ADEC
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

NAVFAC
Naval Facilities Engineering Command

FINAL
DECEMBER 2006

Decision Document SWMU 17, Power Plant No. 3 Area

Former Adak Naval Complex

Adak, Alaska

ADEC Database Record Key 198825X906701

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

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

FINAL DECISION DOCUMENT
SWMU 17, POWER PLANT NO. 3 AREA
FORMER ADAK NAVAL COMPLEX
ADAK ISLAND, ALASKA

COVER SHEET AND SIGNATURE PAGE

SITE NAME: Solid Waste Management Unit (SWMU) 17, Power Plant No. 3 Area

ALASKA DEC DATABASE RECORD KEY: 198825X906701

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

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

CHEMICALS OF POTENTIAL CONCERN (COPC)/MEDIA IMPACTED:

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

ON-SITE CONTAMINANT CONCENTRATIONS:

Chemicals present at SWMU 17, Power Plant No. 3 pose no unacceptable risk to human health above target health goals, provided that institutional controls prohibiting the use of groundwater as a drinking water source remain in effect. In addition, the ecological risk assessment concluded that no significant ecological threat exists to terrestrial receptors or aquatic receptors from chemicals of concern (COCs). However, diesel-range organics (DRO) were detected in groundwater at concentrations greater than 10 times the tabulated groundwater cleanup levels [18 AAC 75.345(b)(1), Table C]. Therefore, the maximum and minimum detected concentrations for DRO in groundwater at SWMU 17, Power Plant No. 3 are provided in Table 1. These concentrations could pose a risk to human health if institutional controls were no longer in place and the groundwater was used as a drinking water source.

Table 1
Concentrations of Chemicals Exceeding Ten Times the Tabulated Groundwater Cleanup Levels

Chemical	Groundwater	
	Min. Conc. (µg/L)	Max. Conc. (µg/L)
DRO	120 J	496,000

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

CLEANUP LEVELS:

Soil: The Alaska Department of Environmental Conservation (DEC) Method Four cleanup levels [18 AAC 75.340(a)(4)], which are based on site-specific risk assessments, were used to establish cleanup levels for the site. However, the risk assessment for this site established that the existing concentrations in soil do not pose a risk to humans or the environment above target health goals. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

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 level for SWMU 17, Power Plant No. 3 is:

- DRO 15,000 micrograms per liter (µg/L) (15 milligrams per liter [mg/L])

Sediment: Alaska State Regulations do not establish chemical-specific cleanup levels for sediment. Therefore, sediment cleanup levels were established based on the results of the ecological risk assessment. Because the ecological risk assessment concluded that significant risks were not present at the site, no cleanup levels are necessary for sediment.

CLEANUP REMEDY:

Alternative 3 – Monitored Natural Attenuation (MNA) and Institutional Controls – is selected as the remedial alternative for SWMU 17, Power Plant No. 3. 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 2006). Institutional controls including

excavation notifications and a groundwater use restriction will remain in effect to protect human health and the environment until Method Two soil cleanup levels in 18 AAC 75.341 and groundwater cleanup levels in 18 AAC 75.345, Table C, have been achieved.

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.

Theodore P. Jones, P.E.
Adak BRAC Environmental Coordinator
U.S. Navy, Naval Facilities Engineering
Command Northwest

1/4/07
Date

Jennifer Roberts
Federal Facilities Environmental
Restoration Program Manager
Alaska Department of Environmental Conservation

Dec 19, 2006
Date

CONTENTS

ABBREVIATIONS AND ACRONYMS vii

1.0 INTRODUCTION 1-1

2.0 BACKGROUND 2-1
2.1 SITE HISTORY 2-1
2.1.1 Site Regulatory History 2-2
2.1.2 Site Release History 2-4
2.2 PHYSICAL CHARACTERISTICS 2-4
2.3 DESCRIPTION OF CONTAMINANTS AND MEDIA IMPACTED 2-6
2.4 CLEANUP ACTIVITIES PERFORMED TO DATE 2-6
2.5 LAND USE 2-10
2.6 GROUNDWATER USE 2-11
2.7 INSTITUTIONAL CONTROLS 2-11
2.7.1 Land Use Restrictions 2-12
2.7.2 Excavation Restrictions 2-12

3.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN 3-1
3.1 SOIL 3-1
3.2 GROUNDWATER 3-2
3.3 SEDIMENT 3-3

4.0 CONTAMINANT CONCENTRATIONS AND POTENTIAL EXTENT OF CONTAMINATION 4-1

5.0 SUMMARY OF RISK ASSESSMENT 5-1
5.1 HUMAN HEALTH 5-1
5.1.1 Human Health Risk Assessment Procedures 5-2
5.1.2 Toxicity Assessment 5-4
5.1.3 Risk Characterization 5-5
5.2 ECOLOGICAL 5-6
5.2.1 Ecological Risk Assessment Procedures 5-7
5.2.2 Problem Formulation 5-7
5.2.3 Screening Level Ecological Risk Assessment 5-8
5.2.4 Baseline Ecological Risk Assessment 5-9
5.2.5 Conclusion 5-10

CONTENTS (Continued)

6.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS 6-1
6.1 REMEDIAL ACTION OBJECTIVES 6-1
6.2 CLEANUP LEVELS 6-1
6.3 EXTENT OF CONTAMINATION 6-3

7.0 REMEDIAL ACTION ALTERNATIVES 7-1

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES 8-1

9.0 DESCRIPTION OF SELECTED CLEANUP ACTION 9-1

10.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS 10-1
10.1 CHEMICAL-SPECIFIC ARARS 10-1
10.2 LOCATION-SPECIFIC ARARS 10-1
10.3 ACTION-SPECIFIC ARARS 10-2

11.0 PUBLIC INVOLVEMENT 11-1
11.1 PUBLIC INVOLVEMENT ACTIVITIES 11-1
11.2 FUTURE CONTACTS 11-1

12.0 RESPONSIVENESS SUMMARY 12-1

13.0 REFERENCES 13-1

APPENDIX

A Legal Description
B Analytical Results

CONTENTS (Continued)

FIGURES

1-1 Location Map, Adak Island, Alaska 1-3
1-2 Site Location and Vicinity, SWMU 17, Power Plant No. 3 1-5
1-3 Legal Boundaries, SWMU 17, Power Plant No. 3 1-7
2-1 Potential Petroleum Sources at SWMU 17, Power Plant No. 3..... 2-13
2-2 Groundwater Flow Map, SWMU 17, Power Plant No. 3 2-15
2-3 Locations of Interim Remedial Actions, SWMU 17, Power Plant No. 3 2-17
2-4 Proposed Land Use, SWMU 17, Power Plant No. 3 2-19
4-1 Estimated Extent of Residual Free Product, SWMU 17, Power Plant No. 3 4-7
4-2 Estimated Potential Extent of Soil Contamination, SWMU 17, Power Plant No. 3..... 4-9
4-3 Estimated Potential Extent of Groundwater Contamination, SWMU 17, Power Plant No. 3 4-11
4-4 Sediment and Surface Water Sampling Locations, SWMU 17, Power Plant No. 3..... 4-13
5-1 Human Health Conceptual Site Model, SWMU 17, Power Plant No. 3 5-11
5-2 Ecological Conceptual Site Model, SWMU 17, Power Plant No. 3..... 5-13
6-1 Estimated Extent of Residual Free Product and Groundwater Contamination, SWMU 17, Power Plant No. 3..... 6-5
8-1 Evaluation of Alternatives for SWMU 17, Power Plant No. 3..... 8-5

CONTENTS (Continued)

TABLES

2-1 Summary of Environmental Field Investigations, SWMU 17, Power Plant No. 3 2-21
2-2 Summary of Site Cleanup Activities, SWMU 17, Power Plant No. 3 2-22
2-3 Free-Product Recovery Data, SWMU 17, Power Plant No. 3 2-23
3-1 Chemicals of Potential Concern in Soil, Groundwater, and Sediment, SWMU 17, Power Plant No. 3 3-4
4-1 Summary of Analytical Results for Chemicals of Potential Concern, SWMU 17, Power Plant No. 3 4-15
5-1 Construction Worker Exposures to Groundwater, Exposure Assumptions and Intake Equations 5-15
5-2 Construction Worker Exposures to Soil, Exposure Assumptions and Intake Equations 5-16
5-3 Trespasser/Recreational Exposures to Sediment, Exposure Assumptions and Intake Equations 5-17
5-4 Carcinogenic Toxicity Criteria for the Chemicals of Potential Concern 5-18
5-5 Noncarcinogenic Chronic and Subchronic Toxicity Criteria for the Chemicals of Potential Concern 5-20
5-6 Summary of Exposure Point Concentrations (EPCs) 5-22
5-7 Summary of Total RME Risks and Hazards for the Construction Worker 5-23
5-8 Summary of Total RME Risks and Hazards for the Trespasser/Recreator 5-24
5-9 Minimum and Maximum Concentrations for the Chemicals of Potential Concern Detected in Soil and Sediment, SWMU 17, Power Plant No. 3 5-25
5-10 Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Soil at SWMU 17, Power Plant No. 3 5-26
5-11 Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Surface Water at SWMU 17, Power Plant No. 3 5-27
5-12 Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Sediment at SWMU 17, Power Plant No. 3 5-28
5-13 Results of the Baseline Ecological Risk Assessment to Identify COCs in Soil at SWMU 17, Power Plant No. 3 5-29
5-14 Results of the Baseline Ecological Risk Assessment to Identify COCs in Sediment at SWMU 17, Power Plant No. 3 5-30
6-1 Soil and Groundwater Screening Criteria and Cleanup Levels, SWMU 17, Power Plant No. 3 6-7
8-1 EPA Criteria 8-7
8-2 Categories of Petroleum Sites on Adak Island 8-8
8-3 Evaluation of Suitability of Cleanup Alternative 8-9

ABBREVIATIONS AND ACRONYMS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ARC	Adak Reuse Corporation
ARAR	applicable or relevant and appropriate requirements
AST	aboveground storage tanks
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CMP	comprehensive monitoring plan
CR	cancer risk
CSM	conceptual site model
cy	cubic yard
DD	decision document
DEC	Department of Environmental Conservation
DO	dissolved oxygen
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
ft^2	square feet
GRO	gasoline-range organics
HI	hazard index
HQ	hazard quotient
ICMP	institutional control management plan
JP	jet petroleum
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
MNA	monitored natural attenuation
NAF	Naval Air Facility
Navy	U.S. Navy
NMCB	Naval Mobile Construction Battalion

ABBREVIATIONS AND ACRONYMS (Continued)

NPL	National Priorities List
ORP	oxidation-reduction potential
OU	operable unit
PAH	polycyclic aromatic hydrocarbons
RAB	Restoration Advisory Board
RAO	remedial action objectives
RBSC	risk-based screening concentration
RCRA	Resource Conservation and Recovery Act
RME	reasonable maximum exposure
ROD	Record of Decision
SAERA	State-Adak Environmental Restoration Agreement
SARA	Superfund Amendments and Reauthorization Act of 1986
SOP	standard operating procedure
SVOC	semi-volatile organic compound
SWMU	solid waste management unit
TAC	The Aleut Corporation
TAqH	total aqueous hydrocarbons
TAH	total aromatic hydrocarbons
TPH	total petroleum hydrocarbons
UCL95	95 upper confidence limit
UST	underground storage tank
VOC	volatile organic compound

DECLARATION

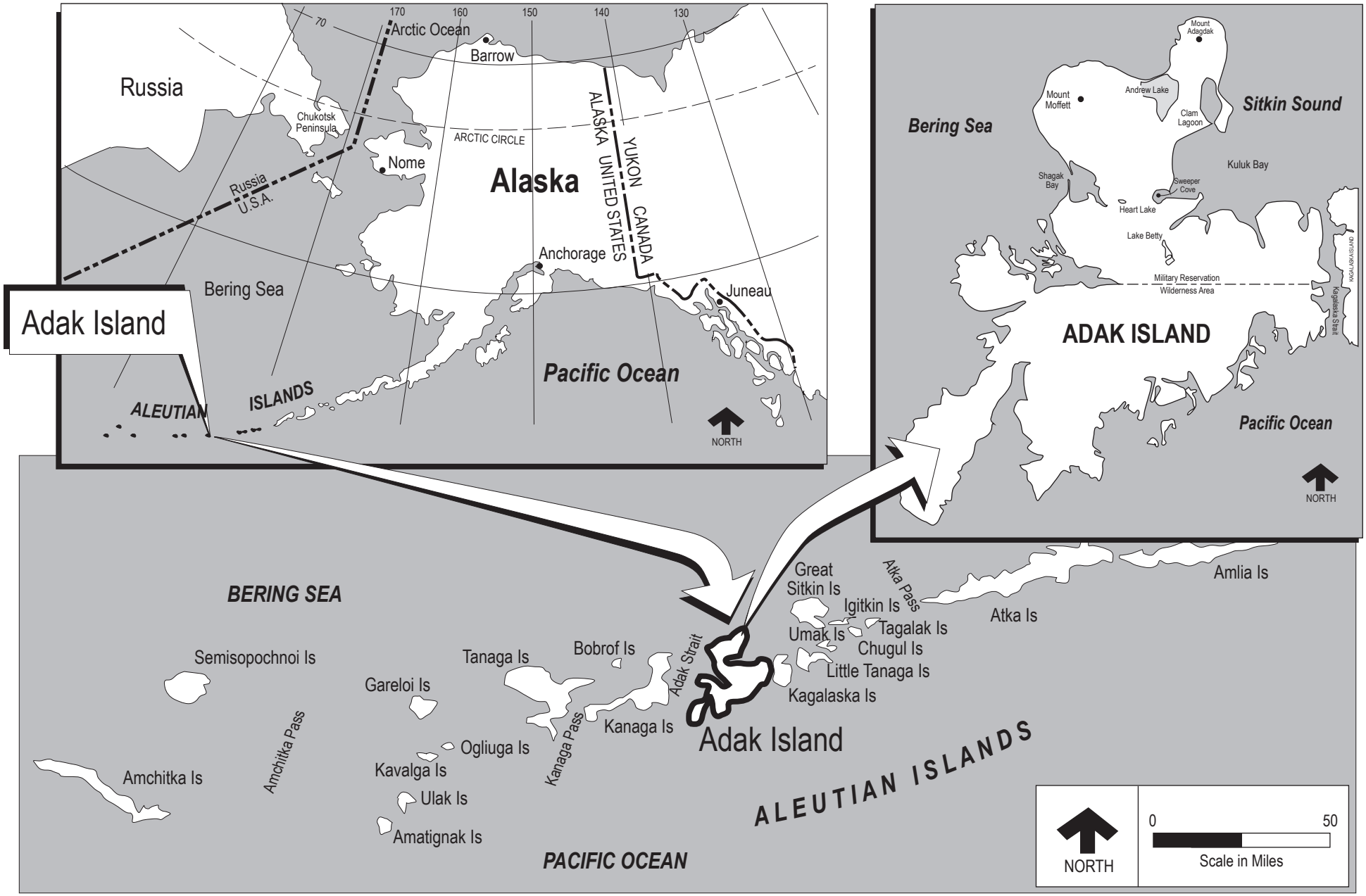
1.0 INTRODUCTION

This decision document (DD) presents the selected cleanup alternative and the supporting rationale for cleanup of the Solid Waste Management Unit (SWMU) 17, Power Plant No. 3 Area (herein referred to as "SWMU 17") 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. In addition, the City of Adak, 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 SWMU 17. A legal description specifying the boundary of the site is included as Appendix A. A site map showing the legal boundary of SWMU 17 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 3 – Monitored Natural Attenuation (MNA) and Institutional Controls – is selected as the remedial alternative for SWMU 17. The selected cleanup alternative for SWMU 17 is discussed in more detail in Section 9.

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). Other regulatory requirements applicable to the implementation of the selected cleanup alternative are provided in Section 10.



U.S.NAVY	**Figure 1-1** **Location Map, Adak Island, Alaska**	Adak Island, AK DECISION DOCUMENT

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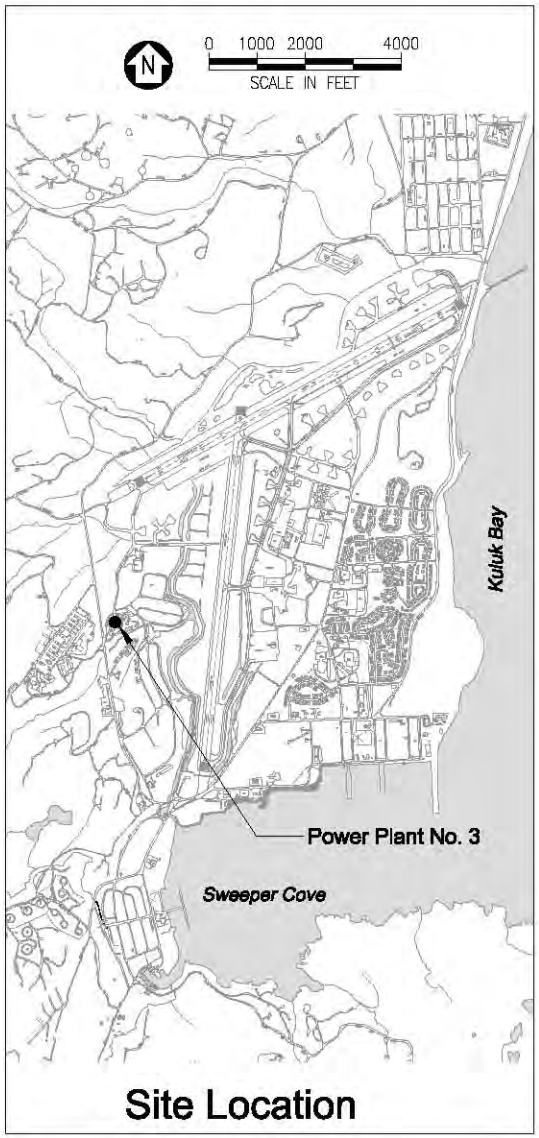

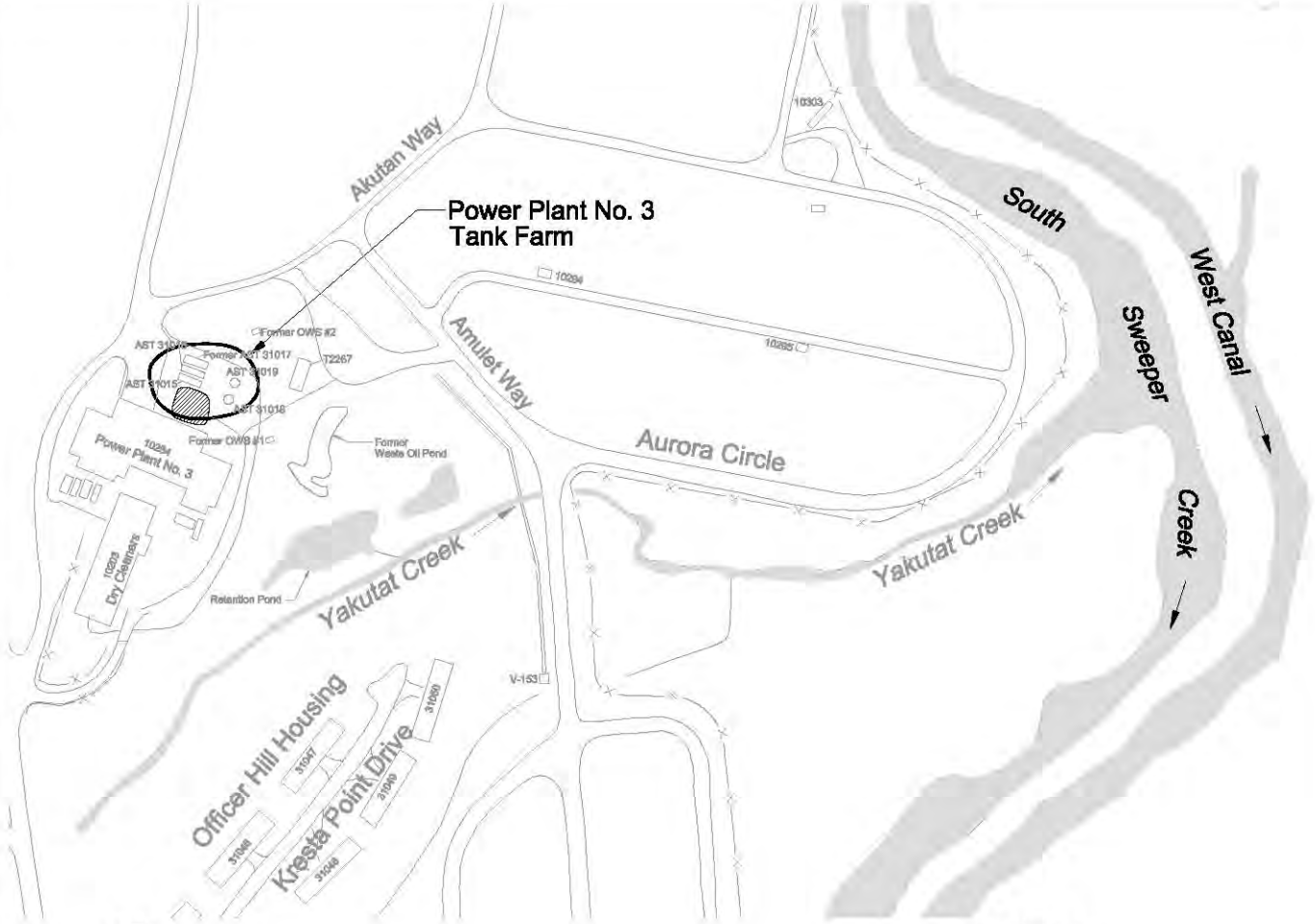

U.S. NAVY	SCALE: AS SHOWN	**Figure 1-2** **Site Location and Vicinity** **SWMU 17, Power Plant No. 3**	Adak Island, AK DECISION DOCUMENT

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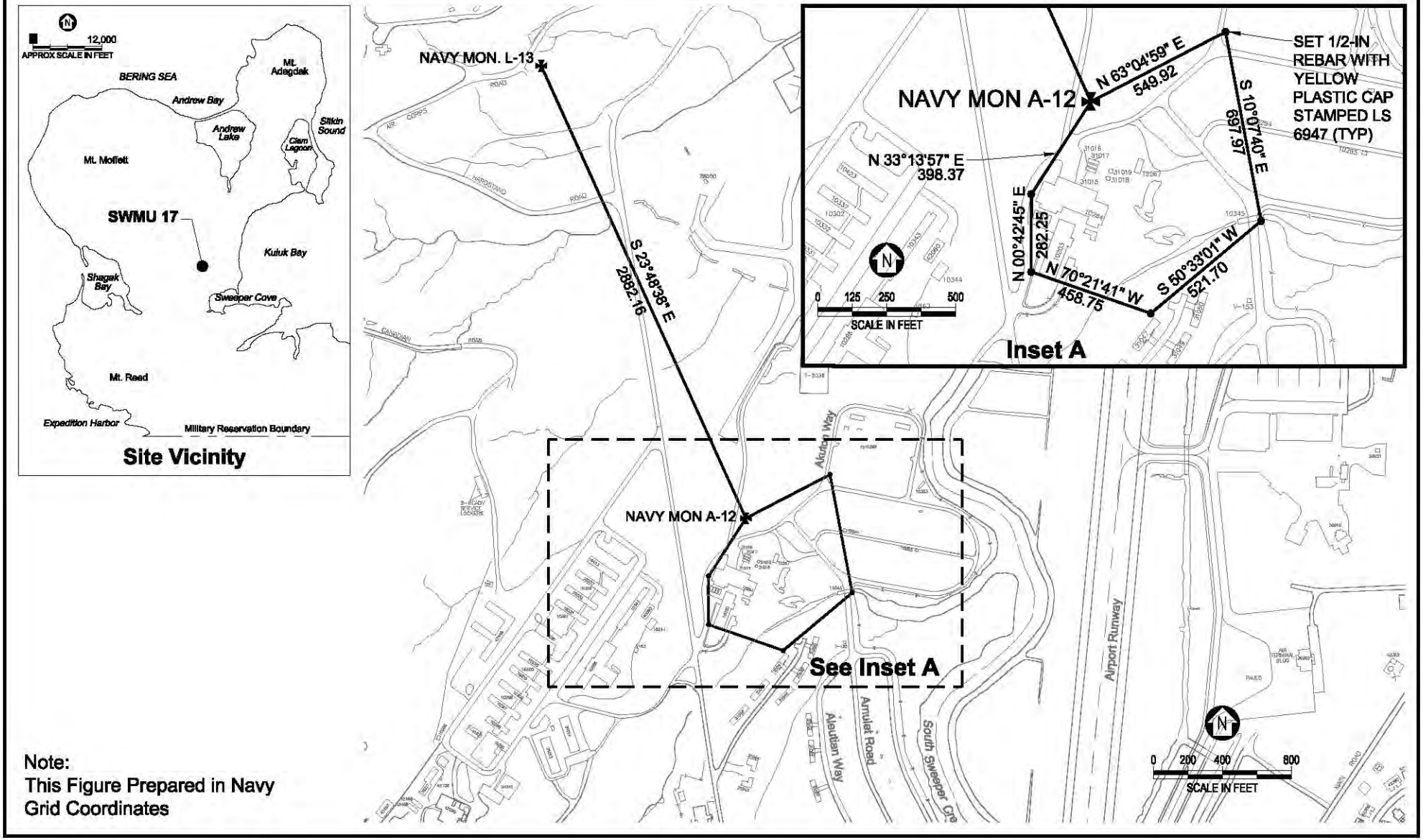

U.S. NAVY	Figure 1-3 Legal Boundaries, SWMU 17, Power Plant No. 3	Adak Island, AK DECISION DOCUMENT

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2.0 BACKGROUND

General background information for SWMU 17 is provided in this section. Additional information for SWMU 17 is provided in the focused feasibility study (FFS) report (URS 2006).

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 that 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 The Aleut Corporation (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 SWMU 17 to the City of Adak. As a result, the City of Adak owns SWMU 17.

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. Notification to the Navy of intrusive soil excavation activities deeper than 2 feet

3. Groundwater restrictions that prohibit use of the downtown aquifer as a drinking water resource

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 underground storage tanks (USTs) and leaking underground fuel lines, would be evaluated under a separate two-party agreement between the Navy and the State of Alaska. This agreement, 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 (U.S. Navy, EPA, and ADEC 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 SWMU 17, one of the 14 free-product recovery sites on Adak Island. Thirteen of the 14 free-product recovery sites were addressed in previously published DDs. The DD for 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, was signed by the Alaska DEC on May 20, 2005 (U.S. Navy and ADEC 2005b). DDs for the three sites where petroleum-related chemicals pose a potential risk to human health or the environment above target health goals have also been finalized. The Naval Mobile Construction Battalion [NMCB] Building T-1416 Expanded Area DD was executed by the Alaska DEC on March 16, 2006 and will be implemented in 2006 (U.S. Navy and ADEC 2006a). The South of Runway 18-36 Area DD was executed by the Alaska DEC on September 20, 2006 and will be implemented in 2006 (U.S. Navy and ADEC 2006b). The Solid Waste Management Unit (SWMU) 62 New Housing Fuel Leak site DD was executed by Alaska DEC on August 16, 2006 and will also be implemented in 2006 (U.S. Navy and ADEC 2006c).

The SWMU 17 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. 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, and this DD was prepared based on these conclusions.

2.1.2 Site Release History

Although environmental field investigations have not identified the petroleum source, the most likely source is from the power plant tank farm, or the two former oil/water separators. A reported release of "approximately 500 gallons" of jet petroleum No. 5 (JP-5) from the Power Plant No. 3 tank farm occurred during 1994 as the result of a cracked valve (URSG 1999a). Free product was not observed on the groundwater surface prior to the petroleum release from the cracked valve. Petroleum product was first observed at this site in monitoring wells MW-17-6 and MW-17-7 during September 1994; however, product thickness was not measured. During the summer of 1995, approximately 2.5 feet of product was observed in MW-17-6, and heavy petroleum staining and stressed vegetation were observed in road-side ditches near the intersection of Akutan Way and Amulet Way. During the removal of the two oil/water separators, petroleum hydrocarbons were reported in soil at levels above the Alaska DEC soil cleanup criteria (Shannon and Wilson 1997). Broken influent and effluent piping as well as overflow of the separators appear to be the causes of the releases. Other possible sources of petroleum releases include over-filling of the aboveground storage tanks (ASTs), leaking piping located in the tank farm, and releases from the waste oil pond and the retention pond. However, tightness testing of the pipelines to the ASTs occurred in October 1996, and the results of the testing indicated that leaks from the piping were very unlikely.

The potential sources of the petroleum hydrocarbons present at the site are identified on Figure 2-1. These potential sources include the tank farm located north of the power plant building, consisting of five ASTs numbered 31015 through 31019; two former oil/water separators located northeast of the power plant building; a former waste oil pond (now removed), which was located east of the power plant; and a retention pond, which is located between the waste oil pond and Yakutat Creek. Two of the ASTs installed at the site stored JP-5, one stored waste oil, and the remaining two stored reserve oil supplies. The two vertical ASTs (31018 and 31019) were reported to be cleaned and closed during 1998. One horizontal AST (31017) was also reported to be removed at that time. The two remaining ASTs (31015 and 31016) remain in operation and contain JP-5 used to fuel the power plant. The former waste oil pond was constructed in the mid-1960s to contain waste petroleum oil and lubricants generated at the plant. As discussed in Section 2.4, the waste oil pond was closed in 1999.

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.

Prior to the military use of Adak Island during World War II, the western portion of the downtown area, which includes the eastern portion of SWMU 17, was occupied by a back-beach lagoon. The lagoon was separated from Kuluk Bay by a series of sand dunes. The lagoon was filled with sand from dune deposits by the military forces to construct the airfield. Therefore, the flat lowland area of the site, between Amulet Way and South Sweeper Creek, is part of the filled lagoon (Figure 1-2). The subsurface material in the lowland area consists of sequences of silty sand (fill) overlying the former lagoon bottom. Glacial till and bedrock are encountered beneath the former lagoon bottom at depth in the lowland portion of the site.

The geology and hydrogeology of the upland portion of SWMU 17 (the western portion of the site) consists of two general profiles: tephra (volcanic ash) over glacial till or tephra over bedrock (URS 1995a). These general profiles are described as approximately 8 feet of tephra directly overlying low-permeability glacial till or bedrock. Typically, the tephra has a fairly uniform thickness throughout the uplands area on Adak Island. The glacial material is predominantly irregular, discontinuous layers of till deposits composed of unsorted gravels supported by a matrix of silt, clay, and fine sand. The underlying bedrock is predominantly volcanic with relatively minor amounts of marine sandstone, conglomerate, and shale.

Groundwater is found beneath the site at depths ranging from less than 2 feet below ground surface (bgs) to as much as 20 feet bgs, depending on the season and the location. Groundwater at the site generally flows northeast, toward South Sweeper Creek (Figure 2-2). Average groundwater depths in the upland (western) portion of the site range from 2.7 to 15.8 feet bgs. Groundwater within the upland portion of the site occurs in discontinuous water-bearing zones contained in the higher permeability materials overlying glacial till or bedrock. Groundwater springs have been observed at the base of the upland section of the site (near Amulet Way) during prolonged periods of heavy precipitation. On average, groundwater in the lowland portion of the site is within 7 feet of the ground surface. Groundwater beneath the lowland portion of the site occurs as a broad, continuous aquifer extending from near the intersection of Aleutian and Amulet Way east toward Yakutat Creek and South Sweeper Creek.

Two streams flow near SWMU 17: Yakutat Creek and South Sweeper Creek. These two streams make up the South Sweeper Creek riverine system that discharges into Sweeper Cove. South Sweeper Creek is a perennial stream located approximately 1,200 feet northeast of the Power Plant No. 3 Building. Yakutat Creek is a perennial stream located approximately 200 feet south of the power plant and is considered the southern boundary of the site. It flows southwest to northeast from the upland area, joining South Sweeper Creek east of the Power Plant No. 3 Building. From the confluence of these two streams, surface water flows south approximately 4,800 feet to Sweeper Cove. South Sweeper Creek and the lower reach of Yakutat Creek are

tidally influenced. The stormwater conveyances in the vicinity of SWMU 17 consist primarily of ditches, culverts, catch basin inlets, manholes, and outlets. In general, surface water collects in the ditches and catch basins, and is transported through the ditches or the storm sewer system to Yakutat Creek or South Sweeper Creek (URSG 1999a).

Three ponds formerly existed at the site: the north pond, the waste oil pond, and the retention pond (Figure 2-1). The north pond was formerly located in the center of the site, northwest of the Quonset hut (Building T2267). The water source for the north pond was cut off in 1992, and it is now a dry depression, except for intermittent surface water accumulation during periods of high runoff. During 1999 ROD-based remedial actions, contaminated sediment was removed from the waste oil pond, and the pond was backfilled with clean material to preexisting land contours (BEESC 2000). Contaminated sediment was also removed from the retention pond during these 1999 remedial actions. The retention pond was allowed to revert to a wetland environment once remediation activities were completed.

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 SWMU 17 between 1986 and 2005, as indicated in Table 2-1. These investigations included site investigations, a preliminary source evaluation, and a remedial investigation to evaluate subsurface conditions and investigate potential sources of contamination. Results of these investigations indicated that petroleum-related chemicals and some volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) were present in samples of subsurface soil, groundwater, sediment, and surface water collected from several locations at SWMU 17. 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 SWMU 17 include:

- Stained soil removal
- Free-product recovery
- Oil/water separator removals
- AST cleaning and closure and AST removal
- Sediment removal
- Surface water protection and compliance monitoring

- Fill placement and grading
- 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 (URS 2006).

Stained Soil Removal

Stained soil was removed from the road-side ditches along Akutan Way up to its intersection with Amulet Way in October of 1995 (see Figure 2-3). Approximately 70 cubic yards (cy) of soil was excavated from the ditch along the northwest side of Akutan Way, and approximately 40 cy of stained soil was also removed from the southeast ditch.

Free-Product Recovery

Free-product recovery activities were initiated at the site shortly after free product was discovered in the roadside ditches during 1995. Coffer dams were installed in the ditches along Akutan Way to act as oil/water separators. In January 1996, roughly 5,000 gallons of mixed water and free product was recovered from the coffer dams (URSG 1999a). In addition, two underground trenches were installed at the site and passive skimmers were installed in existing site wells for free-product recovery. Free-product recovery was conducted at SWMU 17 using the free-product recovery trenches and passive skimmers from October 1996 through July 2002. The product recovery system was shut down on July 25, 2002 because the system met the technical practicable endpoint as established in the ROD for OU A and 18 AAC 75.325(f)(1)(B) for recovery systems that are dependent on water table depression to facilitate product recovery (see Section 4).

The first underground free-product recovery trench was installed through the intersection of Akutan Way and Amulet Way during July 1996 (Shannon and Wilson 1996). Figure 2-3 shows the location of this former free-product recovery trench. The trench was orientated roughly perpendicular to groundwater flow. Free product and water that accumulated in the interceptor trench were removed through a recovery well consisting of a 36-inch-diameter perforated corrugated metal pipe placed vertically at the low point of the trench. The trench was initially designed to work as a passive recovery system, draining through the outflow pipe by gravity alone. However, the system did not appear to effectively remove the increased flux of water that occurs at the site during times of higher precipitation in the winter and spring months (Foster Wheeler 1997a). During August 1997, the Navy installed a groundwater pump within the recovery trench to control the level of groundwater and prevent free product from escaping the trench via the ground surface.

The free-product recovery system experienced several operational interruptions throughout 1998 and the first half of 1999 due to electrical problems associated with high water levels in the trench. As a result, the Navy installed a second free-product recovery trench up slope from the initial trench during July and August 2000. The groundwater elevation in this trench is controlled by allowing the groundwater to gravity drain through a fixed discharge pipe. Figure 2-3 shows the location of this second recovery trench. In addition to providing a second free-product recovery structure at the site, the second recovery trench was constructed to prevent flooding of the lower trench during prolonged periods of heavy precipitation. This also prevented free product from seeping from the hillside during these periods of heavy precipitation. Free product that accumulated in this trench was removed through a recovery well consisting of a 36-inch-diameter perforated corrugated metal pipe placed vertically at the low point of the trench.

In addition to the free-product recovery trenches, free-product was recovered from existing site wells using passive skimmers. The free-product recovery trenches operated from October 1996 through August 2000, May 2001 through November 2001, and May 2002 through July 2002. The passive skimmers operated from July 1997 through May 1998, July 1998 through April 1999, August 1999 through July 2000, and May 2001 through June 2001. The product recovery system recovered an estimated 1,940 gallons of free product during this period (URS 2002), most of which was recovered from the free-product recovery trenches. Free-product recovery data through July 2002 are summarized in Table 2-3.

Oil/Water Separator Removals

During May 1997, two oil/water separators were removed from the site (Shannon and Wilson 1997). Oil/water separators No. 1 and 2 were located northeast of the power plant building and fuel farm. The locations of these structures are shown on Figure 2-3. These structures, which measured approximately 2.5 feet wide, by 8.5 feet long, by 3.0 feet high, were partially buried into the hillside. The former effluent pipes discharged to the waste oil pond located between the power plant and Yakutat Creek. Upon oil/water separator removal, the influent and effluent piping were joined and routed to the sanitary sewer. Petroleum hydrocarbons were reported in soil at levels above the Alaska DEC soil cleanup criteria. Broken influent and effluent piping, as well as overflow of the separators, appear to be the causes of the releases.

AST Cleaning and Closure and AST Removal

The two vertical ASTs (31018 and 31019) were reportedly cleaned and closed during 1998. One horizontal AST (31017) was also reported to have been removed at that time. The two remaining ASTs (31015 and 31016) remain in operation and contain JP-5 used to fuel the power plant. The locations of the ASTs are shown on Figure 2-3.

Sediment Removal

During 1999, the Navy conducted sediment removal actions from the waste oil pond and the retention pond. Contaminated sediment removed from these ponds was treated using thermal desorption prior to disposal in Roberts Landfill. The waste oil pond was backfilled with clean material to approximate preexisting land contours. The site was then capped with topsoil and seeded with a grass mix suitable for Adak. The retention pond was allowed to revert to a wetland environment once remediation activities were completed (BEESC 2000). These removal actions eliminated a large surface exposure to released petroleum hydrocarbons at SWMU 17. The locations of the ponds are shown on Figure 2-3.

Surface Water Protection and Compliance Monitoring

During 1999, the Navy initiated surface water protection and compliance monitoring at SWMU 17. Surface water protection monitoring was initiated as part of the interim free-product recovery remedy specified for the site in the OU A ROD. Surface water protection monitoring has been conducted at four groundwater monitoring wells to monitor migration of petroleum hydrocarbons in groundwater towards South Sweeper Creek. If petroleum hydrocarbons were identified in groundwater at the monitoring locations, additional remedial actions would have been considered for the site. Surface water protection monitoring has been conducted through 2005 and petroleum hydrocarbons have not been measured in groundwater samples collected from the four monitoring locations. Compliance monitoring has been conducted at one groundwater monitoring well to monitor chlorinated solvents in groundwater as part of the CERCLA remedy for this site. Compliance monitoring is currently conducted on an annual basis.

Fill Placement and Grading

During 2002, the Navy conducted an additional interim remedial action to prevent future exposure to petroleum hydrocarbons at the site. This remedial action consisted of fill placement and grading in the vicinity of the intersection of Amulet Way and Akutan Way (see Figure 2-3). This action increased the ground surface elevation at the intersection approximately 8 feet. These actions were conducted to (1) prevent free product from “daylighting” at the ground surface during prolonged periods of heavy precipitation, (2) promote surface water runoff from the site, and (3) prevent surface water from contacting free product and/or contaminated soil as it moves across the site (BEESC 2002).

Natural Attenuation Monitoring

To evaluate the potential for natural processes to attenuate petroleum-related chemicals at SWMU 17, natural attenuation monitoring was conducted for four monitoring wells at the site that were sampled during 2002 as part of the annual groundwater monitoring activities.

Analyses were performed on the groundwater samples for natural attenuation indicator parameters. These natural attenuation indicator parameters consist of dissolved oxygen (DO), nitrate/nitrite, ferrous iron, sulfate/sulfide, dissolved methane, alkalinity, chloride, and oxidation-reduction potential (ORP). No single natural attenuation indicator parameter can be used to identify zones of aerobic versus anaerobic biologic conditions in groundwater. Therefore, the available data must be evaluated as a body of evidence to determine the predominant processes at work degrading petroleum hydrocarbons at the site. Typically, comparisons are made relative to upgradient locations versus source area and downgradient locations. Because no wells are located at the site such that groundwater samples represent upgradient conditions, comparisons are made relative to downgradient wells where petroleum-related chemicals have not been reported in groundwater samples.

Taken as a body of evidence, the natural attenuation parameters measured at SWMU 17 indicate both aerobic and anaerobic conditions were present at the site during the 2002 sampling event. Aerobic conditions predominate in the areas beyond the limits of the dissolved petroleum plumes, while anaerobic conditions predominate within the dissolved petroleum plumes. These conditions indicate that biologic degradation of petroleum hydrocarbons is occurring within groundwater beneath SWMU 17. In addition to the natural attenuation monitoring performed at SWMU 17, natural attenuation monitoring was performed at 10 sites on Adak in May and June of 2003 (USGS 2005). 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

Power Plant No. 3 (Building 10284) became operational in 1950. This facility has been the primary source of electrical power for the downtown area on Adak since that time. The former waste oil pond was constructed in the mid-1960s to contain waste petroleum oil and lubricants generated at the plant. The Quonset hut (Building T2267) was used for electric line and transformer repairs and for auto repair. This structure is no longer in use. The dry cleaning facility (Building 10203), located south of Power Plant No. 3, operated from 1968 until 1995. Two of the ASTs installed at the site stored JP-5, one stored waste oil, and the remaining two stored reserve oil supplies. The two vertical ASTs (31018 and 31019) were cleaned and closed during 1998. One horizontal AST (31017) was also reported to be removed at that time. The two remaining ASTs (31015 and 31016) remain in operation and contain JP-5 used to fuel the power plant.

Future land use at SWMU 17 site is classified for public facilities reuse (Figure 2-4). Public facilities reuse is intended to provide for and protect areas of public lands or facilities for public use, including power-generating facilities. The adjacent property to the south, including the dry

cleaners (Building 10203), and to the west is classified for commercial reuse. The adjacent property to the southeast, east, and north is classified for future residential reuse although no housing units currently exist north of Yakutat Creek. The intent of this category is to reserve areas with existing roads and utilities for residential expansion under the high-level reuse scenario (ARC 2000).

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. Groundwater is not considered a reasonably expected potential future drinking water source at SWMU 17. Groundwater within the upland portion of the site occurs as discontinuous water-bearing zones contained in the higher permeability materials overlying glacial till or bedrock. The discontinuous nature of groundwater in this upland portion of the site is expected to yield a quantity of water insufficient to support a water supply well (URS 1995). The shallow occurrence of groundwater in the lowland portion of the site does not provide sufficient distance between the ground surface and the groundwater surface for the placement of a 10-foot thick watertight seal, as required by Alaska regulation 18 AAC 80.015. Because of the discontinuous nature of groundwater in the upland portion of the site and the shallow occurrence of groundwater in the lowland portion of the site, groundwater beneath SWMU 17 is determined to not be appropriate as a potential future source of drinking water. Institutional controls are also in place prohibiting the future use of any of the downtown groundwater aquifer as a drinking water source.

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 SWMU 17, 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.

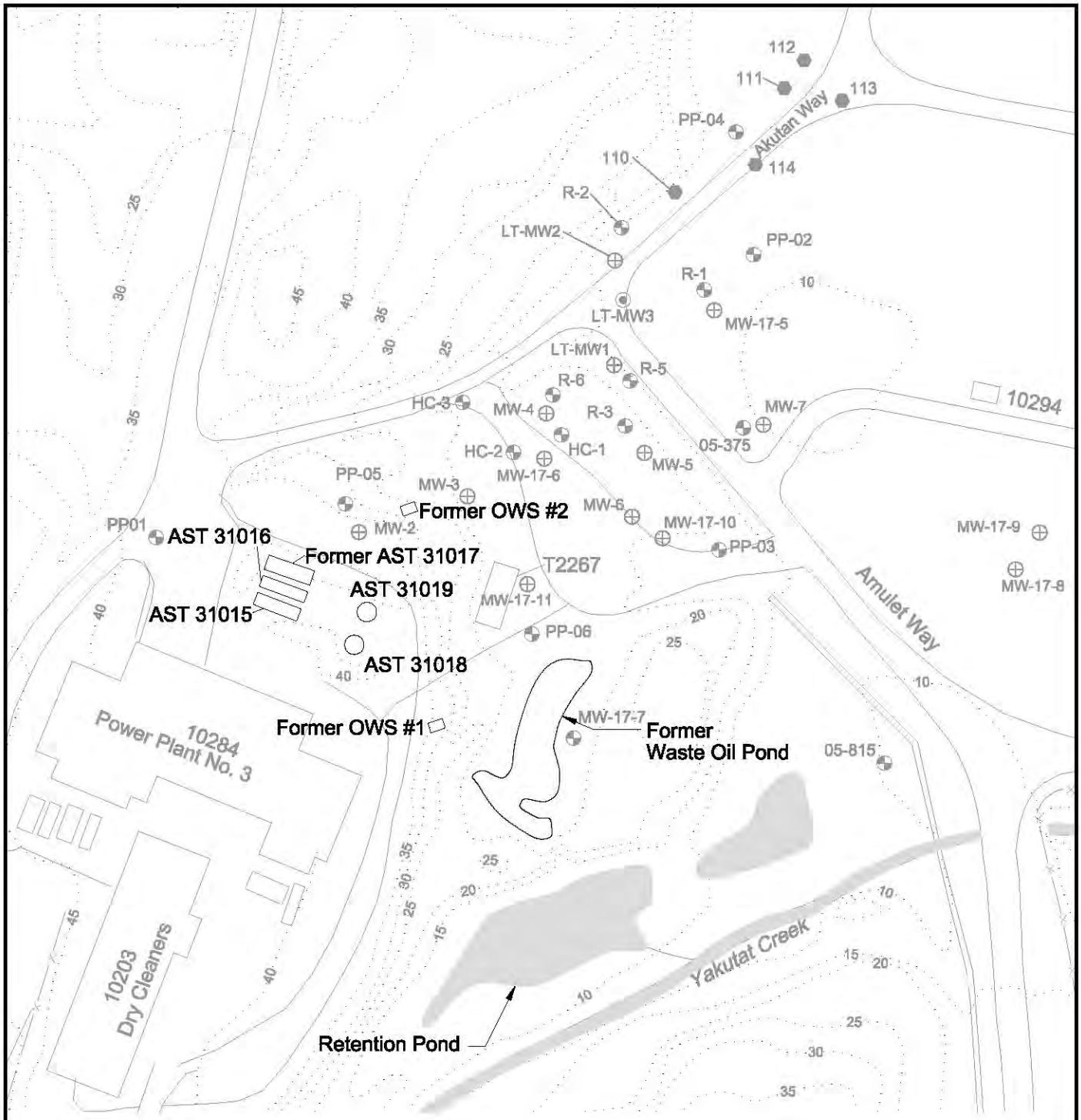
2.7.1 Land Use Restrictions

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 SWMU 17 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: (1) excavation notifications and (2) absolute excavation prohibitions. Excavation notification is required for proposed excavations below 2 feet at each of the institutional controls sites, including SWMU 17. 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.

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 SWMU 17. 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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U.S. NAVY	N 0 30 60 120 SCALE IN FEET	**Figure 2-1** **Potential Petroleum Sources at SWMU 17, Power Plant No. 3**	Adak Island, AK DECISION DOCUMENT

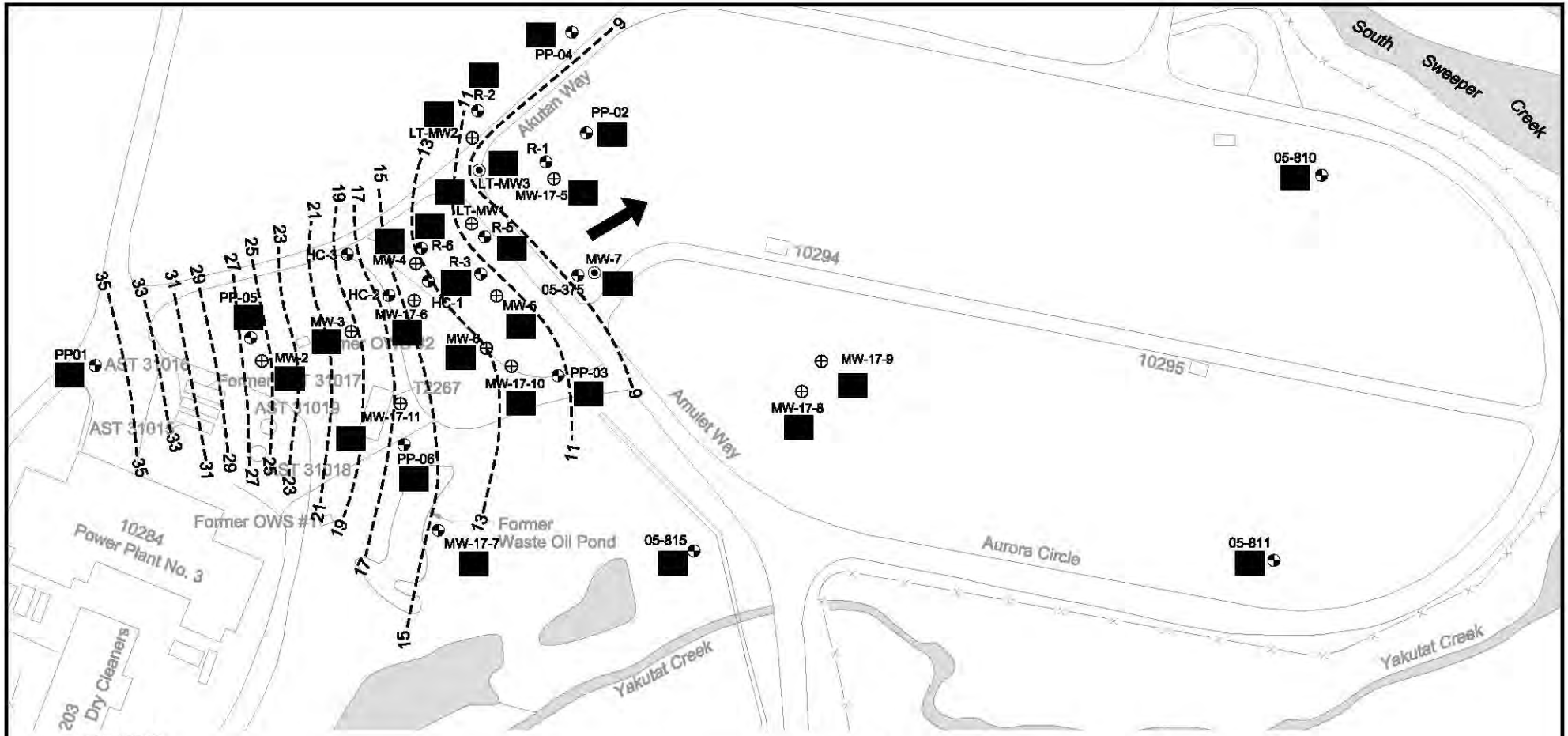

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Figure 2-2
Groundwater Flow Map
SWMU 17, Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT

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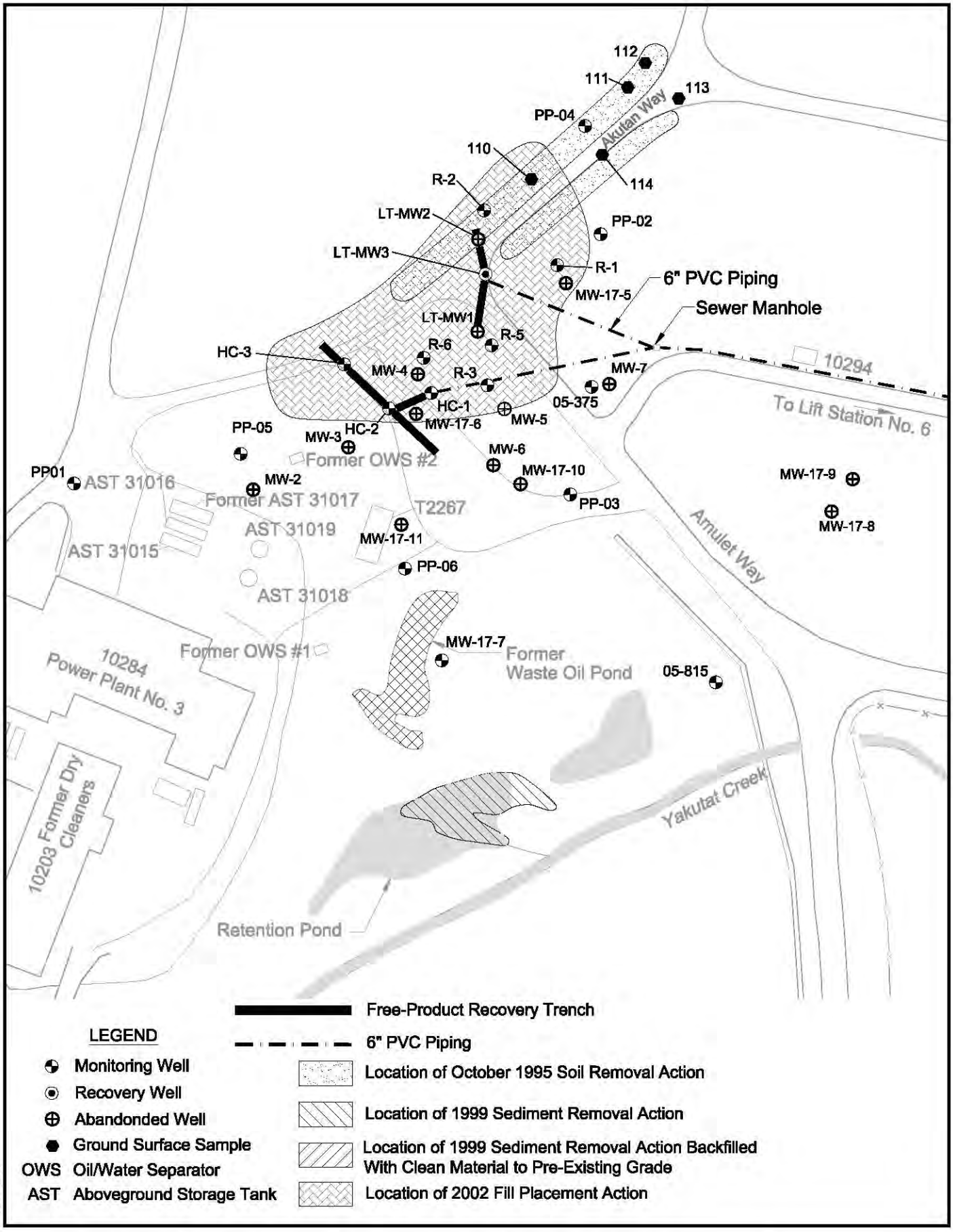

FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\SWMU 17 DEC DOC\FIG 2-3 LOCS INTERIM.dwg
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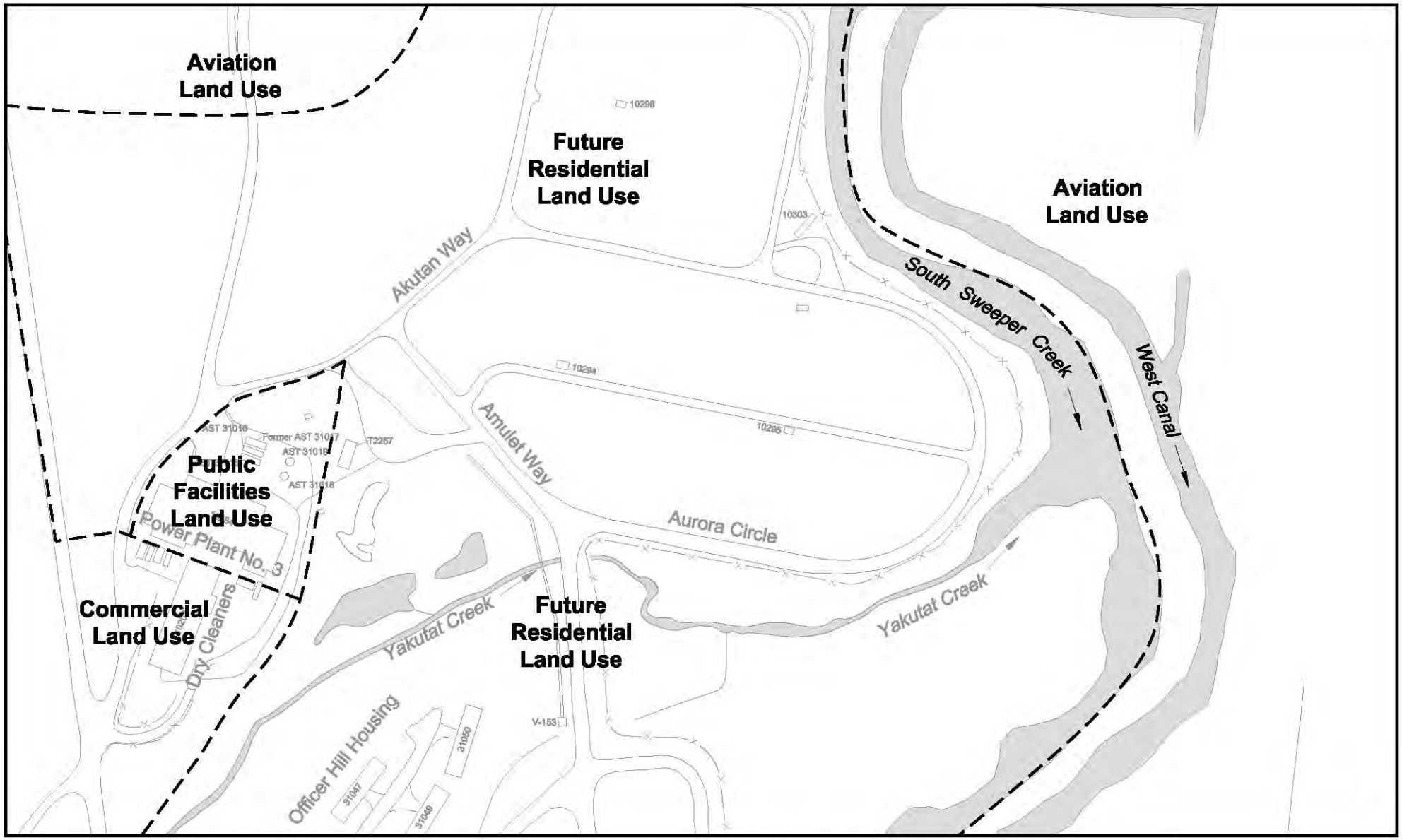
Figure 2-3
Locations of Interim Remedial Actions
SWMU 17, Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT



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SCALE IN FEET

Figure 2-4
Proposed Land Use
SWMU 17, Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT

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Table 2-1
Summary of Environmental Field Investigations, SWMU 17, Power Plant No. 3

Date	Investigation Activity
1986-1995[a]	Initial assessment study (NEESA 1986), site inspection (Tetra Tech 1989), reconnaissance investigation (URS 1990), supplement to the reconnaissance investigation (URS 1991), Resource Conservation and Recovery Act facility assessment (SAIC 1991), site investigation (URS 1993a), and a supplemental investigation and treatability study (URS 1993b)
1995	Preliminary source evaluation to evaluate site conditions resulting from a release of petroleum and hazardous chemicals (URS 1996)
1997	Site investigation to determine the extent and source of the free-product plume (Foster Wheeler 1997)
1999	Site summary report to present all site data collected to that point and compare chemical concentrations in soil and groundwater to supplemental site-screening criteria established by Alaska DEC (URSG 1999a)
2001	Remedial investigation to delineate the lateral extent of dissolved-phase, petroleum-related chemicals in the groundwater (URS 2006)
2005	Site investigation to evaluate the current conditions of the sediment in Yakutat Creek for the ecological risk assessment (URS 2006)

[a]Investigations completed before 1995 primarily addressed COCs under the CERCLA process

Note:
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC - chemicals of concern
DEC - Department of Environmental Conservation

Table 2-2
Summary of Site Cleanup Activities, SWMU 17, Power Plant No. 3

Date	Cleanup Activity
1995	Stained soil removal from roadside ditches along Akutan Way, including removal of approximately 70 cy of soil from the northwest ditch and 40 cy of soil from the southeast ditch
1996 – 2002[a]	Free-product recovery (total of 1,936 gallons recovered)
1997	Removal of oil/water separators no. 1 and 2, including the joining of influent and effluent piping and routing of the discharge to the sanitary sewer
1998	Cleaning and closing of the two vertical ASTs (31018 and 31019) and removal of one horizontal AST (31017)
1999	Removal of sediment from the waste oil pond and the retention pond; backfilling, capping, and seeding of the waste oil pond; and allowing the retention pond to revert to a wetland
1999	Initiation of surface water protection and compliance monitoring
2002[b]	Fill placement of and grading in vicinity of Amulet Way and Akutan Way to prevent free product from daylighting during prolonged periods of heavy precipitation, promote surface water runoff, and prevent contact of surface water with free product or contaminated soil

[a]Intermittent operation
[b]One-time natural attenuation monitoring to obtain snapshot of current site conditions was also performed.

Note:
AST - above-ground storage tank
cy - cubic yards

Table 2-3
Free-Product Recovery Data
SWMU 17, Power Plant No. 3

Date	Gallons Recovered by Recovery Trench	Gallons Recovered by Skimmers
January 1996	---	---
February 1996	---	---
March 1996	---	---
April 1996	---	---
May 1996	---	---
June 1996	---	---
July 1996	System Installed	---
August 1996	---	---
September 1996	---	---
October 1996	---	---
November 1996	283	---
December 1996	---	---
1996 TOTAL	**283**	**0**
January 1997	50	---
February 1997	60	---
March 1997	2	---
April 1997	32	---
May 1997	29	---
June 1997	17	---
July 1997	27	0.01
August 1997	System Modified	0.55
September 1997	203	2.15
October 1997	47	2.22
November 1997	53	2.54
December 1997	19	0.41
1997 TOTAL	**539**	**7.89**
January 1998	30	2.16
February 1998	23	0.4
March 1998	39	0.41
April 1998	31	1.27
May 1998	7	1.27
June 1998	48	---
July 1998	2	0.58
August 1998	1	0
September 1998	80	0
October 1998	48	0.06
November 1998	22	0.01
December 1998	22	0.003
1998 TOTAL	**353**	**6.2**

Table 2-3 (Continued)
Free-Product Recovery Data
SWMU 17, Power Plant No. 3

Date	Gallons Recovered by Recovery Trench	Gallons Recovered by Skimmers
January 1999	0	0
February 1999	3	0.01
March 1999	3	0.01
April 1999	3	0.01
May 1999	13	---
June 1999	7	---
July 1999	46	---
August 1999	144	1.13
September 1999	85	2.95
October 1999	161	0.49
November 1999	19	0.49
December 1999	19	0.53
1999 TOTAL	**503**	**5.61**
January 2000	0	0.75
February 2000	0	0.57
March 2000	14.94	0.19
April 2000	15.7	0.08
May 2000	15.44	0.16
June 2000	7.4	0.08
July 2000	7.96	0.16
August 2000	9.76	NR
September 2000	NR	NR
October 2000	NR	NR
November 2000	NR	NR
December 2000	NR	NR
2000 TOTAL	**71.2**	**2.0**
January 2001	NR	NR
February 2001	NR	NR
March 2001	NR	NR
April 2001	NR	NR
May 2001	60.8	0.41
June 2001	24.7	0.08
July 2001	19.8	---
August 2001	6.88	---
September 2001	2.97	---
October 2001	7.92	---
November 2001	2.85	---
December 2001	---	---
2001 TOTAL	**125.9**	**0.49**

Table 2-3 (Continued)
Free-Product Recovery Data
SWMU 17, Power Plant No. 3

Date	Gallons Recovered by Recovery Trench	Gallons Recovered by Skimmers
May 2002	15.6	--
June 2002	6.72	--
July 2002	16.41	--
2002 TOTAL	**38.7**	**0**
Total quantity of product recovered at the site = 1,936 gallons		

Notes:
--- - recovery system not operating
NR - recovery data not reported

3.0 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Petroleum hydrocarbons, SVOCs, and VOCs have been detected in soil, groundwater, surface water, and sediment at SWMU 17. 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). No COPCs were identified in surface water. The COPCs in soil, groundwater, and sediment are shown in Table 3-1 and are discussed 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), if it was identified as a COPC in the human health risk assessment, or if it was identified as a chemical of potential ecological concern (COPEC) in the ecological risk assessment. The following is a listing of the COPCs identified in soil at SWMU 17:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- 4-Isopropyltoluene
- Benzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Dibenz(a,h)anthracene
- Diesel-range organics (DRO)
- Ethylbenzene
- Gasoline-range organics (GRO)
- Isopropylbenzene
- Naphthalene
- n-butylbenzene
- sec-butylbenzene
- Toluene
- Xylenes

Concentrations of 2-methylnaphthalene, benzene, benzo(a)pyrene, DRO, ethylbenzene, GRO, naphthalene, toluene, and xylenes in soil at the site exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples. Benzene, ethylbenzene, toluene and xylenes were included as COPCs for the site because their concentrations in soil exceeded the most stringent Alaska DEC Method Two soil criteria in one or more samples. However, they were not included as a COPC in the human health risk assessment because the magnitude of the exceedances was low, because of infrequent detection, or because of no exceedance of the screening criteria. 1,2,4-Trimethylbenzene, 1,3,5-trimethylbenzene, benzo(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene were included in the list above because they were identified as COPCs in the human health risk assessment even though their concentrations did not exceed the most stringent Alaska DEC Method Two soil criteria.

Benzene, ethylbenzene, naphthalene, toluene, and xylenes were not identified as COPECs for the site because site chemical concentrations were below the risk-based screening criteria (RBSCs). 4-Isopropyltoluene, isopropylbenzene, n-butylbenzene, and sec-butylbenzene were included on the list above because they were identified as COPECs in the ecological risk assessment even though their concentrations did not exceed the most stringent Alaska DEC Method Two soil criteria. However, there are no RBSCs for these chemicals and the only reason they were included is because they were detected in one or more soil samples collected at the site.

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)] or if it was identified as a COPC in the human health risk assessment. The following is a listing of the COPCs identified at SWMU 17:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- Benzene
- DRO
- Ethylbenzene
- GRO
- Naphthalene
- Xylenes

All chemicals that exceeded the Alaska DEC groundwater cleanup levels (2-methylnaphthalene, DRO, and GRO) in one or more groundwater samples were also included as COPCs in the human health risk assessment. 1,2,4-Trimethylbenzene, 1,3,5-trimethylbenzene, benzene,

ethylbenzene, naphthalene, and xylenes were included in the list above, because they were identified as COPCs in the human health risk assessment even though their concentrations did not exceed the Alaska DEC groundwater cleanup levels.

3.3 SEDIMENT

A chemical was identified as a COPC if it was identified as a COPC in the human health risk assessment or if it was identified as a COPEC in the ecological risk assessment. The following is a listing of the COPCs identified for sediment at SWMU 17:

- Benzo(a)pyrene
- DRO

Table 3-1
Chemicals of Potential Concern in Soil, Groundwater, and Sediment
SWMU 17, Power Plant No. 3

Media	Criteria for Inclusion	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Methylnaphthalene	4-Isopropyltoluene	Benzene	Benzø(a)anthracene	Benzø(a)pyrene	Benzø(b)fluoranthene	Dibenz(a,h)anthracene	DRO	Ethylbenzene	GRO	Isopropylbenzene	Naphthalene	n-butylbenzene	sec-butylbenzene	Toluene	Xylenes
Soil	ADEC Criteria			●		●		●			●	●	●		●			●	●
	Human Health COPC	●	●	●			●	●	●	●	●		●		●				
	Ecological COPEC	●[a]			●[a]						●			●[a]		●[a]	●[a]		
Groundwater	ADEC Criteria			●							●		●						
	Human Health COPC	●	●	●		●					●	●	●		●				●
Sediment	Human Health COPC							●			●								
	Ecological COPEC[b]										●								

[a]These chemicals were only included as ecological COPECs because they were detected in soil. No RBSC is available for these chemicals.
[b]2-Methylnaphthalene was not included as an ecological COPEC for sediment because it was only detected at concentrations above RBSCs in sediments that were removed during interim remedial actions.

Notes:
ADEC - Alaska Department of Environmental Conservation
COPC - chemical of potential concern
COPEC - chemicals of potential ecological concern
DRO - diesel-range organics
GRO - gasoline-range organics
RBSC - risk-based screening concentration

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 by the Navy at SWMU 17 between 1986 and 2005. The environmental field investigations that have been performed at or in the vicinity of SWMU 17 are summarized in Table 2-1. Results of these investigations indicated that petroleum-related chemicals and selected VOCs were confirmed in samples of subsurface soil, groundwater, sediment, and surface water collected from several locations at SWMU 17. In addition, free product continues to be detected in wells at the site. Detailed characterization information for the site is provided in the FFS (URS 2006) and is summarized below.

Extent of Free Product

Between March 1993 and September 2005, monitoring wells within the vicinity of SWMU 17 were measured periodically for the presence of free product. Free product was observed in 16 of the 34 wells installed at the site between March 1993 and November 2002. The maximum measured free-product thickness reported at the site was 3.36 feet, in well MW-4 on April 18, 1998. Between October 2003 and September 2005, only nine wells were gauged for the presence of free product as part of the annual groundwater monitoring program. Free product was not detected in any of the wells gauged between October 2003 and September 2005. Figure 4-1 shows the estimated extent of residual free product remaining at the site based on the maximum measured free-product thickness reported in each well during the period from May 11, 2002 to November 8, 2002. This period of time was selected for determining the estimated extent of residual free product, because it was the last time all of the existing site wells were monitored. Free-product recovery activities at SWMU 17 have reduced the extent of residual free product to approximately 21,000 square feet based on the 2002 monitoring data. It is estimated that between 57 and 280 gallons of recoverable free product remain in the subsurface at SWMU 17.

Free-product recovery was conducted at SWMU 17 from October 1996 through July 2002 using free-product recovery trenches and passive skimmers installed in existing site wells (see Section 2.4). The free-product recovery trenches operated from October 1996 through August 2000, May 2001 through November 2001, and May 2002 through July 2002. The passive skimmers operated from July 1997 through May 1998, July 1998 through April 1999, August 1999 through July 2000, and May 2001 through June 2001. The product recovery system recovered an estimated 1,940 gallons of free product during this period (URS 2002), most of which was recovered from the free-product recovery trenches. Free-product recovery data through July 2002 are summarized in Table 2-3.

The ROD for OU A established the criteria for cessation of free-product recovery based on achievement of the technically practicable endpoints (U.S. Navy et al. 2000). These criteria are based on the operational performance of the recovery system at SWMU 17. The criterion for evaluating the performance of recovery systems that are dependent on water table depression is as follows:

> *When less than 0.5 gallons of free product per 1,000 gallons of treated groundwater is recovered by a system that pumps groundwater for hydraulic control, the technically practicable endpoint for recovery has been reached. If this endpoint criterion has been met for a period of one year, recovery will be considered to be at the technically practicable limit and can be discontinued (URSG 1999b).*

The operation of the free-product recovery system at SWMU 17 was evaluated for shutdown by comparing the monthly free-product recovery data to the estimated monthly groundwater flow discharged to the sanitary sewer from the recovery trenches. During 2000 and 2001, approximately 200 gallons of free product were recovered at the site (Table 2-3), while over 55 million gallons of groundwater was estimated to be discharged to the sewer. At no time during this two-year period were more than 1×10^{-5} gallons of free product recovered per 1,000 gallons of groundwater discharged to the sanitary sewer (URS 2002).

Based on the comparison of monthly free-product recovery data (Table 2-3) to monthly groundwater flow discharged to the sanitary sewer from the recovery trenches, the free-product recovery system at SWMU 17 met the technical practicable endpoint as established in the ROD for OU A and 18 AAC 75.325(f)(1)(B) for recovery systems that are dependent on water table depression to facilitate product recovery (URS 2002). Subsequently, the product recovery system was shut down on July 25, 2002 and designated for removal.

To evaluate the quantity of residual free product remaining at the site once the existing product recovery system met the established shut down criteria, post-recovery monitoring was initiated in eight monitoring wells. Four wells (R-1, R-2, R-5, and R-6) were monitored daily while an additional four wells (R-3, HC-1, HC-2, and HC-3) were monitored weekly. Some of these wells were monitored from October 1998 to November 2002. Product was detected at a measured thickness greater than 0.01 foot in three of the eight wells (HC-1, HC-2, and R-6) monitored during 2002 post-recovery monitoring activities (ICRC 2003). Post-recovery monitoring for free product ended in 2002. Monitoring wells at the site continue to be monitored for petroleum constituents to protect surface water.

Potential Extent of Contamination in Soil and Groundwater

The potential extent of contamination in soil and groundwater at SWMU 17 was estimated in the FFS (URS 2006) and is summarized in this DD. The potential extent of contamination in soil and groundwater was based on data collected through 2002. Because no soil samples were collected after 2002 and groundwater samples were only collected from six wells at SWMU 17 and concentrations were generally lower than detected during previous sampling rounds, 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 for soil and groundwater on Figures 4-2 and 4-3.

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 SWMU 17. 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 extents of contamination shown in Figures 4-2 and 4-3 are based solely on exceedances of the Alaska DEC cleanup levels. The potential extents of contamination shown on these figures 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 pose an unacceptable risk to humans and ecological receptors.

The analytical results for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes are provided in Appendix B for soil and groundwater, respectively. Analytical results obtained for 2-methylnaphthalene, benzene, benzo(a)pyrene, DRO, ethylbenzene, GRO, naphthalene, toluene, and xylenes are included in the analysis conducted to establish the potential extent of contamination at the site. No other chemicals were detected at concentrations greater than Alaska DEC cleanup levels. Basic summary statistics for all COPCs in soil and groundwater are provided in Table 4-1. The COPCs were previously identified in Section 3. These statistics include:

- The total number of samples collected at SWMU 17, including field duplicates
- Samples used in the risk assessment
- The minimum concentration used in the risk assessment
- The maximum concentration used in the risk assessment

- The location of the maximum concentration used in the risk assessment
- The detection frequency
- The 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 4-1 may only have been detected at concentrations which exceeded the human health and/or ecological risk-based screening criteria and not the Alaska DEC cleanup levels.

Soil - Analytical results for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes in soil samples collected at SWMU 17 are presented in Table B-1. The extent of contamination in soil at the site was estimated by comparing analytical results to the most stringent Alaska DEC soil cleanup criteria which were established for the protection of groundwater in the over 40-inches of rainfall zone. Detected concentrations of 2-methylnaphthalene, DRO, GRO, benzene, benzo(a)pyrene, ethylbenzene, naphthalene, toluene, and xylenes greater than their respective Alaska DEC soil cleanup levels were reported in 73 soil samples collected from 44 locations. These 44 locations, shown on Figure 4-2, occur over an area from the power plant fuel farm to northeast of the intersection of Akutan and Amulet Way. 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 line on Figure 4-2. This area is estimated to be approximately 80,500 square feet or 1.85 acres.

Groundwater - Analytical results for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes in groundwater samples collected at SWMU 17 are presented in Table B-2. 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 DRO and GRO were reported in the most recent groundwater samples collected from 11 locations at concentrations greater than their respective Alaska DEC groundwater cleanup criteria for groundwater that is used as a drinking water source. These 11 locations are shown on Figure 4-3. They occur over a single area located downgradient from the SWMU 17 fuel farm and Oil/Water Separator No. 2, and upgradient of the lower fuel recovery trench. The site area estimated to contain petroleum-related chemicals in groundwater at

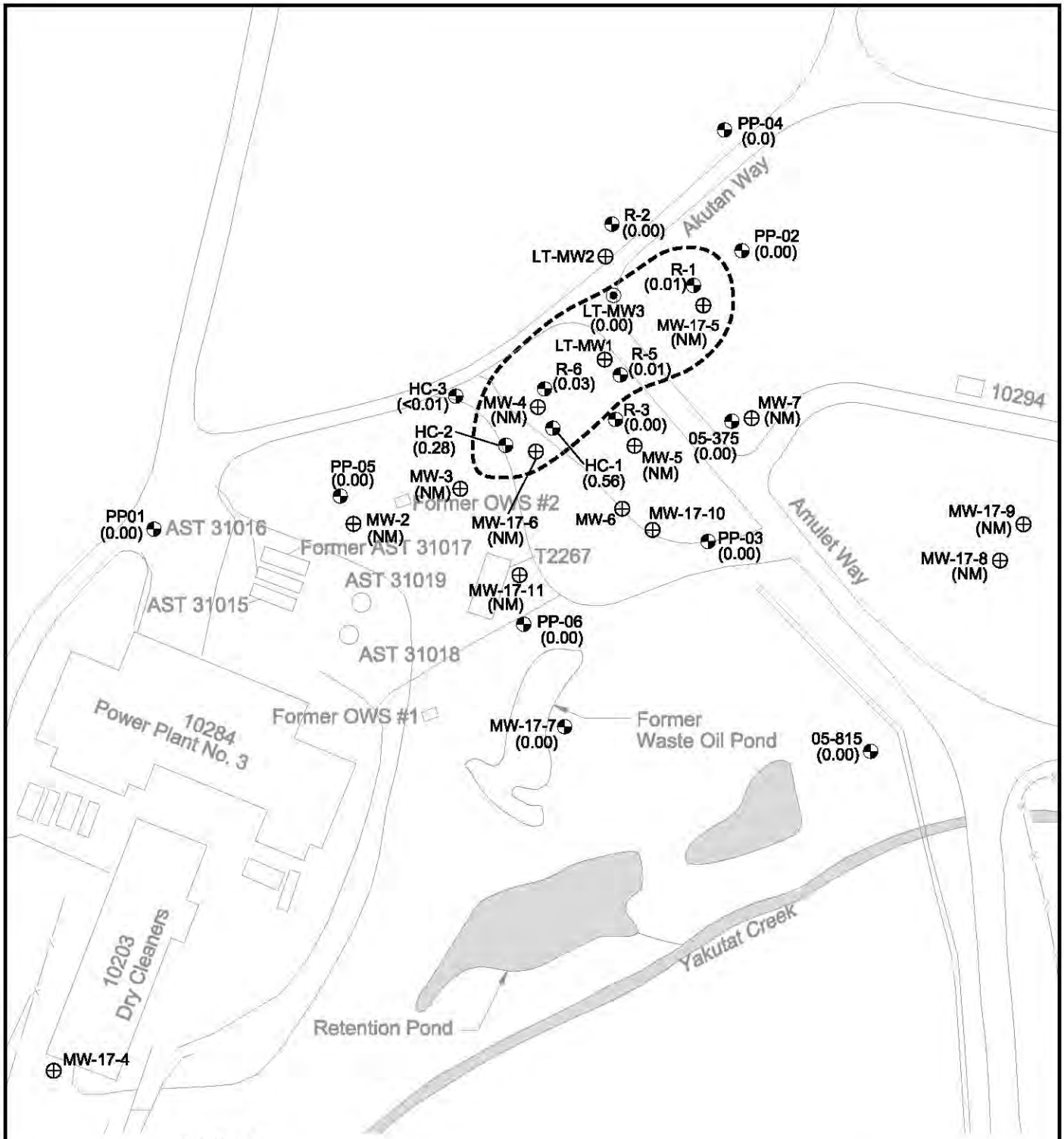
concentrations greater than the Alaska DEC criteria for groundwater that is used as a drinking water source is estimated to be approximately 89,000 square feet (Figure 4-3).

Potential Extent of Contamination in Sediment

The potential extent of contamination in sediment at SWMU 17 was estimated in the FFS (URS 2006) and is summarized in this DD. Analytical results for petroleum-related chemicals in sediment were obtained for 23 sediment samples collected from 17 locations representing in-place sediment. Twenty-two of these sediment samples were collected from 16 locations in or adjacent to Yakutat Creek. The remaining sample was collected from a drainage ditch located down slope from the former Oil/Water Separator No. 1. Table B-3 present results of chemical analyses for benzene, ethylbenzene, DRO, GRO, toluene, and xylenes for these samples. Fifteen additional sediment samples were collected from the former waste oil and retention ponds prior to the 1999 remedial activities at these locations. The sediment removals that took place as part of these remedial activities rendered these fifteen samples no longer applicable.

Potential extent of contamination in sediment was estimated by comparing in-place site concentrations to the ecological RBSCs and human health risk assessment screening concentrations. Detected concentrations of chemicals greater than ecological RBSCs were reported in sediment samples collected from seven locations (9, 12, 16, 17, 95, 96, and 814). As shown on Figure 4-4, these seven locations are within or adjacent to Yakutat Creek. Only DRO exceeded the ecological RBSC in sediment at the site, and it is the only chemical previously identified in Section 3 as a COPEC. Concentrations of two chemicals (benzo(a)pyrene and DRO) were detected at concentrations greater than the human health risk assessment screening concentrations in sediment samples collected from two locations: 9 and 12. These two locations are adjacent to Yakutat Creek and are shown on Figure 4-4. These chemicals are the human health COPCs for the site, as previously identified in Section 3. Basic summary statistics for the COPCs in sediment are provided in Table 4-1.

The seven sediment sampling locations where COPCs were detected at concentrations greater than the ecological RBSCs or the human health risk assessment screening concentrations do not necessarily represent areas where cleanup actions will be required. These locations were considered to be a potential concern and therefore required further evaluation in an ecological and human health risk assessment. However, only site data collected after January 1, 1997 was used in the ecological risk assessment to determine if contaminant concentrations at the site pose an unacceptable risk to ecological receptors. Data collected prior to January 1, 1997 were not considered representative of site conditions in the ecological risk assessment.



LEGEND

- Monitoring Well
- Recovery Well
- Abandonded Well
- OWS Oil/Water Separator
- ----- Estimated Extent of Free Product Based on Measurements From May 11, 2002 to November 8, 2002

(0.01) Maximum Measured Free Product Thickness (ft) From May 11, 2002 to November 8, 2002

(NM) Not Measured From May 11, 2002 to November 8, 2002

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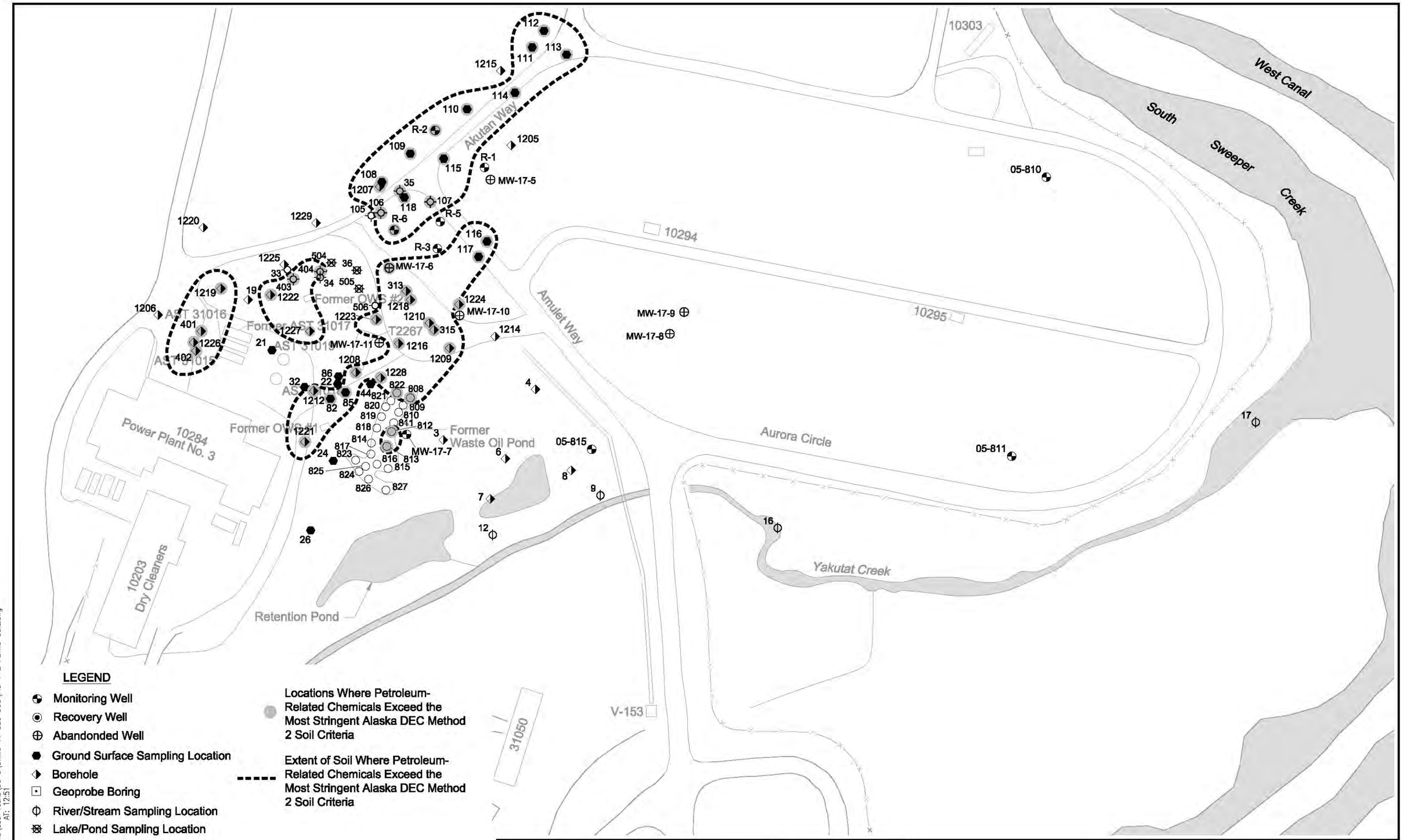
0 30 60 120

SCALE IN FEET

Figure 4-1
Estimated Extent of Residual Free Product
SWMU 17, Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT



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Adak Island, AK
DECISION DOCUMENT

Figure 4-2
Estimated Potential Extent of Soil Contamination
SWMU 17, Power Plant No. 3

FILENAME: T:\ADAK\DIQ\Sub-Tasks\DO 3\SWMU 17 DEC DOC\FIG 4-2 PETRO SOIL.dwg
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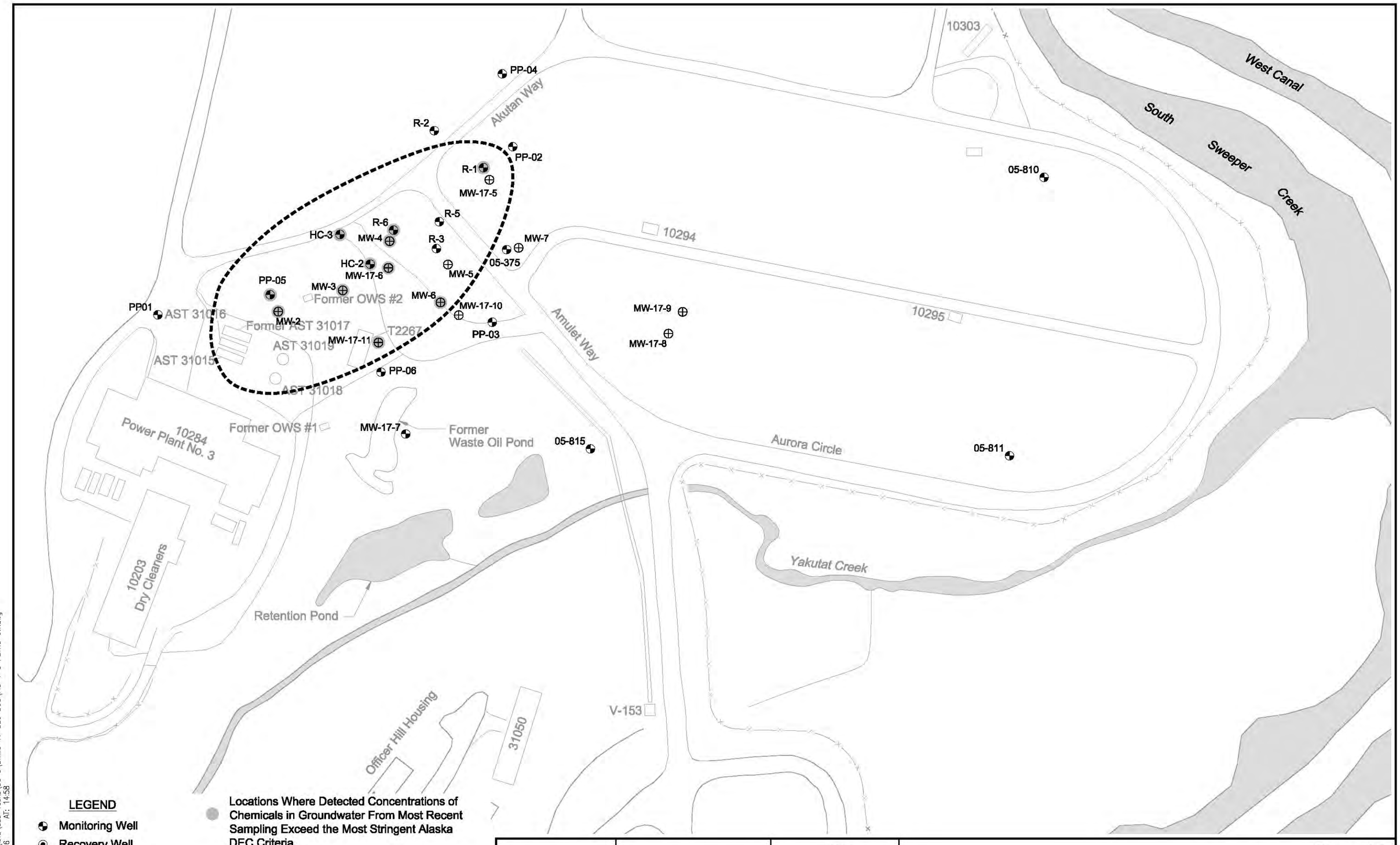

LEGEND

- Monitoring Well
- Recovery Well
- Abandonded Well
- OWS Oil/Water Separator
- Locations Where Detected Concentrations of Chemicals in Groundwater From Most Recent Sampling Exceed the Most Stringent Alaska DEC Criteria
- Generalized Extent of Groundwater Contamination in Excess of the Most Stringent Alaska DEC Criteria

U.S. NAVY

Adak Island, AK
DECISION DOCUMENT

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0 30 60 120
SCALE IN FEET

Figure 4-3
Estimated Potential Extent of Groundwater Contamination
SWMU 17, Power Plant No. 3

FILENAME: T:\ADAK\DD\Sub-Tasks\DD 3\SWMU 17 DEC DOC\FIG 4-3 PETRO GW.dwg
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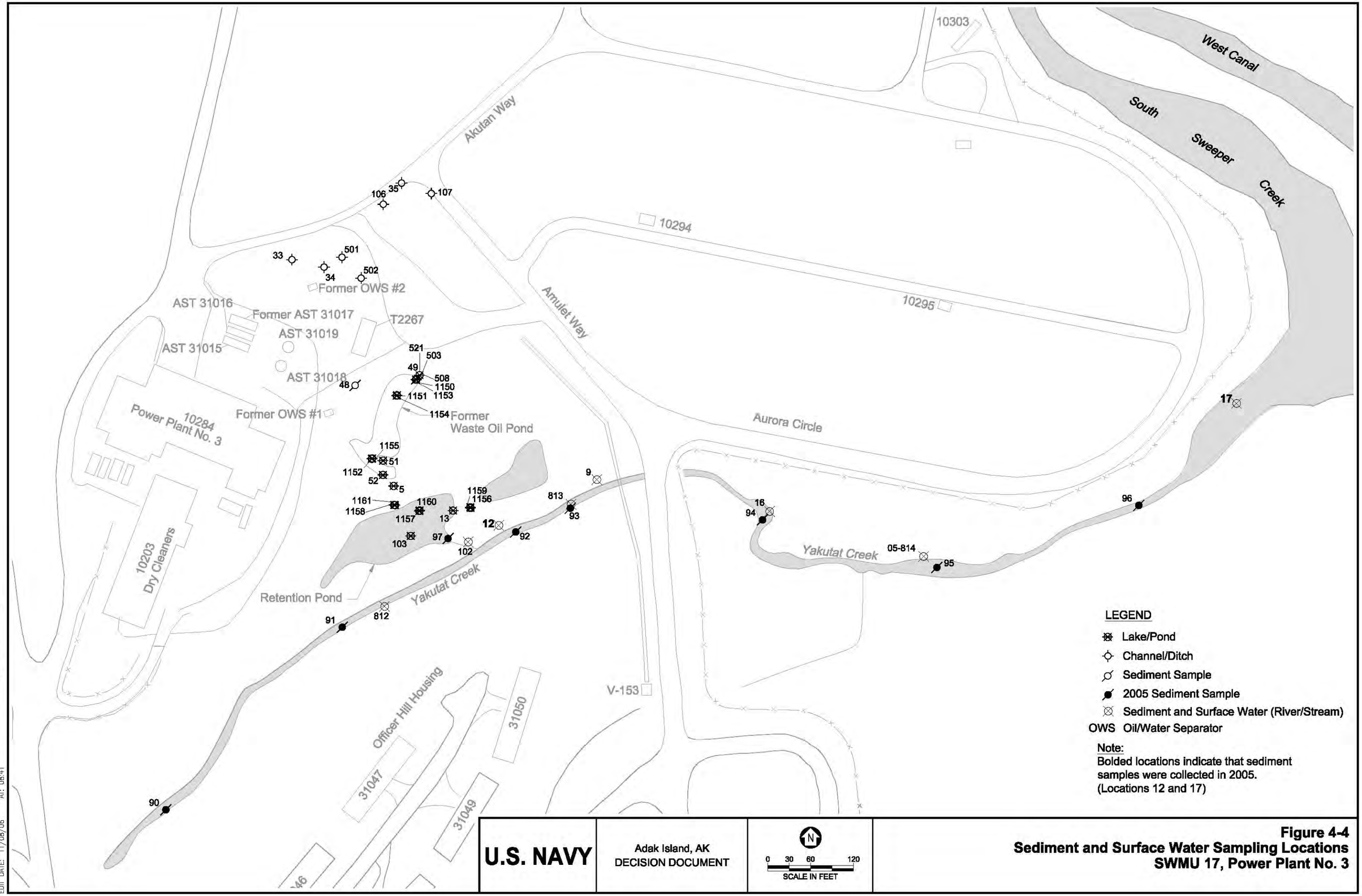

LEGEND

- Lake/Pond
- Channel/Ditch
- Sediment Sample
- 2005 Sediment Sample
- Sediment and Surface Water (River/Stream)
- OWS Oil/Water Separator

Note:
Bolded locations indicate that sediment samples were collected in 2005.
(Locations 12 and 17)

U.S. NAVY	Adak Island, AK DECISION DOCUMENT	N 0 30 60 120 SCALE IN FEET	**Figure 4-4** **Sediment and Surface Water Sampling Locations** **SWMU 17, Power Plant No. 3**

FILENAME: T:\ADAK\DIQ\Sub-Tasks\DO 3\SWMU 17 DEC DOC\FIG 4-4 SED&SW.dwg
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Table 4-1
Summary of Analytical Results for Chemicals of Potential Concern
SWMU 17, Power Plant No. 3

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2,3,4,5,6)	Minimum Concentration (7)	Minimum Qualifier	Maximum Concentration (7)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
SOIL										
Volatile Organic Chemicals (VOCs)										
1,2,4-Trimethylbenzene	6	5	2.33		22.5		mg/kg	1212	4/5	0.0542
1,3,5-Trimethylbenzene	5	4	0.605		5.97		mg/kg	1212	3/4	0.0542
2-Methylnaphthalene	97	84	0.035		71		mg/kg	402	31/84	0.069-77
4-Isopropyltoluene (8)	5	4	0.32		2.79		mg/kg	1212	3/4	0.0542
Benzene	142	119	0.0034		0.8		mg/kg	MW-17-6	16/119	0.0011-37
Ethylbenzene	141	119	0.001	J	16		mg/kg	403	32/119	0.0011-37
Isopropylbenzene	5	0	NA		NA			NA	NA	NA
Naphthalene	102	88	0.16		45	J	mg/kg	401	26/88	0.0542-77
n-Butylbenzene	5	4	1.95		15.7		mg/kg	1212	3/4	0.0542
sec-Butylbenzene	5	4	0.265		2.65		mg/kg	1212	3/4	0.0542
Toluene	142	119	0.0005	J	6.9		mg/kg	403	30/119	0.0011-37
Xylenes	140	118	0.0007	J	120		mg/kg	403	44/118	0.0011-37
Semivolatile Organic Chemicals (SVOCs)										
Benzo(a)anthracene	100	86	0.054		2.2	J	mg/kg	401	13/86	0.025-77
Benzo(a)pyrene	100	86	0.037	J	12		mg/kg	808	13/86	0.043-77
Benzo(b)fluoranthene	100	86	0.037	J	1.3	J	mg/kg	401	19/86	0.069-77
Dibenz(a,h)anthracene	100	86	0.077	J	0.088		mg/kg	108	2/86	0.056-77
Total Petroleum Hydrocarbons (TPH)										
Diesel-Range Organics	135	113	4		220000		mg/kg	403	100/113	4-13
Gasoline-Range Organics	117	97	1.2		870		mg/kg	315	48/97	1-37.1

Table 4-1 (Continued)
Summary of Analytical Results for Chemicals of Potential Concern
SWMU 17, Power Plant No. 3

Chemical	Total Number of Samples Collected (1)	Number of Samples Used in Risk Assessment (2,3,4,5,6)	Minimum Concentration (7)	Minimum Qualifier	Maximum Concentration (7)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits
GROUNDWATER										
Volatile Organic Chemicals (VOCs)										
1,2,4-Trimethylbenzene	13	8	0.49	J	180	J	ug/L	R-6	3/8	1-2
1,3,5-Trimethylbenzene	13	8	18.4	J	18.4	J	ug/L	R-6	1/8	1-2
2-Methylnaphthalene (8)	54	41	0.073	J	740		ug/L	MW-17-6	20/41	0.028-100
Benzene	96	67	0.358		8.73		ug/L	PP-05	18/67	0.2-100
Ethylbenzene	96	67	1.1		270		ug/L	MW-17-8	13/67	0.2-50
Naphthalene	60	45	0.474		214	J	ug/L	R-6	19/45	0.1-200
Xylenes	96	67	0.5	J	640		ug/L	MW-17-8	16/67	0.2-50
Total Petroleum Hydrocarbons (TPH)										
Diesel-Range Organics	75	51	120	J	496000		ug/L	R-6	42/48	100-543
Gasoline-Range Organics	77	51	10	J	2800		ug/L	MW-17-6	18/51	20-100
SEDIMENT										
Semivolatile Organic Chemicals (SVOCs)										
Benzo(a)pyrene	21	8	0.126		0.15		mg/kg	YC-6	2/8	0.012-0.051
Total Petroleum Hydrocarbons (TPH)										
Diesel Range Organics	21	8	13		59000	J	mg/kg	YC-9	8/8	--

Notes:

(1) Number includes field duplicates. Number also includes soil, sediment, and surface water samples collected from waste oil pond and retention pond which are no longer representative of current site conditions because of completed remedial actions.
(2) Number does not include soil samples collected at depths greater than 15 feet below ground surface.
(3) Number does not include soil, sediment, or surface water samples collected from the retention pond or waste oil pond because these have been remediated.
(4) Number does not include soil and groundwater samples collected from 05-810 and 05-811. These wells are not impacted by contamination from site activities.

Definitions:

-- - Compound has 100% detection frequency
J - estimated value
ug/L - micrograms per liter
mg/kg - milligrams per kilogram
NA - not applicable
SVOC - semivolatile organic compound
TPH - total petroleum hydrocarbon
VOC - volatile organic compound

Table 4-1 (Continued)
Summary of Analytical Results for Chemicals of Potential Concern
SWMU 17, Power Plant No. 3

(5) Number does not include groundwater samples collected from HC-2 and HC-3, because data were not available at the time of the risk analysis.

(6) Number does not include groundwater samples analyzed using AK-102-AA.

(7) Minimum/maximum detected concentration.

(8) The following surrogate chemicals used for screening value.

Chemical Name	Surrogate Chemical
2-Methylnaphthalene	Naphthalene
4-Isopropyltoluene	Isopropylbenzene

5.0 SUMMARY OF RISK ASSESSMENT

Baseline human health and ecological risk assessments were conducted to determine if residual petroleum at SWMU 17 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. Risks and hazards calculated for human exposures to chemicals in soil and groundwater were found to be below target health goals. In addition, the ecological risk assessment concluded that no significant ecological threat exists to terrestrial receptors or aquatic receptors in the vicinity of SWMU 17. 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 compounds other than 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 2000). 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 2006).

This section provides a summary of the human health risk assessment that has been conducted for this site. The human health risk assessment was completed in 2004 and used sediment data that was collected prior to the 1999 sediment remedial action at the site. Additional sediment samples were collected from Yakutat Creek in 2005 to evaluate current conditions in sediment. However, only the sediment samples collected in 1995 and 1998 were used to evaluate the human health risk and hazards. The 2005 sediment sampling investigation showed a significant decrease in contaminant concentrations. DRO (one of the two COPCs in sediment) concentrations decreased by more than 2 orders of magnitude at sampling location YC9, the location with the greatest DRO concentration in 1995. Risks and hazards for recreational exposures to sediment calculated using the maximum detected concentrations from the 1995 and 1998 sampling investigation were nearly 2 orders of magnitude below target health goals. Had

the 2005 sediment data been included in the risk assessment, risks and hazards would be even lower and the conclusions of the risk assessment would not change. Therefore, there was no need to perform an updated risk assessment using the data collected in 2005.

Previous investigations have identified petroleum compounds in soil, groundwater, and sediments at concentrations above regulatory levels at the site resulting from spills or leaks associated with ASTs and oil/water separators. The risk assessment evaluated whether potential health risks were present if people encountered these petroleum-impacted materials in their environment. 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 SWMU 17 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 2006).

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. Nine chemicals were selected as COPCs in groundwater:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- Benzene
- Ethylbenzene
- Naphthalene
- Xylenes
- DRO
- GRO

The following 10 chemicals were selected as COPCs in soil:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- 2-Methylnaphthalene
- Benzo(a)pyrene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Dibenz(a,h)anthracene
- Naphthalene
- DRO
- GRO

Two chemicals were selected as COPCs in sediment:

- Benzo(a)pyrene
- DRO

No chemicals were selected as COPCs in surface water because all concentrations were below screening levels.

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 SWMU 17 by the Interim Conveyance Document. Thus, no residential populations would be exposed to chemicals at the site. Off-site populations would not be exposed to chemicals migrating from the site, because most impacted surface material was either removed from site or covered by fill material during the 1995, 1999, and 2002 interim remedial actions to minimize surface exposures. In addition, groundwater beneath the site is migrating away from the existing residential areas on Adak

Island. Therefore, current and future human exposures to chemicals in soil and groundwater at SWMU 17 were evaluated for potential construction workers who could be involved in tasks requiring subsurface intrusion. Because a future residential area is proposed for the currently undeveloped land south of Yakutat Creek, children playing in the creek who could be exposed to impacted sediments were also evaluated. 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.

- Recreators (children aged 6 – 12 years were selected as the most sensitive population with the highest potential for sediment exposure in the future) could be exposed to chemicals in sediment through incidental ingestion and dermal contact at Yakutat Creek.

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, depth and yield likely preclude the use of site groundwater as drinking water.

The exposure factors used in the risk calculations for construction worker exposures to groundwater and soil are summarized on Tables 5-1 and 5-2, respectively; and the exposure factors used for recreational exposures to sediment are summarized on Table 5-3.

5.1.2 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, ethylbenzene, and the carcinogenic polycyclic aromatic hydrocarbons (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.

5.1.3 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 the reasonable maximum exposure (RME) 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.

The following bulleted text summarizes the results of the risk characterization. The exposure point concentrations (EPCs) used to calculate these risks and hazards are presented on Table 5-6.

- **Construction Workers.** Total CRs (2×10^{-6}) and TPH and non-TPH noncancer hazards (0.8 and 0.2, respectively) for combined exposures to soil and groundwater are below target health goals (see Table 5-7). Therefore, concentrations of the COPCs in soil and groundwater at the site are not present in concentrations that are a health concern for construction worker exposures.

- **Elementary Child Recreator.** Table 5-8 summarizes the CRs and noncancer hazards calculated for recreational exposures to petroleum compounds in sediment at Yakutat Creek during recreational play. A cancer risk of 3×10^{-8} for benzo(a)pyrene and a hazard index of 0.3 for DRO were calculated for this exposure pathway. These risks and hazards are below target goals. Therefore, no actions are necessary to protect public health from chemicals in sediment of Yakutat Creek at SWMU 17.

Note that the primary driving factor for noncancer hazards at the site is DRO in soil, as indicted in Table 5-7. The EPC for DRO was based on the 95 percent upper confidence limit (UCL95) of the mean concentration for DRO of 12,860 milligram per kilogram (mg/kg). Based on Alaska DEC requirements that 80 percent of the UCL95 is assumed to be aliphatic and 40 percent is assumed to be aromatic, risk calculations used concentrations of 10,288 mg/kg for aliphatic diesel-range hydrocarbons and 5,144 mg/kg for aromatic diesel-range hydrocarbons to estimate

the health risks for DRO as shown in Table 5-6. The target health goal of a hazard quotient of 1 was not exceeded for DRO; therefore, a UCL95 higher than 12,860 mg/kg could be present on the site and health goals would not be exceeded. In fact, if a hazard quotient of 1 is the target goal, the UCL95 concentrations of DRO could be as high as 30,000 mg/kg without a health concern for the Adak construction worker scenario. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

Some small, discontinuous amounts of free-phase petroleum product are present at the site (less than 300 gallons). While exposures to free product cannot be quantitatively evaluated in risk assessments, exposures to free product may represent an unacceptable health risk. The degree of risk would depend on a number of factors, including the specific type and location of the project and the actual amount of material disturbed. Therefore, in the event that free product is encountered, the appropriate measures should be taken to minimize contact and exposure.

Because the risk assessment for SWMU 17 established that the existing concentrations in soil and sediment at the site do not pose a risk to humans or the environment (refer to Section 5.2) above target health goals at their present contamination level, no separate alternative cleanup levels (ACLs) were calculated. The minimum and maximum concentrations of COPCs detected in soil and sediment at the site are presented in Table 5-9. Through enforcement of equitable servitude, the higher concentrations presented on Table 5-9 should pose no threat to human health or the environment.

Site-specific cleanup levels for groundwater were not calculated. The proposed groundwater cleanup levels for SWMU 17 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., depth and yield preclude the use of site groundwater for drinking water). 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, sediment, and 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 SWMU 17 is depicted on Figure 5-2. The ecological risk assessment concluded that no significant ecological threat exists to terrestrial receptors from chemicals of concern (COCs) in soil or to aquatic receptors from exposures to COCs in surface water and sediment in Yakutat Creek in the vicinity of SWMU 17. 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 2006).

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 [ADEC 2000] and included in Appendix C-II of the FFS [URS 2006]) 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 SWMU 17. Through this exercise, it was determined that Yakutat Creek is considered an Alaska State-Sensitive Environment under Alaska DEC (2000) risk assessment procedures for anadromous runs of Dolly Varden.

An ecological CSM was also prepared for SWMU 17, 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 SWMU 17 that result in the ecologically significant exposure of ecological receptors to site contaminants:

1. Aquatic receptors may be exposed to site contaminants in surface waters and sediments of Yakutat Creek.

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

Based on this assessment, a potential ecological threat exists to ecological receptors from petroleum release products at SWMU 17. 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 2006).

5.2.3 Screening Level Ecological Risk Assessment

Ecological risk at SWMU 17 was estimated for contaminants in site surface soil, and for surface water and sediment of Yakutat Creek. A screening level ecological risk assessment was conducted to determine whether any of the contaminants detected in these media onsite 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 COPECs.

The results of the screening level ecological risk assessment to identify COPECs are presented in Table 5-10 for soil, Table 5-11 for surface water, and Table 5-12 for sediment. Table 5-12 presents only the sediment data collected in June 2005, subsequent to a removal action, because only these data reflect current conditions in sediment at the site.

Six surface soil contaminants were identified as COPECs:

- DRO
- 1,2,4-Trimethylbenzene
- 4-Isopropyltoluene
- Isopropylbenzene
- n-Butylbenzene
- sec-Butylbenzene

No COPECs were identified in surface water.

One sediment contaminant was identified as a COPEC:

- DRO

COPECs 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 UCL95 of the COPEC is compared to the respective RBSC rather than the maximum detected concentration, because ecological exposures would not occur only to the maximum concentration but to some average concentration of the chemical over time. EPA recommends calculating a 95UCL of the average concentration as the best measure of exposure over time (USEPA 2002b). Only the sediment data collected in June 2005, subsequent to a removal action, was used to calculate the 95UCL concentrations for the baseline risk assessment, because only these data reflect current conditions in sediment at the site.

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

Because no chemicals were identified as COCs in soil, ecological hazards resulting from exposure to surface soil are unlikely. However, five chemicals detected in soil lacked toxicity data. These five chemicals are 1,2,4-trimethylbenzene, 4-isopropyltoluene, isopropylbenzene, n-butylbenzene, and sec-butylbenzene. Any potential risks from these five chemicals cannot be defined, and are identified as an area of uncertainty.

One contaminant, DRO, was retained as a COC in sediment. The 95UCL on the mean for DRO is 135 mg/kg. Table 5-14 presents the associated hazard quotient (HQ) of 1.49, which slightly exceeds a HQ of 1.0. As defined by Menzie et al. (1993), HQs less than unity 1.0 indicate that the predicted exposures are generally acceptable and no further action is warranted. Depending on site-specific conditions, HQs greater than 1.0 but less than 10 should be evaluated using professional judgment. The DRO HQ only slightly exceeds 1.0. The chemical is unlikely to present a significant risk to ecological receptors in the creek for the following reasons:

- There are no threatened or endangered species on Adak where each individual receptor must be considered.
- Yakutat Creek was identified as a State-Sensitive Environment within SWMU 17 because it is a migratory pathway and feeding area for anadromous runs of Dolly Varden. However, this species is most likely to be exposed to chemicals in surface water and no surface water COCs were identified. Therefore, adverse effects on Dolly Varden are unlikely.
- Benthic macroinvertebrates are the target ecological receptors, and adverse effects on them are unlikely because mitigating factors, such as high reproductive

potential and recruitment from other areas, may compensate for losses to a portion of the population.

- The DRO RBSC used to estimate the HQ is likely over-protective for macroinvertebrates in sediment. The RBSC is based on modeling of the chemical from sediment to water. The adverse effects that the RBSC is protecting against occur when the chemical is present in surface water. The approach is based on the concentration of freely dissolved chemical in water. However, DRO in Yakutat Creek was not selected as a surface water COC.

- Particularly for mobile species such as the anadromous Dolly Varden, but even for sessile organisms, exposure concentrations are not constant and will vary about some unknown mean concentration over time. Therefore, the mean or median may be a better measure of the central tendency of exposure. The mean concentration of DRO was 76 mg/kg which falls below the 90.6 mg/kg RBSC.

In summary, the environmental significance of the calculated HQ of 1.49 for DRO in sediment to benthic macroinvertebrates at the population level is likely to be low. Consideration must be given to the conservative nature of the benchmark derivation and the lack of elevated DRO measured in surface water. In addition, mitigating factors include a high reproductive potential and recruitment from other areas that may compensate for losses to a portion of the benthic macroinvertebrate population, should effects actually be present. Natural sedimentation over time will further reduce the potential for exposure to benthic communities. Lastly, the mean concentration of DRO in sediments did not exceed the RBSC.

5.2.5 Conclusion

The available data suggest that surface water does not pose a significant quantifiable risk to any ecological receptor. No chemicals were identified as COCs in soil, and ecological hazards resulting from exposure to surface soil are unlikely. Because some detected chemicals in soil cannot be evaluated due to a lack of toxicity information, there is some uncertainty regarding potential ecological threats from these chemicals in soil. Based on the available sediment data, the potential ecological threat to populations of benthic macroinvertebrates in sediment and other aquatic species in Yakutat Creek from residual DRO is unlikely to present a significant risk. Any potential threat is likely lessening over time because of the source removal actions that have occurred at SWMU 17.

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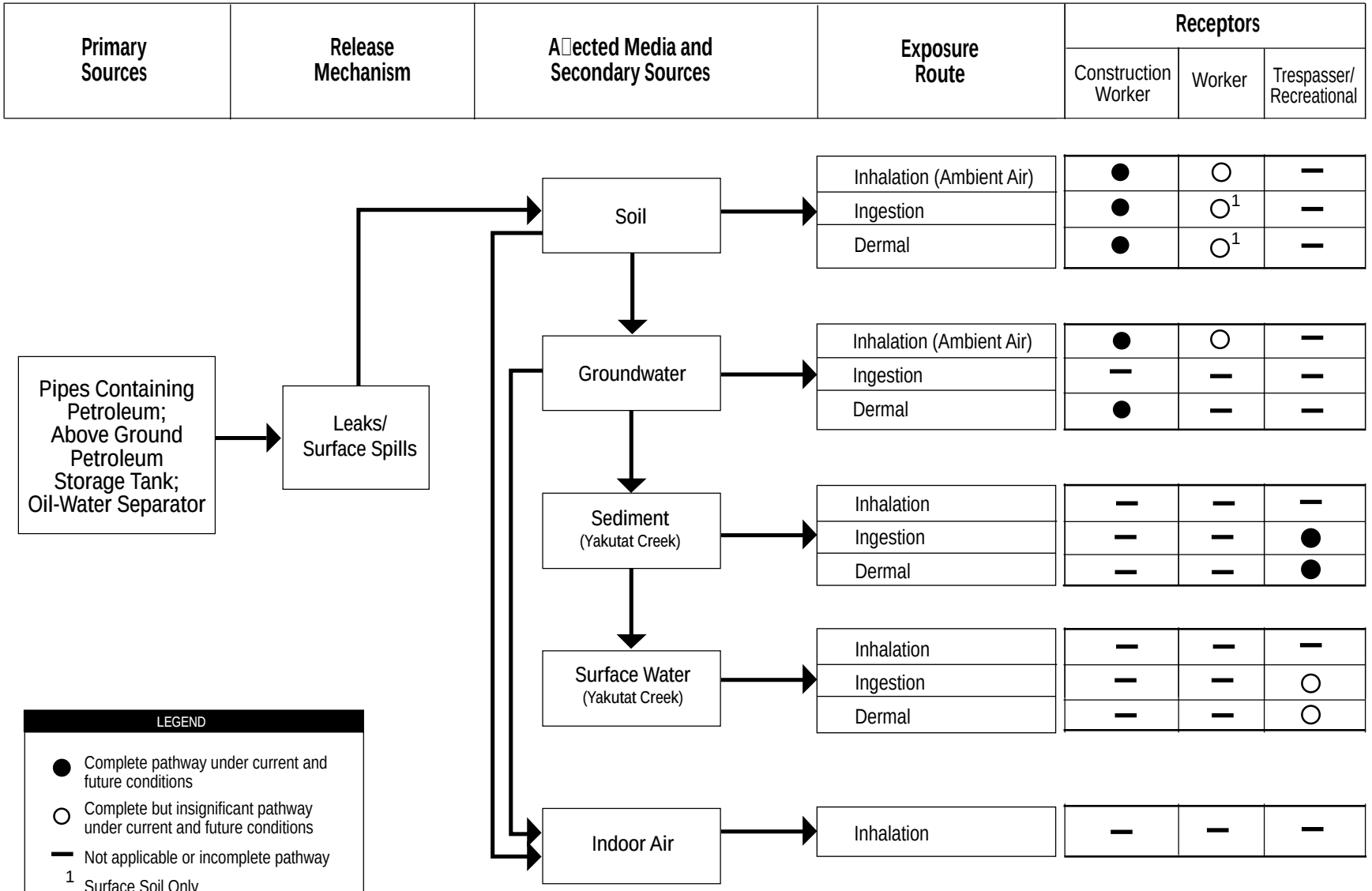

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Figure 5-1
Human Health Conceptual Site Model
SWMU 17, Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT

33759502_05.cdr

Primary Source	Primary Release Mechanism	Secondary Source	Secondary Release Mechanism	Tertiary Source	Tertiary Release Mechanism	Exposure Medium	Exposure Route	Potential Ecological Receptors									
								Terrestrial Biota				Aquatic Biota					
								Plants	Invertebrates	Birds	Mammals	Macrophytes	Phytoplankton/ Zooplankton	Benthic and Epibenthic Invertebrates	Fish	Birds	Marine Mammals
ASTs, ags Pipes, Fuel Dispensers, Drums, FCTs, Fill Spouts on USTs, and/or Unknown	Spills/Leaks of Chemicals into Soil	On-Site Surface Soil	Dust Generation and Volitilization		Particulate and Volatile Emissions	Air	Inhalation	—	○	○	○	—	—	—	—	○	—
						On-Site Surface Soil (0-6 feet bgs)	Incidental Ingestion	—	●	●	●	—	—	—	—	○	—
							Dermal Contact/ Root Uptake	●	●	○	○	—	—	—	—	○	—
							Food Web	—	○	○	○	—	—	—	—	—	—
USTs, bgs Pipes, Disposal Area, and/or Unknown		On-Site Subsurface Soil	Overland Runoff			On-Site Subsurface Soil (>6 feet bgs)	Inhalation	—	—	—	—	—	—	—	—	—	—
							Incidental Ingestion	—	—	—	—	—	—	—	—	—	—
							Dermal Contact/ Root Uptake	—	—	—	—	—	—	—	—	—	—
			Leaching and Infiltration	Groundwater	Discharge to Drainage Ditch	Yakutat Creek Former Ponds Surface Water	Incidental Ingestion	—	—	●	●	—	—	●	●	●	—
							Dermal Contact	—	—	○	○	●	●	●	●	○	—
							Food Web	—	—	○	○	—	—	○	○	○	—
Storm and Wastewater Discharge	Spills/Leaks of Chemicals into Yakutat Creek					Yakutat Creek Former Ponds Sediment	Incidental Ingestion	—	—	○	○	—	—	●	●	●	—
			Slope Erosion				Dermal Contact/ Root Uptake	—	—	○	○	●	—	●	○	○	—
			Sedimentation, Sorption				Food Web	—	—	○	○	—	—	○	○	○	—

LEGEND

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

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Adak Island, AK
DECISION DOCUMENT

Figure 5-2
Ecological Conceptual Site Model
SWMU 17, Power Plant No. 3

Table 5-1
Construction Worker Exposures to Groundwater, Exposure Assumptions and Intake Equations

Equations:

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

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

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

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 1999a
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^2 - centimeters squared
cm^3 - cubic centimeters
hr - hour
kg - kilograms
L - liters
m^3 - cubic meters
mg - milligrams
ug - micrograms
USEPA - U.S. Environmental Protection Agency

Table 5-2
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	chemical specific	m^3/kg	site-specific, USEPA 2002c
EF	Exposure frequency	190	days/year	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^2 - centimeters squared
kg - kilograms
m^3 - cubic meters
mg - milligrams

Table 5-3
Trespasser/Recreational Exposures to Sediment, Exposure Assumptions and Intake Equations

Equations:

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

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

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

Where:

SIF_{ing} (day^{-1}) = summary intake factor for ingestion of sediment

SIF_{derm} (day^{-1}) = summary intake factor for dermal contact with sediment

Parameter	Definition	Value	Units	Source
CSd	Chemical concentration in	chemical specific	mg/kg	analytical data
IR	Ingestion rate	300	mg/day	default value, USEPA 1999b
CF	Conversion factor	1.00E-06	kg/mg	not applicable
SA	Surface area	2,314	cm^2	site-specific, USEPA 1997
AF	Soil to skin adherence factor	0.2	mg/cm^2-event	default value, USEPA 2003b
ABS	Absorption factor	chemical specific	unitless	USEPA 2003b
EF	Exposure frequency(1)	7.5(ing)/21(derm)	events/year	site-specific
ED	Exposure duration	6	years	site-specific
BW	Body weight	33	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
ing - ingestion
derm - dermal

(1) Exposure frequency for the ingestion pathway is adjusted to be representative of a time-weighted exposure assuming an exposure time of 5 hours/event and 14 waking-hour days as follows:
21 (events/year) x 5 (hours/event) / 14 (waking-hour/days) = 7.5 (days/year)

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
1,2,4-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)
Dibenz(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)
Ethylbenzene	None	0.0039	Renal and testicular cancer (male rates)	EPA Group D carcinogen[b]	USEPA 2002a
Naphthalene	None	None	NA	EPA Group D carcinogen	USEPA 2002a
Xylenes	None	None	NA	EPA Group D carcinogen	USEPA 2002a
DRO aliphatics	None	None	NA	Not classified	ADEC 2000

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
DRO aromatics	None	None	NA	Not classified	ADEC 2000
GRO aliphatic	None	None	NA	Not classified	ADEC 2000
GRO aromatics	None	None	NA	Not classified	ADEC 2000

[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.

Notes:
DRO - diesel-range organics
EPA - U.S. Environmental Protection Agency
GRO - gasoline-range organics
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
SF - slope factor
NA - not applicable

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 (SRC TR-02-021/09-19-2002)	remove UF of 10 for subchronic to chronic	0.017	*NCEA (SRC TR-02-021/09-19-2002)*
1,3,5-Trimethylbenzene	0.0017	CNS symptoms	subchronic human occupational	3,000	NCEA (SRC TR-02-021/09-19-2002)	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	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]	--	--	--	--	--	--	
Dibenz(a,h)anthracene	none[e]	--	--	--	--	--	--	
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	
Naphthalene	0.00086	Nasal effects	chronic mouse	3,000	IRIS	remove adjustment from 5 to 7 days[i]	0.0043	
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	
Oral Exposures								
1,2,4-Trimethylbenzene	0.05	Decreased body weight	subchronic rats	3,000	NCEA (SRC TR-02-021/09-19-2002)	remove UF of 10 for subchronic to chronic	0.5	*NCEA (SRC TR-02-021/09-19-2002)*
1,3,5-Trimethylbenzene	0.05	Decreased body weight	subchronic rats	3,000	NCEA (SRC TR-02-021/09-19-2002)	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	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	

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]
Oral Exposures (Continued)								
Benzo(a)anthracene	none[e]	--	--	--	--	--	--	
Benzo(a)pyrene	none[e]	--	--	--	--	--	--	
Benzo(b)fluoranthene	none[e]	--	--	--	--	--	--	
Dibenzo(a,h)anthracene	none[e]	--	--	--	--	--	--	
Ethylbenzene	0.10	Liver and kidney toxicity	subchronic mouse	1,000	IRIS	remove UF of 10 for subchronic to chronic	1	
Naphthalene	0.02	Decreased body weight	subchronic rat	3,000	IRIS	remove UF of 10 for subchronic to chronic	0.2	
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	

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. Therefoe, 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.

EPA - U.S. Environmental Protection Agency
IRIS - EPA's Integrated Risk Information System (on-line data base) (USEPA 2003a)
LOAEL - lowest-observed-adverse-effect-level
NCEA - EPA's National Center for Environmental Assessment
NOAEL - no-observed-adverse-effect-level
RfD - Reference Dose
UF - uncertainty factor

Table 5-6
Summary of Exposure Point Concentrations (EPCs)

Chemical of Potential Concern	Units	EPC [a]
Construction Worker Soil		
2-Methylnaphthalene	mg/kg	6.1
Benzo(a)anthracene	mg/kg	2
Benzo(a)pyrene	mg/kg	2.2
Benzo(b)fluoranthene	mg/kg	2
Dibenz(a,h)anthracene	mg/kg	2.0
DRO (C_9-C_{24} aliphatics)	mg/kg	10,288
DRO (C_9-C_{24} aromatics)	mg/kg	5,144
GRO (C_9-C_{24} aliphatics)	mg/kg	59.4
GRO (C_9-C_{24} aromatics)	mg/kg	42.4
Naphthalene	mg/kg	5.7
Construction Worker Groundwater		
2-Methylnaphthalene	µg/L	83.3
Benzene	µg/L	4.25
Ethylbenzene	µg/L	14.5
Naphthalene	µg/L	27.3
Xylene	µg/L	29.0
DRO (C_9-C_{24} aliphatics)	µg/L	24,125
DRO (C_9-C_{24} aromatics)	µg/L	12,062
GRO (C_6-C_8 aliphatics)	µg/L	198
GRO (C_6-C_8 aromatics)	µg/L	141
1,2,4-Trimethylbenzene[b]	µg/L	180
1,3,5-Trimethylbenzene[b]	µg/L	18.4
Recreational/Trespasser Sediment		
Benzo(a)pyrene[b]	mg/kg	0.15
DRO (C_9-C_{24} aliphatics)[b]	mg/kg	47,200
DRO (C_9-C_{24} aromatics)[b]	mg/kg	23,600

[a] All EPCs are the 95 percent upper confidence limit of the mean, unless otherwise marked.
[b] This data set contains fewer than 10 samples, therefore the maximum concentration was used as the EPC.

Notes:
DRO - diesel-range organics
EPC - exposure point concentration
GRO - gasoline-range organics
µg/L - micrograms of chemical per liter of water
mg/kg - milligrams of chemicals per kilogram of soil or sediment

Table 5-7
Summary of Total RME Risks and Hazards for the Construction Worker

Chemicals of Potential Concern	Total		Groundwater		Soil	
	HI	CR	HI	CR	HI	CR
1,2,4-Trimethylbenzene	0.07	NE	0.02	NE	0.06	NE
1,3,5-Trimethylbenzene	0.04	NE	0.002	NE	0.04	NE
2-Methylnaphthalene	0.002	NE	NE	NE	0.002	NE
Benzene	0.004	1E-08	0.004	1E-08	NE	NE
Ethylbenzene	0.0002	1E-09	0.0002	1E-09	NE	NE
Naphthalene	0.01	NE	0.01	NE	0.02	NE
Xylenes	0.002	NE	0.002	NE	NE	NE
Benzo(a)anthracene	NE	7E-08	NE	NE	NE	7E-08
Benzo(a)pyrene	NE	8E-07	NE	NE	NE	8E-07
Benzo(b)fluoranthene	NE	7E-08	NE	NE	NE	7E-08
Dibenz(a,h)anthracene	NE	7E-07	NE	NE	NE	7E-07
Non-TPH Total Hazard/Risk	0.2	2E-06	0.03	1E-08	0.1	2E-06
DRO (C9-C24 aliphatics)	0.30	NE	NE	NE	0.3	NE
DRO (C9-C24 aromatics)	0.40	NE	NE	NE	0.4	NE
GRO (C6-C8 aliphatics)	0.005	NE	0.00006	NE	0.005	NE
GRO (C6-C8 aromatics)	0.06	NE	0.002	NE	0.06	NE
TPH Total Hazard	0.8	NE	0.002	NE	0.8	NE

Notes:
CR - cancer risk
DRO - diesel-range organics
GRO - gasoline-range organics
HI - hazard index
NE - not evaluated
RME - reasonable maximum exposure
TPH - total petroleum hydrocarbons

Table 5-8
Summary of Total RME Risks and Hazards for the Trespassor/Recreator

Chemicals of Potential Concern	Total		Ingestion		Dermal	
	HI	CR	HI	CR	HI	CR
Benzo(a)pyrene	a	3E-08	a	2E-08	a	1E-08
Non-TPH Total Hazard/Risk	NA	3E-08	NA	2E-08	a	1E-08
DRO (C9-C24 aliphatics)	0.1	a	0.1	a	0.04	a
DRO (C9-C24 aromatics)	0.2	a	0.1	a	0.05	a
TPH Total Hazard/Risk	0.3	NA	0.20	NA	0.09	NA

[a]Toxicity criteria are not available to quantify exposures by this pathway

Notes:
DRO - diesel-range organics
NA - not applicable; these chemicals are not considered carcinogenic or noncarcinogenic by this pathway.
TPH - total petroleum hydrocarbons

Table 5-9
Minimum and Maximum Concentrations for the Chemicals of Potential Concern Detected in Soil and Sediment, SWMU 17, Power Plant No. 3

Chemical	Frequency of Detection	Minimum Detected Concentration (mg/kg)	Maximum Detected Concentration (mg/kg)	Location of Maximum Detected Concentration
Chemicals Selected as COPCs in Soil				
1,2,4-Trimethylbenzene	4/5 (80%)	2.33	22.5	1212
1,3,5-Trimethylbenzene	3/4 (75%)	0.605	5.97	1212
2-Methylnaphthalene	30/84 (36%)	0.035	110	402
Benzo(a)pyrene	13/86 (15%)	0.37	12	808
Benzo(a)anthracene	13/86 (15%)	0.054	2.2	401
Benzo(b)fluoranthene	19/86 (22%)	0.037	1.3	401
Dibenz(a,h)anthracene	2/86 (2%)	0.077	0.088	108
Naphthalene	26/88 (30%)	0.16	45	401
DRO	100/113 (88%)	4	220,000	403
GRO	48/97 (49%)	1.2	870	315
Chemicals Selected as COPCs in Sediment[a]				
Benzo(a)pyrene	2/8 (25%)	0.126	0.15	YC-6
DRO	8/8 (100%)	13	59,000	YC-9

[a]The human health risk assessment only included sediment data collected prior to 1999. Therefore, the 2005 sediment sampling results are not included on this table.

Notes:
COPCs - chemicals of potential concern
DRO - diesel-range organics
GRO - gasoline range organics
mg/kg - milligram per kilogram

Table 5-10
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Soil at SWMU 17, Power Plant No. 3

Chemical	Maximum detected concentration (mg/kg)	RBSC (mg/kg)	Hazard quotient	Poses potential ecological risk?	Rationale
1,2,4-Trimethylbenzene	5.1	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
1,3,5-Trimethylbenzene	0.9	280000	0.000003	NO	Site chemical concentration lower than RBSC
4-Isopropyltoluene	1.3	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
Acenaphthene	1.7	53	0.03	NO	Site chemical concentration lower than RBSC
Acenaphthylene	0.9	37	0.02	NO	Site chemical concentration lower than RBSC
Benzene	0.7	240	0.003	NO	Site chemical concentration lower than RBSC
Ethylbenzene	4.3	1780	0.002	NO	Site chemical concentration lower than RBSC
Fluorene	5.5	67	0.08	NO	Site chemical concentration lower than RBSC
Isopropylbenzene	0.3	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
Lead	1.8	50	0.04	NO	Site chemical concentration lower than RBSC
Naphthalene	8.2	4240	0.002	NO	Site chemical concentration lower than RBSC
n-Butylbenzene	4.0	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
Phenanthrene	6.4	90	0.07	NO	Site chemical concentration lower than RBSC
sec-Butylbenzene	0.5	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
Toluene	5.3	6280	0.0008	NO	Site chemical concentration lower than RBSC
DRO	71000	20,100	3.5	**YES**	Site chemical concentration exceeds RBSC
GRO	870	1,840	0.5	NO	Site chemical concentration lower than RBSC
Xylenes	26.3	3,780	0.01	NO	Site chemical concentration lower than RBSC

Notes:
COPEC - Contaminant of potential ecological concern
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams contaminant per kilogram of soil
NA - not available
NC - not calculated
RBSC - Risk-based screening concentration

Table 5-11
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Surface Water at SWMU 17, Power Plant No. 3

Chemical	Maximum detected concentration (µg/L)	RBSC (µg/L)	Hazard quotient	Poses potential ecological risk?	Rationale
Lead	1	3.2	0.3	NO	Site chemical concentration lower than RBSC
Tetrachloroethene	3.7	840	0.004	NO	Site chemical concentration lower than RBSC
Xylenes	1.1	332	0.003	NO	Site chemical concentration lower than RBSC

Notes:
µg/L - micrograms contaminant per liter of water
COPEC - Contaminant of potential ecological concern
RBSC - Risk-based screening concentration

Table 5-12
Results of the Screening Level Ecological Risk Assessment to Identify COPECs in Sediment at SWMU 17, Power Plant No. 3

Chemical	Maximum detected concentration (mg/kg)	RBSC (mg/kg)	Hazard quotient	Poses potential ecological risk?	Rationale
1-Methylnaphthalene	<0.02	0.0202	NC	NO	One-half detection limit lower than RBSC
2-Methylnaphthalene	<0.02	0.0202	NC	NO	One-half detection limit lower than RBSC
Acenaphthene	<0.02	0.15	NC	NO	One-half detection limit lower than RBSC
Acenaphthylene	0.0234	0.66	0.035	NO	Site chemical concentration lower than RBSC
Anthracene	0.0439	35	0.001	NO	Site chemical concentration lower than RBSC
Benz(a)anthracene	0.0127	1.1	0.012	NO	Site chemical concentration lower than RBSC
Benzo(a)pyrene	0.0302	0.4	0.076	NO	Site chemical concentration lower than RBSC
Benzo(b)fluoranthene	0.0379	2.3	0.016	NO	Site chemical concentration lower than RBSC
Benzo(ghi)perylene	<0.02	0.31	NC	NO	One-half detection limit lower than RBSC
Benzo(k)fluoranthene	0.0016	2.3	0.001	NO	Site chemical concentration lower than RBSC
Chrysene	0.0154	2	0.008	NO	Site chemical concentration lower than RBSC
Dibenz(a,h)anthracene	<0.02	0.06	NC	NO	One-half detection limit lower than RBSC
Fluoranthene	0.0209	0.6	0.035	NO	Site chemical concentration lower than RBSC
Fluorene	<0.02	0.035	NC	NO	One-half detection limit lower than RBSC
Indeno(1,2,3cd)pyrene	0.0253	0.34	0.074	NO	Site chemical concentration lower than RBSC
Naphthalene	<0.02	0.99	NC	NO	One-half detection limit lower than RBSC
Phenanthrene	<0.02	0.225	NC	NO	One-half detection limit lower than RBSC
Pyrene	0.0217	0.35	0.06	NO	Site chemical concentration lower than RBSC
DRO	258	90.6	2.85	**YES**	Site chemical concentration exceeds RBSC

Notes:
COPEC - Contaminant of potential ecological concern
DRO - diesel-range organics
mg/kg - milligrams contaminant per kilogram of sediment
NC - not calculated
RBSC - Risk-based screening concentration

Table 5-13
Results of the Baseline Ecological Risk Assessment to Identify COCs in Soil at SWMU 17, Power Plant No. 3

Chemical	Exposure point concentration (mg/kg)	RBSC (mg/kg)	Hazard quotient	Poses potential ecological risk?	Rationale
1,2,4-Trimethylbenzene	5.1	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
4-Isopropyltoluene	1.3	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
Isopropylbenzene	0.3	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
n-Butylbenzene	4.0	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
sec-Butylbenzene	0.5	NA	NC	**YES**	No RBSC available for this chemical, retain as COPEC
TPH - Diesel	10931	20,100	0.54	NO	Exposure point concentration lower than RBSC

Notes:
COC - chemicals of concern
COPEC - chemical of potential ecological concern
mg/kg - milligrams contaminant per kilogram of soil
NA - not available
NC - not calculated
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons
95% UCL - 95% upper confidence limit of the arithmetic mean chemical concentration

Table 5-14
Results of the Baseline Ecological Risk Assessment to Identify COCs in Sediment at SWMU 17, Power Plant No. 3

Chemical	Exposure point concentration (mg/kg)	RBSC (mg/kg)	Hazard Quotient	Poses potential ecological risk?	Rationale
DRO	135	90.6	1.49	**YES**	Effects at individual level considered possible; effects at population level considered to be low. *

*See Section 5.2.4.

Notes:
COC - chemicals of concern
DRO - diesel-range organics
mg/kg - milligrams contaminant per kilogram of sediment
RBSC - Risk-based screening concentration
TPH - Total petroleum hydrocarbons

6.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

This section describes the remedial action objectives (RAOs) and the cleanup levels established for SWMU 17.

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 SWMU 17:

- 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

- Minimize exposure to free-phase product

The necessity for RAOs to protect ecological receptors was evaluated on the basis of ecological hazards resulting from exposure to petroleum hydrocarbons released at the site. Ecological hazards were estimated for site soil, surface water in Yakutat Creek, and sediment in Yakutat Creek. Ecological hazards from exposure to soil were found to be below target health goals for all detected petroleum compounds with published toxicity information. Ecological hazards from exposure to surface water in Sweeper Cove were found to be below target health goals (i.e., a HQ less than 1). The HQ for DRO in sediment was calculated to be 1.49, which is greater than the target health goal of 1. However, the ecological risk assessment concluded that the potential ecological threat in Yakutat Creek from residual DRO is unlikely to present a significant risk as discussed in Section 5.2.

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 Chapter 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 SWMU 17 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 SWMU 17 to estimate the potential extent of soil impacted by petroleum contamination at the site (see Section 4). The Alaska DEC Method Four cleanup levels [18 AAC 75.340(a)(4)], which are based on site-specific risk assessments, were used to establish cleanup levels for the site. However, the risk assessment for this site established that the existing concentrations in soil do not pose a risk to humans or the environment above target health goals. Therefore, soil concentrations remaining at the site meet cleanup level requirements because they do not represent a health risk for the site-specific population.

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 SWMU 17 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 bodies of the state, Alaska regulation 18 AAC Chapter 70 establishes water quality standards based on water use classes and subclasses. 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 total aqueous hydro-carbons (TAqH) in the water column may not exceed 15 micrograms/liter (µg/L) and that total aromatic hydrocarbons (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)]. No risk-based cleanup levels were calculated for surface water, because the human health and ecological risk assessments determined that risks resulting from exposure to surface water are acceptable. Results of the ecological risk assessment are discussed in Section 5.0.

Alaska State Regulations do not establish chemical-specific cleanup levels for sediment (ADEC 2004). Therefore, sediment cleanup levels were established based on the results of the human health and ecological risk assessments. Because the human health and ecological risk

assessments concluded that significant risks were not present at the site, no cleanup levels are necessary for sediment. The results of the risk assessments are discussed in Section 5.0.

6.3 EXTENT OF CONTAMINATION

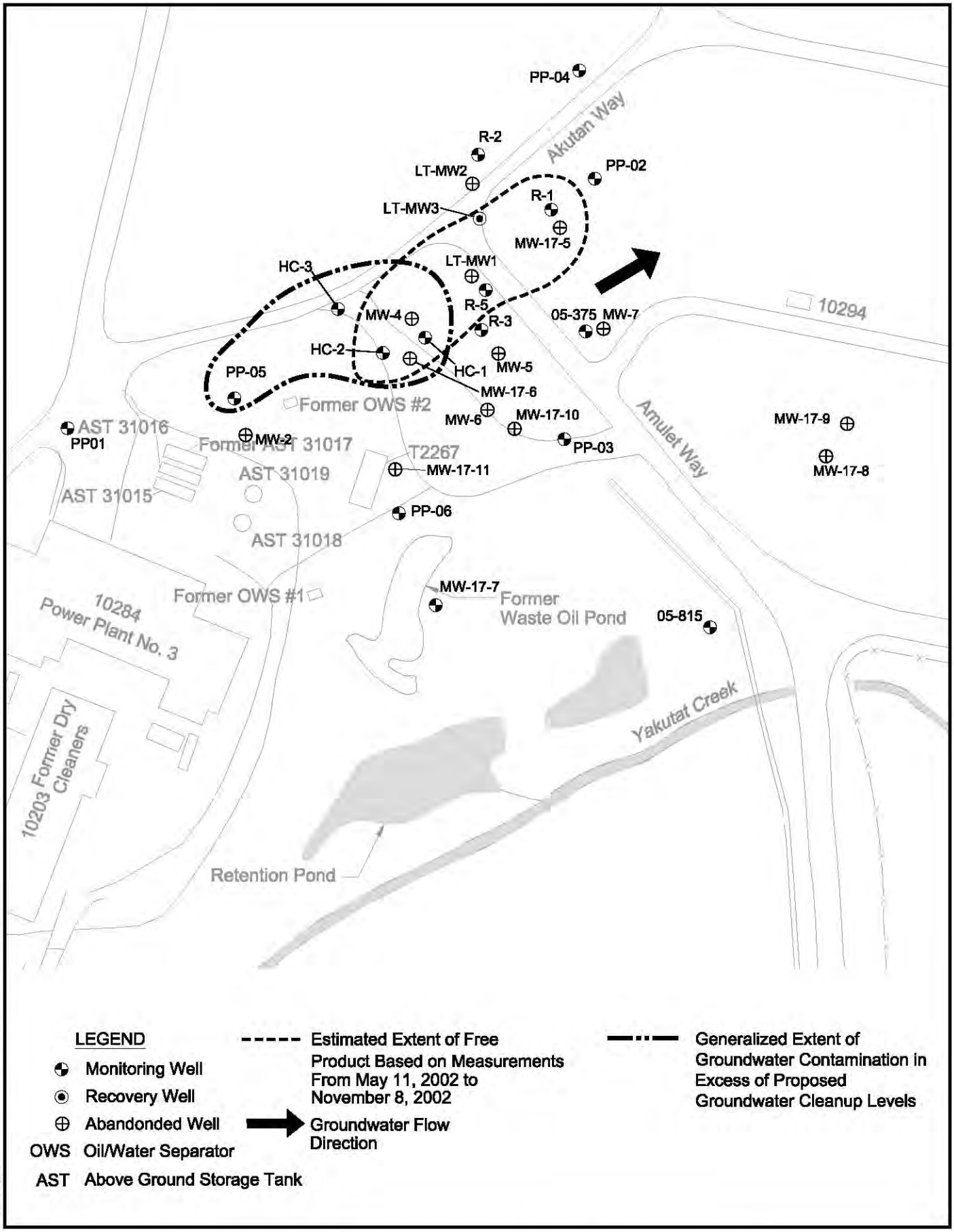
The media of concern for which RAOs were established in Section 6.1 include groundwater and free-phase product. The extent of contamination for these media, based on the cleanup levels presented in Section 6.2, is summarized below and shown on Figure 6-1.

The approximate extent of free-product remaining on the site is presented in Section 4. Figures 4-1 and 6-1 show the estimated extent of residual free product based on measurements obtained between May and November 7, 2002. Free product recovery activities at SWMU 17 have reduced the extent of free product to approximately 21,000 square feet (ft^2). An estimated 57 to 280 gallons of recoverable free product may remain in the subsurface at the site.

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 on Figure 6-1. The Alaska DEC criterion established for groundwater not currently used for, or not reasonably expected to be used for drinking water applicable to this site is:

- DRO 15,000 µg/L (15 milligrams per liter [mg/L])

The area that potentially exceeds the Alaska DEC criteria for groundwater not used for drinking water totals approximately 21,000 ft^2.



FILENAME: T:\ADAK\IDIQ\Sub-Tasks\DO 3\SWMU 17 DEC DOC\FIG 6-1 FREE PROD GW.dwg
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U.S. NAVY	N 0 30 60 120 SCALE IN FEET	**Figure 6-1** **Estimated Extent of Residual Free Product and Groundwater Contamination** **SWMU 17, Power Plant No. 3**	Adak Island, AK DECISION DOCUMENT

Table 6-1
Soil and Groundwater Screening Criteria and Cleanup Levels, SWMU 17, Power Plant No. 3

Chemical	Soil[a]	Groundwater	
	Screening Criteria (Method Two)[b] (mg/kg)	Screening Criteria (Table C)[b] (mg/L)	Ten Times Table C[c] (mg/L)
Total Petroleum Hydrocarbons			
DRO[d]	230	1.5	15
GRO	260	1.3	13
Volatile Organic Compounds			
Benzene	0.02	0.005	0.05
Toluene	4.8	1	10
Ethylbenzene	5	0.7	7
Total Xylenes	69	10	100
Noncarcinogenic Polycyclic Aromatic Hydrocarbons			
2-Methylnaphthalene	38	1.5	15
Naphthalene	19	0.7	7
Carcinogenic Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene	2.4	0.0002	0.002

[a]Cleanup levels for soil are not presented here. Soil concentrations remaining at the site meet cleanup level requirements because they do no represent a health risk for the site-specific population.
[b]Used as screening criteria to determine potential extent of contamination
[c]Used as cleanup levels for remediation
[d]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:
DRO - diesel-range organics
GRO - gasoline-range organics
mg/kg - milligrams per kilogram
mg/L - milligram per liter

7.0 REMEDIAL ACTION ALTERNATIVES

A comprehensive array of remedial alternatives was previously identified, developed, and evaluated by the Navy for the 128 petroleum-release sites, including the 14 free-product recovery sites, at the former Adak Naval Complex during the 1998 FFS, as amended in 1999 (URSG 1998 and 1999b). The 1998 FFS, as amended, provided the information required to select the preferred remedies for the 128 petroleum release sites in the OU A ROD, which was signed in 2000. For the 14 free-product recovery sites, the OU A ROD selected an interim remedy, which consisted of free-product recovery. The OU A ROD also specified that these 14 sites were designated for future final remedy selection. Final remedy selection for SWMU 17 is described in this DD and the SWMU 17 FFS (URS 2006).

The list of cleanup alternatives developed for petroleum-release sites during the 1998 FFS, as amended (URSG 1998 and 1999b), was used as the starting point for identifying alternatives for SWMU 17. The full list of alternatives from the 1998 FFS, as amended, is:

Alternative 1, No Action. This alternative is included as a baseline to represent current conditions. No remedial actions are included with this alternative. It is used for comparison to the other alternatives.

Alternative 2, Limited Groundwater Monitoring. Groundwater monitoring would be conducted to confirm that concentrations of petroleum-related chemicals in groundwater are declining. This approach to cleanup relies on naturally occurring processes to reduce petroleum concentrations in groundwater. Microorganisms present in soil and groundwater break down petroleum compounds into harmless chemicals.

Alternative 3, Monitored Natural Attenuation and Institutional Controls. Groundwater monitoring would be conducted to evaluate whether petroleum-related chemicals in groundwater are attenuating to concentrations below applicable Alaska DEC groundwater cleanup levels. Petroleum-related chemicals that currently exceed applicable Alaska DEC cleanup levels would be monitored, as well as natural attenuation indicator compounds. This approach to cleanup relies on naturally occurring processes to reduce petroleum concentrations in groundwater. This alternative also includes institutional controls as an additional means of reducing potential exposure to petroleum contamination. Institutional controls are currently in place and are described in Sections 2.1 and 2.7.

Alternative 4, Product Recovery. Free product on the groundwater surface would be collected to the maximum extent practicable using skimmers.

Alternative 5, Limited Soil Removal/Source Removal and Thermal Desorption. Petroleum-contaminated soil would be excavated and then heated to drive off the petroleum compounds.

Alternative 6, *Ex Situ* Bioremediation of Soil. Petroleum-contaminated soil would be excavated and placed in a lined pile for treatment. Air, water, and nutrients would be added to the soil to encourage microorganisms to break down the petroleum compounds to harmless chemicals.

Alternative 7, *In Situ* Bioremediation of Soil, Monitored Natural Attenuation, and Institutional Controls. Petroleum-contaminated soil would be treated in the ground. This alternative relies on the same naturally-occurring microorganisms as natural attenuation. However, the growth of the microorganisms is encouraged by increasing air flow in ground by either blowing air into the ground or by pulling air through the soil. This alternative would also include institutional controls. Institutional controls are currently in place and are described in Sections 2.1 and 2.7.

Alternative 8, Soil Cover, Monitored Natural Attenuation, and Institutional Controls. Contaminated surface soil would be covered with a layer of clean soil to prevent contact with petroleum. Institutional controls would be used to further limit contact with petroleum chemicals in soil and groundwater. Natural attenuation would cause the petroleum concentrations to decrease. Institutional controls are currently in place and are described in Sections 2.1 and 2.7.

Alternative 9, Soil Vapor Extraction/Air Sparging, Monitored Natural Attenuation, and Institutional Controls. A vacuum system is used to cause light petroleum compounds to move to vapor extraction wells. It is only effective for lighter petroleum materials such as those present in gasoline. Institutional controls would be used to limit potential contact with petroleum. Institutional controls are currently in place and are described in Sections 2.1 and 2.7.

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The results of the 1998 FFS, as amended (URSG 1998 and 1999b), were applied to the analysis of remedial alternatives for SWMU 17. The criteria used to complete the alternative evaluation in the 1998 FFS, as amended, were based on EPA guidance, which encompasses Alaska DEC guidance, and are summarized in Table 8-1. State acceptance and community acceptance were evaluated after public and state comments on the proposed cleanup action. Therefore, these two criteria were not evaluated in the 1998 FFS, as amended.

An evaluation of alternatives using the EPA criteria was performed separately for each of the 128 petroleum-release sites at the Former Adak Naval Complex in the 1998 FFS, as amended (URSG 1998 and 1999b). In order to summarize the results of the evaluations for the 128 petroleum-release sites, the January 1998 *Proposed Plan for Cleanup Action at Petroleum Sites on Adak Island* (U.S. Navy et. al 1998) presented the evaluations for nine categories of sites. The nine categories of petroleum sites are provided in Table 8-2. Sites that had similar characteristics were grouped together into the nine categories and a single alternative evaluation was presented for each category. Because free product has been recovered to the maximum extent practicable, the category applicable to SWMU 17 is:

- Category 7 – Diesel sites, soil concentrations above screening levels (Alaska DEC Method Two Cleanup Levels), without buildings over the source area, groundwater risk above acceptable risk (groundwater risk is not acceptable if concentrations are greater than the Alaska DEC Cleanup Levels for groundwater not used as a drinking water source)

The alternative evaluation that was performed for the Category 7 Sites in the January 1998 *Proposed Plan for Cleanup Action at Petroleum Sites on Adak Island* (U.S. Navy et al. 1998) is applicable to SWMU 17, because the petroleum concentrations in soil are above the screening criteria (Alaska DEC Method Two cleanup levels) and the petroleum concentrations in groundwater are above the Alaska DEC cleanup levels for groundwater not used as a drinking water source.

The alternative evaluations that were performed for Category 1, 2, 3, 4, 5, 6, 8, and 9 sites are not applicable to SWMU 17. Category 1 is not applicable because the practicable endpoint for free product recovery has been reached as discussed in Section 4. Category 2 is not applicable because DRO is present at this site. Category 3, 4, and 5 are not applicable to this site because groundwater issues are not addressed with these categories. Finally, Category 8 and 9 are not applicable to this site because estimated ecological risks are acceptable.

The alternative evaluation for Category 7 sites presented in the January 1998 Proposed Plan (U.S. Navy et al. 1998) was modified slightly. First, Alternative 2, Limited Groundwater Monitoring, was not evaluated in the January 1998 Proposed Plan. It was added in the 1999 *Focused Feasibility Study Amendment* (URSG 1999b), and an evaluation was never performed for this alternative. Therefore, an evaluation of this alternative was added during preparation of the FFS (URS 2006). Furthermore, the site-specific costs presented in the January 1998 Proposed Plan are not directly applicable to SWMU 17. Therefore, the cost evaluation was also modified to provide relative costs. The resulting modified figure is included as Figure 8-1. Alternative 4 is not applicable to Category 7 sites because free product is not present in recoverable quantities at these sites. Alternatives 8 and 9 are also not applicable to the Category 7 sites. Alternative 8 is not applicable, because this alternative applies only to sites with unacceptable ecological risks. Alternative 9 is not applicable because this alternative applies to sites with only GRO present.

As discussed above, Alternatives 4, 8, and 9 do not apply to Category 7, and an evaluation for these alternatives is not provided in Figure 8-1. In addition, because site conditions do not pose a risk to human health or the environment at SWMU 17, remedial alternatives developed for sites that do pose a risk above target health goals (Alternatives 5, 6, and 7) were eliminated as potential preferred remedial alternatives. Therefore, the list of preferred remedial alternatives that may be selected for this site is limited to Alternatives 1, 2, or 3.

In order to maintain consistency with cleanup decisions made in the OU A ROD, the 1998 FFS (as amended), the January 1998 Proposed Plan, and the OU A ROD were reviewed to determine what factors or criteria were used to select the preferred remedy for the 128 sites addressed in these documents. These factors or criteria are the suitability criteria listed in Table 8-3.

The preferred cleanup alternative for this site was selected based on a comparison of site-specific conditions to the criteria used to determine the suitability of an alternative, as presented in Table 8-3. A solid bullet in this table adjacent to a suitability criterion indicates that site-specific conditions match the alternative's suitability criterion. An alternative is identified as the preferred remedy when site-specific conditions most closely match the alternative's suitability criteria.

Based on these comparisons, Alternative 3, Monitored Natural Attenuation and Institutional Controls, is the preferred remedial alternative for SWMU 17. 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. Alternative 3 is selected for this site because groundwater concentrations are above the Alaska DEC cleanup levels. Monitored natural attenuation is needed to reduce concentrations to below the Alaska DEC cleanup levels, and institutional controls are needed as long as concentrations are above Alaska DEC cleanup levels. Therefore, Alternative 3 is protective of human health and the environment and complies with

Alaska regulations. It provides good long-term and short-term effectiveness at a low cost. In addition, the state concurs with the selection of this alternative and it is acceptable to the public. Finally, Alternative 3 is readily implementable.

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EPA CRITERIA	Alt 1	Alt 2	Alt 3	Alt 4[a]	Alt 5	Alt 6	Alt 7	Alt 8[b]	Alt 9[c]
Overall protectiveness of human health and the environment	○	◔	◒		◔	◒	◒		
Compliance with ARARs	○	◔	◒		◔	◒	◒		
Long-term effectiveness and permanence	○	◔	◒		●	◔	◒		
Reduction of toxicity, mobility, or volume through active treatment	○	○	○		◔	◒	◒		
Short-term effectiveness	◔	◒	◒		◒	◒	◒		
Implementability	●	◔	◔		◔	◒	◔		
Cost	●	●	◔		○	◔	◒		
State acceptance	○	◔	◔		◔	◔	◔		
Community acceptance	○	◔	◔		◔	◔	◔		

ALTERNATIVES	
Alternative 1	No Action
Alternative 2	Limited Groundwater Monitoring
Alternative 3	Monitored Natural Attenuation and Institutional Controls
Alternative 4	Product Recovery
Alternative 5	Limited Soil Removal/Source Removal and Thermal Desorption
Alternative 6	Ex Situ Bioremediation of Soil
Alternative 7	In Situ Bioremediation of Soil, Monitored Natural Attenuation, and Institutional Controls
Alternative 8	Soil Cover, Monitored Natural Attenuation and Institutional Controls
Alternative 9	Soil Vapor Extraction/Air Sparging, Monitored Natural Attenuation, and Institutional Controls

LEGEND

- ● Superior
- ◔ Excellent
- ◒ Good
- ◔ Fair
- ○ Poor
- Technology and/or alternative not applicable for site

[a] This alternative only applies to sites with recoverable amounts of free product. Since free product has been recovered to the maximum extent practicable at SWMU 17, this alternative does not apply.

[b] This alternative only applies to sites with unacceptable ecological risks. Since ecological risks are acceptable at SWMU 17, this alternative does not apply.

[c] This alternative only applies to sites with GRO as a contaminant of concern. Since GRO is not a contaminant of concern at SWMU 17, this alternative does not apply.

U.S.NAVY

Figure 8-1
Evaluation of Alternatives for SWMU 17,
Power Plant No. 3

Adak Island, AK
DECISION DOCUMENT

Table 8-1
EPA Criteria

EPA Criteria	Comparable Alaska DEC Criteria	Description
Overall protection of human health and the environment	Protectiveness	Whether a cleanup action provides adequate protection and how potential risks are eliminated, reduced, or controlled through treatment or control
Compliance with regulations	Regulations	Whether a cleanup action will meet all potential cleanup levels
Long-term effectiveness and permanence	Short- and long-term effectiveness	The ability of a cleanup action to reliably protect human health and the environment over time
Reduction of toxicity, mobility, or volume through active treatment	None	How well treatment technologies that may be used in a cleanup action work; how well the cleanup treatment may work to make the chemicals less harmful, make them less likely to spread, or reduce the amount of contaminated material
Short-term effectiveness	Short- and long-term effectiveness	How quickly the cleanup action is able to protect human health and the environment and what is its potential to create adverse effects during construction and implementation
Implementability, suitability	Practicable	How readily the cleanup can be accomplished: Are needed materials and services available? How appropriate is the solution to the problem?
Cost	Practicable	Costs to build, operate, and maintain the cleanup remedy
State acceptance	None	Whether, based on its review of the project documents and proposed plan, the state agrees with, opposes, or has no comment on the preferred alternative
Community acceptance	Public input	Whether the public agrees with, opposes, or has no comment on the preferred alternative

Notes:
DEC - Alaska Department of Environmental Conservation
EPA - U.S. Environmental Protection Agency

Table 8-2
Categories of Petroleum Sites on Adak Island

Category	Site Description
1	Free product sites
2	Gasoline only sites
3	Diesel sites, soil concentrations below screening levels, near surface water, with buildings over the source area
4	Diesel sites, soil concentrations below screening levels, near surface water, without buildings over the source area
5	Diesel sites, soil concentrations above screening levels, near surface water, with buildings over the source area
6	Diesel sites, soil concentrations above screening levels, without buildings over the source area, groundwater risk is below acceptable risk
7	Diesel sites, soil concentrations above screening levels, without buildings over the source area, groundwater risk above acceptable risk
8	Diesel sites, soil concentrations above screening levels, without buildings over the source area, predicted ecological risk above acceptable risk
9	Diesel sites, soil concentrations above screening levels, with buildings over the source area, predicted ecological risk above acceptable risk

Table 8-3
Evaluation of Suitability of Cleanup Alternative

Criteria to Determine the Suitability of Alternative	SWMU 17
Alternative 1: No Action	
● Petroleum-related chemicals do not pose an imminent threat to human health or the environment	●
● Petroleum-related chemicals on site do not exceed ADEC soil or groundwater cleanup levels	○
Selected as Preferred Alternative	NO
Alternative 2: Limited Groundwater Monitoring	
● Petroleum-related chemicals do not pose an imminent threat to human health or the environment (exclusive of the human health groundwater ingestion pathway)	●
● Groundwater at the site is not a reasonably expected potential future source of drinking water based on 18 AAC 75.350(2)	●
● Groundwater that is closely connected hydrologically to nearby surface water does not cause a violation of the Alaska Water Quality Standards, 18 AAC 70	NA
● Soil contains petroleum-related chemicals at concentrations above ADEC soil cleanup levels	●
● Groundwater monitoring indicates the presence of petroleum-related chemicals at concentrations below ADEC groundwater cleanup levels	○
Selected as Preferred Alternative	NO
Alternative 3: Monitored Natural Attenuation and Institutional Controls	
● Petroleum-related chemicals do not pose an imminent threat to human health or the environment (exclusive of the human health groundwater ingestion pathway)	●
● Groundwater at the site is a reasonably expected potential future source of drinking water based on 18 AAC 75.350(2)	○
● Groundwater that is closely connected hydrologically to nearby surface water does not cause a violation of the Alaska Water Quality Standards, 18 AAC 70	NA
● Soil contains petroleum-related chemicals at concentrations above ADEC soil cleanup levels	●
● Groundwater monitoring indicates the presence of petroleum-related chemicals at concentrations above ADEC groundwater cleanup levels	●
Selected as Preferred Alternative	YES
Alternative 4: Product Recovery	
● Site has quantities of residual free product on the groundwater surface that are considered practicable to recover	○
Selected as Preferred Alternative	NO

● true
○ false

Notes:
AAC - Alaska Administrative Code
ADEC - Alaska Department of Environmental Conservation
NA - not applicable
SWMU - solid waste management unit

9.0 DESCRIPTION OF SELECTED CLEANUP ACTION

Alternative 3 – Monitored Natural Attenuation (MNA) and Institutional Controls – is selected as the remedial alternative for SWMU 17. This cleanup alternative was selected for SWMU 17 based on its ability to meet the two human health RAOs:

- 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
- Minimize exposure to free-phase product

The selected cleanup alternative consists of institutional controls for soil and groundwater and MNA for groundwater. Petroleum concentrations in groundwater will be reduced through natural attenuation. Institutional controls will be used to protect human health and the environment until groundwater no longer exceeds Alaska DEC groundwater cleanup levels.

The MNA timeframe for the site cannot be accurately predicted at this time. Therefore, the timeframe needed to achieve the Alaska DEC groundwater cleanup levels will be estimated after 5 years of monitoring has been completed. 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; 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. Short-term risks associated with monitored natural attenuation will be controlled through the use of personal protective equipment.

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 to be implemented at SWMU 17 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 are presently being conducted as part of the ICMP to evaluate compliance with equitable servitude restrictions, and these site inspections will continue. In addition, groundwater monitoring will be implemented at the site. Monitoring of groundwater will continue 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 (CMP) for the Former Adak Naval Complex (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 monitoring plan. Concentrations of petroleum-related chemicals currently exceeding the 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 2007 as specified in the CMP. All groundwater monitoring activities at SWMU 17 will be coordinated with the ongoing annual monitoring activities described in the CMP.

All available site-specific groundwater 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 and concentrations of petroleum-related chemicals in groundwater are decreasing. 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. If the groundwater contaminant plume is shown to be stable or shrinking during two consecutive annual monitoring events, then the Navy will petition Alaska DEC for less frequent monitoring. MNA 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 two consecutive monitoring events in all site wells selected for monitoring in the CMP. This criteria for cessation of MNA is consistent with the criteria used for the other free-product petroleum sites on Adak that also pose no unacceptable risk to

human health or the environment above target health goals, provided that institutional controls prohibiting the use of groundwater as a drinking water source remain in effect.

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 summarized by the Navy and submitted for review by the Alaska DEC. The 5-year reviews will evaluate the effectiveness of the selected remedy at SWMU 17. Based on these reviews, the Navy and the Alaska DEC will decide whether continued monitoring, or additional actions are necessary at the site.

10.0 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.

10.1 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 SWMU 17 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 SWMU 17 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.

10.2 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 SWMU 17 because remedial actions are not proposed in sensitive environments.

10.3 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)

11.0 PUBLIC INVOLVEMENT

11.1 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 through 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, Silverdale, 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 ADEC 2006d) was provided to the public for review during the 30-day public comment period beginning on August 1, 2006. In addition, the City of Adak (the current landowner) was provided a copy of the FFS (URS 2006) and the proposed plan (U.S. Navy and Alaska DEC 2006d) and was invited to comment on these documents.

11.2 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:

Gary D. Simmons
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1101 Tautog Circle
Silverdale, WA 98315
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Guy Warren
Project Manager, Federal Facilities Environmental Restoration Program,
Contaminated Sites Program
Alaska Department of Environmental Conservation
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Anchorage, AK 99502
Phone: (907) 269-7528
Fax: (907) 269-7649
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12.0 RESPONSIVENESS SUMMARY

No comments were received during the public comment period for the proposed plan (U.S. Navy and ADEC 2006d).

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APPENDIX A

Legal Description

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

Beginning at U.S. Navy control point A-12 (NAD 83 - N=318,813.81 E=3,131,902.86), which is South 23°48′38″ East 2,882.16 feet from U.S. Navy control point L-3; thence North 63°04’59” East 549.92 feet; thence South 10°07’40” East 697.97 feet; thence South 50°33’01” West 521.70 feet; thence North 70°21’41” West 458.75 feet; thence North 00°42’45” East 282.25 feet; thence North 33°13’57” East 398.37 feet to the POINT OF BEGINNING. Containing 12.72 acres more or less.

APPENDIX B

ANALYTICAL RESULTS

Table B-1
Summary of Analytical Results for DRO, GRO, and BTEX in Soil Samples
SWMU 17, Power Plant No. 3

Location ID	Location Cross Reference	Sample Date	Depth Range (feet bgs)	Diesel-Range Organics (mg/kg)	Gasoline-Range Organics (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)
Upland Locations									
19	UA2(SB-2)	7/15/1990	5 - 7	NA	NA	0.0075 U	0.0066 J	0.034	0.064
22	UA5	7/22/1990	0 - 0.5	NA	NA	0.0079 U	0.0093	0.0079 U	0.048
24	UA7	7/22/1990	0 - 0.5	NA	NA	0.0012 U	0.0012 U	0.0012 U	0.0025 U
26	UA9	7/22/1990	0 - 0.5	NA	NA	0.0016 U	0.0016 U	0.0016 U	0.0031 U
34	LA2	7/22/1990	0 - 0.5	NA	NA	0.015 U	0.015 U	0.12	0.43
35	LA3	7/22/1995	0 - 0.5	NA	NA	0.0067 U	0.016	0.0067 U	0.0053
		7/30/1995	0 - 0.5	**17,000**	110 J	1.5 U	1.5 U	1.5 U	1.5 U
44	LA12	7/22/1990	0 - 0.5	NA	NA	0.31 U	0.31 U	0.31 U	0.31 U
82	022-1	7/29/1995	0 - 0.5	**1,500**	1 UJ	0.011 U	0.011 U	0.011 U	0.011 U
85	022-2	7/29/1995	0 - 0.5	**9,500**	130 J	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ
86	022-3	7/29/1995	0 - 0.5	62	1.3 UJ	0.013 U	0.013 U	0.013 U	0.013 U
105	105	7/30/1995	0 - 0.5	150	1.3 UJ	0.012 U	0.012 U	0.012 U	0.012 U
106	106	7/30/1995	0 - 0.5	**66,000 J**	**520 J**	**0.12 J**	0.11 J	0.013 UJ	0.56 J
108	108	8/3/1995	0 - 0.5	**98,000**	130	0.085 U	0.085 U	0.085 U	0.085 U
118	118	8/3/1995	0 - 0.5	**16,000**	51	1.6 U	1.6 U	1.6 U	1.6 U
313	OX-4-7-13	2/3/1997	2 - 3	**3,200**	1.3 U	0.032 U	0.032 U	0.032 U	0.032 U
			3 - 4	**4,700**	2.4 U	0.06 U	0.13	0.06 U	0.38
			4 - 5	**540**	5.1	0.069 U	0.29	0.069 U	0.87
			5 - 6	**71,000**	83	0.37 U	**5.3**	0.37 U	15
315	OX-4-8-15	1/30/1997	1 - 2	46	3.2 U	NA	NA	NA	NA
			2 - 3	**2,100**	**300**	NA	NA	NA	NA
			3 - 4	**470**	**870**	NA	NA	NA	NA
			4 - 5	**5,700**	160	NA	NA	NA	NA
401	0-24'	7/20/1995	0 - 1.5	**250 J**	5.3 U	0.015	0.014	0.004 U	0.006
			1.5 - 3	**13,000 J**	11 U	NA	NA	NA	NA
			3 - 4.5	54	53	0.005 U	0.005 U	0.005 U	0.006 U
			4.5 - 6	13 U	6.3 U	0.004 U	0.004 U	0.004 U	0.003 J
			6 - 7.5	210 J	7.1	0.007	0.005 U	0.005 J	0.047
			7.5 - 9	**3,100 J**	38	0.005 U	0.004 J	0.005 U	0.002 J
			9 - 10.5	**5,600 J**	6.5 U	0.005 U	0.004 J	0.005 U	0.001 J
			10.5 - 12	**7,700 J**	73	0.005 U	0.005 J	0.005 U	0.013
			12 - 13.5	**2,100 J**	7.2	0.005 U	0.005 U	0.005 U	0.006 U
			18 - 19.5	**2,400 J**	12	0.004 U	0.004 U	0.004 U	0.002 J
			19.5 - 21	**300**	9	0.004 U	0.004 U	0.002 J	0.004 J
			21 - 22.5	**300**	5.6 U	0.005 U	0.005 U	0.005 U	0.006 U
			22.5 - 24	11 U	5.7 U	0.005 U	0.005 U	0.005 U	0.006 U
402	0-16'	7/20/1995	0 - 2	**1,300 J**	5.3 U	0.005 U	0.005 U	0.005 U	0.006 U
			2 - 4	**560 J**	11	0.008 U	0.008 U	0.002 J	0.01 U
			4 - 6	**8,200 J**	15	**0.068**	0.032 U	0.037	0.096
			6 - 8	**320**	23	0.005 U	0.005 U	0.004 J	0.007
			8 - 10	**3,500 J**	**380**	0.004 U	0.016	0.033	1.7
			10 - 12	**11,000 J**	**280**	**0.083**	1.8	2.7	6.4
			12 - 14	**4,300 J**	180	0.017 J	0.19	0.39	1.6
			14 - 16	**1,700 J**	38	0.007 J	0.17	0.46	1.8
403	403	8/7/1995	0 - 0.5	**220,000**	22	3.9 U	**6.9**	**16**	**120**
404	404	8/7/1995	0 - 0.5	**64,000**	210	2 U	2 U	2 U	2 U
504	13812	10/24/1992	0.25 - 0.75	NA	NA	37 UJ	37 UJ	37 UJ	37 UJ
505	13813	10/24/1992	0.25 - 0.75	NA	NA	18 U	18 U	18 U	18 U
506	AKU/AMU	10/27/1992	0.25 - 0.75	NA	NA	0.014 U	0.014 U	0.014 U	0.014 U

Table B-1 (Continued)
Summary of Analytical Results for DRO, GRO, and BTEX in Soil Samples
SWMU 17, Power Plant No. 3

Location ID	Location Cross Reference	Sample Date	Depth Range (feet bgs)	Diesel-Range Organics (mg/kg)	Gasoline-Range Organics (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)
808	999080-SL-WP-04	4/27/1999		60	NA	NA	NA	NA	NA
809	999080-SL-WP-05	4/27/1999		71	NA	NA	NA	NA	NA
810	999080-SL-WP-06	4/27/1999		12	NA	NA	NA	NA	NA
811	999080-SL-WP-07	4/27/1999		41	NA	NA	NA	NA	NA
812	999080-SL-WP-08	4/27/1999		**4,000**	NA	NA	NA	NA	NA
813	999080-SL-WP-09	4/27/1999		**2,100**	NA	NA	NA	NA	NA
814	999080-SL-WP-10	4/27/1999		99	NA	NA	NA	NA	NA
815	999080-SL-WP-11	4/27/1999		10	NA	NA	NA	NA	NA
816	999080-SL-WP-12	4/27/1999		25	NA	NA	NA	NA	NA
817	999080-SL-WP-13	4/27/1999		15	NA	NA	NA	NA	NA
818	999080-SL-WP-14	4/28/1999		6.2 U	NA	NA	NA	NA	NA
819	999080-SL-WP-15	4/28/1999		5.3 U	NA	NA	NA	NA	NA
820	999080-SL-WP-16	4/28/1999		18	NA	NA	NA	NA	NA
821	999080-SL-WP-17	4/28/1999		5 U	NA	NA	NA	NA	NA
822	999080-SL-WP-18	4/28/1999		11	NA	NA	NA	NA	NA
823	999080-SL-WP-19	4/28/1999		22	NA	NA	NA	NA	NA
824	999080-SL-WP-20	4/28/1999		27	NA	NA	NA	NA	NA
825	999080-SL-WP-21	4/28/1999		6 U	NA	NA	NA	NA	NA
826	999080-SL-WP-22	4/28/1999		120	NA	NA	NA	NA	NA
827	999080-SL-WP-23	4/28/1999		4.6 U	NA	NA	NA	NA	NA
1206	PPSB10	9/4/2001	5 - 7	103	13.5 U	0.0541 U	0.135 U	0.135 U	0.271 U
			10 - 12	27.2 J	11.7 U	0.0467 U	0.117 U	0.117 U	0.233 U
1207	PPSB11	9/6/2001	3 - 4	105	7.12 U	0.0285 U	0.0712 U	0.0712 U	0.142 U
			4 - 5	**2,920**	39.6	0.048 U	0.12 U	0.12	0.545
1208	PPSB12	9/6/2001	3 - 5	**255**	47.1	0.1 U	0.25 U	0.25 U	0.501 U
			8 - 10	**3,200 J**	44.8	0.03 U	0.0751 U	0.158 J	0.403
1209	PPSB13	9/8/2001	5 - 7	9.84	11 U	0.044 U	0.11 U	0.11 U	0.22 U
			7 - 8	**909**	3.31 U	0.0132 U	0.0331 U	0.0331 U	0.0661 U
1210	PPSB14	9/6/2001	5 - 7	**14,200**	**323**	**0.721 J**	0.815 J	4.25	26.3
			10 - 12	141	37.1 U	0.148 U	0.371 U	0.371 U	0.742 U
1212	PPSB16	9/6/2001	5 - 7	**3,400 J**	26.3	0.0531 U	0.133 U	0.133 U	0.266 U
			10 - 12	**261 J**	20.7	0.04 U	0.1 U	0.1 U	0.2 U
		10/19/2001	3 - 5	NA	4.2	0.0142 U	0.0354 U	0.0354 U	0.0708 U
			7 - 9	NA	89.7 J	0.157 U	0.34 U	1.21	0.822 J
1214	PPSB17	9/10/2001	5 - 7	4 U	5 U	0.02 U	0.05 U	0.05 U	0.1 U
			10 - 12	4 U	3.61 U	0.0144 U	0.0361 U	0.0361 U	0.0722 U
1216	PPSB19	9/17/2001	1 - 5	**4,060 J**	143	0.1 U	0.25 U	0.518 J	2.7 J
			15 - 17	5.76	1.92 U	0.0077 U	0.0192 U	0.0192 U	0.0384 U
			20 - 22	**3,750**	162	0.455 U	1.14 U	1.14 U	2.77 J
		10/19/2001	3 - 5	NA	41 J	0.11 UJ	0.274 UJ	1.04 J	5.87 J
			7 - 9	NA	22.9 UJ	0.0282 U	0.0542 U	0.0542 U	0.458 U
1218	PPSB2	8/25/2001	5 - 7	**14,300 J**	119	0.0191 J	0.0317 U	1.05	2.24 J
			10 - 12	16.7	2.56 U	0.0102 U	0.0256 U	0.0256 U	0.0512 U
1219	PPSB20	9/21/2001	4 - 6	**284**	19.6 U	0.0785 U	0.196 U	0.196 U	0.393 U
			8 - 10.5	**986**	2.52 U	0.0101 U	0.0252 U	0.0252 U	0.0503 U
1220	PPSB21	9/21/2001	4 - 6	4 U	3.24 U	0.013 U	0.0324 U	0.0324 U	0.0648 U
			9 - 11	4 U	2.64 U	0.0106 U	0.0264 U	0.0264 U	0.0528 U
1221	PPSB22	9/21/2001	4 - 6	119	4.28 U	0.0171 U	0.0428 U	0.0428 U	0.0855 U
			9 - 10.5	**8,840 J**	35.4	0.0303 U	0.0757 U	0.624	0.68

Table B-1 (Continued)
Summary of Analytical Results for DRO, GRO, and BTEX in Soil Samples
SWMU 17, Power Plant No. 3

Location ID	Location Cross Reference	Sample Date	Depth Range (feet bgs)	Diesel-Range Organics (mg/kg)	Gasoline-Range Organics (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)
1222	PPSB23	9/29/2001	4 - 5.5	**970**	33.3 J	0.0468 U	0.117 U	0.395	1.14
			8 - 10.5	**11,000 J**	188	0.625 U	1.56 U	2.74 J	4.86 J
			14 - 15.5	**270 J**	11.4	**0.0341**	0.0797 U	0.129	0.458
1223	PPSB3	8/26/2001	5 - 7	**28,700 J**	316	0.08 U	0.2 U	2.69	4.78 J
			10 - 12	89	5 U	0.02 U	0.05 U	0.05 U	0.1 U
1224	PPSB4	8/26/2001	5 - 7	25.1	5 U	**0.0274**	0.05 U	0.05 U	0.1 U
			10 - 12	123	8.7 U	**0.0451**	0.087 U	0.087 U	0.174 U
			16 - 17	16.3	1.94 U	0.0078 U	0.0194 U	0.0194 U	0.0389 U
1225	PPSB5	8/26/2001	8 - 10	4 U	3.11 U	0.0124 U	0.0311 U	0.0311 U	0.0622 U
			18 - 20	142	2.44	0.0133	0.0231 U	0.0231 U	0.0611 J
1226	PPSB6	8/26/2001	10 - 12	**4,540 J**	41.5	0.0101 U	0.0173 U	0.397	1.25 J
			24 - 26	36.4	3.9 U	0.0156 U	0.039 U	0.039 U	0.0781 U
1227	PPSB7	8/27/2001	5 - 7	45.5	8.94 U	0.0357 U	0.0894 U	0.0894 U	0.179 U
			15 - 17	**308**	3.08	0.0103 U	0.0257 U	0.0257 U	0.0514 U
			24 - 26	5.64	2.32 U	0.0093 U	0.0232 U	0.0232 U	0.0465 U
1228	PPSB8	9/4/2001	5 - 7	**35,200 J**	11 U	0.044 U	0.11 U	0.11 U	0.22 U
			10 - 12	140	1.88 U	0.0075 U	0.0188 U	0.0188 U	0.0375 U
1229	PPSB9	9/4/2001	4 - 6	4	1.75 U	0.007 U	0.0175 U	0.0175 U	0.035 U
37	MW-17-6	7/11/1990	3 - 7	NA	NA	0.0089 U	0.0089 U	0.0084 J	0.027
			7 - 11	NA	NA	**0.8**	0.79 J	0.86	2
50	MW-17-7	7/13/1990	3 - 7	NA	NA	0.006 U	0.0026 J	0.006 U	0.006 U
45	MW-17-10	7/14/1990	10 - 12	NA	NA	0.0034	0.0045	0.003	0.0071
			20 - 22	NA	NA	0.01 U	0.011	0.01 U	0.005 J
42	MW-17-11	7/13/1990	3 - 5	NA	NA	**0.058**	0.079	0.26	1.2
3	R-3	8/26/1998	9 - 10	25	5.2 U	0.052 U	0.052 U	0.052 U	0.052 U
6	R-6	8/26/1998	6 - 8	**7,500**	180	0.65 U	0.65 U	0.65 U	1.9
Lowland Locations									
4	YC1	10/25/1990	2.5 - 3	NA	NA	0.0018 U	0.004	0.0012 U	0.0024 U
6	YC3	10/25/1990	2 - 2.5	NA	NA	0.0025 U	0.036	0.0017 U	0.0033 U
7	YC4	10/25/1990	3 - 3.5	NA	NA	0.49 U	0.66 U	0.32	0.46
8	YC5	10/25/1990	3 - 3.5	NA	NA	0.0019 U	0.0039	0.0013 U	0.0025 U
107	107	7/30/1995	0 - 0.5	**8,000**	6 J	1.7 U	1.7 U	1.7 U	1.7 U
109	109	8/3/1995	0 - 0.5	**78,000**	**550**	0.062 U	0.17	0.75	2.4
110	110	8/3/1995	0 - 0.5	**12,000**	67	0.078 U	0.078 U	0.078 U	0.078 U
111	111	8/3/1995	0 - 0.5	**11,000**	91	0.012 U	0.018	0.012 U	0.062
112	112	8/3/1995	0 - 0.5	**33,000**	6.8	0.014 U	0.014 U	0.014 U	0.014 U
113	113	8/3/1995	0 - 0.5	**61,000**	1.3 U	0.012 U	0.012 U	0.012 U	0.012 U
114	114	8/3/1995	0 - 0.5	**18,000**	1.2 U	0.012 U	0.012 U	0.012 U	0.012 U
115	115	8/3/1995	0 - 0.5	**2,100**	1.6 U	1.7 U	1.7 U	1.7 U	1.7 U
116	116	8/3/1995	0 - 0.5	**20,000**	1.1 U	0.056 U	0.056 U	0.056 U	0.056 U
117	117	8/3/1995	0 - 0.5	**4,700**	1.2	0.012 U	0.012 U	0.012 U	0.012 U
1205	PPSB1	8/25/2001	2 - 4	17.1	2.75 U	0.0116	0.0275 U	0.0275 U	0.055 U
			5 - 7	31.1	2.04 U	0.0082 U	0.0204 U	0.0204 U	0.0408 U
			7 - 8	105	2.21 U	0.0088 U	0.0221 U	0.0221 U	0.0442 U
1215	PPSB18	9/17/2001	5 - 7	13.7	5 U	0.02 U	0.05 U	0.05 U	0.1 U
			7 - 7.5	4.42	5.92 U	0.0237 U	0.0592 U	0.0592 U	0.118 U
810	05-810	7/14/1998	4 - 8	4.9 UJ	2.9 U	0.03 U	0.03 U	0.03 U	0.03 U
811	05-811	7/14/1998	4.5 - 5.5	5.7 UJ	2.9 U	0.03 U	0.03 U	0.03 U	0.03 U
815	05-815	7/6/1999	2 - 4	4 U	5 U	0.05 U	0.1 U	0.1 U	0.1 U
			6 - 7	41	5 U	0.05 U	0.1 U	0.1 U	0.1 U
1	MW-17-5	7/11/1990	5 - 7	NA	NA	0.0011 U	0.0017	0.0011 U	0.0007 J

Table B-1 (Continued)
Summary of Analytical Results for DRO, GRO, and BTEX in Soil Samples
SWMU 17, Power Plant No. 3

Location ID	Location Cross Reference	Sample Date	Depth Range (feet bgs)	Diesel-Range Organics (mg/kg)	Gasoline-Range Organics (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)
46	MW-17-8	7/12/1990	5 - 7	NA	NA	0.0011 U	0.0005 J	0.0011 U	0.0025
47	MW-17-9	7/12/1990	3 - 7	NA	NA	0.0011 U	0.0011 U	0.0011 U	0.0011 U
			7 - 11	NA	NA	0.0012 U	0.0012 U	0.0012 U	0.0012 U
4	R-1	8/22/1998	7 - 8.5	4.6 U	2.8 U	0.028 U	0.028 U	0.028 U	0.028 U
2	R-2	8/24/1998	5 - 7	**1,100**	3 U	0.03 U	0.03 U	0.03 U	0.03 U
5	R-5	8/24/1998	7 - 8	5.9	2.9 U	0.029 U	0.029 U	0.029 U	0.029 U
Screening Criteria[a]				8,250	1,400	120	17,000	8,300	166,000
Screening Criteria[b]				12,500	1,400	6.4	180	89	81
Screening Criteria[c]				230	260	0.02	4.8	5	69

[a]Alaska DEC Method 2 soil criteria for human ingestion.
[b]Alaska DEC Method 2 soil criteria for human inhalation.
[c]Alaska DEC Method 2 soil criteria to prevent migration to groundwater.

Notes:
Boldface type with shading indicate detected concentrations that exceed the most stringent Alaska DEC Method 2 soil criteria.
Some sample location IDs on Figure 2-3 may not be included on this table because sample analyses did not include DRO, GRO, or BTEX.
bgs - below ground surface
BTEX - benzene, toluene, ethylbenzene, and total xylenes
DEC - Department of Environmental Conservation
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated concentration
mg/kg - milligram per kilogram
NA - not analyzed
U - chemical not detected at concentration shown

Table B-2
Summary of Analytical Results for DRO, GRO, and BTEX in Groundwater Samples
SWMU 17, Power Plant No. 3

Location Cross Reference	Sample Date	Diesel-Range Organics (µg/L)	Gasoline-Range Organics	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
Upland Wells							
HC-2	06/25/01	**160,000**	163J	1.05	0.5U	10.7	5.31
HC-3	06/26/01	**148,000**	137J	0.2 U	0.5 U	0.776	1.16
MW-17-6	08/22/90	NA	NA	10 U	10 U	10 U	7.7 J
	10/16/90	NA	NA	5 U	5 U	5 U	5 U
	05/31/92	NA	NA	10 U	10 U	10 U	10 U
	08/21/92	NA	NA	10 U	10 U	10 U	10 U
	08/12/95	100 U	**1,400**	3 U	3 U	21	27
	01/11/97	**30,000**	**2,800**	NA	NA	NA	NA
MW-17-7	08/22/90	NA	NA	1 U	1 U	1 U	1.3
	10/16/90	NA	NA	1 U	1 U	1 U	0.5 J
	05/31/92	NA	NA	12 U	12 U	12 U	1 J
	08/22/92	NA	NA	10 U	10 U	10 U	10 U
	11/11/92	NA	NA	10 U	10 U	2 J	2 J
	03/02/93	NA	NA	50 U	50 U	50 U	50 U
	08/10/95	**2,000**	190	3 U	3 U	3 U	3 U
	01/06/97	**2,100**	180	NA	NA	NA	NA
	08/07/98	**1,800 J**	150	1 U	1 U	1.1	2.7
	09/29/01	621	50 U	0.2 U	0.5 U	0.5 U	1 U
MW-17-10	08/22/90	NA	NA	1 U	1 U	1 U	1 U
	10/16/90	NA	NA	1 U	1 U	1 U	1 U
	05/31/92	NA	NA	3 J	10 U	10 U	10 U
	08/22/92	NA	NA	10 U	10 U	10 U	10 U
	08/10/95	510	100 U	3 U	3 U	3 U	3 U
	01/05/97	250 UJ	100 UJ	NA	NA	NA	NA
MW-17-11	08/22/90	NA	NA	2.1	1 U	1 U	5.8
	10/16/90	NA	NA	0.7 J	1 U	1 U	2.9
	08/12/95	**14,000**	110	3 U	3 U	7	3 U
	01/06/97	**1,600**	100 UJ	NA	NA	NA	NA
MW-2	01/04/97	**6,400**	470	NA	NA	NA	NA
MW-3	01/06/97	**9,200**	1,000	NA	NA	NA	NA
MW-4	01/04/97	**5,500**	240	NA	NA	NA	NA
MW-5	01/05/97	1,100	100 UJ	NA	NA	NA	NA
MW-6	01/04/97	**4,900**	100 UJ	NA	NA	NA	NA
PP-01	09/28/01	159	50 U	0.2 U	0.5 U	0.5 U	1 U
PP-03	09/29/01	248	50 U	0.2 U	0.5 U	0.5 U	1 U
PP-05	09/29/01	**40,600**	501 J	8.73	1.25 U	44.2	43.1
PP-06	09/29/01	912	50 U	0.2 U	0.5 U	0.5 U	1 U
R-3	09/19/98	770	100 U	0.9	0.5 U	0.5 U	0.5 U
	06/25/01	**2,930**	50 U	0.413	0.5 U	0.5 U	1 U
	09/27/01	497	50 U	0.358	0.5 U	0.5 U	1 U

Table B-2 (Continued)
Summary of Analytical Results for DRO, GRO, and BTEX in Groundwater Samples
SWMU 17, Power Plant No. 3

Location Cross Reference	Sample Date	Diesel-Range Organics (µg/L)	Gasoline-Range Organics	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
Upland Wells (Continued)							
R-6	09/18/98	**3,800**	350	3.4	1.1	28	24
	06/25/01	**496,000**	445	2.84	0.743 J	24	20.4
	09/28/01	**134,000 J**	346 J	1.16	1.79 J	10.4	8.62 J
	10/03/02	NA	NA	2 U	2 U	2.7	2 U
Lowland Wells							
05-375	06/25/01	296	50 U	0.2 U	0.5 U	0.5 U	1 U
	09/28/01	100 U	50 U	0.2 U	0.5 U	0.5 U	1 U
	10/14/01	698	90 U	0.5 U	1 U	1 U	2 U
	10/03/02	460	18 J	1 U	1 U	1 U	3 U
05-810	08/07/98	200 UJ	100 U	1 U	1 U	1 U	1
	08/13/99	NA	20 U	0.4 U	0.6 U	0.4 U	0.8 U
	11/07/99	200 U	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	02/12/00	160 U	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	05/30/00	160 UJ	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	10/07/01	549 U	NA	0.5 U	1 U	1 U	1 U
	10/03/02	160 U	7.3 J	1 U	1 U	1 U	3 U
05-811	08/07/98	190 UJ	100 U	1 U	1 U	1 U	1 U
	08/13/99	NA	20 U	0.4 U	0.6 U	0.4 U	0.8 U
	11/11/99	160 U	20	0.2 U	0.3 U	0.2 U	0.2 U
	02/05/00	160 UJ	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	05/29/00	160 UJ	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	10/07/01	581 U	90 U	0.5 U	1 U	1 U	1 U
	10/03/02	160 U	50 U	1 U	1 U	1 U	3 U
05-815	08/14/99	NA	20 U	0.4 U	0.6 U	0.4 U	0.4 U
	11/11/99	170	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	02/05/00	160 UJ	20	0.2 U	0.3 U	0.2 U	0.2 U
	05/29/00	160 UJ	20 U	0.2 U	0.3 U	0.2 U	0.2 U
	09/28/01	247	50 U	0.2 U	0.5 U	0.5 U	1 U
	10/07/01	543 U	90 U	0.5 U	1 U	1 U	1 U
	10/03/02	120 J	10 J	1 U	1 U	1 U	3 U
MW-17-5	08/22/90	NA	NA	1.1	1 U	1 U	1 U
	10/16/90	NA	NA	0.8 J	1 U	1 U	1 U
	05/28/92	NA	NA	10 U	10 U	10 U	10 U
	08/21/92	NA	NA	10 U	10 U	10 U	10 U
	08/09/95	**1,600**	100 U	5	3 U	3 U	3 U
	01/11/97	1,400	100 U	NA	NA	NA	NA

Table B-2 (Continued)
Summary of Analytical Results for DRO, GRO, and BTEX in Groundwater Samples
SWMU 17, Power Plant No. 3

Location Cross Reference	Sample Date	Diesel-Range Organics (µg/L)	Gasoline-Range Organics	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
Lowland Wells (Continued)							
MW-17-8	08/22/90	NA	NA	1 U	1 U	1 U	1 U
	10/16/90	NA	NA	1 U	1 U	1 U	1 U
	05/28/92	NA	NA	10 U	10 U	10 U	10 U
	08/20/92	NA	NA	10 U	10 U	10 U	10 U
	03/04/93	NA	NA	100 U	210	270	640
	08/10/95	440	100 U	3 U	3 U	3 U	3 U
	01/05/97	250 UJ	100 UJ	NA	NA	NA	NA
MW-17-9	08/22/90	NA	NA	1 U	1 U	1 U	1 U
	10/16/90	NA	NA	1 U	1 U	1 U	1 U
	05/28/92	NA	NA	10 U	10 U	10 U	10 U
	08/10/95	240	100 U	3 U	3 U	3 U	3 U
	01/05/97	250 UJ	100 UJ	NA	NA	NA	NA
MW-7	01/05/97	**2,100**	120	NA	NA	NA	NA
	08/07/98	280 J	100 U	1.4	1 U	1 U	1 U
PP-02	09/29/01	271	50 U	0.2 U	0.5 U	0.5 U	1 U
PP-04	09/29/01	180	50 U	0.2 U	0.5 U	0.5 U	1 U
R-1	09/19/98	1,500	100 U	2.3	0.5 U	2.4	0.5 U
	06/25/01	**15,100**	50 UJ	1.01	0.5 UJ	2.06	1 UJ
	09/27/01	**2,870**	57.4	0.586	0.5 U	0.5 U	1 J
	10/15/01	**3,730**	NA	NA	NA	NA	NA
R-2	09/19/98	480	100 U	0.5 U	0.5 U	0.5 U	0.5 U
R-5	09/18/98	1,400	100 U	1.5	0.5 U	1.8	2.2
Screening Criteria[a]		1,500	1,300	5	1,000	700	10,000

[a] Alaska DEC criteria for groundwater not used as a drinking water source.

Notes:
Boldface type with shading indicates detected concentrations that exceed Alaska DEC criteria for groundwater not used as a drinking water source.
BTEX - benzene, toluene, ethylbenzene, and xylenes
DEC - Department of Environmental Conservation
DRO - diesel-range organics
GRO - gasoline-range organics
J - estimated value
NA - not analyzed
ug/L - micrograms per liter
U - chemical not detected in concentrations above the method reporting limit.