ADEC
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NAVFAC
Naval Facilities Engineering Command

FINAL
MARCH 2006

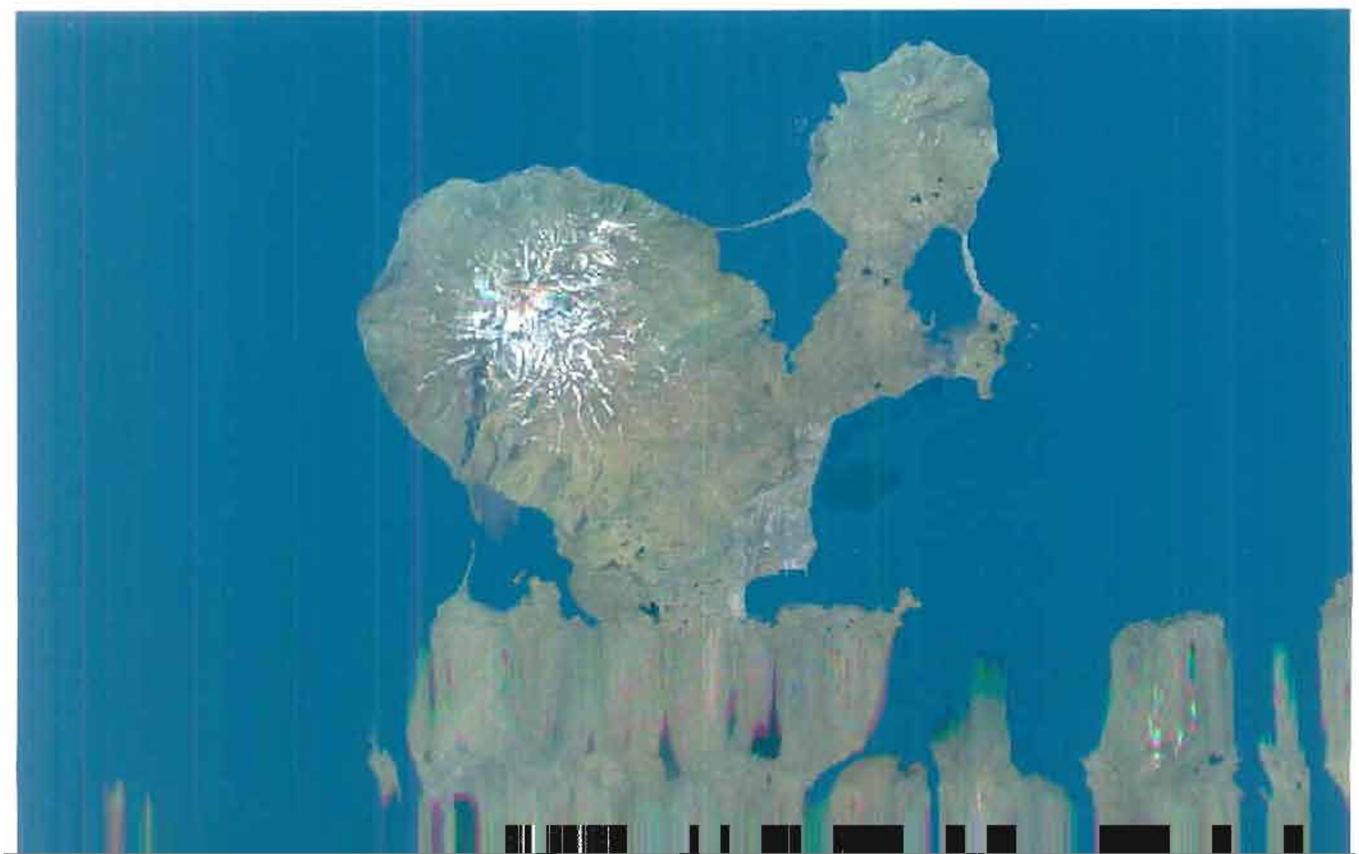
Decision Document
NMCB Building
T-1416 Expanded Area

Former Adak Naval Complex
Adak, Alaska

ADEC Database Record Key 200025X110637

Navy BRAC Program Management Office, West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Alaska Department of Environmental Conservation
555 Cordova St
Anchorage, AK 99502



FINAL DECISION DOCUMENT
NMCB BUILDING T-1416 EXPANDED AREA
FORMER ADAK NAVAL COMPLEX
ADAK ISLAND, ALASKA

COVER SHEET AND SIGNATURE PAGE

SITE NAME: Naval Mobile Construction Battalion (NMCB) Building T-1416 Expanded Area

ALASKA DEC DATABASE RECORD KEY: 200025X110637

ALASKA DEC REGULATORY AUTHORITY: Oil and Other Hazardous Substances Pollution Control (18 AAC 75, Article 3)

RESPONSIBLE PARTY: Navy BRAC Program
Management Office, West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CHEMICALS OF POTENTIAL CONCERN/MEDIA IMPACTED:

Soil: Petroleum hydrocarbons, semivolatile organic compounds (SVOCs), and chlorinated volatile organic compounds (VOCs)
Groundwater: Petroleum hydrocarbons, metals, SVOCs, and chlorinated VOCs
Marine Sediment: Petroleum hydrocarbons and SVOCs

ON-SITE CONTAMINANT CONCENTRATIONS:

Diesel-range organics (DRO) and gasoline-range organics (GRO) were detected in soil at concentrations greater than the alternative cleanup levels (ACLs), which were calculated using Alaska Department of Environmental Conservation (DEC) Method Four [18 Alaska Administrative Code (AAC) 75.340(a)(4)]. The maximum and minimum detected concentrations of DRO and GRO in soil are provided in Table 1. Benzene, DRO, GRO, and lead were detected at concentrations greater than 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C]. The maximum and minimum detected concentrations for these chemicals in groundwater are provided in Table 2. The ecological risk assessment established that existing concentrations of contaminants in marine sediment do not pose an unacceptable risk. Therefore, no cleanup levels were established for marine sediments, and contaminant concentrations for marine sediment are not included in the table below.

Table 1
Concentration of Chemicals Exceeding ACLs in Soil

Chemical	Soil	
	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)
DRO	4.08 J	43,000 J
GRO	2.1	27,000

Notes:
conc. - concentration
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated value
max. - maximum
mg/kg - milligram/kilogram
min. - minimum

Table 2
Concentrations of Chemicals Exceeding Ten Times the Tabulated Groundwater Cleanup Levels

Chemical	Min. Conc. (µg/L)	Max. Conc. (µg/L)
Benzene	0.872	360
DRO	105	44,500
GRO	8.2J	33,000
Lead – Dissolved	1	250
Lead – Total	1.6J	330

Notes:
conc. - concentration
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated value
max. - maximum
µg/L - microgram per liter
min. - minimum

CLEANUP LEVELS:

Soil: Cleanup levels specified for soil are based on Alaska DEC Method Four criteria [18 AAC 75.340(a)(4)], which uses site-specific risk assessments to establish ACLs. The ACLs for soils at the NMCB Building Expanded Area are:

- DRO 31,000 milligrams per kilogram (mg/kg)
- GRO 1,700 mg/kg

Groundwater: Cleanup levels are based on 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)]. The groundwater cleanup levels for the NMCB Building Expanded Area are:

- Benzene — 50 micrograms per liter (µg/L) (0.05 milligrams per liter [mg/L])
- DRO — 15,000 µg/L (15 mg/L)
- GRO — 13,000 µg/L (13 mg/L)
- Lead — 150 µg/L (0.15 mg/L)

Marine Sediment: The ecological risk assessment established that existing concentrations of contaminants in marine sediment do not pose an unacceptable risk. Therefore, no cleanup is necessary.

CLEANUP REMEDY:

Alternative 2 – Institutional Controls, Free-Product Recovery, and Monitored Natural Attenuation (MNA) – is selected as the remedial alternative for the NMCB Building Expanded Area. Free-phase product will be removed via groundwater wells and passive skimmers, petroleum concentrations in groundwater will be reduced through natural attenuation, and institutional controls will be used to protect human health and the environment as long as groundwater concentrations are greater than the groundwater cleanup levels (URS 2005a).

REVIEW OF CLEANUP ACTION AFTER SITE CLOSURE:

Under 18 AAC 75.380(d)(1), the Alaska DEC may require the Navy to perform additional cleanup if new information is discovered which leads Alaska DEC to make a determination that the cleanup described in this decision document is not protective of human health, safety, and welfare or the environment, or if new information becomes available which indicates the presence of previously undiscovered contamination or exposure routes related to Navy activities.

ACCEPTANCE BY PARTIES:

The State of Alaska and the Navy have agreed to the decisions outlined in this document.

Cindy L O'Hare — 3·22·2006

Cindy O'Hare, P.E.
Adak BRAC Environmental Coordinator
U.S. Navy, Naval Facilities Engineering
Command Northwest

Date

Jennifer L. Roberts — March 16 2006

Jennifer Roberts
Contaminated Site Program, Section Manager
Alaska Department of Environmental Conservation

Date

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ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ARAR	applicable or relevant and appropriate requirements
ARC	Adak Reuse Corporation
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CMP	Comprehensive Monitoring Plan
COC	chemical of concern
COPC	chemical of potential concern
CR	cancer risk
CSM	conceptual site model
cy	cubic yard
DD	decision document
DEC	Department of Environmental Conservation
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
FAA	Federal Aviation Administration
FFA	Federal Facilities Agreement
FFS	focused feasibility study
GRO	gasoline-range organics
HI	hazard index
ICMP	institutional control management plan
J	estimated value
JP-5	jet petroleum
mg/kg	milligram per kilogram
mg/L	milligram per liter
µg/L	microgram per liter
MNA	monitored natural attenuation
mogas	motor vehicle gasoline
NA	not applicable
Navy	U.S. Navy
NMCB	Naval Mobile Construction Battalion
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit

ABBREVIATIONS AND ACRONYMS (Continued)

PAH	polycyclic aromatic hydrocarbons
PEB	pre-engineered building
RAB	Restoration Advisory Board
RAOs	remedial action objectives
RBSC	risk-based screening concentration
RME	reasonable maximum exposure
ROD	Record of Decision
RRO	residual-range organics
SAERA	State-Adak Environmental Restoration Agreement
SARA	Superfund Amendments and Reauthorization Act of 1986
SOP	Standard Operation Procedures
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TAC	The Aleut Corporation
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TPH	total petroleum hydrocarbons
UCL95	95 percent upper confidence limit
USGS	United States Geological Survey
UST	underground storage tank
VOC	volatile organic compound

DECLARATION

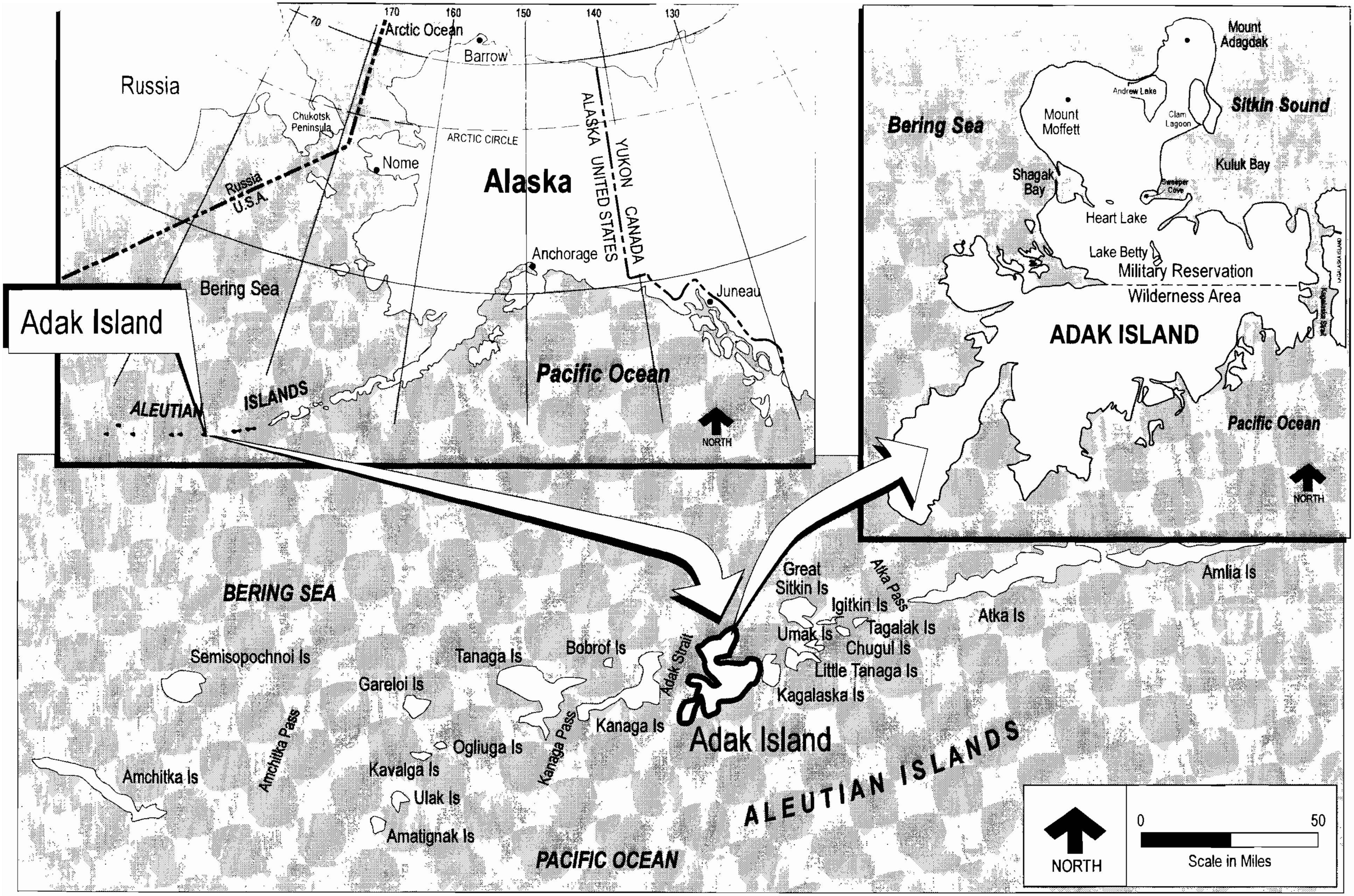
1.0 INTRODUCTION

This decision document (DD) presents the selected cleanup alternative and the supporting rationale for cleanup of the Naval Mobile Construction Battalion (NMCB) Building T-1416 Expanded Area (hereafter referred to as the NMCB Building Expanded Area) at the former Adak Naval Complex, Adak Island, Alaska. The decisions documented in this DD are based on supporting documents in the Administrative Record located at the offices of Naval Facilities Engineering Command Northwest in Silverdale, Washington. The State of Alaska and U.S. Navy (Navy) have agreed to the decisions outlined in this document. Also, The Aleut Corporation (TAC), the current property owner, has concurred with the selected cleanup alternative. The Navy is responsible for implementing the cleanup alternative presented in this DD.

The former Adak Naval Complex is located on Adak Island, which is approximately 1,200 air miles southwest of Anchorage, Alaska, in the Aleutian Island chain (Figure 1-1). Figure 1-2 shows the general location of the NMCB Building Expanded Area. A legal description specifying the boundary of the site is included as Appendix A. A site map showing the legal boundary of the NMCB Building Expanded Area is also provided (Figure 1-3). The legal boundary was developed for land transfer purposes and does not necessarily correspond with the extent of contamination.

Alternative 2 – Institutional Controls, Free-Product Recovery, and Monitored Natural Attenuation (MNA) – is selected as the remedial alternative for the NMCB Building Expanded Area. As part of the remedy, additional activities will be performed at the site to confirm that the remedy is protective. These activities include installation of five new wells, collection of soil samples during the installation of the new wells, collection of additional groundwater samples from the five new wells, and visual monitoring of the Sweeper Cove shoreline. The selected cleanup alternative and additional site activities for the NMCB Building Expanded Area are discussed in more detail in Sections 9 and 10.

This DD was developed in accordance with State of Alaska regulations governing petroleum-release sites, the Alaska Department of Environmental Conservation (DEC) Oil and Other Hazardous Substances Pollution Control Regulations (18 Alaska Administrative Code [AAC] Chapter 75).



U.S.NAVY	**Figure 1-1** **Adak Island Vicinity**	Adak Island, AK DECISION DOCUMENT

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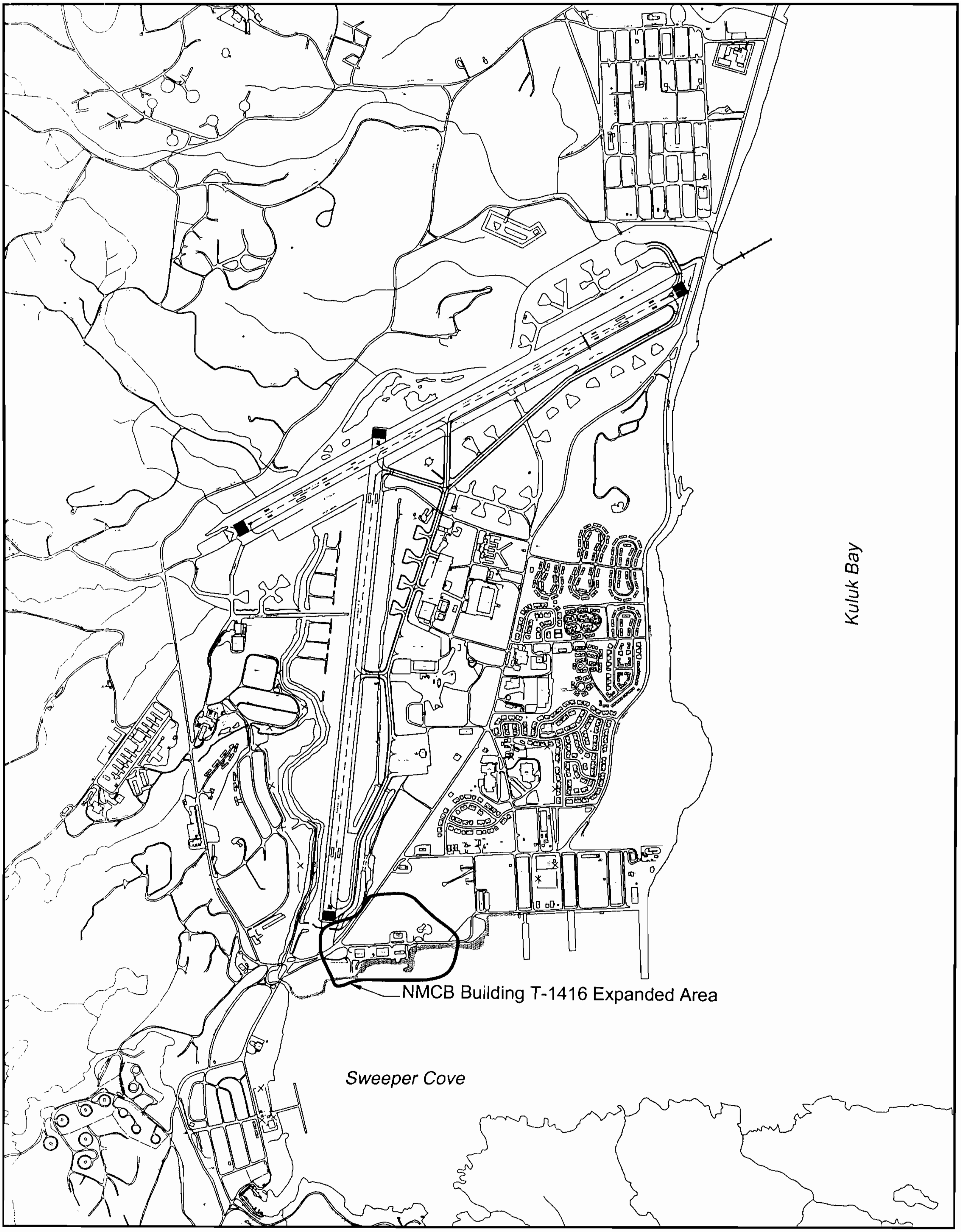
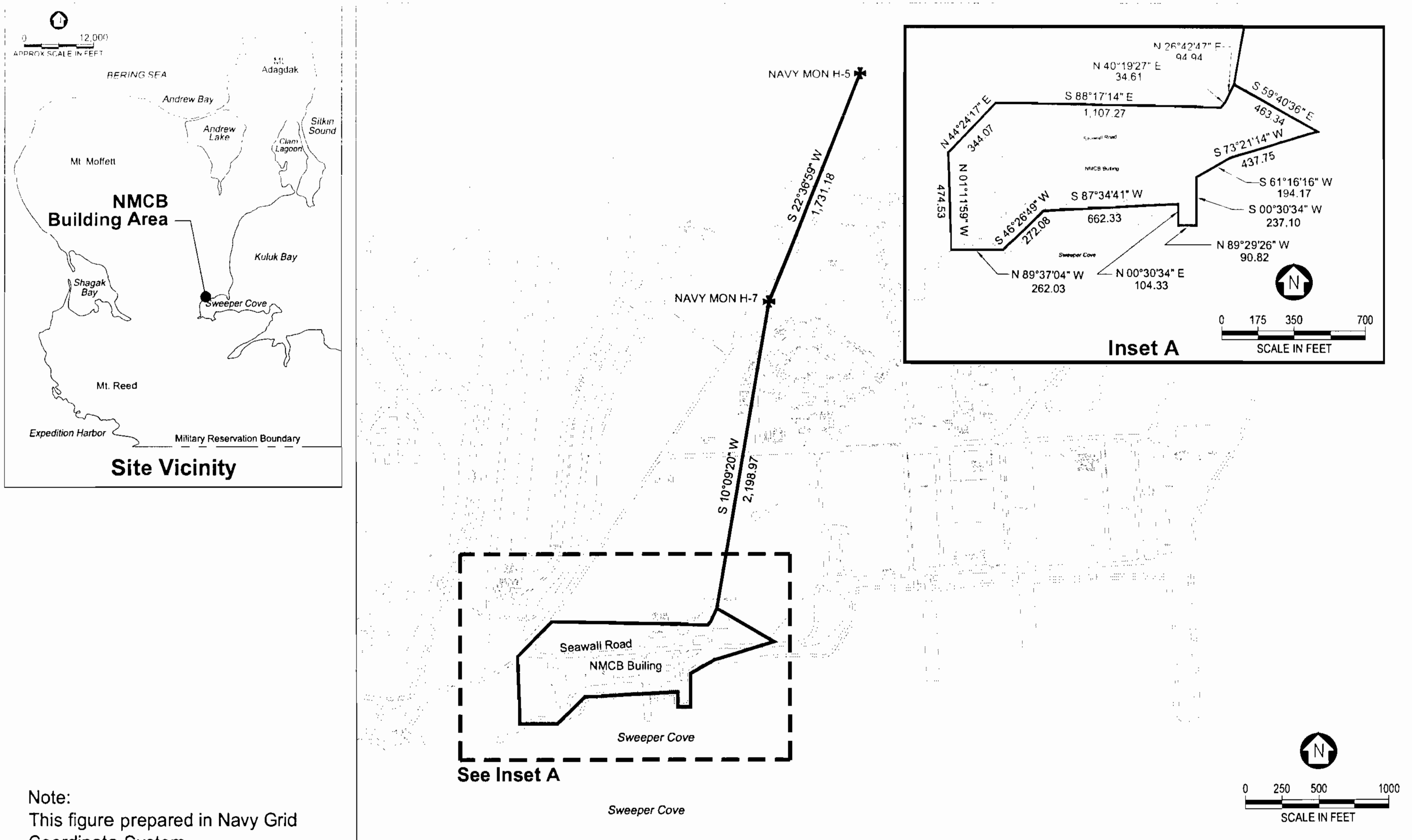


U.S. NAVY	N 0 500 1,000 2,000 SCALE IN FEET	**Figure 1-2** **Site Location** **NMCB Building Expanded Area**	Adak Island, AK DECISION DOCUMENT



Note:
This figure prepared in Navy Grid Coordinate System

Scale as Shown	**Figure 1-3** **Legal Boundaries, NMCB Building Expanded Area**	Adak Island, AK DECISION DOCUMENT

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2.0 BACKGROUND

General background information for the NMCB Building Expanded Area is provided in this section. Additional information for the NMCB Building Expanded Area is provided in the focused feasibility study (FFS) report (URS 2005a).

2.1 SITE HISTORY

Military presence on Adak began in 1942 with its occupation as a staging area to mount a counter-offensive to dislodge the Japanese from Attu and Kiska Islands. The Navy presence at Adak was officially recognized by Public Land Order 1949, dated August 19, 1959, which withdrew the northern portion of Adak Island, comprising approximately 76,800 acres, for use by the Navy for military purposes. The Navy also used the base to conduct a variety of Cold War-era military activities. Naval Air Facility Adak was on the list of Department of Defense installations recommended for closure in 1995, and that recommendation became final when Congress did not disapprove the list. The active Navy mission ceased, and the base operationally closed on March 31, 1997.

From April 1997 through September 2000, critical facilities such as the power plant, airfield, and environmental cleanup systems were operated by the Navy through a caretaker contractor. In June 1998, the Navy entered into a lease with the Adak Reuse Corporation (ARC), the designated local redevelopment authority, which authorized ARC to use or sublease property in the developed core of the military reservation for commercial reuse purposes. In October 2000, ARC commenced operation of community facilities such as the airfield and utility systems in support of reuse activities under the authority of this lease.

In September 2000, the federal government entered into a land transfer agreement with TAC, a Native corporation, as documented in the Agreement Concerning the Conveyance of Property at the Adak Naval Complex, Adak, Alaska. This agreement set forth the terms and conditions for the conveyance of approximately 47,000 acres of the former Adak Naval Complex property to TAC. The actual conveyance or transfer of property occurred on March 17, 2004. The land transfer included all of the downtown area, housing units, and industrial facilities. Excluded from this transfer were any offshore islands, islets, rocks, reefs, and spires; those fixtures and equipment owned by the United States and associated with the airfield; those improvements owned by the United States and managed by the Federal Aviation Administration (FAA); and those improvements owned by the United States and managed by the Fish and Wildlife Service. TAC transferred the portion of the former Naval Air Facility known as Adak Airport and associated facilities and aviation easements, not including FAA navigation aids or weather reporting equipment, to the State of Alaska. As a result of the land transfer agreement, TAC owns the NMCB Building Expanded Area.

The transferred land has institutional controls currently in place as specified in the Interim Conveyance document. The institutional controls that have been implemented at the former Adak Naval Complex through the final institutional control management plan (ICMP) (U.S. Navy 2004) include:

1. Land use restrictions, primarily limited to areas designated for commercial or industrial use
2. Navy notification of intrusive soil excavation activities
3. Groundwater restrictions that prohibit use of the downtown aquifer as a drinking water resource
4. Annual inspection of institutional controls and reporting

These institutional controls are discussed in more detail in Section 2.7.

2.1.1 Site Regulatory History

Investigation and cleanup of petroleum-contaminated sites at the former Adak Naval Complex have been ongoing since 1986. Adak was initially proposed for placement on the National Priorities List (NPL) in 1992 and was officially listed in 1994. The Navy, as lead agency, entered into a three-party Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA) and Alaska DEC as well as a two-party State-Adak Environmental Restoration Agreement (SAERA) with the Alaska DEC to facilitate investigation and cleanup activities.

In 1993 the Navy, EPA, and Alaska DEC signed the FFA, which incorporates the EPA's cleanup process under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The CERCLA exclusion of petroleum as a hazardous substance required that cleanup of petroleum-related chemicals would follow State of Alaska regulations. Therefore, the FFA stated that petroleum-contaminated sites, such as those containing 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, the SAERA, was signed in April 1994.

The former Adak Naval Complex was divided into two operable units (OUs), OU A and OU B, for investigation and cleanup activities. OU A includes CERCLA and petroleum sites, and

OU B includes ordnance explosive sites. A total of 180 sites were evaluated within OU A. The FFA listed 84 CERCLA sites, and the SAERA listed 128 petroleum sites. The number of CERCLA sites plus the number of petroleum sites is greater than 180, because some sites that were originally listed as CERCLA sites were evaluated under SAERA and some sites were evaluated under both CERCLA and SAERA. In May 1997, the Navy and Alaska DEC agreed to integrate the cleanup decision process for petroleum sites with the cleanup decision process being conducted for hazardous substance release sites under CERCLA. As a result, the Record of Decision (ROD) for OU A was prepared for both the petroleum-contaminated sites and the hazardous-substance-release sites. The ROD was signed by the Navy, the EPA, and the Alaska DEC in 2000.

The OU A ROD selected final or interim remedies for each of the 128 petroleum-contaminated sites identified on Adak Island. The interim remedy, free-product recovery, was selected for 14 sites that contained measurable quantities of free-phase petroleum product. In addition, the OU A ROD specified that these 14 sites would require future remedy selection pursuant to the two-party SAERA. To clarify regulatory authority, the OU A ROD was amended in 2003 to remove these petroleum sites and 48 others with further action from CERCLA authority. Therefore, final remedies for the 14 petroleum-contaminated sites will be selected in accordance with Alaska State regulation 18 AAC 75.325 through AAC 75.390 which provides the regulatory procedures and requirements for petroleum cleanup decisions.

This DD addresses one of the 14 free-product recovery sites. The 10 sites where the remaining petroleum-related chemicals pose no risk to human health or the environment above target health goals, provided that institutional controls remain in effect, were previously addressed in a separate DD (U.S. Navy and ADEC 2005b). This site is one of the three sites where petroleum-related chemicals pose a potential risk to human health or the environment above target health goals. The other two sites (the South of Runway 18-36 Area site and the Solid Waste Management Unit [SWMU] 62 New Housing Fuel Leak site) will be addressed in separate DDs to be issued later in 2006. The SWMU 17 Power Plant No. 3 site was originally included as one of the sites where petroleum-related chemicals pose a potential risk to human health or the environment above target health goals, because the initial draft FFS prepared in August 2004 using information current through November 2002 concluded that contaminants in sediment in Yakutat Creek posed a potential unacceptable risk. Because risks were only slightly above target health goals, the data used to evaluate the ecological risk were more than 6 years old and samples were collected before the upgradient contaminant sources were remediated, the Navy performed additional sediment sampling in Yakutat Creek in June 2005 and risks were recalculated using the additional data. As a result, the revised risk assessment concluded that contaminants in Yakutat Creek are unlikely to pose a significant risk. The SWMU 17 Power Plant No. 3 site DD will be issued in a separate DD based on these conclusions later in 2006.

2.1.2 Site Release History

A review of Navy records found no reported releases of petroleum hydrocarbons at the NMCB Building Expanded Area. However, several sources of potential releases are present at the site. These sources include two abandoned 8-inch diameter fuel transfer pipelines, one abandoned 12-inch diameter fuel transfer pipeline, a used-oil collection UST (UST T-1416-A) formerly located adjacent to the north wall of the NMCB Building (T-1614), an oil-water separator located just west of UST T-1416-A, and UST 42484-A formerly located along the north wall of Sewage Lift Station No. 11 (URSG 1998a and URS 1995a). The locations of these potential sources are shown on Figure 2-1.

During September 1990, an abandoned jet petroleum (JP)-5 fuel line located near the southeast corner of Runway 18-36 was uncovered during installation of a new fuel line adjacent to the Main Road (Figure 2-1). Residual product was observed in the excavated trench indicating that a fuel release had occurred at the site (URS 1991). Subsequent site investigation activities indicated the presence of petroleum hydrocarbons in subsurface soil and groundwater over a large area extending from the southern end of Runway 18-36 to Sweeper Cove near the NMCB Building. Measurable quantities of free product have been periodically observed in groundwater monitoring wells located between Seawall Road and Sweeper Cove. In addition, petroleum sheen was reportedly observed on ponded surface water between Building T-1416 and Seawall Road during a January 1994 site visit (EMCON 1996).

Chlorinated volatile organic compounds (chlorinated solvents) were detected at the site during site investigation activities performed to evaluate the extent of the petroleum release at the NMCB Building Expanded Area. However, there have been no documented releases of chlorinated solvents at the NMCB Building Expanded Area. Solvent contamination observed at the site is likely the result of past practices that caused surface spillage during ship or vehicle maintenance, woodworking, or machine shop activities.

2.2 PHYSICAL CHARACTERISTICS

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. The average total annual precipitation for Adak Island 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.

The area occupied by the NMCB Building Expanded Area was formerly part of Sweeper Cove (Figure 1-2). Most of the site south of Seawall Road is underlain by fill material, which was placed as the original shoreline was extended outward and straightened during construction at the site. Subsurface soils beneath the fill material are unconsolidated sand and sandy silt. The subsurface materials have variable permeability, and the saturated subsurface has a high water-bearing capacity. The Sweeper Cove shoreline is sandy near the discharge area for South Sweeper Creek, but lined with riprap and boulders along the rest of its northern and western shoreline, including along the NMCB Building Expanded Area.

Groundwater is found as a regional aquifer beneath the site. The water table is approximately 4 to 15 feet below ground surface (bgs). Groundwater flow beneath the site is complex due to tidal influences and the pumping of water from the airport ditches into South Sweeper Creek. Groundwater surface elevations show a range of fluctuation as high as 7.2 feet bgs because of tidal influences. Groundwater beneath the site typically flows in two directions. In most areas of the site, groundwater flow is toward Sweeper Cove (see Figure 2-2). However, flow in the northwestern portion of the site is to the northwest and is largely controlled by the water level in the East Canal. Water in the East Canal flows through the Crossover Canal and into the West Canal (where it is transferred through turbine pumps into South Sweeper Creek). Because groundwater flows in two directions, East Canal, South Sweeper Creek, and Sweeper Cove are all considered to be downgradient surface water bodies to the NMCB Building Expanded Area.

2.3 DESCRIPTION OF CONTAMINANTS AND MEDIA IMPACTED

Decisions documented in this DD are based upon information gathered from various environmental field investigations performed by the Navy at the site between 1990 and 2003, as indicated in Table 2-1. These investigations included:

- Site assessments conducted to evaluate site conditions during tank removals
- Site investigations to evaluate subsurface conditions and investigate potential sources of contamination
- Site investigations to evaluate concentrations of petroleum compounds in the sediment and surface water of Sweeper Cove

Results of these investigations indicated that petroleum-related chemicals and some volatile organic compounds (VOCs) were present in samples of subsurface soil, groundwater, sediment, and surface water collected from several locations at the NMCB Building Expanded Area. In addition, the concentrations of petroleum hydrocarbons in both soil and groundwater exceeded the applicable Alaska DEC cleanup levels. However, Alaska regulations have not established numerical cleanup criteria for individual petroleum hydrocarbons in surface water and sediment.

2.4 CLEANUP ACTIVITIES PERFORMED TO DATE

Cleanup activities that have been implemented at the NMCB Building Expanded Area include:

- UST and associated piping removals
- Pipeline cleaning and closures
- Contaminated soil excavation
- Free-product recovery
- Natural attenuation monitoring

A summary of the cleanup activities performed at the site is provided in Table 2-2. In addition, results of the free-product recovery activities performed at the site are provided in Table 2-3. Additional information on the cleanup activities performed at the site is provided in the FFS report (URS 2005a).

Former UST Removals and Contaminated Soil Excavation

Former UST T-1416-A was a partially buried 450-gallon steel tank that was situated along the north wall of the NMCB Building. The UST stored used oil generated from operations in Building T-1416. This UST was removed during 1994 as part of the environmental cleanup at the former Adak Naval Complex (Shannon and Wilson 1993). The UST appeared to be in good condition, with no dents, deformities, or holes. The chemical analysis of two soil samples collected from beneath this UST identified diesel-range organics (DRO) at a concentration of 13,000 mg/kg in both samples. Further excavation of petroleum-affected soils was not conducted during UST removal activities due to the presence of underground utilities adjacent to the former UST location.

Former UST 42484-A was a 500-gallon steel tank that was situated along the north wall of the Sewage Lift Station No. 11 Building (Figure 2-1). The UST stored JP-5 that fueled an emergency generator used in the event of a power outage. This UST and associated piping were removed during June 1995 as part of the environmental cleanup at the former Adak Naval Complex (URS 1995a). The UST appeared to be in good condition, with no dents, deformities, or holes. Chemical analyses of 11 soil samples collected during this UST removal identified concentrations of DRO below its Alaska DEC soil cleanup level in 10 of the 11 samples analyzed. Groundwater was encountered at a depth of approximately 8 feet bgs. A heavy sheen was observed on the groundwater surface.

Pipeline Cleaning and Closures

A pipeline assessment was performed during 1995 that included the removal of a valve pit along the pipeline trace north of Seawall Road (URS 1995b). Chemical analyses of one soil sample collected during this valve pit removal identified concentrations of DRO below its Alaska DEC soil cleanup level.

The most northerly 8-inch motor vehicle gasoline (mogas) pipeline north of Seawall Road was cleaned and closed in 2003 (GeoEngineers 2003) (Figure 2-1). An 8-foot section of the pipeline adjacent to Valve Pit A located at the eastern end of the site was excavated and disposed of. An oil-absorbent cylindrical device (pig) was then used to clean the section of the pipeline from Valve Pit A to Valve Pit 1, which is located south of Runway 18-36. All fluids produced in the cleaning of the segment were captured by a vacuum truck for transportation to storage tanks and transport off-island. An electric blower was then used to ventilate the line and volatilize any waste fuel remaining. Blind flanges were then installed on the ends of the pipeline.

Free Product Recovery

Free product recovery has been conducted at the NMCB Building Expanded Area from September 1997 through July 1998, May through July 2000, May through November 2001, May though October 2002, and from August 2004 through July 2005. Free-product recovery data through November 2004 are summarized in Table 2-3. Approximately 201 gallons of free product were recovered at the site based on data through November 2004. Most of this product (189 gallons) was recovered during 2001 and 2002.

Natural Attenuation Monitoring

To evaluate the potential for natural processes to attenuate petroleum-related chemicals at the NMCB Building Expanded Area, natural attenuation monitoring was conducted in selected monitoring wells at the site during July 1998 (URSG 1998a). This monitoring consisted of the collection of groundwater samples from 11 monitoring wells existing at the site. Seven of these wells are located within the dissolved petroleum plume. The remaining four wells are located upgradient or cross-gradient from the dissolved petroleum plume. Taken as a body of evidence, increased alkalinity concentrations, increased ferrous iron concentrations, and increased methane concentrations indicate both aerobic and anaerobic conditions were present at the site and natural attenuation is occurring at the site.

In addition to the natural attenuation monitoring performed at the NMCB Building Expanded Area, natural attenuation monitoring was performed at 10 sites on Adak in May and June of 2003 (United States Geological Survey [USGS] 2005). The site closest to the NMCB Building Expanded Area that was monitored during this investigation was the Former Power Plant Building T-1451. The report concluded that the natural attenuation parameter data that have been collected to date demonstrate that biodegradation plays a significant role in natural attenuation in the downtown area of Adak Island.

2.5 LAND USE

The site and surrounding area were used primarily for industrial purposes up to the military drawdown at Adak in the late 1990s (URSG 1998a). Three buildings were constructed in the area in the early 1940s, of which only Building T-1416 still remains at the site. The pre-engineered building (PEB), located east of Building T-1416, was constructed during 1994. The buildings and surrounding land were used as a woodworking shop, supply depot, machine shop, vehicle motor pool maintenance facility, equipment storage area, and vehicle parking area. Five docks, formerly located at the southern margin of the site, were constructed prior to 1945 and were associated with site operations (EMCON 1996). The Fish and Wildlife Building, located north of Seawall Road, formerly housed the administrative functions of the U.S. Fish and Wildlife Service.

Future land use at the NMCB Building Expanded Area is designated for one of three reuses (ARC 2000) (Figure 2-3). The largest portion of the site is designated for commercial reuse. The portion of the site northwest of the Main Road is classified for aviation reuse. The western portion of the site between the Main Road and Sweeper Cove as well as the portion of the site containing the Fish and Wildlife building are designated for public facilities' reuse.

2.6 GROUNDWATER USE

According to Alaska regulations (18 AAC 65.350), groundwater is considered to be a drinking water source unless it can be demonstrated that the groundwater is not currently being used as a drinking water source and groundwater is not a reasonably expected potential future source of drinking water. Groundwater has not historically been used as a drinking water source on Adak Island, nor is it currently being used as such. Future human use of groundwater on Adak Island as a drinking water source is not expected because of the following:

- Surface water from Lake Bonnie Rose is used as the sole drinking water source on Adak Island.
- The Interim Conveyance document issued by the United States to TAC imposes institutional controls that prohibit the future use of the downtown groundwater aquifer as a drinking water source.

Institutional controls, as described in the ICMP for Adak Island, are currently in place to prevent the use of the downtown aquifer as a future drinking water resource. These institutional controls include a prohibition of well drilling and excavation for the purpose of installing a private or public domestic use well and a requirement for excavation notification. Although institutional controls are in place preventing the use of the downtown aquifer, groundwater is still considered a potential future source of drinking water according to the Alaska DEC if potable water could be obtained from a well installed at the site. However, because saltwater was shown to intrude into nearshore groundwater in the vicinity of the NMCB Building Expanded Area in the Saltwater Intrusion Investigation Report (URS 2001), groundwater is not considered a reasonably expected potential future drinking water source at the site. Therefore, groundwater cleanup levels identified for this sites are 10 times those presented in Table C of Alaska Regulation 18 AAC 75.345(b)(1).

2.7 INSTITUTIONAL CONTROLS

Institutional controls are measures to prevent or limit exposure to hazardous substances left in place at a site, or assure effectiveness of the chosen remedy until cleanup levels are achieved. Institutional controls are placed on property where contaminants remain at levels above regulatory requirements for cleanup, and where exposure pathways, if they exist, may cause harm to human health and the environment. For the NMCB Building Expanded Area addressed in this DD, the institutional controls specified in the Interim Conveyance document include land use restrictions, excavation restrictions, and groundwater restrictions. The land use restrictions and excavation restrictions are discussed in more detail below.

2.7.1 Land Use Restrictions

The Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75) require cleanup of hazardous substances that have been released into the environment to a degree that is determined to be protective of human health and the environment. The purpose of institutional controls is to ensure compliance with land use assumptions used to establish cleanup levels. Residential land use, including permanent or temporary living accommodations, childcare facilities, schools, playgrounds, and hospitals are prohibited at the NMCB Building Expanded Area by the Interim Conveyance document.

2.7.2 Excavation Restrictions

There are two types of soil excavation restrictions implemented at the former Adak Naval Complex through the Interim Land Conveyance document, excavation notifications and absolute excavation prohibitions. Excavation notification is required for proposed excavations below 2 feet at each of the institutional controls sites, including the NMCB Building Expanded Area. The notifications are evaluated by the Navy to determine whether a proposed project at a site is consistent with the land use assumptions. The notifications are an additional tool for the Navy to receive timely information to monitor land use restrictions. The primary purpose of the Excavation Notification is to apprise the Navy of changes to land use.

At some sites, such as former landfills, or where the remedy in place is a protective cover, excavation by non-Navy personnel is absolutely prohibited. Absolute excavation prohibitions are not applicable to the NMCB Building Expanded Area. Excavation for the purpose of digging a domestic use well in the downtown area is also prohibited. Excavation prohibitions have been implemented through the Interim Conveyance document and the Final ICMP (U.S. Navy 2004).

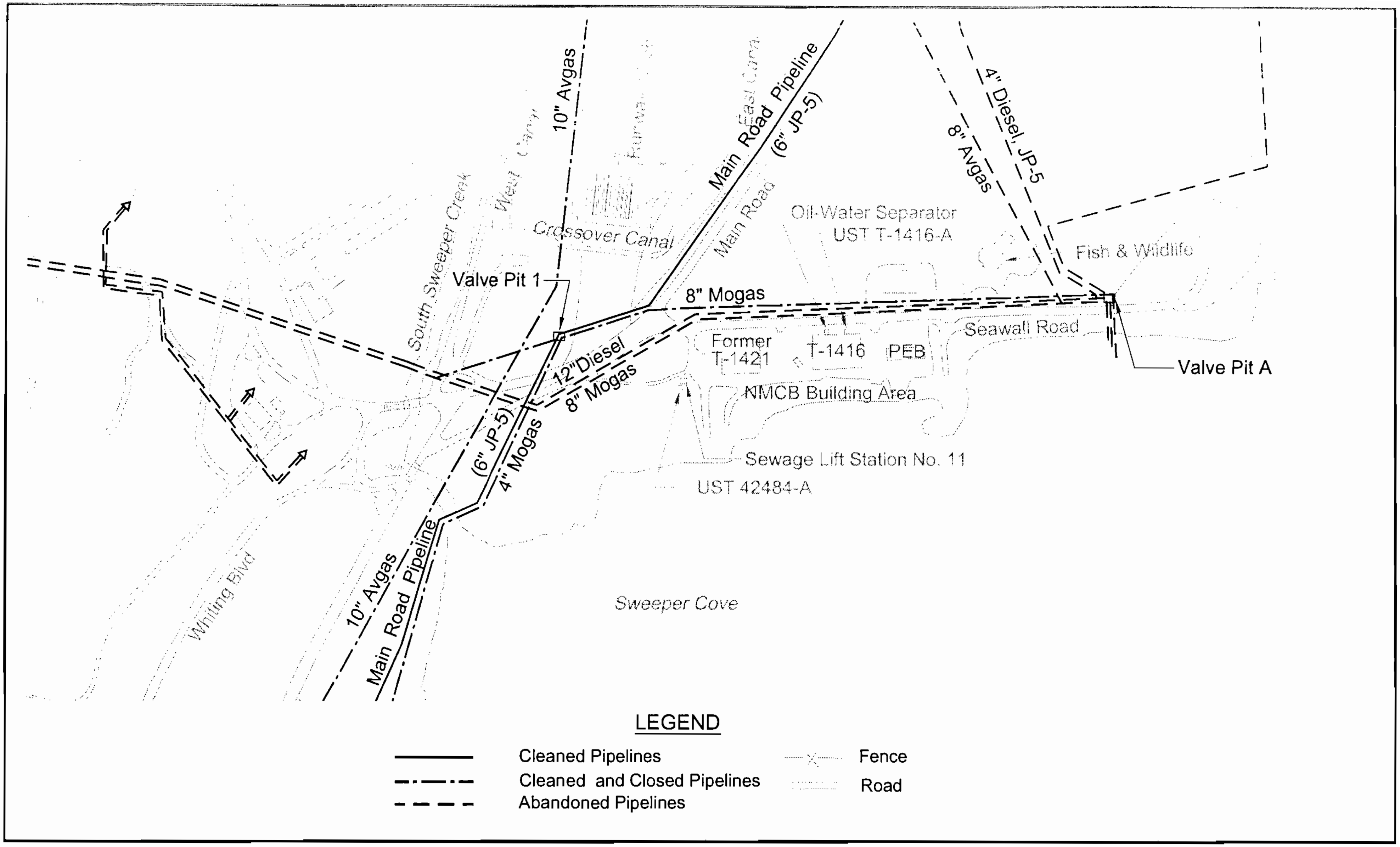

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Figure 2-1
Potential Petroleum Sources at the NMCB Building Expanded Area

Adak Island, AK
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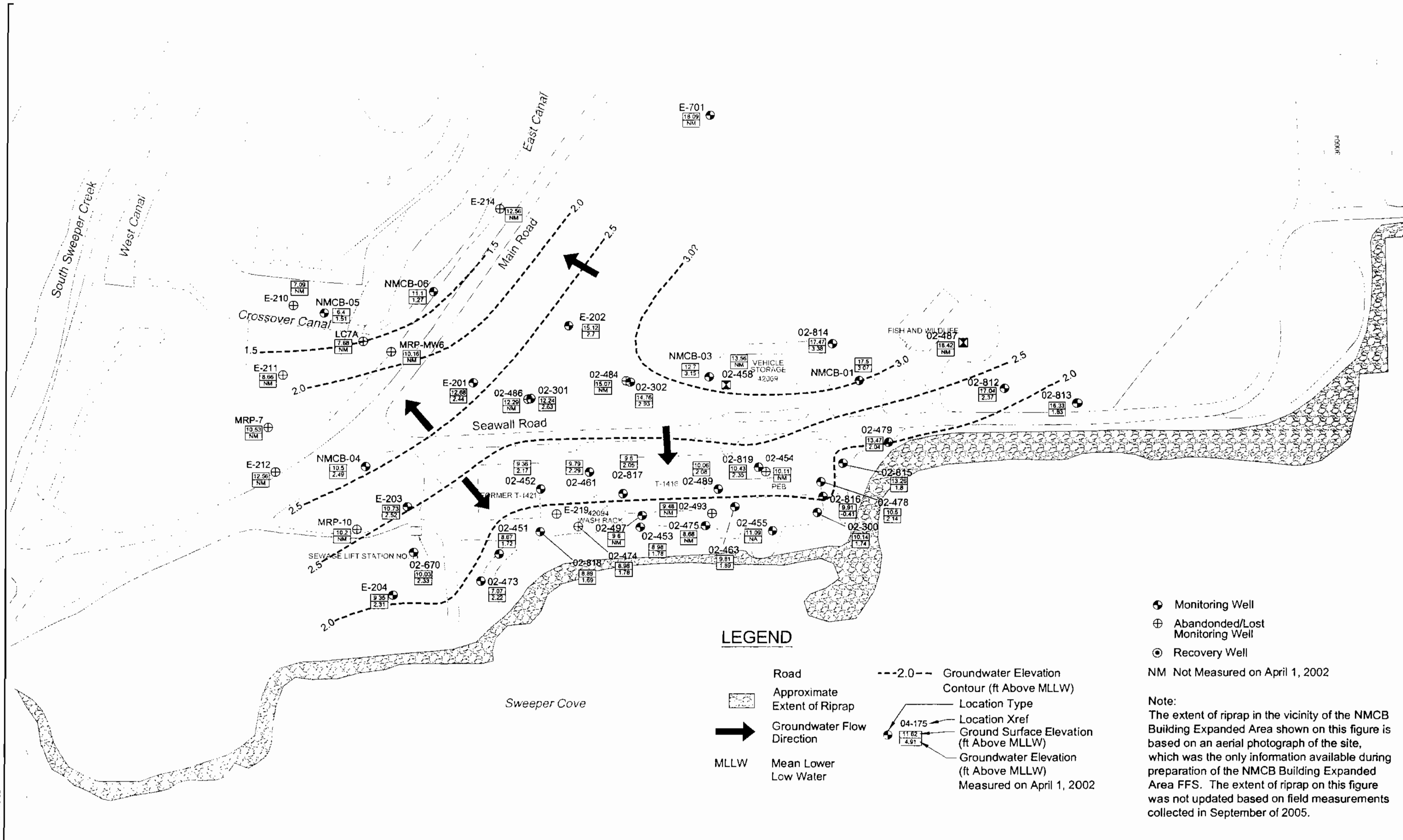

Note:
The extent of riprap in the vicinity of the NMCB Building Expanded Area shown on this figure is based on an aerial photograph of the site, which was the only information available during preparation of the NMCB Building Expanded Area FFS. The extent of riprap on this figure was not updated based on field measurements collected in September of 2005.

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Adak Island, AK
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Figure 2-2
Inferred Groundwater Flow Map
NMCB Building Expanded Area

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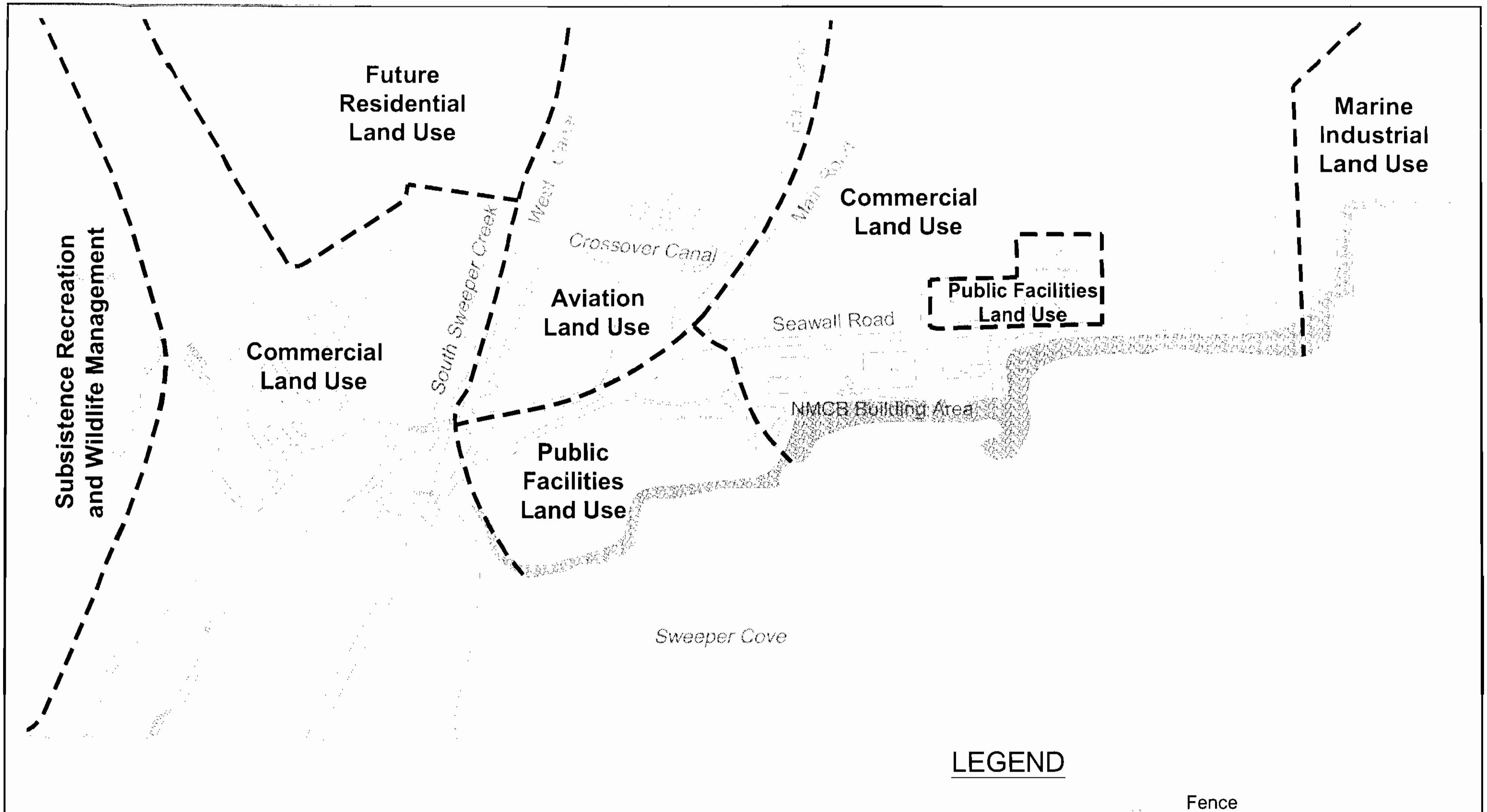

SOURCE: Economic Reuse Study, Phase II: Engineering Analysis
Prepared for Adak Reuse Corporation, September 2000

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Figure 2-3
Proposed Future Land Use
NMCB Building Expanded Area

Adak Island, AK
DECISION DOCUMENT

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Table 2-1
Summary of Environmental Field Investigations, NMCB Building Expanded Area

Date	Investigation Activity
1990	Reconnaissance investigation to evaluate the source of the petroleum hydrocarbons discovered during pipeline installation activities near Runway 18-36 (URS 1990)
1992	Investigation to evaluate possible petroleum releases associated with the Main Road Pipeline (URS 1994)
1993	Investigation to evaluate possible petroleum releases associated with Tank Farm A (EMCON 1994)
1993	Site assessment to evaluate site conditions during the removal of UST T-1416-A from the site (Shannon & Wilson 1993)
1995	Site assessment to evaluate site conditions during the removal of UST 42484 from Sewage Lift Station No. 11, located at the western margin of the site (URS 1995a)
1995	Assessment of decommissioned fuel transfer pipelines that traverse the site (URS 1995b)
1996	Preparation of a summary of site conditions (EMCON 1996)
1998	Site investigation to evaluate the extent of petroleum-related chemicals at the site (URSG 1998a)
1999	Preparation of a site summary report to present all site data collected to that point (URSG 1999a)
2001-2002	Supplemental site assessment to address data gaps (URS 2005a)
2003	Supplemental sediment investigation to provide current data on sediment impacts (URS 2005a)

Note:
UST - underground storage tank

Table 2-2
Summary of Site Cleanup Activities,
NMCB Building Expanded Area

Date	Cleanup Activity
1994	Removal of former UST T-1416-A (450-gallon, used oil UST)
1995	Removal of former UST 42484-A and associated piping (500-gallon, JP-5 UST)
1995	Removal of a valve pit along the pipeline trace north of Seawall Road
1997 – 2004[a]	Free-product recovery (total of 201 gallons recovered)
1998	Natural attenuation monitoring
2003	Cleaning and closure of the most northerly 8-inch mogas pipeline north of Seawall Road

[a] - Intermittent operation
Notes:
JP - jet petroleum
mogas - motor vehicle gasoline
UST - underground storage tank

Table 2-3
Free-Product Recovery Data
NMCB Building Expanded Area

Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered
January 1997	---	January 1998	0.11[1]	January 1999	---	January 2000	---
February 1997	---	February 1998	1.2[1]	February 1999	---	February 2000	---
March 1997	---	March 1998	0.22[1]	March 1999	---	March 2000	---
April 1997	---	April 1998	---	April 1999	---	April 2000	---
May 1997	---	May 1998	0.98[1]	May 1999	---	May 2000	1.64[1]
June 1997	---	June 1998	---	June 1999	---	June 2000	1.58[1]
July 1997	---	July 1998	0.21[1]	July 1999	---	July 2000	0.29[1]
August 1997	---	August 1998	---	August 1999	---	August 2000	---
September 1997	0.61[1]	September 1998	---	September 1999	---	September 2000	---
October 1997	0.46[1]	October 1998	---	October 1999	---	October 2000	---
November 1997	0[1]	November 1998	---	November 1999	---	November 2000	---
December 1997	0.16[1]	December 1998	---	December 1999	---	December 2000	---
1997 TOTAL	**1.2**	**1998 TOTAL**	**2.7**	**1999 TOTAL**	**---**	**2000 TOTAL**	**3.5**
January 2001	---	January 2002	---	January 2003	---	January 2004	---
February 2001	---	February 2002	---	February 2003	---	February 2004	---
March 2001	---	March 2002	---	March 2003	---	March 2004	---
April 2001	---	April 2002	---	April 2003	---	April 2004	---
May 2001	11.42	May 2002	0.2	May 2003	---	May 2004	---
June 2001	18.51	June 2002	1.72	June 2003	---	June 2004	---
July 2001	12.14	July 2002	25.28	July 2003	---	July 2004	---
August 2001	35.99	August 2002	24.37	August 2003	---	August 2004	1.75
September 2001	18.22	September 2002	19.2	September 2003	---	September 2004	2.43

Table 2-3 (Continued)
Free-Product Recovery Data
NMCB Building Expanded Area

Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered	Date	Gallons Recovered
October 2001	8.58	October 2002	0.7	October 2003	---	October 2004	0.56
November 2001	12.56	November 2002	---	November 2003	---	November 2004	0.14
December 2001	---	December 2002	---	December 2003	---	December 2004	NA
2001 TOTAL	**117**	**2002 TOTAL**	**72**	**2003 TOTAL**	**---**	**2004 TOTAL**	**4.9**
Total quantity of product recovered at the site = 201 gallons							

Notes:
"---" = Recovery not occurring
[1]recovered using passive skimmer(s)
NA - not available

3.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Petroleum hydrocarbons, semivolatile organic compounds (SVOCs), VOCs, and metals have been detected in soil, groundwater, surface water, and sediment at the NMCB Building Expanded Area. The concentrations of contaminants in these media at this site were compared to Alaska DEC cleanup criteria and/or human health and ecological risk-based screening criteria to identify the chemicals of potential concern (COPCs). The COPCs in soil, groundwater, surface water, and sediment are presented below.

3.1 SOIL

A chemical was identified as a COPC if its concentration exceeded the Alaska Method Two cleanup levels established to prevent migration of contaminants from soil to groundwater in the over 40 inches of rainfall zone (18 AAC 75.341, Tables B1 and B2) or if it was identified as a COPC in the human health or ecological risk assessments. The following is a listing of the COPCs identified at the NMCB Building Expanded Area:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Carbazole
- Dibenz(a,h)anthracene
- DRO
- Ethylbenzene
- Gasoline-range organics (GRO)
- Indeno(1,2,3-cd)pyrene
- Methylene chloride
- Naphthalene
- Residual-range organics (RRO)
- Toluene
- Xylenes

Concentrations of all chemicals on the above list exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples with the exception of 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, indeno(1,2,3-cd)pyrene, and RRO. Although the concentrations of carbazole, methylene chloride, and toluene in soil exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples and they were included on the COPC list above, they were not included as a COPC in the human health risk assessment because they were below the screening criteria used in the risk assessment or the magnitude of the exceedances was low.

3.2 GROUNDWATER

A chemical was identified as a COPC if its concentration exceeded the Alaska DEC groundwater cleanup levels [18 AAC 75.345(b)(2)] and/or it was identified as a COPC in the human health risk assessment. The following is a listing of the COPCs identified at the NMCB Building Expanded Area:

- 1,2-Dichloroethane
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- Arsenic
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Beryllium
- Cadmium
- Carbazole
- cis-1,2-Dichloroethene
- Chromium
- Dibenzofuran
- DRO
- Ethylbenzene
- GRO
- Lead
- Methylene chloride
- Naphthalene
- Nickel
- n-Propylbenzene
- Toluene

- Trichloroethene
- Xylenes

Concentrations of arsenic, benzene, beryllium, cadmium, carbazole, cis-1,2-dichloroethene, chromium, DRO, ethylbenzene, GRO, lead, methylene chloride, naphthalene, nickel, toluene, and trichloroethene in groundwater at the site exceeded the Alaska DEC groundwater cleanup levels for groundwater that is used as drinking in water in one or more samples. Although concentrations of arsenic, beryllium, cadmium, chromium, lead, methylene chloride, and nickel in groundwater at the site exceeded the Alaska DEC groundwater cleanup levels for groundwater used as drinking water in one or more samples and were included on the COPC list above, they were not included as a COPC in the human health risk assessment. Methylene chloride was not included as a COPC in the human health risk assessment because of infrequent detections and because the magnitude of the exceedances was low. Arsenic, beryllium, cadmium, chromium, and nickel were not included as COPCs in the human health risk assessment because the only location where these metals were detected is upgradient of the source. Lead was not included as a COPC in the human health risk assessment because the lead screening value is based on EPA's tap water action level for lead and is protective of children, the most sensitive population to lead exposures. At this site, the only complete exposure pathways to groundwater are inhalation and dermal contact during subsurface construction activities. Lead is not considered a volatile chemical and is not readily absorbed through the skin. Therefore, construction worker exposures to lead in groundwater would not be significant.

3.3 SURFACE WATER AND SEDIMENT

A chemical was identified as a COPC in surface water or sediment if it was identified as a COPC in the human health risk assessment or the ecological risk assessment.

The human health risk assessment concluded that exposure pathways to marine surface water and marine sediment at the NMCB Building Expanded Area were insignificant due to the presence of a large berm and riprap along the shoreline at the site. Therefore, no COPCs for human health were identified for marine surface water and/or marine sediment at the site. In addition, no COPCs for ecological receptors were identified for marine surface water because surface water concentrations were lower than risk-based screening concentrations (RBSCs). The following is a listing of the COPCs in marine sediment:

- 3- and 4-methylphenol
- DRO

East Canal collects surface water runoff from the airfield and receives surface water and groundwater from a large portion of the downtown area on Adak. Only about 1/18 of the total volume of water entering the East Canal is estimated to originate from the NMCB Building Expanded Area. Given the relatively small portion of water potentially entering East Canal from the NMCB Building Expanded Area, establishing that the impacts in East Canal are the result of contaminant migration from the NMCB Building Expanded Area is not possible. Therefore, establishing that impacts in West Canal and South Sweeper Creek are the result of contaminant migration from the NMCB Building Expanded Area is also not possible, since these surface water bodies are downgradient of East Canal. In addition, known sources of petroleum hydrocarbons are located upgradient of the surface water and sediment sampling locations in East Canal. Finally, there is no habitat of significance within the manmade airport ditch system, including East Canal. As a result, human health and ecological risk assessments were not performed for the East Canal, West Canal, or South Sweeper Creek.

4.0 CONTAMINANT CONCENTRATIONS AND POTENTIAL EXTENT OF CONTAMINATION

Decisions documented in this DD are based upon information gathered from various environmental field investigations performed at the NMCB Building Expanded Area between 1990 and 2003. The environmental field investigations that have been performed at or in the vicinity of the NMCB Building Expanded Area are summarized in Table 2-1.

Results of these investigations indicated that free product is still being detected at the site and petroleum-related chemicals, SVOCs, VOCs, and metals were confirmed in samples of subsurface soil, groundwater, sediment or surface water collected from several locations at the NMCB Building Expanded Area. Detailed characterization information for the site is provided in the FFS report (URS 2005a) and is summarized below.

Extent of Free Product

Between September 1997 and July 2005, monitoring wells within the vicinity of the NMCB Building Expanded Area have been gauged periodically for the presence of free product. However, only data through December of 2004 are reported here. Between September 1997 and December 2004, free product has been detected in 15 of the 50 wells installed at the site. The maximum measured thickness of free product reported at the site was 2.33 feet, in well 02-300 on May 11, 2002. Figure 4-1 shows the estimated potential extent of free product remaining at the site based on measurements from August 1, 2004 through December 4, 2004. This figure also shows the estimated extent of free product based on measurements from January 1, 2001 through November 9, 2002, and the estimated extent based on measurements from November 1992 through June 2000.

The estimated extents shown on Figure 4-1 are based on maximum product thickness measurements obtained from each location during each of the three periods. The extent of free product estimated for the initial monitoring period (November 1992 through June 2000), shows a product extent of approximately 128,000 ft^2. This is the largest extent of residual free product estimated at the site for these three monitoring periods. The extent of residual free product decreased from this initial estimate to approximately 55,000 ft^2 for the period between January 2001 and November 2002. Evaluation of product thickness measurements obtained from August through December 2004 results in a further reduction in the estimated free product extent to approximately 24,000 ft^2.

Based on the 2004 product thickness measurements, as indicated in Table 4-1, an estimated 20 to 80 gallons of recoverable free product may remain in the subsurface at the site. This estimated quantity of recoverable free product was obtained using the procedure described in the FFS for South of Runway 18-36 Area (URS 2005c).

Free-product recovery has been conducted at the NMCB Building Expanded Area from September 1997 through July 1998, May through July 2000, May through November 2001, May though October 2002, and from August through November 2004. As summarized in Table 2-3, approximately 201 gallons of free product were recovered at the site during these periods. Most of this product (189 gallons) was recovered during 2001 and 2002.

Free-product removal began in September 1997 with the installation of one passive-style product skimmer. Additional passive skimmers were installed in two wells during October and November 1997, respectively (URSG 1999). Passive skimmer operations produced 3.9 gallons of recovered product at the NMCB Building Expanded Area between September 1997 and July 1998. Product recovery was suspended at the site from August 1998 through April 2000 due to the presence of halogenated organic compounds identified in one product sample collected from the site. Product recovery resumed during May 2000 with the installation of one passive skimmer. A total of 3.5 gallons of free product were recovered from this well during 2000 before recovery activities were terminated for the winter. Product recovery resumed at the site during May 2001 with the installation of a passive skimmer in one well and the installation of an automated passive skimmer (modified Xitech product recovery device) in a second well. An additional passive skimmer was installed during June 2001. Product recovery activities continued until November 12, 2001 when all recovery activities were terminated for the winter. During the seven months of recovery activities conducted during 2001, approximately 117 gallons of free product were recovered at the site. Product recovery activities were restarted in five wells at the site on May 11, 2002 and continued through October 2002 when all recovery activities were terminated for the winter. During these 6 months of recovery activities, approximately 72 gallons of free product were recovered at the site. Product recovery did not occur at the site during 2003. However, product recovery activities were restarted on August 4, 2004 and are ongoing using automated passive skimmers and passive skimmers. During August through December 2004, 4.9 gallons of free product were recovered at the site. As of July 2005, free-product recovery at the NMCB Building Expanded Area was discontinued in existing site wells because free-product recovery conducted as an interim remedial action has met the practicable endpoint established for the shut down of product recovery as specified in the OU A ROD (TetraTech 2006). The technically practicable endpoint for product recovery systems not dependent on water table depression is as follows:

> *When the monthly volume of recovered product averaged over the most recent 6 months (6-month moving average) is less than 5 gallons of product recovered per month, the technically practicable endpoint for recovery has been reached. If this endpoint criterion has been met for a period of 12 months of product recovery,*

the system is considered to meet the technically practicable endpoint and recovery can be discontinued (URSG 1999b).

Potential Extent of Contamination in Soil and Groundwater

The potential extent of contamination in soil and groundwater at the NMCB Building Expanded Area was estimated in the FFS report (URS 2005a) and is summarized in this DD. The potential extent of contamination in soil and groundwater was based on data collected through 2002. Since no soil samples were collected after 2002 and groundwater samples were only collected from E-701, which is upgradient of the site, data collected after 2002 do not change the conclusions regarding the potential extent of contamination. The potential extent of contamination was estimated by comparing site concentrations from samples collected between 1992 and 2002 to the Alaska DEC cleanup levels. Locations where the concentrations exceeded the Alaska DEC cleanup levels were identified and then used to delineate the area of potential contamination on Figure 4-2.

The Alaska DEC Method Two cleanup levels established to prevent migration of contaminants from soil to groundwater in the over 40 inches of rainfall zone (18 AAC 75.341, Tables B1 and B2) were used to estimate the potential extent of soil impacted by petroleum contamination at the NMCB Building Expanded Area. The tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] were used to estimate the potential extent of groundwater impacted by petroleum contamination at the site. The potential extent of contamination shown in Figure 4-2 are based solely on exceedances of the Alaska DEC cleanup levels. The potential extent of contamination shown on this figure do not necessarily represent areas where risks are unacceptable or where cleanup actions will be required. However, these areas were considered to be a potential concern and therefore required further evaluation in a risk assessment. The site data used to estimate the potential extents of contamination were used in the risk assessment to determine if contaminant concentrations at the site poses an unacceptable risk to humans and ecological receptors.

The analytical results for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes are provided on Plates 1 and 2 for soil and groundwater, respectively. Although known contamination at this site is predominantly petroleum related, certain non-petroleum chemicals, including VOCs, SVOCs, and metals are known to exist at very low concentrations in soil and groundwater in the vicinity of the NMCB Building Expanded Area. Analytical results obtained for these chemicals are included in the analysis conducted to establish the potential extent of contamination at the site. Basic summary statistics for all COPCs in soil and groundwater are provided in Table 4-2. The COPCs were previously identified in Section 3. These statistics include:

- Total number of samples collected at the NMCB Building Expanded Area including field duplicates

- Samples used in the risk assessment
- Minimum concentration used in the risk assessment
- Maximum concentration used in the risk assessment
- Location of the maximum concentration used in the risk assessment
- Detection frequency
- Range of detection limits

The concentrations of contaminants at the site were compared to Alaska DEC cleanup criteria and/or human health and ecological risk-based screening criteria to identify the COPCs in soil, groundwater, surface water, and sediment. Therefore, some chemicals listed in Table 4-2 may only have been detected at concentrations which exceed the human health or ecological risk-based screening criteria and not the Alaska DEC cleanup levels.

The extent of contamination in soil at the site was estimated by comparing analytical results to the most stringent Alaska DEC soil cleanup criteria established for the protection of groundwater in the over 40-inches of rainfall zone. Detected concentrations of chemicals were reported in soil samples collected from 47 locations at concentrations greater than their respective Alaska DEC soil cleanup levels. These 47 locations occur over a large area across the site extending from the intersection of Main and Seawall Roads east to the vicinity of the Fish and Wildlife Building including nearly the entire site south of Seawall Road. The chemicals that exceed the most stringent criteria are 2-methylnaphthalene, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, carbazole, dibenz(a,h)anthracene, DRO, ethylbenzene, GRO, methylene chloride, naphthalene, toluene, and xylenes. Therefore, detected concentrations of these chemicals above their Alaska DEC soil cleanup levels were used to estimate the potential extent of contamination in soil. The site area estimated to contain detected concentrations of chemicals in soil at concentrations greater than their respective most stringent Alaska DEC soil criteria is indicated by the dashed lines on Figure 4-2. Combined, these areas are estimated to encompass approximately 10 acres.

The potential extent of contamination in groundwater was estimated by comparing analytical results to their respective Alaska DEC groundwater cleanup levels which were established for groundwater that is used as a drinking water source. Monitoring wells at the site have been sampled multiple times on a nonuniform schedule. In addition, groundwater samples collected from the monitoring wells were chemically analyzed for a nonuniform list of chemicals. Only the most recent information available for each chemical at each location is compared to the groundwater cleanup levels to determine the potential extent of contamination in groundwater.

Detected concentrations of chemicals were reported in the most recent groundwater samples collected from 37 locations at concentrations greater than their respective Alaska DEC groundwater cleanup criteria for groundwater that is used as a drinking water source. These 37 locations are situated in an area extending from the southern end of Runway 18-36 southeast to Sweeper Cove. This area contains approximately 1,200 feet of Seawall Road, the PEB, Building T-1416, the vehicle wash rack, and former Building T-1421. The remaining location (02-813) is in the extreme northeast portion of the site just north of Seawall Road. The chemicals that exceed the Alaska DEC groundwater cleanup levels for groundwater that is used as a drinking water source are arsenic, benzene, beryllium, cadmium, carbazole, chromium, cis-1,2-dichloroethene, DRO, ethylbenzene, GRO, lead, methylene chloride, naphthalene, nickel, toluene, and trichloroethene. However, data for arsenic, beryllium, cadmium, chromium, and nickel were not included in the evaluation of the potential extent of contamination in groundwater because the only location where these metals were detected is upgradient of the source. The two site areas, estimated to contain detected concentrations of chemicals in groundwater at concentrations greater than the respective Alaska DEC groundwater cleanup levels for groundwater used as a drinking water source, are indicated by the solid lines on Figure 4-2. This area is estimated to be approximately 13 acres.

Potential Extent of Contamination in Surface Water and Sediment

The potential extent of contamination for surface water and sediment is based on a review of analytical results for petroleum-related chemicals, VOCs, SVOCs, and inorganics in surface water and sediment samples collected in Sweeper Cove and East Canal. The extent of petroleum contamination in marine sediment and surface water of Sweeper Cove was evaluated based on review of analytical results obtained for 11 sediment-surface water sample pairs collected during 1998 and the results from an additional 8 sediment samples collected in 2003. All sediment samples were collected from within 0 to 4 inches of the surface of the sediment. The 1998 sediment and surface water samples were analyzed for benzene, DRO, ethylbenzene, GRO, toluene, total xylenes, and SVOCs including polycyclic aromatic hydrocarbons (PAHs). The 2003 sediment samples were analyzed for DRO and SVOCs only.

DRO, 3- and 4-methylphenol, phenol, and selected SVOCs were detected in marine sediment samples from Sweeper Cove. DRO was detected in all 11 marine sediment samples collected in 1998. It was detected in 1 of 8 samples collected in 2003. Detected DRO concentrations in sediment samples from Sweeper Cove ranged from a minimum of 37 mg/kg to a maximum of 146 mg/kg. A co-elution of 3- and 4-methylphenol was detected in 13 of the 19 sediment samples, 9 of 11 in 1998 and 4 of 8 in 2003. Detected concentrations of 3- and 4-methylphenol in Sweeper Cove sediment samples range from a minimum of 0.3 mg/kg to a maximum of 10 mg/kg. The location of this maximum concentration was resampled in 2003, and the resultant concentration was 0.027 mg/kg. Phenol was detected in 9 of the 19 sediment samples, 5 of 11 in 1998 and 4 of 8 in 2003. Detected phenol concentrations in sediment samples from Sweeper

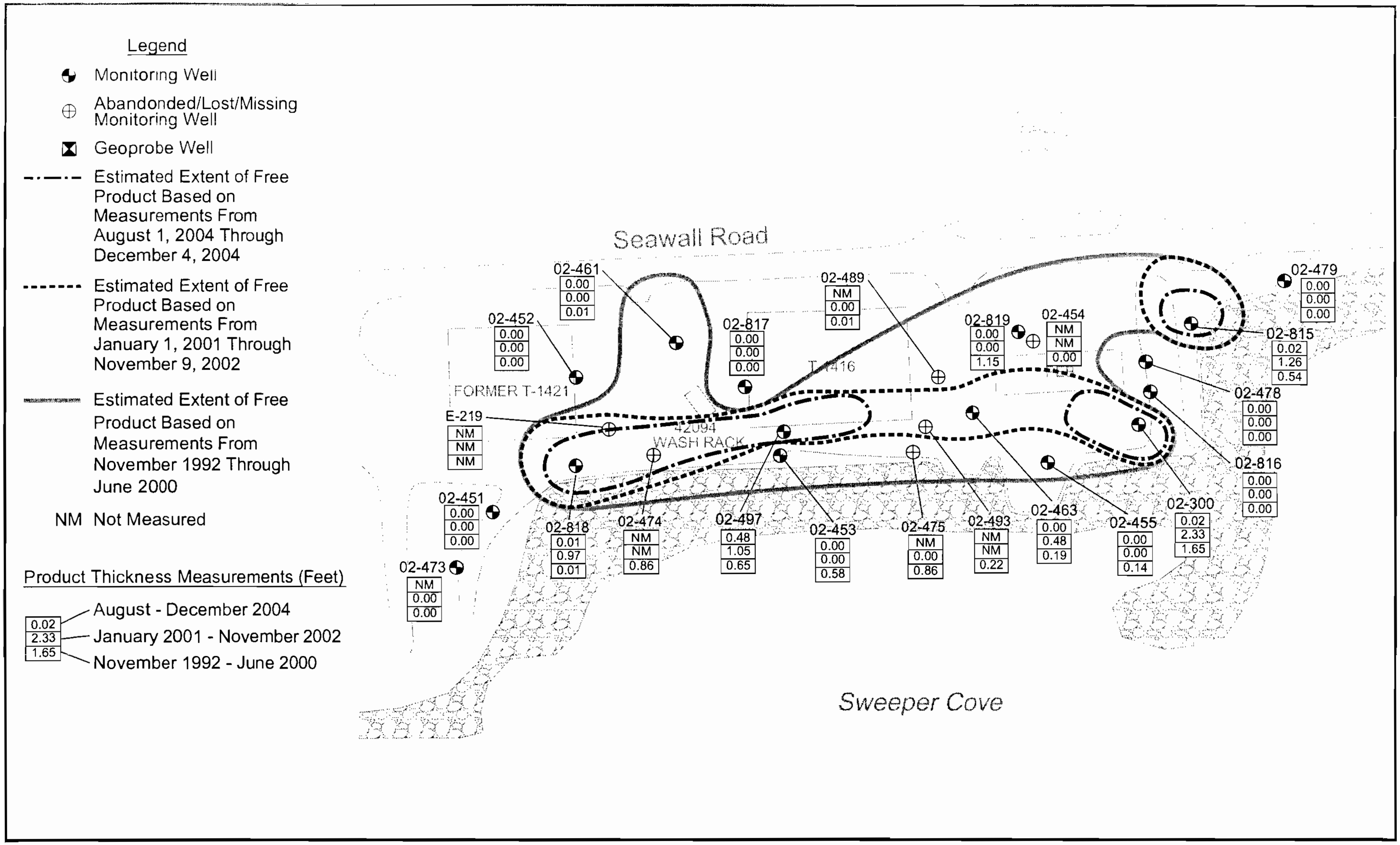
Cove ranged from a minimum of 0.037 mg/kg to a maximum of 0.6 mg/kg. The two locations of the maximum detected concentration were resampled in 2003, and phenol was not detected at either location. Additional SVOCs (not including 3- and 4-methylphenol and phenol) were detected in 5 of the 19 sediment samples, 2 of 11 in 1998 and 3 of 8 in 2003.

Benzene, ethylbenzene, GRO, toluene, total xylenes, total aromatic hydrocarbons (TAH), and total aqueous hydrocarbons (TAqH) were detected in marine surface water samples from Sweeper Cove. GRO was detected in 3 of the 11 surface water samples collected from Sweeper Cove. Detected GRO concentrations ranged from a minimum of 62 micrograms per liter (μg/L) to a maximum of 67 μg/L. Benzene, ethylbenzene, toluene, and total xylenes (BTEX) were detected at low concentrations in surface water samples collected at six locations in Sweeper Cove. Benzene, ethylbenzene, toluene, and total xylenes combined constitute TAH. The TAH concentrations in marine surface water samples collected during 1998 from five locations exceeded the water quality criteria of 10 μg/L established for TAH. PAH compounds in combination with BTEX compounds collectively constitute TAqH. Because PAH compounds were not detected in any of the 11 marine surface water samples collected during 1998, TAqH concentrations were identical to the TAH concentrations at the site. Since the water quality criteria for TAqH is higher than for TAH, the TAqH concentrations exceeded the water quality criteria of 15 μg/L in only four surface water samples collected at the site.

The extent of petroleum contamination in sediment and surface water of the East Canal was evaluated based on review of analytical results obtained for three surface water samples collected during 1993, two surface water samples collected during 1997, two sediment samples collected during 1993, and one sediment sample collected during 1997. All sediment samples were collected from within 0 to 4 inches of the surface of the sediment. The sediment samples collected during 1993 were analyzed for DRO, 3- and 4-methylphenol, and total lead. The 1997 sediment sample was analyzed for benzene, ethylbenzene, GRO, DRO, toluene, total xylenes, and PAHs. The surface water samples were analyzed for benzene, ethylbenzene, GRO, DRO, toluene, total xylenes, di-n-butylphthalate, and dissolved and total lead. The surface water samples collected during 1997, were analyzed for GRO, DRO, VOCs, and SVOCs.

DRO, selected SVOCs, and lead were detected in sediment samples from East Canal. DRO was detected in the sediment samples at estimated concentrations that ranged from 3,120 mg/kg to 33,000 mg/kg. Fluoranthene and pyrene were both detected in one sediment sample tested for PAHs, each at a concentration of 0.3 mg/kg. Total lead was detected in sediment samples from two locations at 25 mg/kg and 190 mg/kg.

Benzene, ethylbenzene, DRO, toluene, total xylenes, TAH, and TAqH were detected in marine surface water samples from Sweeper Cove. DRO was detected in two surface water samples at 8,400 μg/L and 1,700 μg/L. Benzene, ethylbenzene, toluene, and total xylenes were detected in the three surface water samples collected from two locations at concentrations that range from an estimated value of 1.1 μg/L for toluene to 5.2 μg/L for total xylenes. The VOC, cis-1,2-dichloroethene, was detected in the two surface water samples collected from one location at estimated concentrations of 0.79 and 0.82 μg/L.



U.S. NAVY	N 0 75 150 SCALE IN FEET	**Figure 4-1** **Estimated Extent of Residual Free Product** **NMCB Building Expanded Area**	Adak Island, AK DECISION DOCUMENT

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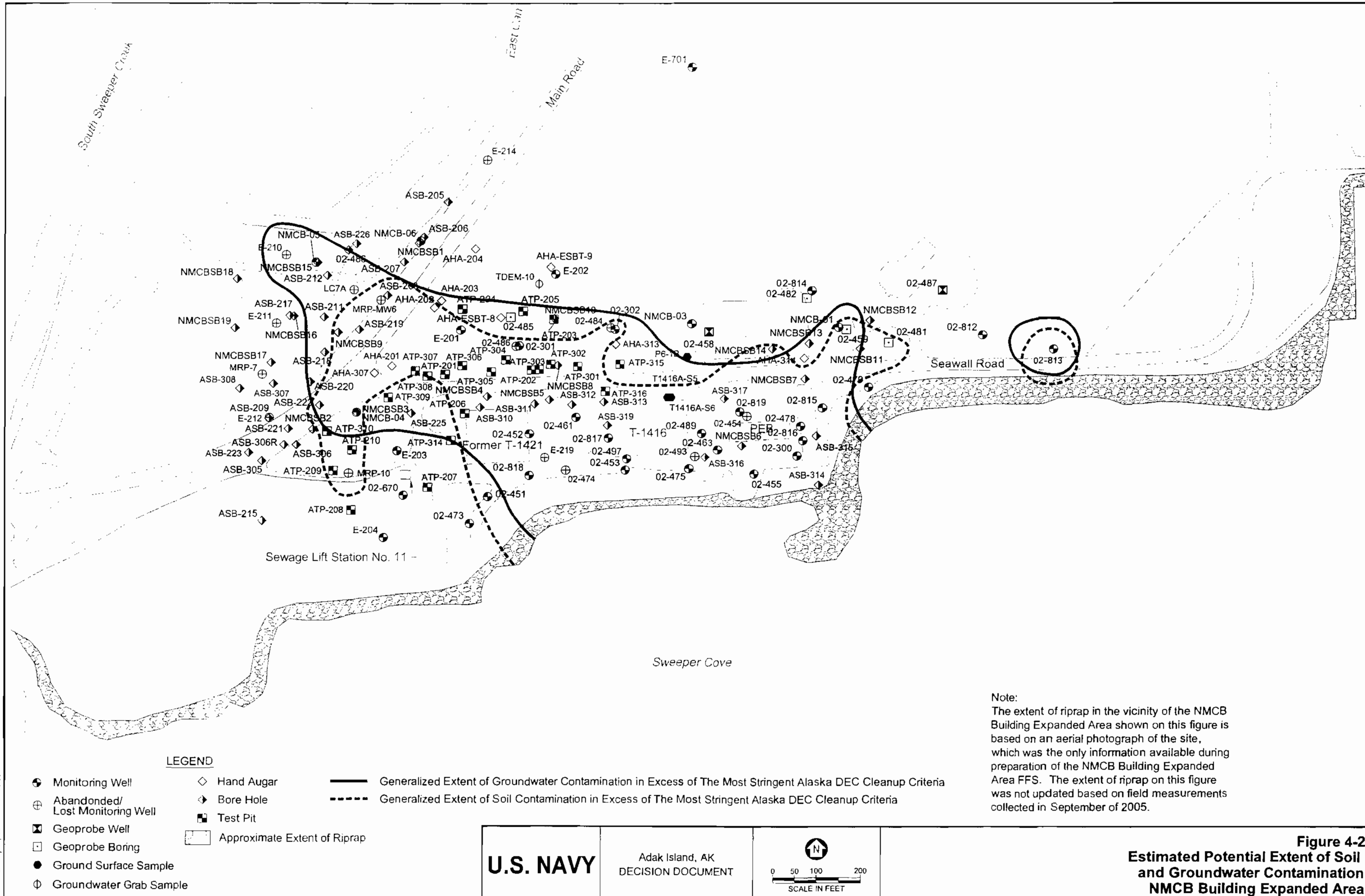


Figure 4-2
Estimated Potential Extent of Soil and Groundwater Contamination NMCB Building Expanded Area

Table 4-1
Recoverable Free Product Volume Estimate
NMCB Building Expanded Area

Plume Area (square feet)	Theoretical Volume Containing Free Product (a) (cubic yards)	Theoretical Volume	Formation Volume (b)		Pore-Space Volume Assuming 100% Saturation (c)	
			Minimum (10 %) (gallons)	Maximum (50 %) (gallons)	Minimum (gallons)	Maximum (gallons)
24,000	21	4,242	424	2,121	127	636

Total Minimum Recoverable LNAPL assuming 12% yield[(d)]: 20

Total Maximum Recoverable LNAPL assuming 12% yield[(d)]: 80

Notes:

(a) Theoretical Volume with free product is calculated based on "apparent" product thickness measurements which are measured in the field. This value was estimated using the product thicknesses and areas for each product thickness contour to come up with cross-sections, and to calculate a volume from the cross-section. The areas for each product thickness were calculated using AutoCAD.

(b) Formation Volume is the calculated Theoretical Volume multiplied by a factor to convert "apparent" free product thickness as measured in the field to "true" or "formation" thickness. The factors (10 and 50%) used to calculate the corrected volume are only an estimate based on literature values for LNAPL thickness in soil as calculated from measured thickness in monitoring wells located within the LNAPL plume. The typical values to convert from apparent to true thickness range from 10 to 50 percent.

(c) The Pore-Space Volume is the Formation Volume multiplied by $n_e(1-S_r)$
where: n_e = effective porosity factor (typically ranges from 0.267 to .421)
S_r = irreducible water content (typically ranges from 5 to 20 percent)
Therefore: $n_e(1-S_r)$ typically ranges from 0.21 to 0.40

(d) The quantity of LNAPL recoverable is calculated by multiplying the Pore-Space Volume by S_y
where: Sy = specific yield (typically ranges from 5-20 % of apparent volume)

Table 4-2
Summary of Analytical Results for Chemicals of Potential Concern
NMCB Building Expanded Area

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2) (3) (4)	Minimum Concentration (5)	Minimum Qualifier	Maximum Concentration (5)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
Soil										
Volatile Organic Compounds (VOCs)										
1,2,4-Trimethylbenzene	17	12	0.006	J	130	J	mg/kg	02-818	8/12	0.02 - 0.2
1,3,5-Trimethylbenzene	17	12	0.008	J	61	J	mg/kg	02-818	9/12	0.02 - 0.2
2-Methylnaphthalene (6)	17	16	0.6		120		mg/kg	02-451	8/16	0.2 - 1
Benzene	171	143	0.007	J	80		mg/kg	02-474	14/143	0.005 - 4.5
Ethylbenzene	171	143	0.025	J	180		mg/kg	02-474	51/143	0.005 - 0.25
Methylene Chloride	20	15	0.08	J	2.09	J	mg/kg	NMCBSB9	3/15	0.01 - 2.2
Naphthalene	24	19	0.01	J	280		mg/kg	02-451	11/19	0.01 - 0.2
Toluene	170	143	0.016	J	120		mg/kg	02-474	38/143	0.005 - 0.729
Xylenes	169	143	0.022	J	920		mg/kg	02-474	69/143	0.005 - 0.15
Semivolatile Organic Compounds (SVOCs)										
Benzo(a)anthracene	21	17	0.0647		80		mg/kg	02-451	3/17	0.2 - 2
Benzo(a)pyrene	21	17	0.0464		40		mg/kg	02-451	3/17	0.2 - 2
Benzo(b)fluoranthene	21	17	0.0401		43	J	mg/kg	02-451	3/17	0.2 - 2
Carbazole	9	9	107	J	107	J	mg/kg	02-451	1/9	0.2 - 0.8
Dibenz(a,h)anthracene	21	17	0.0126		8		mg/kg	02-451	2/17	0.2 - 2
Indeno(1,2,3-cd)pyrene	21	17	0.0295		16		mg/kg	02-451	3/17	0.2 - 2
Total Petroleum Hydrocarbons (TPHs)										
Diesel Range Organics	171	146	4.08	J	43,000	J	mg/kg	02-475	103/146	4-1100
Gasoline Range Organics	168	145	2.1		27,000		mg/kg	02-474	69/145	0.3-600
Residual Range Organics	4	4	110		1,310	J	mg/kg	02-451	3/4	600

Table 4-2 (Continued)
Summary of Analytical Results for Chemicals of Potential Concern
NMCB Building Expanded Area

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2) (3) (4)	Minimum Concentration (5)	Minimum Qualifier	Maximum Concentration (5)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
Groundwater										
Volatile Organic Compounds (VOCs)										
1,2,4-Trimethylbenzene	20	17	2.33		752		ug/L	02-452	17/17	--
1,2-Dichloroethane	39	33	1.4	J	1.5	J	ug/L	E-201	2/33	0.5 - 200
cis-1,2-Dichloroethene (7)	39	33	10.5		400		ug/L	02-474	8/33	0.5 - 200
1,3,5-Trimethylbenzene	20	17	2.41		241		ug/L	02-452	17/17	--
2-Methylnaphthalene (6)	56	50	0.02	J	130		ug/L	02-474	31/50	0.2 - 2.17
Benzene	125	103	0.872		360		ug/L	02-493	47/103	0.2 - 200
Dibenzofuran	18	16	0.4		68		ug/L	02-474	6/16	0.2 - 11
Ethylbenzene	128	106	1.1		970		ug/L	MRP-MW6	70/106	0.2 - 1
Methylene Chloride	39	33	3	J	8	J	ug/L	02-474	2/33	1 - 200
Naphthalene	78	66	0.07	J	1,100		ug/L	02-474	47/66	0.2 - 2.17
n-Propylbenzene	20	17	2.9		89		ug/L	02-461	15/17	1 - 10
Toluene	128	106	0.5		1,600		ug/L	LC7A	64/106	0.2 - 25
Trichloroethene	39	33	12	J	24		ug/L	02-474	3/33	0.5 - 200
Xylenes	128	106	1.1	J	5,000		ug/L	LC7A	73/106	0.2 - 2
Semivolatile Organic Compounds (SVOCs)										
Benzo(a)anthracene	58	51	0.02	J	1		ug/L	02-474	12/51	0.2 - 11
Benzo(a)pyrene	58	51	0.01	J	0.14	J	ug/L	02-474	4/51	0.02 - 11
Benzo(b)fluoranthene	58	51	0.01	J	0.5	J	ug/L	02-474	3/51	0.2 - 11
Carbazole	51	46	0.02	J	160		ug/L	02-455	25/46	0.2 - 0.22

Table 4-2 (Continued)
Summary of Analytical Results for Chemicals of Potential Concern
NMCB Building Expanded Area

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2) (3) (4)	Minimum Concentration (5)	Minimum Qualifier	Maximum Concentration (5)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
Total Petroleum Hydrocarbons (TPHs)										
Diesel Range Organics	115	99	105		44500	J	ug/L	02-475	71/99	100-260
Gasoline Range Organics	112	97	55		33000		ug/L	MRP-MW6	68/97	5-250
Metals										
Arsenic	1	0	NA		NA			NA	NA	NA
Beryllium	1	0	NA		NA			NA	NA	NA
Cadmium	1	0	NA		NA			NA	NA	NA
Chromium	1	0	NA		NA			NA	NA	NA
Lead	18	14	1.6	J	330		ug/L	MRP-MW6	13/14	1
Nickel	1	0	NA		NA			NA	NA	NA

Notes:

(1) Number includes field duplicates.

(2) Number does not include groundwater samples collected at Locations E-701 or TDEM-10 because these wells are not impacted by site contamination.

(3) Number does not include soil samples collected at depths greater than 17 feet below ground surface.

(4) Number does not include groundwater samples analyzed using VPH or AK-102-AA.

(5) Minimum/maximum detected concentration in samples used for the risk assessment.

(6) The surrogate chemical of naphthalene was used for the screening value for 2-methylnaphthalene.

(7) 1,2-Dichloroethene results were pooled with cis-1,2-dichloroethene results for screening.

AK-102-M - State of Alaska analytical method

J - estimated value

mg/kg - milligrams per kilograms

ug/L - micrograms per liter

NA - not applicable, risk assessment was not conducted for this chemical

VPH - volatile petroleum hydrocarbon

5.0 SUMMARY OF RISK ASSESSMENTS

Baseline human health and ecological risk assessments were conducted to determine if residual petroleum at the NMCB Building Expanded Area would pose unacceptable risk to human health or the environment if no cleanup actions were to take place. Contaminant concentrations reported in Section 4 were used to calculate risks and hazards. Hazards calculated for human exposures to chemicals in soil were found to be greater than target health goals. Target health goals established for free-product petroleum sites at the former Adak Naval Complex are the following:

- Human health cancer risk (CR) of 1×10^{-5}
- Human health hazard index (HI) of 1 based on non-total petroleum hydrocarbon (TPH) compounds
- Human health HI of 1 based on TPH
- Ecological HI of 1

5.1 HUMAN HEALTH

Alaska DEC provides guidance for four methods of determining cleanup levels (beginning with Method One) that increase in level of effort and site-specificity. Method Four uses risk assessment to determine site specific cleanup levels (ADEC 2000c). Sufficient site information is available to determine Method Four cleanup levels and the results are summarized below. Details are provided in Appendix C of the FFS report (URS 2005a).

Previous investigations have identified chlorinated solvents and petroleum compounds in soil and groundwater at concentrations above regulatory levels at the site resulting from spills, leaks, or work practices associated with vehicle maintenance, woodworking, and machine shop activities and likely leakage from subsurface fuel lines. The risk assessment, conducted according to the risk assessment procedures specified by Alaska DEC (2000c), evaluated whether potential health risks were present if people encountered these chemical-impacted materials in their environment. Risks and hazards were estimated for each complete, significant exposure pathway. Exposure pathways were determined to be complete and significant based on the site-specific human health conceptual site model (CSM). The human health CSM for the NMCB Building Expanded Area is depicted on Figure 5-1. This section provides a summary of the human health risk assessment conducted for this site. The complete, detailed human health risk assessment is included as Appendix C of the FFS report (URS 2005a).

5.1.1 Human Health Risk Assessment Procedures

A baseline risk assessment typically consists of four major steps: (1) data evaluation, (2) exposure assessment, including development of a CSM, (3) toxicity assessment, and (4) risk characterization and calculation of cleanup levels. A final step is a qualitative analysis of the major uncertainties involved in risk assessment calculations. Details of the procedures used to calculate the health risks are summarized below.

Data Evaluation

At step one, the data applicable to human health exposures are selected and compared to de minimis health-based screening levels. Chemicals with concentrations greater than the de minimis levels are selected as "COPCs" for evaluation in the risk assessment. Nineteen chemicals were selected as COPCs in groundwater:

- 1,2-Dichloroethane
- cis-1,2-Dichloroethene
- 2-Methylnaphthalene
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Carbazole
- Dibenzofuran
- Ethylbenzene
- Naphthalene
- n-Propylbenzene
- Toluene
- Trichloroethene
- Xylenes
- DRO
- GRO

The following 15 chemicals were selected as COPCs in soil:

- 2-Methylnaphthalene
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene

- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Dibenz(a,h)anthracene
- Ethylbenzene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Xylenes
- DRO
- GRO
- RRO

Exposure Assessment

Once COPCs are selected, the second step in risk assessment is an evaluation of the exposure pathways by which people could encounter chemicals. The exposure assessment identifies the populations potentially exposed to chemicals at the site, the means by which exposure occurs, and the amount of chemical received from each exposure medium (i.e., the dose). Only complete exposure pathways are quantitatively evaluated. Complete pathways consist of four elements: (1) a source and mechanism of chemical release, (2) a retention or transport medium (e.g., groundwater), (3) a point of potential human contact with the affected medium, and (4) a means of entry into the body at the contact point. Figure 5-1 presents the CSM, which depicts the complete pathways for this site.

Residential land use, including permanent or temporary living accommodations, childcare facilities, schools, playgrounds, and hospitals are prohibited at the NMCB Building Expanded Area by the Interim Conveyance Document. Thus, no residential populations would be exposed to chemicals at the site. Because there is no exposure to surface soil (site is either paved or covered in gravel) and chemicals in groundwater are moving away from the residential areas, off-site populations would not be exposed to chemicals migrating from the site to the residential areas.

Current and future human exposures to chemicals in soil and groundwater at the NMCB Building Expanded Area were therefore evaluated for potential construction workers who could be involved in tasks requiring subsurface intrusion and building workers occupying the buildings. The following exposure pathways were selected for quantitative evaluation under current and future conditions:

- Construction workers potentially disturbing soil in the course of construction activity could be exposed through incidental ingestion, dermal contact, and inhalation of fugitive dust and volatile chemicals in soil (to a depth of 15 feet).
- Construction workers conducting intrusive subsurface work could be exposed to chemicals in shallow groundwater (less than 15 feet bgs) through dermal contact and inhalation of volatile chemicals.
- On-site building workers occupying the site building could be exposed to volatile chemicals in soil and groundwater by inhalation of chemicals migrating through the soil into the building.

Recreational exposure to surface water and sediment of Sweeper Cove was considered a potentially complete, but insignificant pathway. Therefore, this pathway was not quantitatively evaluated in the risk assessment. Recreational activities at this area are expected to be limited because the shoreline in the NMCB Building Expanded Area is very rocky and access is very limited due to a large berm and riprap; thus, it is not considered an appealing recreational area. There are other shoreline areas near NMCB Building Expanded Area and closer to the residential areas that are attractive beaches with no riprap and are more likely to be visited by community members than the shoreline area around NMCB Building Expanded Area. For this reason, human contact with sediment is expected to be limited and only possible during low tide. At the request of Alaska DEC, detected chemicals in sediment were compared to the State of Texas' sediment protective concentration levels for protection of direct human contact with sediment (www.tnrc.state.tx.us/permitting/trrp.htm#topic3).

Detected concentrations of chemicals in sediment were compared to the State of Texas criteria because these are the only published criteria for recreational exposures according to the ADEC. None of the detected chemicals in sediment were present in concentrations greater than the State of Texas' sediment protective concentration levels. Therefore, in addition to the fact that contact with sediment is expected to be very minimal, chemicals in sediment are not present in concentrations that are a health concern for recreational exposures, even if fairly prolonged contact is assumed (see further discussion in uncertainty section). The small number of surface samples with detected GRO exhibited concentrations below the drinking water standard, and marine waters cannot be used for drinking. In summary, exposures to petroleum compounds in surface water and sediment of Sweeper Cove do not present a health concern for recreational populations.

Ingestion of groundwater is considered an incomplete pathway for all receptors. Institutional controls are currently in place for groundwater, which restrict the use of groundwater as drinking water. In addition, salt water intrusion makes the groundwater at the NMCB Building Expanded Area an unlikely potential future drinking water source.

The exposure factors used in the risk calculations for on-site building worker exposures to volatile chemicals in indoor air are summarized on Table 5-1; and the exposure factors used in the risk calculations for construction worker exposures to groundwater and soil are summarized on Tables 5-2 and 5-3, respectively.

Toxicity Assessment

The third step in risk assessment is an evaluation of the toxicity of the COPCs by an assessment of the relationship between the dose of a chemical and the occurrence of toxic effects. Chemical toxicity criteria, which are based on this relationship, consider both cancer effects and effects other than cancer (noncancer effects). Tables 5-4 and 5-5 present the cancer and noncancer criteria, respectively. The toxicity criteria are combined with the exposure factors when quantifying potential health risks for each COPC. The toxicity criteria are required in order to quantify the potential health risks due to the COPCs. Benzene, 1,2-dichloroethane, ethylbenzene, trichloroethylene, and the PAHs were evaluated for cancer effects; and the other chemicals (where toxicity information exists) were evaluated for noncancer effects.

Note, only noncancer toxicity criteria are available for the petroleum groups. Carcinogenic effects are not evaluated for the petroleum ranges. Rather, the individual carcinogenic compounds present in petroleum (i.e., benzene) are evaluated separately.

Risk Characterization

The last step in human health risk assessment is a characterization of the health risks. The exposure factors, media concentrations, and toxicity criteria are combined to calculate health risks. Health risks are calculated differently for chemicals that cause cancer and for chemicals that cause noncancer effects. The calculation of CR assumes that no level of the chemical is without some risk, whereas for chemicals with noncancer effects, a "threshold" dose exists. Risks (for cancer) and hazards (for noncancer effects) are calculated for a reasonable maximum exposure (RME) scenario for each pathway, a calculation that overestimates risks for the majority of the population in order to ensure that public health is protected. CR estimates represent the potential for cancer effects by estimating the probability of developing cancer over a lifetime due to site exposures. Noncancer hazards assume there is a level of chemical intake that is not associated with an adverse health effect even in sensitive individuals. Alaska DEC (2000c) risk assessment guidelines require that noncarcinogenic effects of the TPH compounds (i.e., DRO and GRO) be evaluated separately from the non-TPH compounds. Therefore, in the summarizing step of the risk characterization section, a HI is presented for each, the non-TPH compounds and the TPH compounds. The results of the risk characterization for each population are discussed separately below:

On-Site Building Worker

Risks and hazards for the individual COPCs for on-site building worker exposures to volatile chemicals in indoor air are presented in Table 5-6. In addition, the exposure point concentrations (EPCs) used to calculate risks and hazards are also presented on Table 5-6. Health risks for the on-site worker inhaling vapors in indoor air did not exceed Alaska DEC target health goals—with an estimated total non-TPH hazard index of 0.03 and TPH hazard index of 0.01 for the non-cancer chemicals and CR of 2×10^{-7}.

These risks and hazards for on-site building worker exposures were estimated using EPA-approved modeling (Johnson-Ettinger model; Johnson *et al.* 1999, Johnson and Ettinger 2000) to predict indoor air concentrations based on groundwater data collected in the vicinity of the building. While volatile chemicals are also selected as COPCs in soil, the majority of the data collected in the vicinity of the building had volatile concentrations less than Alaska DEC Method Two. Therefore, only groundwater data was used to model indoor air concentrations. The model may underestimate indoor air concentrations if the soil type under a building is more permeable to vapors than sand or if the possibility of "preferential pathways" exists. The data for the NMCB Building Expanded Area do not indicate that very permeable soil types or preferential pathways are a concern. The much more likely scenario in the case of petroleum compounds is that the model over-predicts vapor concentrations. The developers of the indoor air model state that their model generally over-predicts, rather than under predicts, indoor air concentrations for most scenarios. Their opinion is that the Johnson-Ettinger model likely over-predicts for hydrocarbon scenarios due to the importance of *in situ* biodegradation.

Because of the tendency for the model to over-predict indoor air concentrations and because risks and hazards calculated for the indoor air pathway were approximately two orders of magnitude below target health goals, the potential for petroleum contamination in groundwater to pose a health concern via the indoor air pathway is highly unlikely. Because of the cleanup activities that have already occurred at the NMCB Building Expanded Area and the selected remedial alternative for the site (specifically, the free-product recovery efforts), indoor air concentrations are expected to decrease over time and result in even lower risk.

Construction Worker

Risks and hazards for the individual COPCs for construction worker exposures to soil and groundwater are presented on Tables 5-7 and 5-8, respectively. In addition, the EPCs used to calculate these risks and hazards are also presented on Tables 5-7 and 5-8. Table 5-9 presents the cumulative risks and hazards from exposure to both groundwater and soil during construction. The cumulative risks and hazards for the construction worker scenario for the non-TPH chemicals were 1×10^{-5} and 1 (for cancer and noncancer effects), while the TPH chemical noncancer hazards were 2. Alaska DEC target health goals for cancer chemicals are no more than a 1 x 10^{-5} chance of developing cancer and target health goals for non-cancer chemicals are a hazard quotient of 1. Therefore, the risks and hazards for the non-TPH chemicals were equal to, but did not exceed, target health goals. However, the hazards due to the TPH chemicals exceeded the target health goal of 1 for non-cancer chemicals.

Free-product recovery has been conducted at the NMCB Building Expanded Area site intermittently from September 1997 through July 2005. Between September 1997 and November 2004 approximately 201 gallons of free product have been recovered at the site. As discussed in Section 3.0 of the FFS report (URS 2005a), measurable thicknesses of free product have been observed in five monitoring wells at the NMCB Building Expanded Area site during groundwater monitoring activities conducted since January 2001.

While exposures to free product cannot be quantitatively evaluated in risk assessments, exposures to free product may represent an unacceptable health risk—although significant risks are unlikely because of the small and localized extent of the remaining product (see Figure 4-1). As of December 2004, the areal extent of free product was estimated to be approximately 24,000 ft^2. The current extent is expected to be much smaller based on additional free-product recovery activities conducted in 2005. In the event that free product is encountered by construction workers performing subsurface activities, the appropriate measures should be taken to minimize contact and exposure.

Because TPH chemicals in soil exceeded target health goals for construction worker exposures and because there is sufficient free product remaining at the site that direct contact with free product could constitute a health risk, action-based alternative cleanup levels (ACLs) were calculated for GRO and DRO in soil as allowed under 18 AAC 75.340. The proposed action-based ACLs are 1,700 mg/kg for GRO and 31,000 mg/kg for DRO. These action-based ACLs were calculated by defining a target health goal and then solving the basic risk assessment equations for concentration, rather than for risk or for hazard. The same site-specific information developed for calculating health risks was used in the action-based ACL calculations. Because only non-cancer health effects are a concern, the ACLs are protective of non-cancer health end points.

Site-specific cleanup levels for groundwater were not calculated. The proposed groundwater cleanup levels for NMCB Building Expanded Area are the Alaska DEC cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for drinking water, because the water is not potentially potable (i.e., saltwater intrusion makes the water undrinkable). In addition, institutional controls are currently in place for groundwater, which restrict the use of groundwater as a drinking water source.

5.2 ECOLOGICAL

Ecological hazards to terrestrial and aquatic biota resulting from exposure to petroleum compounds in soil, marine sediment and marine surface water were estimated for each complete, significant exposure pathway. Exposure pathways were determined to be complete and significant based on the site-specific ecological CSM. The ecological CSM for the NMCB Building Expanded Area is depicted on Figure 5-2. Hazards above target health were only qualified for terrestrial wildlife exposed to petroleum hydrocarbons in surface soil. There were no hazards above target health goals for aquatic biota exposed to petroleum compounds in surface water or sediment at the NMCB Building Expanded Area. In addition, there are no threatened or endangered species affected by the petroleum release at this site. This section provides a summary of the ecological risk assessment conducted for this site. The complete, detailed ecological risk assessment is included as Appendix C of the FFS report (URS 2005a).

5.2.1 Ecological Risk Assessment Procedures

Ecological risk assessment procedures begin with determining whether a detailed ecological risk assessment of that site is required. A detailed ecological risk assessment of a given site is required whenever the potential for an ecological threat from chemicals exists. The decision on whether to perform a detailed ecological risk assessment or not is made during the problem formulation stage of the risk assessment process. Before a decision can be made on the need for a detailed ecological risk assessment of a given site, a determination is made regarding the following:

1. The presence of sensitive environments, critical habitats, or sensitive species at a site

2. The presence of complete exposure pathways which result in the exposure of ecological receptors to site contaminants

If it is determined that no sensitive environments, critical habitats or sensitive species are present at a given site, and complete exposure pathways cannot be identified, Alaska DEC guidance permits the ecological risk assessment process for that site to be terminated.

5.2.2 Problem Formulation

An ecological checklist (found in Appendix B of the Alaska DEC Risk Assessment Procedures Manual and included in Appendix C-II of the FFS [URS 2005a]) was completed, describing the location and characteristics (e.g., environmental setting, land use, environmental fate-and-transport, and ecological receptors) of specific environments within the boundaries of the NMCB

Building Expanded Area site. Through this exercise, it was determined that critical habitat for anadromous salmonids is present at the site.

An ecological CSM was also prepared, describing the completeness and significance of exposure pathways by which ecological receptors may potentially be exposed to site contaminants. The CSM (included as Figure 5-2) revealed that the following complete exposure pathways exist at the NMCB Building Expanded Area and result in the ecologically significant exposure of ecological receptors to site contaminants:

1. Aquatic receptors may be exposed to site contaminants in marine waters and sediments

2. Terrestrial receptors may be exposed to site contaminants in surface soil 0 to 6 feet bgs

Based on this assessment, potential ecological threat exists to ecological receptors from petroleum products released at the NMCB Building Expanded Area. Therefore, an ecological effects evaluation that quantitatively described the potential ecological risk associated with exposure to site contaminants was conducted. Details of this evaluation are provided in Appendix C of the FFS report (URS 2005a).

5.2.3 Screening Level Ecological Risk Assessment

Ecological risk at the site was estimated only for contaminants in surface soil, marine sediment and marine surface water. A screening level ecological risk assessment was conducted to determine whether any of the contaminants detected in these media on site might present an unacceptable risk to ecological receptors. Hazard quotients were derived for the detected contaminants; chemicals with hazard quotients greater than or equal to 1.0 were retained as COPCs.

Two surface soil contaminants were identified as COPCs:

- DRO
- GRO

Two marine sediment contaminants were identified as COPCs:

- 3- and 4-methylphenol
- DRO

No contaminants were identified as COPCs in marine surface water because no contaminants were present in concentrations exceeding the risk-based screening concentrations. The results of the screening level ecological risk assessment to identify COPCs are presented in Table 5-10 for soil, Table 5-11 for marine sediment, and Table 5-12 for surface water. COPCs identified during the screening level risk assessment were forwarded to the baseline ecological risk assessment.

5.2.4 Baseline Ecological Risk Assessment

In the risk characterization phase of a baseline risk assessment, hazard quotients are calculated in a similar manner as in a screening level risk assessment. However, the 95 percent upper confidence limit (UCL95) of the COPC is compared to the respective RBSC rather than the maximum detected concentration. For sediment, the most recent data from each sampled location was used in the calculation of the UCL95s to represent the most current conditions. That is, if a sediment location was sampled during the recent August 2003 sediment sampling investigation, then only the recent result was included in the UCL95 calculations.

The risk characterization phase of the baseline ecological risk assessment did not identify any chemicals detected in marine sediment as having the potential to pose a significant, unacceptable risk to benthic biota (i.e., all hazard quotients less than 1.0). The only potentially significant ecological risk which could be quantified during the baseline ecological risk assessment was exposure of terrestrial wildlife to GRO in soil (hazard quotient of 3.9). No other chemicals of concern (COCs) were identified in soils of the NMCB Building Expanded Area site in the baseline risk assessment of terrestrial wildlife.

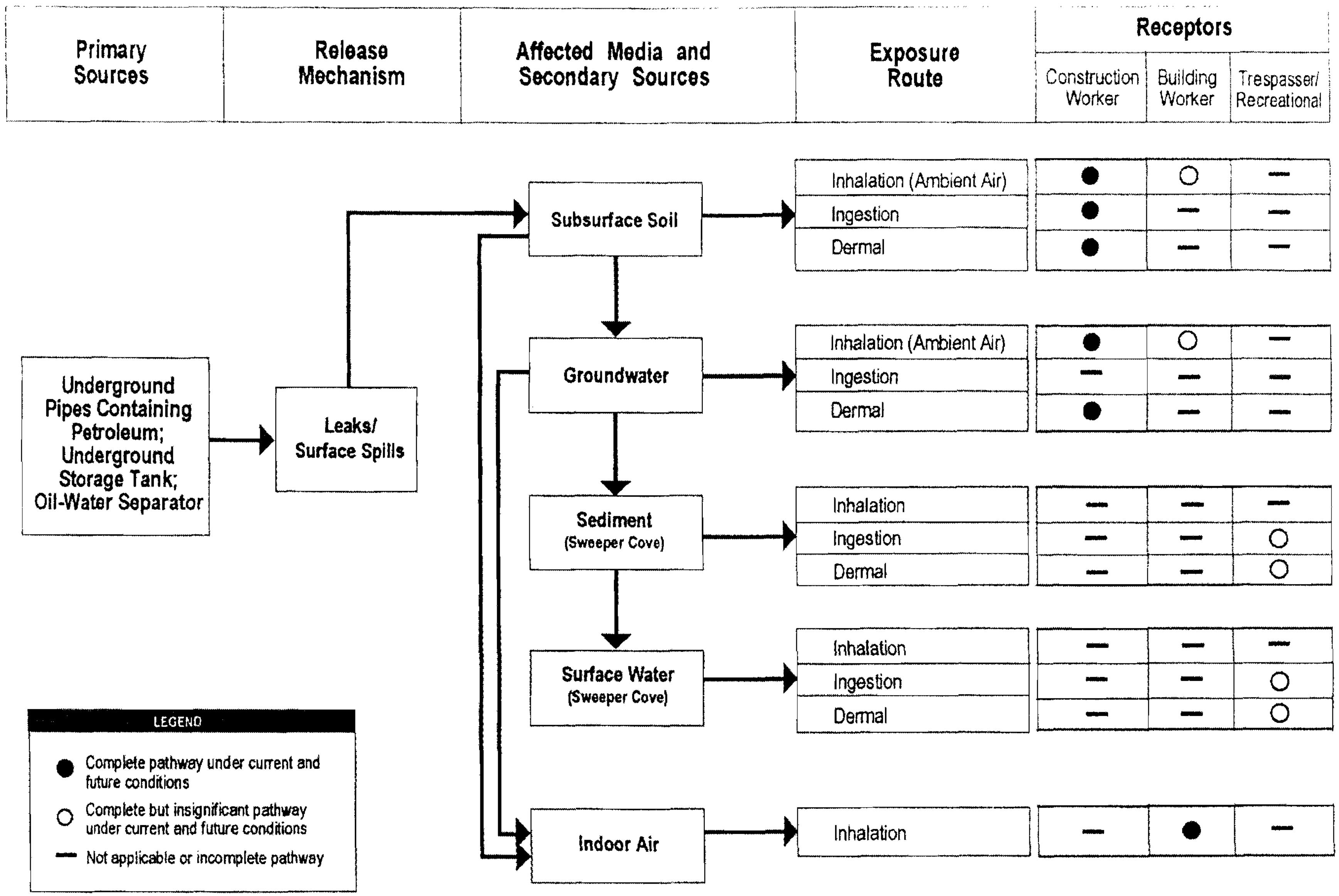
The results of the baseline ecological risk assessment to identify COCs are presented in Table 5-13 for soil, and Table 5-14 for marine sediment.

5.2.5 Conclusion

Site COPCs in marine surface water and marine sediments do not pose significant quantifiable risks to any ecological receptor. As discussed above, the most recent sediment data from each sampled location was used in the calculation of the UCL95s. The use of one data point for a single location in a statistical analysis is appropriate to avoid providing more statistical weight to one location. Furthermore, the detection limits were generally higher in the older data and tend to overestimate the concentration data. Although there is some uncertainty in whether Sweeper Cove is depositional or erosional, using the current sediment data gives the best approximation of current conditions without statistical bias. Collection of additional sediment samples is not considered necessary because newer samples are unlikely to result in different conclusions than those reached using the 2003 sediment data.

Based on the 2003 sediment investigation, marine sediments do not pose significant risk. Based on our experience, accretion of new sediments typically provides a natural "cap" and overall environmental improvement with very little vertical transfer due to "bioturbation." Additional free-product recovery has occurred at the site since the most recent sediment samples were collected. Therefore, it is likely that collection of new sediment samples would show either similar results to those presented in the Baseline Ecological Risk Assessment or even a decrease in ecological hazard, particularly since 3- and 4-methylphenol (the chemical of most potential ecological concern) has a relatively short half-life in marine environments. Therefore, it is unlikely that the measured concentrations of the chemical would remain stable, even if the sediments at the site were physically stable. The hazard quotient resulting from the 2003 sediment data are indicative of conditions that pose no significant ecological risks to benthic biota in Sweeper Cove in the vicinity of NMCB Building Expanded Area (i.e., hazards were approximately one order of magnitude below target health goals).

Based on these data, a potential ecological threat only exists to terrestrial wildlife from GRO in soil at the NMCB Building Expanded Area site. The ecological RBSC for soils of 1,840 mg/kg was selected as the ACL for GRO. However, the human health ACL for GRO of 1,700 mg/kg was lower than that determined for the ecological risk assessment. As such, the human health ACL is considered to be protective of ecological receptors.



U.S.NAVY	**Figure 5-1** **Human Health Conceptual Site Model** **NMCB Building Expanded Area**	Adak Island, AK DECISION DOCUMENT

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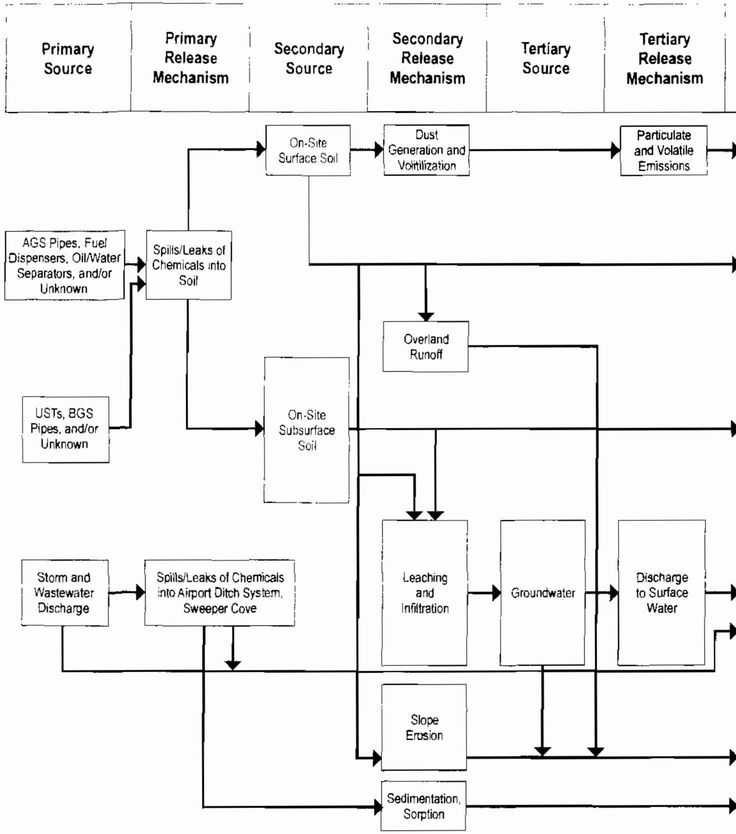

Exposure Medium	Exposure Route	Terrestrial Biota: Plants	Terrestrial Biota: Invertebrates	Terrestrial Biota: Birds	Terrestrial Biota: Mammals	Aquatic Biota: Macrophytes	Aquatic Biota: Plankton	Aquatic Biota: Invertebrates	Aquatic Biota: Fish	Aquatic Biota: Birds	Aquatic Biota: Marine Mammals
Air	Inhalation	—	○	○	○	—	—	—	—	○	○
On-Site Surface Soil (0-6 feet bgs)	Incidental Ingestion	—	●	●	●	—	—	—	—	○	○
	Dermal Contact/ Root Uptake	●	●	●	●	—	—	—	—	○	○
	Food Web	—	○	○	○	—	—	—	—	—	—
On-Site Subsurface Soil (>6 feet bgs)		—	—	—	—	—	—	—	—	—	—
	Incidental Ingestion	—	—	—	—	—	—	—	—	—	—
	Dermal Contact	—	—	—	—	—	—	—	—	—	—
Sweeper Cove East Canal Surface Water	Ingestion	—	—	○	○	—	—	●	●	●	●
		—	—	○	○	●	●	○	○	○	○
	Food Web	—	—	○	○	—	—	○	○	○	○
Sweeper Cove East Canal Sediment	Incidental Ingestion	—	—	○	○	—	—	●	●	●	●
	Dermal Contact/ Root Uptake	—	—	○	○	●	—	●	●	○	○
	Food Web	—	—	○	○	—	—	○	○	○	○

Potential Ecological Receptors

LEGEND

- ● Potentially Complete Pathway
- ○ Minor or Insignificant Pathway
- — Incomplete Pathway
- AGS Above Ground Surface
- AST Aboveground Storage Tank
- BGS Below Ground Surface
- FCT Field Constructed Tank
- UST Underground Storage Tank

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Figure 5-2
Ecological Conceptual Site Model for the NMCB Building Expanded Area

Adak Island, AK
DECISION DOCUMENT

Table 5-1
Assumptions for Worker Exposure to Chemicals in Groundwater Through the Vapor Intrusion Pathway

Equations:

Chemical intake (mg/kg-day) = CA * SIF

$$SIF_{inh} = \frac{CF1 \bullet InhR \bullet EF \bullet ED \bullet ET}{BW \bullet AT}$$

Where:

SIF_{inh} (m^3-mg/ug-kg-day) = summary intake factor for inhalation of vapors from affected media

Parameter	Definition	Value	Units	Source
CA	Chemical concentration in air	chemical specific	ug/m^3	Calculated using the Johnson-Ettinger (1991) Model to estimate chemical movement from affected media (i.e., soil or groundwater) to air.
CF1	Conversion factor	1.00E-03	mg/ug	Not applicable
InhR	Inhalation rate	1.3	m^3/hour	Default value (USEPA 1997a)
EF	Exposure frequency	250	days/year	Default value (USEPA 1991)
ET	Exposure time	8	hours/day	Site-specific
ED	Exposure duration	25	years	Default value (USEPA 1991)
BW	Body weight	70	kg	Default value (USEPA 2002c)
ATnc	Averaging time for noncarcinogenic effects	ED x 365 days/year	days	Default value (USEPA 1991)
ATca	Averaging time for carcinogenic effects	25,550	days	Default value (USEPA 1991)

Notes:
hr - hour
kg - kilogram
m^3 - cubic meter
mg - milligram
ug - microgram
USEPA - United States Environmental protection Agency

Table 5-2
Construction Worker Exposures to Groundwater, Exposure Assumptions and Intake Equations

Equations:

Chemical intake (mg/kg-day) = CW * SIF

$$SIF_{derm} = \frac{CF1 \cdot CF2 \cdot SA \cdot EF \cdot ET \cdot ED \cdot PC}{BW \cdot AT}$$

$$SIF_{inh} = \frac{CF1 \cdot InhR \cdot EF \cdot ED \cdot VFw}{BW \cdot AT}$$

Where:

SIF_{derm} (L-mg/ug-kg-day) = summary intake factor for dermal contact with groundwater
SIF_{inh} (L-mg/ug-kg-day) = summary intake factor for inhalation of groundwater vapors

Parameter	Definition	Value	Units	Source
CW	Chemical concentration in	chemical specific	ug/L	analytical data
CF1	Conversion factor	1.00E-03	mg/ug	not applicable
CF2	Conversion factor	1.00E-03	L/cm^3	not applicable
SA	Skin surface area	3300	cm^2	default value, USEPA 2002c
PC	Dermal permeability constant	chemical specific	cm/hr	USEPA 2003b
InhR	Inhalation rate	20	m^3/day	default value, USEPA 2002c
VFw	Volatilization factor for water	0.01	L/m^3	site-specific, USEPA 1999
EF	Exposure frequency	190	days/year	site-specific
ET	Exposure time	8	hours/day	site-specific
ED	Exposure duration	1	years	site-specific
BW	Body weight	70	kg	default value, USEPA 2002c
ATnc	Averaging time (noncarcinogen)	ED x 365 days/year	days	default value, USEPA 2002c
ATca	Averaging time (carcinogen)	25,550	days	default value, USEPA 2002c

Notes:

cm - centimeters
cm^2 - centimeters squared
cm^3 - cubic centimeters
hr - hour
kg - kilograms
L - liters
m^3 - cubic meters
mg - milligrams
µg - micrograms
USEPA - United States Environnmental Protection Agency

Table 5-3
Construction Worker Exposures to Soil,
Exposure Assumptions and Intake Equations

Equations:

Chemical intake (mg/kg-day) = CS * SIF

$$SIF_{ing} = \frac{IR \cdot CF \cdot EF \cdot ED}{BW \cdot AT}$$

$$SIF_{derm} = \frac{CF \cdot SA \cdot AF \cdot ABS \cdot EF \cdot ED}{BW \cdot AT}$$

$$SIF_{inh} = \frac{InhR \cdot EF \cdot ED \cdot (1/PEF)}{BW \cdot AT}$$

Where:

SIF_{ing} (day^{-1}) = summary intake factor for ingestion of soil
SIF_{derm} (day^{-1}) = summary intake factor for dermal contact with soil
SIF_{inh} (day^{-1}) = summary intake factor for inhalation of fugitive dust

Parameter	Definition	Value	Units	Source
CS	Chemical concentration in soil	chemical specific	mg/kg	analytical data
IR	Ingestion rate	330	mg/day	default value, USEPA 2002c
CF	Conversion factor	1.00E-06	kg/mg	not applicable
SA	Surface area	3300	cm^2	default value, USEPA 2002c
AF	Soil to skin adherence factor	0.3	mg/cm^2-day	default value, USEPA 2002c
ABS	Absorption factor	chemical specific	unitless	USEPA 2003b
InhR	Inhalation rate	20	m^3/day	default value, USEPA 2002c
PEF	Particulate emission factor	5.09E+08	m^3/kg	site-specific, USEPA 2002c
EF	Exposure frequency	190	days/year	site-specific
ED	Exposure duration	1	years	default value, USEPA 2002c
BW	Body weight	70	kg	default value, USEPA 2002c
ATnc	Averaging time (noncarcinogen)	ED x 365 days/year	days	default value, USEPA 2002c
ATca	Averaging time (carcinogen)	25,550	days	default value, USEPA 2002c

Notes:
cm^2 - centimeters squared
kg - kilograms
m^3 - cubic meters
mg - milligrams
USEPA - United States Environmental Protection Agency

Table 5-4
Carcinogenic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Oral Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Tumor Type	EPA Cancer Classification[a]	Reference
1,2-Dichloroethane	0.091	0.091	Lung papillomas in mice	EPA Group B2 carcinogen	USEPA 2003a
1,2,4-Trimethylbenzene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
1,3,5-Trimethylbenzene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
2-Methylnaphthalene	None	None	NA	Not classified	NA
Benzene	0.055	0.029	Leukemia (human)	EPA Group A carcinogen	USEPA 2002a
Benzo(a)anthracene	0.73	0.31	Forestomach, larynx, and esophagus tumors (oral); Pharynx, larynx tumors (inhalation)	EPA Group B2 carcinogen	USEPA 2003a (oral) USEPA 1994 (inhalation)
Benzo(a)pyrene	7.3	3.1	Forestomach, larynx, and esophagus tumors (oral); Pharynx, larynx tumors (inhalation)	EPA Group B2 carcinogen	USEPA 2003a (oral) USEPA 1994 (inhalation)
Benzo(b)fluoranthene	0.73	0.31	Forestomach, larynx, and esophagus tumors (oral); Pharynx, larynx tumors (inhalation)	EPA Group B2 carcinogen	USEPA 2003a (oral) USEPA 1994 (inhalation)
Carbazole	0.02	0.02	Lesions on liver and stomach in mice	EPA Group D carcinogen	USEPA 1997b
Dibenzo(a,h)anthracene	7.3	3.1	Forestomach, larynx, and esophagus tumors (oral); Pharynx, larynx tumors (inhalation)	EPA Group B2 carcinogen	USEPA 2003a (oral) USEPA 1994 (inhalation)
Dibenzofuran	None	None	NA	EPA Group D carcinogen	USEPA 2002a
cis-1,2-Dichloroethene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
Ethylbenzene	None	0.0039	Renal and testicular cancer (male rates)	EPA Group D carcinogen[b]	USEPA 2002a

Table 5-4 (Continued)
Carcinogenic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Oral Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Cancer: Slope Factor $(mg/kg\text{-}day)^{-1}$	Tumor Type	EPA Cancer Classification[a]	Reference
Indeno(1,2,3-cd)pyrene	0.73	0.31	Forestomach, larynx, and esophagus tumors (oral); Pharynx, larynx tumors (inhalation)	EPA Group B2 carcinogen	USEPA 2003a (oral) USEPA 1994 (inhalation)
Naphthalene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
n-Propylbenzene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
Toluene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
Trichloroethene	0.02-0.4[c]	0.02-0.4[c]	Kidney tumors	EPA Group B1 carcinogen	USEPA 2001
Xylenes	None	None	NA	EPA Group D carcinogen	USEPA 2002a
DRO aliphatics	None	None	NA	Not classified	ADEC 2000a
DRO aromatics	None	None	NA	Not classified	ADEC 2000a
GRO aliphatic	None	None	NA	Not classified	ADEC 2000a
GRO aromatics	None	None	NA	Not classified	ADEC 2000a
RRO aliphatic	None	None	NA	Not classified	ADEC 2000a
RRO aromatics	None	None	NA	Not classified	ADEC 2000a

Table 5-4 (Continued)
Carcinogenic Toxicity Criteria for the Chemicals of Potential Concern

Notes:
[a] EPA's Weight-of-Evidence Classification System:
- Group A - human carcinogen (sufficient evidence in humans)
- Group B1 - probable human carcinogen (limited human data available)
- Group B2 - probable human carcinogen (sufficient evidence in animals, inadequate or no evidence in humans)
- Group C - possible human carcinogen (limited evidence in animals)
- Group D - not classifiable as to human carcinogenicity

[b] The IRIS file has not been updated yet to reflect the carcinogenicity of ethylbenzene. Therefore, the cancer classification will likely change.

[c] EPA recommends a range of cancer slope factors for trichloroethene from 0.02 $(mg/kg\text{-}day)^{-1}$ to 0.4 $(mg/kg\text{-}day)^{-1}$. The high end of the range, 0.4 $(mg/kg\text{-}day)^{-1}$, was selected as the slope factor because it is based on occupational studies.

mg/kg-day - milligram per kilogram per day
SF - slope factor
NA - not applicable
USEPA - United States Environmental Protection Agency

Table 5-5
Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Chronic RfD (mg/kg-day)	Toxic Endpoint	Critical Study	Chronic RfD UF[b]	RfD Source	Adjustment from Chronic to Subchronic	Subchronic RfD (mg/kg-day)	EPA Subchronic Source[d]
Inhalation Exposures								
1,2,4-Trimethylbenzene	0.0017	CNS symptoms	subchronic human occupational	3,000	NCEA	remove UF of 10 for subchronic to chronic	0.017	*NCEA (SRC TR-02-021/09-19-2002)*
1,2-Dichloroethane	0.0014	Gastrointestinal effects, liver/gallbladder effects	subchronic human occupational	3,000	NCEA	remove adjustment from 5 to 7 days[i], remove UF of 10 for subchronic to chronic	0.067	
1,3,5-Trimethylbenzene	0.0017	CNS symptoms	subchronic human occupational	3,000	NCEA	remove UF of 10 for subchronic to chronic	0.017	*NCEA (SRC TR-02-021/09-19-2002)*
2-Methylnaphthalene	none[c]	--	--	--	NCEA-S-1400 (April 2003)	insufficient information	--	
Benzene	0.009	Decreased lymphocyte count	subchronic human occupational	300	IRIS	no adjustment for subchronic warranted, primary study is already occupational	0.009	
Benzo(a)anthracene	none[e]	--	--	--	--	--	--	
Benzo(a)pyrene	none[e]	--	--	--	--	--	--	
Benzo(b)fluoranthene	none[e]	--	--	--	--	--	--	
Carbazole	none[e]	--	--	--	--	--	--	
Dibenz(a,h)anthracene	none[e]	--	--	--	--	--	--	
Dibenzofuran	0.004	NA	NA	NA	route-to-route extrapolation from the oral RfD[g]	--	--	
cis-1,2-Dichlorethene	none[a]	--	Inhalation hazards will not be quantified, uncertainties will be discussed.	--	--	insufficient information	--	
Ethylbenzene	0.29	Developmental toxicity	subchronic female rats	300	IRIS	Based on developmental effects during gestational exposures. No subchronic to chronic UF used; therefore, no subchronic value proposed.	0.29	
Indeno(1,2,3-cd)pyrene	none[e]	--	--	--	--	--	--	
Naphthalene	0.00086	Nasal effects	chronic mouse	3,000	IRIS	remove adjustment from 5 to 7 days[i]	0.0043	
n-Propylbenzene	0.097	Increased kidney weight	subchronic female rats	1,000	derived from ethylbenzene[h]	see description for ethylbenzene	0.097	
Toluene	0.11	Neurological effects	chronic human occupational	300	IRIS	no adjustment for subchronic warranted, primary study is already occupational	0.11	
Trichloroethene	0.011	CNS, liver and endocrine effects	subchronic human occupational	1,000	USEPA 2001c	remove UF of 10 for subchronic to chronic	0.1	

Table 5-5 (Continued)
Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Chronic RfD (mg/kg-day)	Toxic Endpoint	Critical Study	Chronic RfD UF[b]	RfD Source	Adjustment from Chronic to Subchronic	Subchronic RfD (mg/kg-day)	EPA Subchronic Source[d]
Xylenes	0.029	Hyperactivity, decreased body weight, and increased mortality	subchronic male rats	300	IRIS	remove UF of 3 for subchronic to chronic	0.09	
DRO aliphatics	0.29	hepatic and hematological changes	NA	NA	ADEC 2000a	The petroleum fraction RfD values presented in ADEC guidance were not adjusted because of their status in State guidance and because of insufficient information on how those values were derived.	0.29	
DRO aromatics	0.06	Decreased body weight	NA	NA	ADEC 2000a		0.06	
GRO aliphatics	5.3	Neurotoxicity	NA	NA	ADEC 2000a		5.3	
GRO aromatics	0.11	Hepatotoxicity and nephrotoxicity	NA	NA	ADEC 2000a		0.11	
RRO aliphatics	none[a]	--	--	--	--	--	--	
RRO aromatics	none[a]	--	--	--	--	--	--	
Oral Exposures								
1,2,4-Trimethylbenzene	0.05	Decreased body weight	subchronic rats	3,000	NCEA	remove UF of 10 for subchronic to chronic	0.5	*NCEA (SRC TR-02-021/09-19-2002)*
1,2-Dichloroethane	0.03	Increase in organ weights	subchronic rat	1,000	NCEA	remove adjustment from 5 to 7 days[f]	0.037	
1,3,5-Trimethylbenzene	0.05	Decreased body weight	subchronic rats	3,000	NCEA	remove UF of 10 for subchronic to chronic	0.5	*NCEA (SRC TR-02-021/09-19-2002)*
2-Methylnaphthalene	0.009	pulmonary alveolar proteinosis	chronic male mice	1,000	NCEA-S-1400 (April 2003)	no adjustment for subchronic warranted because no UF applied for subchronic to chronic.	0.009	
Benzene	0.004	Decreased lymphocyte count	subchronic human occupational	300	IRIS	no adjustment for subchronic warranted, primary study is already occupational	0.004	
Benzo(a)anthracene	none[e]	--	--	--	--	--	--	
Benzo(a)pyrene	none[e]	--	--	--	--	--	--	
Benzo(b)fluoranthene	none[e]	--	--	--	--	--	--	
Carbazole	none[e]	--	--	--	--	--	--	
Dibenz(a,h)anthracene	none[e]	--	--	--	--	--	--	
Dibenzofuran	0.004	NA	NA	NA	NCEA	insufficient information	0.004	

Table 5-5 (Continued)
Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern

Chemical	Chronic RfD (mg/kg-day)	Toxic Endpoint	Critical Study	Chronic RfD UF[b]	RfD Source	Adjustment from Chronic to Subchronic	Subchronic RfD (mg/kg-day)	EPA Subchronic Source[d]
cis-1,2-Dichlorethene	0.01	Hemoglobin production in rats	subchronic rats	3,000	NCEA	remove UF of 10 for subchronic to chronic	0.1	*NCEA (SRC TR-02-017/09-24-2002)*
Ethylbenzene	0.10	Liver and kidney toxicity	subchronic mouse	1,000	IRIS	remove UF of 10 for subchronic to chronic	1	
Indeno(1,2,3-cd)pyrene	none[c]	--	--	--	--	--	--	
Naphthalene	0.02	Decreased body weight	subchronic rat	3,000	IRIS	remove UF of 10 for subchronic to chronic	0.2	
n-Propylbenzene	0.04	increased kidney weight	subchronic female rats	3,000	NCEA (99-010/07-26-99)	remove UF of 3 for subchronic to chronic	0.12	
Toluene	0.2	Changes in liver and kidney weights	subchronic rats	1,000	IRIS	remove UF of 10 for subchronic to chronic	2	*HEAST*
Trichloroethene	0.0003	CNS, liver and endocrine effects	subchronic mouse	3,000	USEPA 2001c	NCEA used EPA's maximum UF of 3,000 but considered the data sufficiently equivocal that even 5,000 might be appropriate. Therefore, data set too uncertain to adjust for subchronic.	0.0003	
Xylenes	0.2	Hyperactivity, decreased body weight, and increased mortality	chronic rat	1,000	IRIS	remove adjustment from 5 to 7 days[i]	0.25	
DRO aliphatics	0.1	hepatic and hematological changes	NA	NA	ADEC 2000a	The petroleum fraction RfD values presented in ADEC guidance were not adjusted because of their status in State guidance and because of insufficient information on how those values were derived.	0.1	
DRO aromatics	0.04	Decreased body weight	NA	NA	ADEC 2000a		0.04	
GRO aliphatics	5.00	Neurotoxicity	NA	NA	ADEC 2000a		5.00	
GRO aromatics	0.2	Hepatotoxicity and nephrotoxicity	NA	NA	ADEC 2000a		0.2	
RRO aliphatics	2	Hepatotoxicity	NA	NA	ADEC 2000a		2	
RRO aromatics	0.3	Hepatotoxicity and nephrotoxicity	NA	NA	ADEC 2000a		0.3	

Table 5-5 (Continued)
Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern

Notes

[a] The chemical was administered by gavage in the critical study upon which the oral RfD is based. Because of the "low" confidence rating of the oral RfD, no chronic inhalation value, based on route-to-route extrapolation, is proposed.

[b] EPA indicates that there are generally 5 areas of uncertainty where an application of a UF may be warranted:

1 variation between species (applied when extrapolating from animal to human)
2 variation within species (applied to account for differences in human response and sensitive subpopulations)
3 use of a subchronic study to evaluate chronic exposure
4 use of a LOAEL, rather than a NOAEL
5 deficiencies in the data base

[c] No inhalation criteria are available for this chemical and NCEA specifically states the route-to-route extrapolation from oral to inhalation is not recommended for this chemical (NCEA-S-1400, April 2003).

[d] If a subchronic value was obtained from a published source, rather than calculated, the source is listed in this column.

[e] This chemical is not a concern based on noncancer health effects. Therefore, there are no noncancer toxicity criteria for this chemical.

[f] No inhalation criteria are available for this chemical.

[g] Although route-to-route extrapolation is not generally recommended, no information is available to discount the use of the oral RfD in estimating inhalation exposures to dibenzofuran. In addition, as only the dermal and inhalation pathways are evaluated for groundwater exposures, if inhalation exposures were not evaluated, then exposures to dibenzofuran would not be quantified because there is no dermal permeability constant with which to evaluate dermal exposures in groundwater. Therefore, the oral RfD was also used as the inhalation RfD.

[h] NCEA derived the oral RfD for these chemicals by dividing the RfD for ethylbenzene by 3 to account for differences in toxicity between these structurally related chemicals. Therefore, this approach was used to estimate an inhalation RfC (ethylbenzene's inhalation RfC was divided by 3).

[i] EPA adjusted the 5-day per week exposure of the NOAEL to a 7-day NOAEL to account for continuous exposure (chronic), rather than subchronic, exposures.

CNS: central nervous system
DRO: diesel-range organics
EPA: Environmental Protection Agency
GRO: gasoline-range organics
HEAST: Health Effects Assessment Summary Table
IRIS: EPA's Integrated Risk Information System (on-line data base) (USEPA 2003a)
LOAEL: lowest-observed-adverse-effect-level
mg/kg-day: milligram per kilogram per day
NA: Not available
NCEA: EPA's National Center for Environmental Assessment
NOAEL: no-observed-adverse-effect-level
RfD: Reference Dose
RRO: residual-range organics
UF: Uncertainty factor

Table 5-6
Summary of EPCs and Total RME Risks and Hazards for the Building Worker

Chemicals of Potential Concern	EPC for Indoor Air[c] ug/L (ug/m^3)	Inhalation of Indoor Air	
		Hazard Index	Cancer Risk
1,2-Dichloroethane	5.4 (0.001)	0.00004	2E-09
cis-1,2-Dichloroethene	78.8 (0.063)	a	a
1,2,4-Trimethylbenzene	523 (0.41)	0.01	NA
1,3,5-Trimethylbenzene	182 (0.20)	0.007	NA
2-Methylnaphthalene	63 (0.0032)	a	NA
Benzene	72.2 (0.078)	0.0005	5E-08
Ethylbenzene	217 (0.263)	0.00005	2E-08
Naphthalene	316 (0.0175)	0.0001	NA
Toluene	193 (0.223)	0.0001	NA
Trichloroethylene	6.6 (0.012)	0.00006	1E-07
Xylenes	1,403 (1.56)	0.003	NA
Benzo(a)anthracene	d	b	b
Benzo(a)pyrene	d	b	b
Benzo(b)fluoranthene	d	b	b
Carbazole	d	b	b
Dibenzofuran	29.3 (2.4×10^{-8})	0.0000000003	NA
n-Propylbenzene	54 (0.076)	0.0005	NA
Non-TPH Total Hazard/Risk	--	0.03	2E-07
DRO (C9-C24 aliphatics)	d	b	b
DRO (C9-C24 aromatics)	d	b	b
GRO (C6-C8 aliphatics)	5,545 (275)	0.003	NA
GRO (C6-C8 aromatics)	3,960 (13.2)	0.007	NA
TPH Total Hazard/Risk	--	0.01	NA

Note:
NA - not applicable; these chemicals are not considered carcinogenic.
EPCs - exposure point concentrations
a - No toxicity criteria available to quantify exposures by this pathway.
b - Chemical is not considered volatile. Therefore, the inhalation pathway is incomplete.
c - The groundwater EPCs were used in the Johnson-Ettinger Model for Subsurface Vapor Intrusion to estimate indoor air concentrations. The resulting modeled indoor air concentrations are in parentheses after the groundwater EPCs.
d - The vapor intrusion pathway was not evaluated for these chemicals because this pathway is only complete for volatile chemicals.
DRO - diesel-range organics
GRO - gasoline-range organics
µg/L - micrograms per liter
µg/m^3 - micrograms per meter cubed
TPH - total petroleum hydrocarbons

Table 5-7
Summary of EPCs and RME Risks and Hazards for the Construction Worker From Soil

Chemicals of Potential Concern	EPC for Soil (mg/kg)	Total		Ingestion		Dermal		Inhalation	
		HI	CR	HI	CR	HI	CR	HI	CR
1,2,4-Trimethylbenzene	47	0.1	NA	0.0002	NA	NE	NA	0.1	NA
1,3,5-Trimethylbenzene	20	0.1	NA	0.0001	NA	NE	NA	0.1	NA
2-Methylnaphthalene	30.5	0.008	NA	0.008	NA	NE	NA	NE	NA
Benzene	3.2	0.10	4E-07	0.002	6E-09	NE	NE	0.09	4E-07
Ethylbenzene	9.4	0.004	7E-08	0.00002	NA	NE	NA	0.004	7E-08
Naphthalene	49	0.2	NA	0.0006	NA	NE	NA	0.2	NA
Xylenes	50.9	0.08	NA	0.0005	NA	NE	NA	0.08	NA
Benzo(a)anthracene	13.8	NA	5E-07	NA	4E-07	NA	1E-07	NA	2E-11
Benzo(a)pyrene	7.2	NA	3E-06	NA	2E-06	NA	7E-07	NA	9E-11
Benzo(b)fluoranthene	7.8	NA	3E-07	NA	2E-07	NA	8E-08	NA	1E-11
Dibenz(a,h)anthracene	1.8	NA	6E-07	NA	5E-07	NA	2E-07	NA	2E-11
Indeno(1,2,3-cd)pyrene	3.1	NA	1E-07	NA	8E-08	NA	3E-08	NA	4E-12
Non-TPH Total Hazard/Risk	--	0.6	5E-06	0.01	3E-06	NE	1E-06	0.5	4E-07
DRO (C9-C24 aliphatics)	4,438	0.1	NA	0.1	NA	0.03	NA	0.000004	NA
DRO (C9-C24 aromatics)	2,219	0.2	NA	0.1	NA	0.04	NA	0.00001	NA
GRO (C6-C8 aliphatics)	1,224	0.008	NA	0.0006	NA	NE	NA	0.08	NA
GRO (C6-C8 aromatics)	874	1	NA	0.01	NA	NE	NA	1	NA
RRO (C25-C36 aliphatic)	1,179	0.002	NA	0.001	NA	0.0004	NA	0.0000002	NA
RRO (C25-C36 aromatic)	393	0.04	NA	0.03	NA	0.01	NA	0.000004	NA
TPH Total Hazard/Risk	--	1	NA	0.3	NA	0.08	NA	1	NA

Notes:
CR - cancer risk
DRO - diesel-range organics
EPCs - exposure point concentrations
GRO - gasoline-range organics
HI - hazard index
mg/kg - milligram per kilogram
NA - not applicable; these chemicals are not considered carcinogenic or noncarcinogenic by this pathway.
NE - not evaluated; toxicity criteria are not available to quantify exposures by this pathway.
RRO - residual-range organics
TPH - total petroleum hydrocarbons

Table 5-8
Summary of EPCs and Total RME Risks and Hazards for the Construction Worker From Groundwater

Chemicals of Potential Concern	EPC for Groundwater (ug/L)	Total		Dermal		Inhalation	
		HI	CR	HI	CR	HI	CR
1,2-Dichloroethane	11.8	0.0005	4E-08	0.0003	1E-08	0.0003	2E-08
cis-1,2-Dichloroethene	58.2	0.0009	NA	b	NA	0.0009	NA
1,2,4-Trimethylbenzene	443	0.04	NA	b	NA	0.04	NA
1,3,5-Trimethylbenzene	151	0.01	NA	b	NA	0.01	NA
2-Methylnaphthalene	39.9	b	NA	b	NA	b	NA
Benzene	46.5	0.04	1E-07	0.03	1E-07	0.008	3E-08
Dibenzofuran	22.1	0.008	NA	b	NA	0.008	NA
Ethylbenzene	213.5	0.003	2E-08	0.002	NA	0.001	2E-08
Naphthalene	208	0.08	NA	0.01	NA	0.07	NA
Toluene	166	0.003	NA	0.0005	NA	0.002	NA
Trichloroethylene	11.8	0.09	3E-07	0.09	2E-07	0.0002	1E-07
Xylenes	1,299	0.08	NA	0.05	NA	0.02	NA
Benzo(a)anthracene	0.52	NA	5E-07	NA	5E-07	NA	a
Benzo(a)pyrene	0.4	NA	6E-06	NA	6E-06	NA	a
Benzo(b)fluoranthene	0.54	NA	8E-07	NA	8E-07	NA	a
Carbazole	19.4	b	NA	b	NA	a	NA
n-Propylbenzene	46	0.00001	NA	b	NA	0.00001	NA
Non-TPH Total Hazard/Risk	--	0.4	7E-06	0.2	7E-06	0.2	2E-07
DRO (C9-C24 aliphatics)	7,414	b	NA	b	NA	a	NA
DRO (C9-C24 aromatics)	3,707	b	NA	b	NA	a	NA
GRO (C6-C8 aliphatics)	5,462	0.002	NA	b	NA	0.002	NA
GRO (C6-C8 aromatics)	3,902	0.05	NA	b	NA	0.05	NA
TPH Total Hazard/Risk	--	0.05	NA	b	NA	0.05	NA

a - Chemical is not considered volatile; Pathway is only complete for volatile chemicals.
b - Toxicity criteria are not available to quantify exposures by this pathway.

Notes:
CR - cancer risk
DRO - diesel-range organics
EPCs - exposure point concentrations
GRO - gasoline-range organics
HI - hazard index
µg/L - micrograms per liter
NA - not applicable; these chemicals are not considered carcinogenic or noncarcinogenic by this pathway.
TPH - total petroleum hydrocarbons

Table 5-9
Summary of Total RME Risks and Hazards for the Construction Worker From Groundwater and Soil

Chemicals of Potential Concern	Total		Groundwater		Soil	
	HI	CR	HI	CR	HI	CR
1,2,4-Trimethylbenzene	0.1	NA	0.04	NA	0.1	NA
1,2-Dichloroethane	0.0005	4E-08	0.0005	4E-08	b	b
1,3,5-Trimethylbenzene	0.1	NA	0.01	NA	0.1	NA
2-Methylnaphthalene	0.008	NA	a	NA	0.008	NA
Benzene	0.2	5E-07	0.04	1E-07	0.1	4E-07
Benzo(a)anthracene	NA	1E-06	NA	5E-07	NA	5E-07
Benzo(a)pyrene	NA	8E-06	NA	6E-06	NA	3E-06
Benzo(b)fluoranthene	NA	1E-06	NA	8E-07	NA	3E-07
Carbazole	a	NA	a	NA	b	b
cis-1,2-Dichloroethene	0.001	NA	0.001	NA	b	b
Dibenz(a,h)anthracene	NA	6E-07	0.008	NA	NA	6E-07
Dibenzofuran	0.008	NA	0.008	NA	b	b
Ethylbenzene	0.008	9E-08	0.003	2E-08	0.004	7E-08
Indeno(1,2,3-cd)pyrene	NA	1E-07	b	b	NA	1E-07
Naphthalene	0.2	NA	0.1	NA	0.2	NA
n-Propylbenzene	0.00001	NA	0.00001	NA	b	b
Toluene	0.003	NA	0.003	NA	b	b
Trichloroethylene	0.09	3E-07	0.09	3E-07	b	b
Xylenes	0.2	NA	0.08	NA	0.08	NA
Non-TPH Total Hazard/Risk	1	1E-05	0.4	7E-06	0.6	5E-06
DRO (C9-C24 aliphatics)	0.1	NA	a	NA	0.1	NA
DRO (C9-C24 aromatics)	0.2	NA	a	NA	0.2	NA
GRO (C6-C8 aliphatics)	0.09	NA	0.002	NA	0.08	NA
GRO (C6-C8 aromatics)	1	NA	0.05	NA	1	NA
RRO (C25-C36 aliphatic)	0.002	NA	b	b	0.002	NA
RRO (C25-C36 aromatic)	0.04	NA	b	b	0.04	NA
TPH Total Hazard/Risk	**2**	NA	0.05	NA	1	NA

a - Toxicity criteria are not available to quantify exposures by this pathway.
b - Chemical was not selected as a COPC in this medium.

Notes:
Bolded values indicate exceedances over target health goals
COPC - chemical of potential concern
CR - cancer risk
DRO - diesel-range organics
GRO - gasoline-range organics
HI - hazard index
NA - not applicable; these chemicals are not considered carcinogenic or noncarcinogenic by this pathway.
RME - reasonable maximum exposure
RRO - residual-range organics
TPH - total petroleum hydrocarbons

Table 5-10
Results of the Screening Level Ecological Risk Assessment
to Identify COPCs in Soil at NMCB Building Expanded Area

Chemical	Maximum Detected Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
1,3,5-Trimethylbenzene	0.047	280,000	0.00000017	NO	Site chemical concentration lower than RBSC
2-Methylnaphthalene	0.6	450	0.0013	NO	Site chemical concentration lower than RBSC
Anthracene	0.2	90	0.0022	NO	Site chemical concentration lower than RBSC
Benzene	80	240	0.33	NO	Site chemical concentration lower than RBSC
Benzo(a)anthracene	0.2	260	0.00077	NO	Site chemical concentration lower than RBSC
Benzo(a)pyrene	0.3	345	0.00087	NO	Site chemical concentration lower than RBSC
Benzo(b)fluoranthene	0.3	345	0.00087	NO	Site chemical concentration lower than RBSC
Benzo(g,h,i)perylene	0.4	490	0.00082	NO	Site chemical concentration lower than RBSC
Chrysene	1	260	0.0038	NO	Site chemical concentration lower than RBSC
Ethylbenzene	180	1,780	0.10	NO	Site chemical concentration lower than RBSC
Fluoranthene	0.6	145	0.0041	NO	Site chemical concentration lower than RBSC
Indeno(1,2,3-cd)pyrene	0.4	415	0.0010	NO	Site chemical concentration lower than RBSC
Naphthalene	0.5	4,240	0.0001	NO	Site chemical concentration lower than RBSC
Phenanthrene	0.2	90	0.0022	NO	Site chemical concentration lower than RBSC
Pyrene	0.4	140	0.0029	NO	Site chemical concentration lower than RBSC
Toluene	120	6,280	0.019	NO	Site chemical concentration lower than RBSC
Diesel range organics	43,000	20,100	2.1	YES	Site chemical concentration greater than RBSC
Gasoline range organics	27,000	1,840	15	YES	Site chemical concentration greater than RBSC
Residual range organics	580	>1,000,000	<0.00058	NO	Site chemical concentration lower than RBSC
Xylenes	920	3,780	0.24	NO	Site chemical concentration lower than RBSC

Notes:
COPC - chemical of potential concern
mg/kg - milligrams contaminant per kilogram of soil
RBSC - risk-based screening concentration

Table 5-11
Results of the Screening Level Ecological Risk Assessment to Identify COPCs in Marine Sediment at NMCB Building Expanded Area

Chemical	Maximum Detected Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
3- and 4-Methylphenol	0.9	0.67	1.34	**YES**	Site chemical concentration greater than RBSC
Anthracene	0.2	2.2	0.091	**NO**	Site chemical concentration lower than RBSC
Benzo(a)anthracene	0.4	1.1	0.36	**NO**	Site chemical concentration lower than RBSC
Benzo(a)pyrene	0.4	0.99	0.40	**NO**	Site chemical concentration lower than RBSC
Benzo(b)fluoranthene	0.5	2.3	0.22	**NO**	Site chemical concentration lower than RBSC
Benzo(g,h,i)perylene	0.2	0.31	0.65	**NO**	Site chemical concentration lower than RBSC
Benzo(k)fluoranthene	0.4	2.3	0.17	**NO**	Site chemical concentration lower than RBSC
Chrysene	0.8	1.1	0.73	**NO**	Site chemical concentration lower than RBSC
Fluoranthene	0.8	1.6	0.50	**NO**	Site chemical concentration lower than RBSC
Indeno(1,2,3-cd)pyrene	0.2	0.34	0.59	**NO**	Site chemical concentration lower than RBSC
Phenanthrene	0.2	1	0.20	**NO**	Site chemical concentration lower than RBSC
Phenol	0.15	0.42	0.36	**NO**	Site chemical concentration lower than RBSC
Pyrene	0.4	10	0.040	**NO**	Site chemical concentration lower than RBSC
Diesel range organics	95	90.6	1.05	**YES**	Site chemical concentration greater than RBSC

Notes:
COPC - chemical of potential concern
mg/kg - milligrams contaminant per kilogram of soil
RBSC - risk-based screening concentration

Table 5-12
Results of the Screening Level Ecological Risk Assessment to Identify COPCs in Marine Surface Water at NMCB Building Expanded Area

Chemical	Maximum Detected Concentration (µg/L)	RBSC (µg/L)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
Benzene	2	1,060	0.0019	**NO**	Site chemical concentration lower than RBSC
Ethylbenzene	3	6,400	0.00047	**NO**	Site chemical concentration lower than RBSC
Toluene	12	3,500	0.0034	**NO**	Site chemical concentration lower than RBSC
Gasoline range organics	67	114	0.59	**NO**	Site chemical concentration lower than RBSC
Xylenes	16	332	0.048	**NO**	Site chemical concentration lower than RBSC

Notes:
COPC - chemical of potential concern
µg/L - micrograms contaminant per liter of water
RBSC - risk-based screening concentration

Table 5-13
Results of the Baseline Ecological Risk Assessment to Identify COCs in Soil at NMCB Building Expanded Area

Chemical	Exposure Point Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
Diesel range organics	14,312	20,100	0.71	**NO**	Site chemical concentration less than RBSC
Gasoline range organics	7,261	1,840	3.9	**YES**	Site chemical concentration greater than RBSC

Notes:
COC - chemical of concern
mg/kg - milligrams contaminant per kilogram of soil
RBSC - risk-based screening concentration

Table 5-14
Results of the Baseline Ecological Risk Assessment to Identify COCs in Marine Sediment at NMCB Building Expanded Area

Chemical	Exposure Point Concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses Potential Ecological Risk?	Rationale
3- and 4-Methylphenol	0.36	0.67	0.5	**NO**	Site chemical concentration less than RBSC
Diesel range organics	51.3	90.6	0.6	**NO**	Site chemical concentration less than RBSC

Notes:
COC - chemical of concern
mg/kg - milligrams contaminant per kilogram of sediment
RBSC - risk-based screening concentration

6.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

This section describes the remedial action objectives (RAOs) and the cleanup levels established for the NMCB Building Expanded Area.

6.1 REMEDIAL ACTION OBJECTIVES

Based on the risk analysis conducted for this site and the regulatory requirements, the following RAOs were developed for the protection of human health at the NMCB Building Expanded Area:

- Prevent human and ecological exposure to petroleum hydrocarbons in soil that would result in adverse health effects
- Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the Alaska DEC groundwater cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for, drinking water.
- Prevent potential future migration of contaminants to surface water at concentrations that could result in adverse ecological effects
- Minimize exposure to free-phase petroleum product

The necessity of establishing cleanup levels to protect ecological receptors from exposure to petroleum hydrocarbons released to soil at the site was evaluated. Because the ecological risk based cleanup level for GRO would be greater than the cleanup level for GRO derived to protect human health, the cleanup level derived to protect human health is protective of ecological receptors. Therefore, no cleanup level is presented in Section 6.2 for GRO in soil based on the protection of ecological receptors.

6.2 CLEANUP LEVELS

Chemical-specific screening criteria and cleanup levels for soil and groundwater have been established for petroleum-contaminated sites at the former Adak Naval Complex in accordance with Alaska DEC regulation 18 AAC 75. Screening criteria were used to estimate the potential extent of contamination. Cleanup levels are the specified concentrations for remediation. The soil and groundwater screening criteria and cleanup levels for the NMCB Building Expanded Area are provided in Table 6-1.

The Alaska regulations establish four methods for determining cleanup levels for soil [18 AAC 75.340]. The Alaska DEC Method Two cleanup levels, the most stringent cleanup levels for soil, were established to prevent migration of contaminants from soil to groundwater in the over 40 inches of rainfall zone (18 AAC 75.341, Tables B1 and B2). The Alaska DEC Method Two cleanup levels were used as screening criteria for the NMCB Building Expanded Area to estimate the potential extent of soil impacted by petroleum contamination at the site (see Section 4). ACLs are specified for remediation of soil and are based on Alaska DEC Method Four [18 AAC 75.340(a)(4)], which uses site-specific risk assessments to establish cleanup levels. Site-specific ACLs were calculated as discussed in Section 5. The ACLs are established at concentrations such that risks from hazardous substances do not exceed the following target health goals:

- Cumulative carcinogenic risk of 1 in 100,000
- Cumulative noncarcinogenic HI of 1.0 (18 AAC 75.325(h))

The Alaska regulations establish three methods for determining cleanup levels for groundwater [18 AAC 75.345]. The tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] were used as screening criteria to estimate the potential extent of groundwater impacted by petroleum contamination at the site (see Section 4). Cleanup levels specified for remediation of groundwater at the NMCB Building Expanded Area are based on 10 times these values because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)].

For surface water, Alaska regulation 18 AAC 70 establishes water use classes and subclasses for the water bodies of the state. Waters of Sweeper Cove and the lower reach of South Sweeper Creek fall within the marine water class, and the following subclasses:

- Water supply aquaculture
- Secondary recreation
- Growth and propagation of fish, shellfish, other aquatic life, and wildlife

The water quality standards established for this use class (and these subclasses) specify that TAqH in the water column may not exceed 15 μg/L and that TAH in the water column may not exceed 10 μg/L. In addition, there may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration [18AAC70.020(b)(17)(A)(i), 18AAC70.020(b)(17)(B)(ii), and 18AAC70.020(b)(17)(C)].

The canals of the airport ditch system, including the East Canal, fall within the fresh water class, and the secondary recreation subclass. The water quality standards established for this use class and subclass specify that petroleum hydrocarbons, oils and grease may not cause a film, sheen, or discoloration on the surface or floor of the water body or adjoining shorelines, and surface waters must be virtually free from floating oils [18AAC70.020(b)(5)(B)(ii)].

Alaska State Regulations do not establish cleanup levels for sediment. Therefore, sediment cleanup levels are established based on the results of the ecological risk assessment. Because no ecological risks above target health goals were found in sediment, no cleanup levels are necessary for sediment. The results of the ecological risk assessment are discussed in the Section 5.

6.3 EXTENT OF CONTAMINATION

The media of concern for which RAOs were established in Section 6.1 include soil, groundwater, and free-phase product. The extent of contamination for these media based on the cleanup levels presented in Section 6.2 is summarized below.

The ACLs were used to delimit the area that exceeds acceptable risk for human exposure to petroleum hydrocarbons in soil. ACLs have been defined for both GRO and DRO although the risk driver is GRO. Their ACLs are:

- GRO 1,700 mg/kg
- DRO 31,000 mg/kg

Three separate areas shown on Figure 6-1 were identified as containing soil with COC concentrations exceeding the ACLs. These three areas encompass a total of approximately 120,000 ft^2. This estimated area excludes the area of riprap adjacent to the shoreline. Because surface water and sediment concentrations in Sweeper Cove result in ecological hazards below target health goals, the riprap area is assumed to be uncontaminated. Soil exceeding the ACLs was found in the areas shown on Figure 6-1 between 4 and 11 feet bgs, generally near the groundwater surface. Soil exceeding the ACLs was found only in one location at the maximum depth of 11 feet bgs. All other exceedances were at depths less than 10 feet bgs.

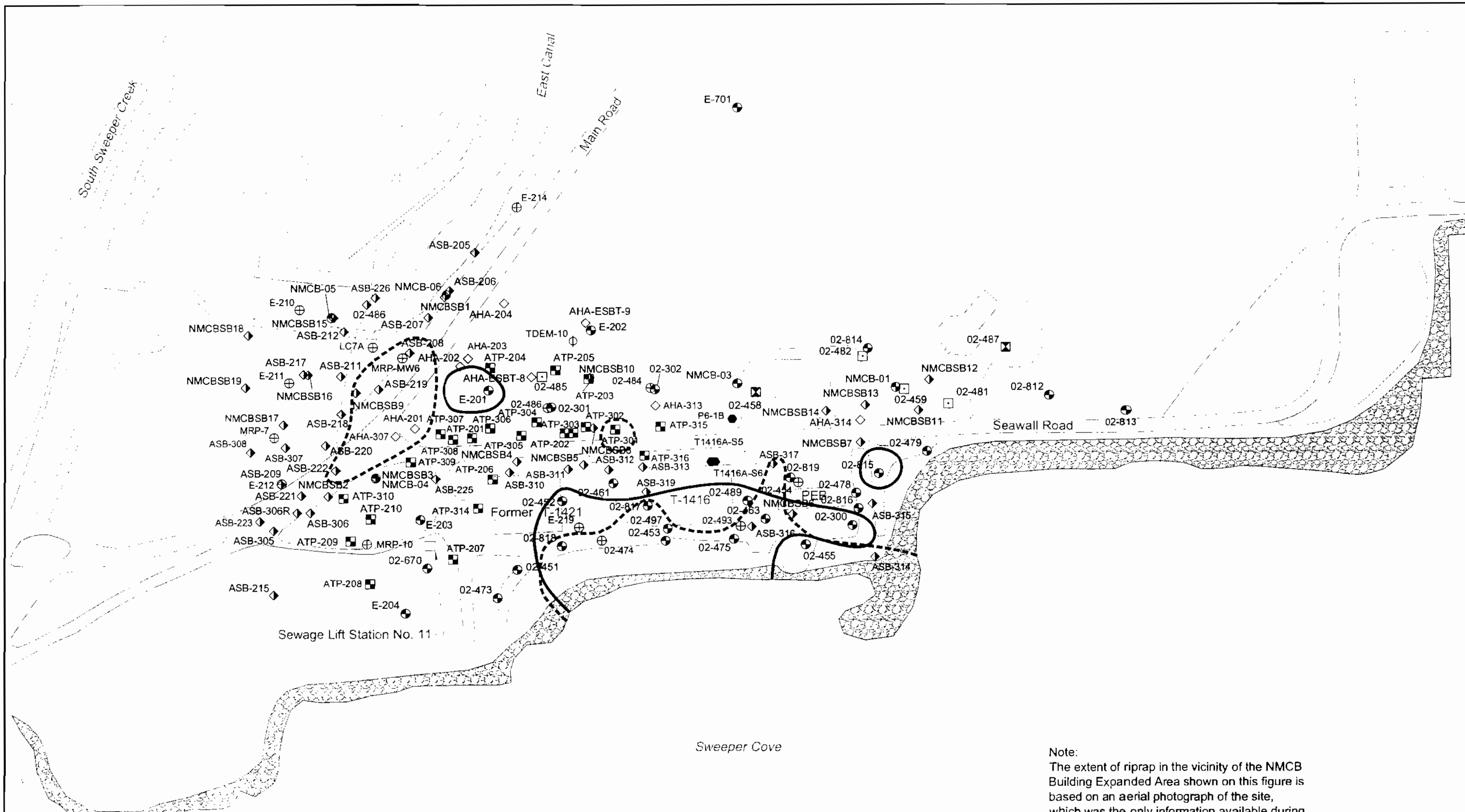
The volume of soil exceeding ACLs was assumed to extend to the minimum groundwater elevation (i.e., the maximum depth to water measured during groundwater monitoring). In all three areas where soil concentrations exceed the ACLs, the maximum depth to water is 10 feet bgs. Based on this depth and the area provided in the paragraph above, the volume of soil exceeding ACLs from ground surface to the maximum measured depth to groundwater is approximately in-place 44,000 cubic yards (cy).

The extent of groundwater that exceeds Alaska DEC Criteria established for groundwater not currently used for, or not reasonably expected to be used for drinking water is delimited in Figure 6-1. The Alaska DEC Criteria established for groundwater not currently used for, or not reasonably expected to be used for drinking water are:

- Benzene 50 µg/L (0.05 mg/L)
- DRO 15,000 µg/L (15 mg/L)
- GRO 13,000 µg/L (13 mg/L)
- Lead 150 µg/L (0.15 mg/L)

The three areas that potentially exceed the Alaska DEC Criteria for groundwater not used for drinking water total approximately 130,000 ft^2, and include the area of riprap adjacent to the shoreline.

The approximate extent of free product remaining on the site is presented in Section 4. Figure 4-1 shows the estimated extent of residual free product for three different timeframes. During 2004, measurable thicknesses of free product were detected in three areas as presented on Figure 4-1. These three areas total approximately 24,000 ft^2.



LEGEND

- Monitoring Well
- Abandoned/ Lost Monitoring Well
- Geoprobe Well
- Geoprobe Boring
- Ground Surface Sample
- Groundwater Grab Sample
- Hand Augar
- Bore Hole
- Test Pit
- Approximate Extent of Riprap
- Extent of Soil Contamination in Excess of Risk-Based ACLs
- Generalized Extent of Groundwater Contamination in Excess of the Proposed Groundwater Cleanup Levels

Note:
The extent of riprap in the vicinity of the NMCB Building Expanded Area shown on this figure is based on an aerial photograph of the site, which was the only information available during preparation of the NMCB Building Expanded Area FFS. The extent of riprap on this figure was not updated based on field measurements collected in September of 2005.

FILENAME: T:\ADAK\IDIQ\Sub-Tasks\D.O 3\NMCB DEC DOC\FIG 6-1 EXTENT SOIL-GW.dwg
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U.S. NAVY	Adak Island, AK DECISION DOCUMENT	N 0 50 100 200 SCALE IN FEET	**Figure 6-1** **Extent of Soil and Groundwater Contamination** **NMCB Building Expanded Area**

Table 6-1
Soil and Groundwater Screening Criteria and Cleanup Levels, NMCB Building Expanded Area

Chemical	Soil		Groundwater	
	Screening Criteria (Method Two)[a] (mg/kg)	ACLs (Method Four)[b] (mg/kg)	Screening Criteria (Table C)[a] (mg/L)	Ten Times Table C[b] (mg/L)
Total Petroleum Hydrocarbons				
DRO[c]	230	31,000	1.5	15
GRO[c]	260	1,700	1.3	13
Volatile Organic Compounds				
Benzene[c]	0.02	NC	0.005	0.05
cis-1,2-dichloroethene	0.2	NC	0.07	0.7
Ethylbenzene	5	NC	0.7	7
Methylene Chloride	0.01	NC	0.005	0.05
Toluene	4.8	NC	1	10
Total Xylenes	69	NC	10	100
Trichloroethene	0.02	NC	0.005	0.05
Semivolatile Organic Compounds				
2-Methylnaphthalene	19	NC	1.5	15
Benzo(a)pyrene	2.4	NC	0.0002	0.002
Benzo(a)anthracene	5.5	NC	0.001	0.01
Benzo(b)fluoranthene	170	NC	0.001	0.01
Carbazole	2	NC	0.04	0.4
Dibenz(a,h)anthracene	5	NC	0.0001	0.001
Naphthalene	19	NC	0.7	7
Inorganics				
Arsenic	1.8	NC	0.05	0.5
Beryllium	38	NC	0.004	0.04
Cadmium	4.5	NC	0.005	0.05
Chromium	1,000	NC	0.1	1
Lead[c]	1,000	NC	0.015	0.15
Nickel	78	NC	0.1	1

[a]Used as screening criteria to determine potential extent of contamination
[b]Used as cleanup levels for remediation
[c]Concentrations of this chemical in groundwater exceeded ten times the Table C values in one or more samples collected at the site. Concentrations of all other chemicals in groundwater did not exceed ten times the Table C values.

Notes:
ACL - alternative cleanup level
DEC - Department of Environmental Conservation
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams per kilogram
mg/L - milligram per liter
NC - not calculated, risk less than target health goal

7.0 REMEDIAL ACTION ALTERNATIVES

Remedial technology types and process options were identified and screened first for the downtown sites as a group, because FFSs will be prepared for four downtown Adak petroleum sites (NMCB Building Expanded Area, South of Runway, SWMU 17, and SWMU 62) that have similar characteristics. Then, the technology types and process options determined to be applicable to the downtown petroleum sites (i.e., the "short list") were evaluated using site-specific information to identify those applicable to the NMCB Building Expanded Area. This evaluation was conducted with respect to protectiveness, ability to meet cleanup levels, and implementability, which are the three criteria identified in Alaska DEC guidance (Alaska DEC 1999a). The technologies and process options that passed the screening steps were combined to form candidate remedial alternatives for the NMCB Building Expanded Area. These candidate remedial alternatives represent the most effective combination of actions for meeting the RAOs. A conceptual design for each alternative was developed and used to estimate capital, operation and maintenance (O&M), and present worth costs for each alternative.

Brief descriptions of the candidate remedial alternatives, including costs, are as follows:

- **Alternative 1 – No Action**: No action or monitoring would be implemented with this alternative. Institutional controls (equitable servitude restrictions), as described in the ICMP, are currently in place for the site. Equitable servitude restrictions applicable to this site include restrictions on land development (i.e., residential land development would be prohibited), the downtown groundwater use prohibition, and the soil excavation notification requirements. This alternative would rely solely on natural attenuation to reduce concentrations of petroleum in the soil and groundwater. However, because monitoring is not included as part of this alternative, there would be no way to verify whether the cleanup levels and RAOs had been achieved. This alternative was retained as the baseline alternative with which the other alternatives were compared.
  Cost: $0

- **Alternative 2 – Institutional Controls, Free-Product Recovery, and MNA**: This alternative consists of institutional controls that are already in place for soil and groundwater as described in the ICMP, installation of three new wells for free-product recovery and groundwater monitoring, free-product recovery from new and existing wells, and MNA for groundwater (see Figure 7-1). Free product would be removed from seven wells (three new and four existing) using passive skimmers, petroleum concentrations in groundwater would be reduced through natural attenuation, and institutional controls would be used to protect human health and the environment as long as groundwater concentrations were greater than groundwater cleanup levels.

- **Cost**: Capital - $210,000, Annual O&M for recovery - $180,000, Annual O&M for MNA - $80,000, Total Present Worth Cost - $1.9 million

- **Alternative 3—Hot Spot Soil Excavation and MNA**: This alternative consists of excavation of 8,300 cy of soil with the highest concentrations of petroleum hydrocarbons (see Figure 7-2). The excavated soil would be treated using thermal desorption to meet soil ACLs, and the treated soil would be replaced in the excavation area. Petroleum concentrations in groundwater would be reduced through MNA; and institutional controls, which are currently in place as described in the ICMP, would be used to protect human health and the environment as long as groundwater concentrations were greater than the groundwater cleanup levels.
  Cost: Capital - $8.5 million, Annual O&M for MNA - $76,000,
  Total Present Worth Cost - $9.5 million

- **Alternative 4—Hot Spot Soil Excavation, In Situ Soil Treatment, and MNA**: This alternative consists of excavation and thermal treatment of 8,300 cy of soil with the highest concentrations of petroleum hydrocarbons. In addition, this alternative includes biological treatment of soil that exceeds the ACLs in areas outside the excavation areas (see Figure 7-3). Petroleum concentrations in groundwater would be reduced through MNA and institutional controls, which are currently in place as described in the ICMP, would be used to protect human health and the environment as long as groundwater concentrations were greater than the groundwater cleanup levels.
  Cost: Capital - $14 million, Annual O&M for in situ treatment - $140,000, Annual O&M for MNA - $76,000, Total Present Worth Cost - $15 million

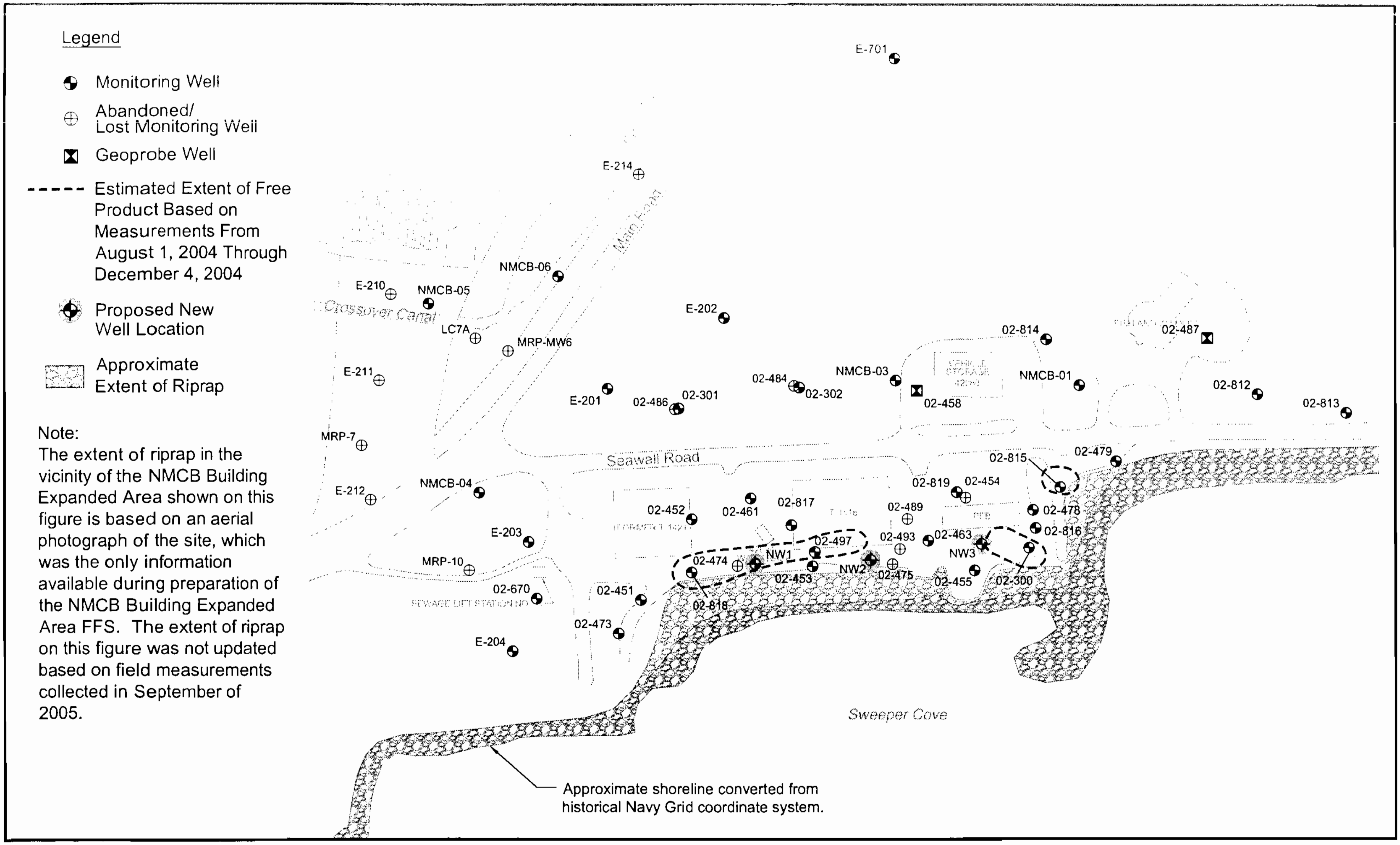

Figure 7-1
Alternative 2 - Proposed Locations of New Product Recovery Wells NMCB Building Expanded Area

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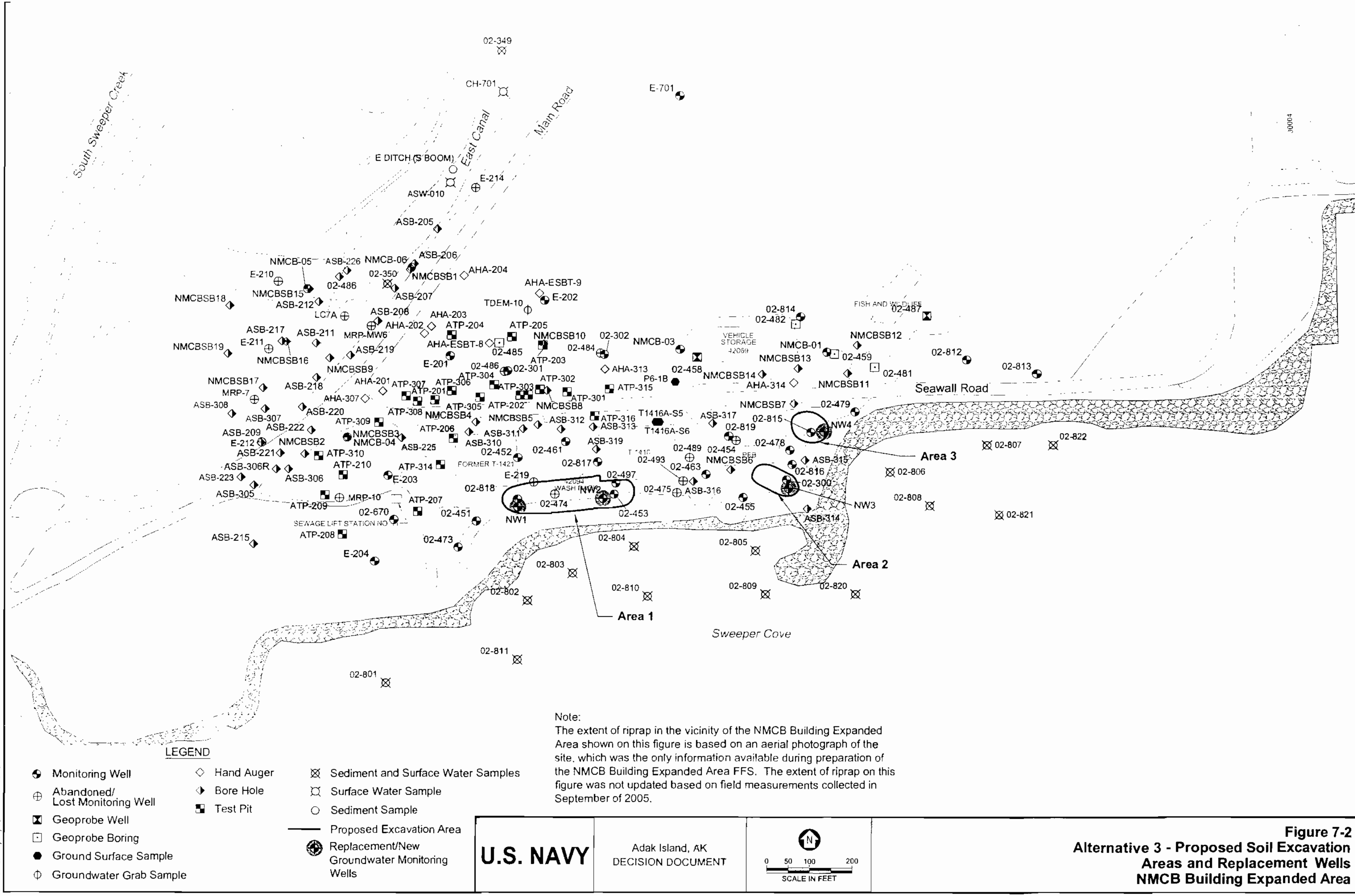

Note:
The extent of riprap in the vicinity of the NMCB Building Expanded Area shown on this figure is based on an aerial photograph of the site, which was the only information available during preparation of the NMCB Building Expanded Area FFS. The extent of riprap on this figure was not updated based on field measurements collected in September of 2005.

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Adak Island, AK
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Figure 7-2
Alternative 3 - Proposed Soil Excavation Areas and Replacement Wells NMCB Building Expanded Area

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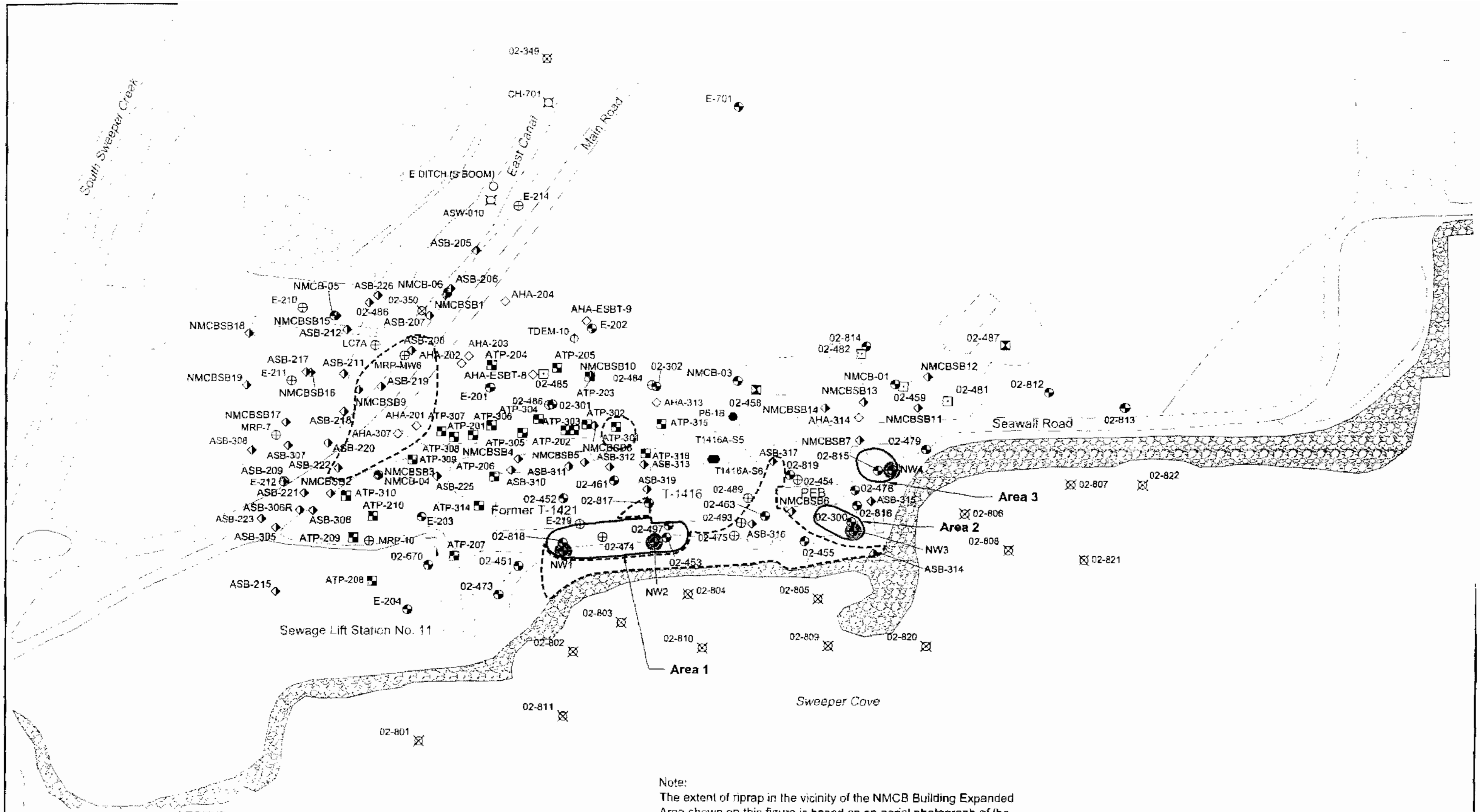

LEGEND

- Monitoring Well
- Abandoned/ Lost Monitoring Well
- Geoprobe Well
- Geoprobe Boring
- Ground Surface Sample
- Groundwater Grab Sample
- Hand Auger
- Bore Hole
- Test Pit
- Sediment and Surface Water Samples
- Surface Water Sample
- Sediment Sample
- Proposed In Situ Bioremediation Area
- Proposed Excavation Area
- Replacement/New Groundwater Monitoring Wells
- Approximate Extent of Riprap

Note:
The extent of riprap in the vicinity of the NMCB Building Expanded Area shown on this figure is based on an aerial photograph of the site, which was the only information available during preparation of the NMCB Building Expanded Area FFS. The extent of riprap on this figure was not updated based on field measurements collected in September of 2005.

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Adak Island, AK
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Figure 7-3
Alternative 4 - Proposed Excavation Areas, Bioremediation Areas, and Replacement Wells
NMCB Building Expanded Area

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

Each alternative for the NMCB Building Expanded Area was evaluated using the five criteria established by the Alaska DEC in *Guidance on Decision Documentation Under the Site Cleanup Rules* (Alaska DEC 1999b): protectiveness; practicability; short- and long-term effectiveness; regulations; and public input. These criteria are summarized in Table 8-1. Public input was not evaluated in the FFS (URS 2005a), because comments had not yet been solicited from the public. Therefore, public input was evaluated after public comments on the proposed plan were received, and the evaluation is included in this document. Each remedial alternative was assessed and assigned a rating of poor, fair, good, excellent, or superior for each evaluation criteria as presented in Figure 8-1 Based on the evaluation of the individual criteria, each alternative was also given an overall rating (poor, fair, good, excellent, or superior).

Alternative 2 was given an overall rating of good, because it provides superior implementability, excellent short-term effectiveness, and good protectiveness and long-term effectiveness at a relatively low cost. Because residual risks remain at the site after active cleanup (free-product recovery), this alternative only obtained a rating of good for long-term effectiveness. However, this alternative minimizes short-term risks and therefore obtained an excellent rating for short-term effectiveness. Although it was rated fair for time to achieve cleanup goals and for regulations because it would take a long time to achieve cleanup goals, Alternative 2 is protective of human health during the period of time required to achieve the cleanup goals (given the implementation of institutional controls and groundwater monitoring). However, it may not be fully protective of the environment during this period of time.

Alternative 3 was given an overall rating of good, because it provides superior long-term effectiveness and protectiveness, good time to achieve cleanup goals, excellent compliance with regulations, and fair implementability and cost effectiveness. This alternative is capable of achieving the cleanup goals significantly quicker than Alternative 2, and is protective of both human and ecological receptors once soil excavation is complete. However, there are additional short-term risks and costs associated with this alternative when compared to Alternative 2.

Alternative 4 was given an overall rating of fair. This alternative was rated lower than Alternatives 2 and 3 because of the difficulty of implementing this complex alternative, the high cost, and the additional short-term risks associated with this alternative. This alternative received superior ratings for long-term effectiveness and regulations, an excellent rating for protectiveness, and a good rating for time to achieve cleanup goals. Although this alternative provides superior long-term effectiveness, the effectiveness is achieved through additional remedial actions, which have additional short-term risks and costs.

Alternative 1 was given a rating of poor. This alternative received poor ratings for time to achieve cleanup goals, regulations, protectiveness and long-term effectiveness. Although this alternative would be easy to implement and would cost nothing, the alternative would not be protective of human health and the environment.

Alternatives 2 and 3 both received the highest overall rating. Therefore, only these two alternatives were considered for selection at the NMCB Building Expanded Area. A summary of the issues at the NMCB Building Expanded Area and how Alternatives 2 and 3 address these issues is provided in Table 8-2. A summary of the advantages and disadvantages of these two alternatives is provided in Table 8-3.

Based on these comparisons, Alternative 2, Institutional Controls, Free-Product Recovery, and MNA, was selected as the remedial alternative for the NMCB Building Expanded Area. This alternative will provide an appropriate, cost-effective remedy that protects human health and the environment and that can be implemented at the earliest possible time, as discussed in more detail below. In addition, the state concurs with the selection of this alternative and it is acceptable to the public.

Alternative 2 is proposed for NMCB Building Expanded Area because the additional costs associated with Alternative 3 are not warranted given that Alternative 2 is protective of human health and the environment. Although risks to ecological receptors may not be effectively controlled in the short-term with Alternative 2 if ecological receptors were exposed to soils at the site, unacceptable risks are present at only two locations within paved areas in an industrial area, and the unacceptable risks are present in soil at depths of 5.5 to 6.5 feet, which is at the lower limits of the biologically active zone. Therefore, ecological risks are most likely below target health goals because of a lack of an exposure pathway. In addition, potential risks will be reduced with time through passive free-product recovery and natural attenuation.

Although TAH and TAqH concentrations were above water quality criteria in 1998, concentrations of petroleum compounds in surface water do not pose an unacceptable risk according to the site-specific ecological risk assessment. In addition, TAH and TAqH concentrations in surface water are likely declining as a result of declining BTEX concentrations in groundwater, and free-product recovery activities that have been implemented at the site since the surface water samples were collected in 1998. If concentrations of TAH and TAqH are not currently below water quality criteria, these concentrations should decline below water quality criteria with the free-product recovery efforts and MNA included as part of Alternative 2. In addition, no sheen has been observed on Sweeper Cove. Finally, Alternative 2 would be much easier to implement than Alternative 3. Alternative 2 would not require water treatment and does not include the complicated thermal desorption system.

Alaska DEC Criteria	Alternative 1 No Action	Alternative 2 Institutional Controls, Free-Product Recovery, and MNA	Alternative 3 Hot Spot Soil Excavation and MNA	Alternative 4 Hot Spot Soil Excavation In-Situ Soil Treatment and MNA
	Rating of Alternatives for NMCB Building			
Protectiveness	○	◑	●	◕
Practicable - Implementability	◕	●	◔	○
Practicable - Cost Effectiveness	●	◕	◔	○
Short- and Long-term Effectiveness Short-term Effectiveness	●	◕	◔	○
Short- and Long-term Effectiveness Time to Achieve Cleanup Goals	○	◔	◑	◑
Short- and Long-term Effectiveness Long-term Effectiveness	○	◑	●	●
Regulations	○	◔	◕	●
Public Input	○	◑	◑	◑
Overall	○	◑	◑	◔

Notes:
MNA - monitored natural attenuation

○ Poor ◔ Fair ◑ Good ◕ Excellent ● Superior

Table 8-1
Alaska DEC Criteria for Evaluating Remedial Alternatives

Criteria	Description
Protectiveness	Whether the remedial alternatives protect human health and the environment both during and after the cleanup actions by eliminating, reducing, or controlling exposures to hazardous substances or contaminants and by protecting human health from physical and other hazards directly associated with the cleanup action
Practicable	Whether the remedial alternatives can be designed, constructed, and implemented in a reliable and cost-effective manner. For ease of evaluation, this criterion is subdivided into two separate criteria; implementability and cost.
Short- and Long-term Effectiveness	Ability of the alternatives to protect human health and the environment during the construction/implementation phase (short-term) and after completion of the cleanup (long-term). The speed with which the alternatives achieve the cleanup goals is also evaluated. For ease of evaluation, this criterion is subdivided into three separate criteria; short-term effectiveness, time to achieve cleanup goals, and long-term effectiveness.
Regulations	Ability of alternatives to attain federal and state applicable or relevant and appropriate requirements or to provide justification for invoking a waiver.
Public input	Whether the public agrees with, opposes, or has no comment on the preferred alternative. Public input will be evaluated after receipt of the public comments on this proposed plan.

Note:
DEC - Department of Environmental Conservation

Table 8-2
What are the Key Issues at NMCB Building Expanded Area and How Do the Alternatives Address These Issues?

Issue	How is the Issue Addressed?	
	Alternative 2	**Alternative 3**
Free product[1]	Institutional controls (excavation notification) and passive free-product recovery	Institutional controls (excavation notification) and soil excavation
Unacceptable risks to construction workers	Institutional controls (excavation notification) and natural attenuation	Institutional controls (excavation notification), soil excavation, and natural attenuation
Groundwater concentrations exceed groundwater cleanup levels (10 times Table C values)	Institutional controls (downtown groundwater use prohibition), passive free-product recovery, and MNA	Institutional controls (downtown groundwater use prohibition), soil excavation, and MNA
Unacceptable ecological risks in soil	Passive free-product recovery and natural attenuation	Soil excavation and natural attenuation
Historical marine surface water concentrations exceeded TAH and TAqH water quality standards	Passive free-product recovery and MNA	Soil excavation and MNA

[1]Measurable thicknesses of free product have only been observed on groundwater. Measurable thicknesses of free product and sheen have not been observed on surface water.

Notes:
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

Table 8-3
Summary of Advantages and Disadvantages of Alternatives 2 and 3, NMCB Building Expanded Area

Advantages and Disadvantages	Alternative 2 – Institutional Controls, Free-Product Recovery, and MNA	Alternative 3—Hot Spot Soil Excavation and MNA
Advantages	• Future construction worker exposure to contaminated soil and free product unlikely because building foundations not constructed at or below the water table where most of the contamination is located • If construction does occur below water table, effectively controls future construction worker risk through institutional controls • Effectively controls exposure to groundwater through institutional controls • Reduces volume of free product in subsurface through passive free-product recovery • Reduces soil and groundwater concentrations through passive free-product recovery and natural attenuation • Relatively inexpensive • Easy to implement	• Effectively controls remediation construction worker risk through institutional controls • Effectively controls future construction worker risk through institutional controls and soil excavation • Effectively controls exposure to groundwater through institutional controls • Effectively controls risks to ecological receptors through soil excavation • Reduces volume of free product in subsurface through soil excavation • Reduces soil and groundwater concentrations through soil excavation and natural attenuation • TAH and TAqH concentrations in marine surface water reduced through soil excavation and natural attenuation
Disadvantages	• Institutional controls not effective for ecological receptors; therefore risks to ecological receptors may not be effectively controlled in the short-term. However, unacceptable risks ▪ Present at only two locations at depths of 5.5 to 6.5 feet, which is at the lower limits of the biologically active zone ▪ Present only within paved areas in an industrial area with little habitat • Passive free-product recovery and natural attenuation may require time to reduce TAH and TAqH concentrations in surface water to below water quality criteria. However, ▪ No unacceptable ecological risk in marine surface water according to the site-specific risk assessment	• Relatively expensive • Relatively difficult to implement for the following reasons: ▪ Soil excavation next to site buildings would require shoring ▪ Soil excavation below the groundwater table complicated by dewatering and shoring requirements ▪ Soil excavation on Adak complicated by the high rainfall ▪ Treatment of water from excavation dewatering (approximately 6,000 gpd) complicated because of

Table 8-3 (Continued)
Summary of Advantages and Disadvantages of Alternatives 2 and 3, NMCB Building Expanded Area

Advantages and Disadvantages	Alternative 2 – Institutional Controls, Free-Product Recovery, and MNA	Alternative 3—Hot Spot Soil Excavation and MNA
	▪ No exceedances of Alaska Water Quality Standards or the EPA National Recommended Water Quality Criteria for 2002 for individual chemicals ▪ Surface water samples collected and analyzed for TAH and TAqH in 1998 before most of the free-product recovery activities occurred at the site ▪ Since 1998, BTEX concentrations in groundwater have decreased to between 3% and 57% of the 1998 values indicating surface water concentrations of TAH most likely declining as well, potentially below surface water quality criteria	the extensive treatment required to meet marine surface water quality criteria ▪ Thermal desorption equipment complicated to operate and requires experienced operators ▪ Thermal desorption also complicated to implement because of the remoteness of Adak Island

Notes:

BTEX - benzene, toluene, ethylbenzene, and total xylenes
EPA - Environmental Protection Agency
gpd - gallons per day
MNA - monitored natural attenuation
TAH - total aromatic hydrocarbons
TAqH - total aqueous hydrocarbons

9.0 DESCRIPTION OF SELECTED CLEANUP ACTION

Alternative 2 – Institutional Controls, Free-Product Recovery, and MNA – is selected as the remedial alternative for the NMCB Building Expanded Area. This cleanup alternative was selected for the NMCB Building Expanded Areas based on its ability to meet the four RAOs:

1. Prevent human and ecological exposure to petroleum hydrocarbons in soil that would result in adverse health effects

2. Reduce petroleum hydrocarbons in groundwater to concentrations less than or equal to the Alaska DEC groundwater cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for, drinking water

3. Prevent potential future migration of contaminants to surface water at concentrations that could result in adverse ecological effects

4. Minimize exposure to free-phase petroleum product.

The selected cleanup alternative is shown on Figure 9-1 and described below. (Note that the approximate extent of riprap on this figure and all subsequent figures in this document were updated from the FFS figures based on field measurements obtained during a site visit in early September 2005.)

The selected cleanup alternative, Alternative 2, consists of institutional controls for soil and groundwater, free-phase product recovery, and MNA for groundwater. Free-phase product will be removed using passive skimmers, petroleum concentrations in groundwater will be reduced through MNA, and institutional controls will be used to protect human health and the environment as long as groundwater concentrations are greater than the groundwater cleanup levels. The MNA timeframe for the site cannot be accurately predicted at this time. However, the timeframe needed to achieve the Alaska DEC groundwater cleanup levels will be estimated after 5 years of monitoring has been completed. It is anticipated that free-product recovery will be completed within 2 years of the start of recovery operations in the three new wells. Short-term risks associated with MNA and product recovery will be minimal and will be controlled through the use of personal protective equipment. Once groundwater concentrations have been reduced to levels less than the Alaska DEC groundwater cleanup levels established for groundwater not currently used for, or not reasonably expected to be used for, drinking water, and free product has been removed to the extent practicable in accordance with the OU A ROD (the technically practical endpoint for free-product recovery is defined in Section 4), residual risks at the site are expected to be acceptable. Note that pockets of free product may remain at the site, even if none is detected in on-site wells. Therefore, some residual risk may remain at a site once cleanup actions have been completed. However, if groundwater concentrations are below cleanup levels throughout the site, the extent of free product is expected to be very limited.

The institutional controls implemented at this site consist of equitable servitude restrictions including restrictions on land development (i.e., residential land development would be prohibited), downtown groundwater use prohibition, and soil excavation notification requirements. These institutional controls have already been implemented on Adak Island. The Navy has an established institutional controls program that was developed to ensure that institutional controls, including the equitable servitude restrictions selected in the OU A ROD, remain effective and reliable. The Navy has prepared an ICMP (U.S. Navy 2004) documenting the approach the Navy will use to ensure that the equitable servitude restrictions remain protective. The ICMP provides details of the institutional controls management program, and therefore, a detailed description of the equitable servitude restrictions is not included here. Institutional controls are expected to remain on the site indefinitely in order to ensure appropriate land uses are maintained at the site (i.e., no residential use). This is necessary because the risk assessment assumed the site would not be used for residential purposes, and cleanup levels were developed based on these land use assumptions. Site inspections will be used to evaluate compliance with equitable servitude restrictions. Monitoring of groundwater will be used to evaluate the protection of human health and the environment until groundwater cleanup goals are achieved.

Monitoring of natural attenuation will consist of periodic groundwater sampling at the site for a period of time sufficient to assess the progress of the natural degradation of petroleum hydrocarbons in groundwater. Details of the monitoring program will be incorporated into subsequent versions of the comprehensive monitoring plan for the Former Adak Naval Complex (CMP) (URS 2004). The CMP describes the existing monitoring program for groundwater as prescribed in the OU A ROD. Groundwater monitoring will be conducted at a frequency to be established by the Navy and Alaska DEC to evaluate whether petroleum-related chemicals in the groundwater are attenuating to concentrations below applicable Alaska DEC groundwater cleanup levels at locations to be specified in the CMP. Concentrations of petroleum-related chemicals currently exceeding these Alaska DEC cleanup levels will be monitored, as well as natural attenuation indicator parameters. Groundwater sampling will be conducted following procedures specified in the appropriate Navy Standard Operating Procedures (SOPs) as specified in future versions of the CMP. Groundwater samples will only be collected for chemical analyses from individual wells if the measured product thickness in the well is less than 0.02 foot. The Navy proposes to initiate remedy-based MNA at this site in conjunction with annual monitoring activities planned for 2006 as specified in the CMP. All groundwater monitoring activities at NMCB Building Expanded Area will be coordinated with the ongoing annual monitoring activities described in the CMP.

All available site-specific data will be evaluated after each year of monitoring is completed. These data evaluations will be performed to assess whether specified institutional controls are being successfully implemented at the sites, concentrations of petroleum-related chemicals in groundwater are decreasing, and/or free product is being recovered to the extent practicable. These analyses will incorporate historical, site-specific data where appropriate. Once the annual data evaluation is completed, the Navy will make recommendations for modifications to the monitoring program or for discontinuing the monitoring program, as appropriate. MNA and free-product monitoring will be discontinued once the Alaska DEC groundwater cleanup levels for groundwater, which is not reasonably expected to be used for drinking water are achieved during three consecutive annual monitoring events in all site wells selected for monitoring in the CMP.

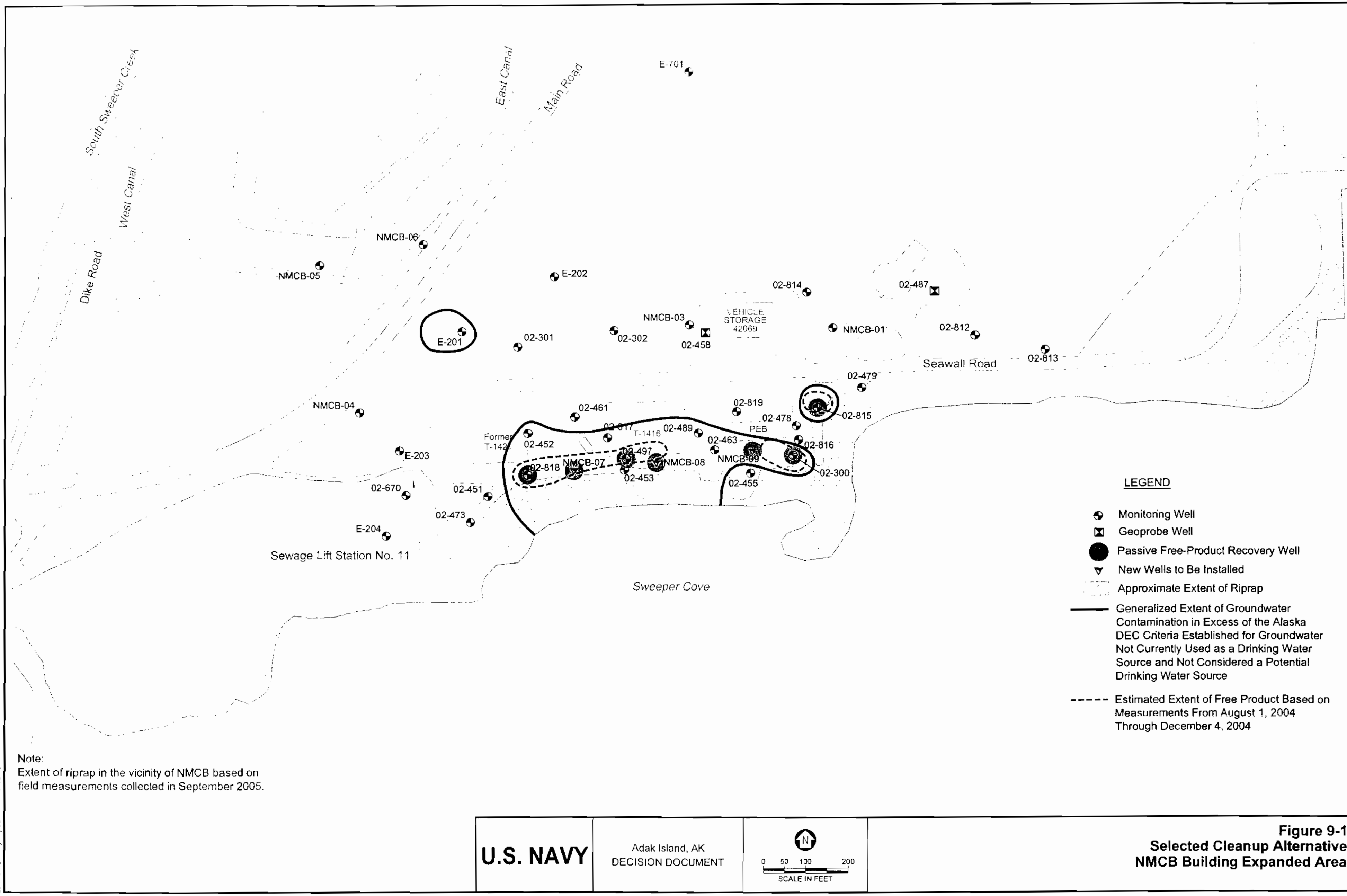
As part of the 5-year reviews required by Amendment Number 3 to the Adak FFA (U.S. Navy, USEPA, and ADEC 2002) and Amendment Number 0001 to the SAERA between the Navy and ADEC (U.S. Navy and ADEC 2002), the results of monitoring will be prepared by the Navy and submitted for review by the Alaska DEC. The 5-year reviews will evaluate the effectiveness of the selected remedy at the NMCB Building Expanded Area. Based on these reviews, the Navy and the Alaska DEC will decide whether continued monitoring, or additional actions, are necessary at the site. If the groundwater contaminant plume is shown to be stable or shrinking during three consecutive annual monitoring events, then the Navy will petition Alaska DEC for less frequent monitoring.

Recoverable product will be removed using passive skimmers. Three new wells, NMCB-07, NMCB-08 and NMCB-09 (Figure 9-1), will be installed in areas known historically to contain product or in areas between two wells containing product, for the purpose of product recovery and groundwater monitoring. The goal of installing new wells is to increase the effective area of recovery and decrease the recovery duration. If free product is detected in these new wells, passive skimmers will be installed. In addition, passive skimmers will be installed in existing wells 02-300, 02-497, 02-815, and 02-818, where measurable quantities of free product were found during the 2004 free-product recovery activities at the NMCB Building Expanded Area. Product recovery will occur on a schedule commensurate with skimmer capacity.

The product recovery schedule may be modified to optimize the recovery rate. Free product occurrence will be measured in additional wells to determine if free product is migrating and if additional wells should be added to the recovery system. The installation of additional product recovery or monitoring wells, if needed, is considered a contingent component of the selected remedy. Any future decision by the Navy and ADEC to install and operate additional product recovery or monitoring wells will not be considered a basis for amending or reopening this DD. Removal of free-phase product will continue until the technically practicable endpoint for free-phase product recovery, as defined in the OU A ROD (U.S. Navy et al. 2000), is achieved.

The costs for this alternative are presented in Table 9-1. Costs to implement MNA are estimated to be $80,000 per year. The costs associated with MNA are the incremental costs associated with the NMCB Building Expanded Area, which are above the base program costs associated with monitoring activities currently specified in the CMP. The MNA estimate includes the costs associated with sample collection at the NMCB Building Expanded Area, sample analysis, and the incremental reporting and mobilization costs. Capital costs for installation of three new wells and seven passive skimmers are $210,000. Annual O&M costs to run the free-phase product recovery system are $180,000. The present worth cost for this alternative assuming a 5 percent discount rate, a 40-year natural attenuation monitoring period and 2 years of active free-phase recovery is $1.9 million. Total capital and O&M costs (no present worth) for this alternative are estimated to be $3.8 million, not accounting for inflationary costs.

Although there are costs associated with the implementation of institutional controls at this site, they were not estimated because island-wide institutional controls will cover site-specific restrictions. The duration and frequency of monitoring and product recovery may vary from the estimated values.



Note:
Extent of riprap in the vicinity of NMCB based on field measurements collected in September 2005.

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Adak Island, AK
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Figure 9-1
Selected Cleanup Alternative
NMCB Building Expanded Area

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Table 9-1
NMCB Building Expanded Area
Cost Estimate For Alternative 2:
Institutional Controls, Free-Phase Product Recovery, and MNA

Item	Unit Cost	Units	Quantity	Cost
CAPITAL DIRECT COSTS (INSTALLED)				
Well Installation Costs				
Mobilize/Demobilize crew/equipment	$10,000	LS	1	$10,000
Shipping	$1.60	LB	1,000	$1,600
Per Diem	$4,700	Week	1	$4,700
Equipment Rental	$2,200	Week	1	$2,200
Well Construction (Labor)	$15,000	Week	1	$15,000
Well Construction (Materials)	$1,000	Well	3	$3,000
Automated Passiver Skimmer Installation				
Shipping	$1.60	LB	7,000	$11,200
Equipment purchase	$2,500	Well	7	$17,500
Equipment Install	$8,000	Week	1	$8,000
Subtotal Capital Costs				$73,200
Contingency Allowances		%	25	$18,300
TOTAL CAPITAL DIRECT COSTS (DC)				$90,000
CAPITAL INDIRECT COSTS				
Preliminary Design	DC	%	25	$22,500
Engineering Design	DC	%	20	$18,000
Regulatory Compliance	DC	%	15	$13,500
Construction QA and Management	DC	%	20	$18,000
System Startup	DC	%	20	$18,000
Closure Documentation	DC	%	15	$13,500
TOTAL CAPITAL INDIRECT COSTS				$100,000
Total Direct and Indirect Capital Costs				$190,000
Site Inspection and Overhead Costs	Total Costs	%	8	$15,200
TOTAL CAPITAL COSTS				**$210,000**

Table 9-1 (Continued)
NMCB Expanded Area
Cost Estimate For Alternative 2:
Institutional Controls, Free-Phase Product Recovery, and MNA

Item	Unit Cost	Units	Quantity	Cost
ANNUAL O&M COSTS				
Annual MNA Costs				
Mobilization				
Mobilize/Demobilize	$2,000	LS	1	$2,000
Shipping	$1.60	LB	2,000	$3,200
Monitoring				
Project Management/Coordination	$120	Well	32	$3,840
Field Labor	$480	Well	32	$15,360
Hydrogeologist	$100	Well	32	$3,200
Equipment Rental	$1,620	Week	2	$3,240
Sampling Supplies	$45	Well	32	$1,440
Analytical (DRO, GRO, BTEX, S/VOCs)	$850	Well	32	$27,200
SUBTOTAL MNA COSTS				$59,480
Contingency Allowances		%	25	$14,870
Site Inspection and Overhead Costs		%	8	$5,948
TOTAL ANNUAL MNA COST				**$80,000**
Cost Projection for 40 years				**$3,200,000**
40-Yr Present Worth MNA*				**$1,400,000**
Annual Free-Phase Product Recovery Costs				
Mobilization				
Mobilize/Demobilize	$2,000	LS	12	$24,000
Shipping	$1.60	LB	800	$1,280
Monitoring				
Project Management/Coordination	$1,440	Well	7	$10,080
Field Labor	$5,760	Well	7	$40,320
Supplies	$3,000	Well	7	$21,000
Hazardous Waste Disposal	$10,000	YR	1	$10,000
Battery/remote system repair/replacement	$25,000	YR	1	$25,000
SUBTOTAL RECOVERY COSTS				$131,680
Contingency Allowances		%	25	$32,920
Site Inspection and Overhead Costs		%	8	$13,168
TOTAL ANNUAL RECOVERY COST				**$178,000**
Cost Projection for 2 years				**$360,000**
2-Yr Present Worth Recovery*				**$330,000**

Table 9-1 (Continued)
NMCB Expanded Area
Cost Estimate For Alternative 2:
Institutional Controls, Free-Phase Product Recovery, and MNA

Item	Unit Cost	Units	Quantity	Cost
TOTAL CAPITAL COSTS				**$210,000**
TOTAL O&M COSTS (40 YEARS)				**$3,560,000**
TOTAL CAPITAL AND O&M COSTS				**$3,800,000**
PRESENT WORTH O&M COSTS*				**$1,700,000**
TOTAL PROJECT PRESENT WORTH*				**$1,900,000**

* Present worth costs calculated using a 5% discount rate.

Notes:

BTEX = benzene, toluene, ethylbenzene, and total xylenes
DRO = diesel-range organics
EA = Each
GRO = gasoline-range organics
LB = Pound
LS = Lump Sum
MNA = monitored natural attenuation
O&M = operation and maintenance
QA = quality assurance
S/VOCs = semivolatile/volatile organic compounds
YR = Year

10.0 ADDITIONAL ACTIVITIES

The Navy will perform additional site activities as part of the selection of the preferred remedial alternative to confirm that the selected remedy is protective. These activities include installation of new wells for soil and groundwater sampling and annual inspections of the Sweeper Cove shoreline for seeps and sheens. The Navy will install the new wells and collect additional soil and groundwater samples to ensure that the contaminant plume is stable or shrinking and surface water is protected. The annual shoreline inspections will be performed to confirm that free product is not migrating to Sweeper Cove. These additional activities are discussed in more detail below.

Five new wells (NMCB-07, NMCB-08, NMCB-10, NMCB-11, NMCB-12) will be installed along the shoreline adjacent to the riprap, as shown on Figure 10-1. These five wells will be used for surface water protection, as well as MNA. Soil samples will be collected during the drilling of these five new wells, and groundwater samples will be collected after installation of the wells as part of the annual surface water protection monitoring and MNA. Two of the wells, NMCB-07 and NMCB-08 will also be used for free-product recovery as discussed in Section 9. NMCB-09, which will be installed as part of the selected remedy will not be used for surface water protection. As discussed in Section 9, this well will be used for free-product recovery and MNA. Soil samples will not be collected from this well during drilling.

As required in 18 AAC 75.345(f), groundwater that is closely connected hydrologically to nearby surface water may not cause a violation of the water quality standards in 18 AAC 70 for surface water or sediment. Comparison of concentrations of petroleum-related chemicals reported in surface water samples from Sweeper Cove in the vicinity of the NMCB Building Expanded Area site identified maximum concentrations of TAH and TAqH at, or just above, water quality standards. All other COCs were detected at concentrations less than the water quality standards.

Surface water protection monitoring will be conducted at locations where concentrations of COCs in groundwater exceed groundwater quality criteria and could discharge to Sweeper Cove. The purpose is to verify that potential contaminants are not migrating into surface water bodies as required by 18 AAC 75.345(f). The planned surface water protection monitoring uses groundwater samples and free-product thickness measurements collected from wells located adjacent to and or upgradient from surface water (i.e., surface water protection wells). If either of the following two conditions are met, then additional actions will be initiated:

1) Condition 1 - analytical results for petroleum compounds exceed the groundwater criteria and an increasing trend in concentrations is found over three consecutive measurements in the surface water protection wells

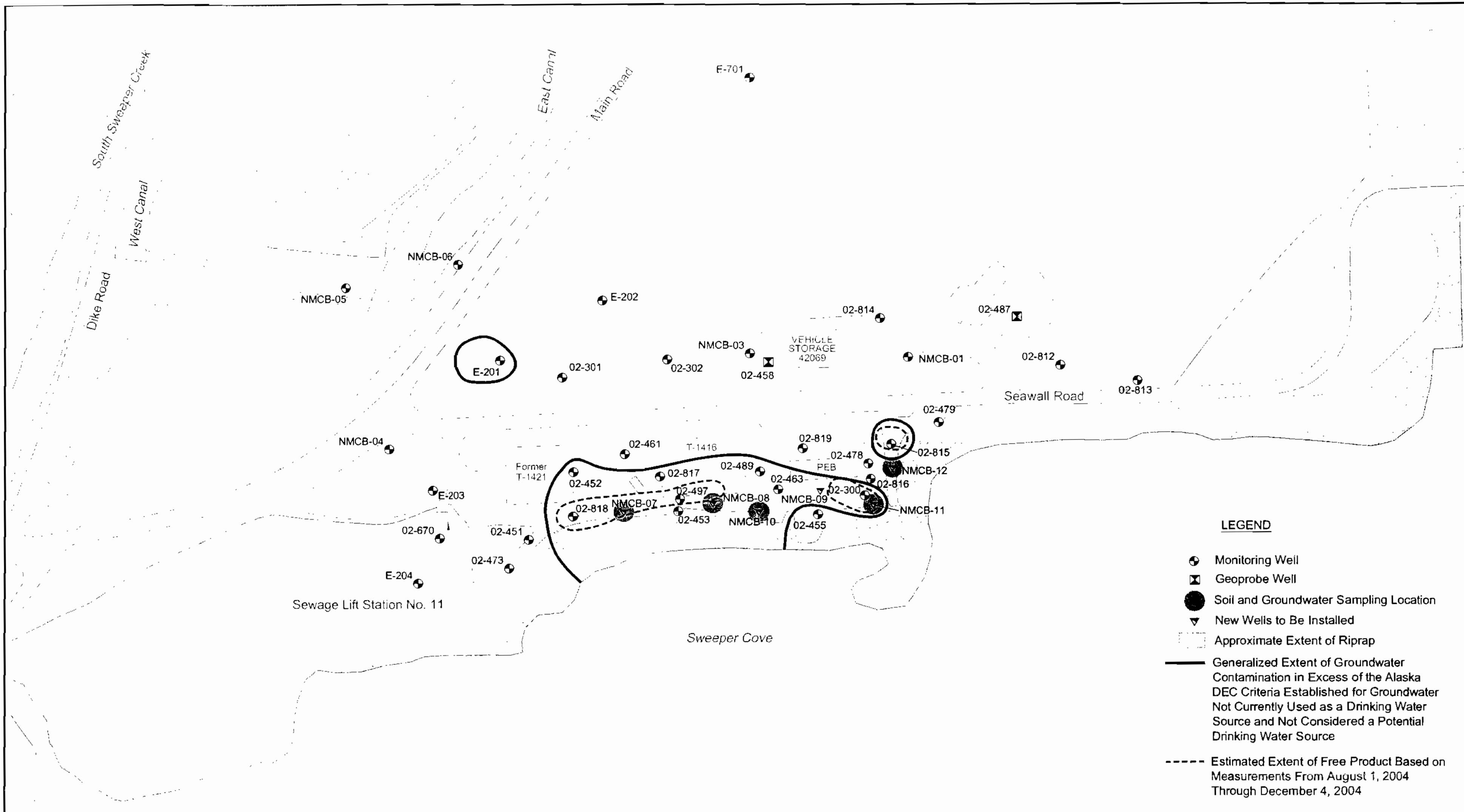
2) Condition 2 - An increasing trend in free-product thickness measurements is found over three consecutive measurements in the surface water protection wells

The following additional actions will be initiated if one or both of the above conditions is met:

- Evaluate the chemicals and their concentrations identified in surface water protection wells relative to the potential for a reasonable threat to downgradient aquatic receptors
- Evaluate the need to conduct surface water sampling
- Review final remedy selected for the site and the remedy performance relative to surface water protection

The endpoint for surface water protection monitoring is directly dependent upon the associated upgradient site achieving the remedial endpoint criteria. The remedial endpoint criteria for the site is a demonstration that the Alaska DEC groundwater cleanup levels for groundwater not reasonably expected to be used for drinking water are achieved during three consecutive annual monitoring events. Once the upgradient site has achieved the remedial endpoint and it can be demonstrated that there is no reasonable threat to the down-gradient receptor, groundwater monitoring for surface water protection at the associated location will be terminated. If the groundwater contaminant plume is shown to be stable or shrinking during three consecutive annual monitoring events, then the Navy will petition Alaska DEC for less frequent monitoring.

Petroleum seeps and or sheens on the shoreline or adjacent surface water of Sweeper Cove have not been reported. However, the shoreline along Sweeper Cove will be inspected during each annual monitoring event. The purpose of the inspection is to identify the presence or absence of petroleum seeps or sheens along the shoreline. If seeps or sheens are observed, the location(s) will be documented on a map and photographs of the seeps or sheens will be taken to document the degree to which petroleum hydrocarbons are entering the surface water environment. In the event that petroleum seeps and or sheens are identified, the Navy will consider alternative monitoring or other actions to address these conditions.



Note:
Extent of riprap in the vicinity of NMCB based on field measurements collected in September 2005.

U.S. NAVY

Adak Island, AK
DECISION DOCUMENT

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SCALE IN FEET

Figure 10-1
Additional Sampling Activities
NMCB Building Expanded Area

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11.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) are promulgated federal and state laws and regulations that are either applicable to the conditions at a cleanup site or are relevant and appropriate. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site. Three kinds of ARARs exist for cleanup of petroleum release sites on Adak Island: chemical-specific, location-specific, and action-specific.

11.1 CHEMICAL-SPECIFIC ARARs

Chemical-specific ARARs are generally risk-based concentration limits or discharge limits for specific chemicals. When a specific chemical is subject to more than one discharge or exposure limit, the more stringent requirement is used. Chemical-specific ARARs for the NMCB Building Expanded Area include Alaska DEC regulations 18 AAC 75 and 18 AAC 70 and the Clean Water Act.

As discussed in Section 6, Alaska DEC regulation 18 AAC 75 specifies soil and groundwater cleanup criteria established for petroleum-release sites located within the State of Alaska. Cleanup levels specified for soil at free-product recovery petroleum sites on the Former Adak Naval Complex are based on Alaska DEC Method Four criteria [18 AAC 75.340(a)(4)]. Cleanup levels specified for groundwater at the NMCB Building Expanded Area are based on 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C] because groundwater is not reasonably expected to be a potential future source of drinking water [18 AAC 75.345(b)(2)]. Alaska regulations [18 AAC 75.345(f)] specify that groundwater hydrologically connected to nearby surface water may not cause a violation of the water quality standards in 18 AAC 70 for surface water. In addition, ambient water quality criteria (33 United States Code 1314, Clean Water Act) are relevant and appropriate for surface water that could be impacted by plume migration.

11.2 LOCATION-SPECIFIC ARARs

Location-specific ARARs are those requirements that relate to the geographic position or physical condition of the site. These requirements may limit the type of remedial activities that can be implemented or may impose additional constraints. There are no potential location-specific ARARs for NMCB Building Expanded Area because remedial actions are not proposed in sensitive environments and because ecological hazards from exposure to sediment and surface water in Sweeper Cove were found to be below target goals (i.e., a HQ less than 1).

11.3 ACTION-SPECIFIC ARARs

Action-specific ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities. Potentially applicable action-specific ARARs for the selected cleanup alternative include the following:

- Resource Conservation and Recovery Act (RCRA) regulations (40 Code of Federal Regulations [CFR] Parts 261, 262, 268)
- Alaska Hazardous Waste Disposal Regulation (18 AAC 62)
- Alaska Oil and Hazardous Substances Pollution Control (18 AAC 75.325 through 375)
- Alaska Water Quality Standards (18 AAC 70.20)
- Federal Clean Water Act – National Pollution Discharge Elimination System (NPDES) Program (40 CFR Part 131)
- Federal Clean Water Act – Pretreatment (40 CFR Part 403)

12.0 PUBLIC INVOLVEMENT

12.1 PUBLIC INVOLVEMENT ACTIVITIES

The Navy established a community involvement program in 1994 to provide interested Alaska citizens and Adak residents with timely and updated information on the environmental cleanup and the transfer and reuse of Navy land and facilities. The community involvement program also provides a mechanism for public input on environmental cleanup decisions. Information is conveyed to the public via fact sheets and newsletters, Restoration Advisory Board (RAB) meetings and other formal public meetings, web site announcements (www.adakupdate.com), information repositories on Adak Island (Bob Reeve High School building, second floor) and in Anchorage (University of Alaska library, reserve room), and the administrative record file located at Naval Facilities Engineering Command Northwest, Poulsbo, Washington. In addition, a mailing list is maintained and updated to inform concerned citizens of upcoming meetings and significant activities, such as public comment periods. Public input is obtained through RAB meetings and other formal public meetings, community interviews, requests for public comments, and a telephone hotline.

The proposed plan (U.S. Navy and Alaska DEC 2005a) was provided to the public for review during the 30-day public comment period beginning on August 16, 2005. In addition, TAC (the current landowner) was provided a copy of the FFS report (URS 2005a) and the proposed plan (U.S. Navy and Alaska DEC 2005a) and was invited to comment on these documents. No comments were received.

12.2 FUTURE CONTACTS

Adak community members are encouraged to contact Navy and Alaska DEC site managers with questions or comments. The Navy and Alaska DEC site managers are:

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Naval Facilities Engineering Command Northwest
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Anchorage, AK 99502
Phone: (907) 269-7528
Fax: (907) 269-7649
Email: jason_weigle@dec.state.ak.us

13.0 RESPONSIVENESS SUMMARY

No comments were received during the public comment period.

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APPENDIX A

Legal Description

That portion of Adak Island, State of Alaska, described as follows:

Commencing at U.S. Navy control point H-7 (NAD 83 - N=317,457.30 E=3,135,573.38), which is South 22°36′59″ West 1,731.18 feet from U.S. Navy control point H-5; thence South 10°09′20″ West 2198.97 feet to the POINT OF BEGINNING; thence South 59°40′36″ East 463.34 feet; thence South 73°21′14″ West 437.75 feet; thence South 61°16′16″ West 194.17 feet; thence South 00°30′34″ West 237.10 feet; thence North 89°29′26″ West 90.82 feet; thence North 00°30′34″ East 104.33 feet; thence South 87°34′41″ West 662.33 feet; thence South 46°26′49″ West 272.08 feet; thence North 89°37′04″ West 262.03 feet; thence North 01°11′59″ West 474.53 feet; thence North 44°24′17″ East 344.07 feet; thence South 88°17′14″ East 1107.27 feet; thence North 40°19′27″ East 34.61 feet; thence North 26°42′47″ East 94.94 to the POINT OF BEGINNING. Containing 18.44 acres more or less.