groundwater conditions made additional removal infeasible. It is reasonable to assume that actual ecological risk is lower than the calculated risk for postremedial action conditions. The surface area of the remaining soil contamination is small relative to the home range of any ecological receptor.
[d] It is reasonable to assume that actual ecological risk is much lower than the calculated risk for postremedial action conditions. There were low frequencies of detection for COPCs and few exceedances of RBSCs. These were single-point exceedances for two semivolatile organic compounds and a few exceedances for lead and zinc (URS 1996a).
[e] Institutional controls are required to keep cover over soils intact to prevent adverse risk to human or ecological receptors. Postremedial site risk to humans is based on a recreational exposure scenario.

Notes:
AAC - Alaska Administrative Code
AK - Alaska
ARAR - applicable or relevant and appropriate requirement
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
COPC - chemical of potential concern
MCL - maximum contaminant level
NC - none calculated
RBSC - risk-based screening concentration
SA - source area
SWMU - solid waste management unit

Table 7-3
Remedial Action Criteria for CERCLA Sites

Site Designation	Site Type	Remedial Action Objectives and Prinipal ARARs	Impacted Enviromental Media	Chemicals of Concern	Action Level Concentrations[a]	Basis for Action Level[b]	General Response Actions
SWMU 4	LF	Environmental Protection Prevent ingestion of and contact with impacted subsurface soils and food by birds and invertebrates and uptake by plants. AK Inst. Controls: 18 AAC 75.375 NPDES Stormwater: 40 CFR 122.26 Solid Waste: 40 CFR 258, Subparts E & F AK Solid Waste: 18 AAC 60 AK SW Quality: 18 AAC 70	Subsurface soil	Zinc	67	A	No action
				Lead	34	A	Institutional
				2,3,7,8-TCDD	2×10^{-6}	A	controls
				Aroclor 1260	1	B	Containment
				Copper	50	A	
				Aroclor 1254	1	B	
SWMU 17 Waste Oil Pond	P/W	Environmental Protection	Freshwater Sediments (organic carbon normalized)	Fluorene	0.54	A	No Action
		Prevent uptake of and contact with impacted freshwater sediments by benthic infauna.		2-Methylnaphthalene	0.67	A	Institutional
				Nickel	51.6	A	controls
		TSCA: 40 CFR 761		bis(2-Ethylhexyl) phthalate	1.9	A	Containment Source control Removal
		AK Inst. Controls: 18 AAC 75.375		Phenanthrene	1.5	A	
		NPDES Stormwater: 40 CFR 230		Ethylbenzene	10	A	
		Coastal Zone: 16 USC 1451		Antimony	25	A	
		AK Coastal Zone: 6 AAC 80		Acenaphthene	0.5	A	
		Solid Waste: 40 CFR 258, Subparts E & F		Aroclor 1260	1	A	
		AK Solid Waste: 18 AAC 60		Mercury	0.59	A	
		AK SW Quality: 18 AAC 70		Fluoranthene	2.5	A	
		Fish & Wildlife Coord.: 16 USC 1661		Chrysene	2.8	A	
		Water Pretreatment: 40 CFR 403		Benzo(a)anthracene	1.6	A	
		HW Identification: 40 CFR 261		Pyrene	3.3	A	
		HW Treatment & Storage: 40 CFR 264		Aroclor 1254	1	A	

Table 7-3 (Continued)
Remedial Action Criteria for CERCLA Sites

Site Designation	Site Type	Remedial Action Objectives and Prinipal ARARs	Impacted Enviromental Media	Chemicals of Concern	Action Level Concentrations[a]	Basis for Action Level[b]	General Response Actions
SWMU 17 Waste Oil Pond (Cont.)	P/W	HW Land Disposal Restrictions: 40 CFR 268 AK Clean Air: 18 AAC 50		Zinc	960	A	
				Lead	530	A	
				Benzo(a)pyrene	1.6	A	
				Benzo(k)fluoranthene	3.6	A	
SWMU 17 Retention Pond	P/W	Environmental Protection Prevent uptake of and contact with impacted freshwater sediments by benthic infauna. ARARs: See Waste Oil Pond	Freshwater sediments (organic carbon normalized)	Aroclor 1260	1	A	
				2-Methylnaphthalene	0.67	A	
				Fluorene	0.54	A	
				Mercury	0.59	A	
				Acenaphthene	0.5	A	
				Nickel	51.6	A	
				Manganese	1,100	A	
				Fluoranthene	2.5	A	
				Zinc	960	A	
				Pyrene	3.3	A	
		Environmental Protection Prevent uptake and contact of impacted surface water by birds.	Surface water	Mercury	0.144	C	
				Zinc	110	C	
				Iron	1,000	C	
				Lead	2.5	C	
				Copper	11	C	

Table 7-3 (Continued)
Remedial Action Criteria for CERCLA Sites

Site Designation	Site Type	Remedial Action Objectives and Prinipal ARARs	Impacted Enviromental Media	Chemicals of Concern	Action Level Concentrations[a]	Basis for Action Level[b]	General Response Actions
Sweeper Cove	RWB	Protection of Human Health	Tissue: Fish	Aroclor 1260	0.0065	A	No action
		Prevent ingestion of impacted fish and shellfish by subsistence fishers.	Tissue: Shellfish	Aroclor 1260	0.031	A	Institutional controls Containment
		AK Inst. Cont.: 18 AAC 75.375 Clean Water: 33 USC 1342-1344 HW Identification: 40 CFR 261 HW Treatment & Disposal: 40 CFR 264 HW Land Disposal Restrictions: 40 CFR 268 Haz Material Transport: 49 CFR 171 Solid Waste: 40 CFR 258 Coastal Zone: 16 USC 1451 AK Coastal Zone: 6 AAC 80 Rivers & Harbors: 33 USC 401 AK Water Quality: 18 AAC 70 AK Solid Waste: 18 AAC 60					Removal
South Sweeper Creek[c]	RWB	Environmental Protection Prevent ingestion of and contact with impacted freshwater sediments by benthic infauna. Allow natural recovery processes to reduce chemical concentration in prey tissues to below acceptable levels over time.	Freshwater sediments (dry weight concentration)	PCBs	1	A	No action Institutional controls Containment Removal
			Tissue	Lead	0.064	A	
				Cadmium	0.042	A	

Table 7-3 (Continued)
Remedial Action Criteria for CERCLA Sites

Site Designation	Site Type	Remedial Action Objectives and Prinipal ARARs	Impacted Enviromental Media	Chemicals of Concern	Action Level Concentrations[a]	Basis for Action Level[b]	General Response Actions
		AK Inst. Cont.: 18 AAC 75.375		Chromium	0.26	A	
		Clean Water: 33 USC 1342-1344					
		HW Identification: 40 CFR 261					
		HW Treatment & Disposal: 40 CFR 264					
		HW Land Disposal Restrictions: 40 CFR 268					
		Haz Material Transport: 49 CFR 171					
		Solid Waste: 40 CFR 258					
		Coastal Zone: 16 USC 1451					
		AK Coastal Zone: 6 AAC 80					
		Rivers & Harbors: 33 USC 401					
		AK SW Quality: 18 AAC 70					
		AK Solid Waste: 18 AAC 60					

Table 7-3 (Continued)
Remedial Action Criteria for CERCLA Sites

Site Designation	Site Type	Remedial Action Objectives and Prinipal ARARs	Impacted Enviromental Media	Chemicals of Concern	Action Level Concentrations[a]	Basis for Action Level[b]	General Response Actions
Kuluk Bay	RWB	Protection of Human Health Prevent ingestion of impacted fish and shellfish by subsisitence fishers.	Tissue: Fish	Aroclor 1254	0.0065	A	No action
			Tissue: Shellfish	Aroclor 1254	0.031	A	Institutional controls
		AK Inst. Cont.: 18 AAC 75.375 Clean Water: 33 USC 1342-1344 HW Identification: 40 CFR 261 HW Treatment & Disposal: 40 CFR 264 HW Land Disposal Restrictions: 40 CFR 268 Haz Material Transport: 49 CFR 171 Solid Waste: 40 CFR 258 Coastal Zone: 16 USC 1451 AK Coastal Zone: 6 AAC 80 Rivers & Harbors: 33 USC 401 AK Water Quality: 18 AAC 70 AK Solid Waste: 18 AAC 60					

[a] Chemical concentrations were derived using procedures in the RI/FS management plan (URS 1996b). Soil, sediment, and tissue concentrations are in milligrams per kilogram (mg/kg). Water concentrations are in micrograms per liter (µg/L). During review of the draft ROD, ecological toxicity values and exposure factors for freshwater sediments were updated from PSE-2 to RI values.

[b] Basis for action level is as follows:
- A - risk-based level
- B - 18 AAC 75 level for soil
- C - 33 USC Section 1314, Ambient Water Quality Criteria

[c] Remedial action criteria for South Sweeper Creek were reevaluated (URSG 1998b) subsequent to additional sediment sampling conducted after issuance of the draft ROD. The action level for PCBs in soil protective of ecological receptors was updated from the preliminary remediation goal of 0.09 mg/kg to 1.0 mg/kg

Table 7-3 (Continued)
Remedial Action Criteria for CERCLA Sites

during review of the draft ROD. A concentration of 1.0 mg/kg is consistent with EPA guidance for protection of wildlife as well as human health (U.S. EPA 1990b). It is also consistent with prior remedial actions conducted on Adak by the Navy.

Notes:
AAC - Alaska Administrative Code
AK - Alaska
ARAR - applicable or relevant and appropriate requirement
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
HW - hazardous waste
LF - landfill
NPDES - National Pollutant Discharge Elimination System
PCB - polychlorinated biphenyl
PSE - preliminary source evaluation
P/W - product/waste storage area
RI/FS - remedial investigation/feasibility study
ROD - Record of Decision
RWB - receiving water body
SW - surface water
SWMU - solid waste management unit
TCDD - tetrachlorodibenzo-p-dioxin
TSCA - Toxic Substances Control Act
USC - U.S. Code

Table 7-4
Petroleum Sites That Require Remedial Action

Site	Impacted Medium[a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Sweeper Cove Basin				
SWMU 14, Old Pestcide Storage and Disposal Area	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
SWMU 15, Future Jobs/DRMO	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Mitigate potential for downgradient migration	No action Remedial action Institutional controls Monitored natural attenuation
SWMU 17, Power Plant 3	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
SWMU 60, Tank Farm A	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
SWMU 62, New Housing Fuel Leak	Groundwater	Free product observed at site	Reduce volume of petroleum free product Mitigate potential for downgradient migration	No action Institutional controls Product recovery
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Institutional controls Monitored natural attenuation
SA 79, Main Road Pipeline, Norh End MRP-MW15) and South End	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
SA 80, Steam Plant 4	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
Amulet Housing, Well AMW-706 Area	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Institutional controls Monitored natural attenuation

Table 7-4 (Continued)
Petroleum Sites That Require Remedial Action

Site	Impacted Medium [a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Sweeper Cove Basin (Continued)				
Amulet Housing, Well AMW-709 Area	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Mitigate potential for downgradient migration	No action Institutional controls Monitored natural attenuation
ASR-8 Facility (UST 42007-B)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Mitigate potential for downgradient migration	No action Institutional controls Monitored natural attenuation
Former Power Plant Building (T-1451)	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil Reduce potential for direct contact with impacted surface soil	No action Remedial action Institutional controls Monitored natural attenuation
GCI Compound (UST GCI-1)	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
Housing Area (Arctic Acres)	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation Product recovery
Navy Exchange Building (UST 30027-A)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
New Roberts Housing (UST HST-7C)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil Mitigate potential for downgradient migration	No action Remedial action Institutional controls Monitored natural attenuation
NMCB Building Area. T-1416 Expanded Area	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Remedial action Institutional controls Monitored natural attenuation Product Recovery

Table 7-4 (Continued)
Petroleum Sites That Require Remedial Action

Site	Impacted Medium [a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Sweeper Cove Basin (Continued)				
NMCB Building (UST T-1416-A)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls
Officer Hill and Amulet Housing (UST 31047-A)	Soil	Concentrations exceeded 18 AAC 75 criteria	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Officer Hill and Amulet Housing (UST 31049-A)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Mitigate potential for downgradient migration	No action Institutional controls Monitored natural attenuation
Officer Hill and Amulet Housing (UST 31052-A)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Quarters A	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Runway 5-23 Avgas Valve Pit	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
South of Runway 18-36 Area	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
Tanker Shed (UST 42494)	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
Yakutat Hangar (UST T-2039-A)	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Remedial action Institutional controls Monitored natural attenuation Product Recovery

Table 7-4 (Continued)
Petroleum Sites That Require Remedial Action

Site	Impacted Medium [a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Sweeper Cove Basin (Continued)				
Yakutat Hanger (USTs T-2039-B and T-2039-C)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Kuluk Bay Basin				
SWMU 61, Tank Farm B	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Mitigate potential for downgradient migration	No action Institutional controls Monitored natural attenuation
Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	Groundwater	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Boy Scout Camp, West Haven Lake (UST BS-1)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Contractor’s Camp Burn Pad	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	
Girl Scout Camp (UST GS-1)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
MAUW Compound (UST 24000-A)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation

Table 7-4 (Continued)
Petroleum Sites That Require Remedial Action

Site	Impacted Medium [a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Kuluk Bay Basin (Continued)				
NAVFAC Compound (USTs 20052 and 20053)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
NORPAC Hill Seep Area	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Remedial action Institutional controls Monitored natural attenuation
ROICC Contractor's Area (UST ROICC-7)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
ROICC Contractor's Area (UST ROICC-8)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
ROICC Warehouse (UST ROICC-2)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
ROICC Warehouse (UST ROICC-3)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation
Clam Lagoon Basin				
SWMU 58, Heating Plant 6	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
SA 73, Heating Plant 6	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery

Table 7-4 (Continued)
Petroleum Sites That Require Remedial Action

Site	Impacted Medium [a]	Rationale for Further Action	Remedial Action Objective	General Response Action
Clam Lagoon Basin (Continued)				
SA 78, Old Transportation Building	Groundwater	Free product observed at site	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation Product recovery
SA 82, P-80/P-81 Buildings	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Remedial action Institutional controls Monitored natural attenuation
SA 88, P-70 Energy Generator	Groundwater	Free product observed at site	Reduce volume of petroleum free product	No action Institutional controls Product recovery
Finger Bay Basin				
Finger Bay Quonset Hut (UST FBQH-1)	Soil	Concentrations exceeded 18 AAC 75 criteria.	Reduce petroleum concentrations in soil	No action Remedial action Institutional controls Monitored natural attenuation

[a] Groundwater is not included if quantities are insufficient for use as a drinking water source.

Notes:
AAC - Alaska Administrative Code
DRMO - Defense Reutilization Marketing Office
GCI - General Communications, Inc.
MAUW - modified advanced underwater weapons
NAVFAC - Navel Facility
NMCB - Naval Mobile Construction Battalion
NORPAC - North Pacific
ROICC - resident officer in charge of construction
SA - source area
SWMU - soild waste management unit
UST - underground storage tank

Table 7-5
Chemical Cleanup Levels [a]

Chemical	Soil Cleanup Levels			Groundwater Cleanup Levels	
	Ingestion (mg/kg)	Inhalation (mg/kg)	Migration to Groundwater (mg/kg)	Groundwater Cleanup Level (mg/L)	10 Times Groundwater Cleanup Level (mg/L)
Acenaphthene	5,000	NA	190	2.2	22
Anthracene	24,900	NA	3,900	11	110
Antimony	33	NA	3	0.006	0.06
Aroclor 1254	1	1	1	0.0005	0.005
Aroclor 1260	1	1	1	0.0005	0.005
Benzene	230	6.4	0.02	0.005	0.05
Benzo(a)anthracene	9	NA	5.5	0.001	0.01
Benzo(b)fluoranthene	9	NA	17	0.001	0.01
Benzo(k)fluoranthene	93	NA	170	0.01	0.1
Benzo(a)pyrene	0.9	NA	2.4	0.0002	0.002
Bis(2-Ethylhexyl)phthalate	490	NA	1,100	0.006	0.06
Chrysene	930	NA	550	0.1	1
Dibenzo(a,h)anthracene	0.9	NA	5	0.0001	0.001
DRO	8,250	12,500	230	1.5	15
Ethylbenzene	8,300	89	5	0.7	7
Fluorene	3,300	NA	240	1.46	14.6
GRO	1,400	1,400	260	1.3	13
Indeno(1,2,3-c,d)pyrene	9	NA	50	0.001	0.01
Lead	NA	NA	NA	0.015	0.15
Mercury	NA	13	124	0.002	0.02
Naphthalene	3,300	NA	38	1.46	14.6
Phenathrene	NA	NA	NA	NA	NA
Pyrene	2,500	NA	1,400	1.1	11
RRO	8,300	22,000	9,700	1.1	11
Toluene	17,000	180	4.8	1	10
Xylenes (total)	166,000	81	69	10	100

[a] Based on 18 AAC 75.340, 341, and 345

Notes:
DRO - diesel-range organics (per Method AK 102)
GRO - gasoline-range organics (per Method AK 101)
NA - not available
RRO - residual-range organics (per Method AK 103)

8.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

8.1 CERCLA SITES

This section summarizes the appropriate remedial alternatives for the CERCLA sites that require remedial actions. Remedial alternatives considered are no action, institutional controls (in various forms), containment, and removal. Included as part of these alternatives are confirmation monitoring, natural recovery, source control, landfill cover, sediment cover, soil and sediment removal, waste disposal, waste treatment, surface water treatment, and sediment dredging. The types of institutional controls considered include land use restrictions, periodic site inspection and monitoring, periodic site reviews, and educational requirements.

Using the RAOs and action levels from Section 7, remedial alternatives were developed for sites throughout OU A. The intent of this approach was to apply remedial actions consistently across all evaluated sites. For example, implementation of institutional controls to prevent future residential land use in chemically affected areas could be a component of a remedial alternative that may be implemented across multiple sites. Remedial alternatives may apply to some or all sites and were assembled to maximize economies of scale (minimize costs), effectiveness of remedial approach, and implementability of the specified actions.

Tables 8-1 and 8-2 summarize the remedial alternatives that were assembled for evaluation. Each alternative takes into consideration various response actions needed to accomplish the RAOs for the particular environmental media and COCs. The alternatives were based on representative process options from among those previously screened for technical feasibility.

Below are summaries of each of the four remedial alternatives considered. The subsections that follow provide more detailed descriptions and general assumptions,

- **Alternative 1—No action.** This alternative would involve no specific response actions, allowing sites to remain in their present condition. Natural processes may reduce the concentrations of some chemicals over time.

- **Alternative 2—Institutional controls.** Sites would be permitted to remain in their present condition with various institutional controls, depending on the site. As summarized in Table 8-2, this would include combinations of land use restrictions, deed restrictions/restrictive covenants, groundwater use restrictions, and soil excavation restrictions, along with engineering requirements such as periodic site monitoring, periodic site inspection and review, and educational requirements. Institutional controls, in general, are most protective of human receptors. However, some institutional controls provide protection to ecological receptors as well (e.g., control mechanisms that ensure long-term integrity of cover systems). Principal ARARs for this alternative are 18 AAC 75.375, Institutional Controls, for areas of Adak where institutional controls are required as part of the remedy in order to reduce or eliminate contact with contaminated media.

- **Alternative 3—Containment.** A variety of containment measures would be implemented along with appropriate institutional controls supplementing the primary remedial actions. Principal ARARs for this alternative are 18 AAC 75.360, Cleanup Operations; 18 AAC 75.365, Offsite or Portable Treatment Facilities; 18 AAC 75.370, Soil Storage and Disposal; 18 AAC 75.340 and 341, cleanup levels for soil and groundwater protection; 40 CFR 141 for protection of groundwater; and 33 USC Section 1314 for protection of surface water.

- **Alternative 4—Removal.** This alternative would involve removal with treatment and/or disposal and appropriate institutional controls supplementing the primary remedial actions. Removal was not considered to be a viable strategy for landfill sites. Principal ARARs are 18 AAC 75.360, Cleanup Operations; 18 AAC 75.365, Offsite or Portable Treatment Facilities; 18 AAC 75.370, Soil Storage and Disposal; 18 AAC 75.340 and 341, cleanup levels for soil and groundwater protection; 18 AAC 60 for disposal of solid waste; 40 CFR 141 for protection of groundwater; and 33 USC Section 1314 for protection of surface water.

The alternatives developed provide a range of response actions offering varying degrees of environmental and human health protection. Comprehensive actions involve multiple processes designed to control COCs or prevent chemical exposures. The no-action alternative serves as a baseline from which to judge the performance of action-oriented alternatives. Some sites will be treated collectively because their characteristics and associated potential remedial alternatives are similar. However, sites will be identified individually where conditions are particular to a specific site and warrant separate discussion. The four alternatives considered to be viable are discussed in the following subsections as they apply to the sites requiring remedial action. These sites are:

- SWMU 4

- SWMU 17

- Water bodies: South Sweeper Creek, Sweeper Cove, and Kuluk Bay

- Other institutional control sites: SWMUs 2 (landfill only), 10, 11, 13, 14, 15, 16, 20, 21A, 23, 29, 52 (including 53 and 59), 55, and 67, and SA 76

The Navy will develop a comprehensive facilitywide approach for establishing, enforcing, and monitoring institutional controls at the sites listed above. The geographic areas as well as the sites are shown generally on Figure 5-1. More specific identification of geographic areas (if needed) will occur in conjunction with the facilitywide approach noted above. The objectives of the institutional controls are described in Section 7.1.2. The types of restrictions are discussed below (Section 8.1.2).

8.1.1 Alternative 1: No Action

This alternative would include no specific response actions to reduce chemical concentrations or exposure to COCs or to control their migration. It would rely solely on natural recovery mechanisms for migration control or ultimate mitigation of risks from degradable COCs.

8.1.2 Alternative 2: Institutional Controls

Institutional controls are defined as those legal mechanisms that ensure that restrictions on land use and any engineering requirements put in place to implement the selected remedy are maintained. The identified institutional controls include land use restrictions, deed restrictions/ restrictive covenants, fishing advisories, groundwater use restrictions and, on an areawide basis, soil excavation restrictions. The controls vary with the site or area. Associated operation and maintenance requirements include conducting site visits and inspections on a regular basis and making repairs as necessary.

Engineering requirements include site monitoring (which involves sampling to determine the status of the remedial action and the effectiveness of institutional controls), site inspections or review (to determine the same), and educational requirements (which involve classroom orientation to convey information about potential health and safety issues or risks to residents of or visitors to Adak Island). Other engineering requirements are signage (discussed below under the fishing advisory) and the “dig permit” (discussed below under soil excavation restrictions).

A property transfer agreement has been drafted to convey a portion of Adak Island to The Aleut Corporation (TAC). The transfer documents between the United States and TAC will notify future landowners of this ROD and limit the uses and activities on the CERCLA sites in accordance with this ROD. The land being considered for transfer includes the Adak downtown area plus land in the Clam Lagoon and more remote areas. SWMU 1, SWMU 2— minefield portion only, SWMU 8, and SA 93 would remain with the Navy.

Institutional controls are viable alternatives and focus on preventing certain land uses. Depending on the type of institutional control, these controls may be removed in the future by petitioning the regulatory agencies and by a clear demonstration (e.g., monitoring results) that site conditions no longer warrant the particular controls. Either the Navy will require future land owners to implement and enforce institutional controls and related engineering controls in accordance with the Adak Island institutional controls management plan (ICMP) or the Navy will implement and enforce them.

Institutional Controls

Institutional controls considered for application at Adak OU A CERCLA sites reflect EPA Region 10 policies (U.S. EPA 1999). Types of institutional controls are discussed in the following paragraphs.

Land Use Restrictions. In the event of conveyance to non-federal entities and private sector reuse of the property, it will be appropriate for other parties, including future landowners and a future local governmental entity such as a Second Class City, to have a role in implementing and enforcing certain institutional controls as part of a system of local land use controls, while not relieving the Navy of its fundamental responsibility to ensure the continued effectiveness of all CERCLA remedies. Any such implementation and enforcement role by those other Parties must be pursuant to their acceptance of that role in completing the property conveyance and reuse process. The transfer documents will contain the statutory covenant that the Navy would have access to respond to releases of hazardous substances, including ordnance materials, due to Navy activities or incidents on the sites.

Deed Restrictions/Restrictive Covenants. In the event of property transfer, restrictive property covenants would be contained in the land transfer agreement and recorded with the State of Alaska or a Second Class City or other entity, if formed. The covenants would be binding on the owner's successors and assignees, place limiting conditions on property conveyance, and restrict land use and construction activity that would disturb the area. Covenants would also require notice to the Navy of any intent to transfer interest or initiate construction activities. Environmental regulatory agencies (i.e., EPA and Alaska DEC) must approve any modification of land use that changes exposure assumptions of the remedy. Agency approvals are generally required for such actions. The covenants could also include continued use and maintenance of appropriate access restrictions, as discussed below. The Navy will maintain responsibility for implementing and enforcing the deed restrictions or restrictive covenants. There may also be a mechanism developed in the property transfer agreement or other contractual arrangements whereby the restrictions or covenants can be legally transferred to a Second Class City or other entity.

Fishing Advisory. Fishing advisories would be issued for subsistence fishers and commercial fisheries regarding harvesting. Signs would be placed along the shorelines of the affected water bodies. Fishing advisories would be discussed at the Adak orientation required for visitors and residents.

Soil Excavation Restrictions. Excavation at specific sites would require a dig permit, which would prevent disturbing the cover material or subsurface soil. Currently, the Engineering Office issues dig permits to anyone digging on Adak for any reason. The regulatory agencies will designate an alternative authority to approve excavations after the property is transferred.

Groundwater Use Restrictions. Domestic use of groundwater on an areawide basis downtown would be restricted because of the potential presence of harmful substances in the groundwater.

Engineering Requirements

Engineering requirements that work in conjunction with the institutional controls noted are discussed in the following paragraphs.

Periodic Site Inspection and/or Monitoring. Particular remedial activities require annual monitoring of site conditions or inspections of site facilities and repair as necessary to ensure long-term effectiveness. Examples include inspection and repair of containment land surface covers; inspection and repair of warning signs; and annual surface water, sediment, and biota sampling. Periodic inspection and/or monitoring will continue for as long as the institutional controls are necessary.

Periodic Site Reviews. CERCLA 121(c) requires 5-year reviews where hazardous substances, pollutants, or contaminants remain at a site. These reviews would be conducted no less frequently than every 5 years to assess site conditions and effectiveness of the institutional controls. The 5-year site reviews would include evaluating the results of annual site monitoring; assessing the need for additional action or a reduction in monitoring requirements; and determining whether institutional controls are in place and effective, or can be removed, as appropriate.

Educational Requirements. Orientations to learn about Adak issues would be required for all island visitors and residents. Fishing advisories for Sweeper Cove and Kuluk Bay would be discussed at these briefings.

SWMU 4

Institutional controls would be implemented in Alternative 2 to protect future ecological and human exposure to landfill media and to monitor site conditions by periodic sampling and site inspection.

Land use restrictions:	Residential development would be prohibited.
Soil excavation restrictions:	No excavation would be allowed without approval from the appropriate agency and reestablishment of the existing cover system.
Periodic site inspection: (Engineering requirement)	Annually for 5 years, then at intervals based on site review for as long as the institutional controls are necessary, the condition of the existing landfill cover would be inspected and repairs made where necessary.
Periodic site review: (Engineering requirement)	The results of periodic site inspections would be evaluated for additional action or reduction of controls, as appropriate, upon notice of a remedy failure but not less than every 5 years.

There are no estimated capital costs for Alternative 2 at SWMU 4. Annual operation and maintenance (O&M) costs are estimated to be $24,000. The procedures for institutional controls are established and available for implementation.

SWMU 17

Institutional controls would be implemented in Alternative 2 to protect future human health and prevent additional ecological exposure to impacted environmental media and to monitor site conditions by periodic sampling and site inspection.

Land use restrictions:	Future land use would be limited to industrial uses only.
Groundwater use restrictions:	No groundwater use would be allowed.
Soil excavation restrictions:	No excavation would occur without approvals from the appropriate agency
Periodic site inspection:	Annually for 5 years, then at intervals based on site review

(Engineering requirement)	for as long as the institutional controls are necessary.
Periodic site review: (Engineering requirement)	The results of periodic site inspections would be evaluated for additional action or reduction of controls, as appropriate, upon notice of a remedy failure but not less than every 5 years.

The estimated capital cost of Alternative 2 for SWMU 17 is $18,000. Annual O&M costs are estimated to be $11,000. The procedures for institutional controls are established and available for implementation.

Water Bodies—South Sweeper Creek, Sweeper Cove, and Kuluk Bay

Institutional controls would be implemented in Alternative 2 to protect future human health from exposure to impacted fish and shellfish tissue and to monitor fish and shellfish tissue in Sweeper Cove and Kuluk Bay. These controls would not provide additional protection to ecological receptors.

Fishing advisory:	Future subsistence fishers and commercial fisheries would be issued advisories about harvesting in these areas. Fishing advisories would be presented during the Adak orientation required for all visitors and residents. Signs would be placed along the Sweeper Cove and Kuluk Bay shorelines and adjacent to shellfish beds warning of the potential risks associated with ingestion of fish and shellfish. Phone numbers would be included on the signs as a source for obtaining supplemental information.
Periodic site monitoring and inspection: (Engineering requirement)	Tissue and sediment sampling and analysis would be conducted annually for 5 years and then at intervals based on site review for as long as necessary to determine whether hazardous constituents are decreasing or additional measures are warranted to protect human receptors. Blue mussel tissue samples would be collected at three shellfish beds in Sweeper Cove (one location adjacent to the discharge of South Sweeper Creek) and at three locations in Kuluk Bay. Rock sole tissue samples would be collected from two fish trawl locations in Sweeper Cove and two fish trawl locations in Kuluk Bay. Sediment samples would be collected from selected intertidal locations within and

	downgradient of impacted areas in South Sweeper Creek. Signs would be checked annually and repaired as needed following inspection.
Periodic site review: (Engineering requirement)	The results of periodic site monitoring would be evaluated for additional action or reduction of controls, as appropriate, upon notice of a remedy failure but not less than every 5 years.
Educational requirement: (Engineering requirement)	The Adak orientation briefings would be the means by which information pertaining to fishing advisories is presented to all visitors and residents.

The estimated capital cost of Alternative 2 for South Sweeper Creek is $8,500. Annual O&M costs of Alternative 2 for South Sweeper Creek are estimated to be $28,000.

The estimated capital cost of Alternative 2 for Sweeper Cove is $35,000. Annual O&M costs of Alternative 2 for Sweeper Cove are estimated to be $26,000.

The estimated capital cost of Alternative 2 for Kuluk Bay is $25,000. Annual O&M costs of Alternative 2 for Kuluk Bay are estimated to be $26,000.

The procedures for institutional controls for the water bodies are established and available for implementation.

Institutional Control Sites

The institutional controls described at the beginning of this subsection would apply to each of the sites in accordance with the selected controls shown in Table 8-2. As indicated previously, many of the sites are well within the acceptable risk range, but require that the land use category not change.

There are no estimated capital costs of Alternative 2 for all 15 institutional-control-only sites. The sum of the annual O&M costs for the 15 sites is estimated to be $200,000. The procedures for institutional controls are established and available for implementation.

8.1.3 Alternative 3: Containment

SWMU 4

Alternative 3 would entail containing landfill refuse and implementing institutional controls in the same manner as Alternative 2. These measures are designed to remove the exposure pathway between future ecological and human receptors and impacted environmental media. Institutional controls provide an additional measure to ensure that landfill covers are maintained without disturbance.

Containment. To protect ecological receptors, containment systems would be employed at the landfill site. Containment options considered included construction of an impermeable cap over the landfill. However, a soil cover was considered to be protective and an impermeable cap unnecessary because the risks at the site are due to exposure to subsurface soil, not a result of leachate generation. There are also no records indicating that hazardous waste was disposed of at the landfill.

Although an impermeable cap was not considered necessary, a soil cover was considered as a containment option. Soil would be imported from an on-island borrow area, placed, compacted, and vegetated with native flora to prevent erosion and establish habitat.

The following quantities are estimated for construction of a soil cover:

- Total landfill area requiring cover system placement: 3.8 acres (Figure 7-4)
- Soil imported for cover systems: 2,500 cubic yards
- Existing site soil to use for cover systems: 610 cubic yards

Institutional Controls. To protect sensitive ecological receptors and to monitor site conditions, institutional controls (in conjunction with engineering requirements) would be implemented to supplement containment measures and ensure the integrity of the landfill covers. The controls employed with Alternative 2 would be applied with this alternative.

The estimated capital cost of Alternative 3 for SWMU 4 is $455,000. Annual O&M costs of Alternative 3 for SWMU 4 are estimated to be $24,000. The time needed to implement the soil cover under Alternative 3 would range from 4 to 12 months dependent upon the ability to obtain approval of the design and the construction season.

SWMU 17

Alternative 3 would entail both containment and institutional controls in the same manner as Alternative 2 and would include source control measures to address existing petroleum in the soil downgradient of the power plant. These measures are designed to remove the exposure pathway between ecological and human receptors and impacted environmental media. Institutional controls would provide an additional measure to ensure that soil covers are maintained without disturbance.

Containment. To protect sensitive ecological receptors, surface water from the waste oil pond and retention ponds (Figure 7-3) would be pumped to the sanitary sewer prior to removing the waste oil pond dam and filling the depressions to surrounding grade with rock and soil covers. Both ponds would be eliminated as surface water features. Discharged water would be monitored and treated as necessary with procedures determined during the design phase. Sediments would be dewatered and left in place beneath the cover systems. Future surface water runoff would be routed to Yakutat Creek. The cover systems would be vegetated with native flora to reestablish habitat and to prevent erosion of the cover.

Draining the ponds and covering the sediments with rock and soil covers would prevent direct contact with impacted sediments by sensitive ecological receptors. Geotechnical aspects of covering sediments with rock and soil would be considered during the design phase. It is likely that measures such as sediment moisture control and geotextile and/or boulder placement may be required so that the cover systems do not become quagmires. For the purposes of developing alternatives, the sediments would be dewatered to a sufficient degree in situ using typical soil dewatering measures; 3 feet of cobbles and boulders would be placed in the dewatered sediments; 1 foot of crushed and compacted quarry spalls would be placed over the boulders and sediment; and 1 foot of imported soil would be placed over the quarry spalls and then compacted and vegetated with native flora.

The following quantities are estimated:

- Imported cobbles and boulders: 1,500 cubic yards
- Imported quarry spalls: 490 cubic yards
- Imported soil: 490 cubic yards
- Pond water and recharge water discharged to sanitary sewer: 235,000 gallons
- Discharge water monitoring (10,000-gallon batches): 24 samples

Source Controls. To protect sensitive ecological receptors, Oil/Water Separator 1 and Oil/Water Separator 2 (shown in Figure 5-2) would be removed, with discharge routed to the sanitary sewer system so that future overflow to the ground surface would not occur. (After remedial alternatives were evaluated, the oil/water separators were removed, and a direct sewer connection was installed.)

Institutional Controls. To protect future human health and sensitive ecological receptors, institutional controls would be implemented in Alternative 3 to ensure the integrity of the containment systems and to monitor sediments and surface water. The controls described for Alternative 2 would be employed, with modification to the following:

Soil excavation restrictions:	No excavation would occur without approval from the appropriate agency and subsequent repair of the cover systems.

The estimated capital cost of Alternative 3 for SWMU 17 is $410,000. Annual O&M costs of Alternative 3 for SWMU 17 are estimated to be $28,000. The time needed to implement the containment and source control measures under Alternative 3 would range from 1 to 2 years dependent upon the ability to obtain approval of the design and the construction season.

Water Bodies—South Sweeper Creek and Sweeper Cove

Alternative 3 would involve containment of chemically affected sediments and implementation of institutional controls in South Sweeper Creek and Sweeper Cove. These measures are designed to eliminate the exposure pathway between future ecological and human receptors and impacted environmental media. Institutional controls and engineering requirements provide an additional measure to ensure that sediment covers are maintained without disturbance. Containment is not considered applicable to Kuluk Bay because marine tissue is the impacted environmental medium. Sediments do not pose significant adverse risk to ecological receptors in Kuluk Bay. Containment is potentially viable in Sweeper Cove because it would prevent exposure of fish and shellfish, which humans consume, to contaminated sediments.

The design of the cover over South Sweeper Creek and Sweeper Cove sediments would require additional characterization and field testing during the design phase to optimize the design so that it will be effective over the long term and minimize disturbance of the ecosystem. Subsequent to completion of the RI/FS, additional sediment sampling was conducted in South Sweeper Creek (URSG 1998b). The data allowed refinement of the extent of chemicals exceeding action levels (Figure 7-5). However, it is likely that after additional sediment characterization in Sweeper Cove, only part of the cove would warrant sediment containment.

Containment. Covering sediments in South Sweeper Creek and Sweeper Cove would involve isolation of impacted sediments beneath a cover system consisting of clean dredged material or fill (e.g., sand and/or rock). Inclusion of additives (e.g., bentonite) to reduce permeability of the cover or sorbents to inhibit migration of contaminants may be considered during the design phase. Standard dredging equipment may be employed to construct the cover systems. Mechanically dredged material or sand/rock fill cover material may be placed by using a split-hulled barge in areas deep enough to allow barge access. Hydraulically dredged material may be placed by using a downpipe and diffuser. Depending on submarine topography, diking may be necessary along the margins of the cover systems to provide lateral support. Containment would adversely impact the ecosystem in the short term by burying habitat and benthic organisms.

For purposes of developing alternatives and estimating costs, it is assumed that a 1-foot-thick cover of rock and sand would be placed over impacted sediments on the bottom of South Sweeper Creek and Sweeper Cove in the areas containing chemical concentrations exceeding action levels. In Sweeper Cove, additional sediment characterization will be required to refine the extent of the containment area. Most biological activity occurs in the top 10 centimeters of sediment. One foot of cover material is considered to be the minimum thickness that will endure and will provide fresh substrate to organisms living in the sediments. Evaluation during the design phase may determine that placement of a thicker cover is necessary in some areas, particularly to prevent erosion. Installing a cover system in South Sweeper Creek would require analysis during the design phase to assess hydraulic impacts associated with placement of a shallow cover system. For the purposes of alternative development and cost estimation, it is assumed that a cover system will not likely endure in water shallower than 10 feet below MLLW in Sweeper Cove because of high wave energy and steep bathymetry along the shore of Sweeper Cove. Therefore, cover placement in these areas is not included in this alternative. Installation of cover systems in shallow water would be evaluated in detail during the design phase.

The following quantities are estimated:

- Area of cover systems:
  - Sweeper Cove: 450 acres
  - South Sweeper Creek: 1.2 acres

- Material for cover systems:
  - Sweeper Cove: 690,000 cubic yards
  - South Sweeper Creek: 2,000 cubic yards

Institutional Controls. Institutional controls in conjunction with engineering requirements would be implemented in Alternative 3 to protect future human health from exposure to impacted fish and shellfish tissue, to protect ecological receptors from exposure to impacted sediments in South Sweeper Creek, and to monitor fish and shellfish tissue in Sweeper Cove. Controls would be implemented to ensure the integrity of the sediment cover. The controls described for Alternative 2 would be employed, with modification to the following control:

Periodic site monitoring: (Engineering requirement)	Tissue sampling and analysis would be conducted annually for 5 years and then at intervals based on site review for as long as necessary to determine whether hazardous constituents are decreasing or additional measures are warranted to protect human receptors. Blue mussel tissue samples would be collected at three shellfish beds in Sweeper Cove (one location adjacent to the discharge of South Sweeper Creek). Rock sole tissue samples would be collected from two fish trawl locations in Sweeper Cove.

The estimated capital cost of Alternative 3 for South Sweeper Creek is $410,000. Annual O&M costs of Alternative 3 for South Sweeper Creek are estimated to be $6,700.

The estimated capital cost of Alternative 3 for Sweeper Cove is $19,000,000. Annual O&M costs of Alternative 3 for Sweeper Cove are estimated to be $26,000.

The time needed to implement the containment measures under Alternative 3 for the water bodies would range from 1 to 2 years dependent upon the need for additional sediment characterization, ability to obtain approval of the design, and the construction season. Additional sediment characterization would be required for Sweeper Cove which would lengthen the implementation period.

8.1.4 Alternative 4: Removal

SWMU 17

Alternative 4 entails pond sediment and surface soil removal and either disposal or treatment. Contingencies for free-product recovery from the groundwater surface, containment of residual impacted subsurface soil, source control, and institutional controls are included.

Removal. To protect sensitive ecological receptors, surface soils in the vicinity of the waste oil pond containing hazardous constituents above action levels would be excavated, stockpiled, and disposed of or treated (Figure 7-1). One sample for each 20 cubic yards of material in the stockpile would be collected and analyzed for hazardous constituents to characterize the material for disposal or treatment.

Surface water from the waste oil pond and retention pond would be pumped to the sanitary sewer prior to demolition of their outfall structures and excavation of bottom sediments for disposal or treatment. Draining the ponds and removing sediments would have a short-term impact to the pond ecosystems. Discharged water would be treated and monitored as necessary with procedures determined during the design phase. Demolition of the outfall structures would cause the retention pond to return to its original size and state.

The following quantities are estimated:

- Surface soil excavated: 160 cubic yards
- Pond sediments excavated: 970 cubic yards
- Pond water and recharge water discharged to sanitary sewer: 235,000 gallons
- Discharge water monitoring (10,000-gallon batches): 24 samples

Two alternatives were evaluated for handling removed materials:

- **Option 1 (Disposal).** Because of the variability in hazardous constituents (organics and inorganics) anticipated for excavated sediments, an appropriate waste disposal facility would be selected after complete characterization of the excavated material. It is possible that off-island disposal at a Subtitle C hazardous waste landfill would be required.

- **Option 2 (Treatment).** Thermal desorption can effectively treat TPH in sediments and soils. Thermal desorption as well as biotreatment of petroleum hydrocarbons are considered for treatment of SWMU 17 sediments and soils. However, these cleanup technologies do not address all COCs recently identified at SWMU 17 since they are not considered to be effective for inorganics. The effectiveness of treatment technologies would be confirmed by additional bench-scale and pilot-scale testing during the design phase and prior to full-scale implementation. Disposal following treatment would be on island at Roberts Landfill.

Containment. After removal of surface soils and the pond sediments, the subsurface soil with residual levels of hazardous constituents below action levels would be covered with a minimum of 1 foot of clean fill before surface water conditions return to a natural state. Both ponds would persist as surface water features. A 2-foot-thick soil cover system would be constructed over areas where surface soils were removed. Cover systems would be vegetated with native aquatic and terrestrial flora to reestablish habitat and to prevent erosion.

The following quantities are estimated:

- Area requiring cover placement: 0.1 acre
- Cover material where surface soil was excavated: 320 cubic yards
- Cover material for former ponds: 970 cubic yards

Source Controls. To protect sensitive ecological receptors, Oil/Water Separators 1 and 2 (shown in Figure 5-2) would be removed and discharge routed to the sanitary sewer system so that future overflow to the ground surface would not be possible. (After remedial alternatives were evaluated, the oil/water separators were removed, and the discharge was routed to the sanitary sewer.)

In addition, the petroleum product recovery system constructed across the intersection of Amulet Way and Akutan Way would continue to be operated, maintained, and monitored as part of this alternative for up to 10 years. This recovery trench system was installed in 1996 to prevent migration of product to South Sweeper Creek.

Institutional Controls. To protect future human health and sensitive ecological receptors, institutional controls in conjunction with engineering requirements would be implemented in Alternative 4 to supplement remedial measures and to monitor sediments and surface water. The controls described for Alternatives 2 and 3 would be applied with this alternative.

The estimated capital cost of Alternative 4 for SWMU 17 is $1,900,000. There are no annual O&M costs for Alternative 4 at SWMU 17. The time needed to implement the removal of pond sediment and surface soil at SWMU 17 would range from 4 months to 2 years dependent on whether off-site disposal or treatment were used. Treatment with thermal desorption would require additional bench-scale and pilot-scale testing during design.

Water Bodies—South Sweeper Creek and Sweeper Cove

Sediment dredging and institutional controls would be implemented in Alternative 4 in South Sweeper Creek and Sweeper Cove to reduce impact to human health from ingestion of fish and shellfish tissue and to reduce risk to sensitive ecological receptors. Removed sediments would be treated and/or disposed of. Institutional controls would be implemented to protect human health by restricting ingestion of impacted fish and shellfish tissue. Removal measures are not considered applicable to Kuluk Bay because sediments do not pose significant adverse risk to ecological receptors.

Sediment Dredging. In Sweeper Cove, additional sediment characterization would be required to delineate areas and depths to be dredged and the nature of the dredged materials. For purposes of alternatives development and cost estimation, it is estimated that an average of 1 foot of impacted sediments would be dredged from the impacted areas of South Sweeper Creek and Sweeper Cove (Figure 7-5). Information from the additional sediment characterization may indicate variable dredge depths depending on location. Dredging may be accomplished by a clamshell to maintain in situ density and minimize water entrapment as much as possible.

Hydraulic dredging techniques may prove the most feasible, especially in South Sweeper Creek. However, extracted slurries would require large areas for dewatering or water extraction machinery. It is assumed that some debris would be dredged along with the sediments. Additional sediment sampling in South Sweeper Creek (URSG 1998b), conducted subsequent to completion of the RI/FS, allowed refinement of estimated extents of chemicals exceeding action levels, as shown in Figure 7-5. For the purposes of this study, it is assumed that the entirety of Sweeper Cove would be dredged. Dredging would result in short-term impacts to the benthic ecosystem.

The following quantities are estimated separately for Sweeper Cove and for South Sweeper Creek:

- Area dredged in South Sweeper Creek: 1.2 acres
- Area dredged in Sweeper Cove: 450 acres
- South Sweeper Creek dredge material: 3,900 cubic yards
- Sweeper Cove dredge material: 740,000 cubic yards

Two alternatives were evaluated for handling removed sediments:

- **Option 1 (Treatment).** Dredged sediments would be stockpiled onshore for treatment. Thermal desorption can effectively treat TPH in sediments. The effectiveness of treating other COCs by this treatment technology would be confirmed by bench-scale and pilot-scale testing in the design phase and prior to full-scale implementation. Thermal desorption or solvent extraction of dredged marine sediments is considered to be the most feasible treatment option and is assumed for the purposes of alternatives development and cost estimation.

- **Option 2 (Disposal).** Marine sediment disposal options that were considered included the following:

  Confined Aquatic Disposal. Dredged sediments would be transported to a suitable location, placed using a split-hulled barge, and contained beneath a marine cover. The cover would be designed to withstand wave and tidal action over the long term, limit direct exposure to the marine ecosystem, and prevent migration of chemicals.

  Open-Water Disposal. Dredged sediments would be transported to a suitable location and placed using a split-hulled barge. Alternatively, hydraulically dredged material could be transported in a slurry by pipeline to the disposal location, thereby minimizing sediment entrainment, exposure potential, and handling requirements. Pipeline transport is considered most feasible for disposal locations within 2 miles of the dredge areas. Suitable locations would be areas in deep water, where benthic populations are small, and in areas with minimal bottom currents to prevent transport of the deposited sediments over the long term.

Nearshore Disposal. Dredged sediments would be placed in a containment cell constructed in a suitable subtidal location. A low-permeability dike would contain the sediments laterally and would be designed to withstand wave and tidal action, limit direct exposure to the marine ecosystem, and prevent migration of chemicals. A cover system would be constructed over the sediments to prevent direct exposure to the terrestrial ecosystem and to prevent migration of chemicals. Ideally, sediments would be hydraulically dredged and transported via a pipeline to the containment cell. Pipeline transport is considered most feasible for disposal locations within 2 miles of the dredge areas.

Upland Disposal. Dredged sediments would be transported by truck or pipeline to a dewatering and treatment facility and then to a containment cell. Disposal facility design features would include a liner and cap system along with a drainage system to control fluids and leachate. The disposal facility may be on or off island. Any off-island disposal would require a permit.

Open-water disposal of dredged marine sediments is considered to be the most feasible disposal option for large dredge volumes and is used for the purposes of alternatives development and cost estimation for Sweeper Cove marine sediments. It is assumed that results of the additional sediment characterization will show that dredged sediments are suitable for open-water disposal and that a suitable disposal area is within 20 miles of Adak Island. Appropriate disposal permits and agency authorizations would be required.

Upland disposal at Roberts Landfill is considered the most feasible strategy for handling small dredge volumes and is assumed for the purposes of alternatives development and cost estimation for South Sweeper Creek.

Institutional Controls. Institutional controls in conjunction with engineering requirements would be implemented in Alternative 4 to supplement remedial measures, to protect future human health from exposure to impacted fish and shellfish tissue, and to monitor fish and shellfish tissue in Sweeper Cove. The controls that would be employed are similar to those described for Alternatives 2 and 3 except that they would not address Kuluk Bay. (Alternative 4 does not apply to Kuluk Bay.)

Fishing advisory:	Future subsistence fishers and commercial fisheries would be issued advisories about harvesting in these areas. Fishing advisories would be presented during the Adak orientation that would be required for all visitors and residents. Signs would be placed along South Sweeper Creek and the Sweeper Cove shorelines and adjacent to shellfish beds warning of the potential risks associated with ingestion of fish and shellfish.
Periodic site monitoring: (Engineering requirement)	Tissue sampling and analysis would be conducted annually for 5 years and then at intervals based on site review for as long as necessary to determine whether hazardous constituents are decreasing or additional measures are warranted to protect human health. Blue mussel tissue samples would be collected at three shellfish beds in Sweeper Cove (one location adjacent to the discharge of South Sweeper Creek). Rock sole tissue samples would be collected from two fish trawl locations in Sweeper Cove.
Periodic site review: (Engineering requirement)	The results of periodic site monitoring would be evaluated for additional action or reduction of controls, as appropriate, upon notice of a remedy failure but not less than every 5 years.
Educational requirements: (Engineering requirement)	The Adak orientation briefings would be the means by which information on fishing advisories is presented to all visitors and residents.

The estimated capital cost of Alternative 4 for South Sweeper Creek is $2,700,000. Annual O&M costs of Alternative 3 for South Sweeper Creek are estimated to be $6,700.

The estimated capital cost of Alternative 4 for Sweeper Cove is $22,000,000. Annual O&M costs of Alternative 3 for Sweeper Cove are estimated to be $26,000.

The time needed to implement the dredging under Alternative 4 for the water bodies would range from 1 to 2 years dependent upon the need to further evaluate options for handling the removed sediments. Treatment options for dredged sediments would require additional bench-scale and pilot-scale testing during design. Disposal options may require additional sediment characterization prior to receiving authorization for disposal.

8.2 PETROLEUM SITES

This section provides a summary of proposed alternatives to achieve petroleum site RAOs. These alternatives are as follows:

- **Alternative 1—No action**
- **Alternative 2—Monitored natural attenuation**. ARARs for this alternative are 18 AAC 75 (for soil and groundwater), 18 AAC 70 (for surface water), the Clean Water Act water quality standards (National Toxics Rule), and MCLs (for drinking water).
- **Alternative 3—Product recovery.** ARARs for this alternative are 18 AAC 75.325 (for product recovery) and 18 AAC 75 and MCLs (for groundwater monitoring to assess plume stability).
- **Alternative 4—Source removal and thermal desorption.** ARARs for this alternative are 18 AAC 75.340 and 341 (for soil), 18 AAC 75.370 and 18 AAC 60 (for soil disposal), and 18 AAC 50 (for air emissions).
- **Alternative 5—Ex situ soil bioremediation.** ARARs for this alternative are 18 AAC 75.340 and 341 (for soil) and 18 AAC 75.370 and 18 AAC 60 (for soil disposal).
- **Alternative 6—In situ soil bioremediation.** ARARs for this alternative are 18 AAC 75 (for soil and groundwater) and MCLs (for drinking water).
- **Alternative 7—Soil cover.** ARARs for this alternative are 18 AAC 75 (for soil) and 18 AAC 60 (for solid waste regulations governing soil disposal).
- **Alternative 8—Soil vapor extraction/air sparging.** ARARs for this alternative are 18 AAC 75.340 and 341 (for soil), 18 AAC 50 (for air emissions), and MCLs (for drinking water).

Table 8-3 presents the alternatives that were evaluated for the further action petroleum sites.

8.2.1 Alternative 1: No Action

The no-action alternative would rely solely on natural attenuation mechanisms that would in time reduce the petroleum concentrations and protect humans and the environment. Retention of the no-action alternative is required by the NCP and is the baseline used to evaluate other alternative.

8.2.2 Alternative 2: Monitored Natural Attenuation

This alternative would combine natural attenuation, which would reduce petroleum hydrocarbon concentrations over time, with institutional controls and monitoring, which would limit the potential for direct exposure in the short term. This alternative is suitable for petroleum sites because petroleum is readily degradable in the natural environment.

Natural attenuation is a passive remedial approach that utilizes natural processes to degrade and dissipate petroleum constituents in soil and groundwater. Processes involved in natural attenuation of petroleum products include aerobic and anaerobic biodegradation, dispersion, volatilization, and adsorption. In general, biodegradation is the most important natural attenuation mechanism for petroleum hydrocarbons. It results in a reduction and eventual elimination of petroleum constituent mass.

Studies have been completed at the NORPAC Hill Seep Area and NMCB Building Expanded Area sites to evaluate the effectiveness of monitored natural attenuation (URSG 1998d, 1998f). Indicator parameters such as dissolved oxygen concentration, the presence of dissolved methane, ferrous iron concentration, and others were measured and evaluated per the EPA OSWER Directive 9200.4-17 concerning monitored natural attenuation (MNA) (U.S. EPA 1997). These studies demonstrated that the natural attenuation processes are active at the two sites. From this and from other information on MNA discussed below, it is reasonable to conclude that MNA is a viable alternative for petroleum sites on Adak Island.

Petroleum hydrocarbon constituents are biodegradable regardless of their molecular weight. For heavier hydrocarbons, which are less volatile and less soluble than many lighter components, biodegradation will exceed volatilization as the primary removal mechanism even though degradation is generally slower for heavier molecular weight constituents than for lighter ones. Studies on Adak (Bradley and Chappelle 1995) indicate indigenous microorganisms are present and capable of biodegrading petroleum-related hydrocarbons under in situ conditions.

Compliance monitoring would include periodic monitoring of petroleum- and/or chemical-affected groundwater. Monitoring data would be used to confirm the progress of natural attenuation, evaluate the rate at which petroleum concentrations are being reduced, and determine whether the appropriate institutional controls are being implemented. The monitoring data would be collected quarterly or annually with the intent of generating a trend database. These data would then be evaluated during the CERCLA 5-year review to determine whether the target remediation timeframe would be achieved.

The target remediation timeframe for MNA is less than or equal to 75 years. This timeframe is based on the results of petroleum product fate and transport modeling performed for the downtown groundwater unit (URSG 1997d) and the BIOSCREEN model (URSG 1999a). BTEX constituents are expected to attenuate to below MCLs in less than 50 years. DRO concentrations are expected to attenuate more slowly. The DRO concentrations would not attenuate to the values in Table C of 18 AAC 75 (Table 7-5 in this ROD) for approximately 75 years.

To limit the potential for human contact while natural attenuation is occurring, institutional controls may be used. These are intended to either minimize time duration on the site or prevent petroleum-affected soil from being excavated. Subsequently, the potential for direct contact while the chemical concentrations are being reduced by natural processes would be reduced.

Applicable institutional controls for petroleum sites would include groundwater use restrictions, soil excavation restrictions, land use restrictions, and deed restrictions or restrictive covenants. Engineering requirements would include site inspections and/or educational programs. Descriptions of these institutional controls are the same as those for the CERCLA sites, as provided in Section 8.1.2.

Many of the sites are in close proximity and have similar characteristics; hence, these sites have similar types of applicable institutional controls. Application of institutional controls would be implemented by the final ICMP, which will provide an inventory of institutional controls that apply to sites throughout Adak Island. The interim ICMP was released in October 1997 (URSG 1997b).

It is anticipated that the groundwater use restrictions would consist of a prohibition against drilling groundwater supply wells within the downtown area. Restrictions on soil excavation within the downtown area would include requirements for acquiring dig permits for any excavation, locating underground utilities, and hand augering to a specified depth. Land use restrictions would involve zoning or other regulatory controls, and deed restrictions or restrictive covenants would be placed on individual parcels.

The costs to implement Alternative 2 for Petroleum Sites are $37,600 per well for 75 years of monitoring. The procedures for monitored natural attenuation are established and available for implementation.

8.2.3 Alternative 3: Product Recovery

This alternative would apply to sites identified as having free product on the groundwater or in the unsaturated zone. "Free product" is defined as petroleum product present (generally on the water table) at concentrations sufficient to saturate the natural medium. Some of these sites already have product recovery systems in place as an interim remedial measure (IRM); product recovery IRMs are being evaluated for the remaining sites. Only Alternatives 1 and 3 are evaluated for the free-product sites.

Alaska DEC regulations require free-product recovery to the maximum extent practicable (18 AAC 75.325). The Navy is committed to continuing free-product recovery efforts in a manner that will minimize the spread of free product into unaffected areas. The final definition of "maximum extent practicable" will be determined for each site based on specific site conditions and the recovery technology used to remove the free product. Endpoints for the two categories of free-product recovery systems (active and passive with monitoring) have been agreed upon by Alaska DEC and the Navy. These endpoints are discussed in Section 10.2.1 of this ROD. To date an estimated 160,000 gallons of free product (including some water) have been recovered at Adak. The vast majority of recovered free product is from SWMU 62.

These sites have active free-product recovery systems operating:

- SWMU 17, Power Plant 3
- SWMU 62, New Housing Fuel Leak
- South of Runway 18-36 Area
- Tanker Shed (UST 42494)
- Yakutat Hangar (UST T-2039-A)

These sites are currently part of a passive product recovery program:

- SWMU 58 and SA 73, Heating Plant 6
- SA 80, Steam Plant 4
- SA 88, P-70 Energy Generator
- NMCB Building Area, T-1416 Expanded Area
- NORPAC Hill Seep Area

The occurrence of free product is being monitored at the following sites:

- SA 78, Old Transportation Building
- SA 82, P-80/P-81 Buildings
- GCI Compound (UST GCI-1)

Free-product recovery efforts have been in operation at Adak since 1989 at SWMU 62 (New Housing Fuel Leak). Active recovery systems were installed at SWMU 17 (Power Plant 3) in 1996, the Yakutat Hangar (UST T-2039-A) site in 1997, and the Tanker Shed (UST 42494) site and South of Runway 18-36 Area in 1998. The remaining free-product sites are being monitored on a regular basis; if recoverable quantities of free product are observed, passive recovery devices are deployed as needed. A product-removal system will be installed as appropriate.

Detected Versus Recoverable Free Product

A free-product site has been defined as any site with detected free product in a well. Oil/water interface probes are used to determine the presence of free product in a well. These probes are generally capable of measuring as little as 0.01 foot thickness of free product in a well. Detection, however, does not mean there is enough free product to recover. The measured thickness of product in a well tends to be considerably greater than the “actual” thickness of product in the surrounding geologic/soil formation. Although the magnitude of the difference depends on a number of variables such as soil type and petroleum product, the EPA recognizes that the measured thickness varies between 1.5 and 3 times greater than the actual thickness in sand (U.S. EPA 1996c). Thus, it is important to recognize the difference between *recoverable* and *nonrecoverable* free product.

A measured product thickness of 1.0 inch of measurable product in a well could represent as little as 0.33 inch of free product in the soil formation. Such a small thickness of oil would take a very long time to flow into an extraction well; at some point, it becomes impracticable to continue removing free product (the small quantity of remaining free product will be adsorbed onto soil particles and eventually will degrade through biological action). Site-specific details on monitoring requirements to determine when recovery is no longer practicable will be included in the Adak Island sitewide monitoring plan that will be finalized in 1999 by the Navy, EPA, and Alaska DEC.

Applicable Recovery Technologies

A variety of technologies can be used to remove free product with varying degrees of effectiveness and a range of installation and operation costs. Recovery systems in operation at or planned for Adak range from simple (hand bailing and/or recovery of petroleum using a passive skimmer) to complex (a total-fluids extraction system covering acres of affected soil). These systems are described below.

- **Passive Skimming.** Passive skimming systems are the simplest method of removing free product. These systems generally use an oleophilic (hydrophobic) screen that passes fuel products but not water; the screen “floats” on the water and allows free product to pass into a small storage reservoir. Passive skimmers must be checked and emptied by hand, so they are typically used only at wells with a very limited amount of free product.

Conventional passive skimmers are appropriate only for use in wells with low product yields. If the product yield in a well is low enough to use a passive skimmer, then the well qualifies for consideration as having achieved recovery to the maximum extent practicable.

Passive skimmer devices are currently being used regularly at SWMU 58 and SA 73 (Heating Plant 6), SA 80 (Steam Plant 4), the South of Runway 18-36 Area, the NMCB Building Expanded Area, SA 88 (P-70 Energy Generator), and the NORPAC Hill Seep Area.

Free product has been detected in five wells at Heating Plant 6 since 1996. However, free product has not been found consistently in any well; when present, free product is typically measured thicknesses of less than 0.5 foot. Therefore, passive skimmers were rotated between wells 12-101, 12-105, 12-106, and 12-121 to assess product recovery. Periodic monitoring of free product and maintenance of the skimmers were conducted weekly throughout May 1997. A combined volume of approximately 5 gallons of free product was recovered from wells 12-105 and 12-121 in 1 month of continuous skimming. Since then, a combined volume of less than 0.1 gallon has been recovered (URSG 1998c). Continued activities planned at this site involve periodic monitoring for free product and maintenance of the passive skimmers.

Free product has been intermittently detected in five of six on-site monitoring wells at SA 80 (Steam Plant 4) since October 1996. One well (04-159) has shown the presence of free product only once. Therefore, passive skimmers were deployed alternating among five of the wells. Product recovery using passive skimmers totals approximately 10 gallons through September 1998 (URSG 1998c).

Free product was detected in two monitoring wells (MW-6A and MW-7A) installed in the South of Runway 18-36 Area during release investigations in 1991. Subsequent investigations indicate that free product occurs sporadically in these wells and in others (AMW-207, -209, and -216) that were installed later. Passive skimmers were installed and maintained in several of these wells, and less than 10 gallons of free product was recovered. In June 1998, a battery-operated active recovery system was installed in well AMW-207. This system recovered approximately 29 gallons of free product between June and September 1998 (URSG 1998c). Currently, passive skimmer devices and the active system installed in the South of Runway 18-36 Area continue to be monitored and maintained.

Free product has been detected in nine wells at the NMCB Building Expanded Area site. Free product was first observed in well 02-474 in August 1997. Passive skimmers were deployed beginning in August 1997 to evaluate recovery. The total volume recovered using passive skimmers, primarily from wells 02-474, 02-475, and 02-453, was less than 5 gallons for the period from August 1997 through September 1998 (URSG 1998c). Additional investigation to further characterize the extent of free product at the site was completed in September 1998 (URSG 1998d). Further evaluation of free-product recovery alternatives is scheduled for 1999.

Free product has been detected in 3 of 10 monitoring wells at SA 88 (P-70 Energy Generator) periodically since installation. In July 1998, a 0.01-foot thickness of free product was detected in a fourth monitoring well. Using passive skimmers and a test active system, free-product recovery has been evaluated at this site. Currently, passive skimmers are deployed in only two to three wells at the site. The data from investigation at the P-70 site indicate the extent of free product is limited generally to the vicinity of the former UST. Using passive skimmers and the test system, approximately 11 gallons of free product have been recovered in the period between January 1997 and September 1998 (URSG 1998c).

Free product has been intermittently detected in one of eight wells at the NORPAC Hill Seep Area since November 1997. The maximum thickness measured in well 04-146 was 0.74 foot. A passive absorbent device was periodically deployed when product was measured. Less than 1 gallon of free product has been recovered (URSG 1999b, 1998e).

Passive skimmers were installed but subsequently removed from the GCI Compound, SA 82 (P-80/P-81 Buildings), and SA 78 (Old Transportation Building). A brief summary of these sites is provided below.

Free product has been detected in 2 of 11 monitoring wells at the GCI Compound. Free product was first detected in well 04-201, which is located within the extent of the former UST excavation. Subsequently, free product was detected in well 04-202, which is located approximately 35 feet west of 04-201. A passive skimmer was installed in well 04-201 in January 1997 to evaluate free-product occurrence and recoverability. The skimmer was removed when monitoring indicated free product was not recurring. Approximately 6 gallons of a mixture of mostly water and some free product was removed in 3 months. In October 1997, subsequent to the discovery of free product in well 04-202, a skimmer was installed to evaluate recovery. The recovered volume of free product, less than 0.3 gallon in 3 months, prompted removal of the skimmer in 1998. No free product has been detected at the GCI Compound since November 1997.

At SA 82 (P-80/P-81 Buildings), free product was initially detected in well 12-170, which is located within the former UST excavation extent. Subsequent monitoring has detected free product sporadically in well 12-170. The maximum detected thickness was 0.40 foot in December 1996. From December 1996 through September 1998, free product was detected on approximately four occasions in two monitoring wells (12-170 and 12-180). Except for the detections in December 1996 and May 1997, the measured thickness in either well has not exceeded 0.01 foot, which is the practical detection limit for monitoring of free product. Free-product recovery efforts using a passive skimmer removed approximately 0.1 gallon during more than 6 months of monitoring (URSG 1998c). The wells on this site are monitored periodically to document the presence or absence of free product.

The SA 78 Old Transportation Building site is at the NSGA complex north of the downtown area. Free product was detected in October 1997 in one of five monitoring wells (location 12-145). Free product has not been detected during subsequent site monitoring events. Because free product was detected on only one occasion, no passive skimmers were deployed at the site. The site is monitored periodically to document the presence or absence of free product.

- **Active and Enhanced Skimming.** This type of system is similar to passive skimming but employs electrical or pneumatic power to remove product from the active skimmers.

Free product has been detected periodically at the Tanker Shed (UST 42494) site in 12 on-site wells since their installation. Therefore, passive skimmers were installed in wells in January 1997 to assess product recovery, and additional free-product monitoring was conducted at the site. Based on the monitoring, free product appears to extend west from the former UST location approximately 110 feet. Therefore, the IRM, started in January 1998, includes pneumatically operated automatic skimmers for 10 on-site wells. About 280 gallons of product have been removed during the period from January 1998 through September 1998.

- **Separate-Phase Recovery Trench.** In this option, free product is recovered from a trench along with groundwater, resulting in a groundwater depression that increases the area of influence. This technology is applicable in areas with moderately permeable to permeable soils (silts, sands, and gravels). Groundwater and product are recovered by separate, independent systems.

  Product recovery trenches have been installed at the Yakutat Hangar (UST T-2039A) site and SWMU 17 (Power Plant 3). Yakutat Hangar is in the central portion of the former Naval base. Free-phase petroleum hydrocarbon releases to the environment were discovered in June 1996 north of the former hangar that housed the hobby complex. An interceptor trench with separate-phase recovery of free product was installed and has operated since February 1997. The interceptor trench employs groundwater extraction to control free-product migration and enhance recovery. Extracted groundwater is discharged to the sewer system. An active skimmer and associated pump are used to recover product and a separate pump is used to transfer water to the sewer. During the period from February 1997 through September 1998, the Yakutat Hangar recovery system removed approximately 630 gallons of free product.

  Approximately 2 feet of free product was discovered at SWMU 17 (Power Plant 3) in one well approximately 200 feet northeast of the power plant during a 1995 investigation. Free-product seeps were also observed in drainage ditches along Akutan Way and Amulet Way (adjacent to SWMU 17). Subsequently, a product interceptor trench was installed in mid-1996 to recover product and prevent further migration of free product. The product recovery system operates on the same principles as the system at Yakutat Hangar. As of September 1998, the system had recovered approximately 580 gallons of free product

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- **Total-Fluids Recovery Well.** This system is similar to the recovery trench option but has one or more recovery wells instead of a trench. Groundwater and product are recovered as a mixture, then separated after extraction.

  The largest recovery system, at SWMU 62 (New Housing Fuel Leak), was installed in 1989. This system has recovered an estimated 160,000 gallons of free product from multiple plumes located in the downtown area of Adak. (Note: The estimated total recovery for SWMU 62 is not exact due to problems with the initial recovery system. The product pumps used in the initial system occasionally pumped water that would have been recorded as free product.) In comparison, total recovery through September 1998 at the other four active system sites is approximately 1,520 gallons.

The free-product recovery system at SWMU 62 consists of 25 recovery wells and 4 treatment units. The recovery wells are dispersed to cover three large free-product plumes and one smaller plume. The recovery system, extensively modified in October 1996, uses a total-fluids recovery approach to remove free product from the water table. A single submersible electric pump located in each recovery well pumps groundwater from the shallow aquifer beneath SWMU 62 to depress the water table and induce free-product flow toward the well. As free product accumulates in the recovery well on top of the water table, it is pumped along with water to a treatment unit. In each treatment unit, an oil/water separator is used to remove free product from the well discharge and to reduce dissolved hydrocarbon concentrations prior to discharge to the sewer system. A soil vapor extraction system is used to enhance free-product removal at each recovery well. A low vacuum (approximately 40 inches of water) is applied to each recovery well using piping connected to the well head and one or more regenerative electric blowers located in each treatment unit.

Since the modification of the initial system in October 1996, the total volume of free product recovered is approximately 21,800 gallons, Approximately 90 percent of this recovery was obtained in the first 12 months of operation (October 1996 through September 1997).

In the period from January through September 1998, the SWMU 62 system recovered approximately 1,602 gallons of free product. During the period from July through September 1998, approximately 895 gallons of free product were recovered, with approximately 871 gallons of this amount recovered in July and only 24 gallons recovered in August and September 1998.

As actions are ongoing, no cost estimates for Alternative 3 (Product Recovery) are provided for the Petroleum Sites.

8.2.4 Alternative 4: Source Removal and Thermal Desorption (Limited Soil Removal)

This alternative would involve treating petroleum-affected soils in a low-temperature thermal desorber. Soils containing DRO in excess of action levels would be excavated from the site. The excavated soils would then be transported to a central mobile thermal desorption treatment location. Utilities requirements that would have to be provided for the treatment unit would include water and electricity.

Pre- and post-processing of soil may be necessary for the thermal desorption alternative. Excavated soils would first be screened to remove large (more than 2 inches in diameter) objects. These objects would be sized (for example, crushed or shredded) and then introduced back into the feed material. The treated soil would be redeposited on site or deposited in Roberts Landfill on Adak. Any treated material deposited at Roberts Landfill would have to meet permit requirements for that facility.

Thermal desorbers are designed to heat soils to temperatures sufficient to cause constituents to volatilize and desorb (physically separate) from the soil. Low-temperature thermal desorption (LTTD) heats soil to 500° to 700°F, which is sufficient to volatilize light- to medium-molecular-weight organics (such as diesel-range petroleum).

Although they are not designed to decompose organic constituents, thermal desorbers can (depending upon the specific organics and the temperature of the desorber system) cause some of the constituents to completely or partially decompose.

The vaporized hydrocarbons are generally treated in a secondary treatment unit (for example, an afterburner, catalytic oxidation chamber, condenser, or carbon adsorption unit) before discharge to the atmosphere. Afterburners and oxidizers destroy the organic constituents. Condensers and carbon adsorption units trap organic compounds for subsequent treatment or disposal.

The excavation of soils for LTTD would not be practicable for petroleum-affected soils beneath a building or close to a building foundation. LTTD also could not be considered for petroleum/affected soils more than 25 feet below ground surface (bgs) where soil excavation is not practicable. LTTD mobilization/demobilization costs are high, which results in a minimum soil treatment volume between 1,000 and 5,000 cubic yards. A test bum for thermal desorption is frequently required. Soils containing high concentrations of humic material or TPH may require blending (pretreatment) or a test burn if the heat value exceeds 2,000 British thermal units per pound (BTUs/lb).

The costs to implement Alternative 4 for the Petroleum Sites range from $600,000 to $36,000,000 per site. The time to implement the remedy would vary between several months to a year dependent upon the available desorber capacity on island and the construction season.

8.2.5 Alternative 5: Ex Situ Soil Bioremediation

This alternative would include treating petroleum-contaminated soils off site in a lined treatment cell (biopile). Soils containing DRO in excess of screening criteria would be excavated from the site. The excavated soils would then be transported to a centralized biopile staging area for bioremediation. Depending on results of pilot testing, it might be necessary to stage the biopiles indoors where the climate can be controlled.

Air is forced into the biopile using a blower. Moisture and nutrients are added as necessary. Naturally occurring microorganisms degrade the petroleum constituents. A biopile is preferred to an ex situ landfarming cell (another ex situ bioremediation technology) because a biopile can be built to a greater height and aerated with warmer air to enhance biological activity. Biopile options include construction outdoors or operation indoors in a facility such as a hangar. Construction indoors would be preferable due to the ability to control temperature and limit excess moisture.

A cover would be required for outdoor biopiles because Adak's annual precipitation averages 60 inches, which would create excessively wet conditions within the biopile. (Excessive moisture restricts movement of air through soil for proper growth of soil microorganisms.) Leachate management may be needed during biopile construction and operation.

Off-gas air treatment may be needed for the biopile if gasoline and other volatile organics are the primary compounds targeted for treatment. Also, biopiles may not be able to achieve cleanup goals for high concentrations (more than 50,000 ppm) of petroleum hydrocarbons.

Typically, temperatures below 10°C are not considered favorable for the biological activity required to degrade petroleum hydrocarbons. It is also considered favorable for biological activity to have at least a 4-month season with average temperatures above 10°C. The mean monthly temperature for August (the warmest month at Adak) is only 10.7°C; the average temperature of a biopile previously constructed on Adak rose above 10°C for only 3 months of its operation. However, recent information suggests that bacteria at Adak are quite active at low temperatures (Bradley and Chapelle 1995; Herrington and Wiedemeier 1996). A conservative approach to this alternative would suggest additional biotreatability studies or the use of heated air injection during operation and/or a temperature-controlled enclosure for the biopile.

More than 1,000 colony-forming units (CFU) per gram of native heterotrophic bacteria are needed for operation. This parameter is frequently measured during biotreatability testing. The addition of commercial "bugs" could be used to augment the biopile if insufficient concentrations of native bacteria are present. (Sufficient native heterotrophic bacteria were present during operation of the previously constructed biopile.)

Ex situ bioremediation in the form of a biopile cannot be considered for soils beneath buildings or near building foundations. Excavation of the soils beneath the building or near utilities would be the limiting factor. In these cases, natural attenuation or in situ bioremediation technologies such as bioventing would be needed.

The costs to implement Alternative 5 for the Petroleum Sites range from $135,000 to $21,000,000 per site. The time needed to implement the biopiles under Alternative 4 for the Petroleum Sites would range from several months to a year dependent upon the ability to obtain approval of the designs and locations of the biopiles and the construction season.

8.2.6 Alternative 6: In Situ Soil Bioremediation

This alternative would apply in situ bioremediation technologies to accelerate the natural biodegradation processes. Appropriate institutional controls would be utilized during treatment to limit direct exposure to the site while soil and other affected media are remediated. Natural attenuation would provide post-bioremediation “polishing.” A monitoring program would provide an assessment of bioremediation progress.

In this alternative, in situ bioremediation (in the form of bioventing, soil tilling, or landfarming) would be used to treat diesel- or JP-5-affected soils. In situ bioremediation uses indigenous microorganisms to biodegrade organic constituents adsorbed to soils in the unsaturated zone. Soils in the capillary fringe and the saturated zone would not be treated using this alternative. In bioventing, activity of the indigenous bacteria is enhanced by inducing air (or oxygen) flow into the unsaturated zone (using extraction or injection wells) and, if necessary, adding nutrients (nitrogen and phosphorus). Soil tilling and landfarming aerate the shallow subsurface to oxygenate the soil.

All aerobically biodegradable constituents can be treated by in situ biodegradation. Bioventing has proved to be particularly effective in remediating releases of petroleum products including gasoline, jet fuels, kerosene, and diesel fuel. However, high petroleum hydrocarbon concentrations (average concentrations greater than 25,000 ppm) may be initially toxic to microorganisms. Bioventing is most often used at sites with mid-weight petroleum products (diesel fuel and jet fuel) because lighter products (gasoline) tend to volatilize readily and can be removed more rapidly using soil vapor extraction (described in Alternative 8).

Intrinsic permeability is the single most important factor in determining the effectiveness of bioventing. Bioventing cannot be used when clay soil is present or when the intrinsic permeability is less than 1×10^{-10} cm^2. Intrinsic permeabilities between 1×10^{-8} to 1×10^{-10} cm^2 would require further evaluation.

Bioventing works only with unsaturated zone soils and cannot be used when depth to groundwater is less than 3 feet. For groundwater depths between 3 feet and 10 feet, bioventing would require special controls (horizontal wells or groundwater pumping).

Pilot testing would be needed for bioventing if the heterotrophic bacteria (background) plate counts are less than 1,000 CFU per gram. Pilot testing may be needed to verify the effectiveness of bioventing when soil moisture content is below 40 percent or above 80 percent, or if more than 95 percent reduction in TPH concentration is needed using bioventing.

In general, temperatures below 10°C are not considered favorable for the biological activity required to degrade petroleum hydrocarbons. It is considered favorable for biological activity to have at least 4 months above 10°C. The mean monthly temperature for August (the warmest month at Adak) is only 10.7°C, and the biopile previously built on Adak averaged above 10°C for only 3 months of its operation. However, recent information suggests that bacteria at Adak are quite active at low temperatures (Bradley and Chapelle 1995; Herrington and Wiedemeier 1996). A conservative approach to this alternative would suggest additional biotreatability studies.

The costs to implement Alternative 6 for the Petroleum Sites range from $975,000 to $43,000,000 per site. The time needed to implement in situ bioremediation under Alternative 6 would range from several months to a year dependent upon the need for pilot testing, approval of design, and the construction season.

8.2.7 Alternative 7: Soil Cover

A soil cover would provide an immediate barrier to petroleum-affected surface soils that pose possible concern through aesthetic nuisance. This alternative would be most effective at sites where there are surface soil impacts but the groundwater is not considered potable and/or sustainable as a drinking water source and chemical leaching is believed to be a relatively insignificant concern.

In this alternative, soil or rock cover would be placed over the affected area. This cover is intended to eliminate the potential for intrusion by ecological receptors by putting petroleum-affected soil below the burrow depth or root zone. Permeability of the soil cover would not be a factor in cover design because controlling infiltration of precipitation and runoff is not a consideration for this alternative. Therefore, crushed rock may be the most appropriate cover at some sites for minimizing erosion, deterring animals from digging or burrowing, and minimizing necessary cover maintenance.

The soil cover option, coupled with institutional controls, would be a highly effective means of limititing direct contact, would require minimal maintenance and controls, and would be easily implemented. Over time, petroleum hydrocarbon concentrations in the underlying soil would be reduced by natural attenuation, and institutional controls could be discontinued.

No costs were provided to implement Alternative 7 for the Petroleum Sites. The time needed to implement the soil cover for the Petroleum Sites would be several months dependent upon the availability of suitable cover and the construction season.

8.2.8 Alternative 8: Soil Vapor Extraction/Air Sparging

This alternative would include soil vapor extraction (SVE) as an in situ process for the removal of gasoline-range volatile organic compounds (such as BTEX and gasoline-range aromatics) from the unsaturated zone soils. In this technology, a vacuum is applied to the soil matrix to create a negative pressure gradient, causing movement of vapors toward vapor extraction wells. Appropriate institutional controls would be utilized during treatment to limit direct exposure to the site while soil and other affected media are remediated. Natural attenuation would provide post-SVE “polishing.” A monitoring program would provide an assessment of SVE progress.

This alternative would address soils impacted by GRO where heavier (and less volatile) petroleum products, such as diesel, are not present in significant quantities. This alternative would apply to the Runway 5-23 Avgas Valve Pit site.

An SVE system consists of a series of vapor extraction wells (commonly referred to as vapor extraction points [VEPs]), soil gas monitoring wells, and air blowers to force air through the soil and into the VEPs. The system also includes extracted air piping and contaminant removal systems. The extracted vapors are treated, as necessary, and discharged to the atmosphere or reinjected to the subsurface. SVE is well suited for the treatment of soil under structures where soil excavation would be impractical.

Intrinsic permeability is the single most important factor in determining the effectiveness of SVE. SVE cannot be used when clay soil is present or when intrinsic permeability is less than 1×10^{-10} cm^2. The intrinsic permeability can best be determined from field tests or can be estimated from soil boring logs and laboratory tests.

SVE works only with unsaturated zone soils and cannot be used when the depth to groundwater is less than 3 feet. Air transport through the soil is inhibited if water is present. If the groundwater table is at depths between 3 and 10 feet, drawdown wells may be necessary. Collection and disposal of the pumped groundwater may cause logistical and disposal problems. If gasoline is present in the saturated zone, air sparging may be the more appropriate technology.

(SVE would still be needed if air sparging was conducted near a building basement or sewer.) SVE can be combined with bioslurping when a free-product layer is also present.

Heavier oils such as diesel fuel, heating oils, and kerosene are not readily treatable by SVE. SVE cannot remove compounds with boiling points above 300°C (boiling points for diesel fuel range from 200° to 338°C). These compounds may not be sufficiently volatile for SVE; bioventing may be a more appropriate technology.

Pilot testing would be required if heavier range organics are thought to be present or if a greater than 90 percent reduction in GRO concentrations is needed using SVE.

The costs to implement Alternative 8 for the Petroleum Sites is about $650,000 per site. The time needed to implement soil vapor extraction/air sparging; under Alternative 8 would range from several months to a year dependent upon the need for pilot testing, approval of design, and the construction season.

Table 8-1
Summary of Remedial Alternatives at CERCLA Sites

		Remedial Alternatives			
		1	2	3	4
Site Type	Site Designation	No Action	Institutional Controls Only	Containment	Removal
Landfill	SWMU 4, South Davis Road Landfill	!	!	!	
Product/Waste Storage Area	SWMU 17, Power Plant 3	!	!	!	!
Water Body	Sweeper Cove	!	!	!	!
	South Sweeper Creek	!	!	!	!
	Kuluk Bay	!	!		

Notes:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
SWMU - solid waste management unit

Table 8-2
Summary of CERCLA Sites With Institutional Controls Only

Site Designation	Types of Institutional Controls				Engineering Requirement			
	1	2	3	4	a	b	c	d
SWMU 2, Landfill	!	!		!	!		!	!
SWMU 10	!	!	!	!			!	!
SWMU 11	!	!		!	!	!	!	!
SMUW 13	!	!	!	!	!	!	!	!
SWMU 14	!	!	!	!		!	!	!
SWMU 15	!	!	!	!		!	!	!
SWMU 16	!	!	!	!			!	!
SWMU 20	!	!		!			!	!
SWMU 21A	!	!		!	!		!	!
SWMU 23	!	!		!			!	!
SWMU 29	!	!		!	!		!	!
SWMUs 52, 53, 59	!	!		!			!	!
SWMU 55	!	!	!	!		!	!	!
SWMU 67	!	!		!	!		!	!
SA 76	!	!	!	!			!	!

Types of Institutional Controls (Implemented by landowner)

1. Restrict future land use. Site can be used for recreational or industrial purpose. Residential use is prohibited.
2. Implement deed restrictions or restrictive covenants on individual parcels. Land use, groundwater use, and soil excavation restrictions will be recorded in the land transfer agreement.
3. Restrict groundwater use. No well installations for domestic use will be permitted.
4. Restrict soil excavation. No person can dig at the site unless a dig permit is obtained from the Engineering Office on Adak.

Engineering Requirement (action responses associated with the implementation of institutional controls) (Performed by Navy)

a. Annually conduct visual inspection of covers at the site (and make repairs as necessary). Ensure that the cover at the site remains intact. This engineering requirement requires that repairs be made to the covers as necessary.

b. Periodically collect and analyze samples of groundwater, sediment, or surface water. Groundwater monitoring will include a water level survey of all site wells and collection of samples from a minimum of two wells. Chemical analysis will include volatile organic compounds and inorganics at SWMU 15 and volatile organic compounds at SWMUs 55 and 14. Monitoring at SWMUs 14, 15, and 55 will be conducted annually for the first 5 years, then the sampling interval will be identified as part of the site review. Groundwater at SWMU 13, and surface water and sediment at SWMU 11, will be monitored according to the interim action ROD. Monitoring will be conducted annually until the 5-year review, at which time the sampling interval may be revised.

c. Annually conduct visual inspection of the site to ensure the effectiveness of institutional controls.

d. Periodically review site conditions, as appropriate, upon notice of a remedy failure, but not less than every 5 years. Assess the need to take additional action or to reduce controls, as appropriate.

Table 8-3
Summary of Remedial Alternatives for Petroleum Sites

Source Area	Applicable Alternatives								Estimated Soil Volume (cubic yards)
	No Action	Monitored Natural Attenuation	Product Recovery (IRM)	Source Removal and Thermal Desorption	Ex Situ Bioremediation of Soil	In Situ Bioremediation of Soil[a]	Soil Cover[a]	SVE/Air Sparging (Sites With GRO Only)[a]	
Sweeper Cove Basin									
SWMU 14, Old Pesticide Storage and Disposal Area	!	!				!			7,560
SWMU 15, Future Jobs/DRMO	!	!		!	!	!			162,000
SWMU 17, Power Plant 3	!	!	!						8,520
SWMU 60, Tank Farm A	!	!		!	!	!			408,000
SWMU 62, New Housing Fuel Leak	!	!	!						827,000
SA 77, Fuels Facility Refueling Dock, Small Drum Storage Area	!	!		!					150
SA 79, Main Road Pipeline, North End (MRP-MW15) and South End	!	!		!	!	!			29,600
SA 80, Steam Plant 4	!		!						40,000
Amulet Housing, Well AMW-706 Area	!	!		!	!	!			1,670
Amulet Housing, Well AMW-709 Area	!	!		!					3,830
ASR-8 Facility (UST 42007-B)	!	!				!			20
Former Power Plant, Building (T-1451)	!	!				!	!		63,600
GCI Compound (UST GCI-1)	!		!						12,000
Housing Area (Arctic Acres)	!	!							52
Navy Exchange Building (UST 30027-A)	!	!				!			37
New Roberts Housing (UST HST-7C)	!	!		!					148
NMCB Building (UST T-1416-A)	!	!			!	!			5
NMCB Building Area, T-1416 Expanded Area	!		!						104,000
Officer Hill and Amulet Housing (UST 31047-A)	!	!				!			5
Officer Hill and Amulet Housing (UST 31049-A)	!	!		!					5

Table 8-3 (Continued)
Summary of Remedial Alternatives for Petroleum Sites

Source Area	Applicable Alternatives								Estimated Soil Volume (cubic yards)
	No Action	Monitored Natural Attenuation	Product Recovery (IRM)	Source Removal and Thermal Desorption	Ex Situ Bioremediation of Soil	In Situ Bioremediation of Soil[a]	Soil Cover[a]	SVE/Air Sparging (Sites With GRO Only)[a]	
Sweeper Cove Basin (Continued)									
Officer Hill and Amulet Housing (UST 31052-A)	!	!				!			7
Quarters A	!	!				!			3
Runway 5-23 Avgas Valve Pit	!	!		!	!			!	100
South of Runway 18-36 Area	!		!						92,600
Tanker Shed (UST 42494)	!		!						3,140
Yakutat Hangar (UST T-2039-A)	!		!	!					889
Yakutat Hangar (USTs T-2039-B and T-2039-C)	!	!		!	!	!			30
Kuluk Bay Basin									
SWMU 61, Tank Farm B	!	!		!					360
Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	!	!		!	!	!			1,190
Boy Scout Camp, West Haven Lake (UST BS-1)	!	!		!					44
Contractor's Camp Burn Pad	!	!		!	!	!			78
Girl Scout Camp (UST GS-1)	!	!		!					133
MAUW Compound (UST 24000-A)	!	!				!			130
Mount Moffett Power Plant 5 (USTs 10574 through 10577)	!	!				!			55
NAVFAC Compound (USTs 20052 and 20053)	!	!				!			2,610
NORPAC Hill Seep Area	!		!						207,000
ROICC Contractor's Area (UST ROICC-7)	!	!		!	!	!			7
ROICC Contractor's Area (UST ROICC-8)	!	!		!					75

Table 8-3 (Continued)
Summary of Remedial Alternatives for Petroleum Sites

Source Area	Applicable Alternatives								Estimated Soil Volume (cubic yards)
	No Action	Monitored Natural Attenuation	Product Recovery (IRM)	Source Removal and Thermal Desorption	Ex Situ Bioremediation of Soil	In Situ Bioremediation of Soil[a]	Soil Cover[a]	SVE/Air Sparging (Sites With GRO Only)[a]	
Kuluk Bay Basin (Continued)									
ROICC Warehouse (UST ROICC-2)	!	!		!					21
ROICC Warehouse (UST ROICC-3)	!	!		!	!	!			80
Clam Lagoon Basin									
SWMU 58, Heating Plant 6	!		!						9,780
SA 73, Heating Plant 6	!		!						2,400
SA 78, Old Transportation Building	!		!						6,110
SA 82, P-80 P-81 Buildings	!		!						710
SA 88, P-70 Energy Generator	!		!						5,780
Finger Bay Basin									
Finger Bay Quonset Hut (UST FBQH-1)	!	!		!	!	!			22

[a]Includes natural attenuation, monitoring, and institutional controls.

Notes:
AST - aboveground storage tank
GCI - General Communications, Inc.
GRO - gasoline-range organics
IRM - interim remedial measure
MAUW - modified advanced underwater weapons
NAVFAC - Naval Facility
NMCB - Naval Mobile Construction Battalion
NORPAC - North Pacific
ROICC - resident officer in charge of construction
SA - source area
SVE - soil vapor extraction
SWMU - solid waste management unit
UST - underground storage tank

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives were evaluated to determine the relative advantages and disadvantages among the alternatives and to assess which alternative best satisfies the evaluation criteria. The objective of the comparative analysis is to facilitate the remedy selection process. Comparative information is provided for use in selecting a preferred remedy and to provide the basis for how remedies satisfy statutory requirements. CERCLA requires that the ROD address and support the specific statutory requirements, emphasize long-term effectiveness, and encourage evaluation of innovative technologies.

Nine evaluation criteria contained in the NCP provide the basis for determining which alternative provides the "best balance" of tradeoffs. The nine criteria are grouped into three categories, based on the role of each criterion during remedy selection.

- Threshold criteria:
    - Overall protection of human health and the environment
    - Compliance with ARARs

- Balancing criteria:
    - Long-term effectiveness and permanence
    - Reduction of toxicity, mobility, and volume through treatment
    - Short-term effectiveness
    - Implementability
    - Cost of implementation

- Modifying criteria:
    - State acceptance
    - Community acceptance

The threshold criteria relate directly to statutory requirements that must ultimately be satisfied in a ROD. These criteria are categorized as threshold because any alternative selected must meet these basic criteria. The potential chemical-specific ARARs that apply to the impacted environmental media and sensitive receptors are summarized in this section. The media of concern for which these ARARs apply are soil, tissue, groundwater, and surface water. The chemicals of concern and the chemical concentrations designated by the ARARs were obtained from a variety of sources including the Toxic Substances Control Act (TSCA), the Alaska Oil and Hazardous Substances Pollution Control regulations, and the ambient water quality criteria guidelines for chronic/acute exposure to freshwater organisms. ARARs were often not available for ecological receptors that frequently were the affected population. In these instances, risk-based chemical concentrations were derived to serve as action levels for chemicals that otherwise have no ARAR values, as indicated in Section 7.1.2.

The balancing criteria are grouped together because they represent the primary factors upon which the comparative analysis is based. These criteria are used to examine technical, cost, institutional, and risk concerns. The level of detail required to analyze each alternative against the primary balancing criteria depends on the type and complexity of the site and the type of technologies and alternatives being considered.

The modifying criteria involve state and community acceptance, which were evaluated following the receipt of state agency and public comments on the RI/FS and the Proposed Plans.

9.1 CERCLA SITES

The comparative analysis is discussed below for each site in relation to each of the evaluation criteria.

9.1.1 SWMU 4

Table 9-1 provides a summary of the evaluation criteria for SWMU 4.

Overall Protection of Human Health and the Environment

For SWMU 4, containment (Alternative 3) would provide the most protection to the environment by minimizing the possibility of contact by ecological receptors by installing a cover system over impacted media. The containment alternative would include controls limiting future excavation and stipulating periodic inspection of the cover systems and periodic site review. Institutional controls (Alternative 2) would provide less protection to ecological receptors. Since a continuous cover does not currently exist at SWMU 4, no action (Alternative 1) would be the least protective alternative.

Compliance With ARARs

The chemicals of concern for SWMU 4 include arsenic, which exceeds ARARs, and lead and zinc, which exceed risk-based standards for this site. Therefore, Alternative 1, no action, does not comply with ARARs. Alternatives 2 and 3 require compliance with Alaska regulations that describe appropriate use of institutional controls for hazardous waste sites (18 AAC 75.375). Proper implementation of Alternative 3 requires compliance with state and federal requirements for landfill closures and postclosure requirements. A list of the ARARs associated with the RAOs for SWMU 4 is provided in Table 7-3.

Long-Term Effectiveness and Permanence

Containment (Alternative 3) would effectively minimize the possibility of contact by sensitive ecological receptors. Although contamination would remain in the subsurface soils, the cover system would permanently reduce risk to ecological receptors to below-acceptable thresholds as long as the cover system remains intact. Therefore, the containment alternative would include controls limiting future excavation and stipulating periodic inspection of the cover systems and periodic site review. Institutional controls (Alternative 2) would be less effective in areas where the existing cover systems are less than 2 feet thick. However, the same controls as employed in Alternative 3 would prevent the deterioration of the existing cover systems over time. Existing ecological risks would remain unmitigated. No action (Alternative 1) would not provide long-term effectiveness where existing cover systems are less than 2 feet thick. Alternative 1 would provide no controls to prevent the deterioration of the existing cover systems over time.

Reduction of Toxicity, Mobility, and Volume Through Treatment

None of the alternatives would reduce toxicity, mobility, and volume through treatment. Only institutional controls (Alternative 2) and containment technologies (Alternative 3) were considered. Landfill capping is a presumptive remedy for municipal solid waste landfills (U.S. EPA 1996f).

Short-Term Effectiveness

Containment (Alternative 3) would have minimal impact to the community and workers during implementation of remedial action as long as appropriate equipment and procedures are used and subsurface soils and refuse are not disturbed. Some habitat destruction would occur with earthwork but the habitat would be restored. Remedial action objectives may be achieved over the short term (likely within approximately 4 months). Institutional controls (Alternative 2) would effectively minimize short-term impacts to the community, workers, and the environment during implementation of remedial action. However, remedial action objectives would be achieved in areas with less than 2 feet of cover material only after contaminants other than inorganics are naturally degraded over the long term. No action (Alternative 1) would not have short-term impacts to the community, workers, or the environment since no action would be taken and remedial action objectives would be achieved in areas with less than 2 feet of cover material only after contaminants other than inorganics are naturally reduced over the long term.

Implementability

The procedures for controls and the technologies used during construction activities are established and would be available for implementation with the containment and institutional controls alternatives (Alternatives 3 and 2, respectively). No action (Alternative 1) would be implementable with approval from agencies.

Cost of Implementation

No costs would be incurred for Alternative 1 (no action). Costs for implementing institutional controls in Alternative 2 ($2l0,000) would be a result of implementing a land use restriction and periodic inspection/site review program. Alternative 3 would use a reasonably low-technology solution for landfill covers designed for protection of ecological receptors. The cost for Alternative 3 ($665,000) would be greater than Alternative 2 since it would include costs for construction of the cover system.

State Acceptance

The selected remedy for SWMU 4 is acceptable to the State of Alaska. Alaska DEC has been involved with the oversight and review of the RI/FS and Proposed Plan. Alaska DEC comments have resulted in substantive changes to these documents.

Community Acceptance

On February 12 and 25, 1998, the Navy held public meetings in Anchorage and Adak, Alaska, respectively, to discuss the Proposed Plan for final remedial action. The Proposed Plan identified the preferred remedial alternatives for SWMU 4 and the other landfills and discussed the other alternatives considered. Comments from the public indicated that some community members supported and some opposed the Navy's preferred alternatives for SWMU 4 and other landfills. Some commentors requested that further investigation of the landfills be conducted and that the landfills be removed from the island. There were also public concerns over potential ordnance materials in the landfills and the Navy's responsibilities for potential future problems with the landfills. These concerns are addressed in the responsiveness summary in Appendix B.

9.1.2 SWMU 17

Table 9-2 provides a summary of the evaluation criteria for the product/waste storage areas.

Overall Protection of Human Health and the Environment

For SWMU 17, sediment and surface soil removal (Alternative 4) would provide the most protection to human health and the environment. Alternative 4 would provide additional protection by implementing source controls, including removal of oil/water separator systems (already completed) and product recovery from groundwater (currently under way), and by implementing institutional controls that limit future land use and excavation and that stipulate periodic site inspection and review. Both the retention pond and the waste oil pond would persist as surface water features with Alternative 4. Containment (Alternative 3) would provide less protection by covering impacted sediments in the ponds and would be supplemented with institutional controls limiting future land use and excavation and stipulating periodic site monitoring, periodic inspection of the cover systems, and periodic site review. The ponds would be completely filled under Alternative 3. Institutional controls (Alternative 2) would provide less protection but would reduce the potential for contact with impacted media by limiting future land use and excavation and by stipulating periodic site review. No action (Alternative 1) would not be protective.

Compliance With ARARs

The chemicals of concern for SWMU 17 include lead and copper, which exceed ARARs, and PCBs and arsenic, which exceed risk-based standards for this site. Therefore, Alternative 1, no action, does not comply with ARARs. Concentrations of VOCs in groundwater exceed MCLs at one location adjacent to the dry cleaning facility. Alternative 2 for groundwater would prevent ingestion of groundwater with VOCs greater than MCLs. It is expected that VOC concentrations will be reduced to below MCLs over time by natural processes. Monitoring of the groundwater would verify this expectation. Alternatives 3 and 4 would meet state and federal ambient water quality criteria by eliminating contact of contaminated soils and sediments with surface waters. Proper implementation of Alternatives 3 or 4 would comply with state and federal regulations governing the excavation, storage, treatment, and disposal of contaminated soils and sediments. Alternatives 2, 3, and 4 require compliance with Alaska regulations (18 AAC 75.375) that describe appropriate use of institutional controls for hazardous waste sites.

Long- Term Effectiveness and Permanence

Sediment and surface soil removal (Alternative 4) would most effectively minimize residual risk. Effectiveness and permanence would be further enhanced by covering areas where contaminated media were removed, by removing the oil/water separator systems (already completed), by recovering floating petroleum product on the groundwater, and by implementing institutional controls that would minimize future exposure to residual risks at the site. Residual ecological HIs for sediments in the ponds and for surface water in the retention pond would be below the acceptable risk threshold. Containment (Alternative 3) would less effectively reduce residual risks because impacted media would remain in place, requiring institutional controls to supplement containment and enhance permanence. Institutional controls (Alternative 2) would less effectively and less permanently reduce the magnitude of residual risks at the sites, but would reduce potential future exposure. No action (Alternative 1) is considered the least effective and permanent and would rely on only natural recovery processes to reduce site risks over time.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternatives 1 and 2 would not reduce toxicity, mobility, or volume of the sediment. Alternative 3 would not reduce toxicity, mobility, or volume to a significant degree. Alternative 4 would allow use of treatment technologies (e.g., thermal desorption and solvent extraction) for reduction of organics in removed media. Irreversible reduction in toxicity and volume would be achieved with destruction of contaminants in the waste streams of treatment processes. Additional bench- and pilot-scale testing during the design phase would allow a more accurate assessment of treatment technology effectiveness, if necessary. Optionally, removed sediment and soil would be disposed of either on or off island at an appropriate engineered facility.

Short-Term Effectiveness

Removal and containment (Alternatives 4 and 3, respectively) would have minimal impact to the community and workers during implementation of remedial action as long as appropriate equipment and procedures are utilized. If media removed in Alternative 4 were shipped off site for disposal, potential impacts to the community would be possible in the case of release during transport. Both Alternatives 3 and 4 would involve impact to habitats during cover placements and removal actions. However, appropriate restoration of habitat would be included in the alternatives. Alternatives 3 and 4 would achieve remedial action objectives in the short term (likely within approximately 4 months). Institutional controls (Alternative 2) would effectively minimize short-term impacts to the community, workers, and the environment during implementation. With Alternative 2, remedial action objectives would be met only over the long term with natural recovery processes. No action (Alternative 1) would not have short-term impacts to the community, workers, or the environment since no action would be taken. Remedial action objectives would be achieved only after the impacted soil and sediment are naturally recovered over the long term.

Implementability

The procedures for controls and the technologies used during construction activities are established and would be available for implementation with the removal, containment, and institutional controls alternatives (Alternatives 4, 3, and 2, respectively). No action (Alternative 1) would be implementable with approval from agencies.

Cost of Implementation

No costs would be incurred with no action under Alternative 1. Costs for implementing institutional controls in Alternative 2 ($110,000) would be low relative to Alternatives 3 and 4 ($650,000 and $1,900,000, respectively), which would rely on increasing amounts of earthwork in addition to the replacement or removal of the oil/water separators. Alternative 4 would be the most costly alternative. The cost of Alternative 4 assumes mobilizing a treatment facility to Adak to treat petroleum hydrocarbons. Capital costs of waste shipping and off-island disposal in Alternative 4 would significantly increase the cost of Alternative 4 to approximately $4,900,000.

State Acceptance

The State of Alaska concurs with the selected remedy for SWMU 17. Alaska DEC has been involved with the oversight and review of the RI/FS and Proposed Plan. Alaska DEC comments have resulted in substantive changes to these documents.

Community Acceptance

On February 12 and 25, 1998, the Navy held public meetings in Anchorage and Adak, Alaska, respectively, to discuss the Proposed Plan for final remedial action. The Proposed Plan identified the preferred remedial alternatives for SWMU 17 and discussed the other alternatives considered. Comments from the public supported the preferred alternatives for SWMU 17. The public raised a concern regarding the presence of cleaning compounds from the dry cleaning facility at SWMU 17. All public comments are addressed in the responsiveness summary in Appendix B.

9.1.3 Water Bodies

Table 9-3 provides a summary of the evaluation criteria for water bodies.

Overall Protection of Human Health and the Environment

Sediment removal (Alternative 4) and sediment containment (Alternative 3) would provide the most protection to ecological receptors and indirectly to human health over the long term by reducing contaminant concentrations in fish and shellfish. Removal and containment measures would be applicable to South Sweeper Creek and Sweeper Cove where adverse ecological risk has been determined in sediments. Implementation of Alternatives 3 and 4 would entail significant disruption to ecosystems.

Both Alternatives 3 and 4 would use institutional controls such as fishing advisories to supplement removal and containment measures because the risk to human health is due to the ingestion of fish, not sediment. Based on the existing data, sediments do not pose an unacceptable risk to fish or humans. Both alternatives would also offer periodic tissue monitoring and site review. Because Alternatives 3 and 4 entail the removal of sediments, but not fish, it is unknown whether these alternatives would be protective of human health. Institutional controls (Alternative 2) would provide no environmental protection but would reduce risks to humans by reducing consumption of fish and shellfish from specified areas. Alternative 2 would also offer periodic tissue monitoring and site review. No action (Alternative 1) would offer no additional protection beyond natural recovery processes and would be the least protective. Under Alternatives 1 and 2, chemical levels in tissues are expected to be reduced to cleanup levels within 75 years.

Chemical concentrations in sediment, fish, and shellfish were compared to risk-based concentrations. A chemical was selected as a chemical of concern if its concentration exceeded its risk-based threshold, Alternative 1, no action, would not meet risk-based levels for cleanup. Alternative 2 would rely on institutional controls to prevent human consumption of marine organisms but would not break pathways for the organisms and sediments. Alternative 3 would break the pathway between chemicals of concern in sediments and marine receptors. Alternative 4 would remove sediments and residual contamination that could act as a source for marine receptors.

Compliance With ARARs

Chemical-specific ARARs are not available for sediments or for fish and shellfish tissue. Alternatives 2, 3, and 4 would require compliance with Alaska regulations that describe appropriate use of institutional controls for hazardous waste sites (18 AAC 75.375). Proper implementation of Alternatives 3 or 4 would comply with state and federal regulations governing the capping, or dredging, storage, treatment, and disposal of contaminated sediments, respectively. A list of the ARARs associated with the RAOs is provided in Table 7-3.

Long-Term Effectiveness and Permanence

Sediment removal (Alternative 4) would effectively and reliably reduce ecological risks from sediments in Sweeper Cove and South Sweeper Creek to below the acceptable threshold and would have some long-term benefit to human receptors. Long-term application of institutional controls at Kuluk Bay, Sweeper Cove, and South Sweeper Creek would effectively and reliably reduce residual risk to humans consuming fish and shellfish. Containment (Alternative 3) would less effectively reduce residual risks in Sweeper Cove and South Sweeper Creek since impacted media would remain in place. However, ecological risk from sediments would be reduced to below the acceptable threshold. The integrity of the marine cover systems may decrease with time due to anthropogenic or natural processes. Reduction of chemical concentrations in sediment should translate to a reduction of risk to subsistence fishers. Institutional controls employed for Alternative 3 would be the same as those in Alternative 4 and would be considered to be effective and reliable for reducing risk to human health. Institutional controls (Alternative 2) would rely on the same institutional controls as Alternatives 3 and 4, which would be considered effective and reliable for reducing risk to human health. No action (Alternative 1) would not reduce exposure to residual risks at the sites.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Only Alternative 4 would include use of treatment technologies (e.g., thermal desorption and solvent extraction) for reduction of organic compounds in removed sediments. Irreversible reduction in toxicity, mobility, and volume would be achieved with destruction of contaminants in the waste streams of treatment processes. Additional bench- and pilot-scale testing during the design phase would allow a more accurate assessment of treatment technology effectiveness at the sites. Optionally, removed materials would be disposed of at an appropriate engineered facility.

Short-Term Effectiveness

Removal (Alternative 4) would have moderate impact to the community and workers during implementation of remedial action because portions of the harbor would be closed to boat traffic while the sediment was removed. Alternative 4 would involve significant impact to the habitat in South Sweeper Creek and Sweeper Cove. Remedial action objectives related to human consumption of fish and shellfish should be met within the short term because institutional controls (i.e., fishing advisories) would be implemented within 6 months. Remedial action objectives related to ecological exposure to sediments would be met within the short term because the sediment removal will likely be completed within approximately 6 months to 1 year. Remedial action objectives related to ecological exposure to impacted fish and shellfish would be achieved by natural recovery processes over the long term (estimated to require up to 75 years).

Containment (Alternative 3) would have moderate impact to the community and workers during implementation of remedial action because portions of the harbor would be closed to boat traffic while the cap is installed. Alternative 3 would involve significant impact to the habitat in South Sweeper Creek. Remedial action objectives related to human consumption of fish and shellfish should be met within the short term because institutional controls (i.e., fishing advisories) would be implemented within 6 months. Remedial action objectives related to ecological exposure to sediments would be met within the short term because sediment containment would likely be completed within approximately 6 months. Remedial action objectives related to ecological exposure to impacted fish and shellfish would be achieved by natural recovery processes over the long term (estimated to require up to 75 years).

Institutional controls (Alternative 2) would not entail short-term impact to the community, workers, or the environment during implementation. With Alternative 2, remedial action objectives for human health would be achieved when institutional controls are put in place. Remedial action objectives related to ecological receptors may be achieved by natural recovery processes over the long term (75 years). No action (Alternative 1) would not have short-term impacts to the community, workers, or the environment since no action would be taken and remedial action objectives would be achieved only after contaminant concentrations achieve cleanup levels by natural recovery processes over the long term (75 years).

Implementability

The procedures for controls and the technologies used during construction activities are established and would be available for implementation with the removal, containment, and institutional controls alternatives (Alternatives 4, 3, and 2, respectively). Permitting issues may require more restrictive, disposal/treatment methods, depending upon the waste characterization of sediments dredged in Alternative 4. No action (Alternative 1) would be implementable with approval from agencies.

Cost of Implementation

No costs would be incurred with no action under Alternative 1. Costs for implementing institutional controls in Alternative 2 would be low relative to placement of covers and dredging included in Alternatives 3 and 4. The relatively higher cost of dredging is a result of handling and disposal of debris and contaminated sediments. The cost estimates for removal of South Sweeper Creek and Sweeper Cove sediments assumes off-island disposal at an appropriate landfill facility. The ultimate disposal approach (on- or off-island) will be determined during development of the remedial design for the site.

Cost estimates for Alternatives 2, 3, and 4 are summarized below:

Alternative 2:	South Sweeper Creek:	$250,000
	Sweeper Cove:	$260,000
	Kuluk Bay:	$250,000
Alternative 3:	South Sweeper Creek:	$470,000
	Sweeper Cove:	$19,000,000

Alternative 4:	South Sweeper Creek:	$2,700,000
	Sweeper Cove:	$22,000,000

State Acceptance

The remedial actions chosen for the water bodies are acceptable to the State of Alaska. Alaska DEC has been involved with the oversight and review of the RI/FS and Proposed Plan. Alaska DEC comments have resulted in substantive changes to these documents.

Community Acceptance

On February 12 and 25, 1998, the Navy held public meetings in Anchorage and Adak, Alaska, respectively, to discuss the Proposed Plan for final remedial action. The Proposed Plan identified the preferred remedial alternatives for the water bodies and discussed other alternatives considered. The public was concerned about PCBs in sediment, primarily in South Sweeper Creek, and desired some type of action. As a result, additional samples were collected, and contaminated sediment in South Sweeper Creek will be removed. Commentors asked for continued monitoring for Sweeper Cove and Kuluk Bay. Additional sampling for these water bodies is planned. All public comments are addressed in the responsiveness summary in Appendix B.

9.1.4 Institutional-Control-Only Sites

Table 9-4 provides a summary of the evaluation criteria for institutional-control-only sites.
Table 8-2 summarizes the institutional controls considered for application to these sites.

Overall Protection of Human Health and the Environment

Institutional controls (Alternative 2) would mitigate (or monitor) risks to human and ecological receptors by a combination of the following:

- Restrictions on future land use
- Deed restrictions or restrictive covenants
- Restrictions on soil excavation
- Restrictions on groundwater use

Engineering requirements include:

- Periodic inspection and repair of existing control systems (i.e., soil covers)

- Periodic collection and analysis of samples of site media
- Periodic review of site conditions and results of periodic site monitoring to assess the need for additional action or modifications of controls

No action (Alternative 1) would not provide protection beyond that provided by natural recovery processes and existing control systems.

Compliance With ARARs

Chemical concentrations were compared to chemical-specific ARARs. Some chemical concentrations exceeded risk-based thresholds and in some cases were greater than chemical specific ARARs or risk-based chemical concentrations. Therefore, neither alternative 1 nor 2 would comply with chemical-specific ARARs except by long-term natural recovery processes. Alternative 2 would require compliance with Alaska regulations that describe appropriate use of institutional controls for hazardous waste sites (18 AAC 75.375). This would be accomplished by maintaining controls that remove human and ecological exposure to impacted media and by monitoring natural recovery and the effectiveness of previous remedial actions. Alternative 2 would comply with location-specific and action-specific ARARs by providing controls such as stipulated monitoring, deed restrictions, or soil excavation restrictions for site conditions and previous interim actions such as soil covers. No action (Alternative 1) would not comply with state institutional control requirements for sites where chemicals remain in excess of risk and regulatory levels. A list of the ARARs associated with the RAOs is provided in Table 7-2.

Long-Term Effectiveness and Permanence

Institutional controls (Alternative 2) would likely be most effective and reliable for protecting human receptors by implementing future land use restrictions. Protection of ecological receptors would be most effective and reliable where existing cover systems are in place, monitored, and maintained. Restrictions on future disturbance of site soils would further reduce risk to potential receptors. Monitoring requirements would allow assessment of risks over time. No action (Alternative 1) would not provide long-term effectiveness where existing cover systems are inadequate and would provide no controls to prevent the deterioration of the cover systems over time. In addition, Alternative 1 would not monitor risks over time. With Alternatives 1 and 2, residual risks would remain until natural recovery occurs over time.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Institutional controls (Alternative 2) and no action (Alternative 1) would not apply treatment to reduce toxicity, mobility, and volume.

Short-Term Effectiveness

No additional short-term impacts to the community, workers, or the environment would be encountered with institutional controls (Alternative 2) and no action (Alternative 1) because active remedial measures would not be implemented. Short-term impact would be minimal for Alternative 2 because site work would be limited to periodic monitoring, site inspections, and repairs. Remedial action objectives would be achieved by long-term natural recovery processes.

Implementability

The methods and procedures for instituting deed restrictions and maintaining and monitoring engineered controls (Alternative 2) are established and would be readily available for implementation. A Second Class City or other entity has not been established to date. Whether such a city will agree to implement land use restrictions (zoning and other) and a dig permit program is unknown and uncertain. No action (Alternative 1) would be implementable with approval from the agencies.

Cost of Implementation

No costs would be incurred with no action (Alternative 1). Costs for implementing institutional controls (Alternative 2), including chemical monitoring at three sites, total $1.8 million.

State Acceptance

The remedial actions for the institutional control sites are acceptable to the State of Alaska. Alaska DEC has been involved with the oversight and review of the remedial RI/FS and Proposed Plan. Alaska DEC comments have resulted in substantive changes to these documents.

Community Acceptance

On February 12 and 25, 1998, the Navy held public meetings in Anchorage and Adak, Alaska, respectively, to discuss the Proposed Plan for final remedial action. The Proposed Plan identified the institutional control sites and the types of controls that would be placed on the sites. One commentor did not support the extensive use of institutional controls. Another commentor thought that institutional controls would not be protective of the environment. An additional concern of the community was the viability of institutional controls over the long term. All public comments are addressed in the responsiveness summary in Appendix B.

9.2 PETROLEUM SITES

This section presents the evaluation of remedial action alternatives for petroleum sites. The evaluation identifies the relative advantages of each alternative and assesses which alternative best meets the evaluation criteria described in Section 8. Table 8-3 summarizes the applicability of the remedial alternatives to the petroleum sites addressed in this ROD. Site-specific evaluations are provided in the *Final Focused Feasibility Study for Petroleum Sites* (URSG 1998a). Some alternatives, such as vapor recovery/air sparging, are applicable only to certain sites and are otherwise identified as nonapplicable in the evaluation. Consistent with the NCP, a limited number of alternatives were evaluated for the petroleum sites. These alternatives are expected to adequately address site conditions.

Alternatives to be evaluated for an individual site were chosen based on the following considerations:

1. Was free product present at the site?
2. Is the site within 200 feet of downgradient surface water (downgradient exposure medium [DEM])?
3. What is the current and/or proposed land use category (residential, industrial, or recreational)?
4. Did measured DRO concentrations in soil exceed the Alaska DEC screening criteria?
5. Did measured GRO concentrations in soil exceed the Alaska DEC screening criteria?
6. Are there buildings over the petroleum-affected area(s)?

Based on these considerations, selected alternatives were not evaluated for every petroleum site. Alternatives that were evaluated for a subset of the petroleum sites are as follows:

- The soil cover alternative was evaluated only at sites where direct contact was a potential concern under current conditions. Therefore, if there were no surface impacts in excess of supplemental criteria, this option was not evaluated.

- Intrusive alternatives (such as product removal or ex situ bioremediation) were not evaluated if existing structures obstructed possible excavation areas.

- The site was evaluated only for natural attenuation, source removal, or in situ bioremediation if the site is within 200 feet of the DEM and (1) on-site concentrations did not exceed criteria and/or (2) groundwater was either absent or groundwater analyses indicated no risk from groundwater exposure.

- The vapor recovery/air sparging alternative was not evaluated unless GRO concentrations exceeded criteria and DRO concentrations did not. Conversely, the two in situ bioremediation alternatives were not evaluated for sites where GRO was the primary compound of concern, as these alternatives are more appropriate for DRO.

The no-action alternative was evaluated for all sites but was not believed sufficiently effective to meet the RAOs.

Results of the comparative analysis for each alternative applicable to the sites listed in Table 8-3 are presented in Table 9-5. Included is an evaluation of each alternative and its ability to meet threshold and balancing criteria. A brief summary of the results is presented below for each site type.

Product recovery has been ongoing at 14 sites. At these sites, only two alternatives were considered: no action or product recovery. When the recovery is completed to the extent practicable, these sites will be reevaluated for additional remedial measures (if any). The petroleum recovery alternative was not evaluated for non-free-product sites. Free-product recovery was applied as a presumptive remedy at free-product sites to meet 18 AAC 75.325 requirements.

The monitored natural attenuation alternative generally ranked *good* to *excellent* in overall protectiveness, compliance with ARARs, short-term effectiveness, and long-term effectiveness and permanence. It ranked *good* to *superior* in implementability. In addition, the implementation cost estimate was generally below $50,000 per site (assuming 30 years of annual monitoring) compared to $135,000 to $36 million per site for the other alternatives.

Both source removal (e.g., limited soil removal) and ex situ soil bioremediation were evaluated along with natural attenuation for several sites. It was concluded that these two intrusive alternatives would reduce petroleum concentrations more quickly and permanently and thus are rated slightly higher in long-term effectiveness. However, the costs of these two alternatives are substantially greater than for natural attenuation. (Implementation costs for the intrusive alternatives are estimated to be in the range of $135,000 to $36 million per site, compared to natural attenuation at about $50,000 or less per site.) Also, the short-term impact to the environment from intrusive damage means that the short-term effectiveness of the removal alternatives is less than for natural attenuation.

In situ soil bioremediation was rated less favorably than monitored natural attenuation in nearly every category for most sites. At one site (Former Power Plant Building [T-1451]), the bioremediation alternative rated better than monitored natural attenuation but less favorably than the soil cover alternative. The cost of in situ soil bioremediation is estimated to be substantially greater than monitored natural attenuation and about four times the cost of a soil cover at the former power plant site.

The soil vapor extraction/air sparging alternative was evaluated for only one site where the primary concern was gasoline-range organics in the unsaturated zone. This alternative ranked about the same as monitored natural attenuation but implementation cost is estimated to be substantially greater (about $650,000).

Table 9-1
Analysis of Alternatives Using Evaluation Criteria for Landfills (SWMU 4)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
1: No Action	This alterative would provide no additional protection beyond that provided by long-term natural recovery processes.	Would not comply with chemical-specific ARARs. However, ARARs are not available for ecological exposure to soils/sediments. Would not comply with state institutional control requirements for sites where chemicals remain in excess of risk or regulatory levels.	This alternative would rely on the existing conditions and would not provide additional environmental protection. Residual risk would remain until chemical concentrations are reduced naturally: Subsurface soil: HI = 130	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	No additional short-term impacts to the community, workers, or the environment would result from this alternative because it does not include remedial action. RAOs would be achieved only by long-term natural recovery processes.	Implementable with approval from agencies.	Capital: $0 Annual O&M: $0 Present worth (30 years) of capital and O&M: $0
2: Institutional Controls	This alternative would reduce future environmental exposure by implementing land use restrictions and periodic site inspection and review. Ecological receptors would be protected by controlling future excavation activities and disturbance of site soils.	Would not comply with state institutional control requirements.	Residual risk to ecological receptors would be minimized by long-term application of institutional controls. Residual risk would remain from uncovered subsurface soil containing COCs until concentrations are reduced naturally: Subsurface soil: HI = 130	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	Implementation of institutional controls would not cause additional short-term impacts to the community, workers, or the environment. RAOs would be achieved only by long-term natural recovery processes.	The procedures for controls are established and available for implementation.	Capital: $0 Annual O&M $24,000 Present worth (30 years) of capital and O&M: $210,000

Table 9-1 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Landfills (SWMU 4)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
3: Containment	This alternative would reduce future ecological exposure by use of a cover system to reduce and control risks. Institutional controls preventing future disturbances of the covers and requiring periodic site inspection, repair, and review would enhance environmental protection in the future. This alternative is considered protective of ecological receptors since COCs would be contained and no receptor impacts would result.	Would comply with chemical-specific ARARS by separating receptors from exposure to soils/sediments. Would comply with location and action-specific ARARs during implementation of remedial actions. Would comply with state institutional controls.	Exposure of ecological receptors to residual risk would be protected by the cover systems and application of institutional controls. This alternative is considered effective and reliable as long as institutional controls are implemented. Remaining residual risks: Subsurface soil: HI # 1 (. 99% reduction)	This alternative would not apply treatment to reduce toxicity, mobility, and volume. Landfill capping considered as a presumptive remedy.	Construction of the cover system and implementation of institutional controls would not cause additional short-term impacts to the community or workers, as long as appropriate equipment and procedures are used and subsurface soils and refuse are not disturbed. Some environmental impact would occur when habitat is covered, but habitat would be restored. RAOs may be achieved within 4 months.	The procedures for controls and the technologies used during construction activities are established and available for implementation.	Capital: $455,000 Annual O&M: $24,000 Present worth (30 years) of capital and O&M: $665,000

[a] The estimated costs of implementation shown are order of magnitude estimates and are accurate with +50% and -30%. A discount rate of 5% was used to determine present worth values.

Notes:
ARARs - applicable or relevant and appropriate requirements
COC - chemical of concern
HI - ecological hazard index
O&M - operation and maintenance
RAO - remedial action objective
SWMU - solid waste management unit

Table 9-2
Analysis of Alternatives Using Evaluation Criteria for Product/Waste Storage Areas (SWMU 17)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
1: No Action	This alternative would not provide protection beyond that of the natural recovery processes.	Would not comply with water quality standards for protection of freshwater organisms in the retention pond. Would not comply with state institutional control requirements.	This alternative would not address risk from site contamination. Residual ecological risk would remain until natural recovery occurs. Remaining residual ecological risk: Surface water in retention pond: HI = 160 (No ecological risk reduction) Sediment in retention pond: HI = 59 (No ecological risk reduction) Sediment in waste oil pond: HI = 110 (No ecological risk reduction)	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	No additional short-term impacts to the community, workers, or the environment would result from this alternative because it would not include remedial action. RAOs would be achieved only by long-term natural recovery processes.	Implementable with approval from agencies.	Capital: $0 Annual O&M: $0 Present worth (30 years) of capital and O&M: $0
2: Institutional Controls	This alternative would protect future human health and reduce future ecological exposure by implementing land use restrictions and periodic site review. Human health would be protected by limiting future site use to industrial only and by implementing groundwater use restrictions. Ecological receptors would be protected by controlling future excavation activities and disturbance of site soils.	Would not comply with water quality standards for protection of freshwater organisms in the retention pond. Would not comply with location-specific ARARs involving wetlands and habitat. Would comply with state institutional control requirements.	Residual risk to receptors would be minimized by long-term application of institutional controls. These measures would be considered effective and reliable. Residual ecological risks would remain until natural recovery occurs. Remaining residual ecological risk: Surface water in retention pond: HI = 160 (No ecological risk reduction) Sediment in retention pond: HI = 59 (No ecological risk reduction)	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	Implementation of institutional controls would not cause additional short-term impacts to the community, workers, or the environment. RAOs would be achieved only by long-term natural recovery processes.	The procedures for controls are established and would be available for implementation.	Capital: $18,000 Annual O&M: $11,000 Present worth (30 years) of capital and O&M: $110,000

Table 9-2 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Product/Waste Storage Areas (SWMU 17)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
2: Institutional Controls (Continued)			Sediment in waste oil pond: HI = 110 (No ecological risk reduction)				
3: Containment	This alternative would protect future human health and reduce future ecological exposure by implementing containment of pond sediments, source controls, land use restrictions, and periodic site inspection. Human health would be protected by limiting future site use to industrial only and by implementing a groundwater use restriction. Ecological receptors would be protected by containing impacted sediments beneath a cover system, by controlling future excavation activities, and by eliminating the possibility of future releases from the oil/water separator systems	Would comply with water quality standards for protection of freshwater organisms. Would comply with location- and action-specific ARARs during implementation of remedial actions. Would comply with state institutional control requirements.	Residual risk to receptors would be reduced by long-term application of institutional controls and by containing impacted media beneath cover systems. Residual risks from surface water would be reduced by filling both the waste oil pond and the retention pond with a cover system. These measures would be considered effective and reliable. Remaining residual ecological risks: Surface water in retention pond: HI < 1 Sediment in retention pond: HI < 1 Sediment in waste oil pond: HI < 1	Toxicity and volume of oil/water separator system discharge and of pond surface water pumped during construction activities would be reduced through treatment at the Adak wastewater treatment plant. Other components of this alternative would not apply treatment to reduce toxicity, mobility, and volume.	Implementation of this alternative would not cause additional short-term impacts to the community. Workers may be exposed to site contamination during construction activities but risks may be minimized with use of appropriate protective equipment and procedures. Habitat at the ponds would be destroyed. RAOs can be achieved within 4 months.	The procedures for controls and the technologies used during construction activities are established and would be available for implementation	Capital: $410,000 Annual O&M: $28,000 Present worth (30 years) of capital and O&M: $650,000

Table 9-2 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Product/Waste Storage Areas (SWMU 17)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
4: Removal	This alternative would protect future human health and reduce future ecological exposure. Impacted surface soil (in vicinity of waste oil pond) and pond sediments would be removed and replaced with cover systems over residual chemical concentrations. The possibility of future releases from the oil/water separator systems would be eliminated and floating oil product would be removed from the groundwater. Residual risk would be controlled by restricting land use, groundwater use, and excavation and by periodic site monitoring, review, and inspection.	Would comply with water quality standards for protection of freshwater organisms. Would comply with location-and action-specific ARARs during implementation of remedial actions. Would comply with state institutional control requirements.	Residual risk would be reduced with removal and containment measures. Long-term application of institutional controls and source controls would also be employed to residual risks. These measures would be considered effective and reliable. Remaining residual ecological risks: Surface water in retention pond: HI < 1 Sediment in retention pond: HI < 1 Sediment in waste oil pond: HI < 1	Toxicity and volume of oil/water separator system discharge and of pond surface water pumped during construction activities would be reduced through treatment at the Adak wastewater treatment plant. This alternative would allow for additional reduction in toxicity, mobility, and volume if treatment options are employed on removed media. Thermal desorption and solvent extraction technologies would be considered for treatment of organic compounds. Destruction of contaminants in waste streams of treatment processes would result in irreversible reduction in toxicity, mobility, and volume. Additional bench- and pilot-scale testing would be required before implementation. Optionally, removed materials would be disposed of at an appropriate engineered facility.	Implementation of this alternative would cause additional short-term impacts to the community if removed media are shipped off island. Workers may be exposed to site contamination during construction activities but risks may be minimized with use of appropriate protective equipment and procedures. Habitat at the waste oil pond would be destroyed. RAOs can be achieved within 4 months.	The procedures for controls and the technologies used during construction activities are established and would be available for implementation.	Capital: $1,900,000 Annual O&M: $0 Present worth (30 years) of capital and O&M: $1,900,000

[a] The estimated costs of implementation shown are order of magnitude estimates and are accurate within +50% and -30%. A discount rate of 5% was used to determine present worth values.

Notes:
ARARs - applicable or relevant and appropriate requirements
HI - ecological hazard index
O&M - operation and maintenance
RAO -remedial action objective
SWMU - solid waste management unit

Table 9-3
Analysis of Alternatives Using Evaluation Criteria for Water Bodies
(South Sweeper Creek, Sweeper Cove, and Kuluk Bay)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
1: No Action	This alternative would not provide protection beyond that provided by the natural recovery processes.	Chemical-specific ARARs are not available for ecological exposure to soils/sediments or human ingestion of shellfish and fish tissue. Would not comply with state institutional control requirements for sites where chemicals remain in excess of risk or regulatory levels.	This alternative would not address risk from site contamination. Residual risk would remain until natural recovery occurs. Remaining residual risks: South Sweeper Creek: Tissue: HI = 45 Sediment: HI = 200 Sweeper Creek: Tissue: HIh = 10 CR = $1x10^{-3}$ Kuluk Bay: Tissue: HIh = 7.3 CR = $1x10^{-4}$	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	No additional short-term impacts to the community, workers, or the environment would result from this alternative because it does not include remedial action. RAOs would be achieved only by long-term natural recovery processes.	Implementable with approval from agencies.	Capital: $0 Annual O&M: $0 Present worth (30 years) of capital and O&M: $0

Table 9-3 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Water Bodies
(South Sweeper Creek, Sweeper Cove, and Kuluk Bay)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
2: Institutional Controls	This alternative would reduce future exposure of subsistence fishers to ingestion of impacted fish and shellfish by implementing fishery advisories and educational requirements. This alternative would allow for periodic site monitoring and review. This alternative would protect human health by reducing ingestion of fish and shellfish as long as controls are in place. This alternative would not protect ecological receptors beyond protection provided by the natural recovery processes.	Chemical-specific ARARs are not available for ecological exposure to soils/sediments or human ingestion of shellfish and fish tissue. Would comply with state institutional control requirement, by maintaining controls that limit exposures and monitoring of previous remedial actions.	Residual risk to human receptors would be minimized with long-term application of institutional controls, which are considered effective and reliable. Residual ecological risk would remain in sediments and tissue until natural recovery occurs. Remaining residual risks: South Sweeper Creek: Tissue: HI = 45 Sediment: HI = 200 Sweeper Creek: Tissue: HIh = 10 CR = $1x10^{-3}$ Kuluk Bay: Tissue: HIh = 7.3 CR = $1x10^{-4}$	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	Implementation of institutional controls would not cause additional short-term impacts to the community, workers, or the environment. Human health RAOs would be achieved when controls are put in place. RAOs for ecological receptors would be achieved by long-term natural recovery processes.	The procedures for the controls are established and would be available for implementation.	South Sweeper Creek: Capital: $8,500 Annual O&M: $28,000 Present worth (30 years of capital and O&M: $250,000 Sweeper Creek: Capital: $35,000 Annual O&M: $26,000 Present worth (30 years of capital and O&M: $260,000 Kuluk Bay: Capital: $25,000 Annual O&M: $26,000 Present worth (30 years of capital and O&M: $250,000

Table 9-3 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Water Bodies
(South Sweeper Creek, Sweeper Cove, and Kuluk Bay)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
3: Containment	This alternative would protect future subsistence fishers by implementing fishery advisories and educational requirements. It would allow for periodic site monitoring and review at Sweeper Cove. This alternative would reduce future ecological exposure (Sweeper Cove, South Sweeper Creek) by containment of impacted sediments beneath cover systems. The integrity of the cover may decrease with time due to natural processes. If COCs continue migrating to water bodies, they may pose future risk to ecological receptors. This alternative would not provide immediate protection to ecological receptors ingesting marine tissues.	Chemical-specific ARARs are not available for ecological exposure to soils/sediments or human ingestion of shellfish and fish. Would comply with location- and action-specific ARARs during implementation of remedial actions. Would comply with state institutional control requirements.	The sediment cover would reduce residual risk to ecological receptors with some long-term benefit to human receptors. The long-term integrity of the cover may diminish over time. Residual risk to human receptors would be minimized by long-term application of institutional controls, which is considered effective and reliable. Residual ecological risks from exposure to sediment would be reduced over time until sediments recovered naturally. Remaining residual risks: South Sweeper Creek: Tissue: HI = 45 Sediment: HI < 200 Sweeper Cove: Tissue: HIh < 10 CR < $1x10^{-3}$ Kuluk Bay: Tissue: HIh < 7.3 CR < $1x10^{-4}$	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	Implementation of this alternative would cause additional short-term impacts to the community because the harbor may be closed to boats. Workers may be exposed to contamination during construction activities, but risks may be minimized with use of appropriate protective equipment and procedures. The aquatic ecosystem would be adversely impacted, with greatest damage to the benthic environment as it is buried by the cover installations in Sweeper Cove and South Sweeper Creek. Some sediments would be worked into suspension in the water column. RAOs related to human consumption of fish and shellfish and related to ecological exposure to sediments may be achieved within 6 months. RAOs related to ecological exposure to impacted fish and shellfish would be achieved by natural recovery processes over the long term.	The procedures for the controls and the technologies used during construction are established and would be available for implementation.	South Sweeper Creek: Capital: $410,000 Annual O&M: $6,700 Present worth (30 years of capital and O&M: $470,000 Sweeper Cove: Capital: $19,000,000 Annual O&M: $26,000 Present worth (30 years of capital and O&M: $19,000,000

Table 9-3 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Water Bodies
(South Sweeper Creek, Sweeper Cove, and Kuluk Bay)

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
4: Removal	This alternative would protect future subsistence fishers by implementing fishery advisories and educational requirements. It would allow for periodic site monitoring and review at Sweeper Cove. This alternative would reduce future ecological exposure (Kuluk Bay, Sweeper Cove, South Sweeper Creek) by removal of impacted sediment.	Chemical-specific ARARs are not available for ecological exposure to soils/sediments or human ingestion of shellfish and fish. Would comply with location and action-specific ARARs during implementation of remedial actions. Would comply with state institutional control requirements.	Sediment removal would reduce residual risk to ecological receptors with some long-term benefit to human receptors. Residual risk to human receptors would be minimized by long-term application of institutional controls, which are considered effective and reliable. Remaining residual risks: South Sweeper Creek: Tissue: HI = 45 Sediment: HI < 200 Sweeper Cove: Tissue: HIh < 10 CR < $1x10^{-3}$ Kuluk Bay: Tissue: HIh < 7.3 CR < $1x10^{-4}$	This alternative would allow for reduction in toxicity, mobility, and volume if treatment options are employed on removed sediments. Thermal desorption and solvent extraction technologies are considered for treatment of organics. Destruction of contaminants in waste streams of treatment processes would result in irreversible reduction in toxicity, mobility, and volume. Additional bench- and pilot-scale testing would be required before implementation. Optionally, removed materials would be disposed of at an appropriate engineered facility.	Implementation of this alternative would cause additional impacts to the community. Workers may be exposed to contaminants during construction activities but risks may be minimized with use of protective equipment and procedures. The marine environment would be adversely impacted as the benthic environment is dredged in Sweeper Cove and South Sweeper Creek. Some sediments would be worked into suspension in the water column. RAOs related to human consumption of fish and shellfish and related to ecological exposure to sediments may be achieved within 6 months to 1 year.	The procedures for the controls and the technologies used during construction and implementation are established and would be available. However, permitting issues may require more restrictive disposal/treatment methods depending upon waste characterization of the sediments.	South Sweeper Creek: Capital: $2,700,000 Annual O&M: $6,700 Present worth (30 years of capital and O&M: $2,700,000 Sweeper Cove: Capital: $22,000,000 Annual O&M: $26,000 Present worth (30 years of capital and O&M: $22,000,000

Table 9-3 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Water Bodies
(South Sweeper Creek, Sweeper Cove, and Kuluk Bay)

[a] The estimated costs of implementation shown are order of magnitude estimates and are accurate within +50% and -30%. A discount rate of 5% was used to determine present worth values.

Notes:
South Sweeper Creek ecological risks from sediment exposure were recently calculated (URSG 1998b) using most recent sediment data including data from 35 new locations sampled in the summer of 1998.
ARARs - applicable or relevant and appropriate requirements
COC - chemical of concern
CR - cancer risk
HI - ecological hazard index
HIh- human hazard index
O&M - operation and maintenance
RAO - remedial action objective

Table 9-4
Analysis of Alternatives Using Evaluation Criteria for Institutional-Control-Only Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
1: No Action	This alternative would not provide protection beyond that provided by the natural recovery processes and existing control systems.	Would not comply with chemical-specific ARARs. However, ARARs are not available for ecological exposure to soils/sediments. Would not comply with state institutional control requirements for sites where chemicals remain in excess of risk or regulatory levels.	This alternative would not address risk from site contamination. Residual risk would remain until natural recovery occurs. Remaining residual risk: Human Health: CR between $1x10^{-6}$ and $1x10^{-4}$ HIh between 1.0 and 7 Ecological: HI between 11 and 260	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	No additional short-term impacts to the community, workers, or the environment would result from this alternative because it does not include remedial action. RAOs would be achieved only by long- term natural recovery processes.	Implementable with approval from agencies.	Capital: $0 Annual O&M: $0 Present worth (30 years) of capital and O&M: $0
2: Institutional Controls	This alternative would provide for restriction of future land use, inspection and repair of control systems, restriction of groundwater use, restriction of excavations, and periodic site monitoring and review. Environmental protection would be provided by inspecting and maintaining cover systems installed under previous interim actions and by restricting excavation activities. Otherwise, environmental protection beyond that provided by natural recovery would not be included in this alternative.	Would comply with some chemical-specific ARARs by maintaining controls to remove human and ecological exposure to soils/sediments. Would comply with MCLs following natural recovery. Would comply with location- and action-specific ARARs by providing control for site conditions and previous interim actions. Would comply with state institutional control requirements.	Residual risk to receptors would be reduced by application of institutional controls. Control measures are considered effective and reliable, especially where existing cover systems are in place and maintained. Residual risks would remain until natural recovery occurs. Remaining residual risk: Human Health: CR between $1x10^{-6}$ and $1x10^{-4}$ HIh between 1.0 and 7 Ecological: HI between 11 and 260	This alternative would not apply treatment to reduce toxicity, mobility, and volume.	No additional short-term impacts to the community, workers, or the environment would result from this alternative because site work would be limited to periodic monitoring, site inspection, and repairs. RAOs would be achieved only by long-term natural recovery processes.	The procedures for controls are established and would be available for implementation.	Sum of cost for all 15 institutional-control-only sites: Capital: $0 Annual O&M: $200,000 Present Worth (30 years) of capital and O&M: $1,800,000

Table 9-4 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Institutional-Control-Only Sites

[a]The estimated costs of implementation shown are order of magnitude estimates and are accurate within +50% and -30%. A discount rate of 5% was used to determine present worth values.

Notes:
ARARs -applicable or relevant and appropriate requirements
CR - cancer risk
HI - ecological hazard index
HIh - human hazard index
O&M - operation and maintenance
RAO - remedial action objective

Table 9-5
Analysis of Alternatives Using Evaluation Criteria for Petroleum Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
1: No Action	This alternative would not provide protection beyond that of long-term natural attenuation of TPH. It would provide no controls over exposure to downgradient receptors. This alternative's ratings are: • **Good** for overall protectiveness for sites where no ecological risks are present, maximum soil concentration is below screening criteria, and groundwater is not potable nor is there sufficient yield • **Fair** for overall protectiveness for sites with soil above screening criteria but where groundwater monitoring conducted at the site has yet to show risk • **Poor** for overall protectiveness for sites with soil above screening criteria, ecological risks, or potable groundwater	Would not meet chemical-specific ARARs for TPH. Location-specific ARARs would not be met. No action-specific ARARs are met (there would be no action). This alternative's ratings are: • **Good** for compliance with state THP ARARs for sites where no ecological risks are present, maximum soil concentration is below screening criteria, and groundwater is not potable nor is there sufficient yield • **Fair** for compliance with state TPH ARARs for sites with soil above screening criteria but where groundwater monitoring conducted at the site has yet to show risk • **Poor** for compliance with state TPH ARARs for sites with soil above screening criteria, ecological risks, or potable groundwater	Residual TPH at the individual sites would not be changed from present conditions except by natural attenuation mechanisms (e.g., biodegradation, leaching, and dilution), which occur slowly over time. For some sites, present conditions are not adequate to prevent migration of TPH into downgradient environments. Source media have not been removed and existing risks would remain. This alternative's ratings are: • **Good** for long-term effectiveness for sites where no ecological risks are present, maximum soil concentration is below screening criteria, and groundwater is not potable nor is there sufficient yield • **Fair** for long-term effectiveness for sites with soil above screening criteria but where groundwater monitoring has yet to show risk • **Poor** for long-term effectiveness for sites with soil above screening criteria, ecological risks, or potable groundwater 5-year reviews would be required.	No active treatment in this alternative.	Short-term effectiveness of no action depends on the potential environmental impacts of not remediating the sites and the time until protection is achieved, which would vary by site This alternative's ratings are: • **Good** for short-term effectiveness for sites below the soil screening criteria • **Fair** for short-term effectiveness for sites above soil screening criteria (with or without ecological risks)	Readily implementable	No cost
2: Monitored Natural Attenuation	The natural attenuation portion of this alternative would reduce and possibly eliminate exposure to TPH through natural processes (e.g., biodegradation, volatilization) over a period of time. The length of time for the natural attenuation processes to achieve protection would vary from site to site. Institutional controls would be in place until remedial goals are met.	This alternative's ratings are: • **Excellent** for compliance with federal and state regulations for sites below the soil screening criteria where no ecological risks are present. • **Execellent** for compliance with federal and state regulations for sites above screening criteria but where groundwater monitoring conducted at the site has yet to show risk.	Time until protection is achieved would depend on natural attenuation processes, which would vary with site. This alternative's ratings are: • **Excellent** for long-term effectiveness of natural attenuation in sites below the soil screening criteria	No active treatment in this alternative.	No short-term risks to workers or wildlife from implementing this alternative. Institutional controls would be implemented as part of the base closure process. Time until protection is achieved depends on natural attenuation processes, which would vary with site.	Readily implementable. Requires administrative coordination for implementing controls during base closure process. Implementability of institutional controls would vary with site.	$37,600 per well for 75 years of monitoring

Table 9-5 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Petroleum Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
2: Monitored Natural Attenuation (Continuted)	This alternative's ratings are: • **Excellent** for overall protectiveness for sites below the soil screening criteria where no ecological risks are present • **Excellent** for overall protectiveness for sites above screening criteria but where groundwater monitoring conducted at the site has yet to show risk • **Good** for overall protectiveness for sites above soil screening criteria with no ecological risks but where groundwater shows risk or has not been sampled • **Fair** for sites that are above soil screening criteria with modeled ecological risks Monitoring would be used to evaluate the progress of natural attenuation and permit the consideration of additional remedies (if needed). Institutional controls (use restrictions, excavation restrictions, groundwater use restrictions) would be used to control exposure to TPH in soil.	• **Good** for compliance with federal and state regulations for sites above soil screening criteria with no ecological risks but where groundwater shows risks or has not been sampled • **Fair** for sites above soil screening criteria with modeled ecological risks This alternative includes groundwater monitoring to evaluate the natural attenuation of possible sources and clarify when additional control measures might be appropriate.	• **Excellent** for long-term effectiveness for sites above screening criteria but where groundwater monitoring at the site has yet to show risk • **Good** for long-term effectiveness for sites above soil screening criteria with no ecological risks but where groundwater shows risk or has not been sampled • **Fair** for long-term effectiveness for sites with soil above screening criteria and with ecological risk impacts Institutional controls would be implemented as part of the base closure process. Environmental sampling of monitoring wells should provide adequate warning of the need for more extensive remedial measures. 5-year reviews would be required.		This alternative's ratings are: • **Excellent** for short-term effectiveness of natural attenuation in sites below the soil screening criteria • **Excellent** for short-term effectiveness for sites above screening criteria but where groundwater monitoring conducted at the site has yet to show risk • **Good** for short-term effectiveness for sites above soil screening criteria (with or without ecological risks)	This alternative's ratings are: • **Superior** for implementability of institutional controls for remote recreational sites where no potable water is available • **Excellent** for implementability of institutional controls for sites with no surface soil above screening criteria • **Good** for implementability of institutional controls for sites where surface soil above screening criteria would remain	

Table 9-5 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Petroleum Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
3 Interim Remedial Measure (Product Recovery)	The product recovery portion of this alternative would reduce the quantity of free product that can reach downgradient human and ecological receptors. At the conclusion of product recovery, the sites would undergo further evaluation	This alternative's ratings are: • **Good** for compliance with federal and state regulations for sites above soil screening criteria with no ecological risks • **Fair** for sites above soil screening criteria with modeled ecological risks This alternative needs further evaluation at the completion of product recovery.	This alternative's rating is: • **Fair** for long-term effectiveness and permanence due to the need to reevaluate site following the completion of product recovery (it may be possible that free-product removal will be effective and permanent if sources of free product are eliminated) At the housing units, use of the existing underground piping system would be discontinued. A review within 5 years would be required under CERCLA.	No active treatment during free-product recovery. However, recovered free product is recycled by burning in boilers on island, which represents reduction of TPH volume through treatment.	For many of the application sites, product recovery is being implemented with minimal or no impacts to workers or wildlife. This alternative's ratings are: • **Good** for short-term effectiveness for sites below the soil screening criteria • **Good** for short-term effectiveness for sites above screening criteria but where groundwater monitoring conducted at the site has yet to show risk • **Fair** for short-term effectiveness for sites above soil screening criteria (with or without ecological risks) but where groundwater at the site has not been sampled or shows risk This alternative needs further evaluation at the completion of product recovery.	The alternative is readily implementable at applicable sites but needs further evaluation at the completion of product recovery. The administrative feasibility of this alternative varies with site.	Actions are ongoing, no cost estimates evaluated
4 Source Removal and Thermal Desorption	Exposures at sites arising from TPH soil contamination would be eliminated by source removal and thermal desorption. TPH in the form of DRO and GRO would be reduced below applicable soil criteria. The limits of excavation are uncertain for many sites because the extent of subsurface contamination has not been completely defined. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings.	Thermal desorption with off-gas treatment would meet all chemical-specific, location-specific, and action-specific ARARs. Determining excavation limits for contamination soil is an uncertainty in achieving the chemical-specific ARARs for TPH in this alternative. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings.	Thermal desorption of TPH from excavated soils would be effective and permanent; certainty of success would be high. No operation and maintenance is needed for this alternative. Monitoring may be required at sites at conclusion of treatment to verify that residual TPH is not present.	Toxicity, mobility, and volume of TPH would be reduced (assuming off-gas treatment). Determining excavation limits for contaminated soil is an uncertainty in reducing the volume of TPH in soil. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings.	Minimal short-term impacts to workers and wildfire are expected due to excavation operations. Alternative could be implemented (and completed) during construction season (summer months) Potential short-term impacts to the environment are expected from thermal desorber operation.	Known process and implementable. Test burn or agency approval may be needed prior to operation. Excavation of TPH-contaminated soil beneath buildings may not be possible. Difficulties may occur in defining the limits of excavation. Need 1,000 to 5,000 yd^3 of soil to use technology (minimum mobilization volume requirements).	About $600,000 to $36,000,000 per site

Table 9-5 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Petroleum Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
4 Source Removal and Thermal Desorption (Continued)						Previous operational difficulties with thermal desorption include obtaining contractors, shortages of parts, and outages.	
5 Ex Situ Bioremediation of Soil	Exposures at sites arising from TPH soil contamination would be reduced and possibly eliminated by ex situ bioremediation of soil. Maintained and operated biopile would reduce DRO and GRO below applicable soil criteria. The limits of excavation are uncertain for many sites because the extent of subsurface contamination has not been completely defined. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings.	Ex situ bioremediation meets all chemical-specific, location-specific, and action-specific ARARs. Determining excavation limits for contaminated soil would be an uncertainty in achieving the chemical-specific ARARs for TPH in this alternative. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings. Reliability of the technology for achieving the chemical-specific ARARs is considered good.	Ex situ bioremediation of TPH in a biopile would be effective and permanent; certainty of success would be moderate. Biopile operation requires moisture control during loading and operation. The biopile may operate 6 months to a year to achieve soil cleanup criteria. Monitoring may be required at sites at conclusion of treatment to verify that residual TPH is not present.	Volume and toxicity of TPH would be reduced. Mobility of TPH would be controlled by cover and leachate collection system during treatment. Determining excavation limits for contaminated soil is an uncertainty in reducing the volume of TPH in soil. Due to excavation limitations, this alternative cannot be used at sites with TPH contamination beneath buildings.	Minimal short-term impacts to workers and wildlife are expected due to excavation operations. Excavation could be implemented during construction season (summer months). Time to achieve cleanup levels for biopiles may range several months to a year. Sites need cover while excavated soil is treated in biopile.	Known processes previously implemented at Adak. Excavation of TPH-contaminated soil beneath buildings may not be possible. Difficulties may occur in defining the limits of excavation. Proper construction of the biopiles will be critical in the performance of this alternative.	About $135,000 to $21,000,000 per site
6 In Situ Bioremediation of Soil, Natural Attenuation, Monitoring, and Institutional Controls	Exposures at sites arising from TPH soil contamination would be reduced and possibly eliminated by in situ bioremediation of soil. This alternative is highly dependent upon subsurface conditions and requires treatability testing prior to selection. In situ bioremediation has the ability to reduce TPH (i.e., DRO) below applicable soil criteria. There is a potential for vapors generated by this technology to migrate toward nearby basements, sewers, and confined spaces. Natural attenuation, monitoring, and institutional controls would be used to "polish" remaining TPH below applicable soil criteria.	In situ bioremediation would meet all location-specific and action-specific ARARs. Ability to achieve chemical-specific (TPH) ARARs under Adak climatic conditions is uncertain.	This alternative would require a successful treatability study to demonstrate the ability of in situ bioremediation to operate under the cold, moist conditions of Adak. The effectiveness of this alternative to achieve soil cleanup criteria is uncertain on Adak. Typically, this alternative's ratings are: • **Excellent** for long-term effectiveness for sites below soil screening criteria • **Good** for sites above soil screening criteria Treatment may be required for more than a year to achieve soil cleanup criteria. Natural attenuation processes	Volume and toxicity of TPH would be reduced. However, in situ bioremediation has the potential for mobilizing the TPH. Treatability testing would be needed. Subsurface conditions may limit the capability of this alternative.	Minimal impacts to workers or wildlife during implementation of this alternative. In situ technology could transfer vapors into sewers or building basements. Time to achieve cleanup would be several months to a year, depending on the site. For residual DRO that is not remediated during process operation, the time until protection is achieved would depend on natural attenuation processes, which would vary with site.	Technology is implementable but pilot testing on island may be needed. Subsurface conditions (permeability and height of water table) may limit effectiveness of alternative, which may result in additional action.	About $975,000 to $43,000,000 per site

Table 9-5 (Continued)
Analysis of Alternatives Using Evaluation Criteria for Petroleum Sites

Remedial Alternative	Overall Protection of Human Health and the Environment	Compliance With ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume Through Treatment	Short-Term Effectiveness	Implementability	Cost of Implementation (Estimate)[a]
6 In Situ Bioremediation of Soil, Natural Attenuation, Monitoring, and Institutional Controls (Continued)	over time after in situ bioremediation has ceased and would provide protection to human health and the environment as described in Alternative 2.		would be expected to "polish" residual TPH to soil cleanup criteria. Environmental sampling of monitoring wells should provide adequate warning of the need for more extensive remedial measures. 5-year reviews would be required		This alternative's ratings are: • **Good** for short-term effectiveness for sites where no building is above the affected soil • **Fair** for short-term effectiveness for sites where a building is above the affected soil		
7 Soil Cover, Natural Attenuation, Monitoring, and Institutional Controls	Applicable to sites where TPH in surface soil represents potential ecological or human health risks via direct contact with surface soil. The soil cover in this alternative would be used to eliminate the pathway of direct contact with TPH in the surface soil. This alternative's rating is: • **Good** for over all protectiveness	Location- and action-specific ARARs would be met at applicable sites where TPH in surface soil poses either potential ecological or human health risks. A 3-foot-thick soil cover would eliminate the direct contact exposure pathway with TPH in the surface soil. TPH would then decline below chemical-specific ARARs by natural attenuation processes such as biodegradation, volatilization, leaching, and dilution over time. This alternative's rating is: • **Good** for sites with human health or ecological risks related to surface soil	Applicable to sites where TPH in surface soil poses potential ecological or human health risks via direct contact with surface soil. The soil cover in this alternative would eliminate the direct contact exposure pathway with TPH in the surface soil. Elimination of the surface soil pathway would be immediate upon placement of the soil cover. However, the time until protection is achieved for soil beneath the soil cover will depend on natural attenuation processes as described in Alternative 2. This alternative's rating is: C **Good** for long-term effectiveness and permanence Institutional controls and long-term maintenance of the soil cover would be required.	The soil cover in this alternative would eliminate the pathway of direct contact with TPH in the surface soil, but not through active treatment.	For applicable sites, there may be minor impacts on construction workers during placement of the soil cover. However, soil cover placement would have less impact to workers and wildlife than excavation. The cover could be placed during summer and completed within weeks. The elimination of direct contact with surface soil would be immediate upon placement of the 3-foot-thick soil cover. For subsurface soils beneath the soil cover, the time until protection is achieved would depend on natural attenuation processes, which vary with site. This alternative's rating is: • **Excellent** for short-term effectiveness	For applicable sites, this alternative is readily implementable, with no unusual construction difficulties. Institutional controls, monitoring, and maintenance of the soil cover would be required. Placement of soil cover at sites where buildings are present may be difficult or not possible. Clean soil for the cover is available on island.	

effectiveness of institutional controls will be conducted and 5-year reviews of these inspections will be performed. These inspections and reviews will begin after this ROD is signed, and a report on this review will be submitted to FFA agencies.

10.1.1 Institutional-Control-Only Sites (Including Sweeper Cove and Kuluk Bay)

Alternative 2, institutional controls, is selected for 17 CERCLA institutional-control-only sites including Sweeper Cove and Kuluk Bay. The specific types of institutional controls for each site are included in Table 10-1. Figures 10-1 and 10-2 show the locations of these institutional-control-only sites and their associated types of institutional controls. Institutional controls are legal controls that are part of the environmental cleanup remedy. These controls are required to limit access to or use of, property as well as to warn of hazards. In the case of the sites discussed in this ROD, the institutional controls in conjunction with engineering requirements prevent exposure of future landowner(s), workers, residents, or visitors and maintain or monitor the integrity of the remedial actions completed to date. The engineering requirements include visual inspections, collection of environmental samples, review of site conditions, or education requirements. Specific remedial action objectives and the anticipated methods for implementing the objectives are described as part of the selected remedies in this section.

Some selected remedies will include requirements for long-term monitoring activities as well as maintenance activities to ensure the long-term integrity of previously installed remedial systems such as soil covers. The Department of the Navy will ensure that all deeds and other conveyances from the United States contain a covenant providing the Navy with access to conduct such activities or additional remedial actions. This will include any easements or rights-of-way, if necessary, to allow access by personnel on behalf of either the Department of the Navy or state or local regulatory agencies to conduct and oversee such monitoring and maintenance activities as are necessary to implement the remedies described herein.

The rest of this subsection specifically addresses those sites for which institutional controls are the selected remedies.

Landfills

Remedial Action Objective. RAOs for the landfills at SWMUs 2, 11, 13, and 29 entail protection of human or ecological receptors (or both) from exposure to land fill debris and soil that could result in a cancer risk greater than 1 x 10^{-5} or a noncancer risk above an HI of 1.0. Table 7-2 provides details concerning the impacted environmental media and receptors, the specific risks determined, and the specific remedial action objectives for each site.

Selected Remedial Strategy. It was determined that institutional controls are the most effective strategy for protecting human health and the environment at the landfill sites. This selected remedy follows previous actions taken at the sites. The institutional controls will minimize potential human exposure to site chemicals by implementing land use restrictions and imposing restrictions on soil excavations. Protection of ecological receptors will be most effective and reliable where existing cover systems are in place, monitored, and maintained. Monitoring requirements will allow assessment of risks and natural recovery processes over time. The specific types of institutional controls for each landfill site are included in Table 10-1.

To ensure the integrity of the landfill covers, containment, and monitoring systems, the U.S. Fish and Wildlife Service, the Department of the Navy, and any future landowner(s) and/or user(s) will be restricted from any activity that will adversely impact the cover and monitoring system or affect the drainage and erosion controls developed for the cover (including soils, cobbles, vegetation, gravel, paving, etc.). The following activities are prohibited:

- Any excavation below the surface grade of the cover other than routine maintenance and/or repair of the landfill cover and environmental monitoring systems

- Any excavation that will affect the drainage and erosion controls developed for the cover

- Any disturbance of equipment associated with the monitoring and/or maintenance of the site without prior approval from the Department of the Navy and appropriate state and local regulatory agencies

The Department of the Navy will undertake an annual landfill inspection program to observe and document site conditions and repair the landfills, as necessary. Annual monitoring activities conducted by the Department of the Navy will continue at SWMUs 11 and 13. Groundwater and surface water monitoring samples will be collected at these two sites; the data will be evaluated in a manner consistent with the monitoring program described in Section 10.3. No groundwater monitoring is required at SWMUs 2 and 29 because the groundwater at these sites is not a viable drinking water supply. At SWMU 2 saltwater would migrate into a supply well because the site is adjacent to Clam Lagoon and Sitkin Sound. At SWMU 29 the groundwater is present in the fill material that contains the landfill contents. The natural geologic material below and surrounding the SWMU 29 landfill is a silty clayey material that could not yield sufficient amounts of groundwater for a water supply. Annual site inspections will be performed for the first 5 years. Five-year site reviews will be conducted by the Department of the Navy and appropriate agencies to evaluate monitoring data and site conditions to determine the need for additional action or reduction of controls, as appropriate.

Institutional controls are expected to remain on the sites indefinitely to meet the RAOs. For land use to change to residential, the concentrations of the risk drivers listed in Table 6-5 would have to be reduced so that acceptable residential cancer risk is less than 1×10^{-5} and noncancer risk (HI) is less than 1.0.

Basis for Selecting the Remedial Strategy. The selected remedy of institutional controls satisfies the regulatory requirements and complies with the ARARs listed in Table 7-2. The controls, such as those established to ensure the long-term integrity of cover systems, were determined to be protective of human and ecological receptors. Institutional controls comply with the State of Alaska regulations concerning institutional controls. Monitoring will be used to assess natural recovery and the effectiveness of previous actions and to verify that there are no downgradient impacts.

Estimated costs for implementing institutional controls at each landfill range from $100,000 (SWMU 11) to $580,000 (SWMU 13) (30-year present worth estimates based on a 5% discount factor).

Sweeper Cove and Kuluk Bay

Remedial Action Objectives. RAOs at Sweeper Cove entail protection of subsistence fishers from ingestion of fish and shellfish containing chemicals that present cancer risk in excess of 1×10^{-5} and a noncancer hazard index in excess of 1.0. The chemical of concern for protection of human health ingestion of fish and shellfish tissue is PCBs. The cleanup levels for total PCBs are 0.0065 mg/kg for fish tissue and 0.031 mg/kg for shellfish tissue. These cleanup levels are risk-based concentrations and were derived using the exposure parameters presented in Section 6 for subsistence fishers and a carcinogenic risk threshold of 1×10^{-5}.

Remedial action objectives at Kuluk Bay entail protection of subsistence fishers from ingestion of fish and shellfish containing chemicals that present cancer risk in excess of 1×10^{-5} and a noncancer hazard index in excess of 1.0. Future risks will be calculated using procedures and exposure assumptions documented in the RI/FS. Future calculations may account for procedures and exposure parameters current at that time and approved by the agencies. The chemical of concern for protection of human health is Aroclor 1254. The cleanup levels for total PCBs are 0.0065 and 0.031 mg/kg for ingestion of fish and shellfish tissue, respectively.

Selected Remedial Strategy. It is concluded that Alternative 2, institutional controls, is the most effective strategy for protecting human health at Sweeper Cove and Kuluk Bay. This selected remedy will supplement removal actions already completed at terrestrial sites in areas draining to the waters and the planned remedial action at South Sweeper Creek. Institutional controls will specify fishery advisories in Sweeper Cove and Kuluk Bay. The advisories will include the installation and maintenance of shoreline warning signs along Sweeper Cove and Kuluk Bay shorelines and adjacent to shellfish beds. The signs will warn that subsistence reliance on resident fish and shellfish is potentially hazardous to human health. Additionally, education of visitors and residents of Adak concerning the fishing advisory will be included in the required orientation briefing.

Site monitoring by sampling and analysis of tissue will be used to determine whether PCB concentrations are increasing or decreasing. The objectives of the monitoring are 1) to document the temporal change in PCB concentrations in mussels and fish in Sweeper Cove and Kuluk Bay following cleanup of known terrestrial source areas and the contaminated sediments in South Sweeper Creek, and 2) determine the date for rescinding institutional controls advising subsistence and commercial seafood harvesters in Sweeper Cove and Kuluk Bay of the potential risk associated with consumption of certain species of fish and shellfish contaminated with PCBs. If data indicate an increase or if there are “hot spots” not previously known, then the remedy will be reevaluated. The frequency of monitoring will be annually for the first 5 years. Monitoring results will be evaluated by the Navy, EPA, and Alaska DEC during the first 5-year review for Adak to evaluate the effectiveness of this remedy and the required frequency of future monitoring. Periodic site review will evaluate monitoring data and the need for additional action or reduction of controls. After reduction of Aroclors in tissues to cleanup levels (0.0065 mg/kg for fish and 0.031 mg/kg for shellfish), the institutional controls will be removed. A tissue monitoring plan will specify and document monitoring rationale, procedures, schedule, and endpoints. It is estimated up to 75 years may be required to reach these cleanup levels.

Basis for Selecting the Remedial Strategy. Institutional controls were selected as the best alternative to meet the RAOs. Fishing advisories will immediately warn fishers of potential risk from ingesting fish and shellfish. Containment or dredging of the sediment would destroy existing habitat and would not remove fish and shellfish from Sweeper Cove and Kuluk Bay. Containment or dredging would cost approximately 20 times more than institutional controls.

Additional rationale can be identified for selecting institutional controls and monitoring as remedial strategy for Sweeper Cove and Kuluk Bay. PCBs were detected in all 19 sediment sample stations from Sweeper Cove at relatively low concentrations (maximum total PCB concentration was 0.73 mg/kg at station 707) and were detected in only 1 of 20 sediment sample stations from Kuluk Bay (total PCB concentration was 0.18 mg/kg at station 517). PCB concentrations in sediment samples from Sweeper Cove were similar and no patterns of elevated PCB concentrations were found. If it were assumed that source controls have eliminated further input of PCBs into Sweeper Cove and Kuluk Bay, the only active remedial option would be limited to containment or removal of contaminated sediments. However, since no specific area of PCB contaminated sediments could be identified for remedial action in either Sweeper Cove or Kuluk Bay, an active remedial option was considered inappropriate.

Arsenic in fish and shellfish in Sweeper Cove and in blue mussel in Kuluk Bay posed more than half of the risk to subsistence fishers. However, arsenic is not related to known site releases and is present in fish and shellfish in background samples.

The selected remedy satisfies the EPA threshold requirement for protection of human health and the environment and for compliance with ARARs listed in Table 7-3. The remedy will advise residents of potential risk associated with subsistence and commercial fishing in the waters of Sweeper Cove and Kuluk Bay.

Estimated costs for implementing institutional controls at Sweeper Cove and Kuluk Bay sum to approximately $260,000 and $250,000, respectively (30-year present worth estimates based on a 5% discount factor).

Other Institutional Control Sites

Remedial Action Objectives. RAOs at several sites (SWMUs 10, 14, 15, 16, 20, 21A, 23, 52 [includes 53 and 59], 55, and 67 and SA 76) involve protection of either human or ecological (or both) exposure to soil or groundwater. This exposure could result in a cancer risk greater than 1×10^{-5} or a noncancer risk above an HI of 1.0. Table 7-2 provides details concerning the impacted environmental media and receptors, the specific calculated risks, and the specific remedial action objectives for each site.

Selected Remedial Strategy. It was determined that institutional controls are the most effective strategy for protecting human health and the environment at the sites. This selected remedy follows previous actions taken at some of the sites. The institutional controls will minimize potential human exposure from site chemicals by prohibiting residential uses and imposing restrictions on groundwater use and soil excavations. However, none of the sites are currently in residential areas and all projected reuse plans show that these sites will be used for nonresidential purposes. The specific types of institutional controls (these vary with site or area), as listed for each site in Table 8-2, are the following:

- Land use restrictions
- Deed restrictions/restrictive covenants
- Groundwater use restrictions
- Soil excavation restrictions

Engineering requirements (these vary with site or area) that will be implemented in conjunction with the institutional controls include the following:

- Periodic inspection and repair of site facilities
- Periodic collection and analysis of site groundwater samples
- Periodic review of site conditions

Groundwater use restrictions will be applied to sites in or adjacent to the downtown area to prevent exposure to impacted groundwater as well as to protect groundwater remediation efforts in this area. SWMUs 15, 16, and 55 and SA 76 are in the downtown area, and groundwater-related restrictions will include those in the following list of bullets. Future land uses of areas in downtown Adak will be finally determined by the approved reuse plan and local zoning.

To ensure the integrity of the groundwater extraction, injection, and monitoring systems, the U.S. Fish and Wildlife Service, the Department of the Navy, and any future landowner(s) and/or users will be restricted from any activity that will adversely impact the functioning of these systems. The following activities will be prohibited:

- Any subsurface drilling or excavation within the shallow or principal groundwater unit (unless the Department of the Navy and the appropriate state and local regulatory agencies determine that there will be no adverse impacts to the in-place remedy)

- The extraction of any groundwater within the shallow or principal groundwater unit from within the site or within a radius of 1 mile of any groundwater extraction, injection, or monitoring well for drinking, irrigation, or other commercial purpose, without prior approval from the Department of the Navy and appropriate state and local regulatory agencies

- The injection or release of any fluids in and around the sites with chemically affected groundwater that may affect the plume flow direction without prior approval from the Department of the Navy and appropriate state and local regulatory agencies

- Disturbance of any equipment associated with the treatment or monitoring of groundwater without prior approval from the Department of the Navy and appropriate state and local regulatory agencies

Periodic site reviews will evaluate monitoring data and site conditions to determine the need for additional action or reduction of controls, as appropriate. If any controls are found to be ineffective, or if there are significant failures posing unacceptable risks to human health and the environment, the Navy would be responsible for any additional remedial actions found necessary.

Basis for Selecting the Remedial Strategy. The selected remedy of institutional controls is better than no action because maintaining current land use of the sites poses no unacceptable risk. If there were no institutional controls and the site land use became residential, risks would be unacceptable. Institutional controls satisfy the regulatory requirements and comply with ARARs shown in Table 7-2. The controls were determined to be protective of human receptors, and in some cases, ecological receptors. Institutional controls comply with the State of Alaska regulations concerning institutional controls. Monitoring will be used to assess natural recovery and the effectiveness of previous actions.

The selection of Alternative 2, Institutional Controls, is the best alternative for the IC only sites because future land use is likely to be the same as existing, which is currently protective of human health. ICs are readily implementable and can be changed in the future. Use of ICs is cost effective and does not prevent future actions or land uses.

Estimated costs for implementing institutional controls at each site range from approximately $50,000 to $170,000 per site (30-year present worth estimates based on a 5% discount factor). The total estimate for implementing institutional controls at the CERCLA sites (excluding SWMUs 4 and 17) is $2,310,000.

10.1.2 SWMU 4

Remedial Action Objectives

RAOs at the SWMU 4 landfill site are to prevent ingestion of and contact with chemically affected subsurface soils within the landfill debris and to protect ecological receptors that may ingest on-site plants. (The plants may uptake subsurface chemicals,) The subsurface soils were estimated to have an ecological HI greater than 1.0. The COCs are listed in Table 7-3.

Selected Remedial Strategy

After evaluation of the potential risks to human health and ecological receptors, the selected remedies (Alternative 3) for SWMU 4 are as follows:

- Placement of a soil cover over the surface of the landfill to reduce human or animal contact with contaminated soil, which is considered a presumptive remedy for a landfill.

- Institutional controls to prohibit residential development and to restrict use so the soil cover is not damaged. Institutional control mechanisms will include site inspections and maintenance (institutional controls for landfill sites are described in more detail in Section 10.1.1). Specific types of institutional controls for SWMU 4 are shown in Table 10-1 and Figure 10-2.

The selected action for SWMU 4 was conducted in 1998 with the approval of the regulatory agencies. Institutional controls will continue.

Basis for Selecting the Remedial Strategy

Covering the SWMU 4 landfill and implementing institutional controls was selected as the best remedy because it is the most protective of human health and the environment by eliminating the exposure pathway to soil and exposed debris. The cover has a higher degree of long-term effectiveness and permanence compared to institutional controls alone.

The selected remedy satisfies the EPA threshold requirement for protection of human health and the environment and for compliance with ARARs listed in Table 7-3. The remedy will eliminate exposure to the media of concern by providing a physical barrier, thus breaking the potential human or ecological exposure pathway. In addition, the implementation of institutional controls will ensure the maintenance of that barrier.

Estimated costs for implementing the selected remedy at SWMU 4 are approximately $600,000 (30-year present worth estimate based on a 5% discount factor).

10.1.3 SWMU 17

Remedial Action Objectives

RAOs at the SWMU 17 waste oil and retention ponds are to protect benthic infauna from contacting sediments and birds from contacting and ingesting surface water. The sediments and surface water were estimated to have an ecological HI in excess of 1.0. These risks were estimated using the procedures and exposure assumptions documented in the RI/FS. The sediment chemicals of concern for protection of benthic organisms in the waste oil pond and/or the retention pond include PAHs (fluorene, 2-methylnaphthalene, bis[2-ethylhexyl]phthalate, phenanthrene, acenaphthene, fluoranthene, chrysene, benzo[a]anthracene, pyrene, benzo[a]pyrene, benzo[k]fluoranthene), a volatile organic compound (ethylbenzene), inorganics (nickel, antimony, mercury, zinc, lead, manganese), and PCBs (Aroclor 1260, Aroclor 1254). The surface water chemicals of concern for protection of birds are inorganics (mercury, zinc, iron, lead, and copper).

Selected Remedial Strategy

It is concluded that aspects of both Alternatives 3 and 4 are the most effective strategy for protecting human health and the environment at SWMU 17. The selected remedy is supplemented by recent removal actions including the following:

- Removal of oil/water separators O/W 1 and O/W 2 and rerouting their inflows directly to the sanitary sewer system for treatment
- Installation and continued operation of a recovery system collecting petroleum floating on the groundwater surface adjacent to the north part of SWMU 17

The selected remedy consists of the following components:

1. **Institutional Controls.** The types of institutional controls as depicted in Figure 10-1, are as follows:

   - Land use restrictions
   - Deed restrictions (limited to industrial use)
   - Groundwater use restrictions
   - Soil excavation restrictions
   - Restrictive covenants. The Navy will provide approvals for excavation before land transfer. After land transfer to a new entity, the regulatory agencies will approve the alternative authority.

2. **Removal, Treatment, and Disposal.** To reduce risk to ecological receptors to a hazard index below 1.0, COC-affected sediments and water in the SWMU 17 ponds will be removed, treated, and disposed of. At the waste oil pond, ecological protection will be achieved by removal of the sediments and by completely filling the manmade pond with clean fill and restoring the area to its native terrestrial habitat. At the retention pond, ecological protection will be achieved by draining the surface water and by removing COC-affected sediments and replacing the dredged material with clean substrate. Restoration of the retention pond will be completed by natural processes. Specific remedial actions for each of the two ponds follow.

Waste Oil Pond. The waste oil pond weir will be removed and the remaining water will be extracted and discharged to the sanitary sewer in compliance with discharge to sewer requirements. Discharges must meet pretreatment requirements for the Adak Island wastewater treatment facility to ensure compliance with the facility's NPDES permit. COC-affected sediments will be removed to the interface with native material free of contamination, contaminated soils adjacent to the pond will be removed, and confirmational samples will be collected from the excavation for analysis of chemicals of concern. Removed sediments will be loaded onto trucks with waterproof beds and transported to an on-island location for additional dewatering and treatment. Sediments will be treated using low-temperature thermal desorption to reduce DRO levels to below 100 mg/kg and residual range organics (RRO) levels to below 2,000 mg/kg to meet Roberts Landfill requirements for recycling as daily cover. PCB concentrations in cover material must be less than 10 mg/kg for this purpose. Air emissions from the treatment unit will comply with 18 AAC 50 standards. The pond excavation will be backfilled with clean fill and restored as a terrestrial habitat. The fill will eliminate the direct exposure pathway to any chemical residuals beneath the excavation. In addition, the results from the confirmation samples will be evaluated per 18 AAC 75 regulations. Because sediment that is not removed will be covered with fill material, it will be classified as soil. To comply with the protection of groundwater under 18 AAC 75.341, chemical concentrations in soil must meet standards based on migration to groundwater. Ecological risk drivers Aroclor 1260, antimony, and mercury (Table 6-7) exceed their standards. Therefore, cleanup levels for Aroclor 1260, antimony, and mercury are 1, 3, and 1.24 mg/kg, respectively.

Compliance with RAOs will be achieved because the action will restore the site to its original terrestrial habitat. The hazard index associated with existing concentrations will be below the risk threshold for terrestrial ecological receptors after the removal.

Retention Pond. The surface water in the retention pond will be drained to the sanitary sewer in compliance with discharge to sewer requirements. Discharges must meet pretreatment requirements to ensure compliance with the NPDES permit of the wastewater treatment facility. PCB-affected sediments will be removed down to material containing less than the total PCB cleanup level of 1 mg/kg (dry weight). (A 2-foot depth is approximated for determining costs; the depth could be shallower or deeper.) Confirmation samples will be collected from the excavation for analysis of chemicals of concern. Based on collocation of PCBs with other chemicals of concern, confirmation samples will be tested for PCB concentrations. Should confirmation testing show that PCB concentrations greater than 1 mg/kg remain in in-place sediments/soils, then future reviews and monitoring may be necessary. The excavated sediments will be loaded onto trucks with waterproof beds and transported to an on-island area for additional dewatering and treatment. Sediments will be treated using low-temperature thermal desorption to meet Roberts Landfill requirements for recycling as daily cover (DRO levels less than 100 mg/kg, RRO levels less than 2,000 mg/kg, PCB levels less than 10 mg/kg). Air emissions from the treatment unit will comply with 18 AAC 50 standards. Finally, the pond excavation will be backfilled with clean substrate to the original sediment grade and the pond will be allowed to restore itself naturally as an aquatic habitat.

3. Groundwater monitoring

Groundwater will be monitored at one location adjacent to the dry cleaning facility for volatile organic compounds. The approach for monitoring groundwater at this location is discussed in Section 10.3.

The selected action for SWMU 17 was conducted in 1999 with the approval of the regulatory agencies. Institutional controls will continue.

Basis for Selecting the Remedial Strategy

The combination of soil and sediment removal, treatment, and disposal along with institutional controls was selected as the remedy for SWMU 17 because it is more protective to the environment than no action, institutional controls only, or containment. SWMU 17 sediment could be removed simultaneously with sediments from South Sweeper Creek. Containment would leave contaminants in place below the water table, which might be a source of contaminants entering the groundwater.

The selected remedy satisfies the EPA threshold requirement for protection of human health and the environment. The remedy will reduce exposure to potential human receptors by implementing access and deed restrictions (limited to industrial use with no groundwater use and no excavation without appropriate approvals).

Ecological protection will be achieved by removing COC-affected media and by eliminating exposure pathways between the COC-affected media and sensitive receptors. In addition to removal and treatment of COCs in the affected sediments, the remediation would result in the removal of petroleum hydrocarbon residuals currently in the ponds. Although petroleum hydrocarbons were not evaluated in the RI/FS, they were identified as performance criteria during remedial design activities. Their removal is expected to provide an added environmental benefit associated with the remediation.

The selected remedy will meet all action- and location-specific ARARs through proper implementation of excavation, treatment, and soil recycling activities. Institutional controls will be met through the implementation and enforcement of the Adak Island institutional controls management plan (ICMP). Chemical-specific risk-based concentrations for soils and sediments are cleanup goals. Chemical-specific ARARs for groundwater are expected to be met through natural recovery processes.

The selected remedy reduces toxicity and volume by treating pond sediments/soils and surface water using low-temperature thermal desorption and the Adak wastewater treatment plant, respectively. Recycling of treated sediments/soils in a permitted solid waste landfill as daily cover will effectively reduce mobility of chemical residuals. There are short-term risks to ecological receptors during the draining, dredging, and filling of the ponds, but these risks are considered small compared to the long-term benefit of the cleanup. Potential short-term risks to workers, the community, and the environment may be minimized with use of appropriate controls.

Estimated costs for implementing the selected remedy at SWMU 17 sum to approximately $1.9 million (30-year present worth estimate based on a 5% discount factor).

10.1.4 South Sweeper Creek

Remedial Action Objectives

RAOs at South Sweeper Creek are to protect benthic infauna from contacting and ingesting COC-affected sediments. The chemical of concern for protection of benthic invertebrates is total PCBs, and the cleanup level is 1 mg/kg (dry weight). This cleanup level is risk based and represents a threshold above which adverse effects to benthic organisms are apparent.

Selected Remedial Strategy

It is concluded that sediment removal (a variation of Alternative 4) is the most effective strategy for protecting human health and the environment at South Sweeper Creek. To achieve the PCB cleanup level of 1 mg/kg, an estimated 3,900 cubic yards of sediments from the affected area will be removed, treated, and disposed of. The estimated extent of the dredge areas is shown in Figure 7-5, and the maximum estimated dredge depth is 2 feet. The 2-foot depth is approximated for determining costs; the depth could be shallower or deeper. Confirmation samples will be collected from the excavation for PCB analysis. Should PCB concentrations greater than 1 mg/kg remain in in-place sediment, then future reviews and monitoring may be necessary. The excavated sediments will be replaced with clean fill material to restore the creekbed to its original hydraulic condition. The excavated sediments will be treated using low-temperature thermal desorption to reduce DRO levels to below 100 mg/kg and RRO levels to below 2,000 mg/kg to meet Roberts Landfill requirements for recycling as daily cover. PCB concentrations in cover must be less than

10 mg/kg for this purpose. Air emissions from the treatment unit will comply with 18 AAC 50 standards.

The selected action for Sweeper Creek was conducted in 1999 with the approval of the regulatory agencies. Institutional controls will continue.

Basis for Selecting the Remedial Strategy

The combination of sediment removal, treatment, and disposal along with clean fill placement and institutional controls was selected as the best remedy because it eliminates the unacceptable levels of PCBs in Sweeper Creek and is more protective to the environment than no action, institutional controls only, or containment. Removing the sediment has the highest level of long-term effectiveness and permanence.

The selected remedy satisfies the EPA threshold requirement for protection of human health and the environment. The remedy will reduce exposure of ecological receptors to PCBs by eliminating contaminated benthic substrate.

The selected remedy will meet all action- and location-specific ARARs through proper implementation of excavation, treatment, and recycling activities. Chemical-specific risk-based concentrations for sediments are cleanup goals.

Ecological risk will be reduced effectively, reliably, and permanently. The selected remedy reduces toxicity and volume through treatment of sediments using low-temperature thermal desorption. Recycling of treated sediments in a permitted solid waste landfill as daily cover will effectively reduce mobility of chemical residuals. There are short-term risks to ecological receptors during the flow diversion and dredging, but these risks are considered small compared to the long-term benefit of the cleanup. Potential short-term risks to workers, the community, and the environment will be minimized with use of appropriate controls.

Estimated costs for implementing the selected remedy at South Sweeper Creek sum to approximately $2.7 million (30-year present worth estimate based on a 5% discount factor).

10.2 PETROLEUM SITES

Four remedial alternatives were selected for the petroleum sites on Adak: free-product recovery, monitored natural attenuation, limited soil removal, and limited groundwater monitoring. In addition, one site (NMCB Building Area [UST T-1416-A]) will be remediated as part of a larger remedial effort at a free-product site. The sites included for remediation by each of these selected alternatives are listed in Table 10-2; a summary of the actions included with each of the remedial alternatives is discussed below.

10.2.1 Free-Product Recovery

This alternative applies to all 14 sites where free product has been observed during past investigations (see Table 10-2).

Free product must be removed to the maximum extent practicable based on 18 AAC 75.325. Product-recovery systems are already in place at these sites as an interim remedial measure, as described in Section 8. Free-product removal will continue to the maximum extent practicable.

Endpoints established for free-product recovery are as follows:

- For active-recovery systems that depend on water table depression for recovery, the practical endpoint for recovery will be reached when less than ½ gallon of free product is recovered for 1,000 gallons of treated groundwater.

- For product-recovery systems not dependent on water table depression, the practical endpoint for recovery will be reached when the monthly volume of recovered product averaged over the most recent 6 months (6-month moving average) is less than 5 gallons per month.

When product recovery is completed for a site, further remediation of the site will be evaluated using a focused feasibility study type of analysis. Identification and selection of additional remedial actions will be done under the terms mutually agreed to by the Navy and the State of Alaska pursuant to SAERA.

10.2.2 Monitored Natural Attenuation

Table 10-2 indicates the 11 sites that have MNA as the selected remedy. The monitored natural attenuation alternative includes the following components:

1. **Natural Attenuation.** Reduction of petroleum concentrations will be achieved by natural degradation and dispersion processes. In terms of long-term effectiveness, this will permanently reduce petroleum concentrations to below cleanup levels.

2. **Monitoring.** Groundwater monitoring will be performed in affected groundwater areas to satisfy three objectives:

- To verify whether natural attenuation is occurring

- To monitor locations where chemical concentrations exceed federal MCLs or 18 AAC 73.345 Table C criteria (see Table 7-5 in this ROD)

- To estimate the rate of natural attenuation to demonstrate achievement of cleanup levels within 75 years

To satisfy these objectives, groundwater monitoring will be performed at selected wells downgradient of petroleum sites that (1) were selected for monitored natural attenuation, (2) have groundwater on site, and (3) have measured exceedances of federal MCLs and/or state criteria. The frequency of monitoring will be quarterly for the first year and annually for the next 4 years. If monitoring criteria described in Section 10.3 are met before the 5-year review, monitoring could be ceased before the end of the 5 years. Conversely, if changes in site conditions warrant more frequent monitoring, semiannual monitoring may be required as part of the 5-year data review.

Site-specific monitoring requirements will be developed for each MNA site in the Adak Island sitewide monitoring plan. Included will be an evaluation of parameters analyzed for the NORPAC Hill and NMCB Building sites per the OSWER 9200.4-17 MNA policy (U.S. EPA 1997). In the event the 5-year review does not demonstrate that the 75-year timeframe will be met, evaluation and implementation of enhancements to the MNA process (e.g., addition of nutrients, oxygen, heat) along with other more active alternatives will be conducted through the focused feasibility study process. It is expected that the decision for subsequent remedy selection will be made by Alaska DEC and the Navy pursuant to SAERA.

3. **Institutional Controls.** Institutional controls will be applied to limit land use activities at the individual sites. These controls will include restrictions on groundwater use and soil excavations. They will be designed to reduce the potential for direct exposure in the short term until petroleum concentrations are reduced below cleanup levels by natural processes. Specific types of institutional controls and engineering requirements for the MNA sites are included in Table 10-1 and Figures 10-1 and 10-2. The Navy will prepare an Institutional Controls Management Plan consistent with the Record of Decision and EPA and ADEC approval.

Because groundwater is affected by multiple and nonpoint sources and because observed MCL exceedances include both petroleum *and* CERCLA-related chemicals (as described in previous sections), the implementation of groundwater monitoring is discussed separately (in Section 10.3).

This monitored natural attenuation alternative will be effective for reducing petroleum concentrations at the sites and mitigating downgradient migration of individual constituents. In the short term, it will limit the potential for direct exposure. It therefore meets the RAOs for all but one of the non-free-product petroleum sites selected for MNA.

Basis for Selecting the Remedial Alternative

Monitored natural attenuation, monitoring, and institutional controls were selected as the best remedy for these sites because the combination of actions provide a readily implementable, proven, and cost effective approach to remediation of petroleum hydrocarbons in groundwater. Use of institutional controls and monitoring in combination with monitored natural attenuation is cost effective and protective.

10.2.3 Limited Soil Removal

Twelve sites where soil petroleum concentrations exceed 18 AAC 75 soil criteria were selected for limited soil removal, as indicated in Table 10-2. The objective of these soil removals is to meet 18 AAC 75 Method Two criteria for DRO. The rationale for selecting these sites for limited soil removal was the following:

- The volume of soil exceeding soil criteria is limited in extent.
- The soils are readily accessible (e.g., not under a building, road, or other structure)
- The DRO criteria exceedances were observed in surface or near-surface soil.

The soil removal alternative includes the following components:

- Excavation of approximately 1,000 cubic yards of petroleum-contaminated soil
- Treatment of the excavated soil on island by thermal desorption in conjunction with remediation of soils and sediments from SWMU 17 and South Sweeper Creek
- Use of the treated soil on island as daily cover at Roberts Landfill

Basis for Selecting the Remedial Alternative

Excavation of petroleum contaminated soil at these sites was selected as the best remedy because site conditions (limited extent and shallow depths) presented optimal conditions for this removal action. Removal of petroleum contaminated materials and replacement with clean fill is the best action at these sites.

10.2.4 Limited Groundwater Monitoring

During the review of site-specific reports and data that have been collected since the issuance of the Proposed Plan, uncertainty was raised regarding the representativeness of existing hydrogeologic data in some areas. At eight sites (listed in Table 10-2) additional groundwater monitoring wells will be installed to confirm that there are no impacts to local groundwater from the site. In the event that the results of 1 year of quarterly sampling show no impacts to the groundwater that exceed 18 AAC 75 Table C criteria (Table 7-5 in this ROD), no further action will be required at these sites through the site-wide monitoring plan.

Basis for Selecting the Remedial Alternative

No further action with limited monitoring of groundwater conditions was selected as the best remedy for these sites because site conditions are currently protective of human health and the environment. Based on these conditions, no further action criteria have been met. The limited monitoring being conducted for one year at these sites will be used to further strengthen understanding of site conditions that support the selected remedy.

10.3 GROUNDWATER MONITORING

Groundwater monitoring will be conducted for CERCLA and petroleum areas where (1) monitored natural attenuation is the selected remedy (2) federal MCLs and/or state criteria were exceeded in areas that could supply adequate groundwater for domestic use or (3) groundwater concentrations exceed water quality criteria and discharge to surface water. The approach for groundwater monitoring is described in the following subsections. Details of the monitoring program will be provided in the sitewide monitoring plan.

10.3.1 Sites Included in Groundwater Monitoring Program

The monitoring well locations where MCLs or state criteria have been exceeded in groundwater (excluding historical exceedances in free-product areas) are listed in Table 10-3. The chemicals exceeding the criteria at each of these locations are also listed in this table. As previously noted, groundwater monitoring will be applied to areas where federal MCLs or state criteria were exceeded.

10.3.2 Monitoring Frequency

Organic Compounds

Exceedances of the GRO allowable levels and the following MCLs have been identified in groundwater as noted in Table 10-3:

- Benzene
- bis(2-Ethylhexyl)phthalate
- Methylene chloride
- Tetrachloroethene
- Ethylbenzene
- Toluene
- Trichloroethene

To verify that these chemicals are attenuating and to provide information on the expected rate of attenuation, groundwater samples will be collected on a quarterly basis for the first year and annually or semiannually, as needed, thereafter. At a minimum, these compounds will be monitored, as well as DRO, BTEX, and MNA indicator compounds. The Navy, EPA, and Alaska DEC will decide what level of monitoring is required.

Inorganics

With the exception of one well at SWMU 14, total lead exceedances in groundwater were not verified by dissolved lead results. In fact, since 1993, 171 samples have been analyzed for total lead across northern Adak, and no exceedances have been observed other than within landfills and at SWMU 14. Therefore, it is believed that earlier total lead exceedances were the result of turbidity in the analytical samples and not dissolved constituents in the groundwater and that additional monitoring is not necessary. Similarly, total thallium was detected once at a concentration exceeding its MCL but was not detected in the dissolved phase.

At the one location where both total and dissolved lead were detected at levels exceeding MCLs (Well 14-201 at SWMU 14), quarterly inorganics samples will be collected for the first year, followed by annual or semiannual sampling, if necessary.

At four sites (Amulet Housing, Well AMW-706 Area; Amulet Housing, Well AMW-709 Area; Former Power Plant Building (T- 1451); and SA 76, Old Line Shed Building) where there was a total lead exceedance but no subsequent sampling has been performed, two semiannual sampling rounds will be performed during the first year of monitoring. The samples will be analyzed for total and dissolved lead. If these analyses verify that total lead concentrations do not exceed MCLs, and that previous lead exceedances were artifacts of sampling methodology, no further action will be required.

10.3.3 Interim Review

After 1 year of quarterly samples have been collected, the data will be evaluated in terms of concentration trend. A trend analysis will be performed for each location with an exceedance of screening criteria to evaluate (1) whether the data indicate a change in chemical concentrations over time and (2) the rate at which concentrations are decreasing. To determine whether there is significant concentration change with time, a nonparametric Mann-Kendall test (Gilbert 1987) will be used. This procedure can be used with data sets that include both missing data and a mixture of detected and nondetected results. (An example of missing data will be longer-than-usual gaps in time between sampling events. When nondetected results are used, one-half the detection limit would be applied for that result.) The results of the Mann-Kendall test will be used to evaluate whether concentrations are decreasing, increasing, or staying the same.

If the slope of the concentration trend-line with time is significantly different from zero (i.e., concentrations are decreasing or increasing), Sen’s test (Gilbert 1987) will be used to calculate the slope (i.e., concentration change over time) of the trend-line. Sen’s test is not greatly affected by small amounts of missing data or outliers within the available data. Once the slope of the trend-line is calculated, the time necessary to reach a target concentration can be estimated. Finally, nonparametric confidence intervals around the trend-line would be calculated to evaluate the degree of confidence in the results. The confidence interval will be based on an 80 percent certainty (Sokal and Rohlf 1995). When added to existing monitoring data, 1 year of quarterly samples consisting of four or more samples would be sufficient to perform these statistical tests.

At locations where monitoring will be continued (based on the first interim review), ongoing monitoring will resume on an annual basis. Additional reviews will be performed after every fifth sampling interval until a monitoring endpoint is reached.

10.3.4 Monitoring Locations and Analyses

Monitoring well locations will be selected to target specific exceedances and to represent the groundwater conditions within representative hydrogeologic areas. Monitoring well locations will be provided in the sitewide monitoring plan for OU A. These locations will be selected to evaluate the effectiveness of natural attenuation and to ensure that migration of attenuated groundwater does not impact downgradient groundwater and surface water bodies.

10.3.5 Monitoring Endpoint

Monitoring will be considered complete at a given well location if chemical concentrations are:

- Below the MCL for groundwater
- Below state and federal surface water quality criteria at groundwater monitoring locations between impacted areas and downgradient surface water

Levels below these two criteria will need to be achieved for two consecutive sampling rounds before monitoring is considered complete.

As a secondary endpoint, monitoring at a specific location could be substantially reduced (based on the tests described in Section 10.3.3) if it can be demonstrated that (1) the concentrations are decreasing at a predictable rate with a degree of confidence of at least 80 percent and (2) the exceedance poses no reasonable threat to downgradient receptors.

If both of these conditions are met and can be demonstrated, it will be concluded that natural attenuation is progressing as predicted, that groundwater in the area poses no reasonable threat to humans or the environment, and that further monitoring could be significantly reduced to confirm achievement of cleanup goals at that location.

If an endpoint is not met, one of the following actions will be taken:

- If the data tests indicate that the concentrations are decreasing over time, but it cannot be demonstrated that the exceedances pose no reasonable threat to downgradient receptors, monitoring will be resumed.
- If the data tests indicate that there is not a significant change in concentrations *or* if the trend-line is found to be outside the confidence interval (i.e., there is uncertainty in the concentration trend), monitoring will be resumed.
- If the data tests indicate that the concentrations are increasing, an evaluation will be performed to determine whether to continue monitoring or take additional action.

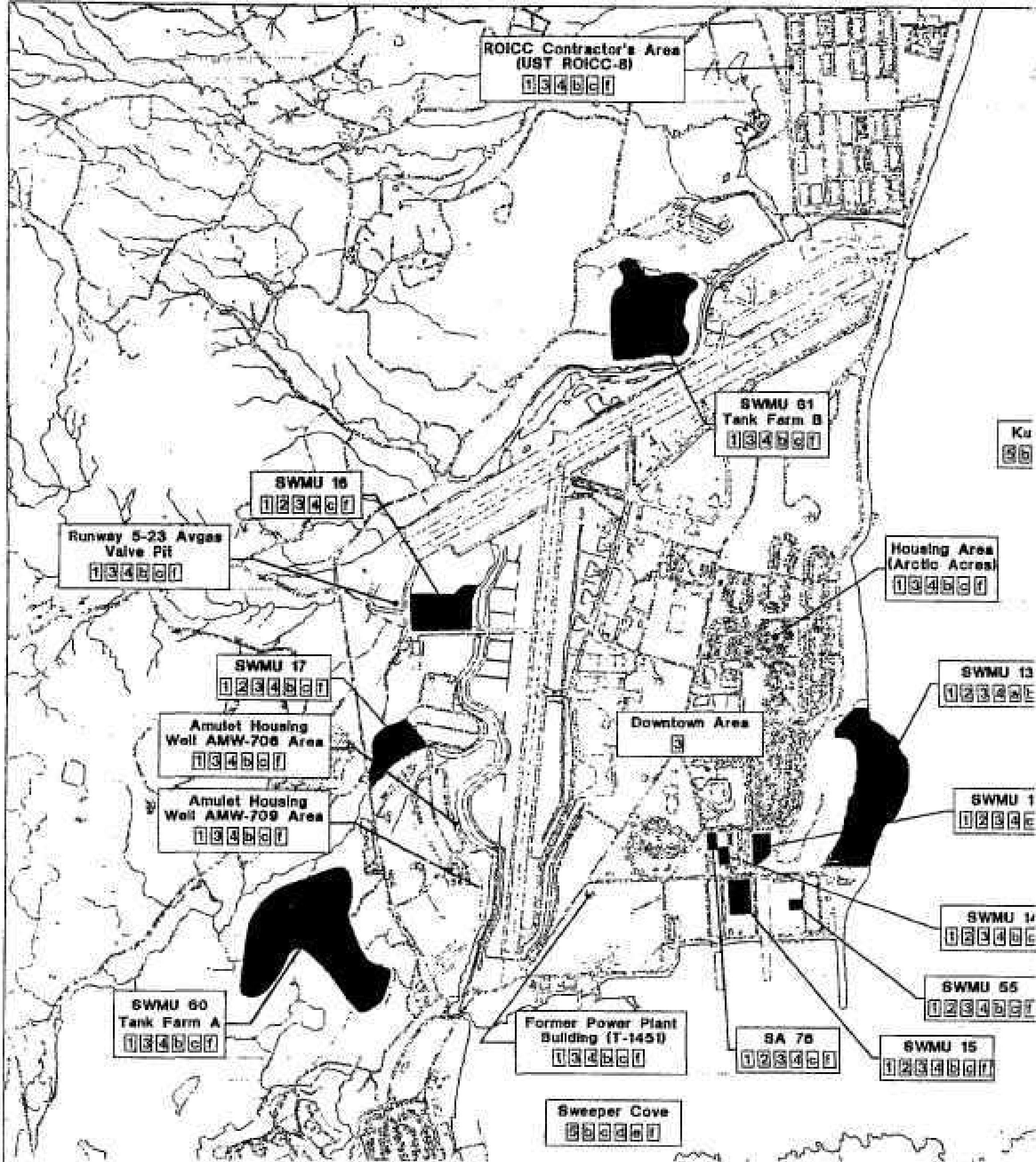
At the 5-year review, a report that defines the results of monitoring will be prepared by the Navy and submitted for review by the EPA and Alaska DEC. The 5-year review will evaluate the effectiveness of the selected remedies and determine the frequency for continued monitoring and identification of future actions, if necessary. The three signatories to this ROD will decide whether continued monitoring, or additional actions, are necessary.

10.4 STATE-PERMITTED LANDFILLS

Two sites on Adak are permitted landfills under Alaska 18 AAC 60 (Alaska solid waste regulations). These are Roberts Landfill (SWMU 25) and White Alice Landfill (SWMUs 18 and19). White Alice Landfill has recently been closed and is maintained and monitored in accordance with these regulations. Roberts Landfill continues to be operated although it is in the process of being closed.

As described in Section 5.3.1, quarterly monitoring at Roberts Landfill was conducted in 1996, and annual monitoring has been ongoing since 1997 at four monitoring wells and five surface water seeps. Monitoring results are reported on an annual basis. Results of sampling are provided in Table 5-13. A landfill closure design has been prepared by the Navy and approved by the state. A formal landfill closure date has not been set, but closure is anticipated within the next 1 to 2 years. Once the landfill is closed, it is anticipated that the monitoring will continue on an annual basis for 3 to 5 years. In addition, the landfill cap will be inspected on an annual basis. Results of the monitoring and inspections will be reported by the Navy and submitted for review by the state on an annual basis.

With regard to White Alice Landfill, quarterly monitoring was conducted in 1996 and annual monitoring has been ongoing since 1997 (see Section 5.3.2). Samples have been collected from two monitoring wells and three surface water locations since 1996 and results reported on an annual basis. Results of sampling are provided in Table 5-14. The landfill was closed and covered in 1997 with a cover designed by the Navy and approved by the state. It is anticipated that annual monitoring will continue at the site for the next 3 to 5 years in accordance with state regulations. In addition, the cover will be inspected on an annual basis. Results of the monitoring will be reported by the Navy and submitted for review by the state on an annual basis.



LEGEND

TYPES OF INSTITUTIONAL CONTROLS

1 Restrict Future Land Use. Site can be used for recreational or industrial purpose. Residential use is prohibited.

2 Implement Deed Restrictions or Restrictive Covenants on Individual Parcels.

3 Restrict Groundwater Use. No well installations for domestic use will be permitted.

4 Restrict Soil Excavation. No person can dig at the site unless a dig permit is obtained at the Engineering Office on Adak.

5 Implement Fishing Advisory. Recommend limiting consumption of fish and shellfish.

ENGINEERING REQUIREMENT (Action responses associated with the implementation of institutional controls)

a Annually conduct visual inspection of the covers at the site (and make repairs as necessary). Ensure that the cover at the site remains intact. This engineering requirement requires that repairs be made to the covers as necessary.

b Periodically collect and analyze samples of groundwater, sediment, surface water, fish, or shellfish.

c Periodically review site conditions, as appropriate, upon notice of remedy failure, but not less than every 5 years. Assess the need to take additional action or to reduce controls, as appropriate.

d Conduct educational orientation (required for shellfish fishery advisory).

e Place and annually inspect signage for shellfish fishery advisory.

f Annually conduct visual inspection of the site to insure the effectiveness of institutional controls.

CERCLA and Petroleun

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CLEAN COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY

0 400 800 1600 SCALE IN FEET

Figure 10-1
Types of Institutional Controls at Downtown Sites

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Map Key Number*	
Limited Soil Removal	
74	ASR-8 Faci
77	Contractor
78	Finger Bay
81	Girl Scout
89	Mount Mof
92	Navy Excha
97	Officer Hill
98	Officer Hill
101	Officer Hill
105	Quarters A
50	SA 77, Fuel
126	Yakutat Ha
Limited Groundwater Monitori	
76	Boy Scout C
85	MAUW Co
91	NAVFAC C
93	New Robert
106	ROICC Con
108	ROICC War
109	ROICC War
52	SA 79, Mair
Combined With a Larger Reme	
94	NMCB Buil
Monitored Natural Attenuation	
71	Amulet Hou
72	Amulet Hou
73	Antenna Fiel
79	Former Pow
82	Housing Are
107	ROICC Cont
110	Runway 5-23
62	SWMU 14, C
63	SWMU 15, F
67	SWMU 60, T
68	SWMU 61, T
Free-Product Recovery	
80	GCI Compou
95	NMCB Build
96	NORPAC Hi

Table 10-1
Summary of Sites With Institutional Controls

Site Designation	Types of Institutional Controls					Engineering F		
	1	2	3	4	5	a	b	c
SWMU 2, Causeway Landfill	•	•		•		•		•
SWMU 10, Old Baler Building	•	•	•	•				•
SWMU 11, Palisades Landfill	•	•		•		•	•	•
SWMU 13, Metals Landfill	•	•	•	•		•	•	•
SWMU 14, Old Pesticide Disposal Area	•	•	•	•			•	•
SWMU 15, Future Jobs/DRMO	•	•	•	•			•	•
SWMU 16, Former Firefighting Training Area	•	•	•	•				•
SWMU 20, White Alice/Trout Creek Disposal Area	•	•		•				•
SWMU 21A, White Alice Upper Quarry	•	•		•		•		•
SWMU 23, Heart Lake Drum Disposal Area	•	•		•				•
SWMU 29, Finger Bay Landfill	•	•		•		•		•
SWMUs 52, 53, 59, Former Loran Station	•	•		•				•
SWMU 55, Public Works Transportation Department Waste Storage Area	•	•	•	•			•	•
SWMU 67, White Alice PCB Spill Site	•	•		•		•		•
SA 76, Old Line Shed Building	•	•	•	•				•
SWMU 4, South Davis Road Landfill	•	•		•		•		•
SWMU 17, Power Plant 3	•	•	•	•			•	•
Sweeper Cove					•		•	•
Kuluk Bay					•		•	•
SWMU 60, Tank Farm A	•		•	•			•	•
SWMU 61, Tank Farm B	•		•	•			•	•
Amulet Housing, Well AMW-706 Area	•		•	•			•	•
Amulet Housing, Well AMW-709 Area	•		•	•			•	•
Antenna Field (USTs ANT-1, ANT-2, ANT-3, and ANT-4)	•		•	•			•	•

Map Key Number[a]
49
51
53
54
57
114
64
66
69
115
125

[a]Map key numbers c

Notes:
AST - aboveground
DRMO - Defense R
GCI - General Com
MAUW - modified
NAVFAC - Naval F
NMCB - Naval Mob
NORPAC - North P
ROICC - resident of
SA - source area
SWMU - solid waste
UST - underground

11.0 STATUTORY DETERMINATIONS

Based upon CERCLA requirements, the detailed analysis of alternatives using the nine NCP criteria (Section 9), and public comments, the Navy, EPA, and the State of Alaska have determined that the selected remedies detailed in Section 10 are the most appropriate for the former Naval Air Facility Adak. These sites do not contain any “principle threats,” as that term is defined in EPA guidance. Under CERCLA Section 121, selected remedies must be protective of human health and the environment, comply with ARARs, be cost-effective, and use permanent solutions and alternative treatment technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that use treatment that significantly reduces volume, toxicity, or mobility of hazardous wastes as their principal element. How the selected remedies for the various sites meet these statutory requirements is discussed in this section.

11.1 CERCLA SITES

This section summarizes the statutory determinations for the CERCLA sites either by site category (grouping sites by common-types of remediation) or by individual sites (utilizing multiple types of remedial technologies). These determinations are based on the evaluation criteria considered during the comparative analysis of alternatives.

11.1.1 Institutional-Control-Only Sites (Including Kuluk Bay and Sweeper Cove)

Fifteen terrestrial sites and two water bodies were identified to require institutional controls as the selected remedy because (1) calculated human health cancer risks were equal to or exceeded 1×10^{-5} or noncancer risks were equal to or greater than an HI of 1.0, or (2) landfill closures require that covers remain intact. Institutional controls consist of several types of restrictions (i.e., land use, deeds/restrictive covenants, groundwater use, and soil excavation) and engineering requirements (i.e., visual inspections, groundwater sampling, site reviews, and educational programs). All sites will require land use restrictions, deed restrictions/covenants, soil excavation restrictions, and site reviews. Additionally, all sites located within the downtown area will require groundwater use restrictions. The three general categories of institutional-control-only sites are the following:

- Retention of Existing Land Use. Institutional control restrictions on land use, deeds/restrictive covenants, groundwater use, and soil excavation are needed to ensure that land use remains industrial or recreational. Sites included under this category are SWMUs 2 (landfill portion only), 10, 16, 20, 21 A, 23, 29, 52 (includes 53 and 59), and 67 and SA 76. For some sites, engineering requirements (sampling of groundwater) will be implemented to verify that natural recovery of site groundwater (to meet drinking water standards) is occurring over time that would allow for residential use. These sites include SWMUs 14, 15, and 55.

Institutional controls are expected to remain on the sites indefinitely to meet the RAOs. For the land use to be changed to residential, the concentrations of the risk drivers listed in Table 6-5 would have to be reduced so that acceptable residential cancer risk is less than 1×10^{-5} and the noncancer risk (HI) is less than 1.0.

- Landfill Closure Requirements. Institutional controls involving postclosure monitoring (sampling of groundwater and surface water) are required to comply with closure plans; inspections and maintenance of the landfill control systems (e.g., cover, signs, fencing) are also required. SWMUs 11 and 13 are in this category.

- Water Bodies/Marine Receptors. Institutional controls involving educational requirements and posting of signs along the shorelines are needed while fish and shellfish tissue are monitored to confirm that chemical concentrations decrease over time. The two sites in this category are Sweeper Cove and Kuluk Bay.

The Navy will require future land owners to implement and enforce institutional controls according to the Adak Island ICMP.

Protection of Human Health and the Environment

Institutional controls will provide protection to human health by issuance of fishery advisories for Kuluk Bay and Sweeper Cove and by various site use restrictions applied to the terrestrial sites. Protection of ecological receptors is provided at the terrestrial sites by implementing the institutional controls and engineering requirements listed in Table 8-2, which include periodically inspecting the existing cover systems and restricting the disturbance of these cover systems and the subsurface soils. Periodic monitoring of site media will measure the reduction of risks over time. Periodic site review will enable assessment of whether the controls are adequate and whether site conditions will allow reduction of controls.

Attainment of ARARs

Institutional controls in the form of periodic monitoring by media sampling and analysis will comply with ARARs and provide a reasonable means of evaluating compliance with ARARs. ARARs for this selected remedy are provided below.

Chemical-Specific ARARs:

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75) are applicable. They specify cleanup levels for soils in the over-40-inch rain zone (18 AAC 75.340 and 341, Tables B1 and B2) and cleanup levels for groundwater and surface water (18 AAC 75.3 45).

- Federal Primary Drinking Water regulations (40 CFR Part 141). The maximum contaminant levels (MCLs) specified for public drinking water supplies are relevant and appropriate. MCLs are used for groundwater cleanup levels for monitoring at institutional control sites.

- Alaska Water Quality Standards regulations (18 AAC 70) are applicable to protect the growth and propagation of fish, shellfish, other aquatic life, and wildlife, as well as protection of uses (e.g., harvesting for consumption of raw mollusks and other raw aquatic life). The regulations specify that turbidity standards not exceed 25 nephelometric turbidity units (NTU) above natural conditions. Total dissolved solids (TDS) may not exceed 1,500 mg/L, including natural conditions; increase in TDS may not exceed one-third of the concentration of the natural condition of the water body.

Location-Specific ARARs:

- Alaska Coastal Zone Management Program regulations (6 AAC 80.130[b], [c][3]) are relevant and appropriate. They require that wetlands and tideflats be managed, to ensure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances.

Action-Specific ARARs:

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.375) are applicable. They define situations where institutional controls are required, describe institutional controls, and specify criteria that institutional controls must meet.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Institutional controls effectively reduce or control risk to potential receptors for as long as the controls are applied. The institutional controls alternative is considered to provide the best balance of reducing risk to potential receptors at these sites, considering the affected media, calculated risks, potential receptors, and environmental destruction that would occur with containment or removal alternatives. Monitoring of chemical concentrations in site media will allow assessment of the effectiveness of the controls over time, the rate of attenuation of risks, and the time when controls may no longer be required. Natural recovery processes may permanently reduce risks over the long term.

Institutional controls are not considered to be treatment technologies.

Preference for Treatment as a Principal Element

The selected remedy will not reduce toxicity, mobility, and volume through treatment.

Cost Effectiveness

Institutional controls are considered cost-effective compared to other more active alternatives evaluated for the sites retained for institutional controls. The institutional controls alternative is considered to maximize the degree of risk reduction, or protection, per dollar expended. This is true especially with Sweeper Cove and Kuluk Bay, where containment and removal would not immediately reduce risk to human or ecological receptors from ingestion of biota and would be very expensive (and environmentally destructive) to implement and maintain. Estimated 30-year present worth costs for implementation of institutional controls at the terrestrial sites total $1.8 million. Application of institutional controls at Sweeper Cove and Kuluk Bay is estimated to cost $260,000 and $250,000, respectively, over 30 years.

11.1.2 SWMU 4

Subsurface soils at SWMU 4, South Davis Road Landfill, were determined to pose excessive risk to ecological receptors. Risks are due to chemical concentrations that exceeded either risk-based thresholds or chemical-specific ARAR values. The COCs are total inorganics, Aroclors, and a single dioxin. Remedial action objectives were developed to prevent ingestion of and contact with impacted subsurface soils by birds and invertebrates and to prevent uptake by plants. To prevent exposure of these receptors to impacted subsurface soils, action levels were developed for the COCs (shown in Table 7-3) and the remedy for reducing risks and satisfying ARARs was selected. It was determined that capping the landfill as a presumptive remedy would be both cost-effective and protective of the environment. Based on regulatory agency review and approval, available funding was used in the summer of 1998 to implement this action. The landfill is now in postclosure operation and maintenance.

Protection of Human Health and the Environment

The soil cover will provide protection to the environment by minimizing the possibility of contact by ecological receptors. Institutional controls will provide additional protection of human health and ecological receptors by restricting future land use, implementing excavation restrictions, and performing periodic inspection and repair of the cover systems.

Attainment of ARARs

The selected remedy of capping the South Davis Road Landfill and implementing institutional controls will comply with all ARARs, which are shown below.

Chemical-Specific ARARs:

- 18 AAC 75.340 and 341. Table B1 and B2 numeric cleanup levels for soils in the over-40-inch rain zone are applicable for impacted soils.

- 18 AAC 75.345. Groundwater and surface water cleanup levels are applicable for groundwater and surface water that could be impacted.

- 18 AAC 70. Water quality standards are relevant and appropriate for fresh and marine surface waters that could be impacted by construction activities.

- 40 CFR 141, Primary Drinking Water regulations. The MCLs are relevant and appropriate for impacted groundwater that has the potential for use as a drinking water supply.

- 33 USC Section 1314, Clean Water Act. Ambient water quality criteria are relevant and appropriate for surface water that could be impacted.

Location-Specific ARARs:

- 6 AAC 80.130. Alaska Coastal Zone Management Program regulations are relevant and appropriate for wetlands that could be impacted by plume migration.

- Executive Order 11990. This order is relevant and appropriate for the protection of wetlands that could be impacted by plume migration.

Action-Specific ARARs:

- RCRA, Subtitle D, Nonhazardous Solid Waste criteria for municipal solid waste landfills (40 CFR Part 258). Groundwater monitoring and corrective action requirements (Subpart E) and closure and postclosure care (Subpart F) are relevant and appropriate.

- Alaska Solid Waste Management regulations (18 AAC 60). Closure (18 AAC 60.395) and postclosure requirements (18 AAC 60.397) for landfills are applicable.

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.375) are applicable. They define situations where institutional controls are required, describe institutional controls, and specify criteria that institutional controls must meet.

- Federal Clean Water Act NPDES Stormwater regulations (40 CFR 122.26) are relevant and appropriate. They specify requirements for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The landfill cover will provide reasonable effectiveness and permanence assuming proper construction and revegetation. Institutional controls will provide additional measures of long-term effectiveness and permanence by restricting land use and providing a means to assess chemicals in groundwater and sediments on an annual basis.

Preference for Treatment as a Principal Element

The selected remedy will not reduce toxicity, mobility, and volume through treatment.

Cost Effectiveness

Covering will be accomplished with readily available technology and will be feasible to complete. The cost of covering the landfill and related maintenance is estimated to be approximately $665,000. The cost of covering the landfill was $455,000. The estimated cost of implementing institutional controls at the landfill is $210,000. This presumptive remedy will more effectively protect the environment and achieve ARARs than the other alternatives.

11.1.3 SWMU 17

Sediment and surface water at the product and waste storage areas at SWMU 17, Power Plant 3, were determined to pose excessive risk to ecological receptors. Risks are due to chemical concentrations that exceeded either risk-based thresholds or chemical-specific ARAR values. The COCs are total inorganics, semivolatile organic compounds, and Aroclors in the retention pond sediments and surface water and in the sediments of the waste oil pond. Remedial action objectives were developed to prevent uptake of and contact with sediments by benthic infauna and to prevent ingestion of and contact with surface water by birds. To prevent exposure of these receptors to impacted media, action levels were developed for the COCs (shown in Table 7-3) and the remedies for reducing risks and satisfying ARARs were selected. It was determined that removal of sediments and replacement with clean material, removal of contaminated soil adjacent to the waste oil pond, and removal of the existing surface water from the retention pond will be both cost-effective and protective of the environment. In addition, groundwater monitoring will be conducted at one location near the dry cleaners, which is outside the area with petroleum-affected groundwater. During a prior round of sampling adjacent to the dry cleaning facility, VOC concentrations were measured in groundwater in excess of MCLs.

Protection of Human Health and the Environment

Removal and treatment of sediment, surface water, and surface soil will provide protection to human health and the environment by eliminating the potential for contact with contaminants at the site. Institutional controls will provide protection of human health by maintaining the land use as industrial and preventing residential development.

Attainment of ARARs

The selected remedy for SWMU 17 will comply with all ARARs, which are listed below. Institutional controls will prevent ingestion of groundwater until MCLs are attained.

Chemical-Specific ARARs:

- 18 AAC 75, Alaska Oil and Hazardous Substances Pollution Control regulations. The specified cleanup levels for DRO in soil (18 AAC 75.340 and 341) are relevant and appropriate.

- 18 AAC 75.341. Table B1 (Method Two) soil cleanup levels are applicable for the waste oil pond for protection of groundwater.

- Federal Primary Drinking Water regulations (40 CFR Part 141). MCLs developed for public drinking water supplies are relevant and appropriate as cleanup levels for groundwater.

Location-Specific ARARs:

- Clean Water Act, Section 404(b)(1) and regulations (40 CFR 230.10), which are EPA guidelines for discharge of dredged or fill materials, are relevant and appropriate. They specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species.

- Alaska Coastal Zone Management Program regulations (6 AAC 80.130[b], [c][3]) are relevant and appropriate. They require that wetlands and tideflats be managed to ensure adequate water flow, nutrients, and oxygen levels and to avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances.

- Executive Order 11990, Protection of Wetlands (also 40 CFR Part 6, Appendix A). The requirement that federal agencies avoid adversely impacting wetlands wherever possible to minimize wetlands destruction and to preserve the values of wetlands is relevant and appropriate.

Action-Specific ARARs:

- RCRA Subtitle D, Nonhazardous Solid Waste criteria for municipal solid waste landfills (40 CFR Part 258). Groundwater monitoring and corrective action requirements (Subpart E) and closure and postclosure care (Subpart F) are relevant and appropriate.

- Alaska Solid Waste Management regulations (18 AAC 60). Closure (18 AAC 60.395) and postclosure requirements (18 AAC 60.397) for Class II landfills such as Roberts Landfill are relevant and appropriate.

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.375) are applicable. They define situations where institutional controls are required, describe institutional controls, and specify criteria that institutional controls must meet.

- Federal Clean Water Act NPDES Stormwater regulations (40 CFR 122.26) are applicable. They specify requirements for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.

- Federal Clean Water Act Pretreatment regulations (40 CFR Part 403) are applicable. They provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits.

- Alaska Clean Air Act regulations (18 AAC 50.300 through 50.380). The substantive construction and operational requirements are applicable for the low-temperature thermal desorber soil treatment unit. These sections include, by reference, other chapters and sections of 18 AAC 50 that specify numerical operational parameters for chemical emissions, feed rates, and so forth.

- Alaska Wastewater Disposal regulations (18 AAC 72) are applicable. They specify separation distances from drinking water (18 AAC 72.015) and requirements for design reviews (18 AAC 72.225), stabilization ponds (lagoons) (18 AAC 72.260), and collection and pumping systems (18 AAC 72.275). They also govern temporary discharge of wastewater and sediments following dredging, gravity separation, and dewatering.

- National Toxics Rule (40 CFR 131.36). Concentration limits for toxics, as well as acute and chronic exposure criteria for freshwater and marine water, are applicable, to protect human health and aquatic life. Application of these standards will ensure that releases from SWMU 17 during remedial action do not cause exceedances in water quality in nearby surface waters.

- Alaska Water Quality Standards regulations (18 AAC 70) are applicable to protect the growth and propagation of fish, shellfish, other aquatic life, and wildlife. The regulations specify that turbidity standards not exceed 25 nephelometric turbidity units (NTU) above natural conditions. Total dissolved solids (TDS) may not exceed 1,500 mg/L, including natural conditions; increase in TDS may not exceed one-third of the concentration of the natural condition of the water body.

- ADEC Permit No. 9425-BA006 for Roberts Landfill. The residual levels of petroleum and other constituents in soil used for daily cover are applicable to SWMU 17 treated soils.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Removal of sediment and surface soil will provide the best long-term effectiveness and a permanent elimination of contamination. Institutional controls will supplement long-term effectiveness and permanence by restricting land and groundwater use.

Preference for Treatment as a Principal Element

Sediment and soil will be treated using low-temperature thermal desorption to reduce DRO and RRO levels to meet Roberts Landfill requirements for recycling as daily cover. This treatment will allow for beneficial recycling of the soils and sediments. Contaminated surface water from the ponds will be pretreated, if necessary, to meet the wastewater influent levels specified in the Adak wastewater treatment plant's NPDES permit. Even if pretreatment is not required, treatment at the Adak Island wastewater treatment facility will reduce or eliminate COCs from the waste stream. Both of these aspects of the remedy satisfy the statutory preference for treatment as a principal element.

Cost Effectiveness

Removal will be accomplished with readily available technology and will be feasible to complete. Removal of sediments, surface water, and surface soil adjacent to the waste oil pond will cost approximately $1.9 million assuming on-island disposal. These remedies will more effectively protect the environment and achieve the ARARs than the other alternatives.

11.1.4 South Sweeper Creek

Sediments and fish tissue from South Sweeper Creek, a receiving water body, were determined to pose excessive risk to ecological receptors. Risks are due to chemical concentrations that exceeded risk-based thresholds. The COCs are Aroclors and total inorganics. Remedial action objectives were developed to prevent ingestion of and contact with sediments by benthic infauna and to allow natural recovery processes over time to reduce chemical concentrations in prey tissues to below action levels. To prevent exposure of these receptors to impacted media, action levels were developed for the COCs (shown in Table 7-3) and the remedies for reducing risks and satisfying ARARs were selected. It was determined that removal of sediments in selected areas (where concentrations were above action levels) and issuance of fishery advisories as an institutional control will be both cost-effective and protective of the environment. Thermal treatment to meet Roberts Landfill permit requirements for use as daily cover will result in beneficial reuse of the treated sediments.

Protection of Human Health and the Environment

Achievement of sediment action levels will result in protection of future populations of benthic macroinvertebrates. Sediment removal will result in protection of higher trophic level receptors as well by eliminating direct contact with sediments. However, tissue concentrations in the food chain will require attenuation over the long term to reduce risk to higher trophic level receptors. Although insufficient fish exist to sustain a long-term fishery in the creek, human health will be protected by issuing a fishery advisory as an institutional control until long-term processes naturally reduce chemicals in fish tissues to below levels of concern.

Attainment of ARARs

The selected remedy of removal of impacted sediments from South Sweeper Creek will comply with all ARARs. The ARARs for the remedy are provided below.

Chemical-Specific ARARs:

- None established for sediments.

Location-Specific ARARs:

- Clean Water Act, Section 404(b)(1) and regulations (40 CFR 230. 10), which are EPA guidelines for discharge of dredged or fill materials, are applicable. They specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species.

- Alaska Coastal Zone Management Program regulations (6 AAC 80.130[b], [c][3]) are relevant and appropriate. They require that wetlands and tideflats be managed to ensure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances.

- Executive Order 11990, Protection of Wetlands (also 40 CFR Part 6, Appendix A). The requirement that federal agencies avoid adversely impacting wetlands wherever possible to minimize wetlands destruction and to preserve values of wetlands is relevant and appropriate.

- Fish and Wildlife Coordination Act (16 USC 661-666c), is relevant and appropriate. It requires consultation with U.S. Fish and Wildlife Service for impoundment or diversion of channels. Adequate provision shall be made for the conservation, maintenance, and management of wildlife resources and habitat to be affected.

Action-Specific ARARs:

- RCRA Subtitle D, Nonhazardous Solid Waste criteria for municipal solid waste landfills (40 CFR Part 258). Groundwater monitoring and corrective action requirements (Subpart E) and closure and postclosure care (Subpart F) are relevant and appropriate.

- Alaska Solid Waste Management regulations (18 AAC 60) are applicable. They specify closure (18 AAC 60.395) and postclosure requirements (18 AAC 60.397) for Class II landfills such as Roberts Landfill.

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.375) are relevant and appropriate. They define situations where institutional controls are required, describe institutional controls, and specify criteria that institutional controls must meet.

- Federal Clean Water Act NPDES Stormwater regulations (40 CFR 122.26). These regulations are relevant and appropriate. They specify requirements for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.

- Federal Clean Water Act Pretreatment regulations (40 CFR Part 403) are relevant and appropriate. They provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits.

- Alaska Clean Air Act regulations (18 AAC 50.300 through 50.380). The substantive construction and operational requirements are applicable for the low-temperature thermal desorber soil treatment unit. These sections include, by reference, other chapters and sections of 18 AAC 50 that specify numerical operational parameters for chemical emissions, feed rates, and so forth.

- Alaska Wastewater Disposal regulations (18 AAC 72) are applicable. They specify separation distances from drinking water (18 AAC 72.015) and requirements for design reviews (18 AAC 72.225), stabilization ponds (lagoons) (18 AAC 72.260), and collection and pumping systems (18 AAC 72.275). They also govern temporary discharge of wastewater and sediments following dredging, gravity separation, and dewatering.

- Alaska Surface Water Quality Standards regulations (18 AAC 70) are relevant and appropriate to protect the growth and propagation of fish, shellfish, other aquatic life, and wildlife. The regulations specify that turbidity standards not exceed 25 NTU above natural conditions. Total dissolved solids (TDS) may not exceed 1,500 mg/L, including natural conditions; increase in TDS may not exceed one-third of the concentration of the natural condition of the water body.

- 18 AAC 75.360, Cleanup Operations Requirements. The requirements for management of daily operations, waste management, and disposal plans are applicable.

- 18 AAC 75.365, Offsite or Portable Treatment Facilities. Requirements for approval of temporary treatment facilities, such as the thermal desorption unit, are applicable.

- 18 AAC 75.370, Soil Storage and Disposal. Requirements for location, liner permeability for temporary stockpiling of petroleum-contaminated soils, and blending with other soils (existing biopile) prior to treatment and disposal are applicable.

- ADEC Permit No. 9425-BA006 for Roberts Landfill. Requirements for acceptance of material for use as daily cover are applicable for treated soils.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Removal, treatment, and recycling of sediments will provide the best long-term solution for management of the PCB-impacted sediments. The concentration of PCBs may not be appreciably reduced by the thermal treatment unit. However, the existing levels are low enough to meet daily cover requirements at Roberts Landfill. The treatment unit will reduce levels of DRO and GRO, which are not COCs, to meet Roberts Landfill requirements for daily cover. Removing the sediments from the aquatic environment eliminates potential future exposure, and recycling after treatment provides a beneficial use.

Preference for Treatment as a Principal Element

Sediment and soil will be treated using low-temperature thermal desorption to reduce DRO and RRO levels to meet Roberts Landfill requirements for recycling as daily cover. This treatment will allow for beneficial recycling of the sediments. Contaminated surface water from the creek will be pretreated, if necessary, to meet the wastewater influent levels specified in the Adak wastewater treatment plant's NPDES permit. Even if pretreatment is not required, treatment at the Adak Island wastewater treatment facility will reduce or eliminate COCs from the waste stream. Both of these aspects of the remedy satisfy the statutory preference for treatment as a principal element.

Cost Effectiveness

Removal and treatment of the sediments will be accomplished with available technology and will be feasible to complete. Removal, treatment, and recycling at Roberts Landfill as daily cover will cost approximately $2.7 million. The level of protection that will be provided by this remedy is greater than the other options and is proportional to its costs.

11.2 PETROLEUM SITES

11.2.1 Free-Product Recovery Sites

These sites are currently being considered as interim remedial measure sites. Alaska DEC regulations require free-product recovery efforts as long as practicably recoverable volumes are present (18 AAC 75.325). Once petroleum has been removed to the maximum extent practicable as defined by 18 AAC 75.990(93), the sites will be evaluated under SAERA in a manner consistent with the FFS (URSG 1999a).

Protection of Human Health and the Environment

Free-product recovery will reduce the presence of petroleum product and associated hazardous constituents. The continued operation of recovery systems will prevent further migration in groundwater and eliminate potential migration that could impact nearby surface waters.

Attainment of ARARs

Because free-product recovery is an interim remedial measure, it is not expected to comply with all chemical specific ARARs until a final action is selected and implemented. The interim action will meet all action- and location-specific ARARs. All of the ARARs are listed below.

Chemical-Specific ARARs:

- 18 AAC 75.340 and 341. Table B1 and B2 numeric cleanup levels for soils in the over-40-inch rain zone are applicable for petroleum-impacted soils.
- 18 AAC 75.345. Groundwater and surface water cleanup levels are applicable for petroleum-impacted groundwater and surface water that could be impacted by plume migration.
- 18 AAC 70. Water quality standards are relevant and appropriate for fresh and marine surface waters.
- 40 CFR 141, Primary Drinking Water regulations. MCLs are relevant and appropriate for the impacted groundwater that has the potential for use as a drinking water supply.
- 33 USC 1314, Clean Water Act. The ambient water quality criteria are relevant and appropriate for surface water that could be impacted by plume migration.

Location-Specific ARARs:

- 6 AAC 80.130. Alaska Coastal Zone Management Program regulations are relevant and appropriate for wetlands that could be impacted by plume migration.
- Executive Order 11990. This order is relevant and appropriate for the protection of wetlands that could be impacted by plume migration.

Action-Specific ARARs:

- 18 AAC 75.325. Site cleanup rules are applicable for the recovery of free product to the maximum extent practicable.
- 18 AAC 75.360, Cleanup Operations Requirements. These requirements are applicable to the operation of the free-product recovery systems.
- 18 AAC 75.375, Institutional Controls. These requirements are applicable for areas of Adak where institutional controls are part of the remedy in order to reduce or eliminate contact with contaminated media.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Free-product recovery and recycling of recovered fuel will not result in a permanent solution for potential adverse risks associated with the presence of petroleum free product. Access restrictions and groundwater monitoring will provide short-term effectiveness by limiting access, ensuring against off-site migration, and reducing the potential for contact with free product.

Preference for Treatment as a Principal Element

Free-product recovery as an interim action meets this criterion through the recovery and recycling of petroleum free product until a final remedy is identified and implemented.

Cost Effectiveness

The costs to date for free product recovery are $4.5 million. The estimated costs for continuation of free-product recovery are $250,000 over the next 5 years. The determination for when free-product recovery is no longer practicable, as defined in 18 AAC 75, is described in Section 10.2.1 of this ROD.

11.2.2 Monitored Natural Attenuation Sites

Protection of Human Health and the Environment

Institutional controls will reduce human contact at these sites, thus reducing the possibility of direct contact with petroleum-affected soils and groundwater. Restrictions against using groundwater as a drinking water source will eliminate the groundwater ingestion pathway. Monitoring will confirm that off-site migration is not occurring or is below action levels, thus providing protection of downgradient habitats.

Attainment of ARARs

The remedy of monitored natural attenuation will immediately comply with action- and location-specific ARARs. Over time, the degradation of COCs will result in compliance with chemical-specific ARARs.

Chemical-Specific ARARs:

- 18 AAC 75.340 and 341. Table B1 and B2 numeric cleanup levels for soil in the over-40-inch rain zone are applicable for petroleum-impacted soils and groundwater.

- 18 AAC 75.345. Groundwater and surface water cleanup levels are applicable for petroleum-impacted groundwater and surface water that could be impacted by plume migration.

- 18 AAC 70. Water quality standards are relevant and appropriate for fresh and marine surface water.

- 40 CFR 141, Primary Drinking Water regulations. MCLs are relevant and appropriate for the impacted groundwater that has the potential for use as a drinking water supply.

- 33 USC Section 1314, Clean Water Act. The ambient water quality criteria are relevant and appropriate for surface waters that could be impacted by plume migration.

Location-Specific ARARs:

- 6 AAC 80.130. Alaska Coastal Zone Management Program regulations are relevant and appropriate for wetlands that could be impacted by plume migration.

- Executive Order 11990. This order is relevant and appropriate for the protection of wetlands that could be impacted by plume migration.

Action-Specific ARARs:

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.340[f]) are relevant and appropriate. They specify when natural attenuation has been successful for soil, using Method Four, site-specific risk assessment.

- For those substances without an MCL, Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.345[b][2]), which provide values for determining when natural attenuation has been successful for groundwater, are relevant and appropriate.

- Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75.350) are applicable. They provide the criteria under which groundwater is not a source of drinking water.

- 18 AAC 75.360, Cleanup Operations Requirements. These requirements are applicable for the operation of the free-product recovery systems.

- 18 AAC 75.375, Institutional Controls. These requirements are applicable for areas of Adak where institutional controls are part of the remedy in order to reduce or eliminate contact with contaminated media.

Other Criteria, Advisories, or Guidance To Be Considered (TBC):

- EPA OSWER Directive 9200.4-17P is “to be considered” for guiding the use of monitored natural attenuation at these sites.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Natural attenuation will ultimately provide a permanent reduction of chemical concentrations through biodegradation, dispersion, volatilization, and absorption; biodegradation is the predominant factor for reducing petroleum concentrations. Access restrictions and monitoring would provide short-term effectiveness by limiting access, ensuring against off-site migration, and reducing the potential for direct contact with petroleum-affected soils or sediments.

Preference for Treatment as a Principal Element

The selected remedy will not reduce toxicity, mobility, and volume through treatment.

Cost Effectiveness

Natural attenuation, institutional controls, and monitoring are readily implementable and have the greatest opportunity for being put into effect to benefit human health. Estimated implementation cost per monitoring well for this alternative is $37,600 for 75 years of monitoring. In comparison, source removal and ex situ soil bioremediation would cost an estimated $135,000 to $36 million per site, whereas soil vapor extraction/air sparging would cost an estimated $650,000 per site. Therefore, natural attenuation, institutional controls, and monitoring are considered a cost-effective remedy because the cost is proportional to the overall effectiveness.

11.2.3 Limited Soil Removal Sites

Protection of Human Health and the Environment

Soil removal will eliminate the potential for contact with petroleum hydrocarbons at levels above State of Alaska criteria. Soil removal will also eliminate the potential for migration of petroleum hydrocarbons to groundwater. Final destruction of petroleum hydrocarbons in removed soil will be attained through thermal desorption in conjunction with SWMU 17 and Sweeper Creek remedial actions.

Attainment of ARARs

The remedy of soil removal and treatment by thermal desorption will meet all ARARs, which are described below.

Chemical-Specific ARARs:

- For soil removal, Alaska Oil and Hazardous Substances Pollution Control regulations for soil (18 AAC 75.340), using Method Two, soil cleanup levels, are applicable.

Location-Specific ARARs:

- None.

Action-Specific ARARs:

- For treated soil disposal at Roberts Landfill, Alaska Oil and Hazardous Substances Pollution Control regulations for soil (18 AAC 75.340) are applicable.

- Alaska Clean Air Act regulations (18 AAC 50.300 through 50.380). The substantive construction and operational requirements are relevant and appropriate for operation of the low-temperature thermal desorber soil treatment unit. These sections include, by reference, other chapters and sections of 18 AAC 50 that specify chemical emissions, feed rates, and other operating parameters.

- Federal Clean Water Act NPDES Stormwater Regulations (40 CFR 122.26). These regulations are relevant and appropriate. They specify requirements for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.

- 18 AAC 75.360, Cleanup Operations Requirements. These requirements for management of daily operations, waste management, and disposal plans are applicable.

- 18 AAC 75.365, Offsite or Portable Treatment Facilities. Requirements for approval of temporary treatment facilities, such as the thermal desorption unit, are applicable.

- 18 AAC 75.370, Soil Storage and Disposal, Requirements for location, liner permeability for temporary stockpiling of petroleum-contaminated soils, and blending with other soils (existing biopile) prior to treatment and disposal are applicable.

- ADEC Permit No. 9425-BA006 for Roberts Landfill. Requirements for acceptance of treated material for use as daily cover are applicable.

Utilization of Permanent Solutions and Alternative Treatment Technologies

Removal and treatment of soils by thermal desorption meets this criterion.

Preference for Treatment as a Principal Element

The selected remedy will reduce toxicity, mobility, and volume through treatment.

Cost Effectiveness

Soil removal and thermal desorption are readily implementable and can easily be put into effect to benefit human health. This alternative is estimated to cost between $12,000 and $280,000 per site to implement. In comparison, the other active alternatives applicable to these sites (in situ soil bioremediation, ex situ soil bioremediation, and soil vapor extraction with air sparging) would cost between an estimated $135,000 and $36 million per site to implement. The monitored natural attenuation alternative would be less costly to implement, would not as effectively protect against short-term exposure, and would require a much longer timeframe to achieve cleanup levels.

12.0 DOCUMENTATION OF SIGNIFICANT CHANGES

This section of the ROD discusses significant changes that have occurred since issuance of the Proposed Plans in January 1998. Explanations of changes regarding ordnance issues, CERCLA issues, and petroleum issues are presented in this section.

12.1 ORDNANCE ISSUES

The Proposed Plan for CERLCA sites known at the time identified a preferred remedy for all ordnance materials sites. However, because archival information regarding additional potential ordnance materials sites was discovered after the Proposed Plan was completed, additional ordnance materials investigation is warranted. As a result, Operable Unit B was formed to address ordnance materials. A separate ROD for OU B will be prepared at a later date. A second Proposed Plan for OU A is not warranted as a result of removing downtown UXO issues from OU A; these issues will be addressed in detail in the Proposed Plan for OU B.

12.2 CERCLA ISSUES

The waste oil pond at SWMU 17 will be restored to a terrestrial habitat. Clean fill material will be used to fill the pond area after contaminated sediments are removed. The two oil/water separators at SWMU 17 were removed and related discharges were rerouted to the sanitary sewer prior to the completion of this ROD.

Additional sampling of South Sweeper Creek sediments has resulted in the decision to remove approximately 3,900 cubic yards of sediments. These sediments contain PCBs that may adversely impact downgradient receptors in the marine environment and may contribute to elevated potential cancer risks for subsistence fishers in Sweeper Cove. The sediments will be treated by low-temperature thermal desorption to reduce DRO and GRO concentrations before recycling as daily cover at Roberts Landfill. In addition, approximately 2,000 cubic yards of petroleum-contaminated soils in the existing biopile will be treated along with these sediments. This will eliminate the need for any further long-term maintenance of the biopile and is expected to enhance the treatability of the soils and sediments through bulking and drying actions.

The remedial action for the SWMU 4 landfill—capping—was completed in the summer of 1998. This action was undertaken by the Navy after the Proposed Plan was published but before this ROD was signed. The action is consistent with the preferred remedy that was presented to the public in the Proposed Plan.

12.3 PETROLEUM ISSUES

At the time the Proposed Plan for petroleum sites was released, the Navy and Alaska DEC were still evaluating site-specific data for many of the petroleum sites. It was stated in the Proposed Plan and at the public meeting that the ongoing evaluations could result in changes to proposed remedial actions. The selected remedial action for several sites was changed based on those reviews. The changes are discussed below.

Five petroleum sites were determined to require no further action based on comparison to 18 AAC 75 Method One Level A criteria. These sites are Boy Scout Camp, South Haven Lake (UST BS-2); Housing Outfall Area (Sandy Cove); McDonalds UST; NSGA Filling Station Mogas and JP-5 ASTs; and TFC to NSGA Pipeline—Area E (Truck Fill Stand).

As indicated in the Proposed Plan, clean soil or rock was imported at five sites and placed on surface soils to mitigate aesthetic concerns consistent with criteria in the draft 18 AAC 75 regulation. These sites are SWMU 58 and SA 73, Heating Plant 6; SWMU 17, Power Plant 3; Former Power Plant Building (T-1451); South of Runway 18-36 Area (airport ditch); and Yakutat Hangar (UST T-2039-A). The promulgated 18 AAC 75 regulation no longer contains provisions for aesthetic remediation activities.

A cleanup action consisting of the removal of soil containing asphalt and the placement of clean soil cover imported from off site was performed at SWMU 74, Old Batch Facility. As a result of this remedial action, this site was transitioned to no-further-action status.

Twelve petroleum sites have been selected for limited source soil removal and thermal desorption (Alternative 4 from the Proposed Plan) as a preferred remedial action. These sites contain petroleum hydrocarbons in soil that is limited in extent and accessible. The soil will be removed from the sites, treated with a thermal desorption unit, and recycled as daily cover at Roberts Landfill.

Two additional petroleum release sites were discovered during 1998 after the Proposed Plan for petroleum sites was published: Pantograph Pad (UST RT-1) and Loran Station (USTs V149A, V149B, and V149C). Based on investigation activities and comparison with 18 AAC 75, these sites were determined to require no further action.

Additional soil and groundwater samples were collected at the petroleum release sites during 1998. Analyses were performed on these samples and on samples collected prior to 1998 at these sites. Results of these analyses were then discussed with the Alaska DEC, and a final determination was made for each of the 128 petroleum release sites. The sites are grouped into the following six categories:

1. Eighty-two sites are determined to require no further action.

2. Twelve sites are identified for limited source soil removal and thermal desorption.

3. Eight sites are identified for limited (quarterly for 1 year) groundwater monitoring.

4. Eleven sites are identified for monitored natural attenuation, including one site (SWMU 15, Future Jobs/DRMO) that is being monitored for nonpetroleum chemicals.

5. One site, the NMCB Building Area (UST T- 1416-A) site, will be remediated as part of the larger remedial effort at the NMCB Building Expanded Area.

6. Fourteen sites containing measurable quantities of free product will be referred to the focused feasibility process once product recovery is terminated.

No other significant changes have been incorporated in the ROD from either the public meeting documented in the Responsiveness Summary (Appendix B) or from regulatory agency comment.

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APPENDIX A

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN IN SAMPLED MEDIA AT CERCLA ACTION SITES

This appendix contains a summary of results for the chemicals of potential concern in all media tested at all CERCLA action sites. The value under the Quantity Tested column reflects the number of samples considered representative of current conditions. Results from samples of soil that have been removed from a site are not included in this data summary because those results no longer represent current site conditions

Appendix A
Human Health and Ecological COPC Sites
List of Tables

Table No.	Site ID	Site Name	Matrix	Tissue Type
Human Health COPC Sites:				
A-1	67	SWMU 67, White Alice PCB Spill Area	SD	
A-2	67	SWMU 67, White Alice PCB Spill Area	SS	
A-3	SWPCRK	South Sweeper Creek	SD	
A-4	SWPCRK	South Sweeper Creek	SW	
A-5	SWPCRK	South Sweeper Creek	TI	DOLLY VARDEN
A-6	SWPCOV	Sweeper Cove	SW	
A-7	SWEEPCOV	Sweeper Cove	TI	MUSSEL
A-8	SWEEPCOV	Sweeper Cove	TI	SOLE, FILLET
A-9	SWEEPCOV	Sweeper Cove	TI	SOLE, WHOLE BODY
A-10	37	SWMU 10. Old Baler Building	SS	
A-11	11	SWMU 11, Palisades Landfill	SD	
A-12	11	SWMU 11, Palisades Landfill	SW	
A-13	11	SWMU 11, Palisades Landfill	TI	MUSSEL
A-14	LRAN	SWMU 52 (53, 59), Former Loran Station	SS	
A-15	39	SA 76, Old Line Shed Building	SS	
A-16	14	SWMU 14, Old Pesticide Storage and Disposal Area	GW	
A-17	14	SWMU 14, Old Pesticide Storage and Disposal Area	SB	
A-18	14	SWMU 14, Old Pesticide Storage and Disposal Area	SS	
A-19	15	SWMU 15, Future Jobs/Defense Reutilization Marketing Office	GW	
A-20	15	SWMU 15, Future Jobs/Defense Reutilization Marketing Office	SB	
A-21	15	SWMU 15, Future Jobs/Defense Reutilization Marketing Office	SD	
A-22	15	SWMU 15, Future Jobs/Defense Reutilization Marketing Office	SS	
A-23	16	SWMU 16, Former Firefighting Training Area	GW	
A-24	16	SWMU 16, Former Firefighting Training Area	SB	
A-25	16	SWMU 16, Former Firefighting Training Area	SD	
A-26	16	SWMU 16, Former Firefighting Training Area	SS	
A-27	17	SWMU 17, Power Plant	GW	
A-28	17	SWMU 17, Power Plant	SB	
A-29	17	SWMU 17, Power Plant	SD	
A-30	17	SWMU 17, Power Plant	SS	
A-31	17	SWMU 17, Power Plant	SW	
A-32	2	SWMU 2, Causeway Landfill	GW	
A-33	2	SWMU 2, Causeway Landfill	SB	
A-34	20	SWMU 20, White Alice/Trout Creek Disposal Area	SS	
A-35	21A	SWMU 21A, White Alice Disposal Area—Upper Quarry	SS	
A-36	23	SWMU 23, Heart Lake Drum Disposal Area	SD	
A-37	23	SWMU 23, Heart Lake Drum Disposal Area	SS	
A-38	29	SWMU 29, Finger Bay Landfill	GW	
A-39	29	SWMU 29, Finger Bay Landfill	SB	
A-40	29	SWMU 29, Finger Bay Landfill	SD	

Appendix A
Human Health and Ecological COPC Sites
List of Tables

Table No.	Site ID	Site Name	Matrix	Tissue Type
Human Health COPC Sites: (cont'd):				
A-41	4	SWMU 4, South Davis Road Landfill	GW	
A-42	4	SWMU 4, South Davis Road Landfill	SB	
A-43	4	SWMU 4, South Davis Road Landfill	SD	
A-44	55	SWMU 55, Public Works Transportation Department Waste Storage Area	GW	
A-45	55	SWMU 55, Public Works Transportation Department Waste Storage Area	SD	
A-46	55	SWMU 55, Public Works Transportation Department Waste Storage Area	SS	
Ecological COPC Sites:				
A-47	11	SWMU 11, Palisades Landfill	SD	
A-48	11	SWMU 11, Palisades Landfill	SW	
A-49	11	SWMU 11, Palisades Landfill	TI	MUSSEL
A-50	13	SWMU 13, Metals Landfill	TI	SOLE, FILLET
A-51	11	SWMU 11, Palisades Landfill	TI	SOLE, WHOLE BODY
A-52	LRAN	SWMU 52, (53, 59), Former Loran Station	SS	
A-53	39	SA 76, Old Line Shed Building	SS	
A-54	10	SWMU 10, Old Baler Building	SS	
A-55	16	SWMU 16, Former Firefighting Training Area	SB	
A-56	16	SWMU 16, Former Firefighting Training Area	SD	
A-57	16	SWMU 16, Former Firefighting Training Area	SS	
A-58	17	SWMU 17, Power Plant 3 Area	SB	
A-59	17	SWMU 17, Power Plant 3 Area	SD	
A-60	17	SWMU 17, Power Plant 3 Area	SS	
A-61	17	SWMU 17, Power Plant 3 Area	SW	
A-62	2	SWMU 2, Causeway Landfill	SB	
A-63	20	SWMU 20, White Alice/Trout Creek Disposal Area	SB	
A-64	20	SWMU 20, White Alice/Trout Creek Disposal Area	SS	
A-65	20	SWMU 20, White Alice/Trout Creek Disposal Area	SW	
A-66	21A	SWMU 21A, White Alice Disposal Area—Upper Quarry	SS	
A-67	23	SWMU 23, Heart Lake Drum Disposal Area	SD	
A-68	23	SWMU 23, Heart Lake Drum Disposal Area	SS	
A-69	29	SWMU 29, Finger Bay Landfill	SB	
A-70	29	SWMU 29, Finger Bay Landfill	SD	
A-71	4	SWMU 4, South Davis Road Landfill	SB	
A-72	4	SWMU 4, South Davis Road Landfill	SD	
A-73	67	SWMU 67, White Alice PCB Spill Area	SD	
A-74	67	SWMU 67, White Alice PCB Spill Area	SS	

Table A–1

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 6 – White Alice PCB Spill Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1254	6	2	.14	.25	.195	.172	.172	2	.0083		
Aroclor 1260	6	6	.11	.42	.227	.325	.325	6	.0083		

Table A–2

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 67 – White Alice PCB Spill Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Pesticides and Aroclors											
Aroclor 1232	65	5	.66	1100	350	65.7	65.7	5	.0083		
Aroclor 1260	65	65	.31	2700	293	413	413	65	.0083		

Table A–3

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: South Sweeper Creek and Yakutat Creek Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzo(a)anthracene	44	10	.03	.93	.316	.269	.269	8	.0875		
Benzo(a)pyrene	44	4	.17	.37	.225	.235	.235	4	.00875		
Benzo(b)fluoranthene	44	9	.044	.7	.296	.273	.273	7	.0875		
Indeno(1,2,3-cd)pyrene	44	3	.036	.15	.105	.216	.15	2	.0875		
Pentachlorophenol	44	1	1	1	1	2.06	1	1	.532		
Pesticides and Aroclors											
Aroclor 1260	44	35	.047	4	.888	.977	.977	35	.0083		
Total Inorganics											
Beryllium	44	38	.09	.26	.146	.228	.228	38	.0149		

Table A–4

Chemicals of Potential Concern in Surface Water Compared to Human Health RBSCs and Adak Background Concentrations
Installation: DAK Site: South Sweeper Creek and Yakutat Creek Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Total Inorganics											
Antimony	2	1	15	15	15	41.6	15	1	1.46		

Table A–5

Chemicals of Potential Concern in Dolly Varden, Whole Body Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site:South Sweeper Creek and Yakutat Creek Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Aroclor 1260	5	5	.116	.24	.182	.237	.237				
Dieldrin	5	2	.00051	.00064	.000575	.000542	.000542				
Total Inorganics											
Cadmium	5	3	.171	.271	.207	.236	.236				

Table A–5

Chemicals of Potential Concern in Dolly Varden, Fillet Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: South Sweeper Creek and Yakutat Creek Zone: All Location Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Aroclor 1260	5	5	.034	1.49	.0864	.127	.127				
Dieldrin	5	4	.00045	.00087	.000668	.000851	.000851				
Total Inorganics											
Cadmium	5	1	1.39	1.39	1.39	.885	.885				

Table A–6

Chemicals of Potential Concern in Surface Water Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: Sweeper Cove Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Total Inorganics											
Antimony	2	1	15	15	15	41.6	15	1	1.46		

Table A–7

Chemicals of Potential Concern in Blue Mussels Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: Sweeper Cove Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Aroclor 1260	6	6	.0269	.0396	.0343	.0384	.0384				
Total Inorganics											
Arsenic	6	6	.991	1.6	1.39	1.57	1.57				
Cadmium	6	6	.78	1.48	1.18	1.39	1.39				

Table A–8

Chemicals of Potential Concern in Rock Sole, Fillet Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: Sweeper Cove Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1260	5	4	.148	.341	.232	.306	.306				
Total Inorganics											
Antimony	5	4	.0078	.0536	.025	.0399	.0399				
Arsenic	5	5	2.74	8.09	5.08	7.32	7.32				
Cadmium	5	1	1.15	1.15	1.15	.737	.737				
Lead	5	5	.0938	.341	.171	.265	.265				
Mercury	5	5	.0435	.0838	.0621	.076	.076				

Table A–9

Chemicals of Potential Concern in Rock Sole, Whole Body Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: Sweeper Cove Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1260	6	6	.056	.095	.0723	.0856	.0856				
Total Inorganics											
Antimony	6	2	.0054	.008	.0067	.00599	.00599				
Arsenic	6	6	1.16	2.64	1.93	2.44	2.44				
Lead	6	4	.0686	.0869	.0761	.0802	.0802				
Mercury	6	6	.0154	.0272	.0208	.0245	.0245				

Table A–10

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 10 – Old Bailer Facility Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
Benzo(a)anthracene	7	4	.099	.45	.232	4.78	.45	4	.0875		
Benzo(a)pyrene	7	6	.11	.63	.263	4.78	.63	6	.00875		
Benzo(b)fluoranthene	7	6	.14	.64	.288	4.79	.64	6	.0875		
Benzo(k)fluoranthene	7	3	.095	.24	.148	4.77	.24	0	.875		
Chrysene	7	6	.15	.66	.36	4.84	.66	0	8.75		
Dibenz(a,h)anthracene	7	1	.1	.1	.1	4.81	.1	1	.00875		
Indeno(1,2,3–cd)pyrene	7	3	.13	.32	.203	4.79	.32	3	.0875		
Pesticides and Aroclors											
Aroclor 1260	7	7	.21	12	2.05	5.27	5.27	7	.0083		
Total Inorganics											
Arsenic	7	7	1.2	10.6	3.91	6.58	6.58	7	.0365	1	7.47
Beryllium	7	7	.6	1	.766	.88	.88	7	.0149	4	.67

Table A–11

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Total Inorganics											
Lead	6	6	2	275	82.3	183	183	0	400	2	8.32

Table A–12

Chemicals of Potential Concern in Surface Water Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Total Inorganics											
Antimony	6	2	.31	.69	.5	.433	.433	0	1.46		
Cadmium	6	1	.13	.13	.13	.0867	.0867	0	1.83	0	8.3

Table A–13

Chemicals of Potential Concern in Blue Mussels Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzoic acid	2	1	1.72	1.72	1.72	6.15	1.72				
Total Inorganics											
Arsenic	2	2	1.53	1.57	1.55	1.68	1.57				
Cadmium	2	2	.434	.535	.485	.804	.535				
Copper	2	2	1.05	1.17	1.11	1.49	1.17				
Lead	2	2	.189	.243	.216	.387	.243				
Selenium	2	2	.4	.5	.45	.766	.5				

Table A–14

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 52 – Loran Station (includes SWMU No. 53 and 59) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
1,4–Dichlorobenzene	36	1	11.57	11.57	11.6	6.65	6.65	1	2.66		
Benzo(a)pyrene	36	1	2.26	2.26	2.26	9.68	2.26	1	.00875		
Dibenz(a,h)anthracene	36	1	1.54	1.54	1.54	9.66	1.54	1	.00875		
Indeno(1,2,3-cd)pyrene	36	1	1.88	1.88	1.88	9.66	1.88	1	.0875		
bis(2–Ethylhexyl)phthalate	35	7	.25	45.45	13.6	9.49	9.49	3	4.56		
Pesticides and Aroclors											
Aroclor 1254	34	8	.054	4.8	1.62	.69	.69	8	.0083		
Aroclor 1260	34	3	.015	1.6	.855	.189	.189	3	.0083		
Total Inorganics											
Antimony	36	5	1.4	182	47.1	15.8	15.8	2	11		
Arsenic	36	32	.67	99.3	13.1	17.1	17.1	32	.0365	13	7.47
Lead	36	36	1.3	4422	247	465	465	5	400	19	10.9
Zinc	36	33	1.5	15156	809	1550	1550	2	8210	10	80.3

Table A–15

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site:SA No. 76 – Old Line Shed Building Zone:All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	9	7	.088	1.9	.454	.783	.783	7	.0875		
Benzo(a)pyrene	9	8	.12	2.9	.581	1.11	1.11	8	.00875		
Benzo(b)fluoranthene	9	8	.12	3.9	.784	1.48	1.48	8	.0875		
Benzo(k)fluoranthene	9	6	.092	1.3	.352	.589	.589	1	.875		
Chyrsene	9	8	.11	2.5	.608	1.07	1.07	0	8.75		
Dibenz(a,h)anthracene	9	1	.35	.35	.35	.396	.35	1	.00875		
Indeno(1,2,3–cd)pyrene	9	6	.078	1.1	.308	.522	.522	5	.0875		
Pesticides and Aroclors											
Aroclor 1260	9	9	.049	.4	.168	.237	.237	9	.0083		
Total Inorganics											
Arsenic	9	8	1	98.5	21	39	39	8	.0365	3	7.47
Beryllium	9	9	.72	1.1	.821	.903	.903	9	.0149	9	.67
Lead	9	9	22.6	769	124	275	275	1	400	9	10.9

Table A–16

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 14 – Old Pesticide Area (and gasoline station) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Bromodichloromethane	3	1	3	3	3	48.4	3	1	1.37		
Chloroform	3	1	16	16	16	48.8	16	1	.275		
Ethylbenzene	4	2	640	790	715	847	790	2	158		
Tetrachloroethene	3	2	5	52	28.5	72.1	52	2	1.43		
Toulene	4	2	2600	4300	3450	4210	4210	2	96.3		
Semivolatile Organics											
bis(2–Ethylhexyl)phthalate	3	1	7	7	7	8.83	7	1	6.08		
Total Inorganics											
Lead	4	3	13.1	86.3	47.9	81	81	2	15	3	11.8
Thallium	4	2	.33	3.3	1.82	3.15	3.15	2	.292		

Table A–16

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 14 – Old Pesticide Area (and gasoline station) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Dissolved Inorganics											
Lead	4	3	11.6	82	46	77.8	77.8	2	15		

Table A–17

Chemicals of Potential Concern in Subsurface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 14 – Old Pesticide Area (and gasoline station) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)pyrene	26	5	.03	.13	.0584	.171	.13	5	.00875		
Pesticides and Aroclors											
Aroclor 1260	26	4	.037	.18	.094	.0416	.0416	4	.0083		

Table A–18

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 14 – Old Pesticide Area (and gasoline station) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	13	11	.021	13	1.33	3.02	3.02	8	.0875		
Benzo(a)pyrene	13	7	.066	12	1.88	2.83	2.83	7	.00875		
Benzo(b)fluoranthene	13	9	.026	11	1.39	2.62	2.62	6	.0875		
Dibenz(a,h)anthracene	13	2	.063	2.6	1.33	.858	.858	2	.00875		
Indeno(1,2,3–cd)pyrene	13	6	.045	6.9	1.22	1.71	1.71	3	.0875		
Pesticides and Aroclors											
Aroclor 1260	13	5	.042	.1	.0662	.0501	.0501	5	.0083		

Table A–19

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 15 – Future Jobs/DRMO (Old Hazardous Waste Storage) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Tetrachloroethene	22	9	35	410	194	132	132	9	1.43		
Trichloroethene	22	12	3.2	51	29.1	23.7	23.7	12	2.54		

Table A–20

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 15 – Future Jobs/DRMO (Old Hazardous Waste Storage) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	17	2	.079	4.3	2.19	1.01	1.01	1	.0875		
Benzo(a)pyrene	17	2	.12	1.7	.91	.657	.657	2	.00875		
Benzo(b)fluoranthene	17	3	.059	5.1	1.85	1.14	1.14	2	.0875		
Dibenz(a,h)anthracene	17	1	.067	.067	.067	.672	.067	1	.00875		
Indeno(1,2,3–cd)pyrene	17	3	.073	.78	.321	.567	.567	2	.0875		
Pesticides and Aroclors											
Aroclor 1260	25	6	.023	40	6.76	4.42	4.42	6	.0083		

Table A–21

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 15 – Future Jobs/DRMO (Old Hazardous Waste Storage) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
Benzo(a)anthracene	8	7	.057	1.1	.282	.544	.544	5	.0875		
Benzo(a)pyrene	8	6	.043	.22	.129	.282	.22	6	.00875		
Benzo(b)fluoranthene	8	8	.094	1.2	.4	.665	.665	8	.0875		
Dibenz(a,h)anthracene	8	2	.057	.067	.062	.273	.067	2	.00875		
Indeno(1,2,3–cd)pyrene	8	4	.14	.19	.163	.301	.19	4	.0875		
Pesticides and Aroclors											
Aroclor 1260	8	7	.071	3.5	1.19	1.86	1.86	7	.0083		

Table A–22

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 15 – Future Jobs/DRMO (Old Hazardous Waste Storage) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzo(a)anthracene	33	27	.04	13	1.04	1.66	1.66	21	.0875		
Benzo(a)pyrene	33	13	.052	6.7	.824	.942	.942	13	.00875		
Benzo(b)fluoranthene	33	25	.052	43	2.67	4.44	4.44	23	.0875		
Dibenz(a,h)anthracene	33	15	.046	.47	.163	.548	.47	15	.00875		
Indeno(1,2,3–cd)pyrene	33	15	.06	.96	.326	.622	.622	13	.0875		
Pesticides and Aroclors											
Aroclor 1260	40	30	.055	7.1	1.4	1.66	1.66	30	.0083		

Table A–23

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Volatile Organics											
1,2–Dichloroethene	27	6	12	79	28.8	14.5	14.5				
Benzene	42	2	.6	1.9	1.25	3.4	1.9	1	.618		
Pesticides and Aroclors											
Aroclor 1260	35	1	.8	.8	.8	1.87	.8	1	.0111		

Table A–24

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Tetrachloroethene	39	4	.009	140	35	9.67	9.67	1	1.25		
Pesticides and Aroclors											
Aroclor 1260	48	23	.59	29	4.21	3.23	3.23	23	.0083		
Total Inorganics											
Thallium	22	1	17	17	17	5.81	5.81	1	2.19	1	3.8

Table A–25

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1260	18	7	.0083	.082	.0299	.0576	.0576	6	.0083		

Table A–26

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Volatile Organics											
Tetrachloroethene	58	23	.0004	46	2.2	2.27	2.27	2	1.25		
Semivolatile Organics											
Benzo(a)anthracene	45	2	.067	.95	.509	3.69	.95	1	.0875		
Benzo(a)pyrene	45	1	.86	.86	.86	3.69	.86	1	.00875		
Pesticides and Aroclors											
Aroclor 1260	38	20	.029	5.8	1.47	1.33	1.33	20	.0083		

Table A–27

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Volatile Organics											
Benzene	42	7	.7	5	2.01	6.29	5	7	.618		
Ethylbenzene	42	5	1.1	270	60.2	20.5	20.5	1	158		
Toluene	42	1	210	210	210	16.2	16.2	1	96.3		
Xylenes	42	10	.5	640	69.1	44.3	44.3	0	7300		
Semivolatile Organics											
2–Methylnaphthalene	35	14	1	740	115	92.5	92.5	2	146		
Dibenzfuran	33	4	1	22	7.5	10.8	10.8	1	14.6		
N–Nitrosodiphenylamine	33	2	9	57	33	15.1	15.1	1	17.4		
Naphthalene	35	11	1.6	180	30.5	26.5	26.5	1	146		
bis(2–Ethylhexyl)phthalate	33	18	.8	610	45.6	64.2	64.2	4	6.08		
Pesticides and Aroclors											
Aroclor 1254	35	3	.08	.97	.557	.361	.361	3	.0111		
Aroclor 1260	35	1	.06	.06	.06	.329	.06	1	.0111		
Total Inorganics											
Antimony	51	5	.01	51.9	30.6	22.8	22.8	4	1.46		
Barium	51	48	5.1	16800	519	1040	1040	12	256	28	54.4
Beryllium	51	23	1	10	2.58	1.78	1.78	23	.0198		
Cobalt	51	33	1.2	230	36.3	34.7	34.7	1	219		
Copper	51	43	3	1530	244	275	275	21	135	31	69.5
Lead	51	31	.04	80	22.7	21.7	21.7	18	15	18	11.8
Manganese	51	51	4.5	12100	2430	3110	3110	45	170	34	746
Nickel	51	29	6.3	700	81.8	78.1	78.1	5	73		
Selenium	51	10	1.3	90	24.2	21.7	21.7	3	18.3		
Thallium	51	7	.008	300	73.2	27.1	27.1	6	.292		
Vanadium	51	43	4.2	2080	294	342	342	36	25.6	29	73.1

Table A–27

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone:All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Dissolved Inorganics											
Manganese	11	11	3.5	8080	1730	2990	2990	9	170	7	768

Table A–28

Chemicals of Potential Concern in Subsurface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	35	8	.055	2.2	1.35	.711	.711	7	.0875		
Benzo(a)pyrene	35	6	.058	.87	.62	.438	.438	6	.00875		
Benzo(b)fluoranthene	35	6	.74	1.3	1.06	.521	.521	6	.0875		
Pesticides and Aroclors											
Aroclor 1260	37	19	.014	5.7	.512	.563	.563	19	.0083		
Total Inorganics											
Arsenic	42	20	3.1	16.9	5.7	7.37	7.37	20	.0365	3	7.47
Beryllium	42	21	.3	1.7	.867	.636	.636	21	.0149	15	.67
Vanadium	42	42	41.7	212	94.9	105	105	1	192	14	105.3

Table A–29

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzo(a)anthracene	31	10	.0055	3.3	.5	6.61	3.3	6	.0875		
Benzo(a)pyrene	31	8	.024	2.5	.388	6.57	2.5	8	.00875		
Benzo(b)fluoranthene	31	14	.023	1.3	.232	6.6	1.3	7	.0875		
Benzo(k)fluoranthene	30	10	.012	2.7	.377	6.8	2.7	1	.875		
Debenz(a,h)anthracene	31	6	.0082	.18	.0509	6.77	.18	4	.00875		
Indeno(1,2,3–cd)pyrene	31	8	.018	.12	.0509	6.8	.12	1	.0875		
bis(2–Ethylhexyl)phthalate	31	12	.11	10	3.83	40.2	10	4	4.56		
Pesticides and Aroclors											
Aroclor 1254	31	1	.4	.4	.4	.0716	.0716	1	.0083		
Aroclor 1260	31	25	.048	2.9	.616	.691	.691	25	.0083		
Total Inorganics											
Copper	31	31	12.1	700	174	229	229	0	1010	11	150
Lead	31	31	3.4	3020	144	307	307	1	400	22	8.32
Nickel	31	27	7.2	598	95.3	124	124	4	203	25	10
Vanadium	31	31	27.8	626	159	202	202	7	192	9	164
Zinc	31	31	26	2310	320	457	457	0	8210	29	44.8

Table A–30

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	31	6	.054	.34	.157	5.26	.34	3	.0875		
Benzo(a)pyrene	31	6	.031	.17	.0825	5.31	.17	6	.00875		
Benzo(b)fluoranthene	31	10	.037	.51	.145	5.33	.51	4	.0875		
Dibenz(a,h)anthracene	31	1	.088	.088	.088	5.32	.088	1	.00875		
Indeno(1,2,3–cd)pyrene	31	3	.016	.22	.0927	5.32	.22	1	.0875		
Pesticides and Aroclors											
Aroclor 1254	38	2	.17	.47	.32	.131	.131	2	.0083		
Aroclor 1260	38	32	.076	13	.947	1.4	1.4	32	.0083		
Total Inorganics											
Nickel	24	23	5	497	42.1	74.9	74.9	1	203	13	14.9
Vanadium	24	24	44.2	987	128	192	192	1	192	5	105.3

Table A–31

Chemicals of Potential Concern in Surface Water Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36–40 and 63) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Volatile Organics											
Xylenes	18	1	56	56	56	10.5	10.5	0	7300		
Semivolatile Organics											
4–Methylphenol	18	3	15	21	17.3	12.4	12.4	1	18.3		
bis(2–Ethylhexyl)phthalate	18	1	18	18	18	4.58	4.58	1	6.08		
Pesticides and Aroclors											
Aroclor 1260	17	1	1.4	1.4	1.4	.51	.51	1	.0111		
Total Inorganics											
Arsenic	18	6	1.9	14.8	6.67	4.7	4.7	6	.0568	1	13.3
Barium	18	15	3.1	468	57.5	92.6	92.6	1	256	3	54.4
Beryllium	18	1	10.8	10.8	10.8	2.21	2.21	1	.0198		
Cadmium	18	2	1.9	3.3	2.6	1.88	1.88	2	1.83	0	8.3
Chromium	18	3	4.4	24.4	12.4	6.65	6.65	0	3650	1	9.4
Cobalt	18	5	1.3	28.2	8.18	6.27	6.27	0	219		
Copper	18	9	12.7	110	36.8	30.8	30.8	0	135	1	69.5
Lead	18	9	1.8	47.5	14.2	12.6	12.6	2	15	3	11.8
Manganese	18	18	11.1	2820	686	1060	1060	8	170	6	746
Mercury	18	9	.1	1.3	.404	.369	.369	1	1.1		
Nickel	18	9	6.4	42.8	17.7	15.7	15.7	0	73		
Silver	18	1	10.3	10.3	10.3	3.4	3.4	0	18.3		
Thallium	18	1	3.5	3.5	3.5	2.48	2.48	1	.292		
Vanadium	18	7	3.9	101	46.2	31.8	31.8	4	25.6	1	73.1
Zinc	18	11	4.7	4340	669	861	861	2	1100	3	320

Table A–32

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 2 – Causeway Landfill and Minefield Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Ordnance											
1,3–Dinitrobenzene	6	1	1.5	1.5	1.5	.865	.865	1	.365		
Total Inorganics											
Arsenic	6	3	.8	5.1	2.7	3.22	3.22	3	.0568	0	13.3
Manganese	6	6	726	10800	3300	6420	6420	6	170	5	746

Table A–32

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 2 – Causeway Landfill and Minefield Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Dissolved Inorganics											
Arsenic	6	3	1	5.2	2.87	3.33	3.33	3	.0568	2	2

Table A–33

Chemicals of Potential Concern in Subsurface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 2 – Causeway Landfill and Minefield Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	7	3	.28	.55	.37	.376	.376	3	.0875		
Benzo(a)pyrene	7	3	.14	.32	.243	.263	.263	3	.00875		
Benzo(b)fluoranthene	7	3	.081	1.2	.654	.695	.695	2	.0875		
Benzo(k)fluoranthene	7	3	.34	2.3	1.25	1.24	1.24	2	.875		
Indeno(1,2,3–cd)pyrene	7	1	.15	.15	.15	.246	.15	1	.0875		
N–Nitrosodinpropylamine	7	1	.33	.33	.33	.277	.277	1	.00913		
Pesticides and Aroclors											
Aroclor 1248	7	1	.44	.44	.44	.199	.199	1	.0083		
Aroclor 1254	7	2	.6	.85	.725	.482	.482	2	.0083		
Aroclor 1260	7	1	.014	.014	.014	.0374	.014	1	.0083		
Total Inorganics											
Lead	7	7	2.6	2730	469	1210	1210	2	400	4	10.9

Table A–34

Chemicals of Potential Concern in Subsurface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 2 – Causeway Landfill and Minefield Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
Benzo(a)pyrene	12	2	.12	.157	.139	.0909	.0909	2	.00875		
Benzo(b)fluoranthene	12	1	.18	.18	.18	.0747	.0747	1	.0875		
Dibenz(a,h)anthracene	12	1	.16	.16	.16	.0857	.0857	1	.00875		
Indeno(1,2,3–cd)pyrene	12	1	.17	.17	.17	.0878	.0878	1	.0875		
Pesticides and Aroclors											
Aroclor 1260	35	11	.1	33	4.39	3.06	3.06	11	.0083		
Total Inorganics											
Lead	24	16	10	1730	144	221	221	1	400	13	10.9

SCREENING CRITERIA:

EPA 10 RBSC	–	EPA Region 10 Risk Based Screening Criteria
ADAK BG D	–	Natural Adak background groundwater concentrations for dissolved inorganics. These criteria are provided because no matrix specific background criteria exist for surface water.
ADAK BG T	–	Natural Adak background concentrations for total inorganics. These criteria are based on sediment and/or groundwater concentrations, but may be compared to surface water, marine water, or soil matrices where appropriate.
ADAK ECO	–	Adak–specific ecological risk–based screening criteria devloped under CERCLA documented in the URS Preliminary Source Evaluation 2 (PSE–2) Guidance Document (July 1996) with subsequent modifications made under CTO 165.

Table A–35

Chemicals of Potential Concern in Surface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 21A – White Alice Upper Quarry Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Pesticides and Aroclors											
Aroclor 1260	25	24	.017	1.6	.314	.43	.43	24	.0083		

Table A–36

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 23 – Heart Lake Drum Disposal Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Total Inorganics											
Arsenic	7	7	2	15.4	6.74	10.4	10.4	7	.0365	3	5.46
Beryllium	7	1	.2	.2	.2	.337	.2	1	.0149		
Manganese	7	7	361	20900	9330	16400	16400	4	1278	6	776

Table A–37

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 23 – Heart Lake Drum Disposal Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)pyrene	4	4	.005	.032	0.153	.0292	.0292	3	.00875		
Pesticides and Aroclors											
Aroclor 1260	4	2	.015	.036	.0255	.0325	.0325	2	.0083		
Total Inorganics											
Arsenic	4	2	5	10	7.5	9.22	9.22	2	.0365	1	7.47
Manganese	4	4	99	96200	39400	91200	91200	3	1278	3	1016

Table A–38

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 29 – Finger Bay Landfill Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Benzene	15	5	.2	1	.44	4.22	1	1	.618		
Total Inorganics											
Beryllium	15	2	.02	.03	.025	.305	.03	2	.0198		
Manganese	15	15	666	21600	5660	8190	8190	15	170	14	746

Table A–38

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 29 – Finger Bay Landfill Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Dissolved Inorganics											
Antimony	15	6	.12	16.6	3.1	5.27	5.27	1	1.46	1	6.2
Manganese	15	15	677	22200	5620	8230	8230	15	170	14	768

Table A–39

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 29 – Finger Bay Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzo(a)anthracene	8	5	.2	.61	.404	.475	.475	5	.0875		
Benzo(a)pyrene	8	4	.12	.27	.198	.293	.27	4	.00875		
Benzo(b)fluoranthene	8	4	.2	.44	.293	.357	.357	4	.0875		
Pesticides and Aroclors											
Aroclor 1254	8	4	.86	3.6	2.74	2.51	2.51	4	.0083		
Aroclor 1260	8	5	.096	2.8	1.06	1.35	1.35	5	.0083		
Dioxins and Furans											
2,3,7,8–TCDD	1	1	.00000444	.0000044	.00000444		.00000444	1	.00000043		
Total Inorganics											
Antimony	8	7	.85	38.6	14.9	22.6	22.6	3	11		
Lead	8	8	29.3	2350	612	1130	1130	4	400	8	10.9
Thallium	8	5	1.8	4.8	2.58	2.75	2.75	2	2.19	1	3.8

Table A–40

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 29 – Finger Bay Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzo(a)anthracene	8	1	.351	.351	.351	.541	.351	1	.0875		
Benzo(a)pyrene	8	3	.319	.63	.513	.526	.526	3	.00875		
Benzo(b)fluoranthene	8	1	.163	.163	.163	.505	.163	1	.0875		
Dibenz(a)anthracene	8	1	.031	.031	.031	.511	.031	1	.00875		
Indeno(1,2,3–cd)pyrene	8	1	.174	.174	.174	.521	.174	1	.0875		
Pesticides and Aroclors											
Aroclor 1260	8	1	.085	.085	.085	.0479	.0479	1	.0083		
Total Inorganics											
Arsenic	8	7	3	14	5.43	7.53	7.53	7	.0365	2	5.46
Beryllium	8	1	.31	.31	.31	.256	.256	1	0.149		

Table A–41

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Total Inorganics											
Antimony	4	2	1.7	2.9	2.3	2.75	2.75	2	1.46		
Copper	4	4	2.7	267	91	233	233	1	135	2	69.5
Lead	4	2	91.6	312	202	274	274	2	15	2	11.8
Manganese	4	4	1930	3630	2510	3430	3430	4	170	4	746
Zinc	4	4	165	2600	1350	2530	2530	3	1100	3	320

Table A–41

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG D Quantity Exceeding	ADAK BG D Value
Dissolved Organics											
Manganese	4	4	1840	3980	2530	3710	3710	4	170	4	768
Zinc	4	4	146	2540	965	2270	2270	1	1100	4	25.4

Table A–42

Chemicals of Potential Concern in Subsurface Soil Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Benzo(a)anthracene	4	3	.19	.61	.337	.552	.552	3	.0875		
Benzo(a)pyrene	4	3	.22	.4	.293	.376	.376	3	.00875		
Benzo(b)fluoranthene	4	3	.3	.64	.473	.625	.625	3	.0875		
Pesticides and Aroclors											
Aroclor 1254	4	3	.18	.59	.371	.53	.53	3	.0083		
Aroclor 1260	4	2	.34	.89	.615	.801	.801	2	.0083		
Dioxins and Furans											
2,3,7,8–TCDD	1	1	.0000023	.0000023	.0000023		.0000023	1	.00000043		
Total Inorganics											
Arsenic	4	4	6.4	24.2	15.4	27.1	24.2	4	.0365	2	7.47
Lead	4	4	145	1040	560	1050	1040	2	400	4	10.9

Table A–43

Chemicals of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Aroclor 1254	14	5	.005	1.3	.475	.371	.371	4	.0083		
Aroclor 1260	14	4	.005	.12	.0518	.0421	.0421	3	.0083		
Total Inorganics											
Manganese	14	14	343	2610	1020	1320	1320	5	1278	7	776

Table A–44

Chemicals of Potential Concern in Groundwater Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 55 – Public Works Transportation Department Waste Storage Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Tetrachloromethene	3	2	81	360	221	465	360	2	1.43		

Table A–45

Chemical of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 55 – Public Works Tranportation Department Waste Storage Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Aroclor 1260	5	5	.032	.55	.31	.491	.491	5	.0083		
Total Inorganics											
Arsenic	5	5	3.3	12.8	6.96	10.6	10.6	5	.0365	3	5.46
Beryllium	5	1	.97	.97	.97	.733	.733	1	.0149		

Table A–46

Chemical of Potential Concern in Sediment Compared to Human Health RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 55 – Public Works Transportation Department Waste Storage Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Volatile Organics											
Tetrachloroethene	29	24	.001	43	2.85	5.23	5.23	2	1.25		
Pesticides and Aroclor											
Aroclor	28	9	.015	.14	.0507	.104	.104	9	.0083		

Table A–47

Chemical of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclors											
Edrin Ketone	23	2	.00013	.00036	.000245	.956	.00036	0	8.21		
PCB (total)	23	7	.0048	.11	.0296	.0567	.0567	5	.0083		
Total Inorganics											
Antimony	23	4	5	15	7.8	6.62	6.62	1	11	1	10
Cobalt	23	23	4	22	11.5	13.3	13.3	0	1640	4	16.2
Vanadium	23	23	16.7	134	62.5	72.5	72.5	0	192	0	164

Table A–48

Chemicals of Potential Concern in Surface Water Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	Quantity Exceeding	Value
Total Inorganics											
Barium	19	19	3	19	8.3	9.55	9.55	0	256	0	54.4
Cadmium	19	1	.13	.13	.13	.592	.13	0	1.83	0	8.3

Table A–49

Chemical of Potential Concern in Blue Mussels Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 11 – Palisades Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK ECO	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Benzoic acid	7	4	.77	1.72	1.11	1.14	1.14				
Pesticides and Aroclors											
Aroclor 1254	6	1	.004	.004	.004	.00454	.004				
Total Inorganics											
Arsenic	6	6	1.21	1.8	1.49	1.68	1.68				
Cadmium	6	6	.349	.636	.5	.595	.595				
Copper	6	6	1.05	56.5	11.4	29.6	29.6				
Lead	6	6	.177	1.11	.372	.671	.671				
Selenium	6	5	.3	.5	.38	.436	.436				

Table A–50

Chemicals of Potential Concern in Rock Sole, Fillet Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 13 – Metals Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Pesticides and Aroclors											
4,4–DDE	5	5	.0004	.001	.00064	.000879	.000879				
Aroclor 1254	5	5	.005	.043	.0182	.0325	.0325				
Aroclor 1260	5	5	.009	.017	.0142	.0172	.017				
Total Inorganics											
Arsenic	5	5	2.3	3.5	3.02	3.53	3.5				
Barium	5	5	.17	2.21	1.07	1.9	1.9				
Cadmium	5	5	.027	.05	.039	.0475	.0475				
Chromium	5	5	.29	.73	.5	.672	.672				
Cobalt	5	5	.013	.047	.0256	.0389	.0389				
Lead	5	5	.038	.29	.137	.246	.246				
Selenium	5	5	.4	1.2	.8	1.12	1.12				
Vanadium	5	5	.08	.5	.246	.405	.405				

Table A–51

Chemical of Potential Concern in Rock Sole, Whole Body Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 13 – Metals Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
Benzoic acid	5	3	.59	.81	.717	.786	.786				
Pesticides and Aroclors											
4,4–DDE	5	5	.0009	.008	.00276	.0056	.0056				
4,4–DDT	5	1	.0002	.0002	.0002	.000357	.0002				
Aroclor 1254	5	5	.018	.35	.0998	.234	.234				
Aroclor 1260	5	4	.014	.034	.022	.029	.029				
Endrin	5	1	.0007	.0007	.0007	.000514	.000514				
Total Inorganics											
Arsenic	5	5	1.4	2.3	1.72	2.05	2.05				
Barium	5	5	.68	3.65	1.81	3.26	3.26				
Cadmium	5	5	.067	.085	.0764	.0828	.0828				
Chromium	5	5	.45	1.08	.774	1.06	1.06				
Cobalt	5	5	.097	.167	.12	.148	.148				
Lead	5	5	.165	.339	.227	.292	.292				
Selenium	5	5	.5	.6	.54	.592	.592				
Vanadium	5	5	.73	1.75	1.11	1.5	1.5				

Table A–52

Chemical of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 52 – Loran Station (includes SWMU No 53 and 59) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK ECO	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Semivolatile Organics											
2,4-Dimethyphenol	36	1	17.7	17.7	17.7	9.65	9.65	0	548	1	.47
4-Methylphenol	36	1	14.38	14.38	14.4	9.55	9.55	0	137	1	.05
Pesticides and Aroclors											
Aroclor 1254	34	8	.054	4.8	1.62	.69	.69	8	.0083	7	.09
Aroclor 1260	34	3	.015	1.6	.855	.189	.189	3	.0083	2	.09
Total Inorganics											
Copper	36	36	12.5	3914	179	363	363	1	1010	6	50
Lead	36	36	1.3	4422	247	465	465	5	400	9	34
Silver	36	8	.59	76.4	10.6	6.12	6.12	0	137		
Zinc	36	33	1.5	15156	809	1550	1550	2	8210	12	67

Table A–53

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SA No. 76 – Old Line Shed Building Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	ADAK ECO Quantity Exceeding	ADAK ECO Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
4-Methylphenol	9	1	.1	.1	.1	.409	.1	1	.05		
Pesticides and Aroclors											
Aroclor 1260	9	9	.049	.4	.168	.237	.237	7	.09		
Total Inorganics											
Cobalt	9	9	8.1	20.1	11.6	13.9	13.9	1	20	1	14.2
Copper	9	9	20.8	393	101	177	177	5	50	3	98
Lead	9	9	22.6	769	124	275	275	4	34	9	10.9
Zinc	9	9	40.6	577	181	296	296	6	67	3	80.3

Table A–54

Chemical of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 10 – Old Bailer Facility Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK ECO Quantity Exceeding	ADAK ECO Value
Pesticides and Aroclors											
Aoclor 1260	7	7	.21	12	2.05	5.27	5.27	7	.0083	7	.09
Total Inorganics											
Copper	7	7	30.5	78.9	56	67.5	67.5	0	1010	5	50
Lead	7	7	23.3	54.3	39.4	47.3	47.3	0	400	4	34
Silver	7	2	2.2	2.5	2.35	4.03	2.5	0	137		
Zinc	7	7	60.4	147	110	132	132	0	8210	6	67

Table A–55

Chemicals of Potential Concern in Subsurface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	ADAK ECO Quantity Exceeding	ADAK ECO Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Pesticides and Aroclors											
Aroclor 1260	48	23	.59	29	4.21	3.23	3.23	23	.09		
Total Inorganics											
Nickel	22	21	3	31	8.85	11.1	11.1	1	25	3	14.9
Thallium	22	1	17	17	17	5.81	5.81			1	3.8

Table A–56

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 –Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Methylene chloride	14	9	.004	.88	.239	.279	.279	1	.55		
Pesticides and Aroclor											
Aroclor 1260	18	7	.0083	.082	.0299	.0576	.0576	0	.13		
Total Inorganics											
Nickel	12	12	3	36.9	10.6	16.7	16.7	2	20.9	2	10

Table A–57

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 16 – Firefighting Training Area (includes SWMU Nos. 32 and 33) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Xylenes	58	13	.0005	13	3.22	1.24	1.24	5	2.75		
Semivolatile Organics											
4-Methylphenol	45	1	.8	.8	.8	3.69	.8	1	.05		
Pesticides and Aroclors											
Aroclor 1260	38	20	.029	5.8	1.47	1.33	1.33	19	.09		
Total Inorganics											
Lead	52	42	.83	311	31	37.1	37.1	9	34	27	10.9
Nickel	36	36	3	31	6.6	7.95	7.95	1	25	1	14.9
Zinc	31	31	14.9	722	90.6	132	132	10	67	9	80.3

Table A–58

Chemicals of Potential Concern in Subsurface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36-40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Actone	41	36	.006	2.8	.328	.637	.637	2	1.35		
Benzene	45	9	.0034	.8	.118	.0678	.0678	1	.78		
Xylenes	45	31	.0007	15	1.02	1.32	1.32	2	2.75		
Pesticides and Aroclor											
Aroclor 1260	37	19	.014	5.7	.512	.563	.563	7	.09		
Total Inorganics											
Arsenic	42	20	3.1	16.9	5.7	7.37	7.37	1	11.2	3	7.47
Cobalt	42	42	1.9	30.3	11.9	13.9	13.9	7	20	15	14.2
Copper	42	42	12.3	173	61.5	71.6	71.6	21	50	8	98
Lead	42	22	.66	55	12.1	10.7	10.7	2	34	9	10.9
Manganese	42	42	137	1330	473	555	555	2	1200	3	1016
Nickel	42	40	3	53.1	20.1	23.2	23.2	15	25	19	14.9
Zinc	42	42	15.2	319	50.9	63	63	7	67	3	80.3

Table A–59

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36-40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Volatile Organics											
Xylenes	31	10	.0053	.89	.27	.444	.444	1	.79		
Semivolatile Organics											
2-Methylnaphthalene	31	11	.28	28	6.6	8.57	8.57	10	.67		
Acenaphthlene	31	4	.22	3.3	2.03	7.54	3.3	3	.5		
Antharacene	31	5	.1	7.4	1.76	7.13	7.13	1	.96		
Benzo(a)anthracene	31	10	.0055	3.3	.5	6.61	3.3	1	1.3		
Benzo(a)pyrene	31	8	.024	2.5	.388	6.57	2.5	1	1.6		
Benzo(k)fluoranthrene	30	10	.012	2.7	.377	6.8	2.7	1	2.3		
Chrysene	31	9	.031	3.6	.659	6.66	3.6	1	1.4		
Dibenz(a,h)anthracene	31	6	.0082	.18	.0509	6.77	.18	0	.23		
Fluoranthene	31	15	.043	15.2	3.63	7.73	7.73	9	1.7		
Fluorene	31	11	.26	12	3.03	6.99	6.99	8	.54		
Napththalene	31	4	.87	21	6.19	8.18	8.18	1	2.1		
Pyrene	31	16	.035	5.7	1.46	6.27	5.7	4	2.6		
bis-(2-Ethylhexyl)phthalate	31	12	.11	10	3.83	40.2	10	8	1.3		
Pesticides and Aroclors											
Aroclor 1254	31	1	.4	.4	.4	.0716	.0716	1	.06		
Aroclor 1260	31	25	.048	2.9	.616	.691	.691	23	.13		

Table A–59

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36-40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Total Inorganics											
Antimony	31	1	12	12	12	8.96	8.96	1	2	1	10
Cadmium	31	10	.6	6.1	3.73	2.22	2.22	3	5.1		
Chromium	31	31	3.1	851	55.4	101	101	1	260	20	12.9
Copper	31	31	12.1	700	174	229	229	4	390	11	150
Lead	31	31	3.4	3020	144	307	307	1	450	22	8.32
Manganese	31	31	126	4270	742	1020	1020	12	460	7	776
Mercury	30	22	.04	3.6	1.16	1.2	1.2	15	.41		
Nickel	31	27	7.2	598	95.3	124	124	19	20.9	25	10
Zinc	31	31	26	2310	320	457	457	7	410	29	44.8

Table A–60

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36-40 and 63) Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclor											
Aroclor 1254	38	2	.17	.47	.32	.131	.131	2	.09		
Arcoclor 1260	38	32	.076	13	.947	1.4	1.4	29	.09		
Total Inorganics											
Cobalt	24	24	1.7	25.3	12.4	14.2	14.2	2	20	6	14.2
Copper	24	24	18.6	1140	127	207	207	12	50	6	98
Lead	24	23	3.8	799	81.7	136	136	9	34	20	10.9
Manganese	24	24	181	2990	697	917	917	4	1200	4	1016
Nickel	24	23	5	497	42.1	74.9	74.9	8	25	13	14.9
Zinc	24	24	34.9	8550	528	1130	1130	18	67	17	80.3

Table A–61

Chemicals of Potential Concern in Surface Water Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 17 – Power Plant No. 3 Area (includes SWMU Nos. 36-40 and 63) Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
Di-n-butylphthalate	17	1	37	37	37	7.55	7.55	1	3		
bis-(2-Ethylhexyl)phthalte	18	1	18	18	18	4.58	4.58	1	3		
Pesticides and Aroclor											
Aroclor 1260	17	1	1.4	1.4	1.4	.51	.51	1	.014		
Total Inorganics											
Aluminium	18	14	11.1	14300	3010	3950	3950	9	87	0	18000
Cadmium	18	2	1.9	3.3	2.6	1.88	1.88	2	1.1	0	8.3
Chromium	18	3	4.4	24.4	12.4	6.65	6.65	0	210	1	9.4
Copper	18	9	12.7	110	36.8	30.8	30.8	9	12	1	69.5
Iron	18	18	310	39500	7170	11400	11400	10	1000	5	11400
Lead	18	9	1.8	47.5	14.2	12.6	12.6	7	3.2	3	11.8
Mercury	18	9	.1	1.3	.404	.369	.369	9	.012		
Nickel	18	9	6.4	42.8	17.7	15.7	15.7	0	160		
Silver	18	1	10.3	10.3	10.3	3.4	3.4	1	.12		
Vanadium	18	7	3.9	101	46.2	31.8	31.8	0	120	1	73.1
Zinc	18	11	4.7	4340	669	861	861	4	110	3	320

Table A–62

Chemicals of Potential Concern in Subsurface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 2 – Casuseway Landfill and Minefield Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
4-Methylphenol	7	2	.089	.33	.21	.474	.33	2	.05		
Pesticides and Aroclor											
Aroclor 1248	7	1	.44	.44	.44	.199	.199	1	.09		
Aroclor 1254	7	2	.6	.85	.725	.482	.482	2	.09		
Dioxins and Furans											
2,3,7,8–TCDF	1	1	.000025	.000025	.000025		.000025				
Total Inorganics											
Copper	7	7	2.9	1000	190	456	456	3	50	2	98
Lead	7	7	2.6	2730	469	1210	1210	4	34	4	10.9
Zinc	7	7	17.6	1300	331	684	684	4	67	3	80.3

Table A–63

Chemicals of Potential Concern in Subsurface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 20 – White Alice/Trout Creek Disposal Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclor											
Aroclor 1260	27	13	.046	89	9.76	10.5	10.5	12	.09		

Table A–64

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 20 – White Alice/Trout Creek Disposal Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Pesticides and Aroclor											
Aroclor 1260	35	11	.1	33	4.39	3.06	3.06	11	.09		
Total Inorganics											
Copper	24	24	21.5	294	86.7	107	107	19	50	8	98
Lead	24	16	10	1730	144	221	221	7	34	13	10.9
Zinc	24	24	22.5	832	160	231	231	16	67	13	80.3

Table A–65

Chemicals of Potential Concern in Surface Water Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 20 – White Alice/Trout Creek Disposal Area Zone: All Locations Units: ug/l
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	ADAK ECO Quantity Exceeding	ADAK ECO Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Total Inorganics											
Silver	10	1	7	7	7	3.06	3.06	1	.12		

Table A–66

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 21A – White Alice Upper Quarry Areal Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclor											
Aroclor 1260	25	24	.017	1.6	.314	.43	.43	18	.09		

Table A–67

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 23 – Heart Lake Drum Disposal Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
bis-(2-Ethylhexyl)phthalate	7	1	2.8	2.8	2.8	1.37	1.37	1	1.3		
Total Inorganics											
Cadmium	7	5	.42	15	4.94	7.57	7.57	1	5.1		
Lead	7	5	1.8	86.6	25.7	41.5	41.5	0	450	3	8.32
Manganese	7	7	361	20900	9330	16400	16400	6	460	6	776
Nickel	7	4	3	64	29.2	36.6	36.6	3	20.9	3	10
Zinc	7	7	36.7	1900	545	1040	1040	3	410	6	44.8

Table A–68

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 23 – Heart Lake Drum Disposal Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Total Inorganics											
Lead	4	3	10	50	33.3	51.7	50	2	34	2	10.9
Manganese	4	4	99	96200	39400	91200	91200	3	1200	3	1016
Zinc	4	4	102	1020	364	883	883	4	67	4	80.3

Table A–69

Chemicals of Potential Concern in Surface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 23 – Finger Bay Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	**Quantity Tested**	**Quantity Detected**	**Minimum Detected Value**	**Maximum Detected Value**	**Average Detected Value**	**95%UCL**	**RME**	**Quantity Exceeding**	**Value**	**Quantity Exceeding**	**Value**
Semivolatile Organics											
4-Methylphenol	8	3	.23	2	1.06	1.14	1.14	3	.05		
Pesticides and Aroclor											
Aroclor 1254	8	4	.86	3.6	2.74	2.51	2.51	4	.09		
Aroclor 1260	8	5	.096	2.8	1.06	1.35	1.35	5	.09		
Dioxins and Furans											
2,3,7,8--TCDF	1	1	.000081	.000081	.000081		.000081				
Total Inorganics											
Cobalt	8	8	6.8	30.7	14.5	20.7	20.7	2	20	3	14.2
Copper	8	8	71.3	667	315	468	468	8	50	7	98
Lead	8	8	29.3	2350	612	1130	1130	7	34	8	10.9
Manganese	8	8	266	2400	806	1270	1270	1	1200	2	1016
Zinc	8	8	130	3050	912	1520	1520	8	67	8	80.3

Table A–70

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 29 – Finger Bay Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	ADAK ECO Quantity Exceeding	ADAK ECO Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Semivolatile Organics											
Anthracene	8	1	.245	.245	.245	.528	.245	0	.96		
Fluoranthene	8	2	.003	.9	.452	.597	.597	0	1.7		
Fluorene	8	1	.116	.116	.116	.516	.116	0	.54		
Phenanthrene	8	2	.005	1.4	.703	.78	.78	0	1.5		
Pyrene	8	2	.005	1.4	.703	.78	.78	0	2.6		
Pesticides and Aroclor											
Aroclor 1260	8	1	.085	.085	.085	.0479	.0479	0	.13		
Total Inorganics											
Manganese	8	8	136	1490	647	979	979	5	460	3	776
Zinc	8	8	54	206	113	144	144	0	410	8	44.8

Table A–71

Chemicals of Potential Concern in Subsurface Soil Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								ADAK ECO		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1254	4	3	.18	.59	.317	.53	.53	3	.09		
Aroclor 1260	4	2	.34	.89	.615	.801	.801	2	.09		
Dioxins and Furans											
2,3,7,8--TCDF	1	1	.0000121	.0000121	.0000121		.0000121				
Total Inorganics											
Arsenic	4	4	6.4	24.2	15.4	27.1	24.2	2	11.2	2	7.47
Copper	4	4	40.3	377	224	408	377	3	50	3	98
Lead	4	4	145	1040	560	1050	1040	4	34	4	10.9
Nickel	4	4	5.3	62	28.6	58.1	58.1	2	25	2	14.9
Zinc	4	4	624	3150	1690	2970	2970	4	67	4	80.3

Table A–72

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 4 – South Davis Road Landfill Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	ADAK ECO Quantity Exceeding	ADAK ECO Value	ADAK BG T Quantity Exceeding	ADAK BG T Value
Pesticides and Aroclor											
Aroclor 1254	14	5	.005	1.3	.475	.371	.371	4	.06		
Aroclor 1260	14	4	.005	.12	.0518	.0421	.0421	0	.13		
Total Inorganics											
Lead	14	14	5.1	346	49.9	91.9	91.9	0	450	11	8.32
Manganese	14	14	343	2610	1020	1320	1320	12	460	7	776
Zinc	14	14	34	633	206	280	280	1	410	13	44.8

Table A–73

Chemicals of Potential Concern in Sediment Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 67 – White Alice PCB Spill Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

								EPA10 RBSC		ADAK BG T	
Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	Quantity Exceeding	Value	Quantity Exceeding	Value
Pesticides and Aroclors											
Aroclor 1254	6	2	.14	.25	.195	.172	.172	2	.0083	2	.06
Aroclor 1260	6	6	.11	.42	.227	.325	.325	6	.0083	4	.13

Table A–74

Chemicals of Potential Concern in Subsurface Compared to Ecological RBSCs and Adak Background Concentrations
Installation: ADAK Site: SWMU No. 67 – White Alice PCB Spill Area Zone: All Locations Units: mg/kg
Sorted by Method Class and Analyte Name

Analyte Name	Quantity Tested	Quantity Detected	Minimum Detected Value	Maximum Detected Value	Average Detected Value	95%UCL	RME	EPA10 RBSC Quantity Exceeding	EPA10 RBSC Value	ADAK ECO Quantity Exceeding	ADAK ECO Value
Pesticides and Aroclor											
Aroclor 1232	65	5	.66	1100	350	65.7	65.7	5	.0083	5	.09
Aroclor 1260	65	65	.31	2700	293	413	413	65	.0083	65	.09

APPENDIX B

RESPONSIVENESS SUMMARY

This responsiveness summary is a compilation of comments received on the Proposed Plans for CERCLA and petroleum sites on Adak. Comments were received from the Alaska Community Action on Toxics, U.S. Fish and Wildlife Service, the Aleutian/Pribilof Islands Association, Inc., The Aleut Corporation (who referred to themselves as the community of Adak), and 14 individuals. The commentors are identified.

VERBAL COMMENTS FROM THE FEBRUARY 12, 1998 PUBLIC MEETING IN ANCHORAGE AND RESPONSES

PAM MILLER

My name is Pam Miller with the Alaska Community Action on Toxics, and this is a project of the Alaska Conservation Foundation and we're at 135 Christianson Drive, and I'm a researcher and director of the Alaska Community Action on Toxics. I've been a part of the RAB process for what seems like a long time now, and my comments tonight are representing the Alaska Community on Toxics, and my comments tonight will also be general and I will be submitting more detailed and technical comments in time for the written comment deadline.

First of all I just want to say that to me Adak is a very special place. It is part of the National Wildlife Refuge System, and we are very concerned about protecting the outstanding values that that refuge was designed to protect. We are also very concerned about protecting for the long-term human health as well as the environment. And now that there is a community on Adak I think we need to give very serious consideration to protecting human health for the long term.

I have several categories of areas of concern. The first is unexploded ordnance. I think the Navy has done quite a bit of effort to address safety hazards of unexploded ordnance, but I don't feel that the Navy has gone far enough to protect human safety on Adak Island in that virtually any part of that island a person could come in contact with unexploded ordnance and thus create a very serious situation that threatens a person's health. I feel that a much greater effort should go toward all the moving of unexploded ordnance rather than just fencing areas off. And basically what I wanted to say about that is that the institutional controls that are proposed, from my perspective, are not adequate, and signs and fences disappear and these are not adequate measures to protect people's health. I am also very concerned about the toxicological effects of munitions and I don't think that the Proposed Plan has addressed the toxicological consequences of the unexploded emissions that remain on Adak.

Response: The Navy has expanded its survey for and clearance of ordnance materials. A separate operable unit (Operable Unit B) has been established to evaluate ordnance materials on Adak. Clearance technologies cannot ensure 100 percent removal of ordnance items. The fencing and signs that are or will be placed around Navy-owned property will be inspected annually and repaired or replaced as necessary. The Proposed Plan did not identify the need to take action on chemical concentrations of ordnance compounds because there was not an unacceptable human health risk (based on regulatory criteria and on risk posed by the detected contaminants) from those chemicals.

And I've raised this issue in the RAB, and I'll do it here again, and that is that no one from the Navy seems to be able to answer questions about whether depleted uranium emissions have been used there. I think that's a very serious question which needs to be answered. And if monitoring has not been done to answer that question that is something that needs to be addressed.

Response: There is no indication that radioactive wastes have been disposed of on Adak. According to the May 1998 report of radiological investigations at the Adak Naval Complex, depleted uranium was used as counterweights in some aircraft that were operated on Adak. Routine maintenance operations required the removal, inspection, and reinstallation of these counterweights. When the counterweights were damaged or corroded, they were replaced. The old counterweights were returned to the manufacturer or disposed of as low-level radioactive waste (off Adak Island). Nevertheless, all unwanted depleted uranium was shipped off the island for disposal.

With regard to the PCB contamination, this is another serious concern that the RAB has wrestled with over over the past months. Again, I believe there are source areas out there that have not been identified, perhaps in the marine environment. That would account for the accumulation of PCBs in sediments and in marine wildlife tissues, particularly the otters. And I again think that institutional controls in the case of having to put up signs that indicate to people that it's unsafe to fish in Sweeper Cove — this is not adequate. I think this is a crime, that the source areas need to be addressed and this very serious threat to human health needs to be addressed, not simply dealt with by signs and fences. Signs and fences do disappear, and are already disappearing from what I understand out there.

Response: At all known sites where PCB-containing materials were spilled, removal actions have taken place. These sites include SWMU 15—Future Jobs/Defense Reutilization Marketing Office, SWMU 16—Fire Training Area, SWMU 20—White Alice/Trout Creek, SWMU 21 A—White Alice Upper Quarry, and SWMU 67—White Alice PCB Spill Site. PCBs have been detected at areas (e.g., Sweeper Creek/Cove) located downstream of original spill sites. PCBs in these areas likely migrated from the original spill sites before remediation occurred. The Navy has conducted additional evaluation of Sweeper Creek sediment since the Proposed Plan was published and has removed sediment with concentrations of PCB of 1 mg/kg in 1999. Risk from consumption from Sweeper Cove and Kuluk Bay consistent with recreational use has been determined to fall within acceptable levels. The unacceptable human health risk is for the person who subsists (126 grams per day or about ¼ of a pound per day) on rock sole (bottom-dwelling fish) from Sweeper Cove and Kuluk Bay or Dolly Varden from Sweeper Creek over a 30-year period. Subsistence use of these resources in this manner is extremely unlikely. However, the Navy has elected to place an advisory posting to inform residents of potential health risks. The diet of a subsistence resident on Adak would likely be composed of salmon and other nonresident fish. Signs will be inspected and repaired if necessary.

With regard to radioactive waste, again depleted uranium, I think, is a big issue that I raised before. I am concerned that the public has not had an opportunity to review the radiological sampling plan, and implementation of that plan, and subsequent monitoring, and I'm concerned that that radioactive sampling has not gone far enough to address potential contamination from radioactive waste that may have been or is present on Adak.

Response: There is no evidence or report of a release of radiological contamination on Adak. See previous response regarding use of depleted uranium on Adak.

With regard to the landfills, I was particularly upset by an incident last fall, and I think this is an indication that there is a problem out there that may just be sort of the tip of the iceberg, and that was when Navy personnel, in their efforts I think to get out of there in hurry, conducted illegal dumping activity of vehicles and contaminated the landfill where materials, hazardous materials that the landfill was not designed to contain. And again I think this may represent the tip of the iceberg in terms of what is not only in the landfills but what may have been dumped on Adak illegally. And this brings me to my concern about the long-term protection of human health and the environment on Adak after the Navy leaves. I don't think that there are adequate measures to ensure proper monitoring and enforcement of regulations to protect the environment there. And periodic monitoring won't do it. I think there really needs to be a very detailed plan in place in case problems come up that have not been addressed in this process, that are not addressed in the Record of Decision, so that these problems can be cleaned up and taken care of.

Response: The personnel responsible for the incident of disposing of vehicles in the landfill without draining the fluids in the vehicles were punished for their activities. The Navy did not condone this action. Standard procedure requires fluids to be drained and recycled or disposed of properly prior to landfilling the vehicle. The Navy entered a page 13 notation on the military records of four enlisted personnel. This "bad mark" will affect their chances for advancement, retirement, and benefits.

The incident described in the comment was reported by the Navy. The Navy completed all necessary response actions in cooperation with regulatory agencies. These response actions included:

- Covering contaminated soils in the area of the improperly disposed of vehicles and placing vehicles with leaking fluids in a containment area

- Draining fluids from these vehicles in a containment area and properly sampling, packaging, and disposing of these fluids

- Sampling, excavating, and treating contaminated soils at the spill site prior to proper disposal.

The Navy has devoted considerable resources to performing environmental cleanup and closure activities in a responsible manner and has kept regulatory agencies informed of progress of these activities.

In keeping with state solid waste regulations (18 AAC 60), as with other landfills in Alaska, annual surface and groundwater monitoring is in progress at the Roberts and White Alice Landfills. The 1997 round was completed in December 1997 and the 1998 round was completed in June 1998. The 1999 round is planned for September 1999.

With regard to Metals and Palisades Landfills, annual monitoring of groundwater, surface water, freshwater and marine sediment (at Palisades only), and mussel tissue is in progress. Sediment and mussel tissue sampling is part of the sampling scheme as outlined in the Record of Decision for these sites. As at Roberts and White Alice Landfills, sampling at Metals and Palisades Landfills follows the requirements outlined in the state solid waste regulations.

If there are unforeseen problems that appear and have not been addressed, a concerned person can call the EPA Hotline number at 1-800-424-8802 or the EPA Region 10 office at (206) 553-1263 to report the problem. Both numbers are staffed 24 hours a day. Calls may also be made to Alaska DEC's spill response hotline at (907) 269-3063 during working hours.

With regard to the risk assessment process, I just want to say that the risk assessment process, and again I said this many times in the RAB, the risk assessment has many limitations that I don't think are acknowledged here—both the ecological and human health risk assessments—in that it doesn't adequately address synergistic effects of toxics. It doesn't adequately consider populations of people who may be more vulnerable. Trends address averages and probabilistic mathematics. But I would urge instead a precautionary approach that really addresses removal, and addresses the source of the problem rather than simply the unquantifiable—tried the quantified and unquantifiables.

Response: The basic science on which risk assessment is based, is insufficient to quantitatively address the synergistic toxic effects of chemicals. This could result in an underestimation of risk. However, risk assessment also can not adequately address antagonistic effects of chemical mixtures that could reduce the effects of individual chemicals. These uncertainties were qualitatively acknowledged in the uncertainty analysis section of the risk assessments. The toxicity values that are provided by EPA in the IRIS database do take into account sensitive populations in that they apply specific safety factors to the final toxicity values. The meaning of the last sentence of the comment was unclear. However, all known terrestrial source areas have been investigated and where needed, cleanup actions have been or will be conducted.

With regard to chemical weapons, again we've been told over and over that the military has lost literally tons of chemical weapons that were at one time on Adak, and I'm not sure that an adequate evaluation as to what the source and ultimate fate of this chemical weapons were and I'm really concerned about where and how and when these chemical weapons are going to turn up, and what long-term health implications that might have.

So again I will present more detailed and technical comments before the end of the written comment deadline. And I thank you for having this meeting tonight.

Response: Searches of archived material have been done by the Navy and its contractors to find resources on chemical warfare material on Adak. Suspected sites where chemical warfare material could have been stored or disposed of were inspected and nothing was found. The Navy interviewed ex-military personnel. None of the information suggested that chemical warfare material was disposed of on island.

DR. LORRAINE ECKSTEIN

My name is Dr. Lorraine Eckstein. I'm an anthropologist. My office is downtown Anchorage. It's called Writing and Research Services, 608 West Fourth, Suite 31, I'm here as a private citizen. I don't do this very often. I'm here from Missouri, and I never even thought I'd ever come to Alaska in my whole life. It just dawned on me that this will be something I'll never do. And I've been here.... This is my fifth winter, so I'm not [undiscernible word]. But I love it here, and one of the things that I learned.. I was reared during the second World War, so I saw all those movies when I was growing up about the military and about the Navy. And I believed all that stuff. I really believed in authority and the government, and the FDA and the EPA and all the people. In the sixties, I took my children to the fire department and the police stations to show them how not to be aftaid of authority and to talk to policemen and firemen.

I wasn't in the group that called the cops "the pigs" in those days. I really believed in the federal government especially the park service. My cousin who was reared with me, who is my age, served on Adak. He was in the Navy. He was in the Seabees. And I wanted to ask him about it but he died a few years ago from lung cancer. So I don't know first hand about, or even second hand, about Adak other than what I've learned from reports at the RAB meetings and stuff. But last September, I think it was, maybe it was October, on the television, in the news, there was this stuff about the Navy burying the stuff underground. You know, the vehicles with oils and petroleum and that kind of stuff. And it was not legal. And it really disappointed me. And it made me wonder again how it is that I'm trusting the feds and the military now that I've been reared to believe in and trust. I felt let down by that. I feel let down, and I come here to find out that there are all these things that I'm supposed to be protected, I'm a citizen, I'm supposed to be protected from. It worries me. It worries me about what's going on now in the military in Anchorage and Fairbanks and all those other places, too. I guess that's what I wanted to talk about. I was pretty upset about that when I heard that.

I'm hoping that you guys will continue protecting us and maybe do like John Wayne would have done or something, you know, instead of what's happening. I don't want all those poisons in my environment. Thank you for letting me speak.

Response: The personnel responsible for the incident of disposing of vehicles in the landfill without draining the fluids in the vehicles were punished for their activities. The Navy did not condone this action. The Navy entered a page 13 notation on the military records of four enlisted personnel. This "bad mark" will affect their chances for advancement, retirement, and benefits. Standard procedure requires fluids to be drained and recycled or disposed of property prior to landfilling the vehicle. The Navy is committed to meeting the requirements of applicable regulations that were established to protect citizens.

The incident described in the comment was reported by the Navy, and the Navy completed all necessary response actions in cooperation with regulatory agencies, which included draining the vehicles prior to final disposal and removing soil contaminated by petroleum releases. The Navy has devoted considerable resources to performing environmental cleanup and closure activities in a responsible manner and has kept regulatory agencies informed of progress of these activities.

CHARLES MCKEE

My name is Charles McKee, at Post Office Box 2433, Anchorage, Alaska 99524. And what I want to really speak on is the fact that who's doing geocentric survey of the areas of contamination, and how that's being plotted and how it's being funded. The reason being is it's a Navy facility and with the addition of the soils that have been contaminated a very accurate survey needs to be done. And of course, that's geocentric constructive survey. And I've been made aware of certain discrepancies in our political environment as to title and I'd like to know who has title within the areas of that survey. And interesting enough there's a question as to what I witnessed last night at the open door governor's meeting was Adak's representative, Adak Corporation's representative, was asking our state government for more subsidy in addition to what they're already receiving. And they're already looking at taking on a plant, a facility, a geocentric constructive facility, by engineering design of $3 billion. I haven't even estimated what the rate of value. And of course, this whole area places them under a geocentric positioning for GPS (geocentric positioning satellites). And of course you have to take into consideration the value of that aspect. Thank you,

Response: Surveys on Adak are being performed by Navy contractors. The survey coordinate system is based on the Navy grid that has been used since 1944 and is the coordinate system upon which survey locations for most of the facilities on Adak are based. It is not clear what specific concerns related to "geocentric surveys" are intended.

VINCE TUTIAKOFF (These comments also reflect written comments submitted by Mr. Tutiakoff)

My name's Vince Tutiakoff, senior resident to Adak. I gave the recorder my information and phone numbers. I have comments or statements here from... I represent the community of Adak on the Community Council I'm also a representative of The Aleut Corporation. The community of Adak and The Aleut Corporation are concerned that closed landfills have been, that have been closed prior to our involvement. We are concerned as to what was placed in the landfills, i.e., waste oils, ammunition. Not accounted for or recorded as to where they have been disposed of. In the 5 to 10 years prior to the closure of those landfills, there was leakage or leaches of various oils or other unknown substances in the next 5 to 10 years after closure.

Response: Previously closed landfills were evaluated. Tests did not indicate that oil or other hazardous substances were leaking from the landfill. The larger, more recently closed landfills (Metals, Palisades, and White Alice—which was a recently operated landfill, and Roberts—which is an operating landfill) have and will follow the Alaska State solid waste regulations, which includes monitoring for leachate in groundwater/surface water and operation and maintenance. Results of monitoring are available in the information repository.

As you aware, the main water line is being rerouted from under the largest landfill, and at this time the new line is being placed downhill from the landfill. Will ADEC, the EPA, acknowledge this landfill as being, this water line as being certified once the Navy leaves Adak. Concern is that the community may be having to remove that line once the Navy leaves. Can the Navy *guarantee that this water line will not be contaminated in 5 to 10 years after they leave? Will EPA or whoever is going to be monitoring this landfill, this water line, require The Aleut Corporation or other landowner of fish and wildlife to remove this line? We are concerned that, like the stuff earlier, concerned that the level of monitoring that the Navy has put into their plant here, we are concerned that the monitoring will be done at their discretion or at their funding levels, and therefore, we will be sitting out there for the next 5 to 10 years and may have to deal with ADEC, EPA, regarding the monitoring. We'd like to see monitoring done on a biannual basis and be required by ADEC and EPA that the Navy do this. And that these records of monitoring be available to the public at Adak or any concerned individual of Alaska.*

Response: Roberts Landfill was sampled for groundwater and surface water contamination in March, June, September, and December of 1996, December of 1997, and June of 1998. Results of this sampling are summarized in *Technical Memorandum of 1998 Landfill Monitoring* (URSG 1998). This report is on file in the information repository. Annual monitoring is planned for the future at Roberts Landfill. Future monitoring is a requirement of the ROD and ADEC permits. Therefore, the Navy will request adequate funding to satisfy the requirements of the ROD. Results show no contamination at unacceptable levels. The water line was located and designed to eliminate the potential for landfill contaminants affecting the water supply. The design and location of the new water supply line comply with relevant regulations. Existing and filture monitoring records will be available in the information repository in Anchorage as well as on Adak in the Adak environmental library.

The minefields oil the north side of Adak, along a very popular lake, a recreational site for the future of the residents of Adak. We'd like for these minefields to be cleared by the Navy, by whoever, not fenced off for the next 50 years.

Response: The Navy cleared this minefield in the 1998 field season. Because no clearance technology can assume 100 percent removal of ordnance materials, the area may remain fenced off. Operable Unit B has been designated to include ordnance sites and to address related concerns.

PCBs are our main concern for the subsistence community of Adak, and we want constant testing of Kuluk, Sweeper Cove, and also Metals Landfill and other landfills around Adak. We want it biannually. We would like Sweeper Cove area to be tested annually. These sediment from the bottoms has settled in the last 4 to 5 years. With no marine activity in that bay this has caused to settle, and as the development of the harbor takes place in the next couple of years, 3 years, 4 years, the sediment will start moving again.

Response: Fish and shellfish in Kuluk Bay and Sweeper Cove will be monitored initially on an annual basis to ensure contaminant levels are decreasing over time. Metals Landfill has been monitored since closure and will continue to be monitored in the future. The extent of the potential impact that ship traffic might have on disturbing the sediments is unknown. The results of monitoring fish and shellfish will indicate if disturbed sediment is impacting the environment. The concentrations of PCBs in fish and shellfish will increase if they are exposed to higher levels of PCBs in sediments.

We at Adak would appreciate the rest of the public meeting be held on March 3, rather than February 25. The community at Adak has been responsive. They would like to be part of this public hearing. The public at Adak would like to have the best input on this date. The next public meeting should be changed to March 3. The Aleut people have desire to see Adak be reused to its fullest potential. The Alaska community must see that the best efforts of the Navy are made to accommodate the full and clean reuse of Adak. Thank you.

Response: The on-island meeting was rescheduled from January 28 to February 25. Public notices had been published and arrangements had been made for the meeting on February 25. Anyone who could not be on Adak for February 25 had the opportunity to participate via telephone and attend the same presentation given February 12 in Anchorage.

WILLIAM ARTERBURN

My name is William Arterburn. I'm a member of the Adak Restoration Advisory Board. My telephone number is 278-2312. I, like Pam Miller, expect to probably be making some written comments by March 4, so I don't need to take a whole lot of time here.

I did want to register a concern about under petroleum sites, about the power plant site, and I think that just doing the ground cover at that site might be a little inadequate treatment. When I think maybe you should look at the alternative that would do bioremediation at that site. This is a site that's definitely over the levels in terms of contamination and I would like for you guys to consider that one.

Response: Bioremediation was not chosen because although it may work for petroleum chemicals, it will not treat other chemicals such as PCBs, antimony, lead, mercury, nickel, and other metals. At the power plant sediment and soil from the site will be removed and disposed of. Clean sediment and soil will cover the excavated areas. The Navy will continue to remove petroleum from the subsurface with the operating petroleum removal system. Institutional controls are needed at the site to achieve the following:

- S To prevent residential use of the site. Note that institutional controls will not prevent the existing land uses on the site or those that are envisioned under future reuse plans.
- – To ensure that periodic inspection and repair of the product recovery system occurs
- – To ensure that periodic collection and analysis of samples from the site occurs
- – To restrict the use of groundwater from the site
- – To ensure that periodic review of site conditions and analytical results occurs
- – To assess the need for additional action or to reduce controls

I had concerns as to some of the RAB members about the long-term issues with respect to Adak. In particular in terms of PCB contamination there and the long-term landfill situation, and I recognize that the Navy's done a good job. I mean there's a lot of contamination on that island. And certainty the Navy's done a good job of categorizing and studying the sites and testing and evaluating them, but I think that in some cases the perspective that the Navy and regulatory agencies have had is perhaps a little on the short-term side. Institutional controls are fine, but there is no real procedure in place for deinstitutionalizing those controls.

We know of the case where in the process of 50 years the records for nerve gas and mustard gas were lost. And somewhere along the line, 50 years down the line, or 100 years, you and I won't be here, but people will be on Adak Island, and I'm very concerned that there's a lot of deed restrictions going in here and a lot of institutional controls and there doesn't seem to be any procedure for removal of those.

Response: The process for removing institutional controls will be described in the Record of Decision. Periodic evaluations will be performed for all sites with institutional controls at no less than 5-year intervals. Institutional controls may be removed from sites once cleanup goals are met. However, at sites where containment is the remedy (i.e. landfills) it is expected that institutional controls will remain to prevent human exposure to subsurface material. Institutional controls are being used in conjunction with other remedies. Institutional controls are used to ensure that remedies are maintained and land use is appropriate for residential risk.

And I think that you need to consider that one other thing that I would like to see somewhat related to my question about the sites that were listed as "no further action," but nevertheless they have restrictions, whether its for digging or penetrating the surface in some way.

Response: Sites listed as no further action in this Record of Decision for Operable Unit A will have no restrictions placed on them based on the findings presented in this ROD.

I think that when you place the institutional controls on a site that you should come up with an estimate, a best guess, or whatever, which identifies how long the Navy and/or the regulators believe that those sites will be contaminated so that there's some basis for future activities on the land out there, and that whoever's in control then, I assume that's going to be Aleut Corporation or its descendants, will have a basis for action because these things that get institutionalized are often very difficult to remove. I think that this would be very helpful. And I'll make the rest of my comments in writing. Thank you.

Response: The process for lifting institutional controls will be described in the Record of Decision. Periodic evaluations will be performed for all sites with institutional controls at no more than 5-year intervals.

JASON BOURDUKOFFTY

My name is Jason Bourdukoffty. I'd like to thank you for giving me the opportunity, to make my comments here, and my name is spelled B-O-U-R-D-U-K-O-F-F-T-Y. First of all I'd like to make a comment that the Navy has been present on Adak for well over 50 years, and as since there's 50 years of contamination there we haven't found yet. So I just want to bring up a few things. I'd like to mention the fact that the Palisades Landfill has been closed, and I was very fortunate to make a trip out to Adak and I wasn't satisfied with the closure a few years ago. From the ground you can see that the beautiful flowers where they did remediate the area and then as you come in on the plane, you see the same area where there's contamination, debris, and everything. In my opinion I feel that it's not properly cleaned. I don't want to see pieces of debris regardless of whether they're contaminated or not contaminated, I think they shouldn't be visible at all. I mean if you're going to cover it or you're going to sweep it under the rug, let's make the sure the rug is big enough.

Response: While the visual appearance of the site has improved since the completion of the remediation, improving the aesthetic characteristics of the site is not a CERCLA remedial action objective. The decision to construct a cover over the entire landfill area was partially based on construction constraints of building on unstable slopes and concerns of negative impacts on surface water. Past monitoring has not shown significant releases of contamination. Future monitoring will ensure the protectiveness of the remedy.

Also I've been doing research on chemical weapons and I noticed that chemical weapons were stored on Adak during World War II, and Adak was the biggest chemical weapons storage area, and I'm very surprised that there's more real big area that was designated as a chemical weapons site, so I'm kind of curious, maybe we're not doing enough research to find where this place is. And also I'd like to mention the ammunition dumped offshore, I realize the fact that everybody else dumped out there. And there's World War II debris, plus maybe Navy debris, Army debris, but its offshore and the Army Corps of Engineers has a responsibility to clean it up, but then I see that the Navy is cleaning up Adak and the focus is on Adak—12 miles off. I think we ought to look at the dump site up there also.

Response: Each of the six chemical warfare service areas on the military reservation at Adak Island was inspected on foot and an extensive archival record review was conducted. Disposal of chemical weapons on Adak was never authorized. Adak was a staging area only. No evidence of chemical warfare material was found on Adak. The area where ammunition was disposed of offshore is not being investigated under CERCLA. Responsibility for investigation of this site rests with the Army Corps of Engineers' Formerly Used Defense Sites program.

And as far as the petroleum free product, I want to make a point clear that I assume you know that under Adak, the housing area, the living area, a few of you know that the piping they had a big manifold of some sort that piped to individual homes or something like that. I think all that piping should have been removed because if it hasn't been, so it won't cause a future problem. Somebody might think it's a bomb. But I want to make that point. I think you know that, I don't think you can get all that fuel out of the underground pipe just by blowing it. I think that there's *still fuel in that pipe. It's capped off at the end. That's all I want to say right now. Thank you for this opportunity.*

Response: The plan for that piping was to clean out the piping to remove any fuel and abandon them in place. This plan was accomplished in the 1998 field season according to standard operating procedures.

DR. MILES NELSON

Hello. My name is Dr. Miles Nelson. My address is 30924 Kuluk Bay Road, Kuluk Bay, Alaska. I'm an emergency physician. I practice here in Anchorage. I want to limit my comments here today to the danger of unexploded ordnances. This is a new subject for me. I had the privilege of attending the RAB meeting last night and learned more about that than I had known before. I'm concerned about the impact of these areas in the northern part of the island for the unforeseeable future.

I understand that institutional controls are being instituted for those areas and I'm wondering as to the adequacy of those for the decades and centuries to come. I learned last night that we're still digging up ordnances from the Civil War that can hurt people. And I would assume that the quality of ordnance from World War II is much higher than that of the Civil War. So I would also assume that it will be dangerous for much longer than that. So I suppose the timeframe that we're looking at is centuries for how long this is going to be dangerous. The ideal, of course, would be able to clean it all up, but I also understand that that's not going to happen. So I think that we should look at institutional controls that would be adequate for centuries rather than just decades. Certainly the fencing and the signage that we saw photos of today in Mr. Murphy's presentation, appear to be adequate for the foreseeable future. However, I noticed on one design that he had demonstrating danger to the area beyond that some of the letters were already knocked off. I assume those are relatively new signs. So I wonder a 100 years, 200 years from now, what those signs are going to look like.

The people's future that live on Adak may not be, certainly they'll be the descendants of the Aleut people, but it may be an entirely different society than we are living in today, and our own society that is making the commitment to maintaining these institutional controls, the Navy, and that sort of thing, who can say what form that will take, will we still have the resources and the motivation and the foresight to maintain those fences and the signage. I suspect we may not be able to.

I would suggest that we look at instituting institutional controls that would be adequate for centuries and be able to communicate to people of the area whether they read English or are of a culture that we're familiar with, that it's dangerous to go beyond this point. I know that in New Mexico, the WIPP Site, the Waste Isolation Pilot Project, is looking at storage of nuclear wastes in Carlsbad area that will be dangerous for certainly centuries. There was a request or proposal to the artists' community, in that area to design some way to communicate to people in the unforeseeable future that it's dangerous to go into this area. This is a contaminated area. I think we should look at something like that too for those areas on the northern part of the island.

Certainly the people of Easter Island have been able to communicate for centuries to us that they don't want anyone to set foot on their island with the huge heads that they have facing out into the ocean. I think we should think of something along the same lines. Maybe... Who knows what form that would take.

So I would suggest that a committee be formed that would be composed of people familiar with anthropology, maybe with medical backgrounds, and certainly people from the military that know what the danger is from these unexploded ordnances. And that they develop a set of criteria that these institutional controls should meet, should be comprised, and how they should communicate and what form they should take. And that they submit this criteria and the request for proposals can be entertained and maybe artists in our community or engineers in our community could respond to this. And I would imagine that this could be done relatively quickly and with relatively little expense. Certainly the committee would be a volunteer committee and that wouldn't incur any expense and we could start construction on something like this within the next few years. I think that would be reasonable.

What I'm concerned about 150 or 200 years from now, some small boy that's beachcombing on the beach that used to be the [undiscernible word] seawall, finds some shining object and being curious tries to determine its characteristics by throwing it against the wall. I don't want to be responsible for that boy. And we need to be able to make the [undiscernible word] beach safe. Thank you.

Response: If signs and fencing (which are already installed in some places) will be used as part of institutional controls, they will be inspected and repaired. Inspections and repairs will be completed on regular intervals which are to be determined. Periodic (5-year) reviews will be performed to evaluate the effectiveness of removal and remedial actions including signage and fencing. These reviews will provide an opportunity to evaluate the need for improvements in the signs and other ICs to effectively communicate hazards. UXO/ordnance explosives issues will be evaluated in operable unit B (OU B) to address some of the concerns in the comment.

SUE DAYTON

My name is Sue Dayton and I work for an environmental program, the Aleutian/Pribilof Islands Association. Do you want me to give the address? It's 401 East Firelane Road, Anchorage, Alaska. I'm standing here because actually what I would like to see is a community of Adak sitting here tonight. And I want you all to know that APIA will be submitting comments before the deadline, but I also want to request that you move the date up for public comment so the community can be involved. And that's it. Thank you.

Response: The comment period was 45 days (January 19 through March 4, 1998), which is longer than the normal 30-day comment period. Comments received after the comment period ended were also included in the Responsiveness Summary.

KIMBERLY WILLIAMS

My name is Kimberly Williams. I'm Executive Director of the Alaska Sea Otter Commission. 505 West Northern Lights, Anchorage. We are a nonprofit Native organization dealing primarily with sea otters. As an Alaska Native person it is very hard for a Native person just to deal with sea otters, so I tend to deal with all marine life. Native people take a very ecosystem approach to anything that is happening. With regards to the action sites for the water body, I am very concerned that... It goes to common sense that when we post advisory signs against human activity for subsistence fishing, animals, wildlife, they don't know how to read, so what are you going to do to stop wildlife from coming into those area. And I would like to see that addressed.

Response: Remediation of known sources of contaminants that may have contributed to contaminated sediments in the marine environment have stopped the release of contaminants from those sources and should allow chemical concentrations in the sediment to decrease with time. Cleaner sediments will be deposited as surface sediment. Over time the wildlife will be exposed to cleaner sediment. Ecological risk assessments based on sediment and tissue analyses and bioassays have generally indicated that risks are acceptable, including risks to sea otters. Any ecological risk that exists in the water bodies does not warrant the destruction of habitat by dredging or capping. Future monitoring of marine organisms will continue. Results will identify whether contaminants in sediment are decreasing or increasing.

Regarding long-term monitoring, I guess that all goes to doing what you can do. I think it's very important that Navy people are involved, especially the Aleut people from the region. The Sea Otter Commission is doing what we call a very long program with local communities. We are bringing in Native peoples to come in to sample the sea otters. That's happening with the Hydroseal Commission. They are bringing in people also. So it's not like you have to have a science degree to go out and wherever a subsistence animal is harvested that we can take livers, kidneys, and get some samples for our analysis. So when you develop your training program, I would like you to look at these different model programs that are out there, and not necessarily sending someone with a Ph.D in Adak to go out and collect samples. And that's all I have to say. Thank you.

Response: Samples of otter organs (i.e., livers) were taken from carcasses that were found along the beach. Otters are captured for blood samples and then released. No additional otter samples are planned for collection at this time pending analytical results of existing samples.

VERBAL COMMENTS FROM THE FEBRUARY 25, 1998, PUBLIC MEETING ON ADAK ISLAND AND RESPONSES

REX POE

The community would like to point out that due to past personnel changes since 1995, the community on Adak has not had a formal or informal briefing from the Navy on environmental plans on the rationale leading to the certain remediation methods over other alternatives. We therefore appreciate the opportunity to now express our opinion to you about your base cleanup plan. The community wants to state for the record that it believes that more outreach to the Adak community should have been made. It is difficult to understand the decisions being made by the Navy and the RAB due to the great distance between Adak and the RAB meetings in Anchorage. We need to participate in the RAB meetings and the Navy should allow us to participate, even by teleconference. We understand that we are a newly formed community, but we request a seat on the RAB.

Response: At RAB meetings briefings have been given regarding environmental plans for remediation and numerous documents are available for review at the information repository in Anchorage. The RAB members who are representatives of the community of Adak have the responsibility of keeping their constituency informed about the issues presented at the RAB meetings. Most people working on Adak are employed either directly by the Navy or under a contract to the Navy and have access to the information repository in Anchorage during rotational trips from Adak to Anchorage. The Adak RAB has always accepted people who wanted membership. The Navy has always provided documents to anyone who requests them.

Since 1994, before Navy departure from Adak, the Navy made intensive efforts to establish a RAB on Adak with no response. In response to this, and the inability of both the Army and Air Force to generate RAB interest in the Aleutians, the Navy entered into a partnership with the Coast Guard and the Army to establish an Aleutian-wide RAB. This effort did not receive positive community interest. Immediately after Adak was proposed for closure, the Navy was able to successfully establish a RAB in Anchorage. The active Navy left the island in May 1997, and procured a caretaker contractor to assist Navy engineers in drawing down island infrastructure. There was no established community on Adak at this time. In the fall of 1997 some Navy contractor personnel expressed an interest in becoming permanent residents should reuse occur. These individuals elected a community council although no recognized community yet exists on Adak. Nevertheless, all information in the environmental repository has been and is available on Adak for Adak "residents." In addition, all requests for environmental information made in monthly LRA meetings and weekly teleconferences (in which on-island Adak reuse personnel have participated) have been addressed.

It is the opinion of both Alaska DEC and EPA that the Navy has met community relations requirements.

BOB DARRINGTON

There is not a complete study of Sweeper Cove, Sweeper Creek, and the bay out here. The Navy has not addressed the fact that Adak has the highest contamination of otters anywhere in the world. I'd like to see that addressed or some studies done to really show what you are going to do. There is a lot of petroleum in the ground. In some places there is a 3-foot level of petroleum in the ground. What is the plan to clean it up? Will the Navy still be cleaning it up in 100 years?

Response: Sweeper Cove and Kuluk Bay have been sampled to evaluate risks and remedial options. Based on the evaluation of risks and remedial alternatives, dredging or capping is not necessary or desirable. Sediment, fish, and shellfish monitoring will still occur in these water bodies. Additional sediment samples were collected from South Sweeper Creek in March 1998 to better define the extent of PCB concentrations for remedial action considerations. The results of this sampling are summarized in the *Supplemental Risk Evaluation for South Sweeper Creek and Yakutat Creek, Adak Island, Alaska* (July 1998, URSG) and in *South Sweeper Creek and Yakutat Creek Evaluation and Recommendation Report* (December 1998, URSG) on file in the information repository for Adak. Based on these results, the Navy removed, treated, and disposed of sediments containing greater than 1 mg/kg PCBs from South Sweeper Creek in 1999.

The otters on Adak have levels of PCBs in their livers similar to otters in California. No studies were done to compare PCB levels in otter livers from Adak to PCB levels in otter livers across the world. Results of the ecological risk assessment in the *Remedial Investigation/Feasibility Study Report* (October 1997, URSG) concluded that risks to otters from eating prey contaminated with PCBs at Adak are below a level of concern. High PCB levels in individual otters does not necessarily mean there is a significant impact to the sea otter population or species. Nor does it mean that there are continued releases of PCBs from Adak. Historical releases could be the cause, but they have been cleaned up. Monitoring of sediments will determine whether there are continued releases.

The Navy intends to recover free petroleum product to the maximum extent practicable and evaluate the site using the same process that has been used to evaluate other petroleum contaminated sites on Adak; this will be a focused feasibility study approach similar to that used to evaluate many of the other petroleum sites on Adak.

CHRIS GATES

We don't think there is a good enough monitoring program to look at all the stuff that is coming out of the landfills. We're asking the Navy to do a better job on monitoring the leachate and monitoring the water coming out of those landfills. Palisades Landfills should be cleaned up. It is an eyesore and should not be acceptable to the community. There is the potential for a storm to wash the trash into the ocean into Kuluk Bay. Probably the most important safety issue is the Rommel sticks, which are devices that are screwed into the ground and have a sharp point on top. We want the Navy's help to get rid of the Rommel sticks that were put up around defensive positions around the north end of the island We are concerned about the sediments in Sweeper

Cove. The sediments look contaminated. The Navy has not done a good enough sampling job of the sediments of Sweeper Cove. We are concerned about the PCB levels and the hot spots in Sweeper Cove and hope that the Navy will get rid of those hot spots. There are up to 3 feet of petroleum in the ground. Is the remediation system working? We want the mines removed from the minefield. We would like to set as a goal and have a team goal between the community and the Navy to clean up Adak and get it off the NPL listing by the year 2010. We want the Navy to commit the resources that are required to clean up this island and all institutional controls and deed restrictions and give us a clean island by the year 2010.

Response: Groundwater from Metals, White Alice, and Roberts Landfills has been and will continue to be monitored, initially on an annual basis, for the required suite of chemicals. Various media downgradient of Palisades Landfill will be monitored, initially on an annual basis, for chemical contamination, The metallic and other debris that is visible at Palisades Landfill may be an aesthetic concern, but do not present a risk to human health and the environment. Therefore, the Navy is not planning to cover the debris. Rommel stakes are a safety issue that should be discussed as part of the reuse safety plan and through land transfer negotiations, but not under CERCLA, which is covered by this ROD. The Navy removed, treated, and disposed of sediments with PCB levels detected above 1 part per million from South Sweeper Creek in 1999 based on additional sediment samples collected in 1998. Please refer to responses to Vince Tutiakoff's comments.

The Navy, regulatory agencies, natural resource trustees, and stakeholders, are involved in continuing discussion to arrive at a monitoring program for Sweeper Cove through the Biological and Technical Assistance Group for Adak.

The petroleum that is present in the ground at various locations is being addressed. The Navy plans to remove the free product via pumping to the maximum extent practical. Approximately 200,000 gallons of petroleum have been recovered as of August 1999.

UXO and ordnance explosives issues will be addressed in OU B.

According to EPA's Superfund web site, EPA has followed these procedures for removing a site from the NPL:

- The Regional Administrator approves a "close-out report" that establishes that all appropriate response actions have been taken or that no action is required.
- The Regional Office obtains State concurrence.
- EPA publishes a notice of intent to delete in the Federal Register and in a major newspaper near the community involved. A public comment period is provided.
- EPA responds to the comments and, if the site continues to warrant deletion, publishes a deletion notice in the Federal Register

ELARY GROMOFF

The co-chair of the RAB requested that this public hearing be delayed next week on the 4th of March for us to have our leadership there to work with the community. I felt that this meeting was held too early for us to go to Adak for us to get our comments in.

Response: The meeting had been postponed from January 28 to February 25. The newspaper announcement was reissued and people involved had already made arrangements to fly to Adak a second time. The request to reschedule the meeting from February 25 to March 4 was not made until the February 12 meeting. There was a public meeting in Anchorage on February 12 that was an option for those who could not attend the February 25 meeting. Comments were received from The Aleut Corporation on February 25. Comments could be submitted as late as the end of the comment period—March 4, 1998, as stated in the Proposed Plans.

WRITTEN COMMENTS FROM A.L. COZZETTI IN A LETTER TO SENATORS TED STEVENS AND FRANK MURKOWSKI

During the late Seventies and early Eighties I drove Taxi in Anchorage on the Weekends. Many of my fares from the airport were service men and contractors returning from ADAK. They told me about life on ADAK. AKAK is one gigantic Liability; a hole in the ocean in which to throw money.

The Airport landing field floods and can only be drained by the use of enormous pumps. The weather defeats 4 out of 5 flights-in. The city is built upon a filled-in lagoon. Mine-fields defend the island. There are undetonated bombs, 105mm howitzer and 80 mm mortar shells, phosphorus grenades, etc. in the practice firing range, spilled liquid poisons and chemicals, and all manner of other things that kill and maim left over from fifty years of military use. Its a Dump: a military garbage dump; worse than any Superfund Site.

Common sense dictates that the facility be mothballed and maintained by a revolving skeleton crew hired on a competitive bid basis. It is unlikely that ADAK will have to be again placed into active militaty status.

ADAK is unsuitable for anything except military use. Ask any of the service people who toured there. The facility requires enormous constant maintenance. Death is right over the fence and down the road.

As a Citizen and Taxpayer, I object to me and my children being stuck with yet another unnecessary government facility maintenance and remediation bill.

Response: Many of the statements made in the above letter are not directly or indirectly related to the Proposed Plans for remediation of Adak. No response is requested.

WRITTEN COMMENTS FROM A.L. COZZETTI ON VERBAL COMMENTS PRESENTED AT THE FEBRUARY 12, 1998, PUBLIC MEETING IN ANCHORAGE

This writer has had occasion to interview actual Residents of ADAK who lived and worked there from 1976 - 1980. The following comments are a reaction from a Concerned Citizen who listened to the comments given at the hearing Feb. 12, 1998, in Anchorage, Alaska. The following people testified at the hearing:

Charles McKee of Anchorage, Alaska 99524 was concerned about who's doing the geocentric survey of the areas of contamination, how that's being platted, and how it's being funded. Reasons given: "it's a Navy facility and the condition of the soils that have been contaminated, an accurate survey needs to be done."; *and* "I've been made aware of certain discrepancies in our political environment as to title."; he wants to "know who has title within the areas of that survey?"; *at* "governor's meeting, Adak Corporation representative, was asking our state government for more subsidy in addition to what they're already receiving. And they're already looking at taking on a facility, a geocentric constructive facility by Engineering Design of $3 billion. I haven't even estimated what, you know, the ready (ph) value. And of course this whole area places them under a geocentric positioning for GPS; Geocentric Positioning Satellites. And of course you have to take into consideration the value of that aspect."

Vince Tutiakoff, Sr. represented himself as a "resident of Adak"; *his card(s) say he is both Chairman of the Aleut Corp. and* "Manager" *of the Adak Reuse Corporation, headquartered in ADAK. He phrases* "The Community of Adak" *[Which now, is composed of the Maintenance Crews and their Campfollowers. The military community, the servicemen and their families, have left.]* "and the Aleut Corporation are concerned that closed landfills" *have covered all manner of trash imaginable in a Military Installation. Of course! Does he expect the government to haul all that trash away? At whose expense? The present* "Community of ADAK" *and the Aleut Corp. are one and the same, and, of course they want a pristine island paradise to be left when the NAVY leaves; all at Taxpayer's expense. Mr. Tutiakoff wants the Navy to* "guarantee that (the) water line will not be contaminated in five to 10 years" *and that the landfills won't leak contaminants and he wants the EPA and the U.S. NAVY to be monitoring the landfills and water lines forever so the Aleuts won't have to spend any money if they gain control over the Island. He wants the records of monitoring to be available to the public (meaning the Aleut Corp.). (He leaves out the fact that each monitoring well cost tens, maybe hundreds, of thousands of dollars.)*

Mr. Tutiakoff worries about the mine fields on the north side of Adak being near a very popular lake, which he calls, "The recreation site for the future of the residents of Adak." *Sounds great, like its Greenlake, or American Lake. He wants the Navy to clear the minefields, like that would be an easy job. That is impossible even if herds of buffalo and caribou walked through the minefields; there is tundra; tundra is like a sponge. This writer wouldn't follow the herds nor would Mr. Tutiakoff let his son walk through the supposedly cleared minefields. That is an American-designed and laid minefield. Its good for centuries. A billion dollars won't guarantee* *a safe minefield. Any expressed thought of subsistence gathering in that area by the* "Community of Adak" *is strictly vapor for ignorant politicians.*

Mr. Tuiakoff <u>*wants*</u> "constant testing of Kulick, Sweeper Cove, and also metal landfills and other landfills around Adak," *He* "want(s) it biannually." *He* wants "the Sweeper Cove area to be tested annually." *He worries about* "(t)he sediment in the bottoms has settled in the last four to five years" *because of no marine activity in that bay*". *Since the Aleuts want to develop the harbor, he worries that* "in the next couple of years, three years, four years, the sediment will start moving again." *He wants the U. S. Taxpayer to pay for all those services and incredible expenses.*

William Arterbern (ph), a member of the Adak Restoration Advisory Board (RAB), worries about the petroleum sites and the power plant site. He worries that the ground cover might be a "little inadequate" *and the NAVY should do more bioremediation. Mr. Arterbern worries in particular about the PCB contamination there and the long term landfill situation, in spite of his recognization that the Navy has done a good job. Apparently* "there is a lot of contamination on that island", *and* "the Navy has done a good job of categorizing and studying the sites and testing and evaluating them", "(b)ut (he) think(s) that in some cases the perspective that the Navy and the regulatory agencies have had is perhaps a little on the short term side" and that "institutional controls are fine but there's no real procedure in place for deinstitutionalizing the controls"...". *He states:*

> "We know of a case where, you know, in the process of 50 years, you know, the records for nerve gas and mustard gas were lost. And, you know, somewhere along the line, 50 years down the line or a hundred years, you and I won't be there. But people will be on Adak Island and I'm very concerned that there's a lot of deed restrictions going in here and a lot of institutional controls and there doesn't seem to be any procedure for removal of those. And I think that you need to consider that.
>
> One other thing that I would like to see, somewhat related to my question about the sites that were listed as no further action but nevertheless they have restrictions, whether it's for digging or, you know, penetrating the surface in some way. I think that when you place institutional controls on a site that you should come up with an estimate, a best guess or whatever, which identifies how long the Navy and/or the regulators believe that those sites will be contaminated so that there's some basis for future activities on the land out there. And that whoever is in control of that, and I assume that's going to be Aleut Corporation or their descendants, will have a basis for action. Because these things that get institutionalized are often very difficult to remove."

Yes, they are, until the issue is settled of whom will assume the Liability? The Aleuts will never take on that monstrous liability. They're not stupid.

Jason Bourdukofsky worries about the Navy's presence "on Adak for well over 50 years" *and the* "50 years of contamination there that we haven't found yet." *He worries about Palisades landfill being closed and that he was dissatisfied with the extent of the attempt at remediation of the area when viewed from the air; he saw* "contamination, debris and everything." *And in (his)* *(educated?) opinion he didn't feel that it was* "properly cleaned". *He doesn't* "want to see rusty old -- regardless of whether they're contaminated or not contaminated, (things). *He* "think(s) they shouldn't be visible at all, you know (like, buried?)." I mean if you're going to cover it or you're just going to sweep it under a rug, I mean let's make sure the rug is big enough." *(Who is going to pay for that rug of unknown proportions?)*

Mr. Bourdukofsky stated that "in the village" *he had* "been doing a lot of research on chemical weapons and (he) found that chemical weapons was stored on Adak during World War II and Adak was the biggest chemical weapons storage area *(in the what? The World? The United States?). He forgets those weapons were to protect us.*

He expressed his "surprise that there's no real big area that was designated as a chemical weapon site." *He is* "kind of curious. You know, maybe we're not doing enough research to find where this place is." ?? *Would the Reader bet that the federal government doesn't know what it did with the chemical weapons it stashed on ADAK?*

> *Mr. Bourdukofsky* "mention(ed) the ammunition dump off shore" *but he* "realize(d) the fact that ... everybody else dumps out there and it's World War II debris plus maybe Navy debris, Army debris." *He thinks that since* "it's off shore (that) the Army Corps of Engineers has the responsibility of cleaning it up." *no matter that dump site is way out there (5 miles) of shore. [Who will pay for that clean up?]*
>
> *He worries about the pipes and plumbing* "under Adak" *in the* "housing area or -- the living area" *and he* "feels(s) that, you know, with the piping, you know, they had a big manifold of some sort that piped to each individual home, or something like that. I think all of that piping should have been removed if hasn't been, you know, so it won't cause a future problem, you know. Somebody might think it's a bomb. I think, you know, that -- I don't think they're going to get all of that fuel out of an underground pipe, you know, just by blowing it or -- you know, I think that there's still fuel in that pipe if it's capped off on the end." *[There probably is some fuel oil left in the countless miles of pipes that routinely service a U.S. Government Military Installation. No amount of blowing it out will get rid of every drop. But is it dangerous? I don't think so. Of course, the Aleuts don't want to deal with all that pipe; they want the Taxpayers to clean it out; its old pipe; they want new pipe.)*

Miles Nelson, a doctor from Eagle River, Alaska; "an Emergency Physician", *is paraphrased as follows: he is worried about the danger of unexploded ordnances ... but admits (t)his is a new subject for (him) that he learned recently. He worries about the northern part of the island because of the doubtful quality of the institutional controls that are being instituted for those areas. He wonders about the adequacy of those (controls) for the decades and centuries to come. He learned that we're still digging up ordnance from the Civil War that could hurt people. (Revelation; where has he been?) He rightly assumes that the quality of ordnance for World War II is much higher than that from the Civil War, however, the old stuff was just as deadly and longlasting. He rightly assumes that it (the unexploded ordnance) will be dangerous* *for much longer than that. He rightly supposes the time frame we're looking at is centuries for how long this (stuff) 1 is going to be dangerous.*

He says that "(t)he ideal course, of course, would be able to clean it all up" *but he knows that that is impossible and that* "that's not going to happen". *He* "think(s) that we should look at institutional controls that will be adequate for centuries rather than just decades." *He rightly realizes that all the fences and signage are inadequate to keep the curious and doubting out of the area and that sooner or later some kids are going to go in there and get blown to pieces. He rightly wonders who is going to be responsible for the upkeep of the fences and the signage? (This writer knows what's going to happen to the fences and the signage when the Navy leaves the Island) The Doc is right. There won't be anyone on the Island who will care a twit about the fences and signage. There are not enough private resources, let alone the motivation and the foresight, to maintain those fences and the signage. There is not enough money to pay for the right institutional controls, which would be a 24-hr patrol alongside the fence at all points for centuries. He said it; he's right.*

Nelson suggested another volunteer committee be formed to start construction of something to keep people from all that unexploded ordnance. Doc, the Logistics alone is beyond our resources.

Sue Dayton works for the Aleutian Pribilof Islands Association. Does she have an axe to grind?

Kimberly Williams is Executive Director of the Alaska Sea Otter Commission, a non-profit Native organization dealing primarily with sea otters. She says, that since she is a Native person it is very hard for a Native person just to deal with sea otters, so she tends to deal with all marine life, (rather a broad subject). She says that "We Native people take a very ecosystem approach to anything that's happening." *She is concerned for the wildlife that might wander into the dangerous areas at ADAK and that "we"* should do something to stop wildlife from coming into those areas." *(because the animals can't read).*

Also, she thinks that is "very important that Native people are involved. Especially the Aleut people from the region. The Sea Otter Commission is doing what we call a very model program with local communities. We're bringing in Native peoples to come in and bio-sample sea otters. That's happening with the Harvest Seal Commission. They are bringing in people also."

Ms. Williams thinks that "You (don't) have to (have) a science degree to go out and ... take livers, kidneys, and get some samples for analysis"... *and that when (the government? the Navy? the Fish and Wildlife? the Fish and Game?) you develop your trend program, she would like you to look at these different model programs that are out there and not necessarily sending in somebody with a Ph.D. into Adak to go out and collect samples. " (Like one does not have to have a degree to belly up to the trough; an interesting but unrealistic approach.)*

ADAK should be abandoned with signs on the beach that read,

---

1 Howitzer shells, 80 mm mortars, phosphorus grenades, etc.

"KEEP OFF"
U.S. GOVERNMENT PROPERTY, NO TRESPASSING

Put the place in mothballs until the next war. Leave a small maintenance crew. Tell the Aleuts that the place will never be a viable "cash cow" for anyone.

Response: Comments noted.

WRITTEN COMMENTS FROM BELL ARTERBURN AND RESPONSES

Thank you for this opportunity to comment. As a member of the Adak RAB, I am well aware that the actions of EFA Northwest to effect interim remedial cleanup activities on Adak Island have been extensive and comprehensive in scope during the term of the Navy's occupancy of the base, with the result that this plan identifies actions only on those sites that remain above the designated and agreed levels of cleanup between DEC, EPA and the Navy. I would like to say also that during the course of the RAB discussions we have had in the past year and a half, the Navy and its contractors have done a tremendous job of presenting to the RAB the information about contaminated sites, the nature and level of the contamination, and summaries of the technical details, in a comprehensible manner, that the RAB needed to participate and comment. I commend you and those who have backed you for a professional and comprehensive job with some very difficult and complicated material.

To say that Adak Island has experienced some considerable environmental damage is an understatement. I think that it is a most definite conclusion of this process that the healing of Adak Island will take many generations of stewardship and oversight by the new owners. My chief complaint about the process is focused not so much on the job performed by the Navy and its contractors, as by the method, which has been very mission focused and does not necessarily carry a long term perspective.

Take the landfills. They are covered, yes. The have impermeable barriers and this is the accepted method of dealing with landfills these days. But it is obvious from the size and scope of the projects that many environmental sins may be buried in those sites. So the answer is to not use the space at all, monitor the area and groundwater surrounding the sites, and do something if a problem shows up. (institutional controls). That is a remedy born of the need to restrict budgets, not a solution for cleaning up the environment. We all know this, and to some extent we even understand. But my question is about the level of future commitment and backing when the problem re-emerges. As I stated in the public hearing, if we are capable of losing mustard gas and other toxic substances in the space of the 55 years since World War II, is it not possible that we might not also forget the landfills and the necessary monitoring in the next 55 years?

How can the Navy assure the community to be, that its commitment to the problem will continue when some large seismic event occurs (they are frequent in the area) and wrecks the barrier. Is there an insurance fund to which the Navy, or the new owners may have recourse if some problem emerges? This is believe is the weakness of institutional controls: they require human administration. In the case of Roberts landfill, the size of the closure, and the indeterminate nature of what is enclosed therein, makes a special long term monitoring program a special need in my view.

Response: The Navy and regulatory agencies chose to leave the landfills in place rather than removing the landfill contents from the island. Removal of the landfills would be a massive undertaking. It would also present a risk to the workers and island residents because of the release of chemicals caused by disturbing and transporting the landfill contents. The remediation of landfills at Adak is consistent with the approach used at other CERCLA sites. If landfill contents were removed, the landfill contents would have, to be placed somewhere else, presenting another problem. Maintaining the covers on the landfills and associated institutional controls eliminates human health risk because the pathway of chemical contact is eliminated. The Navy plans to maintain institutional controls for the landfills for as long as necessary. The Navy will conduct periodic site inspections of the landfills. The Navy will remain liable for the condition of the landfills and will make repairs to landfill covers if they are damaged. Record keeping has improved since the 1940s. Institutional controls will be documented as part of the land transfer documents and in the Record of Decision.

My alternative question about institutional controls is based on the same premise. When things are forgotten and perhaps an area, say a petroleum site, has attenuated such that it may be considered for economic use, what then, if we have an institutional control that no one remembers why it is there? I know these are rhetorical questions, but they do seem to happen. How is the institutional control itsetf removed? Is there a process? And will there be periodic evaluations? This is one reason why I persistently sought during the RAB process to have the Navy predict when a given site, say perhaps, the petroleum contaminated groundwater under the community, will actually resume a state of wholeness and be capable of less restrictive use. So that the land can be evaluated in terms of its usefulness to the community. These must be the defining barriers of institutional controls and monitoring, or there must be some avenue of recourse provided beyond the matter of reopening the Record of Decision, which has a mission based finality to it.

Response: The process for lifting institutional controls will be described in the Record of Decision. Periodic evaluations will be performed for all sites with institutional controls at a minimum of 5-year intervals.

I remain concerned that PCB contamination be addressed where a reasonable effort can be made. The level of contamination from around the island, in animals and sea creatures, is indicative of large and extensive contamination to me. All source points, and all suspected points should be investigated and dealt with. I greatly encourage the Navy to go ahead with some treatment of Sweeper Creek in this regard. I also believe that the White Alice site deserves remain on a long term monitoring program to assure that what we know could be a potential source some day be closely watched.

Response: At all known sites where PCB-containing materials were spilled, cleanup actions have taken place. These sites include SWMU 15—Future Jobs/Defense Reutilization Marketing Office, SWMU 16—Fire Training Area, SWMU 20—White Alice/Trout Creek, SWMU 21A—White Alice Upper Quarry, and SWMU 67—White Alice PCB Spill Site. PCBs have been detected at areas (e.g., Sweeper Creek/Cove) located downstream of original spill sites. PCBs in these areas likely migrated from the original spill sites before remediation occurred. Because all known terrestrial releases of PCBs have been eliminated, it is assumed that there is no addition of PCBs entering the environment that would accumulate in marine tissue. Results of future monitoring will verify whether this assumption is accurate. In 1999 the Navy removed, treated, and disposed of sediment from South Sweeper Creek, which contained greater than 1 mg/kg PCBs. Sediment was excavated deeper than a depth of 2 feet when preliminary test results indicated PCB concentrations greater than 1 mg/kg in the sediment. The results of the 1998 sampling of South Sweeper Creek are summarized in the *Supplemental Risk Evaluation for South Sweeper Creek and Yakutat Creek, Adak Island, Alaska* (July 1998, URSG) and *in South Sweeper Creek and Yakutat Creek Evaluation and Recommendation Report* (December 1998, URSG) on file in the information repository for Adak. Institutional controls will be implemented for SWMU 67 to ensure that the cleanup action is effective.

It seems that a site such as the power plant, which has substantial contamination, yet is essential to serving the community and airstrip and infrastructure that will remain, should more immediate treatment than institutional controls. My recommendation is that the regulators consider bioremediation of the site, which will occasion no damage to the facility itself.

Response: The power plant will receive more attention than only institutional controls. The Navy removed, treated, and disposed of sediment from the waste oil and retention pond in 1999. Clean sediment and soil were placed in the excavated areas. The Navy will continue to remove petroleum from the subsurface with the operating petroleum removal system. Institutional controls are needed at the site to

- Prevent residential use of the site
- Allow periodic inspection and repair of the product recovery system
- Allow periodic collection and analysis of samples from the site
- Restrict the use of groundwater from the site
- Allow periodic review of site conditions and analytical results
- Assess the need for additional action or to reduce controls

Sites that are identified as no further action should be opened to use by the new landowners. How is it that institutional controls are placed on sites that have been 'cleaned up', and no further action is contemplated? If a site is an NFA, it should identify whether it is an NFA because it is impossible to clean it up, as in the case of some minefields, or because it is clean, by whatever definition clean is established. The minimum of that definition should be that if it is clean, it can be used.

Response: No land use restrictions exist for no-further-action sites. Institutional controls are planned for some sites where cleanup actions have occurred that require sampling and inspections of the site to ensure the remedy is adequate, to prevent the cover from being disturbed and exposing landfill material, etc. Institutional controls to prevent digging or subsurface disturbance are envisioned on most areas of Adak to prevent excavation in areas with potential ordnance materials hazards unless ordnance surveying and clearance has been performed in these areas.

Thank you for considering these comments. I look forward to participating in the continuing process of evaluation of this action, and hope the Navy will have success in its efforts to remediate the island under these plans.

WRITTEN COMMENTS FROM A.L. COZZETTI AND RESPONSE

1. *Post signs on Adak—"No Trespassing" abandon the whole island*

2. *Sell it to the Aleuts for $5.00, as is, where is.*

3. *Mothball it with a small maint. crew contracted by Competitive Bid*

4. *It is not worth "cleaning up."*

5. *If you have to clear the mine fields, use a herd of Caribou.*

6 *You'll NEVER BE ABLE TO REMOVE ALL the unexploded ordnance. YOU KNOW THAT. I KNOW THAT. WHO's going to be liable?*

7. *The Island is a Liability.*

8. *Use Adak to quarantine AIDS-infected folks.*

Response: Different options for the future use of Adak have been considered and discussed among the Navy and different agencies over the past few years. Transferring some real property to another party that can productively use the existing facilities is a desirable objective. The Navy is continuing to minimize risk to people and the environment by remediating sites and implementing institutional controls. Although no method of clearing unexploded ordnance and ordnance explosives can ensure removal of all ordnance materials, the Navy plans to clear the SWMU 2 minefield. Clearance of other ordnance materials areas is being evaluated in OU B, and the Navy will retain ownership (including liability) and maintain institutional controls until this evaluation is completed and all necessary remediation has been completed.

WRITTEN COMMENTS FROM LORRAINE ECKSTEIN AND RESPONSE

I was surprised and disappointed when I saw on TV last autumn that the Navy buried vehicles with petroleum on Adak. I've been reared to believe in the military and the federal government and was greatly let down by this careless behavior.

It makes me wonder what the military is doing in Anchorage and Fairbanks and where is our EPA when we need it.

Response: The personnel responsible for the incident of disposing of vehicles in the landfill without draining the fluids in the vehicles were punished for their activities. The Navy did not condone this action. Standard procedure requires fluids to be drained and recycled or disposed of properly prior to landfilling the vehicle. The Navy entered a page 13 notation on the military records of four enlisted personnel. This "bad mark" will affect their chances for advancement, retirement, and benefits.

The incident described in the comment was reported by the Navy. The Navy completed all necessary response actions in cooperation with regulatory agencies. The Navy has devoted considerable resources to performing envirorimental cleanup and closure activities in a responsible manner and has kept regulatory agencies informed of progress of these activities.

WRITTEN COMMENTS FROM ALEUTIAN/PRIBILOF ISLANDS ASSOCIATION, INC. (A/PIA) AND RESPONSES

1. ***A/PIA strongly recommends the appointment of a Naval liaison to: 1) keep the Adak-Aleut community informed of the status of remedial operations; 2) address community comments and concerns; 3) provide for a system of integrating the community into the planning and decision-making processes.*** *By honoring this request the Navy will fulfill the government-to-government relationship shared between the Tribes and the federal government. Despite efforts by the Navy in this monumental clean-up, one area crucial to this process has been overlooked. This has been the failure of the Navy to include the Adak-Aleut community in the planning and decision-making processes, decisions that will ultimately constitute the foundation for the community of Adak's growth, livelihood, and well-being. There are many valid questions from the community - both remedial and legal in nature - that have yet to be fully addressed by the Navy. Unfortunately, the Navy has not provided the Adak-Aleut community with assistance to help answer questions, understand reports, and address community members' concerns in a timely manner. For the Navy to state, "the reports are out there if the community wants to read them," reflects the Navy's indifference in involving the Adak-Aleut community in the planning/remedial processes.*

Response: The Navy has satisfied the three requests stated in the comment, which fulfills the government-to-government relationship between the Tribes and the federal government.

There are many avenues available to the public to be kept informed about the status of cleanup operations.

The public is always welcome at the monthly RAB meetings. Fact sheets are distributed to the public, and newspaper notices are printed to inform the public of proposed cleanup actions and upcoming public meetings. There is also the information repository, which contains documents regarding cleanup operations. Most people working on Adak are employed either directly by the Navy or under a contract to the Navy and have access to the information repository in Anchorage during rotational trips from Adak to Anchorage. The RAB was formed prior to the "community" of Adak. However, the Adak RAB has always accepted people who wanted membership. The Navy has always provided documents to anyone who requests them.

The Adak residents have had ample opportunity to participate in the cleanup process. There are members of the RAB, including the co-chair, who represent The Aleut Corporation and a representative of A/PIA; these members should share information between the Navy and the group they represent. RAB representatives are responsible for a two-way communication between the entity they represent and the Navy. According to the Naval Air Facility Adak Restoration Advisory Board Charter and Bylaws established and signed by all RAB members:

I.V.A.l.d One member will represent each government entity or community...

I.V.A.l.f Members will report to the groups they represent and serve as a conduit of information between the community and the Navy.

2. ***A/PIA requests that the Navy, with the community's approval, appoints an individual to represent the Adak-Aleut community to serve as a member of the Base Re-alignment and Closure (BRAC) Environmental Clean-Up Team (BECT).*** *This person will act as a representative for the 12-federally recognized Aleut Tribes within the Aleutian/Pribilof Islands Region who currently live and work on Adak Island. The refusal of the Navy to allow a member of the Aleut community to sit on the BECT is due to unsubstantiated "conflicts of interest" which the Navy states might develop involving clean-up contracts with Aleut-owned companies.*

   Response: Representatives from the RAB, Pam Miller and Flore Lenkanof (affiliated with A/PIA), have been added to the BRAC Environmental Clean-Up Team.

3. ***Because of differences in opinions from experts trained unexploded ordnance(UXO) removal, A/PIA requests the formation of a team consisting of military and non-military UXO-experts to discuss plans and technologies for continued UXO removal in areas proposed for institutional controls.*** *A/PIA's main concern is the issue of UXO and ordnance explosives (OE) in remote and some not-so-remote areas. What type of mechanism will be in place 50 years from now - 100 years from now - to protect people who will be walking, hiking, and growing up on the Island of Adak? We strongly urge the community of Adak to work with the Navy on plans which involve on-going removal actions of UXO and OE in areas destined for institutional controls. The removal of UXO from these areas will be extremely time consuming, costly, and dangerous; however, according to some UXO removal experts, removal technology is available and areas that contain UXO can safely be removed from Adak Island. The greatest concern surrounding the issue of land mines, bombs, and a variety of other types of hidden explosives on the Island of Adak is* ***CHILDREN*** *who will be a part of the Adak Community. Children know no boundaries, and THEY will be prime targets for loss of life and limb from the threat of these explosive ordnances. It is a terrible oversight on the part of the Navy and other state and federal agencies who currently support institutional controls of these areas filled with unexploded ordnances: the minefleld at Clam Lagoon, the ammunition disposal dump site (near Lake Andrew sea wall), and the demolition and mortar range. We also request further investigation of Mt. Moffett due to likely increases in hiking traffic in the area.*

   Response: Since this comment was submitted, the Navy has discovered information which suggests that the area potentially contaminated by ordnance materials on Adak may be more extensive than previously believed. Ordnance materials on Adak will be evaluated under a new operable unit, Operable Unit B. As a result, elements of the Navy's Proposed Plan for remediation of ordnance materials contamination are being reevaluated. The Navy, in partnership with the Local Redevelopment Authority and regulatory agencies, is developing a plan for additional investigation and possible clearance and removal of ordnance materials from sites on Adak. In the interim, the Navy is revising the existing program of institutional controls and education of Adak residents to better inform them of potential risks associated with ordnance materials. The Navy will continue to inform island residents of developments regarding this issue.

4. ***We have provided comments and suggestions regarding the video, and request that additional videos are created which target children in REALISTIC situations with realistic solutions. Thank you.*** *The video produced for the Navy by Foster/Wheeler: in this cheery and eery, naturalistic and unrealistic video we see Mr. & Mrs. U.S. citizens, model American people. They discover a UXO while birdwatching, and dutifully report it. Viewers are also reminded that no fatalities involving unexploded ordnance have occurred on Adak Island (keep in mind that for the last fifty years the majority of the population on Adak has been the military - along with tight restrictions on UXO arm). Will this be the case after Adak's population begins to increase, with increased tourism and industry?*

   Response: Because ordnance materials on Adak are being re-evaluated under a new operable unit, remedial alternatives are being re-evaluated. The Navy has produced additional videos, featuring Aleut natives and targeted to child audiences. The Navy will continue to inform island residents of related developments.

5. ***A/PIA requests further investigations of UXO in landfills with possible upgrades to currently planned remedial actions.***

   Response: It is not possible to determine if ordnance materials were buried in the landfills except by digging through and inspecting the contents of the landfills. Excavating landfill debris is hazardous and inefficient. The presence of ordnance materials buried in the landfill does not pose a significant threat if the landfill is left undisturbed. Institutional controls will be placed on landfills to prevent digging at the site so that the cap will remain in place and buried contents will not be disturbed.

6. ***We request that the questions and concerns of the Aleut community are adequately addressed AND taken into consideration BEFORE the Adak Restoration Advisory Board casts a vote to end Its current monthly meeting schedule.***

   Response: All comments will be addressed and any issues raised at RAB meetings can be discussed. The BRAC Cleanup Team considers all comments before making cleanup decisions.

7. ***We request community representation of the 12-federally recognized Aleut Tribes within the Aleutian/Pribilof Islands on the BRAC Environmental Clean-up Team.***

   Response: The BRAC Environmental Cleanup Team (BECT) now includes Flore Lenkanof who is affiliated with A/PIA

8. ***We request that the Navy continues to do more sampling for PCBs in Sweeper Cove with possible dredging operations as a remedial option.***

Response: Fish and shellfish in Sweeper Cove and Kuluk Bay monitored for contaminant concentrations, including PCBs. It is expected that existing PCB concentrations in the active zone sediment layer (top few inches) will diminish over time. No sediment samples in Sweeper Cove contained concentrations of PCBs in excess of 1 part per million. Because some locations in the Sweeper Creek drainage contained more than 1 part per million PCBs, additional samples were collected in March 1998. As a result of additional evaluation, the Navy removed, treated, and disposed of sediment containing more than 1 mg/kg PCBs from South Sweeper Creek in 1999.

9. ***We support the Adak-Aleut community in their needs for independent verification.***

Response: The State of Alaska and the EPA serve as independent reviewers of the Navy's work. The RAB has had an opportunity to review and comment on all documents.

10. ***A/PIA requests that the Navy updates its ADAK ISLAND WEB SITE on the INTERNET so that others outside the state and immediate area will be able to make comments.***

Response: The web site for the former base at NAF Adak was established by the NAVFAC Command Headquarters in Washington D.C. as part of its overall program management for BRAC-listed bases. Since establishing the web site, NAVFAC Command Headquarters has cut its staffing and budget and no longer has the resources necessary to maintain and update the web site.

11. ***A/PIA requests that any asbestos-containing buildings that are not scheduled to be re-used should be demolished with the asbestos disposed of properly.***

Response: Asbestos is a health hazard if it is damaged, friable, and accessible. If these three conditions exist in a building, the Navy will properly abate that condition. The Navy does not normally have the authority and funding to remove asbestos-containing materials from property being disposed of, unless those materials are currently a health hazard. However, special legislation has been introduced that would provide such authority and funds for such work at Adak. Upon enactment, Navy will work with the Local Redevelopment Authority to use that authority to remove potential hazards within the limits of the funding provided.

12. ***A/PIA requests that all landfills which will undergo remediation and/or institutional controls be monitored to protect groundwater.***

Response: Groundwater monitoring is planned for Metals Landfill, White Alice Landfill, and Roberts Landfill. Surface water from Palisades Landfill was sampled and shows no unacceptable human health or ecological risks. No groundwater monitoring is planned for SWMU 4. South Davis Road Landfill because the medium of concern is subsurface soil. Results of groundwater monitoring are available in the information for review. It should be noted that groundwater is not used for domestic purposes due to the abundance of readily available surface water and the extensive distribution system that exists to provide this surface water to on-island users.

WRITTEN COMMENTS FROM ALASKA COMMUNITY ACTION ON TOXICS AND RESPONSES

Introduction

As a matter of principle, the Navy should be held to a high standard of cleanup because of the ecological importance of the island and surrounding waters signified by inclusion within the Alaska Maritime National Wildlife Refuge. The island and surrounding waters are also important for subsistence fishing and hunting, as well as commercial fisheries. The Navy should strive intensively to remove contamination sources to non-detectable levels characteristic of pre-military conditions. The proposed plans for cleanup of CERCLA and petroleum sites on Adak are far from adequate to ensure long-term protection of environmental and human health.

Remedies Are Inadequate

We are dismayed that the Navy is relying so heavily on institutional controls and soil capping for the majority of the sites on Adak; with many sites listed as requiring "no further action." The only additional removal actions for CERCLA sites are proposed for SWMU 17 and Sweeper Creek, "if removal is warranted" The Navy should be held accountable for their devastation on Adak Island and required to remove sources of contamination, not merely allowed to apply superficial and ineffective institutional controls that are likely to be inadequately monitored over the long-term (e.g., fencing and signage will be blown down, weathered, or removed by people). We are not assured of the long-term protectiveness of institutional controls such as fencing, land use, restrictions, and signage. These measures are not protective of inquisitive children, for example, who may disregard fences and disregard or not understand signs. The proposed plan does not account for the special vulnerabilities of children, both in terms of their greater likelihood of breaching institutional controls and in their greater level of sensitivity in exposure to contaminants.

Response: The Navy is held to high standards. Three of the remedies and many removal actions were based on ecological risk. Remedies will comply with applicable standards and laws. At those sites where there was no evidence of any contamination, or the calculated risks were not deemed significant by the SAERA/CERCLA process, no action was justified. This was true for 31 CERCLA sites. To be designated a no-further-action petroleum site, sites had to meet one of the two following criteria: (1) They did not contain soils that exceeded established threshold criteria, were more than 200 feet from downgradient surface water, and had no free product, or (2) they were estimated to have potential site-specific risks of less than 1×10^{-5}. The only remedial actions for CERCLA sites are SWMU 17 and Sweeper Creek because the Navy has already conducted cleanup actions at more than 25 sites prior to releasing the Proposed Plan. For example, the Navy recontoured, covered, and revegetated landfills (SWMUs 11 and 13); excavated and disposed of soil with PCBs above 1 ppm from SWMU 16; removed drums and soil containing PCBs from SWMU 20, etc. Institutional controls include more than placing signs and fencing sites. Annual inspections, land use restrictions (i.e., no residential land use), educational measures, limits on excavations, chemical monitoring, and periodic site evaluations are part of institutional controls. Capping has recently occurred at SWMU 4 South Davis Road Landfill in accordance with the selected remedy presented to the public. Capping has also been completed at other sites (primarily landfills) to prevent exposure to subsurface material at those sites. Removal of landfill debris was ruled out for several reasons. It would expose workers, island residents, and the environment to chemicals that would be disturbed and possibly released from a large volume of excavated material. Removal of the material from the island would create the problem of disposal at another location. It would be cost prohibitive.

We do not find an adequately defined plan to monitor, repair, and correct known contamination problems or problems that may arise in the future. The plan must identify timelines, review and monitoring procedures, infrastructure and logistical needs for regulatory agencies to properly monitor and enforce for many decades. Effective public participation in on-going monitoring, remedial, and regulatory actions at Adak must be assured by both ADEC and EPA, with procedures and timelines specified in the plan and record of decision. Thus far, the public has had to rely on data supplied largely by Navy contractors, without adequate opportunities for independent public and scientific participation/oversight in the design and review of the sampling programs (e.g., URS Greiner is serving the Navy's interest, not the public). Monitoring programs in the future should include independent scientific and public oversight.

Response: The Record of Decision includes some information regarding monitoring such as sampling intervals, types of media samples, types of analyses performed, and procedures for completing monitoring. The ROD requires a monitoring plan to provide monitoring requirements for all sites on Adak. This plan is being prepared with participation from the BTAG and the RAB. This plan will be reviewed and approved by Alaska DEC and EPA. It will also be available in the information repository as are other documents for public review. Navy documents have been independently reviewed by the EPA and Alaska DEC.

Although the plan identifies a surface water body as the current and likely future water source for Adak, this should not preclude the Navy implementing cleanup actions that effectively clean the ground water of contaminants that threaten human health and the environment. The people of Adak should have the option of using the groundwater in the future if necessary. Future monitoring programs should include sampling/analysis for harmful degradation products, such as vinyl chloride, a degradation product of TCE, for example.

Response: The Navy plans to remediate groundwater, primarily through free-product recovery, natural attenuation, and monitoring. Groundwater will be monitored for vinyl chloride in areas where that chemical or TCE were present. It should also be noted that the viability of groundwater use in the future is likely to be limited by factors such as salinity, low volume, and turbidity regardless of contamination. The existing drinking water supply system is anticipated to satisfy the community's needs indefinitely. The surface water bodies that have served as a drinking water source to Adak residents are Lake DeMarie and Lake Bonnie Rose.

For the petroleum sites, we recommend a much greater level of remedial action rather than the preponderance of allowances for natural attenuation and no action. EPA policy dictates that "monitored natural attenuation should not be considered a default or presumptive remedy at any *contaminated site." Groundwater should be brought to drinking water standards and soil should be remediated to prevent transfer to any other media or ecological receptors.*

Response: *The Natural Attenuation* alternative that has been selected for several petroleum sites includes monitoring and institutional controls. One purpose of the monitoring is to provide a safeguard to ensure that chemicals from the site are not migrating off site. It is also to ensure that the natural attenuation is, in fact, breaking down the petroleum constituents and reducing concentrations by natural processes. Finally, the purpose of the institutional controls is to ensure that the sites are not disturbed and that contact with chemically affected media is minimized.

The monitored natural attenuation and institutional controls alternative was selected for two reasons: (1) It will cause the least amount of disturbance to the natural ecosystems that flourish at many of these sites. Most other alternatives include intrusive actions, heavy equipment movement, and other activities that would damage or destroy the natural setting of the site. (2) The benefit of active remediation would be outweighed by the damage that would be done at the site. For instance, 23 sites were retained for this alternative because the petroleum concentration exceeded criteria at only one sample location out of the entire site. At an additional 14 sites, none of the petroleum concentrations exceeded criteria, but the site was retained because it was less than 200 feet from a water body. In both these cases, it is believed that the damage that would be sustained from an active remediation would far outweigh the benefit.

Free product will be removed from sites to the maximum extent practical. Then those sites will be evaluated under the focused feasibility study process for final remedial actions.

Landfills

Recent reports concerning the leaching of contamination from military landfills such as Fort Sheridan (infectious medical waste, radioactive waste, solvents, paints and thinners), a former Army base in Michigan, give us cause for trepidation about the undiscovered contents and future leaching of contaminants from the landfills on Adak. The wastes within the landfills have not been adequately characterized through review of historical documents, interviews, excavation, or sampling. The illegal dumping of hazardous waste into Roberts Landfill last year and discovery of UXO in Roberts Landfill are but two examples that include a potentially deep and insidious problem for which there is no remedial mechanism in place to characterize or remedy.

Response: There is some degree of uncertainty regarding the contents of landfills, particularly those areas of landfills operated prior to promulgation of regulations concerning disposal practices at landfills. This is true for Adak as well as other waste disposal sites in the United States, including thousands of non-military landfills.

The best way of managing this uncertainty is to minimize the potential for migration of contaminants and to monitor to ensure migration is not occurring.

Further detailed characterization of the contents must be done before the landfill sites are simply closed and capped. Capping is not effective in isolating contaminants, especially in the weather conditions of Adak. Rodents and other animals can easily disturb and disrupt the soil cover, so *we have no level of confidence that capping is adequately protective of the environment and human health. The public must participate in the design and review of sampling programs for the landfills. We recommend further characterization and removal actions, not simply capping. Capping does not constitute containment.*

Response: Covering landfills is a common cleanup action used to protect human health and the environment. It is highly unlikely that burrowing animals on Adak such as rats and foxes would disrupt the soil cover at landfills enough to expose landfill material. According to the U.S. Fish and Wildlife office on Adak, rats burrow 1 or 2 feet below the surface at most and spend most of their time on the surface among the vegetation. Foxes may burrow to make their dens in sloped surface or cut banks, not on relatively flat surfaces as would be found at covered landfills. Documents relating to the design and monitoring of sites are or will be available in the information repository for public review. Removal was ruled out because that would expose workers, island residents, and the environment to chemicals that would be disturbed and possibly released from a large volume of excavated material. Removal of the material from the island would create the problem of disposal at another location.

Water Bodies

The waters of Sweeper Creek, Sweeper Cove, and Kuluk Bay should be safely fishable as the Clean Water Act intended. These water bodies should not have to be signed to prevent fishing. Sources of contamination must be removed to allow for safe and healthy subsistence food resources within the water bodies. In the case of PCB contamination of sediments in Sweeper Cove, an alternative to dredging and resuspending the contamination should be found that removes the contamination (possibly some form of in situ sorption and removal). The contaminants problems in the marine environment have not been adequately characterized The sampling program has been insufficient to identify potential hot spots and source areas, including potential PCBs/semi-volatile organics/fuel waste dumps in the marine environment of Sweeper Cove and Kuluk Bay.

Additionally, the Navy must characterize potential contamination source areas within the Finger Bay watershed and any contamination problems within the marine environment of Finger Bay. The regulatory agencies must require the Navy to undertake an investigation and remedial actions of the Finger Bay watershed, including the marine environment.

Response: Planned institutional controls will not prevent fishing. They will recommend limitations on fishing. It is not unsafe to fish in Sweeper Cove and Kuluk Bay for the recreational fisher. The highest unacceptable, human health cancer risk is 1 in 1,000 people which refers to an increased chance of 1 in 1,000 of developing cancer over a lifetime. Exposure assumptions for each person includes subsisting (126 grams per day) on rock sole (bottom-dwelling fish) in Sweeper Cove over a period of 30 years. All known sources of PCBs on the island have been remediated. In 1999 the Navy removed, treated and disposed of sediment containing more than 1 mg/kg PCBs from South Sweeper Creek. Additional tissue sampling is planned for Sweeper Cove and Kuluk Bay as part of a monitoring plan.

The only CERCLA sites in the Finger Bay drainage basin were SWMU 29, the Finger Bay Landfill, and SWMU 28, Lake Betty Drum Disposal Area. Both sites were investigated and there was no evidence of significant release of contaminants from either site. Finger Bay is not a CERCLA site. Recent underwater videos provided by the Aleut Corporation and historical anecdotal information may suggest the presence of a dry dock within Finger Bay. The footage does not show the presence of contamination. In fact, there is evidence of abundant marine life. Historical evidence indicates that dry dock activities occurred during a brief period estimated to be between 1942 and 1945 during World War II. If a release of contamination is found in the area, the Navy will be required to investigate the situation to the extent necessary.

UXO/OE Ranges

We are dissatisfied with the extremely limited clearance and removal actions proposed for the UXO sites on Adak, including SWMU 1, 2, 8, SA 93. Institutional controls are not adequate to protect human safety, health and the environment. Sampling programs to measure potential toxic contamination from UXO/OE sites have not been adequate especially in light of recent studies that demonstrate widespread contamination from such bases as a the Massachusetts Military Reserve Camp Edwards, the U.S. Army Grafenwohr Training Area in Germany, and Fallon NAS. Large quantities of heavy metals such as lead, copper, zinc, cadmium, as well as arsenic are deposited in the environment in and around weapons ranges. At Grafenwohr Training Area, surface soils contaminated with heavy metals had to be classified as hazardous waste (measured through toxic characterization leaching procedure). Even the vegetation was contaminated with heavy metals. At other sites, toxic components of the explosives propellants contaminate ground and surface waters with such chemicals as RDX (Royal Demolition Explosive), nitrobenzene, nitrotoluene, and trinitrobenzene.

Response: Because of the new information that suggests that the area potentially contaminated by ordnance materials on Adak may be more extensive than previously believed, elements of the Navy's Proposed Plan for remediation of ordnance materials contamination are being evaluated. The ordnance materials sites will become Operable Unit B and will be addressed in a separate Record of Decision.

The most heavily used range (SWMU 1) did not contain levels of chemical concentrations in sediment, soil, or water that would result in an unacceptable human health risk (based on regulatory criteria).

We insist that a comprehensive sampling program be designed and implemented (with analytical procedures for the full range of toxic contaminants associated with UXO/OE, propellants, explosives), with independent scientific and public scrutiny, to properly assess potential contamination problems in and around the weapons ranges on Adak. Research concerning the potential use of depleted uranium munitions on the ranges must be done and revealed to the public.

Response: Sampling SWMU 1 for contaminants is a sufficient alternative to sampling all known ordnance materials areas. SWMU 1 was used more often than other ranges; therefore, there is likely a higher chance for contaminants to migrate from the site. There are baseline data for the site, and ordnance-related chemicals have been detected. If unacceptable levels of chemicals are detected at SWMU 1, then other ordnance materials sites would be sampled. The Navy will collect samples from SWMU 1 on an annual basis for metals and ordnance-related compounds. There has been no use of uranium-depleted munitions on Adak according to the Radiological Affairs Support Office.

We recommend comprehensive removal actions at all the weapons ranges on Adak to a depth of at least 4 feet, and deeper if technology permits. There should be precise mechanisms/timelines for review of the adequacy of previous removal actions as more effective removal technologies develop in the future. The goal of the Navy must be complete removal within 5-10 years.

Response: Since this comment was submitted, the Navy has discovered information that suggests that the area potentially contaminated by ordnance materials on Adak may be more extensive than previously believed. As a result, elements of the Navy's Proposed Plan for remediation of ordnance materials contamination are being re-evaluated. The Navy, in partnership with the Local Redevelopment Authority and regulatory agencies, is developing a plan for additional investigation and possible clearance and removal of ordnance materials from sites on Adak. In the interim, the Navy is revising the existing program of institutional controls and education of Adak residents to better inform them of potential risks associated with ordnance materials. The Navy will continue to inform island residents of developments regarding this issue. The Navy is clearing the SWMU 2 minefield. All ordnance materials sites will be evaluated as Operable Unit B.

Radiological Monitoring

The proposed plan makes no provisions for the on-going assessment of radiation sources, hazards, contamination from previous nuclear weapons storage, nuclear sub operations, potential use of depleted uranium munitions, and other radioactive sources. Although the Navy undertook a limited radiological survey last summer, this did not include ecological sampling, was inadequate in scope, and did not receive any public or scientific scrutiny. A comprehensive radiological sampling program must be undertaken which includes the landfills, munitions ranges, and other potential source areas, as well as ecological receptors (e.g., lichens, mosses, kelp, mussels, fish, caribou and marine mammals).

Response: There is no indication that radioactive wastes have been disposed of on Adak. According to the Navy's Radiological Affairs Support Office there is no reason for concern. No depleted uranium was used at target practice ranges. According to the May 1998 report of radiological investigations at the Adak Naval Complex, depleted uranium was used as counterweights in some aircraft that were operated on Adak. Routine maintenance operations required the removal, inspection, and reinstallation of these counterweights. When the counterweights were damaged or corroded, they were replaced. The old counterweights were returned to the manufacturer or disposed of as low-level radioactive waste. Nevertheless, all unwanted depleted uranium was shipped off the island for disposal.

Risk Assessment

We find that the risk assessments are inadequate in determining cleanup levels that are protective of environmental and human health. The proposed plans characterize carcinogenic risk as "excess life-time cancer risks," a risk of 1 in 10,000 "usually requires remedial actions." A Hazard Index (HI) is used to measure non-carcinogenic risks, including such health problems as asthma, heart disease and skin rashes. The proposed plan defines an "acceptable" risk without providing the assumptions and uncertainties inherent in risk modeling. We question the scientific validity and ethics of risk assessment methods used here. This risk assessment inadequately characterizes risk from multiple chemical exposures, cumulative and synergistic effects of exposure to combinations of hazardous chemicals. It fails to account for the vulnerabilities of developing fetuses, infants, children, elderly people, and those with compromised health conditions or preexisting health problems such as diabetes, alcohol-related diseases. It fails to assess health threats from exposure to chlorinated chemicals at low levels that may effect endocrine, immune, and reproductive function.

Response: The risk assessments that were performed for Adak is consistent with current federal guidelines. Although these guidelines are not perfect (nor is the science of risk assessment fully developed), they were developed with the objective that they would provide risk assessment results that are protective of human health and the environment. The basic science on which risk assessment is based is insufficient to quantitatively address the synergistic toxic effects of chemicals. This could result in an underestimation of risk. However, risk assessment also cannot adequately address antagonistic effects of chemical mixtures that could reduce the effects of individual chemicals. These uncertainties were qualitatively acknowledged in the uncertainty analysis section of the risk assessments. The toxicity values that are provided by EPA in the IRIS database do take into account sensitive populations in that they apply specific safety factors to the final toxicity values. The effect of low concentrations of chlorinated chemicals on the endocrine system were not evaluated in the risk assessment because there is neither a scientific consensus on the endocrine disruption process nor have the federal or state authorities published guidelines on how to assess risks associated with endocrine disruption.

A Note on the Preparation of the Comments

Alaska Community Action on Toxics is a project of the Alaska Conservation Foundation. These comments were prepared by Pamela Miller, Project Director. Ms. Miller has been a member of the Adak Restoration Advisory Board since its inception. She is a biologist with a masters degree in environmental science and has over 20 years experience in research, marine education, and advocacy.

Thank you for the opportunity to comment.

WRITTEN COMMENTS FROM FISH AND WILDLIFE SERVICE AND RESPONSES

The US. Fish and Wildlife Service (Service) has reviewed the Proposed Plan for Cleanup Action at CERCLA Sites on Adak Island, January 1998, and the Proposed Plan for Cleanup Action at Petroleum Sites on Adak Island, January 1998.

Please be aware, however, that Service policy on contaminants and unexploded ordnance on former military lands is currently undergoing a national review. That review could cause changes in our position before the Record of Decision is signed.

We are also acting upon the assumption, based on our participation in the BRAC Environmental Cleanup Team (BECT) process, that much of the current Navy withdrawal will be traded to the Aleut Corporation in the near future and will be removed from the refuge. If that assumption proves false, the Service will revisit these comments.

Although the Service is the landowner and land manager of Adak Island, it is not a signatory to Federal Facilities Agreement guiding the CERCLA process for Adak. Since we are not a formal member of the Remedial Project Management group with the Navy, the EPA, and the State of Alaska, we appreciate the opportunity to provide input through the BECT process.

<u>*CERCLA Proposed Plan:*</u> *Generally, we are not supportive of the extensive use of institutional controls on Adak that the Navy is proposing as a remedy for many of the contaminant issues. We are uncertain how effective they will be in the future since no government entity is currently in place on the island to enforce them. The efficacy of institutional controls and our concerns have been discussed extensively at the BECT meetings. We are restating them for the record at this time.*

We are also concerned that institutional controls do not protect the wildlife on island from ingesting contaminants. The same fish and shellfish that humans are eating are also being eaten by the sea otters, seals, and eagles on the island. If significant levels of contaminants such as PCB's are entering the food chain, they will continue to do so whether or not institutional controls are in place. Organochlorines such as PCBs are known to affect reproductive success, which means that PCBs in the food chain can, in time, affect wildlife populations and their ability to maintain themselves.

Response: The institutional controls referred to are assumed to be the fish and shellfish harvesting restrictions and they will not affect potential ecological exposure to tissue-borne contaminants. The RI/FS showed that PCBs were detected in aquatic biota in all four of the receiving water bodies (i.e., Sweeper Cove, Kuluk Bay, Clam Lagoon, and Andrew Lake). Results of the ecological risk assessments did not suggest that PCBs detected in this biota were a risk to the aquatic biota themselves or animals that forage on them. In addition, studies conducted outside the RI/FS have not clearly demonstrated PCBs are negatively impacting marine bird and mammal populations on Adak, Therefore, remedial action to address risks to marine birds and mammals is not required. PCB concentrations in sediment in Sweeper Cove and Kuluk Bay did not exceed 1 ppm. Concentrations of PCBs below this level would not pose an unacceptable ecological risk according to Washington State Sediment Management Standards that were used to define the cleanup level for PCBs in sediment in Sweeper Creek. Therefore, dredging is not warranted.

Specific comments:

- *We support the covering of the landfill, SWMU 4.*

- *We support the characterization of contaminants and their removal at the Power Plant, SWMU 17.*

- *We support the removal of ordnance wherever possible, particularly when we are not certain that institutional controls will be effective in preventing people from accessing these sites. We are aware of the effort the Navy has expended in clearing the downtown area and we believe there is very little, if any, risk remaining of unexploded ordnance in this area. Since this is an issue under policy review at this time, we will withhold any remarks on the Service accepting lands with "non-digging" institutional controls for unexploded ordnance.*

- *We support the characterization of contamination in Sweeper Creek and removal of contaminants.*

- *We urge that the same characterization be implemented at Sweeper Cove. As you know from BECT discussions, we do not believe that what we see as the major issue on Adak, the extent of PCB contamination and its impact on the wildlife, has been addressed. In addition, ineffective institutional controls are not protective of the human population. Adak inhabitants have been and will continue to fish in the Cove in spite of the fact that signs have been in place for years forbidding the taking of fish. Therefore, we do not support the preferred alternative for water bodies such as Sweeper Cove.*

The remedy to this situation is for the Navy to perform a statistically appropriate characterization of contaminants in Sweeper Cove prior to proposing a remedy. Institutional controls and monitoring do not determine whether there is a problem. In our discussions of biological monitoring at BECT meetings we have emphasized the need for a good characterization of "hot spots" for identification and removal as well as providing a baseline for monitoring. It is also possible that a good characterization may reduce or eliminate the need for monitoring.

Response: The Navy will collect and analyze additional fish and shellfish tissue in Sweeper Cove. We believe that the institutional controls will be effective for the water bodies. Fishing will not be prohibited. There will not be a limit on catching the salmon because they are not resident fish in Sweeper Creek, Sweeper Cove, or Kuluk Bay. The institutional controls will recommend limits on bottom-dwelling fish such as rock sole. The highest unacceptable cancer risk is that for every

1,000 people who subsist (126 grams per day) on rock sole (bottom-dwelling fish) in Sweeper Cove over a period of 30 years, one person may contract cancer. It is anticipated that contaminants will decrease with time, and now that PCB sources have been remediated, it is anticipated that cleaner sediments will be deposited over existing sediments, resulting in lower concentrations in the food chain. Results of the fish and shellfish monitoring will help identify locations of "hot spots."

Lacking characterization, we insist that the monitoring plan include a definite time frame for reviewing results to determine whether further action is required.

Petroleum Sites Proposed Plan*: We are aware that the Navy has expended a great deal of time and effort to remove sources of petroleum contamination on the island. We are also aware that the Navy is greatly handicapped in their efforts to remove the contamination by the poor condition of the petroleum infrastructure. The aged infrastructure, coupled with the amount of fuel which continues to be handled on the island, has resulted in a large amount of residual fuel in the soils and in the groundwater.*

- *We agree with the free product recovery proposed for fourteen sites. We are aware that the Navy has also invested money and effort to install a free product recovery system for the housing area and we would like to see that continue as long as product is being recovered.*

Response: The Navy is committed to continuing the free-product recovery to the maximum extent practical. Once free-product recovery is completed for a site, the site will be re-evaluated in a manner consistent with the focused feasibility study, and recommendations for additional actions, if warranted, will be made. Monitoring results will be reviewed at no more than 5-year intervals.

- *We are concerned about the proposed remedy of natural attenuation for the majority of the sites. To our knowledge, no treatability study has been done on island proving that natural attenuation is an effective remedy for Adak. Natural attenuation does not appear to have been effective at many of the WWII sites we have on other islands such as Great Sitkin. We suggest that treatability studies be done on island to test the effectiveness of both natural attenuation and enhanced bioremediation. It is possible, as has been demonstrated elsewhere in Alaska, that enhanced bioremediation is the necessary remedy.*

If natural attenuation remains the preferred alternative after public and agency review of the plan, we insist on a monitoring plan which includes a specific time frame for review of the progress of remediation, actions which will be implemented if remediation is not proceeding according to schedule, and a clear agreement as to what constitutes success.

Response: Bioremediation has been successfully implemented at Adak, which would suggest that natural biodegradation is viable on island. In addition, the Navy's literature study for the region has indicated that natural attenuation of petroleum constituents is viable.

In addition, it should be pointed out that the monitored natural attenuation and institutional controls alternative has been reserved for sites where the extent and magnitude of petroleum-affected media are small. It is the conclusion of the Navy that the monitored natural attenuation and institutional controls alternative should be selected at these sites for two reasons: (1) It will cause the least amount of disturbance to the natural ecosystems that flourish at many of these sites. Most other alternatives include intrusive actions, heavy equipment movement, and other activities that would damage or destroy the natural setting of the site. (2) The benefit of active remediation would be outweighed by the damage that would be done at the site. For instance, 23 sites were retained for this alternative because the petroleum concentration exceeded criteria at only one sample location out of the entire site. At an additional 14 sites, none of the petroleum concentrations exceeded criteria, but the site was retained because it was less than 200 feet from a water body. In both these cases, it is believed that the damage that would be sustained from an active remediation would far outweigh the benefit.

The monitoring component of this alternative will ensure not only that off-site migration and possible downgradient impacts are not occurring, but also that natural attenuation is providing adequate long-term protection of humans and the environment. This monitoring plan would include pre-defined intervals for evaluation of the sampling data and re-evaluation of the effectiveness of this alternative. The agreement for SAERA sites includes revisiting remedies if plumes do not shrink as expected.

As is the case for all contaminants, we urge that every effort be made to remove the source rather than relying on institutional controls to eliminate the pathway from contaminant to receptor. It is a fact that Adak Island, in the absence of the Navy, becomes once more a basically residential and recreational site for humans and a wildlife refuge. Institutional controls are not generally acceptable remedies for such sites in the continental United States.

Response: The Navy recognizes its responsibility to ensure the effectiveness of all elements of the cleanup actions taken at Adak sites, including institutional controls aimed at reducing risks to acceptable levels. The process for removal of such institutional controls will be developed based on mutual agreement among regulatory agencies, the Navy, and stakeholders (including future landowners).

We wish to reemphasize that Service policy for contaminant cleanup and unexploded ordinance on former military lands is presently undergoing review. We also emphasize that these comments are based upon the assumption that Adak Naval Station will be transferred out of the refuge.

We appreciate the opportunity to comment on these documents. Please feel free to call me at (907) 235-6546 or Sonce De Vries, Environmental Contaminants Specialist, Anchorage Field Office at (907) 271-2781 if there are any questions.

COMMENTS FROM THE COMMUNITY OF ADAK AND RESPONSES

*Comments that are identified with an asterisk are not necessarily related to the Proposed Plans; however, the Navy has provided responses to those comments. Comments not related to the Proposed Plans were not considered in arriving at the selected remedial actions.

Testimony of the Community of Adak to the US Navy, Environmental Protection Administration, State of Alaska Department of Environmental Conservation, Adak Restoration Advisory Board Adak Reuse Corporation Aleutian Pribilof Island Association and the Aleut Corporation regarding the proposed Base Closure Plan for former Naval Air Facility Adak.

The Community of Adak, acting as a pre-incorporation community association, working with the Adak Reuse Corporation, submits the following comments to the US Navy's suggested BRAC Base Cleanup Plan.

As you will see from the paragraphs listed below, the community is concerned about past Navy use of Adak and the impacts to the community as a result of those past uses. Specifically, we have major concerns over the adequacy of remediation efforts to date, the lack of independent verification of Navy opinions, the potential problems associated with Sweeper Creek, and polluted sediments in Sweeper Cove, decisions regarding remediating landfills, the difference between proper action and legally required cleanup actions and the lack of concern over the most threatening and dangerous hazards—the "Rommel Sticks"/barbed wire and verification of potential chemical weapons disposal in the area. The community also expresses concern over Navy tactics to compel acceptance of their cleanup plan or face lengthy delays in being allowed to bring families to the downtown area and ramp-up of commercial leasing. It is unfair to link these two issues. We request revision of the Base Cleanup plan to provide a nominally clean community and the immediate ability to start reuse of Adak immediately.

The community appreciates the willingness of the Navy to accept these comments. We would like to express our appreciation to Navy personnel for holding a meeting on Adak. We specifically recognize those who tried to come to Adak during the week of January 26th to hold a public hearing on Adak.

We look forward to working with Navy and independent environmental planners in the future to address the below listed concerns.

Response: The Navy is pleased to respond to these comments. The Navy notes that the comments were faxed from The Aleut Corporation fax number, (907) 563-4328. It is not clear who comprises the island residents as the comments do not indicate an author, there is no signature, and no list of individuals subscribing to the comments is provided.

All cleanup plans for work done on Adak have been reviewed independently by regulatory agencies and are not based on Navy opinion. Many of the specific concerns are addressed on a comment-by-comment basis below. Issues that are not related to the Proposed Plans are being handled under the ongoing Base Closure and Realignment Act process.

Please note that the island residents have had the opportunity to participate in the cleanup process. There are members of the Restoration Advisory Board (RAB), including the co-chair, who represent The Aleut Corporation; these members should share information between the Navy and the group they represent. RAB representatives are responsible for a two-way communication between the entity they represent and the Navy. According to the Naval Air Facility Adak Restoration Advisory Board Chapter and Bylaws established and signed by all RAB members:

I.V.A.1.d. One member will represent each government entity or community...

I.V.A.1.f Members will report to the groups they represent and serve as a conduit of information between the community and the Navy.

1. *The community would like to point out that due to past personnel changes since 1995, the community on Adak has not had a formal (or informal) briefing from the Navy on environmental plans on the rationale leading to certain remediation methods over other alternatives. We therefore appreciate the opportunity to now express our opinion to you about your Base Clean-up Plan.*

Response: It is not clear who is providing the comment and who has not been briefed. At RAB meetings briefings have been given regarding environmental plans for remediation and numerous documents are available for review at the information repository at the University of Alaska library in Anchorage. The RAB members who are representatives of the island residents have the responsibility of keeping their constituency informed about the issues presented at the RAB meetings. Most people working on Adak are employed either directly by the Navy or under a contract to the Navy and have access to the information repository in Anchorage during rotational trips from Adak to Anchorage. The Adak RAB has never rejected a request for membership. The Navy has always provided documents to anyone who requests them. Anyone may leave a request for information or specific documents on the Navy's toll free line at 1-800-360-1561.

2. *The community wants to state for the record that it believes that more out-reach to the Adak community should have been made. It has been very difficult to understand the decisions being made by the Navy and the RAB due to the great distance between Adak and the RAB meetings in Anchorage. We need to participate in the RAB meetings and the Navy should allow us to participate even by teleconference. We understand that we are a newly-formed community, but we request a seat on the RAB.*

Response: Since 1994, before Navy departure from Adak, the Navy has made intensive efforts to establish a RAB on Adak with no response. In response to this, and the inability of both the Army and Air Force to generate RAB interest in the Aleutians, the Navy entered into a partnership with the Coast Guard and the Army to establish an Aleutian-wide RAB. This effort did not receive positive community interest.

Immediately after Adak was proposed for closure, the Navy was able to successfully establish a RAB in Anchorage. The active Navy left the island in May 1997, and procured a caretaker contractor to assist Navy engineers in drawing down island infrastructure. There was no established community on Adak at this time.

In the fall of 1997, some Navy contractor personnel expressed an interest in becoming permanent residents should reuse occur. These individuals elected a community council, although no formally recognized community yet exists on Adak. Nevertheless, all information in the environmental repository has been and is available on Adak to read for all interested parties. In addition, all requests for environmental information made in monthly LRA meetings and weekly teleconferences (in which on-island Adak reuse personnel have participated) have been responded to.

The island residents have been represented at RAB meetings through The Aleut Corporation participation. The Navy has no objection to telecon participation and welcomes the participation of island residents.

It is the opinion of both Alaska DEC and EPA that the Navy has met community relations requirements.

3.[*] *The community would like to continue to express its concern that the Adak Reuse Corporation has been continuously denied participation on the BECT even though their LRA "predecessor" was invited to attend the BECT meetings. We believe that the quality of public involvement would have been greatly improved if there had been one non-regulatory agency, speaking for the reuse of Adak, on the BECT meetings.*

Response: The ARC has never been denied the opportunity to participate in the BECT meetings. However, their participation could have precluded them from participating in competitive bidding for Navy contracts that involved environmental cleanup work. Two representatives from the RAB were selected to participate in the BRAC Environmental Cleanup Team meetings.

4. The Community has many unanswered questions about the Federal Facilities Agreement entered into between the Navy and the State of Alaska - and any modifications to that agreement. We understand that this was negotiated prior to the departure of the "active" Navy, but we will be living with the concepts and decisions which are contained in this agreement. We request a detailed briefing about what that agreement contains and how it will impact this community when the Navy ceases active remediation, and how we get the Navy to respond to sites which were inappropriately dropped from consideration or are newly found.

Response: The Federal Facilities Agreement can be reviewed in the information repository to help answer some of your questions. The Federal Facilities Agreement identifies sites to be investigated and sets forth the process that the parties will use, such as the preliminary source evaluation (PSE) process and the remedial investigation/feasibility study (RI/FS) process. Briefings about the Federal Facilities Agreement contents and plans for cleanup have been presented and discussed at the RAB and partnering sessions at the request of The Aleut

Corporation and the RAB. Adak residents have the same options available to them as do other U.S. and State of Alaska citizens to insist on enforcement of all state, federal, and local environmental regulations. The Federal Facilities Agreement and State-Adak Environmental Restoration Agreement (SAERA) do nothing to reduce these options. Newly discovered sites may be reported to the EPA hotline number at (800) 424-8802 or to the Region 10 office at (206) 553-1263. Both numbers are staffed 24 hours a day. Newly discovered sites can also be reported to DEC's spill response hotline at (907) 269-3063.

5. *We hold similar concerns regarding the State of Alaska, Adak Environmental Restoration Agreement. What has this done to establish the framework for remediation and how does it work in the future.*

Response: The State-Adak Environmental Restoration Agreement (SAERA) can be reviewed at the information repository in Anchorage. This agreement, which is a companion document to the Federal Facilities Agreement, lists petroleum sites to be investigated and sets forth the cleanup process that the Navy will use, If petroleum contamination at a site exceeds certain criteria, then the site is evaluated through the focused feasibility study (FFS) process, as created under SAERA. This process establishes the remediation to be used to clean up the sites. Requirements for completion of the remediation will be explained in the Record of Decision and/or monitoring plan.

6. *The Community of Adak would like some input into decisions about the standards used to say when a polluted site is cleaned up.*

Response: The remedial goals, or cleanup levels, are based on human health and ecological risks for CERCLA sites and state criteria for petroleum sites. Additionally, the Navy will comply with applicable state and federal cleanup levels. One of the nine evaluation criteria is state acceptance.

7. *The Community requests a formal briefing with regard to the thinking of regulators when they approved the covering of "metals" landfill. Our understanding is that there was sufficient indication of potentially dangerous items in the dump to justify removal of its contents, off-island as the best alternative for the community. We would like to see empirical evidence, evaluated by independent sources which support the decision to cap it and leave it on Adak.*

Response: The Record of Decision published in February 1995 for the interim actions at Metals and Palisades Landfills is a matter of public record and is available at the information repository in Anchorage. The Proposed Plan (dated April 1994) for these interim remedial actions was presented at public meetings in Anchorage and Adak prior to finalization of the Record of Decision. The Navy has met its obligations required by regulations. Monitoring results since the completion of these interim remedial actions are also available for review in the information repository. In summary, the groundwater monitoring results show a decrease in the number of chemical concentrations that exceed human health or ecological risk-based screening criteria. Four rounds of groundwater sampling have occurred since the closure of the landfill in the summer of 1996. The number of exceedances were 25, 11, 11, and 10 in the four sampling rounds completed in July 1996, November 1996, May 1997, and December 1997, respectively.

This trend supports the adequacy of the interim remedial action. Without evidence that the interim remedial actions are failing, no further briefings are planned.

8.[*] *The community notes the number of times which the Adak Reuse Corporation has requested direct evidence that the Chemical Warfare Munitions Dump located to the north of Adak does not pose a threat to sealife or people in the region. We strongly request that the Navy fund an independent team to evaluate the site physically - even to tell us if there's a supertanker full of Lewisite about to rust through and decay. We do not accept the Navy's refusal to physically investigate this dump site as being acceptable to the community.*

Response: As has been discussed at many previous RAB and other meetings, the "Chemical Warfare Munitions Dump" site is not being evaluated or remediated under the agency authority for the CERCLA site at NAF Adak. Responsibility for investigation of this site rests with the Army Corps of Engineers' Formerly Used Defense Site program. Discussion of this program has been provided at RAB meetings, which the authors of these comments have attended.

9. The community notes that the Navy can't account for two tons of chemical munitions which are unaccounted for and possibly "lost" on Adak. We request that the physical characteristics of the containers be included in the briefing given to Adak inhabitants. We request that more work be put into interviewing Navy personnel who remain alive, who might have some information leading to the conclusion that the gas is off or on Adak.

Response: Extensive investigations have been conducted in the form of on-island site inspections and archival searches of sources of records and information regarding the use and disposal of chemical warfare material on Adak. Sites that had a potential connection with chemical warfare material were designated as SWMU 94. These investigations have been conducted by URS Greiner, Foster Wheeler, and the Army Corps of Engineers, and are summarized in reports that are on file in the information repository. The RAB has been briefed on these reports on many occasions. The summary conclusion of these investigations is that there is no known existing disposal area for chemical warfare material on the northern half of Adak Island. Ex-military personnel who worked on Adak during World War II were interviewed in 1998. No new information from the interviews contradicts previous findings. The Navy stands behind the adequacy of the investigative efforts it has made regarding this issue.

10. The Community is very concerned about the design of the closure of Robert Landfill being predicated around the premise that there were no UXO's in the landfill. We have all learned that UXO's have been found in the landfill. We believe the design of the landfill closure would have been very different had regulators taken the conservative view, and even though no UXO had been reported, designed the closure in light of the reality of UXO everywhere on Adak. We request that an independent team be contracted at Navy expense, by the community of Adak, or the Adak Reuse corporation or Adak RAB, to design a landfill closure based upon the fact of UXO's having been found in and around the landfill. Does the current design meet our current knowledge of the high probability of ordinance in the landfills on Adak? What is the design life of the liner or *capping? Has erosion and seismic shaking been designed into the remediation plan for the landfills? We would like to have these details answered before the design is accepted for the landfills on Adak.*

Response: There is no basis to believe that the design for closure of Roberts Landfill would have been modified based on the discovery of the ordnance items discovered. The closure design for this state-permitted landfill was prepared by professional, licensed design engineers and approved by the State of Alaska solid waste program, and is considered conservative. Upon completion of the closure of the landfill, the site will be restricted from future development with appropriate fencing, signage, and zoning. It would be cost-prohibitive and probably technically infeasible to survey and clear the landfill site for ordnance materials. Any attempt to do so would likely result in an overall increase in risk associated with exposure to physical and chemical hazards associated with the contact with landfill contents. Groundwater is being monitored for indicator compounds that would identify a release from the landfill. Ordnance materials on Adak will be further evaluated under the OU B Record of Decision.

11. *The community objects to having to accept an imposed plan for remediation or be denied a chance to create a new and sustainable community by the time the Navy leaves in October. The two goals - creating a new and sustainable community on Adak and proper environmental remediation should stand separate and apart from each other.*

Response: There is currently no environmental issue that precludes reuse in the developed area for the ways that this area has been used in the past. The Base Closure and Realignment Cleanup Plan has made every attempt to incorporate the latest reuse proposals into remedial decisions. Navy is not aware of any formal reuse plan put forward by the community which is incompatible with Base Closure and Realignment Cleanup Plan.

12. *The community requests that regulators establish a bias for active and direct petroleum remediation. The community is reticent to accept passive attenuation given the 3 foot depth of product by Steam Plant 4 and the 1.5 foot depth of product near Yakutat hanger.*

Response: The Navy and Alaska DEC have committed to recovery of free product to the maximum extent practical (feasible) prior to re-evaluating the site under the focused feasibility study process. The Navy is continuing free-product recovery efforts. The Navy has also removed surface soils and capped the remaining surface of the old asphalt batch plant (SWMU 74).

13. *We understand that the Navy has committed to remove and restore the WWII minefield located to the north of Clam Lagoon. We thank you for that decision.*

Response: Clearance of the minefield began in June 1998, and was completed by the end of the 1998 field season.

14. *The community is concerned that the Navy has not performed adequate sampling and analysis required to demonstrate that intensive commercial use or dredging of Sweeper Cove in the future will not be hampered. We request an independent sediment sampling program be established to prove to USACoE and State regulators that there are, or are*

no future use concerns associated with pollutants trapped in sediments of Sweeper Cove. The community is greatly concerned that the low level of contamination of Sweeper Cove has not been adequately investigated. We request funding for an independent sampling and analysis program to be conducted by the community of Adak, Adak Reuse Corporation, or the Adak RAB.

15. *The community request removal of contaminated sediments within Sweeper Cove which, after independent analysis and assessment, are deemed to interfere with the expected use and development of the petroleum facilities, port facilities or community as a whole.*

Response to 14 and 15: The CERCLA process evaluates and remediates unacceptable risk; it does not ensure commercial use. This CERCLA evaluation of the sediments in Sweeper Cove was conducted in a manner consistent with EPA guidance using procedures and methodology designed to obtain data of sufficient quality upon which to base cleanup decisions. EPA, Alaska DEC, and U.S. Fish and Wildlife Service participated in the development of this investigation and serve as independent reviewers to ensure the adequacy of the investigation.

Regarding the reference to dredging of Sweeper Cove, in the absence of a specific reuse plan describing the basic nature and purpose of the dredging, it is not possible to respond to the concern in any meaningful way. Existing exposure pathways are evaluated in the *Remedial Investigation/Feasibility Study Report.*

It should be noted that the Navy is planning to perform additional monitoring of Sweeper Cove to demonstrate the effectiveness of the selected remedy for the approach.

16. *The community requests that Metals landfill be removed or the monitoring of ground water and leachate be considerably expanded to include a broad spectrim of pollutants associated, or reasonably likely to have been associated, past Navy use of the landfill.*

Response: Groundwater samples have been and will be analyzed for total inorganics, dissolved inorganics, volatile organic compounds, semivolatile organic compounds, pesticides, and Aroclors. If there were a release of contaminants, one of the chemicals in these chemical classes should be detected, The Navy's continued monitoring of Metals and Palisades Landfills is evidence of the adequacy of the interim remedial action at these sites. These monitoring efforts are based on detecting contaminants likely to be associated with the landfills. Monitoring results can be reviewed in the *Preconstruction Sampling Results for Metals Landfill* and the *Technical Memorandum 1997 Annual Landfill Monitoring* documents in the information repository. All sites being monitored will be evaluated at least every 5 years to review the adequacy of the remediation.

17.* *The community would like to confirm that all housing area broken fuel pipelines will be remediated so that future development will not be hindered by decaying pipes which collapse and cause a hazard to the safety of the community.*

Response: The Navy intends to close and clean all underground housing area fuel lines in 1998. In preparation for this action, the Navy is installing aboveground fuel tanks on all Sandy Cove houses. The Navy is not aware of any broken pipelines in the housing area.

18. *The Community requests that the navy establish a drainage monitoring program of all runoff waters which pass through a drainage containing a remediation or polluted site to ensure no future contamination of our natural resources.*

Response: While the Proposed Plan does not envision a monitoring program specifically targeted at stormwater, a monitoring program that demonstrates the effectiveness of cleanup at various sites is envisioned. This monitoring plan will address the concern expressed regarding future contamination of natural resources. At many sites, this monitoring is already being performed. Stakeholders are invited to provide input on the final monitoring plan, which will be developed as part of the post-ROD remedial design for Adak.

19. *We requests that the Navy implement remediation processes and procedures which will assure the community that groundwater will be restored to drinking water quality within 10 years from the date of the Navy's departure from active military operations on Adak.*

Response: Aside from contamination issues, it is not certain that the groundwater at Adak could ever support drinking water use due to possible salinity and available volumes. This issue aside, groundwater has never been used as a drinking water source on Adak and there is no reason to believe that it will be in the future. There is an abundance of high-quality surface water and an existing utility infrastructure for distribution to users on Adak. The lakes that have served as a drinking water source are Lake Bonnie Rose and Lake DeMarie, located approximately 2.5 and 1.5 miles southwest of Sweeper Cove, respectively.

20.* *The community requests that the Navy establish a clean up program sufficient to allow the construction of housing and new subdivisions in the area outside of the runways. (Specifically on slopes facing the downtown core area.)*

Response: The comment has no direct relationship to the Proposed Plans for Adak. In the absence of a specific proposed location for this development, it is not possible to comment on the suitability of the proposed site for the development.

21. *We request all former landfills to be monitored for evidence of the full spectrum of possible hazardous material waste streams as well as structural integrity and functionality of the impoundment.*

Response: The Navy's evaluation of these sites included the "full spectrum of possible hazardous material waste streams" that might have been disposed of at these sites. If chemicals were not at a level of concern after several sampling events at these former landfills, then the Navy does not believe future monitoring is necessary. The need for remedial action and long-term monitoring at these sites as described in the Proposed Plan is based on the results of these investigations.

22. *The community is concerned by the frequent use of the word "impractical" in Navy Environmental decision making. Any use of the word "impractical" should allow independent verification by those who will be negatively impacted by the decision. For example why specifically is it considered impractical for the Navy to perform a surface scan of the area outside of the downtown area for "Rommel Sticks" and discarded UXO?*

Response: Since these comments were submitted, the Navy and agencies have agreed to remove ordnance materials from the Proposed Plan and establish a separate operable unit for investigations and remediation of ordnance materials contamination. Rommel stakes are not a subject of the CERCLA or petroleum Proposed Plans and should be addressed as a separate reuse safety issue.

23. *The community requests a copy of the environmental, UXO and "Rommel Stakes" risk assessment for Adak before it closes the public record associated with this Record of Decision.*

Response: The latest version of the *Reuse Safety Plan* contains this information and will be made available in the information repository as well as on island. UXO and ordnance explosives issues will be evaluated, in OU B.

24. *The community requests that the Navy support the Adak Reuse Corporation with funding for reviewing remediation plans and providing an independent review of all the work that has been done to date - to ensure the safety of the base to the community.*

Response: Community organizations can apply for EPA Technical Assistance Grants and Department of Defense (DoD) TAPP grants for independent review of environmental cleanup actions (excluding RABs). These applications must be made through EPA and DoD, respectively. Adak Reuse Corporation representatives are members of the RAB, and this information has been provided to the RAB.

25.* *The community notes the requirement for an EIS under BRAC closure regulations. The community has heard that the Navy had set aside funds for an EIS yet subsequently choose to not consider Adak a BRAC closure. We suggest that the navy should be consistent with its treatment of Adak's closure. You can't use BRAC procedures for all aspects of remediation standards and base closure process - and then casually say "We don't need to follow BRAC's requirement to do an EIS prior to transfer." Either call it a non-BRAC closure as was written in the draft base closure plan, and do away with BRAC standards (including standards relating to asbestos remediation), or call it a BRAC closure and perform an EIS prior to transfer. The EIS is important for several reasons:*

   a. *It's the only part of base closure planning - which allows independent criticisms to be addressed and appealed. Without it, we only have what the Navy, EPA or ADEC chooses to share with us. An EIS would, in the worst case, allow an independent party to determine what information should be released, and not just the Navy.*

b. *It is the only vehicle to address the impacts to the region with regard to reuse alternatives. It would allow citizens in the region to understand your plan and its impacts to the region and the impacts of reuse alternatives.*

c. *An EIS allows the closest adjacent community to Adak, Atka, to have information about the impacts to their community as a result of past Navy actions on Adak, and the range of reuse alternatives and remediation alternatives under consideration. Atka and Adak are jointly impacted if the chemical munitions dump pollutes the fish in the area, or Sweeper Cove leaches pollutants. We all saw what happened to fish sales and fish tax revenue (the two most important sources of revenue for the whole community of Atka) when we had a pollution incident in Prince William Sound a few years ago.*

Response: The decision not to conduct an EIS was based on Council on Environmental Quality regulations implementing the National Environmental Policy Act. These regulations provide for categorical exclusions for actions that do not have a significant effect on the human environment; therefore, an environmental assessment or environmental impact study is not required. Generally, categorical exclusions include actions with primarily economic or social effects.

The Department of the Navy has codified categorical exclusions; they are published in OPNAVINST 5090. 1B dated 1 November 1994. The Navy's relinquishment of its public land withdrawal from Adak is excluded from environmental assessment or environmental impact study analysis pursuant to Categorical Exclusion Number 23 (return of public lands) and Number 19 (transfer of real property to another federal agency). Accordingly, an environmental assessment or environmental impact statement has not been prepared and none is planned.

The CERCLA process provides for public participation and involvement. In this regard the U.S. Department of Justice has determined that the public participation requirements of CERCLA are the functional equivalent of the National Environmental Policy Act.

27. We request that the Navy remove anti-personnel stakes and barbed wire from the north end of Adak. They are a hazard to the safety of children, hikers and tourists and to members of the community of Adak. A single surface scan by metal detectors had a +90% success rate in finding these hazards in spite of 50 years of grass and tundra. These hazards must be removed. We request a formal review of the anti-invasion, defensive plans of the army and military in WWII and later years, including the mapping of probable anti-personnel defenses We request the surface scan and removal of these anti-personnel devices as a high priority in this Base Cleanup Plan.*

Response: Rommel stakes should be addressed as a separate reuse safety issue because this subject is not part of the CERCLA or petroleum Proposed Plans.

28. The community wants to go on record opposing the Navy's "all or nothing" position regarding asbestos. There are hundreds of asbestos laden buildings that will not be *reused in even the highest reuse scenario, yet it appears that the Navy is requiring The Aleut Corporation, and this community to accept responsibility to clean these up in the future. No community or private company could practically or legally accept that future liability.*

Response: DoD policy requires the Navy to comply with all existing environmental laws and regulations upon property transfer. Facilities with asbestos-containing materials will comply with these regulations upon transfer. It is the choice of The Aleut Corporation to choose to receive Adak.

29. *We have a concern that because of past Navy actions on Adak, we will have to pay for and conduct UXO scans/analysis for any digging, or new roads anywhere on Adak (except within the downtown area.) The community requests that the Navy establish a fund to pay for UXO required surveys in the future. We should not be penalized for past Navy actions on Adak.*

Response: All aspects of UXO and OE on Adak will be re-evaluated in Operable Unit B, a recently created operable unit. The Navy is addressing ordnance in accordance with Department of Defense Explosive Safety Board and CERCLA requirements. Deed restrictions, covenants, and institutional controls will be enacted in a manner so as to protect human safety and not to preclude reuse as currently envisioned. Further, both the Adak Reuse Corporation and the RAB have formally endorsed the ordnance Reuse Safety Plan.

UXO surveys and dig permits may be part of the institutional controls proposed for Adak. Under the current land exchange agreement being discussed among Department of Interior, The Aleut Corporation, and the Navy, The Aleut Corporation can elect not to go forward with the land exchange if The Aleut Corporation does not wish to abide by institutional controls. The Navy has no plans to establish a fund to pay for UXO surveys for future development.

30. *The community requests that the Navy's proposed institutional controls for environmental and UXO's <u>not interfere</u> or prohibit the reuse of Adak by forcing the community to implement or enforce the controls.*

Response: The Navy intends to dispose of Adak with controls that mandate community responsibility in adhering to those controls. The Navy will monitor adherence to those controls. Should the community decide to take development actions that go beyond these controls, the community will be responsible for ensuring that all actions necessary to remove or appropriately mitigate those controls are taken. Navy is not aware of any formal reuse plan put forward by the community that is incompatible with institutional controls expected to be required because of potential ordnance contamination.

31.[*] *We object to the proposed level of contamination remaining in the downtown area which would not allow reuse for residential or child care purposes. We request that the downtown area be remediated to allow for construction and operation of residential and childcare facilities.*

Response: Navy is not aware of any formal reuse plan put forward by the community that suggests the need for development of additional residential or childcare facilities on Adak outside the areas where such uses will be permitted. Ample sites exist in the downtown Adak area for these facilities in areas where no land use restrictions related to environmental contamination are envisioned. The reuse community will be able to establish childcare facilities in existing residential and other areas, such as the schools and Housing Recreational Center. Industrial areas that are normally inappropriate for day care, or that may be otherwise precluded because of Housing and Urban Development regulations, are not recommended for childcare facilities.

32. *The community requests that the Navy continue to research technology to remediate environmental contamination so that all institutional controls and deed restrictions are eliminated by the year 2010 as a date certain.*

Response: The Navy plans to perform technology reviews every 5 years to determine if there are new technologies practical to use at UXO sites. In addition, the Navy plans to perform 5-year reviews to ensure the adequacy of cleanup actions at sites where hazardous wastes are left in place.

The Navy recognizes its responsibility to ensure the effectiveness of all elements of the cleanup actions taken at Adak sites, including institutional controls aimed at reducing risks to acceptable levels. The process for removal of such institutional controls will be developed based on mutual agreement among regulatory agencies, the Navy, and stakeholders (including future land owners),

33. *The community requests information about PCB laden fluorescent ballasts. Where were they found? Are any still on Adak? If so, where?*

Response: The Navy has an ongoing management program to address PCB-containing items in accordance with TSCA. TSCA does not regulate the disposal of non-leaking, intact capacitors that contain less than three pounds of PCB dielectric fluid. There are likely no records regarding light ballasts on Adak.

34. *The community desires to know more about how the JP-5 Plume was measured and delineated. We request that the Navy fund the Adak Reuse Corporation to help the community understand the information which led to the current estimate of the underground JP-5 plume.*

Response: Presumably, the JP-5 plume referred to is the housing area fuel release. The plume was measured and delineated by installing over 100 monitoring wells. Selected wells have been monitored monthly since January 1996. The recovery system includes 25 recovery wells and 4 treatment units. For those who desire more details and related data, one can refer to the following documents:

EMCON Northwest, Inc. (EMCON). 1994. *Draft Housing Fuel Recovery Project. Corrective Action Report, Naval Air Facility, Adak, Alaska.* Prepared for U,S. Navy, EFA Northwest, Bothell, Washington. October l994.

Foster Wheeler Environmental Corporation (Foster Wheeler) (formerly Ebasco). 1994 through 1997. *Monthly Progress Reports for Delivery Order 0028, Adak Housing Area Fuel Recovery System.* Contract N44255-93-D-4050. Bellevue, Washington. Monthly reports dated January 1994 through June 14, 1997.

Space Mark, Inc. 1997. *Monthly Progress Reports for Delivery Order 0028, Adak Housing Area Fuel Recovery System.* Contract N44255-93-D-4050. Monthly reports dated July 1997 through December 1997.

URS Greiner. 1998. *Draft Site Summary Report, SWMU 62, New Housing Fuel Leak, Adak Naval Complex, Adak, Alaska.* Prepared for U.S. Navy, EFA Northwest, Seattle, Washington. March 1998.

Also, the *Focused Feasibility Study* report includes a site summary report for the housing area fuel spill.

35. The community objects to the current design of the remediation of Palisades landfill. It is an eyesore and needs to be cleaned up. We also have substantial concerns about the present and future materials leaching into the stream and Kuluk Bay which originates from that landfill. The community requests funding and preparation of a formal strategy, plan and process, acceptable to EPA and ADEC to completely remove Adak from the NPL listing by the year 2010.

36. The community requests funding and preparation of a formal strategy, plan and process, acceptable to EPA and ADEC to completely remove Adak from the NPL listing by the year 2010.

Response to 35 and 36: The 1995 Record of Decision for interim remedial actions at Metals and Palisades Landfills and monitoring results subsequent to the interim remedial actions at this site are a matter of public record and support the protectiveness of the remedy. While the visual appearance of the site has improved dramatically since the completion of remediation, improving the aesthetic characteristics of the site is not a CERCLA remedial action objective. According to EPA’s Superfund web site, EPA has followed these procedures for removing a site from the NPL:

- The Regional Administrator approves a “close-out report” that establishes that all appropriate response actions have been taken or that no action is required.

- The Regional Office obtains State concurrence.

- EPA publishes a notice of intent to delete in the Federal Register and in a major newspaper near the community involved. A public comment period is provided.

- EPA responds to the comments and, if the site continues to warrant deletion, publishes a deletion notice in the Federal Register.

37. The community requests evidence that the Navy removed all drums from Metals Landfill before it was capped (or evidence that all drums were certified as empty and cleaned prior to being buried in the landfill.)

Response: Extensive monitoring was conducted prior to and after completion of the interim remedial actions at Metals Landfill. This monitoring provides the necessary objective evidence that no unacceptable risks exist from contamination associated with the landfill. No requirement exists to certify that all drums were removed, cleaned, or certified as empty prior to closure of the landfill.

38. The community requests to see the details of the fence and other monitoring contracts which the Navy anticipates using after transfer before the public record is closed under the RoD.

Response: Work plans are available that delineate existing fencing, monitoring plans, and cleanup actions as well as many other aspects of the cleanup on Adak. These documents are available in the information repository in Anchorage, the administrative record in Poulsbo, Washington, as well as in the environmental office at CSO Adak. The Navy has no plans to "close" the public record or the administrative record supporting the ROD.

39. *The community requests to see the completed Finding of Suitability to Lease and EBS, and have the chance to comment on these completed documents at a public hearing, prior to closing the public record under the RoD.*

Response: The EBS is in the information repository and is available for public review and comment. The Finding of Suitability to Lease is an exhibit to the lease agreement between the Navy and the Adak Reuse Corporation. A copy will be placed in the information repository and will be available to the public for review.

40. The community requests a detailed briefing on the mechanism/process available, and standards for accepting new sites (and for the clean-up of new sites) which are found after Navy departure from Adak.

Response: Newly discovered sites may be reported to the EPA Hotline Number at (800) 424-8802 or to the EPA Region 10 office at (206) 553-1263. Both numbers are staffed 24 hours a day. Newly discovered sites may also be reported to DEC's spill response hotline at (907) 269-3063.

41. *The community requests removal of the asbestos contained in the storage bunkers near Roberts landfill.*

Response: The bunkers containing asbestos have been closed according to a permit amendment between the Navy and Alaska DEC. Because the bunkers are and shall remain inaccessible, there is no health hazard.

42. *The community requests a briefing (and subsequent ability to modify these comments) of the Federal Facilities Agreement's 58 non-petroleum sites needing clean-up.*

43. *The community requests a briefing and ability to alter these comment for the 114 petroleum sites established for clean-up.*

Response to 42 and 43: The CERCLA and petroleum sites have been extensively discussed at previous RAB meetings where Adak residents were represented by several RAB members. The Adak residents were provided a briefing of the Proposed Plans for these sites at the February 25 meeting. Prior to that, numerous RAB briefings were held on this subject with Adak residents represented by several RAB members. Please refer to the response to the introductory comments.

44. *The community would like to thank the Navy for cleaning up some petroleum sites not included in the SAERA agreement.*

Response: Comment noted.

45. *The community requests a briefing (and subsequent ability to amend these comments) of the RI/FS document and its conclusions.*

Response: The *Remedial Investigation/Feasibility Study* report has been discussed at previous RAB meetings that were attended by representatives of Adak residents. The document has been in the information repository for the public's review for more than one-half year.

46. *The community requests a copy of the RCRA 1994 audit which led to changes in the handling of hazardous wastes on Adak, and the formal response to all recommendations contained in that document.*

Response: The Navy assumes you are requesting the document titled *Technical Support of Environmental Compliance Programs at Naval Air Station Adak, Alaska* (May 1994). This document is in the information repository and the administrative record. There is no formal response to the recommendations in the document.

47. *Please help the community to understand what a "focused feasibility process" is and if there is any independent assessment (non-government) of the "feasibility" part of that process. If there was not independent assessment of "feasibility", then the community requests either a peer reviewed process, or the immediate feasibility review by an independent professional source acceptable to the community.*

Response: The focused feasibility process is explained in the *Focused Feasibility Study* report finalized in January 1998, which is available in the information repository in Anchorage. A contractor review was performed by Ecology and the Environment with Alaska DEC oversight.

48. *The community is intensely interested in expedited active clean up of the JP-5 plumes under the housing area. Please <u>actively</u> remediate these areas.*

Response: The Navy has committed to active free-product recovery at this site to the maximum extent practical as stated in the Proposed Plan. To date, approximately 160,000 gallons of free product and groundwater (approximately 15 to 20 percent of the total) have been recovered. Once free product is recovered from a site to the extent practical, then the site will be evaluated under the focused feasibility study process.

49. *The community requests Navy funding for an independent check of the evidence of plume reduction during 1996-1997.*

Response: Alaska DEC will continue to review current and future monitoring plans to document the effectiveness of remediation of all petroleum sites.

50. *Please help the community understand when recovery of spilled JP-5 will be completed in the housing area. As now written it states until it is not "practicable." When is this? Who decides what's practicable? Will the community have input into the definition of "practicability"?*

Response: The end points for free-product recovery at petroleum sites are as follows:

- For active recovery systems that depend on water table depression for recovery, the practical endpoint for recovery will be reached when less than one-half gallon of free product is recovered for 1,000 gallons of treated groundwater.
- Product-recovery systems not dependant on water-table depression, the practical endpoint for recovery will be reached when the volume of recovered product averaged over the most recent 6 months (6-month moving average) is less than 5 gallons per month

51. *The community is concerned that it will have to operate a sewer system which 1. Is regularly inundated with JP-5, and 2. is being used as an additional recovery well. We request that the breaks in the sewer system be repaired prior to transfer.*

Response: The sanitary sewer system is not regularly inundated with petroleum as the comment suggests. Some accidental releases of petroleum to the sewer system have occurred in the past and are not related to breaks in the system as far as we know. These events have never interfered with the normal operation of the sewage treatment plant.

52. *We note that the 3 ½ feet of jet fuel was found in the monitoring well near the steam plant #4 appears not to have decreased from the 1994 level. Is pump and treat working?*

Response: Free product measurements at this site date back only to October 1996. Free product was measured in one location at a thickness of 3.26 feet in Well 04-173 in August 1997. Since then, free-product thicknesses at this well have decreased to 0.0 foot. Free product was also measured at Well SP4-2 at a thickness of 3.18 feet in August 1997. Since then, product thickness at Well SP4-2 in October 1997 was 1.55 feet and the thickness in December 1997 was 0. 3 8 foot. Therefore, it would appear that product thicknesses in these two wells are decreasing. The greatest thickness at any other on-site well monitored since October 1996 is 1.42 feet at Well 04-

155; however, no product has been measured at this well since June 1997. Passive skimmers are currently installed at the site and have recovered about 10 gallons of product since early 1997. A pump-and-treat system is not currently installed at the site, nor has one operated previously.

53. *The JP-5 site near the power plant showed about ¾ of foot of product in 10/97. This is described as a rocky shoreline. Please actively remediate this site to accelerate recovery to keep products from entering the waters of the community?*

Response: It is presumed that this comment is referring to the NORPAC Hill Seep site rather than the power plant site. Free product was measured once in Well 04-146 at a thickness of 0.72 foot in October 1997. That well is located about 100 feet from the Kuluk Bay shoreline, a cobble and boulder (rocky) shoreline. The presence of free product was not confirmed in any of the three monitoring rounds after that round; however, free product has just recently been observed again for the first time since the October 1997 measurement.

Monitoring of the site wells will be continued, however, and recovery actions will be initiated when necessary.

54. *The community is concerned about the statement that "there is a possibility of encountering disposed, abandoned, or unexploded ordinance anywhere on Adak". What is the risk of our kids coming in contact with UXO's outside of the downtown area? What criteria for contact/exposure did the risk assessment use?*

Response: The Navy continues to work with the agencies to characterize the nature and extent of the ordnance materials in Operable Unit B.

55. *The community requests information regarding the disposal of batteries (vehicle and other) on Adak over the last 50 years. When did the Navy start removing them from Adak? Where, and in what concentration, were the batteries left during the past 50 years? What remains?*

Response: It is not possible to account for every vehicle battery that has been used on Adak since World War II. Presumably, prior to regulations concerning the disposal of such batteries, they were disposed of in on-island landfills the same way they would have been at any other municipal landfill at the time. Since regulations concerning disposal of batteries have been in place, the Navy has been managing their disposal as required under the Resource Conservation and Recovery Act.

56. *What was the generation rate of Hazardous Waste for the periods 1980-1985, 1985-1990, 1991-1995 and 1995 to date?*

Response: Hazardous waste on Adak has been managed properly in accordance with RCRA requirements. None of the managed hazardous waste is believed to have contributed to CERCLA releases. The Navy prepares a hazardous waste management report every two years for Adak. These reports are not in the information repository because they are not CERCLA related documents. However, available records on hazardous waste manifested from Adak are available on request from the Environmental Division files at the Caretaker Site Office on island.

57. The community requests that Roberts landfill not receive additional asbestos.

Response: Roberts Landfill is permitted to receive asbestos and will continue to do so in compliance with requirements for operating the landfill as specified by Alaska DEC.

58. The Navy states that all large capacitors have either been removed from Adak or have been remediated. What is a "large" capacitor, and how many (and where) are the smaller ones?*

Response: Please refer to 40 CFR 761 for regulatory definitions of PCB-contarninated items including transformers. Reporting requirements of 40 CFR 761 include annual reporting of PCB transformer disposal. These records are submitted in annual reports to EPA by the Navy as required by 40 CFR 761.

59.[*] We understand that the Navy only abated asbestos where it was a) friable and b) damaged and c) accessible. We request you abate any friable or damaged asbestos which is accessible.

Response: The Navy will meet its obligation to obey existing laws and regulations. The Navy will continue to abate asbestos that meets all three criteria: friable, accessible, and damaged.

60.[*] We request a full briefing and completed report regarding radioactive indications of any kind on Adak prior to closure of the public record on this RoD. We request Navy funding of a security-cleared individual to have independent access to Navy records regarding past radioactive activities and investigations on Adak.

Response: The Navy has made available the report on radiological issues from the Navy's Radiological Affairs Support Office (RASO) dated May 1998. Island residents and other stakeholders are welcome to review this report and provide comments. No separate briefing is planned. It should be noted that there has been no reported release of radiological contamination at any site on Adak, and investigations are being conducted as a matter of Navy policy for Base Closure and Realignment Act bases, not because there is a reason to believe a release has occurred.

61. Please provide records for hydrocarbon intrusion into the storm or sanitary sewer outfall over the last few years and approval for hydrocarbon discharge by regulatory agencies.

Response: Some accidental releases of petroleum to the sewer system have occurred in the past. We are unaware of records that show more instances of petroleum in the sewer system with the exception of accidental release. The Navy's contractor is monitoring a lift station to check for occurrences of petroleum.

62.[*] *We request to modify the focus of the RASO radiation analysis to include an investigation of any current indication of radioactive activity on Adak, instead of the current focus of the analysis to "identify radioactive material that may have been disposed of on island but not recovered".*

Response: No such modification of the RASO investigation is required since there is no indication of a radiological release on Adak to the knowledge of the Navy.

63. *The community requests that all references to "no historical documentation confirming the existence of ordinances in landfills" be changed to reflect the conservative view of "probable disposal of ordinance in Adak landfills".*

Response: The Navy recognizes the validity of the comment to the extent that there is no accurate record of the disposal history for any of the landfills on Adak (or other solid waste disposal facilities in Alaska or the contiguous United States). Given this, it is possible that ordnance materials wastes were disposed of in these landfills. The Navy stands behind the statement that there is no historical or archival documentation confirming the systematic disposal of ordnance in Adak landfills.

64. *The community requests some involvement with modifications to the "Community Relations Plan". We request more than this one opportunity to comment on remediation activities affecting Adak.*

Response: No limitation has been imposed by the Navy on stakeholder input and involvement in the remedial decision-making process on Adak. Island residents have had and continue to have representation at the RAB meetings through the community co-chair and other representatives. The Navy will gladly entertain constructive suggestions to enhance the ability of stakeholders, Adak residents, or others to participate in the community relations program for the environmental cleanup on Adak.

65. *Please distribute fact sheets and newsletters to citizens of Adak.*

Response: The Navy has made efforts to distribute these materials to individuals on island and will continue to do so in the future. The Navy maintains a mailing list and provides fact sheets and newsletters to the people on the list. For example, in August 1998 a fact sheet that explained the creation of Operable Unit B for further evaluation of ordnance sites on Adak was mailed out. Anyone who has not received mailings from the Navy and would like to be added to the list should call 1-800-360-1561.

66. *Please note that the citizens of the community of Adak never had the opportunity to attend the "open house" in 93 & 94 or to discuss closure in 7/95. Everyone, except two individuals, that could have attended those meetings has left the community.*

Response: Comment noted. It should be noted that this same meeting and open house was provided in Anchorage. There was no community of Adak during those times.

67.[*] Please help us understand what the "Biological Technical Assistance Group" is, and what they have discussed in their past meetings on Adak.

Response: The Aleutian Island Biological Technical Assistance Group was formed in 1994 to assist in the planning and interpretation of ecological risk assessments. Biological Technical Assistance Group members include regional ecological experts from the natural resource trustee agencies (e.g., U.S. Fish and Wildlife, National Oceanic and Atmospheric Administration, State of Alaska, and the Navy). The Navy, EPA, DEC, and other State agencies participated in the Biological Technical Assistance Group (BTAG). The BTAG has been convened annually since 1994 to discuss ecological risk assessment issues pertaining to Adak Island. The Biological Technical Assistance Group was instrumental in developing the approach to the Adak Island ecological risk assessment and reviewed and supplied comments on the remedial investigation/feasibility study work plans and report.

68.[*] Why does the navy discuss free product recovery ending in 1998? Please change references to indicate completion when finished (BCP pg. 45).

Response: Page 4-5 of the Base Closure and Realignment Cleanup Plan states "Free-product recovery will be ongoing into 1998...". That statement means that free-product recovery will continue in 1998; it does not mean that it will end in 1998. The Base Closure and Realignment Cleanup Plan does not give dates for completing free-product removal. The comprehensive monitoring plan explains how to determine when free-product removal will cease.

69. The strategy of "cost-effective risk reduction" without impartial, independent involvement by the community should be changed. We are the ones to feel the increased "risks" which navy cost reduction efforts might produce. How does the community enter the "cost-effective risk reduction" equation? The report says that the BCT will decide the "endpoints", yet the BCT does not have community representation. Shouldn't we who are going to live with residual pollutants have some say as to risk or cost?

Response: Community involvement has always been possible through RAB meetings. The BECT considers community concerns when decisions are made. The regulatory agencies provide independent review of the cleanup strategy and consider protection of human health and the environment as threshold criteria that must be met. Cost is considered only as a secondary criterion. Please refer to response to Comment 3 regarding BCT representation. The BCT considers all concerns provided to it before making final decisions.

70. The community requests the Navy to not decommission the oil water separators located in the storm sewer system of Adak. Reuse of Adak may be faster (or slower) than anticipated. The community will need to retain the O/W separators that are currently planned for removal.

Response: It is not certain which oil/water separators are being referred to. The Navy has already removed two oil/water separators from the Power Plant 3 area and rerouted discharges appropriately.

71. *The community request surface analysis and surface cleaning of SWMU 1, 2, and 8 in case people ignore the fence or otherwise hike to, and in, the UXO areas.*

Response: SWMU 2 minefield will be cleared in the 1998 field season. All ordnance sites and remedial options will be evaluated as part of the recently created Operable Unit B.

72. *Please make the information repository available to concerned citizens on Adak. Provide electronic access solutions or provide a fund for up to 20 round-trip travel "accesses" per year, or transfer the repository to Adak, or copy the repository for Adak use.*

Response: The information repository is available for access to the individuals from Adak and other stakeholders. Virtually every resident on Adak is employed directly by or under contract to the Navy. The terms of this employment allow for regular rotational leave with paid air transportation to Anchorage. Adak residents have the same access to the information repository as other members of the public while in Anchorage. The information is also available on Adak in the Adak environmental library.

73. *Please fund a full RAB meeting on Adak to hear community environmental concerns.*

Response: See previous comment responses related to island resident representation at RAB meetings.

74.* *Please fund a communications specialist to assist the community to understand complicated environmental reports and to assist residents to actually understand the dangers and risks to Aleut families.*

Response: See previous comment responses related to island resident representation at RAB meetings. The community is invited to investigate eligibility for TAG or TAPP grants using information provided to RAB members. The island residents are represented at the RAB by the community co-chair.

75.* *Please fund a computer and specialized training for an individual, within the community of Adak, to understand and use the Navy's Geological Information System and database. Specifically, it is important for the community to have information about hazardous sites, the design of remediation plans and information about determining the success or failure of remediation. These require community understanding of Navy GIS and associated databases.*

Response: The community is invited to investigate eligibility for TAG or TAPP grants using information provided to RAB members.

76.* *We are concerned with the statement "... the Navy had to prioritize spending based on economic efficiencies and expenditures." While this is, or course, a reality in all projects, the question remains - what cleanup fell off the end of the prioritized list? What would have been done if the money were available?*

Response: All contamination that the Navy is aware of has been, or currently is planned for remediation to meet existing laws and regulations. No sites were dropped off the list.

77.* *Please remove dangerous and ugly solid waste throughout Adak. We would be happy to assist the Navy in identifying the numerous debris sites which should be removed.*

Response: The Navy has plans to remove debris in certain locations including the "rot lot" and the contractors camp. However, the Navy is not planning to remove other debris that does not pose a hazard, nor does the Navy intend to remove building remnants. The historical resources plan does not allow the removal of building remnants.

78.* *Can the community have an explanation about, and copy of, the OSF-WS/Navy LAG for 1997?*

Response: The Navy is not clear what the OSF-WS/Navy LAG is.

79.* *The community requests that all cabins which were filled with solid waste by the Navy be cleaned out prior to Navy departure in October. These are important for the well being of the community and for the tourism/guiding portion of the reuse strategy.*

Response: The Navy inspected all cabins on Adak and removed all hazardous materials.

80.* *Please remove sludge from Davis Lake Lagoon or help the community to understand why it will not be a factor in intensely using the adjacent property or water in the future.*

Response: This comment is not directly related to the Proposed Plans for the FFA and SAERA sites. The Navy is preparing plans for closure of the Davis Lake sludge lagoon.

81.* *The Office of Economic Adjustment and the Economic Development Administration provided funding to update the Adak Reuse Plan. The Navy assisted in getting funding. We request a delay in the final Base Cleanup Plan until the recommendations contained in this federally funded report are completed. The community is currently preparing its comments on Phase I of that work.*

Response: This is not a Proposed Plan issue.

82.* *The community of Adak would like to inform the Navy of its recent work to complete documents required to petition the State of Alaska to form a second class city on Adak. On January 24, 1998, the community approved the submittal of a petition upon completion of an operating budget for the new city. The City of Adak is expected to take over public services from the Adak Reuse Corporation in 1998 and 1999. We are looking forward to performing your monitoring activities and working with you further on the institutional control items.*

Response: Comment noted.

83. *The community is concerned about the large quantity of metal and surface debris apparent on Norpac Hill (water tank hill). We specifically request removal of this debris and further analysis to determine if the site was ever used as a dump by military personnel. If the site was used in the past as a dump we request removal of the dump.*

Response: There is no reason to believe that this area has chemical contamination. Improving the aesthetic characteristics of a site is not a CERCLA remedial action objective.

84. *The community is concerned about the dry cleaning facility located next to power plant 3. Has the site been adequately investigated for the presence of dry cleaning chemicals? Please supply details regarding the type of investigation conducted at the site and the result of any testing for the presence of Tetra-based cleaning, or other cleaning compounds and the name of the individuals conducting the site analysis and sampling.*

Response: Chemicals associated with dry cleaning were included in the analyses of samples collected from the area surrounding Power Plant 3 (SWMU 17). Groundwater, surface water, sediment, and soil were sampled. Well installations and sampling were conducted by URS Greiner and Foster Wheeler. Chemicals related to dry cleaning that were detected at Power Plant 3 include tetrachloroethene, trichloroethene, and vinyl chloride. The table below identifies which media the chemical was detected in, the number of times that the chemical was detected, the number of samples collected, and the maximum concentration, If the chemical was not detected in a medium, no values are shown.

Chemical	Media	Number of Detections	Number of Samples	Maximum Concentration
Tetrachloroethene	Groundwater	1	40	52 ppb
	Surface water	4	35	6.7 ppb
	Sediment	1	37	0.048 ppm
	Soil	6	59	1.1 ppm
Trichloroethene	Groundwater	1	40	3.6 ppb
	Surface water	2	35	1.1 ppb
	Sediment	1	37	22 ppm
	Soil	4	59	0.043 ppm
Vinyl chloride	Groundwater	1	40	0.08 ppb

Notes:
ppb - parts per billion
ppm - parts per million

85. *The community requests a special briefing on the condition of the NSGA facility and its remaining risk to the community.*

Response: The island residents are invited to review the relevant documents from the information repository. Specific documents that provide information on sites that were investigated for contamination at the NSGA facility include *Preliminary Source Evaluation 1 (PSE-1) Report for Batch 1 Sites* (URS 1995), *PSE-2 Report for Batch 1 Sites* (URS 1995), *RCRA Facility Assessment* (SAIC 1991), *Site Assessment Report for NSGA Heating Oil Plant #6* (URS 1995), and *Site Assessment Report for NSGA Fire Station* (URS 1995).

86. As currently written, the community objects to your plan to write on the federal transfer documents that "all remedial actions necessary to protect human health and the environment have been taken." People will be hurt - physically, if the Navy abandons Adak in its current condition. We do not believe that the remediation actions accepted by regulators are the correct actions to take on Adak, or that the remediation actions taken to date have been demonstrated to operate properly. Without PCB and full-spectrum monitoring of landfills you will never know if capping the landfills demonstrates success. Without considerably better information no one will know if the plan is working.

Response: The Navy notes the objection to the language "all remedial actions necessary to protect human health and the environment have been taken;" however, Section 120(h) of CERCLA requires that the deed of transfer include a covenant that (1) all remedial actions necessary to protect human health and the environment with respect to any such substances remaining on the property have been taken before the date of such transfer, and (2) any additional remedial action found to be necessary after the date of such transfer shall be conducted by the United States.

The Navy will continue to use cleanup systems, institutional controls, and periodic site reviews for sites as necessary on Adak. Active cleanups should be completed or started when the property is transferred. The Navy intends to provide long-term operation and monitoring support to confirm the effectiveness of this cleanup. Monitoring will include sampling fish, shellfish, and marine environment for contaminants including PCBs.